SDM

by Kapil Pokhrel

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Sincerely,
Kapil Pokhrel(NPI000030)
Saroj Kandel(NPI000043)
Shivam Ranabhat(NPI000047)
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1.Project Planning:

1.1 Introduction

Figure: Logo of Khusii Car Rental

The Khusii Car Rental company is a car leasing company that was established in 2014. Its goal is to provide its customers with a low-cost car rental process that is simple and effective. This company specializes in car rentals and offers a variety of models and options to their customers. Aside from providing a low-cost rental process, this company also helps their customers save money by offering a more personalized approach. This company specializes in car rentals. They provide a variety of models and various details about each one.

1.2 Scope

In today's fast-paced world, most of us don't have time to visit a car rental company and rent a car. As a result, the demand for online car rental services is rapidly increasing. To handle all business operations digitally as the home delivery service expands, an online delivery tracking system is necessary. Furthermore, in this era of digitization and automation, every company has begun to use technology. Because of these factors, the need for this System critical.

1.3 Aim

The goal of analysis and design is to create a system that performs in each environment and sets out the objectives and functions of the system.

1.4 Objectives

i. To facilitate communication between the client and the server.
ii. To make ordering easier for customers by providing a user-friendly interface.
iii. To decrease the time required for ordering and to perform efficient measures once the car rental order has been placed.
iv. Automate and computerize the system to scale it up in the future.

2.Agile Principles:

Our team has decided to choose Agile methods which could be beneficial to apply in our project due to its twelve principles to make it more agile. Agile is a software development process where demands and solution of the obstacles are evolved during the collaboration stage between self-organized, cross-purpose teams and their client. This methodology prefers to deliver the software by applying changes from the beginning rather than deliver everything at once during the end of the project. Needs, plan, and results are continuously evaluated so that the agile teams can react quickly to change with a natural process. Collaboration, investigation from clients and trust among the project member is the core of agile methodology. Agile is not defined by special methods of development but it is a collection of various methodologies and known as “Umbrella of Methodologies”.

Fig: Agile Methodology

The twelve principles of agile are listed below:

1. Customer satisfaction is achieved through timely and continuous software delivery.
2. Welcome the changes in requirements.
3. Early delivery of the software.
4. The business skate holders and developers worked together throughout the project.
5. Motivated individuals are required to build the project. Provide the support and environment they need and trust them to get the project finished.
6. Face-to-face interaction

7. Key measure of progress is functional software.
8. Long lasting development.
9. Continuous priority should be given to excellence in technology and good design.
10. Simplicity in functional software should be maintain.
11. Best architectures, requirements and design can be created by self-organizing team.
12. The team regularly examines how to improve and adapt accordingly.

Using those method which comes under the agile and its twelve principles helps to make a project more agile. So, implementing the principles we can make our project agile as follows:

a. Motivated individuals are required to build the project. Provide the support and environment they need and trust them to get the project finished:

The agile principle can make above CRC project more trusted and agile for both owner and developer. All the developers need to trust each other to build confidence for each other. Like if the project handler assigns a task to the team member, the manager should trust their team member to complete the given task in time. During the working phase the developers can face many problems during the development phase of CRC system so, the rest team members should offer some encouragement and ideas as a help to carry on task continuously. By this all the team members can build trust and can motivate each other. Similarly, if the developers are more motivated, the result will also be more reliable, and the CRC system owner would have more trust and confidence in the developer teams.

Example: If the project manager will trust, provide the advice and support the developer team and the project team desired, then the CRC system will be ready with sustainable facilities.

b. Face-to-face Interaction:

One of the major steps to make Car Rental System more agile is face to face interaction between the owner, developers, and client. The team along with product owner and customer shall meet regularly to allow direct communication in order to ensure that there is no misunderstanding. Due to face-to-face interaction with clients and project team it becomes easier to know if there any new feature which can be added to Car Rental System to make the system more sustainable.

Example: Rather than online survey the customer will provide more information or suggest more feature through face-to-face interaction to enhance the car rental system.

c. Welcome the changes in requirement:

In case of the requirement if any additional features are suggested or desired by the customer which can enhance the overall system then the team should begin to implement those requirements in the Car Rental System at any time. This will help to satisfy the customers and make CRC system more reliable.

Example: If a customer wants a facility for scanning of driving license, verification documents should be added at phase of the system development.

d. The team regularly examines how to improve and adapt accordingly:

The team can work efficiently by following the above-described principles while developing the CRC system. Meetings can be conducted in order to allow the team to discussed about the tasks completed. This will help the team to determine the obstacles faced in CRC system and their possible solutions.

Example: The problem of online cancelation of the booking can be found as a problem and online payment can be added to improve which can be found through discussion among team members. Hence the developer team will add such features which will solve the problem and improve the system too.

e. Best architectures, requirements and design can be created by self-organizing teams:

The self-organizing team consist of experienced and highly knowledge people who can add some additional features in the system which can enhance the system into next level. All the team members are motivated to take responsibility for their tasks, develop new ideas. This allows the team members to share ideas and communicate with each other to enhance the system.

Example: As there are only few facilities given to add in the Car Rental System. As the hired project team of the CRC system are well experienced, they are better known about the system by which they can add extra facility like rent a car including and excluding a driver. This will help the customer in such a case like they don't have license or unknown about the traffic rules of that place if they are foreigner. The project team can also add the internal messaging system between driver and customer by which the customer can get a pleasing experience.

2.2 IS Methodologies.

The summary table comparing the features and advantages of various structured and object-oriented based methodologies that we recommend for the Car Rental System so that distinct advantages are seen for the application into the project are mentioned below:

Characteristics	XP	Scrum	RUP	Crystal	Waterfall
Time Period	Very Short (2-3 weeks maximum)	Medium (2-4 weeks)	Short	Depend upon project (Up to 4 months for large project)	Short
Project Size	Appropriate for Smaller Projects.	Proper for all the projects	Fit for all projects	Suitable for all type of projects	Suitable for small project
Involvement of client	Customer involvement required	Customers represent as the role of product's owner	High involvement of clients	Involvement through incremental release	Very low involvement of client
Requirement Type	Requirement should be clear	Requirement not clear	Requirement should be clear	Requirement may not be clear	Clear requirement required
Team Size	Small size (less than 20 members)	Small size (2-9 members)	Based on size of project	Any team size (highly skilled and experienced members)	Not specified
Advantages	Customer are involved as a group member, more importance given to feedback	Involved top level of communication for best results	Based on few fundamental phases so that timing, place, and division of work to the team	Supports fixed price contracts	Requirement is clear and all phases must be completed before next phase.

			members is clearly defined.		

3.System Analysis:

System analysis and design is focused with identifying and describing what the system should perform to design and implement it. It also discusses how the system's many components should be integrated. A system analyst may address a variety of business problems by analysing information system needs and developing such systems using various design approaches.

3.1 Business Intelligence:

BI (Business Intelligence) Analysis combine data mining, data visualization infrastructure, combine business analysis and data tools. BI helps to make great data driven decision and support the organization to rapidly adapt to market change. It is directly affected on organizations tactical, strategic, and operational business decisions. If an agency uses BI analysis business opportunity can be identified. It supports the agency to analysis their own weakness and strength against their competitors. In addition, this analysis support to identify and support to overcome customer dissensions. CRC company improve their services when customer is unhappy. It is easy to manage the next staffing and schedule. It supports the CRC company manager monitor the presentation of their staffs and how it works with the existing employee. BI also supports without any difficulty to the work of personnel. It makes easier and faster to report, plan, and analyse. CRC data analyst doesn't spend more time to analyse a particular data set. Business Intelligence analysis has some disadvantage. BI Implementation is costly than other and cost of implementing this analysis structure is hard for small businesses like CRC.

If a company uses Business Intelligence tools a minor system fault can lead to data failure, and it can damage the clients, employees, and customers. In conclusion the CRC can choose BI analysis in the requirement elicitation stage.

3.2 Statistical Analysis:

It is the process of analysing and collecting data to classify trends and patterns. It is a way to use numeric to try to eliminate any bias when checking information. It is used to produce useful chart or graph to view data and to deliver business owner with insights to progress business presentation but also to make well decision. Statistical analysis is used for the data analysis in this mission as it can contribute to the CRC company sales through the guess of customer requirements. The data analysis can initial of all allow clients to choose what kind of car they need to rent. The vending record show order patterns on a variety of days of the week, like a weekend or weekend, necessary patterns on a dissimilar slot on a day like peak and off peak, and finally also order patterns of the vehicle type based on ease, luxury, or budget. So, CRC company can develop a suitable marketing plan to focus their clients based on the test result and deliver high client satisfaction to enhance retention rate for clients. The CRC firms can also set the accurate prices for their products that are gainful and affordable, based on the statistical analysis of the vehicle's rental free. The vending and marketing squad can also develop a successful vending advancement with the accurate pricing strategy to encourage more vending, since statistical analysis of the former vending recording data can reveal a vending prediction to increase decision making.

4.Design:

4.1 Conceptual Diagram: Use Case Diagram

The Use Case diagram depicts the early stages of system requirements for developing software. It's a representation of predicted behaviour's, not how they'll happen. The key advantage of using a use case diagram is that it allows us to build a system from the perspective of the end user.

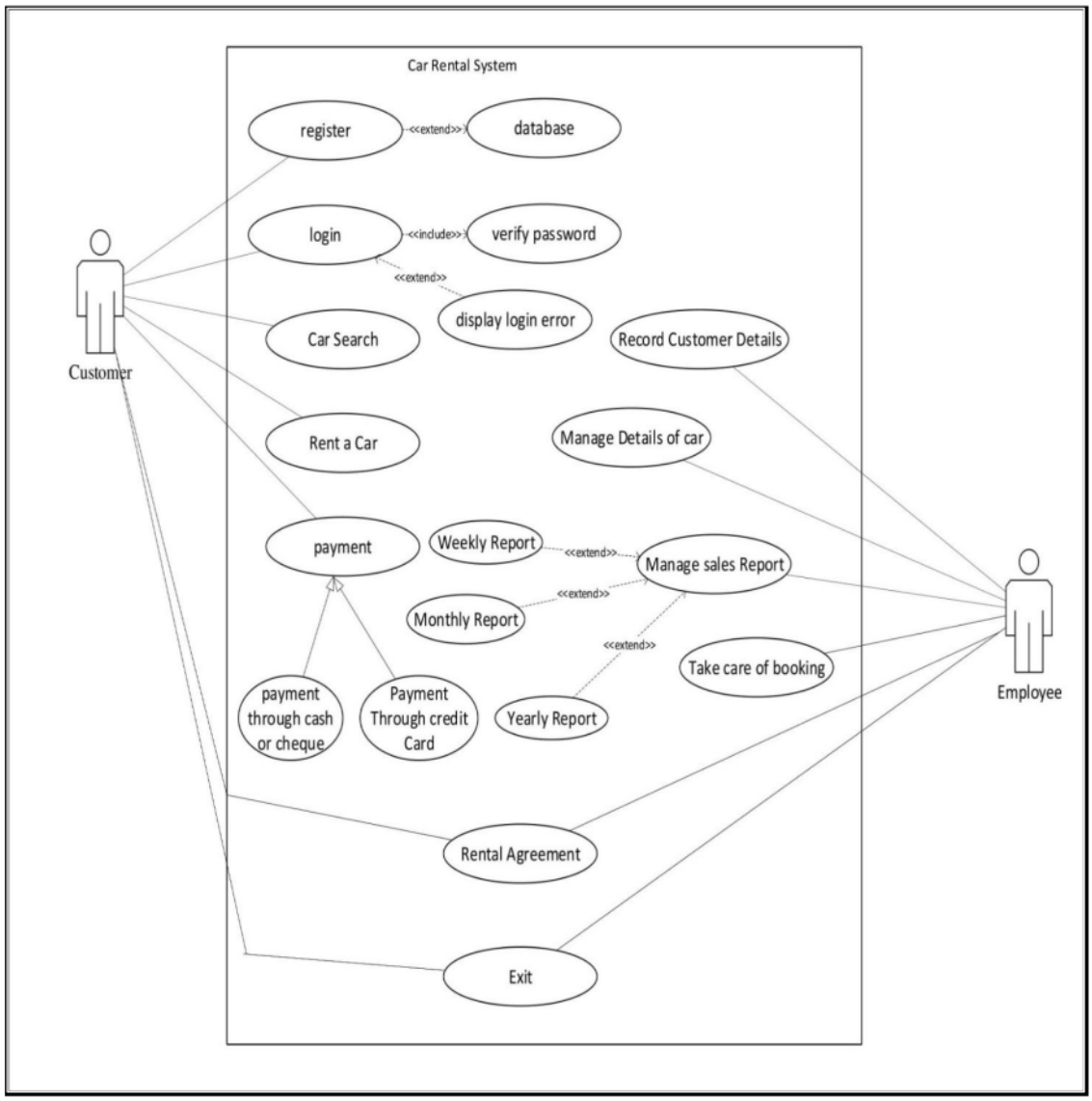


Fig: Use Case Diagram of Car Rental System

4.2 Class Diagram

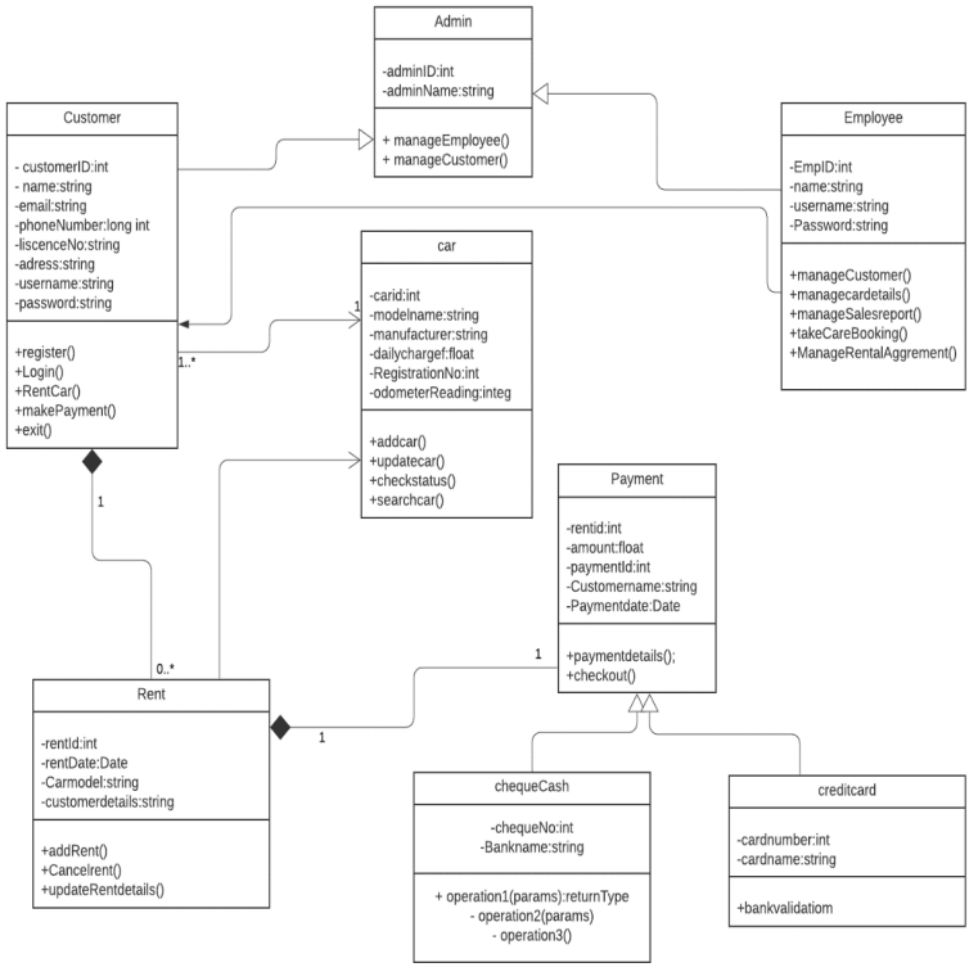


Figure: Class Diagram of Car Rental System

4.3 Physical Design : Prototype

The prototype is a working model of how a system will work and function. It's a beta version of a software release that's used to test it before it's released to a customer. Its primary purpose is to discover flaws and issues.

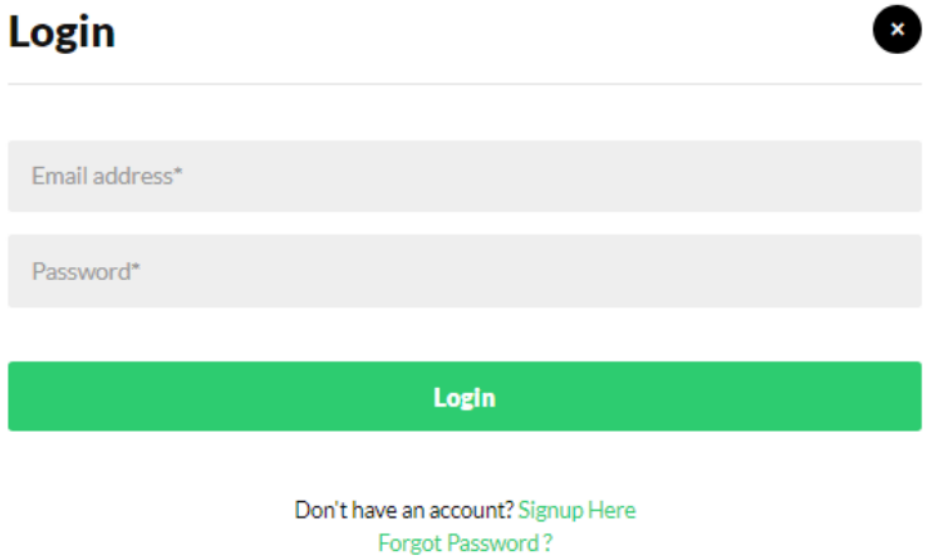


Figure:Login Menu

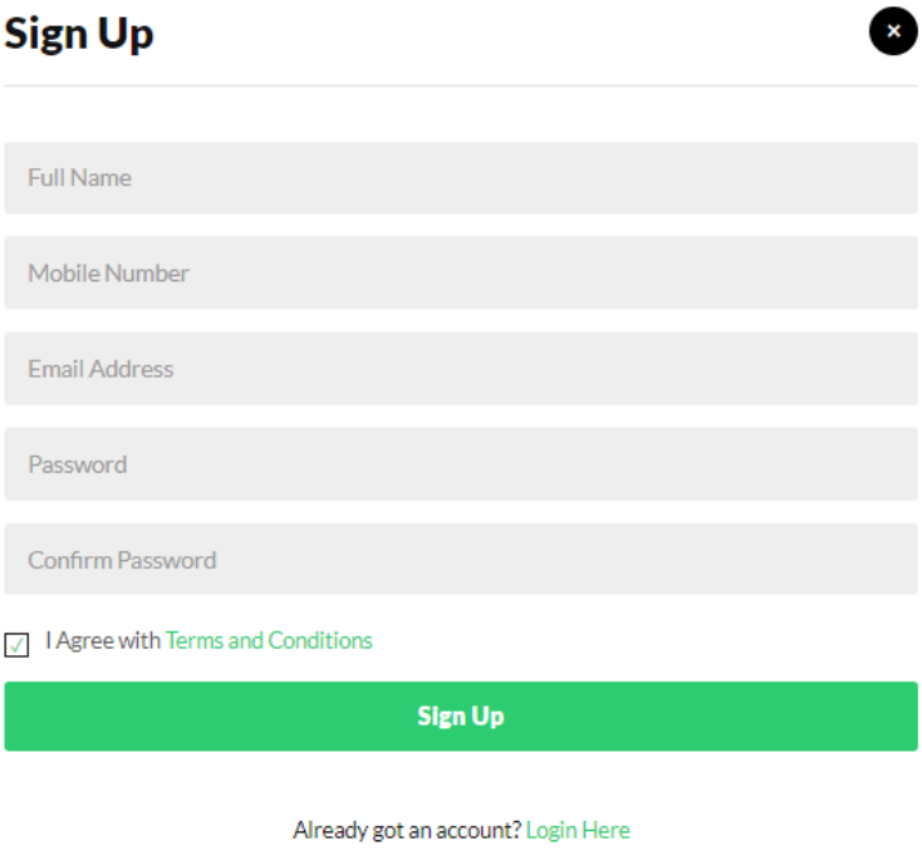


Figure: Registration Menu

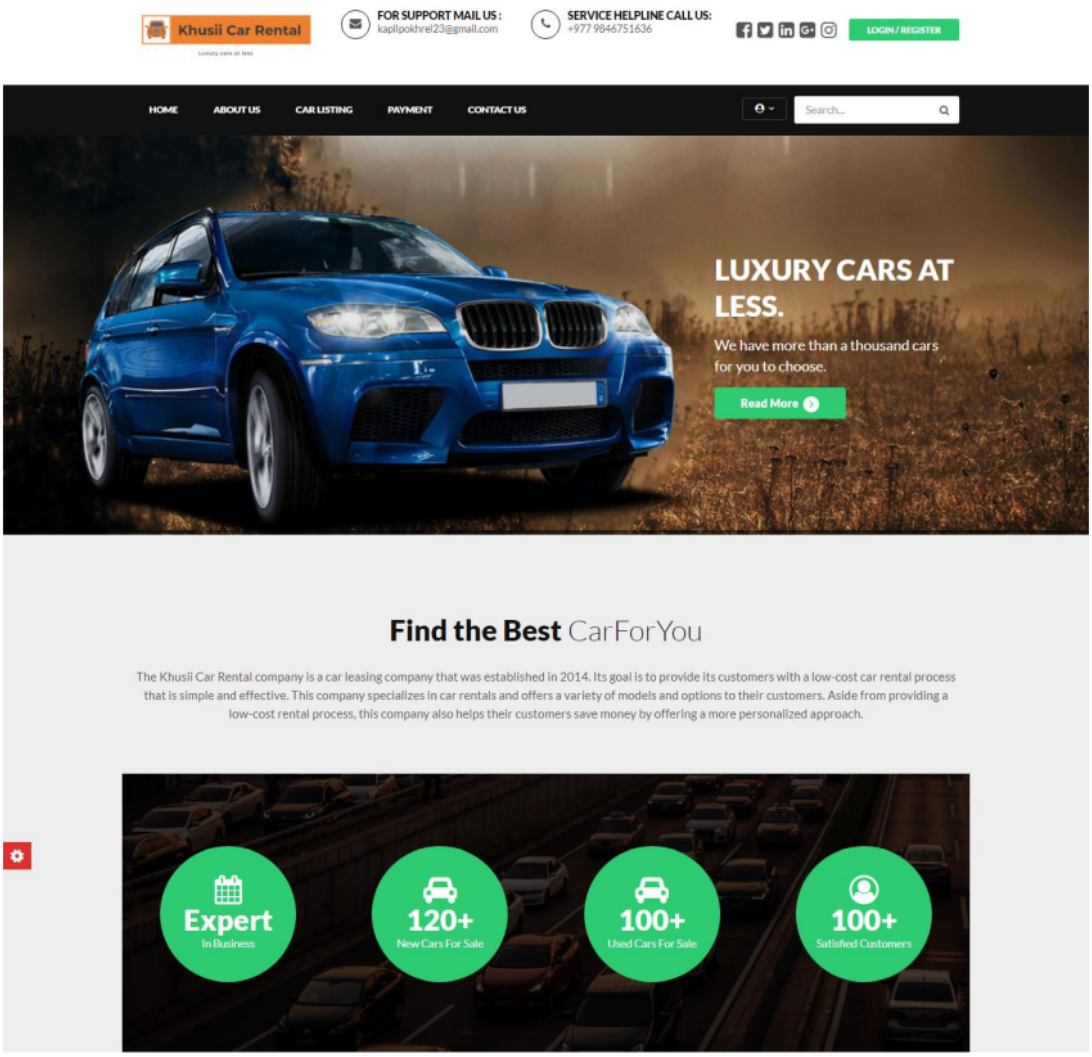


Figure: Home Page

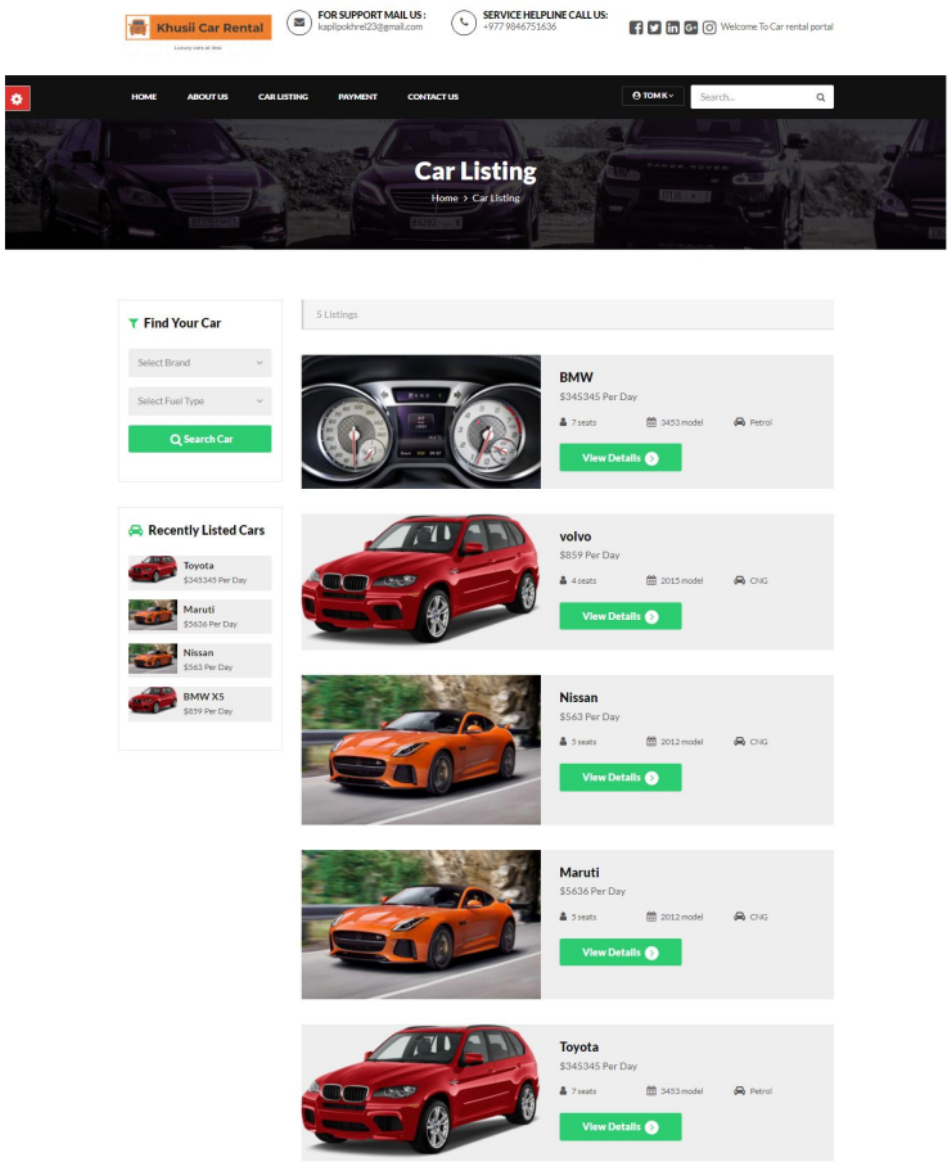


Figure: Car Listing Menu

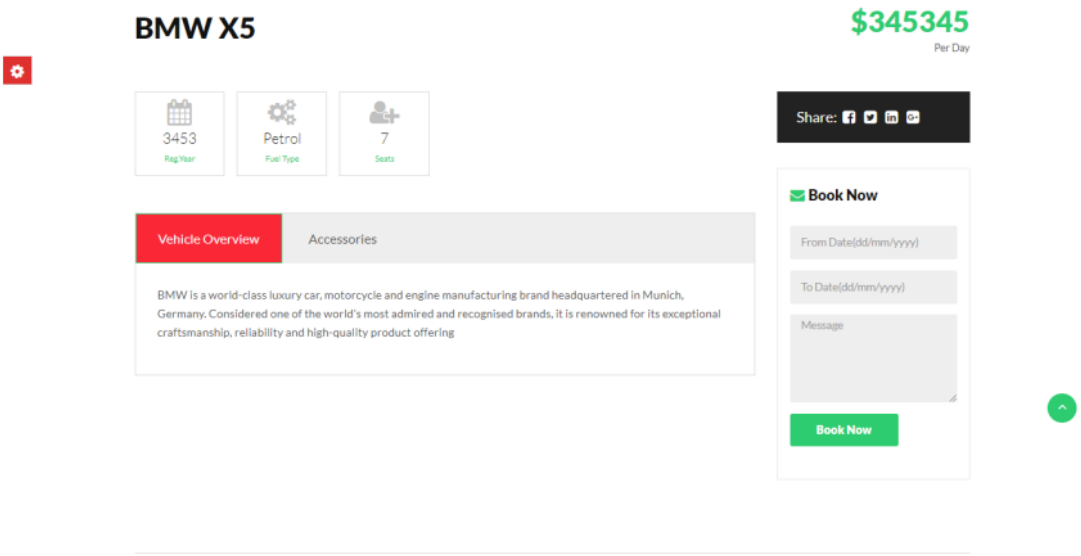


Figure: Booking Menu

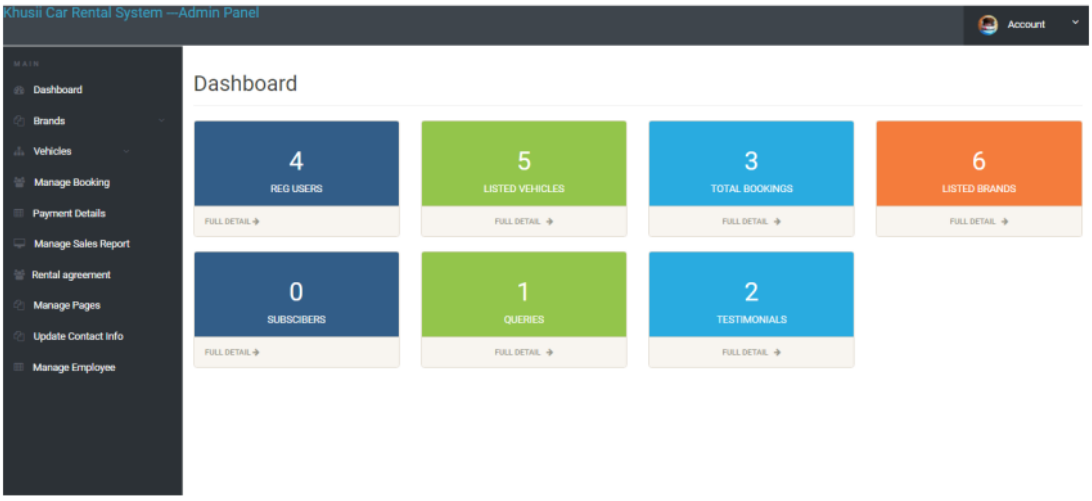


Figure: Admin panel of Car Rental System

5.0 System implementation & deployment:

5.1 Construction

The construction of this project must be supported with open-source database and platform. If we use the open source, it will be flexible for large and small project and it will help to decrease the financial resource. We must determine the suitable platform, language and database of the project need to be done based on the system requirements.

5.1.1 Platform

Visual studio is a Microsoft Integrated Development Environment (IDE) is an open source. In this platform we can develop the web application, desktop application and mobile application. Visual studio run on different platform like macOS, Linux, Windows etc.it also support the collaborative platform for teamwork as a result we are planning to use Visual studio IDE for this project as it provides the integrated support for the complete development cycle, from creating a project through profiling, debugging and deployment.

5.1.2 Language

Html, CSS, and JavaScript is most used web language. For the front-end development of this project, we are planning to use this best web programming language. With the help of JavaScript, we can have popup menus, complex animation buttons which can be clicked etc. JavaScript is one of the best programming languages because all the major browsers support without the need of plug-ins or compilers. Back-end will be completed using PHP.PHP is an object-oriented programming language which is used to make websites interactive and more dynamic.'

5.1.3 Database

There are different database management systems for example PostgreSQL, file maker, clipper, FoxPro etc. MySQL is best database management system among them so to make our project best we are preparing to use this best database management system. It is an open source database management system. It is optimized and designed for online web application because of its reliability, speed, and flexibility. Structure query language or SQL is employs by MySQL for processing and accessing data contained in databases. Extreme performance for both writes and read operation is provided by MySQL which is very important for web-application.

5.2 Testing

The process of preventing bugs, improving performance, reducing cost, and verifying and evaluating that a software product does what it is supposed to do is called testing. There are different types of testing each type of testing have specific methods and strategies. Some types of testing which I suggest for our system are given below.

1. **Functional testing**

   Functional testing ensures that the system requirements are met, and that the system's functioning is as described. The entire code is checked and decided if it is functional or not during functional testing of a computerized Car Rental system; if it is not, it is adjusted further.

2. **Acceptance testing**

   After the unit and integration testing in this method we must verify the complete project works as intended or not.

3. **Performance testing**

   In this method of testing, we must check the performance of software with different workloads. We can take the load testing as an example of performance testing.

4. **Regression testing**

   It is the method of testing where we test while updating system or adding new features it breaks or degrade the functionality or not. We will perform the surface level regression because there is no time for full regression test.

5. **Security testing**

   While we are working on the online based system it is very important to test out for integrity, authentication, non-repudiation, and confidentiality to ensuring unauthorized access to data.

5.3 System deployment:

1. Pilot Changeover

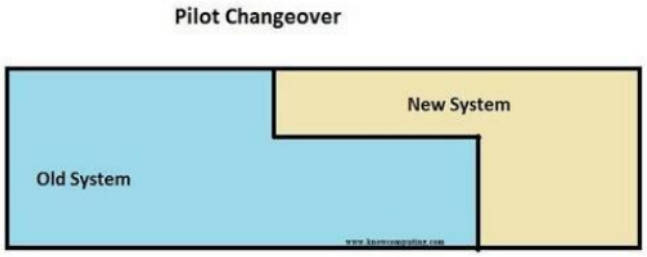


Fig: Pilot changeover (KNOWNCOMPUTING, 2018)

Pilot changeover means selecting a branch or specific location of the organization and implementing the software in that specific branch first. The specific location where the software was implemented at first before the whole company is called pilot site. Pilot changeovers allow to test the project on a small part on all its functionality and help to change if necessary to solve the difficulty when later it is rolled on all branches of organization. This method can be used as a alternative to another method parallel change over because it almost achieves the same result and less cost than pilot changeover. The risk is decrease because in this method only one part of organization is involved so if there is any problem occurs during the process only one branch will be affected. This method will be more productive than direct changeover because the pilot phase is like training for the employee. (KNOWNCOMPUTING, 2018)

2. Phased changeover

Fig: Phased changeover (knowcomputing, 2018)

In this method of changeover where until the whole system is implemented the module of the system will be implementing. Each part of the software is implemented until it succeeds that when the next one is implemented. If new system fail during the phased changeover then only one part will be affected not the complete software. In this changeover the user can be trained gradually for the part of the system that is being implemented because the software is implemented in stages. This method is also best for the debugging and finding error since small portion of the system being implemented. The risk is very low in this method because there is no fast deadline. The

disadvantages of this method is staff lack the focus because of its extended period of deployment staff must be concentrate on a single module or department at a time rather than on the system. The cost of this method is very high because the company must devote resources to maintaining the old system and new system as well as any temporary interfaces used to link the two systems.

3. Parallel changeover

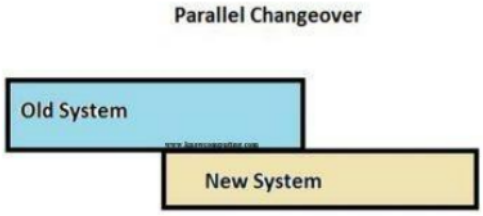


Fig: parallel changeover (knowcomputing, 2018)

Parallel changeover is another system changeover strategy. In this method both system old and new are run concurrently. Both systems involve running until the knowing that the new system is working properly with low risk. After getting confidence about new system the old system taken offline then fully activate the new system.

The main disadvantages of this method/strategy are it takes more resources than other method because resources are required for both systems. While using this method user have to put data in both new and old system so it is more time consuming and it needs more storage.

The advantages of this system is lower risk and user can continue their work if system fail. The old systems can be operating properly until the applicable changes are made for the new systems.

4.Direct Changeover

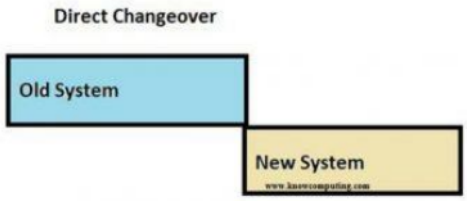


Fig: direct changeover (know computing, 2018)

Direct changeover is another changeover strategy in which the complete system is replaces in an instant as new software the existing software will be taken down. Simply we can say that direct

system is an immediate replacement of a system. It is mostly used when the old software's data losing risk is low and if the software has most the functions that are new. Direct changeover needs less resource and storage than parallel pilot and phase changeover because only one system can be run at one time.

In this changeover method the risk is very high because if some error came, new system cannot perform properly at that time we do not have backup or old system. It will also affect the productivity because staffs must know how to use it. Users are not confident at first.

The advantage of this strategy is it need less resources like people, money, time and equipment and it is straight forward method.

To deploy our project direct changed over is best. The instant replacement of new facility, product, and method in the **Car Rental System** is known as direct changeover. Customers can place orders over the phone or on the company's website after the new system is installed. Drivers bring the car to the customer's residence within the specified time frame and keep a detailed record of their work. All service charges are collected by the driver and managed by him. It emphasizes the Khusii Car Rental System's leadership abilities, ingenuity, and innovation.

6. Individual Components:

6.1 Rational Unified Process (RUP) (Kapil Pokhrel NPI000030)

6.1.1 Introduction

A component of the Software Development Process is the 'Rational Unified Process'. It provides a method for delegating tasks and duties inside a company that is disciplined. Rational Unified Process' objective is to assure the timely and cost-effective delivery of high-quality software that fulfills the demands of its end customers. With suitable rules and templates, RUP delivers best practices to each team member. Rather to producing vast volumes of paper documentation, Rational Unified Process focuses on product development and maintenance.

6.1.2 Why choose RUP.

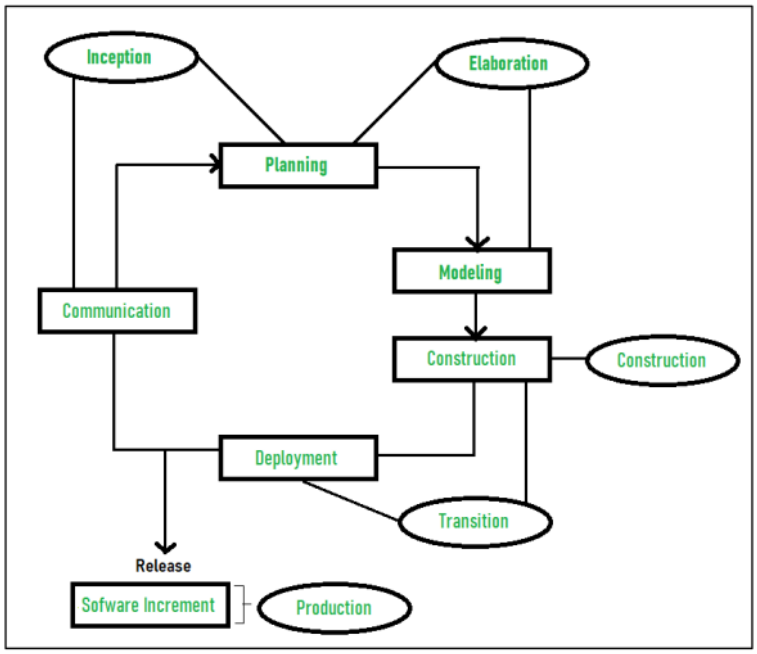
I believe that the Rational Unified Process is the best way to delegate jobs and responsibilities inside the Online Car Rental System of drivers on Wheel. In 2003, IBM helped to design the software development process. It aids in the development of high-quality software that satisfies the demands and expectations of each client in the Online Car Rental System. The RUP strategy for the Online Car Rental system's extraordinary success was developed to be familiar in any setting and to give a wide range of services to its customers. Rational Unified Process was created for big-scale companies since it is a flexible methodology that allows for access to broad geographic areas.

Within this CRC, Rational Unified Process is declared as a collection of best practices for the creation of complex and big systems. Some of the advantages are given below: Why is RUP appropriate for an online car rental system?

- RUP allows you to have more control over the Online Car Rental system.
- By offering instructions and tool mentors within the Online Car Rental System, it boosts team efficiency.
- A quick and easy booking process.

6.1.3 Phases of Rational Unified Process

The RUP life cycle is divided into five stages:



1.Inception

The whole cost and timeline for the Online vehicle Rental System are assessed during the inception phase. During this phase, the initial evaluation is conducted to determine the scope of the system by assembling members of the car company and discussing whether the Online Car Rental system is worth pursuing or not, what is aimed to be in the product and what is not, as well as preparing the project's supporting environment.

2.Elaboration

The planning and modelling phases are the most important during the elaboration phase. CRC undergoes a thorough assessment and development strategy in order to reduce hazards. An executable design of the system is created based on one or more iterations, depending on the restrictions, such as the scope and size of the CRC.

3.Construction

The CRC project has been created and is completed. After that, testing is done on the system or source code. All the components and applications of the workable system are built and incorporated into the product during this phase, which is then fully tested.

4.Transition

The transition phase is intended when the system is ready to be deployed in the client environment. In this stage the final CRC project is released. The project is transferred from development to production. Project documentation is updated. Beta testing is done. Defects are eliminated from the project based on public input.

6.1.4 RUP Best Practices

Rational Unified Process(RUP) offers CRC with comprehensive guidance, recommendations, and several pathfinders that are required for the company's whole team to prioritize one task above another based on the following best practices:

1. **Develop iteratively:**

Iterative development arose from the realization that far too many software projects were being delivered with a low-quality perception, which was mostly due to poor testing procedures. Furthermore, far too many problems (or flaws) were discovered late in the system development cycle.

2. **Manage Requirement:**

Describe how the ordering system is to be organized, how customers may order online and describe the capabilities and restrictions necessary in the ordering system and easily track customer requests.

3. **Use component architectures:**

The focus is mostly on developing software components that offer **a daily deposit slip, weekly, monthly, and yearly sales reports.** And record when a consumer makes an order either over a phone or via the website of the company.

4. **Model visually:**

The Rational Unified Process gives a graphical representation of the object of the Unified Modelling Language Online Car Rental System.

5. **Continuously verify quality:**

As with other RUP procedures, the quality evaluation should be included in all development cycle activities and processes. That indicates the whole project is tested. As soon as a fault is identified, it is easier to correct. If no fault is discovered and engineers continue to build on this problematic component, an even worse situation happens.

6. **Manage change:**

Describes how all modifications may be controlled and tracked to make it possible for effective iterative development to take place during the on-line car rental system development.

Advantages of RUP

- This is an entire approach with an emphasis on proper documentation.
- The project hazards related to developing customer require attentive change demand management may be proactively resolved.
- The method of integration throughout the life cycle of the software development takes less time for integration.

6.1.5 Project Scheduling of RUP

Task Name	Duration	Start Date	End date
Introduction to RUP	3	6/2/2021	6/4/2021
Deline Project Feasibility	2	6/3/2021	6/4/2021
Identify constrsnts	1	6/4/2021	6/4/2021
Why RUP	2	6/5/2021	6/6/2021
Best Prsctices of RUP	5	6/5/2021	6/9/2021
Inception Phase	4	6/7/2021	6/10/2021
Business Modeling	4	6/10/2021	6/13/2021
Gather Resources	4	6/13/2021	6/16/2021
Estimating release time	3	6/17/2021	6/19/2021
Elaboration Phase	4	6/17/2021	6/20/2021
Resarch Design	4	6/20/2021	6/23/2021
Configuration Management	3	6/23/2021	6/25/2021
Create Design and Requirememt	2	6/26/2021	6/27/2021
Construction Phase	3	6/26/2021	6/28/2021
Create Coding	3	6/28/2021	6/30/2021
Implementation	2	7/1/2021	7/2/2021
Trasnsition Phase	3	7/3/2021	7/5/2021
System Development	3	7/5/2021	7/7/2021
Project Management	3	7/7/2021	7/9/2021
Taking Feedback	3	7/8/2021	6/10/2021
Feedback from customer	4	7/10/2021	7/13/2021
Analysis Feedback	3	7/12/2021	7/14/2021

Fig: Gantt Chart Scheduling of RUP

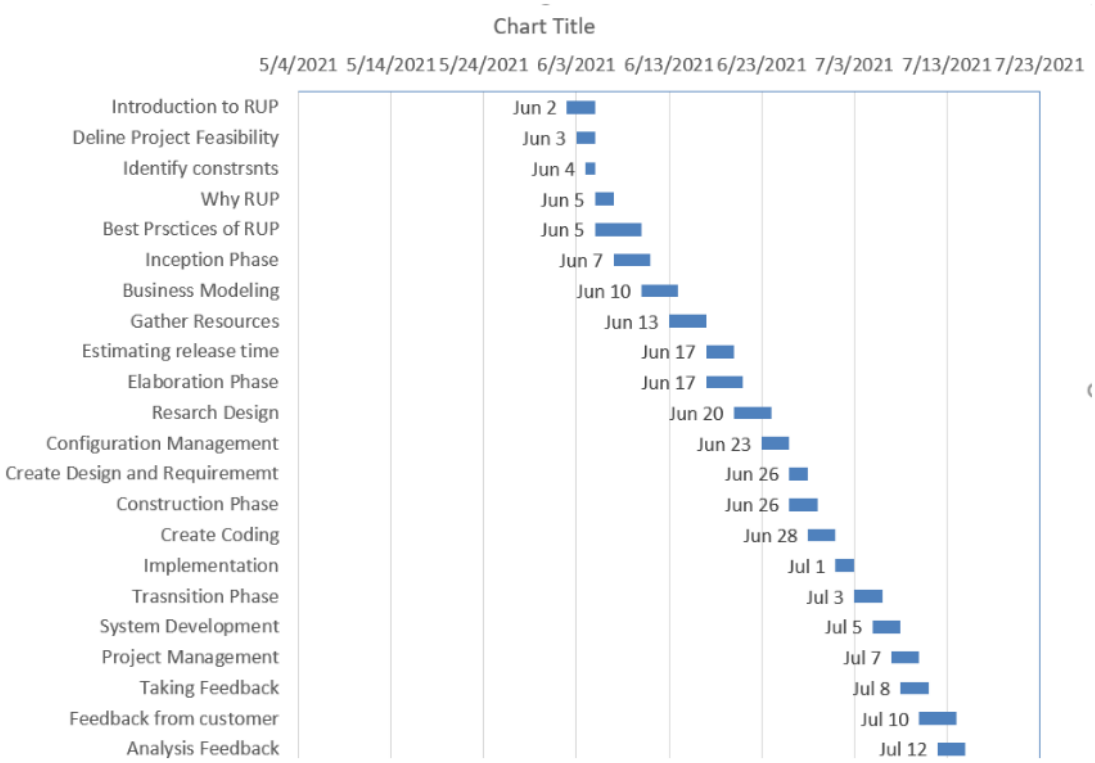


Figure:Timeline Scheduling of RUP

6.2 Scrum Methodologies (Shivam Ranabhat NPI000047)

6.2.1 Introduction

Scrum is a framework facilitates teamwork. Like rugby team who train for a great game, scrum encourages team to get knowledge and develop their skill through experiences, organize themselves while they are working on a problem and to think about winning and losing out (Drumond, 2015).

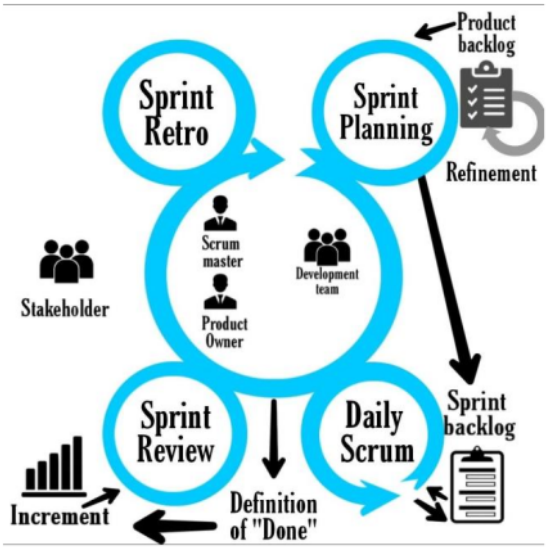


Figure: Scrum Methodology

6.2.2 Scrum Principles

When applied to solving complex problems, Scrum outperforms predictive project management approaches. In these circumstances it is difficult to accurately analyze the problem and identify an effective solution (Latre,2019). So, using the following scrum principles we can easily run our project solving all the problems with their effective solution.

1. **Empirical Process Control:**
   Using this principle, CRC system will become more transparent, evaluated and adaptive in nature.
2. **Self-organization:**
   This principle helps to increases the independence and performance of the whole project team of CRC system.
3. **Collaboration:**
   This principle teaches to work collaboratively which increases awareness, clarity, and distribution of work during the development of CRC system.
4. **Value-based Prioritization:**
   Using this principle, the tasks with maximum value will be prioritized from the beginning of CRC system project and more output will be delivered at the end.

5. **Timeboxing:**

   This principle tells to allocate a certain time for a certain task and in that time the work should be done in order to frequently complete the CRC system project.

6. **Iterative Development:**

   In scrum, the requirements of project are constantly changing and adapted, tasks during software development are also reconsidered, revised results in the delivery of best product (Abbate,2020). Using this principle, tasks during the development of CRC system will also be revised, reviewed, and reconsidered to make it better.

6.2.3 Phases of Scrum methodology

According to the requirement of CRC company scrum methodology is suitable for this project. Following above scrum principles, the CRC system will be more agile. As scrum is an agile way of developing a system with the collaboration of team members who develop, maintain and deliver the complex projects that's why it is known as one of the best methodologies. As scrum made of a series called sprints which break down large and complex project into smaller to make it easier to perform and manage it is divided into three phases which is suitable for the CRC firm:

1. **The Pregame:**

In every project, planning is the major phase similarly, in scrum also planning is the first step in this phase. At first, backlog must be created. Backlog is the collection of functions and requirements of the system which the owner of the CRC company wants to have in the CRC system. So, he/she should list all the functions and requirements to create a backlog. After this the project team will analyze the backlog to see whether any changes required in order to make the system better and more sustainable. Then the project team begins to design the implementation process and the system architecture after the structure of CRC company has established.

2. The Game:

The team will lead a meeting before starting any tasks during the game phase. The first stage of this phase is development, in which the project team starts analyzing the backlog data of CRC company, designing and implementing those features in order to create a CRC platform and testing of course. After completing the development process, a complete working software for CRC system is developed. Now another meeting will be conducted to present the tasks and progress of each team members examining the arising problems, adding new backlog requirements if needed or available for upgrading the facilities of CRC system and also review all the possible risks. Finally, all the information of modification is collected and correction of some parts of the system where changes are discussed which also called implementation stage of this phase.

3. The Postgame:

At last, the concluding phase of scrum methodology called the postgame where the project team of CRC system will prepare to release the CRC system after concerned everything and the project has been checked and tested well. The project team must submit the user documents, training and preparation of marketing material.

6.2.4 Scrum Advantages

As everything has both advantages and disadvantages scrum also have both. As an advantage scrum can help to reduce time as the iteration time of this methodology is 2-3 weeks maximum. By this the system for CRC company can created very quickly. Similarly, scrum helps to divide larger project into smaller parts so that the project team can get a clear image of the tasks they have to performed through the scrum meetings. Therefore, this methodology is suitable for CRC company, as CRC company have some different requirements which they want in their system. For implementing all those requirements each step can be broken down so that time will also reduce

6.2.5 Scheduling of Scrum

Task Name	Duration	Start Date	End Date
Product Backlog	4	6/1/2021	6/5/2021
Sprint Planning Meeting	3	6/6/2021	6/8/2021
Sprint Backlog	5	6/9/2021	6/13/2021
Daily Standup Meeting	3	6/14/2021	6/16/2021
Finished Work	6	6/17/2021	6/22/2021
Sprint Review/testing	4	6/23/2021	6/26/2021
Sprint Retrospective	3	6/28/2021	6/30/2021

Figure: Gantt Chart Scheduling of Scrum

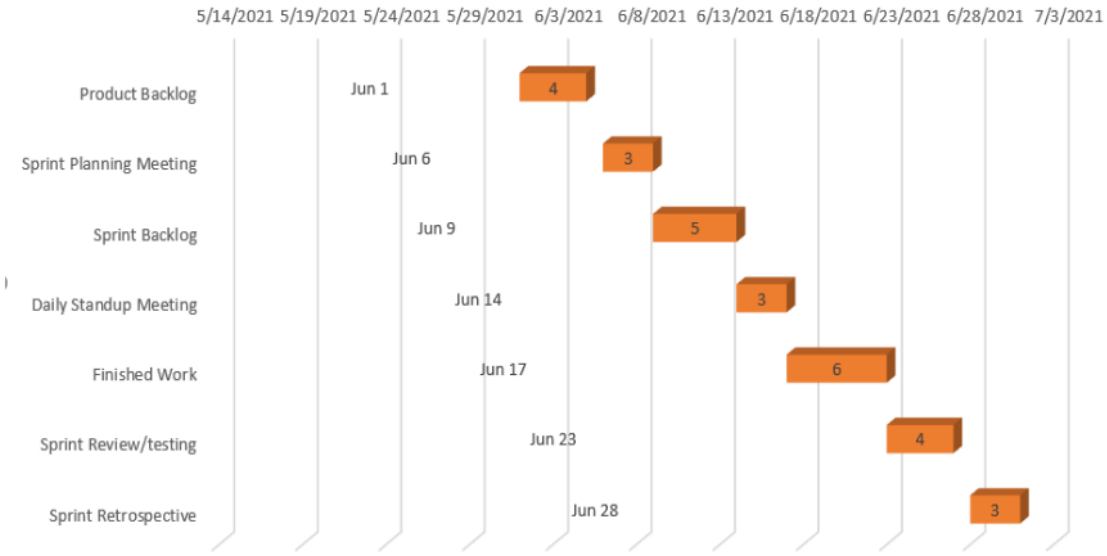


Figure: TimeLine Scheduling of Scrum

6.3 Extreme Programming XP (Bikram Shrestha NPI000022)

6.3.1 Introduction

XP is a type of agile methodology the aim of this methodology is to produce high class of software and higher quality of life for the development squad. XP is the agile framework maximum specific to appropriate software development engineering practices. It has several agile frameworks which is applied by many IT company. XP methodology provide principle and value to guiding the team performance. XP has methodological and software development tools. It is a low-risk, scientific, lightweight, flexible, efficient and predictable method to develops a software.

XP methodology is the good methodology for CRC proposed system because, it helps to produce better quality software as well as better quality of life for development team. Iterative steps in XP methodology show in below figure:

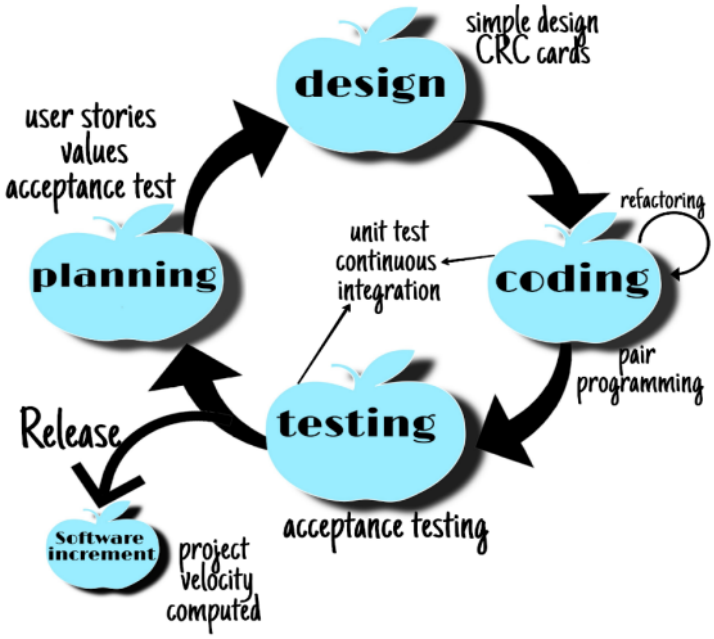


Figure: Phases of XP

6.3.2 Phases of Extreme Programming

In Extreme Programming methodology includes four basic phases they are planning, designing, coding, and testing.

- Planning:

Planning is the first phase, in this phase client visit the development team and presents the requirement stories and information of CRC company. Then the team estimate the story and makes a release plans, which is separated into the required parts of functionality. All the team members discuss and crate a suitable timetable and divisions the project into iterations. In planning phase CRC company provide all requirement to the developer and developer start to work.

- Designing:

After planning phase next phase is designing, in this phase developers team prepare the logical design and designing the interface for CRC company system. It is start with simple design; it takes minimum time than complex's solutions. The pairs will be negotiating so that all the system design is discussed each other in this step.

- Coding:

After designing next phase is coding, in coding phase uses pair programming to agree programmers to sit down to grow the system. During coding phase one programmer effort on coding for CRC company system and the other remaining associate to checking the code and their character can be changed at any time.

- Testing:

Next is the testing phase, in this phase test that takes place during and prior to the coding phase. Coding unit testing supports the designer to classify errors as soon as probable and fix them, while the receipt test before the meeting provider a clearer signal for the entire team and discuss any difficulties during the meeting.

6.3.3 Best Practises of Extreme Programming

XP follows 12 practices which is arranged in four gathering for example code understanding, feedback, continual process and work conditions, the twelve practices are recorded below:

1. The planning game:

For this stage vital plans are made for the undertaking from the gatherings among engineers and client. The community-oriented gathering among engineers and clients is directed to support the highlights of the framework and next emphasis is arranged.

2. Small Releases:

The whole task is partitioned into numerous capacities, after the fruition of each capacity it is joined with a primary vault and deliveries its adaptation to clients. This delivery cycle is abbreviated and incessant to get customary criticism from clients.

3. Simple Design:

The framework is simplified and intelligent with least conceivable class and strategies which make the task simpler and quicker to finish. We center around the present prerequisites as opposed to that to be utilized later on.

4. Metaphor:

It is a framework design that will be underlying a way that can be effectively perceived by every exsiccated with the office.

5. Continuous Testing:

It simply states that an engineer prepares tests for each and every capacity, and that after those capabilities have completed their evaluations, the assessments are given to clients.

6. Code Refactoring:

It's basically reworking a code to make it more understandable. The copy codes are obliterated here. We don't use complicated codes, lengthy approaches, or unnecessary classes in XP.

7. Pair Programming:

To assemble similar code, two engineers work on the equivalent machine. The first is for writing code, while the second is for auditing.

8. Collective Code 0wnership:

Here is not a particular part for a particular capacity. Anybody can work in any piece of the framework whenever.

9. Continuous Integration:

If the framework changes, it should be periodically coordinated to ensure that it functions before and again after inclusion.

10. 40 hours work week:

Engineers should keep an equilibrium in their work-life it keeps from getting pushed and burnout. Additional time are just acknowledged now and again.

11. On Site Customer:

At least one customer should always be able to answer all developers' queries and settle discussions.

12. Coding Standards:

Each software engineer ought to observe the normal coding standard with the goal that it turns out to be not difficult to others to survey code. It helps in collective responsibility for piece of code.

6.3.4 Values of Extreme Programming

XP has five different values they are:

- **Communication:**

The achievement of the project communication plays an important role. The lack of communication also leads to project problems. All the development team member meets face-to -face very day. All the development team member shares their knowledge from one member to other member.

- **Simplicity:**

The main meaning of simplicity is "what is the simplest work to do?" this is to protect waste and do only things that are absolutely needed, such as keeping the system design as simple as probable so that reviews, maintenance, and support are easier. Developers try to generate easy and time saving code which will makes the product desirable.

- **Feedback**:

Development team members regularly deliver software, get feedback, and improve the product to meet novel requirements.

- **Courage:**

The theory of XP does not clearly expression courage that contains some aggressiveness. The team does not justify for this loss as the team wants to succeed. Any team member does not work alone in the team because these switches can be made by the team when required.

- **Respect:**

In the development team every member respect each other and they provide and accept feedback. All the team member assigned project supports achieves a mutual goal.

6.3.5 Why choose XP.

Extreme Programming is doable to time and cost than other methodologies. The simplicity of the code serves to exceptionally lessen the measure of the cost and time taken which keeps designers form getting disappointed. Continuous criticism from client assists designer with working on the product. The breakdown of the venture into little modules and continuous criticisms permits designers to finish the task on schedule. Its short iterative cycle and capacity to change as per business needs to expands the efficiency of the business in an exceptionally high scale.

6.3.6 Scheduling of XP

Task name	Duration	Start Date	End Date
Introduction	2	6/2/2021	6/3/2021
Identiify Objective	2	6/3/2021	6/4/2021
Identiify stakeholder	1	6/4/2021	6/4/2021
Determine scope	5	6/4/2021	6/8/2021
Planning	3	6/9/2021	6/11/2021
About user stories	2	6/11/2021	6/12/2021
Gather resources	3	6/11/2021	6/13/2021
Estimating release time	3	6/13/2021	6/15/2021
Design	4	6/15/2021	6/18/2021
Research design	3	6/17/2021	6/19/2021
Select design	3	6/19/2021	6/21/2021
Create design	5	6/21/2021	6/25/2021
Codeing	3	6/26/2021	6/28/2021
Create coding	3	6/28/2021	6/30/2021
Revies codes	3	7/1/2021	7/3/2021
Testing	3	7/4/2021	7/6/2021
Create unit test	3	7/7/2021	7/9/2021
Chek for errors	3	7/9/2021	7/11/2021
Feedback	2	7/11/2021	7/12/2021
Analyze feedback	3	7/11/2021	7/13/2021
clients feedback	1	7/13/2021	7/13/1900

Figure: Gantt Chart Scheduling of XP

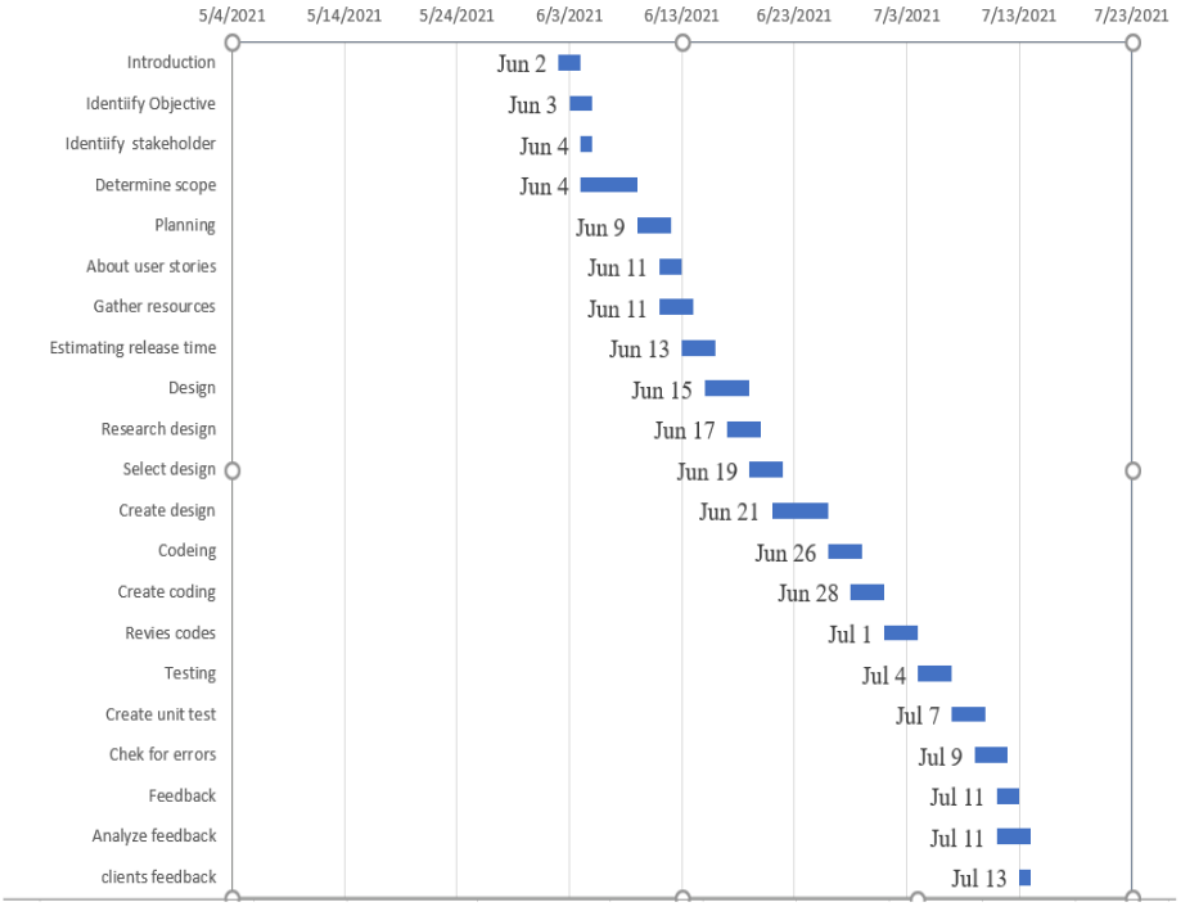


Figure: Timeline Scheduling of XP

6.4 Crystal Methodology (Saroj Kandel NPI000043)

6.4.1 Introduction

Crystal methods are the family of methodology which is developed in 1998 by Alistair Cockburn from his research. The crystal method mainly focuses on the activity and interaction of the developer or people. In the crystal methodology give more priority for the developer then the equipment and the methods or process. A software development methodology mainly had to focus on the priority and criticalities of a business, this methodology follows these two priorities and criticality of business so that this is one of the best methodologies. Crystal methodology is a package of man powered, light, stretch-to fit, and adaptive application development methodologies. The introducer of the crystal methodology Alistair Cockburn believes on developer's talent and skill as well as way of communication has the huge or power full impact on the outcome of project, so he introduced this methodology in 1998 with special emphasis on people, interaction, community, and skill.

Crystal methodology is the best methodology for CRC system because of it is suitable for every type of group, it is mainly focus on the developer group, we can choose the suitable procedures and tools for our project, active user involvement is another characteristic which help to get better productivity, it requires short documentation and report so we it is easier than other methodology. The major region for selecting the crystal is based on two essential assumptions in which one is group, or the development teams can streamline our processes as our project and become a more optimized development group and another is work or project are dynamic unique and require specific procedures.

6.4.2 Characteristics of crystal methodology

- Human-powered

  Human- powered is normally emphasizes that the development team or developer group is the most vital component of this methodology. In this methodology all the tools and the methodology are relative to them. With this development methodology developers become more competent and organized.

- Adaptive

  A method and not a set of prescribed procedures and tools for software expansion, this methodology is a stretch to methodology. Adaptive indicates in fact that instruments are not fixed but modified to fit the group's requirements and job.

- Active user involvement

  For the successful every developer should be active. With this methodology each person has to regularly inform about project progress. Active user involvement makes the result better.

- Delivering on commitments

  The developer group struggles for the recurrently delivery of potentially shippable functionalities and user valued.

- Ultra-light

  There will be no more reporting, management, and documentation with crystal technique. By focusing on the transparent workflow between groups and users through open communication across groups, it keeps objects light.

6.4.3 Best practices of crystal methodology

There are many methods in crystal methodology, among them seven prevailing common properties are given below.

1. **Frequent delivery**

Crystal approach enables teams to release tested code to genuine consumers often. In this way, they need not enjoy spending their energy and time creating a product that nobody wants to buy.

2. **Reflective Improvements**

Each time your organization may increase a product, no matter how awful or good it has gotten, techniques and techniques can occur.

3. **Close or 0smotic Communication**

Crystal allows for important data to be collected without being involved directly in the discussion on specific subjects.

4. **Personal Safety**

The members of the squad should communicate openly and really, without fear, whether presenting a new concept or the potential problem, to build healthy environments and a true group culture.

5. **Focus**

Each member of the group understands exactly what to do, allowing them to focus and avoid switching duties.

3

6. **Easy Access To Expert Users**

It permits groups to preserve communication and get steady response from real users.

7. **Technical Environment With Automated Tests, Frequent Integration, and Management**

Very specific tools for software groups highlighting nonstop integration so that errors could caught in just a matter of minutes.

6.4.4 Why crystal Methodology

The crystal approach ruminates people as the more essential then other so that approaches should be demonstrated to achieve the requirements of the crew. It has iterative and incremental development approach, an energetic user involvement, and lunch on promises also it is adaptive, without a set of arranged tools and techniques and does not needs too much documentation, reporting or management.

One of the flexibler agile frames is the crystal technique. Due to its design based entirely on the team member and depending on a range of tools or processes. That is so that our teams can choose a technique that encourages them to achieve our work, but they think it is most successful. However, it is crucial to bear in mind that this technique stresses direct team cooperation around the software that we develop and underlines the significance of documenting and reporting, which could result in other teams in the organization.

6.4.5 Scheduling of Crystal

Task	Duration	Start Date	End Date
Introduction	2	6/2/2021	6/3/2021
Determine project feasibi	2	6/3/2021	6/4/2021
Determine scope	3	6/4/2021	6/6/2021
Why Crystal	4	6/5/2021	6/8/2021
Best Practices of Crystal	4	6/6/2021	6/9/2021
Inception Phase	3	6/9/2021	6/11/2021
Gather Resources	5	6/11/2021	6/15/2021
Planning	4	6/16/2021	6/19/2021
Research Design	6	6/20/2021	6/25/2021
UI/UX Design	4	6/25/2021	6/28/2021
Configuration Manageme	3	6/28/2021	6/30/2021
Construction Phase	3	7/1/2021	7/3/2021
Coding	4	7/4/2021	7/7/2021
Individual code testing	3	7/7/2021	7/9/2021
Check for error	2	7/9/2021	7/10/2021
Analysis Feedback	5	7/10/2021	7/14/2021

Figure: Gantt Scheduling of Crystal

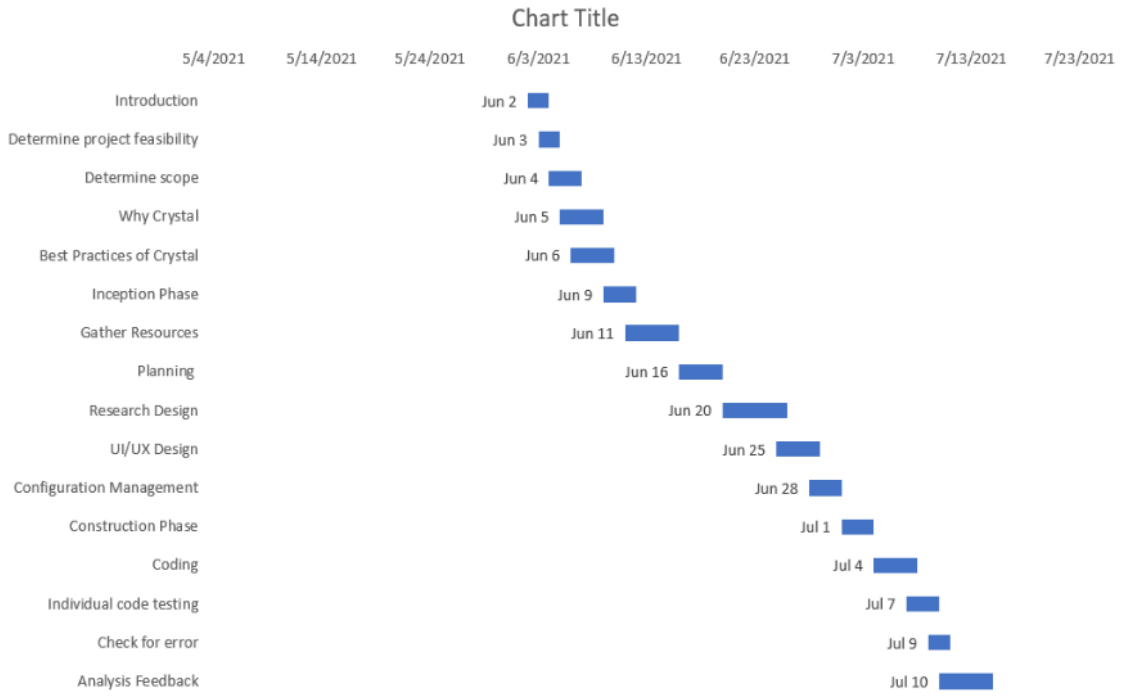


Figure: TimeLine Scheduling of Crystal

7. Conclusions:

The Online Car Rental System is designed to tackle the current problem in this project. To achieve this objective, our firm considers numerous agile techniques to undergo various phases of system development. The technique for system development is flexible and user-friendly and allows to make changes to any business successfully. The methods selected for this system, i.e., rationally unified process, Scrum, Crystal and Extreme, serve both developing teams and clients.

Throughout the project, we learnt about a variety of approaches for creating information systems as well as a variety of concepts for web-based apps. This project creates an online automobile rental system that allows customers to easily place an order. This program has taught us to collaborate and operate in a legitimate industry. Agile concepts are used to create ways to increase customer satisfaction and contentment. The full system development process is finished in order.

SDM

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