

Project Report
TEAM ID: PNT2022TMID04321

- 1. INTRODUCTION**
 - 1.1 Project Overview
 - 1.2 Purpose
- 2. LITERATURE SURVEY**
 - 2.1 Existing problem
 - 2.2 References
 - 2.3 Problem Statement Definition
- 3. IDEATION & PROPOSED SOLUTION**
 - 3.1 Empathy Map Canvas
 - 3.2 Ideation & Brainstorming
 - 3.3 Proposed Solution
 - 3.4 Problem Solution fit
- 4. REQUIREMENT ANALYSIS**
 - 4.1 Functional requirement
 - 4.2 Non-Functional requirements
- 5. PROJECT DESIGN**
 - 5.1 Data Flow Diagrams
 - 5.2 Solution & Technical Architecture
 - 5.3 User Stories
- 6. PROJECT PLANNING & SCHEDULING**
 - 6.1 Sprint Planning & Estimation
 - 6.2 Sprint Delivery Schedule
 - 6.3 Reports from JIRA
- 7. CODING & SOLUTIONING (Explain the features added in the project along with code)**
 - 7.1 Feature 1
 - 7.2 Feature 2
 - 7.3 Database Schema (if Applicable)
- 8. TESTING**
 - 8.1 Test Cases
 - 8.2 User Acceptance Testing
- 9. RESULTS**
 - 9.1 Performance Metrics
- 10. ADVANTAGES & DISADVANTAGES**
- 11. CONCLUSION**
- 12. FUTURE SCOPE**
- 13. APPENDIX**
 - Source Code
 - GitHub & Project Demo Link

1.INTRODUCTION

1.1 PROJECT OVERVIEW

Recent Covid-19 pandemic has raised alarms over one of the most overlooked areas to focus:Healthcare Management,while healthcare management has various usecases for using data science,patient length of stay is one of the critical parameter to observe and predict if one wants to improve the efficiency of the healthcare management in a hospital

This parameter helps hospitals to identify patients of high LOS-risk (patients who will stay longer) at the time of admission. Once identified, patients with high LOS risk can have their treatment plan optimized to minimize LOS and lower the chance of staff/visitor infection. Also, prior knowledge of LOS can aid in logistics such as room and bed allocation planning.

1.2 PURPOSE

The purpose is to accurately predict the Length of Stay for each patient on case by case basis so that the Hospitals can use this information for optimal resource allocation and better functioning. The length of stay is divided into 11 different classes ranging from 0-10 days to more than 100 days.



2.LITERATURE SURVRY

2.1 EXISTING PROBLEM

Due to lack of effective data governance procedures,capturing data is one of the biggest obstacles for healthcare organizations .To use data more efficient,it must be clean, presize, correctly formatted do that it can be used across various healthcare systems.The challenges of data analytics are how the amount of data being collected,collecing meaningfull and real-time data,visual representation of data,data from multiple sources.

2.2 REFERENCES

AUTHOR NAME: Viceconti
YEAR OF PUBLISHING: 2015:-

AUTHOR NAME: Prop. Nagarathna Kulennavar, Priyanka.K.
YEAR OF PUBLISHING: 2014.

AUTHOR NAME: Ritu, Rajesh et al.
YEAR OF PUBLISHING: 2017

AUTHOR NAME: V.S. Tseng
YEAR OF PUBLISHING: 2017

2.3 PROBLEM STATEMENT DEFINITION

1. DESCRIPTION:-

The various huge and complicated data sets that are challenging to analyse and manage with conventional software or hardware are referred to as "big data" in the healthcare and medical fields. Data integration, data quality assurance, analysis, modelling, interpretation, and validation are all included in big data analytics. Utilizing big data analytics allows for thorough knowledge discovery from the vast amount of data that is now available. The integration, exploration, and analysis of massive amounts of complicated heterogeneous data with many types, including biological data, experimental data, electronic health record data, and social media data, is a very promising procedure in medicine and healthcare. Big data analytics integrate a number of domains, including bioinformatics, medical imaging, sensor informatics, medical informatics, medical informatics, health informatics, and computational biomedicine.

2. DESCRIPTION:-

BA The robust model put forth by Ritu, Rajesh, and others has to be improved because it takes massive data into account. Additionally, it can jeopardise data security and privacy and reduce the consistency and processing of big data. The main benefit of predictive data analytics comprises the phase of disease recognition as well as the evaluation and effective treatment of the diseases. However, there is still a necessity for future work to get more efficient results in the medical arena. To share information among laboratories, hospital networks, clinical centres, and other players, the dispersed system needs to be organised. For instance, the Laboratory Investigation System may interface with biomedical devices that are HL7 or DICOM compatible.

3. DESCRIPTION:-

Ritu, Rajesh, and colleagues' robust model should be improved because large data is now included in the model. Additionally, it can jeopardise data security and privacy and reduce the consistency and processing of big data. The main benefit of predictive data analytics comprises the phase of disease recognition as well as the evaluation and effective treatment of the diseases. However, there is still a necessity for future work to get more efficient results in the medical arena. To share information among laboratories, hospital networks, clinical centres, and other players, the dispersed system needs to be organised. For instance, the Laboratory Investigation System may interface with biomedical devices that are HL7 or DICOM compatible. Security solutions should guarantee protection for analytics and Big Data Frameworks.

4. DESCRIPTION:-

The focus now is on designing and delivering digital health services that, by utilising real-time data, enable integrated and effective governance. This is made possible by the rapid deployment of new emergency equipment, including wireless communications, mobile computers, and mobile devices. The clinical team's decisions will be supported by the progressive adoption of cutting-edge digital solutions, which will also free up time for the most beneficial clinical tasks and the care of the most difficult situations. In addition to their immense promise in the fight against infectious diseases, BD and AI can also be applied to the quick development of pharmaceuticals and vaccines. Assistance procedures are reimaged from a digital standpoint and enable BDA and cutting-edge technology-based decision-making.

3. IDEATION AND PROPOSED SOLUTION

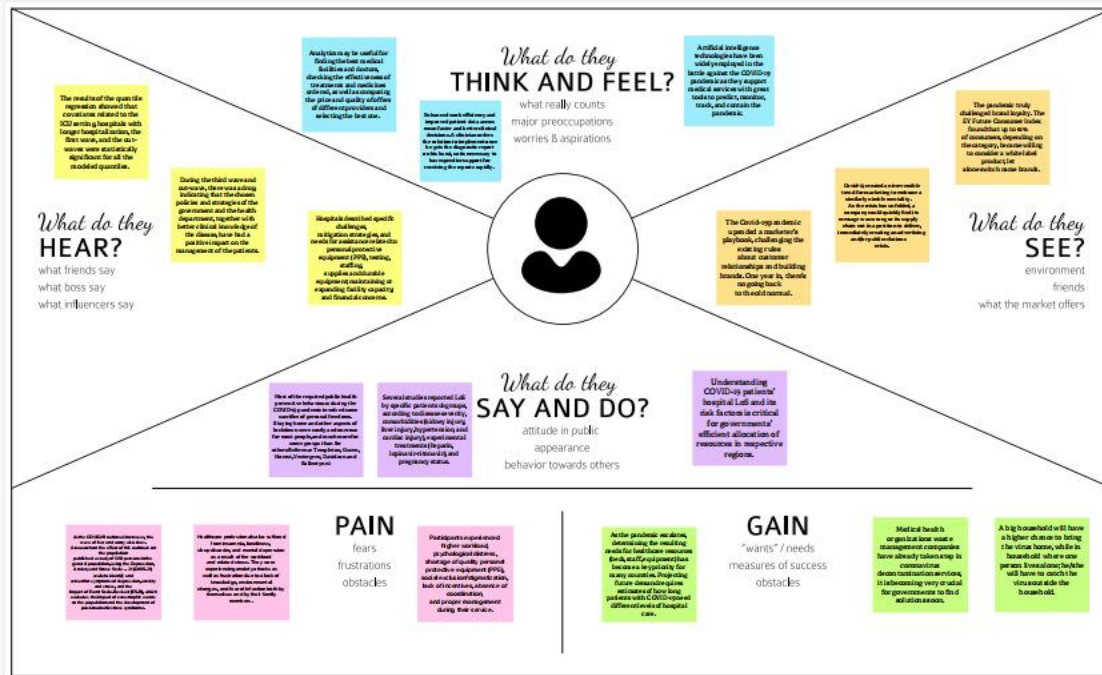
3.1 EMPATHY MAP CANVAS

Empathy Map Canvas

Gain insight and understanding on solving customer problems.

1

Build empathy and keep your focus on the user by putting yourself in their shoes.




3.2 IDEATION AND BRAINSTROMING

Brainstorm & Idea Prioritization :

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.




Step-1: Team Gathering, Collaboration and Select the Problem Statement.

Template




Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.


 10 minutes to prepare
 1 hour to collaborate
 2-8 people recommended


[Share template feedback](#)




Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.


 10 minutes

 **Team gathering**


Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.


 **Set the goal**

Think about the problem you'll be focusing on solving in the brainstorming session.

 **Learn how to use the facilitation tools**


Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) 




Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

 5 minutes


Recent Covid-19 Pandemic has raised alarms over one of the most overlooked areas to focus: Healthcare Management


Patient duration of stay is one crucial statistic to monitor and forecast if one wishes to increase the effectiveness of healthcare management in a hospital, even if there are many use cases for data science in healthcare management. At the time of admission, this metric aids hospitals in identifying patients who are at high LOS-risk (patients who will stay longer). Once identified, patients at high risk for LOS can have their care plans adjusted to reduce LOS and reduce the risk of infection in self or visitors. Additionally, prior awareness of LOS might help with planning logistics like room and bed allotment. Let's say Health Man has hired you as a data scientist.





Key rules of brainstorming


To run an smooth and productive session


 Stay in topic.

 Defer judgment.

 Go for volume.

 Encourage wild ideas.

 Listen to others.

 If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping

3

Group ideas

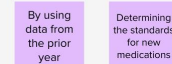
Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes

LOS Prediction



Improving Performance



TIP



Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Management



Target



Safety Measures



2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

 10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!



Archana S

Accurate knowledge of the variables influencing LOS and ongoing advancements in processing and monitoring may enable more effective control of the LOS of inpatients.

Machine learning algorithms can be used to optimize the patient's length of stay. To prevent the various causes of the length of stay, it is important to have a clear understanding of the factors that influence it. In addition, the dashboard can be used to monitor the LOS of inpatients.

The patient's average length of stay (ALOS) is a key performance indicator (KPI) for the hospital. The dashboard can be used to monitor the ALOS and to identify the factors that influence it. The dashboard can also be used to monitor the LOS of inpatients.

The dashboard can be used to monitor the LOS of inpatients. The dashboard can be used to monitor the LOS of inpatients. The dashboard can be used to monitor the LOS of inpatients.

Boomika E B B

Display the various Length of Stay ranges according to the type of sickness.

Determine the duration of the stay using machine learning techniques

Show the length of stay in relation to the disease's severity.

The dashboard, which shows the length of stay, may be made using IBM Cognos Analytics.

Harisudhan S

Information gathering to improve learning and development

Optimizing Organization Management

Ensure that the area where you are living is clean.

Enhancing the requirements from the hospital management side

Ashok R

The pre-processing methods can be enhanced to acquire high precision

Significant correlations were found between a number of factors and the length of stay (LOS), including facility, discharge status, time, frequency of operations, frequency of diagnosis, severity, and grade, and insurance type.

The dataset is cleaned and shown before a prediction model is created using ensemble algorithms made up of several decision trees.

Patient's Length of Stay (LOS) can be predicted by taking into account key variables including disease type, age, and severity.

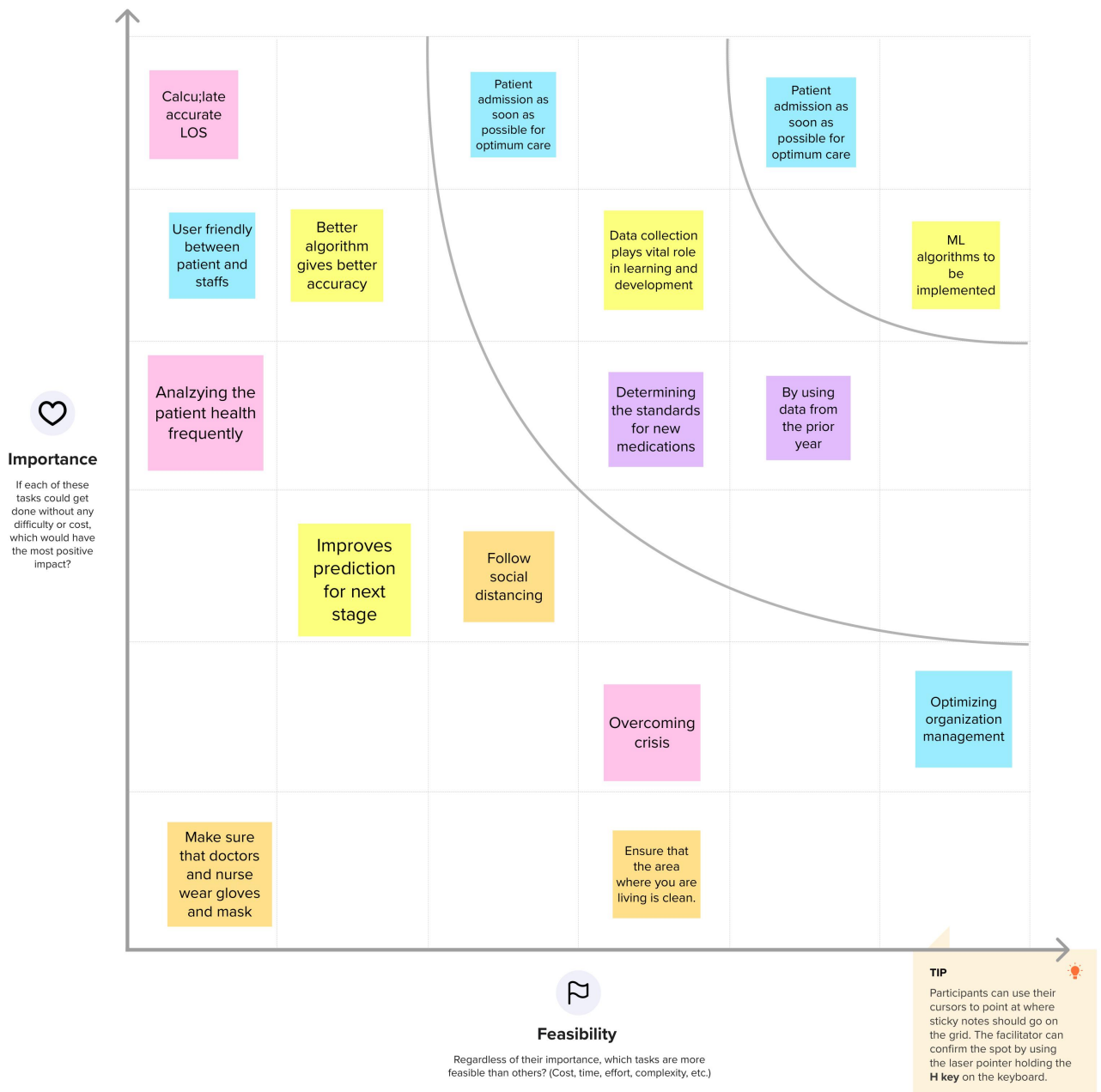
Step-3: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes



3.3 PROPOSED SOLUTION

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

Sl.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To precisely determine the patient's length of hospital stay
2.	Idea / Solution description	Gather patient data from medical facilities Examining the specifics of the patient's documents Create a Cognos Analytics dashboard to show patient data
3.	Novelty / Uniqueness	Accurate understanding of the factors associating with the LOS and progressive improvements in processing and monitoring may allow more efficient management of the LOS of inpatients.
4.	Social Impact / Customer Satisfaction	A shorter LOS reduces the risk of acquiring staph infections and other healthcare-related conditions, frees up vital bed spaces, and cuts overall medical expenses.
5.	Business Model (Revenue Model)	The length of stay (LOS) is an important indicator of the efficiency of hospital management. Reduction in the number of inpatient days results in decreased risk of infection and medication side effects, improvement in the quality of treatment, and increased hospital profit with more efficient bed management.
6.	Scalability of the Solution	Remote patient monitoring systems enabling effective distance treatment. Patient portals that allow people to better manage their health themselves;

3.4 PROBLEM SOLUTION FIT

Problem-Solution Fit canvas

Purpose / Vision

Version:

Explore AS, differentiate

Focus on PR, tap into BE, understand RC

Extract online & offline CH of BE

Define CS, fit into CL	1. CUSTOMER SEGMENT(S) CS Hospitals, Health Care Centers, Nursing Home, Clinics	6. CUSTOMER LIMITATIONS CL <small>EG. BUDGET, DEVICES</small> --Information to access the developing solution --Only highly confidential individuals are permitted access	5. AVAILABLE SOLUTIONS AS <small>PROS & CONS</small> Predicting the patient's LOS using basic Machine Learning techniques and with fairly Tess accuracy is the accessible solution.
	2. PROBLEMS / PAINS + ITS FREQUENCY PR Unpredictability of Resources 5-Often Lack of Proper Management System 3-Sometimes Lack of Customer Satisfaction 1-Rare	9. PROBLEM ROOT / CAUSE RC Unexpected Conditions like Covid Lack of Management of Resources Intension of Caring Patients	7. BEHAVIOR + ITS INTENSITY BE More Employee to manage system 5 Increase the number of available Resources 4
Identify strong TR & EM	3. TRIGGERS TO ACT TR When customers got informative ideas regarding the system and understanding the helplines: of highly pandemic situation like Covid.	10. YOUR SOLUTION SL Patients' length of stay (LOS) is influenced by several important variables, including age, disease type, and degree of severity. The most crucial information from the dataset is pre-processed first. The dataset is then analysed and visualised, and a prediction model is created using ensemble algorithms, which use numerous decision trees.	8. CHANNELS of BEHAVIOR CH ONLINE More Employee to manage system
	4. EMOTIONS EM <small>BEFORE / AFTER</small> Before - Frustration to manage resources After - Ease in Management		 OFFLINE 1. More Employee to manage system 2. Increase the number of available resources

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Undertaking various Registration	HMS is able to facilitate various Registration to enter the details of patients.
FR-4	Visualizing Data	User can visualize Departments, ward types, bed availability, city id, remaining rooms available through Dashboard created using IBM cognos Analytics.

FR-5	Check Out	The HMS helps facilities in ensuring all formalities and commitments using unique ID.
FR-6	Generating report	User can view his/her health report and can make Decisions accordingly.

4.2 NON FUNCTIONAL REQUIREMENTS

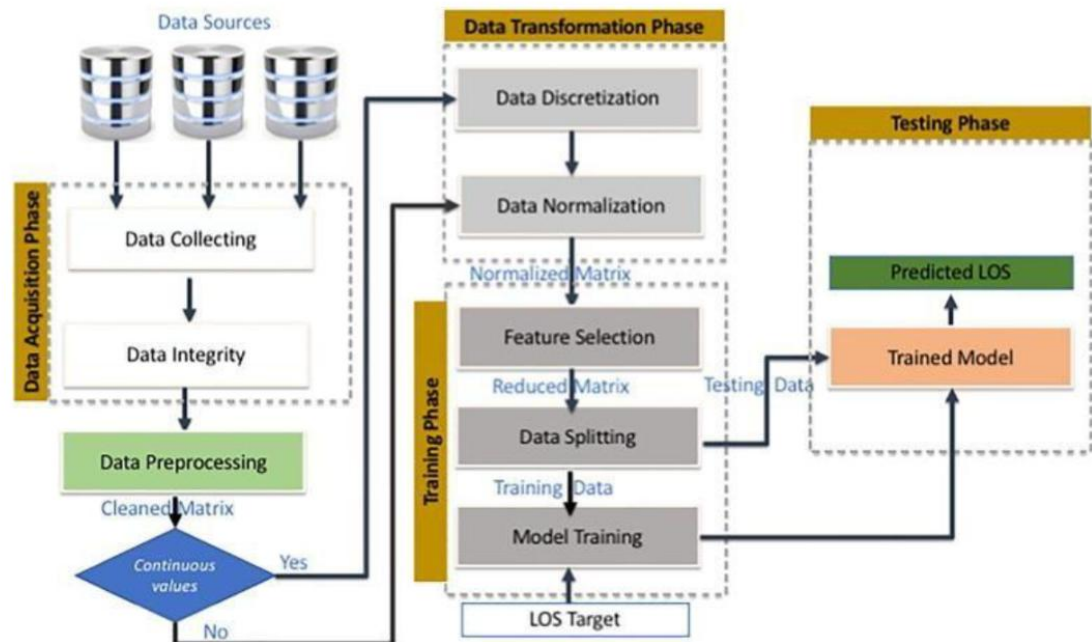
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The application will have a simple and user friendly graphical interface. User will be able to understand and use all the features of the application easily. Any action has to be performed with just a few clicks.
NFR-2	Security	For security of the application the technique known as database replication should be used so that all the important data should be kept safe. In case of crash the system should be able to backup and recover the data.
NFR-3	Reliability	The application has to be consistent at every scenario and has to work without failure in any environment.
NFR-4	Performance	Performance of the application depends on the response time and the speed of the data submission. The response time of the application is direct and faster which depends on the efficiency of the implemented algorithm.
NFR-5	Availability	The application has to be available 24x7 for users without any interruption.
NFR-6	Scalability	The application can withstand the increase in the number of users and has to be able to develop higher versions.

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

Data Flow Diagrams:



5.2 SOLUTION AND TECHNICAL ARCHITECTURE

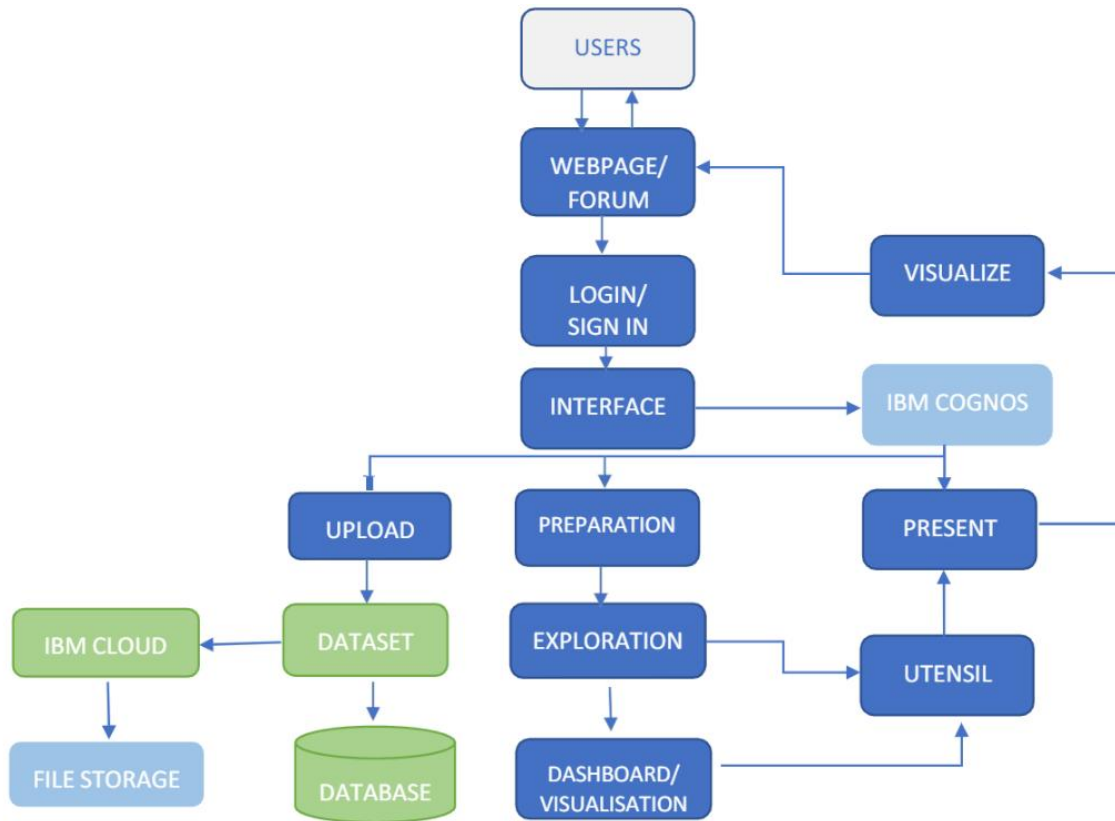


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Dashboard Logic-1	Logic for a process in the dashboard	IBM Cognos Analytics
3.	Dashboard Logic-2	Logic for a process in the dashboard	MS Excel
4.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
5.	Cloud Database	Database Service on Cloud	IBM Cloudant
6.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
7.	Uploading and visualization data	Using exploration and visualization	IBM Cognos Analytics

Table 2 : Application characteristics

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	The dashboard Framework is used to see the Length Of Stay of patient and all the hospital details and through the visualization of data the user can easily understand and it is user friendly	IBM Cognos
2.	Security Implementations	Industry level security will be provided	IAM Controls
S.No	Characteristics	Description	Technology
3.	Scalable Architecture	The workload may change and the user requirement may change and the architecture of the dashboard is designed in such a way that it can even handle the more workload	IBM Cognos
4.	Availability	The user can view the upto date information and also the dashboard available all the time . It will be useful for the user to get the information.	IBM Cognos
5.	Performance	The dashboard quickly response to the user commands and it is user friendly	IBM Cognos

5.3 USER STORIES

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	HIV/AIDS Risk Smart Form for Data Entry	USN-1	As a Clinician , I need to review , consolidate and update HIV/AIDS Risk Form. So that I can Determine the patient's risk of HIV/AIDS(risk category), and ensure proper remedy accordingly.	I can access patient record or data accurately	High	Sprint-1
	BPA to prompt ordering HIV/AIDS on Admission	USN-2	As an Inpatient, I want to be prompted to order HIV/AIDS on admission.so that I remember to place my patient on AIDS	Maintain the record for correct preference.	High	Sprint-1
	HIV/AIDS dynamic order group in Admit order sets	USN-3	As an inpatient , I want to view only risk-appropriate HIV/AIDS options in Admission order sets So that I can ensure my patient is getting optimal HIV/AIDS prophylaxis.		Low	Sprint-2
		USN-4	As a user, I can access the data in visualise mode.		Medium	Sprint-1
	Dashboard	USN-5	As a user, I can access the data from the queries,graph ,pie char		High	Sprint-1
Customer (Web user)			Get the older information from the hospitals			
Customer Care Executive			Have data in graph modes		Medium	
Administrator			Access in cloud easily		Medium	

6. PROJECT PLANNING AND SHEDULING

6.1 PROJECT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team members
Sprint-1	Registration	USN-1	As a user, I can register for the dashboard by entering my email, and password, and confirming my password.	10	High	Archana S
Sprint-1		USN-2	As a user, I will receive a confirmation email once I have registered for the dashboard	10	High	Boomika E B B
Sprint-2		USN-3	As a user, I can register for the dashboard through social media	8	Low	Harisudhan S

Sprint-2		USN-4	As a user, I can register for the dashboard through Gmail	8	Medium	Ashok R
Sprint-2	Login	USN-5	As a user, I can log into the application by entering email & password	4	High	Archana S
Sprint-3	Dashboard	USN-6	As a user, I can use my account in my dashboard for uploading dataset.	8	Medium	Boomika E B B
Sprint-3	Website	USN-7	As a user, I can use my dashboard in website	5	Medium	Harisudhan S
Sprint-3		USN-8	As a user, I can contact Customer care Executive for my login.	2	High	Ashok R
Sprint-3		USN-9	As a user, I can contact administrator for my queries.	5	High	Archana S
Sprint-4	Dashboard	USN-10	As a user, I can prepare data by using Exploration Techniques.	4	High	Boomika E B B
Sprint-4	Dashboard	USN-11	As a user, I can Present data in my dashboard.	8	High	Harisudhan S
Sprint-4	Dashboard	USN-12	As a user, I can Prepare Data by using Visualization Techniques.	8	High	Ashok R

1.3 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

4.3 REPORTS FROM JIRA



7. CODING AND SOLUTIONING

7.1 FEATURE 1

Login using HTML

Features of HTML:

- User Friendly & Simple.
- Semantic Structure.
- SEO – Search Engine Optimisation.
- localStorage & IndexedDB – Client-side data storage.
- Offline Capabilities (PWA) with Cache API & Service Workers.
- Canvas for Game Development.
- Platform Independent.
- Media Support.

PYTHON:

- It's Simple.
- It's Free.
- It's Easy to Use.
- It's Highly Compatible.
- It is Object-Oriented.
- It has Lots of Libraries.
- It has Built-in Data Structures.
- It's Widely Applicable.

ANACONDA:

- It is free and open-source.
- It has more than 1500 Python/R data science packages. Anaconda simplifies package management and deployment.
- It has tools to easily collect data from sources using machine learning and AI.

JUPYTER

Advantages:

- Exploratory data analysis.
- Feature engineering.
- Model comparison.
- Final model.