ANALYTICS FOR HOSPITAL AND HEALTH-CARE

DATA PROJECT REPORT

Submitted by

KIRUTHIKA S   **610519104046**

KARTHIKA K   **610519104049**

DEEPA SREE A   **610519104013**

JYOTHI G   **610519104046**

TEAM ID : PNT2022TMID29804

in partial fulfillment for the award of the

degreeof

BACHELOR OFENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DHIRAJAL GANDHI COLLEGE OF TECHNOLOGY

Opposite salem Airport,Omalur

ABSTRACT

This paper is mainly streamed towards hospitals and their health-care data. Due to recent covid-19 pandemic has raised alarms over one of the most overlooked areas to focus. Healthcare management has various use cases for data science, patients health details and therir past history with data records. Analyizing the data's with a module and exploring the visualization can improve the dataset. In order to discuss health data analytics and the role it plays in the health care sector, we must first understand the data that is being collected and analyzed. There is data being collected on the processes and procedures of the business side of health care, but there is also an enormous amount of health data being gathered, stored and analyzed. Health data is any data relating to the health of an individual patient or collective population. This information is gathered from a series of health information systems (HIS) and other technological tools utilized by health care professionals, insurance companies and government organizations. Consider the impact this has had on the COVID-19 pandemic. The data being collected is analyzed in real time to understand the effects of the virus better and predict future trends so we may slow the spread and prevent future outbreaks. Health care data management has the potential to lead to better care if used properly. With centralized datasets, there is immediate access to necessary information whenever and wherever it is needed. The addition of big data analytics improves efficiency on all fronts. Better data leads to better care.

TABLE OF CONTENTS

TABLE OF CONTENTS

INTRODUCTION

CHAPTER 1

INTRODUCTION

The introduction about the analytics for hospital and health-care data with IBM-Cognos and analytics.

1.1 PROJECT OVERVIEW

Recent Covid-19 Pandemic has raised alarms over one of the most overlooked areas to focus on Healthcare. While Healthcare management has various use cases for using data science, patient length of stay is on 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 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. Suppose you have been hired as Data Scientist of Health Man a not for profit organization dedicated to manage the functioning of Hospitals in a professional and optimal manner. The goal is to accurately predict the length of stay of 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.

1.2 PURPOSE

a. This type of analysis is used to investigate why an event happened.

b. This form of analysis is used to forecast something that will happen in the future. For example, a hospital might predict, based on trends observed over the past decade, that incoming cardiac patients will most likely increase by 20% this year.

This is possibly the most important form of analysis in healthcare and the trend that is growing quickest. This form of analysis takes pre-existing data and implements treatment plans. For example, a healthcare provider might use a smart device to automatically analyze a patient's vital signs, preemptively alert them that they're at risk for developing a medical condition, and instruct them to visit their healthcare provider.

c. While healthcare data analytics is highly advantageous, it can get pretty complicated, too. Whether the data was collected by assessing important real-time signs or through electronic health records (EHR), it needs to be derived from various sources by following proper government regulations, thus making the process precarious and complex.

d. Anything from clinical data to patient behaviour, medical expenses, healthcare, or pharmaceuticals data analytics can be employed at the micro and macro level to evidently enhance operations, boost patient care, and even tackle the overall expenses.

Fig 1.1 Analytics for healthcare

LITERATURE SURVEY

Chapter-2

2.LITERATURE SURVEY

2.1 References

Hospital Practice: Psychology's Call to Action

- Michael F. Enright
- Robert J. Resnick Professional Psychology Research and Practice 24(2):135-141
- DOI:10.1037/0735-7028.24.2.135

The general public has recently made demands for continuity of care in psychological services from outpatient settings to inpatient facilities and back. These demands plus 3 economic and structural modifications within the nation's health-care arena, including the incursion of for-profit health-care corporations into the health delivery industry the 1985 Joint Commission of Accreditation of Hospitals decision to include nonphysician providers on hospital medical staffs, and the 1990 California Supreme Court Decision (CAPP v. Rank) ensuring full medical staff participation by California psychologists, have opened the doors to the independent practice of psychology in hospitals, rehabilitation centers, nursing homes, and day treatment facilities This article presents current professional realities for psychologists in hospitals and health-care settings and reviews the work of the American Psychological Association in support of hospital independent practice. (PsycINFO Database Record (c) 2012 APA, all rights reserved)

A survey of mental health professionals' perceptions of the qualifications of clinical psychologists

- DOI:10.1080/J294v12n04_02
- M.J. D'Ortona

While the literature suggests that among the general public, there is an awareness that psychologists are competent to provide mental health treatment, there is little

literature referring to how psychologists are perceived by their fellow mental health professionals (e.g., psychiatrists and social workers) regarding their professional roles. From observation, it appears that many no psychologist mental health providers, often are either uninformed or unwilling to acknowledge the expertise of psychologists in areas in which they are trained to practice. The purpose of this study was to determine similarities and differences between psychiatrists and social workers in their perceptions of the various competencies of psychologists. Statistically significant group differences were found between psychiatrists and social workers regarding their perceptions of which activities psychologists are qualified to perform. Explanations for these differences were discussed as well as the limitations of the present study, and potential directions forfuture research.

At home or in hospital: Home treatment and mental healthstigma

Background Stigmatized attitudes towards people with mental illness may influence treatment choice for oneself and others. Aim To gauge the attitudes of theUK general public towards treatment at home for mental Background Stigmatized attitudes towards people with mental illness may influence treatment choice for oneself and others. Aim To gauge the attitudes of the UK general public towards treatment at home for mental to measure stigma, we used an adapted version of the Attitudes to Mental Illness Questionnaire (AMIQ) with vignettes asking about treatment at home and using scales for social distance and poor expectations; participants also filled in the Mental Health Knowledge Schedule (MAKS).

2.2 Problem Statement Definition

The application of big data in health care is a fast- growing field, with many discoveries and methodologies published in the last five years. Big data refers to datasets that are not only big but also high in variety and velocity, which makes them difficult to handle using traditional tools and techniques. Moreover, medical data is one of the most growing data, as it is obtained from Electronic Health Records (EHRs) or patients themselves. Due to the rapid growth of such medical data, we need to provide suitable tools and techniques in order to handle and extract value and knowledge from these datasets to improve the quality of patient care and reduces healthcare costs. Furthermore, such value can be provided using big data analytics, which is the application of advanced analytics techniques on big data. This paper presents an overview of big data content, sources, technologies, tools, and challenges in health care. It also intends to identify the strategies to overcome the challenges.

The main aim of this paper is to provide a deep analysison the research field of healthcare data analytics. This paper is analyzing the previous studies and works in this research area, as well as highlighting some of guidelines and gaps. This study has used seven popular databases and selected most relevant papers, in order to conduct this paper. The paper has listed some data analytics tools and techniques that have been used to improve healthcare performance in many areas such as: medical operations, reports, decision making, and prediction and prevention system. Moreover, the systematic review has showed an interesting demographic of fields of publication, research approaches, as well as outlined some of the possible reasons and issues associated with healthcare data analytics, based on geographical distribution theme.

IDEATION & PROPOSED SOLUTION

CHAPTER 3

IDEATION & PROPOSEDSOLUTION

3.1 EMPATHY MAP CANVAS

An empathy map is a simple,easy –to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to helps teams better understand their users..

Creating an effective solution requires understanding the true problem and the person who is experiencing it.The exercise of creating the map helps participants consider thingsfrom the user'sperspective along with his or her goals and challenge.
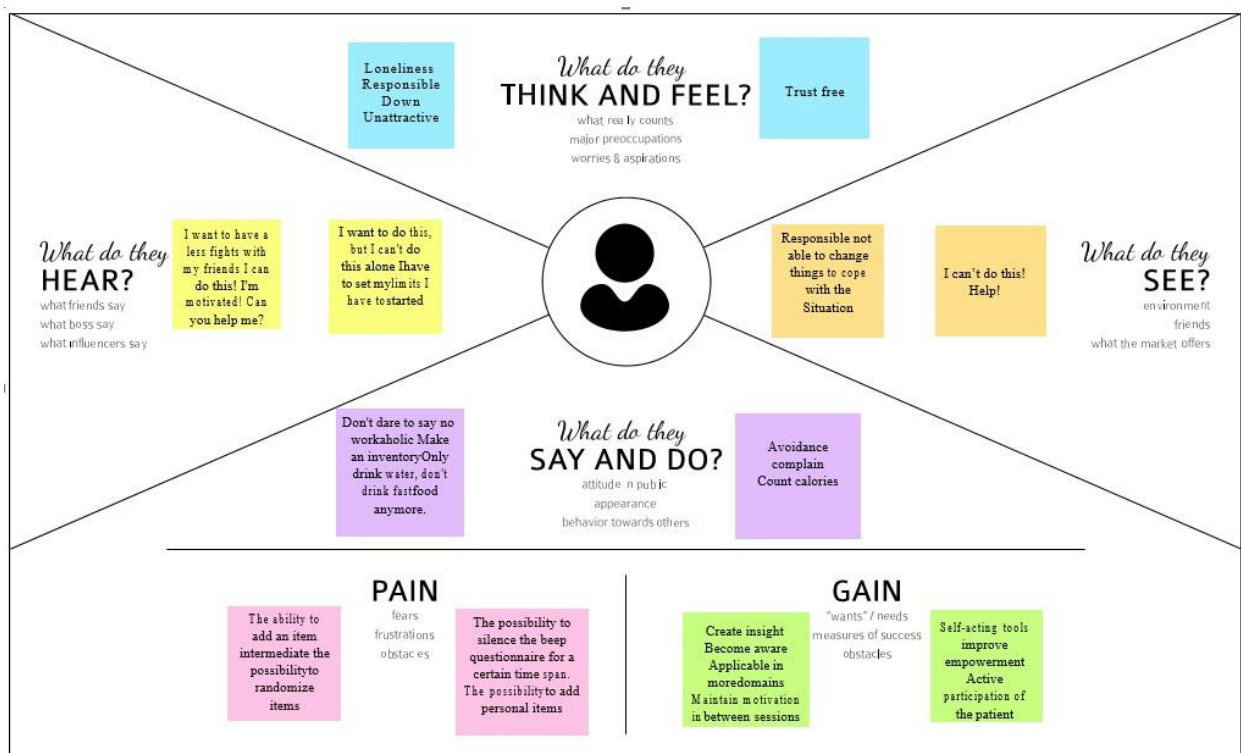
3.2 IDEATION & BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyonewithin a team to participate in the creativethinking 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.

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

Need some inspiration?
See a finished version of this template to kickstart your work.

Open example →

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

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

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

C   Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1

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

PROBLEM
How might we [your problem statement]?

Key rules of brainstorming
To run a smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.

BRAINSTROM 1
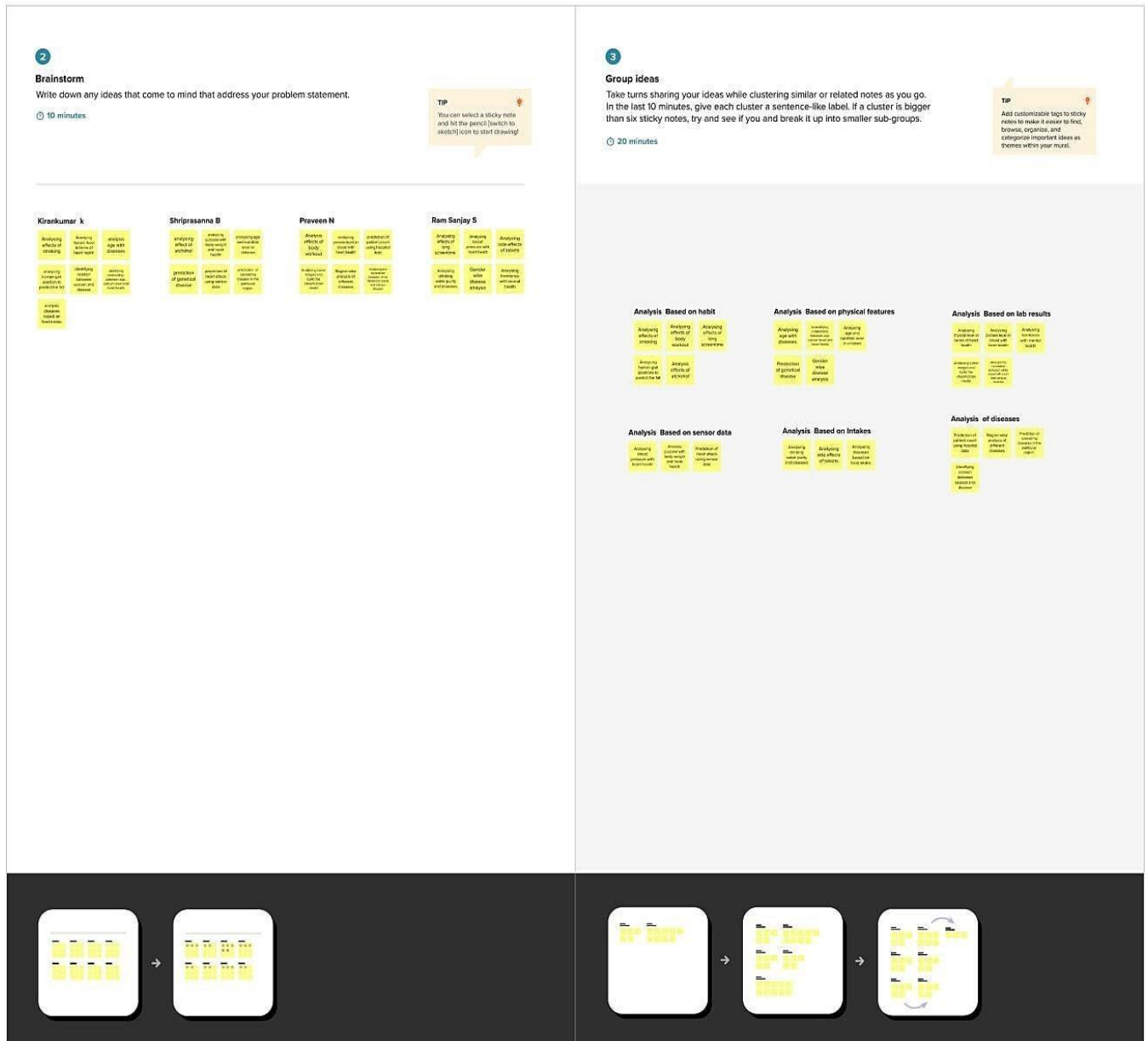
BRAINSTROM 2

3.3 Proposed Solution

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	Health care is a fast-growing field, Electronic Health Records (EHRs) or patients, deep analysis on the research field of healthcare data analytics.

2	Idea / Solution description	The impact COVID-19 has had on the health care industry is evident to anyone and everyone. You don't need to be plugged into the world of medicine to see what has been happening worldwide during this pandemic What most people don't see, though, is the impact COVID-19 has had on health care data analytics. "Big data tools have played an increasingly significant role in health care decision making" says *HealthAnalysis* Collect and mine data, Examine Current and historical data, Evaluate raw data, Build predicitive models, Automate remotes.

3	Novelty / Uniqueness	Big data analytics (BDA) is of paramount importance in healthcare aspects such as patient diagnostics, fast epidemic recognition, and improvement of patient management
4	Social Impact / Customer Satisfaction	Big data analytics (BDA) is of paramount importance in healthcare aspects such as patient diagnostics, fast epidemic recognition, and improvement of patient management
5	Business Model (Revenue Model)	Analytics is playing a huge role in helping companies taking informed decisions, within different therapeutical areas, markets, and regions to reach up to decisions within the stipulated timeframe, and get exposed to real-world insights from competitors, payers, regulators, patients, etc.
6	Scalability of the Solution	In hospitals, Clinical Decision Support (CDS) software analyzes medical data on the spot, providing health practitioners with advice as they make prescriptive decisions.

3.4 Problem Solution fit

1.CUSTOMER SEGMENT(S)

Segmentation of patients is usually a way to categorize patients based on age, gender, interests, disease, beliefs, lifestyle, etc. This way, the healthcare practitioner can more according to the patient segments.

2. JOBS-TO-BE-DONE / PROBLEMS

The healthcare industry also lacks the right kind of resources to understand the level of customer satisfaction and the changes needed for improving patient experience.

3.TRIGGERS

Patient Response Protocol" Target: Patients that require urgent evaluation/treatment (Ideally within 5 min) but currently do not require Critical Care interventions

4. EMOTIONS: BEFORE / AFTER

- Burden of preventable medical errors. ...
- Medical information explosion. ...
- The slow diffusion of medical knowledge. ...
- Good care costs less.

5.AVAILABLE SOLUTIONS

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.

6. CUSTOMER CONSTRAINTS

- Needs (based on patient perception)
- Patient preferences.
- Price or cost of use.
- Income.
- transportation cost.
- waiting time.

7. BEHAVIOUR

Practices to improve access to care included addressing illiteracy and low health literacy, identifying cost-effective resources, expanding care offerings, enhancing the patient–provider relationship, and cultivating a culture of teamwork and customer service.

8. CHANNEL BEHAVIOUR

8.1 ONLINE

From using telemedicine to provide convenient remote doctor visits and offering patient portals, so patients can access their health record from home to using digital signage in waiting rooms to help reduce perceived wait time, modern healthcare is being driven by digital media solutions

8.2 OFFLINE

The 3 P's model encompasses an evidence-based approach to preparation, protection, and prevention, for safety of patients and healthcare staff

9. PROBLEM ROOT CAUSE

Patient data lies within paper charts, electronic records, and other sources. These sources are often incompatible, which makes it nearly impossible for clinicians to access a patient's entire medical profile. This leads to wasted time, duplicative care, inefficient patient visits, and misdiagnosis.

10. YOUR SOLUTION

The deep penetration of the mobile apps is transforming the way patients are given medicinal treatment in the hospital and addressing all the challenges the healthcare industry is facing. Many healthcare giants have leapfrogged in the healthcare industry embracing advanced mobility solutions for better patient care.

REQUIREMENT ANALYSIS

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	VTE Risk SmartForm	As a Clinician patient's risk
FR-2	Data Entry	VTE (risk category), and ensure proper prophylaxis
FR-3	BPA to Prompt Ordering VTE	As an Inpatient MD/APP
FR-4	Dynamic Order Group in Admit Order Sets	Inpatient MD/APP, I want to view only risk-appropriate VTE
FR-5	Data	As a user, I access the data in visualize mode

FR No.		Description
	Requirements	
FR-6	Dashboard	As a user, I can access the data from queries,graph,pie chart

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 effectiveness, efficiency and satisfaction with which specific users can achieve a specific set of tasks in a particular environment.
NFR-2	Security	Educate Healthcare Staff. Restrict Access to Data and Applications. Implement Data Usage Controls. Log and Monitor Use
NFR-3	Reliability	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.
NFR-4	Performance	Promote preventive measures by giving patients greater insight into their health and treatment goals. Integrate data from consumer fitness devices and other patient-provided sources of health data.
NFR-5	Availability	Transitioning to a career in data analytics can mean stable employment in a high-paying industry once you have the right skills. Each year, there is more demand for data analysts and scientists than there are people with the right skills to fill those role
NFR-6	Scalability	Scalability is the ability of a health intervention shown to be efficacious on a small scale and/or under controlled conditions to be

		expanded under real world conditions to reach a greater proportion of the eligible population, while retaining effectiveness.

PROJECT DESIGN

5 PROJECT DESIGN

5.1 Data Flow Diagrams
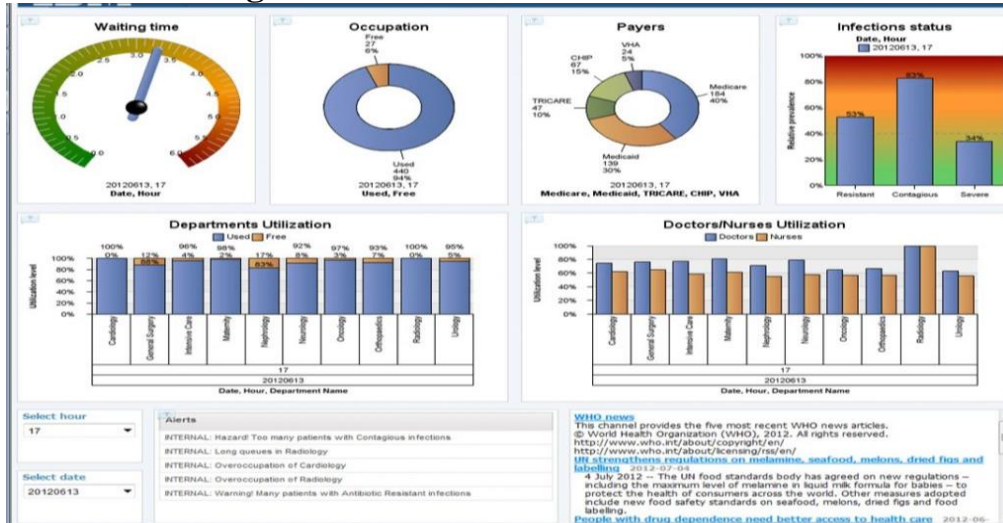
5.2 SOLUTION & TECHICAL ARCHITECTURE
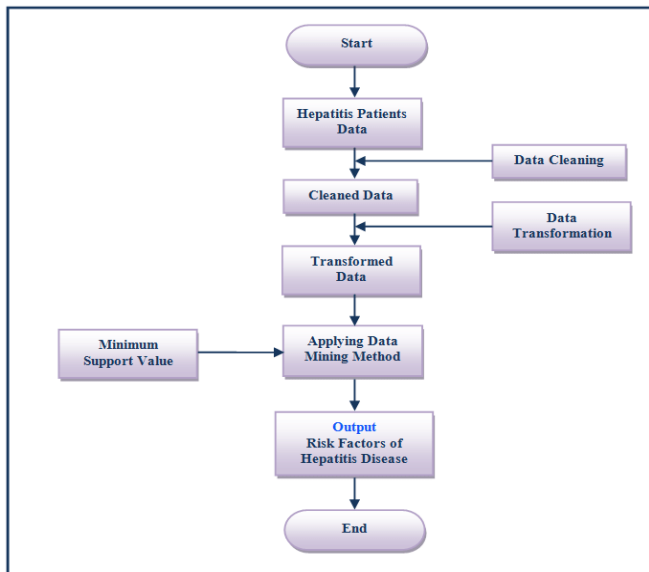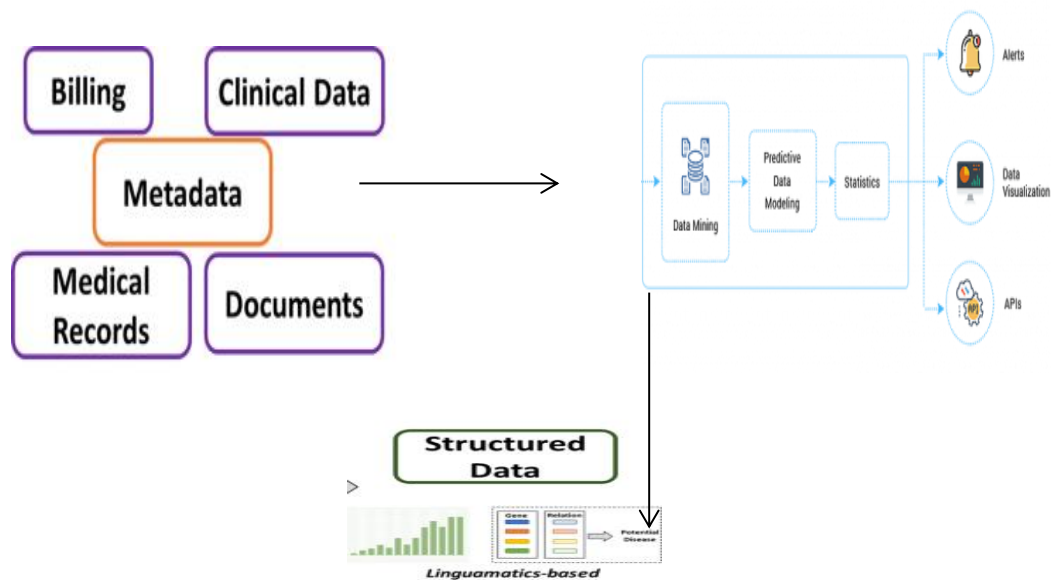
5.3 USER STORIES

UserType	Functional Requirement(Epic)	User Story Number		User Story /Task	Acceptanc ecriteria	Priority	Release
Customer(Web user)		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	High	Sprint-1
		USN-2		As a user, I will receive confirmation email once I haveregistered for the application	I can receive confirmatio n email & click confirm	High	Sprint-1

		USN-3		As a user, I canregister for the application through Gmail	I can register & access the dashboard	Medium	Sprint-1
	Login	USN-4		As a user, I can log into the application by entering email & password	I can access the dashboard	High	Sprint-1
	Dashboard	USN-5		As a user, I canupload the datasets to the dashboard	I can access various operations	High	Sprint-1
	View	USN-6		As a user, I can view the patientdetails	I can view the visual dataandthe result after the prediction	High	Sprint-2
Admin	Analyse	USN-7		As an admin, I will analyse the given dataset	I can analysethe dataset	High	Sprint-2
	Predict	USN-8		As an admin, Iwill predict the length of stay	I can predictthe length of stay	High	Sprint-2

Table 5.1 User Stories

PROJECT PLANNING & SCHEDULING

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

MILESTONES	ACTIVITY LIST
MILESTONE-1	Collecting the data based on the application
MILESTONE-2	Uploading the collected data on the IBM COGNOS platform
MILESTONE-3	Data exploration in the IBM COGNOS platform
MILESTONE-4	Data visualization in the IBM COGNOS platform
MILESTONE-5	Creating an interactive dashboard
MILESTONE-6	Displaying the prepared dashboard
MILESTONE-7	Preparing a standard dataset and removing the unwanted data using the python programming
MILESTONE-8	By using the various algorithm and exploring the result and getting the accurate result with the help of an algorithm which give more accuracy
MILESTONE-9	Displaying the result according to the required format for example displaying the Length Of Stay of a patient
MILESTONE-10	Deployed in the GitHub

Table 6.1 Sprint Planning and Estimation

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	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 arecollected.	20	High	2 Members
Sprint-2	Analyze	USN-2	As a health care provider all the data thatare 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 canpresent data in my dashboard.	10	High	2 Members

Table 6.2 Sprint Delivery Schedule

6 REPORTS FROM JIRA

6.1 JIRA BOARD

BACKLOGS

ROADMAP

CODING AND SOLUTIONING

CHAPTER 7

CODING AND SOLUTIONING

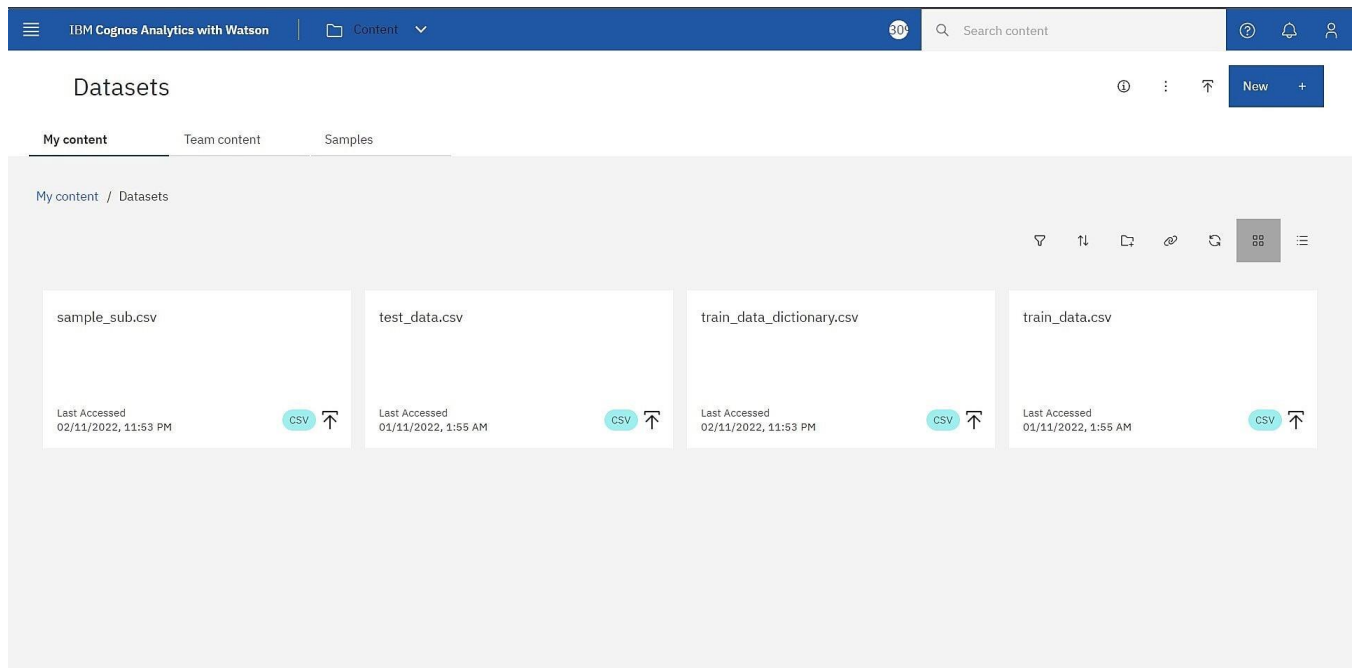### 7.1 CREATE AND CONFIGURE IBM CLOUD SERVICES

USN 1: As a user, I will create IBM cloud account
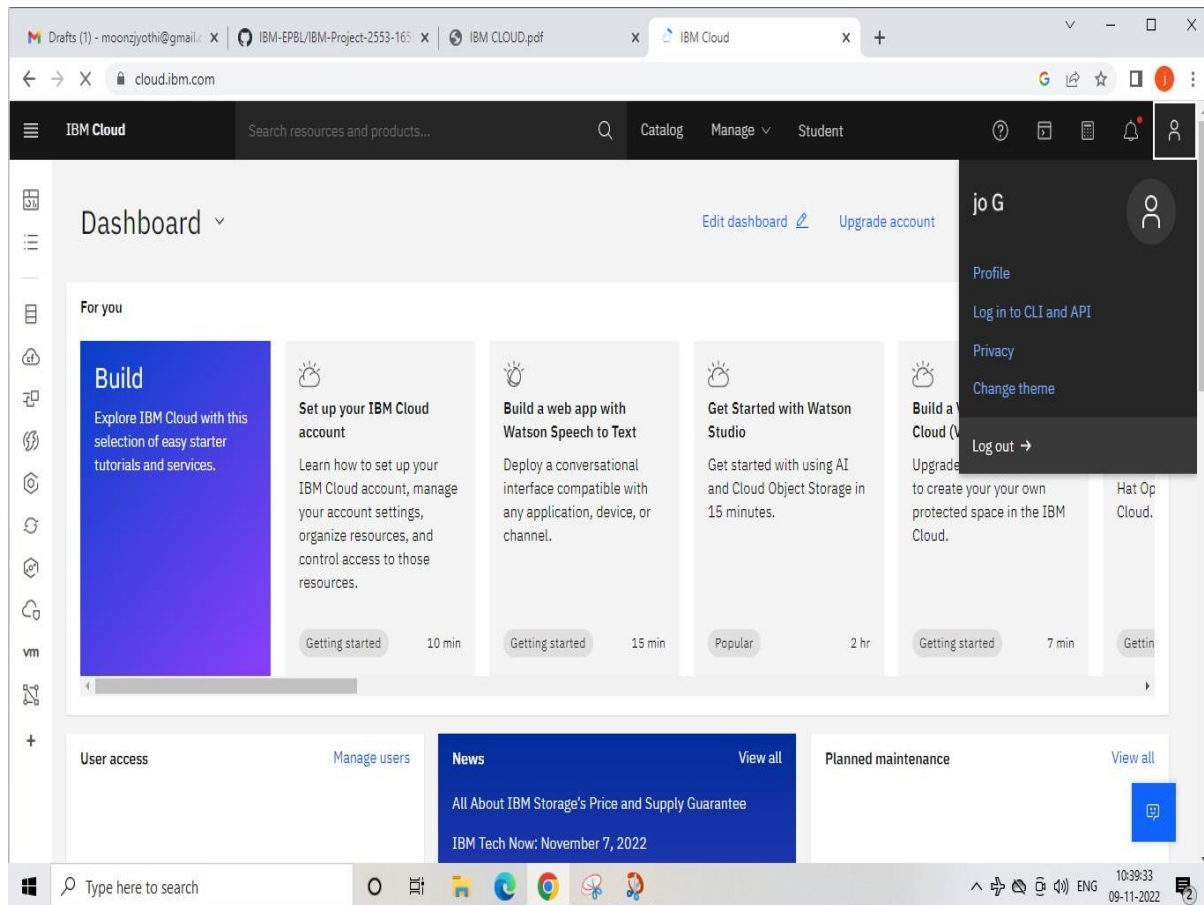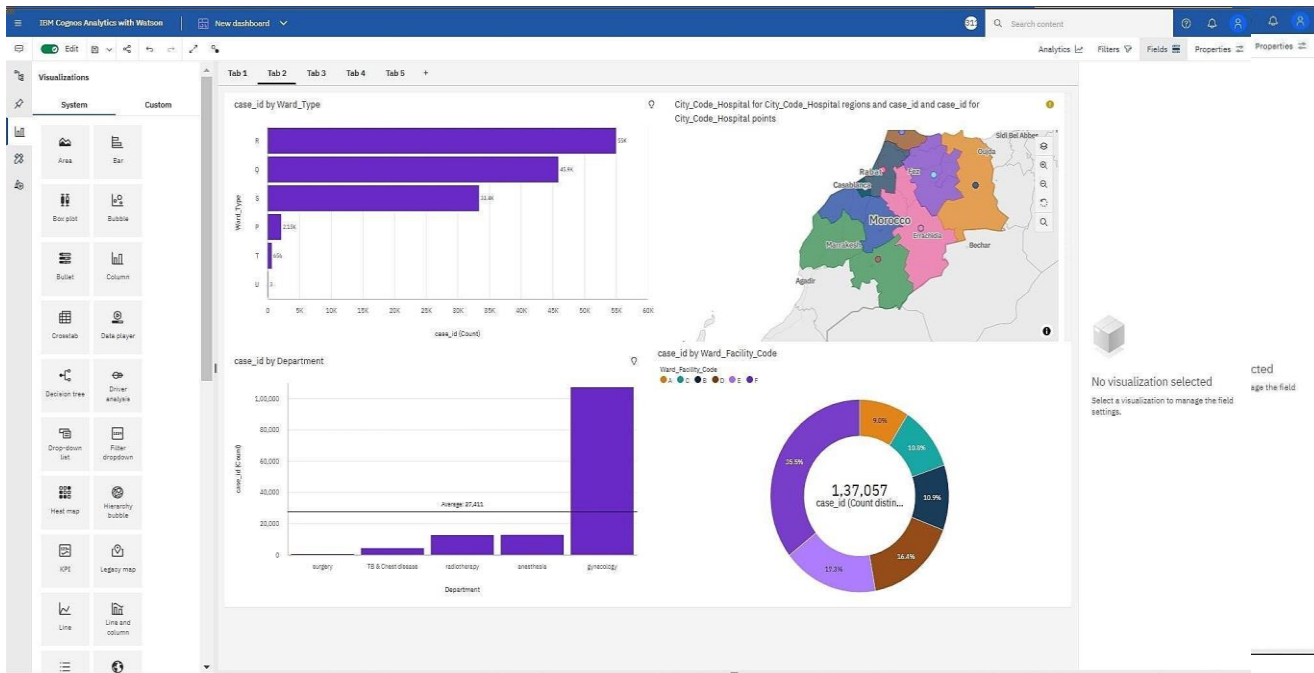

USN 2: As a user, I will create IBM cognos account.
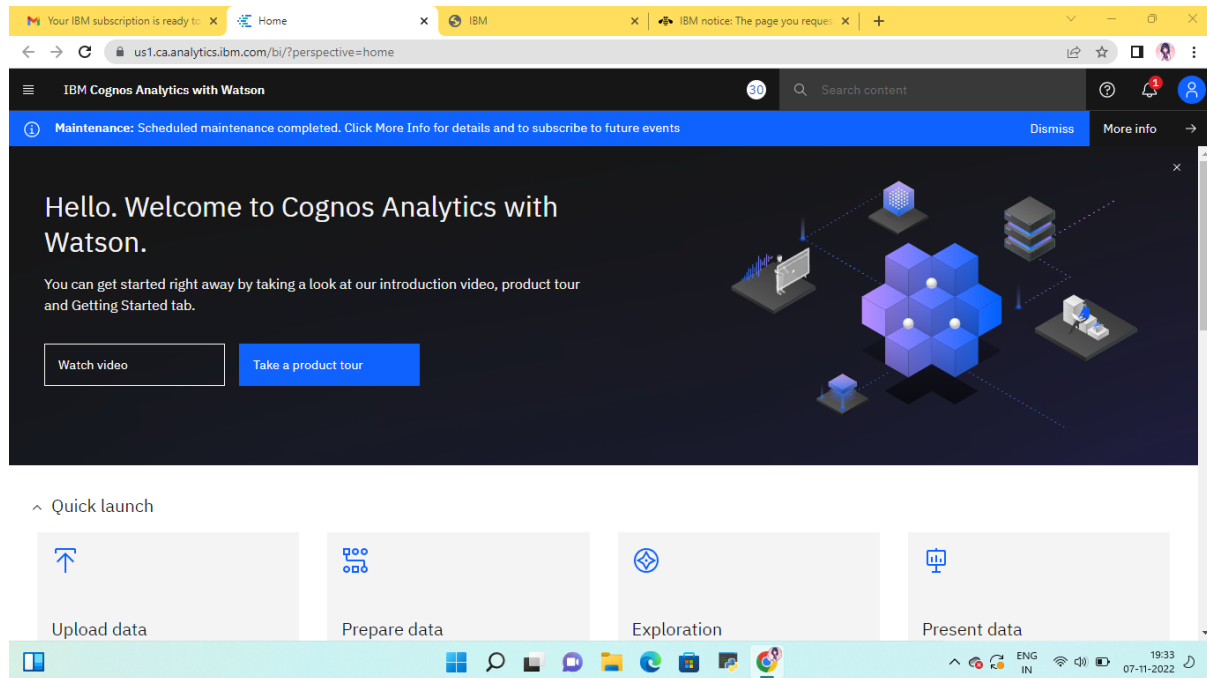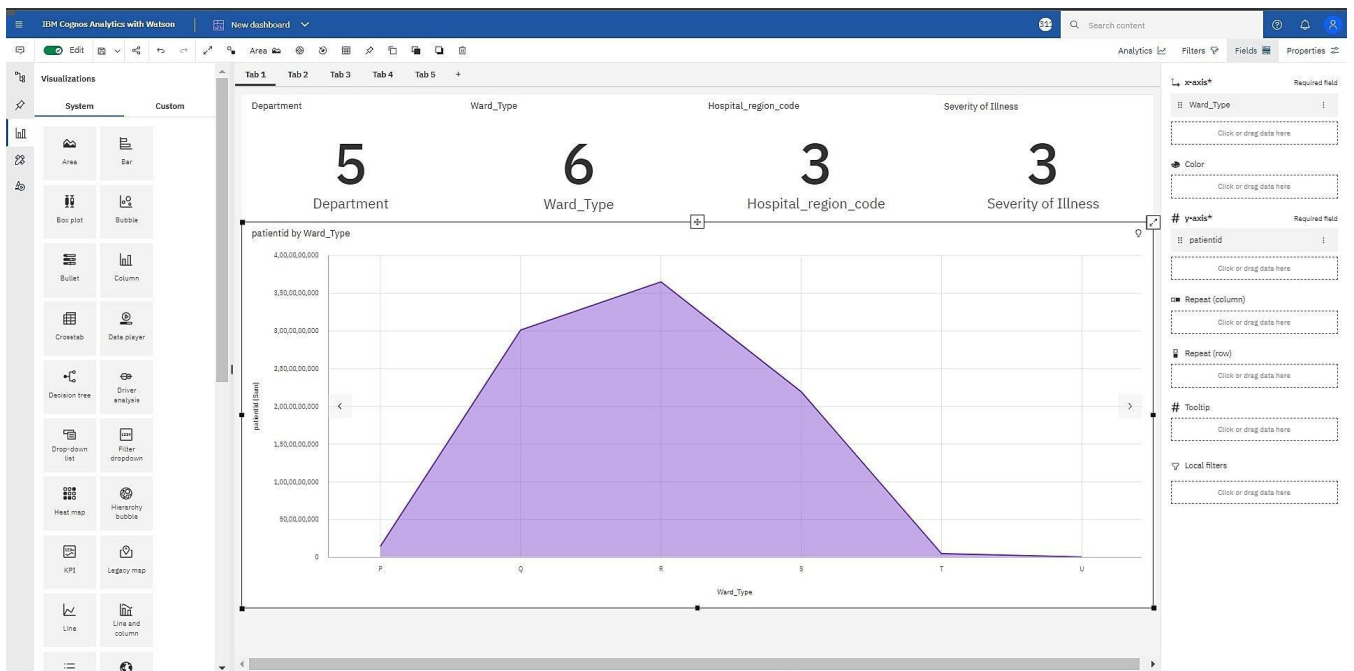
USN 3: Loading the datasets

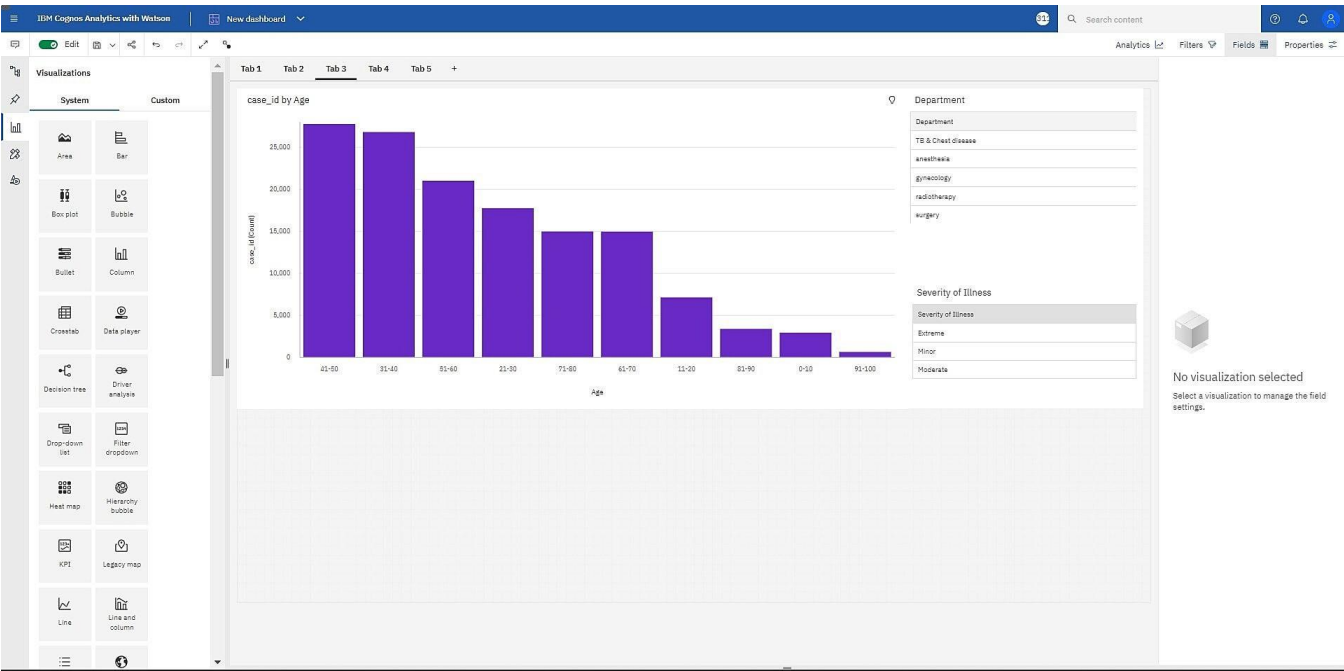USN 4: Data analysing with different visualisatioin chart

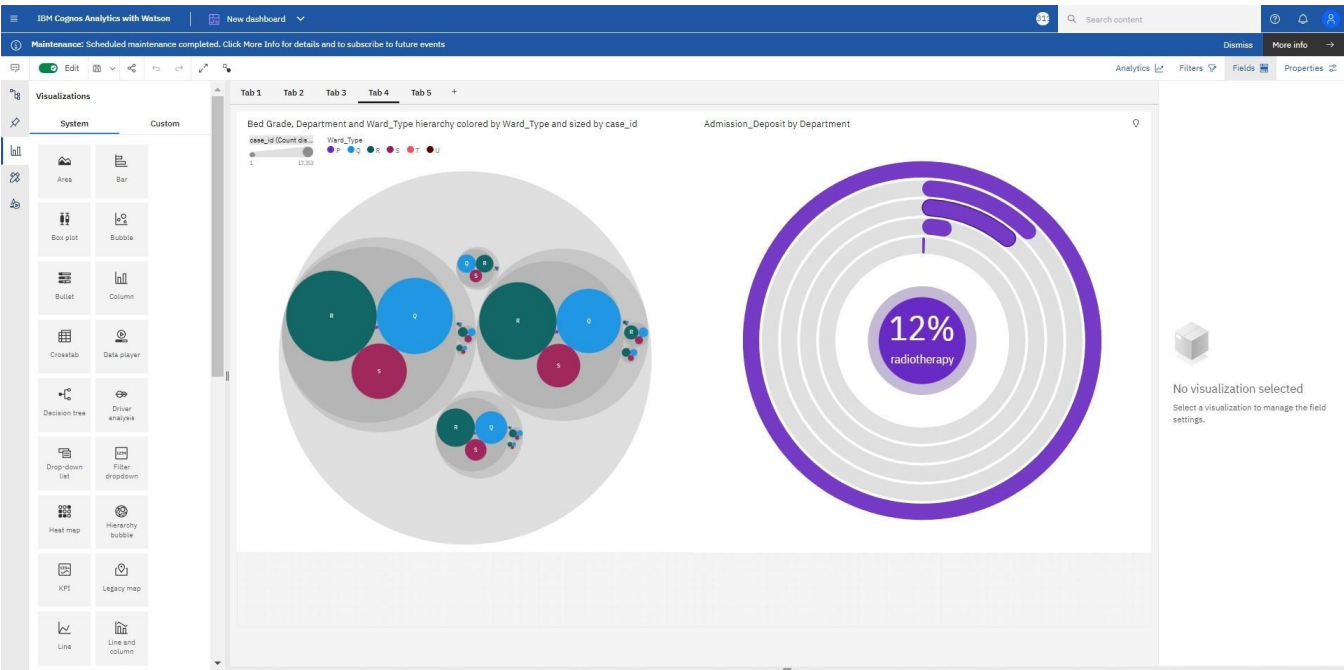## Data Visualizations

USN 5: Number of Patients By ward types.

USN 6: Dashboard to show number of patients.

USN 7 : Age wise patients with department and severity filters.

USN 8: Dashboard with Hierarchy bubble and radial visuals.

USN 9: Select the dataset.

USN 10: Prepare the dataset.

USN 11: Null values cleaning process.

USN 12: Python pandas with numpy.

```python
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns

%matplotlib inlinedf=
pd.read_csv("C:/Users/nprav/OneDrive/Desktop/
Healthcare_Data/train_data.csv")

df
```


Histogram for Admission_Deposit

Edit calculation

Name: City_Code_Patient

Components | Expression

Search
- between
- case
- contains
- currentMeasure
- default
- distinct
- else
- end
- ends with
- escape
- for
- for all
- for any

```
1  IF ( City_Code_Patient is missing )
2    THEN ( median (City_Code_Patient  ))
3    ELSE ( City_Code_Patient )
```

Validation Results

✓ The expression is valid.

Cancel   OK

USN 13: Visitors with patient by type of admission.

Visitors with Patient by Type of Admission

Details

No details found

No details were found for this visualization.

USN 14: Hospital region code for hospital region code regions.

Create + ∧ 6/10 ▾ | Map ⊕ Related 🗔 Compare 🗗 📌 ⛶ 🗑 | Analytics 〽 Details 📈 Fields 📊 Properties ⚙

Hospital_region_code for Hospital_region_code regions

Hospital_region_code
● Y

Details

The total number of results for
Hospital_region_code, across all
Hospital_region_code, is over 318 thousand.

7.2 DASHBOARD CREATION WITH DATASETS.

OVERVIEW

LOCATION WISE ANALYSIS
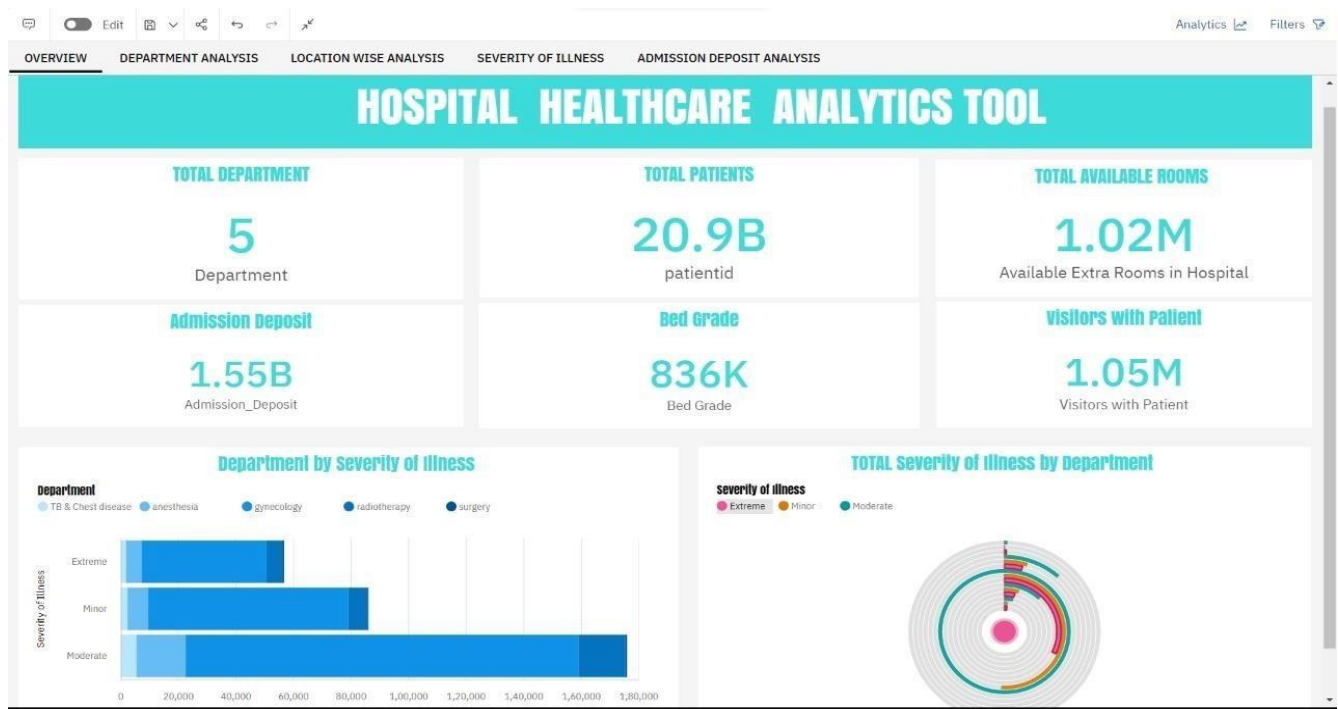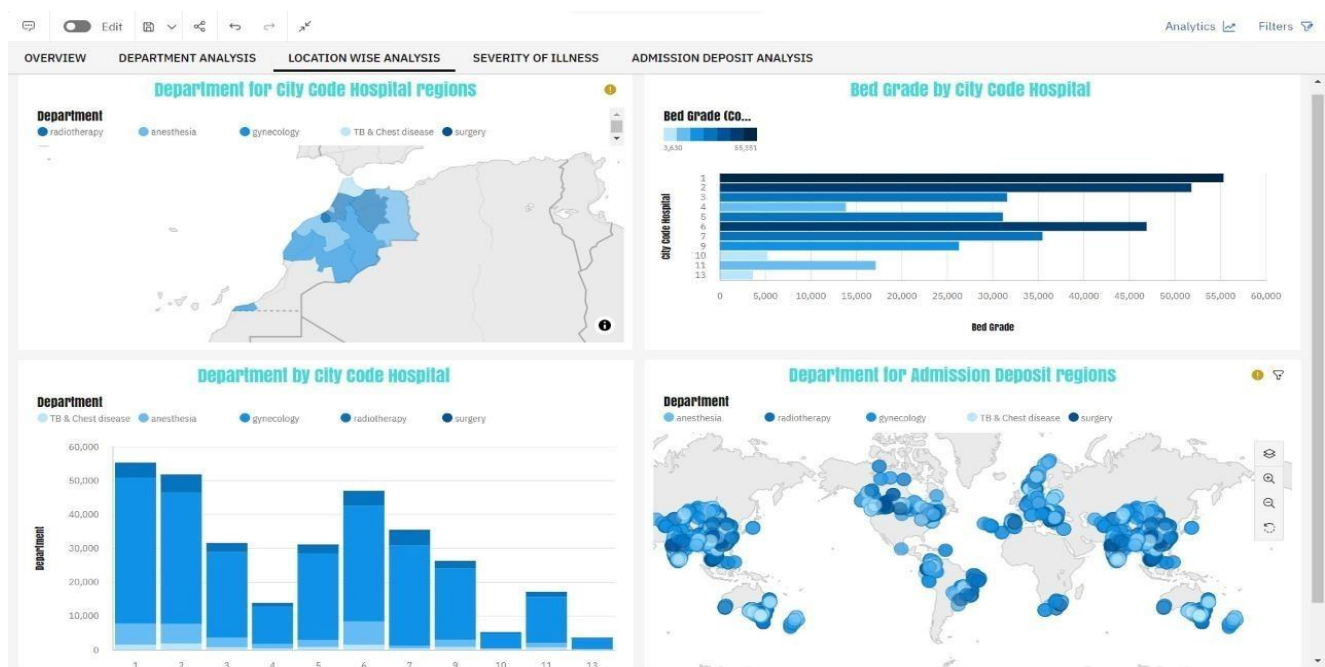
SEVERITY OF ILLNESS

ADMISSION DEPOSIT ANALYSIS

RESULTS

CHAPTER 8

RESULT

HOSPITAL HEALTH CARE DATA ANALYTICS REPORT
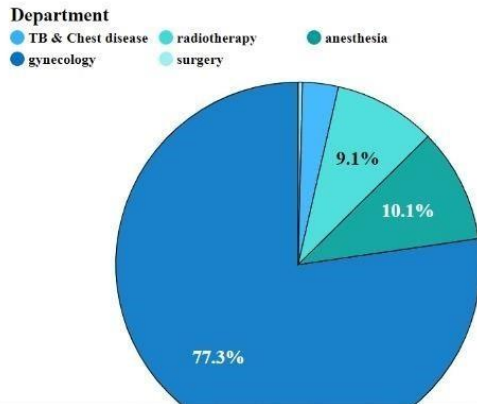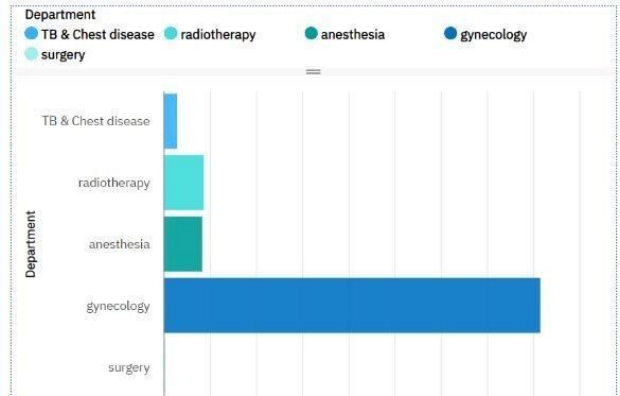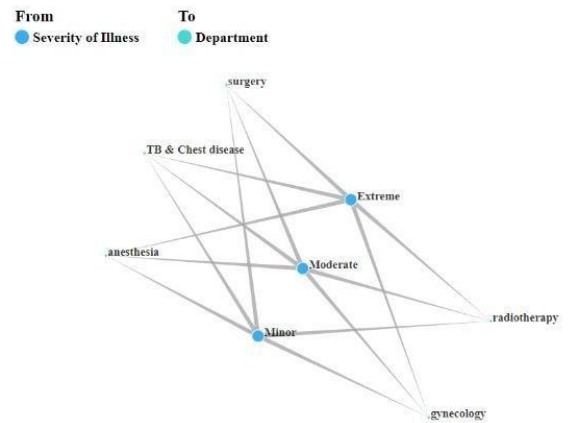
CITY CODE HOSPITAL BY DEPARTMENT

Department
- radiotherapy
- anesthesia
- gynecology
- TB & Chest disease
- surgery
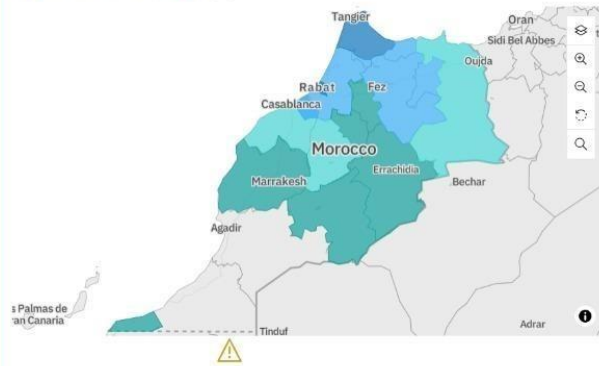
TYPE OF ADMISSION BY ADMISSION DEPOSIT

Type of Admission
- Urgent
- Trauma
- Emergency

ADVANTAGES AND DISADVANTAGES

CHAPTER 9

ADVANTAGES AND DISADVANTAGES

9.1 ADVANTAGES

- As the internet reaches the far ends of our world, so does digital health. With a simple internet connection, anyone can access **patient health records** online without visiting the medical center.

- Gone are those days of securely storing all the handwritten prescriptions and test reports. With **electronic health record** apps, you can store all the relevant health data in one place without worrying about losing one.
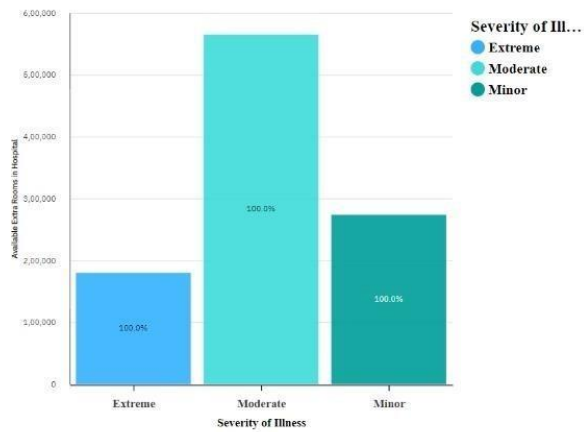
- Personal digital health tools like fitness bands let you know your health-relateddata on a real-time basis.

- Those technological marvels constantly track your vitals and auto-dial emergencynumbers in case anything wrong happens to you.

9.2 DISADVANTAGES

- Adapting to new technologies has always been a challenge for senior citizens.

- Adapting to new technologies has always been a challenge for senior citizens. Some of them prefer the old-school treatment methods instead ofgetting used to digital health facilitators.

- If not done properly, these apps can often crash, resulting in an inconvenience.

CONCLUSION

CHAPTER 10

CONCLUSION

This research demonstrates Analytics for hospital and health care data with data visualization and anlaytics.This information is gathered from a series of health information systems (HIS) and other technological tools utilized by health care professionals, insurance companies and government organizations. Consider the impact this has had on the COVID-19 pandemic. The data being collected is analyzed in real time to understand the effects of the virus better and predict future trends so we may slow the spread and prevent future outbreaks. Health care data management has the potential to lead to better care if used properly.

Healthcare analytics can be understood as the gathering and analysis of healthcare sector data with the purpose of deriving insights and prompting decision-making. Ranging from main areas like medical expenses, clinical data, patient behavior, or pharmaceuticals, healthcare data analytics can be employed at both the macro and micro level to sufficiently boost operations, enhance patient care, and curtail overall expenses.

Nevertheless this data, while being highly advantageous is also pretty complicated. Be it the data from electronic health records (EHR) or the data gained by assessing real-time vital signs, the data is not only derived from a number of varying sources, but it is also required to follow government regulations, making it a complex and precarious process.

FUTURE SCOPE

CHAPTER 11

FUTURE SCOPE

The data analytics market in the healthcare space has only increased over the last few years. Considering the rising costs of medical treatments globally, a proper body of knowledge was needed to reduce the costs at the business-level as well as the professional-level. McKinsey, in one of its reports, states that healthcare expenses constitute 17.6 percent of the GDP in the USA, which is approximately US$600 billion, more than what is the set benchmark for the ideal size of population in the country. This is a serious indicator of bigger trouble. Hence, the usage of healthcare data analytics is being promoted these days.

To some, the domain of healthcare data analytics may look new, but it has a lot of potential, especially if you wish to engage in challenging job roles and build a strong data analytics profile in the upcoming years. In this blog, we have covered some of the major topics such as what is healthcare data analytics, its applications, scope, and benefits, etc. We hope it helps you in your decision-making as a healthcare data analytics professional.