SaMaRTH

(Safety Management & Resource Tracking Helmet)

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Problem Identification

Introduction

India being a developing country has its economy based on various industries and other sectors of society which require a huge amount of manpower. At the site level workers, engineers, managers are the main workforce. Ensuring safety and proper management of workers in such vulnerable sites is very important.

Stakeholders

Helmets are used at construction sites, warehouses, factories, mining sites etc. Its main stakeholders are:

Workers

- Workers are ignorant regarding their safety and often forget to wear their helmets.
- Workers are not able to get timely first aid treatment, due to late response, or not taking the injury seriously.

Management

- The management is not able to properly implement the wearing of helmets as workers take them out.
- The management becomes liable for any accidents that happen at the workplace. It is a difficult task to actively monitor the status of workers.
- Management face problem in taking attendance of workers and ensuring that they are present in their desired workplace.
- Management is unable to provide timely treatment to injured workers, which may lead to hidden injuries, permanent ailments, or even loss of life

Scale

An estimate of 11,614 accidents occur in the construction sector annually, in which an average of 500 lives are lost.

In an analysis of Dadra and Nagar Haveli, some points were mentioned. Injury prevalence is 2.63 - 2.74 per 1000 and the death rate is 0.21 per 1000. Head injury accounts for 7 % of the total accidents.

It is also shown in the report (refer references), how incomplete data the police have which is suspected to be 30% reporting of the total deaths.

Workers have a lack of safe working conditions causing many health issues. The construction area is usually far away from proper facilities which means for proper treatment, it will take a long time to travel. Timely stabilizing injuries may prevent permanent losses.

Market Analysis
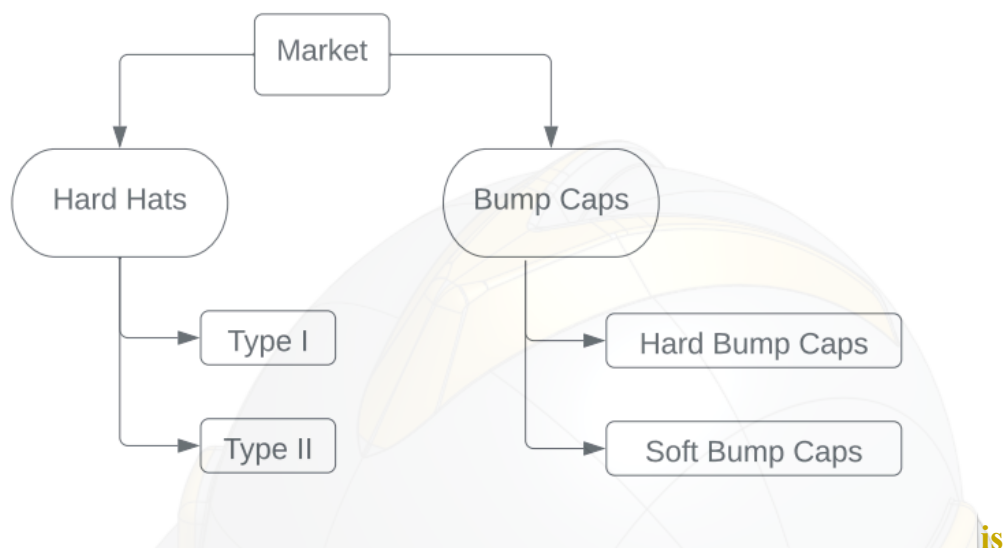
The leading players in the market are MSA Safety, 3M, Honeywell, Delta Plus Group, Karam and many others.

The construction industry employs around 6 Crore workers and is expected to grow with a compound annual growth rate of 7.8%. Apart from the construction sector, the coal industry employs 4.85 lakh workers. The oil and gas industry has 1.07 lakh workers. The manufacturing industry of steel has 25 lakh workers. **The overall target market is 6.3 crores workers.** These show us that the working labor population is huge and their safety is a matter of concern.

Existing Solutions

Parameter	Protection	Surveillance	Health Monitoring	Cost
Foreign Prototype MachTek	★★★★★	★★★★	★★★★★	★★
Existing Helmet	★★★★	NA	NA	★★★★★
CCTV Cameras	NA	★★★★	NA	★★★
Biometric Scanner	NA	★★	NA	★★★
SaMaRTH	★★★★★	★★★★	★★★★	★★★★

Proposed Solution

After being aware of the actual problems, we propose our product SaMaRTH. Our product has unique selling propositions as there is not a single existing product in the market ensuring safety of workers, worker surveillance and health monitoring of workers. So our product will be helpful for both the workers and management sector of a working site.

Features
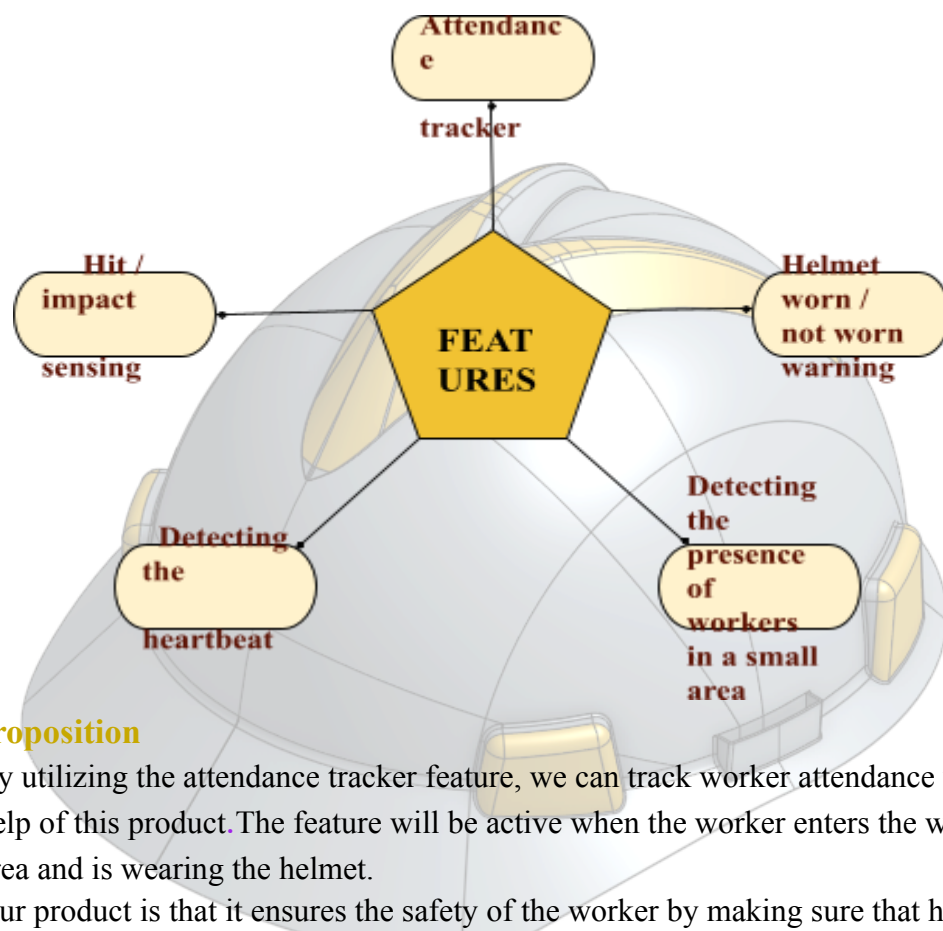
Value proposition

- By utilizing the attendance tracker feature, we can track worker attendance with the help of this product.The feature will be active when the worker enters the working area and is wearing the helmet.
- Our product is that it ensures the safety of the worker by making sure that he never does his job without wearing a helmet which will alert the manager when the helmet was worn or not.
- Tracking or detecting the presence of workers within a small area is possible with our product. Therefore, a manager of the allotted checkpoint area can check the presence of a worker on a screen and see the signals as pointers.
- This product can also detect the worker's pulse rate. So, if the worker's pulse rate is abnormal, this will alert the manager.
- Using this product, we can detect if a worker faces an accident on the job and there is a head-on collision on the helmet. The helmet will quickly send an alert to the manager about this emergency situation if the impact is significantly high during an accident.

Components

Push switch

Simple push switch is placed directly above the head of the worker, so that the switch is pressed due to the normal force from head, activating the whole circuitry of the helmet and other functions.

Pulse rate sensor

We have integrated pulse rate sensors in the product to ensure that the worker is wearing the helmet throughout the work hours. Upon detection of no pulse, concerned authorities will be informed of the helmet not worn by the worker.

Accelerometer(MPU6050)

It is a low-power, 3-axis MEMS accelerometer module that helps to detect the force on the helmet. A threshold acceleration will be determined experimentally. If acceleration exceeds the threshold, a warning will be raised.

Microcontroller (AT89C2051)

It is a low-voltage, high-performance [7]CMOS 8-bit microcomputer with 2K bytes read only memory (PEROM). It is used to govern specific functions.

Bluetooth Module (NRF24L01)

One chip [8]will be installed in the safety helmet serving as the link for communication between the safety helmet and the Checkpoints. Further data from checkpoints will be sent to the Cloud .

Battery

3.7V and 290mAh Li-ion battery to power the system. The power of the battery selected will last for about a week and is rechargeable.
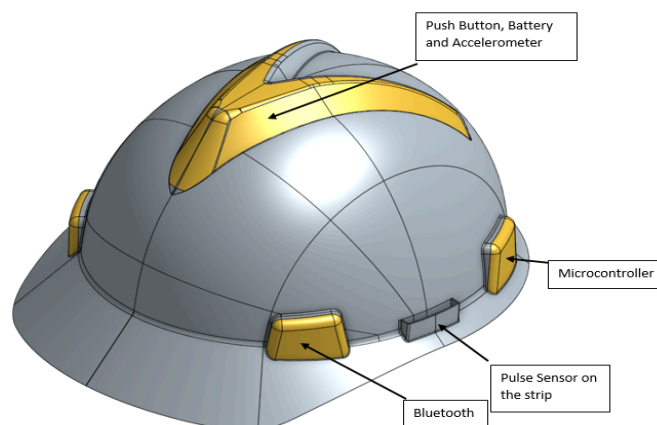
CAD Design of the prototype with marking and placement of various components.

Workers Journey

Arrives at workplace → Helmet worn → Detects workers pulse rate → Accelerometer regularly checks for hit impact on worker

Arrives at workplace → Helmet not worn

Helmet not worn → Attendance ✗

Warning sent to worker → Helmet worn

Detects workers pulse rate → Attendance ✓

Accelerometer regularly checks for hit impact on worker → Above threshold Hit impact

Above threshold Hit impact → Warns manager for treatment requirement

Manager Journey

Manager or Supervisor at work → Taking the attendance of workers → Ensure that they have worn safety helmets During working hours → Monitoring The work of every workers → They ensure the safety and health well being of large numbers of workers on site

Ensure that they have worn safety helmets During working hours — if the workers do not wear helmets → Warns the workers if exceeded a set time

Monitoring The work of every workers — if a workers' absence exceeds certain time → Alert the workers

They ensure the safety and health well being of large numbers of workers on site — If there is hit or impact on helmet → Get informed about the workers' health .If a serious health issue Provide relaxation from work

Annexure

Financial Analysis

Cost Estimation

S.no.	Product	Quantity	Price
1	MPU6050 Sensor	1	40
2	Pulse Rate Sensor	1	110
3	Typical Helmet	1	50
4	Li-ion battery	1	40
5	AT89C2051 Microcontroller	1	70
6	Push Switch	1	0.2
7	Manufacturing cost	-	30
8	Customer acquisition cost	-	2
		Total Cost Price	342

Selling Price:
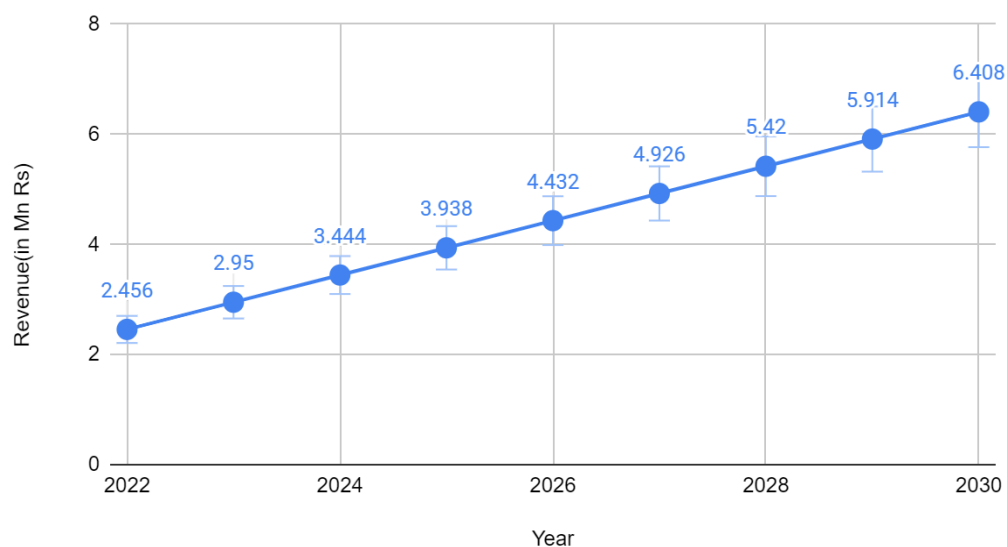
Gross margin is set to 55%, the selling price of the product is given by:

$Gross\ Profit\ Margin\ =\ (Selling\ price - Cost\ Price)\ /\ Selling\ price\ x\ 100$
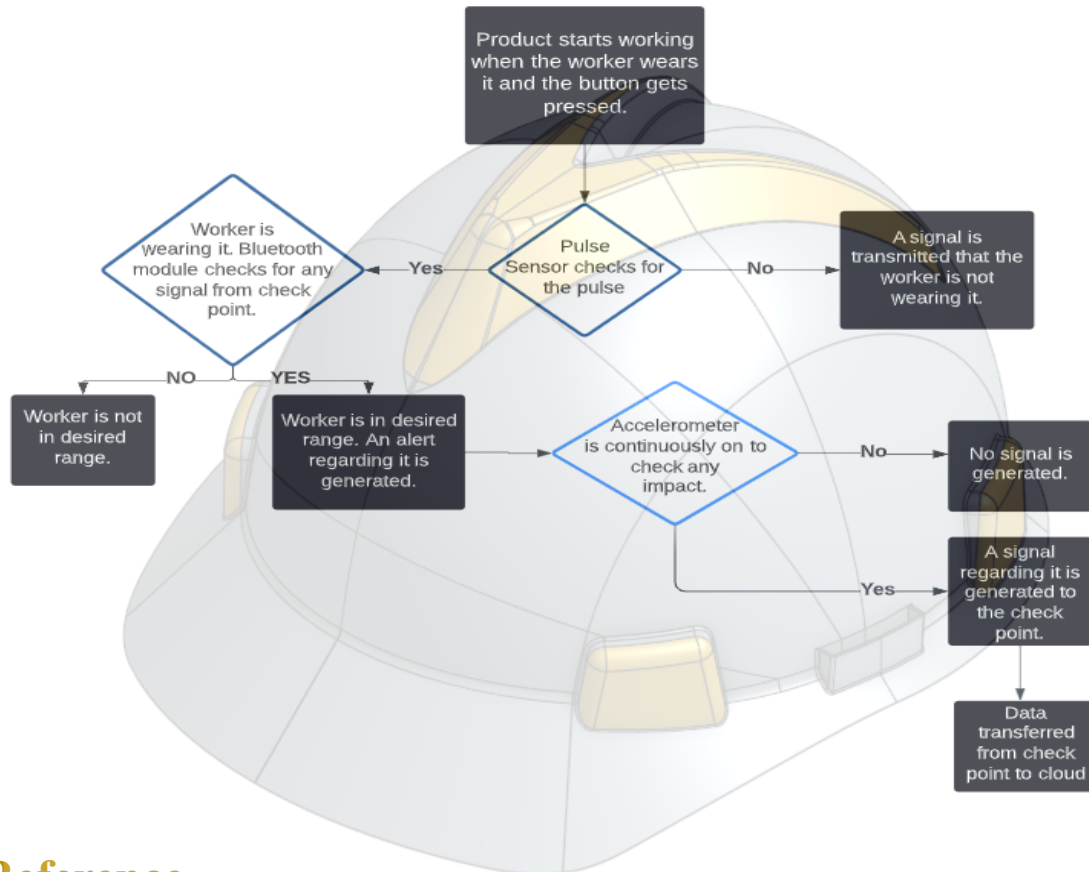
Therefore, the selling price of the product is Rs.735.

Revenue Projection

Revenue(in Mn Rs) vs. Year

Workflow

Reference

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