

Project Report

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|--------------|---|
| Team ID | PNT2022TMID33778 |
| Project Name | Analytics for Hospital's Health-Care Data |

1. INTRODUCTION

1.1 Project Overview

- Data analytics in clinical settings attempts to reduce patient wait times via improved scheduling and staffing, giving patients more options.
- when scheduling appointments and receiving treatment, reduce readmission rates by using population health data to predict which patients are at the greatest risk

1.2 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 and treatments faster, keep better track of inventory, involve patients more in their own health, and empower them with the tools to do so.

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 center 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

- 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.
- Traditional supply chain management is often wasteful and inefficient.

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 its 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. Archana

TITLE: Historical Review Of Health Policy Making

AUTHOR: Ravi Duggal

2.3 Problem Statement Definition

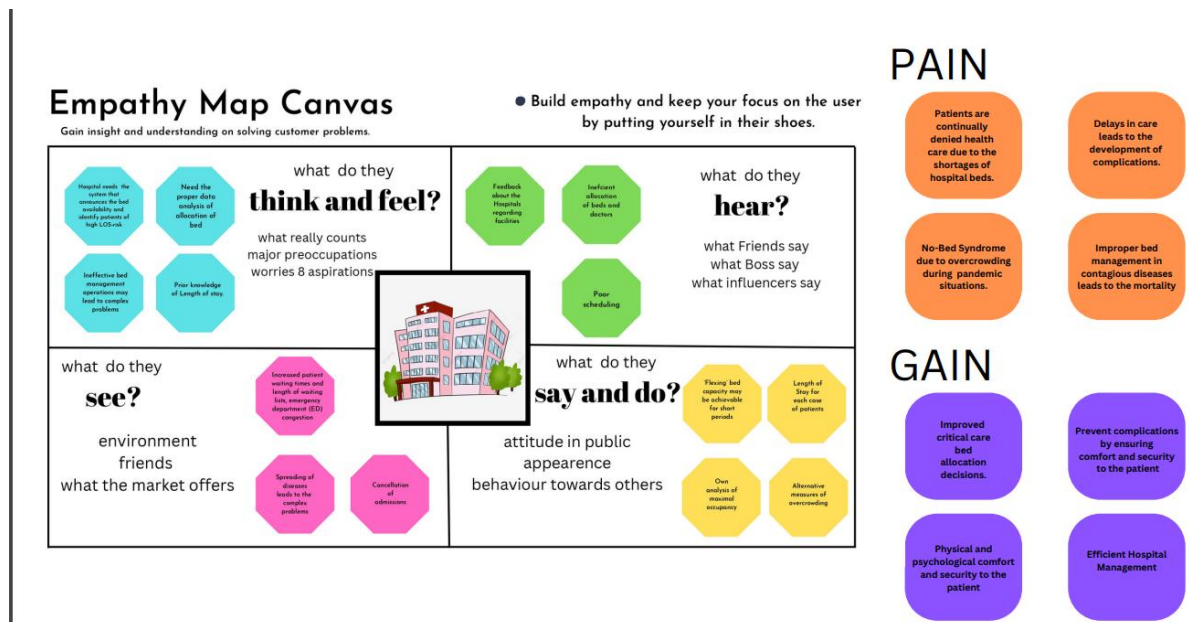
- Collection dataset. Upload the dataset into cognos .
- Open the properties->data module.
If null value is present in character field use mode method.
- If the null value is present in continuous field use average or medium .

- Display the data in respective charts.
Create conclusion using summary

3. IDEATION & PROPOSED SOLUTION

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.

2

Brainstorm

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

🕒 10 minutes

AGS Jimson

Track process without errors

Patients self involvement

Effective and time saving

Create Better Strategies

Venciya R

Display lists

Display Patient Status

Display Patient Information

Display Details

Vishnu K

Maintain Digital Records

Revenue Cycle Management

Better Department Coordination

Great Customer Experience

Tamil Kumaran C

Digital Medical Records

Facility Management

Patient Self-service

Better Customer Experience

3.3 Proposed Solution

Problem solution

| S.No. | Parameter | Description |
|-------|--|--|
| 1. | Problem Statement (Problem to be solved) | To accurately predict the Length of Stay for each patient on case-by-case basis so that the Hospital can use this information for optimal resource allocation and better functioning. The length of stay is divided into 11 different classes ranging from 0-10 days to more than 100 days. |
| 2. | Idea / Solution description | The goal is to predict the length of stay using predictive analytic tools such as neural network and decision trees that makes predictions using historical data combined with statistical modelling. We are collecting and interpreting data from multiple sources like cost, reports, electronic health record (EHR), etc. and then building models and analysing data to uncover the trends and patterns using data visualization techniques. |
| 3. | Novelty / Uniqueness | Healthcare data tends to reside in multiple places. Aggregating this data into a single, central system, makes our solution unique moreover the use of specific algorithms help us achieve more accuracy. |

| | | |
|----|---------------------------------------|---|
| 4. | Social Impact / Customer Satisfaction | Data Analytics offers predictive solutions that are able to anticipate visits and admission rates. These solutions reduce labour costs and improve customer service, as well as reducing wait times and providing better quality care. The symptoms of diseases can be detected at a very early stage using data mining techniques, so that number of days for recovery can be predicted easily. It helps to boost productivity in diagnosis and treatment. |
| 5. | Business Model (Revenue Model) | The length of stay (LOS) of a patient and the available resources go hand in hand. By understanding the average LOS, we would definitely be able to plan better and provide immediate help with both resources and medical support. Our model helps with understanding the pattern behind the disease, the LOS and the resource utilised. Also, as the more number of predictions we make the better the accuracy gets. This way hospitals are able to accommodate well without spending too much or too little money on resources. |
| 6. | Scalability of the Solution | Hospital's data grows day by day and with more data we would be able to provide more accuracy. Data Mining and prediction techniques are used here for tracking the availability of resources for handling emergencies. This is why scalability is seen as an advantage over here. |

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 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 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.

| | | | | |
|--|---|--|--|--|
| Define CS, fit into CC | 1. CUSTOMER SEGMENT(S) Who is your customer? I.e., working parents of 0-5 y.o. kids CS Hospital management who manage all the data. | 6. CUSTOMER CONSTRAINTS CC What constraints prevent your customers from taking action or limit their choices of solutions? I.e. spending power, budget, no cash, network connection, available devices. Maintenance, budget, System maintenance problem, No cash, Network Errors, Data privacy and security, Regulations and compliance, difficulty in training users technically, shortage of health informatics professionals, data interoperability, Less experienced staff Shortage in equipment facilities, low knowledge in using High end professional devices | 5. AVAILABLE SOLUTIONS AS Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? I.e. pen and paper is an alternative to digital notetaking. Most healthcare organizations collect EMR abstracts, claims data, and data about enrollment and medical programs. Only leading organizations additionally use electronic EMR feeds and disease management program data. Very few organizations use non-health data sources that can be used to augment formal medical data, such as patient lifestyle information, remote monitoring and wearable devices, and survey data about patient experience. | Explore AS, differentiate |
| | 2. JOBS-TO-BE-DONE / PROBLEMS J&P Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. The goal is to predict the length of stay using predictive analysis tools that makes predictions using historical data combined with statistical modelling. Patterns and relationships among the diseases, frequency in the season and number of days for recovery and are identified using data visualization, techniques by using the processed data. | 9. PROBLEM ROOT CAUSE RC What is the real reason that this problem exists? What is the back story behind the need to do this job? I.e. customers have to do it because of the change in regulations. Process of examining raw datasets to find trends, draw conclusions and identify the potential for improvement. Health care analytics uses current and historical data to gain insights, macro and micro, and support decision-making at both the patient and business level. The use of health data analytics allows for improvements to patient care, faster and more accurate diagnoses, preventive measures, more personalized treatment and more informed decision-making. At the business level, it can lower costs, simplify internal operations and more. | 7. BEHAVIOUR BE What does your customer do to address the problem and get the job done? I.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (I.e. Greenpeace) It identifies the patient's admission, attending, and frequency of the stay they have in the particular hospital. And majorly to manage the accounts and data that are to be handled by making physical documents and records and finally they are uploaded in the method of software-oriented Files and it is monitored by Data Analysts to decide the results. | |
| Focus on J&P, tap into BE, understand RC | | | | Focus on J&P, tap into BE, understand RC |

| | | | | |
|-----------------------|--|---|--|-----------------------|
| Identify Strong TR&TM | 3. TRIGGERS TR What triggers customers to act? I.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. The covid-19 pandemic proved the importance of resource management. Several people died due to unavailability of hospital beds, ventilators etc. It is during such crucial moments: we step back and realize the importance of planning the length of stay (LOS) of patients before hand | 10. YOUR SOLUTION SL If you are working on an existing business, write down your current solution first, fill in the commas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the commas and come up with a solution that fits within customer limitations, solves a problem and matches customer behavior. Collecting data from patients Analyzing the needs of hospitals Structuring and sorting the data for use Performing Data Analytics using various tools Implementing algorithms on the data to extract insights Building predictive models with the development team | 8. CHANNELS OF BEHAVIOUR CH 8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7 To handle all the documents and Records of the length of stay about the patients and manage them in a proper way. They must give proper details about the patient and accurate medications that are advised to follow. 8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. The treatment and consultation that are to be done in offline that must be of full effective to the patients as they follow the Physician's advice and allowing their admission in respective beds and the major equipment for the treatment. | Identify Strong TR&TM |
| | 4. EMOTIONS: BEFORE / AFTER EM How do customers feel when they face a problem or a job and afterwards? I.e. lost, insecure - confident, in control - use it in your communication strategy & design. Before: There is no proper data collection and analysis. Lack of privacy and security After: monitoring of patient's data, tracking of medical inventory and assets, organizing collected data and visualization of data on the dashboard and the reports Before: There is no proper data collection and analysis. Lack of privacy and security, Data storage, Data cleaning. After: monitoring of patient's data, tracking of medical inventory and assets, organizing collected data and visualization of data on the dashboard and the report. | | | |

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|--------|-------------------------------|--|
| FR-1 | User Registration | The User has his/her own ID to get registered in the portal |
| FR-2 | User Confirmation | Confirmation via Email Confirmation via OTP |
| FR-3 | Dashboard | The collected data are found in visualized format and the prior data are analyzed. |

| FR No. | Non-Functional Requirement | Description |
|--------|----------------------------|-------------|
|--------|----------------------------|-------------|

| | | |
|------|-------------------------|---|
| FR-4 | Dataset | The patients record and staffs record are collected and consolidated as dataset |
| FR-5 | Report Generator | The periodic reports of patients and the LoS are reported |
| FR-6 | Exploration | The data exploration on available dataset |

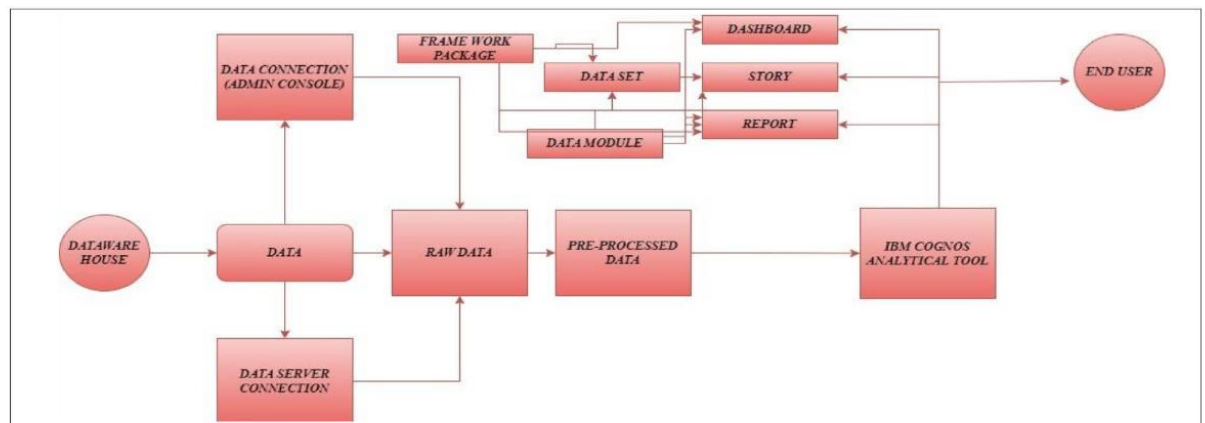
4.2 Non-Functional requirement

| | | |
|-------|--------------------|--|
| NFR-1 | Usability | No prior experience required to use the dashboard. People with basic understanding can use the system. |
| NFR-2 | Security | Only registered user can use this application. |
| NFR-3 | Reliability | The Analytics system ensures the reliability |
| NFR-4 | Performance | Gets updated regularly to improve the performance of the application. |

5. PROJECT DESIGN

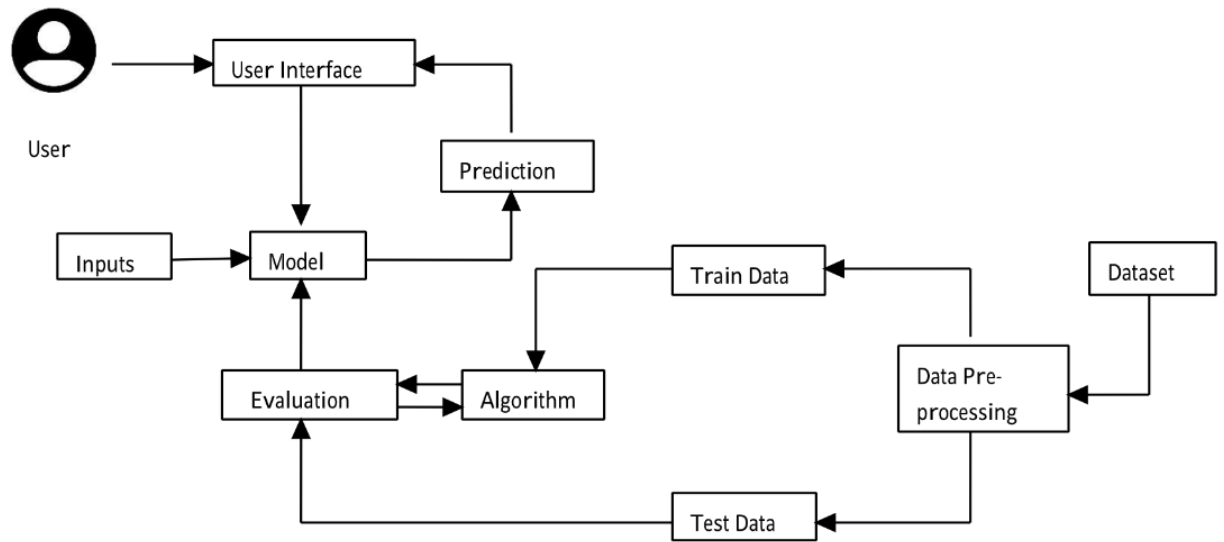
5.1 Data Flow Diagrams

- 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 similar to 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.



5.3 User Stories

| User Stories | | | | | | |
|---------------------|-------------------------------|-------------------|--|--|----------|----------|
| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
| Patient | Hospitalization | USN-1 | Patients are required to hospitalize if they have any medical issues | Direct Hospitalization | High | Sprint-1 |
| | Treatment Report | USN-2 | Patients should collect them treatment report and get further doctor consult | They can receive the report from hospital | High | Sprint-1 |
| Hospital Management | Resource Allocation | USN-3 | Hospital Management should allocate the Necessary resource for treating the Patients | Should be ready for any circumstance | High | Sprint-2 |
| | Predicting Length of Stay | USN-4 | The Doctors should be aware of condition of Patients to predict the LoS | Exploring the data about the patient health condition and predicting LoS | High | Sprint-1 |
| | Resource Availability | USN-5 | The Hospital Staff should be aware of available resources in hospital | Visualizing the about the resource availability | High | Sprint-1 |

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|--------|-------------------------------|-------------------|-------------------|--------------|----------|--------------|
|--------|-------------------------------|-------------------|-------------------|--------------|----------|--------------|

| | | | | | | |
|----------|----------------------------------|-------|---|----|--------|-----------------|
| Sprint-1 | Data Collection | USN-1 | As a Admin, I can collect data and maintain it | 10 | Medium | AGS Jimson |
| Sprint-2 | Data Preparation | USN-1 | As a admin I need to prepare the data for further process | 20 | High | AGS Jimson |
| Sprint-3 | Data exploration | USN-2 | After preparing the data,the data need to be explored . | 10 | High | Venciya R |
| Sprint-4 | Dashboard | USN-3 | A Dashboard is created for the project .. | 10 | High | Venciya R |
| Sprint-5 | Dashboard | USN-4 | As a user, I can upload patient medical reports. | 20 | High | Vishnu K |
| Sprint-6 | Report generation and virtualise | USN-5 | As a user, I can virtualize the data which are analyzed | 20 | High | Tamil Kumaran C |

6.2 Sprint Delivery Schedule

| Sprint | Total Story Points | Duration | Sprint Start Date | Sprint End Date (Planned) | Story Points Completed (as on Planned End Date) | Sprint Release Date (Actual) |
|----------|--------------------|----------|-------------------|---------------------------|---|------------------------------|
| Sprint-1 | 20 | 3 Days | 28 Oct 2022 | 31 Oct 2022 | 20 | 31 Oct 2022 |
| Sprint-2 | 20 | 3 Days | 31 Oct 2022 | 03 Nov 2022 | 20 | 02 Nov 2022 |
| Sprint-3 | 20 | 3 Days | 03 Nov 2022 | 6 Nov 2022 | 20 | 4 Nov 2022 |
| Sprint-4 | 20 | 6 Days | 8 Nov 2022 | 16 Nov 2022 | 20 | 16 Nov 2022 |

6.3 Reports from JIRA

Velocity:

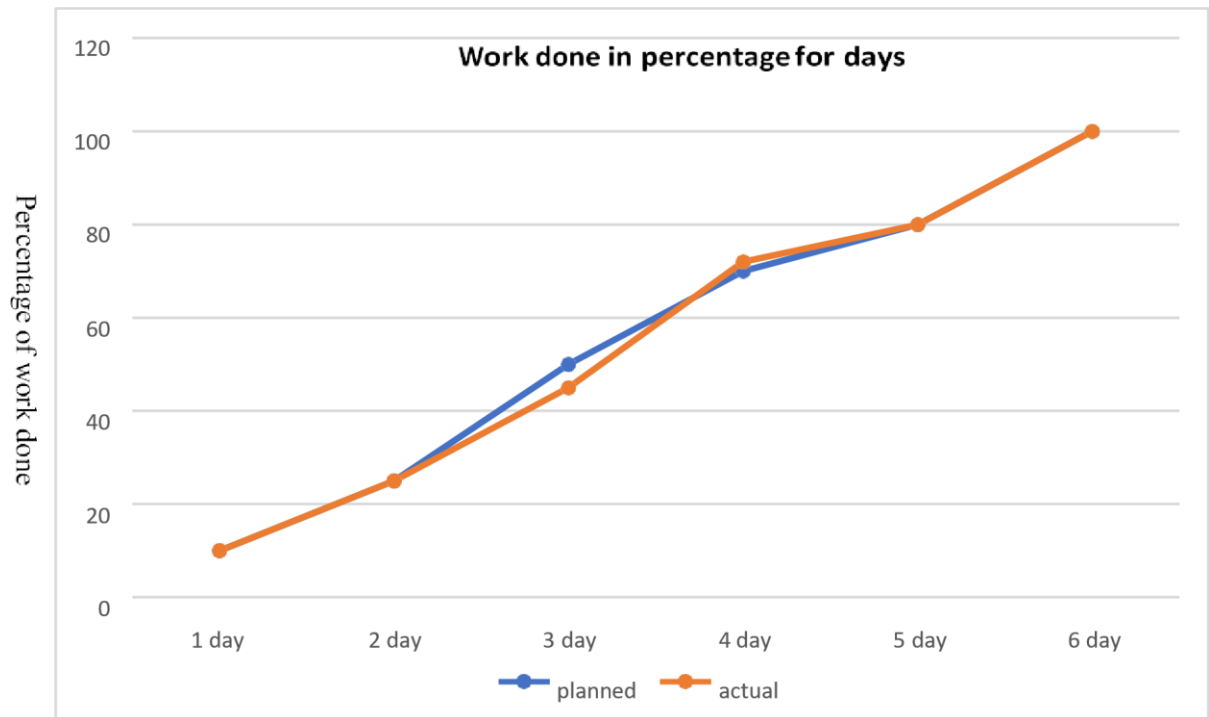
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

Sprint duration

$$AV = \frac{\text{Sprint duration}}{\text{Velocity}} = 20/10 = 2$$

Velocity

Burndown Chart:



7. CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1

- Creating a responsive dashboard.
- Inserting filter for each chart
- Creating report
- Created reports using multiple graphs and charts

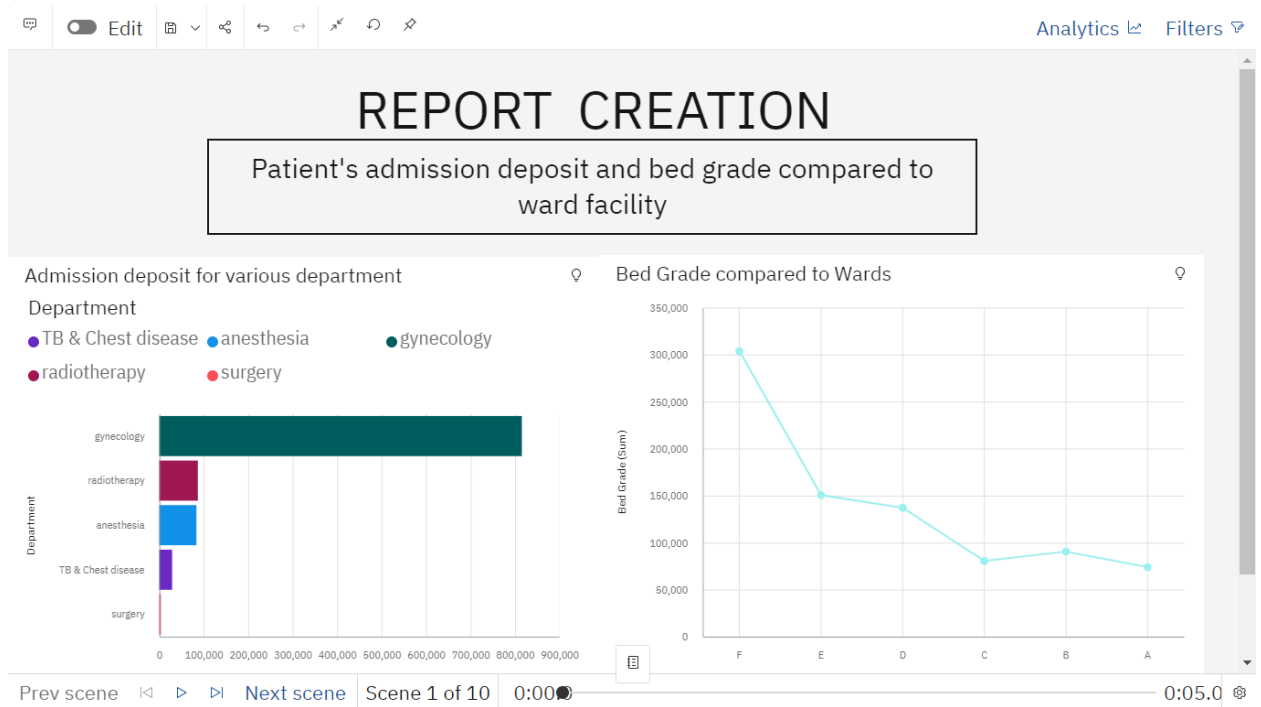
7.2 Feature 2

- Creating stories and performed.
- Perform animation render images from website.
- Included graphs and charts.
- Embedded the Cognos web application.

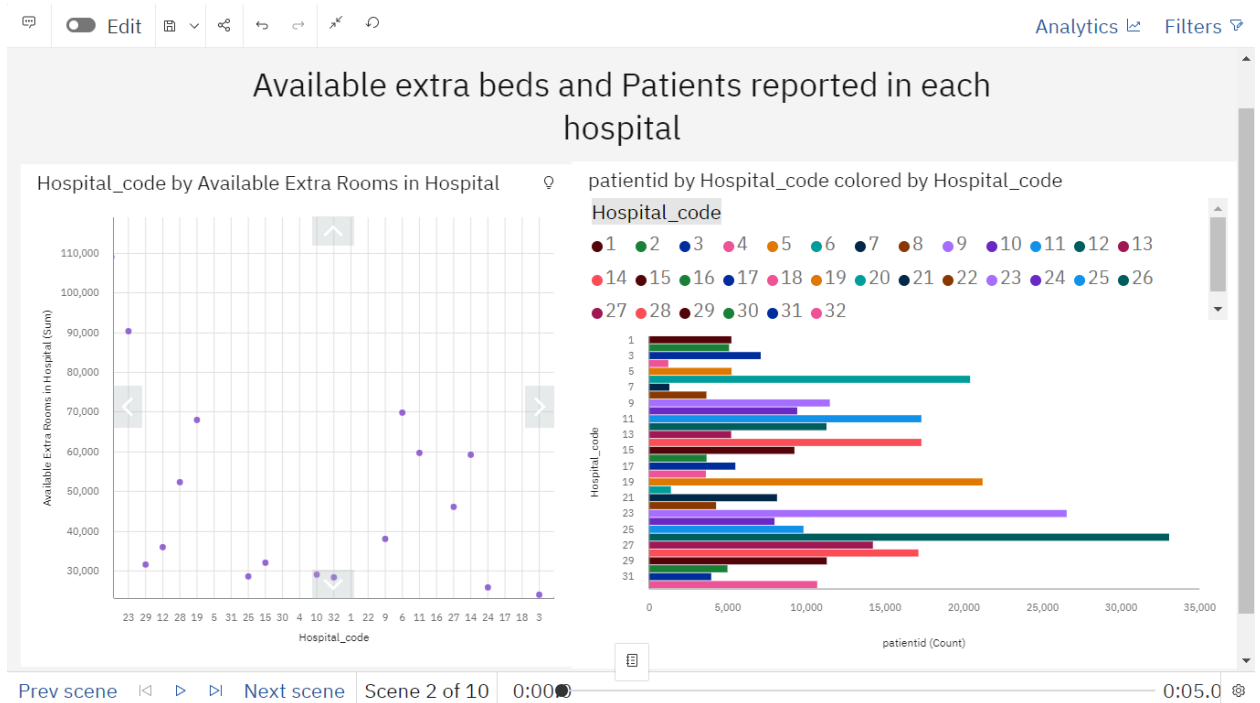
8. RESULTS

8.1 Performance Metrics

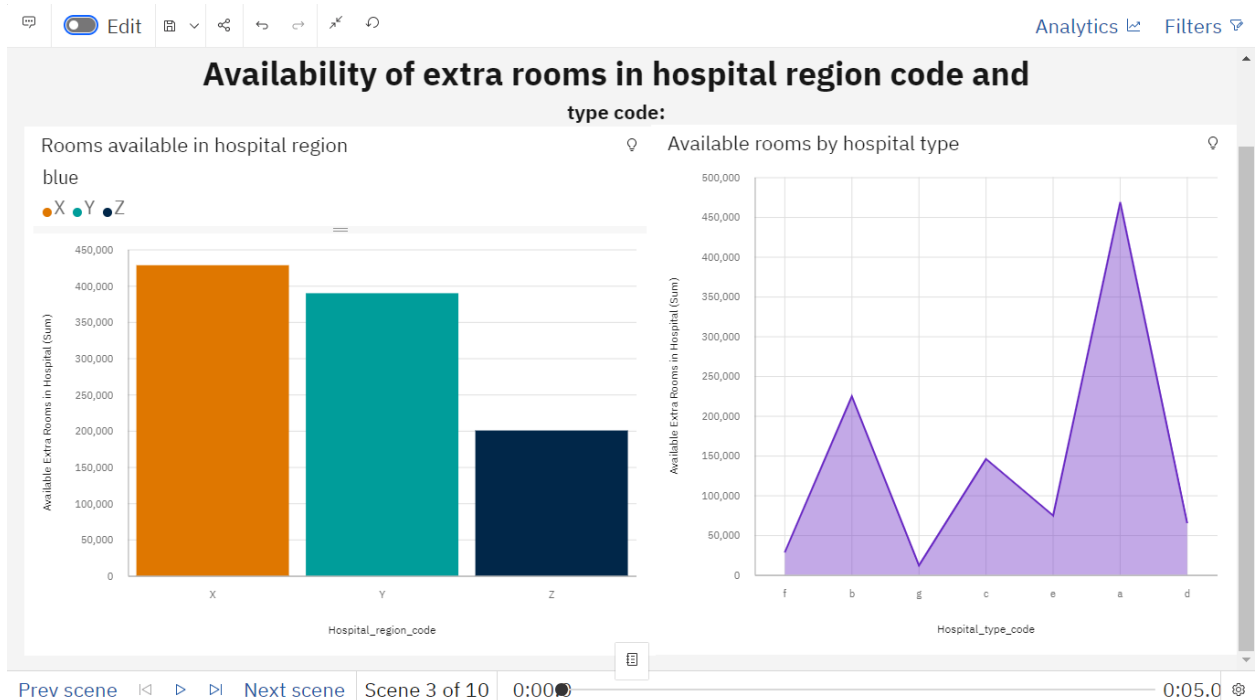
Dashboard design – 12 graphs



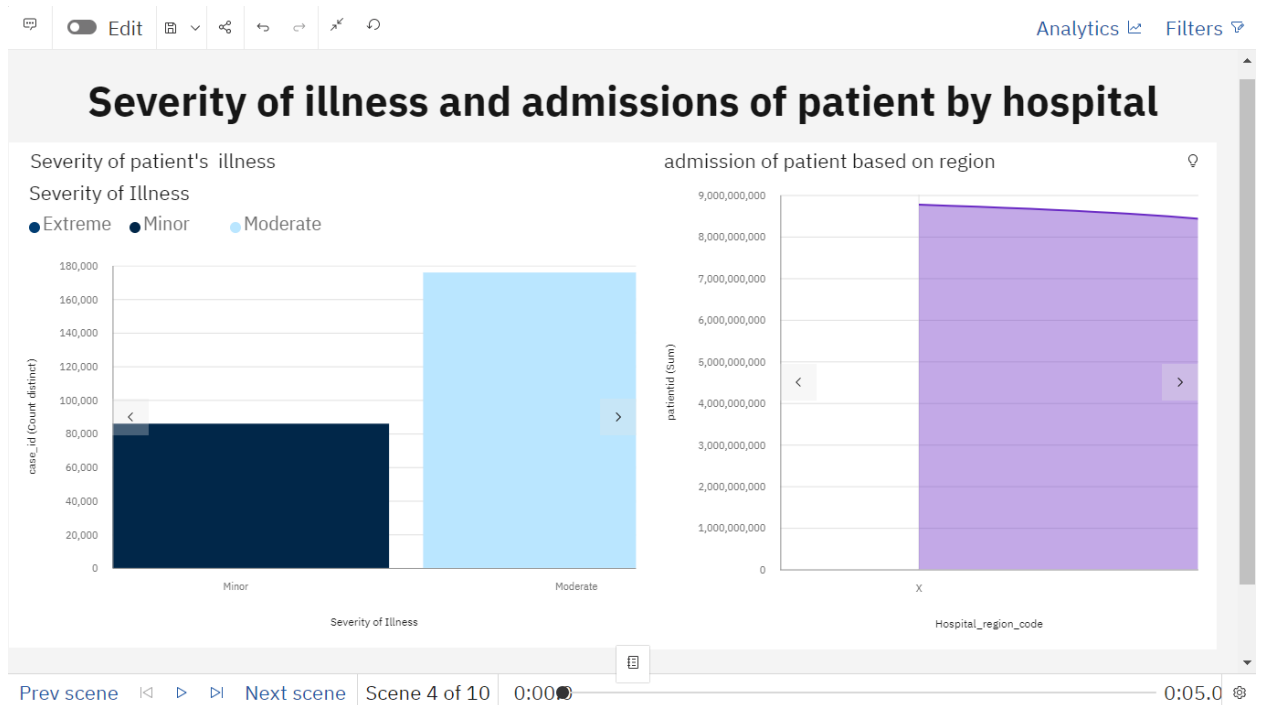
Data responsive- as the data change chart also change



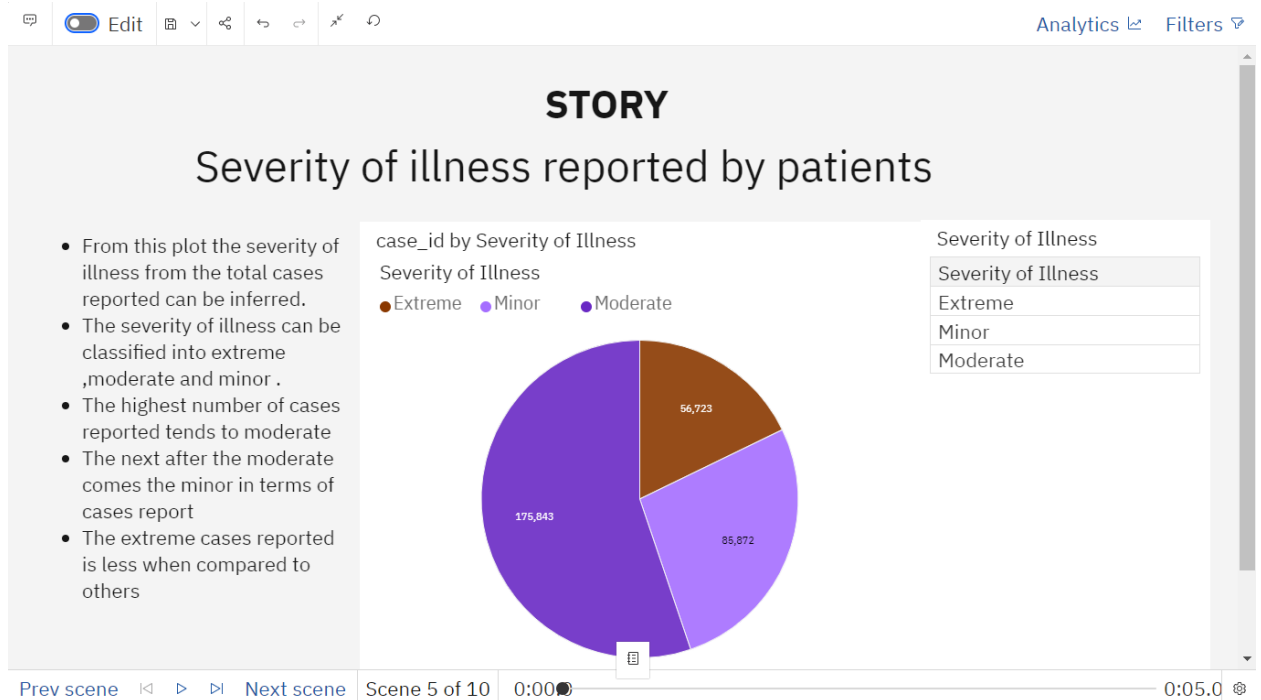
Amount of data used – number of data rendered is 318438 rows

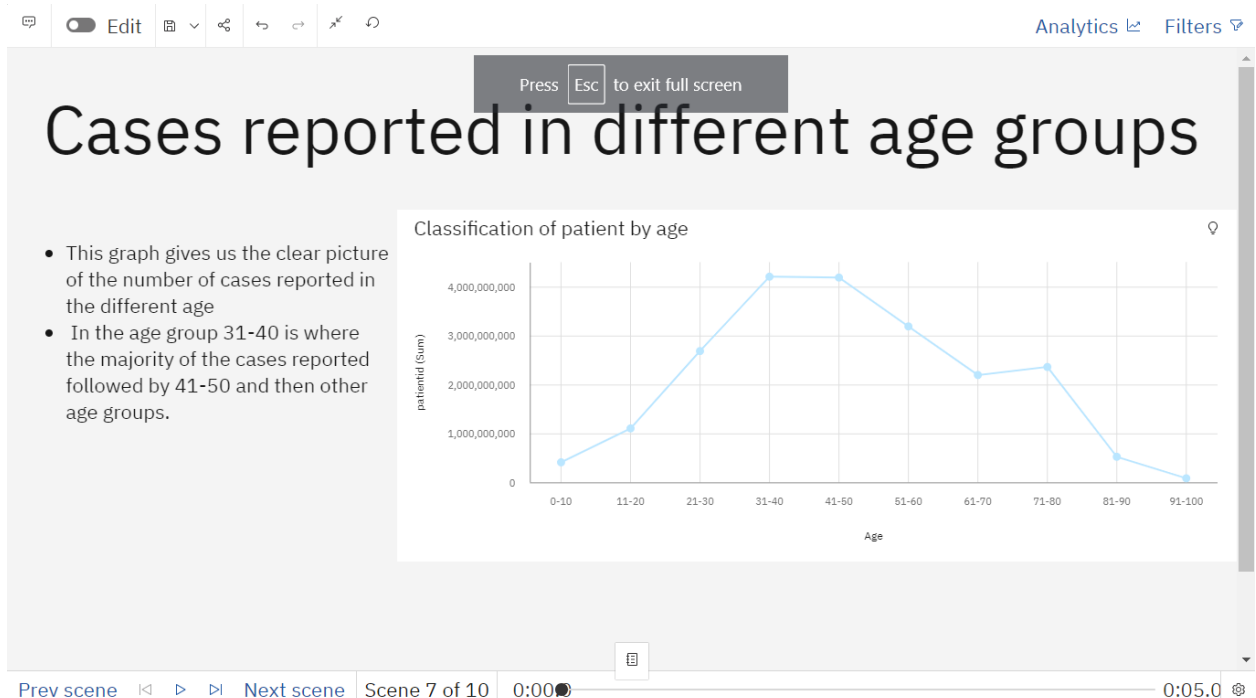
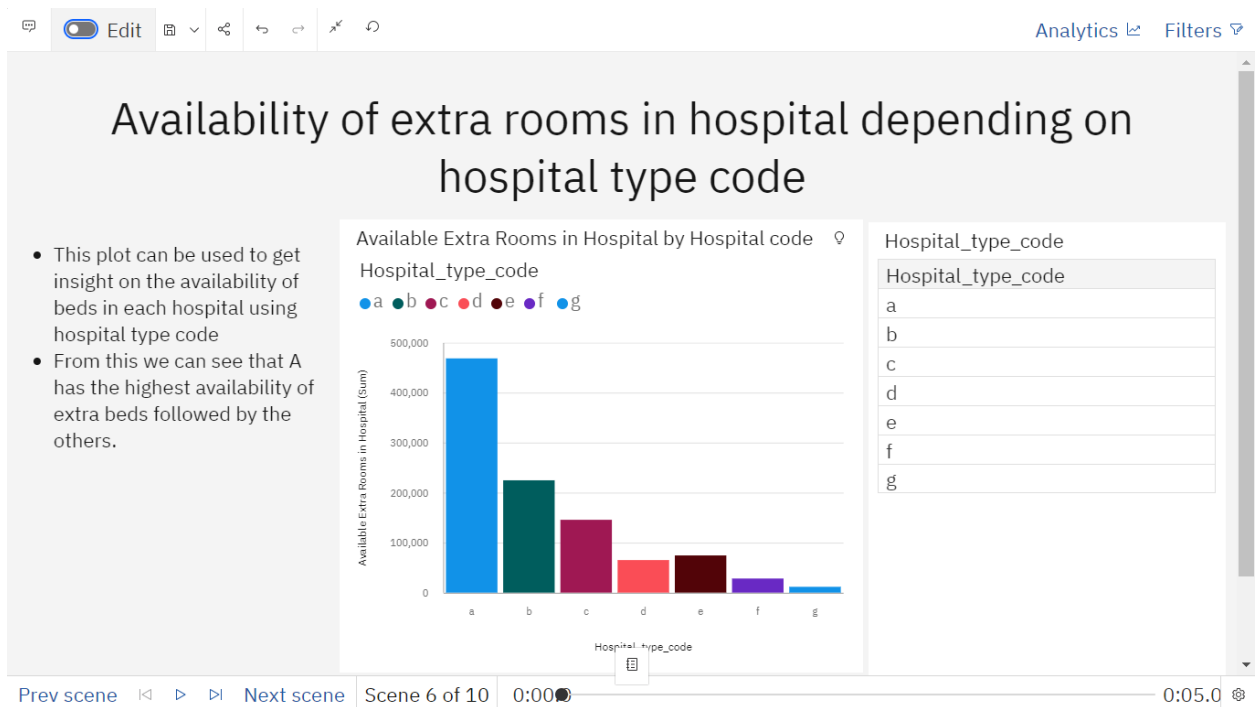


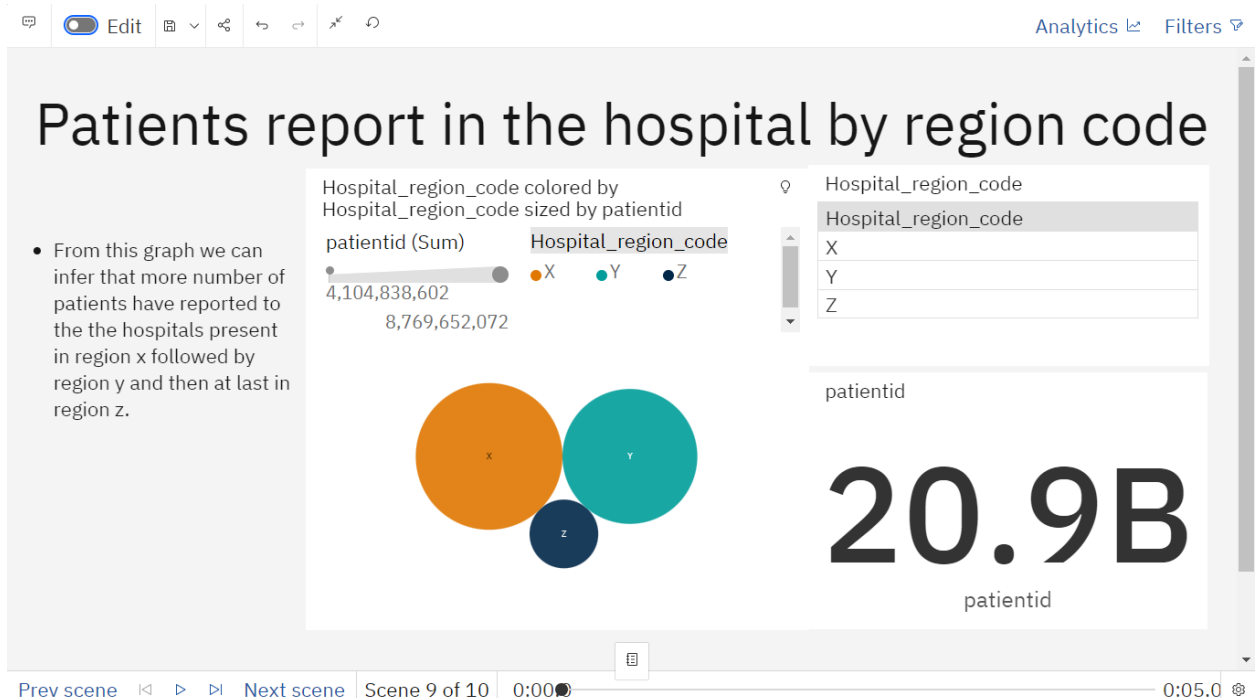
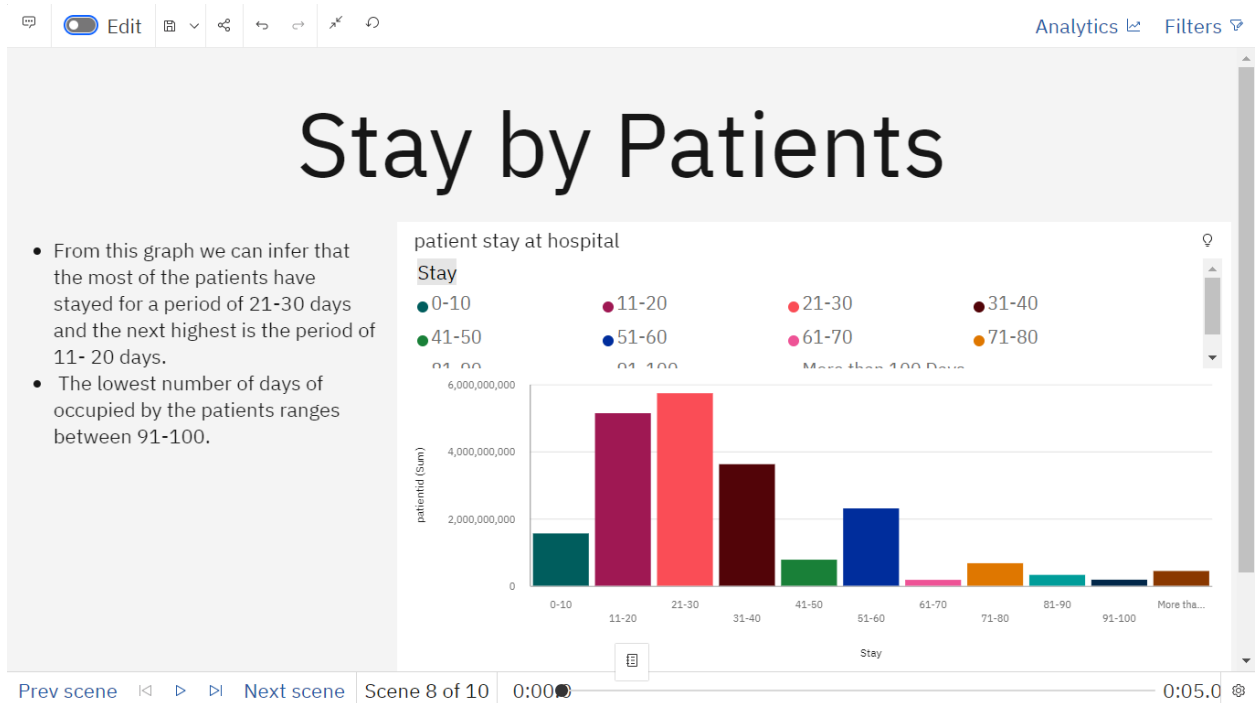
Utilizing of filters- we implemented filters which is good in performance



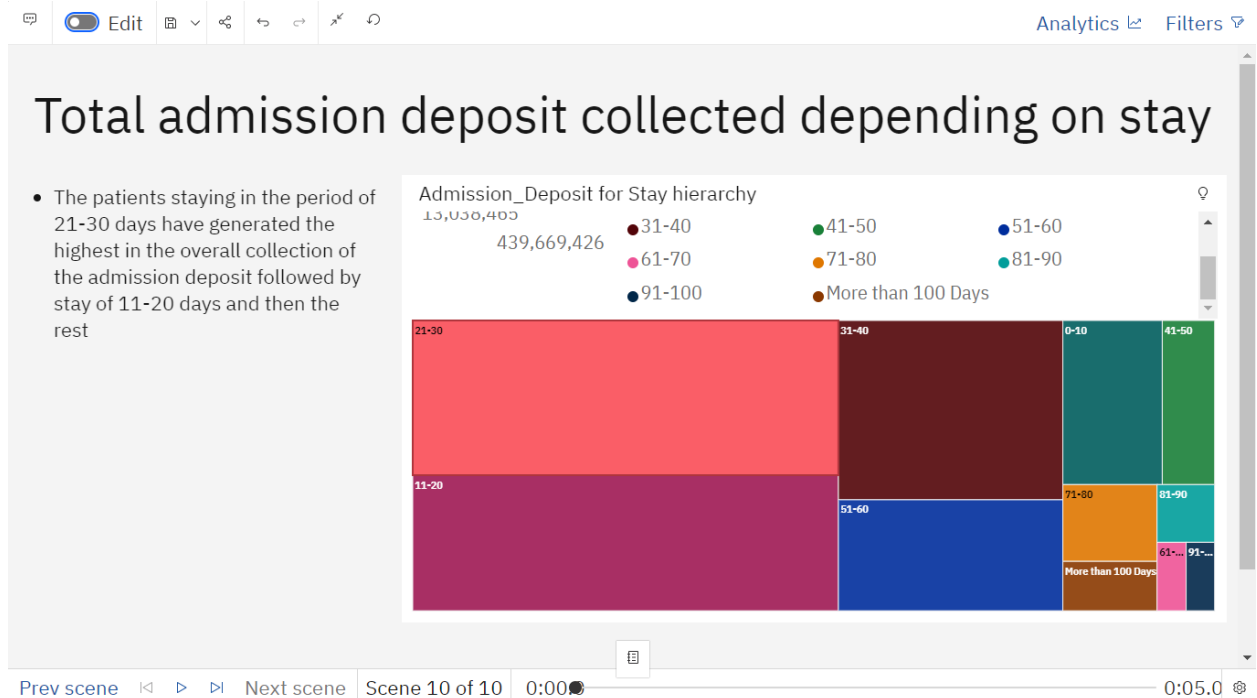
Effective user story – 6 scenes added ,displayed perfectly



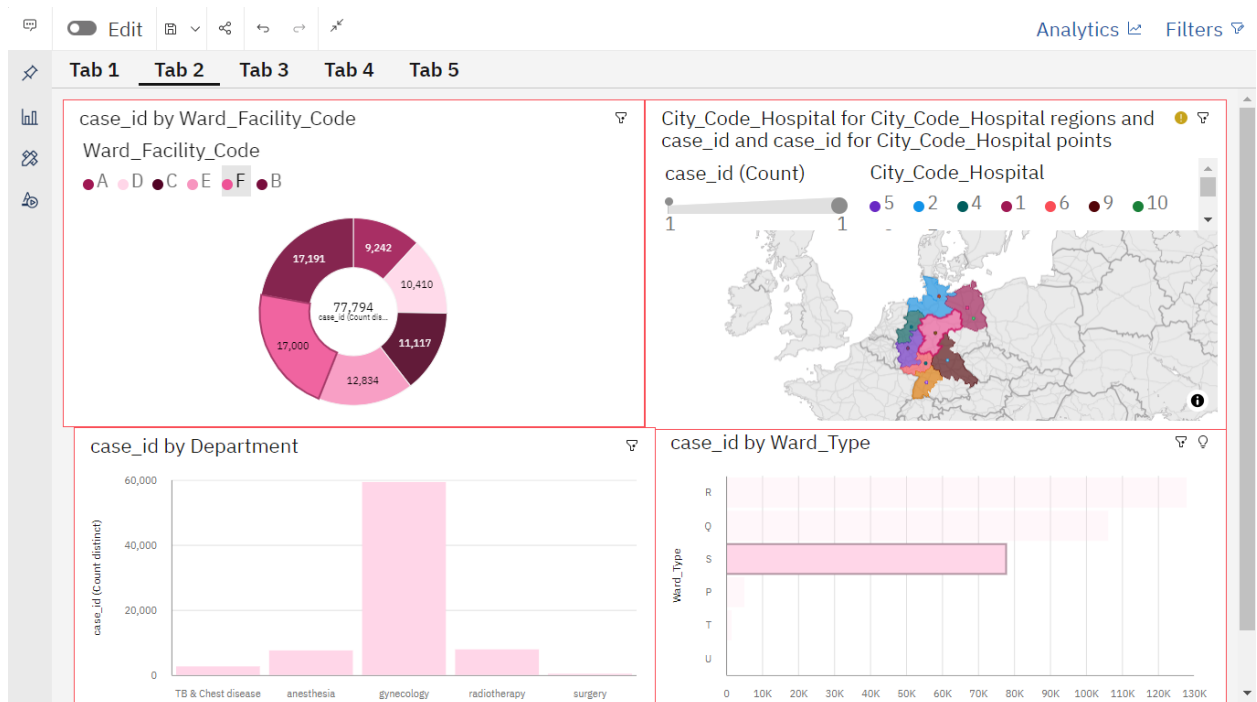




V



Descriptive informative reports – graphs 6 is used



9. ADVANTAGES & DISADVANTAGES

ADVANTAGES

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

DISADVANTAGES

- Privacy
- Replacing Doctors
- Cybersecurity risks
- Healthcare Regulatory Changes

10.CONCLUSION

- It also means describing how health plans, health care organizations and clinicians should be accountable to patients and society 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.

11.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.

12. APPENDIX

Source Code

```
<html lang="en">
<head>
<title>Data Analytics</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-
scale=1">

</head>
<body>

<br>
```

```
<center>
    <h2 style="color:rgb(231, 69, 69);">ANALYTICS FOR
HOSPITALS' HEALTH CARE-DATA</h2>
    <h4><i><b>Team ID : PNT2022TMID33778 </b></i></h4>
</center>
```

```
<table class="table table-bordered" style="text-align:center;">
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```
<tbody>
```

```
<tr>
```

```
<td>Team Leader</td>
```

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<td>AGS Jimson</td>
```

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</tr>
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<tr>
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<td>Team member</td>
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<td>Tamil Kumaran C</td>
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</tr>
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<tr>
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<td>Team member</td>
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<td>Vishnu K</td>
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</tr>

<tr>

<td>Team member</td>

<td>Venciya R</td>

</tr>

</tbody>

</table>

<div>

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my_folders%2FNew%2Bstory&closeWindowOnLastView=true&
ui_appbar=false&ui_navbar=false&shareMode=embedded&a
ction=view&sceneId=model0000018478d7be61_00000002&scene
Time=0"

width="700" height="700" frameborder="0" gesture="media"
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</div>

</body>

</html>

GitHub

<https://github.com/IBM-EPBL/IBM-Project-30113-1660140243>

Project Demo Link

<https://youtu.be/oGh9mrCMZAE>