

ECOTAGS

Self-triggered Eco battery tags for instant and ubiquitous event detection

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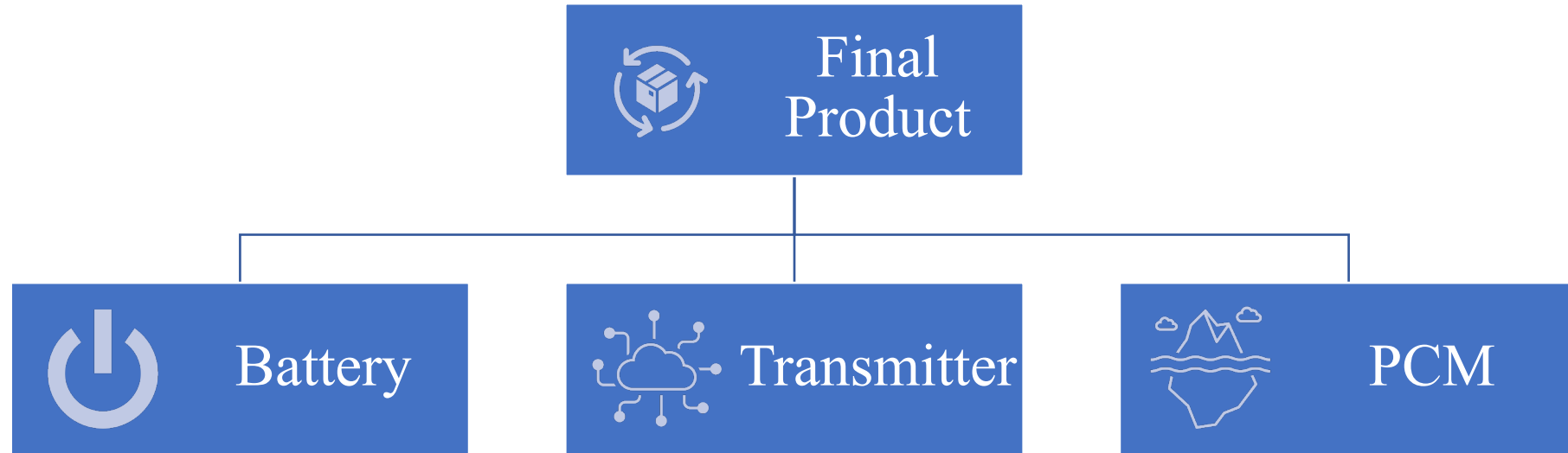
Back-up



ECOTAGS - Briefing

“ECOTAGS project aims to develop a new paradigm of assessing alarm monitoring in wireless nodes with a zero-energy consumption strategy. The main idea is to utilise phase change materials (PCM) to harvest the variation of energy involved in a particular environmental change to be recorded.”

- attract-eu.com



Actual application of the technology is in its final form, already being sold in the market.

TRL 9.

It as been successfully been tested in a laboratory.

TRL 6.

Still in its early stages and components have undergone successful trials.

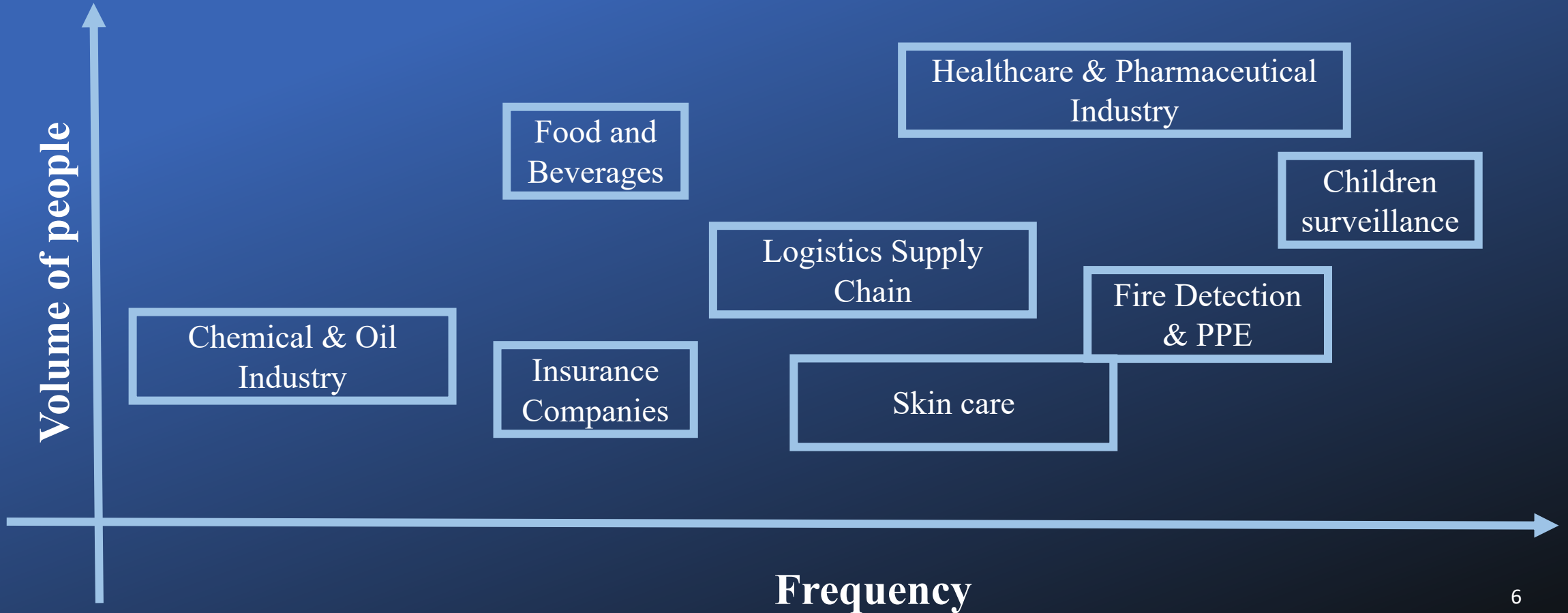
TRL 1 – 6 (depending on the temp. range).



Demo



Possible Applications





Market Research



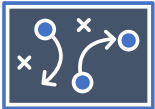
Market Research



What are the existing ways of solving the problem?



What is the value for our end customer?



What are the technical requirements of the product?



What are the legal constraints?

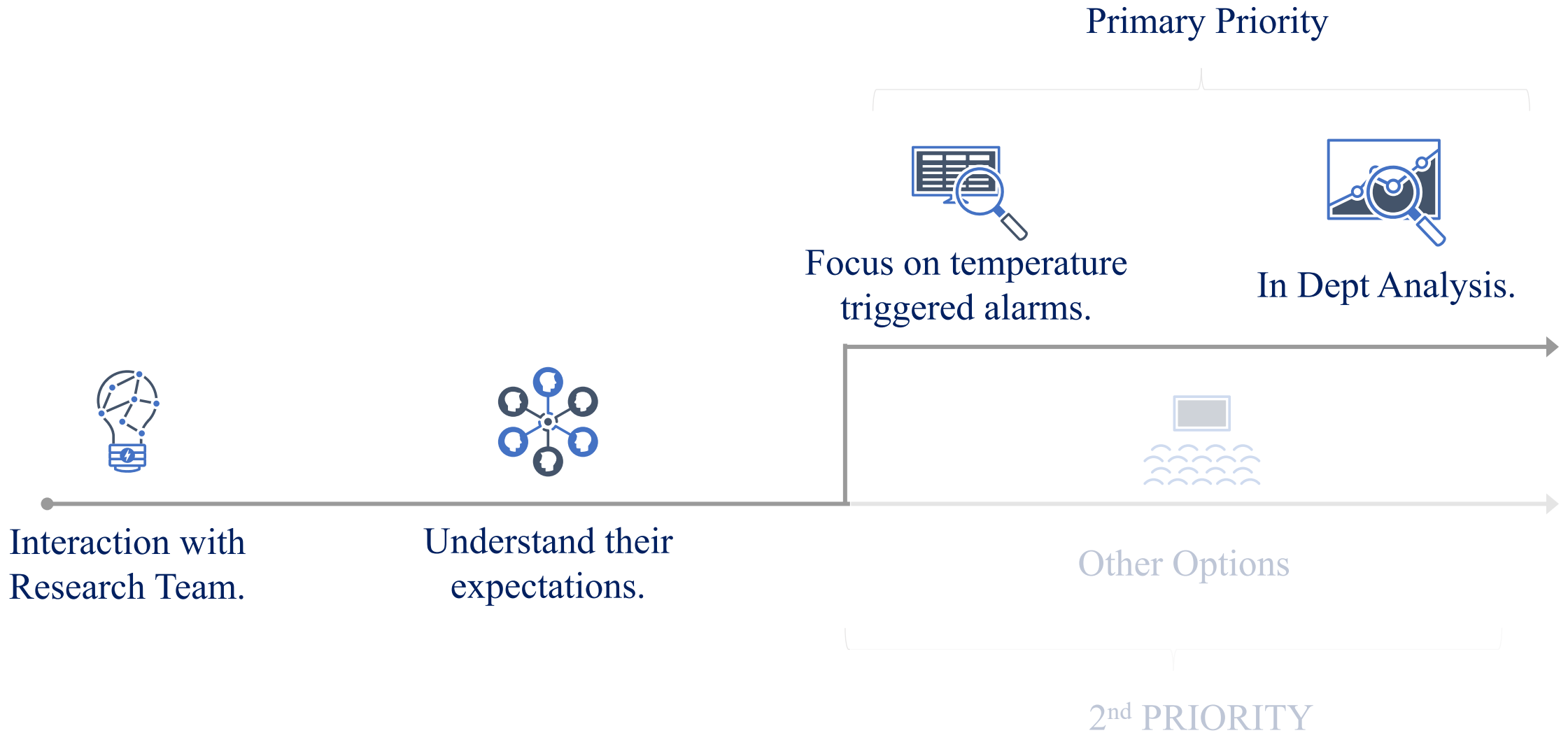
How to validate

- Online market research.
- Contact people in the industry.
- Interact with experts.





Aligning Interests

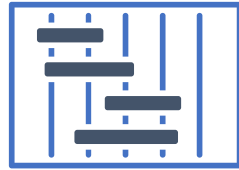




Market Findings : Temp-triggered alarms



Companies are really interested in cost effective solutions.



Most industries require constant monitoring of temperature.



Smoke detectors are faster than temperature detectors.



Institutional barriers (various regulations that need to be complied with.)

Conclusion:

Given the Institutional barriers and technical requirements of the industry, we will have to modify our product and meet the technical requirements of our customers.



11 Interviews Conducted



CO - Founder



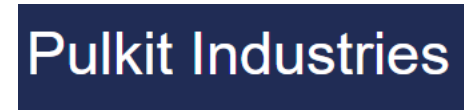
CEO



Brand Manager



Head Coordinator - LAB



Engineer

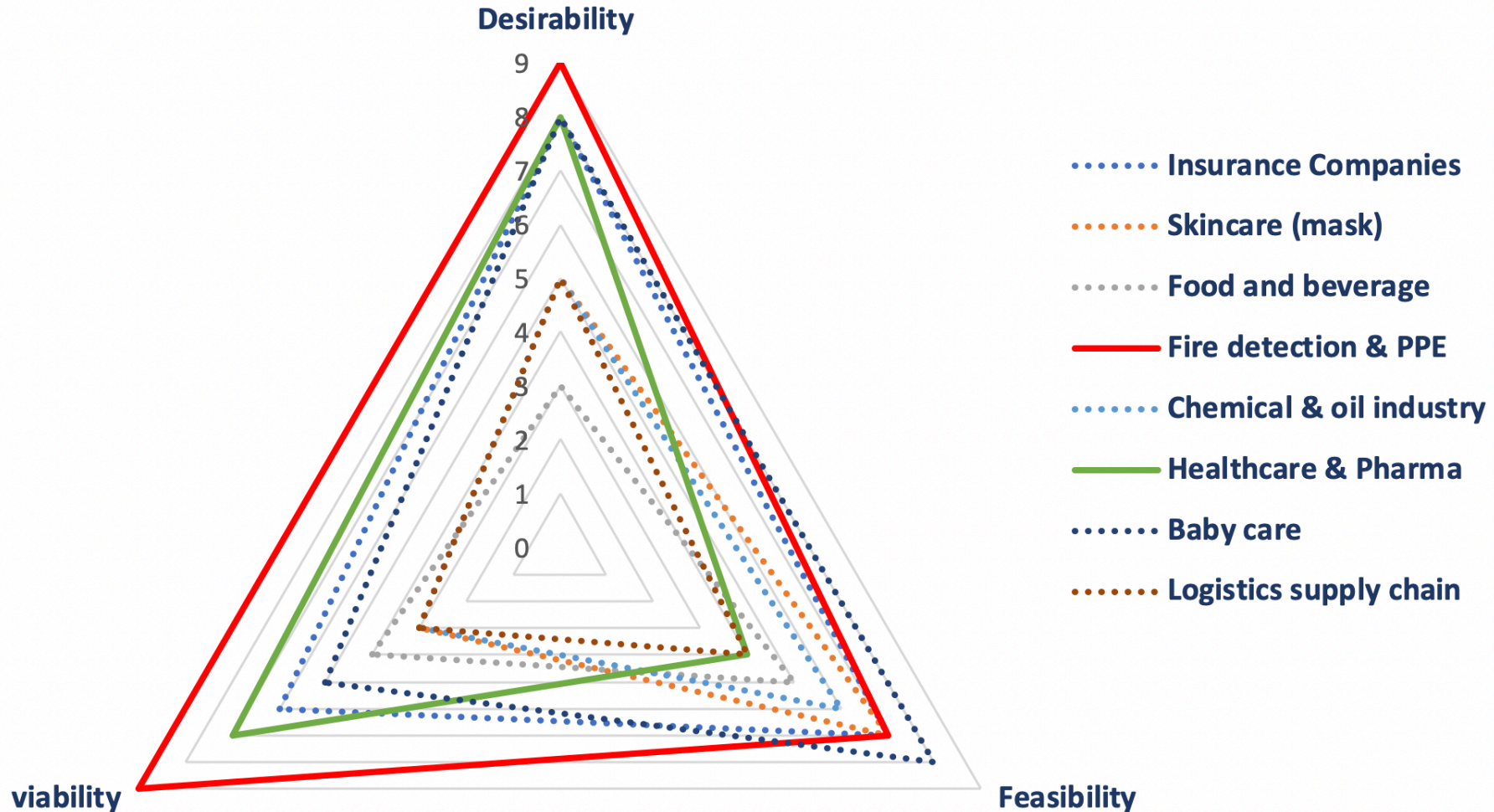


Geologist

Servei Català de la Salut



Desirability Feasibility Viability Analysis





Forest Fire Detection & PPE



8.5 Million ha – burnt area in the EU 2000-2017



17,791 firefighters and civilians have lost their life.



€54 Million worth of economic losses.



This is expected to increase due to climate change.

Countries impacted the most: Portugal, Spain, France, Italy and Greece.



Existing Solutions:



Forest Fires - Detection

- Air Patrols.
- Infrared Technology.
- Human watchtowers.
- Optical Smoke Detection.



PPE

- Highly specialized suits with constant monitoring.
- At the discretion of the person in suit.



Possible Use Cases:



Forest Fires - Detection

To be able to detect forest fires at an early stage would be a great advantage and combined with a wireless transmitter, it is a viable solution.



PPE

In Personal Protective Equipment, the sensor could detect sudden changes in the temperature and trigger an alarm.



Interview Summary: PPE



Value generation

- Very interested in smart protective suits that monitor temperature of the suit.
- Integration with existing suits would be highly cost effective instead of purchasing new specialised suits.



Their Concerns

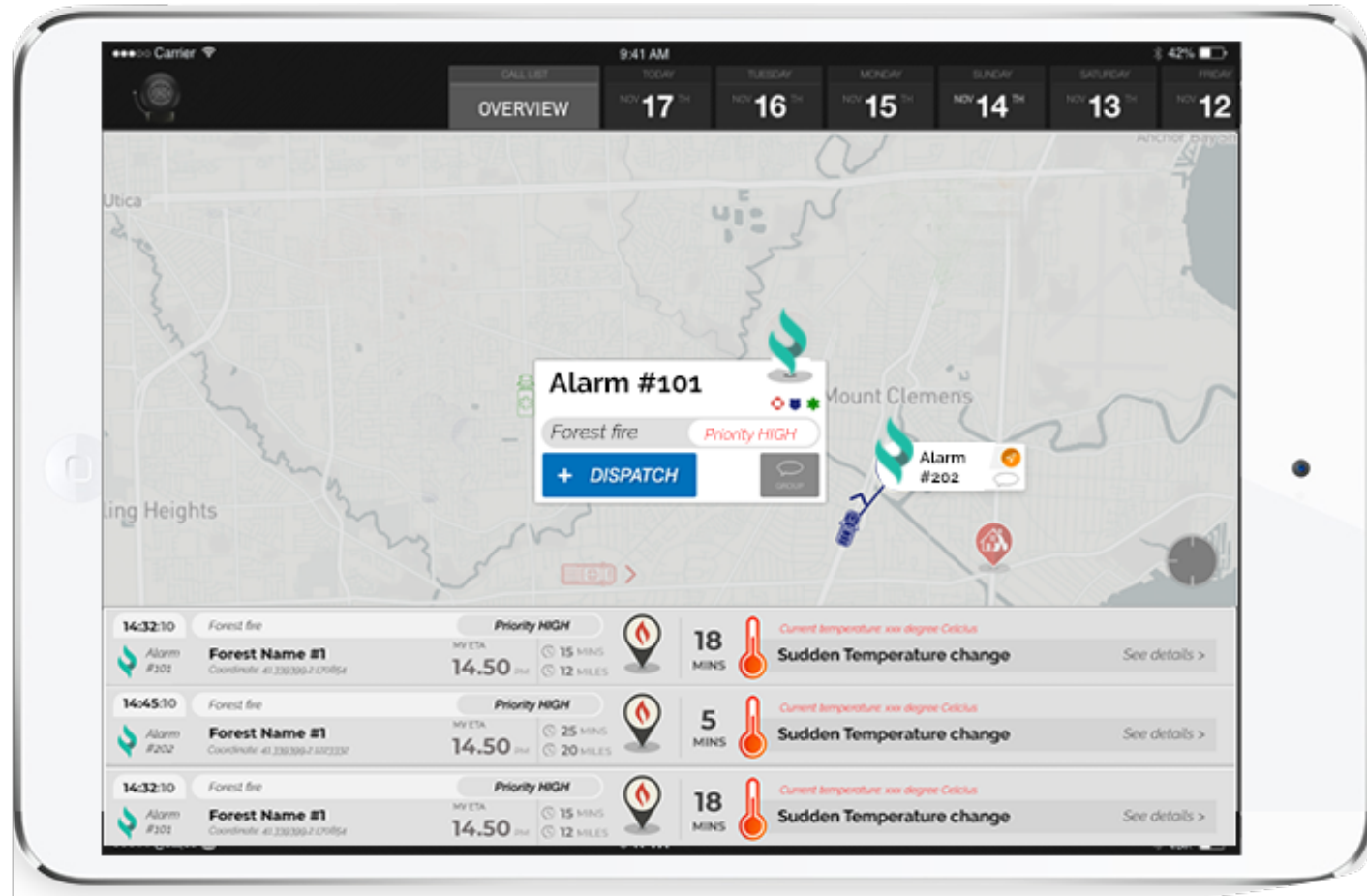
- Operating temperature range is 40-45 degree Celsius.
- Range of transmitter.



Prototype Proposal



Prototype: Forest fire detection





Alarm Log Details Explanation



A Ecotags alarms specification

B Time stamp when the alarm is triggered

C Type/ info of the fire

D Location of the fire with coordinate

E Drive time/ distance relating to GPS of current device.
 My ETA - The actual time on the scene
 🕒 - total minutes to the scene
 📏 - total miles to the scene

F Level of Priority

G GPS Location of the current scene
 Click for navigation

H The minutes into the alarm was triggered

I Brief info of the situation/ why the alarm was triggered

J Current temperature of the scene

K Details of the temperature change click to see more

L See details >

14:32:10	Forest fire	Priority HIGH	MY ETA 14.50 PM 🕒 15 MINS 📏 12 MILES	📍	18 MINS	🌡️	Current temperature: xxx degree Celcius	Sudden Temperature change	See details >
14:45:10	Forest fire	Priority HIGH	MY ETA 14.50 PM 🕒 25 MINS 📏 20 MILES	📍	5 MINS	🌡️	Current temperature: xxx degree Celcius	Sudden Temperature change	See details >





Conclusion & Recommendation



Conclusion

- Companies are very interested in an economic, environmental friendly solutions.
- With the existing development, PPE & Forest fire detection are the most viable use cases.
- In most industries, the product can be easily integrated with existing equipment.
- We need to watch out for the legal constraints as they vary from places and industries.
- No. of possible application is dependent on the temperature range offered by the product.



Recommendations



Validate Prototype Testing



Pricing Modalities



Thank you!

Q&A



Back-up



Sector summary: alarm system manufacturers



UTC Fire & Security

A United Technologies Company



detnov



Value generation

- Could be useful for domestic use, since continuous monitoring is not required.
- An economic solution that meets the regulatory conditions would be desirable in the industry.
- Different applications for ECOTAGS vs the standard heat detectors in the market.



Their Concerns

- Industrial regulations require constant temperature monitoring.
- Smoke detectors are faster than temperature-based detectors.
- Regulatory compliance varies from country to country for our proposed product.

Sector summary: food and beverages



Value generation

- Due to periodic maintenance of existing continuously monitoring sensors, a single use alarm would be more economical.
- Desirable for premium products very sensitive to change in temperature.



Their Concerns

- Integration of the proposed product with the machines would not be possible due to preexisting temperature control mechanism.
- The alarm should signal at 210-230 degrees Celsius, would the proposed product be able to withstand these temperature ranges!



Interview Summary: food industry (cold chain)

Pulkit Industries



Value generation

- Desirable in flexi containers, which are used for transporting food from cold storage units to shelves.
- Currently they are using ice boxes to transfer food, which need to be refrigerated after use.



Their Concerns

- Would the proposed product be able to function in cold storage areas where they alarm should go off at 4 degrees Celsius but would be exposed to temperatures as low as -5 degrees Celsius.
- Would getting exposed to water affect the performance of the proposed product?



Sector summary: chemical and oil industry



Value generation

- Wireless alarms would be preferred than the current solutions.
- For heat monitoring, it is a viable product.



Their Concerns

- Industrial regulations require constant temperature monitoring and highly sensitive alarms are preferred.
- Regulatory compliance for manufacturing and monitoring to be met.



Sector summary: medical and pharmaceutical industry



Value generation

- Could be very useful in transporting specimens from.
- Given current Covid-19 situation, it will be in high demand.



Their Concerns

- They need a wide temperature range from 15-60 degree Celsius with alarm signaling at 40 degrees Celsius and 60 degrees Celsius.
- The alarm should signal at 210-230 degrees Celsius; would the proposed product be able to withstand these temperature ranges?



Industries: alarm manufacturers

Miguel Ribalda - Hardware Engineer, UTC Fire & Security (Carrier)

- Lasers to detect fire before smoke comes out.
- In industry they need a continuous monitoring, low time response and large amount of detectors. They use cables to transmit the information.
- Smoke detectors are better than heat detectors.
- Could work in homes, where the regulation is not that strict. Patches to control boilers could be a feasible solution.
- If it's a single use, false alarms are more critic.



Industries: alarm manufacturers

Rafael Guisado - Engineer & Co-Founder at DETNOV SECURITY

- Thermal alarms are slower than other alternatives.
- For industrial applications, continuous monitoring, connected to the current and have to be tested yearly.
- For domestic use, the current products need to save battery so the monitoring is not continuous. They notify as an sound alarm and do not send any information to any central.
- Wireless alarms are only used in Museums or places where it's not easy to install new things.
- All the alarms compute slope of temperature/time.



Industries: Food

Sources: Valencia Gabriella (Brand manager in Unilever)

Disadvantages:

- The alarm you produce may not be applicable for food and beverage industry as the machine and system used in our factory already incorporate temperature control. And it needs continuous monitoring.
- The price of the products are quite cheap; hence it may not make sense if the consumers need to pay higher just to accommodate the temperature control. (in terms of packaging or shelves in the market)

Advantages:

This sensor may work for premium product and for product that are very sensitive to temperature change.

Sources: Issabela Shinta (AAK Netherlands)

Currently is using the temperature sensor alarm in deodorization step, temperature sensor is to be put inside the tanks (without touching the product) which will stop the production process when the temperature falls outside the temperature range (between 210-230 celcius degree).

The companies have a regular periodic maintainance of the sensor alarm (per 3 months) and it is rarely happened when the temperature goes outside the range, so in theory having a single use alarm could be more economically beneficial than the current continuous monitoring ones, but it does require more efforts to change to a new one if its activated.



Industries: Pharmaceutical/Medical

Tri Wahyuningsih - Head Coordinator of Laboratory in RSCM Hospital

Possible Applications:

The sensor can be used to transfer the laboratories' specimen from one place to another place. They need to control the temperature as it may damage the specimen. If the temperature changes, it can deteriorate the sample hence the sample will not have an accurate result.

Advantages:

- As currently we have this COVID19 situation, this sensor may be applicable to be attached to this specimen.
- People may be willing to pay an expensive price for this. (especially for the embryo sample)
- This could also be applied to transfer embryo sample, since it is required a specific temperature range and the product could help monitor the embryos sample to be delivered in the perfect condition for the test.

Michel van der Bruijn - HAL Allergy

Chemical modification temperature:

the process temperature is controlled using a temperature probe, so the probe touches the product (in a form of a liquid) and showed on a small screen what the temperature of the product is. One process step needs to be $60\pm 1^{\circ}\text{C}$ and other is at $40\pm 1^{\circ}\text{C}$. the rest of the process is at a controlled ambient temperature ($15\text{-}20^{\circ}\text{C}$)

Disadvantages: it need continuous monitoring; it can be single use but there will be a lot of waste.

Industries: Chemical/Oil



Francisco Javier Membrives, Chief of Instrumentation and Electricity Maintenance – DOW/REPSOL (TRANSFORMADORA DE ETILENO), Tarragona

Regulations: Alarm systems installing companies vs. Alarm manufacturing companies.

Industries: predominance of continuous monitoring alarm systems.

There is mainly a use of wired-based installations.

Regulations on communications for industrial alarm installation.

Possible fit: heat monitoring device.

Main issue in industrial environments: Faraday cages enveloping structures.





Industries: Chemical/Oil

Ignatius Primadi - Well Test Engineer Star Energy Geothermal Ltd and Wellsite Geologist in TOTAL

Currently using sensor alarms for personal multi gas detector that measures ambient concentration of O₂, CO, H₂S, and other combustible gas contents (CH₄, NO, etc).

Gas Monitoring process:

In an electrochemical sensor the cells combine enclosed electrodes and electrolyte. H₂S or other gases diffuse through a permeable membrane, the volume of gas increases in the air, an oxidation or reduction reaction occurs at one of the electrodes, and as a result, a linear current change occurs. This enables a display or an amplifier device to generate an indication of the gas level. These detectors also have high sensitivity and repeatability, which has established this as the toxic detection technology of choice in a wide variety of applications.

Operating temperature is between 40-60 degree celcius.

Disadvantages:

The sensor is to detect H₂S in geothermal environment. The personal detector uses the rechargeable battery that usually lasts up to 24-hour run time. So single use battery would not be applicable for this process.



Industries: Personal Protective Equipment



Director of Research, U.PROTEC

Summary:

The company has high interest on smart suit and physical temperature monitoring of firefighters and other workers and they also want to apply paper battery as battery for other function and device.

Her main concern:

- **temperature range** (40-45): it needs to be lower than fire alarm one.
- **transmitter**(distance and visible signal): the transmitter needs to send signal to mobile device in controlling centre and team leader.
- **safety** (exploding risk): if it works well under high temperature.
- **voltage as battery** : capacity to serve as battery for other devices such as fans and location sensors.
- **portability** (size, foldable, etc): it should be easily carried by users under protection suit.



Industries: Pharmaceutical/ Medical Industry

S. G. - Resident Doctor of Hospital de Barcelona

For COVID-19 (VIRUS) medical samples they applied biological material to the different types of test: quick tests, PCR and Serology. Expecting a positive or negative result.

Pregnancy test to detects if there is enough amount of BHCG (HORMONE) in the urine.

One of the most used medical sample is the detection of streptococcus pyogenes antigen (BACTERIA), as it's important to detect the bacteria in a couple of minutes to start applying antibiotics.

Other example is rapid HIV (VIRUS) test, applied specially for pregnant woman, it is interesting to know very quickly (before delivery occurs) if the mother is infected.

Those test detect a specific particle of the virus, bacteria or hormone in each case with a chemical reaction.

Medical samples that need energy as the strips for control anticoagulant in blood use regular batteries.

Usually this type of test need to be collected and analyzed in-house at the clinic itself.

In case sample need to be sent to a laboratory, tests are done IPSO FACTO after collecting the sample (many times by the same doctor), so they do not need special conservation measures, only if the sample has to be sent to a distant laboratory and we know in advance this type of biological material can be spoil, then we need to refrigerated those samples.

It is import to keep in mind the expiration of the reactive agents of each test, but as many are single-use do not require any special care.