HAZARDOUS AREA MONITORING FOR INDUSTRIAL PLANT POWERED BY IOT

Submitted by

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1. INTRODUCTION:

1.1 PROJECT OVERVIEW:

In some industrial plants, there are some areas which are to be monitored from time. Sometimes the condition become critical which may leads to loss of property and else human loss and to monitor the condition we can integrate the smart devices in the areas which are needed to be monitoring .Every device will be acting as a beacons and it is connected to temperature data along with the location of that particular area through beacons. After a plant grown into a feet it is placed into an intelligent monitoring system. Plants are monitored and controlled by mobile phone using mobile application. Errors in system are mainly due to improper monitoring of this system. So plant growth is affected. To overcome this problem the parameters are monitored by using exceeds its limit then the alarm is put on, simultaneously the concentration of all gases are displayed in the LCD display The proposed system is placed in an industry where the hazardous gases have to be monitored. The individual sensors are placed to read the range of gaseous concentration in ppm. Each sensor is sensitive to its own specific gas. These sensor values are read by the microcontroller, and then it is programmed to monitor the range of all gases. When the concentration of any gas**.**

The small LPG cylinder of weight 5kg in which the burner is located immediately over the cylinder without using a rubber tube is seen to be safer than the one which uses a rubber pipe as this subway has the hazards of getting cracked which in turn can make way to leakage [3]. In this research, a computer program running online was created to detect leakage locations and act as an automatic supervisor in remote areas; simple gas leak detector is a simple device that is used to detect the leakage of gas and if the gas leak occurs, an equivalent message is conveyed by the means of a buzzer and powered by Wi-Fi, it is capable to broadcast messages to the stakeholders about the LPG leak through the cloud which is based on the IoT technology; where -IoT is defined as a system that permits the devices for communicating with each other directly without human intervention [4]-. The proposed system will continuously monitor the environment for any leakage. Just in case of any leakage detection, it'll alert the user via a buzzer and by using the ESP2866 wifi microcontroller and an IOT platform ; it'll alert the user about the environmental conditions to the gas level of that location of IBM cloud (as mentioned previously) notification.

1.2 PURPOSE:

In every day many people are facing some industrial hazards like fire hazards, chemical exposure. It causes workers have physical and psychological problems in industrial plants. Any industry in the world. Which work make a electricity and other efficient products for peoples. So, we cannot avoid these industrial plants, but we can control the risk of power plants. Because we using automatic alarm based on IoT. Create mobile application it works detect the fire hazard and gas leak aging level in the industry. We using IoT device and web application it can protect the workers and protect the physical equipment’s of the plant. This intelligent device can help to growth of industries and improve the security protection basics of IoT make automation and give solution to the risks. Tish IOT integrated with controller and sensors for intelligent monitoring and controlling purposes like avoid hazards in industrial sides. System is made

automated through IOT which improves the efficiency and reduces the efforts and it reduce hazards fire, burn, gas leakage, toxic gases, explosion, physical problems of peoples and industry**.**

KEYWORDS: Hazardous, IBM Cloud platform, LPG, Alarm system.

2. LITERATURE SURVEY:

2.1 EXIXTING PROBLEM:

The need to industrialize to compete with global standards is a complete requisite to realize a booming economy. However, there is no question that it has wreaked havoc on the environment caused industrial emissions of dangerous chemicals. This study aimed to create a system that will allow Industrial plants and factories to monitor the emission of the smoke stacks. But leakage can take place through pipes or regulators or knobs which may cause accidents like suffocation, uneasiness or sometimes. The existing system in gas leakage detection is done using microcontroller. This system contains only few application like gas leakage detection and producing an alarm signal whenever gas leakage is detected.

2.2 REFERENCES

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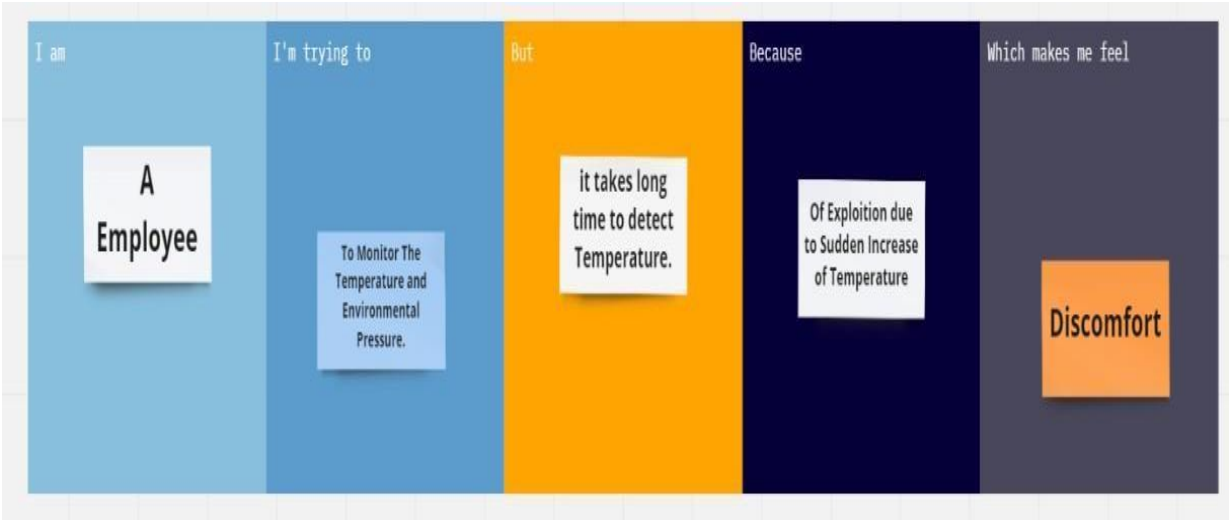
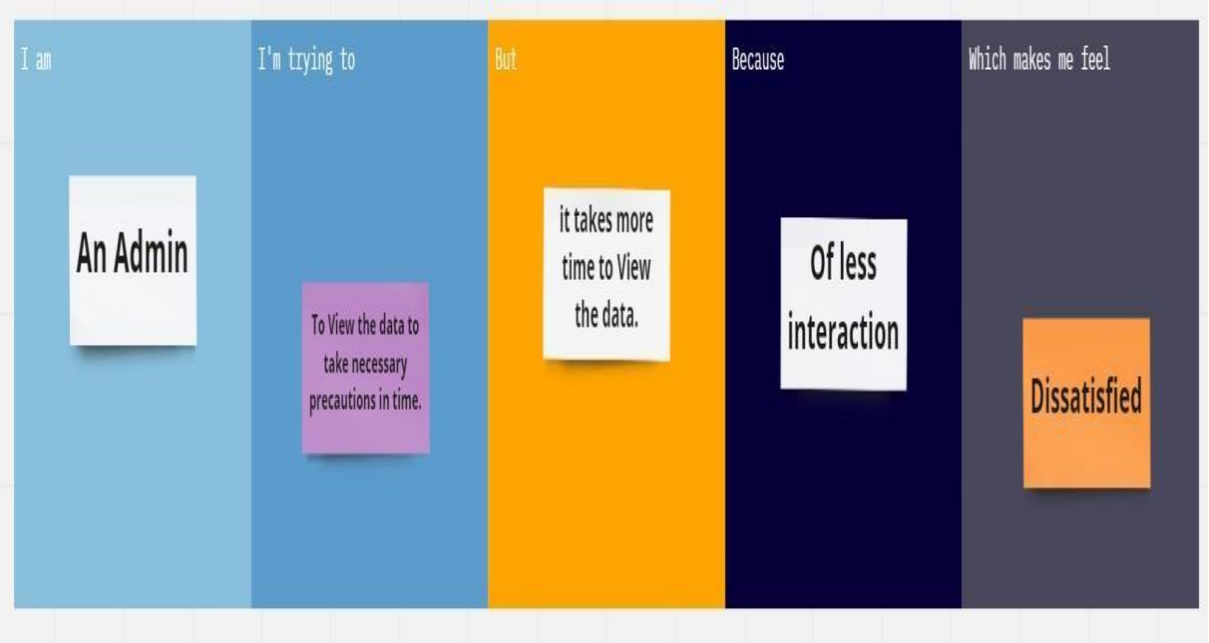
2.3 Problem Statement

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face.

Throughout the process, you’ll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.



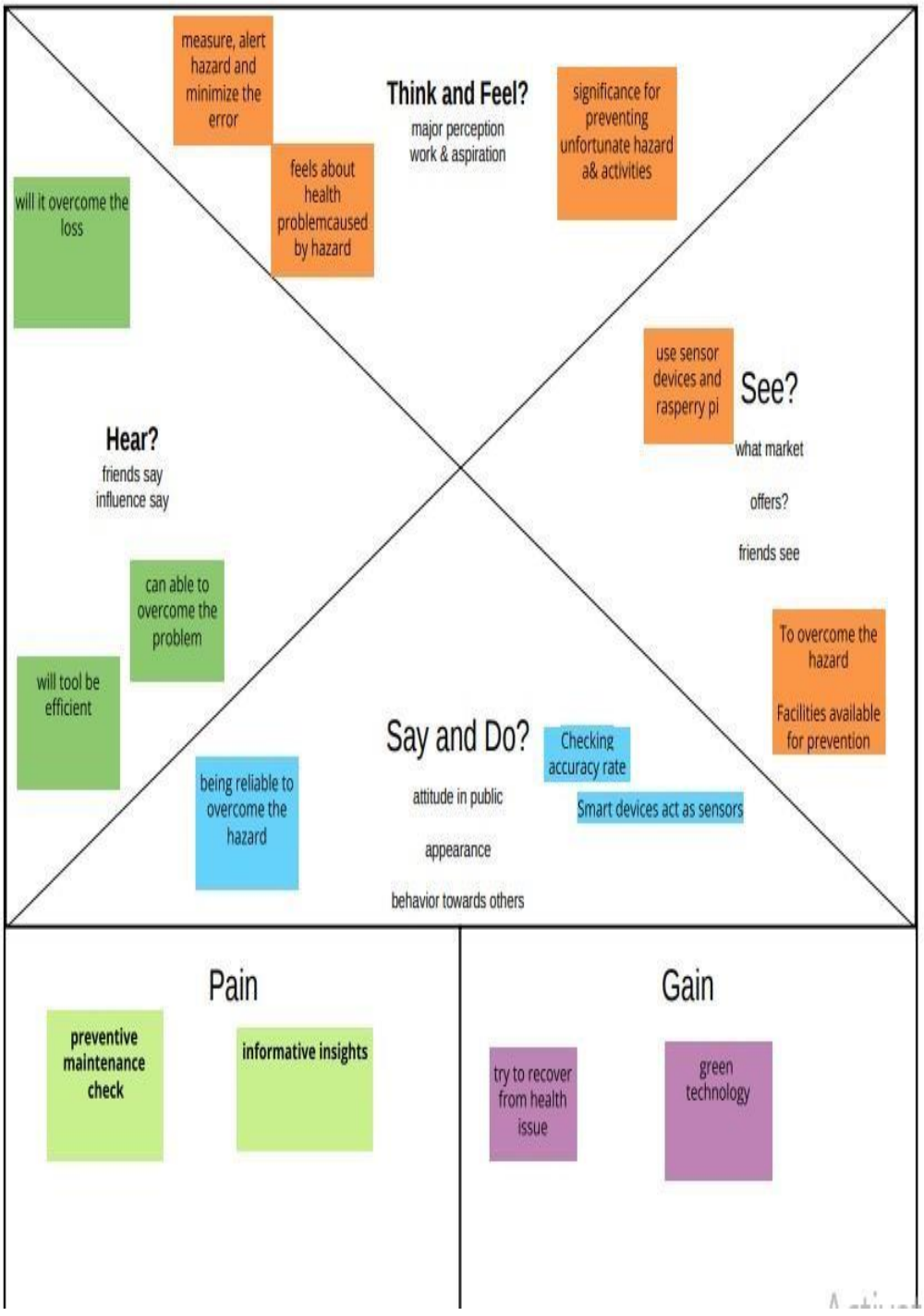


Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A Employee	To Monitor the temperature and environment pressure	It takes long to detect Temperature	Of exploitation to sudden increase of Temperature	Discomfort

PS-2	An Admin	To view the data to take necessary precaution in time	It takes more time to view the data	Of less interaction	Dissatisfied

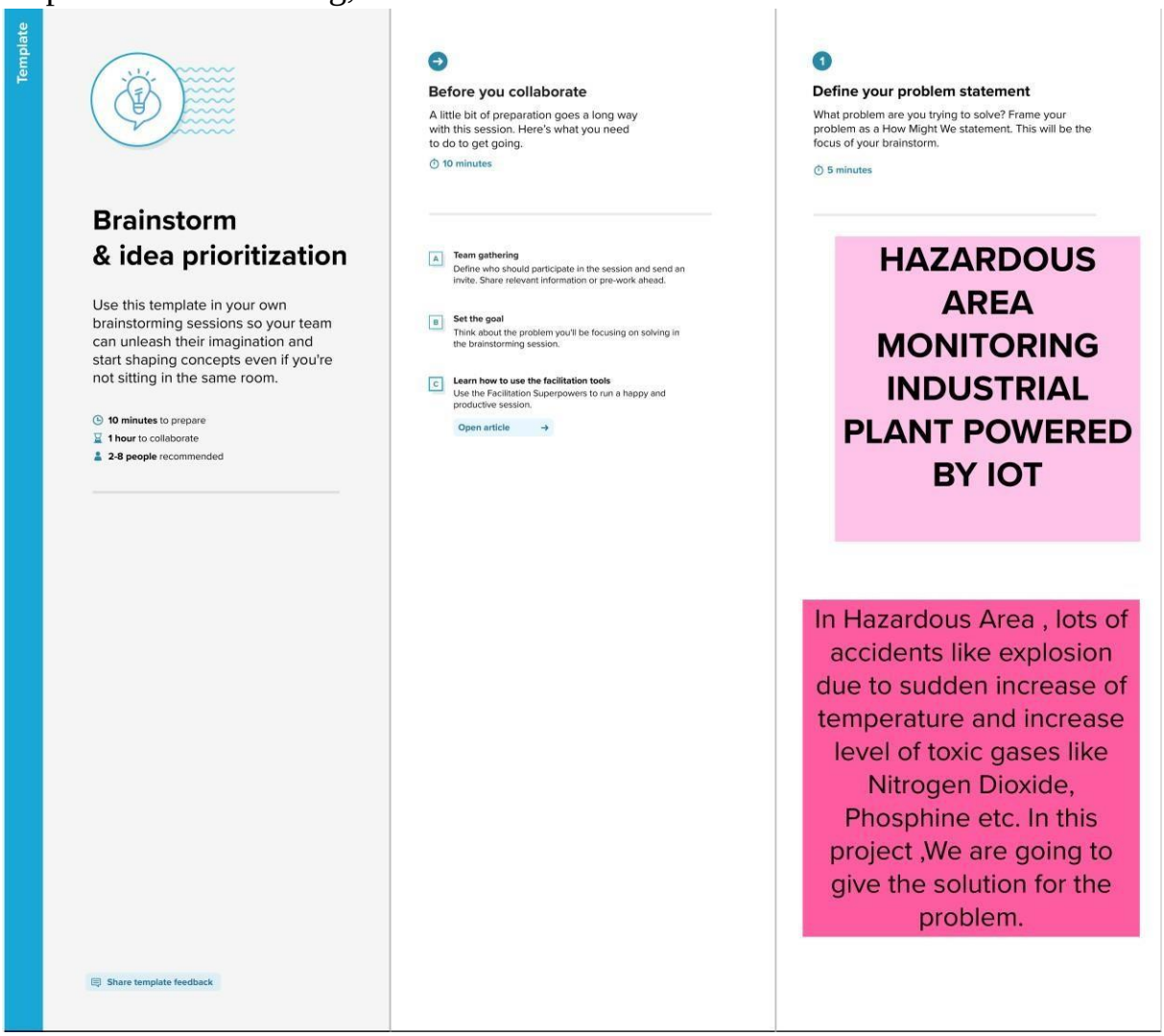
3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map

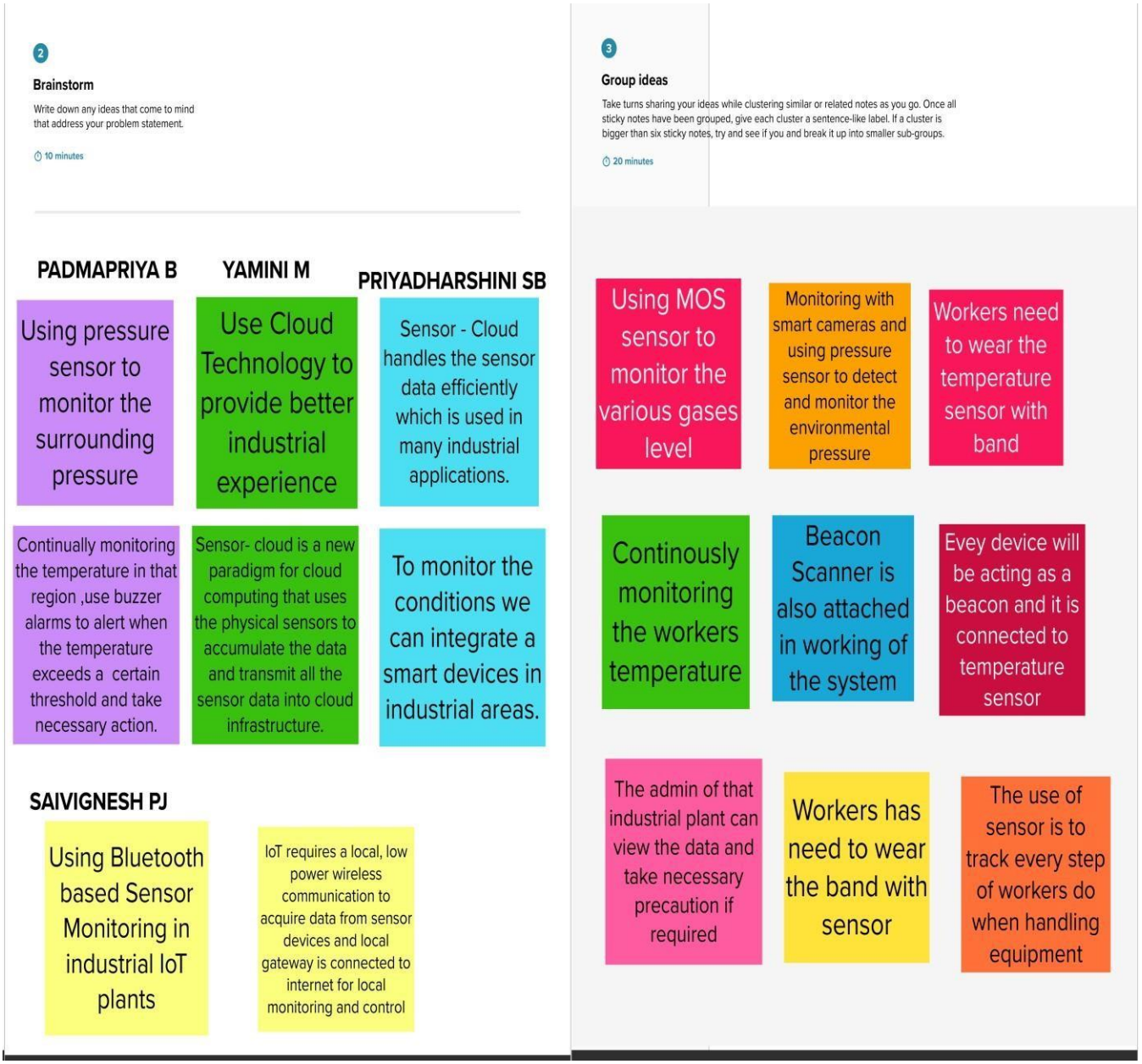


3.2 BRAINSTROMING

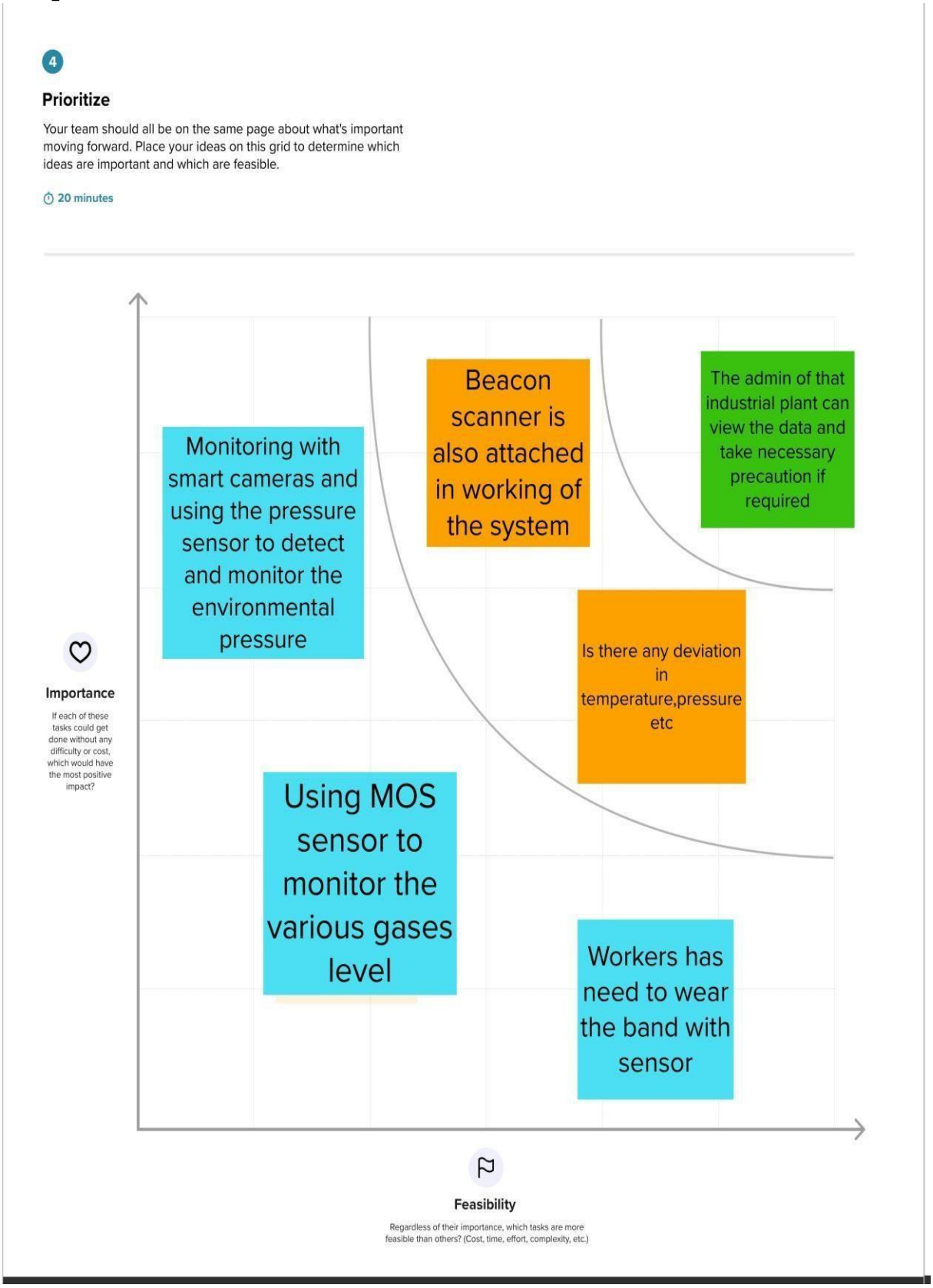
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3.3 PROPOSED SOLUTION:

In industrial areas fire accidents can be prevented by fire detection using temperature and gas sensors. Harmful or toxic gas leakages can identified. By the use of wireless technology, information from these sensors can be broadcasted to the particular individual. Alert message are sent via an application and buzzer sound is enabled.

A versatile modular monitoring equipment for the proactive diagnosis and monitoring of a wide range of industrial equipment is becoming more and more useful. Automation systems have started to be modularized in order to be able monitor a wide range of equipment (such as compressors, electric motors, gas turbines, blowers etc.) A properly designed automation cabinet [4, 5] can increase productivity, lowers costs, and ensure processes reliability.

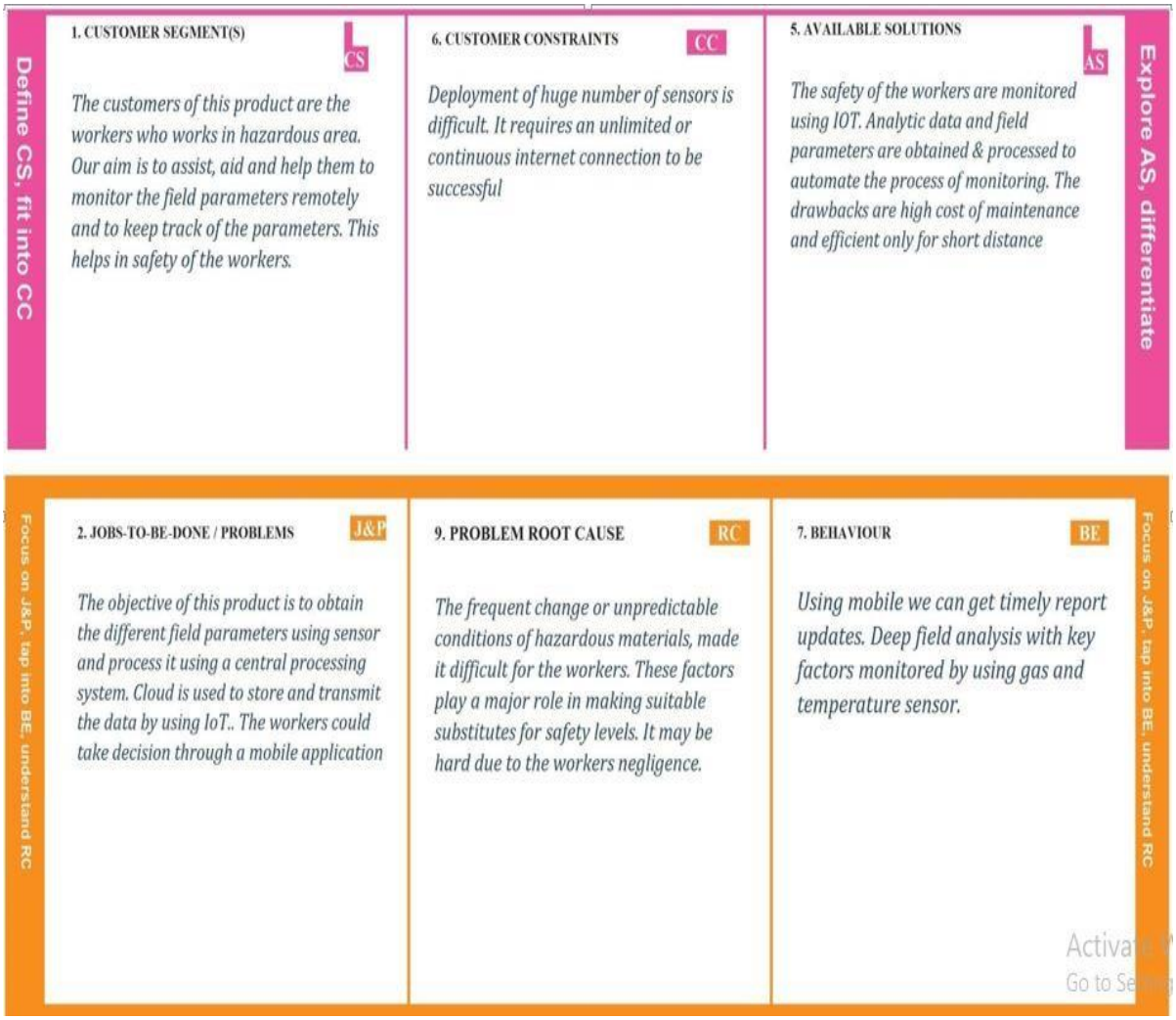
This application has a powerful impact not only on the people but also on the environment. By using this application ,individuals are alerted incase of danger or threat. Thereby environment as well as thousands of life can be saved which in-turn causes contentment.

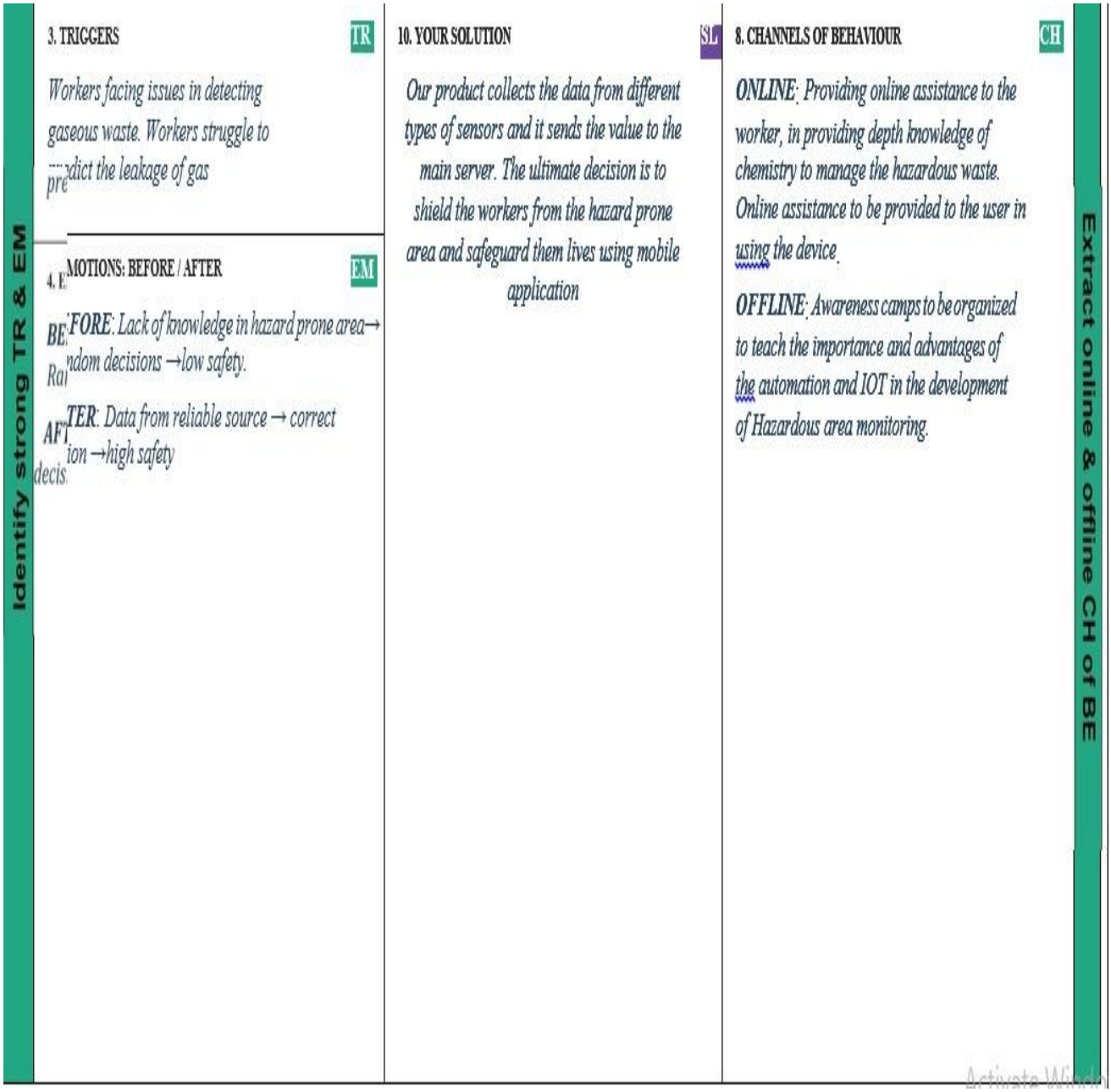
Industrial plans are the one that contain both hazardous and nonhazardous area . The monitoring of the hazardous area in industrial plants in important from time to time. If the damage that occurs in hazardous areas can result in the loss of property or lives. So monitoring for Industrial plants is a project that focuses on the necessity of the monitoring of hazardous area in industrial plants .There can be smart devices integrated at the hazardous area that can help in detecting any fishy things that can occur in the particular area. The software needs to

monitor the temperature parameters of the hazardous area in industrial plants.

The uniqueness of our application we will get live updates of temperature, humidty and radiation in and around the workers environment using IoT

3.4 PROPOSED SOLLUTION FIT




Identify strong TR & EM
3. TRIGGERS
TR
Workers facing issues in detecting gaseous waste. Workers struggle to
dict the leakage of gas
4. E
MOTIONS: BEFORE / AFTER
EM
BE
FORE: Lack of knowledge in hazard prone area→
ndom decisions →low safety.
AFT
TER: Data from reliable source → correct
ion →high safety
10. YOUR SOLUTION
SL
Our product collects the data from different types of sensors and it sends the value to the main server. The ultimate decision is to shield the workers from the hazard prone area and safeguard them lives using mobile application
8. CHANNELS OF BEHAVIOUR
CH
ONLINE: Providing online assistance to the worker, in providing depth knowledge of chemistry to manage the hazardous waste. Online assistance to be provided to the user in using the device.
OFFLINE: Awareness camps to be organized to teach the importance and advantages of the automation and IOT in the development of Hazardous area monitoring.
Extract online & offline CH of BE

4 REQUIREMENT ANALYSIS

4.1 Functional Requirements

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement	Sub Requirement
FR-1	Data Gathering	The smart beacon must be able to detect and the temperature of a particular area in real.
FR-2	Location Detection	The smart beacon must be able to detect when a wearable device has entered an area near it.
FR-3	Beacon Data Syncing	The smart beacon must be able to share its stored data with both the wearable device and admin dashboard through the cloud.
FR-4	Wearable Device Display	The wearable device must be able to display the temperature of the area where the worker is currently present.
FR-5	SMS Notification	If the temperature of the area is found to reach dangerous levels, the worker should be informed via SMS to their phone instructing them to leave the area.
FR-6	Admin Dashboard	If the temperature of the area is found to reach dangerous levels the admin is informed via the dashboard and must take the necessary precautions.

4.2 NON FUNCTIONAL REQUIREMENTS

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

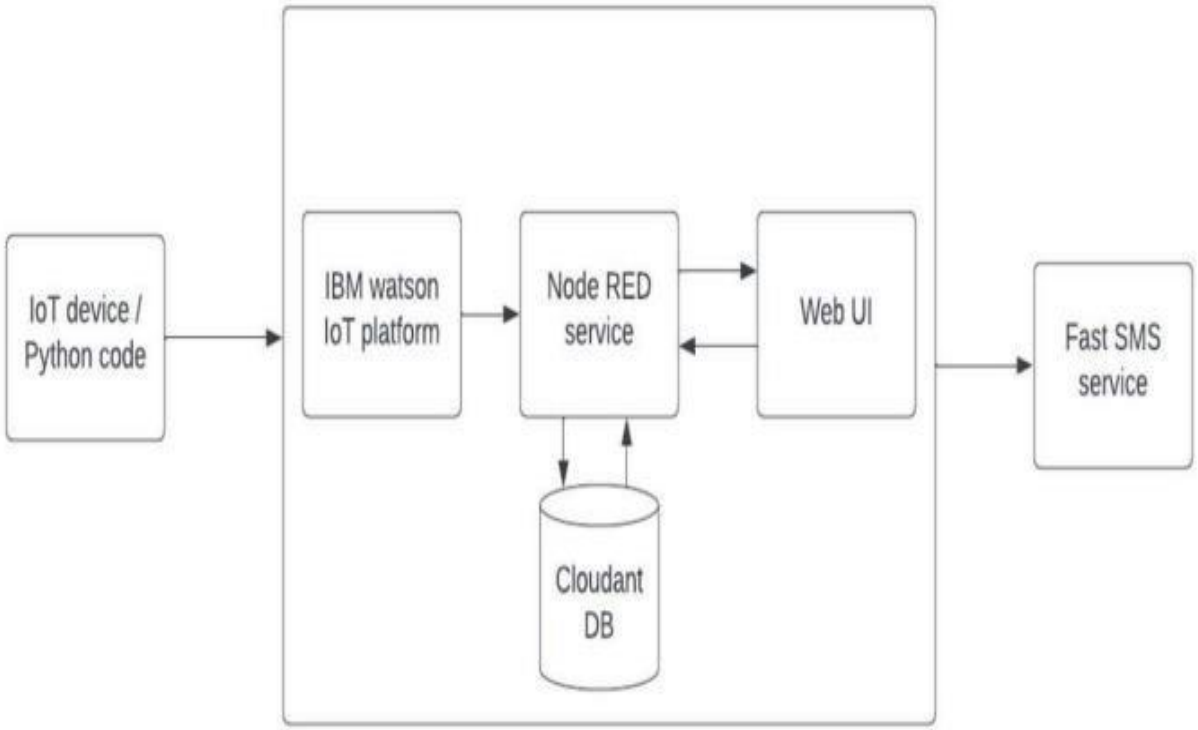
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The wearable device should be slim and not annoy or disturb the workers who are wearing them. They should also reliably display the temperature without large delays and notifications should be clear in cases of detected danger.
NFR-2	**Security**	The connection of the beacons to the cloud and wearable devices should be secure. The security of the database housing all the temperature data should also be bolstered.
NFR-3	**Reliability**	The wearable device should be able to function without any faults even at dangerous temperatures. If a fault is detected it should notify the user and the admin to be immediately repaired and replaced. The beacons should also be regularly

		maintained to ensure reliability.
NFR-4	**Performance**	The device should update temperature readings in real time and requires high end sensors and processors to do so. The time to send data to the cloud and other devices should also be made as small as possible.
NFR-5	**Availability**	The user should be able to check the temperature of the area no matter where or at what time they are in the plant. The dashboard should be constantly active so as to ensure safety precautions can be executed whenever danger is detected.
NFR-6	**Scalability**	If the area that needs to be monitored needs to be increased all one has to do is install new smart beacon devices and connect them to the same system as the previous beacons.

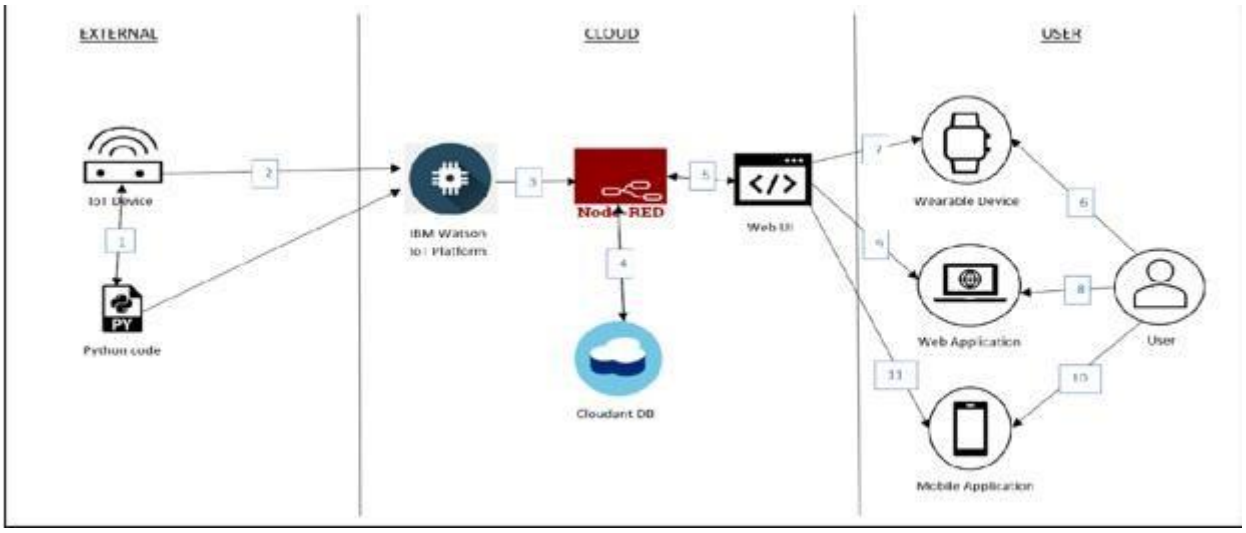
		It can also be replicated in different plants with different factors to be monitored giving it highly scalability.

5. PROJECT DESIGN

5.1 Data Flow Diagram



5.2 Technical Archicture



6 PROJECT PLANNING:

6.1 SPRINT PLANNING & ESTIMATION:

6.2 SPRINT DELIVERY SCHEDULE:

6.3 REPORT FROM JIRA:

The circuit for an LPG leakage detector is readily available in the market, but it is extremely expensive and usually based on a microcontroller (MCU). Presented here is a low-cost circuit for an LPG detector that you can build easily. The main objective of the circuit is to detect LPG leakage anywhere.

Circuit and Working of the LPG leakage detector:

Circuit diagram of the low-cost LPG detector is shown in Fig. 2. It is built around step-down transformer X1, two rectifier diodes 1N4007 (D1 and D2), a 1000µF capacitor (C1), 7805 voltage regulator

(IC1), MQ-6 LPG gas sensor (GS1), dual comparator LM393 (IC2), darlington transistor TIP122 (T2), 12V high-gain siren/buzzer (PZ1) and a few other compon.

7 CODING & SOLUTIONING:

7.1 FEATURE:1

```
import wiotp.sdk.device import time import
random myConfig = identity" :
{
"orgId": "6yafic", "typeId":
"Sprint1",
"deviceId":
"SprintID"
},
"auth":
{
"token": "sW(iQhEK*t)4!jgrjD"
}
}
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s"
   % cmd.data['command']) m=cmd.data['command'] client =
   wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect

while True:
        data=myData,  temp=random.randint(0,50)
        heart=random.randint(60,100)
        myData={'temperature':temp,
```

```
                                        'heartrate':
heart} client.publishEvent(eventId="status",
msgFormat="json", onPublish=None)  print("Published
data Successfully: %s", myData)
 client.command Callback = myCommandCallback time.sleep(5)
client.disconnect()
```

7.2 FEATURE:2

```
include
"LiquidCrystal.h"
LiquidCrystal
lcd(9,8,7,6,5,4);
int
GAS_VA
L = 0; void
setup()
{ pinMode(A0, INPUT); // MQ-6 A0
  Pin Serial.begin(9600);
  lcd.begin(16,2);
  pinMode(11,OUTPUT); // LED Green
  pinMode(12,OUTPUT); //
  LED Red

  lcd.setCursor(0,0); lcd.print("
  GAS SENSOR ");
```

```
} void
loop()
{
 GAS_VAL              =
 analogRead(A0);
 Serial.println(GAS_V
 AL);

 if (GAS_VAL > 500)
 { lcd.setCursor(0,1);
   lcd.print("          LPG
   Detected          ");      digitalWrite(11,HIGH); digitalWrite(12,LOW
   );
 }

 else
 { lcd.setCursor(0,1); lcd.print("LPG Not Detected");
    digitalWrite(11,LOW); digitalWrite(12,HIGH);
 }
 delay(10);
}
```

7.3 DATABASE SCHEME

Today, India has around 16.64 crore active consumers of Liquefied Petroleum Gas (LPG). Around 21 million tonnes of LPG is required for consumption per annum. This deimport RPi. GPIO as GPIO

Listed below are the schemes provided for the benefit of LPG consumers. As per this scheme, BPL families can receive a new LPG connection without having to pay the security deposit for a cylinder and a pressure regulator. However, they are required to bear the following expenses,

7.3.1 Installation or demonstration charges for the new connection.

7.3.2 Administrative charges and cost of DGCC.

7.3.3 Cost of gas stove and LPG rubber tube at the time of release of new LPG connection.

7.3.4 If the stove is not procured from the LPG distributer, it needs to be inspected. These inspection charges will be borne by the customer.

7.3.5 Price of LPG in the new cylinder.

All these charges should be paid to the concerned distributor. Every cylinder that is used by a consumer carries a subsidy of around Rs. 200. This amounts to a huge subsidy burden that deters the government from utilizing these resources in other developmental activities. In an attempt to focus the LPG subsidy towards the needy, the government has launched the 'Opt out of subsidy' scheme. As per this scheme, the government motivates LPG consumers who can afford to pay the market price for LPG to surrender their subsidy.

Customers can opt-out from LPG subsidy through the website, www.mylpg.in or by submitting Form-5 to their distributors.

This scheme is targeted at streamlining the possession and transfer of LPG connections.

7.3.6 For connection transfers, a written consent is needed from the registered customer for transfer to the person holding the equipment and SV.

7.3.7 The distributor verifies the submitted documents and settles the security deposit amount between the registered customer and holder of the equipment.

8 TESTING:

8.1 TEST CASES:

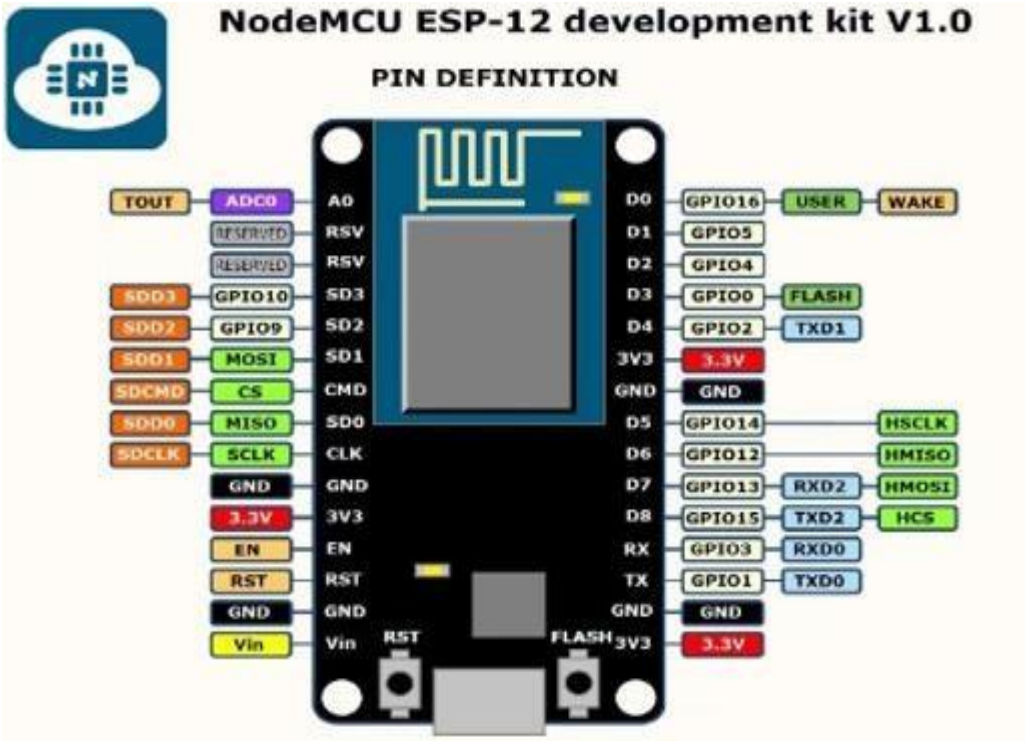
The higher the LPG gas is detected, the higher the voltage released. When the sensor output is moved The presence of gas, then Arduino will activate, and activate the buzzer and display the writing on the LCD stating the gas is high (high), which means there has been a gas leak, then the GSM SIM800L module will send a notification message to the handphone number specified in the program. However, if the sensor does not detect a leak, the sensor will not remove the output, and the sensor will continue to work until it is proven that there is an LPG gas leak. The system design in this study is described in the form of a flowchart to facilitate the reading and understanding of the system that will be made in this study. When the program is run the system will immediately detect LPG gas detected by the sensor.

Then the Arduino microcontroller will read LPG gas through an LPG gas sensor. If it detects a gas leak, the red LED will light up, the buzzer will activate, then the system will send a notification message stating that there has been an LPG gas leak. If no LPG gas leak is detected, the system will continue to detect the gas level through the LPG gas sensor until it detects an LPG gas leak. System flow. The way the

system works and this tool is, first when the system is turned on and this tool will immediately detect the gas content, using a sensor that is designed to be able to detect LPG gas, namely the MQ-2 gas sensor. Then each LPG gas level detected by the sensor is directly processed or converted into an analog signal. Then the analog signal will be sent directly by the MQ-2 sensor to Arduino. Because the analog signal to be sent is a number of LPG gas levels detected by the MQ-2 sensor.

8.2 USER ACCEPTANCE TESTING:

Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.



9. RESULTS:

9.1 PERFORMANCE METRICS:

The result of this project is determined by using a lighter to collect leaked gas around the gas sensor, after sensing procedure if sensor value is greater than the threshold value then ESP 8266(NODE MCU) will perform its programmed tasks : Immediately turn off the regulator knob to stop further leakage. After detecting the gas leakage, the relay will be on the Enhanst fan to prevent any further accidents. Buzzer starts beeping to alert the nearby people. The exhaust fan will fan out all enclosed gas from the environment. The wi-fi module updates the information to the cloud. The user can get to know the gas values and status of the system through the app and also control of the power supply can be done manually by the user through the app.

10. ADVANTAGES AND DISADVANTAGES:

ADVANTAGES: o The smart box has been developed as a prototype to measure the level of air quality, dust, temperature, and humidity.

- It is suitable to implement and apply in a smart city for the near future.
- This will help companies in maintaining the machine Technology. and provide them emission data of gaseous elements such as carbon monoxide, particulate matter, sulfur and nitrogen dioxide that will help them in complying with the environmental standards of industrial emission.
- Get real-time alerts about the gaseous presence in the atmosphere o Prevent fire hazards and explosions o Supervise gas

concentration levels o Ensure worker's health o Real-time updates about leakages o Cost-effective installation o Data analytics for improved decisions o Measure oxygen level accuracy o Get immediate gas leak alerts

APPLICATIONS:

Harmful Gas Detection:

The sensing of toxic gases such as H2S, Methane, and CO is of great importance in any industry to avoid unwanted leakage and consequences like poisoning or explosions. The presence of these gases can be easily detected in the industrial facilities and commercial buildings with the help of IoT-powered gas monitoring solution. Moreover, a gas detector or sensor device is a crucial part to carry out safe industrial operations. The sensor-enabled solution helps prevent the high risk of gas explosions and affecting any casualties within and outside the premises.

DISADVANTAGES: o It gets reacted due to heating of wire. o It measures toxic gases in very low concentrations. o It has ability to detect wide range of gases.

o It is difficult to know failure modes unless very advanced methods of monitoring are used. o It causes suffocation, in case of leakage as it heavier than air.

11. CONCLUSION:

It is always better to have preventive measure, rather than taking actions after a disaster. Having a system to monitor the changes in the surroundings should help the owners of the industry to keep their

industries safe and also keep their workers safe. Though the initial cost of installation of the device is higher, it is always better to spend on precaution, than spending on fixing any harmful situation.

12. FUTURE SCOPE:

Another major future scope could be including a Automatic Shut-off device which will turn off the gas supply whenever it will detect any gas leakage. This system can be implemented in Industries, Hotels and wherever the LPG cylinders are used.

1) Fast Speed of response.
2) Immune to catalytic poisons.
3) High Reliability & Repeatability.
4) Heated optics eliminates condensation.
5) Ability to operate in the absence of oxygen or in enriched oxygen As detectors measure a specified gas concentration, the sensor response serves as the reference point or scale.

Gas Detector Technologies :-

Gas detectors are categorized by the type of gas they detect: combustible or toxic. Within this broad categorization, they are further defined by the technology they use: catalytic and infrared sensors detect combustible gases and electrochemical and metal oxide semiconductor technologies generally detect toxic gases.

13. APPENDIX:

Fire detection using temperature and gas sensors. Harmful or toxic gas leakages can identified . By the use of wireless technology, information from these sensors can be broadcasted to the particular individual. Alert message are sent via an application and buzzer sound is

enabled. The uniqueness of our application we will get live updates of temperature, humidity and radiation in and around the workers environment using IoT. This application has a powerful impact not only on the people but also on the environment.by using this application ,individuals are alerted incase of danger or threat. there by environment as well as thousands of life can be saved which causes contentment.

13.1 GITHUB LINK:- **https://github.com/IBM-EPBL/IBM-Project-19890-1659708460.git**

13.2 PROJECT DEMO LINK:-

https://github.com/IBM-EPBL/IBM-Project-19890-1659708460/blob/0213eb91c66bf0232c785d80c9aa1b9bcabe7c00/Final%20Deliverables/demo%20video/FINAL%20VIDEO.mp4