

MASTER OF INFORMATION AND COMMUNICATION STUDIES
Capstone Project



**UNIVERSITY OF THE PHILIPPINES
OPEN UNIVERSITY**

MASTER OF INFORMATION AND COMMUNICATION STUDIES

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Design and Development of the UPLB Vehicle Sticker Management System

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10 May 2024

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Design and Development of the UPLB Vehicle Sticker Management System

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This paper prepared by **Abril A. Moldez** with the title: “**Design and Development of UPLB Vehicle Sticker Management System**” is hereby accepted by the Faculty of Information and Communication Studies, U.P. Open University, in partial fulfillment of the requirements for the degree Course.

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ACKNOWLEDGMENTS

First and foremost, I want to express my gratitude to Jesus, my Lord and Savior, for His abundant blessings and unwavering favor throughout this journey.

I am immensely grateful to my family for their unwavering support and encouragement, especially my wife Cecille, whose constant belief in me pushed me to strive for excellence. I am also thankful for my two sons, Jairen and Josiah, who are a source of happiness and enjoyment during challenging times. Additionally, I extend my gratitude to all the members of my family, including Tatay Ensong and Nanay Josie, Tatay James and Nanay Esper, Tito Bok, Boss JM, Tita Afa and Nathan, Kuya Ian, Ate Bebe, Ianne and JE, as well as Kuya Nelson, Tita Dada, and Dwayne. Your unwavering love and support have been my strength throughout this journey, and I am deeply grateful for each of you.

I extend my sincere appreciation to the University of the Philippines Los Baños (UPLB) Office of the Vice Chancellor for Community Affairs (OVCCA), Vice Chancellor Roby Cereno, Ma'am Benevie Villanueva, Ma'am Joy Cordez, and the dedicated staff of the Security and Safety Office (SSO) led by Attorney Eric Peralta. Your trust in me to design and develop this project is truly humbling.

I am deeply indebted to my project adviser, Ma'am Ria Borromeo, for her invaluable guidance and support throughout development. My gratitude also goes to my former supervisor, Mr. Mark Lester Chico, for his unwavering support. Also, to the UPLB DIC personnel under Dr. Paolo Sanchez's leadership and, specifically, to the System Administration team.

Lastly, I would like to thank the Square Bits team, who have been part of my UPOU journey. Thank you Jiggz, Sir Oli, Ken, Sir Raf, Lein, Anna, Ma'am Janice, Bryle, and Zed. I valued all the times we met virtually and encouraged each other.

ABSTRACT

The University of the Philippines Los Baños (UPLB) aims to revamp its Vehicle Sticker Application system through the Office of the Vice Chancellor for Community Affairs and the Security and Safety Office. The existing online platform, developed hastily during the pandemic, has proven inefficient and user-unfriendly, leading to user dissatisfaction. Operating on outdated technology (CodeIgniter v3), the system faces security and functionality issues. This project proposes a redesign and technology update to enhance the application process, making it accessible, efficient, and secure. The new system will streamline the registration, payment, and appointment processes by transitioning to a modern technology stack, such as Laravel and FilamentPHP. It aims to provide a user-friendly interface, real-time tracking, and improved management functionalities. This initiative addresses current system inadequacies and aligns with UPLB's commitment to campus security and efficient traffic management.

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Chapter I

INTRODUCTION

A. Statement of the Problem

The University of the Philippines Los Baños - Office of the Vice Chancellor for Community Affairs (UPLB-OVCCA), through the Security and Safety Office (SSO), has an existing application called the UPLB Vehicle Sticker Application. This project is an online system for processing applications for UPLB vehicle stickers. Due to the pandemic, the university had to transition from its traditional method of processing sticker applications to an online platform. Because the project was rushed and didn't have detailed plans, constituents applying for UPLB vehicle stickers found the process confusing. This resulted in several unpleasant responses, specifically regarding the registration, payment, and appointment processes, which are time-consuming and inefficient. In terms of development, the application operates on an old technology setup, particularly using CodeIgniter v3 [1], which might face problems like bugs and security issues.

Therefore, the problem is to redesign and update the UPLB Vehicle Sticker Application, making sure it includes all the changes needed to be user-friendly, efficient, and secure. Specifically, the system should be able to:

- Simplify the application process to make it more accessible to non-technical individuals
- Streamline the registration, payment, and appointment processes to reduce processing time
- Upgrade the application to a modern technology stack to improve security and eliminate potential bugs and issues
- Enhance the overall user experience of the application.

B. Background and Objectives of the Project

UPLB has introduced a vehicle sticker system to manage the traffic of vehicles around the campus. This system also adds an extra level of security, given the numerous vehicles entering and leaving through various entry points. Previously, the Single Sign-On (SSO) manually handled all applications from different UPLB members. However, it was only during the pandemic that they opted to use an online platform for sticker applications and related procedures.

The previous system, the UPLB Vehicle Sticker Application, is an online platform that processes sticker applications for UPLB students, faculty, staff, alums, and other constituents who enter UPLB with their vehicles. However, this system posed several issues that made the users anxious and hesitant to use the application. Aside from this, the system runs on an outdated technology stack (CodeIgniter v3) that has potential security risks and may encounter bugs. This current system's registration, payment, and appointment processes are also not optimized, leading to inefficiencies and delays.

Objectives:

The project aims to upgrade the current system by designing and developing a vehicle sticker management system. Specifically, the project would like to achieve the following:

- Update the system to a more modern technology stack that is secure and scalable to accommodate future updates and enhancements.
- Reduce processing time and delays by automating and optimizing the sticker management process.
- Provide a more intuitive and user-friendly interface for the online application process that minimizes confusion and streamlines the registration, payment, and appointment processes.
- Provide real-time tracking, monitoring, and reporting functionalities to ensure transparency and accountability in the management of vehicle stickers.

C. Significance and Scope of the Project

Significance:

The significance of this project lies in its potential to improve the SSO's service in managing the processes that involve UPLB Sticker, from account registration to sticker application until issuance. With enhanced security, simplified process flow, and user-friendly UI, the development of the UPLB Vehicle Sticker Management System solves the frustrations and threats of the original system.

As an MIS student, this project presents an excellent opportunity to apply theoretical concepts to real-world problems, gain practical experience in system development, and contribute to improving the UPLB community.

Scope:

This project includes designing, developing, and implementing the UPLB Vehicle Sticker Management System using modern technologies such as Laravel and FilamentPHP. The system features account management, vehicle and sticker applications, application evaluation and approval, vehicle inspection, record violations, and sticker issuance control. It will also generate real-time reports needed by management.

D. Documentation of Existence and Seriousness of the Problem

The UPLB Vehicle Sticker Application has been in place for several years. Still, recent developments have highlighted several issues that must be addressed. The current system is a computer-aided mechanism that leads to inefficiencies, inaccuracies, and delays in the processing of vehicle sticker applications. Additionally, it lacks the necessary functionalities

for tracking and monitoring vehicle stickers' status. The current system does not provide the means to retrieve crucial information regarding sticker number assignment, sticker inventory, and vehicle information, leading to complications and increased security risks for the university.

A review of the current UPLB Vehicle Sticker Application revealed the following issues:

Confusing process flow

The system involves multiple isolated steps, including account registration and payment verification. Applicants must pre-register using a Google Form provided by the SSO and wait at least two(2) to three(3) days before their accounts are uploaded into the system. Also, after paying for the sticker, the proof of payment must be emailed to the cashier. These steps confuse the users and lead to application processing delays, increasing staff workload. Appendix B shows the flow chart of the previous system.

Inefficient Digital Workflow and Time-consuming Processes.

Despite being computerized, the current process relies on a third-party application and involves additional actions. Applicants must create a Google Drive, upload their documents, and share the Google Drive link with the designated UPLB sticker email address. This additional workflow introduces complexities and prolongs the processing time, hindering the seamless issuance of stickers.

In reference with the flow chart of the previous system, it will take days for an applicant to complete the process. Since the whole process is a combination of manual and online procedures, only the online approval of the requests were able to be measured. The previous approval process took 18 days 5 hours and 52 minutes on average. Adding to this are the times spent in the verification process and releasing process. Without a doubt, the previous version of the system was time-consuming.

Outdated Technology

The current UPLB Vehicle Sticker Application runs on an obsolete technology stack (CodeIgniter v3), which could encounter bugs and security issues. The application's codebase is challenging to maintain and update, which could lead to further delays and potential system downtime.

Tracking and Monitoring difficulties

The current system makes tracking and monitoring stickers' issuance, sticker inventory, and vehicle lists challenging. This could lead to potential security risks, such as fraudulent activities and inconsistent information.

Chapter II

REVIEW OF EXISTING ALTERNATIVES

Overview

UPLB's vehicle sticker has validity; in the last period, it can only be used to access the campus for three(3) years, 2021 - 2023. Since the information on the vehicle and sticker application are in the same table, it would be challenging for the SSO to separate the last stickers for the new period. To solve this problem, an update to the data model could be done, but the SSO has no technical personnel to do this. Another way is to reset all sticker and vehicle information, meaning the last period data will be deleted. This approach could be done quickly, but the system will face the same problem.

This section explores the available alternatives and possible solutions to help SSO improve vehicle and sticker-related information processing and management.

Vehicle Information System

A Vehicle Information System (VIS)[2] is a software solution that manages vehicle-related data, such as fuel consumption, maintenance schedules, and driver behavior. VIS optimizes vehicle operations, improves efficiency, and reduces operational costs. It provides real-time insights into vehicle performance, maintenance needs, and compliance requirements, benefiting various sectors such as transportation, logistics, and public services.

Fleet Complete is a system for fleet managers that includes real-time GPS tracking, route optimization, maintenance scheduling, and driver performance monitoring. It helps streamline fleet operations, improve efficiency, and reduce costs. Fleet Complete also provides insights into vehicle utilization, fuel consumption, and maintenance requirements. Its user-friendly interface, customizable reporting tools, and advanced analytics make it a preferred choice for organizations seeking to optimize their vehicle management processes.

Entrance Access Control System

An entrance access control system utilizing vehicle stickers is a widely used security measure by organizations and residential areas to manage access. Stickers are issued to authorized vehicles and attached to a visible part, like the windshield, allowing automated gates with sensors to identify and grant access. This system enhances security, controls traffic, and ensures safety by managing vehicle entry, reducing unauthorized access, and maintaining a secure environment. It also streamlines entry processes, alleviates congestion, and improves the user experience, offering better security, operational efficiency, and safety.[3]

One of the most common applications of entrance access control systems using vehicle stickers is Automatic Vehicle Identification (AVI) systems. AVI systems utilize RFID (Radio Frequency Identification) technology to automatically identify vehicles with RFID tags or stickers as they approach entry points. These systems are widely used in various industries, including gated communities, corporate campuses, parking facilities, and toll roads, to facilitate efficient access control and vehicle management. AVI systems offer real-time vehicle movement monitoring, secure access control, and seamless integration with existing security infrastructure. Popular AVI system providers include Nedap, Sirit Technologies, and TransCore[4].

The Vehicle Sticker Management System (VSMS) of UPLB provides various benefits that other solutions do not offer.

Comprehensive Management

While Vehicle Information Systems (VIS) and Fleet Complete focus on managing vehicle-related data and fleet, VSMS concentrates on managing vehicle stickers and access control within the university premises. It is a dedicated solution for handling sticker applications, issuance, and access control, ensuring efficient management that caters to the university's needs [15].

Customization and Integration

VSMS differs from Entrance Access Control Systems and Automatic Vehicle Identification (AVI) systems, which mostly deal with security and access control. VSMS offers customization options to adapt to the unique requirements of UPLB, ensuring seamless integration with existing systems and operational workflows.

User-Centric Approach

VSMS prioritizes the user experience of UPLB constituents. It provides an intuitive interface for applying for vehicle stickers online and managing access within the campus. While other systems may focus on broader fleet management or security functionalities, VSMS is tailored to meet the specific needs of students, faculty, and staff, providing a user-friendly solution that enhances overall satisfaction and convenience.

Cost-Effectiveness

Commercially available solutions such as Vehicle Information Systems, Fleet Complete, and Entrance Access Control Systems typically involve significant upfront costs, licensing fees, and ongoing subscription expenses. However, the UPLB Vehicle Sticker Management System (VSMS) can be developed and implemented to meet the university's budget constraints. With in-house development expertise and open-source technologies, VSMS offers a cost-effective solution that can be customized and scaled according to the university's financial resources, providing long-term savings and flexibility in budget allocation.

Chapter III

PROJECT DETAILS

A. Overview

Description of the Design

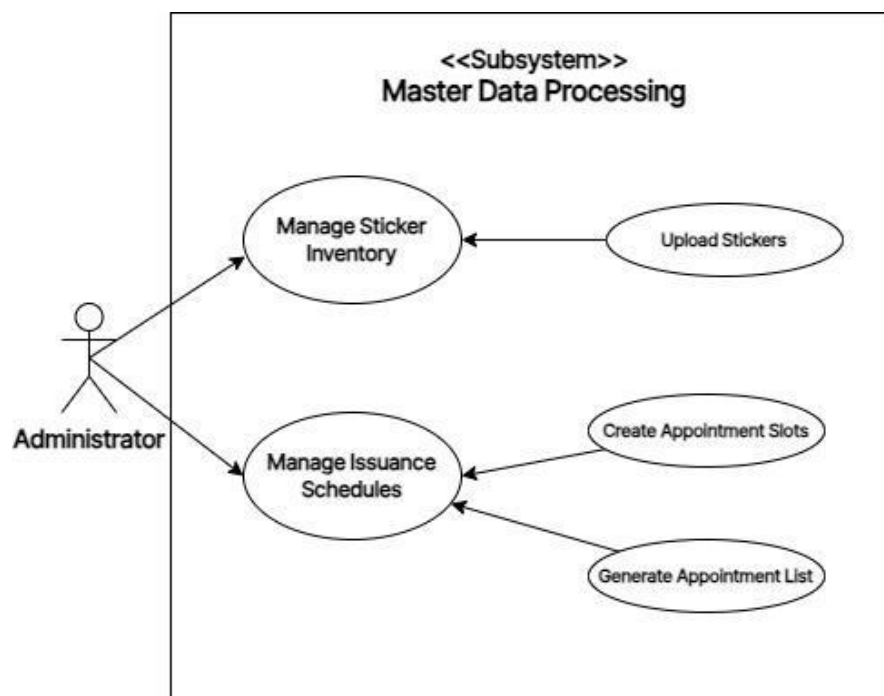
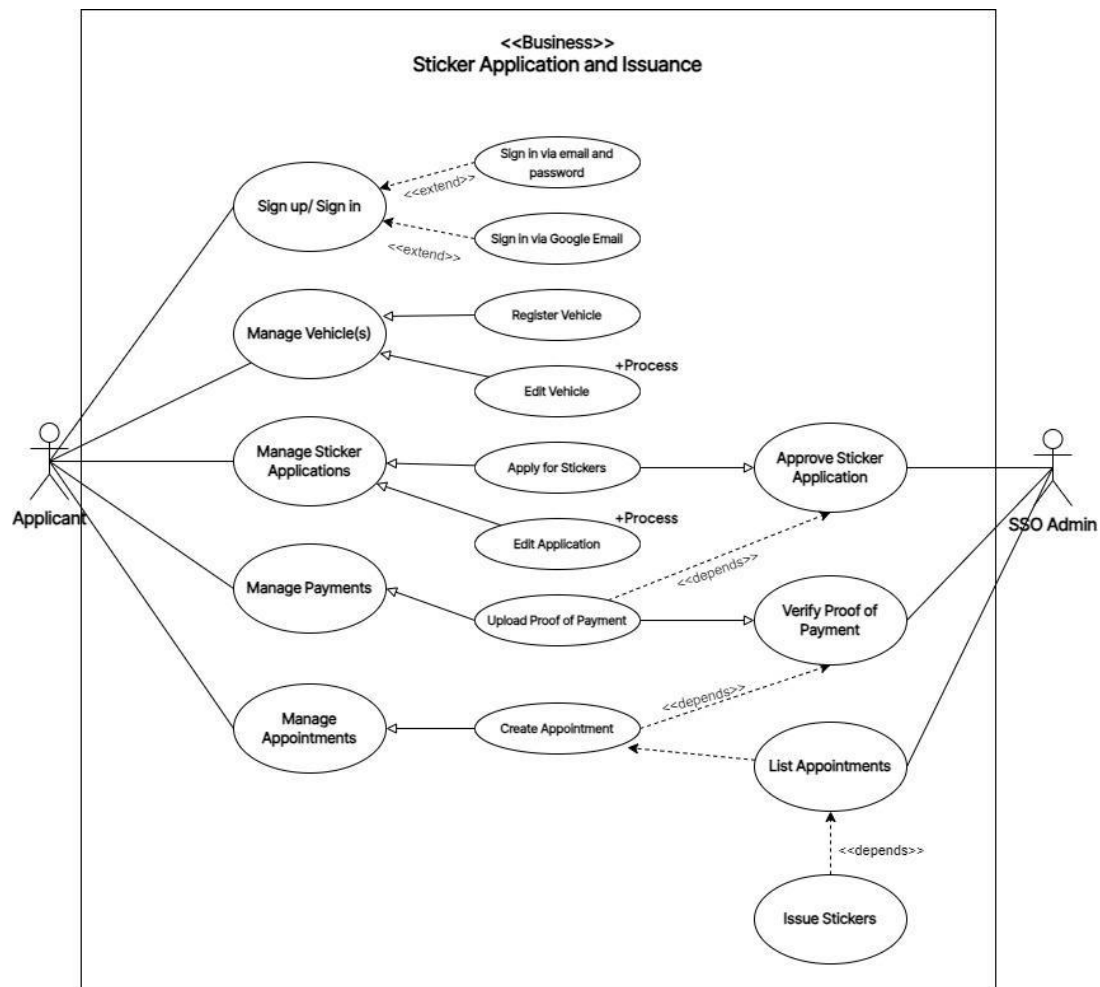
The UPLB Vehicle Sticker Management System (VSMS) is a web-based system that computerizes the management of vehicle and sticker applications for the University of the Philippines Los Baños (UPLB) [5]. It is designed to replace the current system, which is outdated, inefficient, and not scalable. VSMS allows UPLB constituents to apply for vehicle stickers online, and the SSO uses the system to process and issue the stickers.

UPLB VSMS was developed by incorporating various frameworks. The model-view-controller (MVC)[6] pattern divides the application into three interconnected components. To implement this, the Laravel framework creates the application's scaffolding.

The application was also created using the TALL stack,[7] a development stack comprising TailwindCSS for user interface, Alpine.js for interactivity, Livewire for real-time server-side interaction, and Laravel to handle the backend.

The application can be accessed using a web browser from desktop computers, laptops, tablets, and smartphones.

Use Case Diagram



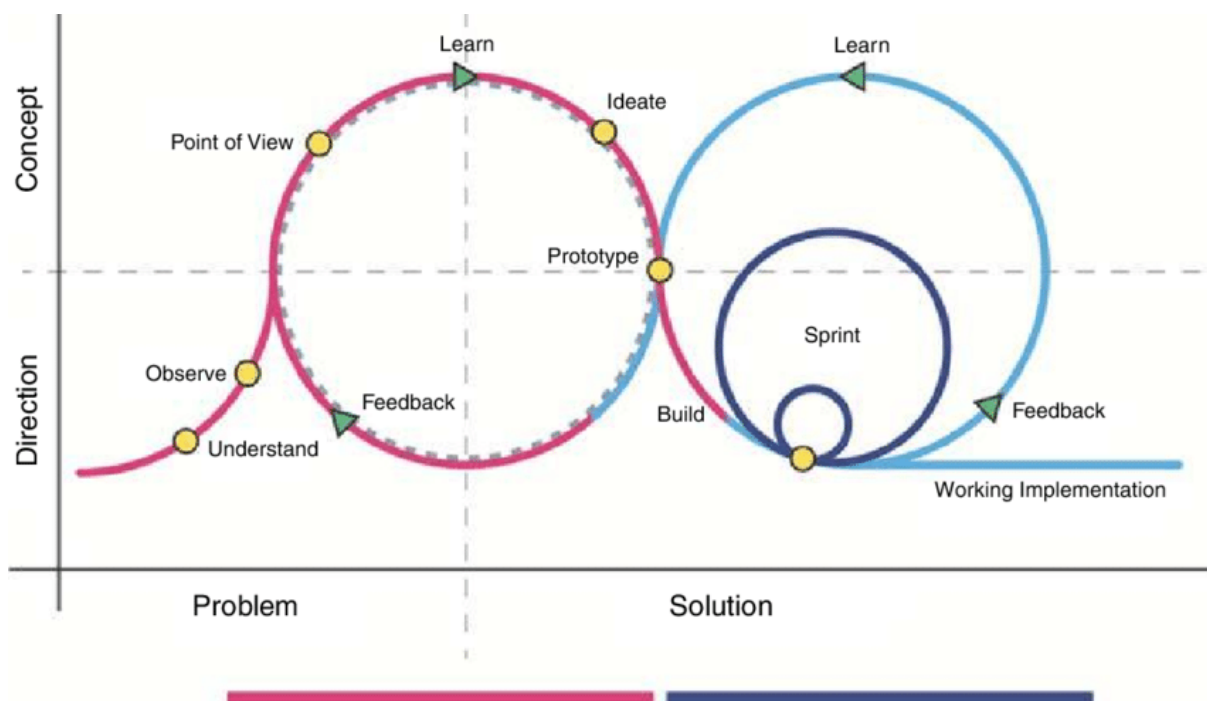
The VSMS use case diagram illustrates interactions between system actors and functionalities.

Actors:

1. **Applicants:** Represent individuals who want to apply for UPLB vehicle stickers.
2. **SSO Admin:** This group represents SSO employees responsible for managing vehicles, processing sticker applications, scheduling appointments, and issuing stickers.
3. **Administrator:** Represents users with administrative privileges who manage system settings, user accounts, sticker inventory, and access permissions.

B. Theoretical Framework

Co-creation process model



The Co-Creation process model is pivotal in fostering user-centric, innovative solutions through active stakeholder engagement.[10] This model thrives on the collaboration between end-users, management, and developers throughout the development journey, ensuring that

the final product closely aligns with its users' actual needs and expectations. This alignment boosts user satisfaction and significantly enhances the chances of successful system adoption. By promoting a shared sense of ownership and commitment among all involved parties, co-creation paves the way for continuous refinements and innovations, making the solutions more competitive and relevant.

Pairing this model with the Kanban methodology, [11] a vital component of the Agile framework, further amplifies its effectiveness. Kanban emphasizes continuous delivery, collaboration, and adaptability through iterative progress. It utilizes a visual board to map the development process, aiding in smooth workflow management and quickly identifying bottlenecks. This collaboration between co-creation and Kanban promotes continuous improvements and quick reactions to evolving needs, ensuring the development process stays agile and effective.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a theoretical framework that aims to understand the factors influencing adopting and using new technologies within organizations. [12] Fred Davis developed TAM in the 1980s, proposing that an individual's intention to use technology is mainly determined by perceived ease of use and usefulness. Perceived ease of use refers to the extent to which users believe that using the technology will be effortless and free of complexity. On the other hand, perceived usefulness relates to the belief that the technology will enhance job performance or productivity. TAM has been widely used in research and practice to gain insights into user attitudes and behaviors towards information systems. It guides the design and implementation process to enhance user acceptance and satisfaction.

Unified Modeling Language (UML)

Unified Modeling Language (UML) [9] is a standardized modeling language used in software engineering to visualize, design, and document software systems. UML provides a set of graphical notations and symbols representing system architecture, components, interactions, and behaviors, making it easier for developers and stakeholders to communicate and understand complex systems. By using UML diagrams, such as use case diagrams, class diagrams, sequence diagrams, and activity diagrams, developers can visualize system requirements, design decisions, and implementation details in a clear and structured manner.

C. Technologies Used

The UPLB VSMS was developed using various technologies to create a comprehensive and interactive web application. The primary programming language used in the development is PHP. To streamline the development process and ensure best practices, the developer utilized the Laravel framework. It is a popular and powerful framework that provides a robust foundation for web application building[13]. To kickstart the development, the developer used Filament PHP [14], a helpful tool for developing full-stack applications. Filament PHP is a tool that utilizes the TALL stack, including technologies such as Tailwind CSS, Alpine.js, Livewire, and Laravel. The database used to deploy UPLB VSMS is MariaDB[16]. However, since Laravel utilizes Object-Relational Mapping (ORM)[17], a database abstraction layer, the application can also support other database systems such as MySQL, PostgreSQL, SQLite, and SQL Server. UPLB VSMS runs on a Nginx server in a Linux operating system for the web server. Additionally, Redis is utilized to ensure efficient session handling. The UPLB VSMS delivered a high-performing and user-friendly web application by leveraging these technologies.

A version control system, Git [18], was used for system update and maintenance. The developer created a private repository of the program files on Github, and during testing and deployment, the system was launched using a CI/CD tool called GoCD.

D. System Design

a. System Features

VSMS List of features:

1. Authentication and authorization

The system allows users to register accounts and has a module for managing user roles and permissions.

2. Online application of vehicle stickers

Enables users to apply for vehicle stickers online, eliminating the need for physical forms.

3. Processing of applications and verification of documents

A module for UPLB SSO to process applications and check uploaded documents

4. Management of Registered Vehicles

Recording vehicle information such as plate number, brand and model, color, vehicle year, and owner.

5. Issuance and assignment of vehicle sticker numbers

Sticker numbers are automatically generated upon application completion to simplify the issuance process.

6. Generation of appointment list and appointment information

This feature allows the applicant to generate information about their appointment that will be used during sticker issuance.

7. Sticker Inventory

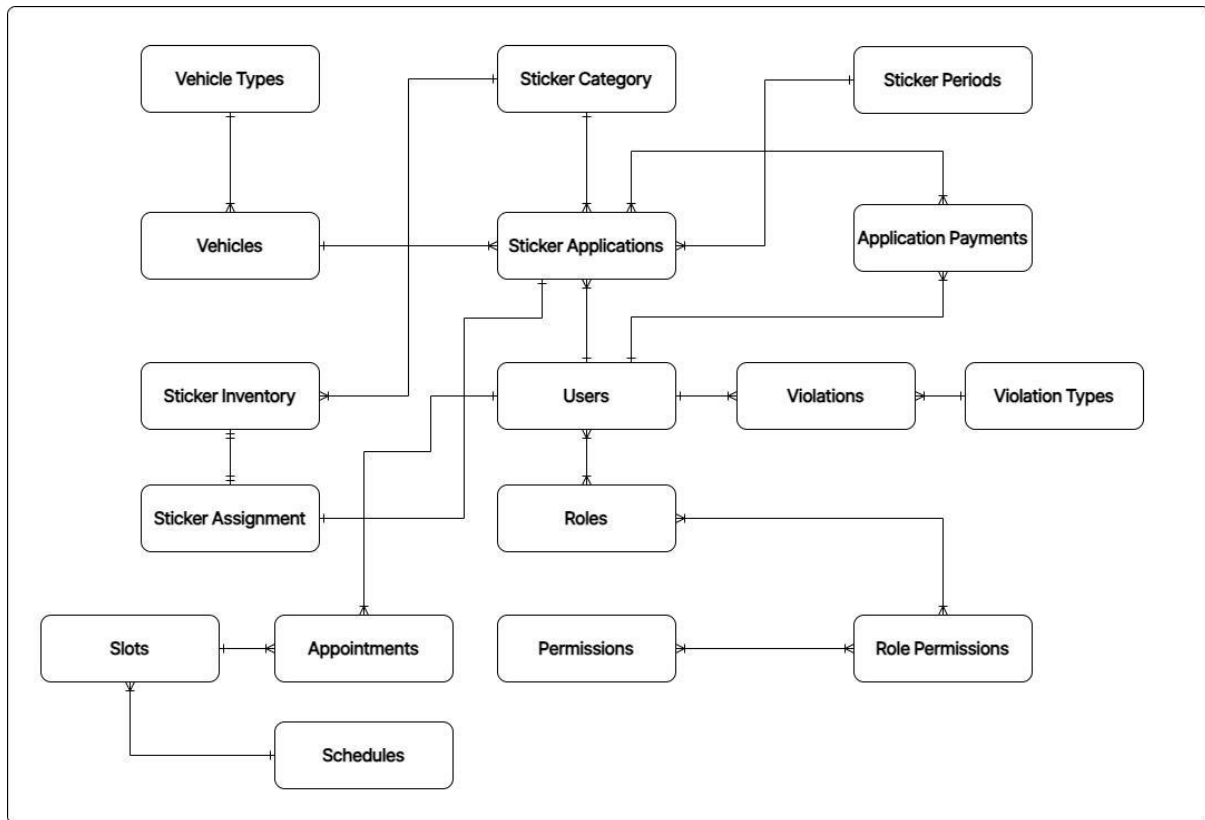
Maintain an inventory of available stickers and receive alerts when supplies are low.

8. Vehicle Inspection

Incorporate a feature for SSO Inspectors to verify vehicle condition and compliance during the sticker issuance.

b. Database Design

Entity Relationship Diagram



The diagram depicts the relationship between the entities in this UPLB VSMS application. The SSO (Security and Safety Office), the application's administrator, enters all configuration data for entities like the vehicle types, sticker categories, violations, inventory, roles, appointment schedules, and slots. With this setting, the master data for sticker management and processing will be created. [9].

In this ERD

Entities

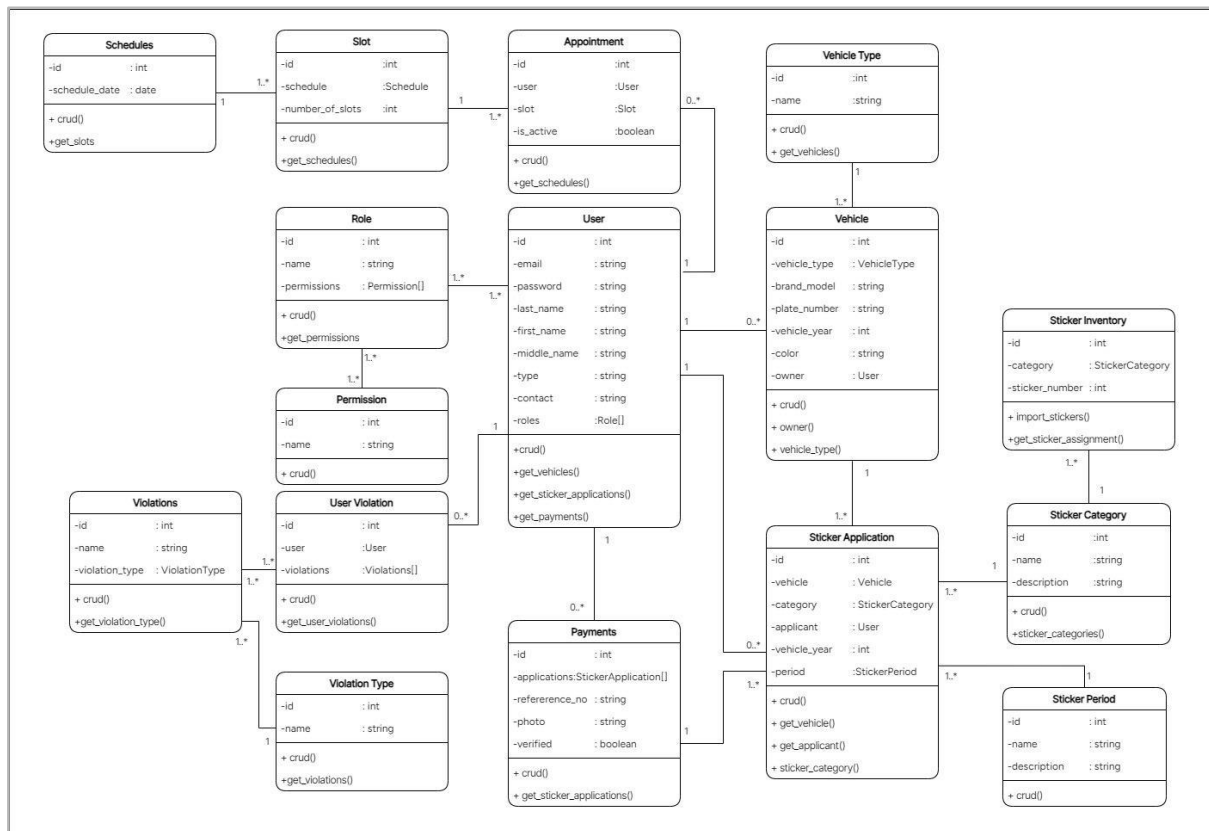
1. **Vehicle:** Represents the registered vehicles in the system, storing information about each vehicle available for application. Attributes include vehicle_id, owner_id, plate_number, model_year, brand_model and color.

2. **Applicant (User):** Represents the users interacting with the application. Attributes include user_id, email, last_name, first_name, middle_name and contact information.
3. **Sticker Application:** Represents the applications placed by the users. Attributes include id, applicant_id, sticker_category_id, vehicle_id, approver_id and status.
4. **Application Payment:** This represents the uploaded proof of payment made by the users. Attributes include id, reference_number, payment_date, image of payment, and is_verified.
5. **Sticker Inventory:** This represents the number of physical stickers recorded in the system. Attributes include id, sticker_category, and sticker_number.
6. **Sticker Assignment:** Represents the sticker number assigned to a completed application. Attributes include id, application_id, and sticker_inventory_id.

Relationships

1. **Has/owns:** Represents the relationship between users and vehicles. It indicates that the user owns or registers a vehicle. This is a one-to-many relationship because a user can own one or more vehicles.
2. **Apply:** Represents the relationship between users and sticker applications. It indicates that a customer applies for a vehicle sticker. This is a one-to-many relationship because a user can apply for one or more vehicle stickers.
3. **Assigned:** Represents the relationship between sticker applications and sticker inventory. It indicates that a sticker application has been assigned a sticker number. This is a one-to-one relationship because a sticker application can only be assigned to a single number.

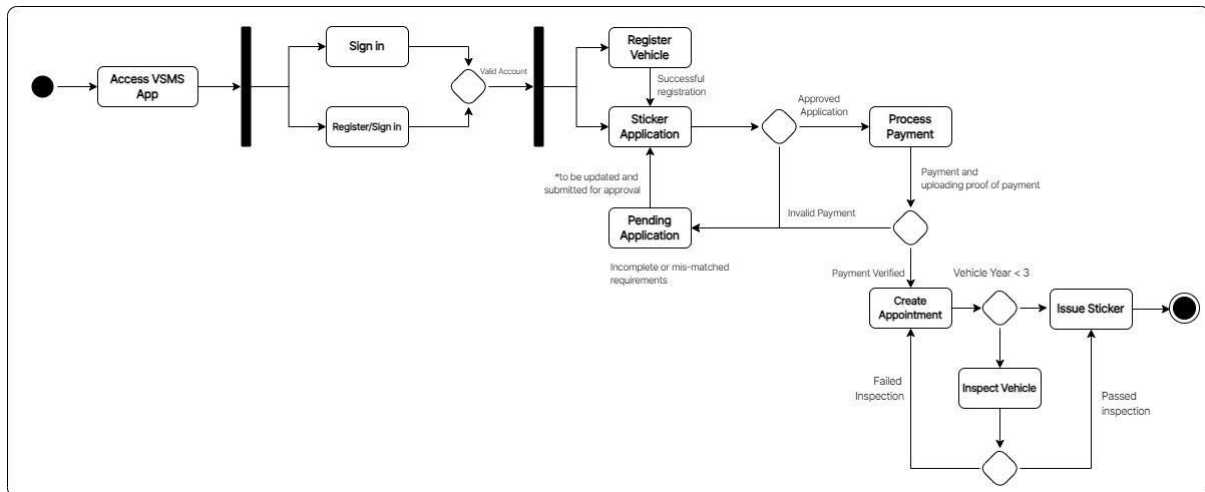
Class Diagram



The class diagram for the Vehicle Sticker Management System (VSMS) depicts the essential components and their relationships within the system. It comprises classes representing key entities, their attributes, and methods.

1. **Vehicle:** Represents the class for vehicles. It has a public attribute of vehicle_type, brand_model, plate_number, vehicle_year, color, and owner. Operation includes vehicle_types(), and sticker_application().
2. **User:** Represents the class for users. It has an attribute for email, password, last_name, first_name, middle_name, and contact information. Operations includes get_sticker_applications(), get_vehicles() and, get_payments().
3. **Sticker Application:** Represents the class for sticker applications. It has attributes such as sticker_category, vehicle, applicant, status, and approver. Operations includes sticker_category(), get_applicant(), and get_vehicle().

Activity Diagram



The activity diagram for the Vehicle Sticker Management System (VSMS) outlines the sequential steps involved in various operations within the system. It begins with the initiation of the system and progresses through critical activities such as:

Authentication: The diagram depicts how customers interact with the system, including logging in or signing up for an account.

Vehicle Registration: It illustrates activities related to registering or updating a vehicle.

Applying for a Sticker: The diagram shows the instructions involved in the sticker application process, including filling out an application form and uploading the required documents.

Process payment: This includes uploading proof of payment and verification.

Appointment Scheduling: The diagram may also depict activities related to creating an appointment for sticker issuance.

Vehicle Inspection and Issuance: Illustrates the process of inspection and issuance during the appointment time.

The activity diagram visually represents the Vehicle Sticker Management System workflow from account registration to sticker issuance. It helps identify process dependencies, streamline operations, and ensure efficient system functionality.

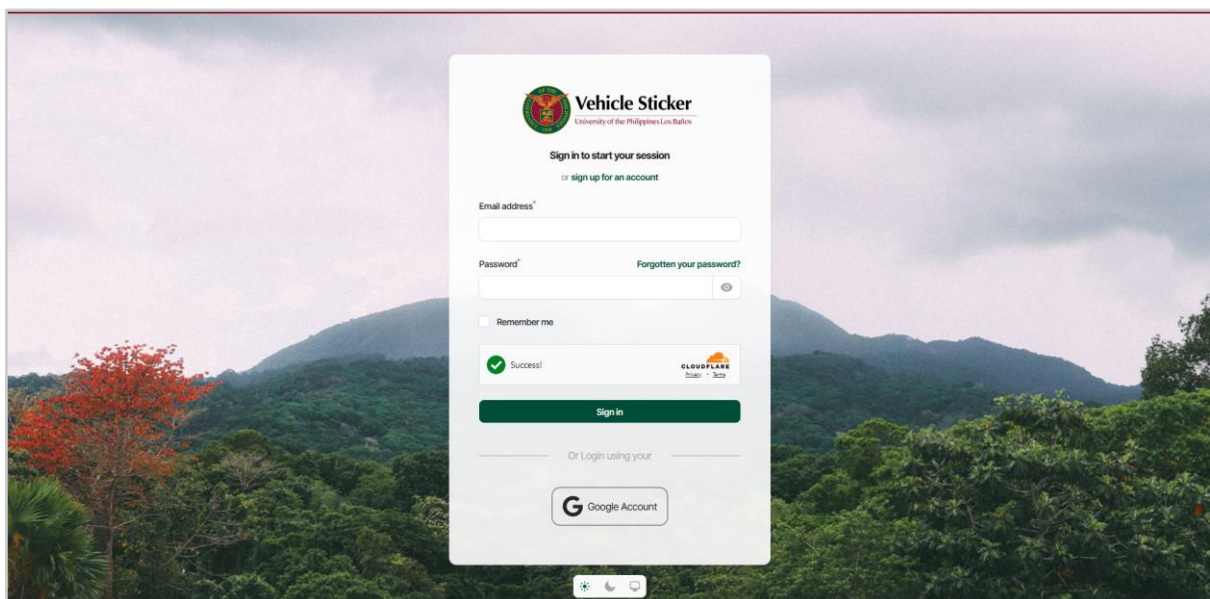
E. Implementation

In implementing the UPLB Vehicle Sticker Management System (VSMS), the Security and Safety Office (SSO) devised a strategy for scheduling access and efficiently processing sticker applications. UPLB employees (FACULTY, REPS, and ADMIN) were the first to access the application to register and apply for a vehicle sticker. User guides, process flowcharts, and sticker terms and conditions were prepared to guide the applicants using the application. During this period, the system only allowed access via Google email. Employees' account details were exported from the previous system and imported to UPLB VSMS.

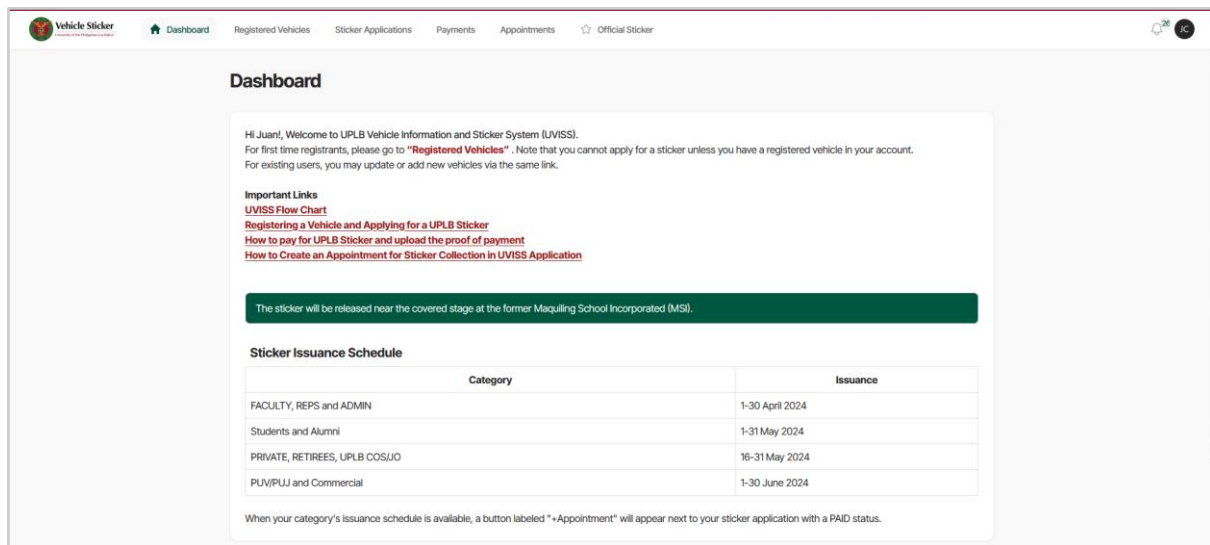
On the developer's side, the program files were shared with the UPLB Digital Information Center (UPLB DIC) via GitHub to prepare for deployment. It was deployed first using a test server for testing and verification and was scheduled to be publicly available on March 11, 2024. The application can be accessed via web browser at this address: <http://sticker.uplb.edu.ph>. Later on, the application was transferred to a pipeline to facilitate better system updates and maintenance.

F. Resulting System

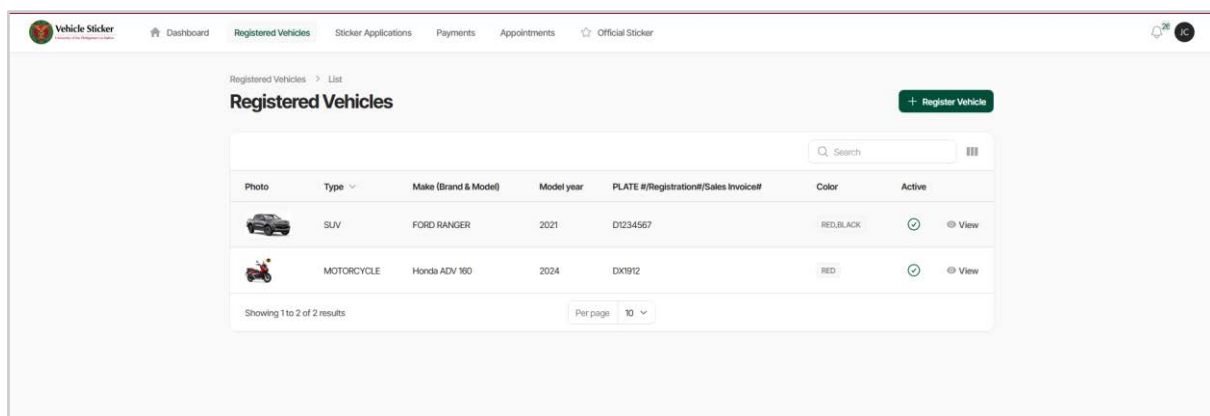
1. Applicants Panel



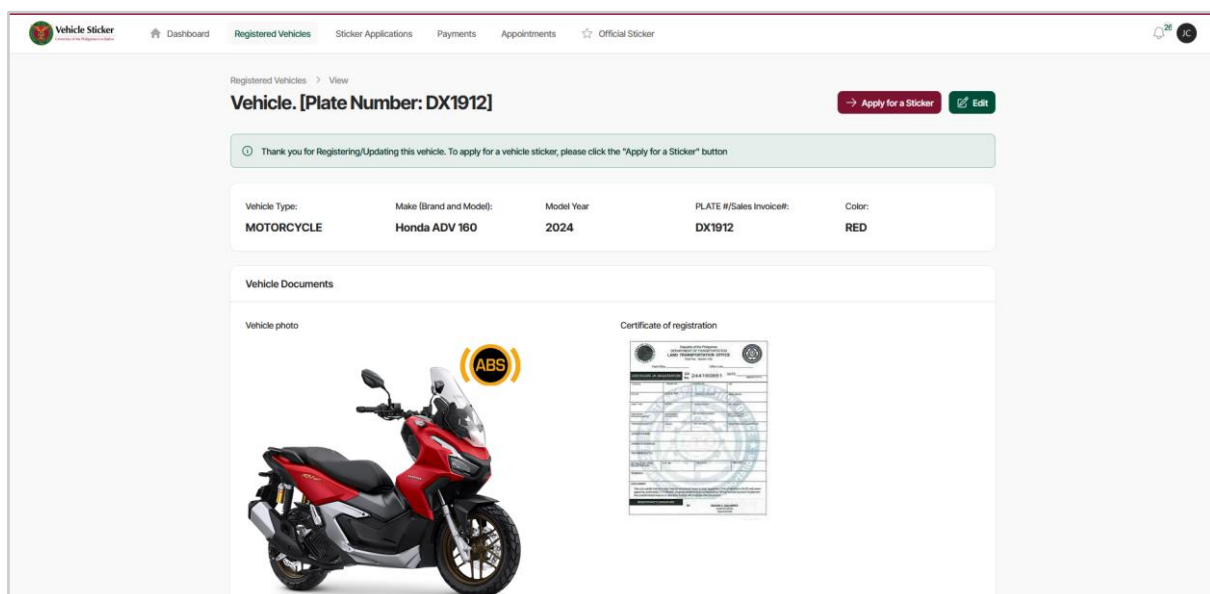
Sign-in page



Dashboard



List of registered vehicles



View of a registered vehicle

Vehicle Sticker Dashboard Registered Vehicles Sticker Applications Payments Appointments Official Sticker					
Sticker Applications List					
Sticker Applications + New sticker application					
Search					
Category	Vehicle type	Plate#/Registration#/Invoice#	Model Year	Status	
STUDENTS	SUV	D1234567	2021	PAID	View + Appointment
Showing 1 result		Per page 10			

List of sticker applications

Sticker Applications

Create

Apply for a Vehicle Sticker

01 Important Notice

02 Application Information

03 Application Requirements

Welcome **Juan Dela Cruz** to the UPLB Vehicle Information and Sticker System. We would like to inform you that we value your privacy and will ensure that your personal data is handled with utmost care and in compliance with the Data Privacy and other applicable laws. By submitting your application, you agree that the UPLB OVCCA may collect, record, organize, update/modify, retrieve, consult, consolidate, and use your personal data as part of the evaluation and archiving process of the office.

To continue, please agree to the terms an condition below.

☒
I Agree to the [Terms and Conditions](#) for UPLB Vehicle Stickers 2024-2025*

Next

→ Submit Application

↶ Cancel Application

Step 1: Sticker application

Sticker Applications

Create

Apply for a Vehicle Sticker

✓ Important Notice

02 Application Information

03 Application Requirements

Sticker Category*

Select an option

Select Vehicle*

Select Registered Vehicle

Registered Vehicles will be shown in this field. If it is not in the list, check it in the Registered Vehicles and make sure to update the information

Back

Next

→ Submit Application

↶ Cancel Application

Step2: Sticker application

Sticker Applications > Create

Apply for a Vehicle Sticker

✓ Important Notice

✓ Application Information

03 Application Requirements

Select and upload the requirements (Check the list of requirements below.)

Drag & Drop your files or [Browse](#)

You are only allowed to upload a maximum of six (6) files (Image Only), each with a size limit of 2MB per file.

[Back](#)

[→ Submit Application](#)
[← Cancel Application](#)

Step 3: Sticker application

Sticker Applications > View

Sticker Application. [Plate Number: D1234567]

ⓘ Your payment has been verified. You can now schedule an appointment to receive your sticker. Please check the issuance schedule of your application category.

ⓘ Sticker Application Information

👤 Applicant Information

🚗 Vehicle Information

Vehicle Type	Make(Brand and Model)	Plate # / Registration# / Invoice#	Model Year	Color
SUV	FORD RANGER	D1234567	ⓘ 2021	RED,BLACK

📄 Requirements





View of a sticker application

Application Payments

Upload Proof of Payment

Search

Category	Vehicle	Reference number	Payment date	Verified	
STUDENTS	D1234567	SAMPLE-PAYMENT-AAMOLDEZ	Mar 18, 2024		View

Showing 1 result

Per page 10

List of application payments

Upload Proof of Payment

Select sticker application (Search for brand/model)*

Select an option

This will display all of your Sticker Applications that were approved for payment.

Transaction Reference #*

Payment date*

mm / dd / yyyy

Proof of Payment*

Drag & Drop your files or [Browse](#)

File format should be image (jpg or png is recommended) and less than 2MB in size

Remarks

Upload Cancel

Uploading of proof of payment

Appointment

Schedule*

31 May 2024

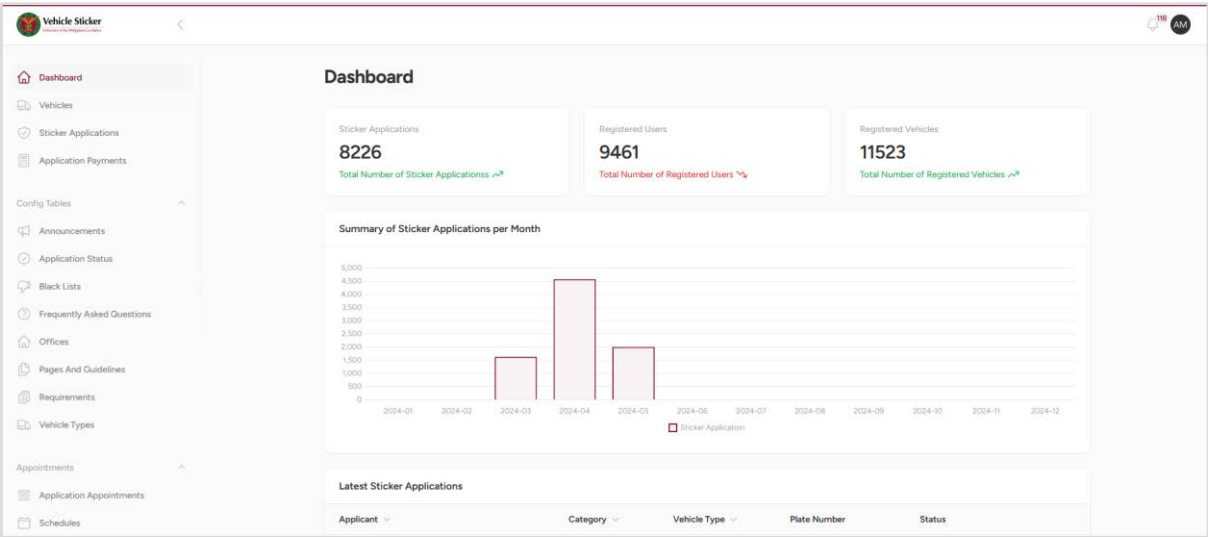
Choose Time*

01:00 PM to 04:00 PM
Available Slots: (20)

Submit Cancel

Creating an appointment

2. Admin Panel (SSO)



Administration dashboard

Vehicle Sticker

Vehicles

[New vehicle](#)

☐ Vehicle type	Brand model	Vehicle year	Plate number	Color	Owner	Is active
☐ SEDAN	Toyota Corolla	1992		Silver		☒ View Edit
☐ MOTORCYCLE	Honda Click 125	2020		Black		☒ View Edit
☐ SEDAN	Honda Civic	2017		Modern Steel		☒ View Edit
☐ SUV	Ford Everest Titanium	2016		Cool White		☒ View Edit
☐ SEDAN	Suzuki Alto	2016		Black		☒ View Edit
☐ VAN	Suzuki APV	2017		Black		☒ View Edit
☐ AUV	Toyota Avanza	2017		Gray		☒ View Edit
☐ SUV	TOYOTA RUSH	2021		Bronze Mica Metallic		☒ View Edit
☐ EBIKES	Suzuki Raider 150 FI	2020		Black		☒ View Edit
☐ SEDAN	Mazda 3	2013		White		☒ View Edit

Showing 1 to 10 of 11,523 results

Per page: 10

1 2 3 4 ... 1152 1153 >

List of vehicles

Vehicle Sticker

Dashboard

Vehicles

Sticker Applications

Application Payments

Config Tables

Announcements

Application Status

Black Lists

Frequently Asked Questions

Offices

Pages And Guidelines

Requirements

Vehicle Types

Appointments

Application Appointments

Schedules

Settings

Sticker Applications

ALL

FOR APPROVAL 1062

APPROVED 629

PAID

PENDING

FOR INSPECTION

FOR RELEASING

COMPLETED 4627

New sticker application

Q Search

Lastname	Firstname	Category	Vehicle Type	Plate Number	Status	
		FACULTY	SUV		COMPLETED	View Edit
		FACULTY	MPV		COMPLETED	View Edit
		ADMIN STAFF	SUV		COMPLETED	View Edit
		ADMIN STAFF	MPV		COMPLETED	View Edit
		FACULTY	SEDAN		COMPLETED	View Edit
		FACULTY	SUV		COMPLETED	View Edit
		ADMIN STAFF	MOTORCYCLE		COMPLETED	View Edit
		FACULTY	MOTORCYCLE		COMPLETED	View Edit
		ADMIN STAFF	MOTORCYCLE		COMPLETED	View Edit

Vehicle Sticker

University of the Pacific - OASIS

Schedules

Settings

Canned Responses

Sticker Periods

Email log

Activity Log

Sticker Applications

Official Stickers

Sticker Categories

Sticker Inventory

Application Inspections

Account Management

Roles

10

Users

Violation Configuration

Violations

Violation Types

Sticker Inventory

Faculty and Staff

3498

Faculty, REPS and Admin

Alumni and Students

2498

Alumni and Students Category

PRIVATE

1499

Retiree, Private, COS/ICS %

COMMERCIAL

0

New sticker inventory

Import

Search

Category	Sticker number	Applicant	
ADMIN STAFF	1001		Edit Delete
ADMIN STAFF	1002		Edit Delete
ADMIN STAFF	1003		Edit Delete
ADMIN STAFF	1004		Edit Delete
ADMIN STAFF	1005		Edit Delete
ADMIN STAFF	1006		Edit Delete
ADMIN STAFF	1007		Edit Delete
ADMIN STAFF	1008		Edit Delete

Chapter IV

PROJECT ASSESSMENT

A. User Testing

To gauge the usability and user satisfaction of UPLB VSMS, a System Usability Survey was given to 100 participants. The System Usability Scale (SUS) [20] was developed as a straightforward usability measurement tool. It comprises a ten-item scale that provides a comprehensive perspective on subjective usability evaluations. The list below shows the survey items:

1. *I think that I would like to use the system frequently.*
2. *I found the system unnecessarily complex.*
3. *I thought the system was easy to use.*
4. *I think that I would need the support of a technical person to be able to use the system.*
5. *I found the various functions in the system were well-integrated.*
6. *I thought there was too much inconsistency in the system.*
7. *I would imagine that most people would learn to use the system very quickly.*
8. *I found the system very cumbersome to use.*
9. *I felt very confident using the system.*
10. *I needed to learn a lot of things before I could get going with the system.*

Below are the steps in deriving the usability score from each respondent:

For odd-numbered items: subtract 1 from the response;

For even-numbered items: subtract the response from 5; and

Get the sum of the converted responses and multiply that total by 2.5.

The total usability score is derived by averaging the usability scores of the respondents. If this score exceeds the global mean of 68, the evaluated solution is deemed relatively usable [27]. Additionally, the SUS Adjective Scale, shown in Table 1, offers a means to interpret SUS scores [28].

Table 1
The SUS Adjective Scale

Usability Score	Adjective
0-25	Worst Imaginable
25-39	Poor
39-52	OK
52-73	Good
73-85	Excellent
85-100	Best Imaginable

Bug Reporting and Resolution Process

During the beta phase of implementation, a bug reporting tool was integrated into the system via a Google Form. This allowed users to report any issues or bugs directly to the support team. Upon receiving bug reports, the developer meticulously investigated and attempted to replicate the reported errors within the staging (testing server) environment. This involved isolating the conditions that triggered the error and assessing its impact on system functionality. Once the error, bugs, or glitches have been identified, the developer makes necessary code modifications to address the issue.

Following code modifications, testing was conducted within the staging environment to validate the effectiveness of bug fixes and ensure system stability.

After successful testing, updated code changes were deployed to the production server. This involved a seamless transition of the tested and validated code from testing to production, ensuring minimal disruption to system operations. Post-deployment monitoring was conducted to verify system stability and functionality.

B. Security Testing

The UPLB VSMS was tested using Zed Attack Proxy (ZAP). ZAP is an open-source penetration testing tool maintained under the umbrella of The Software Security Project (SSP)[23]. It is designed specifically for testing web applications and is both flexible and extensible. Its results summarize four (4) medium-risk and eight low-level vulnerabilities. Medium risk includes the absence of a CSRF token, content security policy(CSP), hidden files, and missing anti-clickjacking header.

The application uses Livewire to handle form requests, and its documentation outlines[24] how its internal security is handled. This describes the usage of the "checksum," which ensures that the data between each request is not tampered with.

However, it does not mention CSRF explicitly. Nonetheless, since each subsequent Livewire request is a POST request to the /livewire/message endpoint, it must be protected with a CSRF token. Since Livewire uses normal Laravel routes, it will validate the token in the backend by default, ensuring all requests are protected. This means that when using any Livewire action, such as wire: click or wire: submit, the framework already handles it.

The next alert concerns setting the CSP header. A Content Security Policy[25] (CSP) is a security standard designed to add a layer of security to web applications. It allows developers to restrict which resources (such as JavaScript, CSS, Images, and others) can be loaded. To handle this risk, the developer coordinates with the UPLB DIC to assess what needs to be done. A strategy to do a security audit of the server was scheduled. However, since the UPLB VSMS is currently being used, the audit will be done using the test server.

The discovered hidden files were included in the application's Laravel package, which helps the framework locate the necessary files for updating the dependencies.

Chapter V

DISCUSSIONS

I. Introduction

This study aimed to update and enhance the existing system using a modern, secure, scalable technology stack. The objective was to reduce processing time and delays, improve user experience, and add real-time tracking and reporting features for transparency and accountability. The Co-creation model was employed to develop the application with collaborative input from stakeholders. The study meets current needs while laying the foundation for future updates and enhancements.

II. Key Findings

Implementation of Co-creation Model in the Design and Development of VSMS

The co-creation process model plays a vital role in the collaboration and stakeholder engagement during the UPLB Vehicle Sticker Management System (VSMS) development. This approach fostered a dynamic environment where stakeholders actively participated in the design process, offering valuable insights and feedback. Consequently, the developer customized the application to meet the unique needs of UPLB, ensuring alignment with the campus's operational workflows and regulations.

Moreover, the involvement of end-users in the co-creation process led to the adoption of a user-centric design approach for the VSMS. By prioritizing intuitive navigation, clear instructions, and simplified workflows, the system was tailored to enhance user experience. As a result, the VSMS boasted a user-friendly interface that minimized confusion and frustration, ultimately driving higher adoption rates and user satisfaction.

Furthermore, the co-creation process cultivated a sense of ownership and buy-in towards the VSMS among the UPLB community. Stakeholders felt personally invested in the system's development, facilitating smoother implementation and adoption across the campus.

This increased acceptance and willingness to embrace the new application was pivotal in overcoming resistance to change and ensuring the successful integration of the VSMS.

The iterative nature of the co-creation model also played a crucial role in the application development lifecycle. Continuous feedback and refinement were solicited from stakeholders at critical milestones, allowing the developer to address emerging challenges, incorporate new requirements, and adapt to evolving user needs. This iterative approach ensured that the final product was functional and closely aligned with stakeholders' expectations, resulting in a system that effectively met the needs of the UPLB community.

The outcomes of the SUS analysis are depicted in Table 2. The collection of 100 scores from the SUS provides significant insights into the perceived usability of VSMS. The mean SUS score of 71.65 shows that, on average, respondents held a moderately favorable view of the system's usability. This metric suggests a general sentiment of ease and effectiveness in system navigation. While the median SUS score of 70 serves as a pivotal point. Positioned at the midpoint of the dataset, it signifies a dichotomy in user experiences. While some users found the system highly intuitive, others encountered complexities or limitations that tempered their evaluations. This variability is further emphasized by the standard deviation of 22.69, indicating that the scores are dispersed around the mean. This means that while the average perception is positive, there are significant variations in individual opinions, with some users rating the usability higher and others lower. Amidst this diversity, a notable outlier emerges in the form of the mode SUS score, which stands at 100. This denotes a subgroup of users who experienced an exceptionally seamless and user-friendly interaction with the system, presumably aligning perfectly with their needs and expectations. This variation holds significance for the developer to take into account during the design or enhancement of the subsequent iteration of VSMS, ensuring alignment with the requirements and anticipations of a broad range of users.

Table 2
SUS score analysis

SUS Score	
<i>SUS score mean</i>	71.65
<i>SUS score median</i>	70
<i>SUS score mode</i>	100
<i>SUS score standard deviation</i>	22.69

Modernizing UPLB VSMS using the TALL Stack and FilamentPHP

In the quest to modernize the UPLB Vehicle Sticker Management System (VSMS), the adoption of FilamentPHP emerged as a pivotal strategy. Integrated seamlessly within the TALL stack framework, FilamentPHP played a critical role in enhancing development efficiency and management capabilities.

FilamentPHP, a comprehensive toolkit for Laravel applications, streamlines development workflows with powerful admin panel functionalities. Its intuitive interface and pre-built components facilitate rapid development, enabling the developer to focus on core features and user experience enhancements. Moreover, FilamentPHP's modular architecture allows easy customization and extensibility, ensuring the VSMS can seamlessly evolve with future requirements.

The utilization of the TALL stack, complemented by FilamentPHP, fostered a cohesive development environment where frontend and backend technologies harmonized effortlessly. Tailwind CSS facilitated the creation of sleek, responsive interfaces, while Alpine.js provided lightweight interactivity without sacrificing performance. Laravel was the robust backend foundation, ensuring security and scalability, while Livewire enriched user experiences with seamless server-side rendering.

The VSMS has been deployed in an NGINX web server known for its outstanding performance, scalability, and robust security features. NGINX's event-driven architecture and efficient resource management ensured optimal performance even under heavy loads, providing a seamless user experience during peak periods.

Additionally, Redis[26] was employed for session handling, offering fast and reliable in-memory data storage—Redis's ability to store and retrieve data in milliseconds significantly improved application responsiveness, enhancing user satisfaction. Furthermore, Redis's persistence mechanisms and built-in replication ensured data durability and high availability, mitigating the risk of data loss or service disruptions.

The integration of FilamentPHP in the TALL stack, along with NGINX for deployment and Redis, has significantly contributed to the modernization and enhancement of the UPLB VSMS. Leveraging these technologies has improved development efficiency, performance, security, and user experience, positioning VSMS as a cutting-edge solution for streamlined vehicle sticker management. Implementing these tools has brought notable improvements to the UPLB VSMS.

Streamlining Processes Enhances Turnaround Time for Sticker Issuance

Eliminating external applications like Google Drive for requirement uploads, email for confirming payments, and Google Forms for pre-registration significantly sped up the process from application submission to the issuance of vehicle stickers. By incorporating these functionalities directly into the UPLB VSMS, users no longer need to use multiple platforms, thereby streamlining the entire process from start to finish.

Incorporating the upload of requirements, payment verification, and registration processes into the VSMS made the user experience more straightforward by removing unnecessary steps and potential delays and allowing for a more seamless sticker application and payment confirmation within the same system.

Additionally, centralizing these operations within the VSMS significantly improved data security and confidentiality by reducing the need to transfer sensitive information across different platforms. Keeping all sensitive data within a single, secure system lessened the chances of data breaches or leaks from third-party applications, ensuring adherence to privacy regulations and increasing user confidence.

The data captured from the VSMS offers insights into the average processing times within a given system. Firstly, the average approval time of the sticker application is reported at 1,075.39 minutes, delineating the typical duration for approval processes to reach completion. Subsequently, the average time for payment verification is documented as 2,650.73 minutes, signifying the average period necessary for payment verification procedures. Furthermore, the average release time is indicated to be 3.53 minutes, representing the standard duration for the stickers to be released. Overall, the average turnaround time, computed as the aggregate of the average approval time, average payment verification time, and average releasing time, totals 3,729.6628 minutes. This equates to approximately 2 days, 14 hours, and 9 minutes, providing a comprehensive overview of the typical time frame required for the entire process, from approval to payment verification to releasing the vehicle sticker.

In summary, by discarding third-party applications and directly embedding streamlined processes within the VSMS, a notable decrease in the time required for issuing stickers was achieved. This approach made the system more efficient and secure and enhanced the user experience, supporting the modernization and service improvement goals within the UPLB campus community.

Chapter VI

CONCLUSION

In conclusion, the redesign and upgrade of the UPLB Vehicle Sticker Application embody a significant leap toward enhancing the UPLB community's operational efficiency and security. This project addresses the current system's immediate inadequacies—such as outdated technology and user-unfriendly processes. It sets a foundation for sustainable, user-centric development by incorporating the co-creation process model. By actively involving stakeholders in the development process, the project ensures that the system truly meets the needs and expectations of its users, fostering a sense of ownership and acceptance among them. Additionally, the Technology Acceptance Model (TAM) is crucial in guiding the design and implementation phases to enhance the system's usability and perceived usefulness, thereby increasing the likelihood of its adoption among users. Integrating advanced technologies and frameworks, like Laravel and FilamentPHP, promises a secure and efficient system and exemplifies the practical application of MIS theories to solve real-world problems. Ultimately, this initiative is anticipated to significantly improve vehicle management and security within the UPLB campus, creating a more seamless and secure environment for all its constituents.

Chapter VII

FUTURE WORK

In the dynamic landscape of modern software development, the pursuit of efficiency, scalability, and user-centric design is paramount. Within this context, the University of the Philippines Los Baños (UPLB) Vehicle Sticker Management System (VSMS) is pivotal in facilitating seamless vehicular access and management within its premises. However, the VSMS can still be improved by following recommendations proposed for its refinement:

Implementation of Microservices Architecture

The VSMS comprises three significant modules: Authorization, Approval and Issuance, and Payment. Adopting a microservices framework can significantly improve the system's modularity and scalability. The system can achieve greater flexibility and efficiency by breaking down these modules into separate services, such as Authorization and Authentication Service, Sticker Processing Service, and Payment Service. Additionally, integrating a mail service into each module would facilitate seamless email notifications and address a crucial communication aspect of the VSMS.

Real-Time Verification of Payment

Currently, payment verification relies solely on manual processes, leading to delays in application processing. A real-time verification mechanism within the VSMS must be implemented to overcome this challenge. By integrating with payment gateways or financial institutions, the system can automatically verify payments as they are made. This would expedite the application process and reduce reliance on manual verification, improving overall efficiency and user satisfaction.

Incorporation of AI Image Processing

Document verification is a critical aspect of the VSMS, but it often involves manual review and validation, which can be time-consuming and prone to errors. Incorporating AI image processing technology is an excellent addition to addressing this issue. By leveraging AI algorithms, the VSMS can automatically recognize and verify uploaded documents, such as driver's licenses or vehicle registration certificates. This automated verification process would streamline application processing, reduce manual intervention, and enhance accuracy.

These recommendations aim to introduce innovative solutions to enhance the performance and effectiveness of the UPLB Vehicle Sticker Management System. By implementing these enhancements, the application can optimize the system's functionality, improve efficiency, and ultimately enhance the overall user experience for stakeholders involved in the VSMS.

REFERENCES

- [1] CodeIgniter user guide. CodeIgniter User Guide - CodeIgniter 3.1.13 documentation. (n.d.). <https://codeigniter.com/userguide3/index.html>
- [2] Fleet Complete. (2023). Fleet Complete: Fleet Management Solutions. Retrieved from <https://www.fleetcomplete.com/>
- [3] Cayetano, F. (2024, March 25). *Vehicle Access Control: 4 Systems and Trends*. ButterflyMX® - Official Site | Video Intercoms & Access Control. <https://butterflymx.com/blog/vehicle-access-control/>
- [4] *Parking & Access Control*. TransCore. (n.d.-a). <https://transcore.com/rfid/parking-access-control>
- [5] [1] Albacea, Eliezer A. and Xavier Aurelio Q. Tabbada. 1998. Management Information Systems Los Baños, Laguna: UP Open University.
- [6] "MVC Framework - Introduction." *Tutorialspoint*, https://www.tutorialspoint.com/mvc_framework/mvc_framework_introduction.htm.
- [7] *Tailwind CSS, Alpine.js, Laravel, and Livewire. One happy family*. TALL stack. (n.d.). <https://tallstack.dev/>
- [8] "Concept: Use-Case Model." *UTM*, https://www.utm.mx/~caff/doc/OpenUPWeb/openup/guidances/concepts/use_case_model_CD178AF9.html.
- [9] Fakhroutdinov, K. (no date) The Unified Modeling Language, UML Diagrams - overview, reference, and examples. Available at: <https://www.uml-diagrams.org/> (Accessed: 06 May 2024).
- [10] Yalcinkaya, Mehmet & Singh, Vishal. (2018). Exploring the Use of Gestalt's Principles in Improving the Visualization, User Experience, and Comprehension of COBie Data Extension. Engineering Construction & Architectural Management. 26. 10.1108/ECAM-10-2017-0226.

[11] (PDF) Kanban in Software Development: A systematic literature review. (n.d.).
https://www.researchgate.net/publication/260739586_Kanban_in_Software_Development_A_Systematic_Literature_Review

[12] eBusiness@Newcastle (no date) *Technology acceptance model - theoryhub - academic theories review for research and T&L, TheoryHub - Reviews of academic theories*. Available at: <https://open.ncl.ac.uk/theories/1/technology-acceptance-model/> (Accessed: 06 May 2024).

[13] *Laravel - The PHP Framework For Web Artisans*, <https://laravel.com>.

[14] Harin, D. (2023a) *Accelerated Laravel Development Framework: Admin panel, form builder, table builder, and more, Filament*. Available at: <http://filamentphp.com/> (Accessed: 03 May 2024).

[15] Wohlin, C., Aurum, A., Jeffery, R., Fernandez-Sanchez, C., and Russo, B. (2012). Building Custom Systems: A Software Engineering Perspective. In Engineering and Managing Software Requirements (pp. 359-361). Springer.

[16] *MariaDB foundation*. MariaDB.org. (2019, November 13). <https://mariadb.org/>

[17] Awati, R. (2023, March 28). *What is object-relational mapping (ORM)? – TechTarget definition*. TheServerSide.com. <https://www.theserverside.com/definition/object-relational-mapping-ORM>

[18] Atlassian. (n.d.). *What is Git: Atlassian Git Tutorial*.
<https://www.atlassian.com/git/tutorials/what-is-git>

[19] “Agile Gantt Charts & How to Use Them.” *Wrike*, <https://www.wrike.com/agile-guide/agile-gantt-charts/>.

[20] Brooke, John. “(PDF) SUS -- a quick and dirty usability scale.” *ResearchGate*, https://www.researchgate.net/publication/319394819_SUS_-_a_quick_and_dirty_usability_scale.

[21] “Entity Relationship Diagram Tutorial.” *Gliffy*, 2 October 2020,
<https://www.gliffy.com/blog/how-to-draw-an-entity-relationship-diagram>.

- [22] *Open source continuous delivery and release Automation Server*. GoCD. (n.d.). <https://www.gocd.org/index.html>
- [23] *The zap homepage*. ZAP. (n.d.). <https://www.zaproxy.org/>
- [24] *Security*. Livewire. (n.d.). <https://laravel-livewire.com/docs/2.x/security>
- [25] MozDevNet. (n.d.). *Content security policy (CSP) - http: MDN*. MDN Web Docs. <https://developer.mozilla.org/en-US/docs/Web/HTTP/CSP>
- [26] *The real-time data platform*. Redis. (2024, May 1). <https://redis.io/>
- [27] Pugoy, Reinald Adrian, Consuelo Habito, and Roberto Jr. Figueroa. "Hybrid online/offline mobile solutions for accessing open educational resources in areas with poor internet connectivity." In: Asian Association of Open Universities Journal 11.2 (2016), pp. 182– 196.
- [28] Bangor, Aaron, Philip Kortum, and James Miller. "Determining what individual SUS scores mean: Adding an adjective rating scale." In: Journal of usability studies 4.3 (2009), pp. 114–123.

APPENDICES

A. Appendix A: Deliverables and Milestones

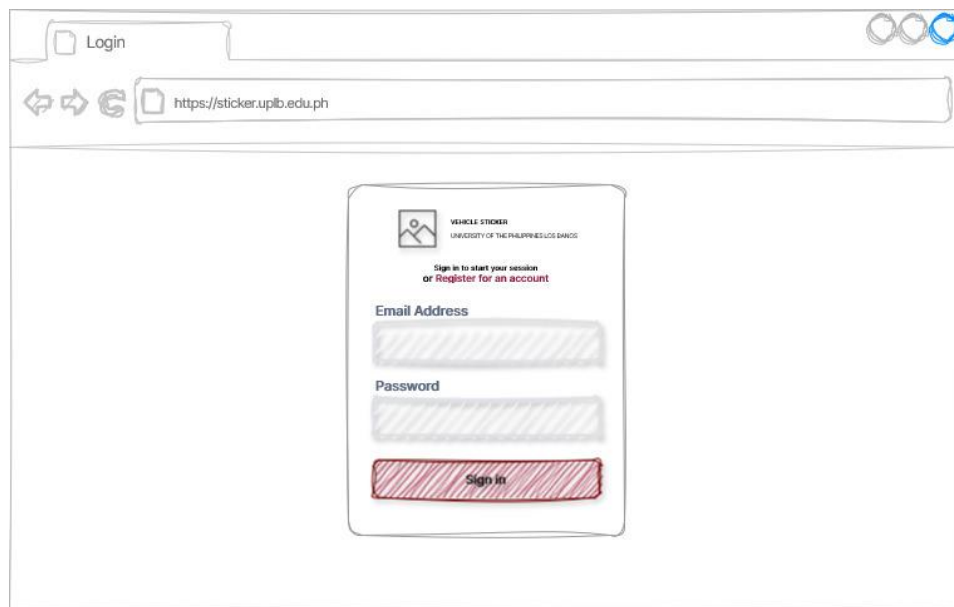
1. Activity Chart

Activity Chart

Activity	SPRINT 1 APR 1 - JUN 7	SPRINT 2 JUN 8 - SEP 30 (Split every 2 weeks)	SPRINT 3 OCT 1 - 15	SPRINT 4 OCT 16 - NOV 15	SPRINT 5 NOV 16 - DEC 15
Needs Assessment	☒				
Requirements Gathering	☒				
Co-creation Workshop with OVCCA - SSO staff	☒				
Create Database Design	☒				
Design Mockups and Wireframes	☒				
Develop Prototype		☒	☒		
Present and Improve Prototype		☒	☒		
Data Migration			☒		
Beta Testing				☒	
Training				☒	
Implementation					☒
Maintenance					☐

☒ - Completed Task

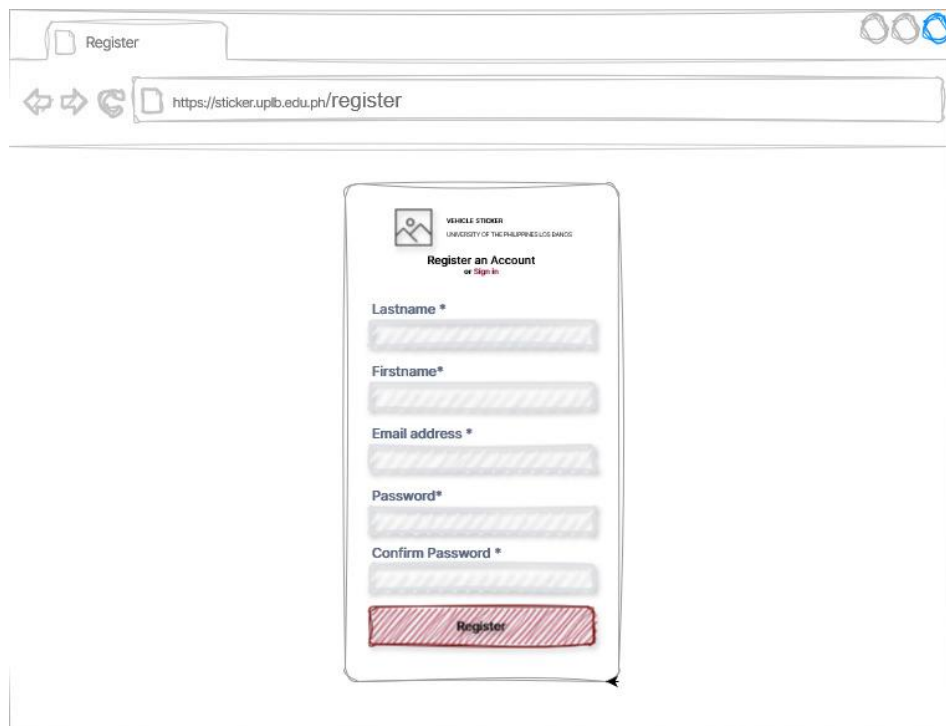
2. Prototype



The wireframe shows a web browser window with a tab labeled 'Login'. The address bar contains the URL 'https://sticker.uplb.edu.ph'. The main content area features a login form with the following elements:

- Logo: A small icon of a person and a car, with the text 'VEHICLE STICKER' and 'UNIVERSITY OF THE PHILIPPINES LOS BAÑOS' below it.
- Text: 'Sign in to start your session or Register for an account'.
- Form fields: 'Email Address' and 'Password'.
- Button: A red 'Sign in' button.

Figure 1: UPLB VSMS Login Page (wireframe)



The wireframe shows a web browser window with a tab labeled 'Register'. The address bar contains the URL 'https://sticker.uplb.edu.ph/register'. The main content area features a registration form with the following elements:

- Logo: A small icon of a person and a car, with the text 'VEHICLE STICKER' and 'UNIVERSITY OF THE PHILIPPINES LOS BAÑOS' below it.
- Text: 'Register an Account or Sign in'.
- Form fields: 'Lastname *', 'Firstname*', 'Email address *', 'Password*', and 'Confirm Password *'.
- Button: A red 'Register' button.

Figure 2: UPLB VSMS Account Registration Page (wireframe)

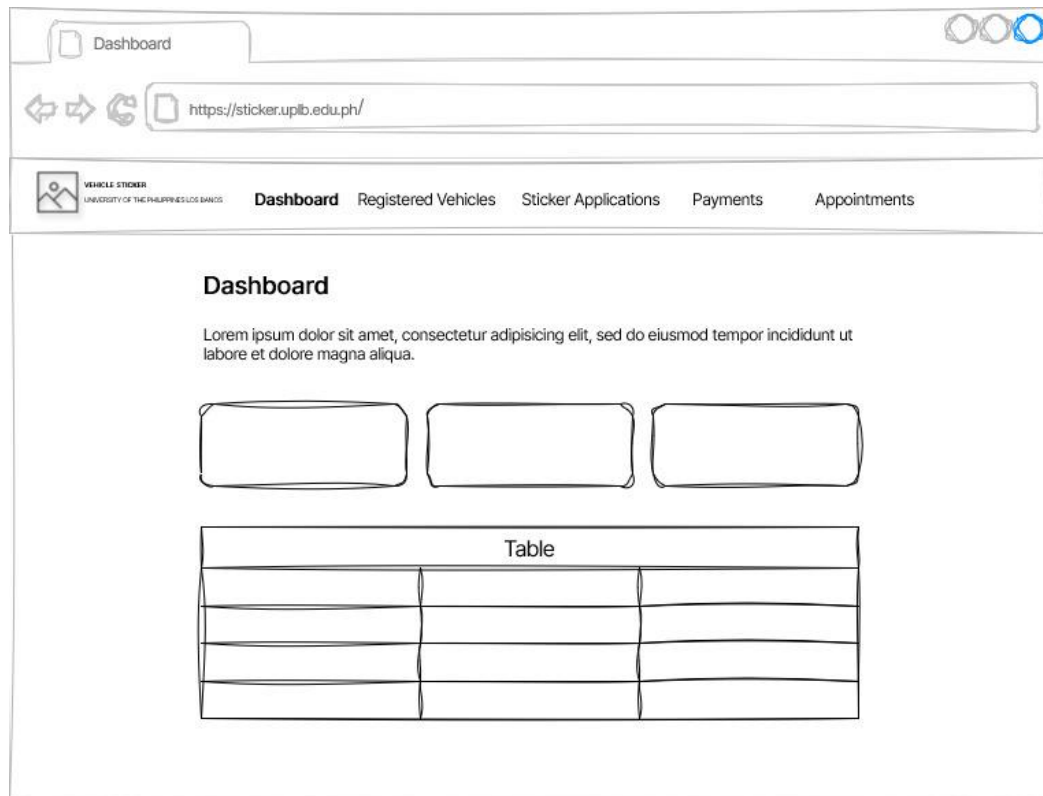


Figure 3: UPLB VSMS Applicant's Dashboard

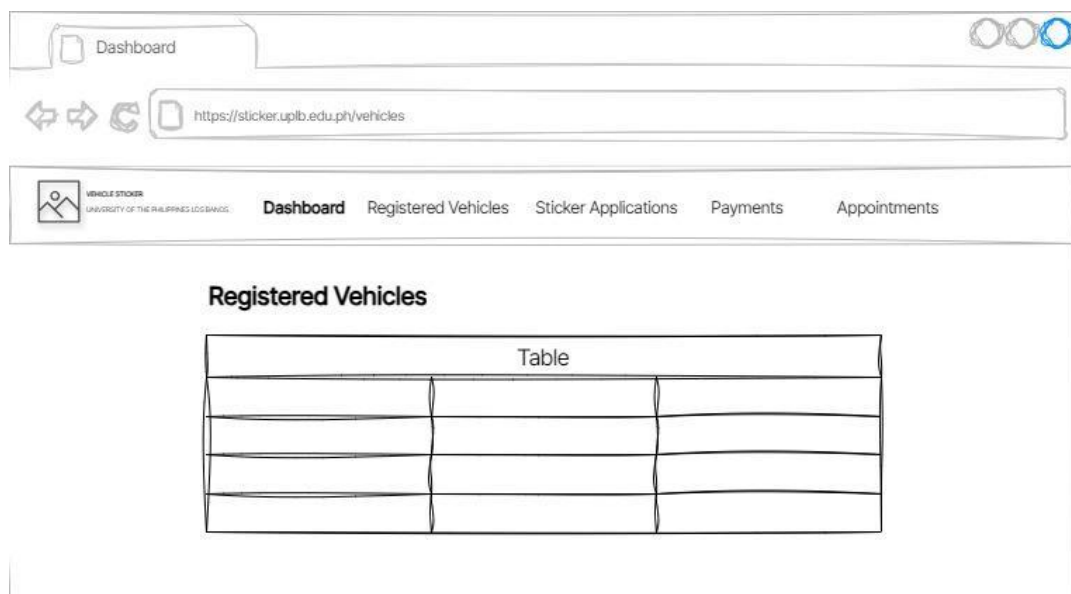


Figure 4: UPLB VSMS Applicants List of Registered Vehicles

3. Report of result for User Testing and Assessment Plan

1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	Timestamp	1. I think 2. I found 3. I thought 4. I think 5. I found 6. I thought 7. I would 8. I found 9. I felt 10. I needed to learn a										OOD		EFTN		SUS Score										
2	3/5/2024 8:52:09	4	1	5	2	5	1	5	1	5	2	24	19	7	18	92.5										
3	3/5/2024 9:51:04	5	1	5	2	5	1	5	1	4	1	24	19	6	19	95							Mean	71.65		
4	3/5/2024 12:50:37	5	1	5	1	5	1	4	1	5	1	24	19	5	20	97.5							Median	70		
5	3/11/2024 9:17:39	5	4	5	1	5	1	5	5	5	1	25	20	12	13	82.5							Mode	100		
6	3/11/2024 9:46:49	3	1	4	4	4	4	3	3	4	5	18	13	17	8	52.5							Variance	514.93		
7	3/11/2024 10:04:34	5	5	5	5	5	1	5	1	5	1	25	20	13	12	80							Standard D	22.69199788		
8	3/11/2024 15:31:24	5	1	5	1	5	1	5	1	5	1	25	20	5	20	100										
9	3/11/2024 19:20:27	4	2	5	1	5	1	4	1	5	1	23	18	6	19	92.5										
10	3/11/2024 19:34:09	4	5	5	1	5	1	5	1	5	1	24	19	9	16	87.5										
11	3/11/2024 19:59:22	3	3	4	4	4	3	4	2	4	3	19	14	15	10	60										
12	3/12/2024 9:36:13	3	3	3	3	3	3	3	3	3	3	15	10	15	10	50										
13	3/12/2024 11:43:41	4	4	4	2	4	1	4	1	5	3	21	16	11	14	75							0-25	Worst imaginable		
14	3/12/2024 11:47:35	3	4	5	2	5	2	5	2	5	3	23	18	13	12	75							25-39	Poor		
15	3/12/2024 12:55:54	4	4	4	4	4	4	4	4	4	3	3	19	14	19	6	50							39-52	OK	
16	3/12/2024 13:19:56	4	3	4	2	3	4	3	3	4	2	18	13	14	11	60							52-73	Good		
17	3/12/2024 13:41:13	4	2	4	2	3	1	3	2	4	3	18	13	10	15	70							73-85	Excellent		
18	3/13/2024 6:28:03	2	3	4	2	3	3	3	3	3	2	15	10	13	12	55										
19	3/13/2024 9:47:39	3	3	5	1	5	1	5	1	4	2	22	17	8	17	85										
20	3/13/2024 10:09:11	5	3	5	1	4	1	5	1	5	1	24	19	7	18	92.5										
21	3/13/2024 11:04:23	5	4	3	4	3	5	4	3	4	2	19	14	18	7	52.5										
22	3/13/2024 11:07:21	3	2	3	3	3	3	3	3	3	3	15	10	14	11	52.5										
23	3/13/2024 11:49:38	3	3	3	3	4	4	3	2	2	3	15	10	15	10	50										

Figure 5: SUS Survey Result

4. Suggestions for revisions of the prototype for the next version

The University of the Philippines Los Baños (UPLB) Vehicle Sticker Management System (VSMS) uses a Panel Roles plugin. This plugin allows or restricts users from accessing a specific panel based on their role. However, the current setup embeds roles in the code for each panel, which would create challenges in the future if a Single Sign-On (SSO) needs to add another role. A configurable module could be added to eliminate this problem. This module could include a configuration that lists all the available panels and sets the user role that can access them.

Additionally, it is best to access the application using Google Chrome or Mozilla Firefox. During implementation, some applicants encountered bugs while using Safari and Brave browsers.

B. Budget

NONE

C. Qualifications

Abril A. Moldez

Computer Programmer / Web Developer

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Los Baños, Laguna
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WORK EXPERIENCE

Computer Programmer II
Information Technology Center, UPLB
FEBRUARY 2024 - PRESENT

Computer Programmer II
Office of Public Relations, UPLB
JANUARY 2023 - JANUARY 2024

Computer Programmer II
Information Technology Center, UPLB
AUGUST 2017 - 2022

Website Administrator
Information Technology Center, UPLB
AUGUST 2015 - APRIL 2017

IT Staff / Church Secretary
Hasik Bagong Buhay Christian Ministries Inc.,
JUNE 2014 - JULY 2015

IT Faculty / Thesis Coordinator / Comp Lab Facilitator
STI College Calamba, Calamba City, Laguna
JUNE 2011 - MARCH 2015

SKILLS

Can Teach (Information
Technology Courses Instructor
2011 - 2014)

Desktop Publishing (Microsoft
Office and LibreOffice)

Website Content Management
System (WordPress, Joomla! ,
Drupal)

Programming Languages
(Java, PHP (Laravel, CodeIgniter
and Yii2), Visual Basic, Python,
JavaScript (AJAX, jQuery,
AngularJS) HTML, CSS, XML and
JSON, Android Development
using Android Development Tool
or Ionic Framework)

Database Management
System (MySQL, PostgreSQL,
SQLite, MS SQL Server, IBM DB2
and MS Access)

AVP (Audio / Video Production
using Adobe Photoshop, Adobe
After Effects, PowerDirector)

PC Troubleshooting and
Networking

TRAININGS

The Ultimate SEO Training
2023 + SEO for WordPress
Websites
Udemy.com

Exploring the world of Merge
Cube and Minecraft
Education Webinar
Department of Information and
Communication Technology

D. Contributors/Collaborators

NONE

E. Resources

1. Complete Program Listing

Github link: https://github.com/aamoldez/VSMS_UPLB

Software requirements: PHP v8.1+, Composer, DBMS (MySQL or PostgreSQL), and Nodejs v.20+

Installation Steps:

- a. Clone repository (This is a private repo; request to owner is needed)
- b. Access the cloned repository using the terminal inside the folder run:
cp .env.example .env
This command will copy the example env file and open it in the code editor to change the env credentials. Inside the .env file, update the database credentials and the app URL.
- c. Save and run **composer install** in the terminal. This will install all the dependencies the application requires. After this run **php artisan key:generate** to create a unique key for the application
- d. Next, run **npm install** to install all nodejs packages need in the frontend
- e. When all dependencies are installed, run **php artisan migrate:fresh --seed** to migrate the database tables
- f. Lastly, run **php artisan shield:install --fresh**. This will install and create roles and permissions needed by the application. Follow the instructions to complete the process
- g. Open the assigned URL to check the application.

The application uses Google OAuth, Gmail SMTP, Redis, and Cloudflare's turnstile.

Open the .env file and look for the following lines:

ENV config to sign in via Google email:

```
GOOGLE_CLIENT_ID=  
GOOGLE_CLIENT_SECRET=  
GOOGLE_REDIRECT_URI=
```

For sending emails:

```
MAIL_MAILER=smtp  
MAIL_HOST=smtp.gmail.com  
MAIL_PORT=465  
MAIL_USERNAME=  
MAIL_PASSWORD=  
MAIL_ENCRYPTION=tls  
MAIL_FROM_ADDRESS=""  
MAIL_FROM_NAME="${APP_NAME}"
```

Redis config for session handling:

```
REDIS_HOST=  
REDIS_USERNAME=  
REDIS_PASSWORD=  
REDIS_PORT=
```

Cloudflare Turnstile for anti-bot

```
TURNSTILE_SITE_KEY=  
TURNSTILE_SECRET_KEY=
```

2. Technical reference

Final system specifications

Hardware: Memory (RAM): 4GB
 Storage: 100GB
 Cores: 4

Operating system: Ubuntu 22.04.4 LTS

Programming Language: PHP v8.1 (FilamentPHP v.3.2+)

Server applications used: Nginx (Webserver)

Maintenance plan for the UPLB Vehicle Sticker Management System

1. Regular Software Updates

The application uses Composer package manager, which updates the system dependencies. To execute a software update, fix bugs, or add a feature, the process undergoes a CI/CD pipeline to ensure seamless updates or upgrades.

2. Database and Program Files Backup

The application's hosting provider, the UPLB DIC, has a daily database and program file maintenance backup mechanism. Optimization and integrity checks are also performed to ensure data reliability and availability.

3. System Monitoring

The hosting provider uses Zabbix to monitor the application's uptime, usage, storage, and access. Zabbix is software that monitors numerous network parameters and the health and integrity of servers, virtual machines, applications, services, databases, websites, the cloud, and more.

3. User manuals

Registering a Vehicle and Applying for a UPLB Sticker

URL: [Registering a Vehicle and Applying for a UPLB Sticker.pdf](#)

How to pay for UPLB Sticker and upload the proof of payment

URL: [How to pay for UPLB Sticker and upload the proof of payment.pdf](#)

How to Create an Appointment for Sticker Issuance in VSMS Application

URL: [How to Create an Appointment for Sticker Collection in UVISS Application.pdf](#)

4. Appendix B: Tables and figures

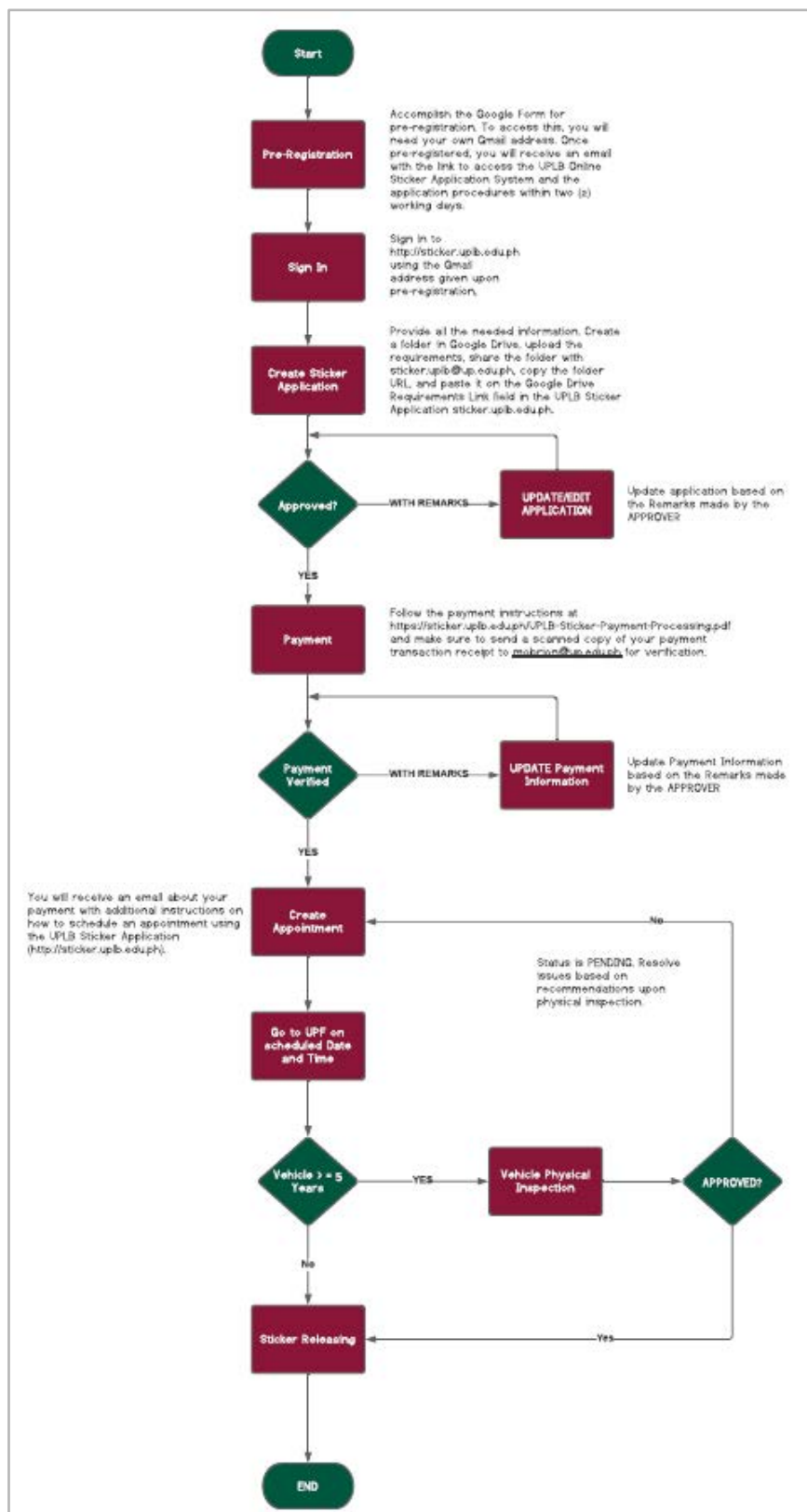


Figure 6-A: Old Vehicle Sticker Application System FC

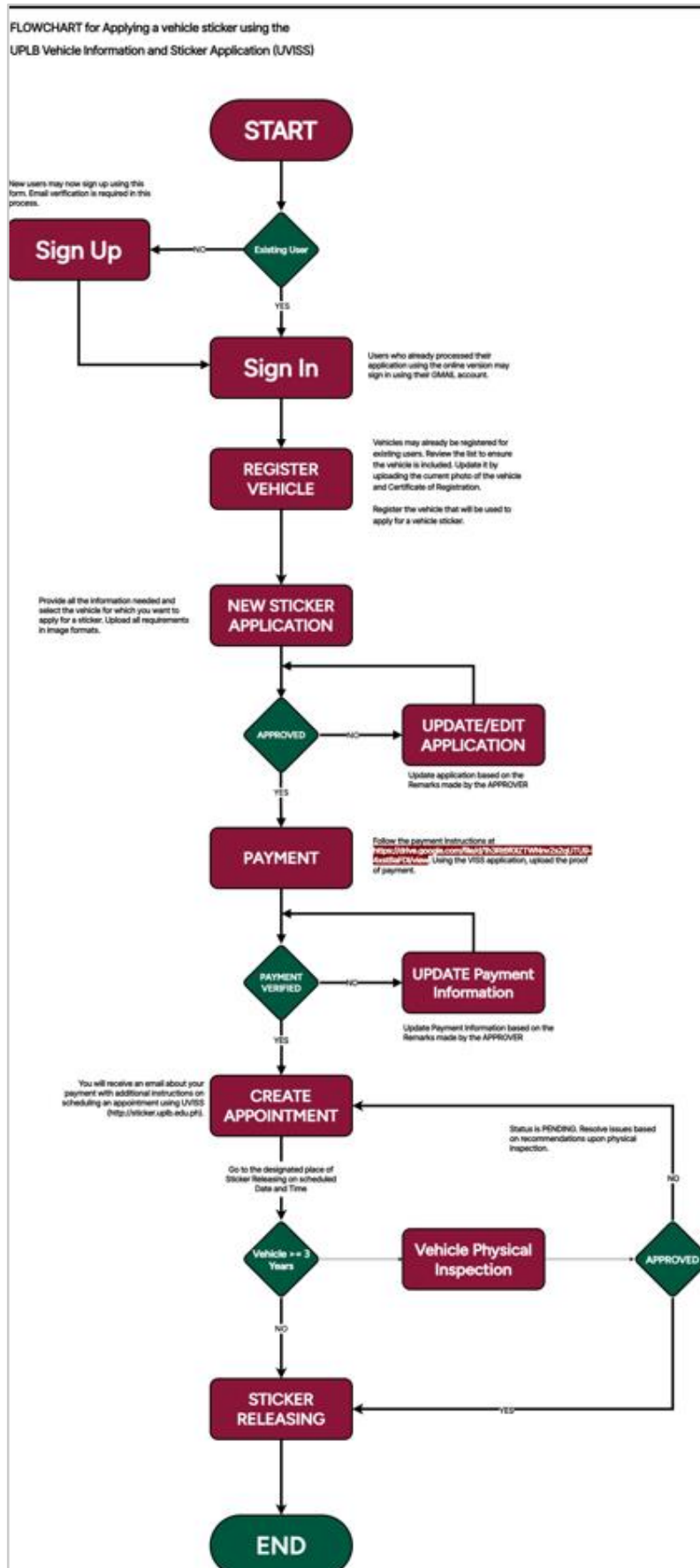


Figure 6-B: UPLB VSMS Flowchart

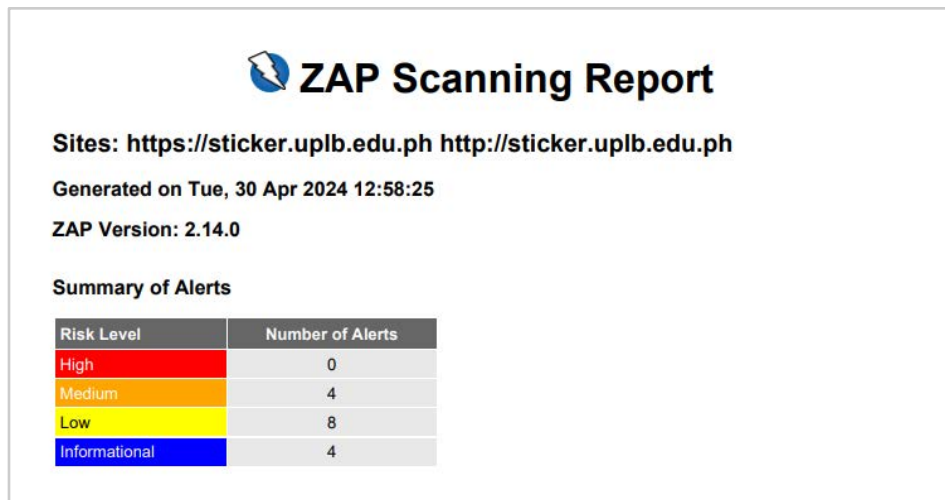


Figure 7: ZAP Scanning Report

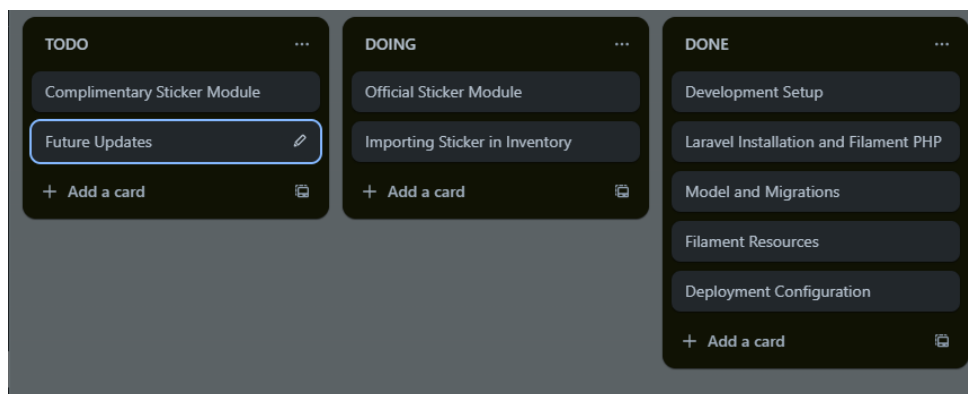


Figure 8: Trello Board

UVISS

Appointment Information

Dela Cruz, Juan
UPLB SSO
rb.abril.moldez@gmail.com

Schedule Date	Time
15 April 2024	01:00 pm to 04:00 pm
Application Information	
Sticker Category	ADMIN STAFF
Vehicle type	SUV
Plate#/Registration#/Invoice# and Model year	D123456 2021
Brand/Model and Color	FORD RANGER RED,BLACK
Place of Sticker Releasing	Covered stage at the Former Maquiling School Incorporated (MSI).

Reminders

1. Entry within the issuance area must only be on your approved schedule of appointment
2. Bring a copy of your appointment, together with the original copy of your LTO Driver's license and OR/CR
3. Remove the old UPLB Sticker on your vehicle before entering the issuance area.
4. Check your vehicle's body appearance, lights, engine, exhaust, muffler noise, and attachments.
5. If you're late on your schedule, you'll have to reset an appointment.
6. The whole parking area is for vehicles with approved schedule of appointment within a day.

Figure 9: Appointment Information

