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**BY**

HAPARARI CRAIG PANASHE H200805T

CHIFAMBA PANASHE LIBERTY H200204X

KAJESE ANOIDA ASHLEY H200252Q

MUNDOGA TAKUDZWA STEWARD H200813Z

MAZAMBANI TINASHE H200412X

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**Chapter 1:Proposal**

**1.1Introduction**

The goal of an online car rental management system is to allow clients to rent cars online in the comfort of their homes thereby reducing time taken and money costs by going to the nearest car rental management system .Online car rental management system will be web based system whereby clients will rent cars online in the comfort of their homes .A client will only enter the required information via a website.

**1.2Background**

The manual car rental system provides services only during office hours. This provides customers limited time to make any transactions or reservation of cars they wanted to book in time. Some of the current company systems have a car rental system which is not a web-based application .So this is a limitation that gives them capability to store customer details but at the same time they cannot make their services more available to the public through the internet .They were making use of posters to advertise their services to the public and also make use of phone call reservations which is also limited to a few features as compared to a web based system .The customers would not get time to make a choice of the car they wanted to book due to limited working hours of the company therefore at the end of the day they would make reservations of the car they have no knowledge of and a car that they don’t want. To rent a car in the manual system the customer must first go to the nearest office and register as a client and then state the car he/she wanted and check if it‘s available, the customer doesn’t have time to do that. It involves a lot of paperwork and consumes time and make renting look like a long process while it can be done by a single click of a single button .The process of managing customers and data is slow if the company is still using the manual system and there might be a lot of clients .It is very hard to keep records of the all the rental cars and their current users.

**Problems of the existing system**

* The organization was experiencing double allocation on vehicles since it was all paper work, the updating style was very slow.
* Difficult to track those with clients who will have overstayed with the company`s vehicle.
* The system cannot restrict a client from renting a vehicle with registering.
* There are low security measures since any worker can have access to the files and also to the data source any one can edit or delete a booking.

**1.3Problem Statement**

The manual car rental system provides services only during office hours. This gives customers have limited time to make any transactions or reservation of cars they wanted to book in time. Some of the current company systems have a car rental system which is not a web-based application .So this is a limitation that gives them capability to store customer details but at the same time they cannot make their services more available to the public through the internet .They were making use of posters to advertise their services to the public and also make use of phone call reservations which is also limited to a few features as compared to a web based system .The customers would not get time to make a choice of the car they wanted to book due to limited working hours of the company therefore at the end of the day they would make reservations of the car they have no knowledge of and a car that they don’t want. To rent a car in the manual system the customer must first go to the nearest office and register as a client and then state the car he/she wanted and check if its available the customer doesn’t have time to do that. It involves a lot of paperwork and consumes time and make renting look like a long process while it can be done by a single click of a single button .The process of managing customers and data is slow if the company is still using the manual system and there might be a lot of clients .It is very hard to keep records of the all the rental cars and their current users.

**1.4Aims**

* Provide rental cars at affordable prices.
* Offer cars that are in good conditions that our clients will use comfortably.
* Offer a 24/7 online car rental system to promote availability.
* Improve customer satisfaction level, increasing efficiency by providing better services to their customers.

**1.5 Objectives**

* To design a user friendly system that enables client check for availability of vehicle and book and reserve a vehicle online.
* To develop a simple and secure system that protects client information and the confidential information of the company.
* To design a system that register users securely on the system.
* To develop a system that digitally store the car bookings and reservation information and keep track of records.

**1.6** **Signiﬁcance of the Project**

The study enhanced on our knowledge, skills and abilities in systems development and management. It also enhanced on our social behavior through the social interaction with the system users in a bid to identify the user requirements. The system ensures data consistence and easy generation of records; storage and retrieval of stored information hence ensure security of data. The system also reduces management costs through decreasing paper work and time. The report could be used as a ground for future research and further help to narrow the knowledge gap on the better information.

**1.7 Methodology**

In order to find out how the present system is operating, the researcher used a number of fact finding tools. The techniques used include interviews, questionnaires and observations.

**1.7.1 Interviews**

Interviews were carried out and found out that there were some advantages and disadvantages of the current system. The interviews were carried also to outline possible solutions to the problems discovered. Interviews with the Information Technology Manager and The Management were carried out.

**Advantages for using interviews**

* First-hand information about the current system.
* The interviews were direct and offered the researcher immediate responses.
* They gave an opportunity to personally meet and familiarize with the affected members of staff

**Disadvantages of using interviews:**

* Some of the information may be biased
* They are time consuming for both the interviewee and the interviewer.
* Careful planning was required to ensure that the analyst got the most out of the interview
* Some of those interviewed were not comfortable being interviewed and this might have influenced their responses.
* Requires courage since it is very difficult to deal with people of high ranks in an organization.

**1.7.2 Questionnaires**

The system analyst also employed the Questionnaires technique to gather information such as current stands application an allocation systems’ limitations/constraints and current user needs. The questionnaires were designed such that the people given to fill them understood each question very well for the analyst to gather the required information for the study.

**Advantages**

* Using questionnaires the respondent is given time to assemble the required information;
* Saves the analyst time when getting information required from a large sample hence reducing costs;
* It can be used to verify data that was gathered using other methods;
* Generally cheap for decentralize organizations and systems.

**Disadvantages**

* Difficult to frame questions which are certain to obtain the exact data required;
* Does not give room for opinions and suggestions;
* Does not guarantee that the intended person to answer the questions was actually the one who really answered the questionnaires;
* Not all questionnaire forms will be returned, many people object to filling forms while others delay completing them until they are eventually forgotten.

**1.7.3 Observations**

This method allowed the analyst to observe operations and draw conclusions from the system in question. The analyst observed all movements, relationships in the system with his own eyes and managed to gather the necessary information about the current system.

The analyst, upon concentration, observed that:

* The accounts clerk encountered so much pressure on handling rental bookings and payments made;
* The workers have a negative attitude to work because of the manual work they do;

**Advantages**

* First-hand information/details are obtained from the observations;
* It is a very fast method of getting required and relevant information at the required time;
* It is good for observing bottlenecks and checking facts that result in weak performance which have already been noted.

**Disadvantages**

* Behavior of the observed is modified, negatively or positively, when the analyst is present;
* It is an effective & inefficient method in case of a decentralized system;
* Long periods are taken to observe in the case of a decentralized system and excessive time is • taken to come up with the desired outcome;
* It affects and de-motivates workers who do not want to be observed whilst doing their work.

**1.8 Scope**

The study mainly concentrated on the development of the centralized online car rental management information system that helps in processing, advertising and keeping track of information from the customers.

The main aim of the system is to develop a reliable and user-friendly system which is flexible in bringing accuracy and efficiency together with effectiveness in the activities of the Sales and Information Technology Department and hence in the whole organization.

Every system survives under its boundaries and dependencies, it also sets limits to the operation and the limits make up restriction. The scope of the system is from the point when the client apply for a vehicle, view the cars available at the moment and vehicle cost range, and submit their choice of car, details are stored and now you are a client of ours.

The proposed system is mainly centered in the Rentals and Information Technology department; it does not have much influence on the activities of other departments .Though there are several activities performed by the Car Rental, the proposed system does not operate on all of them. Instead the operations of the proposed system are:

* Process vehicle details and clients details
* Allocate successful bookings.
* Manage hired vehicles.

**1.9 Deﬁnition of Key Variables**

These are the things that play a key role in your overall project, these include:

Cars

Clients

Administration

**1.10 Conclusion**

**Chapter 2:Literature Review**

**2.1 Introduction**

This chapter analyses and reviews literature in the implementation of the online car rental system. It also reviews the different types of components used in the system. The methods, theories and design parameters to be adopted by the researchers on the detail designs of the online car rental system are also highlighted in this chapter. Computerized systems have been increasing worldwide nowadays. Information Technology plays a very important role in the 21st century.

**2.2 Synthesis of literature**

Accessing customer records at Impala car rental is manual and makes the process labor intensive and ineffective. The process requires very large amounts of data and hence consuming time. The cause of data retrieval, loss of information results since person involved in data search and managing bookings deals with very many files. The manual car rental system provides services only during office hours. This promotes customers have limited time to make any transactions or reservation of cars they wanted to book in time. Some of the current company systems have a car rental system which is not a web-based application .So this is a limitation that gives them capability to store customer details but at the same time they cannot make their services more available to the public through the internet .They were making use of posters to advertise their services to the public and also make use of phone call reservations which is also limited to a few features as compared to a web based system .The customers would not get time to make a choice of the car they wanted to book due to limited working hours of the company therefore at the end of the day they would make reservations of the car they have no knowledge of and a car that they don’t want

**Reasons Why We cannot Use the Manual System**

* It faced a possibility of many human errors caused by the person who will be managing bookings like when someone books a car that is already booked by someone and there will be a clash on their bookings.
* It is time consuming in terms of capturing, analyzing and verifying details about bookings and scheduling and this may lead to many errors

High possibility of losing previous records and files due to misplacement, disasters occurrence.

**2.2.1 Information Systems**

Information systems are a collection of people, procedures and equipment designed, built, operated and maintained to collect, store, retrieve and display information. Information systems are generally meant to satisfy organizational information requirements. They are responsible for planning information services and designing systems that can meet user requirements. Information is an assemblage of data in a comprehensible form that is recorded on paper or some other medium, which is capable of being communicated to others (Harold K., 1984). Also observed that information is not a commodity which one can afford to collect and possess (Abidi, 1991). It has to be used for increased benefit for solution of problems for approp1iate development and decision-making, the observation by Abidi justifies information as indeed a basic resource that is essential for any organization to perform its activities and hence achieve its goals. Information sources represent facts of knowledge necessary for day-to-day rum1ing of any organization. According to Groller et al (197 6), data flows from both within and outside an organization. This data is encoded, processed, transmitted and stored in suitable memories and then later retrieved to support decision-making. Therefore the total apparatus for handling information within the organization in all respects (Chapman and Oliver, 1999).

**Challengers Associated with Management Systems**

Organization implementation of electronic meeting is also a big barrier to management systems. Mackintosh (1987) observed that these meetings cannot yield enough data that will be needed by the system data provided /received from these meetings is limited to the space provided by the electronic tool that is being used. Information technology and competitors is a big barrier to management information. This is so because competitors tend to block channels of data information from reaching the organization and thus making it difficult for the system to operate well without the data (Ferrat, 1995). Barriers to software re-use adoption. Mint berg (1997) said that organizations are not yet adopted by the method of software re-use. This has greatly hindered the development of management information system Lack of agency processes supporting distributed records and information management. The transition from central managed records and information management to the centralized environment where records and information management responsibility lies with the users at the desktop, has created problems for identification, management, and preservations of agencies' information assets.

**2.2.2 BUY ALREADY DEVELOPED SOFTWARE**

This is an off-the-shelf package which is already developed and ready for use. It can be purchased by the organization and be used to solve the current system’s problems. These packages are generalized and are not meant for a specific problem. They provide criteria which are set by the developers’ and not the users’ requirements. It can be used to manage information and solve problems in question more efficiently and effectively, e.g. the HDS Multifamily suite.

**Advantages**

* Since the system is already developed, it is readily available on the markets;
* These application packages are tried and tested before being put on the market;
* The costs are fixed, once the software is purchased there are no other costs such as paying the programmer, the designer or developer;
* It takes less time on improvement of the system hence fewer disturbances.

**Disadvantages**

* The package may not meet the system or users’ requirements and needs;
* Workers in the system may resist change due to difficulties in using the new system which results in low production;
* The system users may fail to get adequate training on how to use the system and this may lead to the system purchased being ineffective.

**2.3 Conclusion**

The above literature has shown us the adoption of Online Car Rental Management system. This gives an insight of how we are going to carry out our research and proves the feasibility of the concept. After a close look at the above ideas, evaluating alternatives and weighing the costs, one can safely opt for a development of a new system internally. Therefore the proposed system was adopted and in-house development approved. The proposed solution is developing a tailor made system, a system that is required by the users to meet all their requirements. The developments are done and modified basing on collected efforts of user requirements, recommendations by the project team and existing methodologies to solve the current problem in question. Users can modify and maintain the implemented system since a source code is provided. Users and Management will take part in the whole processes throughout the system of which they can say out their views on matters such as screen layouts and design. With this alternative, security is available to keep information from unauthorized users.

**Chapter 3:Requirements Analysis**

**3.1 Introduction**

This chapter aims at analyzing the current system with the view of determining whether the proposed system can be put into practice in such a way that it adds value to the manual car rental system. The chapter also aims to determine the functional, non-functional, interface as well as technical requirements.

**3. 2 Current System.**

Most car rentals in Zimbabwe have been using a manual system when operating. The manual car rental system provides services only during office hours. This promotes customers have limited time to make any transactions or reservation of cars they wanted to book in time. Some of the current company systems have a car rental system which is not a web-based application .So this is a limitation that gives them capability to store customer details but at the same time they cannot make their services more available to the public through the internet .They were making use of posters to advertise their services to the public and also make use of phone call reservations which is also limited to a few features as compared to a web based system.

**Limitations of the Current System**

* **Time consuming and error Prone**

A manual written process is both time consuming and comes with a higher degree of error.

* **Lack of backup and limited security**

What do you do if there’s a fire that wipes out all your physical files? Or a moth infestation that, quite literally, eats up all your data? Physical files, once lost, are impossible to recover. Electronic records, however, have data backup and storage, so even if a malicious entity manages to infiltrate and get access, there’s still a fallback option.

* **No Clear Audit Trails and Version History**

Paper records don’t have built-in version histories and audit trails. If changes are made, it’s not easy to locate where the changes were and who made them.

* There is double booking of the same vehicle at the same time.

**3.2.1 Context Level Diagram**

A context level diagram is a diagram that defines the boundary between the system, or part of the system, and its environment showing how the entities interact with it.

**3.2.2 Process Flow Diagram**

Register

Search Record

Log In

Delete Record

Add Record

Update

Edit Record

Log Out

**3.2.3 Use - Case**

**3.3 Feasibility Study**

This is an investigation to assess and determine the practicality of introducing the proposed system. It is aimed rationally and objectively at uncovering the strengths and weaknesses of the proposed system in order to provide justification on whether the objectives can be achieved within the prevailing financial, economic, legal and technological constraints. This phase is critical in the development of the system since it consider the economic, operational, social, and technical and schedule feasibility of developing and implementing the system. It ensures that the system has to be feasible in order for the management to release resources towards the development of the system. A feasibility study is used to determine the viability of an idea, such as ensuring a project is social, operational and technically feasible as well as economically justifiable. It tells us whether a project is worth the investment. The feasibility report will look at how a certain proposal can work in a long-term basis and the risks that may come. It is also helpful in recognizing potential cash flow. Another important purpose is that it helps planners focus on the project and narrow down the possibilities. Accordingly, a feasibility study can provide reasons to or not to pursue the said project or proposal.

**3:3:1 Technical Feasibility**

Technical feasibility emphasizes on the technological resources that the organization has or requires in order for the system to be successfully implemented. The organization has most of the technologies which includes the web server, internet connection in all most every office at the organization as well as the technical expertise in the IT department which is an added advantage to go on with the project, only a few items needs to be added so as to complete all the requirements of the system. Web Technology being the master piece of the project as it allows all of our members to develop the system using web based scripting languages like HTML CSS JS and PHP. There are other tools that we can also use in order to make our project a success like the use of IDEs eg there is Dreamweaver, VScode, Visual Studio etc are all IDEs that we can use in the process of project development. Fortunately, all our member have easy access to at least relatively faster machines that they will be using for the course of the project development thus all our r laptops are at least core i3 with at least 4 gig RAM and Enough HDD to store files.

**3:3:2 Economic Feasibility**

This determines whether the proposed software solution is capable of generating financial returns for the organization. It can be assessed by comparing the costs incurred on the software development process such as estimated hardware costs and the projected gains. The project can be regarded as economically feasible if the expected benefits outweigh the cost of developing and implementing the project. This can be achieved through a cost-benefit analysis.

**3:4 Requirements Analysis**

This encompasses the tasks required to determining the needs or conditions to be met by the proposed system. It involves the process for defining the expectations of users of the system. Requirements are either defined as hardware, software, functional or non-functional requirements.

**Hardware Requirements**

4 Gig RAM

Quad Core processor @ 2.5GHz

500 GB Hard Disk Drive

**User Requirements**

The customers would need a system that is:

User friendly

Fast and efficient in terms of data processing and retrieval of information.

Secure in terms of viruses, data integrity and system equipment.

Produce reports on request.

Provide security measures and do away with unauthorized system access and improve data integrity.

**Software Requirements**

HTML & CSS text editor

Anti-viruses

XAMPP

**3:4:1 Functional Requirements**

These define a system by describing the functions that the system has to perform. The following are the system functional requirements:

It will be able to show available vehicles.

Process vehicle details and clients details

Allocate successful bookings.

Manage hired vehicles.

Store bookings and reservations information to help the Organization stay up to date.

**3:4:2 Non Functional Requirements**

These requirements define system attributes that ensure the usability and effectiveness of the entire system.

**Usability** - The system uses an interactive website that is user friendly and comprises of buttons, links and detailed fields to help the user in interact with the system.

**Performance**- The system is web based and it allows multiple clients to access information in real time

**Usability** - The system is very much usable, and it is expected to be used by individual who have the basic knowledge about operating on a website.

**System extendibility**-The system should be easy to extend based on the iterative model used in development thus, the code should be written in a way that favours easy implementation of new modules and features. This is done for the implementation of future functions and integration of these functions into the current system

**Simplicity** – the provided functionality of the system must be simple and straightforward for the users of the system. The system should be designed in a way which can be easily adapted by users.

**Interface Design** – the interface design and menus have a layout/format which is easy for users to understand.

**3:4:2:1 Performance**

Our system shall be a web based one so shall utilize web performance techniques. Web performance refers to the speed in which web pages are downloaded and displayed on the user's web browser.

Faster website download speeds have been shown to increase visitor retention and loyalty and user satisfaction, especially for users with slow internet connections and those on mobile device. To ensure that our system performs efficiently, we shall use various web optimization techniques that we have covered.

**HTTP requests reduction**

In general, the more HTTP requests your web page makes the slower it will load. A browser is limited to opening only a certain number of simultaneous connections to a single host. To prevent bottlenecks, the number of individual pages elements are reduced using resource consolidation whereby smaller files, such as images, are bundled together into one file. This reduces HTTP requests and the number of round trips required to load a webpage. Making fewer HTTP requests turns out to be the most important optimization technique, with the biggest impact. If your time is limited, and you can only complete one optimization task, pick this one.

**Loss compression**

Loss compression techniques, similar to those used with audio files, remove non-essential header information and lower original image quality on many high-resolution images. These changes, such as pixel complexity or color gradations, are transparent to the end-user and do not noticeably affect the perception of the image.

**Web caching optimization**

Web Caching Optimization reduces server load, bandwidth usage, and latency. CDNs use dedicated web caching software to store copies of documents passing through their system. Leveraging the browser cache is crucial. It is recommended to have a max-age of 7 days in such cases. This saves server time and makes things altogether faster.

**Image Optimization**

We Don’t upload the original photos on your website, they are too heavy. We are going to use tools like TinyPNG, Kraken.io, JPEGmini, etc, which reduces the size of the image while quality remains more or less the same.

**3:4:2:2 Usability**

System will have a user-friendly interface requiring very little time to learn and understand how to effectively operate the system for both the customer and company when handling exceptions. The system will be accompanied by a detailed manual to aid in understanding it.

**Clarity**

At first glance when a client opens the web application, they are capable of finding the resources they want to see without any destructions.

**Learnability**

Our goal is to design intuitive interface, an interface that do not require instructions, or even a long process of trial and error to figure it out. Our objective is to create a user friendly interface system.

**Availability**

Imagine if a client wants to access the web site to book a car in an emergency situation and tries to access the web and there is no one at the end to comply with them. So we will have 24hour server uptime running to help our clients anytime.

**3:4:2:3 Security**

Our system shall be as secure as possible so as to minimize security risk. We are going to achieve this using the aspect of Web Application Security (WebSec) to ensure that we maintain all the three major security goal which are Confidentiality, integrity and Authentication.

**3.5 Interface Requirements**

An interface we can define it as the interaction of the system we want to develop and other system, because in general no system interact on itself alone there are going to be external system for that particular system to interact with. The following are the interfaces that our application is going to interact with.

**The web browser**

This is the most crucial interface that should be there for our application to work. It allows the web server, the database and the end user to interact with the system. The browser should be adequate for our system to operate. A web browser should be able to quickly load the system no matter how dynamic the application will be. It must also accommodate the increased amount of data as well as users going through it. A web browser should also be simple and easy to use. The user interface should not take up a lot of screen space, which would be used for the content that a user is trying to consume. Browsers should also be very secure, as malware is a constant threat on the internet. If a browser is not secure it could lead to serious data breach and leakage which could cause serious damage to the institute. At least nowadays web browsers are now designed to prioritize user’s security.

**The web Server**

A web server’s main purpose is to store website files and broadcast them over the internet for the end user to see it. It is an interface that will allow stored components of the software to be stored and transmitted over the internet. Without webservers in general there is no internet because every resource being accessed on the internet are stored on web servers. Web servers should be a very secure internet infrastructure as the whole of the system shall resides there so there is need for only authorized individuals to access it.

**The database**

It is an interface that stores a collection of structured information. The data base will be controlled by a database management system (DBMS) which can then be easily accessed, managed, modified, updated, controlled and organized. The reason why we need a DBMS is for access, integrity and security of data. Access is about making data available to users. Database support good data access because, large volumes of data can be stored in one place. Multiple users can read and modify the data at the same time. Databases are searchable and sortable, so the data you need can be found quick and easily. The data structure is extendable and can be modified as requirements change. Integrity is about making sure that the data stored within the database is correct. To ensure the integrity of a database, each change or transaction must conform to a set of rules known as ACID (Atomicity, Consistency, Isolation, and Durability). Security – databases can be made very secure, and that includes the ability to have access rights to specific parts of the database and not others. Databases allow access to be controlled, allowing users to have different privileges eg reading and not able to write. It allows data to be segmented eg data for patients, practitioners, finances and the administration as a whole.

**Networking infrastructure**

Network infrastructure comprises of hardware and software, systems and devices and it allows our software to interact with the web server and ultimately the end users. These include protocols and networking devices that transmit the data from and to the server. Whenever our system shall be interacting with the network infrastructure, there is a necessity for ensuring that confidentiality, integrity and availability of data is not compromised.

**3.7 Assumptions**

An assumption is something that we assume to be the case even without the proof at all. As developers we make diverse assumptions as we code, that’s involving the interpretation of requirements, type of data and availability of resources. There are several types of assumptions we have to make characterized below.

**Control Assumptions**

Our assumption is that every method or function that shall be within the software shall going to be invoked.

**Environment Assumptions**

Database shall be stored on a remote server. DBMS is MySQL

**Data Assumptions**

We are expecting that whenever the data is input into the system, there is going be an expected outcome.

**Usage Assumptions**

The system is going to be used by Car Rental Firms.

**3:8 Conclusion**

Basing on the analysis done and extensively pondering over the strengths and weaknesses of the current systems in use and the proposed system, it unanimously spells out that the proposed system outweighs the current systems. The requirements of the proposed system are maintainable and inexpensive compared to other alternatives. Therefore, proceeding with the system is acceptable.

# **CHAPTER 4: DESIGN**

**4.1 Introduction**

This design phase outlines how the proposed system is going to be developed and used by end users. It includes the system’s input design, user interface design, file design, procedure design, record specification and output design, security and control.

**4.2 Proposed Solution**

The proposed system will functions as follows, when a user connects to the internet and opens the Nexus Car Rental website, the client will select “Book a Car” tab, a page will be provided with a SIGN UP form that he/she needs to fill in order to proceed as you are not a client yet. After a client has completed the form and log in the system. The client can now be allowed to search and select a vehicle desired, the system will process the booked car now checking whether the desired car is available and the client now makes the payment for the vehicle selected and stating the number of days he is going to need the car. Information is stored in the database. The system allows users to manage their accounts that is change of password and adding of another user by the admin, more so the admin can view different reports.

**4.3 Solution Architecture**

A solution Architecture it is an architectural description of a specific solution. Solution Architecture combines some guidance from different enterprise architecture viewpoints (information, business and technical) as well as from the Enterprise Solution Architecture.

1. **Business**

Our website will be linked with the business objective of renting out cars to those both who can afford and those who cannot and also those who are in need of them and having a competitive advantage in the Car rental sector will give us at the start a good penetration to the market and in the long run proving a good reputation in the market and later maximizing our profits.

1. **Information**
2. **Technical**

**4.4 Constraints**

The system will require an active internet connection 24/7 otherwise it will become unreachable and this can disrupt and defeat the entire toll collection process leading to stockpiling of cars and congestion in turn. The system uses email for communication and users can miss importance messages if they do not access their emails for prolonged periods of time. . There are three major constraints that our project may face which include time, scope and cost. These are also known to be project management triangle. Each of these constraints are connected to each other in a net. The following we will try to address the triple constraints of project management.

1. **Time constraint**

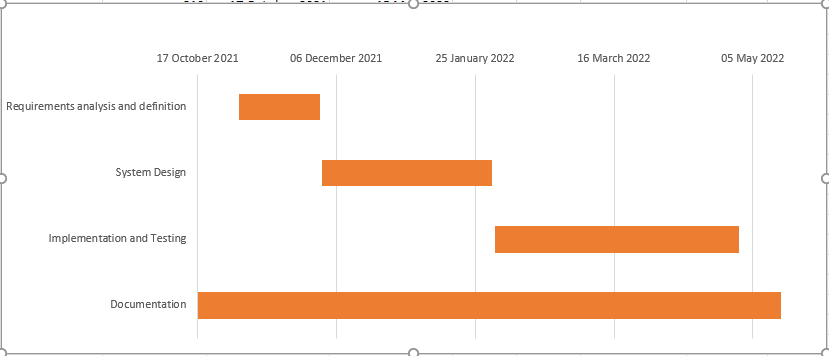
There is need for us to come up with proper scheduling of time. Scheduling according to Project Management Body of Knowledge has the following steps that should be taken for an effective time management.

1. Planning
2. Scheduling
3. Monitoring

To eliminate these time constraints we created a work plan in a form of a Gantt chart to increase efficiency and effectiveness of our project development and management.

|  |  |  |  |
| --- | --- | --- | --- |
| **PHASE** | **Duration in days** | **Starting date** | **Ending Date** |
| Requirements analysis and definition | 26 | 4 November 2021 | 30November 2021 |
| System Design | 55 | 1 December 2021 | 30 January 2022 |
| Implementation and Testing | 138 | 1 February 2022 | 25 April 2022 |
| Documentation | 148 | 26 April 2021 | 5 May 2022 |

**Gantt Chat**



1. **Scope Constraint**

This documentation will be there to provide the boundaries to which our project will start and will finish. It set up a process for managing any changes, so if one proposes a change, so there is a controlled system in place for how that change will be reviewed, to either approved or rejected, and implement if its ok.

1. **Cost Constraint**

For cost reduction in the production of our project we are going to utilize open source components for our development process, using free open source components such as Git-Hub, Bootstrap for now.

**4.5 Security Design**

The security of the system is designed in a way that highlights the measures to safeguard the system and its components from unauthorized access and accidental or intentional malicious modification. The security design goals mainly focus on achievement of integrity, availability and confidentiality of data in transit, process and storage within the system. To measure these security goals, the system will use the following design principles:

• The system maintains a log of all transactions for accountability.

• The database is protected and information required will be supplied basing on access levels.

• The login portal is password protected to avoid unauthorized access.

So to ensure the 3 goals of Security are meet to increase security:

**Validation**

This is the mechanism that we are going to check the format of the user input first. If the format is incorrect, the form is not submitted, and an error message asks the user to correct the input.eg, validation ensures that e-mail addresses are in the correct format (i.e., a username followed by a @ symbol followed by an ISP address). This prevents incorrect data (email) from being entered into a database table.

**Sanitization**

This can be achieved by two methods: using standard PHP cleaners or using the filter-var () function with a SANITIZE attribute. Sanitizing removes undesirable characters automatically before the data is sent to the database table and displayed on the web page. When you are using the SANITIZE attribute, no error message is displayed. Users are not alerted to the fact that they have made a mistake or that their input contains dangerous characters or scripts. This may not be desirable, as it does not provide the user with the opportunity to correct what they have entered. Sanitization will remove or inactivate HTML tags and JavaScript commands that could harm a database.

**Hashing the password**

All passwords must be hashed to keep hackers from discovering them,we are storing them in a more like encrypted format. Hashes are impossible to convert back into plain text, but you don’t need to convert them back in order to break them,once you know that a certain string converts to a certain hash, you know that any instance of that hash represents that string.

**4.6 System Design Model**

**4.6. UML –Activity Diagram**

The **Unified Modelling Language** (**UML**) is a general-purpose, developmental, modelling language in the field of Software Engineering that is to provide a standard way to visualize in the design of a system

Client/Admin Log In

Enter Username

Enter Password

Check if username and password are correct ?

E

No

Invalid Try Again

Yes

View Records

Add Records

Search Records

Delete Records

Log Out

**4.6.2 UML – Class Diagram**

**4.6.3 UML – Sequence Diagram**

**4.6.4 UML – Deployment Diagram**

|  |  |  |  |
| --- | --- | --- | --- |
| SYMBOL: | NAME: | SYMBOL: | NAME: |
|  | Terminator |  | Decision |
|  | Process |  | Manual Input |
|  | Display |  | Direct Access  Storage |
|  | Input /Output  Data |  | Connector |
|  | Document |  | Multiple  Documents |

**Proposed System DFDs**

**DEFINITIONS AND SYMBOLS OF DFDs:**

|  |  |  |
| --- | --- | --- |
| NAME | SYMBOL(S) | DESCRIPTION |
| 1. EXTERNAL ENTITY |  | Entities that can send or receive data/ information from the system. Considered and named using a noun. |
| 2. DATA FLOWS  (ARROWS) |  | Show the movement of data/ information from one point to another with the head arrow pointing the data’s destination. |
| 3. PROCESS |  | Denotes change in/ transformation of data. Each has a unique identifier & unique name indicating its level in the system/diagram. |
| 4. DATA STORE |  | This is where the system data or information is stored or held. Each data store is given a unique reference number to show its level. |

*Input Documents*

* Application document
* Payment Document

*Output Documents*

The following documents are going to be output from system

* Vehicle reports
* Applicants reports
* Allocation reports

**4.7 Database Modelling**

**4.7.1 E – R Diagram**

**kkkkkkk**

**4.7.2 DATA DICTIONARY**

A data Dictionary defines each term called data element. It is a means for recording data of the organization. It describes all data items which include data flows, data stores (files) - it describes how all these data items are stored and the process resources and requirements.

**Clients Details Relation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute Name | Required | Format | Max Field Size | Description |
| id | **Yes** | **Integer** | **11** | **This is the primary key** |
| firstname | **yes** | **string** | **45** | **Client’s firstname** |
| lastname | **yes** | **string** | **45** | **Client’s lastname** |
| gender | **yes** | **string** | **10** | **Client’s gender** |
| email | **yes** | **string** | **60** | **Client’s email** |
| Address1 | **yes** | **string** | **100** | **Client’s address** |
| Address2 | **yes** | **string** | **100** | **Client’s address** |
| hashedpassword | **yes** | **string** | **60** | **Client’s Password** |
| Registration\_date | **yes** | **Date andtime** | **20** | **Date of registration** |
|  |  |  |  |  |

**Admin Details Relation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute Name | Required | Format | Max Field Size | Description |
| id | **Yes** | **Integer** | **11** | **This is the primary key** |
| firstname | **yes** | **string** | **45** | **admin’s firstname** |
| lastname | **yes** | **string** | **45** | **admin’s lastname** |
| gender | **yes** | **String** | **10** | **admin’s gender** |
| email | **yes** | **string** | **60** | **admin’s email** |
| Address1 | **yes** | **string** | **100** | **admin’s address** |
| Address2 | **yes** | **string** | **100** | **admin’s address** |
| hashedpassword | **yes** | **string** | **60** | **admin’s Password** |
| experience | **yes** | **integer** | **20** | **Admin years of experience** |
|  |  |  |  |  |

**Client Booking Relation**

**4.7.3 Relational Schema**

Clientdetais(**id**, firstname, lastname, gender, email, address1, address2, phone, hashedpassword, registrationdate, user\_level)

Admindetails(i**d**, firstname, lastname, gender, email, address1, address2, phone, experience, hashedpassword, user\_level)

**4.7.3.1 1st Normal Form**

**4.7.3.2 2nd Normal Form**

**4.8 Algorithm Design**

**Login Algorithm**

[1]: INPUT email and Password

[2]: IF email == email in database

IF password == password of email in database

Proceed to the dashboard

ELSE

Print “Incorrect Password”

[3]: ELSE

Print “Incorrect Email Please register to proceed”

[4]:ENDIF

**Registration Algorithm**

[1]: INPUT firstname, lastname, email, gender, address1, address2, phone, password, confirm password

[2] : IF password == confirm password

IF **ALL** INPUTS NOT EMPTY:

IF email exists in database

PRINT “email already taken”

ELSE

Store All INPUTS into the database

IF stored successfully:

PRINT “Successfully Stored Now login”

ELSE

PRINT “An error occurred whilst storing”

ELSE

Print “All fields must be filled”

END IF

[3]:ELSE

Print “Password do not match”

[4]:ENDIF

**Register Admin**

[1]: INPUT firstname, lastname, email, gender, address1, address2, department,phone, password, confirm password

[2] : IF password == confirm password

IF **ALL** INPUTS NOT EMPTY:

IF email exists in database

PRINT “email already taken”

ELSE

Store All INPUTS into the database

IF stored successfully:

PRINT “Successfully Stored Now login”

ELSE

PRINT “An error occurred whilst storing”

ELSE

Print “All fields must be filled”

END IF

[3]:ELSE

Print “Password do not match”

[4]:ENDIF

**4.9 Interface Design**

Services

About us

Our team

Contact us

Login

Registration

Class selection

**4.10 Conclusion**

**Chapter 5 Implementation**

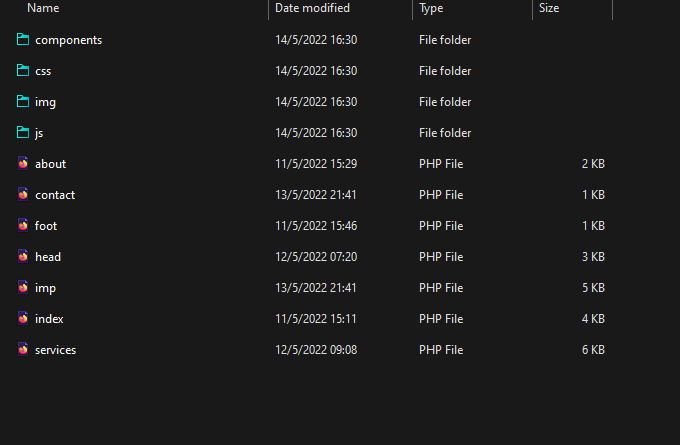
**5.2 Introduction**

The implementation stage involves the transformation of the TDP package (software technical data) into one or more invented, integrated, and tested software configuration items that are ready for software acceptance testing. The primary activities of software implementation include the following:

## 5.2 Coding Conventions

File Organisation:

File organization is very important within our project as it defines our workspace to be smart and on point.



**Components**

It contains the whole information pertaining to the client and the administration

**CSS**

Contains all the cascading style sheets that the application is going to use here.

**Img**

This contains all the images that the application shall use in the system.

**Js**

Contains all the java-script files which will add functionality within the web app development.

**Layout**

Contains the base layout of the web page which is the boiler template navigation bar, and the footer

**Indentation**

Indentation refers to the spaces at the beginning of a code line. We have done this to ensure that the code is kept in a readable format and to keep it smart and easy to analyze.

**Pic)**

**Comments**

As our project grew in complexity with a lot of line of code, it become more difficult to know what each code does. But with the aid of comments, we can use that in the code so that we know what each line does and how it executes.

**Pic)**

**Name Convention**

Naming the variables within should be done in such a way that the name may have an idea of an associated value stored within the lines of code.

**Pic)**

**Effective- Debugging**

We have achieved this using (try and catch) block ensuring that we maintain the normal flow of the code in the system.

Pic)

**5.3 Coding Strategy**

Structured programming is a programming paradigm which divides the code into modules and functions. We have decided to implement our application using structured programming.

**Advantages of structured programming:**

1. It is easier to learn.
2. They are easier to maintain
3. Similar to English vocabulary of words and symbols.
4. It is user friendly and easy to understand.
5. They require less time to write.
6. These are mainly problem oriented rather than machine based.

**Disadvantages of structured programming:**

1. The object code generated by a translator might be inefficient compared to an equivalent assembly language program.
2. Data type are proceeds in many functions in a structured program. When changes occur in those data types, the corresponding change must be made to every location that acts on those data types within the program. This is really a very time consuming task if the program is very large.
3. A high level language has to be translated into the machine language by translator and thus a price in computer time is paid.
4. Let us consider the case of software development in which several programmers work as a team on an application. In a structured program, each programmer is assigned to build a specific set of functions and data types. Since different programmers handle separate functions that have equally shared data type. Other programmers in the team must reflect the changes in data types done by the programmer in data type handled. Otherwise, it requires rewriting several functions.

**5.4 Coding Review**

**5.5 Conclusion**

This is the end of the implementation stage where we converted our designs into an executable program that we are going to use and then will solve problems that we identified in earlier stages of problem definitions and findings.

**Chapter 6: Systems Testing**

**6.1 Introduction**

**6.2 Testing Categories and Results**

**6.2.1 White Box**

**6.2.2 Black Box**

**6.3 Types of Testing and Results**

**6.3.1 Functional Testing**

**6.3.2 Non-Functional Testing**

**6.4 Test Cases**

**6.5 Levels of Testing and Results**

**6.5.1 Unit Testing**

**6.5.2 Integration Testing**

**6.5.3 Validation Testing**

**6.5.4 Systems Testing**

**6.5.5 Acceptance Testing**

**6.6 Security Testing**

**6.6 System Evaluation**

**6.8 Conclusion**

**Chapter 7:Conclusion**

**7.1 Introduction**

**7.2 Scope of Future Work**

* To design a system that enables clients pay their car rentals online.

## 7.3 Recommendations

Bibliography

Appendix A

APPENDIX I - User Manual

Appendix B

APPENDIX II - Project Proposal

Appendix C

APPENDIX III - Survey Paper

Appendix D

APPENDIX IV - Technical Paper