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## 1. Introduction

Many people across the world suffer from hair loss. The most common type of hair loss is androgenetic alopecia, which affects 80% of men and 50% of the women, 16% of men between 18 and 29 have moderate to extensive hair loss, while 53% of those between 40 and 49 experience it (T Rhodes, 1998). For more [click](#)

To address this, "KnowYourHair" is a web application designed to predict an individual's future risk of hair loss based on key inputs such as family history, lifestyle habits, nutrition, and other additional factors. The output includes a personalized prediction indicating the likelihood and timeframe of potential hair loss, along with a risk category (low, medium, or high).

According to the prediction and risk category, prevention tips are provided, such as dietary recommendations for increased nutrient intake, suggestions for better hair care products, and guidance on consulting dermatologists and clinics.

Users can search for and book appointments with dermatologists from multiple clinics directly through the web application, which provides complete information about the clinics and their services. Additionally, "KnowYourHair" also includes a list of hair care products and medications, each with detailed descriptions which the user can purchase for themselves. The web application also offers instructional content about hair health, addressing common myths and providing accurate information. This comprehensive approach ensures that users have access to expert consultations, effective products, and valuable information to support their hair care needs. Users can also register in the system, and agents can also register to add their clinics details and services, including dermatologist information, though these will need to be approved by the admin before being shown to users.



### 1.1. Problem Scenario

In today's world where hair loss is one of the most growing problems even teenage people have been seen hair loss Between 15.5% and 38.5% of adolescents worldwide experience teenage hair loss (wimpoleclinic, 2024).

Hair plays one of the most important roles in every person's life as it is always taken as a first impression, it determines the self-image of an individual and to make accurate interpretations with other people. Click for more details [more](#)

This issue arises because many individuals fail to take proper steps to address hair thinning at an early stage, often spending large amounts of money on unnecessary remedies and supplies that can ultimately worsen the condition. Many only become concerned when it's too late, frequently finding that the only remaining option is a costly hair transplant. If users were aware of their risk of hair loss and informed about the essential nutrients they need to incorporate into their diets, they could take proactive measures to prevent further loss. While genetics play a significant role, maintaining adequate nutrient intake, maintaining lifestyle and regularly consulting with a qualified dermatologist can help mitigate the effects of hair loss.

### 1.2. The Project as a Solution

To address the growing concern of hair loss, which affects individuals from teenagers to the elderly, the "KnowYourHair" web application provides a comprehensive solution. This platform is designed to predict an individual's future risk of hair loss based on key inputs such as family history, lifestyle habits, and different nutrition incorporated in their day-to-day life, and other additional factors. The output includes a personalized prediction indicating the likelihood and timeframe of potential hair loss, along with a risk category (low, medium, or high).

With the help of this web application, users can determine their future probability of hair loss and risk category. For those at high risk, the system offers valuable tips to

address the factors contributing to hair loss. It also highlights the importance of timely consultations with dermatologists by providing suggestions for various clinics, emphasizing that early intervention is crucial for minimizing hair loss. For more click here [now](#)

## 2. Aims and Objectives

### 2.1. Aim

To develop a web application that predicts the individual's risk of future hair fall early and provide them with access to preventive measures, hair care products, professional consultations to reduce the risk of balding and avoid unnecessary expenses and resources wasted on hair loss remedies.

### 2.2. Objectives

#### 1. For predictive analysis,

- I. Use Kaggle to obtain a dataset to work with and implement a predictive model that evaluates the possibility of future hair fall based on user input and data.
- II. Create and incorporate an AI model for predicting future hair fall, which can handle complicated datasets and capture non-linear interactions.

#### 2. User Interactions:

Create a user-friendly web application that allows users to interact with the system.

- I. Create a responsive and intuitive web interface.
- II. Enhance user registration, login, and profile management to provide tailored interactions.

#### 3. Product and Clinic Integration:

Allow users to purchase hair care-related products, search for clinics, and book appointments.

- I. Develop a feature for browsing and purchasing products.
- II. Implement a search and booking system for clinics and doctors to enable users to schedule consultations easily.

#### 4. Admin and Agent Management:

Create functionalities for admin and agents to manage the system's content and user interactions.

- I. Develop admin functionalities for content approval and user management
- II. Implement agent functionalities for adding clinic information and products

### 3. Expected Outcomes and Deliveries:

The web application will serve as a comprehensive platform for the users who are concerned about their hair health and are concerned on going bald , it will assess them with the risk they have on going bald and help them prevent it by providing tips to recommending products which they can buy too and also suggest and allow them to book the best dermatologist clinic for more professional support.

The deliveries are listed below:

- 1) User and Agent Registration: The system will allow both users and agents to register and create accounts within the platform.
- 2) Admin CRUD Operations: The admin will have the ability to perform Create, Read, Update, and Delete (CRUD) operations, managing content and user information effectively.
- 3) Hair Fall Risk Prediction: Users will answer a series of questions related to their lifestyle and other factors, which will be used to predict the risk of future hair loss. The system will display the probability and risk category (low, medium, high).
- 4) Product Purchasing: Users will have access to an online store where they can browse and purchase various hair care products.
- 5) Appointment Booking: Users will be able to book appointments with dermatologists from available clinics, enhancing their access to professional consultation.
- 6) Agent Clinic Management: Agents can add their clinic details and services, but these will only be displayed to users after admin approval.
- 7) Prevention Tips and Consultation Recommendations: If the risk of future hair fall is high, users will receive prevention tips related to diet, lifestyle, and other techniques. The system will also recommend consulting a dermatologist to manage and reduce the risk effectively.

#### 4. Project risks, threats and contingency plans

##### 1. Lack of feedback during development process

Threat: During the development process of the system frequent feedback is required either from the end user or the supervisor to know it is relevant, it is required to understand the expectations and needs of the end user to fulfil the requirement throughout the process.

For contingency plans please refer [Contingency 1](#)

##### 2. Model Bias towards insignificant factors

Threat: While predicting the hair fall risk the model might focus on irrelevant factors which does not add much value and might not much focus on the factors that holds the most value

For contingency plans please refer [Contingency 2](#)

##### 3. Inadequate backup and recovery plans

Threat: Due to sudden data loss or system failure can severely impact project development process and everything might need to be done again which result in time being wasted

For contingency plans please refer [Contingency 3](#)

##### 4. Quality of work being hampered with Health issues

Threat: Long hours working on the project might lead to burn out and many health calamities and it might hamper the quality of the work due to the body and mind being stressed and tired. Our mind could not give us the output we desired, and we might be sick for a few days which will eventually hamper the project schedule

For contingency plans please refer [Contingency 4](#)

## 5. Conflicting academic priorities

Threat: Balancing the project schedule and timeline with other academic responsibilities like other coursework and internship can be challenging and some milestones may not be completed on the time we have scheduled.

For contingency plans please refer [Contingency 5](#)

## 5. Methodology

### 5.1. Considered methodology

During the process to select a proper and suitable methodology to work with many methodologies were considered all are explained and discussed, to dive into the explanation please refer here ([Considered Methodology](#))

### 5.2. Selected methodology

For this project, I have chosen the Agile methodology, specifically utilizing the Scrum framework within Agile. As industries and organizations seek continual growth, Scrum stands out as one of the most popular and well-defined methodologies under Agile.

In contrast to other methodologies like waterfall, which follow a step-by-step hierarchical approach, SCRUM methodology uses sprints, which are goals that are set out over several weeks or months. SCRUM is carried out in various sprints, which are essentially mini projects for larger projects with distinct outcomes. This framework is also suitable for iterative development, and it is flexible and adaptable.

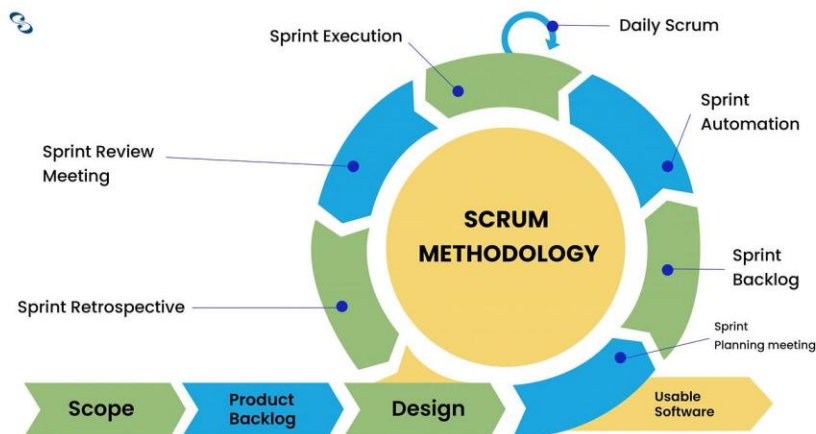


Figure 1: SCRUM methodology

Scrum is chosen for the "KnowYourHair" project because of its incremental approach, which incorporates simplicity, adaptability, and inherent flexibility, as well



as its emphasis on continual improvement. As many challenges and biases of the model may arise, its adaptation to changes and challenges is an important factor for the project to stay on track.

There are several reasons for using Scrum which are explained and discussed, to dive into the explanation please refer [here](#)

## 6. Resource Requirement

For the successful completion of this project, required tools and technologies are:

### 6.1. Hardware Requirement:

Hardware	Specification
Laptop	A laptop with intel i5 10 <sup>th</sup> generation and Nvidia 1650 with 8 GB RAM, 512 GB SSD will be used to complete the project

*Table 1: Hardware requirement*

### 6.2. Software Requirement

Software Specificaiton	Details
Operating System	Windows 11 will be used during the completion of this project
IDE	PyCharm and Google collab will be used for the development process.
Programming Language	Python will be used for the backend and model development, HTML and CSS for styling and structuring web page and JavaScript for additional features.
Framework	Django will be used for the backend task and API services and bootstrap and tailwind will be used for interactive and responsive front-end design.
Database	MySQL or PostgreSQL will be used for data storage retrieval task of the system
Designing and prototyping tools	Balsamiq and Figma are used for wireframe and UI designs, Canva for

	diagram, templates and Draw. Io for flowcharts or any other diagram
Version Control	GitHub is used for managing code and tracking throughout the development cycle
Web Hosting	AWS (Amazon web services) for scalable and reliable web hosting.

*Table 2: Software Requirement*

## 7. Work breakdown structure

The below WBS is a structure where all the components of the projects are divided into many components to make a proper project plan, so the large project is completed within the schedule. It is mainly used to ease the task of completing large projects more efficiently (Gurnov, 2024).

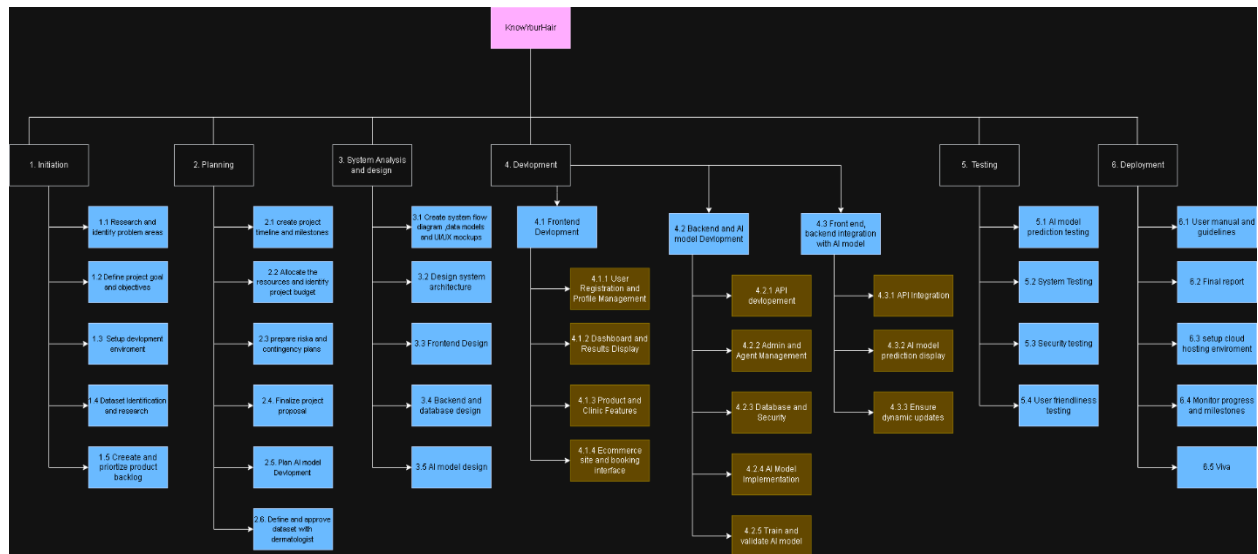


Figure 2: Work Break down structure

## 8. Milestones

Some milestones are shown in the picture below to highlight the important parts in the projects to lead to sustain motivation and for clear direction towards completing the project in time.

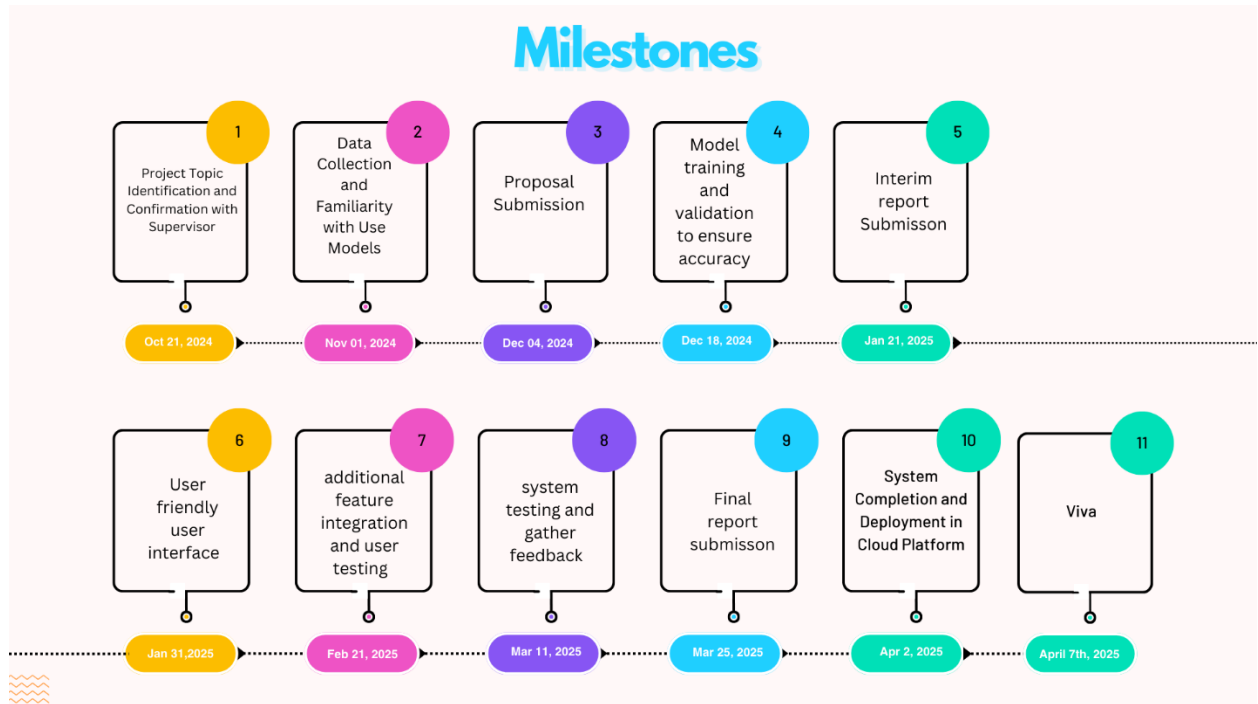


Figure 3: Project Milestones

## 9. Gantt Chart

Following the scrum methodology the project is broken down into different sprints each sprint being 2 weeks long and the frequent reviews and improvement is done, to ensure all the task are done in schedule to ensure proper time management this Gantt chart is created as shown in the picture below.

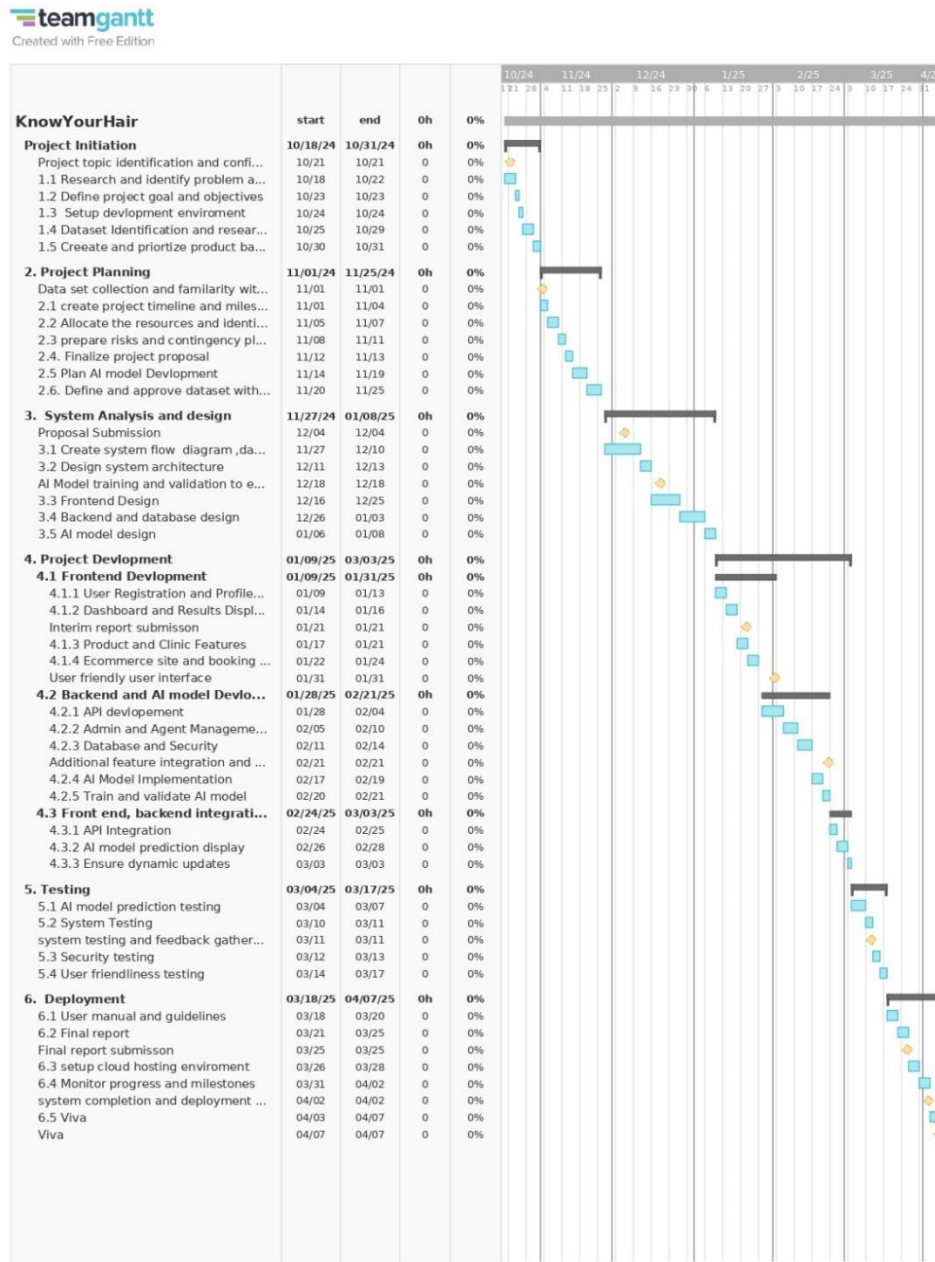


Figure 4: Project Gantt Chart

## 10. Conclusion

The "KnowYourHair" web application aims to provide an effective solution for predicting and managing future hair loss risk and emphasizing the importance of consulting a dermatologist for effective hair loss prevention. By combining predictive analytics, user-friendly design, and integration with hair care products and professional services, the project addresses a significant need for early intervention and informed decision-making.

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## 13. Appendix

### 13.1. Introduction

Approximately 25% of men with hereditary hair loss experience thinning hair before the age of 21.66% of men aged 35 will have experienced some degree of hair loss. 85% of men at 50 will have significantly thinner hair (American Hair Loss Association, 2024).100% of men over 80 will likely experience hair loss, according to a study conducted among Singaporean men.

Deficits in critical nutrients such as protein, iron, zinc, and vitamins can all contribute to hair loss. Identifying and treating hair loss early on can help manage or even reverse the problem with proper care.

### 13.2. Problem Scenario

Over 70% of men has agreed that hair is and has been the most important aspect of their image on how people see them in a first impression. 62% believe that it affects their self-esteem and always lose their confidence which makes them unhappy and unsatisfied with themselves. 43% men believe and linked hair loss has been a key factor of them losing their attractiveness which decreases their confidence in dating. 42% men fear that they will soon be bald and wear cap all the time. 37% worries about aging quickly and loses their self-esteem too, and 22% puts a negative impact on their social lives by cutting off all the social contact with everyone by feeling insecure and 21% starts feeling of depression which is quite scary (Mariola Alfonso, 2005).

“As soon as you notice you are losing hair, make an appointment with a health care practitioner, like a dermatologist,” advised Dr. Reid Maclellan, the founder and CEO of Cortina Health, and adjunct professor of plastic surgery at Harvard Medical School in Boston, MA (Kingsland, 2022).

### 13.3. Project as a solution

Since hair loss can significantly impact individuals both mentally and physically, the system aims to reduce risk through preventive measures. It offers diet plans to boost essential nutrients, suggests healthy lifestyle changes, and provides access to various hair care products. Users can purchase these products directly through the platform, helping them adopt effective solutions and avoid factors that negatively affect their hair.

Scientists have linked hair loss to deficiencies in key nutrients, including protein, iron, zinc, vitamin B3, fatty acids, selenium, vitamin D, and biotin. Low levels of these nutrients can adversely affect hair growth and health, which is why this system suggests proper diets and encourages a healthy lifestyle (Hind M. Almohanna, 2019).

### 13.4. Contingency plans

#### 13.4.1. Contingency 1

- 1) Online survey and beta testing
- 2) Schedule regular checkup with the end user and supervisors during each sprint

#### 13.4.2. Contingency 2

- 1) Update the model with new data as due to insufficient factors that might be the case
- 2) Regularly review the prediction score.

#### 13.4.3. Contingency 3

- 1) Regularly backup all the files in the external drives or cloud storage

- 2) Use version control system like GitHub to prevent from data loss

#### 13.4.4. Contingency 4

- 1) Following balanced schedule and not trying to complete everything in one go
- 2) Following proper nutrition and practicing good ergonomics.

#### 13.4.5. Contingency 5

- 1) Prioritize the task based on the deadlines which are closer, and which need to be more focused on.

### 13.5. Considered Methodology

#### 13.5.1. Waterfall methodology

Waterfall methodology is a linear sequential approach which is one of the old school methodology approach, other methodologies like agile is flexible methodologies but waterfall cascades downwards sequentially in 5 stages and without completing any of the stages first we cannot move to the next stage.

The 5 stages of waterfall methodology are:

##### 1. Requirements

In this stage the entire project requirement is specified, and the project scope is also determined from business obligations to what the user needs or what is trend in the market. What the system should do and what are all the things required to fulfil all the criteria is discussed in this stage. What are the resources required in the project what are all the team members responsible for all are discussed

##### 2. Design

After all the requirements are gathered and all the factors in the requirement stage is fulfilled then only this step is reached. In this stage according to the requirements gathered the designers develop solution to fulfill all the requirements, the outcome they are expected the deliveries are provided by the designers to for example the design of the deliveries is provided to meet the requirements.

##### 3. Implementation

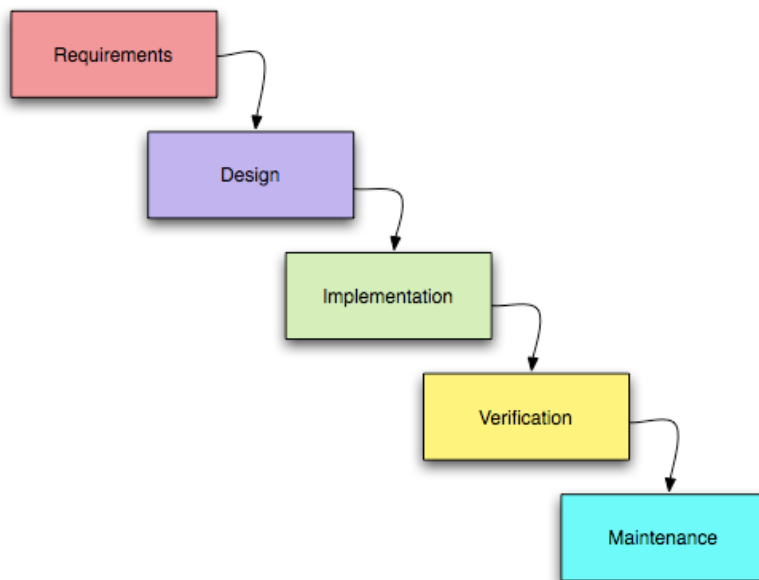
After the designs done in the design stage is approved then implementation stage is reached, the developer of the team starts with the implementation and starts to develop if for example some design made in the design stage is not applicable or cannot be implemented then the stage again goes back the designers again repeat the process until and unless the implementation can be done.

##### 4. Verification

After the implementation by the developers are done than the Quality assurance verifies the work done by the developers to check all the minute to advance detail to not release any bug or glitches to the end user, if any bugs are found they document it which are needed to be fixed

## 5. Maintenance

After all the stages the product is deployed but it does not mean everything is over than the maintenance stage comes where the released product frequent maintenance is done to address if there is any bugs, glitches or error is found so that the team re-release with better manner.



*Figure 5: Waterfall methodology*

### 13.5.2. Prototype methodology

Prototype methodology is creating an early working model to gather feedback from and later build a final version fulfilling all the criteria. The feedback gathered

throughout the process are collected from the stakeholders and end user and the necessary changes are implemented and the product is made as per the requirements, it is also very useful to check the feasibility of the product and its all the functionalities. This method is mainly used when the exact details or the exact requirements is unknown, so the necessary requirements is gathered throughout the methodology process (indeed, 2024).

Prototype methodology is done in 5 phases:

1. Initial Requirement gathering and analysis

The first and foremost stage of the prototype methodology here the market research is done by the team with the stake holders and with the end user to know what the market trend is and what people are more interested in, then the necessary requirements are gathered and moved into other stages.

2. Prototype Development

With the available data a quick design is made and a basic prototype according to the requirements prototype is build, it is a working model and then it is presented with the stakeholders and end users to receive more feedback to make it better

3. User / stakeholders evaluation

Here the end user and the stakeholders evaluate the working prototype model of the system and here it is evaluated and all the changes needed is given with the necessary feedback for the product, the pros and cons of the product is highlighted here which the developer can use to improve the prototype.

4. Prototype refinement

In here after the developer gathers all the information and the feedback, they refine the prototype and this process and repeated many times until and unless the stakeholders and the end user are satisfied.

5. Final product development and deployment

After the modification is done and the stakeholders and the users approve the final product is developed and ready to be deployed, then the final product is deployed and is maintained by the team to address any bug or errors and fix it.

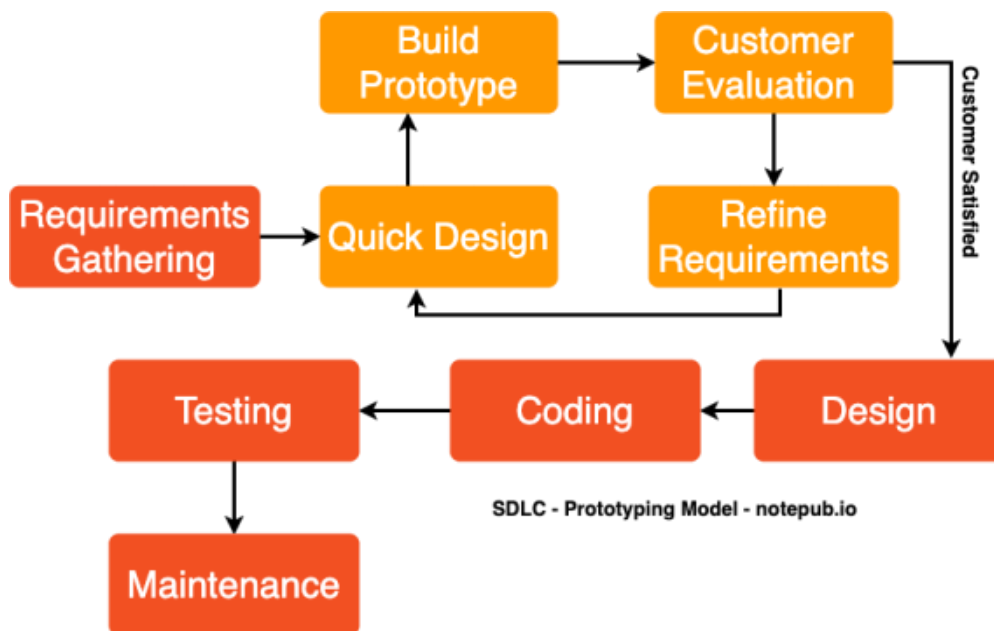


Figure 6: Prototyping Methodology

### 13.5.3. Kanban methodology

Kanban is one of the agile methodology which is one of the powerful to to manage several large or small work efficiently and to It is like a board or card which is mainly done to visualize the work in the working environment to maximize the efficiency and productivity in the team and help to prevent overloading and improve the team performance continuously, each task is moved from left to right

Some key components in the kanban board are:

1. Backlog - The tasks that are yet to be started by the team are kept here.



2. On hold - The tasks which need to be done and ready to be worked on are kept here.
3. In progress - The task that the team is currently working on is kept here.
4. Review - The tasks that are completed and that need to be reviewed or verified are kept here.
5. Done - The tasks which are completely completed are kept here.

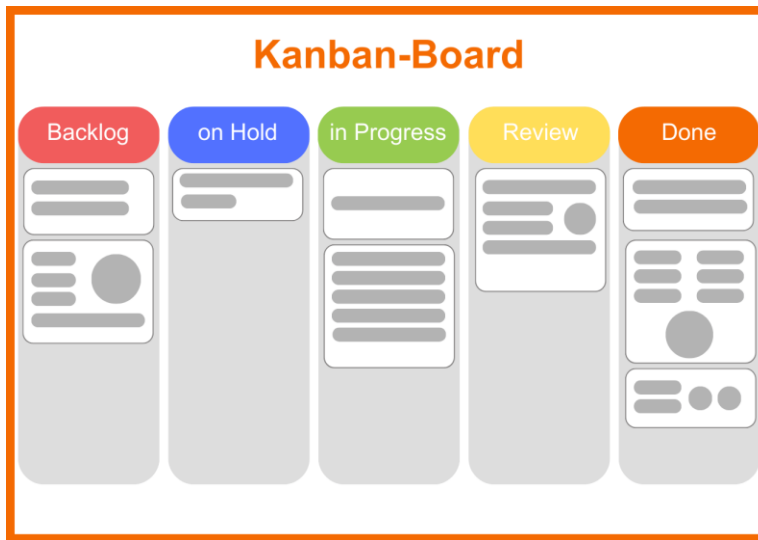


Figure 7: KanBan methodology

#### 13.5.4. Incremental methodology

In Incremental methodology the project which is normally larger due to various features it is broken down into Small manageable increments and the project is worked on one by one rather than all at once, it is developed, tested, and released independently and overtime all these increments are integrated together to form a complete system. With this methodology the web application can be deployed early with features being added slowly and slowly.

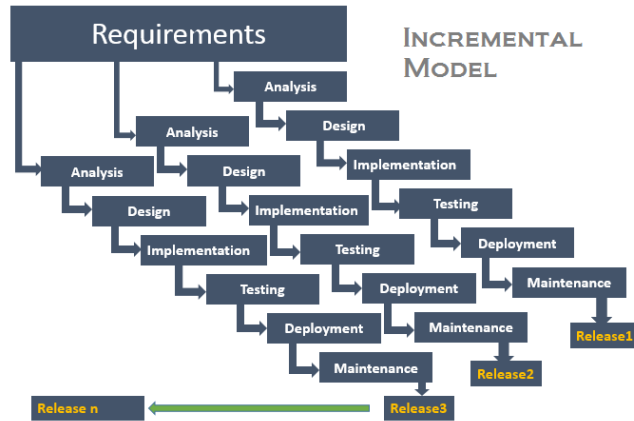


Figure 8: Incremental Methodology

### 13.6. Selected methodology

The main reasons to choose Scrum methodology as the go to methodology for “KnowYourHair”

#### 1. Iterative Development for Complex Features

1. The iterative approach to development divides the project into small sprints, allowing for incremental progress while staying on schedule. This incremental progress helps build features and improve accuracy over time.

#### 2. Prioritizing the product backlog.

1. The product backlog prioritizes crucial functionalities, such as risk prediction and prevention suggestions, to ensure timely completion of the most important outcomes.
2. Future sprints can include other elements such as clinic advice, preventative tips, and an ecommerce site.

#### 3. Provide frequent feedback for continued improvement.

1. After each sprint, gather input from end users and supervisors to assess the model's prediction accuracy.
  - a. Evaluate product recommendations for their relevance and usefulness.

- b. Effectiveness of clinic and prevention tips for hair health.
- 2. Use feedback to increase user satisfaction and system accuracy.
- 4. Adaptability to changing requirements.
  - 1. Adapts easily to new data, user needs, and supervisor-requested adjustments.
  - 2. Consider suggestions from supervisors, such as adding new features without affecting existing ones.
- 5. Regular Progress Reviews.
  - 1. Conduct end-of-sprint reviews and set goals for future sprints. Monitor progress on prediction, recommendations, and prevention tips with end users and supervisor.
  - 2. Adjust sprint goals based on feedback to identify and address issues early on.