AMRITA COLLEGE OF ENGINEERING AND TECHNOLOGY

PROJECT REPORT

REAL-TIME RIVER QUALITY MONITORING AND CONTROL SYSTEM

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Water is known to be the universal solvent, plays an important role in the survival of various forms of life on earth. Furthermore, quenching our thirst, this transparent chemical substance is used for several other purposes. It is used to fulfill several household tasks. Water is also used for agricultural purpose and industrial use. Only 3% of the world's water is suitable for drinking and 2% of which is found mainly in glaciers and ice so in reality, only 1% of the earth's water is accessible and potable. Auspiciously, the water uses with the highest demands for quantity often have the lowest demands for quality. By contrast, drinking water requires the highest quality water but in relatively small quantities. With increase in the industrialization and the growth of large urban centers have been accompanied by increases in the pollution stress on the aquatic environment. From ancient times, water in rivers, lakes and oceans has also been considered as a convenient receiver of wastes. This abuse conflicts with almost all other uses of water and most seriously with the use of freshwater for drinking, personal hygiene and food processing.

Water is the Elixir of life. Water Pollution may be a major international problem. It has been surveyed that pollution is the leading explanation for deaths and diseases worldwide. The records show that quite 14,000 individuals die daily worldwide. In India, 580 individuals die of pollution. With the increase in industrialization and the growth of large urban centers have been accompanied by increases in the pollution stress on the aquatic environment. From ancient times, water in rivers, lakes and oceans has also been considered as a convenient receiver of wastes. This abuse conflicts with almost all other uses of water and most seriously with the use of freshwater for drinking, personal hygiene and food processing. By focusing on the above issues, we proposed a real time water quality monitoring system using IOT technology. The measured values from the sensors be processed by nodemcu which are then send to the cloud platform. These data can be viewed anytime from anywhere in the world.

1.2 PURPOSE

Due to the limitation of the budget, the current projects only focuses mainly on measuring the quality of river water parameters. This project can be extended into an efficient water management system of a local area. Hence our idea is to focus on the parameters such as accuracy of PH sensor as the program encoded should be highly reliable. Proper purification process using Water quality index since the usage of sensors detect different parameters of the water but fails in purification process of water. In our method the major parameters are measured in real time using sensor technology at reduced cost. The sensed data are mainly send to think speak cloud where the information are analyzed and represented in the form of graphical representation. Also, the data can be viewed in the form of numericals in excel sheet with date and time. Though the list of water quality monitoring (WQM) parameters is very large, a limited set of significant WQM parameters is generally utilized to monitor water quality. On the basis of such parameters, a water quality index generates a single number expressing the overall quality of water acquired from a target locality at a specific time. The main objective of WQI is to transform complicated water quality data into some understandable form of information. These data in the cloud can be viewed anytime anywhere in the world. Then it also sends an alert message if the water quality is not within the standard limit.

2 LITERATURE SURVEY

2.1 EXISTING PROBLEM

Existing system has a mechanisms which are semi-automated or manually controlled devices which are to be handled by a person responsible for monitoring the water quality. There is need to have human intervention intaking various reading of the water parameters. The instruments or tools are used either by putting/inserting a water sensing partinto water and seeing the result on small display device or by directly inserting aportable device in water and watching the output on the display. Central Water Commission (CWC) monitors water quality, by collecting samples from representative locations within the processing and distribution system.

These samples are analyzed at the well-equipped laboratories. At these laboratories, samples of raw water, filter water and treated water are taken for analysis, these analysis can be performed by human intervention which for specific period only. The disadvantage of this system is, water is not monitoring seamlessly, and it always needs a human intervention.

2.2 REFERENCES

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- In[2] Smart Water Quality Monitoring System Using IoT Environment (Nikhil R1, Rajender R2, Dushyantha G R3 , M N S Khadri4, Jagadevi N Kalshetty52018
- In [3] Water Quality Monitoring System on IoT (Vaishnavi V. Daigavane and Dr. M.A Gaikwad 2017) Design and development of a low cost system for real time monitoring of the water quality in IOT(internet of things).
- In [4] An IoT Based System for Water Quality Monitoring (Pranita Mahajana,Prachi Shahaneb 2020) .
- In [5] Water Quality Monitoring System based on IoT platform (Ahmed Abbas Fadel , Mohamed Ibrahim Shujaa 2020)
- In [6] IoT Based Smart Water Quality Monitoring Recent Techniques, Trends and Challenges for Domestic Application (Parag Warungase1, Anuj Worlikar 2, Jatin Mhatre3, Dona Saha4, Prof.Gauri Salunkhe5 2017)
- In [7] Efficient Cloud Based Real Time Water Quality Monitoring System Using Internet of Things (M.Usha Rani #1, Dr.R.Alageswaran #2, Sathish Kumar A #3 2018).
- In [8] Smart Water Quality Monitoring System Using Iot Technology (Vennam Madhavireddy1, B. Koteswarrao2* 2018
- In [9] Smart Water Quality Monitoring System With Cost-effective Using IoT(Sathish Pasika *, Sai Teja Gandla 2019.
- In [10] IoT Based Real Time Water Quality System(1Nihil R, 2Riya Rajan, 3Rangit Varghese 2019).

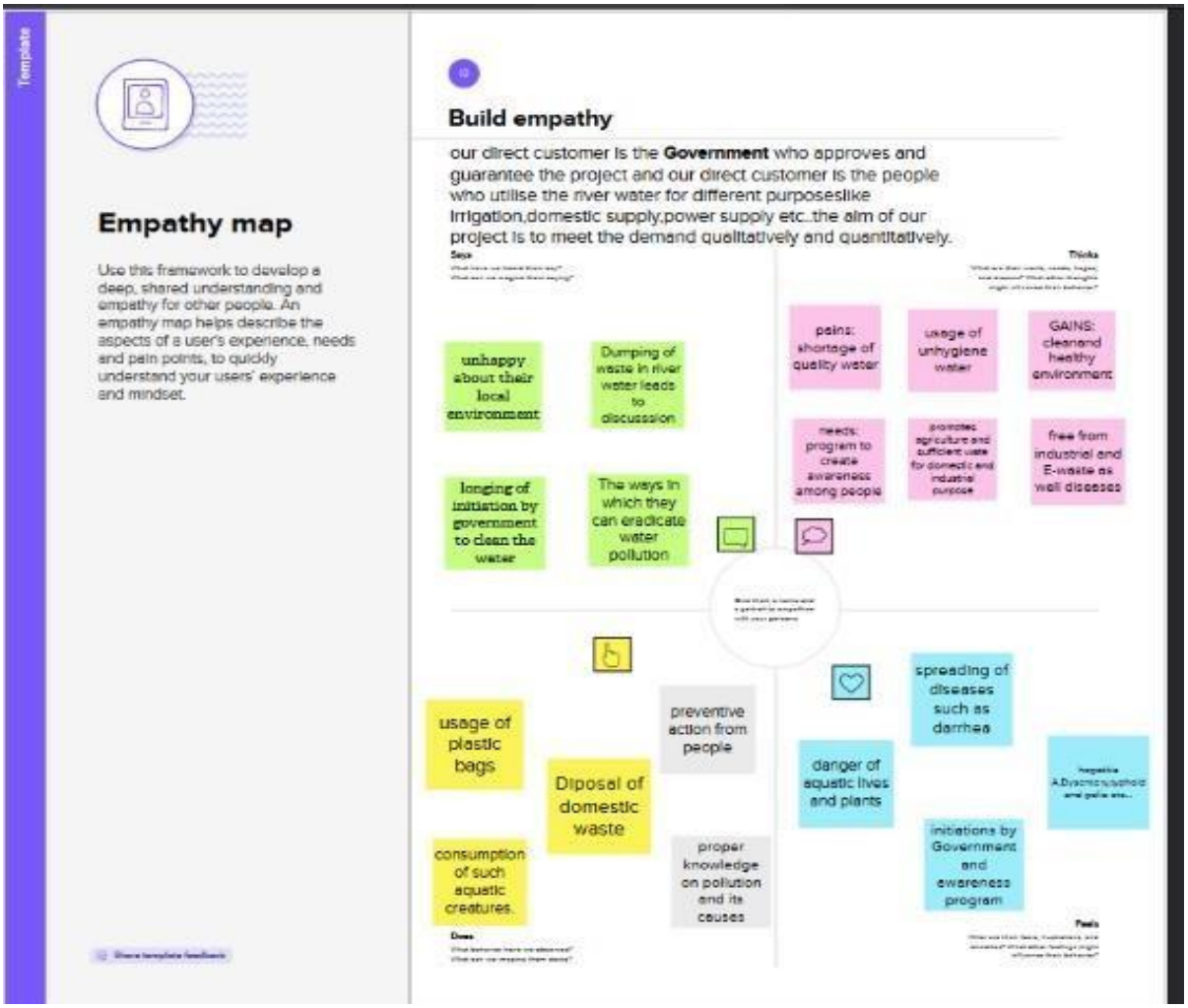
2.3 PROBLEM STATEMENT DEFINITION

Due to the limited water resources and the endangerment of pollution , water becomes the immense need of the world. The advancement in the modern life style is also one of the reason to the emerging danger of the water borne diseases and water scarcity. Thus in order to get rid of diseases and to increase the availability of water we need to monitor the quality as well to implement a control system. Using the components of wireless sensors network with the help of IOT a solution is to be proposed for " water Quality monitoring system" that checks all the quality parameter and provide better performance rate with perfect accuracy. In our method the major parameters are measured in real time using sensor technology at reduced cost. The sensed data are mainly send to Thingspeak cloud where the information are analysed and represented in the form of graphical representations. Also, the data can be viewed in the form of numerical in excel sheet with date and time. Though the list of water quality monitoring (WQM) parameters is very large, a limited set of significant WQM parameters is generally utilized to monitor water quality. On the basis of such parameters, a water quality index generates a single number expressing the overall quality of water acquired from a target locality at a specific time. The main objective of WQI is to transform complicated water quality data into some understandable form of information. These data in the cloud can be viewed anytime anywhere in the world. Then it also sends an alert message if the water quality is not within the standard limit.

3.IDEATION AND PROPOSED SOLUTION

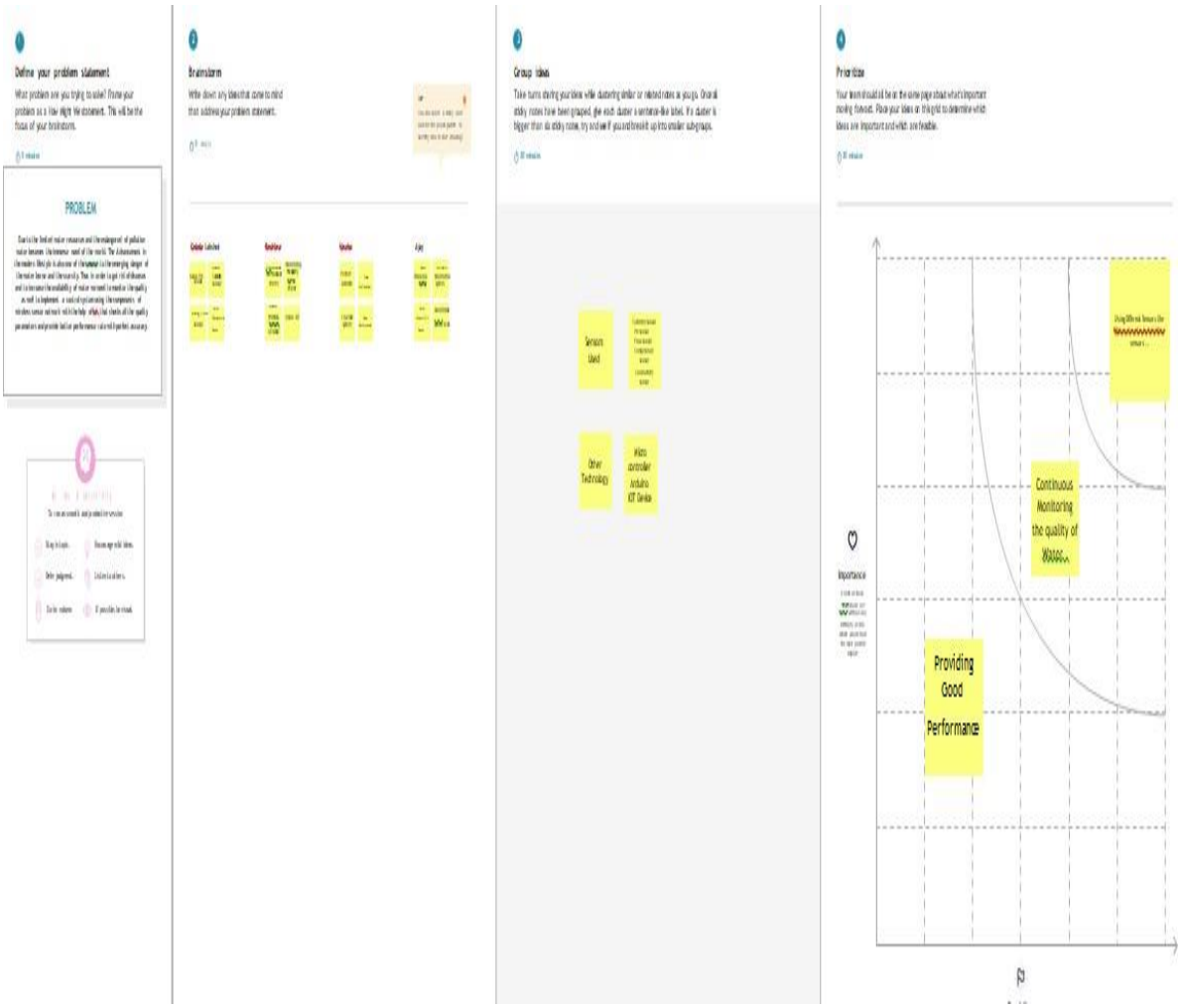
3.1 EMPATHY MAP CANVAS

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.



3.2IDEATION AND 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 developa rich amount of creative solutions.



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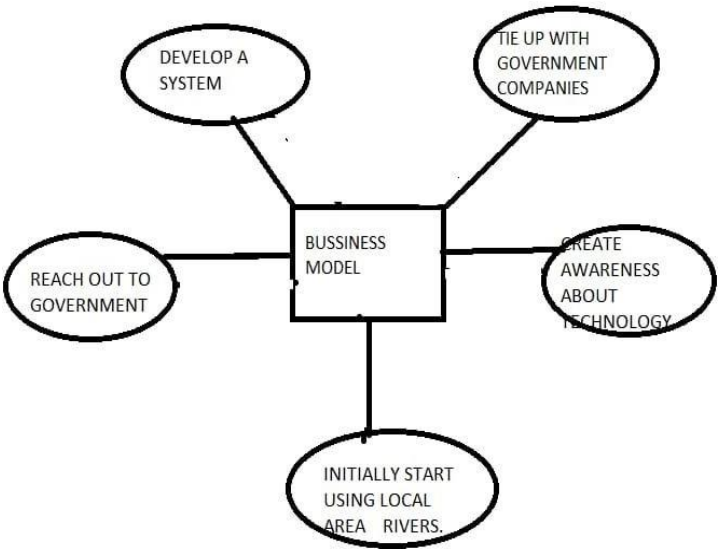
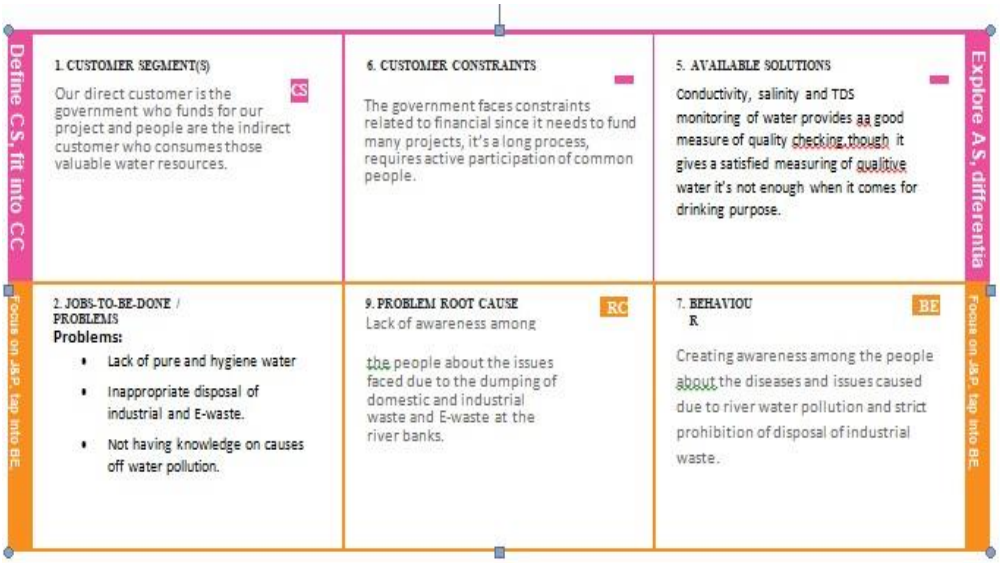
3.3 PROPOSED SOLUTION

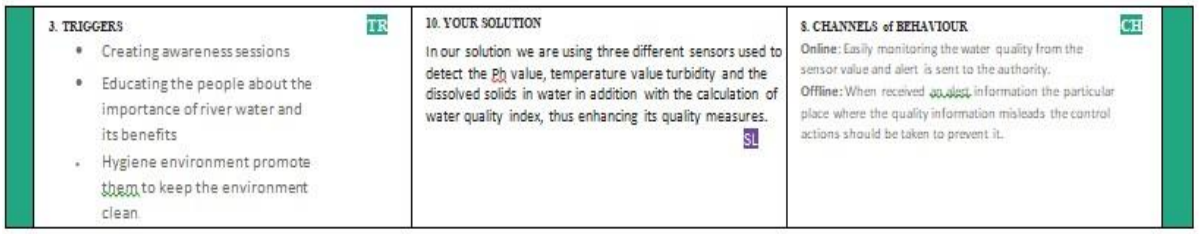
S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Due to the limited water resources and the endangerment of pollution , water becor es t immense need of the world. The advancement in the modern life style is also one c the the emerging danger of the water borne diseases and water scarcity. Thus in order to ge diseases and to increase the availability of water we need to monitor the quality as well implement a control system. Using the components of wireless sensors network with th

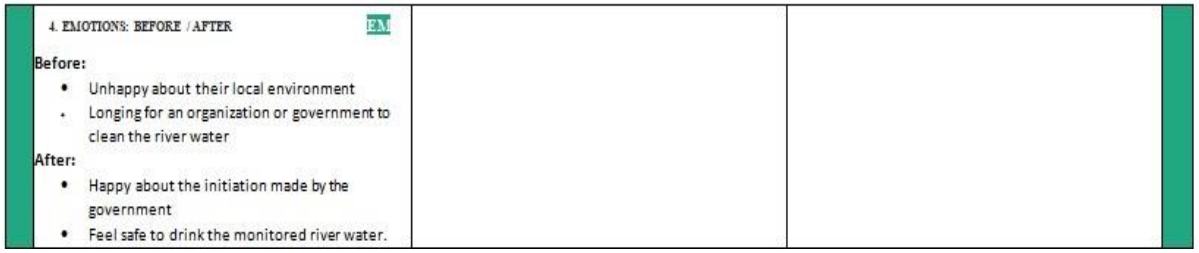
<table>
<tr><td></td><td></td><td>IOT a solution is to be proposed for “ water Quality monitoring system” that checks all quality parameter and provide better performance rate with perfect accuracy.</td></tr>
<tr><td>2.</td><td>Idea / Solution description</td><td>Due to the limitation of the budget, the current projects only focuses mainly on measu quality of river water parameters. This project can be extended into an efficient water management system of a local area. Hence our idea is to focus on the parameters suc accuracy of PH sensor as the program encoded should be highly reliable .Proper purifi process using Water quality index since the usage of sensors detect different paramet water but fails in purification process of water.</td></tr>
<tr><td>3.</td><td>Novelty / Uniqueness</td><td>Most of the Projects are done only based on the detection of Parameters, but we are Calculating the Water quality Index.
The Value of the Sensors are Shown as follows
<table>
<tr><td></td><td>Safe water</td><td>Unsafe Water</td></tr>
<tr><td>pH</td><td>6.5-8.5</td><td><6.49 and>8.5</td></tr>
<tr><td>Turbidity</td><td><5</td><td>>5</td></tr>
<tr><td>Action</td><td>Turn On Green Led</td><td>Turn On Red Led and Buzzer</td></tr>
</table>
Threshold values of temperature sensor
<table>
<tr><td></td><td>Normal</td><td>Hot</td><td>Cold</td></tr>
<tr><td>Temperture</td><td>10<=T>=29</td><td>T>29</td><td>T<10</td></tr>
<tr><td>Action</td><td>Green Led</td><td>Red Led</td><td>Blue Led</td></tr>
</table>
The above tabulation shows the value of the sensors , When the Value Exceeds Buzzer can be used.</td></tr>
<tr><td>4.</td><td>Social Impact / Customer Satisfacti
on</td><td>Our ultimate Customer is Government . The aim of our water quality monitoring syste meet the demand qualitatively and quantitatively. Although quality can be maintained appropriate operation and maintenance strategies, supplying increasing demand in te quantity is a problem, because large-scale investments are sought for water supply uti However, satisfaction of consumer cannot be neglected under these circumstances. H objective of the current study is to examine the influence of the level of service suppli quality variations and the geographical location of consumers on their perceptions on delivery, satisfaction and risk perception.</td></tr>
</table>

5.	Business Model (Revenue Model)	Our System Will be more beneficial to the Government since Government is our S pre Customer . We Will Showcase our System to the Government. As the Whole process is controlled by sensor and other components Manpower can be very much reduce . So government can save Labour cost and can gain more profit. As the sensors are monito of the parameters of water ,the error can be reduced. 
6.	Scalability of the Solution	Our Project is very much efficient since it is based on IOT. We are using Temperature Humidity Sensor , Flow Sensor , Flow of the Water . As the Parameters of the water are monitored continuously , the quality of water can be measured easily which makesthe s more efficient , Since we are Calculating the index of water , the system will becor e m efficient .

3.4 PROBLEM SOLUTION FIT







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	User confirmation	Conformation via E mail confirmation via OTP.
FR-2	TDS Sensor	It is a small hand held devices used to indicate the TOTAL DISSOLVED SOLIDS in a solution,usually water
FR-3	Ph level detection	Ph sensor is used to monitor the water quality and the signals are send to Arduino.
FR-4	Turbidity detection	Turbidity sensor TS-300B measures the turbidity (counter of suspended matter) in the wash water andthe signals are send to Arduino.
FR-5	Temperature sensor	It is capable of measuring temperature in the range of -5 degrees centigrade to +50 centigrade with a resolution of 0.1 degree.

4.2 Non-functional Requirements

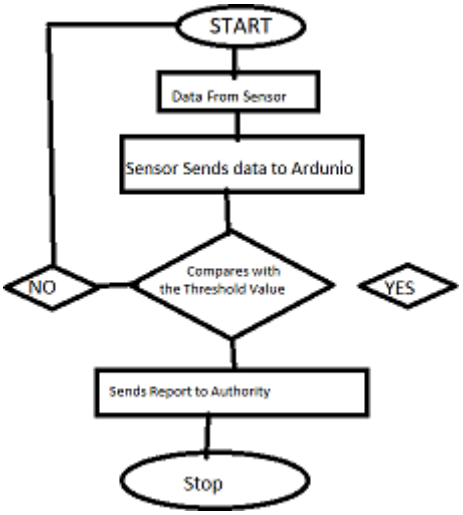
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Efficient to use and has simple monitoring system.
NFR-2	**Security**	Mobile application is secured with firewalls protection.
NFR-3	**Reliability**	Real time sensor output values with future predicted data storage. 98% efficient monitoringoutput. Assurance for aquaculture safety
NFR-4	**Performance**	Greater performance and environmentally safemodel.
NFR-5	**Availability**	In form of mobile UI 24 x 7 monitoring system.
NFR-6	**Scalability**	Highly Scalable.
NFR-7	**Stability**	It is highly stable.
NFR-8	**Efficiency**	It is highly efficient and it has simple monitoring system.

5 PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

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

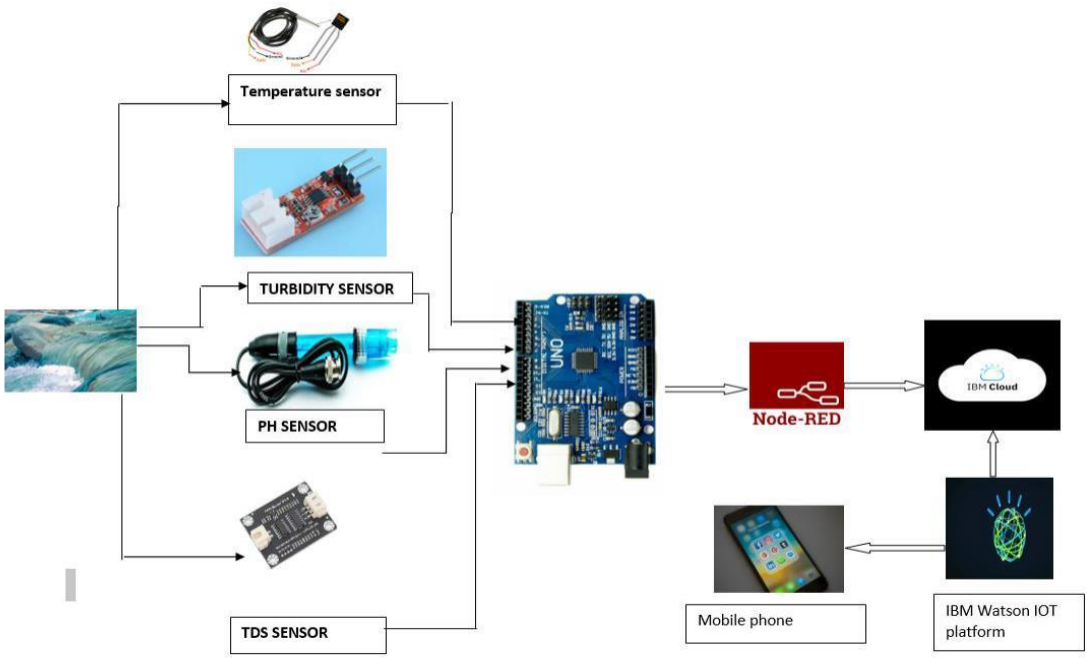


5.2 SOLUTION ARCHITECTURE

- The best solution to monitor the water quality with the help of IOT, where different sensors are deployed to detect the various parameters like PH, turbidity, temperature, etc.. so that it can be utilities for agriculture, drinking ..
- Here software utilised here was Python IDLE. IDLE is the standard Python development environment. It stands for "Integrated DeveLopment Environment". It is a easy, human readable language with lot of libraries.

- Efficient to use and has simple monitoring system. Mobile application is secured with firewalls protection. Real time sensor output values with future predicted data storage. 98% efficient monitoring output. Assurance for aquaculture safety

- Temperature sensor-DS18B20,liquid PH Sensor, turbidity sensor-DfRobot ,Arduino UNO.



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 (Mobile user)	Registration	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 have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the	I can register & access the dashboard	Low	Sprint-2

			application thr ough Facebook	with Facebook Login		
		USN-4	As a user, I can register for theapplication through Gmail		Mediu m	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Confirmatio n	USN-6	Confirmation via E mail confirmation via OTP		High	
Sensors	Detection	USN-7	TDS Sensor - It is a small hand held devices used to indicate the TOTAL DISSOLVED SOL IDS in asolution ,usually water			
	Ph level detection	USN-8	Ph sensor is used to monitor thewater qualit y and the signals are send to Arduino.			
	Turbidity detection	USN-9	Turbidity sensor TS-300B measuresthe turbidity			
	Temperatur e Detection	USN-10	It is capable of measuring temperature in the range of -5 degrees centigrade to +50 centigrade with a resolution of 0.1 degree			

6 PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND 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	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-1		USN-2	Create the IBM Cloud services which are being used in this project.	6	High	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-1		USN-3	Configure the IBM Cloud services which are being used in completing this project.	4	Medium	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-2		USN-4	IBM Watson IoT platform to connect the web application to IoT devices, so create the IBM Watson IoT platform.	5	High	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-2		USN-5	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.	4	Medium	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-2		USN-6	Configure the connection security and create API keys that are used	10	High	Gokula Lakshmi A Pavithra G A

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
			in the Node-RED service for accessing the IBM IoT Platform.			Varsha R Ajay R
Sprint-3		USN-7	To create a web application using Node-RED service.	10	High	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-3		USN-8	Create a HTTP request to communicate with mobile app	4	Medium	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-4		USN-9	Configure the application to receive data from cloud	5	Medium	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-4		USN-10	Develop a python script.	6	Medium	Gokula Lakshmi A Pavithra G A Varsha R Ajay R
Sprint-4		USN-11	Develop a python script to publish random sensor data to the IBM IoT platform	7	High	Gokula Lakshmi A Pavithra G A Varsha R Ajay R

6.2 SPRINT DELIVERY SCHEDULE

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

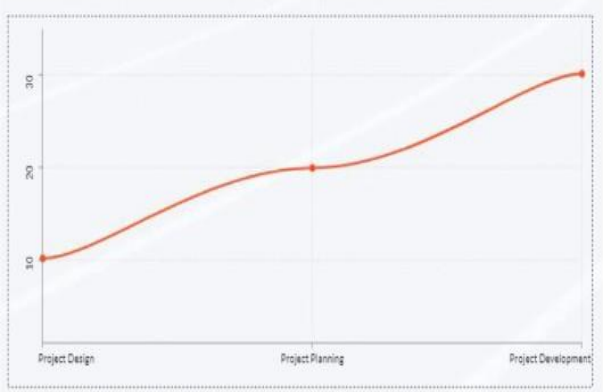
Velocity:

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)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



7 CODING & SOLUTION

7.1 FEATURE 1

Arduino Code for Sensor Calibration:

```
#include <OneWire.h>
#include <DallasTemperature.h>
#define ONE_WIRE_BUS 5
OneWire  oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);
float Celcius=0;
float Fahrenheit=0;
float voltage=0;
const int analogInPin = A0;
int sensorValue = 0;
unsigned long int avgValue;
float b;
int buf[10],temp;
void setup(void)
Serial.begin(9600);
sensors.begin();
 int sensorValue = analogRead(A1);
voltage = sensorValue * (5.0 / 1024.0);
sensors.requestTemperatures();
Celcius=sensors.getTempCByIndex(0);
Fahrenheit=sensors.toFahrenheit(Celcius);
for(int i=0;i<10;i++)
{
```

```
 buf[i]=analogRead(analogInPin);
 delay(10);
for(int i=0;i<9;i++)
 for(int j=i+1;j<10;j++)
 if(buf[i]>buf[j])
 {
 temp=buf[i];
 buf[i]=buf[j];
 buf[j]=temp;
 }
for(int i=2;i<8;i++)
avgValue+=buf[i];
float pHVol=(float)avgValue*5.0/1024/6;
float phValue = -5.70 * pHVol + 21.34;
Serial.println(phValue);
Serial.print("pH");
 Serial.print(" C ");
Serial.print(Celcius);
Serial.print(voltage);
Serial.print("V");
delay(10000);
}
```

7.2 FEATURE 2

Python Code for Serial Data Monitoring:

```
import serial
import time
import csv
import numpy as np
import matplotlib.pyplot as plt
Water Monitoring System
ser = serial.Serial('/COM6',9600)
ser_bytes = ser.readline(10)
print (ser_bytes)
ser.flushInput()
while True:
 try:
 ser_bytes = ser.readline()
 decoded_bytes = float(ser_bytes[0:len(ser_bytes)-2].decode("utf-8"))
 print(decoded_bytes)
temp = float(decoded_bytes(1:3))
turb = float(decoded_bytes(4:6))
pH = float(decoded_bytes(6:8))
with open("test_data.csv","a") as f:
writer = csv.writer(f,delimiter=",")
 writer.writerow([time.time(),decoded_bytes])
 except:
 print("Keyboard Interrupt")
 ser.close()
```

```
 break()
t = np.arange(0.0, 2.0, 0.01)
s = 1 + np.sin(2*np.pi*t)
plt.plot(t, s)
plt.xlabel('time (s)')
plt.ylabel('Celsisus (C)')
plt.title('Temperature')
plt.grid(True)
plt.savefig("Temperature.png")
plt.show()
plt.xlabel('time (s)')
plt.ylabel('Volatge (C)'
)
plt.title('Turbidity')
plt.grid(True)
plt.savefig("Turbidity.png")
plt.show()
plt.xlabel('time (s)')
plt.ylabel('pH ')
plt.title('pH')
plt.grid(True)
plt.savefig("pH.png")
plt.show()
Serial.begin(9600);
sensors.begin();
 int sensorValue = analogRead(A1);
 voltage = sensorValue * (5.0 / 1024.0);
```

```
}
void loop(void)
{
 sensors.requestTemperatures();
 Celcius=sensors.getTempCByIndex(0);
 Fahrenheit=sensors.toFahrenheit(Celcius);
 for(int i=0;i<10;i++)
{
 buf[i]=analogRead(analogInPin);
 delay(10);
}
for(int i=0;i<9;i++)
{
 for(int j=i+1;j<10;j++)
 {
 if(buf[i]>buf[j])
 {
 temp=buf[i];
 buf[i]=buf[j];
 buf[j]=temp;
 }
n = 256
X = np.linspace(-np.pi, np.pi, 256, endpoint=True)
C,S = np.cos(X), np.sin(X)
plt.plot(X, C)
plt.plot(X,S)
plt.show()
```

```
print ("Visualization of real time sensor Data.")
print("/n")
while True:
 try:
 ser_bytes = ser.readline()
 decoded_bytes = float(ser_bytes[0:len(ser_bytes)-2].decode("utf-8"))
 print(decoded_bytes)
temp = float(decoded_bytes(1:3))
turb = float(decoded_bytes(4:6))
pH = float(decoded_bytes(6:8))
with open("test_data.csv","a") as f:
 writer = csv.writer(f,delimiter=",")
 writer.writerow([time.time(),decoded_bytes])
 except:
 print("Keyboard Interrupt")
 ser.close()
 break()
t = np.arange(0.0, 2.0, 0.01)
s = 1 + np.sin(2*np.pi*t)
plt.plot(t, s)
```

9 RESULTS

9.1 PEFORMANCE METRICS

			NFT - Risk Assessment						
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
1	REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM	New	Low	No Changes	Moderate	3days	>5 to 10%	ORANGE	As we have seen the changes

10. ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- The prototype developed for water quality maintenance is very beneficial for safeguarding public health and also adds to the clean environment.
- The automation of this water monitoring, cleaning and control process removes the need of manual labor and thus saves time and money.
- The automation of the system makes the control and monitoring process more efficient and effective. Real time monitoring on mobile phone which is possible through the interface of plc with Arduino and Bluetooth module allows remote controlling of the system.

DISADVANTAGES

- It is difficult to collect the water samples from all the area of the water body.
- The cost of analysis is very high
- The lab testing and analysis takes some time and hence the lab results does not reflect real time water quality measurement due to delay in measurement.

- The process is time consuming due to slow process of manual data collection from different locations of the water body.

11 CONCLUSION

This paper has successfully improvised an intelligent water quality monitoring system. The system can be monitored from a PC and is also capable of sending a smart alert through IFTTT. It is a low cost and robust model that does not require people on duty. It provides quick and easy monitoring of turbidity and TDS level to ensure clean water is maintained continuously. ThingSpeak has provided a suitable environment for analyzing and comparing the sensor data as observed in graphics and smart alerts. As per the obtained results, the proposed system can be considered as suitable water quality monitoring system. Our system has made water quality testing more economical, convenient and reliable with timely feedback.

12 FUTURE SCOPE

This proposed system gives information to every user who depend on that plant. We can use more sensors to detect more parameters for the water quality analysis purposes. The supply of water can be controlled by interfacing relay for easy detection. This system can be used to monitor other water quality parameters. The operation is user-friendly. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value.

13 APPENDIX

SOURCE CODE

```
import time

 import sys

import ibmiotf.application

 import ibmiotf.device

 import random

. #Provide your IBM Watson Device Credentials

organization = "uo60re"


deviceType = "AKASH"

 deviceId = "1234"

 authMethod = "token"
```

```
 authToken = "12345678"


# Initialize GPIO




def myCommandCallback(cmd):
 print("Command received: %s" %
cmd.data['command']) status=cmd.data['command']
 if status=="lighton":
print ("led is on")
else:
 print ("led is off")
 #print(cmd) cmd):
 print("Command received: %s" %
 deviceType = "AKASH"
 deviceId = "1234"
authMethod = "token"
authToken = "12345678"


# Initialize GPIO def myCommandCallback(
cmd.data['command'])
status=cmd.data['command'] if status=="lighton":
print ("led is on")
 else:
print ("led is off")
 #print(cmd)
```

```
try:

deviceOptions = {"org":

organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token":
authToken} deviceCli = ibmiotf.device.Client(deviceOptions)

#.....



except Exception as e:

 print("Caught exception

connecting device: %s" % str(e))

sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type
"greeting" 10 times

deviceCli.connect()



while True:

#Get Sensor Data from DHT11

temp=random.randint(60,100) Turbidity=random.randint(0,100)


phvalue=random.randint(2,14)
```

```
data = { 'temp' : temp, 'Turbidity':
 Turbidity,'phvalue': phvalue}
#print data
def myOnPublishCallback():
 print ("Published temp = %s
'C" % temp, "Turbidity = %s %%" % Turbidity,"phvalue = %s %%" % phvalue, "to IBM Watson")

success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=myOnPublishCallback)
if not success:
print("Not connected to
IoTF")
time.sleep(10)




deviceCli.commandCallback = myCommandCallback



# Disconnect the device and application from the cloud
deviceCli.disconnect()
```