IOT BASED INDUSTRY SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

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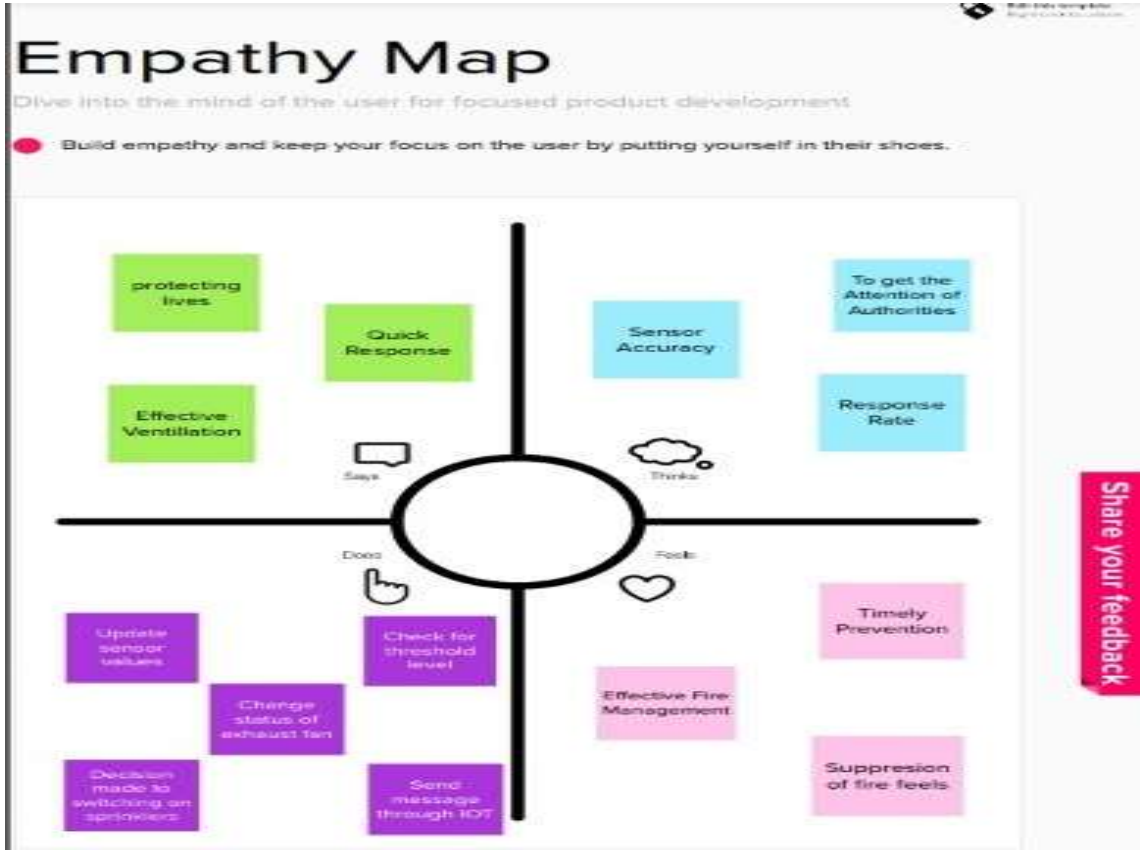
E.ATCHAYA
R.DHANYA

INTRODUCTION

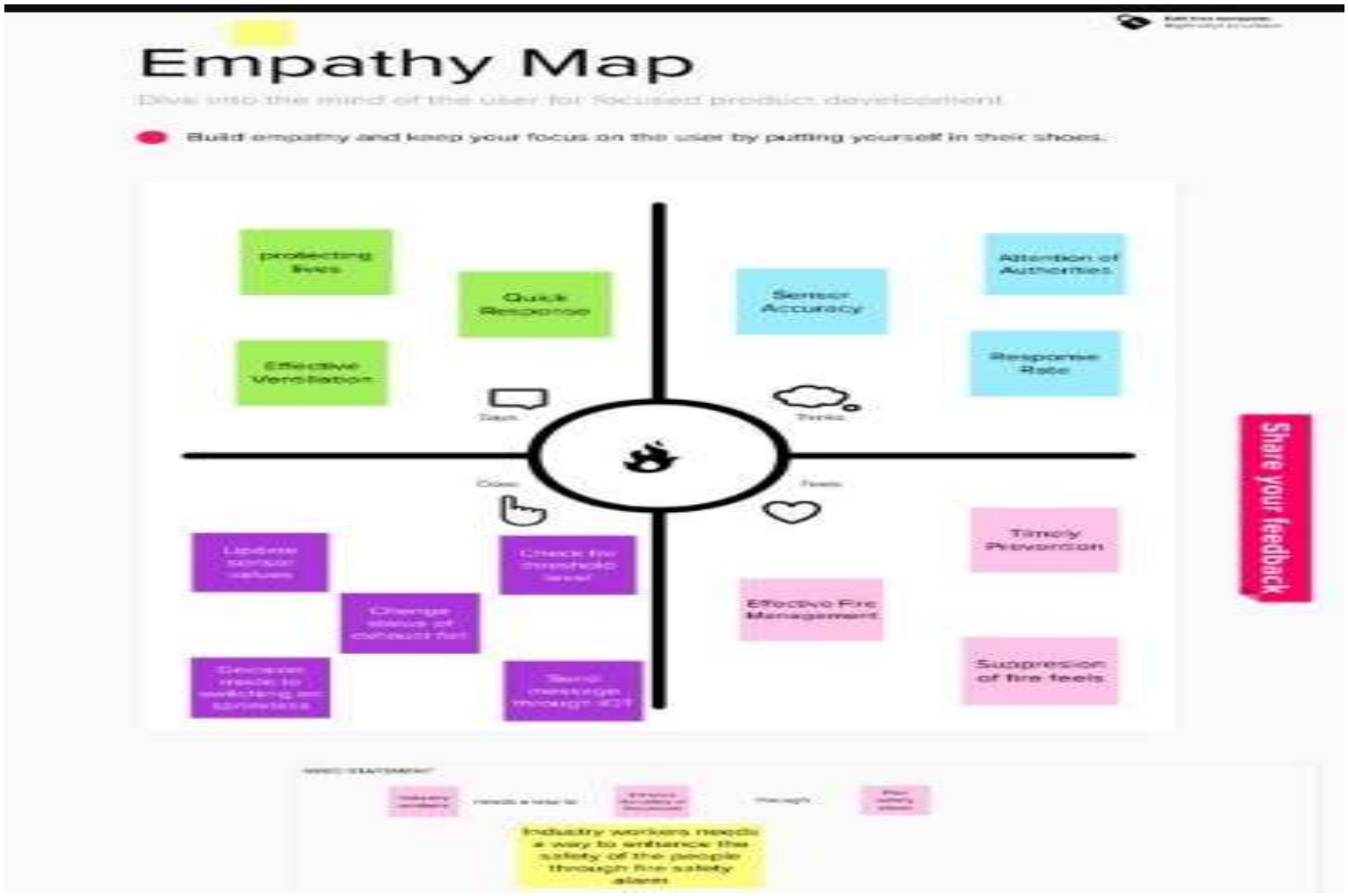
- Fire safety is the set of practices intended to reduce the destruction caused by fire. Fire safety measures include those that are intended to prevent the ignition of an uncontrolled fire and those that are used to limit the development and effects of a fire after it starts.Fire safety equipment at a construction site in ChinaProperty loss caused by arson.Fire safety measures include those that are planned during the construction of a building or implemented in structures that are already standing, and those that are taught to occupants of the building.

EMPATHY MAP


Empathy Map
Dive into the mind of the user for focused product development
Build empathy and keep your focus on the user by putting yourself in their shoes.
protecting lives
Quick Response
Effective Ventillation
Says
Sensor Accuracy
To get the Attention of Authorities
Response Rate
Thinks
Does
Feels
Update sensor values
Check for threshold level
Change status of exhaust fan
Decision made to switching on sprinklers
Send message through IOT
Timely Prevention
Effective Fire Management
Suppresion of fire feels
Share your feedback

IDEATION PHASE

SNO	NAME	POSITION	COLLEGE
1	ANJUKA P	TEAM LEADER	K.RAMAKRISHNAN COLLEGE OF ENGINEERING
2	DHANYA R	TEAM MEMBER 1	K.RAMAKARISHNAN COLLEGE CF ENGINEERING
3	AKSHAYA RS	TEAM MEMBER 2	K.RAMAKRISHNAN COLLEGE OF ENGINEERING
4	ATCHAYA E	TEAM MEMBER 3	K.RAMAKRISHNAN COLLEGE OF ENGINEERING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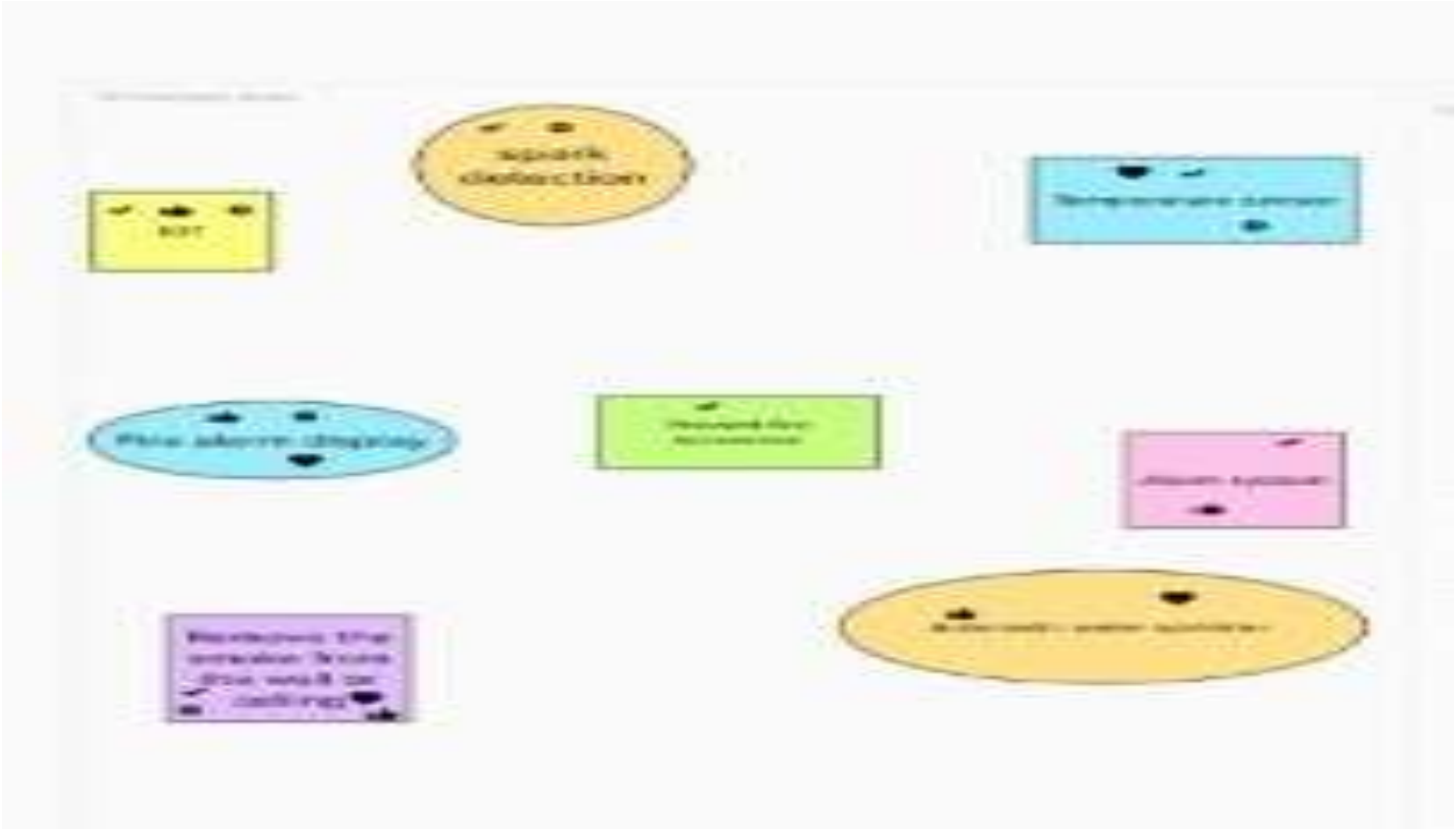
Industry workers needs a way to enhance the safety of the people through fire safety alarm



LITERATURE SURVEY

- 1)Topic : Fire Safety Management in Transportation of Municipal Wastes with the Use of Geographic Information Systems
- Author:A.A. Zakharova,A.V. Pak,O.P. Savoshinsky Published:IEEE International Conference"Management of Municipal Waste as an Important Factor of Sustainable Urban Development" (WASTE)
- Abstract:Fire safety management is one of the main tasks in the field of waste safety. The transportation of municipal waste is a complex management task that requires a highly skilled decision maker. The current management technique is based on the approach to the construction of systems based on the analysis, by assessing the set of initial factors, which does not allow to achieve the management goal. The proposed approach based on synthesis is devoid of this drawback. The application of the system is shown by the example of the use of geoinformation systems to the problem of fire safety in the transportation of municipal waste.

- 2)Topic: Analysis & Design of Fire Protection & Rescue Training Emulation System Based on Virtual Reality
- Authors: Zhenhai Mu,Zhongxuan Tan Published in:2017 international conference
- Abstract:Virtual accident scenes in specific environments are simulated via the virtual reality technology. In the light of emergency rescue principles, trainees are allowed to mobilize and deploy emergency rescue forces, and work out combat schemes to control the development and expansion of accidents. In addition, based on the tactical knowledge repository, the system carries out logical reasoning for combat schemes of trainees, and automatically generates intelligent aided judging results and result interpretations of relevant schemes. Virtual accident scenes are emulated dynamically at real time with the implementation of such combat schemes, thus creating a highly immersive training environment for trainees.

- 3)Topic: Building fire rescue with evacuation management information system and its application
- Author: Xu Tao,Li Xin,Zhao Lin,Mao Guozhu Published:2009 16th International Conference on Industrial Engineering and Engineering Management
- Abstract:Building Fire Rescue with Evacuation Management Information System (BFREMIS) is established. And the evacuation model of BFREMIS was analyzed and presented in this paper. Based on the constructed network model, the evacuation of the teaching building in the university was analyzed by using the software EVACNET4. The analysis items included: the total evacuation time, the floor clear time, evacuation bottleneck, and the visual path of the evacuation on MAPGIS platform. BFREMIS is valuable in building safety assessment and building fire rescue.

- 4)Topic:Development of a Multi-Sensor Fire Detector Based On Machine Learning Models.
- Author:M. Nakıp and C. Güzeli Published in: 2019 Innovations in Intelligent Systems and Applications Conference (ASYU)
- Abstract:This study suggests a technique for reducing false positive fire alarms that combines data from several sensors with a particular machine learning model. In order to identify 7 physical sensory inputs, we create an electronic circuit using 6 sensors. In order to accomplish the fusion and classification of sensor data, we experimentally collect datasets for machine learning models that will be utilised for training and testing. An method is developed that uses a trained machine learning model to classify sensor data before thresholding. Based on comparisons between multi-layer perceptrons, support vector machines, and radial basis function networks, machine learning models are chosen. Measures for comparison include classification accuracy percentage, false negative error, and false positive error.

- 5)Topic: High Resolution Weather Modeling for Improved Fire Management
- Authors:K. Roe,C.McCord,D.stevens Published :2001 ACM/IEEE Conference on Supercomputing
- Abstract:A critical element to the accurate prediction of fire/weather behaviour is the knowledge of near-surface weather. Weather variables, such as wind, temperature, humidity and precipitation, make direct impacts on the practice of managing prescribed burns and fighting wild fires. State-of-the-art Numerical Weather Prediction (NWP), coupled with the use of high performance computing, now enable significantly improved short-term forecasting of near-surface weather at a 1-3 km grid resolution. This proof of concept project integrates two complementary model types to aid federal agencies in real-time management of fire. (1) A highly complex, full-physics mesoscale weather prediction model (MM5) which is applied in order to estimate the weather fields up to 72 hours in advance. (2) A diagnostic fire behavior model (FARSITE) takes the near-surface weather fields and computes the expected spread rate of a fire driven by wind, humidity, terrain, and fuels (i.e. vegetation).

- 6)Title:Fire-fighter: a decision support system for fire management
- Author:K. F. Li and E. Miska Published in:[1991] IEEE Pacific Rim Conference on Communications, Computers and Signal Processing Conference Proceedings
- Abstract:A navy vessel's on-scene captain is assisted by a firefighter who is a smart assistant. Firefighters will create a fire management plan to put out the fire based on a ship's model, its configuration, contents, fire-fighting resources, and some fire-specific knowledge. The role of a firefighter relies on scriptbased planning. The concept of scripts is similar to that of contingency plans for emergencies. The skeletal plan is instantiated using the data from the known situation. Planning, carrying out, and monitoring are interspersed by fire fighters to better respond to a changing environment. Firefighters will keep an eye on the implementation of the strategy to gauge the effectiveness of their emergency operations. Replanning will start when actions fail or seem to fail.
  7)Tilte:Intelligent Community System Based on L

- 7)Tilte:Intelligent Community System Based on LonWorks Technology
- Author:Y. Huang, C. Wan and Z. Zhou, Published in: 2008 IEEE Pacific-Asia Workshop on Computational Intelligence and Industrial Application
- Abstract:With the fast improvement of electronic innovation and PC innovation, the clever advancement of local area framework turns into a pattern. Shrewd people group is a wise, computerized, network and advantageous framework. It enjoys many benefits like expense saving and productive administration. In this paper, the plan of keen local area framework in view of LonWorks innovation is presented which centered around the particular technique for remote meter perusing and alarm observing. Simultaneously, the establishment in the LonWorks control organization of remote meter record framework in light of LonWorks innovation is made sense of. The plan of LonMaker network view is likewise presented. In the framework, GST200 alarm regulators are utilized. LonWorks innovation and GST transport innovation are coordinated from LonWorks Door. The plan of insightful hub and LonMaker control network are likewise depicted which in view of LonWorks innovation.

- 8)Title:Analysis & Design of Fire Protection & Rescue Training Emulation System Based on Virtual Reality
- Author:Z. Mu and Z. Tan Published in: 2017 International Conference on Robots & Intelligent System (ICRIS)
- Abstract:The virtual reality technology simulates virtual accident situations in particular surroundings. The mobilisation and deployment of emergency rescue forces as well as the preparation of combat plans to halt the spread and progression of incidents are permitted to trainees under the guidance of emergency rescue principles. Additionally, the system does logical reasoning for trainees' battle schemes based on the tactical information repository, and automatically creates intelligently assisted judging outcomes and result interpretations of pertinent schemes. With the use of such battle methods, virtual accident situations are dynamically simulated in real time, providing students with a highly engaging learning environment.

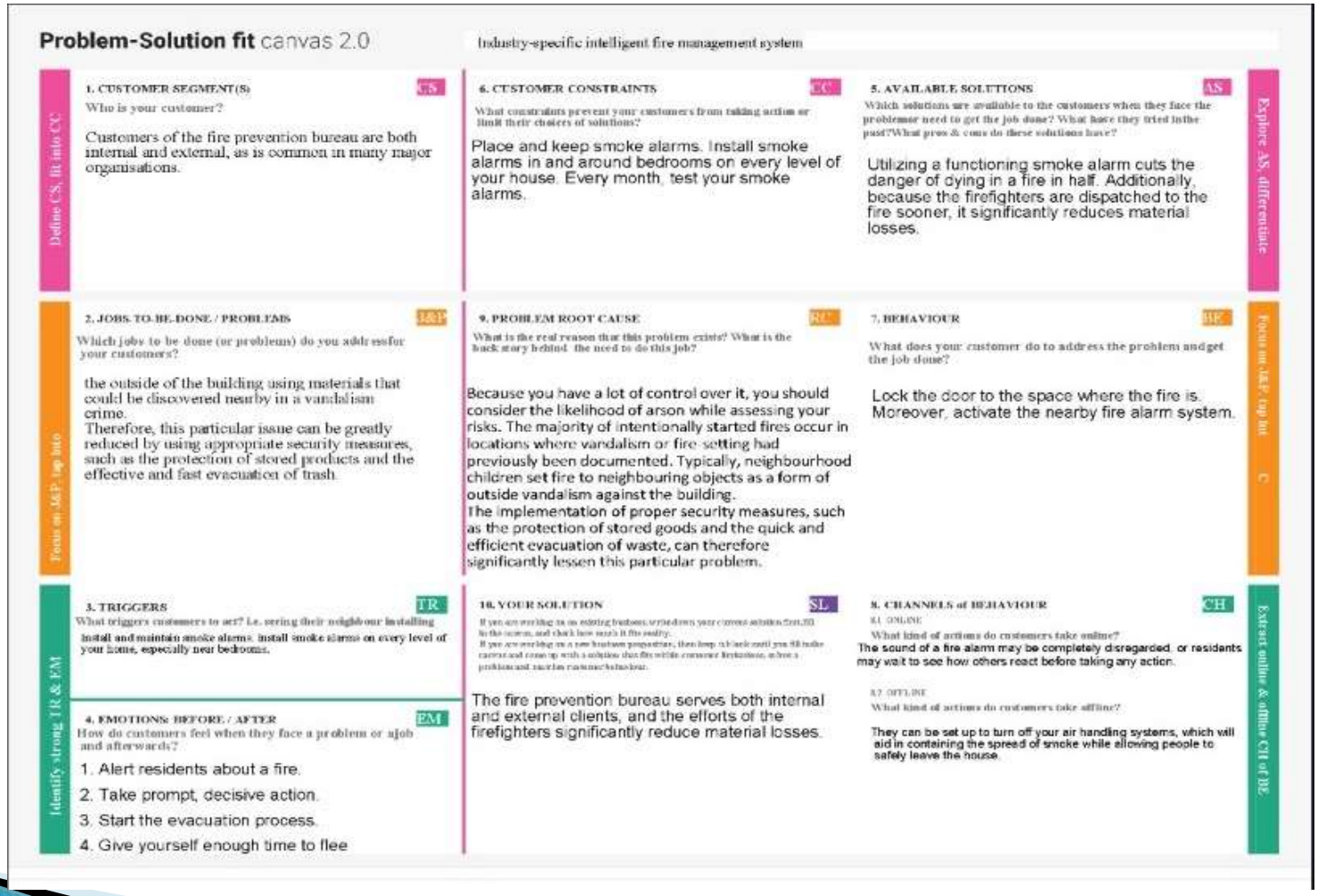
- 9)Topic:Intelligent indoor emergency evacuation systems: Reference architecture and data requirements
- Author:J. W. S. Liu, F. T. Lin, E. T. H. Chu and J. . -L. Zhong Published in: 2016 Future Technologies Conference (FTC)
- Abstract:An intelligent indoor emergency evacuation system (IES) can respond to notifications from building safety systems warning of emergencies originating inside the building and from government agencies warning of natural catastrophes affecting the nearby areas by taking the proper risk reduction measures. In order to identify the data requirements for major public buildings, this article presents a data model, IES's reference architecture, and case studies. Widespread use of IES may face numerous technological and practical obstacles. Examples of these difficulties are provided, along with suggestions for overcoming them.

- 10)Topic:Prediction of Forest Fire Using Machine Learning
- Author:P. Rakshit et al. Published in: 2021 6th International Conference on Innovative Technology in Intelligent System and Industrial Applications (CITISIA)
- Abstract:The natural vegetation and forest life suffer from a number of damaging repercussions as a result of forest fires. Everyone's lives and the environment are significantly impacted by forest fires. Many ecosystems, including grasslands and temperate forests, depend heavily on forest fires. Optimizing the situation will be made easier with the capacity to anticipate the potential forest fire's location. In the paper, a machine learning algorithm was used to predict the likelihood of forest fires using meteorological data. We can infer from the body of available research and its limitations that numerous studies have suggested various models for predicting forest fires and have quantified the quantity of scorched land caused by forest fires

PHASE DESIGN 1

- PHASE DESIGN 1 SOLUTION FIT
- PROPOSED SOLUTION
- ARCHITECTURE

PHASE DESIGN 1 SOLUTION FIT



Problem-Solution fit canvas 2.0

Industry-specific intelligent fire management system

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?

Customers of the fire prevention bureau are both internal and external, as is common in many major organisations.

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions?

Place and keep smoke alarms. Install smoke alarms in and around bedrooms on every level of your house. Every month, test your smoke alarms.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problemor need to get the job done? What have they tried inthe past?What pros & cons do these solutions have?

Utilizing a functioning smoke alarm cuts the danger of dying in a fire in half. Additionally, because the firefighters are dispatched to the fire sooner, it significantly reduces material losses.

Explore AS, differentiate

Focus on J&P, tap into

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you addressfor your customers?

the outside of the building using materials that could be discovered nearby in a vandalism crime.
Therefore, this particular issue can be greatly reduced by using appropriate security measures, such as the protection of stored products and the effective and fast evacuation of trash.

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?

Because you have a lot of control over it, you should consider the likelihood of arson while assessing your risks. The majority of intentionally started fires occur in locations where vandalism or fire-setting had previously been documented. Typically, neighbourhood children set fire to neighbouring objects as a form of outside vandalism against the building.
The implementation of proper security measures, such as the protection of stored goods and the quick and efficient evacuation of waste, can therefore significantly lessen this particular problem.

7. BEHAVIOUR BE

What does your customer do to address the problem andget the job done?

Lock the door to the space where the fire is. Moreover, activate the nearby fire alarm system.

Focus on J&P, tap into

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? I.e. seeing their neighbour installing

install and maintain smoke alarms. Install smoke alarms on every level of your home, especially near bedrooms.

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or ajob and afterwards?

1. Alert residents about a fire.
2. Take prompt, decisive action.
3. Start the evacuation process.
4. Give yourself enough time to flee

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep filling it in and adapt it until you feel the solution fits well with the customer limitations, solves a problem and matches customer behaviour.

The fire prevention bureau serves both internal and external clients, and the efforts of the firefighters significantly reduce material losses.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE

What kind of actions do customers take online?

The sound of a fire alarm may be completely disregarded, or residents may wait to see how others react before taking any action.

8.2 OFFLINE

What kind of actions do customers take offline?

They can be set up to turn off your air handling systems, which will aid in containing the spread of smoke while allowing people to safely leave the house.

Extract online & offline CH of BE

PROPOSED SOLUTION

Project Design Phase-I
Proposed Solution Template

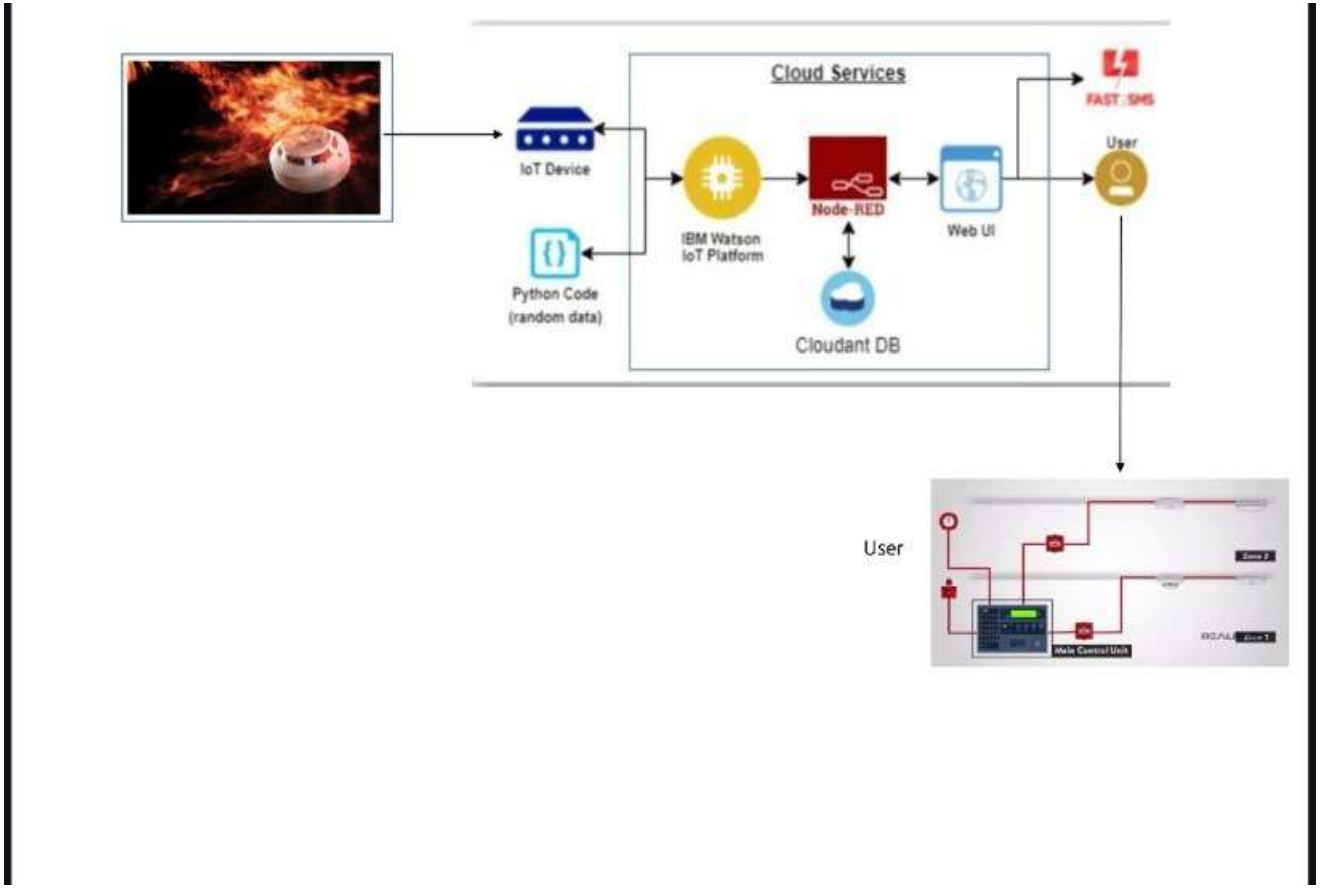
Date	30 September 2022
Team ID	PNT2022TMID10962
Project Name	Project - Industry Specific Intelligent Fire Management System
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To improve the safety management system within the sector. improving the safety management system to stop the occurrence of industrial fires.
2.	Idea / Solution description	creating an IOT-based fire safety management system for the industrial sector by integrating an Arduino Uno board with a fire detection and fire extinguisher system. Additionally, some sensors use a GPS tracking system (such as a humidity, flame, and smoke sensor).
3.	Novelty / Uniqueness	a comprehensive system that keeps an eye on temperature, gas levels, and flames, deploys fire extinguishers on its own with precise position information, and calls or sends SMS messages when a response is needed.
4.	Social Impact / Customer Satisfaction	Accidental industrial fire costs can be reduced through early prevention. locations nearby for better dependability and accuracy. Designing integration for compatibility
5.	Business Model (Revenue Model)	This product has broad application. This can be considered a practical and beneficial item given the various industries that are now involved in preventing fire mishaps that result in the loss of persons and equipment.
6.	Scalability of the Solution	Because we need to give an Arduino-modified device that receives signals from sensors, it is attempting to implement this way. simple to run and maintain. Low maintenance intervals were required. Cost is an accurate value.

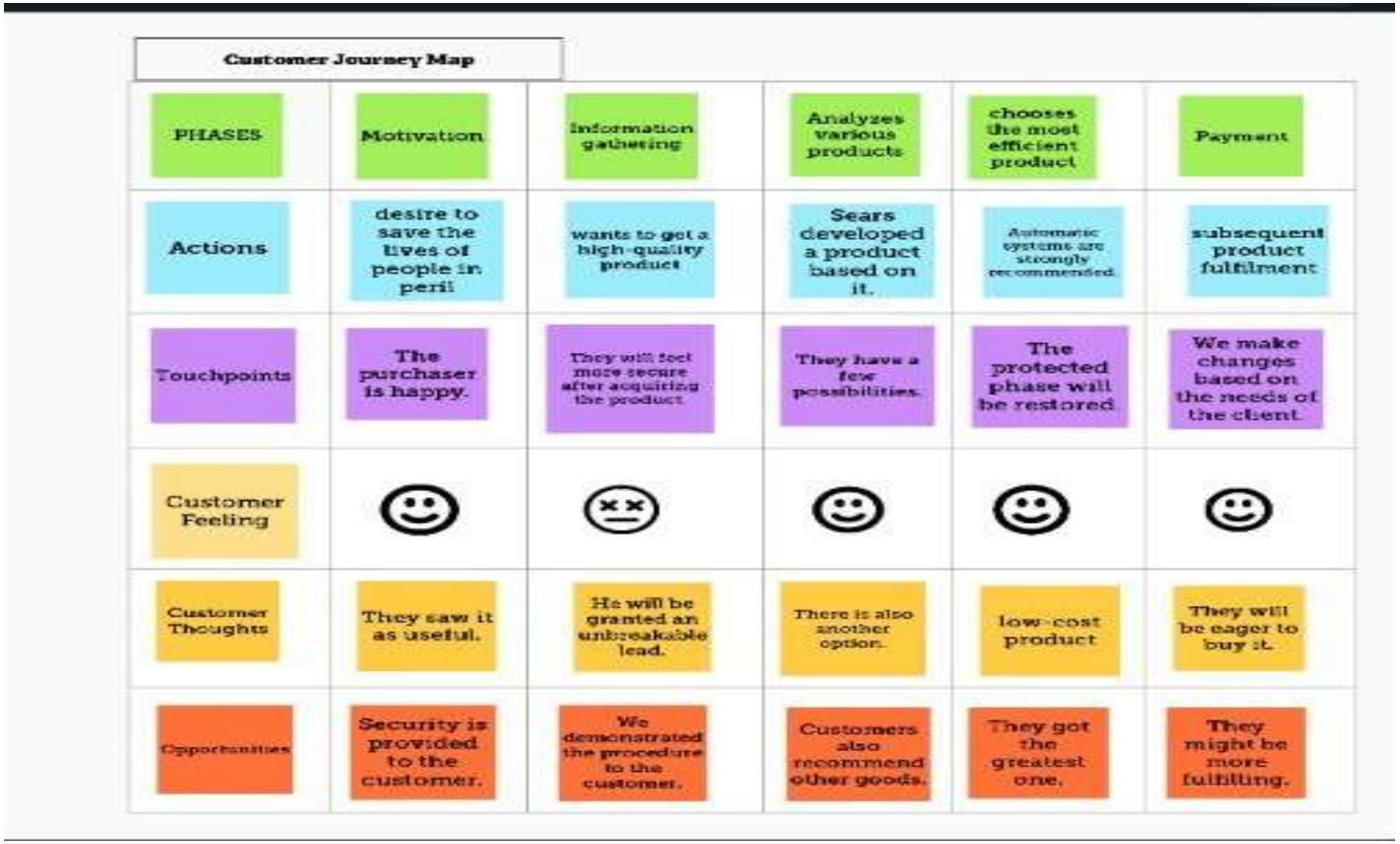
ARCHITECTURE



PHASE DESIGN 2

- CUSTOMER JOURNEY MAP
- TECHNOLOGY ARCHITECHTURE
- FUNCTIONAL REQUIREMENT
- DATA FLOW DIAGRAM

CUSTOMER JOURNEY MAP

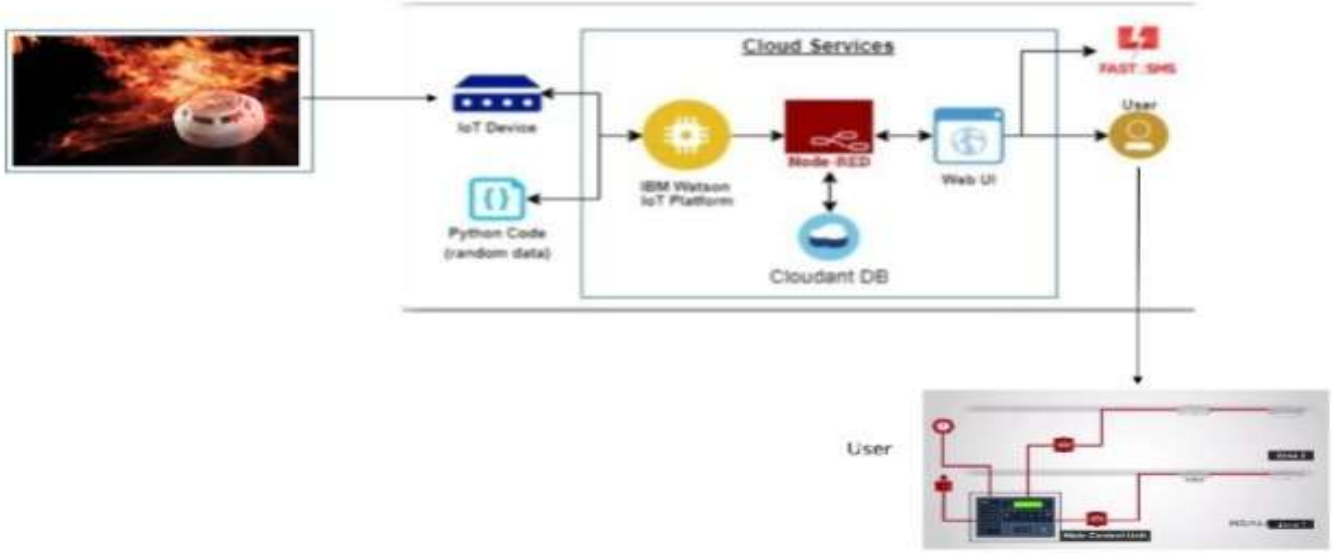


TECHNOLOGY ARCHITECTURE

Architecture and data fow of the IOT Based industry-specific intelligent fire management system images.

Solution Architecture Diagram:

Field:



FUNCTIONAL REQUIREMENTS

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Requirements	Smart linked sign boards that meet all requirements will replace static signboards.
FR-2	User Registration	Manual Sign-Up using a Website or Gmail
FR-3	User Confirmation	Conformation through phone Conformation Through email And OTP authentication
FR-4	Payments options	Bank Transfer
FR-5	Product Delivery and installation	The Place will affect the installation cost.
FR-6	Product Feedback	Through a website via Gmail

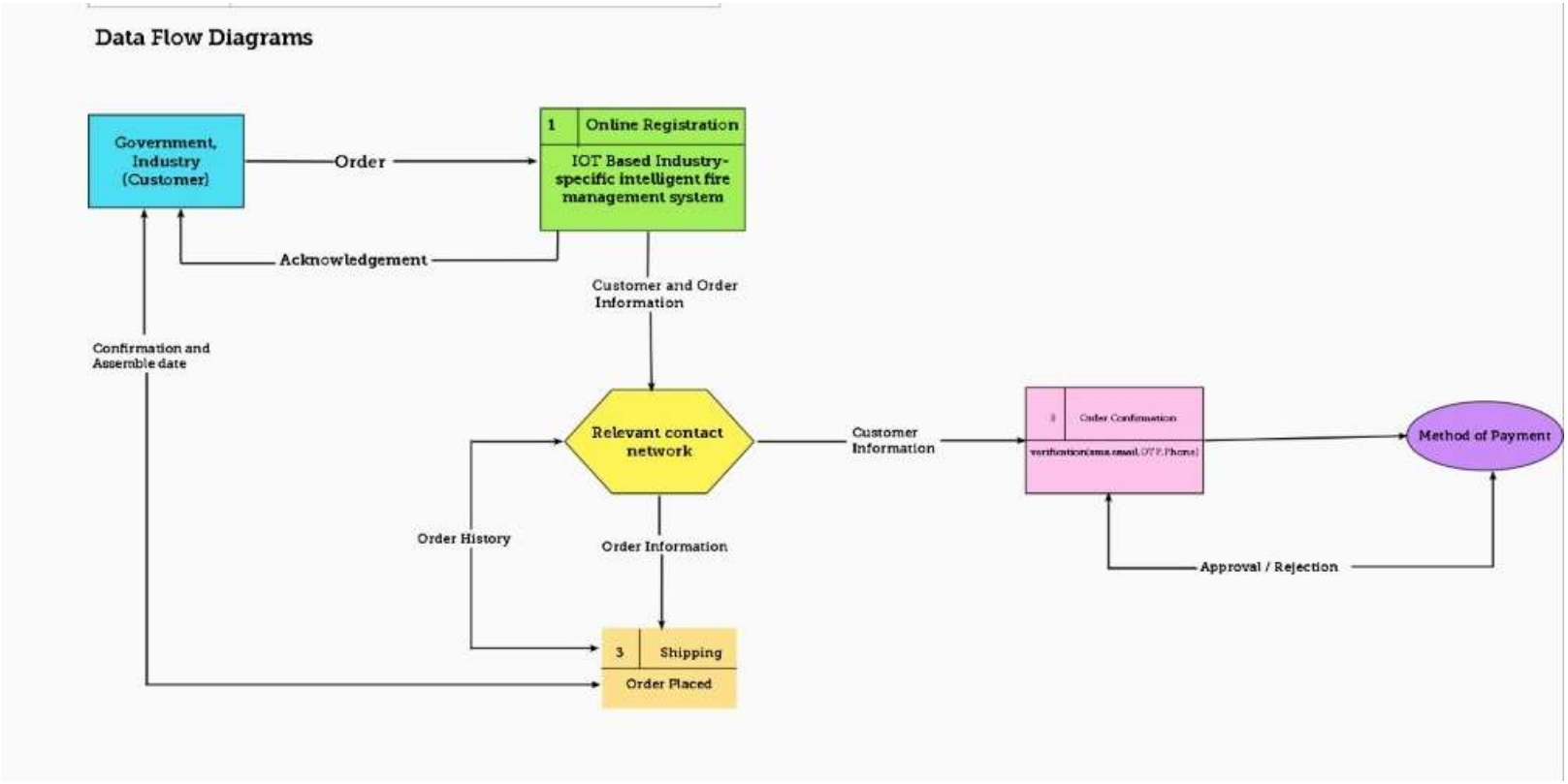
NON–FUNCTIONAL REQUIREMENTS

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Have simple product instructions and a product that speaks for itself.
NFR-2	**Security**	The network must contain cloud data that has been condensed. Keep an eye on the board at all times and avoid real-time avoidance.
NFR-3	**Reliability**	Hardware components are tested on a regular basis.
NFR-4	**Performance**	The user experience on the smart board must be enhanced, and the output must be accurate.
NFR-5	**Availability**	All necessary functionality will be provided based on the user's requirements.
NFR-6	**Scalability**	The product should cover the full Placed system and is based on Fire alarm signals.

DATA FLOW MAP



PROJECT PLANING PHASE

TITLE	DESCRIPTION	DATE
Literature Survey& Information Gathering	A literature review is a comprehensive summary of previous researches on the topic.	3 September 2022 3
Prepare Empathy Map	An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. It helps us to understand the customer's pain, gain and difficulties from their point of view.	10 September 2022

TITLE	DESCRIPTION	DATE
IdeationBrainstorming	Brainstorming is a group problem-solving method that helped us to gather and organize various ideas and thoughts from team members.	17 September 2022
Define Problem statement	The Customer Problem Statement helps us to focus on what matters to create experiences people will love. A well-articulated customer problem statement allowed us to find the ideal solution for the challenges customers face.	19 September 2022

Problem Solution Fit	It helped us understand and analyze all the thoughts of our customer, their choice of options, problems, root cause, behavior	26 September 2022
Proposed solution	It helped us analyze and examine our solution more in the ground uniqueness, social impact, business model, scalability	28 September 2022
Solution Architecture	Solution architecture is a complex process with many sub-processes and technology	1 October 2022

Customer journey map	It helped to analyse the various steps, interactions, goals and motivation, positives, negatives	7 October 2022
Solution requirements	It briefs about functional and non-functional requirements. It involves the various steps in the entire process.	12 October 2022
Technology stack	A tech stack is the combination of technologies a company uses to build and run an application or project. It helps us analyse and understand various technologies	15 October 2022

Data Flow	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 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.	11 October 2022
Prepare milestone and activity list	Helps us understand and evaluate our progress and accuracy so far	23 October 2022
Project Development – Delivery of Sprint-1	Develop and submit the developed code by testing it	In progress

Sprint Delivery plan	Sprint Planning is an event in scrum that defines what can be delivered in the upcoming sprint and how that work will be achieved. It helps us to organise and complete the work effectively and efficiently.	22 October 2022

SPRINT DELIVERY PLAN

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	Anjuka P
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Anjuka P
Sprint-1		USN-3	As a user, I can register for the application through Facebook	2	Low	Anjuka P
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Dhanya R
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Dhanya R
Sprint-1	Dashboard	USN-6	As a user, I can log into the application by entering email & password and access all the resources and services available	2	High	Dhanya R

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Login	USN-1	As a weather data controller, I log into my profile and start monitoring the weatherupdates	3	High	Anjuka P

Sprint-2	Dashboard	USN-2	I receive all the information about weather from web from weather API. Whenever there is change in weather, corresponding updates are made on fire sign boards.	2	Medium	Dhanya R
Sprint-3	Login	USN-1	As a image controller, I keep note of all the images received from various areas and detect fire in that particular area.	3	High	Akshaya R S
Sprint-3	Dashboard	USN-2	With the fire, updates I change the status of fire alarm.	2	Medium	Akshaya R S

Sprint-4	Login	USN-1	As a zonal officer, I ensure that alarms near school and hospitals.	3	High	Atchaya E
Sprint-4	Login	USN-1	As an administrator, I ensure that all departments work co-ordinated and ensure the accuracy and efficiency.	2	Medium	Atchaya E

PROJECT TRACKER ,VELOCITY AND BURNDOWN CHART

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		
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		

VELOCITY

- Sprint-1 and Sprint-2
- AV = Sprint Duration / Velocity= 15/7=2.14
- Sprint-3 and Sprint-4
- AV=Sprint Duration / Velocity = 10/6 = 1.6

APPLICATION

- Fire protection systems
- Detection
- Alarming and evacuation
- Extinguishing
- Danger management
- Applications
- Cerberus Cloud Apps
- Fire safety digital services

CONCLUSION

- In conclusion, fire in workplaces should be avoided at all times because besides the damage of property and loss of lives, there are people whose career might be ruined by such incidences

THANK YOU