ANALYTICS FOR HOSPITAL HEALTH CARE

NALAIYA THIRAN PROJECT BASED LEARNING

On

PROFESSIONAL READINESS FOR INNOVATION,EMPLOYABILITY

AND   ENTREPRENEURSHIP

UNDER THE GUIDANCE OF

Industry Mentor(s) Name : Shivam Shivare, Hari Prabu

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Submitted By

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COMPUTER SCIENCE AND ENGINEERING

IMAYAM COLLEGE OF ENGINEERING

TRICHY - 621206

Project Report Format

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PROJECT REPORT

1.INTRODUCTION:

1.1 PROJECT OVERVIEW:

➢ Data analytics in clinical settings attempts to reduce patient wait times via improved scheduling and staffing, give patients more options.

➢ when scheduling appointments and receiving treatment, and reduce readmission rates by using population health data to predict which patients are at greatest risk.

1.2 PURPOSE:

➢ This is the purpose of healthcare data analysis: Access to healthcare has become one of the defining issues of our time. While in many countries the fundamental challenge is how to provide basic healthcare services and deliver essential vaccinations, in the United States healthcare has become a political football where Congressional leaders fight about who should get health insurance and who should pay for it.

2. LITERATURE SURVEY:

➢ **Data analytics in healthcare**

Healthcare is a multi-dimensional system established with the sole aim for the prevention, diagnosis, and treatment of health-related issues or impairments in human beings. The combined pool of data from healthcare organizations and biomedical researchers has resulted in a better outlook, determination, and treatment of various diseases. This has also helped in building a better and healthier personalized healthcare framework. Modern healthcare fraternity has realized the potential of big data and therefore, have implemented big data analytics in healthcare and clinical practices.

➢ **Electronic Health Records in Chiropractic Practice**

The purpose of this study was to review the literature on current challenges and propose solutions for the optimal utilization of the electronic health records (EHRs) in chiropractic practice.

> **Systematic review of clinical prediction models to support the diagnosis of asthma in primary care**

Diagnosing asthma is challenging. Misdiagnosis can lead to untreated symptoms, incorrect treatment and avoidable deaths. The best combination of clinical features and tests to achieve a diagnosis of asthma is unclear. As asthma is usually diagnosed in non-specialist settings, a clinical prediction model to aid the assessment of the probability of asthma in primary care may improve diagnostic accuracy. We aimed to identify and describe existing prediction models to support the diagnosis of asthma in children and adults in primary care.

2.1 REFERENCES:

> J Big Data Volume - 6, 19th June 2019.

> Common Challenges and Solutions, Journal of Chiropractic Humanities, Volume 24, Issue 1, 5th 2017, ISSN 1556-3499.

> Big data analytics for drug discovery,IEEE International Conference on Bioinformatics and Biomedicine, September 2013

> NPJ primary care respiratory medicine vol. 29. 9th May 2019

2.3.Problem Statement Definition:

- Patient who wants to be evaluated correctly so that he can recover completely
- Patients want a way to find out their disease priorly so that they can get treatment and recover quickly.
- Patients want a way to visualize their medical records so that they can understand easily.
- Patients want a way to check their health status so that they can control their food habits.
- Patients want a way to know their health condition without a doctor so that they can know if something is wrong.
- Patients want to realtime deliver alerts to healthcare providers by analyzing health data

3.1 EMPATHY MAP CANVAS:

> An empathy map is a tool which aids in understanding another person's perspective.
> Empathy maps have up until now not been used in a medical education setting.

> To assess the attitudes towards, applicability and usefulness of empathy maps as part of medical student's communication skills training
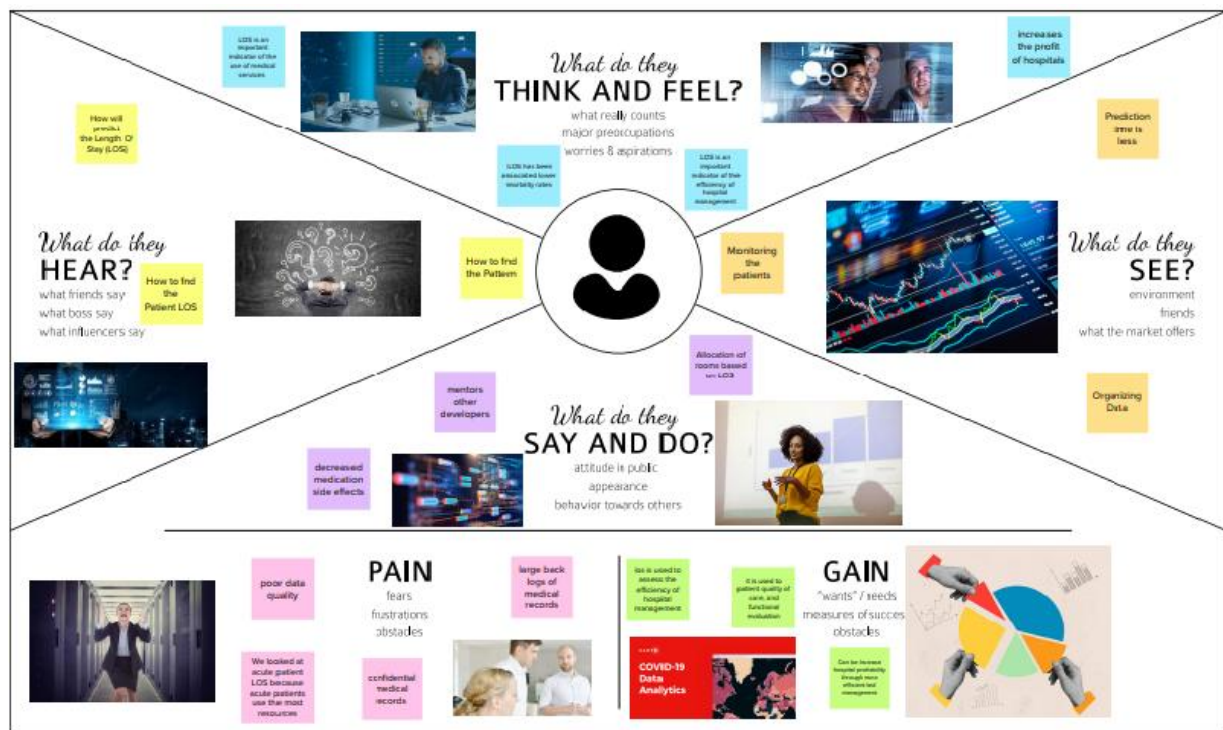
3.2 IDEATION & BRAINSTORMING:

> To try to solve a problem or come up with new ideas by having a discussion that includes all members of a group: to discuss a problem or issue and suggest solutions and ideas.
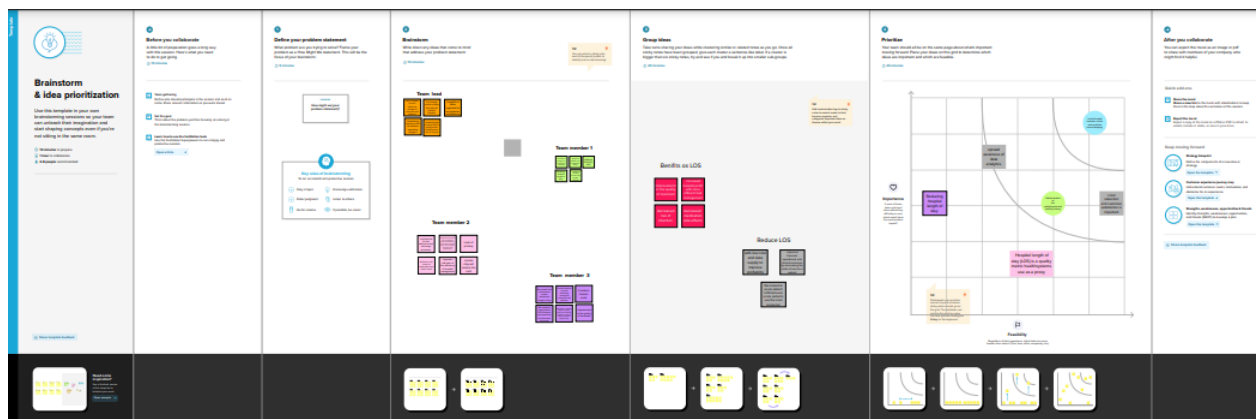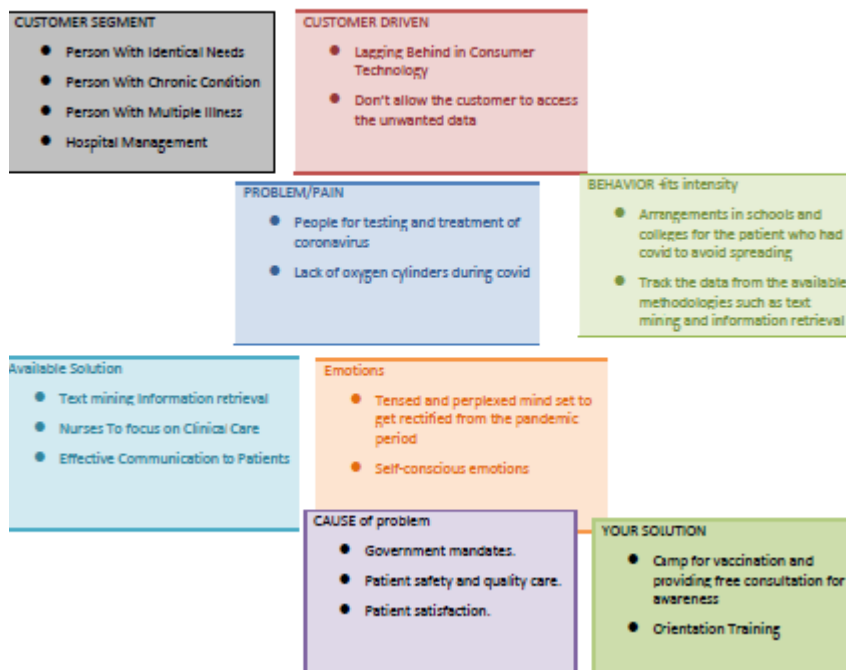

3.3 PROPOSED SOLUTION:

> Identify key hurdles to healthcare sustainability in India and propose a set of solutions thatmutually benefit and the pharmaceutical industry Pragmatic literature review of 43 articles published by regional and international organizations.

3.4 PROBLEM SOLUTION FIT:

- ➢ The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it solves the customer's problem
- ➢ In an age where medical science has made noteworthy advancements, inefficiencies and healthcare errors are still persistent because of the healthcare industry's traditional technology for management.
- ➢ One specific area of concern is the exchange of patient data in case of patient transfer from one department or hospital to another.
- ➢ Patient record sharing, when done the traditional way, is time-consuming and inefficient and exposes patient information to a breach.
- ➢ To deliver a holistic and satisfactory patient experience, different parties involved in healthcare – doctors, scheme providers, insurance providers, doctors, and patients – should be able to exchange information among themselves securely

PROBLEM SOLLUTION FIT:

CUSTOMER SEGMENT
- Person With Identical Needs
- Person With Chronic Condition
- Person With Multiple Illness
- Hospital Management

CUSTOMER DRIVEN
- Lagging Behind in Consumer Technology
- Don't allow the customer to access the unwanted data

PROBLEM/PAIN
- People for testing and treatment of coronavirus
- Lack of oxygen cylinders during covid

BEHAVIOR +its intensity
- Arrangements in schools and colleges for the patient who had covid to avoid spreading
- Track the data from the available methodologies such as text mining and information retrieval

Available Solution
- Text mining Information retrieval
- Nurses To focus on Clinical Care
- Effective Communication to Patients

Emotions
- Tensed and perplexed mind set to get rectified from the pandemic period
- Self-conscious emotions

CAUSE of problem
- Government mandates.
- Patient safety and quality care.
- Patient satisfaction.

YOUR SOLUTION
- Camp for vaccination and providing free consultation for awareness
- Orientation Training

4. REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENT:

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	Interoperability	Dashboard helps to share the patient's information interoperable to the hospitals in timely manner
FR-4	Accuracy	Dashboard helps predict the patient's Health risks accurately based on LOS(Length of Stay).
FR-5	Compliance	The compliance of a dashboard is like to use very interactively in real time by the hospitals
FR-6	Concise	These dashboards are clear, intuitive, and customizable and interactive in manner.

4.2 NON-FUNCTIONAL REQUIREMENTS:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	This Dashboards are designed to offer a comprehensive overview of patient's LOS, and do so through the use of data visualization tools like charts and graphs
NFR-2	Security	The Dashboard helps to indicate the current threat level to the Hospitals; an indication of events and incidents that have occurred; a record of authentication errors; an indication of scans, probes and unauthorized access, and an indicator .
NFR-3	Reliability	This dashboard will be consistent and reliable to the users and helps the user to use in effective ,efficient and reliable manner.
NFR-4	Performance	This dashboard can scan the backend users and analyzing the frequency in which they visit the dashboard helps understand how useful and helpful the data displayed is for tasks.

### 5. PROJECT DESIGN:
5.1 DATA FLOW DIAGRAMS:

A data flow diagram shows the way information flows through a process or system. It includes data inputs and outputs, data stores, and the various sub processes the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their

relationships.
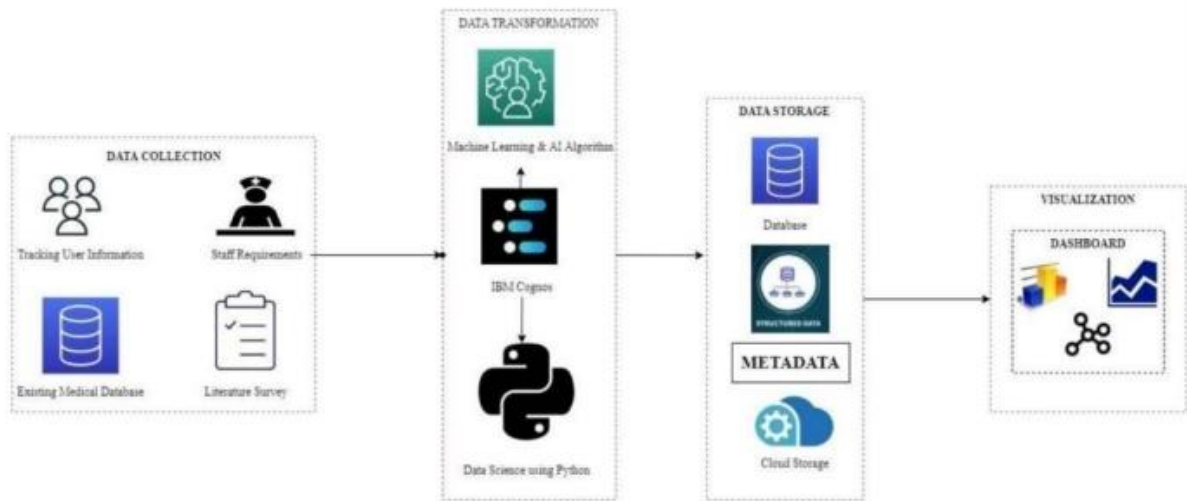
5.2 SOLUTION & TECHNICAL ARCHITECTURE:

➢ Solution Architects are most like project managers, ensuring that all parties, including stakeholders, are on the same page and moving in the right direction at all stages.

➢ Technical architects manage all activities leading to the successful implementation of a new application.
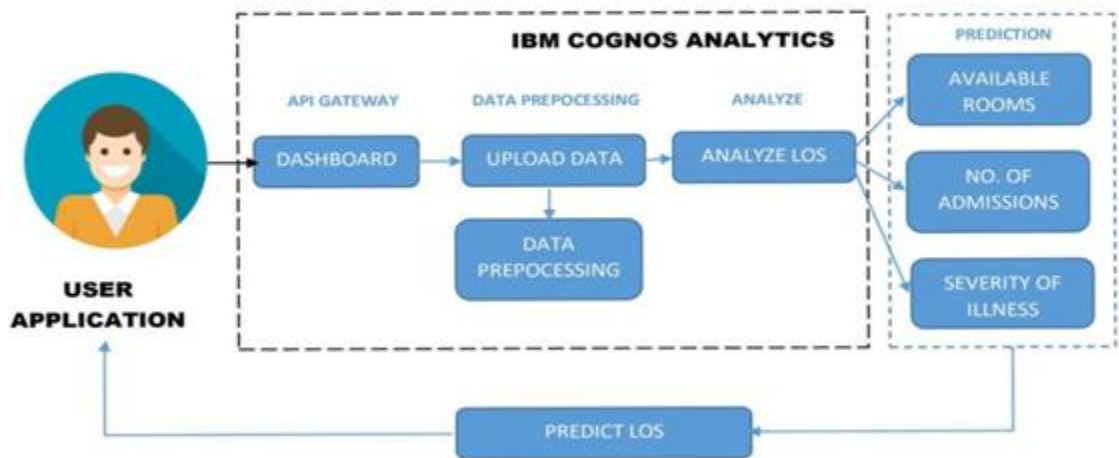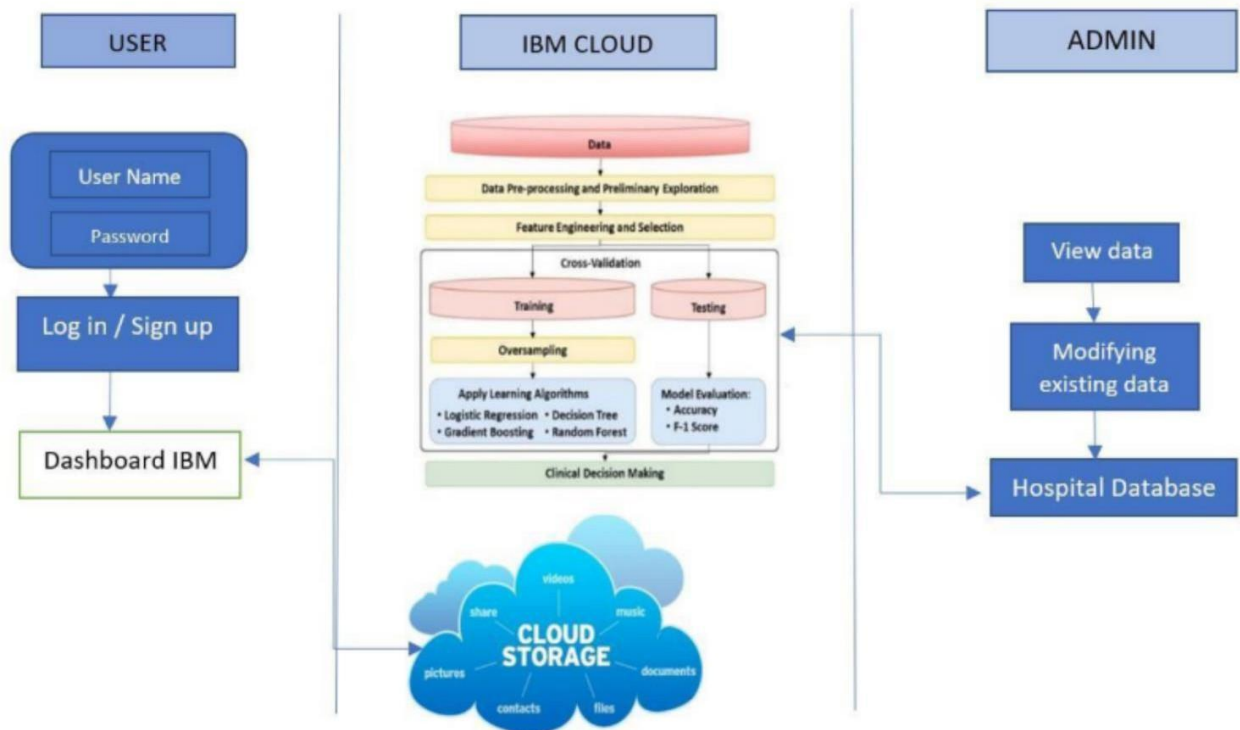
Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	Uploading and Presentation	Using Exploration and Visualization	IBM Cognos Analytics

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of Opensource framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	Technology used
4.	Availability	Justify the availability of application (e.g. use of load balancers, distributed servers etc.)	Technology used
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.	Technology used

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 (Web user)	Registration	USN - 1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard		Sprint - 1
		USN - 2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint - 1
	Login	USN - 3	As a user, I can log into the application by entering valid email & password		High	Sprint - 1
Protection Services department	Login	USN - 4	Person can log into the application by entering authenticated email & password		High	Sprint - 1
Customer Care service	Register	USN -5	The user can register for the application through official Gmail account	They can register and access the dashboard	Medium	Sprint - 2

6. PROJECT PLANNING & SCHEDULING:

6.1 SPRINT PLANNING & ESTIMATION:

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date	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

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{Sprint\ Duration}{Velocity} = \frac{20}{10} = 2$$

6.2 SPRINT DELIVERY SCHEDULE:

| Sprint	Functional Requirement (Epic)	User Number Story	User Story/Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a health care provider, I can create account in IBM cloud and the data are collected.	20	High	2 Members
Sprint-2	Analyze	USN-2	As a health care provider, all the data that are collected is cleaned and uploaded in the database or IBM cloud.	20	Medium	2 Members
Sprint-3	Dashboard	USN-3	As a health care provider, I can use my account in my dashboard for uploading dataset.	10	Medium	2 Members
Sprint-3	Visualization	USN-4	As a health care provider, I can prepare data for Visualization.	10	High	2 Members
Sprint-4	Visualization	USN-5	As a health care provider, I can present data in my dashboard.	10	High	2 Members
Sprint-4	Prediction	USN-6	As a health care provider, I can predict the length of stay	10	High	2 Members

**6.3 Reports from JIRA:**
 Road Map:

A roadmap is a strategic plan that defines a goal or desired outcome and includes the major steps or milestones needed to reach it. It also serves as a communication tool, a high-level document that helps articulate strategic thinking—the why—behind both the goal and the plan for

getting there.
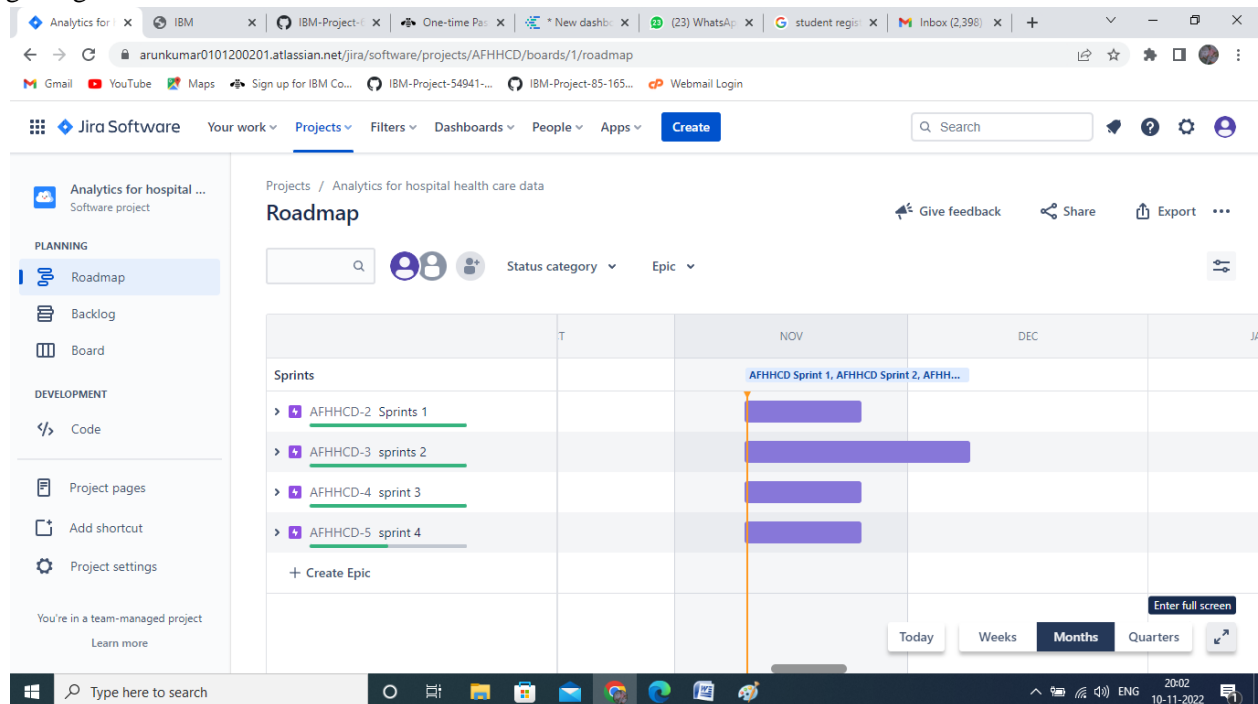
Kanban Board:

A kanban board is an agile project management tool designed to help visualize work, limit work-in-progress, and maximize efficiency (or flow). It can help both agile and DevOps teams establish order in their daily work.
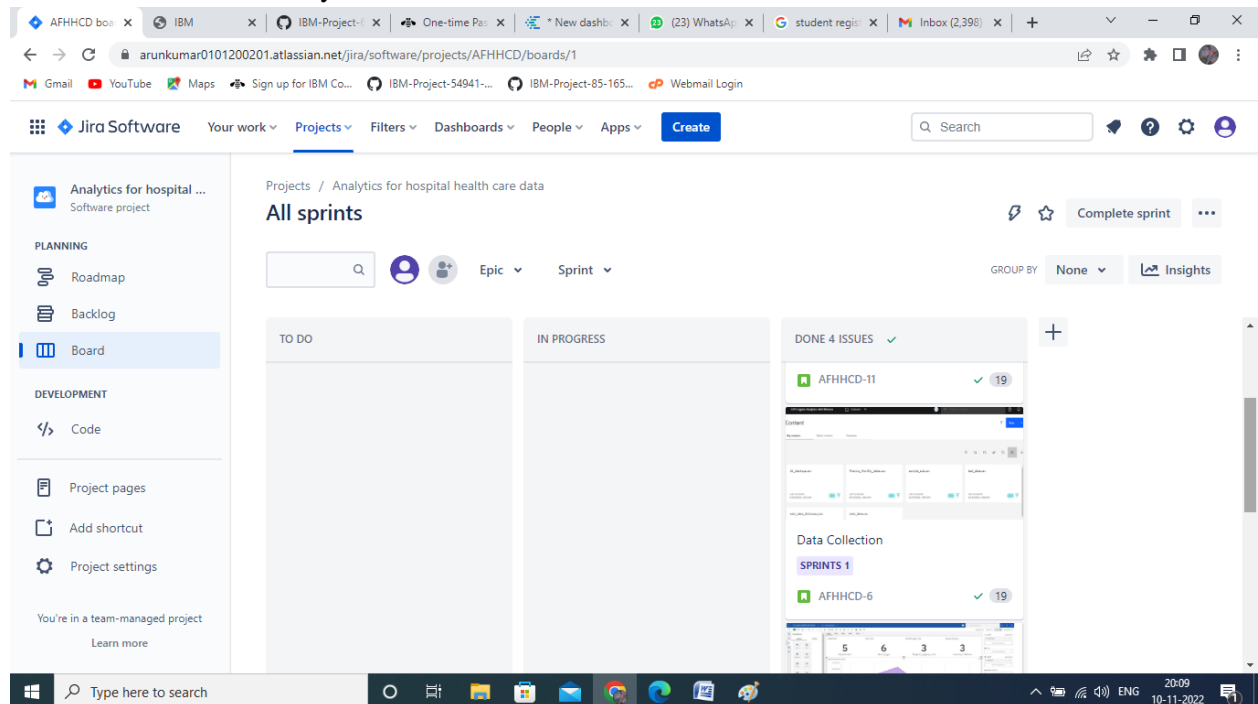
BURNDOWN CHART:

7. CODING & SOLUTIONING:

7.1 Feature 1:
- ➢ Fetched the data from DB2 database.
- ➢ Creating responsive dashboard.
- ➢ Inserting filter for each chart
- ➢ Creating report
- ➢ Created reports using multiple graphs and charts

7.2 Feature 2:
- ➢ Creating stories and performed.
- ➢ Perform animation render image from website.
- ➢ Included graphs and charts.
- ➢ Creating web application using bootstrap.
- ➢ Embedded the cognos with web application.

7.3 Database Schema:
- ➢ case_id
- ➢ Hospital_code
- ➢ Hospital_type_code
- ➢ City_Code_Hospital
- ➢ Hospital_region_code
- ➢ Available Extra Rooms in Hospital
- ➢ Department
- ➢ Ward_Type
- ➢ Ward_Facility_Code
- ➢ Bed Grade
- ➢ Patient id
- ➢ City_Code_Patient
- ➢ Type of Admission
- ➢ Severity of Illness

> ➢ Visitors with Patient
> ➢ Age
> ➢ Admission Deposit
> ➢ Stay

8. TESTING:

8.1 Test Cases:

> ➢ Verify user can see home page.
> ➢ Verify user can see Dashboard page.
> ➢ Verify user can navigate to Report page.
> ➢ Verify user can navigate to story page
> ➢ . Verify filters are working

8.2 User Acceptance Testing:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	6	4	2	3	15
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	5	22
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	20	14	13	11	58

3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	10	0	0	10
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS:

9.1 PERFORMANCE METRICS:

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	17 / 5
2.	Data Responsiveness	The final output from IBM Cognos With Watson further converted into PDF or Story file ,So it can be viewed by all devices.
3.	Amount Data to Rendered (DB2 Metrics)	0 KB.
4.	Utilization of Data Filters	The Utilization of data Filters like Ascending, Descending, Format and so on.
5.	Effective User Story	12
6.	Descriptive Reports	17 / 5

10. ADVANTAGES:
- Improved research efforts
- Improved health outcomes
- Obtain operational insights
- Improved staffing
- Informed strategic planning
- Higher-Quality Care

DISADVANTAGES:
- Privacy
- Replacing Doctors
- Frustration with poor implementation.
- Cybersecurity
- risks Healthcare Regulatory Changes.
- Healthcare Staffing Shortages

11. CONCLUSION:
- It also means describing how health plans, health care organizations, and clinicians should be accountable to patients and society and conversely.
- How individuals can take appropriate responsibility for their own health. Data analytics is the science of analysing raw datasets in order to derive a conclusion regarding the information they hold.
- It enables us to discover patterns in the raw data and draw valuable information from them.

12. FUTURE SCOPE:

- ➤ Improved Decision Making: Data Analytics eliminates guesswork and manual tasks. Be it choosing the right content, planning marketing campaigns, or developing products.
- ➤ Organizations can use the insights they gain from data analytics to make informed decisions. Thus, leading to better outcomes and customer satisfaction Data analytics to achieve business goals of pharmaceutical companies, payers, insurance companies, physicians, hospitals, medical equipment companies, sales reps, and other stakeholders in the healthcare business, need for this have only increased after the Affordable Act came into being.

13. APPENDIX:

Source code

```
<!DOCTYPE HTML>
<html lang="en">
<head>
<title>Data Analytics</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>
<script
</head>
<body>
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>
<nav class="navbar navbar-inverse ">
<div class="container-fluid">
<div class="navbar-header">
<a class="navbar-brand" href="#">Analytics for Hospitals' Health-Care Data</a>
</div>
<ul class="nav navbar-nav">
<li><a href="index.html">Home</a></li>
<li class="active"><a href="#">Dashboard</a></li>
<li><a href="report.html">Report</a></li>
<li><a href="story.html">Story</a></li>
</ul>
</div>
</nav>
<div class="container">
<iframe
src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2F
Sprint%2B2%2FFinal%2BDashboard&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_n
avbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model000
00184774a03ac_00000002"
width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
</div>
</body>
</html>
```

Index html

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html>
<html lang="en">
```

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<head>
<title>Data Analytics</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
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<script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></scrip
t>
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></scr ipt>
</head>
<body>
<nav class="navbar navbar-inverse">
<div class="container-fluid"> <div
class="navbar-header">
<a class="navbar-brand" href="#">Analytics for Hospitals' Health-Care Data</a> </div>
<ul class="nav navbar-nav">
<li class="active"><a href="#">Home</a></li>
<li><a href="dashboard.html">Dashboard</a></li>
<li><a href="report.html">Report</a></li>
<li><a href="story.html">Story</a></li>
</ul>
</div>
</nav>
<div class="jumbotron">
<center> <h4><i><b>Team ID : PNT2022TMID44886 </b></i></h4></center>
</div>
<table class="table table-bordered">
<tbody>
<tr>
<td>Team Leader</td>
<td>ARUN KUMAR S</td>
</tr>
<tr>
<td>Team member</td>
<td>GUNA A</td>
</tr>
<tr>
<td>Team member</td>
<td>VASANTH R</td>
</tr>
<tr>
<td>Team member</td>
<td>DEEPAK M</td>
</tr>
</tbody>
</table>
</body>
</html>
```

Report html

```html
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<link rel="stylesheet"

href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">

<script

src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>

<script

src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>

</head>

<body>

<nav class="navbar navbar-inverse ">

<div class="container-fluid">

<div class="navbar-header">

<a class="navbar-brand" href="#">Analytics for Hospitals' Health-Care Data</a>

</div>

<ul class="nav navbar-nav">

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<li class="active"><a href="#">Report</a></li>

<li><a href="story.html">Story</a></li>

</ul>

</div>
```

```
</nav>

<div class="container">

<iframe

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t&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode

=embedded&amp;action=edit"

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</br>

</div>

</body>

</html>
```

Story html

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<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">

<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>

<script src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>

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</div>

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<li class="active"><a href="#">Story</a></li>

</ul>

</div>

</nav>

<div class="container">

<iframe

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d=model00000184574031b2_00000002&amp;sceneTime=0"

width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>

</div>

</body>

</html>
```

GitHub link:

https://github.com/IBM-EPBL/IBM-Project-6005-1658822040

Project Demo Link:

https://drive.google.com/drive/folders/1dB1IYKZ2oeH14kvcR08BGk1XMJ3QbNCu