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An Undergraduate Internship on Car Finance Website

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Independent University, Bangladesh

An Undergraduate Internship on Car Finance Website

By

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Summer, 2022

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Department of Computer Science & Engineering

Independent University, Bangladesh

September 13, 2022

Dissertation submitted in partial fulfilment for the degree of Bachelor of Science in Computer Science

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

This is to certify that the report titled "Car Finance Website" was completed by Omar Faruk (ID-1610890) submitted in partial fulfillment of the requirement for the Degree of Computer Science from Independent University, Bangladesh (IUB). It has been completed under the guidance of Md. Noor Nabi (Internal Supervisor) and Fahim Abdullah Sajid (External Supervisor). I also certify that all my work is original and has not been submitted earlier to this university or any other institution. All the sources of information used in this Project Report has been duly acknowledged in it.

Signature: ..... Date: 14-09-22

Omar Faruk

Acknowledgement

I would like to begin with expressing my gratitude and thanking the Almighty Allah for His blessings and giving me the ability to work hard and the opportunity to complete this report.

I would like to thank my honorable faculty Mohammad Noor Nabi, Senior Lecturer, Department of Computer Science Engineering, Independent University, Bangladesh, for his continuous guidance and providing with advice and suggestions which helped me to complete my project and the report successfully.

I would also like to thank everyone who helped me with information, advice and suggestions for making this report. My thank goes to the Department of Computer Science and Engineering, Independent University Bangladesh for helping me to gain essential knowledge and skills during my Bachelor's in CSE.

My endless thank goes to Hasibul Islam, CEO, for giving me the opportunity to work for Spanwide as an intern. My experience in Spanwide was nothing but wonderful and I thoroughly enjoyed working and learning here. I would also like to thank Fahim Abdullah Sajid, CTO, for his guidance and brilliant mentorship throughout the internship period. Last but not least I would like to thank all my colleagues in Spanwide who welcomed me in their team and provided their continuous support to carry out my project and the report, it would not have been possible without them.

Finally, I would like to thank Independent University Bangladesh, and all the respected faculties and staffs who were a vital part of my bachelor's program in CSE. My respect and heartful gratitude go to my faculties and mentors who shared their knowledge with me to teach and prepare me to achieve success in my future.

Letter of Transmittal

September, 2022

Mohammad Noor Nabi

Senior Lecturer

Department of Computer Science & Engineering

Independent University, Bangladesh (IUB)

Bashundhara R/A, Dhaka 1229, Bangladesh

Subject: Report submission of the internship

Dear Sir,

With due respect and honor, I would like to submit my report of Internship for the completion of my Bachelor of Computer Science and Engineering degree. I prepared this report based on my internship experience in Spanwide starting from 1st of June, 2022 till date. I was assigned in the development team as a Developer intern. I successfully served my internship period in Spanwide.

In Spanwide I worked under the supervision of Fahim Abdullah Sajid, CTO. This report is based on my project in Spanwide. I was assigned with the project Car Finance Website, where I worked as the developer with the team. My experience in Spanwide was great. The main objective of the internship is to learn and gain knowledge and enhance our skills and get the first taste of the corporate world, which I believe I have achieved by working here. I would also like to thank you Sir, for your continuous support and guidance which helped me to complete the project.

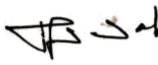
I pray and hope this report will be informative and fulfil your expectations. I have tried my best to avoid my deficiencies and hope that my report will be of satisfactory standard. I would also like to thank you again for giving me the opportunity to submit this report.

Sincerely,

Omar Faruk

Id – 1610890

Evaluation Committee



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MOHAMMAD NOOR NABI

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Abstract

The world is heading towards a totally digitalized era everyday with the help of technology. And at the center of it all is the internet, connecting everyone and everything around the globe. Approximately 5.03 billion people around the world uses the internet and the number keeps rising. Due to this businesses, different platforms, organizations are evolving and getting digitalized. This opens a huge opportunity for business organizations to promote themselves online. Like every other business sector, Car Dealerships have also taken this opportunity to grow their business and reach more people. Our client has partnered with such Car Dealerships to help them reach the online platform to promote their business. In order to do so my organization(Spanwide) has decided to build a Car Finance website for our client. The following report is based on the development of this website. The website aims to help their customers and interested buyers with important information, easy solution to contact or apply for a loan as well as other services related to cars.

The report also describes my internship experience with Spanwide, a well-known digital agency based in Dhaka, Bangladesh. I am glad to join them and work with them in the development team as a Developer intern.

The report is divided into 3 parts explaining the project and the process of the development. It starts from part-1 with the introduction of the project in the first chapter focusing on the overview and the objective of the project and the scopes of work we had. The second chapter is about the literature review where I covered how the project is related with my bachelor's degree. Then on the third chapter, the methodology that is followed for the project is described and how that methodology helped us in planning and development. Then in part-2 I have discussed the lessons I learned from part-1 which includes the problem statement and the solution to those problems.

Table of Contents

Chapter – 6: Results & Analysis

Chapter – 7 Project as Engineering Problem Analysis

Chapter – 8: Lesson Learned

Chapter – 9: Future Work & Conclusion

Bibliography

Appendix

List of Figures & Tables

Chapter – 1: Introduction

1.1 Background of the Work

The world is heading towards a totally digitalized era everyday with the help of technology. And at the center of it all is the internet, connecting everyone and everything around the globe. Approximately 5.03 billion people around the world uses the internet and the number keeps rising. Due to this businesses, different platforms, organizations are evolving and getting digitalized. This opens a huge opportunity for business organizations to promote themselves online. Like every other business sector, Car Dealerships have also taken this opportunity to grow their business and reach more people. Our client has partnered with such Car Dealerships to help them reach the online platform to promote their business. In order to do so my organization(Spanwide) has decided to build a Car Finance website for our client. The following report is based on the development of this website. The website aims to help their customers and interested buyers with important information, easy solution to contact or apply for a loan as well as other services related to cars.

The concept of searching for vehicles and buying them on the internet is relevantly new. But in this era of digitalization where people are more dependent on the internet to search for their needs, vehicle businesses are also ensuring their presence on the internet to be found by its customer with ease.

Our clients sought the help of Team Spanwide to make a website for their car finance business to ensure strong presence on the internet. Through their website they wanted to showcase various vehicles from different car dealerships in a beautiful organized way for their customers. The visitors would be able to select a vehicle from the list of vehicles on display. All the detailed necessary informations related to the selected vehicle will be displayed to the visitor. A detailed view of the vehicle will be catered for the visitors through photos and other information which will give them a good idea without even visiting the location physically. The visitors will also be able to contact with the car dealerships in case they want any further details or to apply for a financial aid while purchasing through a contact form.

1.2 Objectives

The main objective of the project is to reach more customers and investors through their online presence which will also provide the visitors an easy solution for communication through the web platform. Given the current pandemic situation, moving from one place to another has become very challenging and time-consuming task. It has also become difficult for people who are interested in buying cars to travel from location to location and find their desired vehicles. As a solution this website would serve the purpose of making peoples lives easier and finding their desired vehicles online.

The website is designed with good concepts of UI/UX in mind. The User Interface is designed to give the website a premium yet user friendly look. The concepts of User Experience are also taken into account while designing to give its user a good experience. The website is also made seamlessly accessible through mobile devices, which gives the advantage for its user to browse through the website on the got at any time.

1.3 Scopes

i. **Landing (Home) Page** – The index page of the website where users will get a summary of the full website.

ii. **About Page** – A detailed page to highlight on what car finance is.

iii. **Cars Page** – Display all the cars with details provided by the car dealerships.

iv. **Apply Page** – Car dealerships will have to register and get approved first by applying through this page to advertise their vehicles for sell. Customers will have to apply to purchase a vehicle and also to get a loan.

v. **Admin Page** – Admins or the manager would approve or decline the requests sent by the car dealerships or the customers. Admins would also view and edit all the requests, car dealerships, cars and customers that are already listed to update their status accordingly.

vi. **Dealership Pages** – Approved dealerships would add or delete and update information for their vehicles through this page.

Chapter – 2: Literature Review

2.1 Relationship with Undergraduate Studies

CSE 213, Object-oriented Programming: Through this course I learnt the concept of treating data as an object and also modular code structure which made codes shorter but more efficient. The concept of using functions and class was very helpful and was widely used in my project.

CSE 303, Database Management: This was a basic core course which focused on teaching us how to plan and design a project. In this course I learnt the basics of a database and how it works, database languages, Rich Picture, ER Model, Converting ERD-Relations, Introduction to Normalization and Structured Query Language. All these knowledges were useful while I designed and planned the project. Knowledges of MySQL, PHP and use of local server was also useful in my project to make it dynamic.

CSE 307, System Analysis and Design: This course gave a brief idea on Software Development Life Cycle which helped me to plan all the steps and phases of the project. It helped me to identify the goals and challenges. Through the 7 stages if SDLC analysis we formed a plan which made the work easier for me and the whole team at Spanwide.

CSE 307, Web Application and Internet: This was the most important course for my project where the course covered the important parts of developing a web application. Here I learnt HTML, CSS, Js, Jq, PHP, MySQL etc. which was directly implemented in my project.

2.2 Related Works

The Car Finance Website we are building will be UK based and car dealership business on the internet is not a brand-new idea in the UK. In fact while carrying out our research session we have come across a few Car Finance Websites which are already in business. While researching we noticed that most of those websites were relatively new and had certain limitations. So there is room for introducing new ideas and so car finance websites have a long way to go. Some of those websites are listed below:

i. **Durham Cars 4 U**

ii. **Luv Car Loans**

iii. **Car & Finance London**

Chapter – 3: Project Management & Financing

3.1 Work Breakdown Structure

Work Breakdown Structure is defined as a deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables. It organizes and defines the total scope of the project. [1] We have also created a WBS so that our project is managed smoothly and more efficiently in an organized way. We have used a top-down approach to produce our WBS and a phase based WBS.

The 5 elements in our Level 1 and how the phases are followed is described briefly below:

i. **Requirement Analysis:** Clients Requirement is taken and accordingly a sitemap is produced. Project timeline is produced, risk factors are analyzed and costing is estimated
ii. **Design Layout:** Through various techniques of system analysis the design layout is produced like, UML diagram, Rich Picture and Activity diagrams. Then User interface is designed based on the analysis.
iii. **Development:** Starts with the front-end development and proceeds to backend development. Both the developments start with separate development meetings and then followed by different phases which includes number of audits to ensure quality, making the site mobile response, CMS setup and versioning, data entry etc.
iv. **User Acceptance Testing (UAT):** This phase starts when the site is functional and the site is taken through testing and fixing and showed to the client to obtain their feedback and further revisions are done.
V. **Development:** In this final stage upon client approval the site goes live.

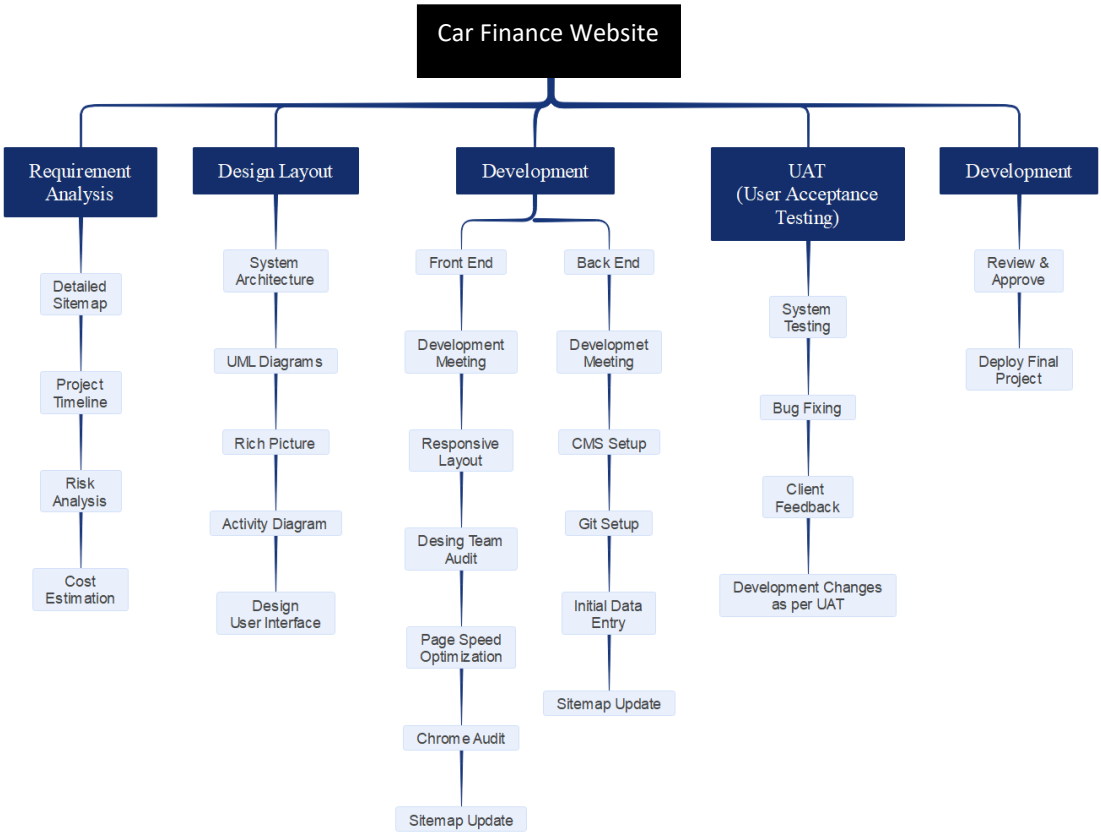


Figure 1: Work Breakdown Structure (WBS)

3.2 Process/Activity wise Time Distribution

According to our WBS, we produced a table to demonstrate ideally what percentage of work should be completed in given time. The total time estimated for the project completion was 70 days. The total task is divided into 5 major tasks which sums up to 100% of the total work. The five major tasks are:

i. **Requirement Analysis**: In this we talked with the client and take a list of all the requirements like functionalities, design and security was discussed. Further in-house analysis of the requirements helped us to decide the costing and time needed for the project. This takes around 10 days and considered 10% of the total work.

ii. **Design Layout:** UI/UX design is done using adobe XD according to the sitemap and a mockup us produced to show the client to portray how the site will look like. This takes around 15 days and considered 10% of the total work.

i. **Development:** The most important part of the project where the whole project gets life. The frontend and backend coding are done in this phase. This is the largest phase of the project and takes around 45 days and considered 47% of the total work.

ii. **User Acceptance Testing**: After the above 3 phases the project is shown to the client by arranging a meeting. All the functionalities and options are explained from our team. Then a detailed feedback is asked from the client and revisions are done to the project as per the feedback. Quality assurance is also taken care in this phase. This takes around 10 days and considered 18% of the total work.

iii. **Deployment:** Finally, after the approval from the client, the project is hosted on the client's domain and hosting and the CMS is handed over to the clients and necessary training is provided to the client. This takes around 10 days and considered 5% of the total work.

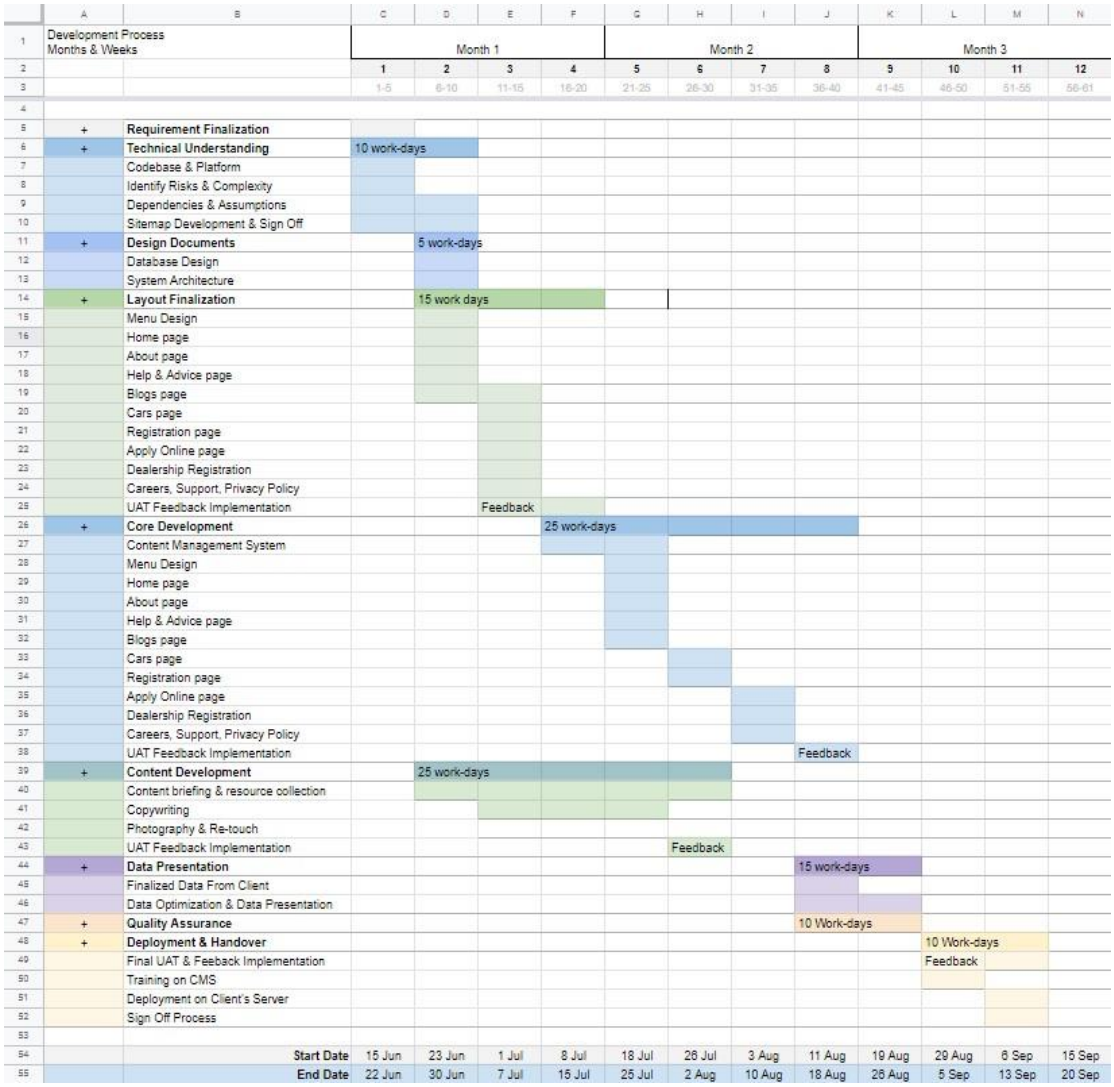
Task	Days	Work Percentage
Requirement Analysis	10	10%
Design Layout	15	20%
Development	25	47%
User Acceptance Testing (UAT)	10	18%
Deployment	10	5%
Total	70	100%

Table 1: Activity wise resource & time allocation

3.3 Gantt Chart

A Gantt chart is a project management tool assisting in the planning and scheduling of projects. Project management timelines and tasks are converted into a horizontal bar chart, showing start and end dates, as well as dependencies, scheduling and deadlines, including how much of the task is completed per stage and who is the task owner.

We made a Gantt Chart which helped us to plan and schedule all the activities of the project in details.



1		Development Process Months & Weeks	Month 1				Month 2				Month 3				
2			1	2	3	4	5	6	7	8	9	10	11	12	
3			1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-61	
4															
5	+	**Requirement Finalization**													
6	+	**Technical Understanding**	10 work-days												
7		Codebase & Platform													
8		Identify Risks & Complexity													
9		Dependencies & Assumptions													
10		Sitemap Development & Sign Off													
11	+	**Design Documents**		5 work-days											
12		Database Design													
13		System Architecture													
14	+	**Layout Finalization**		15 work days											
15		Menu Design													
16		Home page													
17		About page													
18		Help & Advice page													
19		Blogs page													
20		Cars page													
21		Registration page													
22		Apply Online page													
23		Dealership Registration													
24		Careers, Support, Privacy Policy													
25		UAT Feedback Implementation			Feedback										
26	+	**Core Development**				25 work-days									
27		Content Management System													
28		Menu Design													
29		Home page													
30		About page													
31		Help & Advice page													
32		Blogs page													
33		Cars page													
34		Registration page													
35		Apply Online page													
36		Dealership Registration													
37		Careers, Support, Privacy Policy													
38		UAT Feedback Implementation								Feedback					
39	+	**Content Development**		25 work-days											
40		Content briefing & resource collection													
41		Copywriting													
42		Photography & Re-touch													
43		UAT Feedback Implementation						Feedback							
44	+	**Data Presentation**								15 work-days					
45		Finalized Data From Client													
46		Data Optimization & Data Presentation													
47	+	**Quality Assurance**								10 Work-days					
48	+	**Deployment & Handover**										10 Work-days			
49		Final UAT & Feeback Implementation										Feedback			
50		Training on CMS													
51		Deployment on Client's Server													
52		Sign Off Process													
53															
54		**Start Date**	15 Jun	23 Jun	1 Jul	8 Jul	18 Jul	26 Jul	3 Aug	11 Aug	19 Aug	29 Aug	6 Sep	15 Sep	
55		**End Date**	22 Jun	30 Jun	7 Jul	15 Jul	25 Jul	2 Aug	10 Aug	18 Aug	26 Aug	5 Sep	13 Sep	20 Sep	

Figure 2: Gantt Chart

3.4 Estimated Costing

The costing of a web app project depends on several factors like size of the project, functionalities, design of the website and any additional feature demands by the client. Below is the estimated costing table we have where we have considered all the cost which includes design service like, theme, logo, icons, the cost for custom home page slider, live chat option, social media connection, SSL Certificate, SEO and other plugins and services provided. The cost of official resources used are also taken into consideration. The total costing was estimated at BDT 3,20,000 with domain and hosting and the possibility of additional charges if any
additional service is required within 1 year of the deployment of the website.

Work Distribution	Costing in BDT
UX Development	70,000
Front End Development	1,00,000
Content Management System (CMS)	1,00,000
Domain and Hosting	50,000
Total	3,20,000

Table 2: Cost Estimation

Chapter – 4: Methodology

There are a number of methodologies and models available for a system development life cycle. Each of these models are different in some way, but all of them serves the same purpose of organizing a project and helping the team working on the project to work more effectively and efficiently, for example:

- Waterfall
- Lean
- Agile
- Spiral

Agile: The Agile methodology is a way to manage a project by breaking it up into several phases. It involves constant collaboration with stakeholders and continuous improvement at every stage. Once the work begins, teams cycle through a process of planning, executing, and evaluating. There are several software package development technologies or models that are employed in development: among them we've got used the Agile method to develop my project. Agile software package development refers to a gaggle of software package development methodologies supported unvaried development, wherever needs and solutions evolve through collaboration between self-organizing
cross-functional groups. The Agile Methodology is predicated on varied and progressive development rather than a linear approach. It doesn't build a complete system right away, but rather develops incrementally.
Agile could be a versatile software package development methodology, involving an oversized number of assorted iterations.

The most widely used Agile methodologies are:
1. Agile scrum methodology

2. Lean Software Development
3. Extreme Programming (XP)
4. Dynamic Systems Development Method (DSDM)
5. Feature Driven Development (FDD)
6. Prototyping

Development Tools Used:

To build the website, we have used several development tools.

Those are:
a) **React**: React.js is an open-source JavaScript library that is used for building user interfaces specifically for single-page applications. It's used for handling the view layer for web and mobile apps. React also allows us to create reusable UI components. React was first created by Jordan Walke, a software engineer working for Facebook. React first deployed on Facebook's newsfeed in 2011 and on Instagram.com in 2012.React allows developers to create large web applications that can change data, without reloading the page. The main purpose of React is to be fast, scalable, and simple. It works only on user interfaces in the application. This corresponds to the view in the MVC template. It can be used with a
combination of other JavaScript libraries or frameworks, such as Angular JS in MVC. I have used react for the frontend development of my website.

b) **Yii 2**: It is a high performance, component-based PHP framework for rapidly developing modern Web applications. Yii 2 inherits the main spirit behind Yii for being a simple, fast and highly extensible PHP
framework. Yii features include:

• Model–view–controller (MVC) design pattern.
• Generation of complex WSDL service specifications and management of web service request handling.
• Internationalization and localization (I18N and L10N), comprising message translation, date and time formatting, number formatting, and interface localization.
• Layered caching scheme, which supports data caching, page caching, fragment caching and dynamic content. The storage medium of caching can be changed.
• Error handling and logging. Log messages can be categorized, filtered and routed to different destinations.
• Security measures include prevention of cross-site scripting (XSS), cross-site request forgery (CSRF) and cookie tampering.
• Unit and functionality testing based on PHPUnit and Selenium.
• Automatic code generation for the skeleton application, CRUD applications, through the Gii tool.
• Code generated by Yii components and command line tools complies to

the XHTML standard.
• Designed to work well with third-party code. For example, it is possible to include code from PEAR or the Laminas.

I have used Yii 2 for the backend development of my website.

Chapter – 5: Body of the Project

5.1 Work Description

The main purpose of a car finance website is to reach more customers and investors through their online presence which will also provide the users an easy solution for communication through the web platform. The customers will be able to choose from several vehicles as per their liking. This website will also help car dealerships to reach more customers.

My job here was to build the web application focusing on the frontend developing, system designing and the backend part.

The languages used for the front-end are:

- **HTML/CSS**
- **Bootstrap**
- **JavaScript**
- **jQuery**
- **Ajax**

Languages and frameworks use in back-end are:

- **PHP**
- **YII2 (framework)**
- **MySQL (Database)**

5.2 System Analysis

A system analysis is carried out in order to help us to identify the goals of the system. System analysis is defined as a problem-solving technique which helps to identify goals and purposes to create a system to achieve these efficiently.

5.2.1 Six Element Analysis

	Human	Non Computing Hardware	Computing Hardware	Software	Database	Communication
Submit Form	User, Dealerships	N/A	Computer	Web Browser	RDMS	WAN/LAN
Create Products	Dealerships	Pen, Paper	Computer	Web Browser	RDMS	WAN/LAN
View Products	User	N/A	Computer	Web Browser	RDMS	WAN/LAN
Update Products	Dealerships	Pen, Paper	Computer	Web Browser	RDMS	WAN/LAN
Delete Products	Dealerships	Pen, Paper	Computer	Web Browser	RDMS	WAN/LAN
Manage Forms	Admin	Record Books	Computer	Web Browser	RDMS	WAN/LAN
Manage Registered Users	Admin	Pen, Paper	Computer	Web Browser	RDMS	WAN/LAN
Manage Registered Dealerships	Admin	Pen, Paper	Computer	Web Browser	RDMS	WAN/LAN

Table 1: Six Element Analysis

5.2.2 Feasibility Analysis

A feasibility study evaluates the project's potential for success; therefore, perceived objectivity is an important factor in the credibility of the study for potential investors and lending institutions. Generally, feasibility studies precede technical development and project implementation. In its simplest terms, the two criteria to judge feasibility are cost required and value to be attained.

Three feasibility studies are conducted for the project, which are discussed below:

i. **Technical Feasibility**:

Technical feasibility is the assessment of whether the existing resources and technologies owned are sufficient for the development of the project. This assessment helps to identify if the requirement in terms of the technical skill of the team, technology used, hardware and software used are good enough to complete the project and also provide support in the future.

ii. **Economic Feasibility:**

This analysis is conducted to find the cost and the benefit of the project. A detailed cost for the website development is estimated, which includes all the cost breakdowns. This cost is

then generally compared to whether the company will be economically beneficial from the website. Since there is no charge for the visitors of the website, the Car finance website will get a certain percentage every time a customer applies for a vehicle purchase and also every time a car dealership registers. The goal is to generate profit from these percentages.

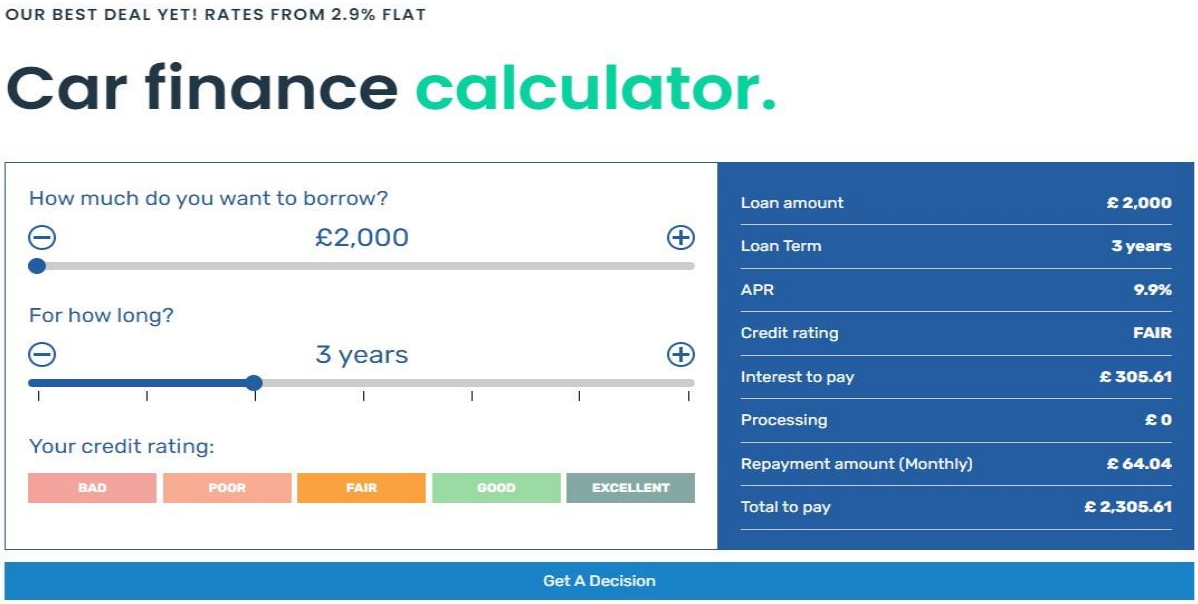
iii. **Scheduling Feasibility:**

The project was planned very well before starting which will help to complete the project in due time. Spanwide is very strict on deadlines so the working process is designed accordingly without any obstructions.

5.2.3 Problem Solution Analysis

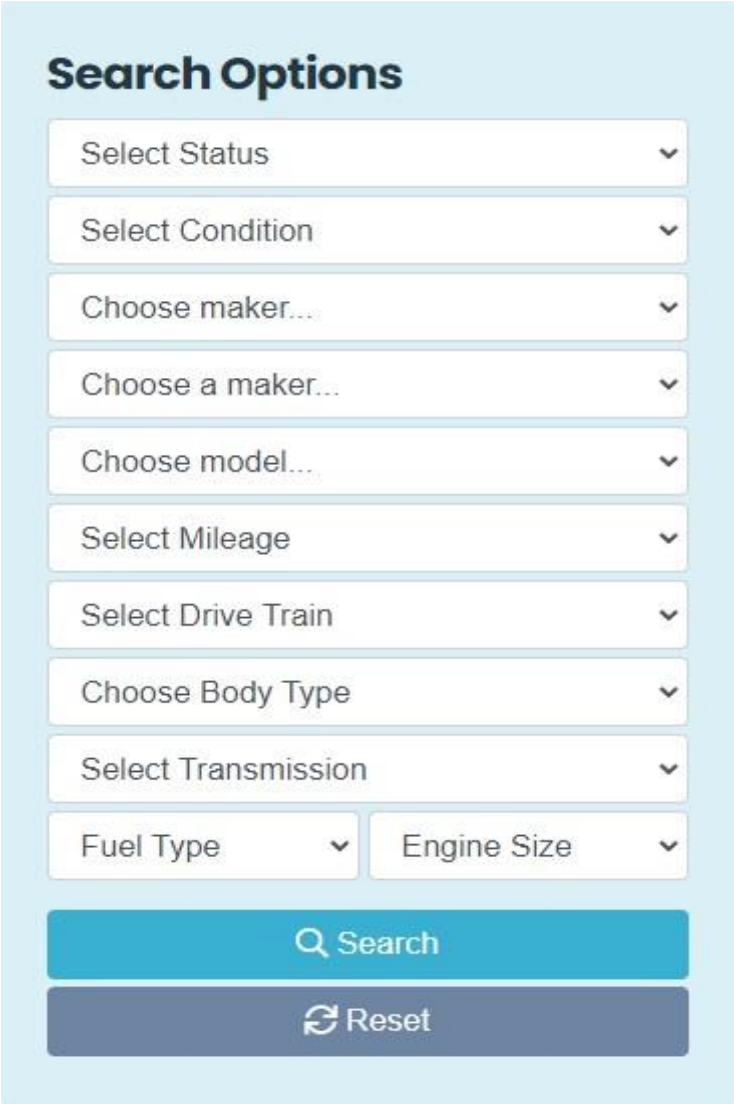
At this stage I have faced number of problems during project management and financing part. There are several types of diagrams and charts has to be drawn which takes a lot of time and method. Also there is some planning and meetings regarding which part of the work will be divided into several person, after that , whole work is transformed into work hour which then is converted to money per hour. So there are many kinds of obstacles in many areas of the project that I have been facing.

i. Developing the car finance calculator:



While developing the car finance calculator we faced a few problems. The data and the calculations had to be precise in order to deliver the closest estimation. A calculator plugin was is used to run the calculations in the background.

ii. **Vehicle Filtering System**:



We are using a jQuery plugin 'Nice Select' in the drop-down option of the filters. But as the filtering was done through Ajax call, once we selected an option it was supposed to submit a request by firing an invisible 'submit' function and relevant data was supposed to be returned to the function. But due to using the plugin the request was not able to complete and no data was returned. We are solving the problems by doing RND and configuring the plugin.

iii. SMTP mailer issue:

We faced issues configuring the SMTP mail server which resulted in failure of sending email. We configured the SMTP mail server again and did some RD prior to configuring and the new configuration seemed to work.

5.2.4 Effect and Constraints Analysis

The website is built with the aim to provide its visitor with the option to view vehicles and easily decide on which one they want to buy. The goal is to make peoples life easier for buying vehicles. The website also provides easy contact solution with the car dealership for the visitors.

Though buying vehicles online is not the traditional way for people but we are hopeful that in near future more technological features could be added and people would practically be able to check and buy their vehicles online.

5.3 System Design

5.3.1 Rich Picture

A Rich Picture is a way to explore, acknowledge and define a situation and express it through diagrams to create a preliminary mental model. We created a rich picture to create a model to map the significant journey of different kind of users.

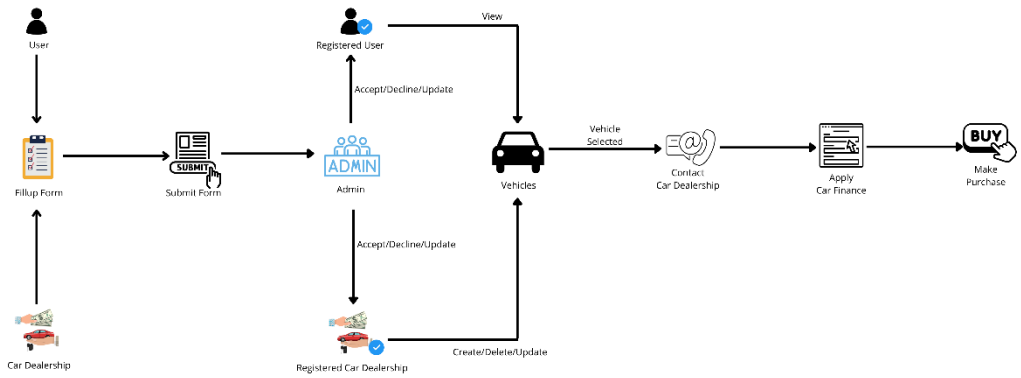


Figure 1: Rich Picture

5.3.2 UML Diagram

UML, or Unified Modeling Language, is a specification language that is used in the software engineering field. It can be defined as a general-purpose language that uses a graphical designation which can create an abstract model. This abstract model can then be used in a system. This system is called the UML model. There are different types of UML Diagram that can be produced for a project. We did activity diagram and the most important of all UML.

Activity Diagram:
The workflow of a system can be illustrated by an activity diagram. The activity diagram for the user is drawn for 2 kinds of user:

- Prospective Customers
- Prospective Car Dealership

This diagram illustrates the journey of the users. We have designed the follow activity diagrams:

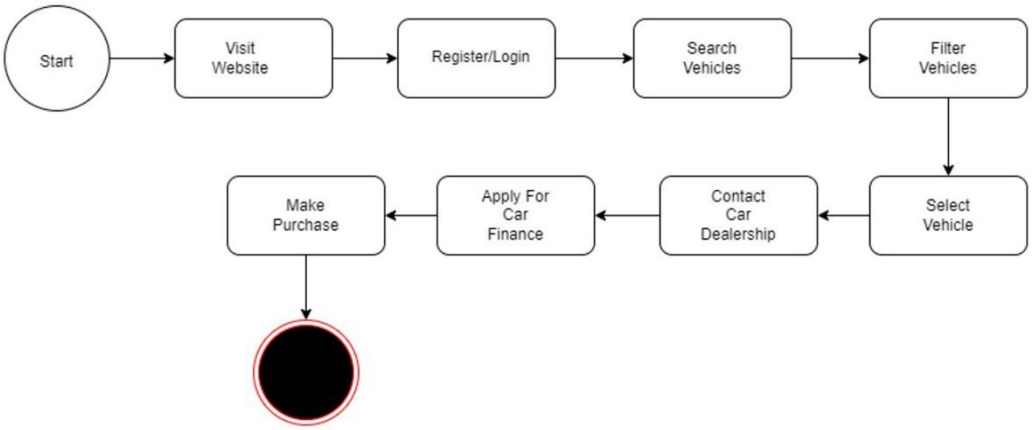


Figure 2: Activity diagram for Customers

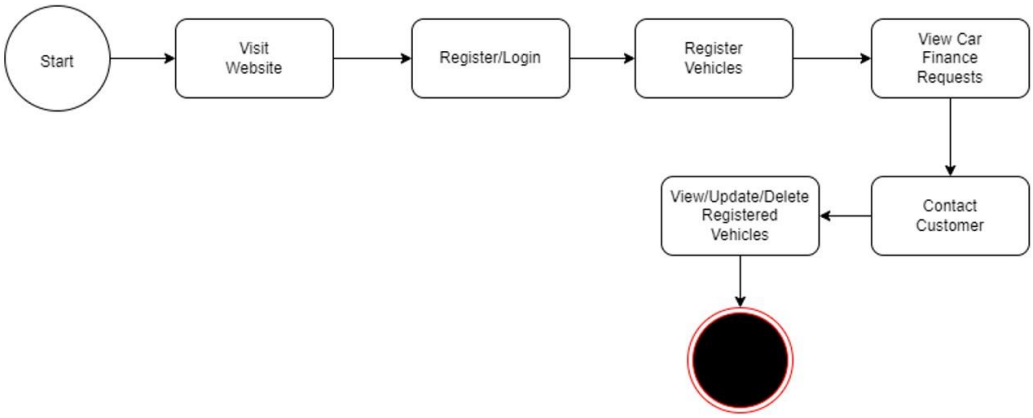


Figure 3: Activity diagram for Car Dealership

Activity Diagram for Admin: The activity diagram for the admin. This diagram illustrates the journey of the admin where he is in control of the admin panel (CMS).

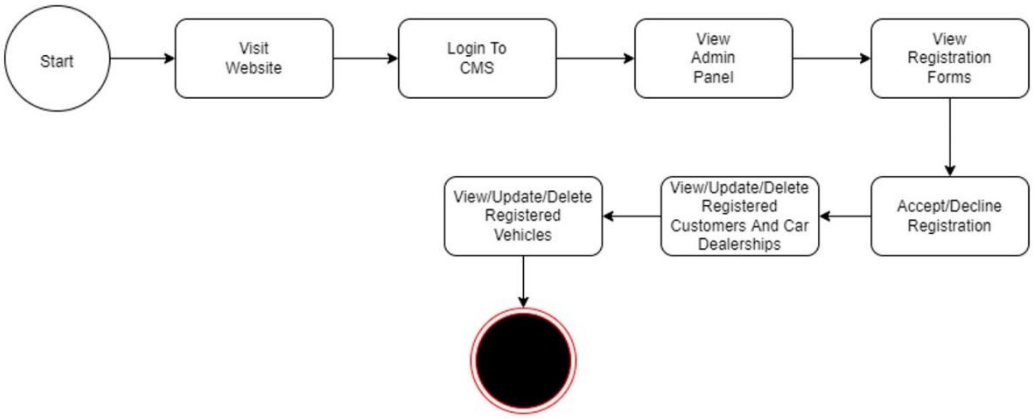


Figure 4: Activity diagram for Admin

Use-Case Diagram: As the most known diagram type of the behavioral UML types, use-case diagrams give a graphic overview of the actors involved in a system, different functions needed by those actors and how these different functions interact.

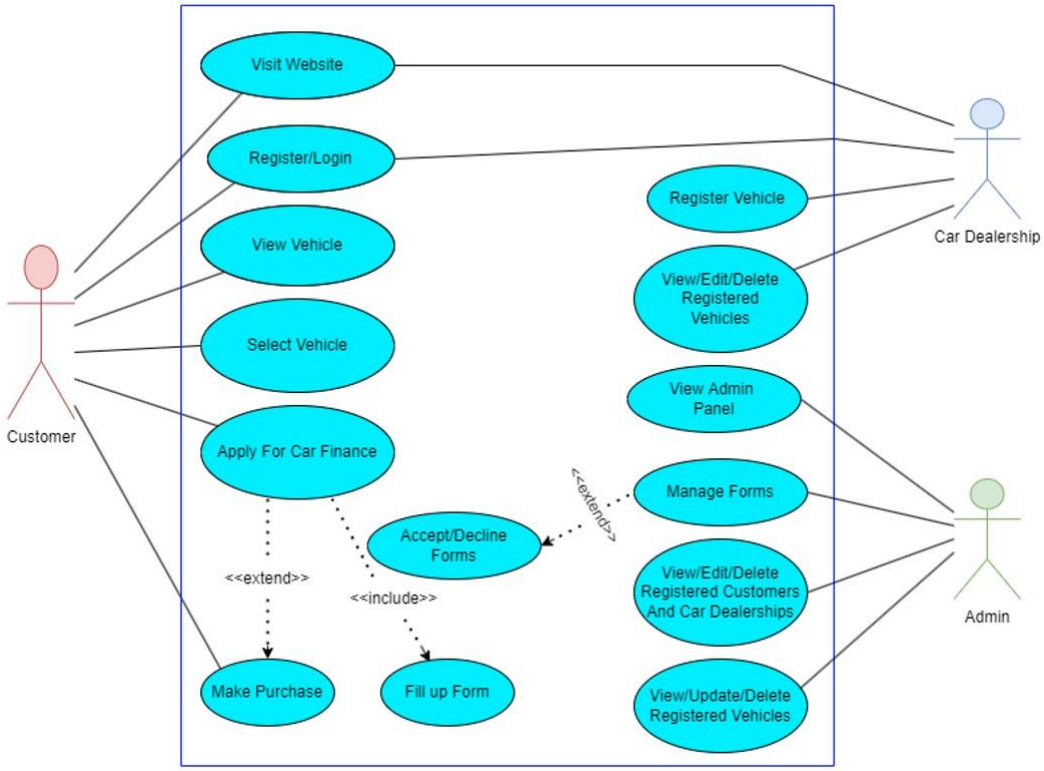


Figure 5: Use Case Diagram

ERD Diagram: An Entity Relationship Diagram is drawn to illustrate the structure and connection of the system with the database. It shows the entities which will be the tables in the database and the attributes of the entities. It also demonstrates the relationships of the entities with each other.

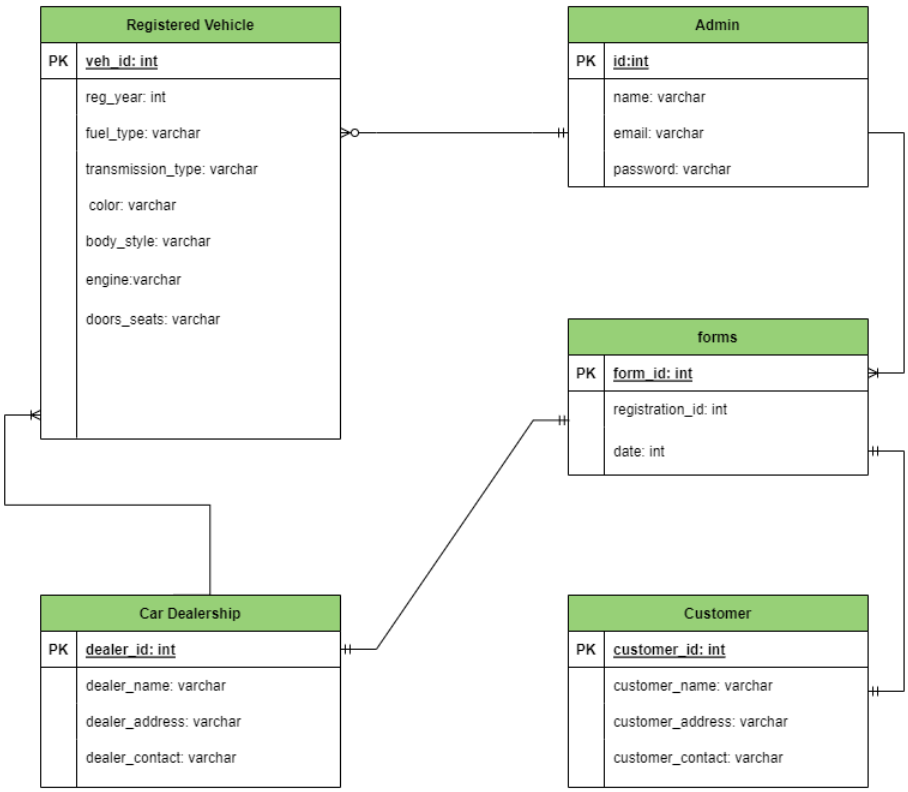


Figure 6: ER Diagram

5.3.3 Functional and Non-Functional Requirements

Functional Requirements:

Function:	**Finding Desired Vehicle**	
Input:	**Process:**	**Output:**
Select price, mileage, condition:	Visits the website	Can view all vehicle details
Pre-conditions:	User must have a device with internet connection	
Post-conditions:	User views the desired vehicles as per choice	

Table 2: Functional Requirement to find vehicle

Function:	**Applying for Car Finance**	
Input:	**Process:**	**Output:**
Name, number, email, financial information	Visits applying page	Form is submitted
Pre-conditions:	User must be registered before applying	
Post-conditions:	Successfully submitted the form for car finance	

Table 3: Functional Requirement to Apply for Car Finance

Non-Functional Requirements:
The non-functional requirements of the project are discussed below:

- **Performance:**

Performance defines how fast or slow the system will respond. In our project, we gave our focus on the loading time and also handling the traffic of the website at a time. Through following best practices in using good code and content optimization. Also configuring the server so that we can make sure a smooth experience for the visitors ensuring better loading time and traffic handling of the system.

- **Portability and Compatibility:**

We made a very user-friendly design for the system and made it responsive for maximum range of devices from mobile to desktop to large tv. Ensuring that the website will be responsive in those resolutions. We also ensured cross-platform compatibility to make sure that the website runs on commonly used browsers and minimum specifications needed to run the system without any issues.

- **Security:** The system is secured at both client end and server end. SSL certification, form validation through CORS – cross origin resource sharing is ensured to protect from unauthorized access and malware attacks. Also we use some security plugins inside the website to secure it more.

- **Availability Requirements:**

It's very important to keep running the system 24/7 for our client. So we need to ensure and support our system and server running properly without any issues.

- **Maintainability Requirements:**

The maintenance of the website has been made very straightforward so that client can easily work and any changes can be easily done through the admin panel with our custom CMS. In case of any issues occurred, it can be easily fixed by updating from our part to resolve the issue.

- **Usability:**

The whole system is designed in mind of accessing this website and browse through it and find necessary information and straightforward to everything that our client's targeted people needs. User interface and user experience design has been done with time so that we can ensure a user-friendly and easy to access design. The admin panel is also designed so the admin can easily maintain the website.

5.4 Product Features

Product features defines the functionality of the product and how that will benefit the users of the product. I have discussed the features of our website below:

5.4.1 Input

The input for a product is whatever resource is needed for system. This includes resources used in the production stage like money, time, people, skills and efforts, documents and plans, machines and hardware used. In our scenario the computer we have used and also the computer used by the visitors, the processor, ram, hard drive space, internet, devices like phone and laptops are all included in the input. Also, software that might be used are also included like PDF reader to read the CV of the applicants.

5.4.2 Output

In context to our project all the services, features and products of the company that is gained from the website is considered as an output.
Here are the outputs given below:

Online Consultation:
The live chatbot can be used to consult with the company online and also the form will be used to reach them.

5.4.3 Architecture

An architecture defines the structure of any project. It is designed to show how a structure will work for a website . A website architecture defines the structure of the website that is, how the website will work and how the data will be transferred and where they will be stored. If we see into the diagram below for details, we can see that the architecture we designed for the project where the diagram clearly demonstrate that user will see and interact with the front-end of the website. Request or commands received from the front-end part from the users and transfer it to the web server where all the data is stored on a server, which then retrieves data from the file system and database accordingly and sends it back to the front-end for the users as a view and response.

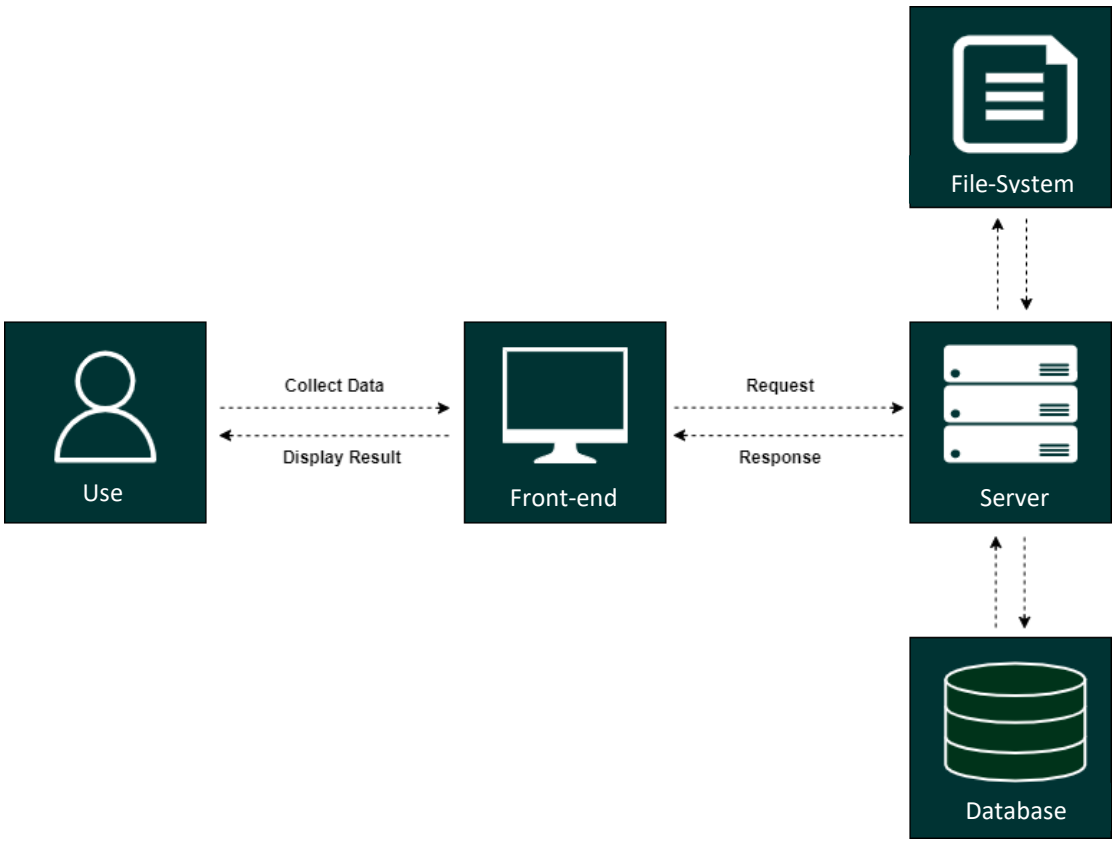


Figure 7: Website Architecture

5.5 Implementation

In our project to build a website for we used a number of web languages, frameworks and scripts.

- **HTML/CSS:**

HTML is a hypertext markup language that is specifically used to design
the main skeleton of the website. It uses Cascading Style Sheets(CSS) properties and integrating with our HTML codes, we ensure a modern, user friendly User Interface of the a website.

- **Bootstrap:**

Bootstrap is a CSS framework used to develop responsive websites. We used Bootstrap to make the website responsive and mobile friendly. We also used media queries for specific devices to present our website best in all sizes of devices.

- **JavaScript:**

JavaScript programming interpreter. We used JavaScript in our website along with React.js for the animations, effects and reducing loading time.

- **YII2:**

YII2 is a component-based PHP framework, known for its high performance.
PHP is an open-source scripting language. We used YII2 framework for our backend code.

- **MySQL:**

MySQL is a relational database management system. We managed our Database and backend through SQL queries.

Chapter – 6: Results & Analysis

6.1 Results

The project of Car Finance website was developed with the aim to promote the marketing and selling of vehicles online with financial aid. Car dealerships are getting more involved in the online business sector as it helping them reach more people and grow their business. Our client believed a strong online presence will help them in their cause, as people will be easily able to find their desired vehicle from their website. We catered to their need and built a website for them meeting most of the requirements given by the client. Below is an overview of what we have achieved in the project and how that will help the visitors of the website:

Menu: A global menu is used in the Navigation Bar. The menu is accessible through the hamburger icon, which gives a Fullscreen menu to access different pages of the website. The color of the pages listed on the menu changes every time the user hovers over them.

Footer: A global footer is there, accessible from all pages with contact details and social media links. Also Contact details so that a people can scroll down and see all the details without going back to search contact details again.

Landing Page: The landing page or the index page is first page that a visitor is able to see in the website. This page is designed to give an overview of the whole website.
The page starts with short details about car finance. Then there is a car finance calculator which can filter options after giving the details required according to the desired vehicle. After that, there are few short details on how to apply for financial aid and how it helps in making the purchase easier. Then there are all the contact information.

About Page: The about page is designed in such a way that it gives a detailed overview on the company. Starting from a summary on how the company started and how this website helps buying and selling vehicles much easier than before. Then a detailed section is shown about how secure and reliable the company is. There is not much interaction for the visitors on this page as this is an informative page focusing on introducing the visitor with the company.

Help & Advice Page: In this page the user can make any type of queries or clear out any kind of confusion. And for the users help, a number of common questions are shown. The user can also book a call for queries directly by pressing on the button given.

Blogs Page: This page simply shows different contents regarding vehicles according to what's trending. The interface of this page is much similar to other social media's news feed.

Cars Page: This page shows all the vehicles registered by all the car dealerships. There is also a filtering system available so the user can search for the perfect vehicle according to their preferences.

Apply Online Page: This page is developed as an online form by which the user can directly apply for a car finance by filling up the details required.

6.2 Introduction to Test Case

A test case is a document, which has a set of test data, preconditions, expected results and postconditions, developed for a particular test scenario in order to verify compliance against a specific requirement.

Test Case acts as the starting point for the test execution, and after applying a set of input values, the application has a definitive outcome and leaves the system at some end point or also known as execution postcondition. [8]

We have conducted a test case for Edison Real Estate to assure quality and the functionalities of the website.

6.2.1 Issue Tracking and Reporting System

The project will be uploaded in Spanwide's test server and the URL will be shared among the development team and a specialized QA tester. The testing phase by the QA tester will start at the end of the development along with the development team members. All the modules and functionalities will be tested. Once a problem is found, the issue will be noted down in a share google sheet with detail comment on the issue. The developer will fix the issues once fixed will mark the issue as fixed in the sheet. After the initial development is done the system is rechecked again by the QA tester for issues. Feedback is received from client and issues are fixed if needed after that before the final deployment of the project.

6.3 Test Case Analysis

The following functionalities has been tested for this particular website:

- Admin login to CMS
- Add vehicle
- Delete vehicle
- Update vehicle
- Change password
- Logout
- Mobile Responsiveness
- Contact forms

6.3.1 Test Table

#	Case	Action	Precondition	Steps	Expected Result	Result obtained	Status	Remarks
1	**Login**	Admin login	i. Connected to the admin panel through internet. ii. Valid login credentials.	i. Add admin information to the users table in DB. ii. Fill up the fields and Press login button.	i. Logins in to the database and view the dashboard interface. ii. Wrong credentials give an error message: "Login failed".	Login successful.	Pass	N/A
2	**Register vehicle**	Car dealership can add new projects of the company	Must be Registered	i. put relevant vehicle information in the ii. Clicks on register car button to add	New vehicle post will be added	New vehicle added successfully in the DB and visible in the website	Pass	N/A
3	**Delete vehicle**	Car dealership can delete a vehicle from the DB	Must be logged in as the dealership	i. Goes to the list of vehicles ii. Selects the vehicle to be deleted iii. Press on the delete icon iv. Confirms to delete by pressing confirm	Vehicle deleted from the system and website	Project successfully deleted	Pass	N/A

				button				
4	**Update vehicle**	Admin can edit the project details	Must be logged in to the admin panel	i. Goes to the list of projects ii. Selects the project to be edited iii. Press on update icon iv. Edits required fields to update v. Saves the changes by pressing Save button	Existing vehicle will show updated information of the vehicle	Data were updated successfully except the Project Description field	Failed	Check codebase
5	**Change Password**	Admin can update password	i. Access to the admin panel ii. Logged in as admin	i. Login to the admin panel ii. Click on the user's icon and selects change password iii. Input old existing password iv. Input new password v. Confirms new password vi. Clicks Save to change password	i. A message to confirm that password has been changed successfully is shown ii. Changes not saved message is shown if passwords don't match	Password change is successful and new password can be used to login	Pass	N/A
6	**Logout**	Admin can successfully log out	i. Needs to be logged in to the admin pane	Click logout from user menu in profile icon	Logs out from the admin pane	Successful logged out	Pass	N/A
7	**Mobile Responsive**	The design and layout is responsive to the commonly used screen size	i. Any user with internet connection can view the responsiveness	Visit the website URL	Design is responsive without breaking the layout	The website isn't perfectly responsive to all common screen size	Failed	Check Bootstrap implementation and Media query code.
8	**Forms**	Fill up the contact form and submit	Connected to internet	i. visits the website ii. Fill up the form and click submit button	A success message is show upon submission	Success message received and the message is received by admin	pass	N/A

Chapter – 7: Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

In this modern world full of competition, every system needs to give attention to sustainability. It is a challenging task but to survive in long run ensuring that the purpose of the system is served to the consumers, sustainability is essential and plays a vital role.

In software and web development cases the systems are made sustainable in order to ensure that it serves indefinitely without any problems both on the owners and the user side. To ensure sustainability in our project the website is designed in such a way that the website is accessible regardless of the environment of the user's machine.

The website we created is not dependent on the user's computer specification, operating system, resolution or internet speed. The website will run on all computers, smartphones using the commonly used browsers.

The sustainability of the website will also be maintained through regular maintenance of the website and its server. The HTML, CSS, JS and backend code for the website is well optimized. By reducing repetitive codes, minifying different scripts that are used, and maintaining proper coding standards it is made sure that the website performs well and easily accessible by users regardless of the device's specification.

Regarding the design and layout, the website is designed in a user-friendly manner, giving importance to the User Experience. The visitors with minimal computer knowledge will be able to easily access and navigate through the website. The media files like images, videos, icons and logos are all optimized to ensure good loading speed of the pages so people with low end devices and slow internet can also access the website.

7.2 Social and Environmental Effects and Analysis

The Car Finance Website lists all of its vehicles and have a filtering option so the user may quickly have access their specific preferences. This allows users to save time by gathering information.

Instead of visiting various showrooms physically, you can simply visit the website. This is something that anyone can do. Rather than spending hours stuck in city traffic, they may do it from the comfort of their own homes while also saving money and time. In addition, considering the recent pandemic crisis, it is recommended that people stay at home and have minimal physical contact. The website was created with the goal of maximizing efficiency while conserving resources.

We made every effort to make our programming and media material as efficient as possible. The website is ad-free, has fewer redirections, and only uses basic plugins, all of which contribute to overall optimization, resulting in less power consumption and energy savings.

Our office is totally digitally operated and equipped with energy-saving machinery and equipment. In our office, we are constantly conscious of the importance of avoiding wasting electrical energy. This allows us to be more energy efficient while also reducing our use of paper, which has a positive impact on the environment.

7.3 Addressing Ethics and Ethical Issues

The more technologically advanced our world becomes, the more necessary it is to address ethical challenges and follow accepted ethical principles and guidelines. Sensitive data is constantly sent over the internet via numerous systems, and it must be verified that the data is not compromised in any way.

We ensured that our project data was secure enough to prevent hacking or breaches. We ensured that no extremely sensitive data is gathered via the website, and that only data that is required is saved. To secure sensitive data from any form of leak, proper security procedures are taken. Data is securely stored in the cloud, and critical information such as passwords is encrypted. These data can only be accessed by our team's Lead Developer with valid credentials, and no one else on our team has access, ensuring the data's security. Spanwide keeps all project-related papers, negotiations and agreements, and coding secret to protect the company's and our clients' privacy.

Chapter – 8: Future Work & Conclusion

8.1 Problems faced during this period

Since this was my first attempt to a big real time project, I did face a number of problems and issues. Most of them were some issues where I have lacking of understanding for example, customizing the jQuery plugins for animation, maintaining the grid and responsiveness, writing SQL queries for the forms. Understanding how javascripts will work in a specifc part of the project. Also we were having a problem regarding how to configure with the server as I am very much new to these new technology used to developing the website which I have not done before. As a team, with our supervisor, we were having severel meetings to rectify all the problems we are facing or we will face in future.

It was also challenging to learn so many new technologies at such a short time. I didn’t get to learn the technologies in depth as much as I would have liked given the fact that I was on a deadline. So, the learning had to be rushed. It was very stressful to learn and implement the knowledge at such a short time. It was difficult for me to cope up with the pace of the experienced developers in the team.

8.1 Solution of those problems

The solution to the next problem is to keep learning and practicing the technologies more in depth. Spending more time with these technologies will surely make me an expert like the other developers in the team in near future.

Chapter – 9: Future Work & Conclusion

9.1 Future Works

A proper vehicle business website should not only be utilized to gather vehicle information but also to allow users to have almost all the experiences a physical showroom provides while searching for their desired vehicle. Although this is a bold idea and many people are still unaccustomed to and unwilling to accept a new manner of purchasing vehicles rather than the traditional one, it is a viable option. We intend to improve the website's functionality by adding a few other functionalities in the future. To summarize our future plans, we intend to do the following in the near future:

- Add short video clips of the vehicle.
- Add a live chatting option for the customers.
- Develop an Android and IOS supported application.
- Add multiple language options.
- Update animations using jQuery.

9.2 Conclusion

The Car Finance Website has been implemented effectively. My organization and our clients are pleased with the final result. We believe there are still areas where we can improve, which we will address over time. Now that the website is live on the internet, we believe that it will assist them in growing as a brand and a business.

Spanwide provided me with a fantastic internship opportunity. Working at an IT firm with skilled staff was a really rewarding experience for me. I learned and implemented new skills and strategies, which enabled me not only to create a good website, but also to broaden my skill set. Thanks to Spanwide, my professional skills, communication skills, and last but not the least, my technical skills have all improved. They led me through each stage and assisted me whenever I needed it. I've also learned how to work under pressure and to meet tight deadlines. My team mates, on the other hand, played an important part in making my job easier by offering advice and suggestions, and I never felt like a newcomer in the firm. This internship opportunity has also provided me with an introduction to the website building industry, and I am confident that I will learn and grow as a result of it.

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[8] "Tutorialspoint," [Online]. Available: https://www.citationmachine.net/ieee/cite-a-website/confirm.

UI Images (Screenshots)

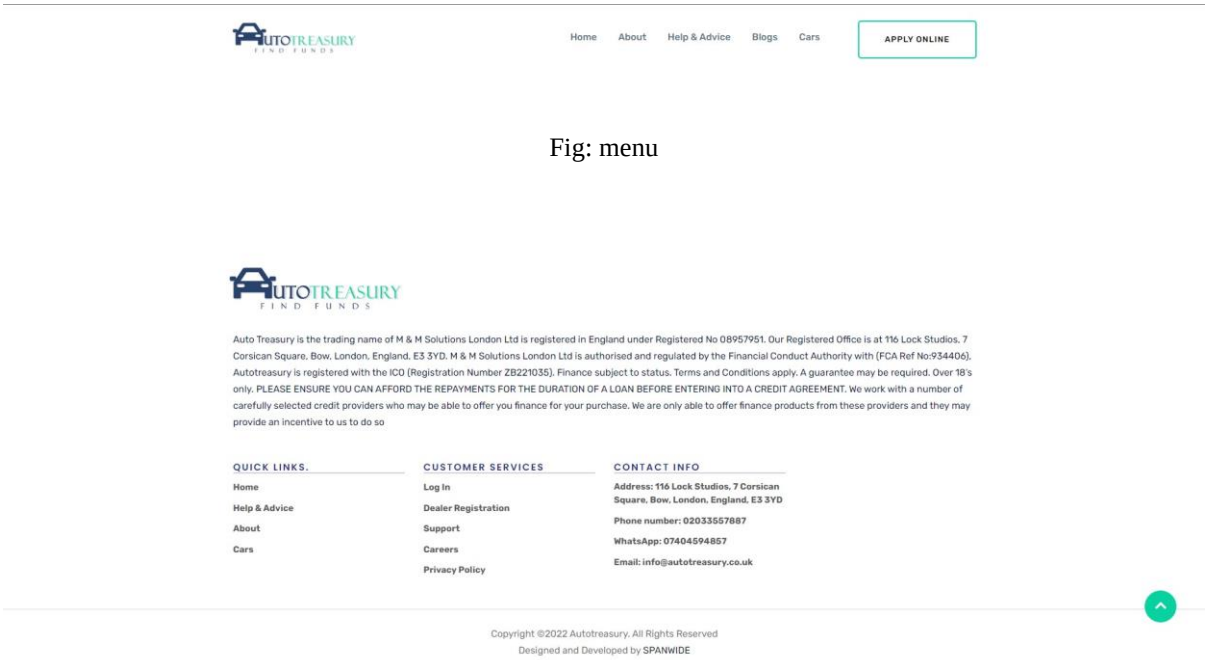

Fig: menu

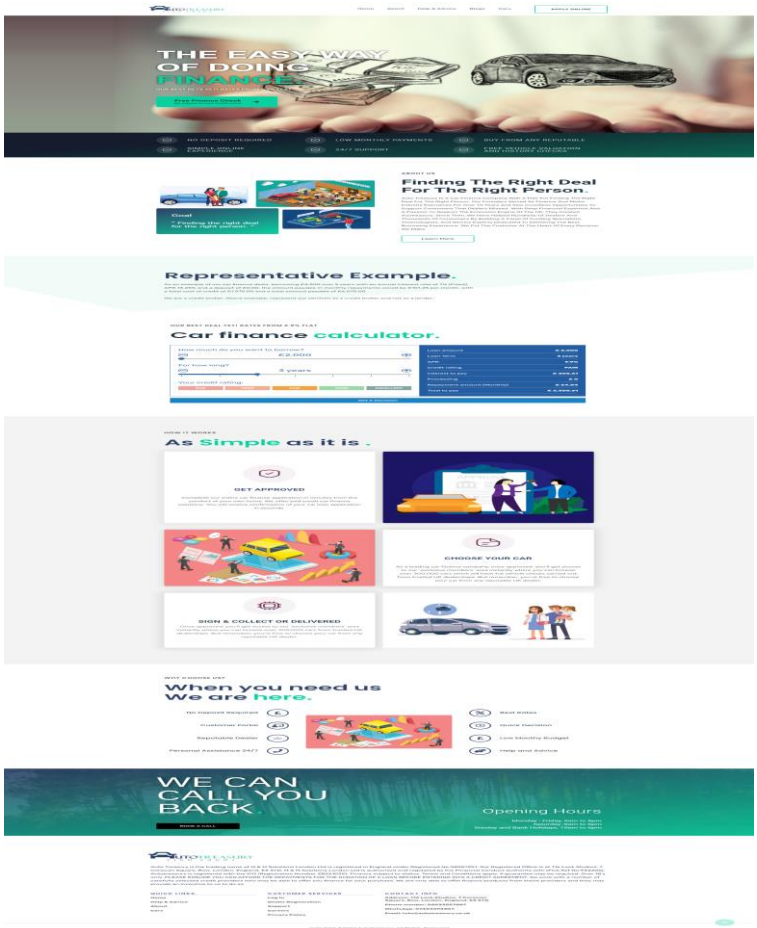

Fig: landing page

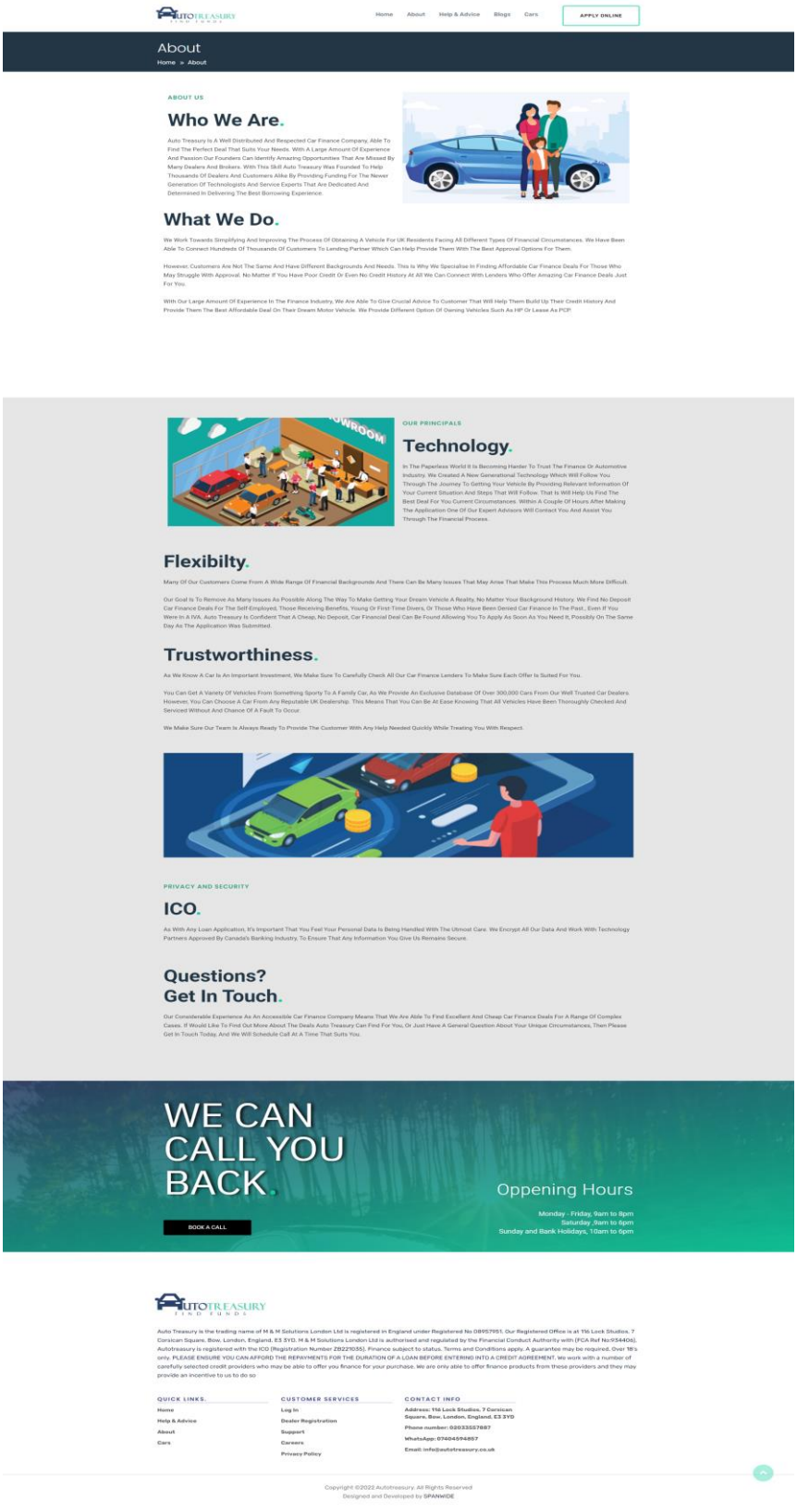

Fig: about page

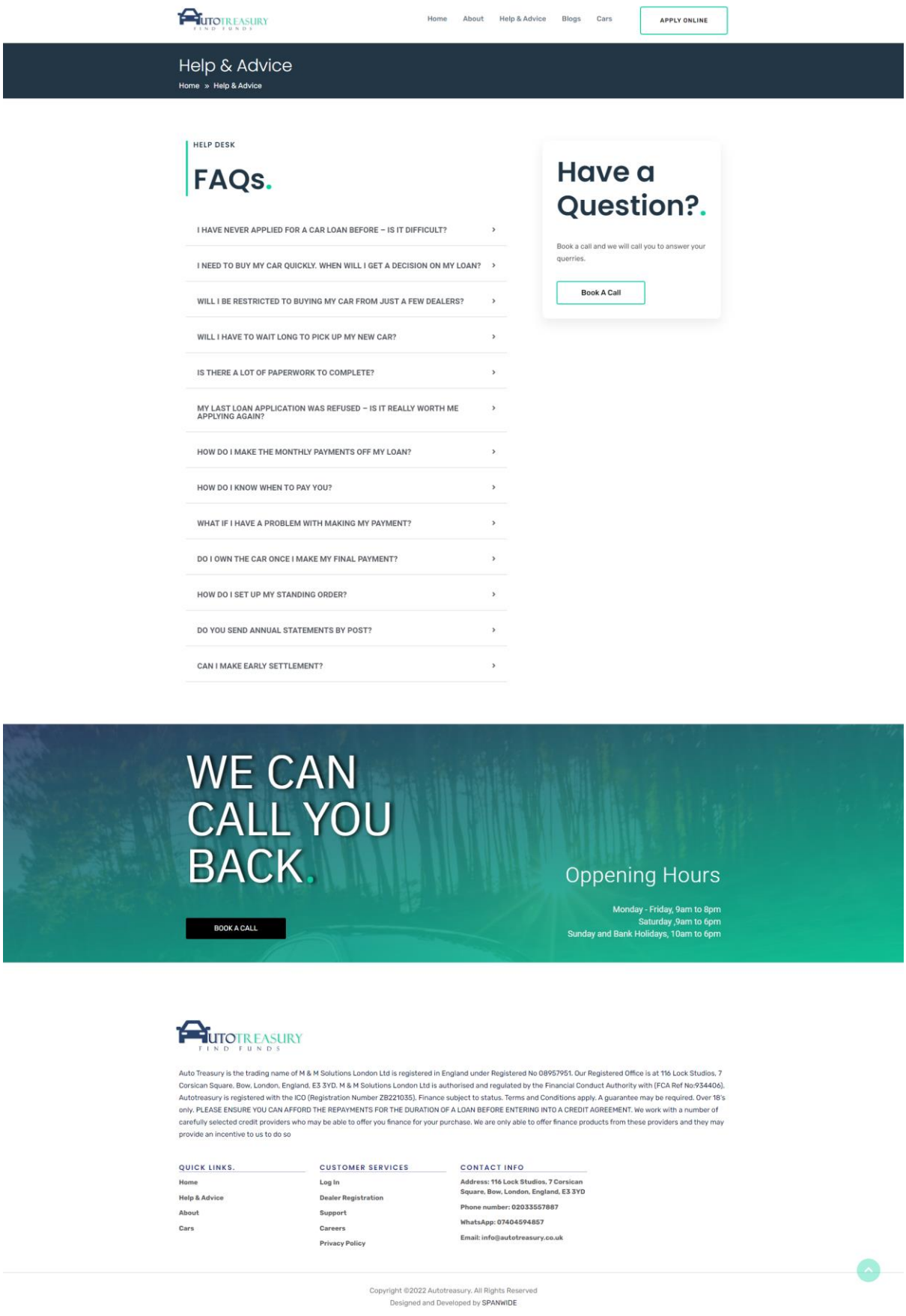

Fig: Help & advice page

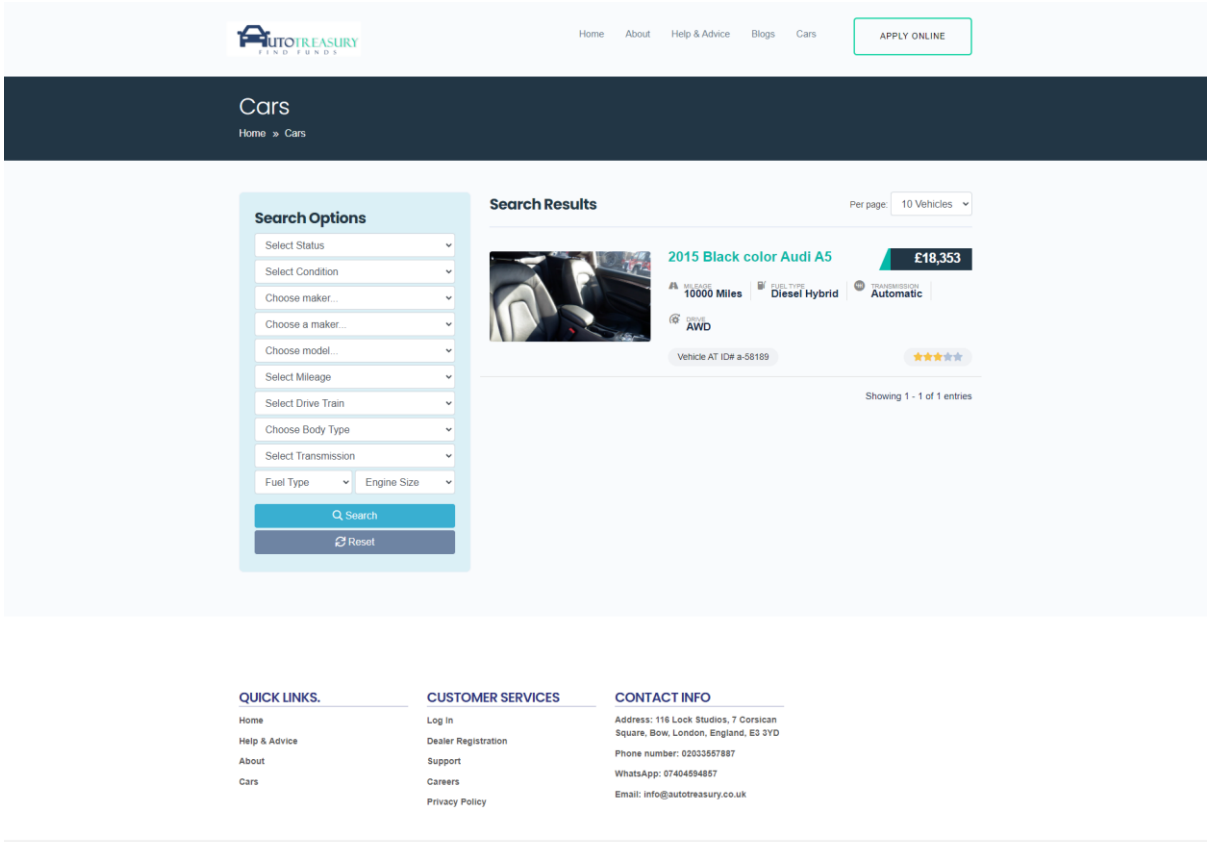

Fig: cars page

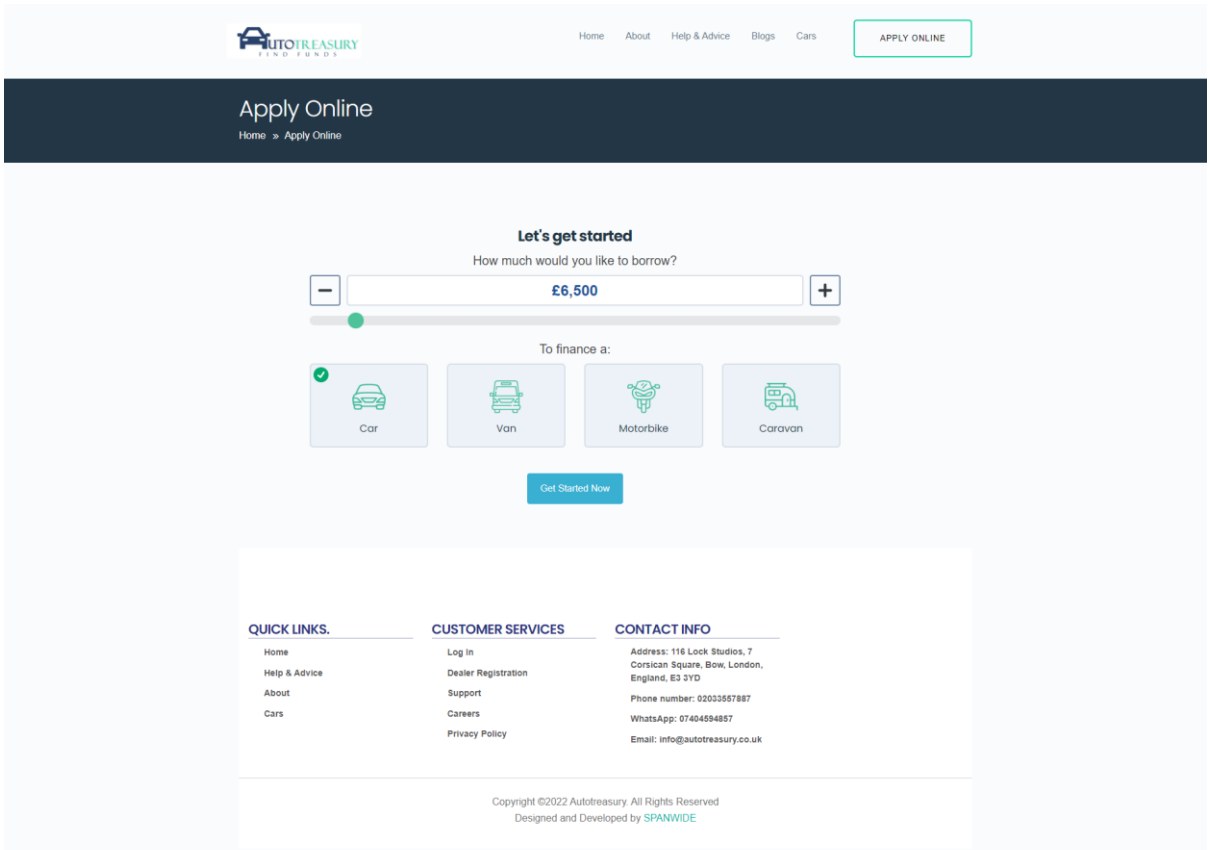

Fig: apply online page

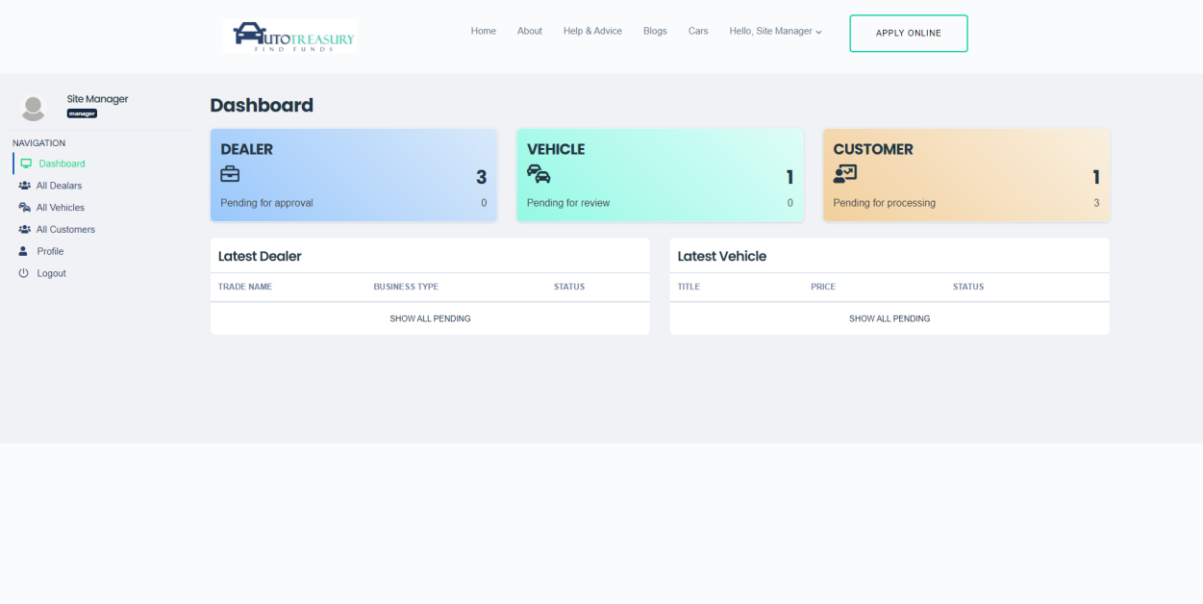

Fig: admin dashboard

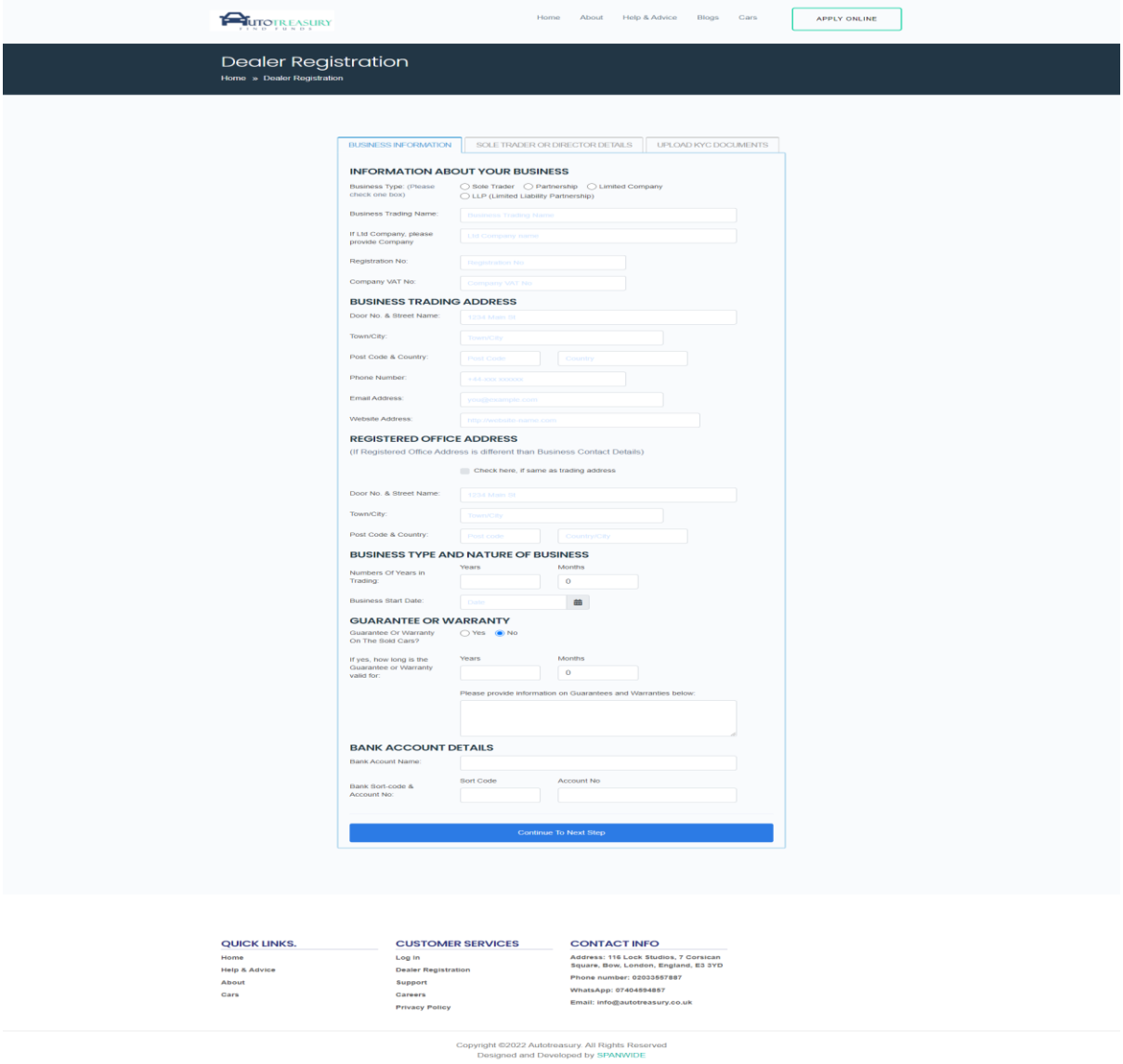

Fig: dealer registration page

An Undergraduate Internship/Project on Car Finance Website

By

Omar Faruk

Student ID: **1610890**

Summer, 2022

Consent Form

The student modified the internship final report as per the recommendations made by his/her academic supervisor and/or panel members during final viva, and the department can use this version for archiving.

(Signature of the Supervisor)

Mohammad Noor Nabi

Department of Computer Science & Engineering

Independent University, Bangladesh