

ANALYTICS FOR HOSPITAL HEALTH CARE



NALAIYA THIRAN PROJECT BASED LEARNING

On

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

Submitted By TEAM ID: PNT2022TMID08862

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in partial fulfillment for the award of the degree

of

Bachelor of

Technologyin

Information Technology

Dr. Mahalingam College of Engineering and Technology

Pollachi - 642003

An Autonomous Institution

Affiliated to Anna University, Chennai - 600 025

PROJECT REPORT

Team ID	PNT2022TMID08921
Project name	Analytics for Hospital Health Data

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:

2.1 EXISTING PROBLEM:

> No remote access:

Healthcare is associated with in-person consultations. This problem obligates the
patients to run to the nearest healthcare centre for treatment.

- The COVID outbreak and lockdowns made it even worse.
- The contagion effect of the virus restrained people within the four walls of their homes.
- 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 preventative
 measures regarding shrinkage, all play into the reality that hospitals are epicenters
 of wasteful operations without a proper supply management system.

➤ 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 analysis to

understand how an event is unfolding, and reacting to it accordingly.

• It's the only way that critical healthcare resources can be delivered to the right

people at the right time during emergencies and natural disasters.

• A major problem with hospital management systems is they don't provide access

to the kind of real-time metrics that could improve response times and

outcomes—for example, how many beds are available at a facility at any given

time or the location of critical supplies.

2.2 REFERENCES:

TITLE: Healthcare

AUTHOR: Dr.leena V Gangloi

TITLE: Information System Healthcare Sectors

AUTHOR: Wager

TITLE: Data Analytics in Healthcare

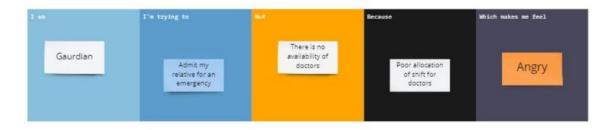
AUTHOR: J. Archean

TITLE: Historical Review Of Health Policy Making AUTHOR:

Ravi Duggal

2.3 PROBLEM STATEMENT:

Problem Statement 1



Problem Statement 2



Problem Statement 1



Problem Statement 2



Problem Statement 3



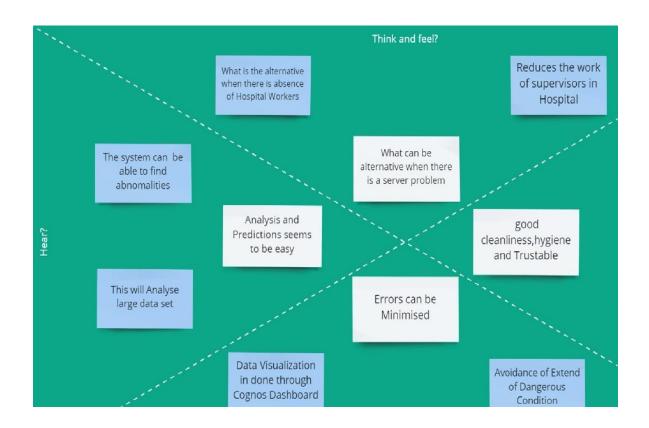
Problem Statement 4



3. IDEATION & PROPOSED SOLUTION:

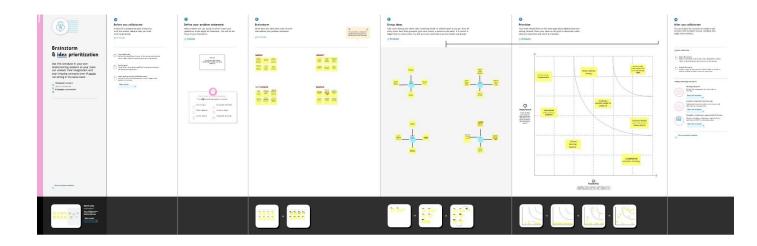
3.1 EMPATHY MAP CANVAS:

- 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.
- Objective: 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 that the pharmaceutical industry Pragmatic literature review of 43 articles published by regional and international organizations.
- ➤ UNIVERSAL HEALTHCARE COVERAGE Attainment of UHC comes with the habof having to provide care to a higher number of patients.
- ➤ EVOLVING DEMOGRAPHICS Population aging has resulted in a growing number delderly 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 sustainable value-based healthcare systems should be explored.

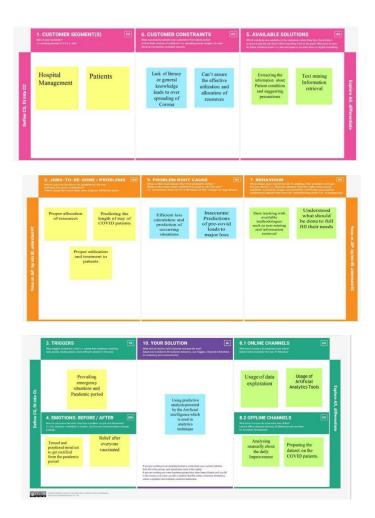
- VALUE ADDED SERVICES The pharmaceutical industry should move 'beyond the pill' and collaborate with to design and offer programs aimed at improving healthcare sustainability (e.g., training, administrative support, etc.
- MULTI-STAKEHOLDER COALITIONS Multi-stakeholder coalitions can serve as a platform to discuss healthcare challenges and co-create healthcare solutions to achieve 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)	EHR data matched patient-reported data
		in 23.5 percent of records in a study at an
		ophthalmology practise. Patients' EHR
		data did not agree in any way when they
		reported having three or more eye health
		complaints.
2.	Idea / Solution description	Predictive analytics can create patient
		journey dashboards and disease
		trajectories that can lead to effective, and
		result driven healthcare. It improves
		treatment delivery, cuts costs, improves
		efficiencies and so on.
3.	Novelty / Uniqueness	Healthcare data frequently resides in
		several locations. from various
		departments, such as radiology or
		pharmacy, to various source systems,
		such as EMRs or HR software. The
		organisation as a whole contributes to the
		data. This data becomes accessible and
		usable when it is combined into a single,

		central system, such as an enterprise data warehouse (EDW).
4.	Social Impact / Customer Satisfaction	Enhanced diagnosis, Improved medical treatment, Improved health results, Improved relationships with patients, More positive health indicators
5.	Business Model (Revenue Model)	The two factors that have the biggest negative effects on hospital income are claim denials and patient incapacity to pay their part. 90% more uncollectible claim denials were written off by hospitals and healthcare systems in 2017 compared to the preceding six years
6.	Scalability of the Solution	A variety of institutions must store, evaluate, and take action on the massive amounts of data being produced by the health care sector as it expands quickly. India is a vast, culturally varied nation with a sizable population that is increasingly able to access centralised health care services.

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.



4. REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENT:

FR Functional Requirement No. (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	Analytics	Because raw data is imperfect, Cognos analytics is used to clean and analyse it.			
FR-4	Check out	Deleting Patient ID from the dashboard during patient's checkout and then make the bed empty so the beds are visible in the dashboard			
FR-5	Report	Preparing reports on current patients, number of beds, Patient's needs.			
FR-6	visualizations	Build the visualizations for length of stay, severity of illness age, department wise patient, room availability, case study.			

4.2 NON-FUNCTIONAL REQUIREMENTS:

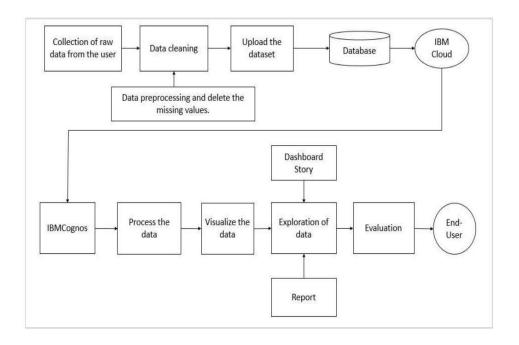
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The designed dashboard provides the Patient's LOS and Severity of illness through graphs, pie chart, cross tab and other tools
NFR-2	Security	The dashboard provides login ID that is any users who make use of the dashboard needs to hold a login ID and password.

NFR-3	Reliability	Users will find this dashboard to be constant and dependable, assisting them in using it effectively, efficiently, and dependably.			
NFR-4	Performance	This dashboard operates quickly, offers high levels of interactive data, and has a large capacity for data. And datas are frequently updated.			
NFR-5	Availability	This dashboard is always accessible.			
NFR-6	Scalability	This dashboard will be able to accommodate a larger user base in the future and will satisfy the customer's future needs.			

5. PROJECT DESIGN:

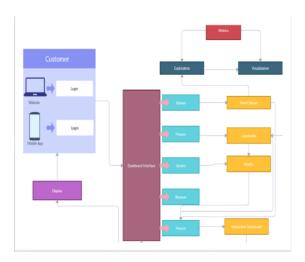
5.1 DATA FLOW DIAGRAMS:

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.



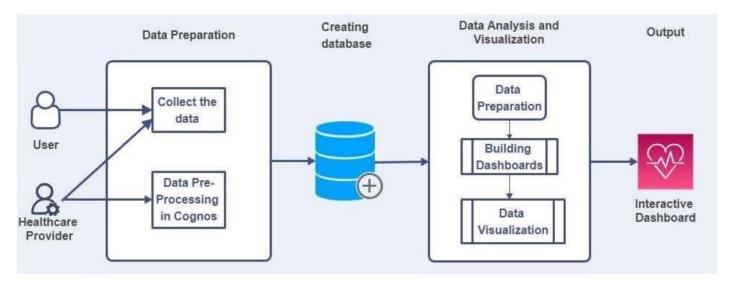


Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	Dataset	Gathering Dataset from the internet	Kaggle API
2.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
3.	Data Processing	The data from the dataset is pre-processed	IBM Cognos Analytics
4.	Database	Database Service on IBM Cloud	IBM Cloud
5.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
6.	Uploading Dataset	Uploading dataset to the IBM Cognos	IBM Cognos Analytics
7.	Data Visualization	ation The data is visualized into different forms IBM Cognos Analytics and	
8.	Data Prediction	Prediction of the Length Of Stay (LOS)	IBM Cognos Analytics and python

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Dashboard frameworks in the form of charts, graphs and more.	IBM Cognos
2.	Scalable Architecture	Scalability 3-tier => Database, application, server	Web server – HTML, CSS Application server- Python
3.	Availability	This dashboard is available for health care providers which helps them to managing the hospital resources	IBM Cognos
4.	Performance	This dashboard can contain numerous data and provides interactive visualizing performance which helps in easy usage	IBM Cognos
5.	Storage	It is a database used to store the Data(MySQL)	DB2

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	Registration	USN-1	As a health care provider I can create account in IBM cloud and the data are collected.	I can create an account and collect data.	High	Sprint-1
3		USN-2	As a health care provider all the data that are collected is cleaned and uploaded in the database or IBM cloud.	I can access the cleaned and uploaded data.	Low	Sprint-2
	Login	USN-3	As a health care provider I can log into the dashboard by entering email & password	I can login to the account in my email login.	High	Sprint-2
	Dashboard	USN-4	As a health care provider I can use my account in my dashboard for uploading dataset.	I can login to the account for uploading dataset.	Medium	Sprint-3
Customer (Web user)	Website	USN-5	As a health care provider I can create the database and process the data.	I can create the database and process the data.	Medium	Sprint-3
Visualization	Dashboard	USN-6	As a health care provider I can prepare data for Visualization.	I can prepare data for Visualization.	High	Sprint-3
Presentation	Dashboard	USN-7	As a health care provider I can Present data in my dashboard.	I can present data by using my account in dashboard.	High	Sprint-4
Exploration	Dashboard	USN-8	As a health care provider I can explore Dashboard Story and Report.	I can explore dashboard story and report.	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING:

6.1 SPRINT PLANNING & ESTIMATION:

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

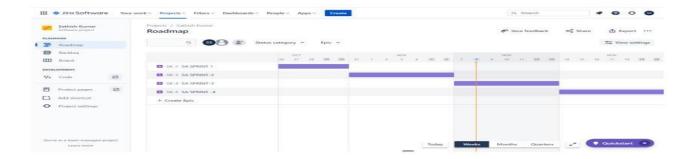
6.2 SPRINT DELIVERY SCHEDULE:

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:

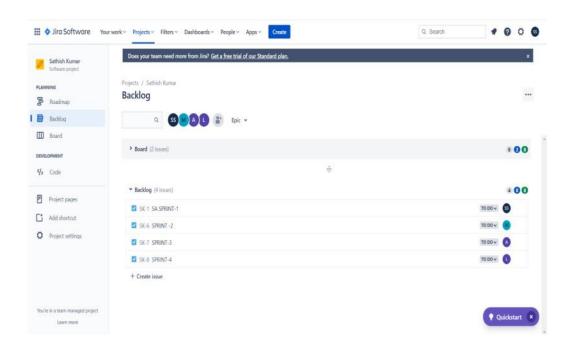
A roadmap is a strategic plan that defines a goal or desired outcome and includes the major steps or milestones needed to reach it. It also serves as a communication tool, a high-level document that helps articulate strategic thinking—the why—behind both the goal and the plan for getting there.



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:



VELOCITY

Average velocity for sprint - 1:

$$AV = 3/7 = 1.14$$

Average velocity for sprint - 2:

$$AV = 8/3 = 1$$

Average velocity for sprint - 3:

$$AV = 5/3 = 1.67$$

Average velocity for sprint - 4:

$$AV = 5/4 = 1.25$$

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	8	5	0	3	16	
Duplicate	1	0	5	0	6	
External	0	3	2	1	6	
Fixed	13	4	3	16	36	
Not Reproduced	0	-1	0	0	1	
Skipped	0	1	0	1	2	
Won't Fix	1	4	2	1	8	
Totals	23	18	12	22	75	

3. Test Case Analysis

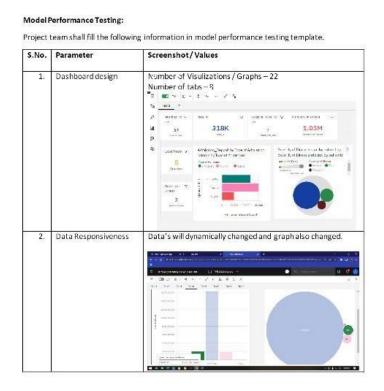
This report shows the number of test cases that have passed, failed, and untested

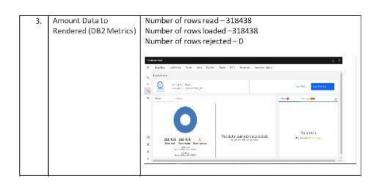
Section	Total Cases	Not Tested	Fall	Pass
Print Engine	9	0	0	9
Client Application	43	0	0	43
Security	3	0	0	1
Outsource Shipping	i	0	0	9

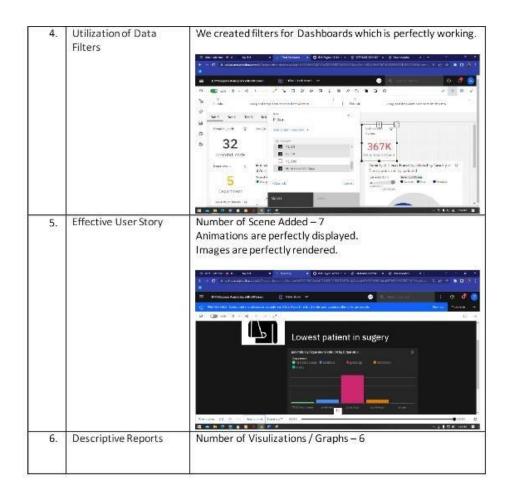
Exception Reporting	9	0	0	9
Final Report Output	10	0	0	10
Version Control	1	0	0	1

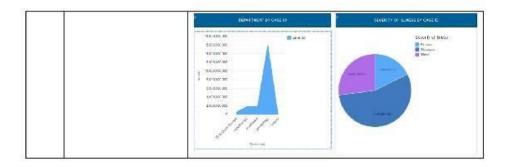
9. RESULTS:

9.1 PERFORMANCE METRICS:









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

Dashboard html

```
<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>
        <a href="index.html">Home</a>
              cli class="active"><a href="#">Dashboard</a>
            <a href="report.html">Report</a>
            <a href="story.html">Story</a>
    </div>
</nav>
    <div class="container">
 <iframe
          src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard\&pathRef=.my\_folders\%2F
     Sprint%2B2%2FFinal%2BDashboard&closeWindowOnLastView=true&ui_appbar=false&ui_n
     avbar=false&shareMode=embedded&action=view&mode=dashboard&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">
                   src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></scrip
                   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>
                            class="active"><a href="#">Home</a>
                                  <a href="dashboard.html">Dashboard</a>
                                 <\!\!li\!\!><\!\!a\,href="report.html"\!\!>\!\!Report<\!\!/a\!\!><\!\!/li\!\!>
                                 <a href="story.html">Story</a>
                        </div>
                    </nav>
                       <div class="jumbotron">
                              <center> <h4><i><b>Team ID : PNT2022TMID08776 </b></i></h4></center>
```

```
</div>
  >
   Team Leader
   SATHISH KUMAR S
  >
   Team member
     MONASRI A
  >
   Team member
  LOGITHA R
  >
   Team member
    ABIRAMI V 
  </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">
                 k rel="stylesheet"
          href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
          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>
                   <a href="index.html">Home</a>
                        <a href="dashboard.html">Dashboard</a>
                         cli class="active"><a href="#">Report</a>
                       <a href="story.html">Story</a>
               </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>

<
```

Story html

```
<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>
              <a href="index.html">Home</a>
                   <a href="dashboard.html">Dashboard</a>
                   <a href="report.html">Report</a>
                   cli class="active"><a href="#">Story</a>
            </div>
  </nav>
  <div class="container">
      <iframe
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GitHub link

https://github.com/IBM-EPBL/IBM-Project-8218-1658911600

Project Demo Link

 $\underline{https://drive.google.com/file/d/1XLCY9YmJPGGGWAud7j7jpOElKHAONtUR/view?usp=share_link}$