PROJECT REPORT

Team ID	PNT2022MID15567
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PROJECT NAME : Project -Analytics for Hospitals' Health-Care Data

INTRODUCTION

Project Overview

- Data analytics in clinical settings attempts to reduce patient wait times viaimproved scheduling and staffing, give patients more options.
- when scheduling appointments and receiving treatment, and reduce readmissionrates by using population health data to predict which patients are at greatest risk.

purpose

- This is the purpose of healthcare data analysis: using data-driven findings to predict and solve a problem before it is too late, but also assess methods andtreatments faster, keep better track of inventory, involve patients more in theirown health, and empower them with the tools to do so.

2. LITERATURE SURVEY

Existing problem

- **No remote access**
  - Healthcare is associated with in-person consultations.

So, what do they do if they need to see a doctor and have an emergency?The need for remote access or virtual consultations is the need of the hour, which needs to be taken care of to stay one step ahead in the technology adoption race.

- Insufficiency and errors in data sharing
  - 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.

- This is not just a hurdle in medical science; it causes regression because of the waste it generates.
- Not only do patients pay the price in the form of inconvenience and health, but we also see a rise in administrative expenses and litigation owing to these inefficiencies and errors.
- An incomplete or inefficient exchange of this data can be dangerous in patients needing urgent or complicated treatment

Absence of supply management system

- Traditional supply chain management is often wasteful and inefficient.
- It leads to money wasted on lost and damaged inventory, improper delivery of equipment or medication, and the damage caused to patients,all of which amount to massive financial losses for healthcare services.
- Supply shortages, misplaced inventory, and less-than-stellar preventativemeasures regarding shrinkage, all play into the reality that hospitals areepicenters of wasteful operations without a proper supply managementsystem.

Data security

- Another challenge mentioned by multiple respondents was data security. Between 2009 and 2020, 70% of the U.S. population was affected by healthcare data breaches—a trend that isn't likely to go away.
- Cigarillo believes the healthcare industry needs government funding to strengthen their IT resources.
- But there are also a number of best practices healthcare organizations can implement now that will help them more effectively secure valuable healthcare data, such as educating healthcare staff, restricting access to data and applications, implementing data usage controls, and more.

Lack of real time situation management

- True crises used to be few and far between, but the past year has

presented a perpetual state of crisis—a scenario that has posed an incredible challenge for healthcare organizations.

- According to Terry Zysk, CEO of LiveProcess, public health emergencies like COVID-19 require situation management: using real-time data analysisto understand how an event is unfolding, and reacting to it accordingly.
- It's the only way that critical healthcare resources can be delivered to theright people at the right time during emergencies and natural disasters.
- A major problem with hospital management systems is they don't provideaccess to the kind of real-time metrics that could improve response timesand outcomes—for example, how many beds are available at a facility at any given time or the location of critical supplies.

References

TITLE: Healthcare
AUTHOR: Dr.leena V Gangloi
TITLE: Information System Healthcare Sectors
AUTHOR: Wager
TITLE: Data Analytics in Healthcare
AUTHOR: J. Archenaa
TITLE: Historical Review Of Health Policy Making
AUTHOR: Ravi Duggal

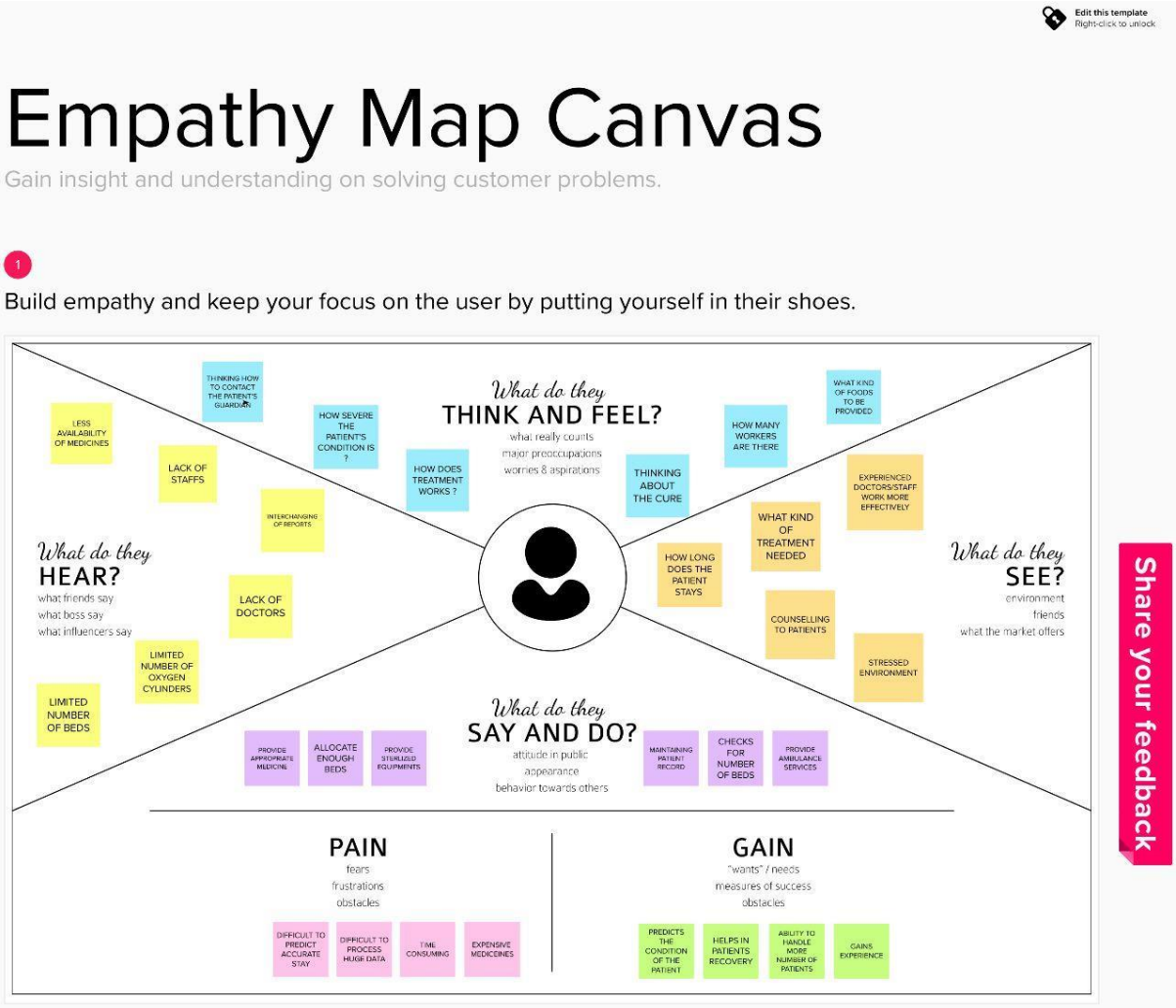
Problem Statement Definition

- Collection dataset.
- Upload the dataset into cognos . Open the
- properties->data module.
- If null value is present in character field use mode method.
- If the null value is present in continuous field use average or medium.Display
- the data in respective charts.
- Create conclusion using summary.

3. IDEATION & PROPOSED SOLUTION

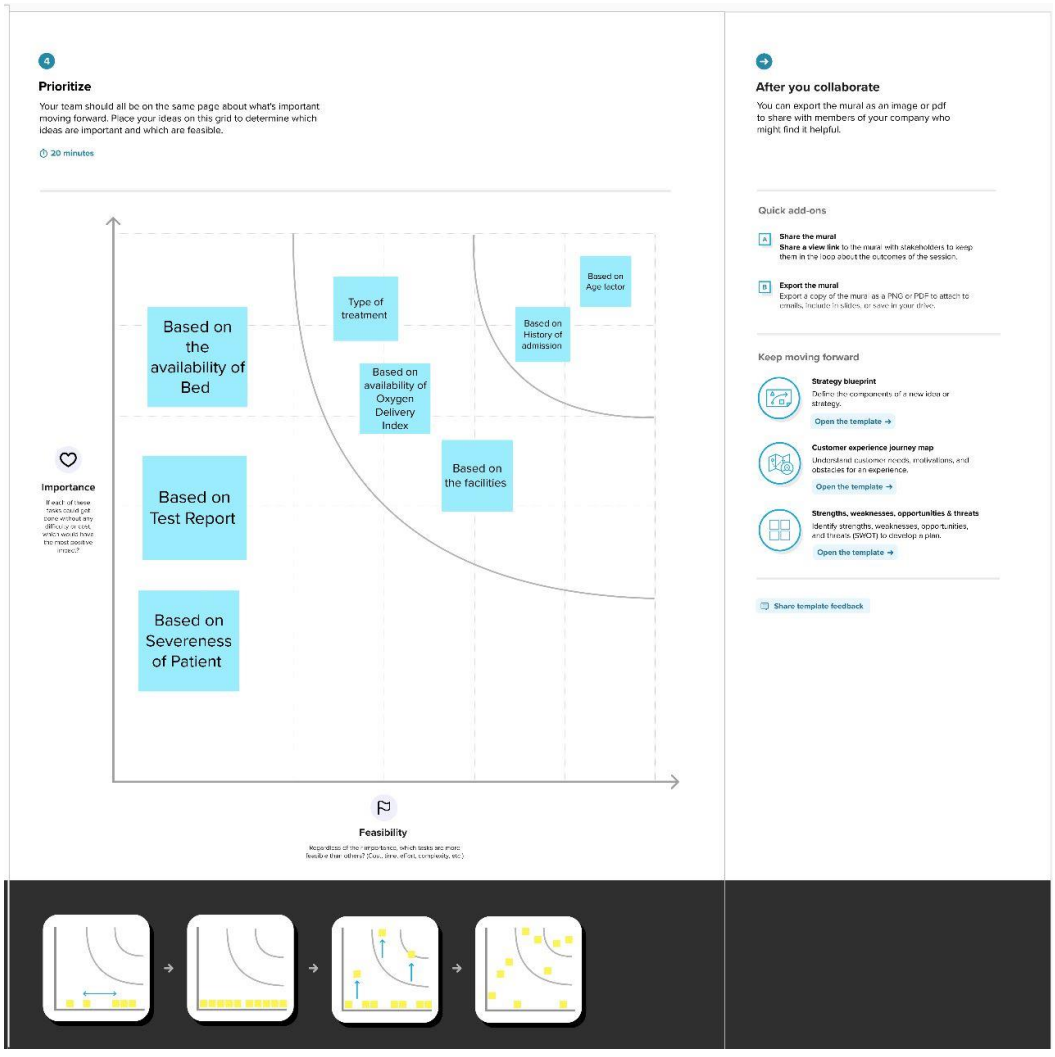
Empathy Map Canvas

- 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.
- Objective: To assess the attitudes towards, applicability and usefulness ofempathy maps as part of medical student's communication skills training.



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 andsuggest solutions and ideas.



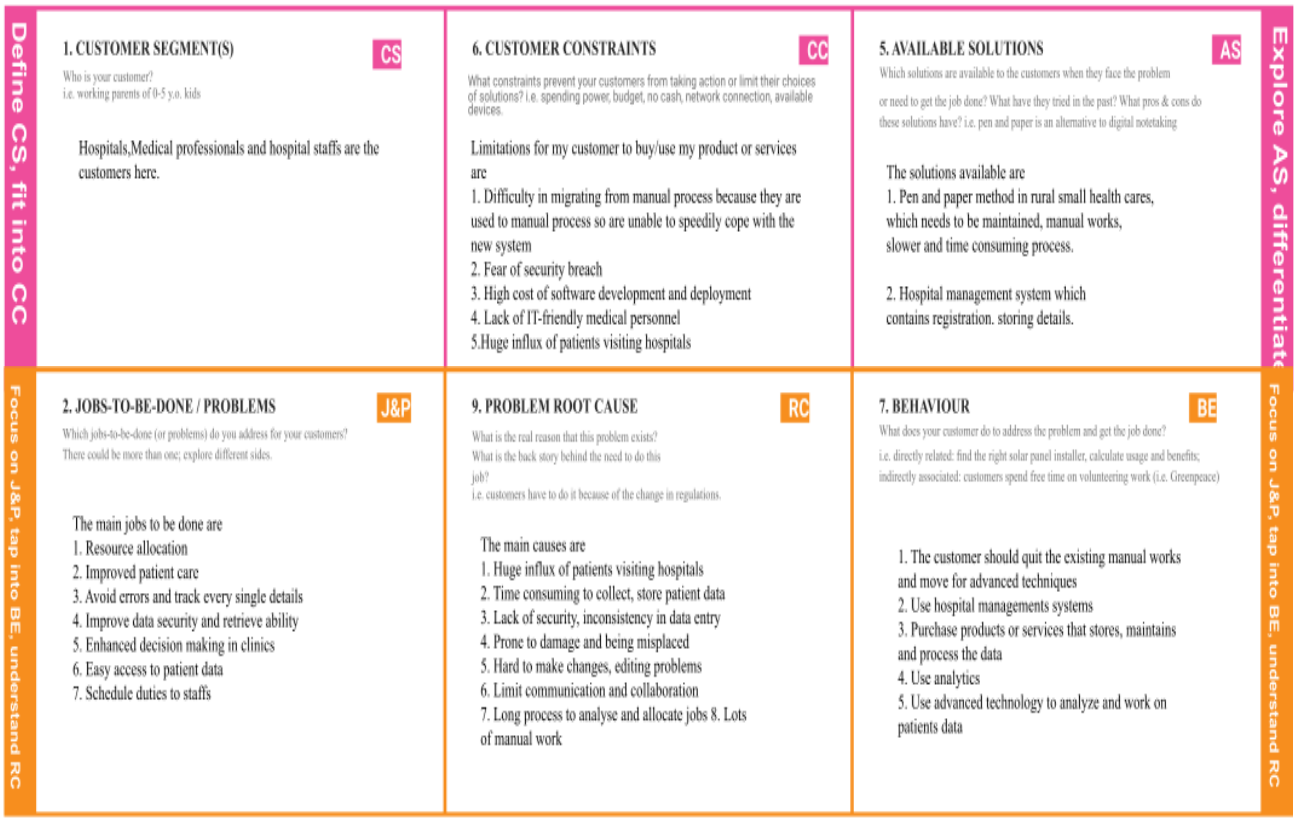
Proposed Solution

- Identify key hurdles to healthcare sustainability in india and propose a set ofsolutions that mutually benefit and the pharmaceutical industry Pragmaticliterature review of 43 articles published by regional and international organizations.
- UNIVERSAL HEALTHCARE COVERAGE Attainment of UHC comes with the hurdle of having to provide care to a higher number of patients.
- EVOLVING DEMOGRAPHICS Population aging has resulted in a growing numberof elderly dependents at higher risk of disease and complications.
- RISING COST OF R&D Today, the cost of developing a medicine can exceed USD 2.6 B compared to USD 179 M in the 1970s.
- WIN-WIN SOLUTIONS ARE NEEDED TO ATTAIN SUSTAINABILITY Mutually beneficial solutions that allow for productive movement towards sustainablevalue-based healthcare systems should be explored.
- VALUE ADDED SERVICES The pharmaceutical industry should move ‘beyond thepill’ and collaborate with to design and offer programs aimed at improving healthcare sustainability (e.g., training, administrative support, etc.
- MULTI-STAKEHOLDER COALITIONS Multi-stakeholder coalitions can serve as a platform to discuss healthcare challenges and co-create healthcare solutions toachieve defined common goals..
- INTEGRATED HEALTHCARE MODEL Investment in integrated healthcare systems that focus on prevention and early diagnosis is key to move towards sustainability in the LA region.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Create a model predicting the length of stay for every beneficiary at the time of admission.
2.	Idea / Solution description	The solution is to collect data such as the beneficiary's history and ailments, beneficiary's drug, and allergy history, family history, and beneficiary's demographics and predict the length of the stay by analyzing the data and build a prediction model
3.	Novelty / Uniqueness	Beneficiaries can utilize the application to make better financial decisions, thereby increasing the community's standard of living. This application intangibly encourages citizens to enroll in the healthcare programs.
4.	Social Impact / Customer Satisfaction	The application has a Drug Information System which accounts for the drug history of the beneficiaries. The system provides up-to-date, accurate medication profiles for improved health planning, evaluation, and research. It also includes a comprehensive Drug Utilization Review (DUR) and flags potential interactions with a patient's medication profile.
5.	Business Model (Revenue Model)	Providers (hospitals) can access the model/application through a subscription service. The minimum subscription period will be an year.
6.	Scalability of the Solution	At the start, the model is designed to ingest and process 100 providers and 100000 patients, which can be expanded exponentially increasing processing power and database upgrades biannually.

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 actually 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 healthcareindustry'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, whendone 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 involvedin healthcare – doctors, scheme providers, insurance providers, doctors, and patients – should be able to exchange information among themselves securely



REQUIREMENT ANALYSIS

Functional requirement

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 EmailConfirmation via OTP
FR-3	Operability	Share patient data and make it interoperable among themanagement
FR-4	Accuracy	The dashboard will be able to predict length of stay based on multiple combinations based on input sourceswith a n accuracy of upto 85%
FR-5	Compliance	The product is to be used within the hospital so any formof data need not be hidden
FR-6	Productivity	The dashboard is believed to improve the predictions ofLength of Stay and thereby creating a scenario of providing better solution

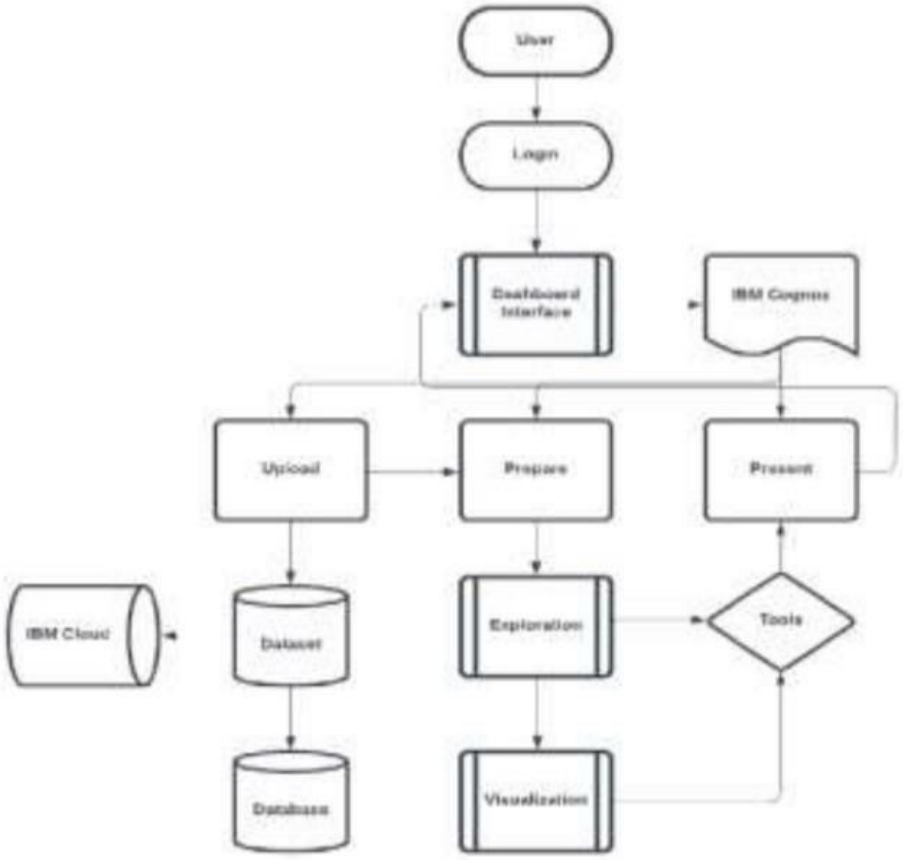
Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	This Dashboards are designed to offer a comprehensive overview of patient's LOS, and doso through the use of data visualization tools like charts and graphs.
NFR-2	**Security**	General industry level security shall be provided
NFR-3	**Reliability**	This dashboard will be consistent and reliable to the users and helps the user to use in effective, efficientand reliable manner.
NFR-4	**Performance**	The dashboard reduces the time needed for analysingdata and has an automated system for that which improves the performance
NFR-5	**Availability**	The dashboard can available to meet user's demand in timely manner and it is also helps to providenecessary information to the user's dataset
NFR-6	**Scalability**	It is a multi-tenant system which is capable ofrimming on lower level systems as well.

4) PROJECT DESIGN

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 subprocesses the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships.



Solution & Technical Architecture

- Solution Architects are most similar to project managers, ensuring that all parties, including stakeholders, are on the same page and moving in the rightdirection at all stages.
- Technical architects manage all activities leading to the successful implementation ofa new application.

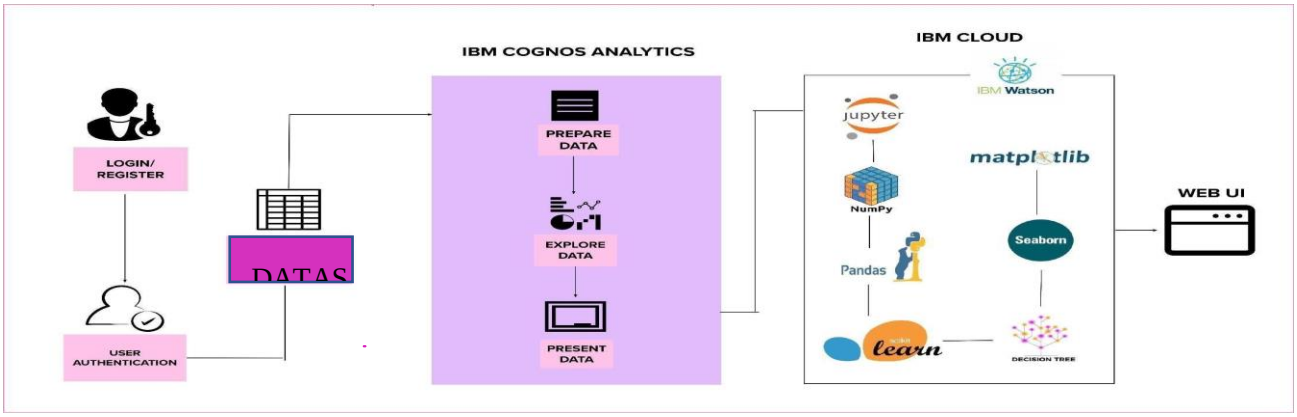


Table-1: Components & Technologies:

S. No.	Component	Description	Technology
1.	User Interface	User interacts with the application using IBM Cloud, whichis used to analyze the dataset.	IBM Cloud
2.	Application Logic	The logic is to obtain useful insights about the Patient details of the Hospital.	Python
3.	Dataset	It contains the details about the Hospital Data	Dataset from IBM
4.	Cloud Database	It is used to store all the datasets.	IBM Cloud Pak for Data
5.	Visualization	It is used to prepare, explore and present the data in the form of charts and graphs.	IBM Cognos Analytics
6.	Machine Learning Model	It allows the user to feed a computer algorithm, an immense amount of data and have the computer analyse and make data-driven recommendation and	Model for Hospital Health(if Required)

		decision based on only the input data.	
7.	Infrastructure	It provides the platform for deployment and services.	Kubernetes

User Stories

S.NO	Funnctional Requirements	User Story Number	Tasks	Acceptance Criteria	Priority	Release
1	Data Gathering	1	Gathering Data	Using API	High	Sprint1
2	Pre-processing	2	Cleaning the data in proper format	Cleaned Data	High	Sprint 1
3	Data Exploration	3	Explore the data	Display data in graph	High	Sprint1
4	Dashboard	4	Creating various chart	Intractive Dashboard	High	Sprint 2
5	Reports	5	Creating report for various field	Intractive Report	High	Sprint 3
6	Story	6	Creating Animation Using picture	Various animation and slides	High	Sprint 4
7	Web Application	7	Cognos Embeded Web application	Intractive Web Application	High	Sprint 4

4. PROJECT PLANNING & SCHEDULING

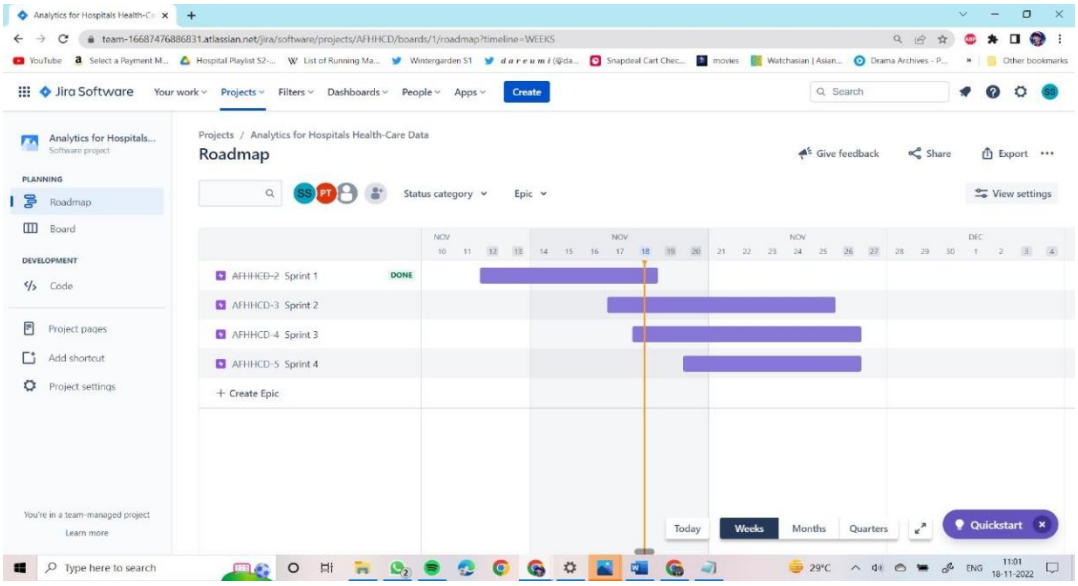
Sprint Planning & Estimation

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

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—thewhy—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 bot agile and DevOps teams establish order in their daily work.

BURNDOWN CHART


Progress Burdown Chart
25
20
15
10
5
0
24-Oct-22
26-Oct-22
28-Oct-22
30-Oct-22
01-Nov-22
03-Nov-22
05-Nov-22
07-Nov-22
09-Nov-22
11-Nov-22
13-Nov-22
15-Nov-22
17-Nov-22
Estimated Effort
Actual Effort

VELOCITY

Average velocity for sprint - 1:

AV = 8/7 = 1.14

Average velocity for sprint - 2:

AV = 8/8 = 1

Average velocity for sprint - 3:

AV = 5/3 = 1.67

Average velocity for sprint - 4:

AV = 5/4 = 1.25

5. CODING & SOLUTIONING

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

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.

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

6. TESTING

Test Cases

- Verify user is able to see Home page.
- Verify user is able to see Dashboard page.

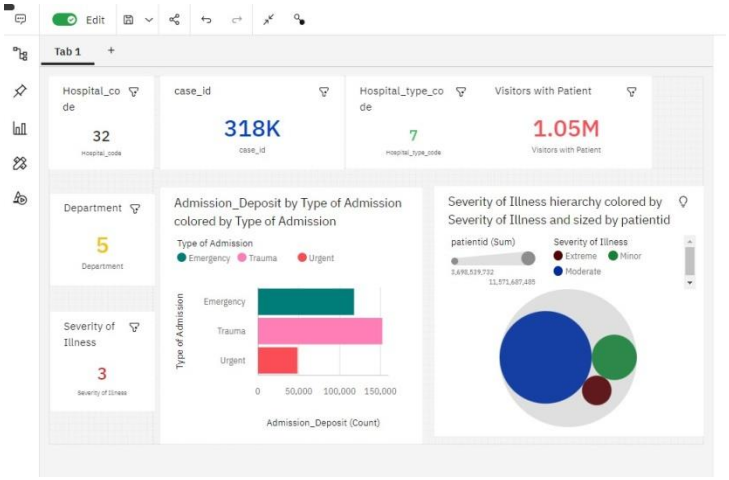
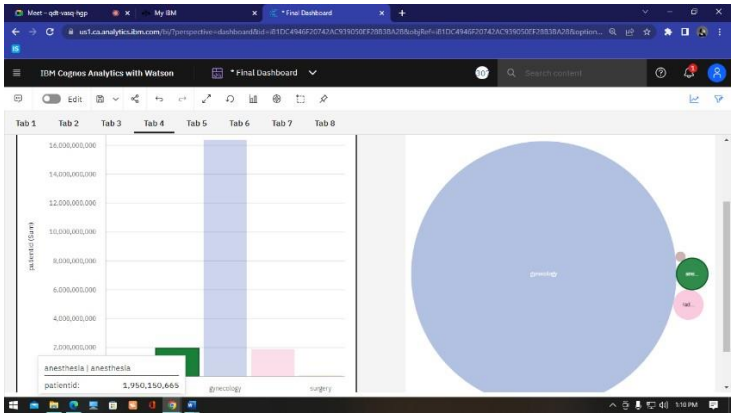
- Verify user is able to navigate to Report page.
- Verify user is able to navigate to story page.
- Verify filters are working

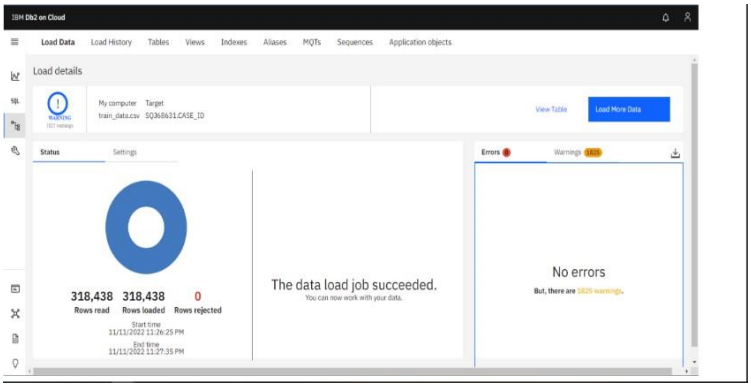
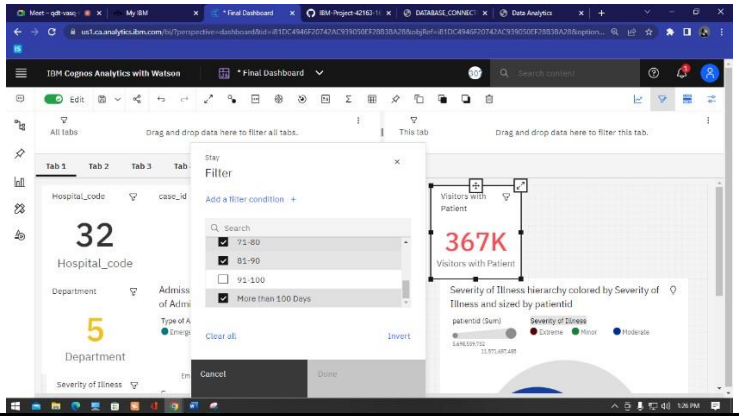
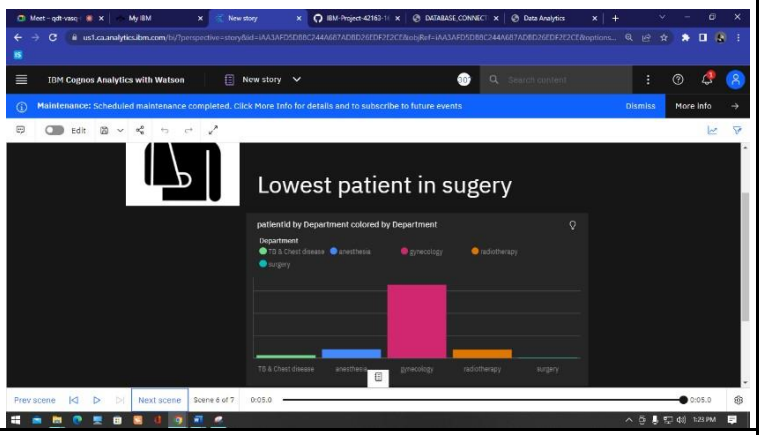
User Acceptance Testing

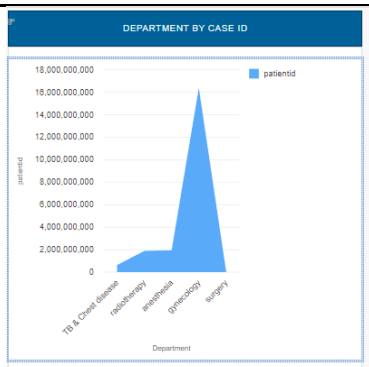
SECTION	TOTAL CASES	NOT TESTED	FAIL	PASS
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
3Execution Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

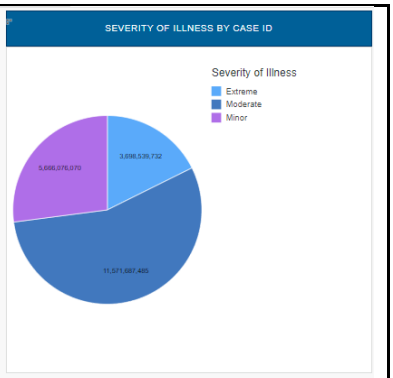
7. RESULTS

Performance Metrics

S.No.	Parameter	Screenshot/ Values
1.	Dashboard design	Number of Visulizations / Graphs – 22 Number of tabs – 8 
2.	Data Responsiveness	Data's will dynamically changed and graph also changed. 

3.	Amount Data to Rendered (DB2 Metrics)	Number of rows read– 318438 Number of rows loaded–318438 Number of rows rejected 0 
4.	Utilization of Data Filters	We created filters for Dashboards which is perfectly working. 
5.	Effective User Story	Number of Scene Added– 7 Animations are perfectly displayed. Images are perfectly rendered. 
6.	Descriptive Reports	Number of Visulizations / Graphs – 6


DEPARTMENT BY CASE ID
patientid
18,000,000,000
16,000,000,000
14,000,000,000
12,000,000,000
10,000,000,000
8,000,000,000
6,000,000,000
4,000,000,000
2,000,000,000
0
TB & Chest disease
radiotherapy
anesthesia
gynecology
surgery
Department


SEVERITY OF ILLNESS BY CASE ID
Severity of Illness
Extreme
Moderate
Minor
3,698,539,732
5,666,076,070
11,571,687,485

8. ADVANTAGES

- Improved research efforts Improved
- health outcomesObtain
- operational insightsImproved
- staffing
- Informed strategic planning
- *Higher-Quality Care*

DISADVANTAGES

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

9. 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 analyzing 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.

10. FUTURE SCOPE

- **Improved Decision Making**: Data Analytics eliminates guesswork and manualtasks. 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 satisfactionData 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 haveonly increased after the Affordable Act came into being.

11. APPENDIX

Source Code

Dashborad

html

```
<!
DO
CT
Y
PE
ht
m
l>
      <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
      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">
            <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

```
<!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"></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 : PNT2022MID15567 </b></i></h4></center>

</div>
<table class="table table-bordered">

    <tbody>
      <tr>
        <td>Team Leader</td>
        <td>SUMITHRA S</td>

      </tr>
      <tr>
        <td>Team member</td>
        <td>SANDHIYA M</td>

      </tr>
      <tr>
        <td>Team member</td>
        <td>PAVITHRA T</td>

      </tr>
          <tr>
        <td>Team member</td>
        <td>RANJINI RJ</td>

      </tr>
    </tbody>
  </table>
</body>
</html>
```

Report html

```
<!DOC
TYPE
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
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>
</head>
<body>

<nav class="navbar navbar-inverse ">
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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

src="https://us1.ca.analytics.ibm.com/bi/?pathRef=.my_folders%2FReport%2FFinal%2BRepor
t&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode
=embedded&amp;action=edit"
    width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media"
allowfullscreen=""></iframe>
</br>

</div>

</body>
</html>
```

Story html

```
<!D
OCT
YPE
htm
l>
        <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 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">
              <li><a href="index.html">Home</a></li>
              <li><a href="dashboard.html">Dashboard</a></li>
              <li><a href="report.html">Report</a></li>
              <li class="active"><a href="#">Story</a></li>
            </ul>
          </div>
        </nav>

        <div class="container">
          <iframe

        src="https://us1.ca.analytics.ibm.com/bi/?perspective=story&amp;pathRef=.my_folders%2Fstory%2FNew%2Bstory&amp;clo
        seWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;sceneI
        d=model0000184574031b2_00000002&amp;sceneTime=0"
            width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media"
        allowfullscreen=""></iframe>
        </div>


        </body>
        </html>
```