Web Based Sales And Vehicle Maintenance System For Samagi Motors

A dissertation submitted for the Degree of Master of Information Technology

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Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of

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under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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Supervisor Name: Prof. N. D. Kodikara

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Abstract

Samagi Motors is a Company that acts the role of an authorized Sales agent of "David Pieris Motor Company Limited" at Pelawaththa area in Kaluthara District other than its own business of vehicle maintenance. The Management of Samagi Motors has identified a number of problems with their manual system. Inaccuracy of payment calculation, difficulty in handling customer records, unavailability of a backup system, delay in search of data and manager mostly being out of office premises get difficult to handle business activities in the office are some of them.

Therefore, considering these reasons, the management of Samagi Motors has decided that they are in need of a Web Based Sales and Vehicle Maintenance System to control and manage the business activities of the company, effectively, and efficiently.

The new proposed web based Sales and Vehicle Maintenance System has been developed according to the concept of Object Orientation and Iterative Development. Storing data, report generating, calculating payments, generating alerts, pre estimating, confirming estimates, job cards, invoicing, generating emails, backups and generating SMS are the most critical functionalities of this system.

This system has been developed using .NET framework.ASP.NET, C#.NET languages have been used in coding along with MS SQL, which is a relational database management system.
The new proposed web based Sales and Vehicle Maintenance System helps Samagi Motors to fulfil the management and administrative activities along with CRM activities efficiently, and enable profit maximization. Finally, user feedback was collected, evaluated and has done a feedback analysis successfully.

Acknowledgment

I make this an opportunity to pay my heartiest gratitude to everyone who helped me and guided me to make the project into a realistic success. First of all I would like to offer my gratitude to University of Colombo School of Computing and all the staff conducting a valuable master degree program.

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I must thank Managing Director of Samagi Motors, Mr.Sajith Sasanka, for providing me the necessary documentations, clear requirements and the opportunity to develop this system for them.

Also my heartiest thanks goes to my loving parents for encouraging and supporting me throughout the whole two years in the process of completion.

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List of Acronyms

ICT - Information Communication Technology

MIT -Master of Information Technology

SMS - Short Message Service

QC - Quality Control

SDLC - System Development Life Cycle

UML - Unified Modelling Language

OOD - Object Oriented Design

ERD - Entity Relationship Diagram

GUI - Graphical User Interface

SQL - Structured Query Language

HTML - Hypertext Mark-up Language

IDE - Integrated Development Environment

IT - Information Technology

CSS - Cascading Style Sheets

Chapter 1: Introduction

1.1. The Client-Samagi Motors

Samagi Motors is a leading business shop at the area of Pelawaththa, in Kaluthara district. It plays the role of an authorized dealer of David Peiris Motors Company Limited for Bajaj bikes other than its own vehicle maintenance business activities.

Samagi Motors has built good relationships with its customers as they provide their full service with all the facilities to the customer at concessionary rates and attractive discount rates. Because of these reasons there is a great promotion in youth in purchasing bikes from them, as an agent of David Peiris Motors and therefore, now their bike sales business has expanded.

Other than the sales of new bikes, the manager of Samagi Motors has expanded his business to do tinkering, painting, adding spare parts and quality controlling of vehicles (light vehicles, specially cars) to provide the best of the service to the customers in that area. At present, this business has also expanded as the customers have grown rapidly, due to the quality of service they provide. Therefore, Samagi Motors have now defeated all the competitors in the market at Mathugama region regarding the sales of new bikes and vehicle maintenance.

1.2. Problem Domain

Samagi Motors has many problems with their on-going manual business process. Therefore, it is necessary for them to have a computerized information system to make their work more ease, efficient and effective.

As the manager of Samagi motors is mostly handling the business process being out of the office premises, it is convenient and more applicable this computerized system to be web based, as it can be handled even being remotely at any time.

Therefore, this computerized web based Sales and Vehicle Maintenance system is built to control and support all the management, administrative, and business activities within the company, reducing all the paper work of Samagi Motors to help the employees in their job roles, in order to achieve business success.

1.3. The Problems In The Existing System

Management of Samagi Motors (David Peiris Motors Agent) has identified several difficulties of handling their business process.

- The manager of the company, has the difficulty in handling the business activities as he mostly have to be out of the office premises. Therefore, the need of a web based system has emerged in order to manage the business activities being remotely and away from office premises at any time.
- Also, their business has been expanded to another business other than playing the role of an authorized dealer of David Peiris Motors Agent. It includes the process of fixing spare parts, repairing, painting, quality controlling up to the gate passing of vehicles (light vehicles, specially cars) with the process of invoicing and estimating the values for those activities. All the processes of vehicle related activities are handled manually and it is time consuming.
- The manual process has number of files and lots of paper work. It is difficult to obtain a record urgently and difficult to maintain and manage.
- The current process has the inaccuracy of payment calculations, discounts, invoicing and estimate calculations.
- As the number of customers are increasing day by day, the business has expanded and sometimes due to some loss of document, losses happen within the business, due to the unavailability of a backup system.
- Lesser security, for confidential data, as they are on papers.
- Management activities are being complex to monitor.
- Inconveniencies are caused because of the eligible handwriting of documents.
- Difficulty in updating records from the past.

1.4. Motivation

In the current business context, human lifestyles have become more and more complex and complicated. People expect to have much easier, simple and productive systems that they can use to achieve their daily needs successfully and effectively. Therefore, for that purpose IT based solutions are now having a good approach.

The manual business process of Samagi Motors is very time consuming, inaccurate, not safe due to the unavailability of a backup system and very tiresome to handle, as the load of information to be handled is too much. As the manager of the company is mostly working out of the office premises he needed to work remotely at any time. For these reasons, the management of Samagi Motors was looking for a computerized automated system which can accomplish their fulfilment with current technology.

1.5. Aims and Objectives

The main aim of this project is to develop a web based automated sales and vehicle maintenance system for the client, which support most of his sales activities related as a David Peiris Motors Agent, vehicle maintenance activities as another business of Samagi Motors and Customer Relationship Management Activities of the business in an effective and efficient manner. The main aim is further identified as many objectives to fulfil, when completing this project. Those objectives are as follows:

- Help the employees in the client company to make their carrier more easier.
- Making the system available at any time at any location, to any authorized user.
- Demonstrating and explaining the benefits of getting aid from this kind of software in day to day business activities.
- Promoting the software to other clients of this kind.

1.6. Scope

The scope of this project is mainly condensed to have a practical implementation of a developed automated Sales and Vehicle Maintenance System for the client which fulfils his daily business needs and goals. The scope of this project can be mainly divided into two modules as the sales module (as the agent of David Peiris) and the module of vehicle maintenance, to manage his own vehicle business activities.

The Sales Module is related to the processes of sales of Bajaj bikes, as a David Peiris Motors agent. The scope of the Sales Module includes the capturing and storing of customer details, bike details, bike category details as master data. It also includes the process of capturing customer

order details. Calculation of payment instalments of the customers, and calculation of discounts, initial payments are also done through this proposed system. Generation of alerts and notices for manager mentioning about late payments, displaying on screen alert mentioning about the payers for a respective day and sending SMS to such customer's mobile are also considered as major tasks. Generation of reports such as sales report, purchase and stock details report, customer details report, bike details report are also included. The proposed system is also capable of handling the ability to update the interest rates for payments, generating warning letters for late payers and generating cash receipt for each customer at each payment related to the sales activities.

The Vehicle Maintenance Module is related to the own business activities of Samagi Motors and the proposed system store panel details of vehicle, vehicle make and model details, customer details, contractor details, insurance details of vehicles as master data. Saving of pre estimates, confirming pre- estimates in to estimates along with printouts is done. Open a job card to a customer against the estimate confirmation and generate a job card print is also significant. The proposed system has the capability of handling the separate divisions as Spare Part, Tinker, Paint, Quality Control and Gate Pass and pass the job according to the job works of each vehicle through these divisions automatically. The system have the context of temporary out process of vehicles and temporary out receipt generation. Generating SMS to customers in several instances of job such as notifying the start of the job, end of the job and promotions are also done. Sales invoicing and invoice print along with the gate passing and gate pass print is also possible. Notification to staff showing the count of jobs in the Quality Control division to be passed to gate pass and notification to display the customer feedback comments count are the customized features of this system.

The system is capable to generate reports such as gate pass summary report, daily vehicle in out report, Insurance wise sales report, sales journal, divisional summary report, cash book report, vehicle summary report and delivery date report and sending SMS to staff such as daily in out vehicle count, over dated vehicles for the current date in each divisions as over dated spare parts, over dated tinker, over dated paint, over dated qc, daily insurance wise sales, temporary out SMS.

Email generation to authorized staff members on delivery date vehicle list and customer calling list and payment list related with the previous day and backup the system and setting the user

permissions are another main special features that can be included in the scope of the automated Sales and Vehicle Maintenance System. This system scope will not contain the online payment facilities for the customers and online registration for the customers themselves.

Note:-SMS generation, email generation and generation of backups will be implemented through windows services, while SMS sending will be also done through a windows service separately and alerts and notifications will be generated from the website.

1.7. Structure of the Report

This report contains four chapters in order to give a comprehension to technical and non-technical stakeholders about this web based sales and vehicle maintenance system.

Chapter1: Introduction

The introduction chapter provides an overview of the project and define the problem, motivation and objectives in the project. The scope is also well defined through this chapter.

Chapter 2: Background

This chapter gives a summary of the background information to the implementation. In addition, a critical review of similar systems, technologies available and summary of implementation tools are explained.

Chapter 3: Analysis and Design

This chapter includes fact gathering techniques, functional and non-functional requirements, feasibility study, design diagram methods and tools used in design, user interface design, database design etc.

Chapter 4: Implementation

Implementation technology, justifications, creation of user interfaces and important code segments are descriptively explained in this chapter.

Chapter 5: User Evaluation and Testing

This chapter includes evaluation scenarios, test plan, test cases, tools such as questionnaires, test automation tools and testing frameworks.

Chapter 6: Conclusion and Future Work

This is the final chapter of the dissertation. This chapter summarizes the work and include about lessons learnt, achievement of objectives and how the work could be extended.

Chapter 2: Background

2.1. Introduction

Web based information systems are the systems that uses internet web technologies to deliver information and services to users.“It is a software system whose main purpose is to publish and maintain data by using hypertext-based principles. Web browser is typically used as front-end whereas database as back end”[1].

2.2. Implementation Background

The proposed system is a web based information system that handles the sales activities and the vehicle maintenance activities. This system will be implemented in a busy business premises. This system will be hosted in a hosting server and the client computers in the office premises are networked through a wi-fi internet connection. Printers will be connected to client computers as shared devices through the same wi-fi network. A server space will be needed to upload the backups of the database taken daily. Therefore, the internet connection is a must to the functioning of this system. A SMS gateway is going to be used to send the SMS to customers and to the selected authorized members of the staff. Gmail server will be used to send the emails to recipients through an automated service.

The system will be deployed for different user levels and the functioning will be restricted each user wise according to the user levels. The users of the system will be mostly the customer care coordinators, sales manager, accountant, quality control manager, division managers, managing director, administrator, executive, service advisor and auditor. The employees and the managing director will be the internal stakeholders of the system while customers and suppliers will be the external stakeholders of the system.

The SMS will be generated from a windows service and will be sent to the recipients through another windows service. Another windows service will be used to implement the email generation and sending and a separate windows service will be used to generate and upload the backups of the database. The web site will have the rest of the functionalities implemented along with the alerts, notifications and prompts that the user expects. This system has actually two main

modules as sales (sales related as a dealer of David Peiris Motors Company) and vehicle maintenance.

Nowadays, there are different technologies that can be used to implement a web based solution. Languages such as PHP, Java, Perl, Python, Drupal, Ruby, ASP.NET can be used in developing the system with the database technologies of Mysql, MS SQL, Oracle etc. For the proposed system selected languages are ASP.NET with C# as the programming languages and MS SQL as the database.

This system has been implemented as a web based system, as the manager of the Samagi Motors is sometimes out of office premises he need to check the current activities and can manage his business being at anywhere. As the client is mostly familiar with Microsoft technologies, it was decide to use Microsoft tools for the development of the project.

2.3. Similar Systems

- Samantha Motors, Agalawaththa

  Samantha Motors, is using a standalone sales management system. They have been using this system since 2014. This system supports all the sales management activities related to sales of motor bikes. This system also has the functionality in selling of the spare parts too. This software has been developed using java as the programming language along with Mysql as the database. This system has some similar features related only to the sales module of the proposed system. This system is standalone and cannot be used out of the office premises. This system has no functionalities such as auto generation of emails and database backups as the proposed system. Therefore this system is insufficient in the particular case.

Figure 2.1:Interface of Samantha Motors

- Mr.Paint, Colombo 02

  Mr.Paint is using a web based vehicle maintenance system, named as an Information Management System in their words, since 2012.This system supports all the vehicle maintaining activities, estimating and invoicing process. The system have very simple user interfaces. This is also a proprietary software developed using ASP.NET as the programming language and MS SQL as the database. But it is not hosted in a server and is used on a local server. This system also has the ability of generation and sending of sms to its customers and staff other than its web site functionalities. This system has some similar features related only to the vehicle maintenance module of the proposed system and the sales module is totally different to the proposed system. Therefore this system is insufficient in the particular case.

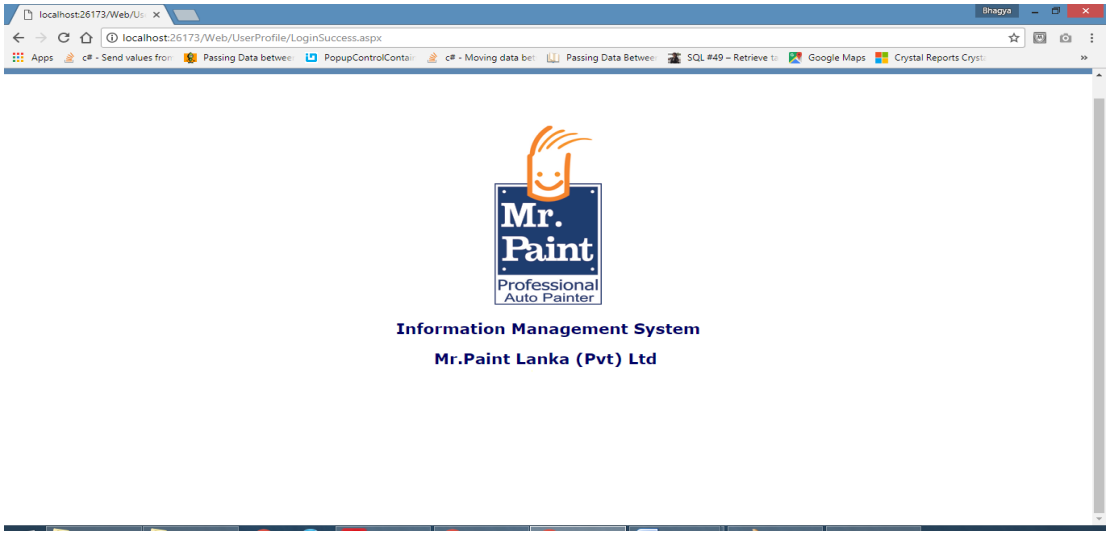

Figure 2.2:Interface of Mr.Paint

- Yamaha Bike Centre, Kiribathgoda.

  Yamaha Bike Centre in Kiribathgoda uses a sales management system to keep track of the sales activities of the entire business. Manager and staff members have the user privileges to the system. The system is capable to do automatic calculations, stock control, reports and alert generations. The Yamaha Bike Centre, Kiribathgoda has been using this system for more than 5 years now. It has been developed as a standalone system using the language of C#.net and MS SQL as the database, but it has some similar features related to the proposed system, regarding selling of bikes. This system also has some similar

features related only to the sales module of the proposed system. As this system is a standalone software, it cannot be used out of the office premises. This system do not have any special functionalities such as auto generation of SMS, emails and database backups. Therefore this system is insufficient in the particular case.

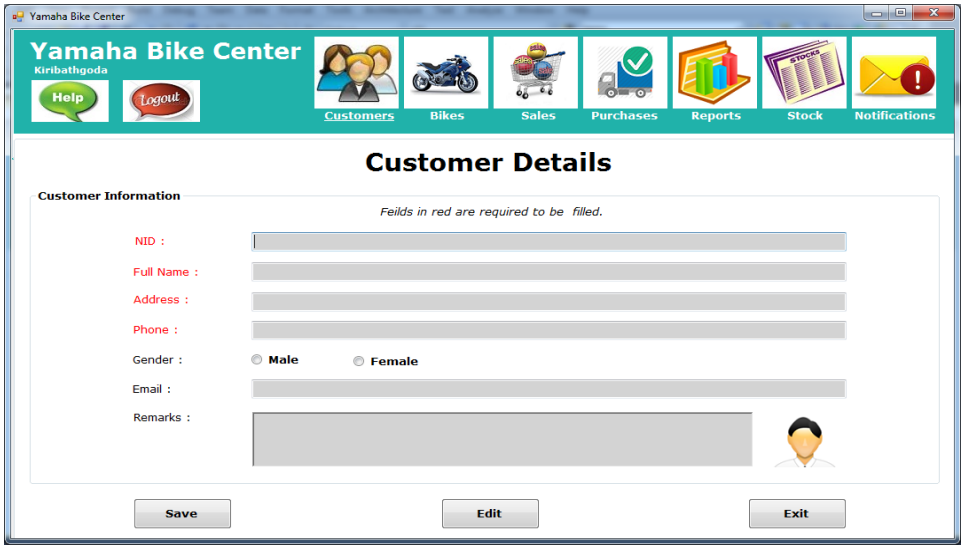

Figure 2.3:Interface of Yamaha Bike Centre

2.4. Alternative Technologies

There are several different alternative technologies for implementing the proposed web based system. Different types of programming languages can be used for the front end. Here are only few of them which are on the lead and used by majority.

- PHP

  PHP stands for the Hypertext Pre-processor. It is a server side scripting language designed mainly for web development. PHP can be used in combination with various web frameworks, templates and content management systems.

- Python

  Python is an interpreted programming language which is used in general purpose programming. Python is also object oriented.

- Java

  Java is an object oriented general purpose programming language as python. Java is used in Android smart phone applications and internet related developments widely nowadays.

- Ruby

  Ruby is also an object oriented, general purpose computational programming language which has the features of dynamic type system and automatic memory management.
- Perl

  Perl is a family of languages with Perl 5 and Perl 6.Perl is a high level, general purpose and dynamic programming language.
- Javascript

  Javascript is one of the three core technologies used for the world wide web content. It is a high level, interpreted, prototype based programming language mostly used along with the HTML and CSS.

2.5. Pros and Cons of Alternative Technologies

When comparing the alternative front end technologies that can be used to the development of the web based systems, we can identify some pros and cons related to each of those technologies.
For the comparison the below mentioned facts were taken in to consideration.

- Efficiency of the language
- Available platforms and frameworks
- Community support
- How quick and ease the language was learnt
- Security

Language/Technology	Pros	Cons
PHP	• It works well with databases, file systems, images, etc. • Having lot of frameworks. • Availability of performance accelerators for PHP • Easy to learn	• Not too fast (good for building database interfaces, not making calculations) • Full of bugs and might change semantics without note • Inconsistent function names in the standard library • Not secure

Python	• Clean, expressive • Free availability • Powerful • Performs well across different platforms. • Easy to learn	• Too slow in performance (than java or ASP.NET) • Not secure • Absence of commercial support • Absence of GUI
Java	• Platform independent • Portable • Easy to learn • Open source, freely available	• Lack of dynamic language features • Bugs in library implementations • High storage capacity and uses more memory • Less security
Ruby	• Easy to learn • Framework has a simple structure • Has a big development community • Powerful • Rapid development(reduced development time)	• More expensive • The performance is not fast as PHP • Not so common • Require more boot speed • Consumes more system resources
Perl	• Multipurpose • Versatile • Quick running	• Poor usability • Not portable • Slow
Javascript	• Easy to learn • Versatile • Speed being client side	• Less secure • Interpreted differently on different browsers

Table 2.1:Table of comparison of technologies

This chapter summarizes about the implementation background, similar systems to the proposed system, alternative technologies and pros and cons of alternative technologies, that gives a clear comprehension about the background of this proposed system.

Chapter 3: Analysis and Design

3.1.Introduction

System analysis and design are two outstanding important phases in SDLC. The analysis chapter gives a better comprehension about the existing system and client domain along with the fact gathering techniques, functional and non-functional requirements etc. Analysis should be completed in an effective an efficient manner in order to achieve a better design. Design phase emphasis on the technical or implementation concerns of the system. In the process of design, defining of inputs, outputs, files, modules, interfaces and other computer based components are done.

3.2. Existing System

Bike sales activities related scenario:

Currently, all the management of sales are done manually. Samagi Motors should present a sales forecast, to the David Pieris Motor Company Limited and should place a quotation for motor bikes via sets of forms, before three months for supply. All types of bikes are normally included in an order. Each bike can be categorized into various categories according to their types. Some such categories are, “Discover-125”, “Pulsar”, “Boxer,” “Patina” etc. A bike is separately recognized by its chassis number and the engine number.

The bikes are sold according to the sales method of first- in first- out. When the stock gets expired, David Peiris Motor Company Limited renew the stock. Each bike has a bank guarantee. Samagi Motors has the responsibility of renewing the bank guarantee of bikes. A special payment is not done to the David Peiris Motor Company by Samagi Motors. David Peiris Motor Company Limited pays for the damages to Samagi Motors, if a bike gets damaged and that damage is related to their terms and conditions, mentioned in their insurance for any damages that happen after sold to the customer.

When a customer come to Samagi Motor to place an order the staff member has to check the customer’s names or details in the log book, whether he/she is having existing payments left mentioned as the black list . If not, when a satisfactory bike model is picked by customer he/she can proceed to place an order. If the customer requirement model is unavailable, he/she can make

an application free of charge and will be included in a waiting list. At the time of accepting an order, the office personnel will get particular details from the customer, if the customer wishes to proceed with purchasing.

If a customer made a successful complete payment he/she can do the registration of the bike from David Peiris Motor Company directly or through Samagi Motors. Otherwise if a customer made just an initial payment, he/she can move to the finance facility method offered by Samagi Motors itself or can get assist another financial company. At the times a customer comes to make a payment the staff member has to find the respective page of the customer in log book and has to calculate the rest of number instalments. If a customer gets unable to pay the rest of the amount, he /she should return the bike.

Vehicle maintenance activities related scenario:

When a customer comes and request for a pre estimate for his vehicle the office personal will definitely provide the customer with the requested pre estimate. Then if the customer confirms the pre estimate and say that he wanted his vehicle to be done from Samagi Motors a confirmation of the estimate is done. Details are sent to an insurance if the vehicle repair is done through an insurance and estimate confirmation details are obtained while the process of job card is opened. According to the type of repair or paint or fixing spare parts the vehicle passes along the relevant divisions of Spare parts, Tinker, Paint and finally comes to quality control division. If it is just a washing or polishing work the job directly passes to the QC division. Before the job passes to QC normally, invoicing is done for a vehicle. After the QC manager checks the completion of vehicle activities he confirms a date and a time to be given to the customer to come and pick up the vehicle. A office personnel approved that time and put a gate pass and release the vehicle and inform the customer to come by giving a call.

While the process happens, if the customer wants his vehicle for a urgent case, the office personnel check the condition of the vehicle and put a temporary out for that vehicle. After the completion of the whole vehicle repairing or painting processes and when customer took his vehicle from the gate pass, after a day , an office personnel gives a call to that relevant customer and collects his/her feedback about the vehicle and the work done and keeps records about the feedback in a special log book.

Use case diagram for the existing system along with other diagrams are included in Appendix- A.

3.2.1. Drawbacks of the Existing System.

The management of Samagi Motors has identified a number of problems with their manual system.

- Time consuming.
- Lot of paper work, that is difficult to manage.
- Having no backups.
- Inaccuracy of payment calculations.
- Difficulty of obtaining records, urgently.
- Less security for confidential data, as they are on papers.
- Management activities being complex to monitor.
- Inconvenience caused because of eligible handwriting of documents.
- Difficulty in updating the records.

3.3 Feasibility Study for the Proposed System

A feasibility analysis was done for this proposed system, under the following categories, in order to satisfy main business requirements.

3.3.1. Operational Feasibility

An operational feasibility was done by analyzing all system functionalities in order to find whether they meet and fulfill all business requirements.

3.3.2. Market Feasibility

A market Feasibility was done, as there are five more sales dealers of David Peiris Motor Company Limited in Kalutara District, and checked whether the system could face with the huge market.

3.3.3. Economic Feasibility

Having the sales management system reduce labourer cost. The system need only hardware, maintenance costs and tool costs.

3.4 Fact Gathering Techniques

"Fact finding is a format process that uses techniques to collect/ gather information about system requirements, problems and preferences. Also known as information gathering."[3]. From the available fact gathering techniques, the following were used to collect information of the system.

- Interviews
- Questionnaires
- Observation of the working environment
- Sampling of existing documents.

- Mainly the facts were gathered by interviewing the manager of the Samagi Motors who is going to be the main user of the system. The staff members of Samagi Motors too were interviewed.

- A questionnaire was prepared and obtained answers from the whole staff, including the manager.

- An observation was done to verify the facts and for additional comprehension of the system.

- Sample materials such as member registration forms, receipts, invoices, job cards, estimates, photographs and feature descriptive documents, leaflets were gathered in order to complete the fact gathering part of analysis.

3.5. Requirement Analysis

"Requirements analysis, also called requirements engineering, is the process of determining user expectations for a new or modified product"[4].

When the requirements of Samagi Motors is being analysed, it can be further classified as functional requirements and non-functional requirements.

3.5.1.Functional Requirements

Given below are summarised functional and non- functional requirements of the system.

Bike Sales Module Related (Process of Sales Of Bajaj Bikes, as a David Peiris Motors Agent):

- Capture and store customer details, bike details, bike details and bike category details.
- Capture customer order details
- Calculate payment instalments and discounts.
- Display balance payment, outstanding value and arias amounts for each customer.
- Generate alerts and notices for manager mentioning about the late payments.
- Generate monthly income report, sales report, salary report of employees, purchase detailed report, customer detailed report, bike detailed report.
- Display on screen alert mentioning about today's payers list and sending SMS to customer mobile.
- Update interest rates for payments in special conditions by manager.
- Generate a warning letter to customers with late payments.
- Generate a cash receipt to each customer at each payment.

Vehicle Maintenance Module Related:

- Store pre estimate details, spare part details, panel details of vehicles, customer details, insurance details of vehicles.
- Confirm pre estimates in to confirmed estimates.
- Open a job card to a customer with the print of a job card.
- Create separate divisions as Spare part, Tinker , Paint, QC and Gate pass and pass the job according to the job card of each vehicle through these divisions automatically.
- Display the vehicle existing division in a picturesque manner at a quick search.
- Generate reports of over dated vehicles in each division separately as spare part over dated report, tinker over dated report, paint over dated report and qc over dated report to manager and authorized staff.
- Temporary out process of vehicles and temporary out receipt generation.
- Generate SMS to customer thanking SMS, notifying the start of the job, end of the job and promotions.

- Sales invoicing and invoice print along with gate pass and gate pass print.
- Notification to staff showing the count of jobs in qc division to be passed to gate pass and notification to display the customer feedback comments count.
- Generate reports such as gate pass summary report, daily vehicle in out report, Insurance wise sales report, sales journal, divisional summary report, cash book report, vehicle summary report and delivery date report.
- SMS to staff such as daily in out vehicle count, over dated vehicles for the current date in each divisions as over dated spare parts, over dated tinker, over dated paint, over dated qc, daily insurance wise sales, temporary out SMS.
- Customer feedback handling process.
- Email generation to authorized staff members on delivery date vehicle list and customer calling list and payment list related with the previous day.
- Backup the system and setting the user permissions.

3.5.2.Non Functional Requirements

- The system should be easy to use.
- Should have attractive interfaces.
- The system should be accurate and reliable.
- There should be a security system to prevent unauthorized access.
- The maintainability of the system should be at low cost.
- The system should be able to accomplish it tasks consuming only a short time.

3.6. Important Calculations of the System

3.6.1. Calculating the advance amount

Bike model original price (Rs) = x

Insurance fee (Rs) = y

Registration fee (Rs) = z

Other expenses (Rs) = n

Total bike's value (Total) (Rs) = x+y+z+n

Advance Amount(Adv)=(x+y+n+z)×10%

The interest rate for a month has a range of(2.5%-7.5%)

- Advance payment should be a minimum of the value of the bike model.
- Discounts are given if the full payment was done by cash at once.
- Number of instalments can be requested by the customer, and is done to customer's choice.(It can be 12 months,24 months ,36 months likewise..)

3.6.2. Calculating the Interest

Total amount of the bike =Total

Advance amount paid = Adv

Balance amount (BA) = Total- Adv

Interest per year = (Total –Adv) × Monthly interest rate ×12

3.6.3. Calculating Installment values

Instalment value (Interested value + Balance amount) / 12

3.6.4. Calculating Late Payments

After passing 3 days of due payment date penalty rate is newly added to the existing value and is calculated according to the number of days passed from the due date.

Existing balance amount = BalAmt

Monthly penalty rate = 7.0%

Total dates for a month = d_T.

The number of late days

From the due date =d_L.

∴The new balance amount

To be paid $= \left(\frac{\mathbf{BalAmt \times 7\%}}{\boldsymbol{dT}} \mathbf{x\ d_L}\right) \mathbf{+BalAmt}$

3.6.5. Calculating Invoice Payments

- NBT- 2%
- VAT-15%

3.7. Design Methodology

"A software development methodology or system development methodology in software engineering is a framework that is used to structure, plan, and control the process of developing an information system"[5].

There are several design methodologies. Among them, the proposed system is to be developed using the design methodology of Evolutionary Prototyping.

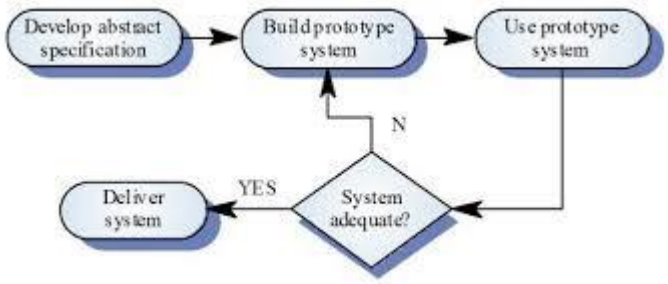

Figure3.1 :Evolutionary Prototyping

The reasons to select Evolutionary Prototyping over other methodologies are as follows.

- In Evolutionary Prototyping, system is developed in increments so that it can be modified in response to end-user feedback. So, as the client Samagi Motor's requirements have the possibility of changing, by using this methodology can obtain a successful output to the proposed system.
- The development can be started from the parts of the system that have been understood.
- The system can evolve ahead by adding the new features proposed by the customer.
- Can start with any high risk area.

Waterfall model will not suit as the requirements of clients may change. Spiral Model is costly when compared. Agile development can be used, but as this is not a project done by a team, it is not practical. Rapid Application Development methodology is better for mostly short time process. Rational Unified Process is too complex for the proposed system, though they can be used as alternatives.

3.8. Alternative Design Methodologies

	Pros	Cons
Waterfall Model	• Easy to understand and implement • Widely known • Document driven • Identifies deliverables and milestones	• Does not match with the reality • Difficulty in risk management • Costly for small teams • Absence of an iterative nature
Spiral Model	• High risk analysis • Software is produced early at the life cycle • Better for large and mission critical projects	• Costly • Doesn't work on smaller projects • Project success depend on the way of risk analysis.
Agile Development	• Test based approach • Iterative • Incremental development is supported • Maintains simplicity	• Costly • Better in team projects • Lack of emphasis on documentation
Rapid Application Development	• High productivity • Iterative • Can be used at evolutionary requirements	• Suitable for projects requiring shorter development times • Costly
Rational Unified Process	• Accurate documentation • Integration throughout the life cycle of software development • Reusability of components	• Too complex • Need expertise

Table 3.1:Table of comparison of design methodologies

3.9. Design Strategy

"Design strategy is a discipline which helps firms determine what to make and do, why do it and how to innovate contextually, both immediately and over the long-term. This process involves the interplay between **design** and business **strategy**"[6].

The proposed system will be using the design strategy of Object Oriented Design.

Object Oriented Design

The reasons to select object oriented designing over the other design strategies for the proposed system are,

- Reusable, maintainable and scalable
- Bottom up approach
- Have the features of abstraction, encapsulation, inheritance and polymorphism.

This is widely used newest design strategy. UML is the most popular method used in this concept of OOD. According to UML the following models were used for the designing phase.

- Use case diagram
- Class diagram
- Entity relationship diagram
- Sequence diagram
- Activity diagram

There are some other alternative design strategies too.

3.9.1 High Level Use Case Diagram for the proposed System.

"Use case modelling is widely used to support requirement elicitation. A use case can be taken as a simple scenario that describes what user expects from a system"[7]. Figure 3.2 shows the use case diagram which covers the basic system functionalities and shows the interaction of use case along with the relationship such as include, extend generalization likewise.

Refer Appendix-A for more activity diagrams and sequence diagrams.

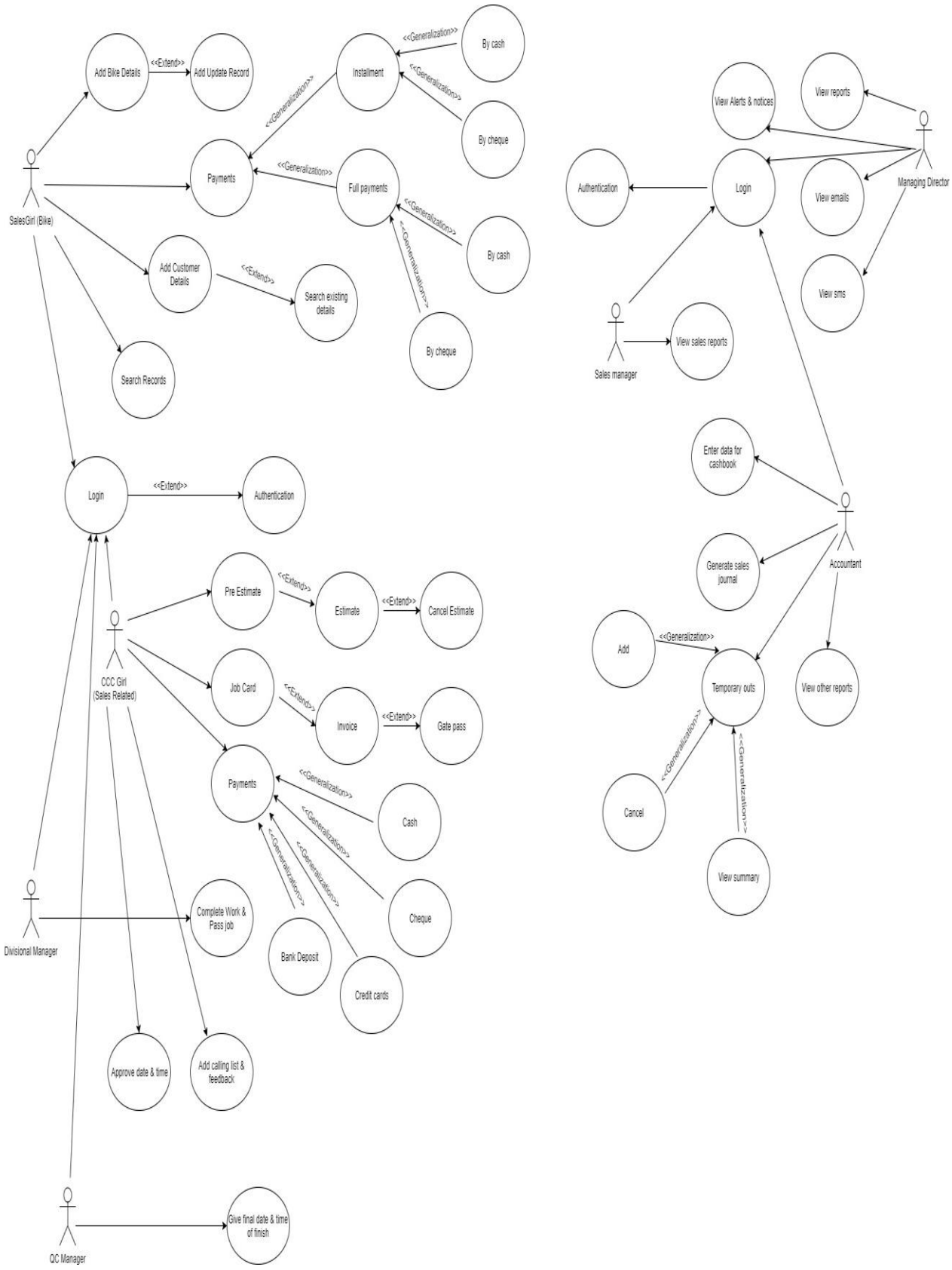

Figure 3.2: High level use case diagram for the proposed system

3.9.2.Class Diagram for the Web Based Sales and Vehicle Maintenance System

"Class diagrams are used when developing an object oriented system model to show classes in a system and associations between these classes" [7]. The following figure 3.3 illustrates the class diagram for the Web Based Sales and Vehicle Maintenance System.

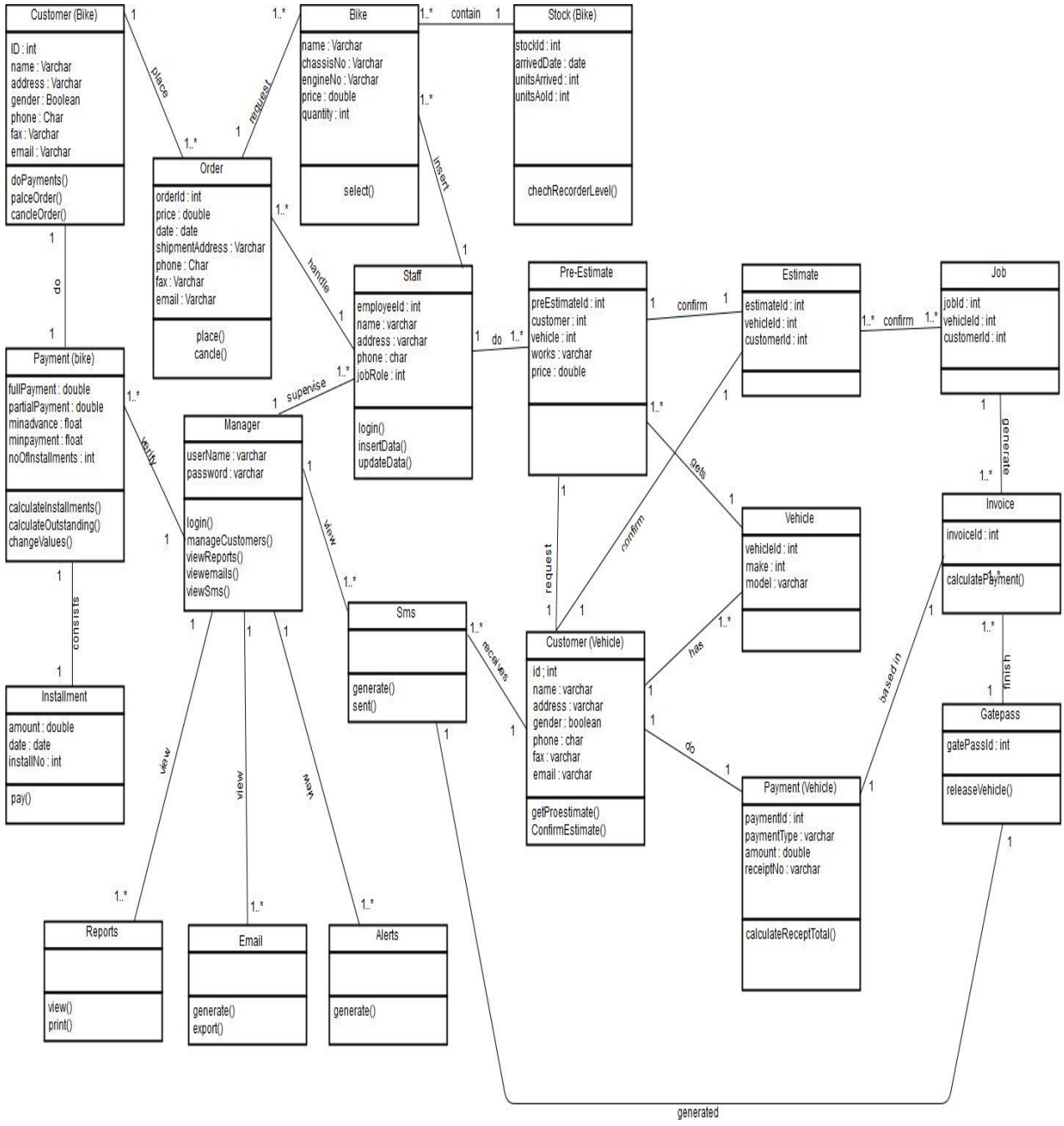

Figure 3.3 : Class diagram for the proposed system

3.10. Comparison of Alternative Design Strategies

There are several alternative design strategies .

- Structured Design
- Function Oriented Design

	Structured Design	Function Oriented Design
Features	• Conceptualization of problem into several well-organized elements of solution. • Concerned with the solution design • Give better understanding of how the problem being solved • Based on 'divide and conquer' strategy • Modules of the design are well organized	• System is viewed as a set of many smaller sub-systems known as functions. • Top down approach • Each function is described at large.
Pros	• Improved Design • Greater productivity • A good design has high cohesion and low coupling	• Higher level of abstraction • Structural decomposition • More expressive
Cons	• Lack of encapsulation • Repetition • Lack of information hiding	• Lack of encapsulation

Table 3.2:Table of comparison of design strategies

3.11 Database Design

The definition of databases can be stated as follows. “Databases are programs that allow for the storage and retrieval of large quantities of related data” [8].

A database must have a good design. A good database design ensure data integrity. A well designed database should be reliable, adaptable and scalable to new requirements, be efficient in data storage, updating, retrieval and should support the business requirements of the information systems.

Since anomalies lead to data redundancy and loss of data integrity, the database must be normalized. Data redundancy occur when data is duplicated on the database. The process of normalization solve this problem. “The Database Normalization is the process of organizing the fields and tables of a relational database to minimize redundancy and dependency ” [9].

Normalization ensure data integrity. Through normalization, larger tables are broken in to smaller tables by examining relationships between attributes. Normalization is a database design technique. The purpose of this normalization is to identify a suitable set of relations that supports data requirements of an enterprise.

Following briefly describes about the first three normal forms.

1st Normal Form -	A relation is in the 1st normal form, if all its attributes are atomic and if each attribute is a primitive.
2nd Normal Form -	The 2nd normal form, deals with the relationship between non-key and key fields and it is relevant when the key is composite.
3rd Normal Form -	The 3rd normal form deals with transitive dependencies. A relation is in 3rd normal form if it is in 2nd normal form and each non-key attribute is not dependent on any non-key attribute.

3.11.1 Entity relationship Diagram for the proposed system.

ERD shows data in terms of entities and relationships described by data. Figure 3.4 illustrates the ER diagram for Web Based Sales and Vehicle Maintenance System.

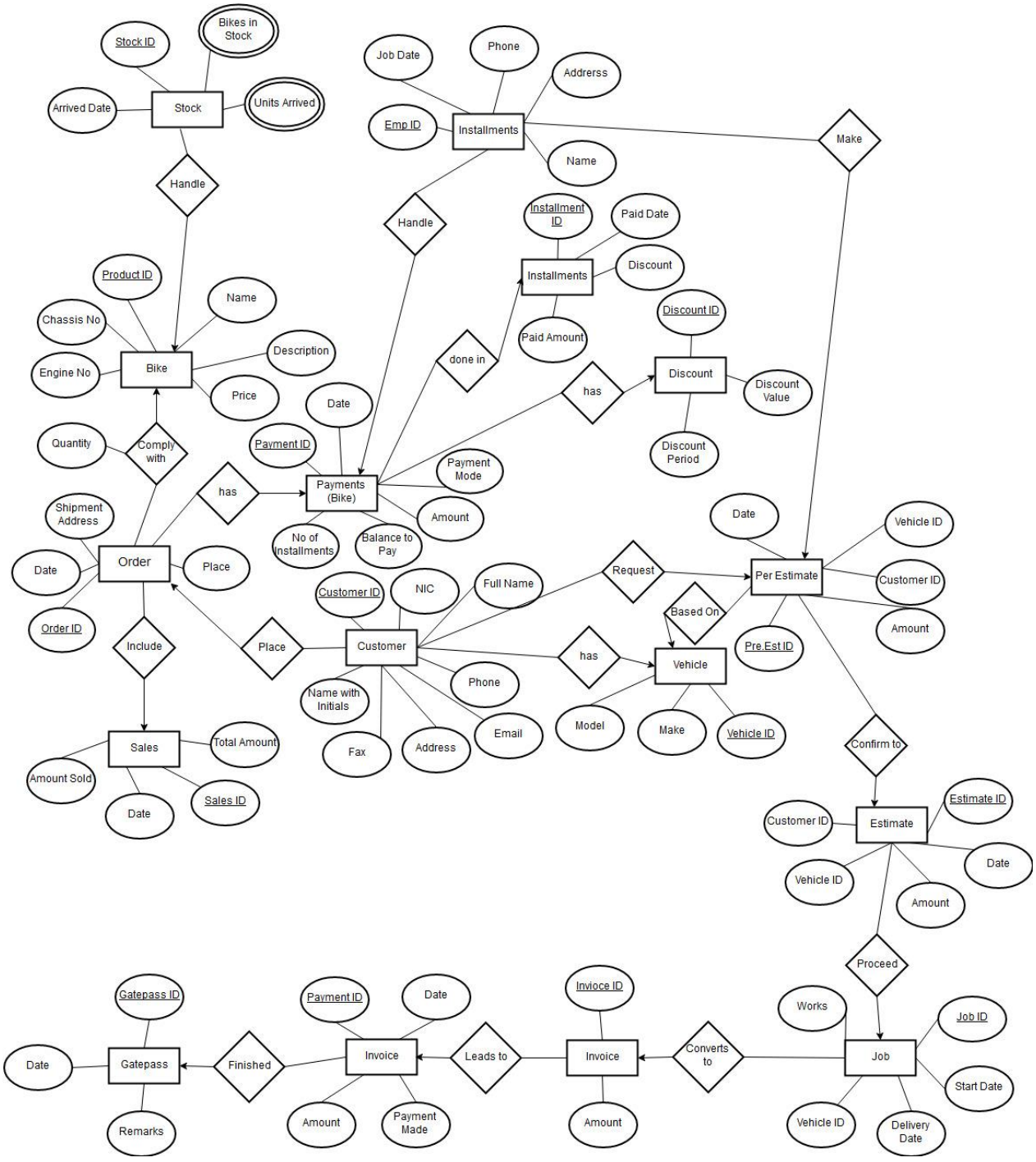

Figure 3.4 : ERD diagram for the proposed system

3.12.User Interfaces Designing

According to the request of the client, the proposed system for Samagi Motors should be able to use even by a medium level computer skilled person without more training. Therefore some of the main properties the user interfaces of this sales management system should have are as follows.

- Being simple and user friendly.
- Being consistent
- Should provide feedback making error messages, warnings etc.
- Making interfaces more comprehensive to the users.
- Being attractive and using colours appropriately in order to manage user's pleasant view.
- Easy navigation through the screens

This sales management system consists of different interfaces with different functionalities. Few main interfaces out of them are shown below.

User Login Interface

The figure 3.5 shows the initial interface, of the system. This is a common user interface, which users of the system use to log into the system using their user names and passwords. If any authorized persons attempts to login or any error done by user will be displayed in error messages on the screen.

Figure 3.5: Login Interface

Home Page

Figure 3.6 shows the home page of the web based sales and vehicle maintenance system. This is the most important and basic page of the system. Main activities are categorized and are made accessible to the user easily via this. Instead of using text, pictorial representations have been used displaying the activities.

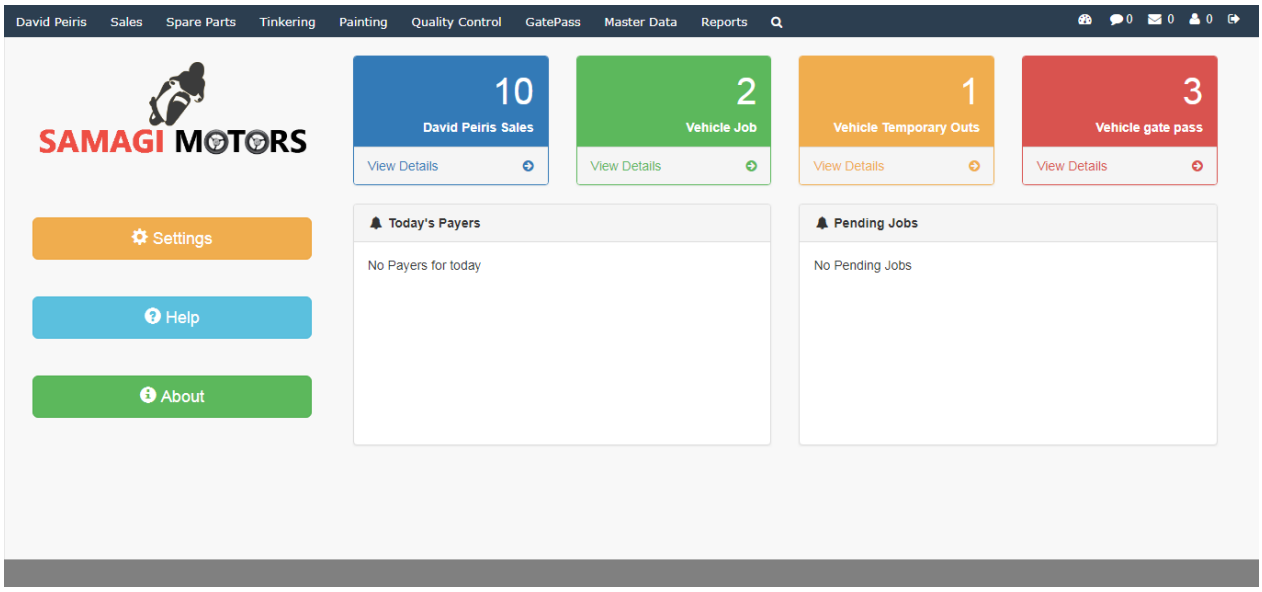

Figure 3.6: Home Interface

Pre-estimate Interface

This is the interface of adding pre estimates of the vehicles requested by customers.

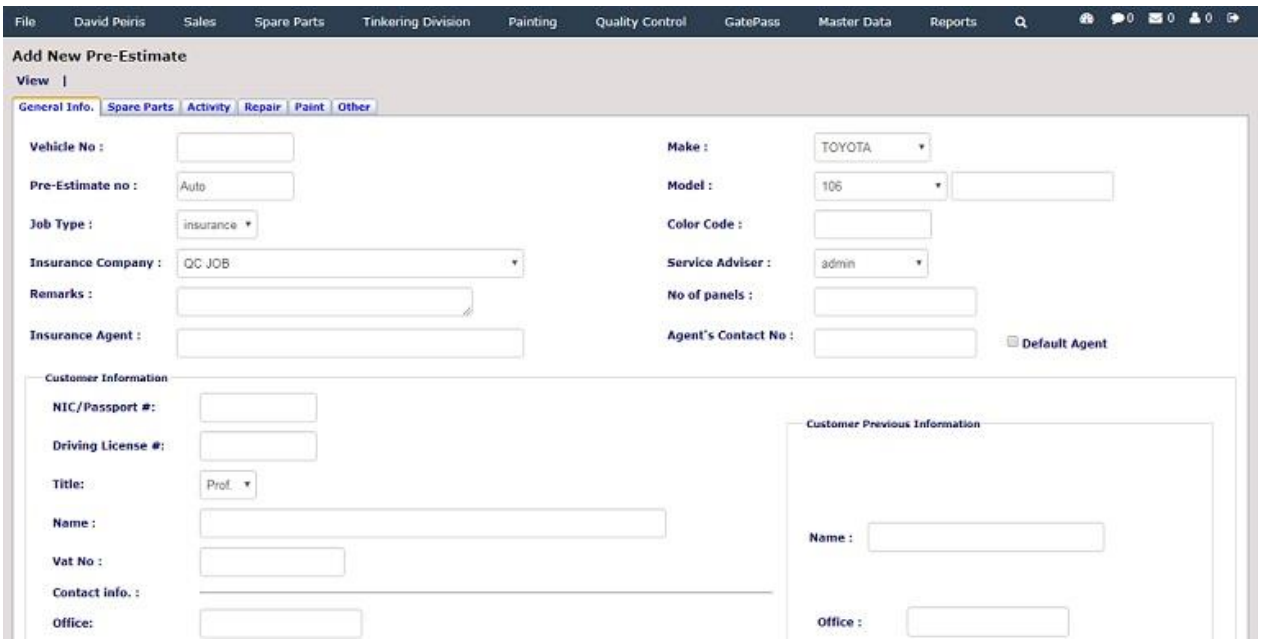

Figure 3.7:Interface of Pre estimate

Vehicle Information Interface

This interface is used to enter initial vehicle details to the system.

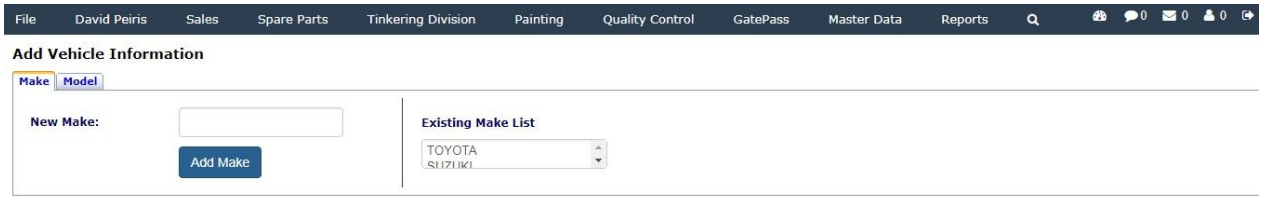

Figure 3.8: Interface to add vehicle information

Insurance company adding Interface

The figure 3.9 is the interface used to add insurance information to the system.

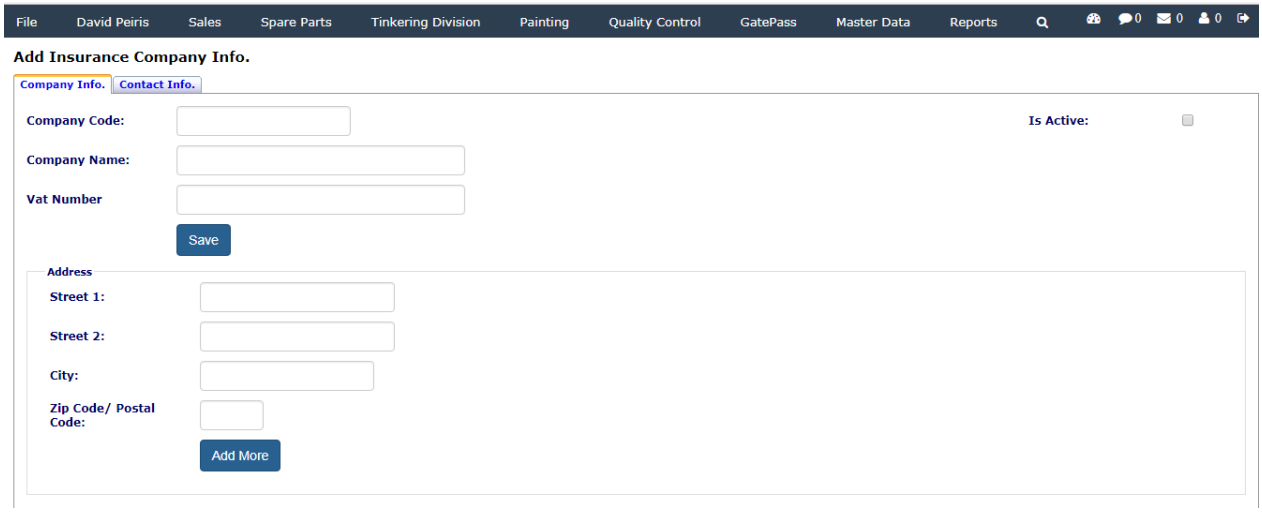

Figure 3.9 : Interface to add insurance company information

This chapter summarizes about the design and the analysis part covering the areas of the existing system, drawbacks of the existing system, feasibility study for the proposed system, fact gathering techniques used, requirement analysis done as functional and non functional, important calculations of the system, design methodologies with alternative methodologies, design strategy used and the comparison with the other design strategies, database designing and user interface designing. Refer Appendix-B for the rest of the user interfaces of the system.

Chapter 4:Implementation

4.1. Introduction of Implementation

In the implementation phase, it creates and program the final system. This phase is the following and the resulting phase of the design phase. All the activities during the previous phases are implemented in the real world during this phase. This Web Based Sales And Vehicle Maintenance System is built with the help of the selected development tools and technologies and implemented in order to meet all client's requirements.

4.2. Implementation Tools Review

This Web Based Sales and Vehicle Maintenance system was developed under following hardware and software requirements.

Hardware requirements for the implementation,

- Client computers
- Printers
- Mobile phones
- Wi-fi / Internet connectivity

Software requirements for the implementation,

- .NET framework 4.0
- Hosting server
- SMS gateway

4.3. Development Tools

Development tools used for the implementation,

- Microsoft SQL server 2012

  As a database, it is a software product whose primary function is to store and retrieve data as requested by other software applications. Its primary query language is transact SQL. Microsoft SQL server 2012 has been used as the database server in this project.

- Microsoft Visual Studio 2012

  This is an integrated development environment from Microsoft which is used to develop programs. Version 2012 of the IDE is used in this project to develop the web site. The

code editor supporting intelligence as well as code refactoring made the work easy and speed.

- Microsoft Visual Studio 2010

  This is also an integrated development environment from Microsoft which is used to develop programs as Visual Studio 2012.Version 2010 is used in this project to create the other services other than the website which are used to generate backups, generate SMS, send SMS and generate emails. The built in tools of visual studio 2010 made the work more efficient.

- Crystal reports

  Crystal report is a business intelligent application. It is used in design and report generation in .net applications.

- .NET Framework 4.0

  ".NET framework is a software framework developed by Microsoft that includes the large library and provides language interoperability (each language can use code written in other languages) across several programming languages" [2].

  The class library of .NET Framework is a set of reusable components which makes the development more efficient. NET framework 4.0 is used in this project.

Languages used for implementation,

- ASP.NET

  Asp.net is a server side web application framework designed for web development. It has been developed by Microsoft. Used in building web sites, web applications and web services.

- C#.NET

  This is a general purpose, object oriented programming language developed by Microsoft.

- CSS

  CSS refers to Cascading Style Sheets. It is a style sheet language used for presentation of the document written in a mark-up language.

- JQuery

  This is designed to simplify the client side scripting of HTML. This is a free open source software.

- Javascript

  Javascript is one of the three core technologies in world wide web content production.

Third party tools aided for implementation,

- Ajax control toolkit

  This is a third party tool aided in the application development which provide enhanced features or tools for the development.

- Bootstrap

  Bootstrap is a web design tool to improve the design of a web application or a web site.

4.4. Technology of Implementation

ASP.NET with C# is used as the technology as the technologies of the front end. The reasons to select ASP.NET compared over the other languages are,

- Security reasons
- High scalability and performance
- Simplified model
- Well organized structure
- Good community feedback
- Productivity
- Code reusability

4.5. User Interfaces Design and Reports

User interfaces in this system are designed using the languages of asp.net, css, bootstrap, ajax tool kit. Some main interfaces of the system are the login, main dashboard interface, pre estimate interface, job interface, gate-pass interface etc.

Reports in the system are designed using Crystal report, which is a business intelligent application used to design and generate reports from various data sources. Some sample reports are as shown by the Figure 4.1 and Figure 4.2.Other reports are included in the Appendix-C.

Report of Spare Part Over Dated Report

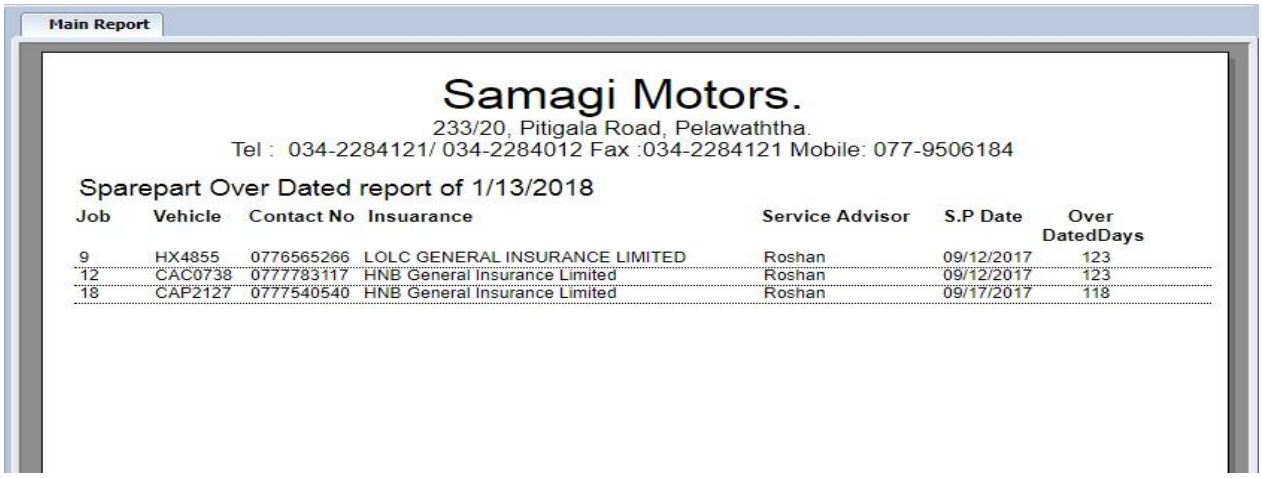

Figure 4.1 : Report of Spare Part Over Dated Vehicles

Report of Sales Journal

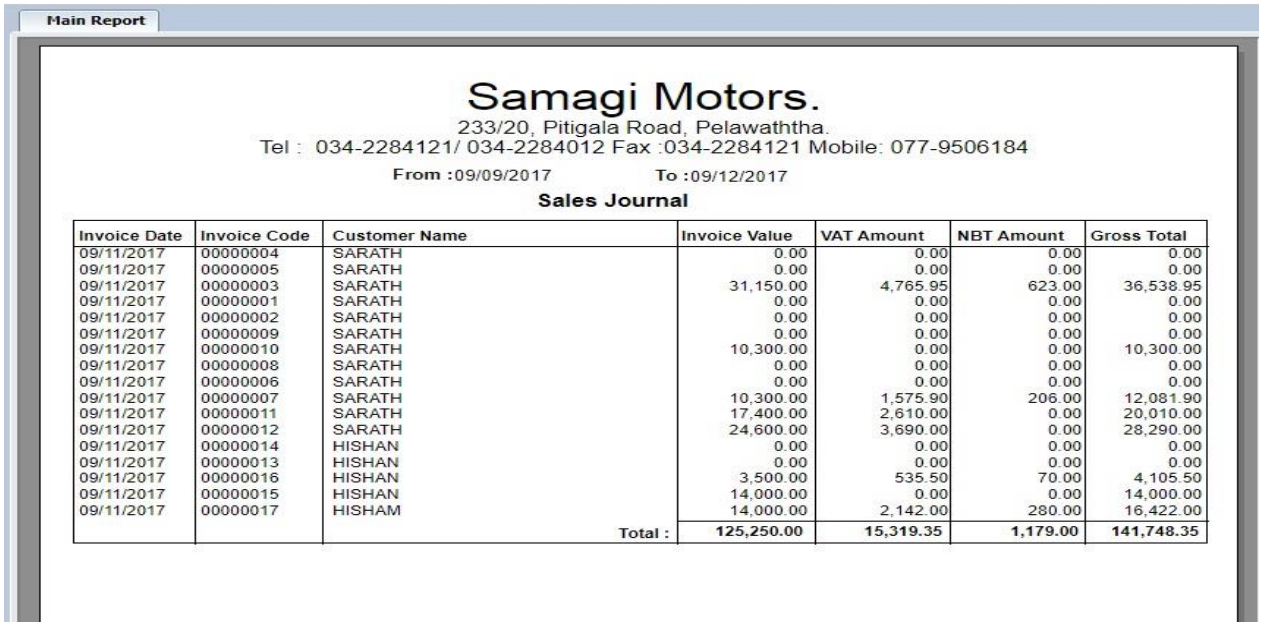

Figure 4.2 : Report of Sales Journal

The implementation chapter summarizes about the tools used for the development, a review of the implementation tools, technology of implementation, and about the user interfaces and reports of the system. Refer Appendix-C for other management reports.

Chapter 5: User Evaluation and Testing

5.1. Introduction

Testing the software is the process of validating and verifying a software program. Validating means testing whether the requirements of the system are satisfying and verification means testing whether the system meets its functions. This is an important phase in the software development life cycle. So, the main objective of software testing is to deliver a quality product to the client. Therefore, a good system evaluation and testing has to be introduced to the system.

"The definition of testing according to the ANSI/IEEE 1059 standard is that testing is the process of analysing a software item to detect the differences between existing and required conditions (that is defects/errors/ bugs) and to evaluate the features of the software item". [10]

5.1. Test Plan

In the testing of the Sales And Vehicle Maintenance System, testing was conducted for the each functionality of the web site, starting from the login to each tasks of saving, searching, updating the records and alert generating, report generating that occur in the system. The testing was also carried on the rest of the windows services which were used to generate SMS, send SMS, generate backups and generate emails other than the web site.

When coding the system a unit test was carried out to check their performance as intended. Integration testing was done to test each modules of the system. Through integrated testing it was ensured that all the integrated modules performed correctly. After completing the unit testing and integrating testing according to the test strategies, the whole system was tested. After the system testing, the software was tested by the clients through a user acceptance testing to ensure whether the system fulfil their intended functions. Selenium IDE was used as an automation tool and the testing framework in the testing process of the web site. Questionnaire was made to collect the user feedback on the final outcome of the tested system.

Through this testing procedures, it was able to find instances where inaccurate outputs that are generated and wrong functioning of some modules. They were subjected to testing again

and finally they were remedied. User feedback was also collected through the questionnaire and the system was tuned according the gathered feedback.

5.2. Test Cases and Test Results

The following table 5.1 show the test case and test results of the login.

Login

No	Test Case	Expected Output	Actual Output	Status
01	Wrong user name entered	Show error message	Show error message	Pass
02	Wrong password entered	Show error message	Show error message	Pass
03	Press Cancel Button	Cancel details filled	Cancel details filled	Pass
04	Identify username and password	Login success and show username on home page	Login success and show username on home page	Pass

Table 5.1: Login test case and test results

The following table 5.2 show the test case and test results of customer registration.

Register Customers

No	Test Case	Expected Output	Actual Output	Status
01	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass
02	Required fields filled	Saving completed	Saving Completed	Pass
03	Non numeric values entered to phone number field	Show error message	Show error message	Pass
04	Invalid email address entered to email	Show error message	Show error message	Pass
05	Invalid national ID number entered to customer NID field	Show error message	Show error message	Pass
06	When customer already exists	Show message	Show message	Pass

Table 5.2:Register Customer test case and test results

The following table 5.3 show the test case and test results of order placement .

Place Order

No	Test Case	Expected Output	Actual Output	Status
01	Auto generation of order ID	Show Order ID	Show Order ID	Pass
02	When customer NID is filled	Show customer details on the side	Show customer details on the side	Pass
03	When required fields are not filled	Prompts user to fill them	Prompts user to fill them	Pass
04	When all required fields are filled	Success saving order	Success saving order	Pass

Table 5.3: Place order test case and test results

The following table 5.4 show the test case and test results of updating and deleting bike details.

Updating and deleting Bike details

No	Test Case	Expected Output	Actual Output	Status
01	Update any field	Updated detail	Updated detail	Pass
02	When required fields are not filled	Prompt user to fill	Prompt user to fill	Pass
03	Deleting the record	Record deleted	Record deleted	Pass
04	Required fields filled	Complete updating	Complete updating	Pass

Table 5.4: Updating and deleting bike details test case and test results

The following table 5.5 show the test case and test results of initial payment calculation

Initial Payment Calculation

No	Test Case	Expected Output	Actual Output	Status
01	Load the related correct details from the database	Fields filled correctly	Fields filled correctly	Pass
02	Do the calculations correctly	Display correct values in sub-total and total fields	Display correct values in sub-total and total fields	Pass
03	Check payment type	If full option then disable instalment tab If instalments option then enable instalments tab	If full option then disable instalment tab If instalments option then enable instalments tab	Pass

04	All the required fields are filled	Successful saving	Successful saving	Pass
05	Payment duration not selected under the instalment tab	Disable rest of the fields	Disable rest of the fields	Pass
06	Under the instalment tab, check the instalment value	Display accurately calculated value	Display accurately calculated value	Pass

Table 5.5: Initial Payment Calculation test case and test results

The following table 5.6 show the test cases and test results of the pre estimates interface.

Pre Estimate Interface

No	Test Case	Expected Output	Actual Output	Status
01	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass
02	Required fields filled	Saving completed	Saving completed	Pass
03	Non numeric values entered to phone number field	Show error message	Show error message	Pass
04	Load the form	Data loaded correctly on to the form	Data loaded correctly on to the form	Pass

Table 5.6:Pre-estimate interface related test case and test results

The following table 5.7 show the test case and test results of the Job Card interface.

Job Card Interface

No	Test Case	Expected Output	Actual Output	Status
01	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass
02	Required fields filled	Saving completed	Saving completed	Pass
03	Load the form	Data loaded correctly on to the form	Data loaded correctly on to the form	Pass
04	Click on print button	Generate the job card print after saving	Generate the job card print after saving	Pass

Table 5.7:Job Card interface related test case and test results

The following table 5.8 show the test case and test results of the Gate-Pass interface.

Gate Pass Interface

No	Test Case	Expected Output	Actual Output	Status
01	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass
02	Required fields filled	Saving completed	Saving completed	Pass
03	Load the form	Data loaded correctly on to the form	Data loaded correctly on to the form	Pass
04	Click on print button	Generate the gate-pass print after saving	Generate the gate-pass print after saving	Pass
05	Non numeric values entered to receipt number field	Show error message	Show error message	Pass

Table 5.8:Gate Pass interface related test case and test results

The following table 5.9 show the test case and test results of the Employee Registration interface.

Employee Registration Interface

No	Test Case	Expected Output	Actual Output	Status
01	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass
02	Required fields filled	Saving completed	Saving completed	Pass
03	Non numeric values entered to phone number field	Show error message	Show error message	Pass
04	Invalid national ID number entered to employee NIC field	Show error message	Show error message	Pass

Table 5.9:Employee registration test case and test results

The following table 5.10 show the test case and test results of the Insurance Company Data saving and updating interface.

Insurance Company Data Saving and Updating Interface

No	Test Case	Expected Output	Actual Output	Status
01	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass
02	Required fields filled	Saving completed	Saving completed	Pass
03	Non numeric values entered to phone number field	Show error message	Show error message	Pass
04	Load the form	Data loaded correctly on to the form	Data loaded correctly on to the form	Pass

Table 5.10:Insurancecompany data saving and updating related test case and results

More test cases are included in Appendix-D.

5.3. Test Automation Tools and Testing Frameworks

Figure 5.1 Image of Selenium tool

Selenium is a software testing framework for web applications. Selenium provides a playback tool for authoring tests without the need to learn a test scripting language.
Therefore, Selenium IDE is used as the test automation and testing framework for the proposed web based Sales And Vehicle Maintenance System as a Mozilla Fire-fox add-on, which is to be aided in testing to get more successful bug free output of the system.

5.4. Evaluation Tools

The evaluation tools used for this proposed system is an evaluation form type questionnaire which was used to get the user feedback about the final system and to tune the system according to the feedback collected. User Evaluation form is included in Appendix –D.

5.5. Evaluation Results

Following bar chart shows the evaluation results analysis of the feedback collected from the users, through the user evaluation forms about the system.

About 11 members in the staff of different user roles participated in filling the questionnaire provided and according to that, a summary about the system was extracted as follows. The users were asked to mark the ratings as excellent, good, average and poor in the given questionnaire and those ratings were taken as the final output to the bar chart by analysing all. The questionnaire which was used to collect feedback is in Appendix-D.

Figure 5.2: Bar graph for the user feedback collected about the system

User Evaluation and Testing chapter summarizes about the test plan , test cases and test results, test automation tools and the testing frameworks used, about the evaluation tools and the evaluation results analysis.

Chapter 6:Conclusion and Future Work

6.1.Overview

Samagi Motors is a well known David Peiris authorized bike dealer and a vehicle repairer in Mathugama area. They started their business activities in a traditional way. But as the competition arouse, they were in need of an automated computer system in order to make their work ease. That was the begin of the development of this Web Based Sales and Vehicle Maintenance system which is a good solution for them to carry on their business activities successfully and efficiently.

This developed system supports all sales activities regarding bikes, vehicle maintenance related activities and provide facilities in generating SMS, sending SMS, generating backups, generating emails and generating reports too. System performs accurate calculations and display the up to date data on it. This system is fully secured in order to ensure the privacy of data.

The new developed system saves the time of the user. Another special feature of this system is, even a person having less knowledge of IT can use this system, because of its simplicity. The interfaces are designed attractively and simple in order to keep the user without getting bored. This system has become a valuable solution for the business activities of Samagi Motors, because of the includance of all above mentioned distinguished features in the system.

6.2.Benchmark of Work

"Benchmarking is comparing one's business processes and performance metrics to industry best's and best practices from other companies" [11].

This system is unique from already existing other similar applications, as it is developed to cover client's specific requirements. Normally the similar applications are only of one type, such as sales managing, vehicle maintaining or financial handling etc. But this system is a combination of several such modules and fulfil client's all requirements and the need of several systems at once in a single system.

6.3.Lessons Learnt

By doing this project, learnt how to apply the theoretical knowledge what was gained over the past three years practically.

At the initial stage, even at the submission of the project proposal, a clear idea on the development of the system was not available. But gradually followed the guidelines for the project and learnt how to overcome the weaknesses. Proper time management were achieved by following the schedule of the project. The implementation phase was the hardest phase of the project and it made to try out the languages like asp.net, C# in deep. Writing the dissertation was another interesting part of the project. There the ability of developing writing skills were gained further more.

6.4.Future Enhancements

The system could be improved if the business enhances with the following features.

P.O.S terminal for payments

A POS machine can be linked to the system so that the customers will have the facility to do their payments via credit/debit cards.

On line payments

Ability for the customer to do their payments on line.

Online Customer Registration

Ability for the customer himself to register and view data and do the transactions via online.

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Appendix A – Design Documentation

Activity diagram for customer registration

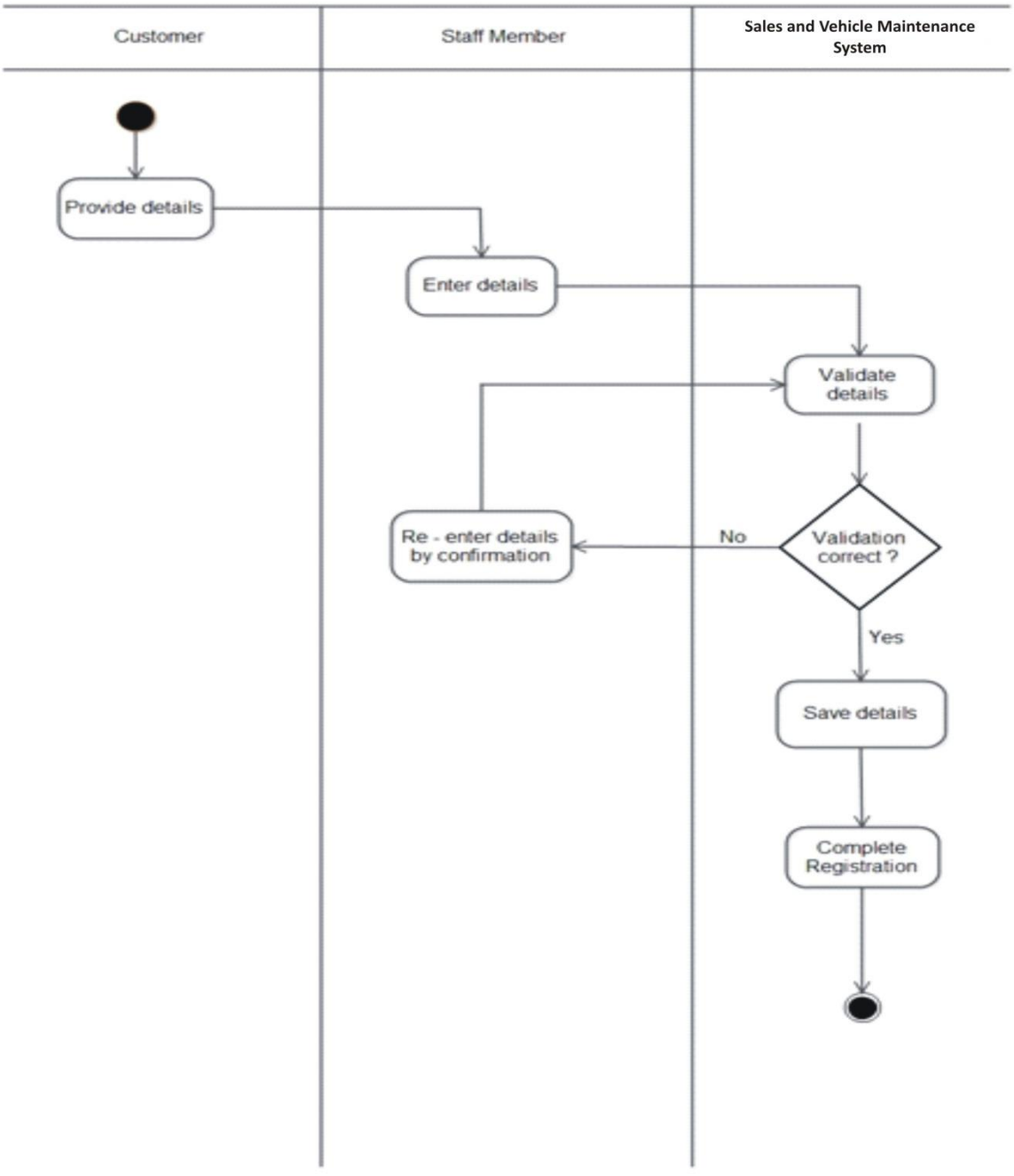


Figure A.1:Activity diagram for customer registration

Activity diagram for placing bike order

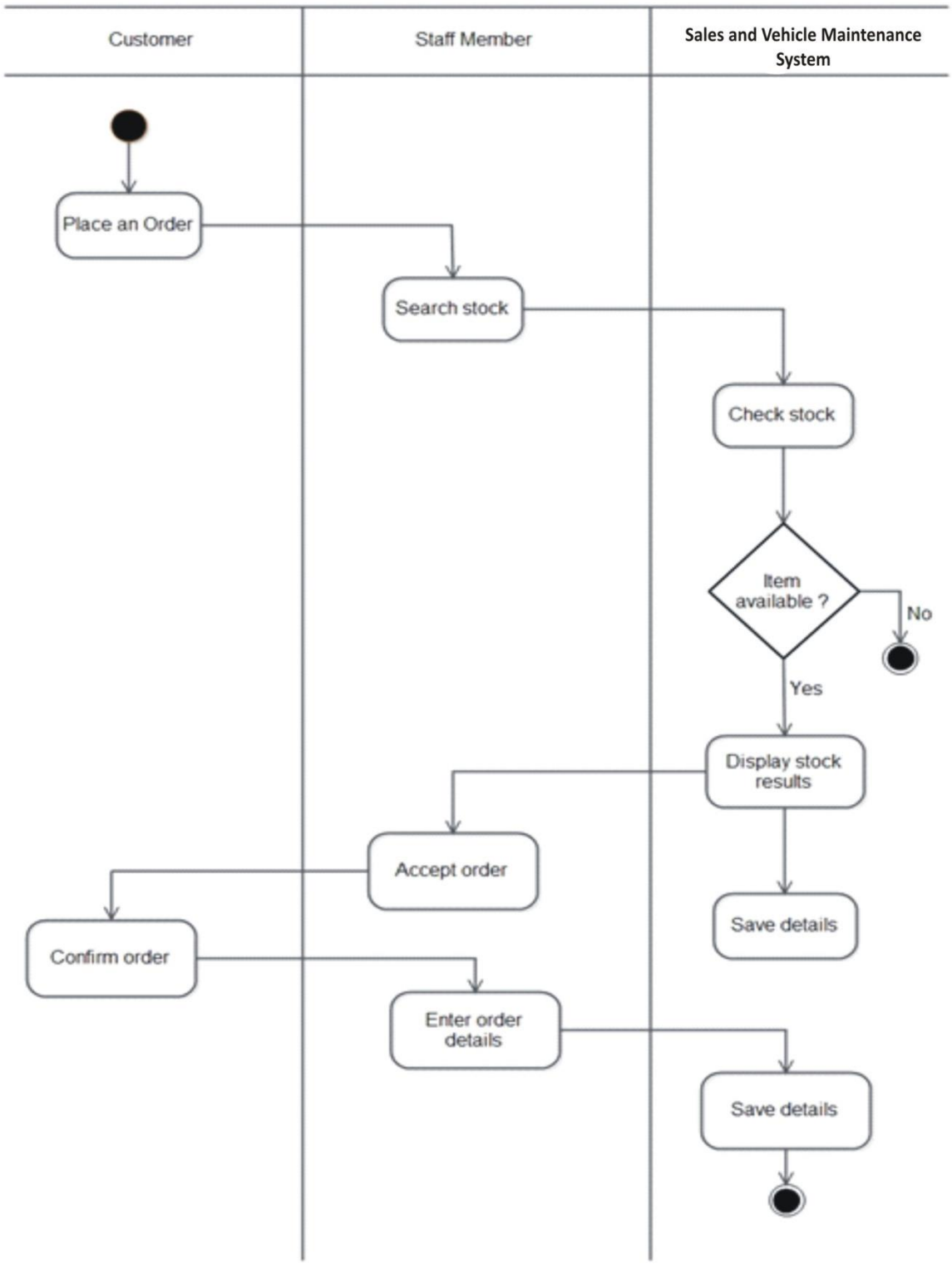


Figure A.2:Activity diagram for placing bike order

Activity diagram for making initial payments for bikes

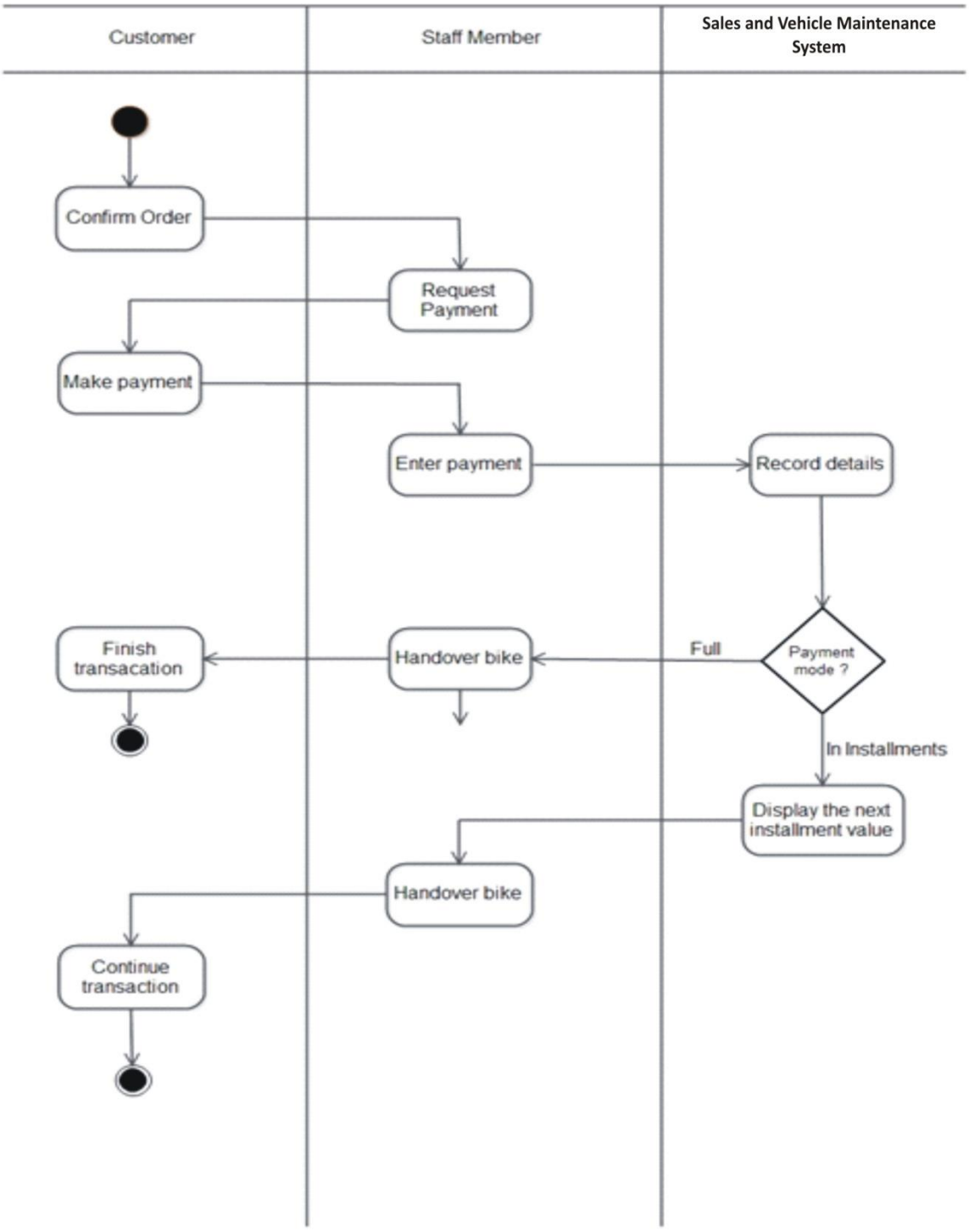


Figure A.3:Activity diagram for making initial payments for bikes

Activity diagram for paying instalments of bike sales

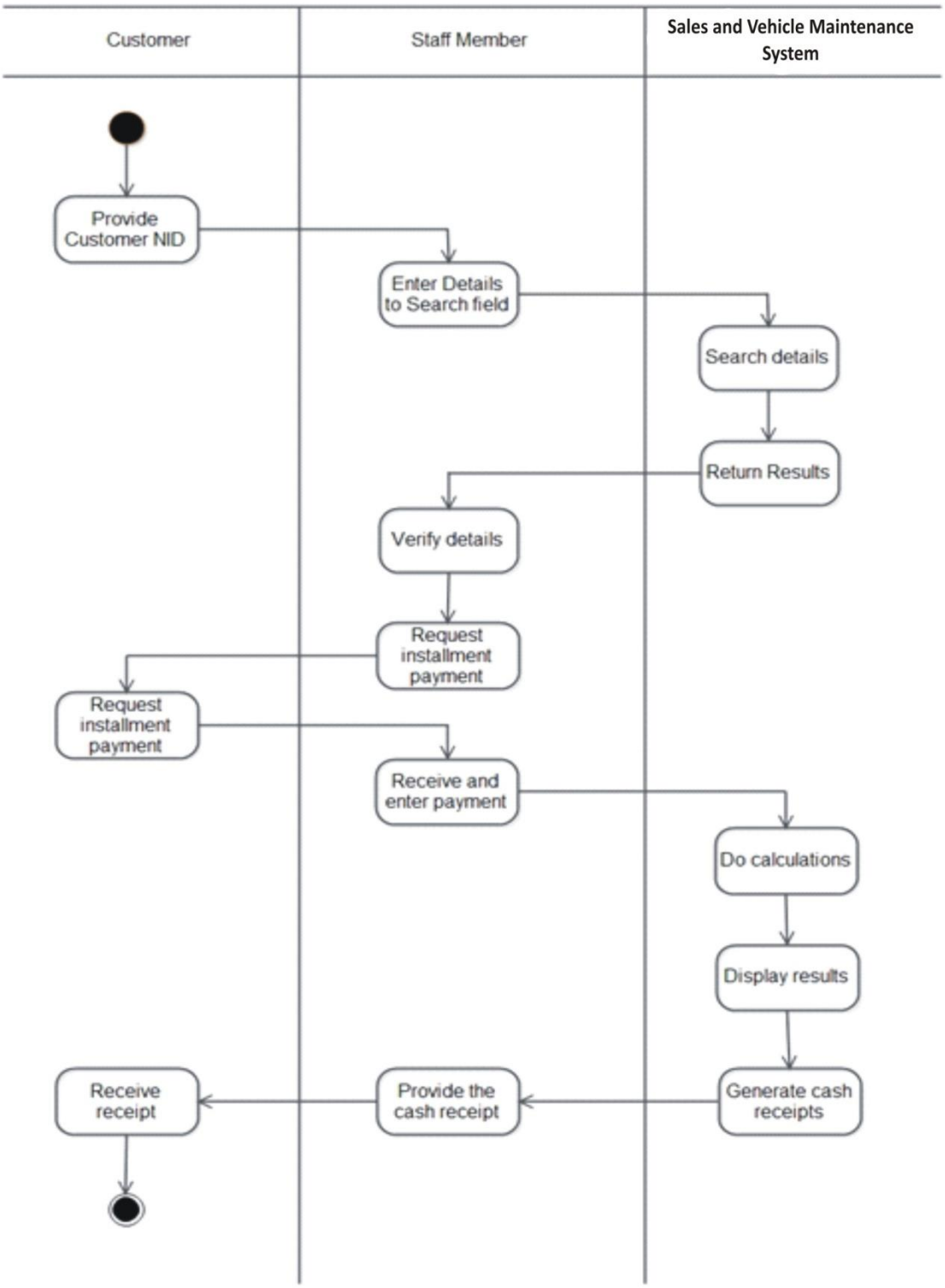


Figure A.4:Activity diagram for paying instalments of bikes

Activity diagram for informing the due dated payers

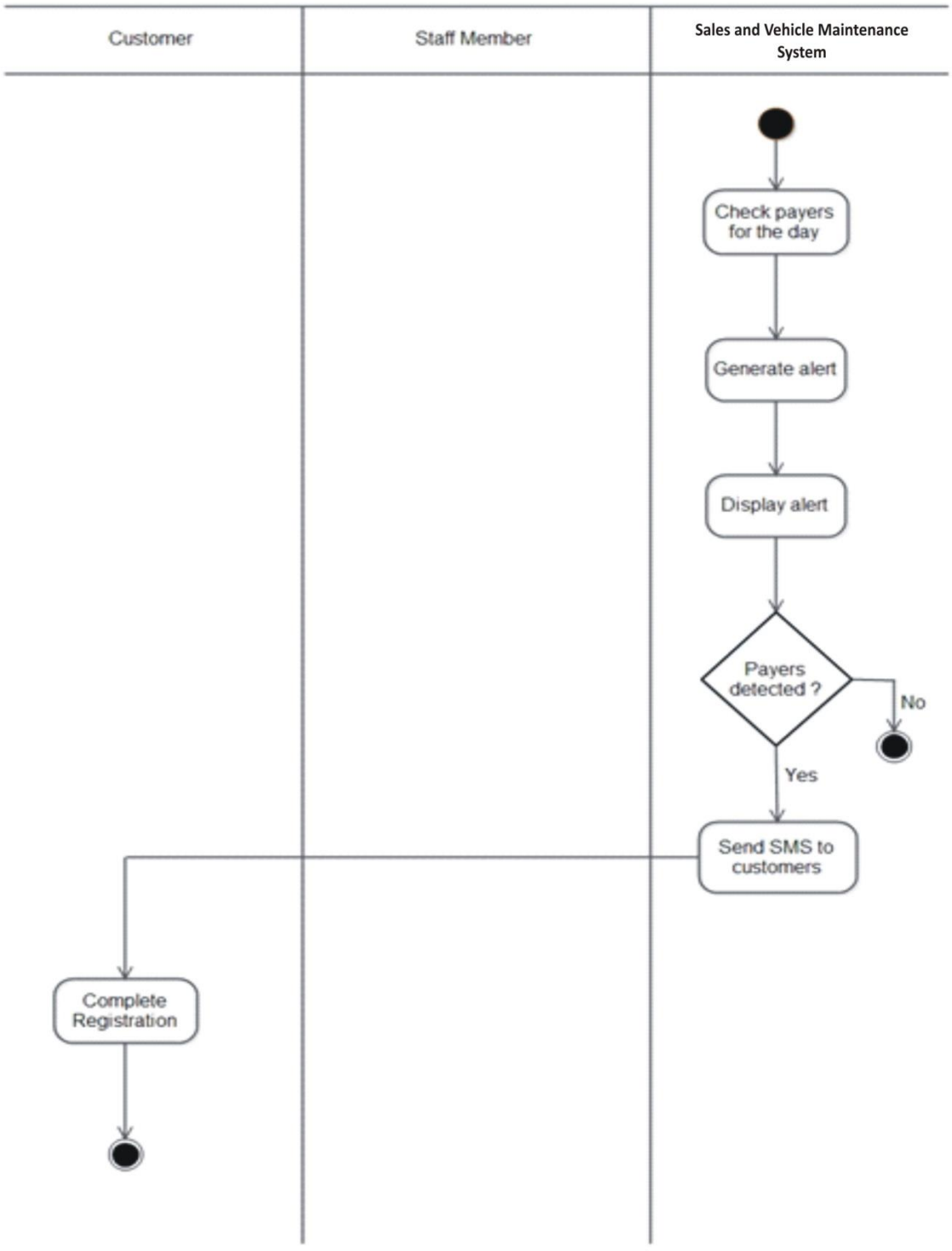


Figure A.5:Activity diagram for informing the due dated payers

Activity diagram for informing the late payers of bike related sales instalments

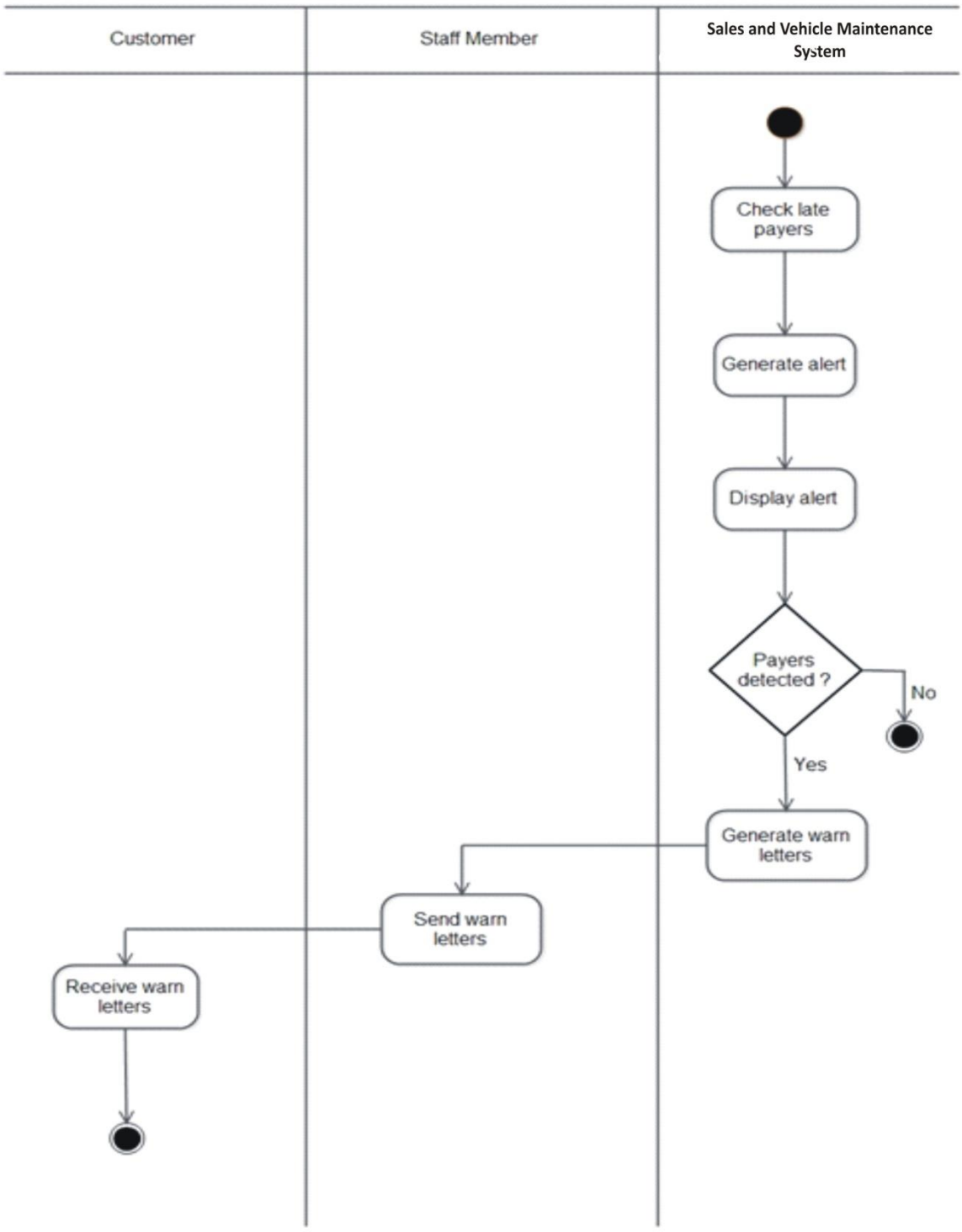


Figure A.6:Activity diagram for informing the late payers of bike related sales

Sequence diagram for placing bike orders

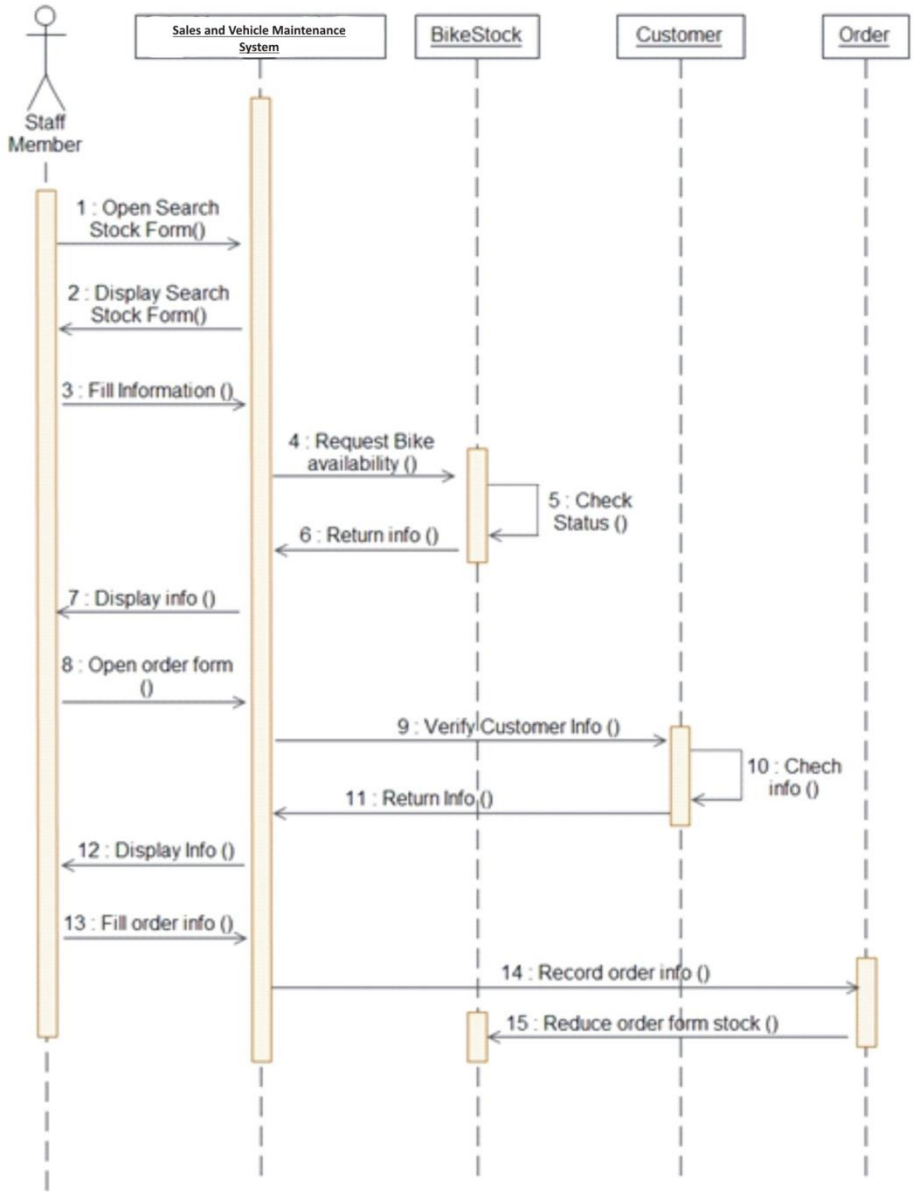


Figure A.7:Sequence diagram for placing bike order

Sequence diagram for instalments payment for bike sales

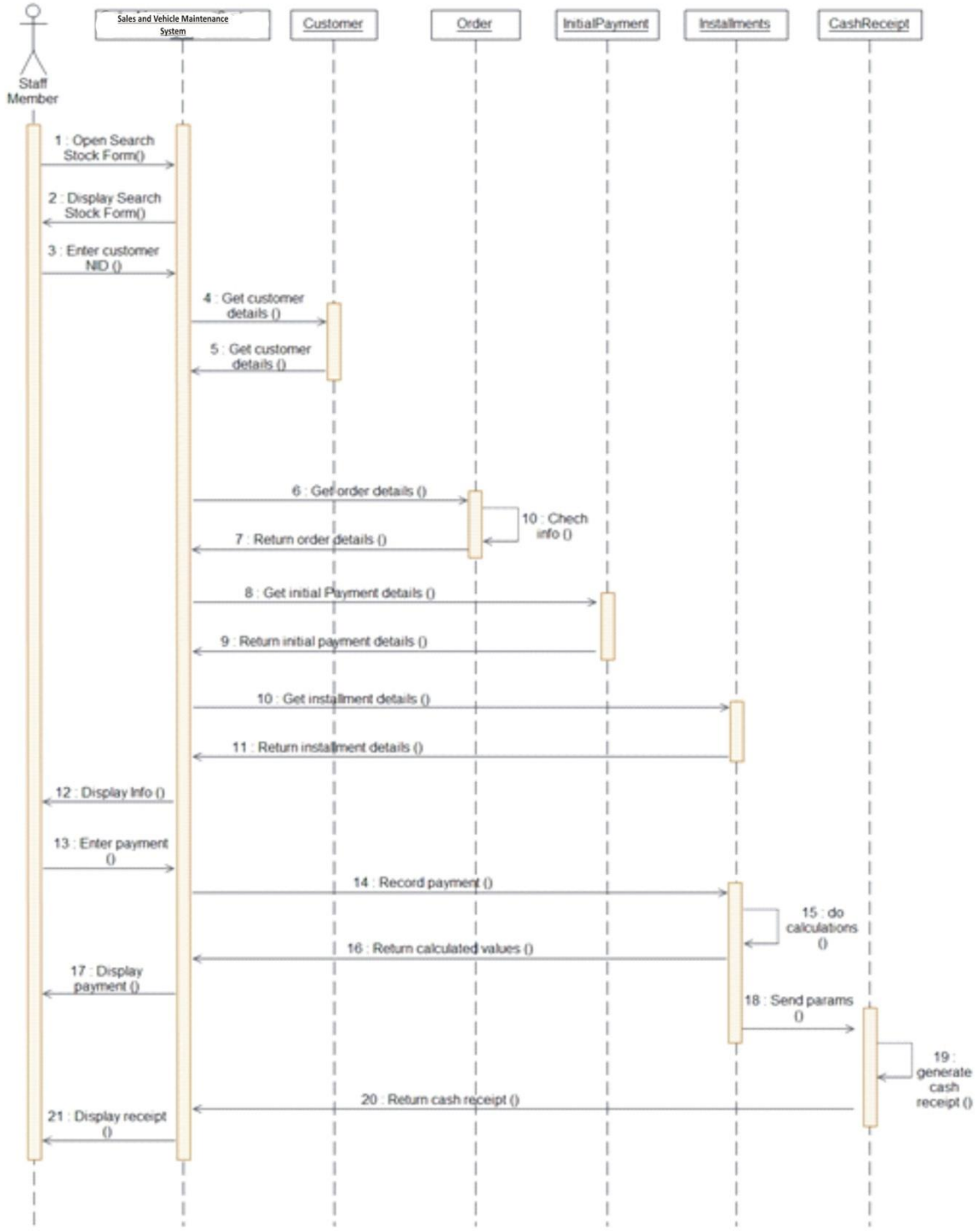


Figure A.8:Sequence diagram for instalment payment for bike sales

Activity diagram for placing pre-estimates

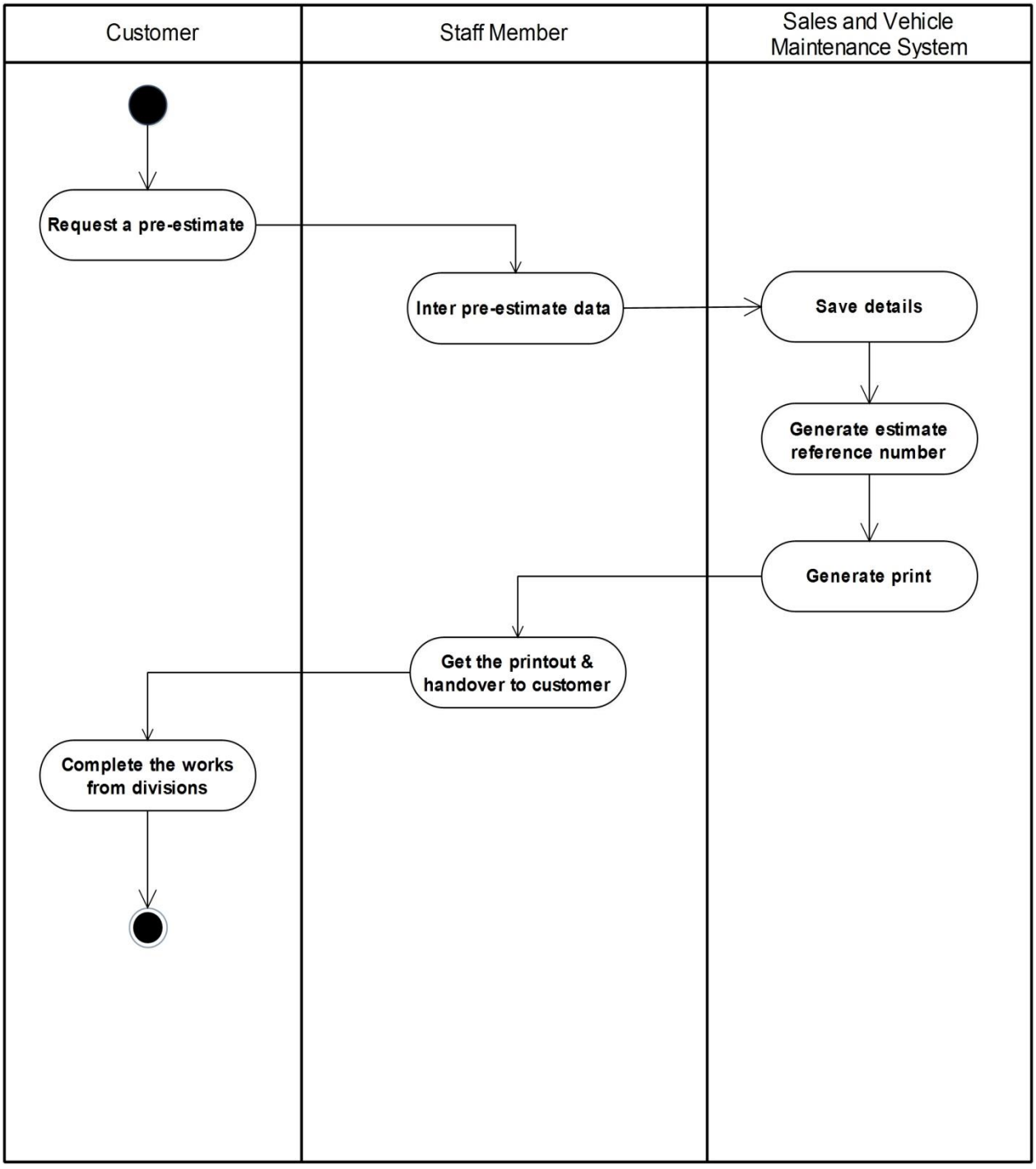


Figure A.9:Activity diagram for placing pre estimates

Activity diagram for confirming pre-estimates

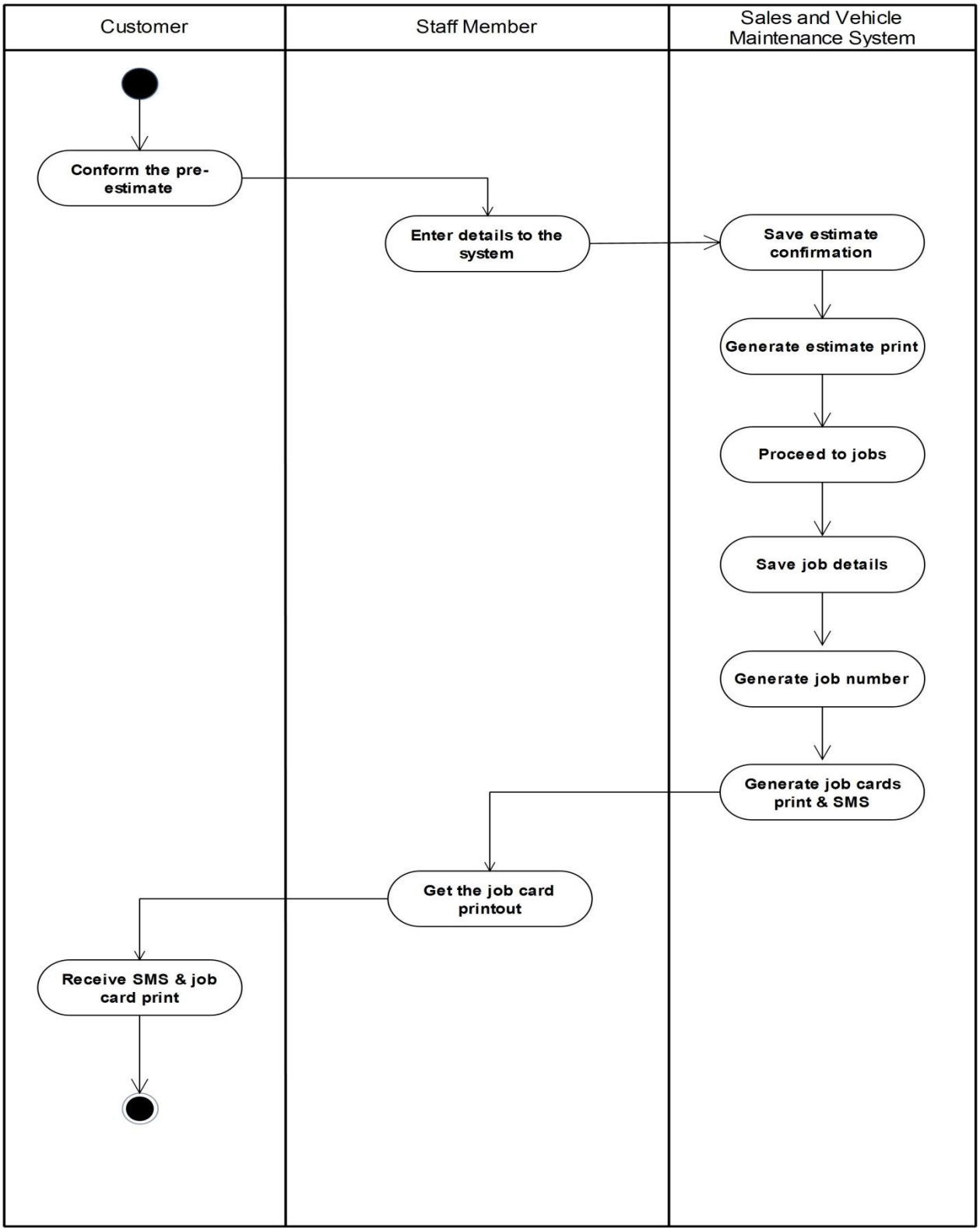


Figure A.10:Activity diagram for confirming pre estimates

Activity diagram for completing vehicle jobs

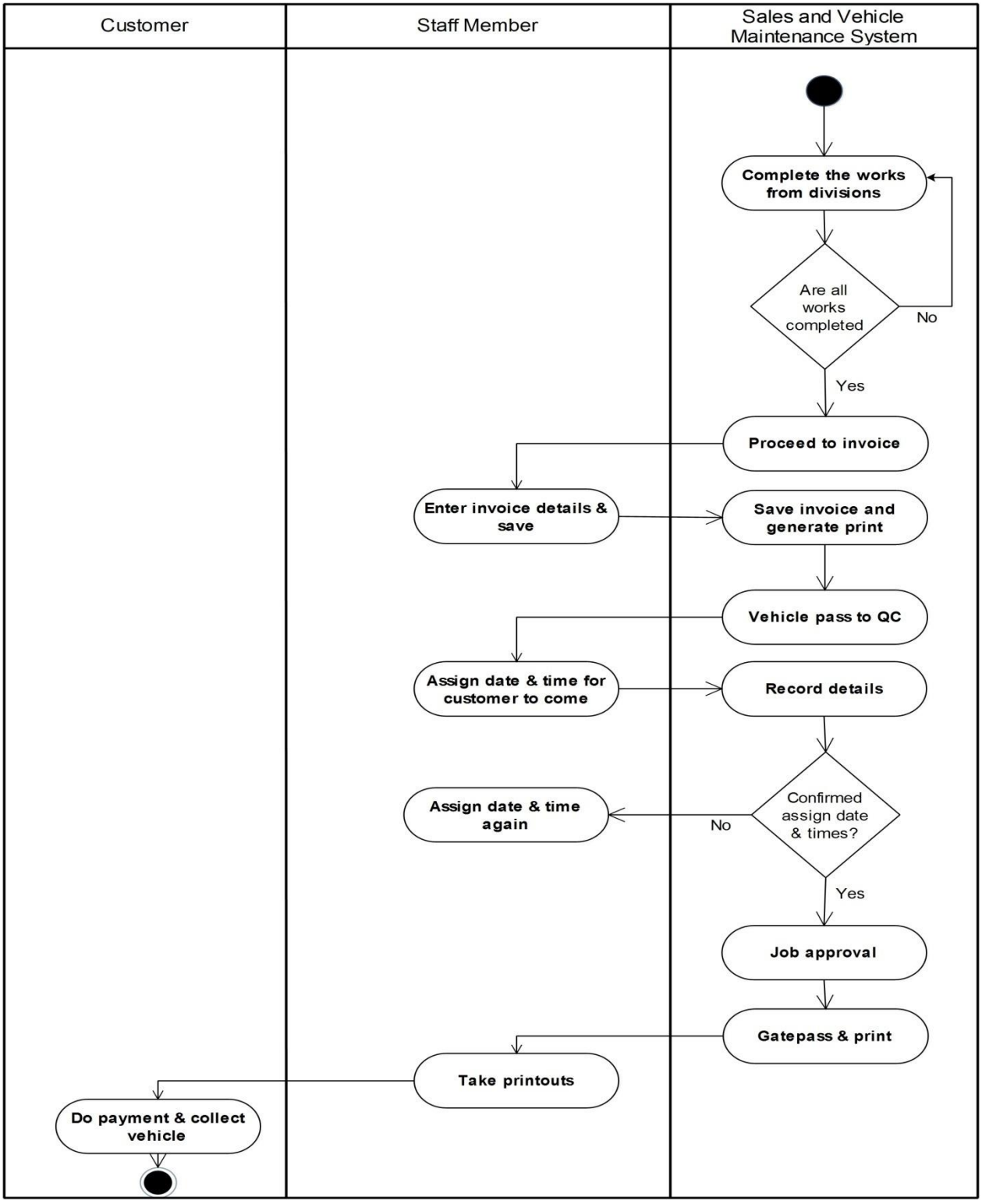


Figure A.11:Activity diagram for completing vehicle jobs

Sequence diagram for confirming pre-estimates

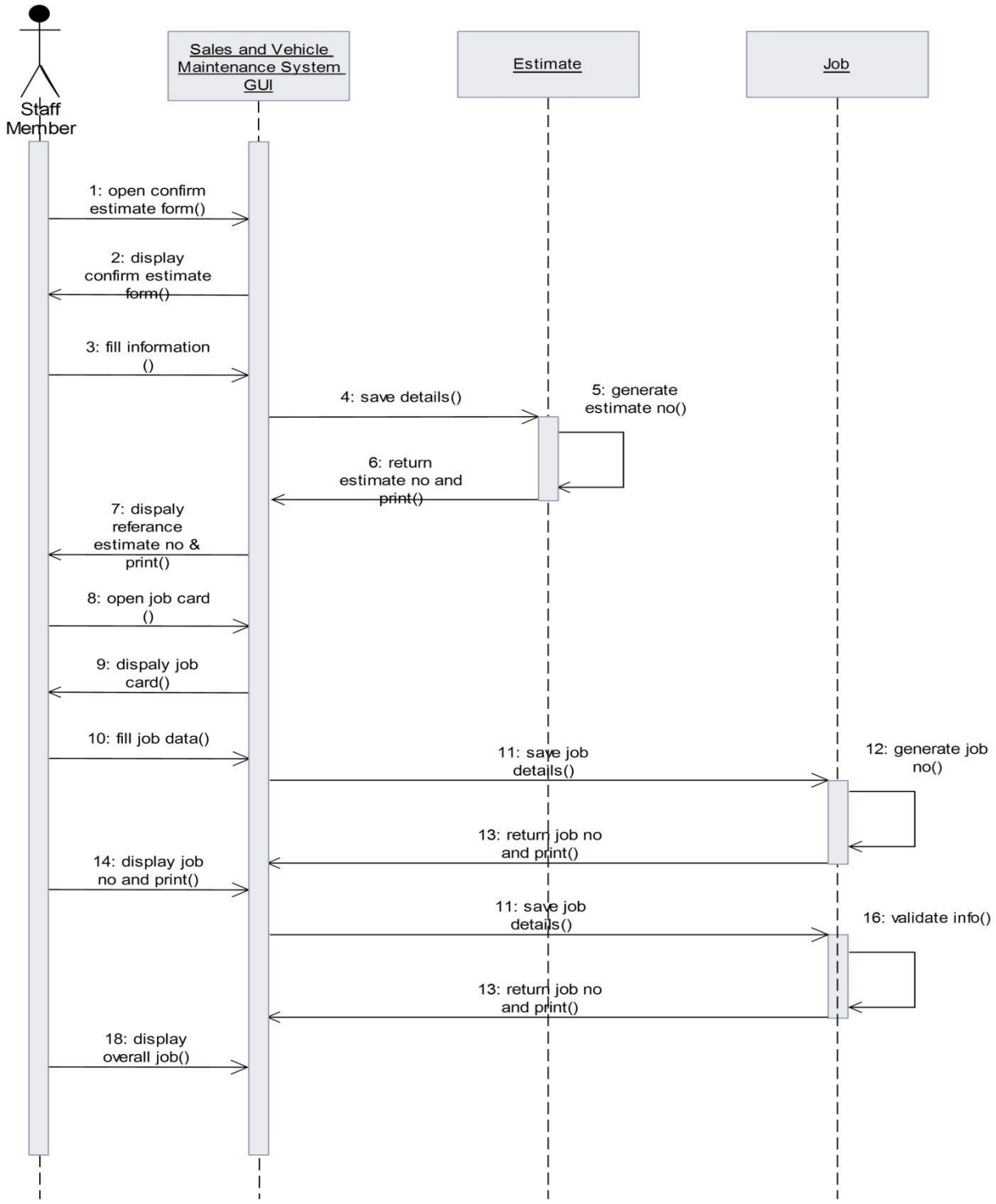


Figure A.12:Sequence diagram for confirming pre estimates

Sequence diagram for completing vehicle jobs

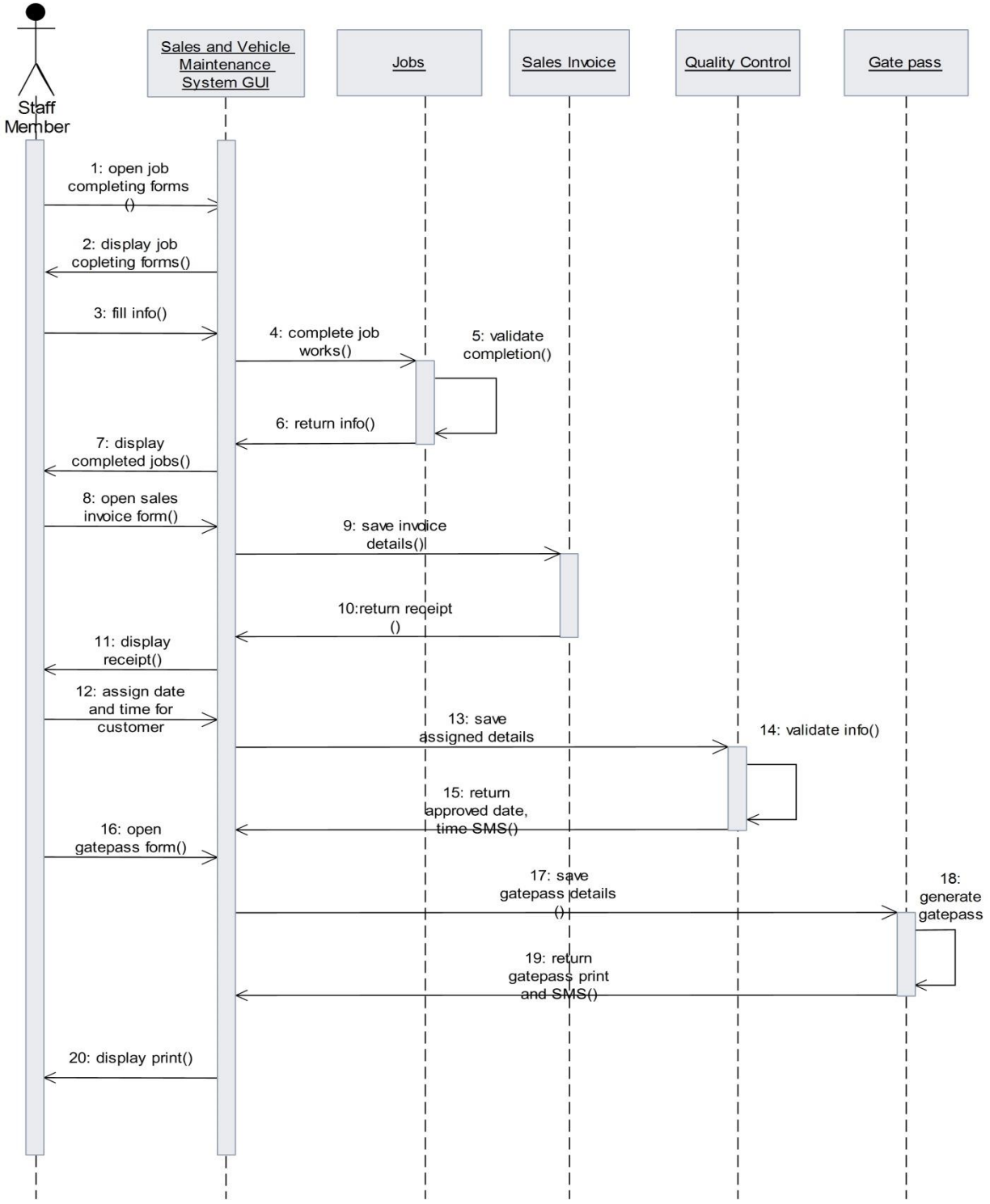


Figure A.13:Sequence diagram for completing vehicle jobs

Use case diagram for the existing system

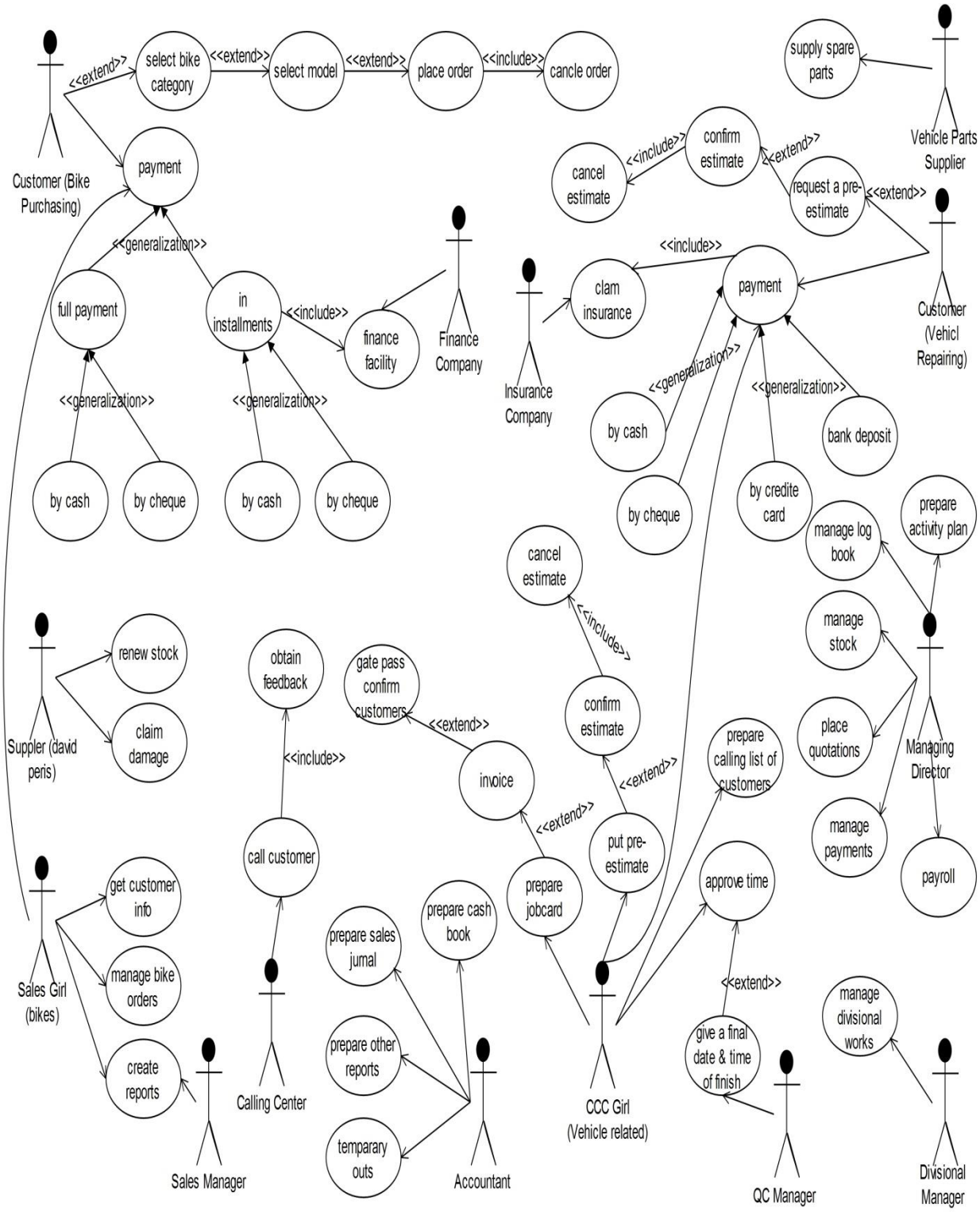


Figure A.14:Use case diagram for the existing system

Appendix B – User Documentation

Login screen

Figure B.1.Login Screen

Figure B.1 shows the first screen at the start up of the program. The user is required to fill the space with his valid user name and password. An authorized, or invalid usernames and password will be restricted by the system.

Dashboard

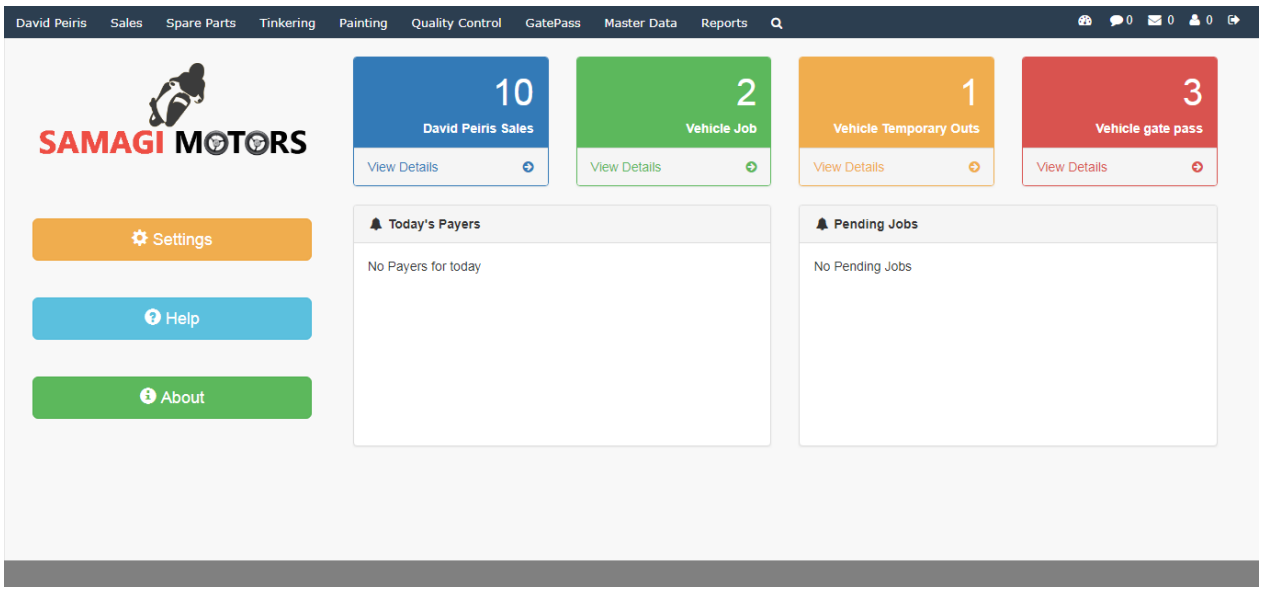


Figure B.2.Dashboard Screen

Figure C.2 shows the main screen of the system. On the top the main activities of the system are displayed through menus.

Main Menu Icons

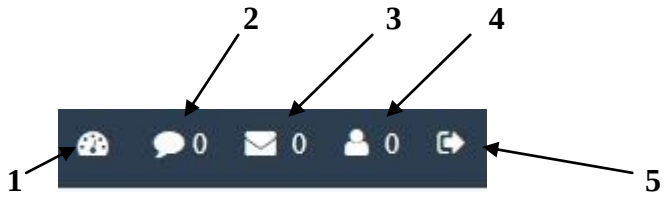


Figure B.3:Main icons

1-Dashboard
2-Customer Comments
3-Approved Quality Control jobs
4-Late Payers
5-Logout

Main Menu Items

Figure B.4: Menu items

1- David Peiris : Contains the sales activities supporting functions regarding the sales as a David Peiris Motors agent
2- Sales : Contains the Sales activities related supporting process interfaces regarding the vehicle maintenance system
3- Spare Parts :This is the Spare Part division related to the functioning of vehicle maintenance activities
4- Tinkering: This is the tinkering division related to the functioning of the vehicle maintenance activities
5- Painting: This is the painting division related to the functioning of the vehicle maintenance activities
6- Quality Control : This is the quality control division related to the functioning of the vehicle maintenance activities
7- Gate Pass : This is the last division of the vehicle maintenance related activities.
8- Master Data: This section includes all the master data capturing and storing forms related with the vehicle maintenance activities
9- Reports : Include the reports related to the vehicle maintenance activities
10- Quick Search : Display a quick summary of a vehicle which is in the system.

Sub Menu Items

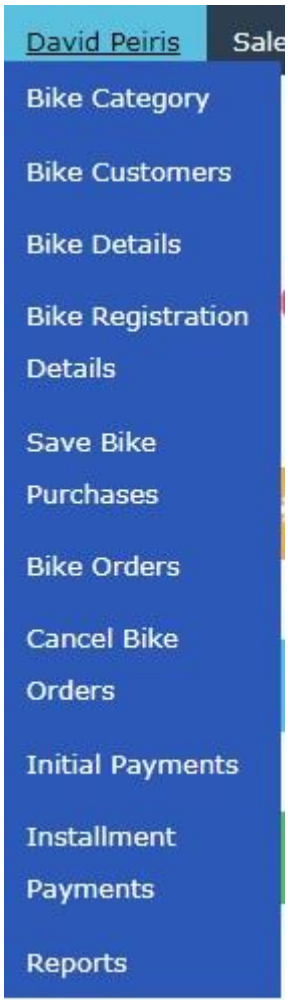


Figure B.5 :David Peiris menu items

This “David Peiris” named menu covers all the activities that contains the sales activities as a David Peiris Motors agent. It includes the following menu items that renders the separate functionalities as given below.

- Bike Category interface
  Allows saving and updating of bike category details.

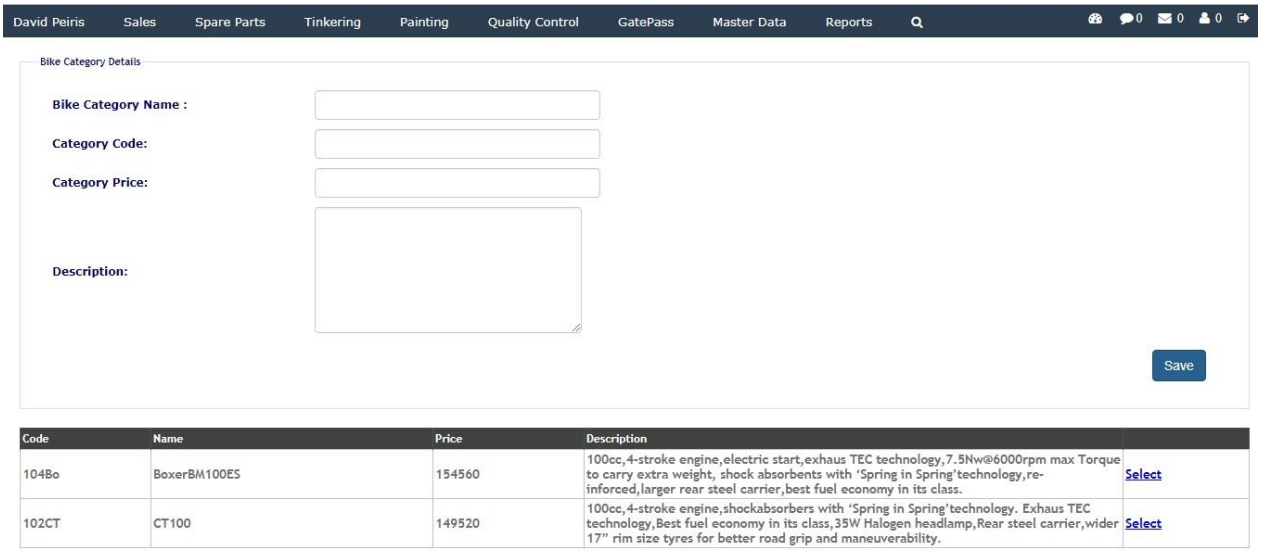


Figure B.6 :Bike Category Interface

- Bike Customer interface
  Allows saving and updating of customers related to bike sales

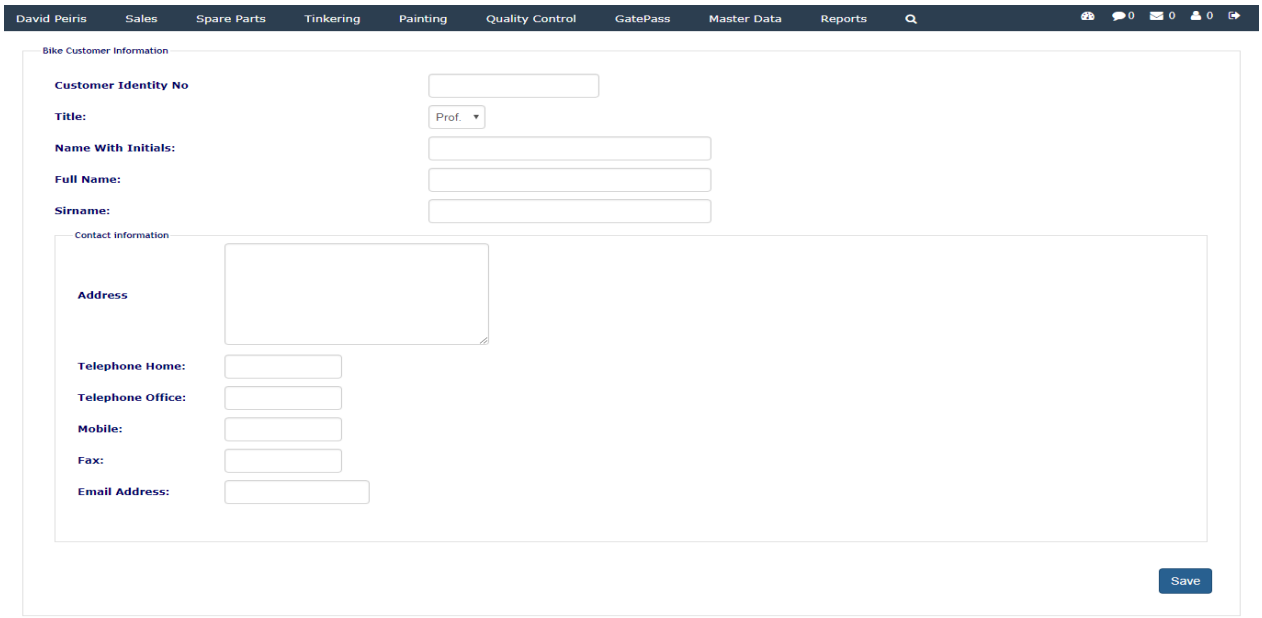


Figure B.7 :Bike Customer Registration Interface

- Bike Details interface
  Allows saving and updating of bike details of each bike category

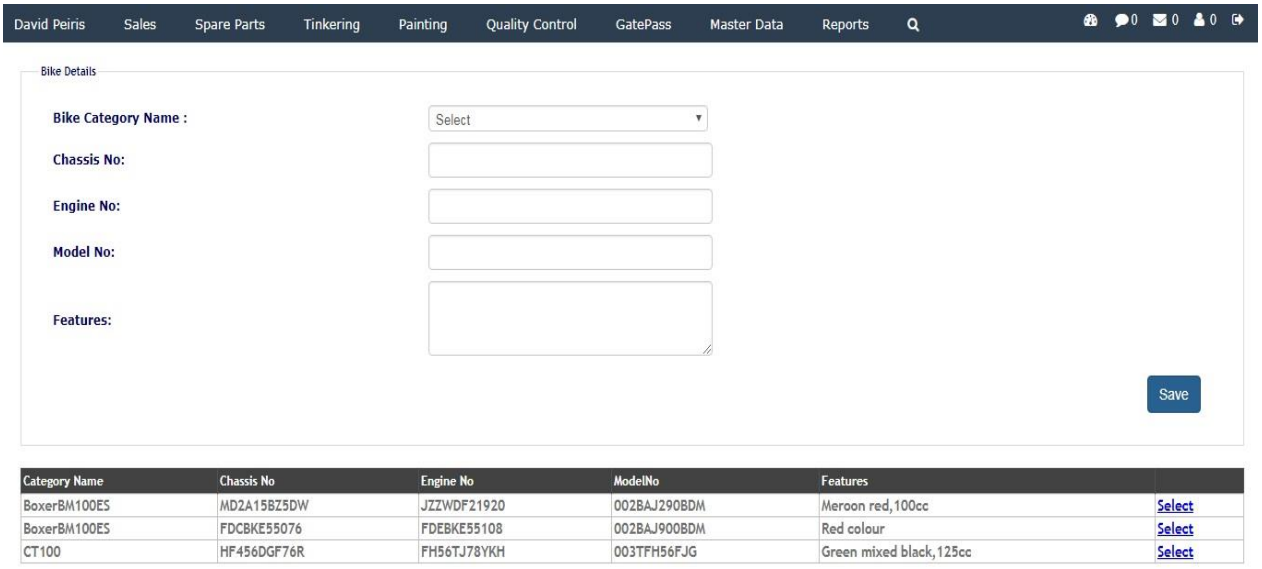


Figure B.8 :Bike Details Interface

- Save Bike Purchases interface
  Allows saving of bike purchasing details against invoice numbers

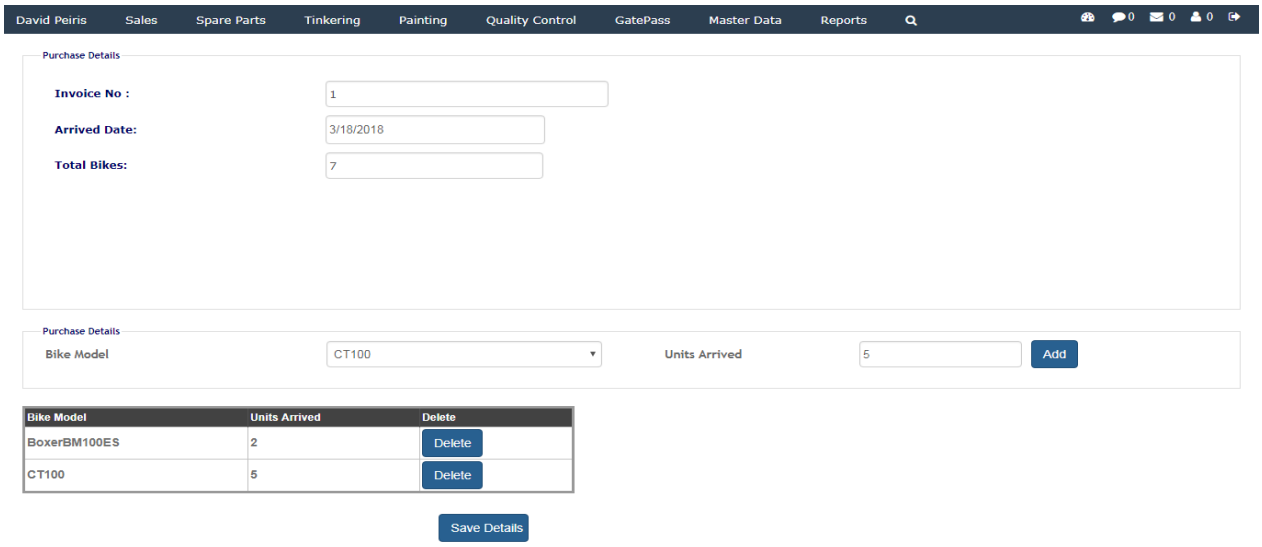


Figure B.9 :Save bike purchasing details interface

- Bike Orders interface
  Allows saving of bike order details to the system

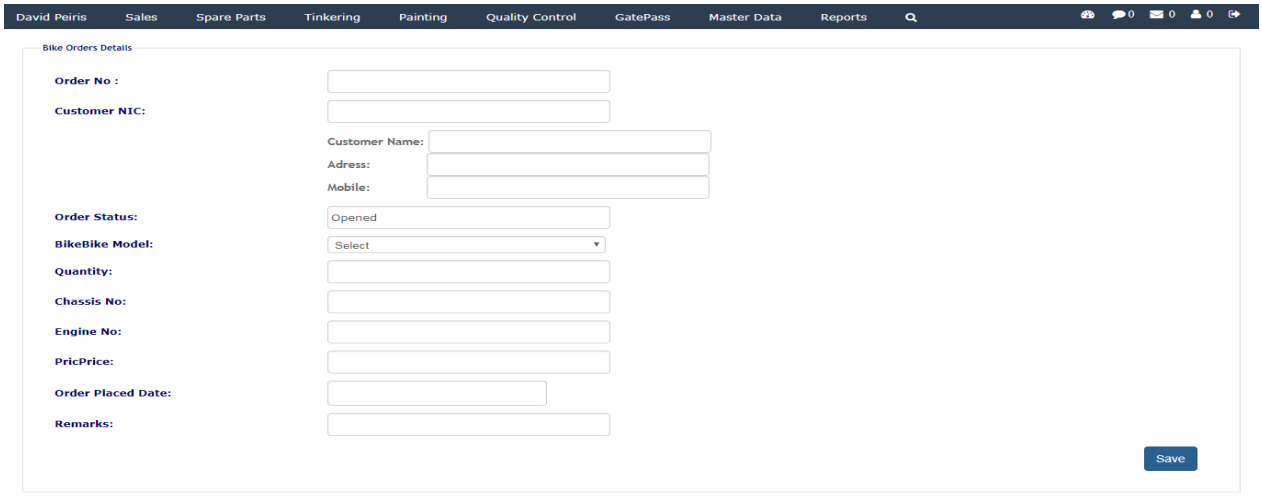


Figure B.10 :Save bike order details interface

- Initial Payments interface
  Allows saving of bike initial payments at the instance of ordering a bike by the customer

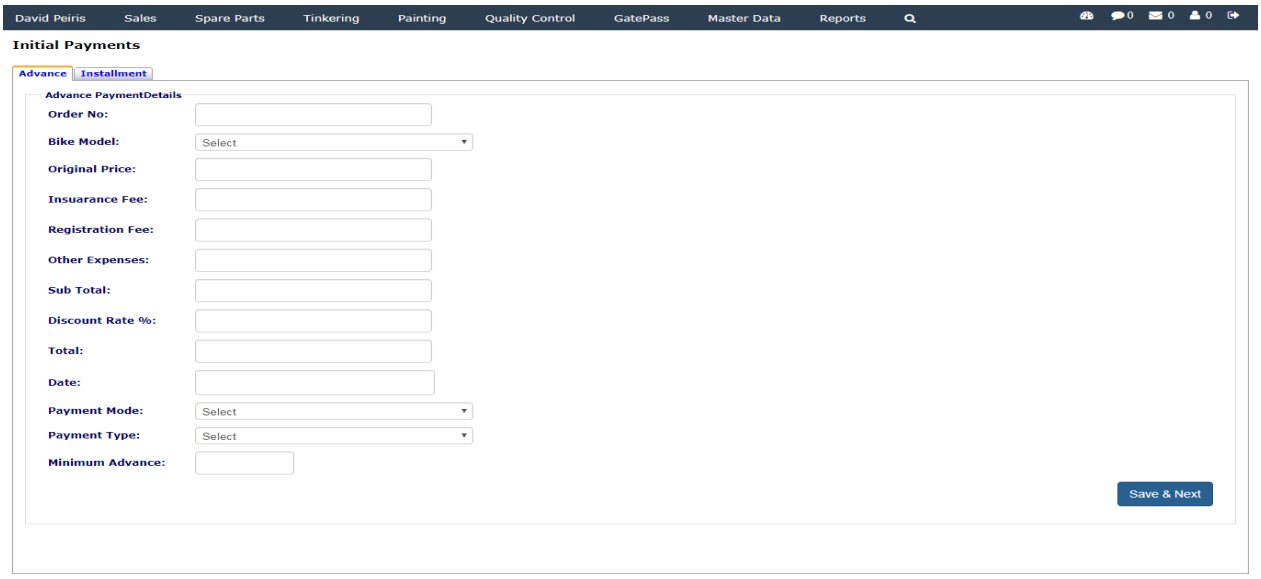


Figure B.11 :Save initial payments details interface

- Installments payments interface
  Allows saving of installments payments to the system at each pay time of the customer who comes to pay installments

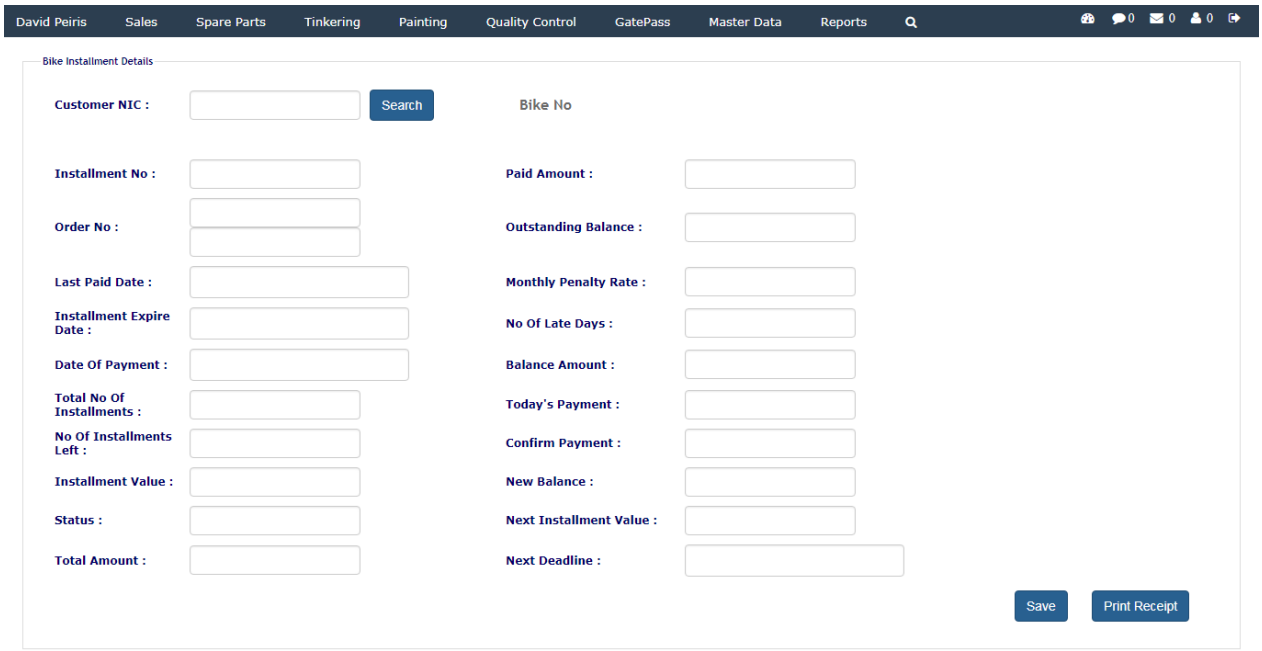


Figure B.12 :Save installments payments details interface

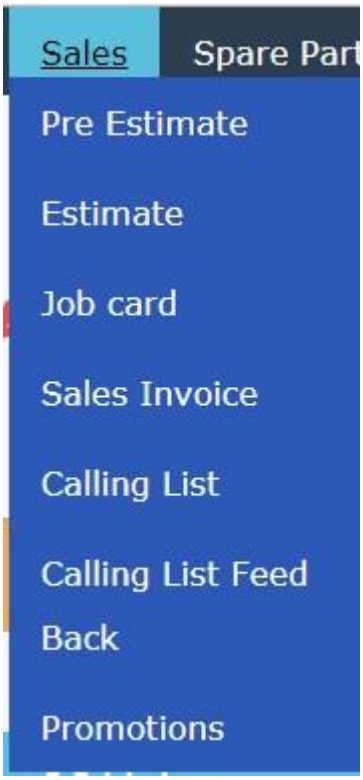


Figure B.13 :Sales menu items

This “Sales” named menu covers all the activities that contains the sales related activities of vehicle maintenance. It includes the following menu items and sub menu items under each that renders the separate functionalities as given below.

- Pre Estimate
  Contains sub menus for saving a pre estimate and re print a estimate.

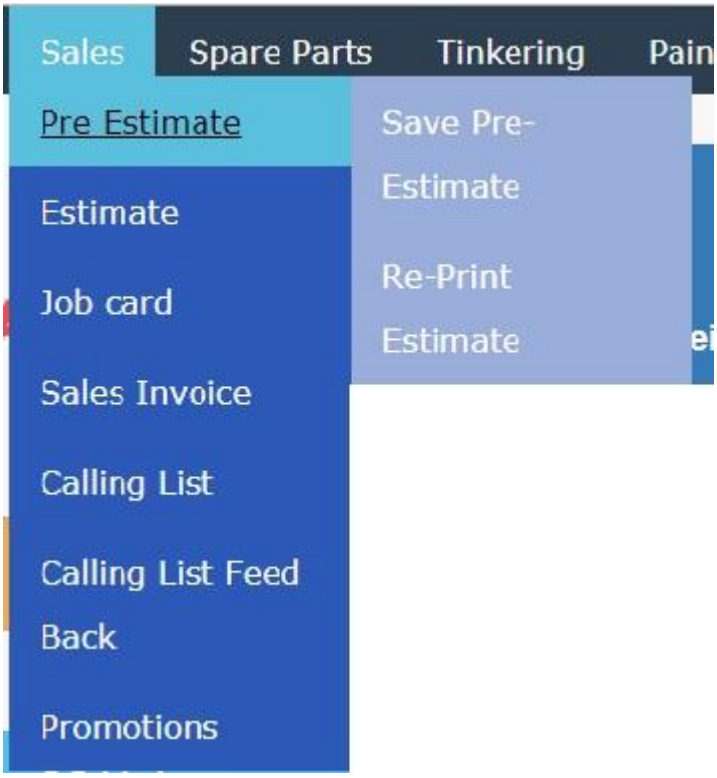


Figure B.14 :Pre estimate sub menu items

Save Pre estimate interface is the core interface of the vehicle maintenance related activities. Pre estimates gives the start to all the vehicle maintenance activities. Through this interface vehicle details and customer related interface are saved automatically in to the system along with the pre estimate details.

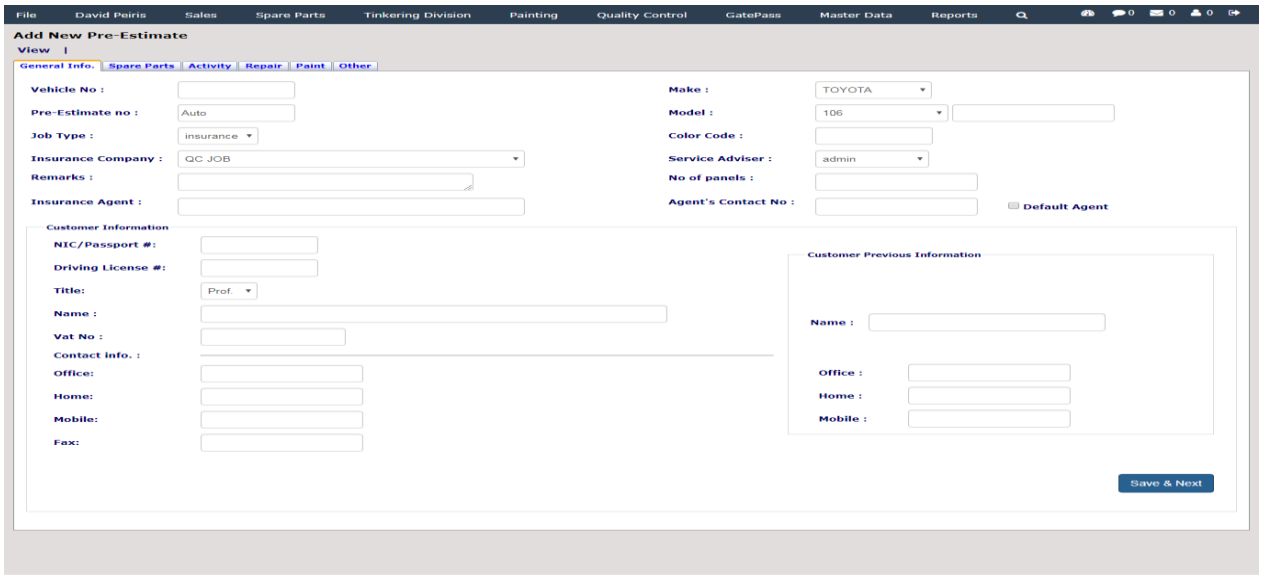


Figure B.15 :Pre estimate interface

- Estimate
  Contains sub menus for confirming a pre estimate, view estimate details and cancel estimates.

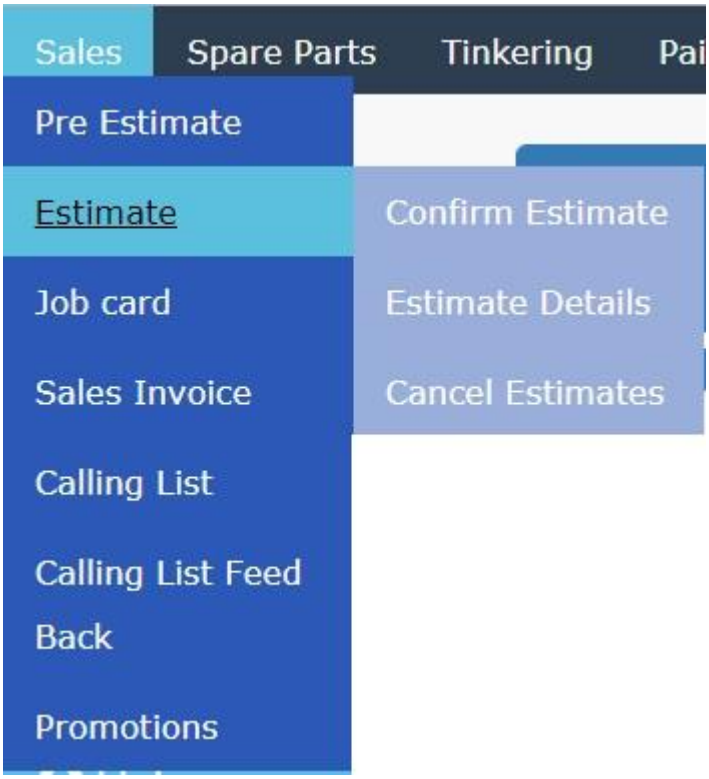


Figure B.16 :Estimate sub menus

- Job Card
  Contains sub menus for saving a job card, re print the job card and to edit document details related to the job card information.

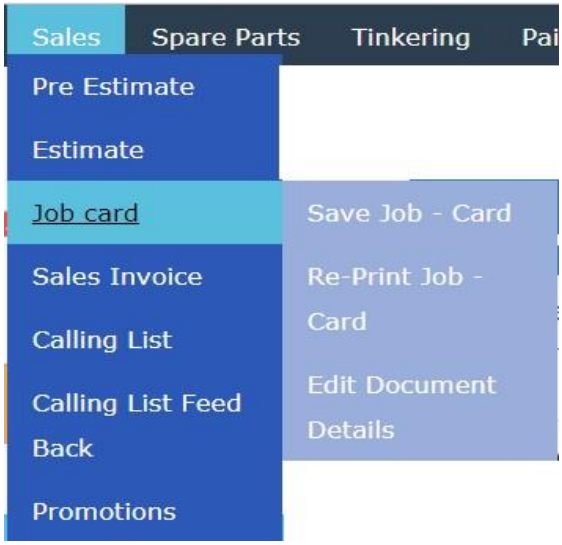


Figure B.17 :Job card sub menus

Job card takes another significant place in the vehicle maintenance processes and it plays an important role throughout the system flow.

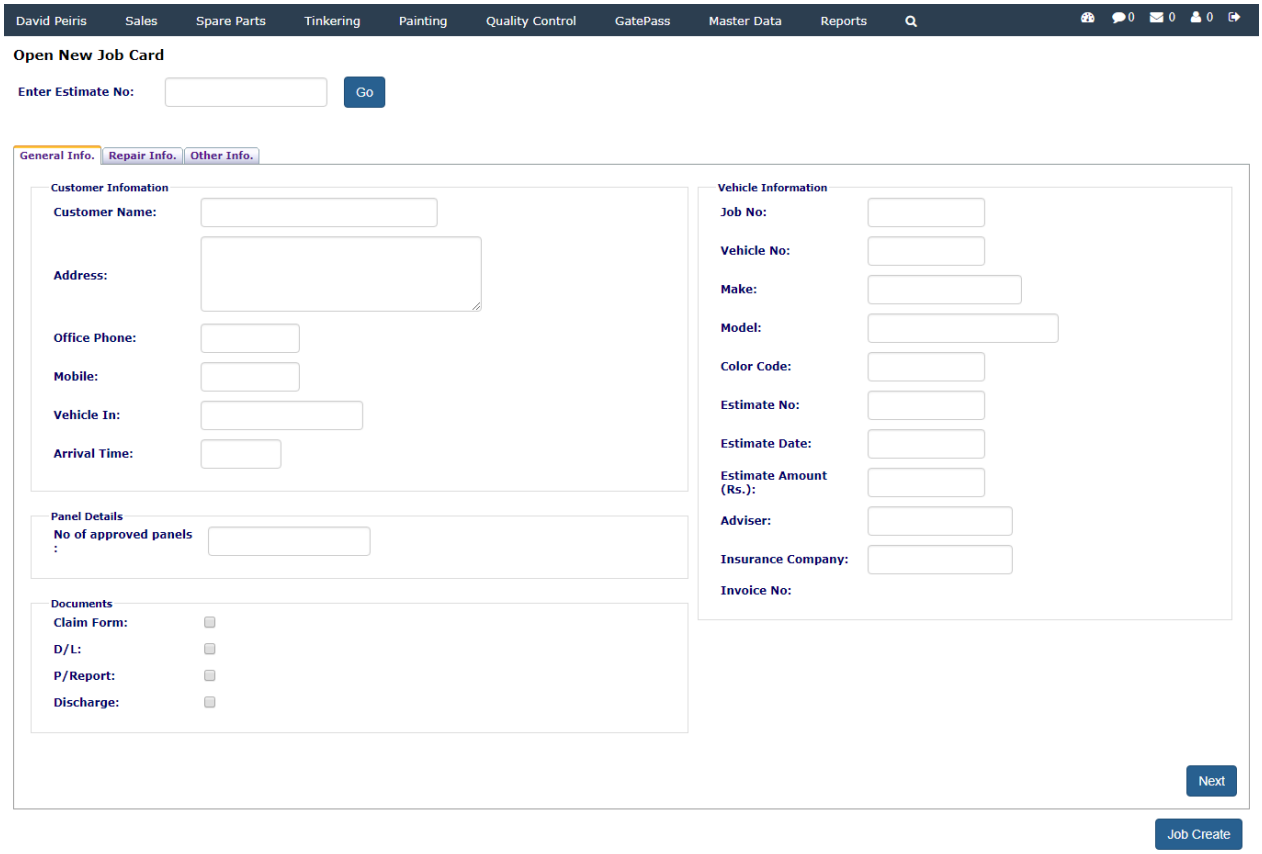


Figure B.18 :Saving Job card details interface

- Sales Invoice
  Contains sub menus for invoicing process and to view sales invoices and print after each done.

Figure B.19 :Sales invoice sub menus

Following figure displays the interface to save the sales invoice details of the vehicle maintenance process. Invoice can be generated by searching through vehicle or job number. All the details related to the vehicle are filled automatically at search and rest of the details has to be filled by the user.

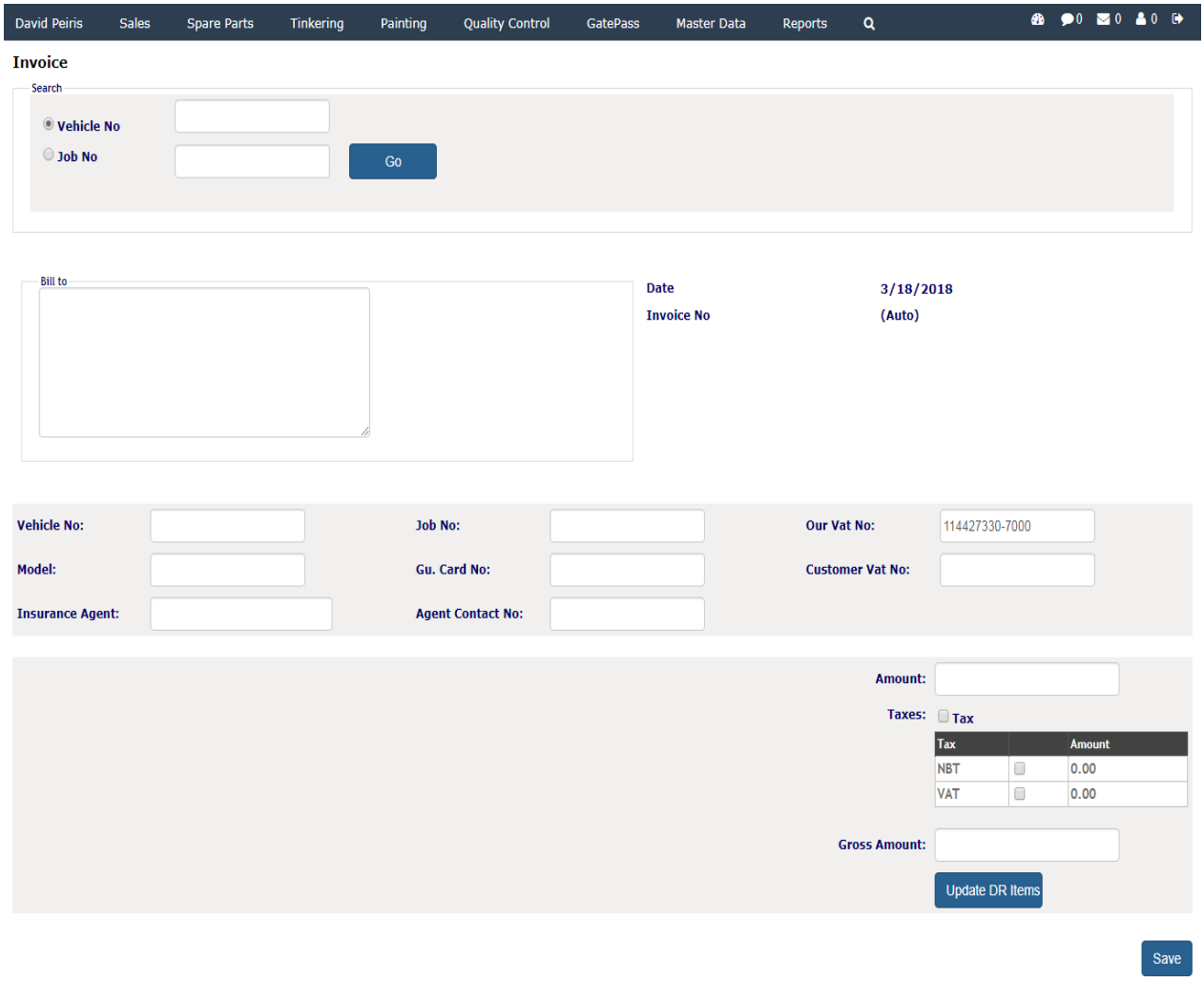


Figure B.20 :Sales Invoice Interface

After saving the invoice , to view the invoice and get the print of each invoice, view sales invoice menu has to be clicked. Then the following interface appears. A job can have several invoices. Each invoice can be viewed and can be printed.

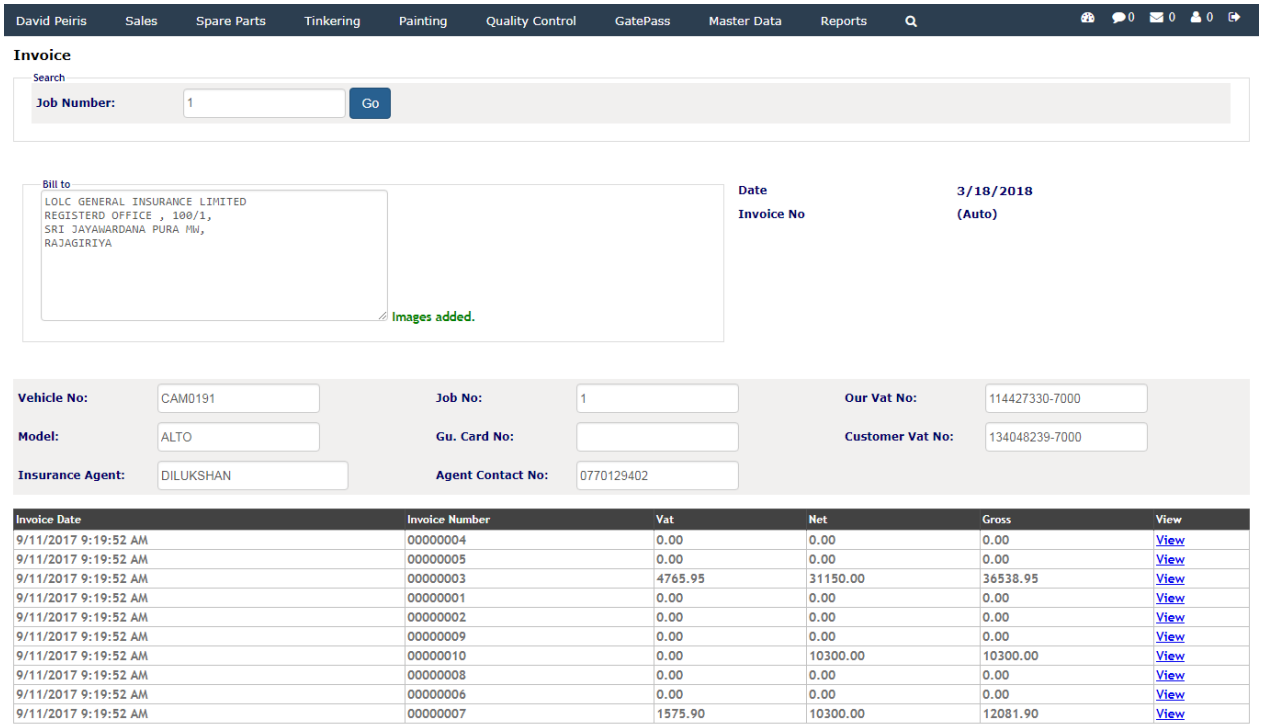


Figure B.21 :View Sales Invoice Interface

- Calling List

  This is the form provided by the system to enter the feedback provided by the customer to the system at each call made to them by the calling center of Samagi Motors.

- Calling List Feedback

  This is the form provided by the system to enter the feedback provided by the customer with their "comments" to the system at each call made to them by the calling center of Samagi Motors

- Promotions

  This is the form provided by the system to enter the promotion messages

Next are the division menus that allows to complete the separate division works related to a vehicle and pass the job through the divisions. Each division menu consists of menu items as complete jobs, divisional summary and an over dated report.

The following figures show the menu items of each divisions.

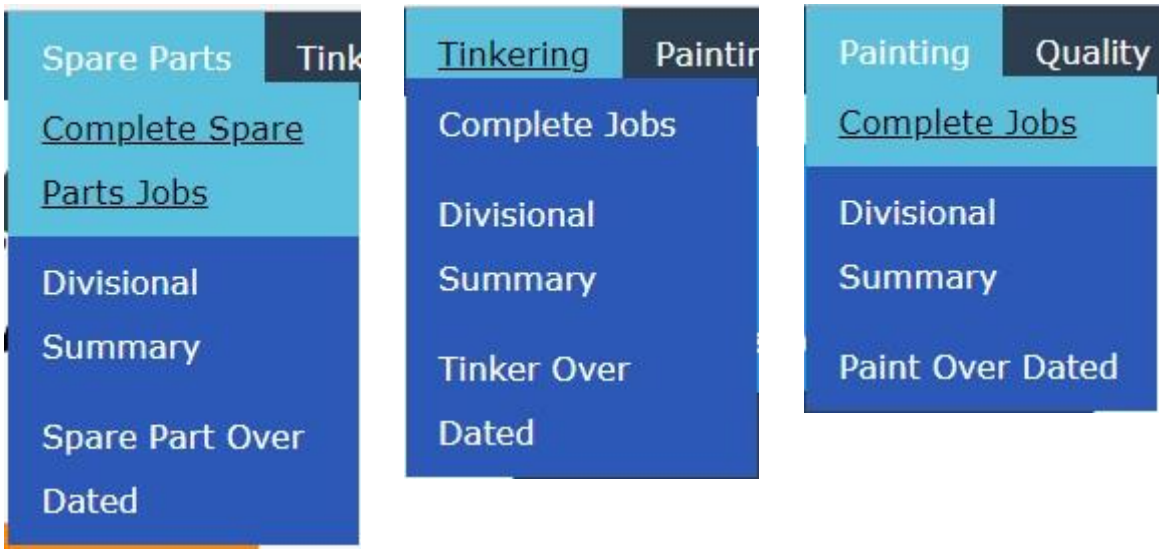


Figure B.22 :Menu items of Spare Parts, Tinkering and Painting

The following interfaces show the interface of completing jobs of the spare part jobs.

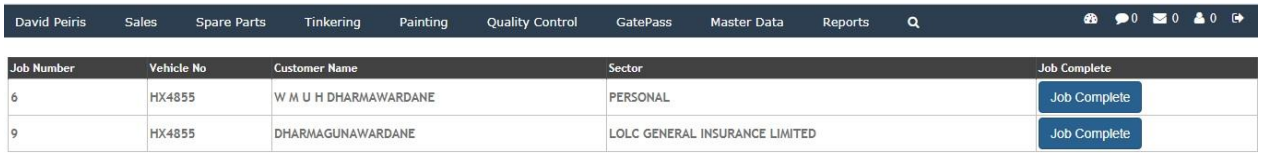


Figure B.23 :Complete Spare Part jobs interface

The following figure B.24 shows the interface of tinkering divisional summary

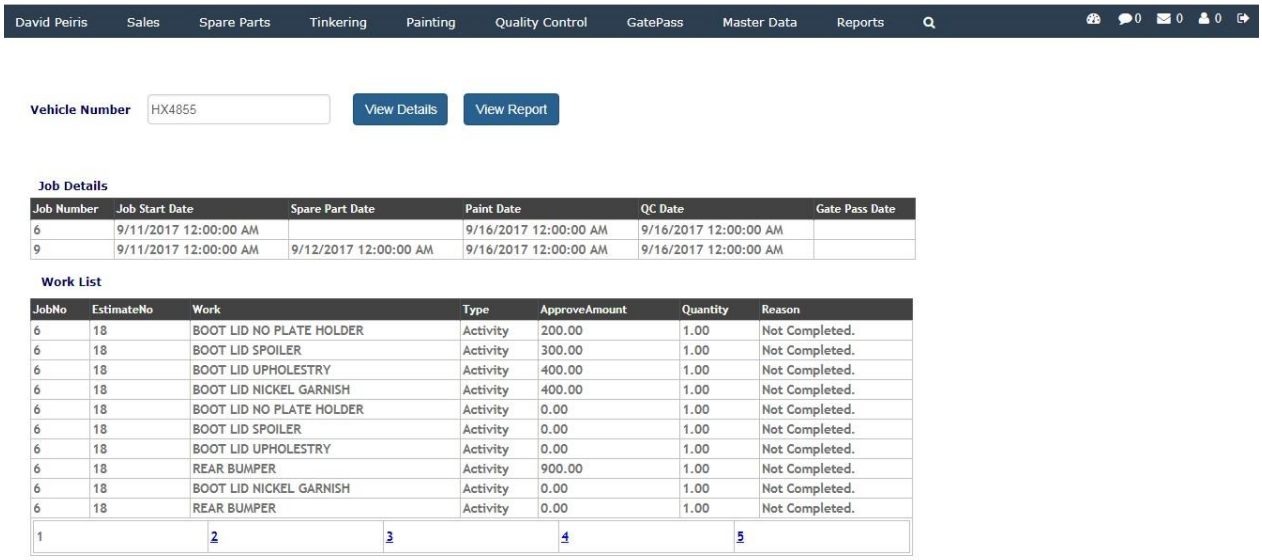


Figure B.24 : Tinkering divisional summary interface

Figure B.25 : Quality Control menu items

Quality Control menu items include the following.

- Pending QC List- Contains the job list that passed to Quality control division and that should be passed from Quality Control division.
- QC Over Dated- The report containing over dated jobs of the Quality Control division.
- Quality Check List-Includes all the quality list items for vehicles
- Quality Check List Report- Report of the quality check list items of vehicles

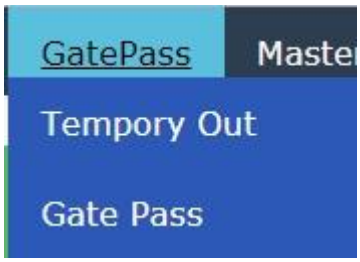


Figure B.26 :Gate pass menu items

Gate pass menu items contain temporary out and save gate pass mainly. Each menu items have sub menus. Temporary Out menu item has sub menu to Save temporary outs, cancel them and a summary of temporary outs. Gate pass menu items has sub menu items of saving gate pass, summary report and detailed report.

The following figure B.27 shows the sub menus of gate pass menu items.

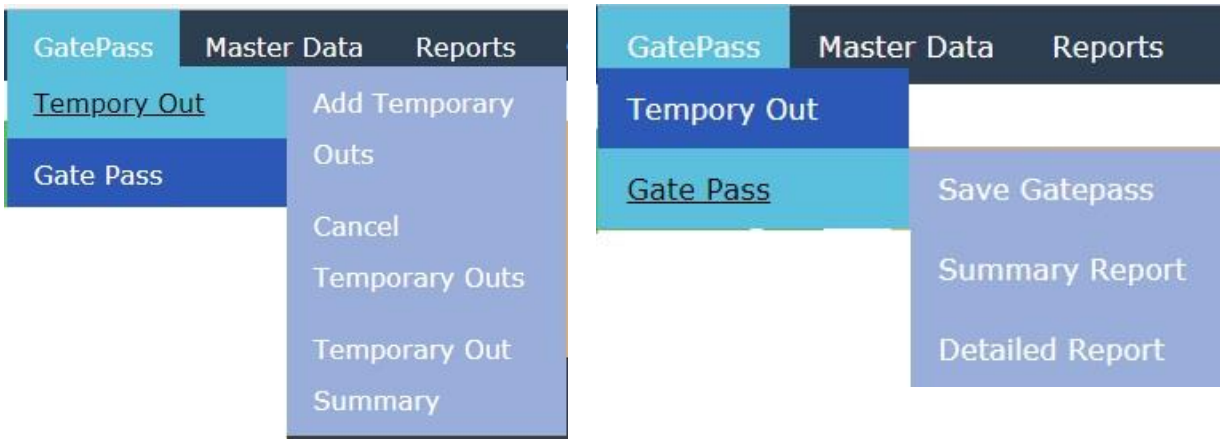


Figure B.27 : Sub menu items of Temporary Out and Gate pass menu items

The temporary out interface which is shown by the figure B.28 is the interface to add or save temporary out vehicle details to the system.

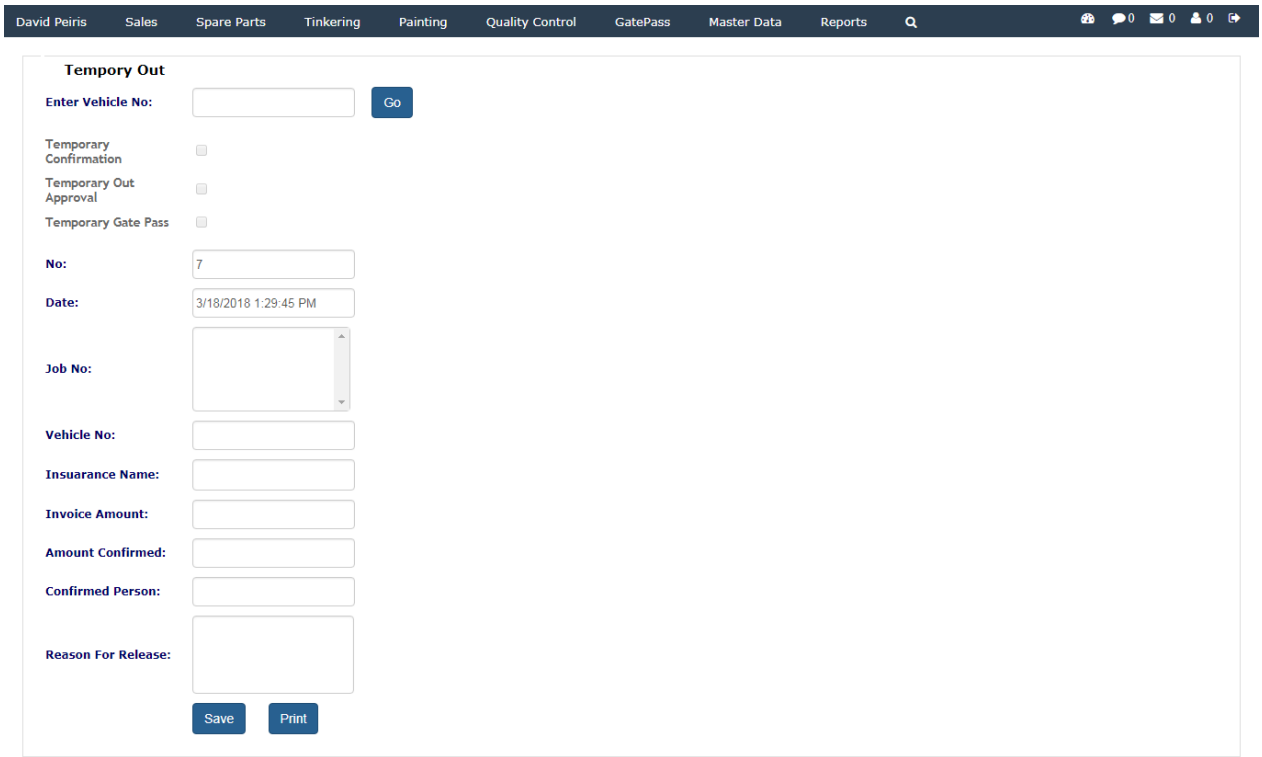


Figure B.28 : Save Temporary Out details interface

The interface to cancel the temporary outs and involve the vehicles to the maintenance process again is shown by figure B.29

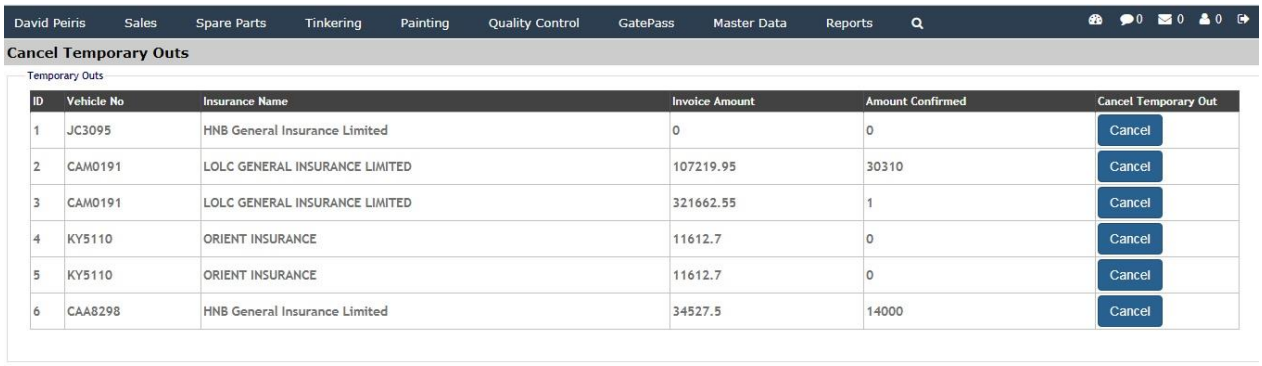


Figure B.29 : Cancel Temporary Outs

"Save Gate Pass" interface is the final and another significant form in the vehicle maintenance process related activities. It allows to remove a vehicle from the ongoing processes and make ready the vehicle to handover to the customer. Below figure illustrates the gate pass interface.

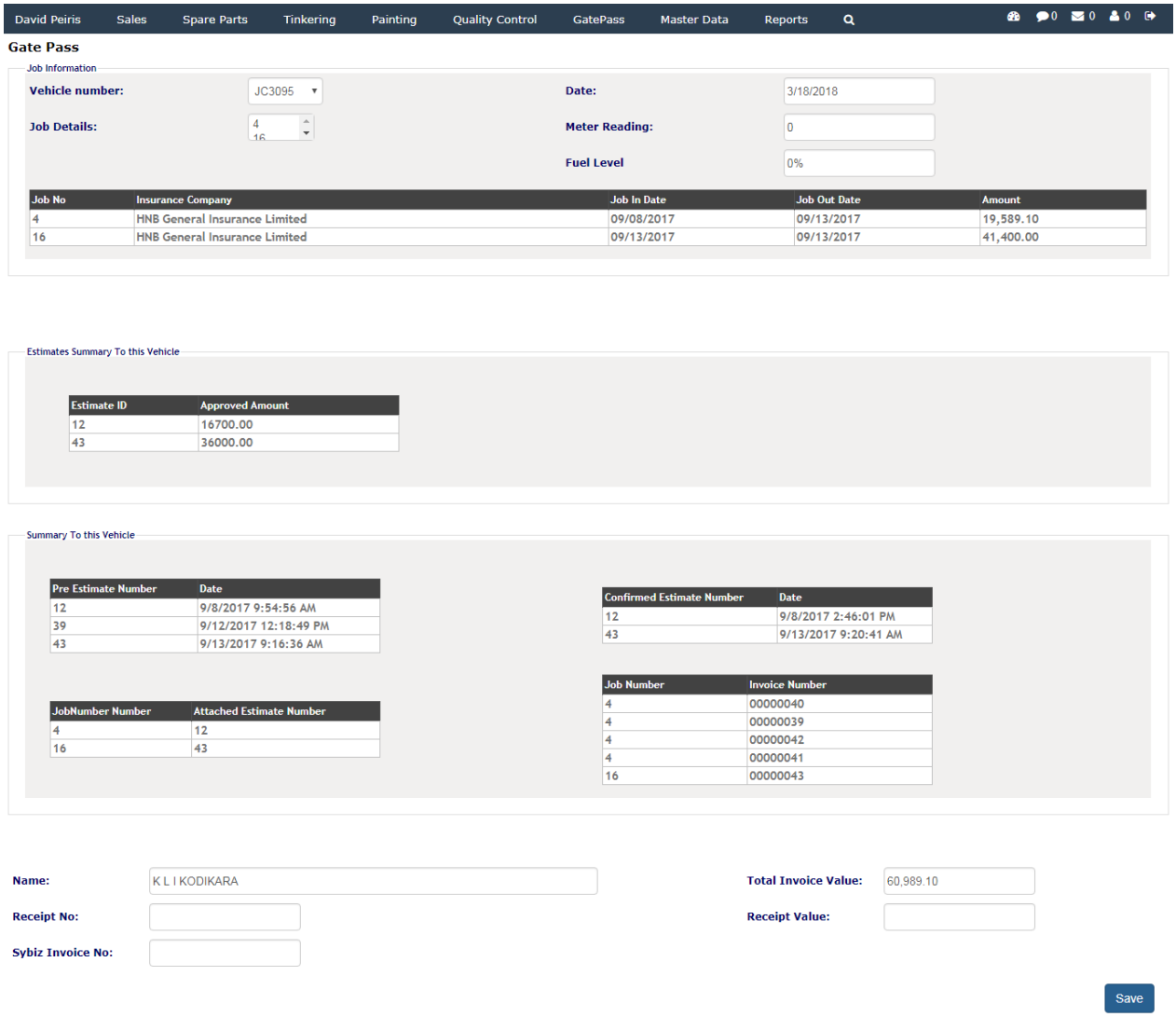


Figure B.30 : Save Gate Pass details interface

Figure B.31 :Master Data menu

Master Data menu items include the following.

- Vehicle at a glance- Display the vehicle located division at one search easily.
- Panel Wise Estimated Date- This is the form to set the number of days according to the panels working
- Vehicle Brand-Form to save the vehicle makes and models
- Insurance Company- Interface to save the vehicle insurance company details to the system
- Employee Master-This menu has some sub menu items of add/edit contractor details, add new employee, change account details and edit employee

Figure B.32 : Employee Master sub menus

- Tax details-This form is to edit tax details (VAT and NBT)
- Standards-Form allows to add vehicle standards to the system for later use

Figure B.33 :Report Menu

- Sales-Sales menu item contains sub men items of Sales Journal, Sales Journal vehicle wise and insurance wise sales invoice list

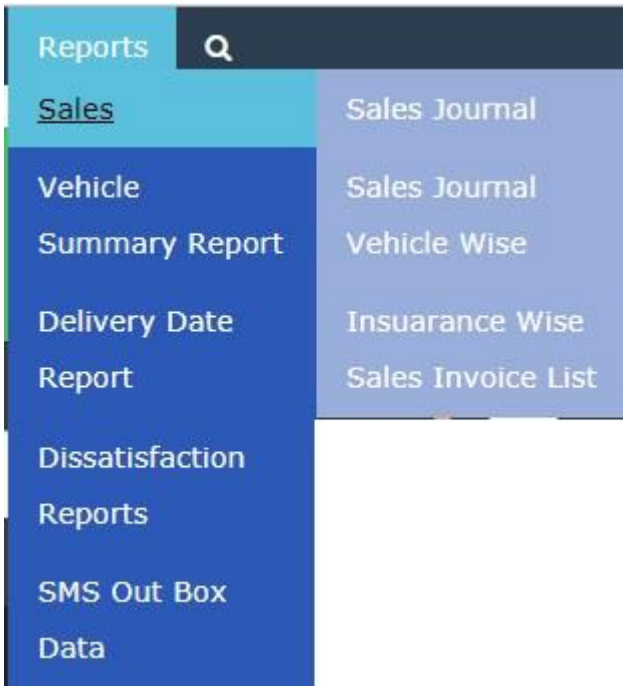


Figure B.34 : Sales Sub menu items

- Vehicle Summary Report- Display the vehicle summary
- Delivery Date Report- Display the report considering the delivery dates of the vehicles
- Dissatisfaction Reports-Display the reports of customers who gave dissatisfied comments
- SMS Out Box Data-Display the SMS list

Dashboard Buttons

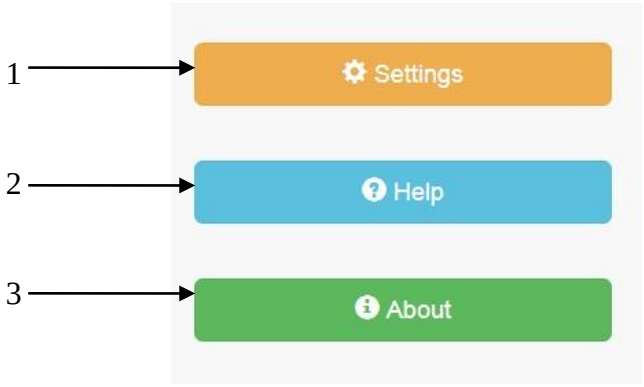


Figure B.35 :Dashboard buttons

1- Settings : This lets you to save / change user profile settings
2- Help : This opens the user manual of the software
3- About : Mention the version and a little description on the software

Dashboard Alerts

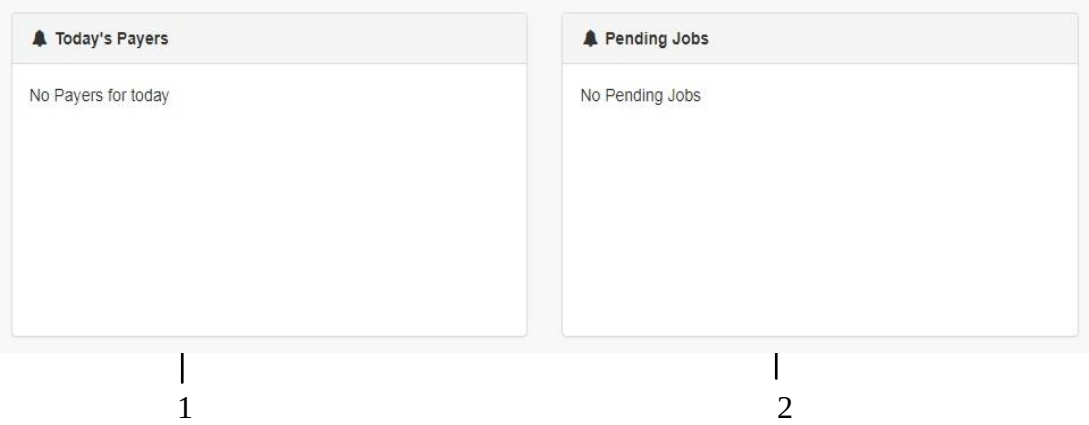


Figure B.36 : Dashboard alerts

1- Alert the payers of the day regarding the David Peiris related bike instalments.
2- Alert the pending jobs that has to be done up to date related to the vehicle maintenance activities.

Emails and SMS

Apart from the web site functioning, there are automated services which generate emails for staff members and SMS to customers and staff members.
For an example, from the Today's Payers alert list , a SMS is generated to the customers as a reminder about the payment date.

Figure B.37 : SMS Screenshot

Emails are also automatically generated as Customer Calling List and Delivery Date Report and send to the respective mails as follows.

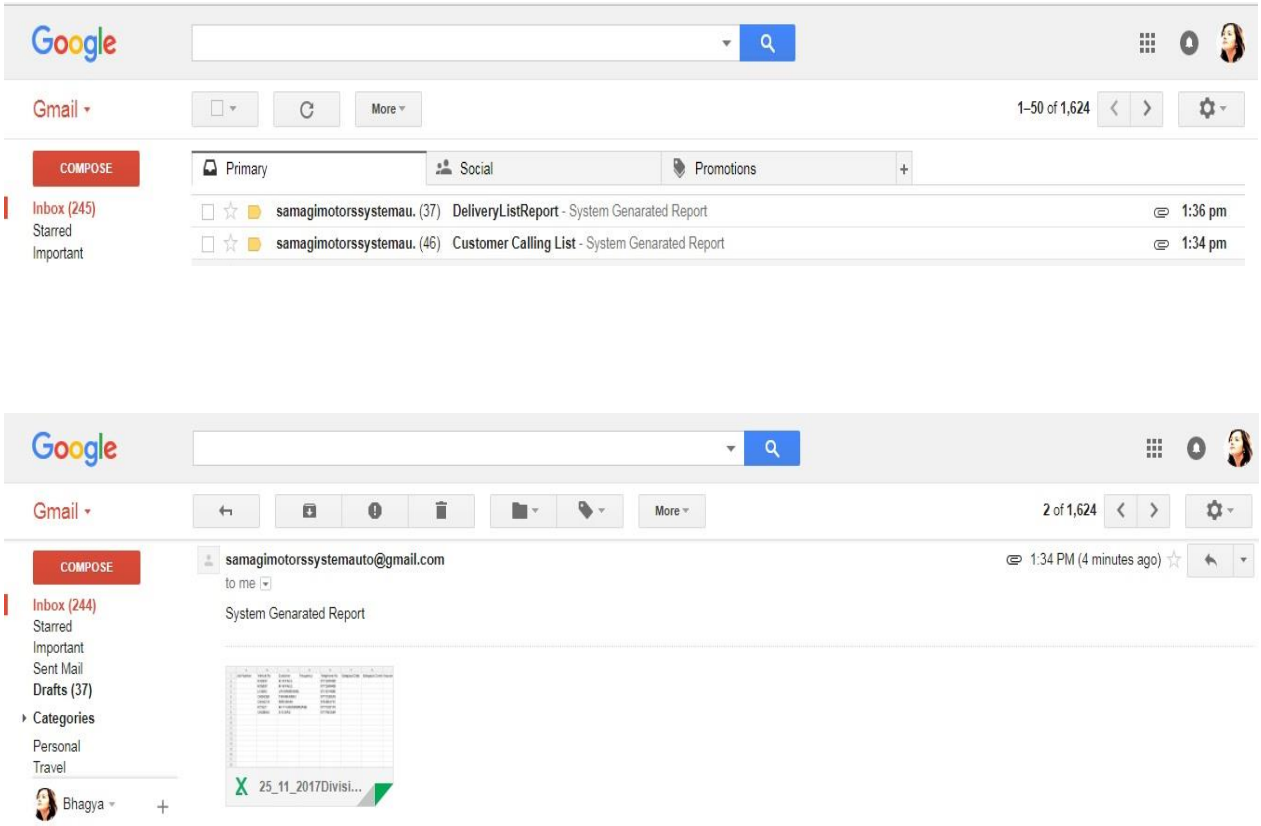


Figure B.38 : Emails Screenshot

Appendix C – Management Reports

Figure C.1 to C.10 show the screenshots of the management reports of the system.

Bike Detailed Report

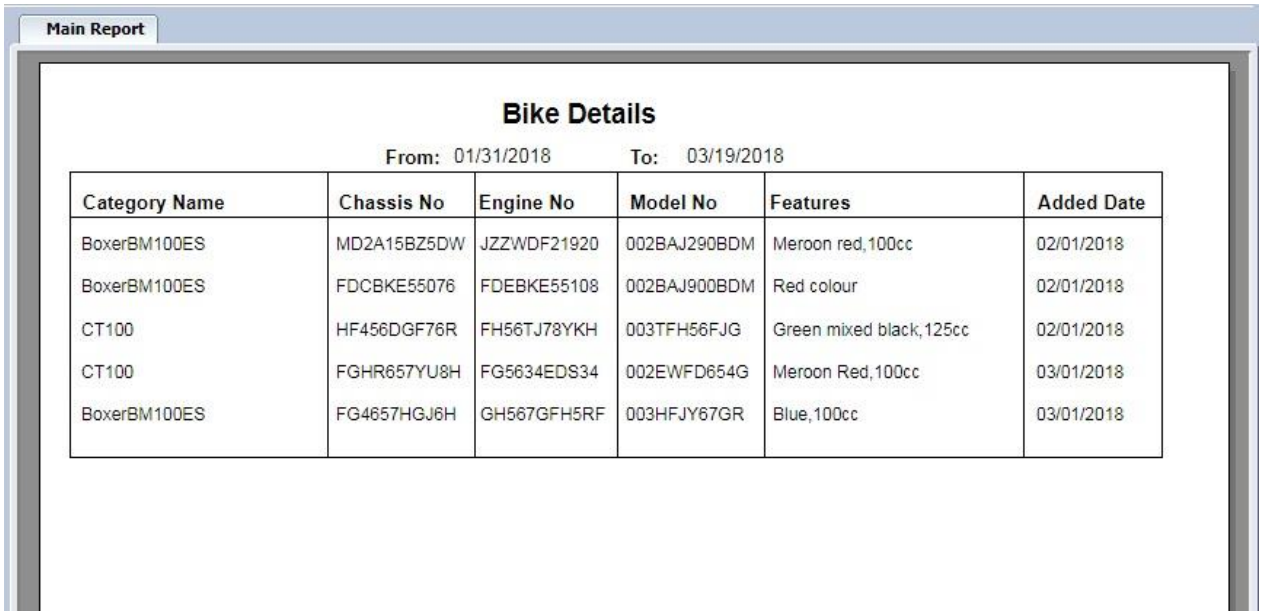


Figure C.1 : Bike Details Report

Bike Customer Details Report

Figure C.2 : Customer Details Report

Initial Payment Details Report

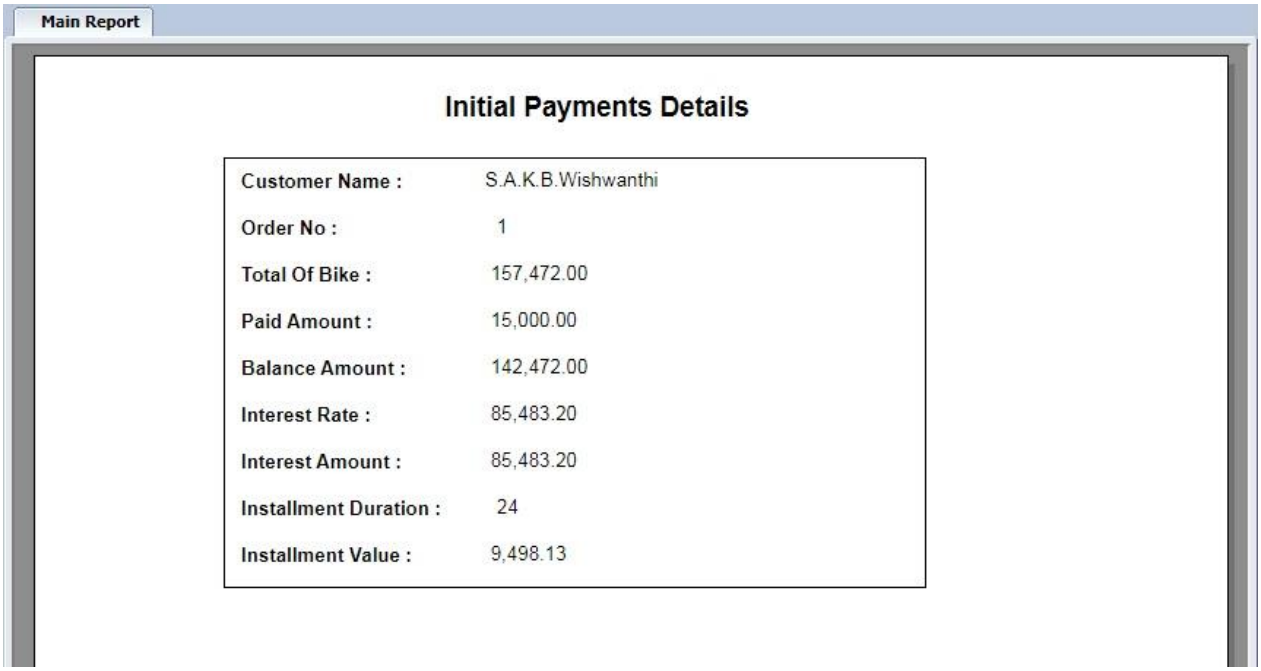


Figure C.3 : Initial Payments Details Report

Installments Payment Details Report

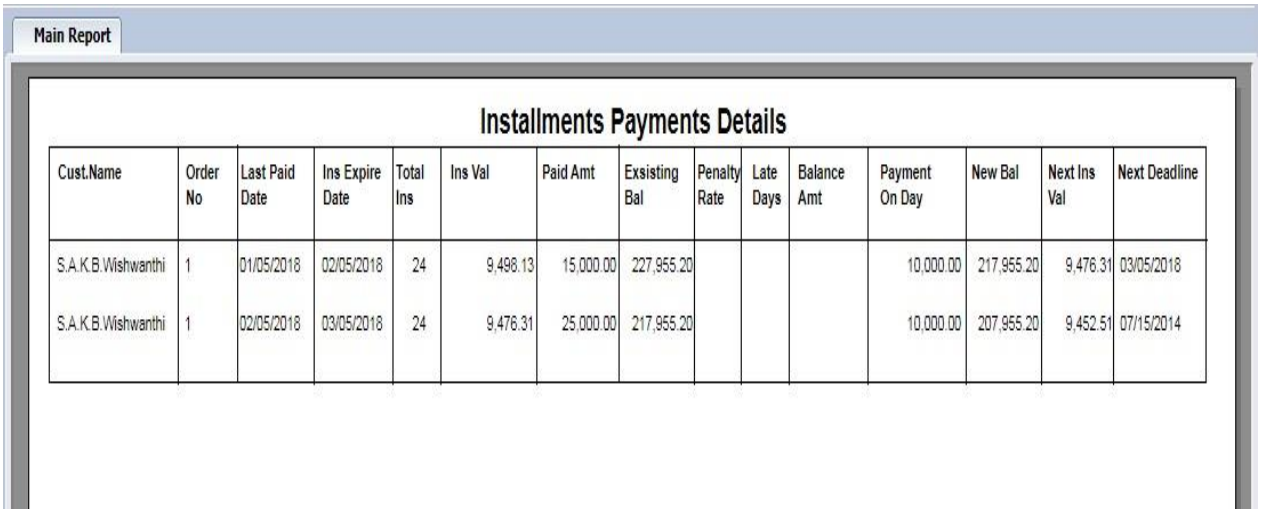


Figure C.4 : Instalments Payments Details Report

Bike Orders Details Report

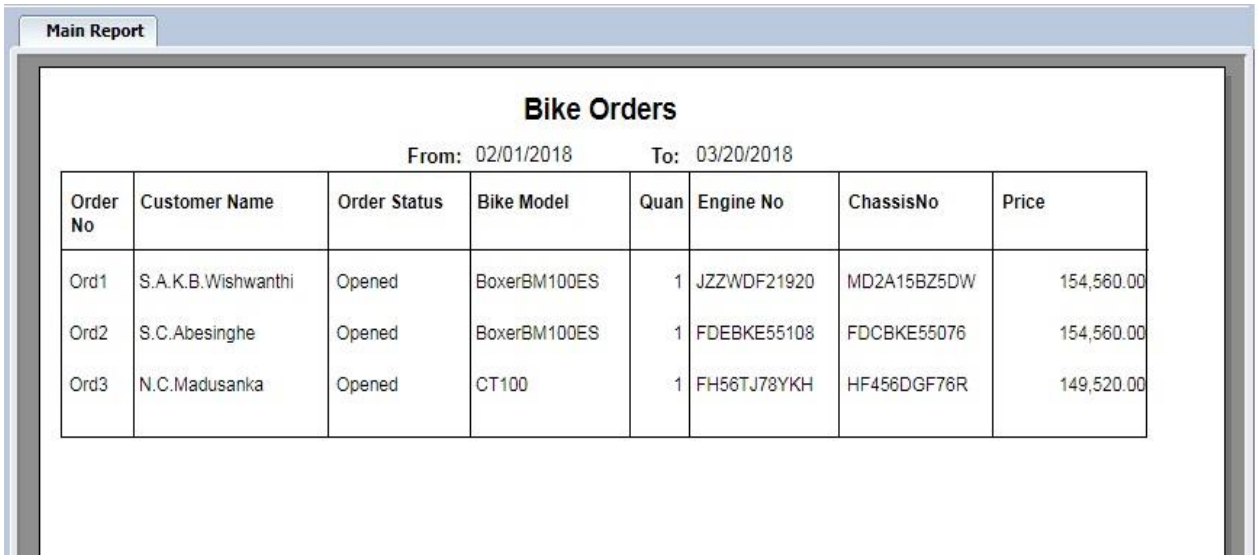


Figure C.5 : Bike Orders Details Report

Bike Purchases Details Report

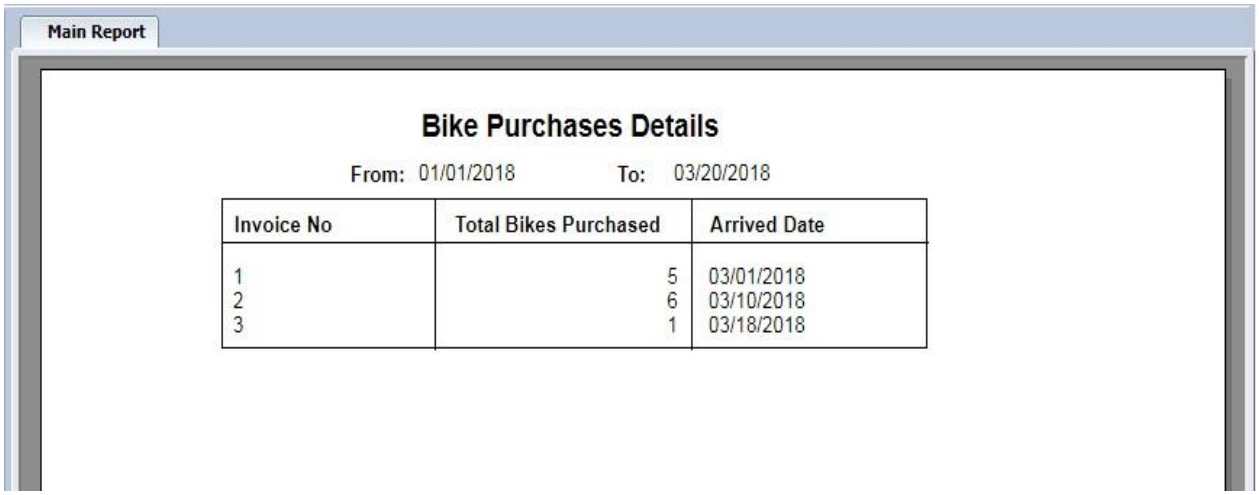


Figure C.6 : Bike Purchases Details Report

Bike Stock Summary Report

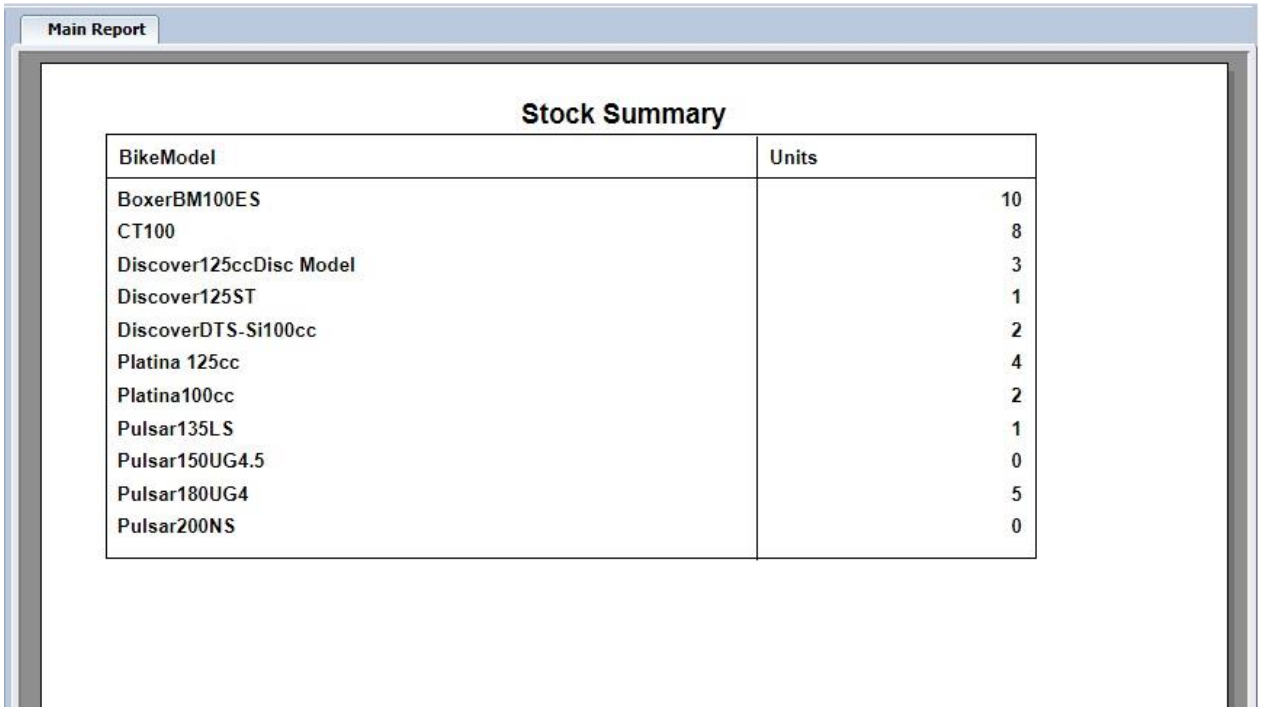


Figure C.7 : Bike Stock Summary Report

Spare Part OverDated Report

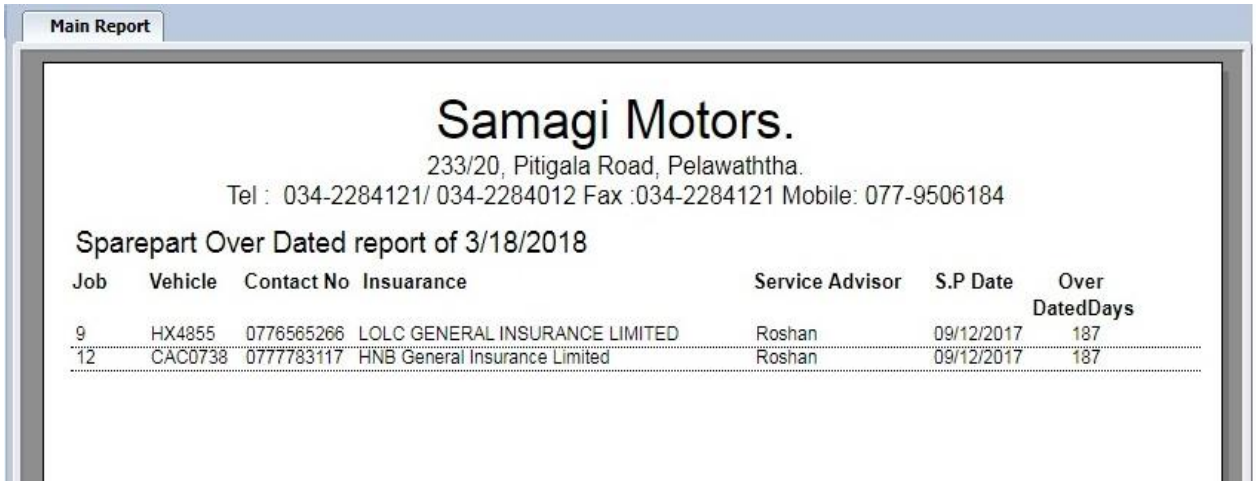
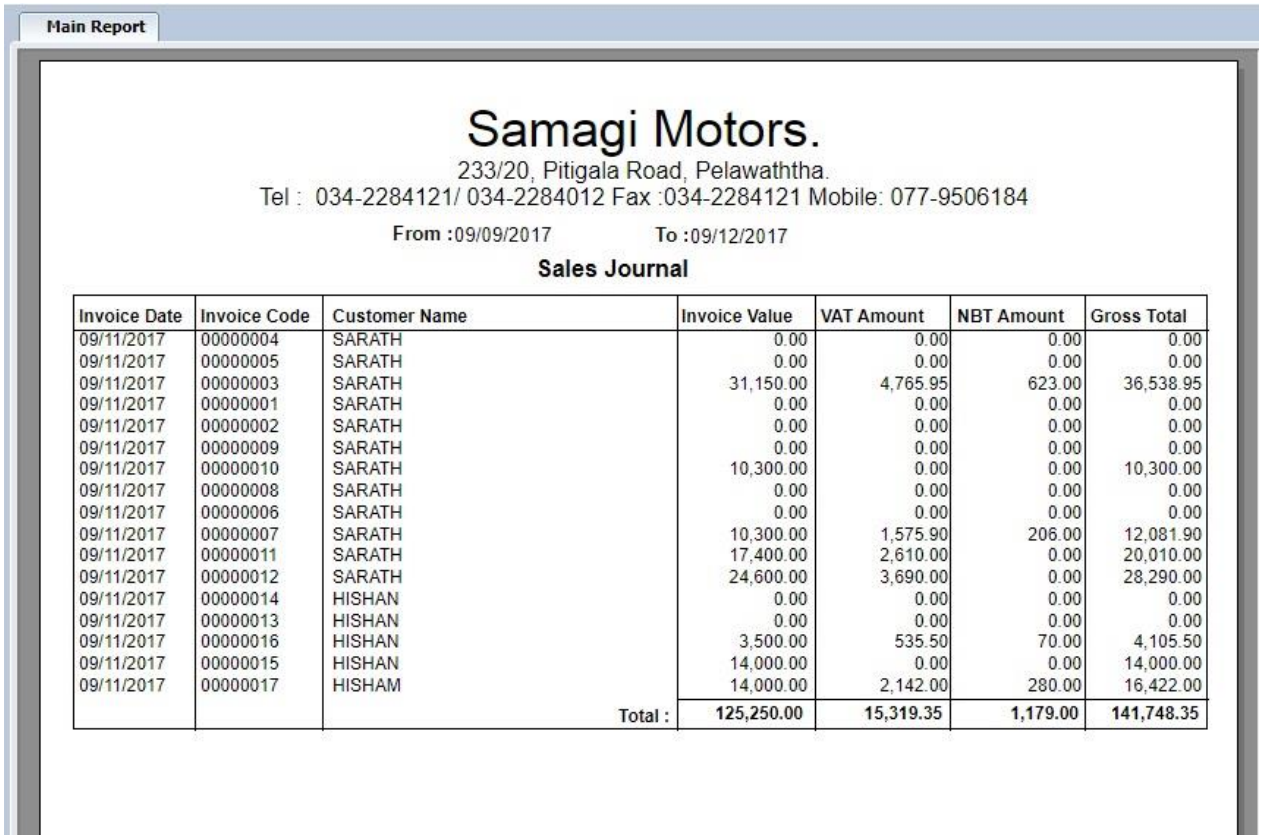


Figure C.8 : Spare Part Over Dated Report

Sales Journal Date Range Wise Report



Main Report

Samagi Motors.

233/20, Pitigala Road, Pelawaththa.

Tel : 034-2284121/ 034-2284012 Fax :034-2284121 Mobile: 077-9506184

From :09/09/2017 To :09/12/2017

Sales Journal

Invoice Date	Invoice Code	Customer Name	Invoice Value	VAT Amount	NBT Amount	Gross Total
09/11/2017	00000004	SARATH	0.00	0.00	0.00	0.00
09/11/2017	00000005	SARATH	0.00	0.00	0.00	0.00
09/11/2017	00000003	SARATH	31,150.00	4,765.95	623.00	36,538.95
09/11/2017	00000001	SARATH	0.00	0.00	0.00	0.00
09/11/2017	00000002	SARATH	0.00	0.00	0.00	0.00
09/11/2017	00000009	SARATH	0.00	0.00	0.00	0.00
09/11/2017	00000010	SARATH	10,300.00	0.00	0.00	10,300.00
09/11/2017	00000008	SARATH	0.00	0.00	0.00	0.00
09/11/2017	00000006	SARATH	0.00	0.00	0.00	0.00
09/11/2017	00000007	SARATH	10,300.00	1,575.90	206.00	12,081.90
09/11/2017	00000011	SARATH	17,400.00	2,610.00	0.00	20,010.00
09/11/2017	00000012	SARATH	24,600.00	3,690.00	0.00	28,290.00
09/11/2017	00000014	HISHAN	0.00	0.00	0.00	0.00
09/11/2017	00000013	HISHAN	0.00	0.00	0.00	0.00
09/11/2017	00000016	HISHAN	3,500.00	535.50	70.00	4,105.50
09/11/2017	00000015	HISHAN	14,000.00	0.00	0.00	14,000.00
09/11/2017	00000017	HISHAM	14,000.00	2,142.00	280.00	16,422.00
		Total :	125,250.00	15,319.35	1,179.00	141,748.35

Figure C.9 : Sales Journal Date Range Wise Report

Quality Check List Items Report

Main Report

QUALITY CHECK LIST

Job No. Vehicle No. Date. 03/18/2018

Main Items

Name Good

Functional Instrument

Name Good

Over Spray

Name Good

Interior Cleaning

Name Good

Boot Checking

Name Good

Engine Room

Name Good

I hear by certify I have checked the above check list items and the job is under perfect condition without any issues & defects

Signature of Quality Manager

Figure C.10 : Quality Check List Report

Appendix D – Test Results

The tables (D.1 to D.25) are the test cases used and test results obtained during testing.

Save bike category details

No	Test Case	Expected Output	Actual Output	Status
01	When compulsory fields are not filled	Prompts user to fill the required fields	Prompts user to fill the required fields	Pass
02	All required fields are entered	Save details	Save details	Pass

Table D.1: Save bike category details test results

Save bike details

No	Test Case	Expected Output	Actual Output	Status
01	When required fields are not entered	Prompts user to enter the required fields	Prompts user to fill the required fields	Pass
02	All required fields are entered	Save details	Save details	Pass

Table D.2: Save bike details test results

Save instalment details

No	Test Case	Expected Output	Actual Output	Status
01	Invalid customer NID entered	Show error message	Show error message	Pass
02	Not filling required fields	Prompt user to fill them	Prompt user to fill them	Pass
03	Do the calculations correctly	Display accurate values in related fields	Display accurate values in related fields	Pass
04	Generation of cash receipt	Display cash receipt	Display cash receipt	Pass

Table D.3: Save instalment details test results.

Save purchase details

No	Test Case	Expected Output	Actual Output	Status
01	When required fields not entered	Prompt user to enter required fields	Prompt user to enter required fields	Pass
02	When pressing "Add values" button	Total amount of bikes should get updated	Total amount of bikes should get updated	Pass
03	All required fields are entered	Saving completed	Saving completed	Pass

Table D.4: Save purchase details test results

Save user details

No	Test Case	Expected Output	Actual Output	Status
01	When current password not entered	Prompt user to fill the current password	Prompt user to fill the current password	Pass
02	When password is not confirmed	Prompt user to confirm password	Prompt user to confirm password	Pass
03	Required fields filled	Saving completed	Saving Completed	Pass

Table D.5: Save user details test results

Today's payers alert

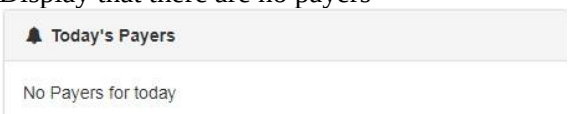
No	Test Case	Expected Output	Actual Output	Status
01	Check payers and if having	Display player list	Display payer list	Pass
02	If having payers	Generate and send SMS	Generate and send SMS	Pass
03	If no payers	Display that there are no players	Display that there are no payers 	Pass

Table D.6: Today's payers alert test results

Late payers alert

No	Test Case	Expected Output	Actual Output	Status
01	Check payers and if having	Display late payers list	Display late payer list	Pass
02	If having no late payers	Display no late payers	Display no late payers	Pass

Table D.7: Late payers list test results

Warning letters

No	Test Case	Expected Output	Actual Output	Status
01	Check late payers and if having	Display payer list	Display payer list	Pass
02	If no payers	Display no payers	Display no payers	Pass
03	Generate warning letters for each selected customers	Warning letter generated	Warning letter generated	Pass

Table D.8: Warning letter test results

Pending Jobs list

No	Test Case	Expected Output	Actual Output	Status
01	Check pending jobs and if having	Display jobs list	Display jobs list	Pass
02	If no jobs	Display no jobs	Display that there are no jobs 	Pass

Table D.9: Pending jobs list test results

Updating bike category details

No	Test Case	Expected Output	Actual Output	Status
01	When select a category detail to be updated load data correctly	Data loaded correctly	Data loaded correctly	Pass
02	When compulsory fields are not filled	Prompts user to fill the required fields	Prompts user to fill the required fields	Pass
03	All required fields are entered	Update details	Update details	Pass

Table D.10: Update bike category details test results

Save Bike registration details

No	Test Case	Expected Output	Actual Output	Status
01	When required fields are not entered	Prompts user to enter the required fields	Prompts user to fill the required fields	Pass
02	All required fields are entered	Save details	Save details	Pass

Table D.11: Save bike registration details test results

Cancel Order Details

No	Test Case	Expected Output	Actual Output	Status
01	When date range entered load the order details	Loaded order details	Loaded order details	Pass
02	When press on the cancel Order button the order must be cancelled	Order cancelled	Order cancelled	Pass

Table D.12: Cancel order details test results

Confirm Estimate Details

No	Test Case	Expected Output	Actual Output	Status
01	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass
02	Required fields filled	Saving completed	Saving completed	Pass
03	Load the form	Data loaded correctly on to the form	Data loaded correctly on to the form	Pass

Table D.13: Confirm estimate test results

Sales Invoicing

No	Test Case	Expected Output	Actual Output	Status
01	Data loading correctly on the form when searched from vehicle no or Job no	Data loaded correctly	Data loaded correctly	Pass
02	Not filling all required fields	Prompt user to fill	Prompt user to fill	Pass

03	Calculations being correct with VAT and NBT values	Calculations are correct	Calculations are correct	Pass
04	Required fields filled	Saving completed	Saving completed	Pass

Table D.14: Invoicing interface test results

View Invoice Interface

No	Test Case	Expected Output	Actual Output	Status
01	Data loading on the form when searched from vehicle no or Job no	Data loaded correctly	Data loaded correctly	Pass
02	When click on view sales invoice view as report	Sales invoice can be viewed	Sales invoice can be viewed	Pass

Table D.15: View invoice interface test results

Save Temporary Outs

No	Test Case	Expected Output	Actual Output	Status
01	When vehicle no entered data loads correctly on the form	Data loaded correctly	Data loaded correctly	Pass
02	When required fields are not entered	Prompts user to enter the required fields	Prompts user to fill the required fields	Pass
02	All required fields are entered	Save details	Save details	Pass

Table D.16: Save temporary outs test results

Cancel Temporary Outs

No	Test Case	Expected Output	Actual Output	Status
01	Data load successfully at form load	Data loaded successfully	Data loaded successfully	Pass
02	When press on the "cancel" button the temporary out must be cancelled	Temporary out cancelled	Temporary out cancelled	Pass

Table D.17: Cancel temporary outs test results

Complete Spare Part Jobs

No	Test Case	Expected Output	Actual Output	Status
01	Data load successfully at form load	Data loaded successfully	Data loaded successfully	Pass
02	When press on the "Complete" button, the division works have be completed	Division works Completed	Division works Completed	Pass
03	Job passed out of the spare part division successfully	Job Passed	Job Passed	Pass

Table D.18: Complete spare part jobs test results

Complete Tinkering Jobs

No	Test Case	Expected Output	Actual Output	Status
01	Data load successfully at form load	Data loaded successfully	Data loaded successfully	Pass
02	When press on the "Complete" button, the division works have be completed	Division works Completed	Division works Completed	Pass
03	Job passed out of the tinkering division successfully	Job Passed	Job Passed	Pass

Table D.19: Complete tinkering jobs test results

Complete Painting Jobs

No	Test Case	Expected Output	Actual Output	Status
01	Data load successfully at form load	Data loaded successfully	Data loaded successfully	Pass
02	When press on the "Complete" button, the division works have be completed	Division works Completed	Division works Completed	Pass
03	Job passed out of the paint division successfully	Job Passed	Job Passed	Pass

Table D.20: Complete paint jobs test results

Complete Quality Control Jobs

No	Test Case	Expected Output	Actual Output	Status
01	Data load successfully at form load	Data loaded successfully	Data loaded successfully	Pass
02	Not Filling the required date and time fields	Prompts the user to fill	Prompts the user to fill	Pass
03	When press on the "Complete" button, the division works have be completed	Division works Completed	Division works Completed	Pass
04	Job passed out of the pending QC division successfully	Job Passed	Job Passed	Pass

Table D.21: Complete quality control jobs test results

Customer Comments Resolving Interface

No	Test Case	Expected Output	Actual Output	Status
01	When required fields are not entered	Prompts user to enter the required fields	Prompts user to fill the required fields	Pass
02	All required fields are entered	Save details	Save details	Pass
03	Jobs are resolved	Resolved jobs get disappeared from the screen interface	Resolved jobs get disappeared from the screen interface	Pass

Table D.22: Customer comments resolving test results

Approving Quality Control Jobs Interface

No	Test Case	Expected Output	Actual Output	Status
01	Data load successfully at form load	Data loaded successfully	Data loaded successfully	Pass
02	Not Filling the required date and time fields	Prompts the user to fill	Prompts the user to fill	Pass
03	When press on the "Complete" button, the	Division works Completed	Division works Completed	Pass

	division works have be completed			
04	Job passed out of the QC division successfully	Job Passed to gate pass	Job Passed to gate pass	Pass

Table D.23: Approving quality control jobs test results

Updating Tax details

No	Test Case	Expected Output	Actual Output	Status
01	Data load successfully at edit button click	Data loaded successfully	Data loaded successfully	Pass
02	All required fields are entered	Updates successfully	Updates successfully	Pass
03	Clear data after updating	Data cleared successfully	Data cleared successfully	Pass

Table D.24: Updating tax details test results

Quick Search interface

No	Test Case	Expected Output	Actual Output	Status
01	Load data to drop down at form load	Data loaded successfully	Data loaded successfully	Pass
03	Searched data load after click on “search” button	Data loaded successfully	Data loaded successfully	Pass

Table D.25: Quick search interface test results

User Evaluation Form For Web Based Sales And Vehicle Maintenance System for Samagi Motors

Name : SAJITH SASANKA RANEPURA HEWAGE WANIGATHUNGA

Designation : MANAGER

Ratings

A : Excellent **B : Good** **C : Average** **D : Poor**

No	Questions	A	B	C	D
1	Understandability of the system	✓			
2	Look & feel of the system	✓			
3	Cover all the required functionalities and requirements	✓			
4	Provide adequate security features (For Different user categories and backup availability)		✓		
5	Easiness of the system interface usage	✓			
6	Provide adequate error massages	✓			
7	Accuracy of calculations	✓			
8	Clear reports generation	✓			
9	Easy data viewing and searching	✓			
10	Easiness of entering data to the system	✓			
11	Ability to maintain data		✓		
12	Provide adequate information under help menu		✓		
13	SMS generation and sending facility	✓			
14	Email Generation and sending facility	✓			
15	Benefits gain through the system		✓		

Suggestions

.....

.....

Signature : .....

Date : 20/02/2018

Appendix E – Special Codes

Re-used Codes

Database access

```
<connectionStrings>
<addname="SamagiMotorsConnectionString"connectionString="Data Source=OZI-
PC2\MSSQLSERVER212;Initial Catalog=SamagiMotors;User ID=sa;Password=december99"
providerName="System.Data.SqlClient" />
<addname="Entities"connectionString="metadata=res://*;provider=System.Data.SqlClient;provi
der connection string=&quot;Data Source=OZI-PC2\MSSQLSERVER212;Initial
Catalog=SamagiMotors;Persist Security Info=True;User
ID=sa;Password=december99;MultipleActiveResultSets=True&quot;"providerName="System.Data.En
tityClient"/>
</connectionStrings>
```

Log Helper(code that is used to keep log record for specific instances)

```
using System;
usingSystem.Collections.Generic;
usingSystem.Linq;
usingSystem.Text;
using System.IO;

namespaceGenerateSMSService
{
classLogHelper
    {
staticstringlogFileName = string.Empty;
staticLogHelper instance = null;

publicLogHelper()
        {
try
            {
logFileName = AppDomain.CurrentDomain.BaseDirectory + DateTime.Now.ToString("MM_dd_yyyy")
+ ".txt";
if (!File.Exists(logFileName))
                {
File.Create("log.txt");
                }
            }
catch
            {
            }
        }

publicstaticLogHelper Instance()
        {
if (instance == null)
            {
instance = newLogHelper();
            }
return instance;
        }

///<summary>
```

```
///pass only log text here
///</summary>
///<param name="text"></param>
publicboolWriteLog(string text)
        {
try
            {
stringlogText = Environment.NewLine + DateTime.Now.ToString();
logText += Environment.NewLine + "---------------------------------------

------------------";
logText += Environment.NewLine + text + Environment.NewLine;
try
                {
File.AppendAllText(logFileName, logText);
returntrue;
                }
catch (Exception ex)
                {

                }
            }
catch
            {
            }
returnfalse;
        }

publicstringReadLog()
        {
stringlogText = string.Empty;
try
            {
try
                {
logText = File.ReadAllText(logFileName);
                }
catch (Exception ex)
                {
logText = "Log reading failed" + Environment.NewLine + ex.Message;
                }

            }
catch
            {
            }
returnlogText;
        }
    }
}
```

BAJAJ

Samagi Motors

233/20, Pitigala Road, Pelawatta.

Reg - W.N.N. 427

Tel: 034-2284121 / 034-2284012
Fax: 034-2284121 Mobil: 077-9506184

20/03/2018

Coordinator,
MIT Degree,
University Of Colombo,
UCSC.

Dear Sir,

Web Based Sales And Vehicle Maintenance System for Samagi Motors

This is to inform you that Miss S.A.K.B.Wishwanthi (RegNo:2015/MIT/074, IndexNo: 15550741) who is studying at your University has successfully delivered us the proposed Web Based Sales and Vehicle Maintenance System.

We admit that this system supports us to carry out our business activities successfully and efficiently. Thanks.

Yours truly,

Manager,
Samagi Motors.

SAMAGI MOTORS
No. 233/20, Pitigala Road,
Pelawatta.
Tel: 034-2284121

Glossary

Use case diagram	-	This is a diagram which display the relationships among actors and use cases in a system.
Feasibility study	-	This study is to analyse the ability to carry out a certain activity.
Process models	-	A software process model is a simplified representation of a software process .(I Sommerville, 9th edition)
Graphical User Interface	-	This is a type of interfaces that allows users interact with electronic devices through graphical icons and visual indicators
Test Plan	-	A test plan documents the strategy that will be used to verify and ensure that a system meets its specified requirements
Activity Diagram	-	A special kind of a state chart diagram that shows the flow from activity to activity within a system.
Sequence Diagram	-	An interaction diagram that graphically depicts how objects interact with each other via messages in the execution of a use case operation.
Object Oriented Designing	-	A method that was objects in developing the system.
Unified Modelling Language	-	This is a general purpose modelling language which is designed to provide a standard way to visualize the design of the system.
Evaluation	-	This is a systematic determination of subject's importance and significance using criteria governed by a set of standards.

Index