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DATA ANALYTICS

DEPARTMENT OF INFORMATION TECHNOLOGY

TOPIC: Aquatic Insights Cognos – Powered Water Portability Analysis

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ABSTRACT

Aquatic Insights Cognos represents a significant advancement in the field of water portability analysis. By integrating real-time data from various sources, this system empowers users with a comprehensive and up-to-date understanding of water quality conditions. Its cognitive analytics capabilities, driven by artificial intelligence and machine learning, allow for in-depth scrutiny of water parameters, helping identify potential contaminants and microbial threats that could compromise water safety. Furthermore, it goes beyond mere data analysis by employing predictive modeling to forecast future water quality trends, enabling proactive decision-making. The user-friendly interface and customizable alerting system make Aquatic Insights Cognos accessible to a wide range of stakeholders, from water management authorities to the general public, facilitating informed decision-making and timely responses to any water quality deviations. Additionally, its geographical mapping features enhance understanding by visually displaying data on maps, helping users identify regional variations and potential sources of contamination. Overall, Aquatic Insights Cognos is a powerful tool for safeguarding water quality and ensuring its availability for a sustainable future.

Project Report Format

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1.INTRODUCTION

1.1. PROJECT OVERVIEW:

"Aquatic Insights is a transformative project leveraging IBM Cognos for water portability analysis. It focuses on collecting, cleaning, and standardizing diverse water quality data from various sources. Using Cognos, the project delivers data analytics and reporting, with a user-friendly interface, mobile accessibility,and strong security measures. It promotes collaboration, public awareness, and continuous improvement. Aquatic Insights aims to enhance our understanding of water resources and support sustainable management of aquatic ecosystems."

1.2. PURPOSE:

The project "Aquatic Insights: Cognos-Powered Water Portability Analysis" aims to use IBM Cognos and advanced analytics for several purposes:

- Assess water quality and portability.
- Integrate diverse data sources for a comprehensive view.
- Standardize data to ensure consistency.
- Provide advanced analytics to identify trends and threats.
- Create a user-friendly platform for data interaction.
- Raise public awareness and offer educational resources.
- Foster collaboration among experts.
- Ensure data security and privacy.

The overarching purpose is to improve understanding and facilitate sustainable management of aquatic ecosystems for the benefit of researchers, policymakers, and the public.

2.LITERATURE SURVEY

2.1. Existing problem:

In the literature survey for the project "Aquatic Insights: Cognos-PoweredWater Portability Analysis," several existing issues are identified:

- Limited data integration from diverse sources.
- Challenges in data standardization and consistency.
- Lack of predictive modeling for water quality trends.
- Poor accessibility and user-friendliness.
- Limited collaboration among stakeholders.
- Insufficient mobile accessibility for on-the-go access.
- Inadequate attention to data security and privacy.
- Limited emphasis on public awareness and education.
- Gaps in regulatory compliance.
- Potential issues with outdated information.

Addressing these problems is crucial for the project's success, ensuring it provides valuable and up-to-date insights into water quality and portability fora wide range of users and stakeholders.

2.2. References:

• Carpenter, S. R., & Cottingham, K. L. (1997). Resilience and water quality. Ecology, 78(3), 899-904.

• Jin, X., Yang, Z., & Han, H. (2019). A review on predicting algal blooms in freshwater lakes using satellite remote sensing.

Environmental Science and Pollution Research, 26(19), 19513- 19530.
• Cognos Analytics Documentation. IBM. [Link to official IBM Cognos documentation for technical reference and usage.]
• Ouyang, W., & Bartholic, J. (2009). Application of the Soil and Water Assessment Tool (SWAT) for water quality research: A review. Journal of Environmental Quality, 38(2), 515-523.

2.3. Problem Statement Definition:

The problem statement for "Aquatic Insights: Cognos-Powered Water Portability Analysis" centers on addressing several key challenges in water quality assessment and management:

- Fragmented data sources and inconsistent data hinder comprehensive analysis.
- Current methods lack predictive modeling for anticipating water quality trends.
- Inadequate accessibility and user-friendliness limit information dissemination.
- Collaboration among experts and stakeholders needs improvement.
- Mobile accessibility for on-the-go access is lacking.
- Data security and privacy concerns pose risks.
- Public awareness and education about water quality are often insufficient.
- Regulatory compliance gaps and legal issues may arise.
- Environmental conditions change, requiring continuous updates.

The project aims to resolve these issues by creating a user-friendly, data-driven platform for understanding and managing water quality and portability in aquatic ecosystems.

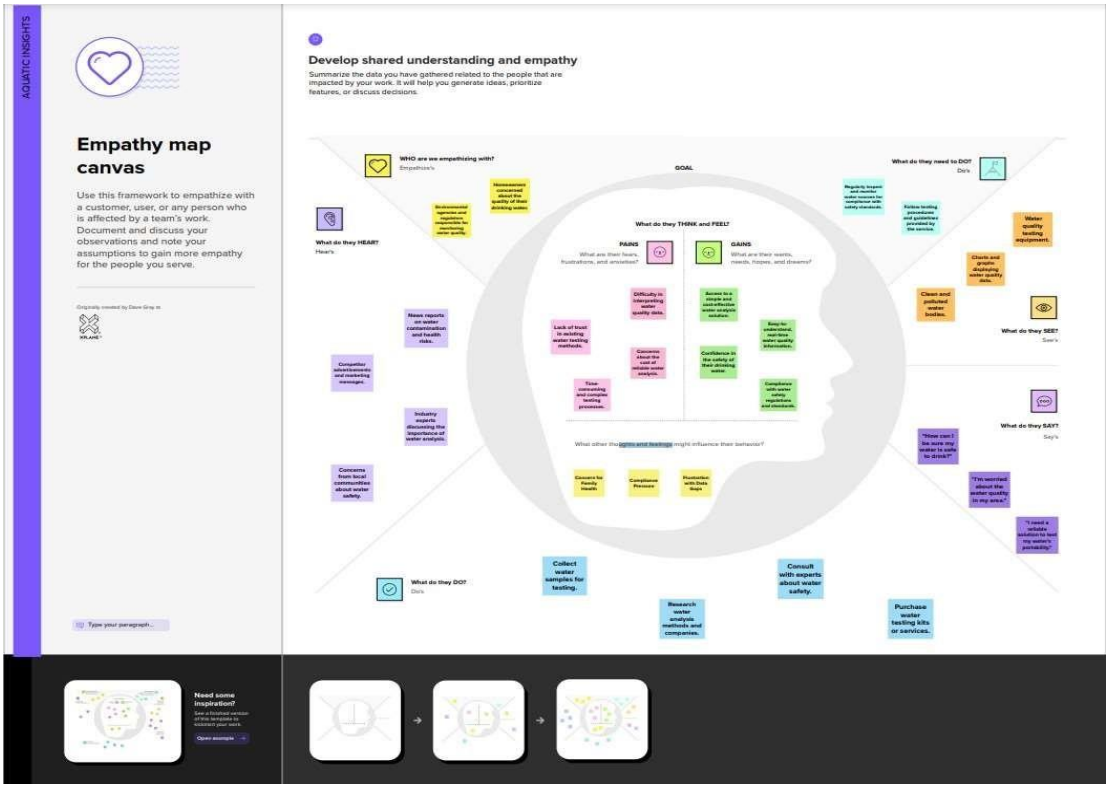
3.IDEATION & PROPOSED SOLUTION

3.1. Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours 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 things from the user's perspective along with his or her goals and challenges.

Example:



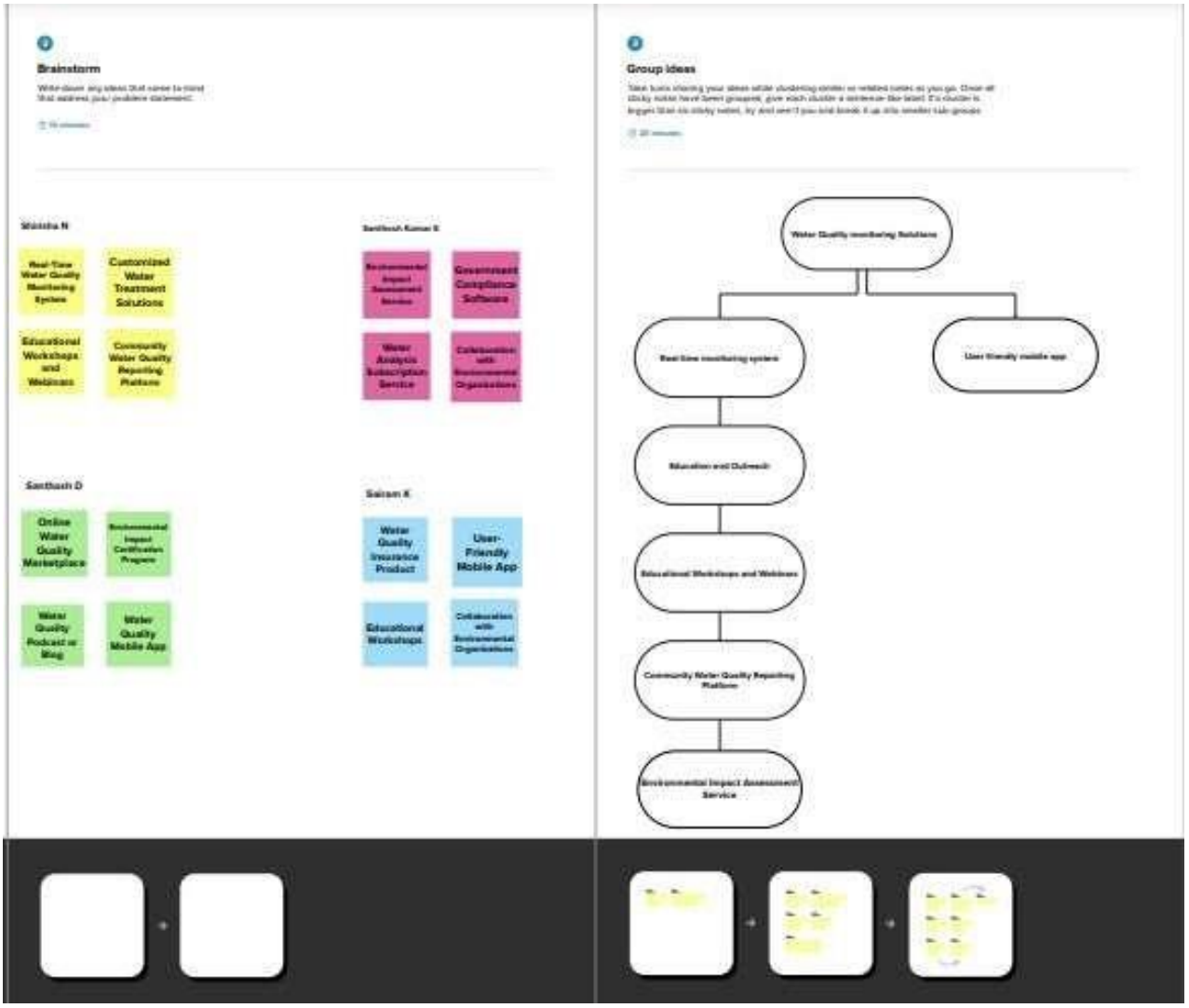
3.2. Ideation & Brainstorming:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking 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.

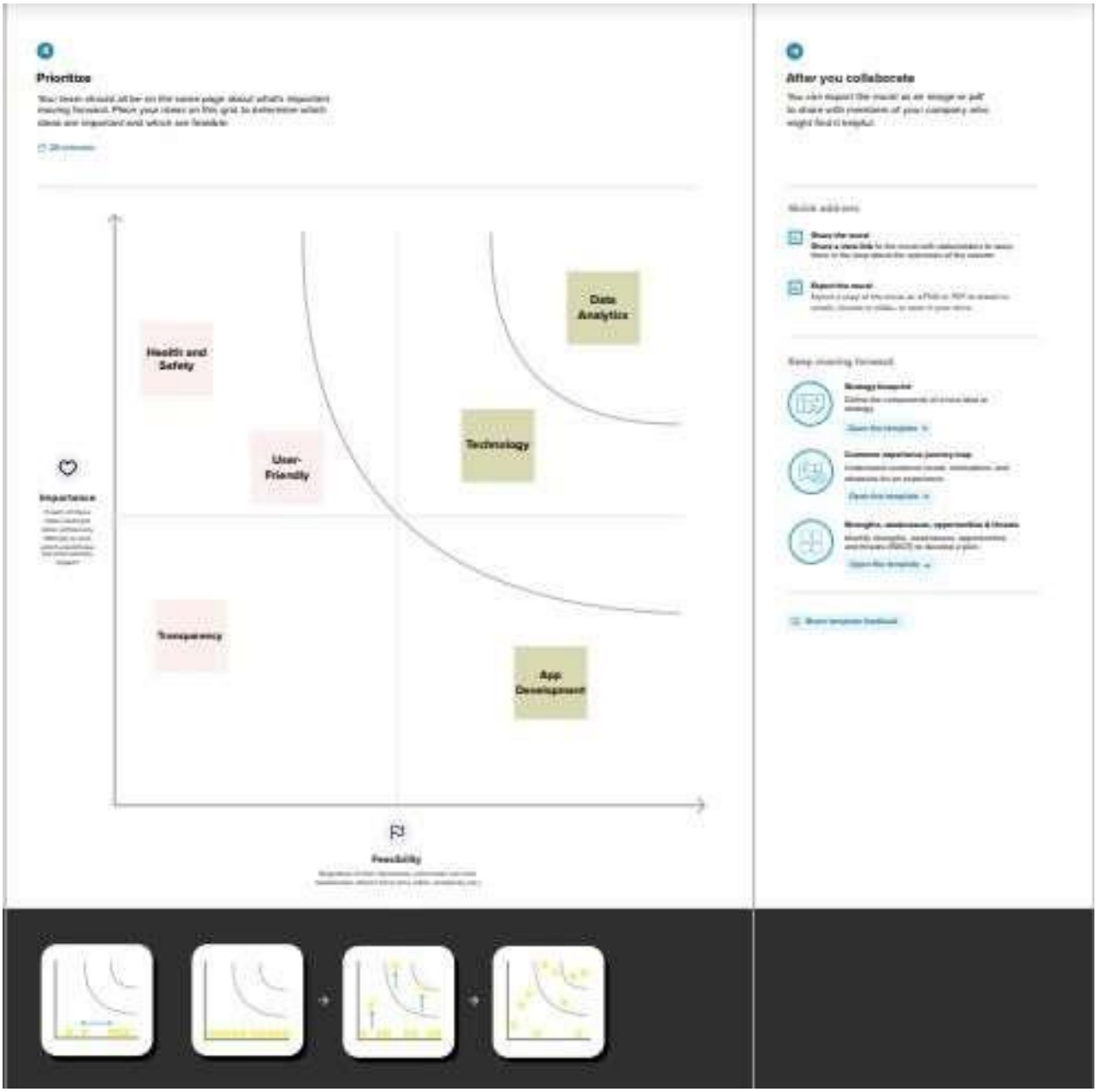
Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



4.REQUIREMENT ANALYSIS

4.1. Functional requirement:

The functional requirements for "Aquatic Insights: Cognos-Powered Water Portability Analysis" outline the specific features and capabilities the project's platform should possess. These requirements include:

- Data integration and management from various sources.
- Data standardization for consistency.
- Analytics and predictive modeling for water quality assessment.
- Interactive dashboards for data visualization.
- User profiles and access control.
- Development of a mobile application.
- Collaboration tools for experts.
- Strong data privacy and security measures.
- Reporting and alerts for critical events.
- Public engagement and education features.
- Continuous platform improvement.
- Regulatory compliance.
- Scalability and performance for handling large data volumes and users.

These requirements serve as the basis for creating a comprehensive and user-friendly platform for analyzing and managing water quality and portability in aquatic ecosystems.

4.2. Non-Functional requirements:

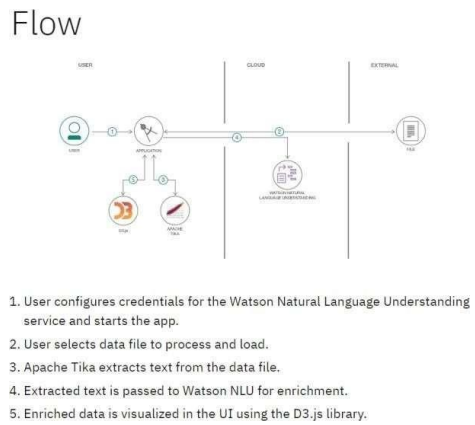
The non-functional requirements for "Aquatic Insights: Cognos-Powered Water Portability Analysis" outline the performance, reliability, usability, security, and compliance standards that the platform should meet. Key points include:

- Fast performance and scalability to handle growth.
- High reliability and data protection mechanisms.
- Intuitive user interface and accessibility for all users.
- Robust security and data privacy measures.
- Interoperability with other systems.
- Easy maintenance and regular updates.
- Compliance with regulations and standards.
- Load handling during peak events.
- Data archiving and user support.

These non-functional requirements ensure the platform's effectiveness, user experience, and adherence to legal and environmental standards.

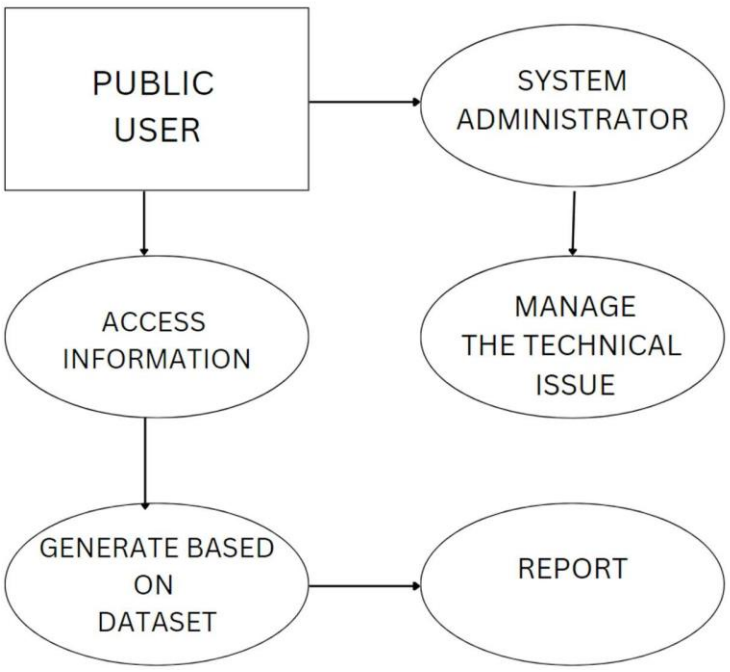
5.PROJECT DESIGN

5.1. Data Flow Diagrams & User Stories:



A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the rightamount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Flow diagram:



User Stories:

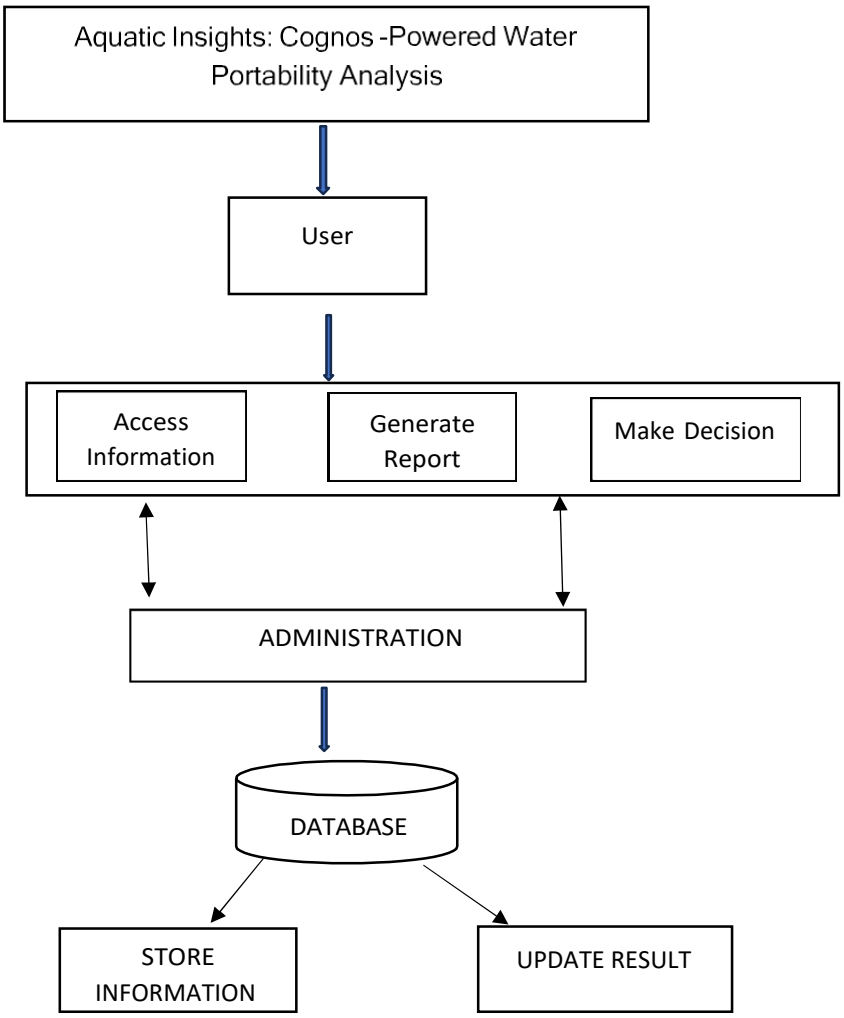
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
PUBLIC	check water quality information for their area	USN-1	Public users can access the system to check the quality of water in their area. They can view real-time water quality information, including potability status.	I can access my account / dashboard	o/1	
		USN-2	Public users may set preferences to receive real-time alerts and notifications about water quality issues, such as water contamination or safety concerns.		0/1	
		USN-3	They can access historical water quality data to track changes and trends in water quality over time		0/1	
	Dashboard					
System Administrator			Infrastructure Management: System administrators are responsible for managing the technical infrastructure, including servers, databases, and software updates. They ensure that the system is running smoothly and efficiently.			

5.2. Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridgesthe gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of thesoftware to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed,and delivered.

Example - Solution Architecture Diagram**:**

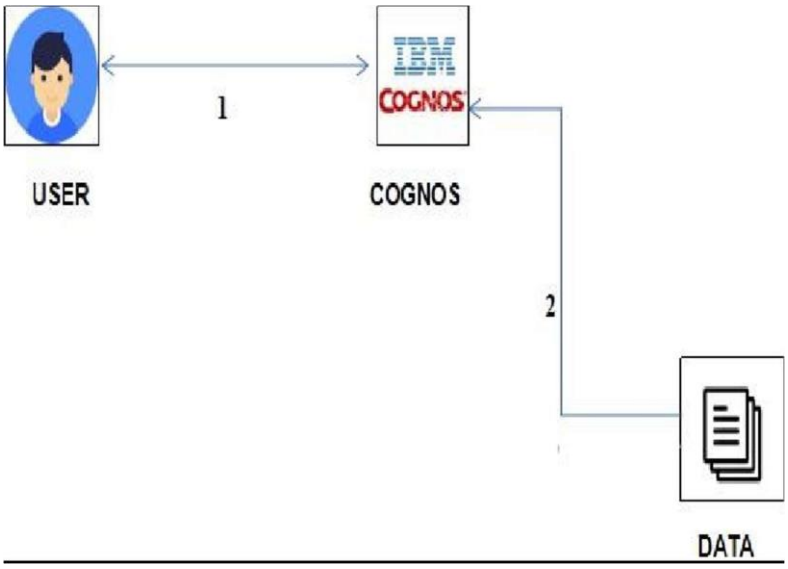


6.PROJECT PLANNING & SCHEDULING

1. Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Reference: https://www.kaggle.com/code/khsamaha/potable-water-prediction-0-798- with-caret-rf-r/input



- **Components & Technologies:**

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbotetc.	HTML, CSS, JavaScript / Angular Js / ReactJs etc.
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Cognos Analytics
4.	Application Logic-3	Logic for a process in the application	IBM Cognos Analytics
5.	Database	Data Type, Configurations etc.	Excel

6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc.
10.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

2. Sprint Planning & Estimation:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	
Sprint-2		USN-3	As a user, I can register for the application through SmartInternz	2	Low	
Sprint-1		USN-4	As a user, I can register for the application through smartInternz provided email id.	2	Medium	
Sprint-1	Login	USN-5	As a user, I can log into the applicationby entering email & password	1	High	
	Dashboard					

3. Sprint Delivery Schedule:

Sprint	Total StoryPoints	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	1 Days	16 Oct 2023	16 Oct 2023	16 Oct 2023	16 Oct 2023
Sprint-2	20	1 Days	17 Oct 2023	17 Oct 2023	17 Oct 2023	17 Oct 2023
Sprint-3	20	1 Days	18 Oct 2023	18 Oct 2023	18 Oct 2023	18 Oct 2023
Sprint-4	20	1 Days	19 Oct 2023	19 Oct 2023	19 Oct 2023	19 Oct 2023

7. CODING & SOLUTIONING

7.1. Feature 1:

```
<!DOCTYPE html>
<html lang="en">
<head>
        <meta charset="UTF-8">
        <meta name="viewport" content="width=<device-width>, initial-scale=1.0">
        <title> Water Portable </title>
        <style
    >body{
      background-color: rgb(0, 0, 0);
    }
    h1{
      text-align: center;
      font-size:50px;
    }
    p{
      font-size: 25px;
      font-style: italic;
      font-weight: 100;
      margin-left: 20px;
    }
  </style>
</head>
<body>
        <h1 style="font-size: 40px;color: rgb(255, 255, 255);"><b>Aquatic Insights</b></h1>      <h1
style="font-size: 40px;color: rgb(255, 255, 255);"><b>COGNOS POWERED</b></h1> <h1 style="font-
size: 40px;color: rgb(255, 255, 255);"><b>WATER PORTABILITY ANALYSIS</b></h1>
        <h2 style="font-size: 25px;color: rgb(255, 255, 255);">Here is the data analyst regarding the
water analysis. We are analysed with the different datas like ph values , Hardness , TDS , Chloramines
, Sulfate , Conductivity , Organic carbon , Trihalomethanes , Turbidity , Potability of the water
samples.</h2>
        <iframe src="https://us3.ca.analytics.ibm.com/bi/
perspective=dashboard&amp;pathRef=.public_folders%2FProject
2FDashboard_water&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=fal
se&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model00
00018b452f8bbd_00000000" width="800" height="800" frameborder="0" gesture="media"
allow="encrypted-media" allowfullscreen=""></iframe>
        <h1 style="font-size: 40px;color: rgb(255, 255, 255);">STORY BOARD</h1>
        <p style="font-size: 29px;color: rgb(255, 255, 255);"><!--stry goes here-->Our Analysis are
Seperate the Samples as Portable and Non Portable , Average Sulphate content of portable and non
portable , Summerizing cloramines taking their average , Summerizing Organic - Carbon content
taking their average , Average Organic- Corbon content of portable and non-portable water ,
Chloramines by Conductivity (Group) colored by Potability and ph by Hardness (Group) colored by
Potability. </p>
```

<iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.public_folders%2FProject%2FStory%2Bof%2BWater%2Bpotability&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedded&action=view&sceneId=model0000018b4795eed0_00000000&sceneTime=3350" width="800" height="800" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
</body>
</html>

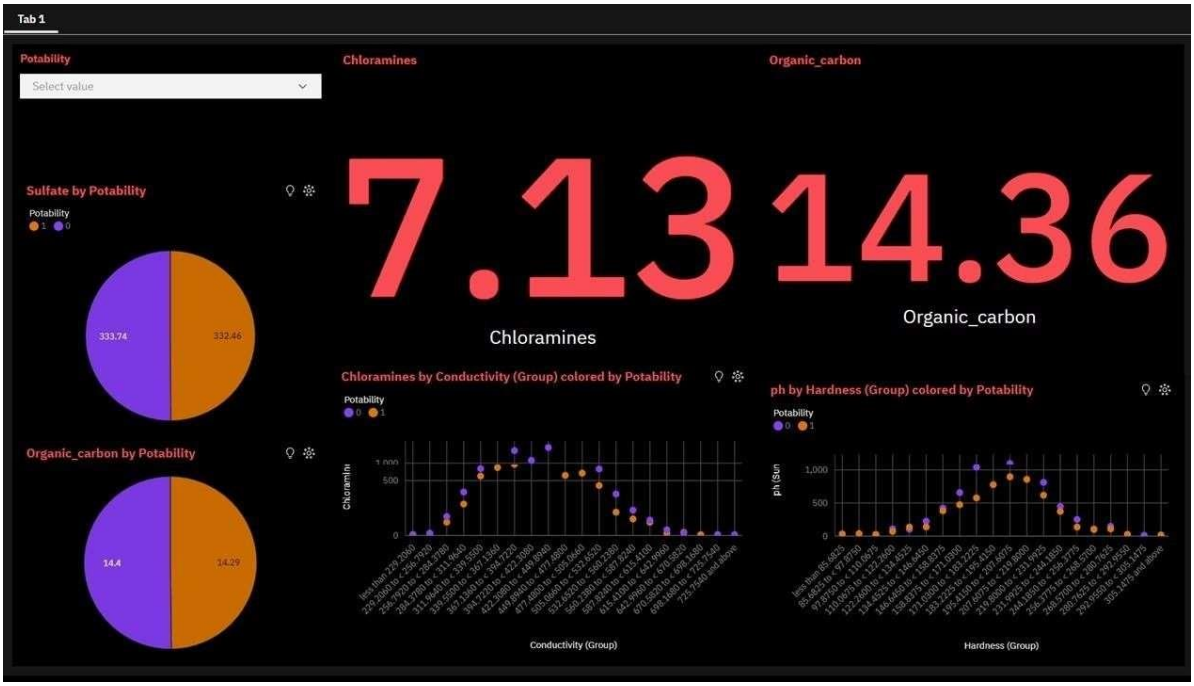
8.PERFORMANCE TESTING

8.1.Performace Metrics:

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visualizations / Graphs – We have include 4 tabs
2.	Data Responsiveness	The system's ability to efficiently analyze these indicators and provide real-time predictions, ensuring the availability of safe drinking water in regions facing a crisis
3.	Amount Data to Rendered (DB2 Metrics)	The global drinking water crisis by ensuring the availability of safe and potable water in regions facing water quality concerns
4.	Utilization of Data Filters	Employed to narrow down the dataset and focus the analysis such as assess water quality
5.	Effective User Story	No of Scene Added - 4
6.	Descriptive Reports	No of list / Graphs – 1

9.RESULTS

9.1. Output Screenshots:



10.ADVANTAGES & DISADVANTAGES

□ Advantages:

The project "Aquatic Insights: Cognos-Powered Water Portability Analysis" offers a range of advantages:

- Comprehensive water quality assessment with predictive capabilities.
- User-friendly interface accessible to experts and the public.
- Data integration for a complete view of water quality.
- Facilitation of collaboration and knowledge sharing.
- Promotion of public awareness and regulatory compliance.
- Robust data security and continuous improvements.
- Resource efficiency and environmental sustainability.
- Data-driven decision-making for policymakers and researchers.
- Customization and scalability for future growth.
- Real-time monitoring and international collaboration.

These advantages collectively contribute to improved water qualitymanagement and sustainable ecosystems.

□ Disadvantages:

The project "Aquatic Insights: Cognos-Powered Water Portability Analysis" comes with several potential disadvantages and challenges:

- Handling complex and diverse data sources.
- Data availability limitations in remote or less-studied areas.
- Technical barriers for some users with limited skills.
- Ongoing maintenance and software update costs.
- Stringent data privacy and security requirements.
- Regulatory compliance complexities.
- Resource-intensive computational and human requirements.
- High initial implementation costs.
- Sustaining user engagement and public awareness.
- Ensuring data consistency across various sources.
- Adaptation to changing environmental conditions.
- Potential public resistance to sharing data.
- Mobile application compatibility challenges.
- Scalability concerns as the project grows.
- Effective communication with diverse stakeholders.

Mitigating these challenges will be vital for the project's success and its ability to deliver comprehensive water quality insights.

11.CONCLUSION

In conclusion, "Aquatic Insights: Cognos-Powered Water Portability Analysis" represents a promising solution for addressing challenges in water quality assessment and management. The project leverages advanced data analytics,user-friendly interfaces, and collaboration tools to provide valuable insights
into aquatic ecosystems. It offers advantages such as improved water quality assessment and informed decision-making, contributing to environmental sustainability.

Despite potential challenges such as data complexity and privacy concerns, the project's goals are attainable with careful planning and dedication. "Aquatic Insights" has the potential to be a valuable resource for various stakeholders, serving as a catalyst for positive change in aquatic ecosystem management. The project signifies a promising path toward sustainable water quality management and the preservation of natural water resources.

12.FUTURE SCOPE

The future scope for "Aquatic Insights: Cognos-Powered Water Portability Analysis" is expansive and promising. It includes:

- Incorporating advanced data sources, AI, and IoT for more comprehensive and real-time water quality analysis.
- Implementing blockchain for enhanced data security and transparency.
- Facilitating global collaboration and data sharing.
- Developing educational resources and influencing water quality policies.
- Addressing climate change and ecosystem health, and expanding the project's focus to include flood monitoring and environmental equity.77
- Promoting sustainable practices and contributing to open data initiatives.

The project has the potential to become a comprehensive and collaborative platform, empowering stakeholders to better understand and manage aquatic ecosystems in an increasingly complex world.

13.APPENDIX

Source Code:

Index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Water Portable</title>
    <style>
        body {
            background-color: rgb(0, 0, 0);
        }
        h1 {
            text-align: center;
            font-size: 50px;
            color: rgb(255, 255, 255);
        }
        h2 {
            font-size: 25px;
            color: rgb(255, 255, 255);
        }
        p {
            font-size: 29px;
            color: rgb(255, 255, 255);
        }
        .center-img {
            text-align: center;
        }
        .center-img img {
            display: block;
            margin: 0 auto;
            max-width: 100%; /* Ensure images don't exceed their container width */
        }
    </style>
</head>
<body>
    <h1><b>Aquatic Insights</b></h1>
    <h1><b>COGNOS POWERED</b></h1>
    <h1><b>WATER PORTABILITY ANALYSIS</b></h1>
    <h2>Here is the data analysis regarding water analysis. We have analyzed various data points such as pH values, hardness, TDS, chloramines, sulfate, conductivity, organic carbon, trihalomethanes, turbidity, and potability of the water samples.</h2>
    <div class="center-img">
        <img id="image1" src="C:/Users/murar/OneDrive/Desktop/NM/FINAL DELIVERABLES/templates/pic 1.png">
    </div>
    <h1>STORY BOARD</h1>
    <p>Our analysis separates the samples as portable and non-portable, averages sulfate content for portable and non-portable water, summarizes chloramines taking their average, summarizes organic carbon content taking their average, and considers the average organic carbon content of portable and non-portable water. We also look at chloramines by conductivity (group) colored by potability and pH by hardness (group) colored by potability.</p>
    <div class="center-img">
        <img id="image2" src="C:/Users/murar/OneDrive/Desktop/NM/FINAL DELIVERABLES/templates/pic 2.png">
```

```
        <img id="image3" src="C:/Users/murar/OneDrive/Desktop/NM/FINAL DELIVERABLES/templates/pic
3.png" style="display: none;">
    </div>
    <script>
        // Image transition timer (5 seconds)
        setInterval(function() {
            var image1 = document.getElementById("image1");
            var image2 = document.getElementById("image2");
            var image3 = document.getElementById("image3");

            if (image2.style.display === "none") {
                image2.style.display = "block";
                image3.style.display = "none";
            } else {
                image2.style.display = "none";
                image3.style.display = "block";
            }
        }, 10000);
    </script>
</body>
</html>
```

App.py

```
from flask import Flask, render_template
app = Flask(_name_)
@app.route("/")
def index():
    return render_template("index.html")if
name_____=="_main_":
    app.run()
```

Github link:

https://github.com/Sucharitha0905/Naan-Mudhalvan

Project Demo Link:

https://drive.google.com/file/d/1AmmSpJEQ6i-iZnZ4SO3YIfRfPQLrYQHu/view?usp=drive_link