PROJECT DESCRIPTION (Performance & Safety)

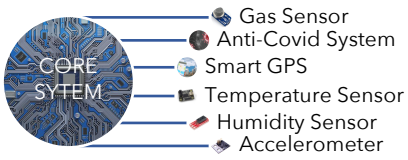
Considering that in recent years sensitivity towards safety in the workplace, wellbeing and Performances has grown exponentially among both big players and medium-sized companies, we believe that today the industrial market is booming.

The company's goal is to gain a strong positioning in the workplace safety and performances markets, developing a series of specific products based on new flexible technologies, highly scalable and economic, based on the innovative, powerful algorithms and Artificial Intelligence (AI) capable of fully satisfying the ever-growing market demand.

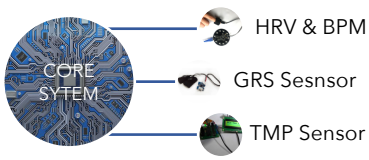
The social and human costs related to health problems and accidents in the workplace, from an economic point of view there is an overload caused by a lack of well-being at work for both the business and the economy. This is especially true when medical costs are added to the drop in productivity. The lack of well-being in the workforce is estimated to cost between 10 and 15% of the global GDP (Gross Domestic Product) on the global economy. The company pays insurance to cover these costs. The proposed technologies would allow a more in-depth and updated knowledge of the insured and therefore the possibility of reducing the insurance premium.

To answer to the needs coming from the market our company is developing three different devices, named: Smart Badge, Smart Bracelet, Smart Helmet, that provide an integrated system of information about the operators and people psychophysical state and environmental conditions able to increase the people safety and wellbeing.

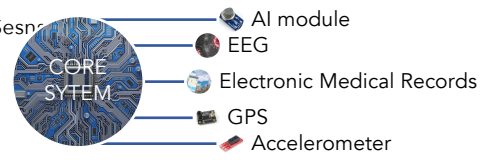
SmartBadge



SmartBracelet



SmartHelmet



These devices find applications in a multitude of both industrial and consumer markets and thanks to their operation they can be offered both as products for individuals and as services to small and large companies.

Thanks to its characteristics, the Smart Badge finds great application in the industrial market and specifically in the following sectors: Maritime, Engineering, Construction & Infrastructure and Telecommunications, Energy, Utilities & Resources. In addition, by integrating the smart bracelet with the smart badge, it increases its potential for use, because it allows you to simultaneously record a lot of information about the external environment.

In the maritime sector, it allows one of the most important problems to be resolved, that is, that of detecting and intervening in real time in the event of a man falling overboard, whether it is an operator engaged on a container port, an oil tanker which, of a passenger on a cruise ship.

The SmartBracelet borns with the aim of detecting some bio-signals (functional to monitor the operator's psychophysical state. This device is interconnected with the smart badge via Bluetooth connection which detects the following bio-signals:

- Skin temperature;
- Skin conductance;
- Heart rate variability (HRV & BPM);

Sensors are installed on or in people and in their environments, and they provide data from which their physiological state and behavior can be derived. Often, normal physiological states and behavior are distinguished from the unusual. In the unusual, we should at least distinguish between sudden anomalies (a heart attack) and gradual changes (e.g. slowly increasing stress levels). Furthermore, the possibility of monitoring the temperature of the operators, the system can also be used as an effective and powerful anti-COVID measure.

The SmartHelmet has as main objective to detect the operator's brain activity, this is because as some research has suggested, information regarding people's mental state such as, for example, alertness, sleepiness and stress can be measured accurately through recordings with EEG. Using an artificial intelligence algorithm, it could identify the risk level coming from health issues such as fatigue, sleepiness, high stress, etc. A haptic device, is integrated to the helmet in order to alert the operator when computed risk level (fatigue, high stress or error) reaches a threshold. Once the risk level of accident breaks the threshold, a signal will be sent wirelessly to stop the relevant machine tool or process.

DESCRIPTION OF NEEDS TO BE SATISFIED (Performance & Safety)

SCENARIO & PROBLEM

According to recent estimates released by the International Labour Organization (ILO), each year 2.78 million workers die from occupational accidents and work-related diseases (of which 2.4 million are disease-related) and an additional 374 million workers suffer from non-fatal occupational accidents. It is estimated that lost work days globally represent almost 4 per cent of the world's GDP, and in some countries, this rises to 6 per cent or more (Hämäläinen et al, 2017[1i]; Takala et al, 2014[2]).

Direct Costs.

Direct, or insured costs for accidents are usually considered those costs covered by workers compensation insurance and other minor medical costs for the accident. The company pays insurance to cover these costs. The average direct costs depend on the nature of the injury or illness, but usually range from $1,000 to $20,000. A good round figure to use when estimating all lost time workplace injuries is $10,000. Of course, the more accidents, the higher the insurance.

Indirect costs

Indirect costs are all the "uninsured" additional costs associated with an accident. What is important to realize is that indirect costs are usually much greater than direct costs: From 2-10 times as expensive. Another important point is that, unlike direct costs, indirect costs are uninsured...they come right out of the corporate pocketbook. These are the costs that can drive a company into the red.

Examples of indirect or uninsured costs:

Lost production time.
Productive time lost by an injured employee.
Productive time lost by employees and supervisors helping the accident victim.
Cleanup and startup of operations interrupted by an accident.
Time to hire or train a worker to replace the injured worker until they return to work.
Property damage. Time and cost for repair or replacement of damaged equipment, materials or other property.
Cost of continuing all or part of the employee's wages, plus compensation.
Reduced morale among your employees, and perhaps lower efficiency.
Cost of completing paperwork generated by the accident.
OSHA penalties.

The unknown costs of an accident

You will hear or read a lot about direct (insured) and indirect (uninsured) costs associated with workplace accidents. But, there are other costs that are difficult or impossible to measure that

may have a "fatal" impact on the success of the company. We're talking about the unknown or unknowable costs of workplace accidents: morale and reputation.
When a serious accident or fatality occurs in the workplace, a very basic, negative message may be sent to employees: "management does not care." The message may be subtle, but it may be there. In many instances employee morale suffers, and this usually negatively impacts the quantity and quality of the work they perform. Employee turnover usually increases after a serious accident, and always after a fatality.
Another factor that might affect the long-term success of the company is that of reputation. What do employees and the members of the local community think about a company that does not keep its workplace safe and healthful? What message about the company does the family of accident or fatality victim send to their relatives, friends, and neighbors? Will a company with a poor accident record maintain competitive advantage when hiring the best qualified people? The reputation of a company is a reflection of its public image and must be considered as an important factor influencing its success.

THE NEEDS

The need that arises from this scenario is therefore the availability of new technologies capable of improving the well-being of people and of preventing and reducing the risk of accidents, of shortening intervention times in the event of an accident and consequently reducing direct and indirect costs related to these events. As far as insurance agencies are concerned, these technologies would allow a more in-depth and updated knowledge of the insured and therefore the possibility of reducing the insurance premium.

1) Hämäläinen, P.; Takala, J.; Boon Kiat, T. 2017. *Global Estimates of Occupational Accidents and Work- related Illnesses 2017* (XXI World Congress on Safety and Health at Work, Singapore, Workplace Safety and Health Institute).

2) Takala, J.; Hämäläinen, P.; Saarela, K.; Yun, L.; Manickam, K.; Jin, T.; Heng, P.; Tjong, C.; Kheng, L.; Lim, S.; Lin, G. 2014. "Global Estimates of the Burden of Injury and Illness at Work in 2012" in Journal of Occupational and Environmental Hygiene, 11(5):326-337.

3) TOWARDS AN OPERATOR 4.0 TYPOLOGY: A HUMAN-CENTRIC PERSPECTIVE ON THE FOURTH INDUSTRIAL REVOLUTION TECHNOLOGIES - David Romero, Johan Stahre, Thorsten Wues3, Ovidiu Noran4, Peter Bernus, Åsa Fast-Berglund2, Dominic Gorecky - CIE46 Proceedings, 29-31 October 2016, Tianjin / China, ISSN 2164-8670 CD-ROM, ISSN 2164-8689 ON-LINE [BEST PAPER AWARD]

4) Healthy Operator 4.0: A Human Cyber–Physical System Architecture for Smart Workplaces - Shengjing Sun, Xiaochen Zheng , Bing Gong , Jorge García Paredes andJoaquín Ordieres-Meré - Article in Sensors · April 2020 DOI: 10.3390/s20072011

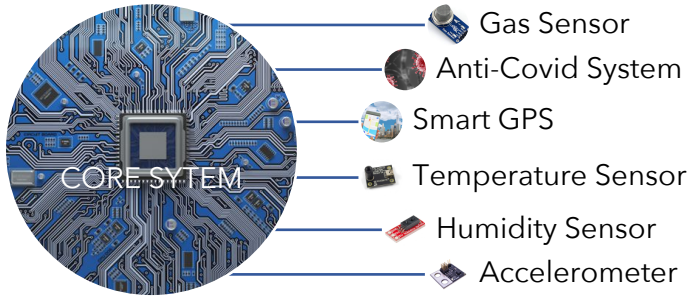
PRODUCTS AND MARKETS

PRODUCTS

PERSAFE intends to develop innovative systems for the safety of operators and to improve sports and mental performance. Such systems called: Smart Badge, Smart Bracelet, Smart Helmet whose architecture is the principle of operation is shown below:

Smart Badge

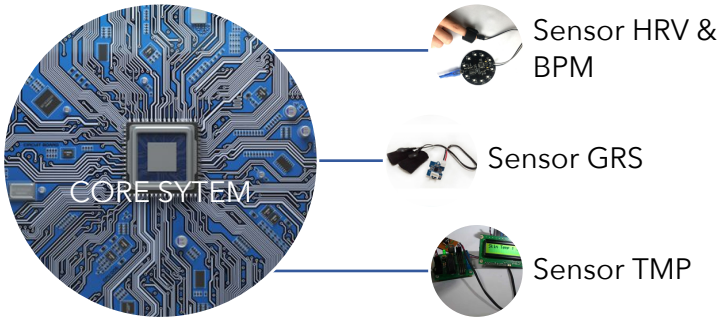
The Smart Badge has the purpose of providing, in real time both to the operator and to a remote control room, information about the presence of gas in the environment, on accidental falls, on external temperature and on GPS positioning. The SB has the following architecture:



Smart Bracelet

The Smart Bracelet borns with the aim of detecting some biosignals (functional to monitor the operator's psychophysical state. This device is interconnected with the smart badge via bluetooth connection which detects the following biosignals and architecture:

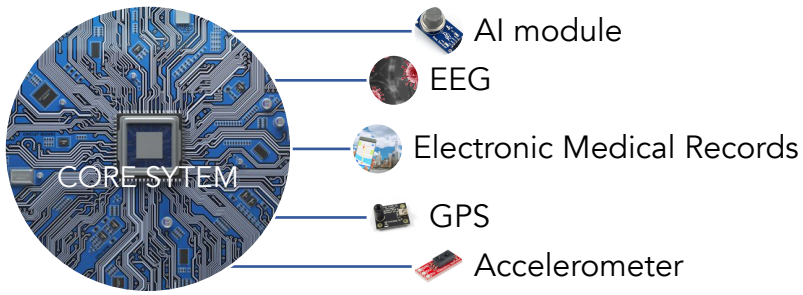
- Skin temperature;
- Skin conductance;
- Heart rate variability (HRV & BPM);



Smart Helmet

SH has as main objective to detect the operator's brain activity, this is because as some research has suggested, information regarding people's mental state such as, for example,

alertness, sleepiness and stress can be measured accurately through recordings with EEG[21].
The system architecture is shown in the following figure:



MARKETS

To understand the potential of these applications, consider a research by ABIsearch (Wearables on the Workplace: Enterprise Market Update), which shows that in 2016 companies distributed around 201 million wearable devices; ABI expects the number to reach 500 million by 2021.
The report produced by markets and markets and published in June 2017 tells us that the global market for IPR in 2017 was $ 45.1 billion and that in 2022 it will be around $ 62.0 billion, with an annual rate of growth (CAGR) of 6.5% in the period 2017-2022. The fields of application are the most varied and range from the world of professional sport where athletes control wearable devices to monitor biometric data in order to improve performance, the health and safety sector and the prevention of accidents to the military and hospital.
From our analysis, the following markets have been identified for each product we are going to exploit and based on its potential use.

TABLE I
APPLICATION FIELDS OF PRESAFE PRODUCTS IN THE MARKET

	MARITIME	ENG./ CONSTR. /INFRASTR.	TELECOM. /ENERGY /UTIL. /RESOURCES	MANUFACTORING	MILITARY	HOSPITAL	CONSUMER
SMART BADGE	***	***	***	**	*		***
SMART BRACELET	**	**	**	*	**	***	***
SMART HELMET	*	*	**		***	***	**

Thanks to its characteristics, the Smart Badge finds great application in the industrial market and specifically in the following sectors: Maritime, Engineering, Construction & Infrastructure

and Telecommunications, Energy, Utilities & Resources. In addition, by integrating the smart bracelet with the smart badge, it increases its potential for use, because it allows you to simultaneously record the following parameters:

- track worker location;
- provide jobsite information to decrease operational risk,
- monitor vital signs (detecting the operator's level of stress, alertness and mental fatigue) and environmental risks to worker health;
- smart proximity (social distancing);
- detection of gas above the allowed thresholds;

In the maritime sector, it allows one of the most important problems to be resolved, that is, that of detecting and intervening in real time in the event of a man falling overboard, whether it is an operator engaged on a container port, an oil tanker which, of a passenger on a cruise ship.
The smart helmet finds mainly application in the military, hospital and consumer market sectors.

DESCRIPTION OF THE INTERNATIONAL SCALABILITY MODEL

The marketing and commercialization activities of PerSafe products will be carried out, at an initial stage, within the national market by directly intercepting target customers who may be interested in these technologies. The sales strategies will be based on a try & buy approach that allows the customer to experiment and test the capabilities of the solutions and be able to appreciate their performance with the condition of purchase in the case of satisfying the requirements requested by the customer. In addition, for some solutions, the provision of services will be evaluated rather than the sale of the stand alone product, against payment of a monthly fee. One of the main markets to which PerSafe technologies, and in particular the SmartBadge, are aimed at is the shipowning one where accidental falls and man overboard falls represent one of the greatest risks for operators.
This business model that is intended to be adopted to enter the national market will be extended and fully scalable and easily extendable to the international market where we will make use of agents, resellers, system integrators and the large number of contacts and knowledge of international customers already belonging to the portfolio of the team and operating in the markets that you want to intercept.