**Chapter 2: Analysis**

# Introduction to analysis

In simple terms, analysis is the process determining any given situation. In software development, it is the process of determining the requirements, user expectations, predicting risks and collecting data of all possible factors related to a new or an already launched product. It helps in breaking down the project in manageable chunks or parts which helps to understand the problem aspects. It helps in the estimation of time and budget needed for the project which is an essential part of a project success.

<https://www.quora.com/What-is-the-importance-of-analysis-and-design-in-software-engineering>

The importance of performing analysis on my project are:

* It helps in gathering information about the different aspects of tea farmers and manufacturers business. I.e. their way of business operation, rules and regulations.
* It helps to gather information to check the feasibility of the project.
* It helps to understand the problem being faced by the local people easily.
* <https://www.synapseindia.com/6-stages-of-software-development-process/141>
* It enables to understand the requirement of the local people of the area and develop a project that suits both their requirement and knowledge.
* It also facilitates in clarifying the local people on what they think they want from what they actually need.
* This process will also help my project to understand the market areas that are currently involved in the products related to my project.

# Analysis methodology

The type of analysis technique undertaken for project development is known as analysis methodology. There are several approaches to software development namely soft system approach, hard system approach, combined approach etc. Among these methodologies, I am going to undertake soft system methodologies.

**Soft System Approach**

This methodology is an approach to system modelling for solving general project problems and developing feasible as well as desirable changes based on a differentiated group of people and other factors of social, cultural, ethical kinds etc. It shows that user interaction in any project is of the same importance as the technical considerations. Unlike other methodologies that analyses “how a system should operate”, this methodology provides a soft analysis on ‘what the system should do ‘and ‘how the system should do it.

Susan Gasson, OR/S Group, Warwick Business School October 1994

<http://cci.drexel.edu/faculty/sgasson/Vita/UseOfSSM.pdf>

The process of soft system approach is carried out in several steps.

**Stage 1**

**Finding out problem**

This step includes activities like interviews and observations to try to understand the problem that the project will be solving as deep and as wide as possible.

As a residence of Ilam myself, contacting the local people of my place was an easy tasks and through them the major problems related to the local products of the place were found to be:

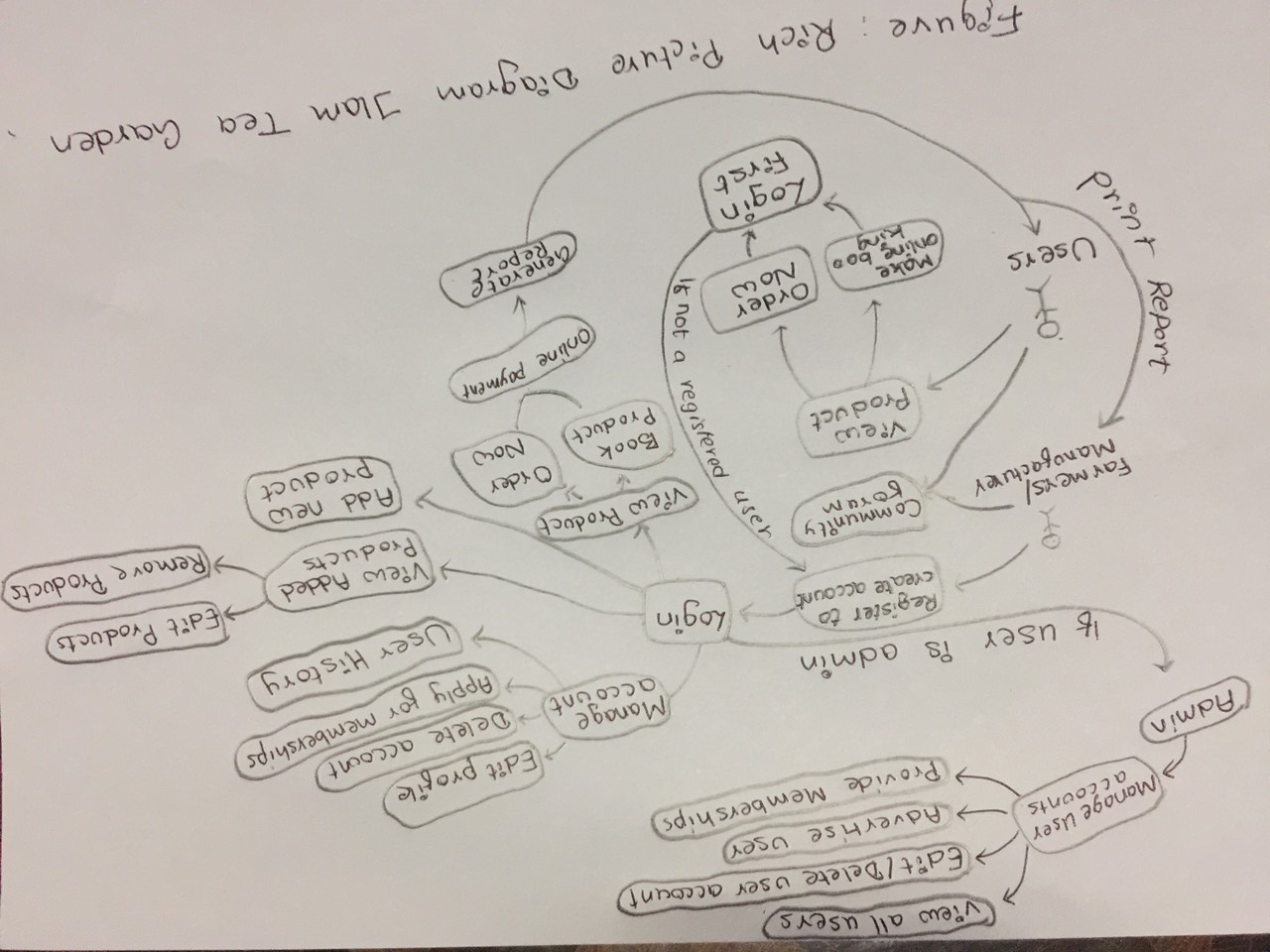
* The local products of the place not getting a proper national market.
* Mediators benefitting from the hard work of the local farmers and manufacturers.

**Stage2**

**Expressing the problem situation**

This step of SSM includes tasks of communication of the problem statement and to validate the analyst’s understanding of the situation and representing them using tools like Rich Pictures.

Rich pictures are used for giving an idea of the different factors that the problem influences and relate those factors. The rich picture of the situation is given in the picture below.



**Stage 3**

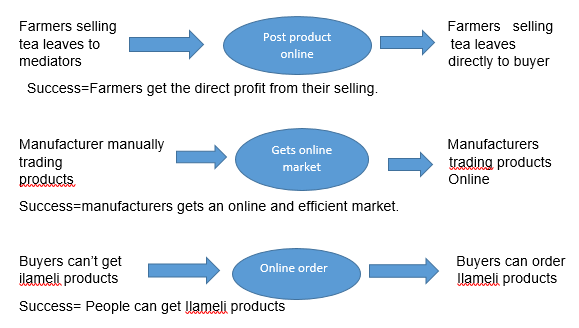
**Deriving Root Definitions**

Root definition is the process of naming a system, which are short statements that describe the aims and functions of the system to be developed. They are of two types namely

* Primary Task Root Definitions focusing on the process
* Issue-based Root Definitions focusing on the problems.
* **Input-Output Diagrams**

This step of root definitions involves creating possible transformation processes using a single transformation process as much as possible.

Some of the input-output diagrams are shown below.

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* **Root Definitions (Process based)**

A root definition has been derived from the list of input-out diagrams given above.



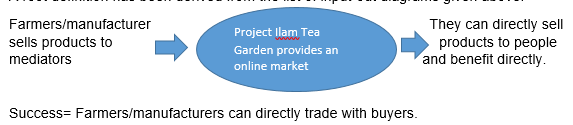
* **Performing the CATWOE Analysis:**

The type of analysis that focuses on the different elements of a project like **C**ustomer, **A**ctors, **T**ransformation, **W**orldview, **O**wner and **E**nvironment factors is known as **CATWOE.** The following elements were drawn out by undertaking this analysis on the project.

1. **C**ustomer = Product Buyers
2. **A**ctors = Farmers and Manufacturers
3. **T**ransformation= Allow direct trading between buyers and sellers.
4. **W**orldview=Farmers and manufacturers is benefitted and buyers get what they want.
5. **O**wners=Project Investors
6. **E**nvironmental constraints=Controlled Educational Environment

* **Root Definitions (Problem based)**

A root definition has been derived from the list of input-out diagrams given above.



* **Performing the CATWOE Analysis:**

1. **C**ustomer = Product Buyers
2. **A**ctors = Farmers and Manufacturers
3. **T**ransformation= Mediators are eliminated between farmers/manufacturers and product buyers.
4. **W**orldview=Farmers and manufacturers are only benefitted and buyers get what they want.
5. **O**wners=Project Investors
6. **E**nvironmental constraints= Controlled Educational Environment

**Root Definition**

A system owned by project investors, where tea farmers/ local products manufacturer can directly sell their products to interested buyers without any mediators. With a feature of ordering and booking products between the two parties, the system will allow the sellers to get high benefit and buyers get to enjoy the local products of Ilam.

**Stage 4**

**Deriving Conceptual Models**

A conceptual model can be defined as a set of concepts combined to represent a system so as to make the viewer easily understand the different models of the system. It represents the different activities that the actors need to perform for achieving the designated transformations. By listing different activities and graphically relating them using monitor and feedback activities, a conceptual model is designed. The conceptual model for project is given below.

**Stage 5: Comparing the concept of the system with the actual system**

This step compares different aspects of a conceptual model with the real project developed since not everything will be pitch perfect and in conjunction to the conceptual model.

|  |  |
| --- | --- |
| Conceptual Model Analysis | Real World Project Analysis |
| All users has the ability to add products for sale | Since the project is based on a particular place, only the farmers and product manufacturer uses the function. |
| The feature of adding new product has been given to all users to allow the project to expands its products in future. | The project is only based on limited products at present. |
| The conceptual model is somewhat expandable. | The real world project is not expandable for now. |

**Stage 6: Analyzing Feasible and Desirable Changes**

This step of SSM follows activities to show the rich picture and conceptual diagram to people who are the major stakeholders of the project and other users who can help analyze the system model with the above diagrams. Some of the changes that have been analyzed are as follows

* The rich picture shows that all users can add products but since the project is based only on Ilam, it was taken into consideration that not all users can add products for sale for now.
* Community forum should link all users and admins to make a trustworthy project.

# Feasibility Study

The study undertaken to find out whether or not a project is practically possible in the real world scenario, its probability to success and its ability to do what a project aims for is known as feasibility study. These factors can be determined by understanding the cost, times and benefits related to the project. For a project to be successful, the project should have the ability to achieve its purpose with the benefit always greater than the cost required for the project.

The different feasibility study that I performed in my project are given in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| S.no | Feasibility Study | What does this study finds out? | How it is related to my project. |
| 1 | Schedule Feasibility | Is there enough time to work on the project?  Can the project be completed in given time? | I have created WBS, Gantt charts and milestones for this project. The tasks are performed based on those timelines till now and will also be followed further. |
| 2 | Economic Feasibility | Is the allocated budget enough to complete the project?  Does the project benefit outweighs the project cost? | The project will have the feature of current location in the future so as to track the buyers address which required GPS tracker and it costs some money. For now it is economically feasible and the benefits that the local people will get from this project will be higher than the costs . |
| 3 | Technical/Resources feasibility | Is the technical requirement for the project available?  Is the knowledge skill required for the project sufficient? | My current technical equipment (i.e. Lenovo Laptop) is sufficient for this project. I too have a good internet connection available. My skills required for the project is good enough and is getting better with time. |
| 4 | Marketing Feasibility | What is the market that is project is targeting for?  Will people want the project after it is developed? | The project will be a beneficial system for the tea farmers and local products manufacturers of Ilam.  By following a good marketing strategy, the project market will cover the whole of Ilam district. |
| 5 | Cultural Feasibility | Will the project result in negative/positive impact to the culture and traditions of its users? | The project is a marketing web based applications that focuses to market the product that the local people grows and manufacture.  It involves those products that people have been consuming for a long time without any barrier from the culture and tradition. |
| 6 | Operational Feasibility | How well the project be able to solve the problems of the targeted people presented? | Since an online information system and market for the local products of Ilam is currently lacking, the project will be highly advantageous to them. |
| 7 | Ethical Feasibility | Is the project ethically acceptable by the users? | The focus of the project is to help the farmers and local manufacturers by eliminating the mediators between them. It is ethically acceptable by the targeted people and maybe unacceptable by the mediators. |
| 8 | Comprehensive Feasibility | How does the project impact on different factors like, cultural, ethical, marketing etc.? | Feasibility tests for these factors are performed above. |

# Requirement Analysis

## Functional Requirement

Functional requirement in project development are those features which are planned to be incorporated in a system being made. These requirements include technical features, hardware-software and their functionality to operate as per the needs of the system user.

The functional requirements of my project is introduced below along with its rationale and dependencies.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.no | Functional Requirements | Data | Rational | Description | Dependencies |
| **Fr01** | Registration | First name, Middle name, Last Name  Email Address  Phone Number  Address  Password | To create an account with the system | Login can only be accessed with an existing account | **N/A** |
| **Fr02** | Login | Email/Phone Number  Password | To use the system as a registered user, | It helps to gain access to more features of the system | **Fr01** |
| **Fr03** | Manage Profile | Personal details given in registration and a profile picture | To make changes in case of change in personal data. | Adapting to changes in personal details.  Can be done by user as well as admin | **Fr01**  **Fro2** |
| **Fr04** | Edit Profile/ Delete account | Every data related to the account | To completely remove user account data | In case the user feels like using a new account or completely discard the account data (can be done by user and admin) | **Fro1**  **Fro2**  **Fro3** |
| **Fr05** | View Products | Product name  Product manufacture area  Product quantity/quality. | To surf through the different products in the platform. | In case the user wants to view products only which are currently in the market or already sold. | **Fr01**  **Fr02** |
| **Fr06** | Review Products | Open text data from users on a particular product | To allow users comment on their opinions about a product. | This is like product rating but users can write their opinion on any products. | **Fr01**  **Fr02**  **Fr05** |
| **Fr07** | View Product Owner Profile | User details that can be viewed by the public such as name, phone number. | To know about the party that a user is buying from and communicate with them. | In case the user wants to communicate with the seller or buyer directly or through messaging. | **Fr01**  **Fr02**  **Fr05** |
| **Fr08** | Online Booking | Personal details  Date  Product details | To make an order or book a certain product for future. | Allows users to book products which may not be available in market or required for future. | **Fr01**  **Fr02** |
| **Fr09** | Online Payment |  | To make safer means of payment | Transactions can be done online using connection with different banks. | **Fr01**  **Fr02**  **Fr08** |
| **Fr10** | Messaging | Message parties  Message ID  Message content | To make communication between farmers/manufacturer and customers | Messaging can help trades become more trustworthy. | **Fr01**  **Fr02**  **Fr05**  **Fr07** |
| **Fr11** | Product Rating | Star system | To gather information of products | Rating can help users select and buy highly rated products. | **Fr01**  **Fr02**  **Fr05** |
| **Fr12** | Community Forum | Queries  Views  Opinions  Discussions | To make a community among the users of the system | Community forum allows every users whether registered or not to be a part of the system. | **Fr01**  **Fr02** |
| **Fr13** | Add New Products | Product name  Product type  Manufacture area  Product amount  Product Price; | To add the product in selling list | This facilitates the selling party to market their product. | **Fr01**  **Fr02**  **Fr14** |
| **Fr14** | My Products | Product name  Product type  Manufacture area  Product amount  Product Price; | To view any products added by the user themselves or sale. | This allows the users to track their products. | **Fr01**  **Fr02** |
| **Fr15** | Order Now | N/A | To make an instant trade of products. | Removes the product from the selling list and adds to the buyers list. | **Fr01**  **Fr02**  **Fr05** |
| **Fr16** | Edit/Remove Products | N/A | To edit an already added product from selling list | Some products might go bad by natural causes and not available or may need to be edited. | **Fr01**  **Fr02**  **Fr14** |
| **Fr17** | Posting Query | Query content  Replies content | To make an indirect communication between sellers and buyers. | Buyers can ask questions about products. | **Fr01**  **Fr02**  **Fr05** |
| **Fr18** | Logout | N/A | To protect the account from unauthorized users | User can get out of the system with free will. | **Fr01**  **Fr02** |
| **Fr19** | View all users | Data of all registered users | To allow the admin to manipulate user accounts. | Admins sometimes may need to filter out inactive users. | **Fr01**  **Fr02** |
| **Fr20** | Delete/Edit User accounts | Manipulation of user accounts by the admin | To allow the admin to filter through accounts that are required to be removed and edited. | Admins can control and manage user accounts based on conditions and situations. | **Fr01**  **Fr02**  **Fr19** |
| **Fr21** | Advertise User | User products  User rating records  User review records. | To advertise the best reviewed user/products to be seen to other users. | It allows people to buy products from the best reviewed seller. | **Fr01**  **Fr02**  **Fr19** |
| **Fr22** | User History | User Transaction records | To provide feedback on personal activities, | It allows the user to review their own activity and transaction. | **Fr01**  **Fr02** |

## Non-Functional Requirement

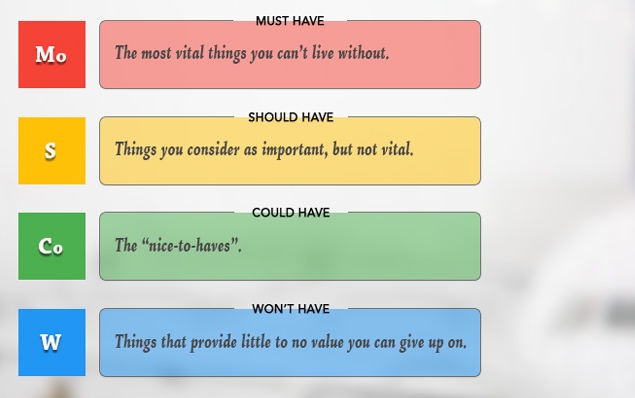
Those requirements that sets up specific criteria for judging the operation of a developed system is known as non-functional requirements. These non-functional requirements usually determine the quality attributes of the system rather than some specific behavior or functions. These requirements determine the status of the system among users and the market.

The non-functional requirement of my project is shown in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S. no. | Non Functional Requirement | | Description | Rational | Dependencies |
| **Fr23** | | Security | System should have data security features to protect the confidentiality, integrity and availability of data. | To protect the user data safe and secure. | **Fr01**  **Fr02**  **Fr22** |
| **Fr24** | | Performance | System should always function the same for any given situations | To ensure users get smooth and efficient performance using the system | N/A |
| **Fr25** | | Legal Clearance | System should be made without crossing any legal boundaries. | To make a legal value of the system in the market | N/A |
| **Fr26** | | Documentation | System should provide guidelines, documentation to allow users to know the system better, | To ensure users know about the system | N/A |
| **Fr27** | | Maintainability | System should be maintainable to discard any flaws within the system. | To ensure the system fixes any appearing bugs and errors and manages to maintain what users feels difficult to use. | N/A |
| **Fr28** | | Capacity | System should function with the same ability for any given users. | To ensure the system can handle large data from number of users with the same efficiency. | N/A |
| **Fr29** | | Environmental | System should not harm the environmental factors. | To ensure that the project follows concepts of Green IT and in no manner cause harm to the environment more than the services it provides. | N/A |
| **Fr30** | | Recoverability | System should be recoverable whenever required. | To ensure prevention from factors like software/hardware crashes and data loss. | N/A |

## MoSCoW Prioritization

Commonly referred as MoSCoW method, it is the technique for prioritizing requirements of a system. The level of priority for a system are Must Have, Should Have, Could Have and Won’t Have. This method determines what requirements are compulsory, optional and what a system will not have. This method is also applicable in our life represented by the figure below.



The different level of priorities suggests the following meanings.

* **M**ust Have: Any requirements that needs to be in the system and plays to vital role for achieving the aims of the project.
* **S**hould Have: Any requirements that also has high priority if included. These requirements are likely to be added within the time frame of the project.
* **C**ould Have: Any requirements which doesn’t need to be included but if possible can be added to make the system nicer.
* **W**on’t Have: Any requirements that is not added in the current version of the system but can be considered in future versions.

The table below shows the prioritization of different functional requirements of my project.

|  |  |  |  |
| --- | --- | --- | --- |
| S.no | Functional Requirements | Priority | Reasons based on project. |
| 1 | Registration | **M**ust Have | Since the project is based on online marketing and revolves around customer and seller details, these aspects are required to gather those details. |
| 2 | Login |
| 3 | Manage Profile | **M**ust Have | Personal details can change from time to time and does not remain constant. |
| 4 | Edit Profile/Delete account | **M**ust Have | If users feels like editing profile or deleting their account to use a new account but can also do that by registering for a new account. |
| 5 | Online Payment | **S**hould Have | The project is based on online product marketing and should have this feature but does not to be a key requirement since cash on delivery disregards this requirement. |
| 6 | Messaging | **S**hould Have | This could make trading more reliable |
| 7 | Online Location Tracker | **C**ould Have | This feature makes deliveries more efficient, but the project can also perform without this. |
| 8 | Community Forum | **M**ust Have | The users community has to have a place to share their opinions. |
| 9 | Adding New Products | **M**ust Have | Sellers and buyers need to perform trading in the project, that can only be performed by keeping products for sale and buying it. |
| 10 | Order Now |
| 11 | Removing Products | **M**ust Have | Some added products might not be available since the project deals with products that doesn’t have longer sustainability. |
| 12 | Posting Query | **S**hould Have | Users will have efficiency in buying products. |
| 13 | Product Rating | **S**hould Have | This helps the users to get high rated products and help admin advertise users. |
| 14 | View Products | **M**ust Have | Users must be able to see different products in the market as well as from specific users. |
| 15 | Review Products | **S**hould Have | Users should be able to leave comments on the product they are buying to give their opinions. |
| 16 | View User Profile | **M**ust Have | User must be able to view their user profile to track their activities. |
| 17 | View added product list | **M**ust Have | Any user who have added products must be able to see those list and make changes if required. |
| 18 | Edit Products | **M**ust Have | Users must be able to edit their products since the project deals with products that is degradable. |
| 19 | View all users | **M**ust Have | Admin must be able to keep track of the users that are involved to the project.2 |
| 20 | Delete/Edit User Accounts | **M**ust Have | Admins must have the ability to bring changes to user accounts with proper user authentication. |
| 21 | Advertise Users | **S**hould Have | This can help users perform their trade with reliable and trustworthy sellers. |
| 14 | Online Booking | **S**hould Have | This can allow ordering products which are not yet currently in the system. |
| 15 | Logout | **M**ust Have | Users has to be secure of their accounts at any cost in an online marketing platform. |

The table below shows the prioritization of different non-functional requirements of my project.

|  |  |  |  |
| --- | --- | --- | --- |
| S.no | Non-Functional Requirements | Priority | Reasons based on project |
| 1 | Security | **M**ust Have | The project deals with user transactions which needs to be secured. |
| 2 | Performance | **M**ust Have | Project performance need to be at peak to provide service to more users. |
| 3 | Legal Clearance | **M**ust Have | The project must be legally accepted by the rules and regulations of the country and its people. |
| 4 | Documentation | **S**hould Have | It can be helpful but does not have to be compulsory. |
| 5 | Maintainability | **S**hould Have | Every project will always have bugs, errors and non-functioning features. |
| 6 | Expandability | **W**on’t Have | The project is based on Ilam for now but can also be expanded in the future. |
| 7 | Capacity | **M**ust Have | The project deals with large number of data. |
| 8 | Environmental | **M**ust Have | The project must not be harmful to the environment. |
| 9 | Recoverability | **M**ust Have | Loss of data can occur from many factors which are likely to happen at some point in the project. |

This analysis conducted in my project gave the following information.

* It identified key requirements of my project.
* It identified any aspects that my project doesn’t require right now.
* It helped to identify future aspects of my project.

## System Requirement Specification

A system Requirement Specification is a set of documents details the features and functionality of a system to be developed. It also provides details on different hardware and software required while developing the project as well as what users will require to use the project.

The hardware/software requirements for my project is given below.

* Pre-project requirements

The hardware/software required for developing the project from initiation to deployment is known as Pre-project requirements.

|  |  |
| --- | --- |
| Hardware | Software |
| * Laptop (HP) * Processor (I5 intel) * RAM (4 GB) * Hard Disk Space (500GB) | * Windows 10 Operating system * Microsoft Office * XAMP * Sublime Text 2 (Coding) * My SQL database * Google Chrome * Star UML * Project Libre |

* Post project requirements

The hardware/software that is required at minimum to use the project by the user is known as post project requirement.

|  |  |
| --- | --- |
| Hardware | Software |
| * Android devices   **For Internet connection**   * Routers   **For desktops and laptops**   * Minimum Core 2 Duo and above processor * RAM minimum 2 GB * Hard Disk space (minimum 100GB) | **Operating System**   * Windows 10, 8, 8.1   **Browsers**   * Google chrome * Mozilla Firefox |

# **Use Case Diagram**

A use case diagram is a diagrammatic representation of the different entities of a system. It clarifies the role of different external parties on the functionality of the system commonly called actors. It is made to show the relationship of the external entities with the different aspects of the system shown in different use cases.

The advantage of creating this diagram on my project are as follows.

* It is an easy and understandable method of representing a system to the local people since it doesn’t have any technicality.
* Use cases evolve with each iteration and change in requirements can be traced easily.
* It helps to identify the role of different entities like farmers and manufacturers, customers and admin in a clear way.
* It shows the relationship of these entities with different functionalities

The use case diagram of my project is given below.

1. User Login System Use Case

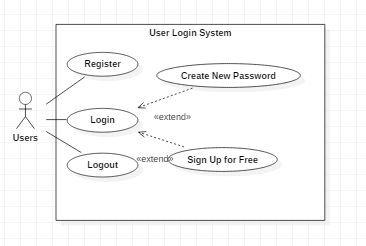


Figure 1 User Login System Use Case Diagram

Unregistered users will have to register their account first to create and account. After they are registered, they can login to the system. If in any case, the user forgets their password or need to sign up with another account, they can create a new password or sign up for free respectively as shown by the extend relation.

1. Admin Login System Use Case.

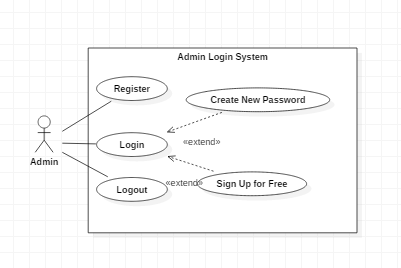


Figure 2 Admin Login System Use Case Diagram

Users at first need to be registered as admin. After they are registered, they can login to the system. If in any case, the admin forgets their password or need to sign up with another account, they can create a new password or sign up for free respectively as shown by the extend relation.

1. Admin/Users Profile Use Case Diagram

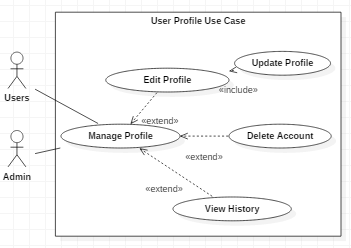


Figure 3 Admin/User Use Case Diagram

Both admin and users can manage their profiles in the system. They can edit their profile details, delete their account as well as view their activity history as shown by the extended relation. To update their profile though, both admin and users compulsorily need to make changes to profile as shown by the include relation.

1. Admin Functionality Use Case Diagram

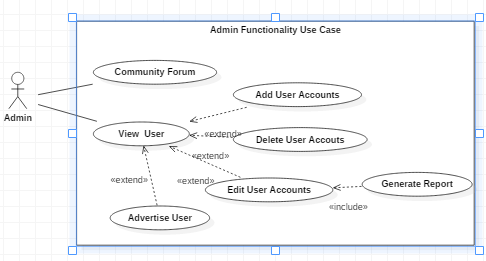


Figure 4 Admin Functionality Use Case Diagram

Admin can participate in the community and view all users. Admin can manipulate users by adding new users, delete user accounts, edit user accounts as well as advertise deserving users as shown by the extended relation below. It is compulsory to edit user accounts in order to generate report which is shown by the include relation.

1. Products Handling Use Case Diagram

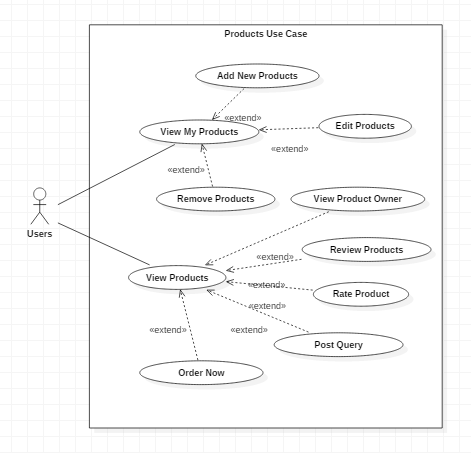


Figure 5 Products Handling Use Case Diagram

Users can either view products that are on sale or view their own products that are for sale. They can add new products, edit their products details as well as remove products based on circumstances as shown by the extended relation. After viewing products that are at sale users can view the product owner profile, review the products, rate the product, post any query and order the product as shown by the extended relation.

1. Product Order Use Case Diagram

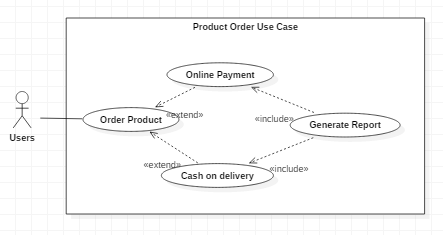


Figure 6 Products Order Use Case Diagram

After users order a certain product, they can either make an online payment or choose to pay can on delivery as per their needs. To generate payment reports it is necessary to perform these as shown by the include relation.

# Natural Language Analysis (NLA)

The process of identifying the different aspects of a system by using an unstructured text that are completely understandable to non-technical people is known Natural Language Analysis. It revolves around an unstructured text where nouns are selected as potential object candidates, verbs are selected as potential candidate methods and adjectives are selected as potential attributes. These three factors later help in the creation of different diagrammatic figures like class diagram, activity diagram, system architecture etc. These diagrams in turn play key roles for development of a system.

To perform Natural Language Analysis, an unstructured text related to the project is required. The scenario for my project is presented in the unstructured text below

Ilam Tea Garden is a project that focuses on the marketing of the local products of Ilam. Dairy products like churpi, lollipop, cheese, ghee and tea leaves of the place is famous all over the country. Statistics shows that Ilam is one of the top tea trading place of the country. Production of these products are usually done by the local farmers and manufacturers. I am creating an information technology for marketing those products.

The system will allow users that includes farmers and manufacturers as product sellers, consumers as product buyers and also an admin to register their details and sign up to create a new account. To login, users are required to insert some of their personal data. Admins will also have the ability to add users if in any case the user lacks proper technologies. If users or admins forgot their password, a feature of creating a new password is provided by the system. Users will be able to manage their account information by bringing changes to their profile. They should be able to edit their profile and update them. For those users who are willing to delete their account to create a new one, the system will have a feature of delete account. Users can also apply for memberships which are granted by the admins following certain criteria. Once the user is into the system, they will have the ability to add new products for sale, view their products list as well as remove added products based on situation. The added products will then appear in the view products list of all users. After viewing the product users can order the product, post queries on the product, review the products, look into the product owner profile and they can also rate the products based on their opinions. An online booking system will also be available for users where they can book their required products to a certain user. Users as well as admins can participate in the online community forum where they can share their views and opinions. Users will only be able to manipulate their account but admins can view all the registered users, edit and delete user account. Admins can also advertise users based on their reviews and ratings which will be visible to more users. Some of the details that will be required for the system to be highly efficient are given below.

* User as well as admin’s name, address location, e-mail and phone number.
* Product name, type, quantity, manufacture date,

From the unstructured text given above **NLA** will be carried out in the following steps.

* Selection of nouns as potential candidate classes
* Selection of adjectives as potential candidate attributes
* Selection of verbs as potential candidate methods

**Step 1 Listing all nouns in the text.**

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