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Customized Green, Safe, Healthy and

Smart Work and Sports Wear

PROJECT FINAL REPORT

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[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

1 Final publishable summary report

1.1 Executive Summary

Nowadays, the full adoption of customer-driven production methodologies and technologies is recognized as of definitive importance for the European Manufacturing Industry (SMEs in particular): it is a key strategy to compete in terms of value-added, as cost-based competition is hardly suitable to face the threats posed by emerging countries. Specifically, the Proposal targets two sectors, ***Sportswear*** and ***Work-wear***, where best opportunities are left only for value added products.

In addition to this consideration, social phenomena[3] like ***ageing*** (19% of EU population is between 50 and 64 years old, and 17% over 65 years old), increase of ***obese people*** (35% overweight and 15% obese over the total population), increase of ***diabetics*** (8% of the adult population) and major sensitivity towards ***disabled people*** (15% over population, ranging from light to severe disabilities) and eco-friendly products, result into challenging specifications for personalized solutions for Sport and Work, where European manufacturers need methodologies and technologies to get the chance to fully exploit their excellence.

Thus, the project has addressed ***the production*** of next generation ***health, safe and eco-friendly customized work-wear and sports-wear goods*** for specific target groups, such as ***elderly, disables, diabetics and obese*** people, which are of wide and increasing impact in terms of market share for the European industry.

MyWear project aimed at responding to such needs by conceiving an **Engineering Framework** - i.e. **methods, tools and technologies have been developed, necessary to consumer centred product/services and process innovation** - **addressing footwear and garments, for specific market segments as work, spare time, and sport**.

Pilot implementations in industrial settings, demonstrating feasibility of new concepts and solutions as for shoes and garments, have been developed with reference to two specific market segments: *safety/professional for workers* and *sport.*

Expected results and their potential impact and use

The following picture is meant graphically depict the objectives and their interaction.

[3] Data referred to 2011: many official sources

1.2 Project context and objectives

MYWEAR mission was to sustain the development of a new generation health, safe and ecofriendly customized work-wear and sportswear goods for elderly, disables, diabetics and obese people.

The following objectives have mainly been addressed:

New Customization Process:
Starting from recognizing of the user's biometric and morphologic properties, and that completing with the mass-customized products; customized yet respecting costs and delivery times typical to industrial processes. This implies to conceive a shop designed to collect user preferences and wishes concerning morphology, functional properties and product use as well as an Infrastructure that integrates data collected in the shop with parameters fundamental to driving the mass-customized production processes as well as integrates production and customization data in CAD / CAM to be more effective and efficient in support the design of customizable products.

Adaptive Production System for shoes:
To develop production machines able to dynamically modify the parameters as a function of the form used (e.g.: change of the injection path of the robot), the implementation and application of different lasts and tools for the same shoe model and the selection of the best insole to use to serve the customer with the BEST FITTING shoes.

Environmental conscious:
To implement and apply new high performing materials, such as green polymeric materials that have high performance both functionally and environmentally, which will be implemented in sport- and work-wear.
To develop tools that assist in minimize environmental impact already at the design phase with the purpose of reducing environmental impact of new products by 20% through a improved selection of material and components.

Smart textile and value added services:
To develop a "Textile Intrinsic communication layer" using textile-based circuits, and specifically designed connection points that can be manufactured as standard in work-wear, sports-wear and shoes, to facilitate the connection of a range of sensors to support individual monitoring. The communication can be for example a full integration in the garment's fabric, or welded textile conductors combined with non-intrusive cabling. To instantiate specific services for the single customer considering customer's health conditions, real-time monitored parameters and historical acquired data and to develop value added services tailored to meet the single customer's needs

The project started on December 1st 2011 and ended at November 30th 2014. It aimed at developing innovative process technologies for a new generation of customized, eco-friendly, safe, healthy and smart work wear and sportswear products for elderly, obese, diabetics and disabled people.
In 3 years of activities different personalized and value added products have then been conceived and developed, capable to meet customers demand, with a specific focus on health, innovation and reduced environmental impact. Main categories of the products developed are:

- *work-shoes: safety shoes* with a high level of customization, achieved through the flexible combination of the main components like last, sole and insole;
- *work- and sports-wear*: clothing with customized fitting and specific sensors for monitoring comfort and performance parameters as well as safety and health conditions.

The most important investigation areas for R&D activities have been:

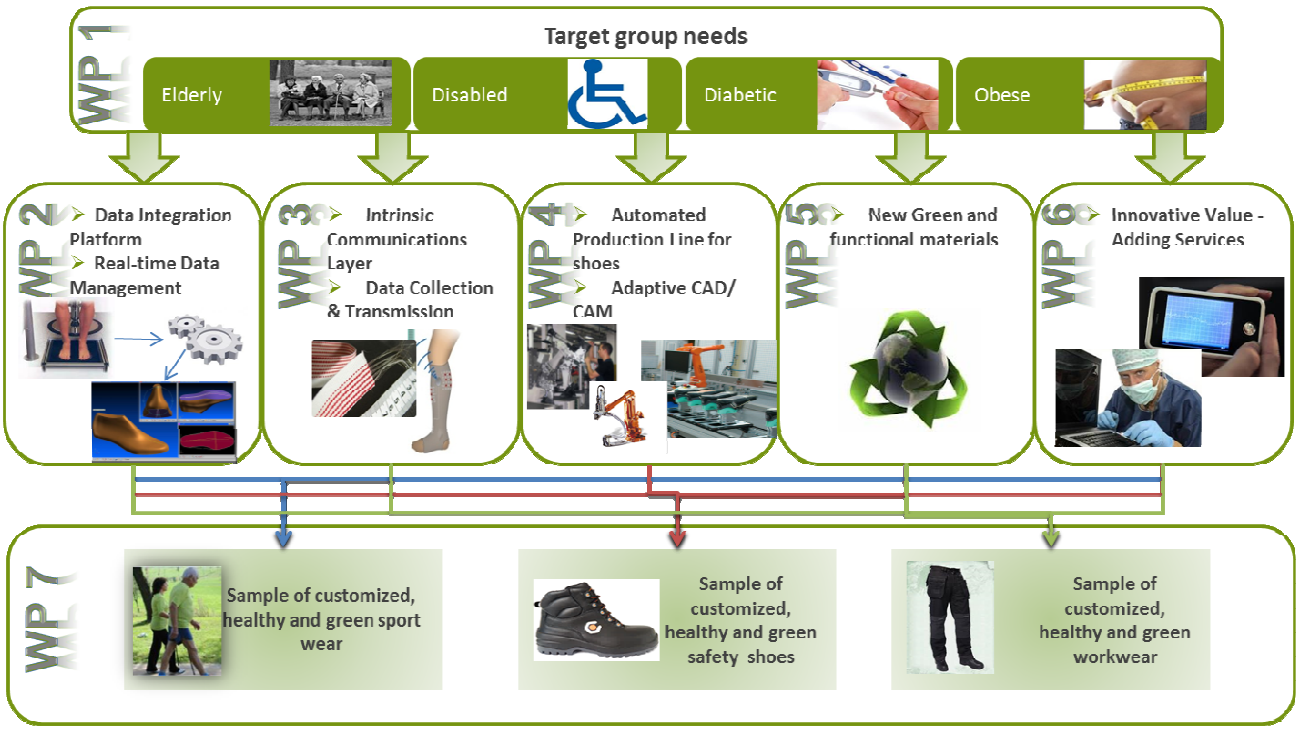
- design customized products using “light” biodegradable materials, and through integrated LCA methodologies.
- adaptive production systems and processes for the production of customized goods;
- technologies for constant remote monitoring of customer biometric parameters;
- an integrated data management platform, to collect and analyze user data;

To achieve the MY Wear project objectives a lean, skilled and complementary partnership has been built, involving 10 partners of 6 different member states. MY Wear is strongly industry driven, with 7 industrial partners out of 10, 6 of which being SMEs with leading roles in the project consortium.

Beneficiary name	Organization type	Beneficiary short name	Country
BASE PROTECTION SRL	SME	Base	Italy
Scuola Universitaria Professionale della Svizzera Italiana	RO	SUPSI	Switzerland
Consiglio Nazionale delle Ricerche – Istituto di Tecnologie Industriali e Automazione	RO	ITIA-CNR	Italy
KLOECKNER DESMA Schuhmaschinen GmbH	LE	DESMA	Germany
Ohmatex ApS	SME	OHM	Denmark
Centro Tecnologico das Industrias Textil e do Vestuario de Portugal	RO	CITEVE	Portugal
Synesis scarl	SME	Synesis	Italy
P&R Texteis SA	SME	P&R	Portugal
Ropardo srl	SME	Ropardo	Romania
Longhi SA	SME	Longhi	Switzerland

The results of the MY Wear project have been validated by the setup of integrated industrial demonstration, involving all industrial partners of the project and the addressed target consumers groups.

An overview of the project structure concerning the technical activities is provided in the following figure:



More details on the whole set of work packages is provided in the following paragraphs:

Work package 1 - *"**My-Wear reference framework**" has mainly defined the guidelines for the other work packages to set the reference framework for the project. The work done in this WP is the basic foundation for all the research activities of the project carried out in parallel in five WPs (2-6). WP1 outcomes (especially the validation scenarios) then have also been the innovation and market oriented principles inspiring all the research activities aiming at the full characterization of important product and service properties in relation to some specific consumer categories. The chosen scenarios have been defined considering the chance to be effective in terms of production process improvements and market requirements.*

Work package 2 - *"**Data Integration Platform**" addressed the designing and the implementation of the Platform providing the MY-Wear system with the following functionalities:*

- *Integration with a set of health and biometric scanning devices for initial customer data gathering, to drive the production process of personalized goods;*
- *Efficient management of sensors feedback information, as provided by WP3 development, towards real-time monitoring of specific health parameters;*
- *Providing remote status monitoring for personalized services (WP6);*
- *Providing a health status history over time for each person being monitored.*

Work package 3 - *"**Textile Intrinsic communication layer**" addressed the design of textile circuitry which has been adapted and integrated in a variety of garment types using standard textile manufacturing and confectioning techniques. Four sensor modules using commercially available micro-electronics components (Heart Rate, Respiratory Rate, Falling and Plantar Pressure sensors) have been integrated in different garments in order to demonstrate the feasibility of the concept and to facilitate verification of both, the textile platform and connectors, and demonstrating potential encapsulation technologies. As a further demonstration activity, the integration of biometric data collected from the sensors with the Data Platform was successfully tested.*

Work package 4 - "Adaptive production systems and processes" concentrated on the development of a new pilot of automated production line for the manufacturing of customized shoes based on:

- *new **robotized cells for flexible upper roughing and cementing**. A new software modules has been developed in order to generate consumer specific design customization options. An **innovative CAM** modules has also been realized, aiming at a rapid computing of adequate robot/machine set up and configuration parameters. New mechanisms for "on-the-fly" automatic piece detection and geometric trajectory recognition have been implemented on a multifunctional robotized roughing/cementing cell, based on vision system and on self-learning algorithms for PLC-PC based control and digital cameras.*
- *innovative solutions for **flexible sole injection**. A new self-cleaning mixed head, able to handle up to 8 component/additive valves, has been developed. This technology gives the manufacturer the most degrees of freedom, in fact is able to change the complete mixing ratio between Polyol and Isocyanate as well as the article parameters (hardness, density, …) and the Polyurethane components from shot to shot, without interrupting the production cycle. The basic idea is to modify the existing polyurethane chemistry in order to vary the sole properties. By varying the sole properties, the achieved sole can be harder, softer, more or less flexible, better slip resistance etc. This injection solution as well as the robotized cells have been implemented within the industrial plant of Base Protection for their final validation.*
- *new cell for the **automated production of customized insole/footbed** in shoe models. A new process for integrating customized footbed in shoe model, reducing overall foot bed costs and engineering times by means of fast production techniques, has been designed and developed at prototype level.*

Work package 5 - "Light biodegradable materials and new integrated LCA methodologies" mainly *investigated on how the use of new eco-friendly materials integrated with specific LCA methodologies could improve the performances and the overall value of the products. In this Workpackage the following results have been obtained:*

- *New protection and reinforcement component in order to be integrated in work wear and sport adapted to specific use, such as heavy work-wear and sportswear reinforcement like knee pad inserts in pantsuits.*
- *New biodegradable Polyurethane for footwear soles.*
- *New customized high-performing ether-based Polyurethane for particular workplaces (agriculture, food industry, hospital, …).*
- *New innovative green stain resistance nano technological treatment for fabric.*
- *Innovative modular LCA and eco-design solutions for green products development and assessment in order to limit environmental impact of new work-wear and sportswear.*

Work package 6 - *"Customer-centric sensors-enabled value-adding services"* *mainly designed and developed a set of application services aimed at exploiting the benefit deriving from MY-Wear integrated solutions. To this scope, an in-depth analysis of three dimensions has been addressed:*

- *targeted stakeholders characteristics and requirements;*
- *contexts of use;*
- *identified, developed and adopted sensors performances and functionalities;*

to design and develop value adding services for targeted stakeholders aimed at exploiting the benefit deriving from MY-Wear integrated solutions. The development proceeded in the following directions:

- *gathering and description of services functional requirements to present a graphical overview of the detailed functionalities provided by each of the identified product-service solution;*
- *non-functional requirements gathered and represented consistently with services functional requirements;*

Work package 7 - "Industrial pilots and validation scenarios" *main objectives have been the validation of the MY-Wear tools, technologies and services as a whole and the promotion of demonstration scenarios where to test MY-Wear concept and products with reference to the addressed target groups.*
This work-package anticipated, on one hand, the validation of the MY-Wear tools, technologies and services as a whole and, on the other hand, promoted the development of demonstration scenarios. Within this Workpackage all the most relevant results developed have been implemented and validated. In particular two main categories of results have been deployed:

- *Industrial pilot within a real manufacturing plant (Base Protection);*
- *Sample of products addressing the needs of end users belonging to the target groups*

Work package 8 - *"Dissemination, exploitation and new business model"* *main goals have been to promote MY-Wear results implementation to other sectors to promote the project and to ensure proper dissemination also addressing future potential customers of the developed solutions (esp. ones from the target groups), to support the exploitation of the MY-Wear research results and of the technologies provided. This is strictly related with the development of a proper and consistent business model.*

Work package 9 - *was dedicated to all the **"Project Management"** activities.*

1.3 Main S&T results

1.3.1 Innovative Sportswear and Workwear

1.3.1.1 The Data Integration Platform

A new integration data platform, has been conceived to integrate a wide range of health and biometric devices, capable to gather client data as a base for customer driven production.

> ☞ Once the goods are produced and supplied, the platform guarantees efficient management of sensors feedback information, providing remote physiologic life status monitoring in order to enable customized services deployment.

To summarize, a user can have devices and sensors assigned to him. In order for a sensor to send data (which is stored in the database) it needs to be registered in DIP and associated to a user.

Principal system components

Sensors. The possibility to integrate sensors directly with the Data Integration Platform has been excluded in the architecture. The main reasons for rejecting the direct link between sensor and DIP are:

- Aim to use the same HW platform in all sensor cases;
- The GSM-module requires a lot more extra energy;
- Implementation of a GSM-module or the like in each sensor solution will require more physical space (and will add extra weight).

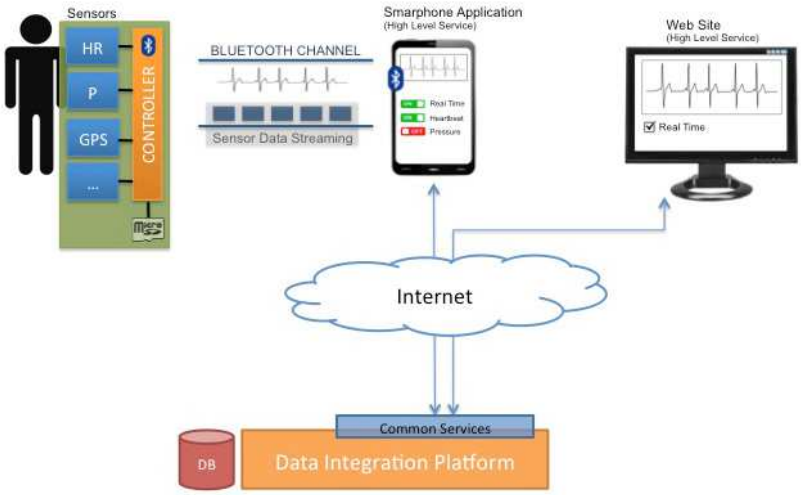
The sensors controller has to foresee a data buffering mechanism in order to avoid data loss in case of no connection between sensor and master unit. The size and format of the buffer depends hardly on the final use case at each scenario (ex. if the shirt is intended to be used for two hours the buffer size could be designed to hold data equal to 12 minutes (10%)!).
Communication Protocol. A protocol has been designed meant to regulate communication between the smartphone application and sensors through the Bluetooth channel. The communication protocol foresees a set of commands that allow the Smartphone Application to access some information about the actual sensor configuration.

Services interaction: These services represent the presentation layer of the architecture (the topmost level of the MyWear system). The presentation layer displays information related to such services as real time monitoring, analysis functionalities, etc. It communicates with the application layer by outputting data to the user side application (smartphone applications, desktop application or web site).

Smartphone application: The Smartphone has been designed according to the plug-in infrastructure in order to guarantee the scalability of the application: the application has been designed to be extensible with new and different sensors. A sensor plug-in is in charge to manage connection and/or to retrieve raw data coming from sensors via wireless connection. The architecture will define the specifications and the interfaces that allow each sensors system to couple with the internal logics of the smartphone application. The sensor plug-in has to implements a reference interface that foreseen a set of methods able to manage sensor connection and sensor data interacting via a well-defined communication protocol. The sensor plug-in has to be able to interpret data and to translate them into a common data model.

Desktop Application: It represents a high service application that allows users to interact with the data integration platform. Desktop Application is connected with the data integration platform through the dedicated common services.

Web Site. It represents a high service application that allows users to interact with the data integration platform. It will provide a set of services customized according to the user is going to use it. Web Site is connected with the data integration platform through the dedicated common services. DIP is online at http://myhealth.host4u.ro



Sensors integration schema

The Data Integration Platform exposes a set of functionalities that allow external applications such as Biometric Scanning Devices and Production Planning System to be integrated.

Data coming from scanning devices can be provided to the DIP too that will act both as a repository and broker of information. Eventually the Adaptive CAD/CAM tools will get those data, elaborate them and drive production of the customized goods. The embedded sensors will also provide data to the DIP. Those information, together with user data coming from the initial scans, will empower the customer-centric sensors-enabled value-adding services. For these reasons, data coming from biometric scanning devices has to be adapted to the foreseen human data model in order to make them available to the Data Integration Platform, which uses these data for different purposes (to drive the production planning system and to empower the customer-centric sensors-enabled value-adding services).

1.3.1.2 Textile intrinsic communication layer

A "Textile Intrinsic communication layer" using textile-based circuitry and especially designed connection points and which facilitates connection of a range of sensors and communications technologies for individual customer specific monitoring solutions, has been designed and developed.

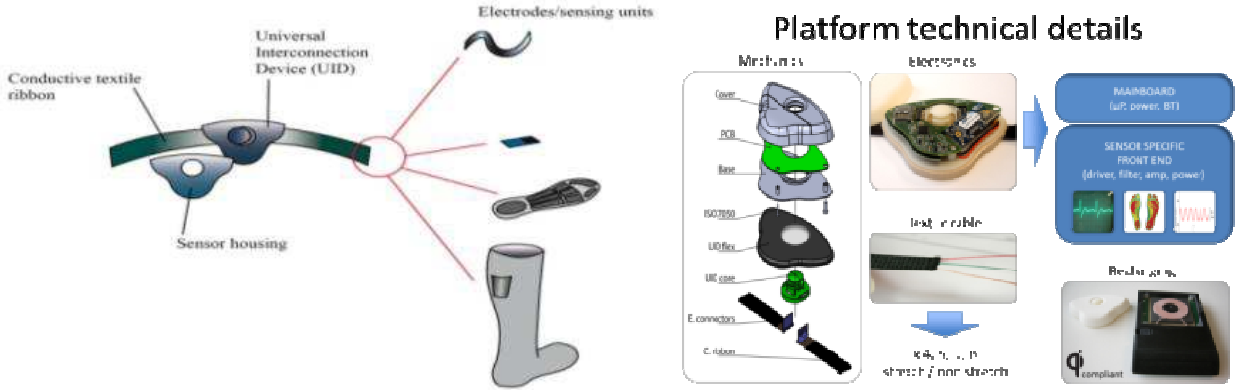
☞ This technology is able to collect, manage and transfer to a database a large amount of biometric data managed by the integration data platform (DIP, objective Nr.1) in order to enable customized services deployment.

The textile platform is effectively a small independent electronic device with a number of features that enable simple implementation of a variety of wearable sensor solutions in garments and shoes.

This task focuses on goods manufacturing processes and methods and technologies used in integrating sensors with the aid of the developed textile integration platform.

The platform comprises a universal interconnection device (UID) which mechanically attaches sensor electronics to a textile surface and which houses microelectronics that enable signal collection and transmission from one or more sensors connected to the device via textile cables. Sensors are positioned and fixed into place using well-known mechanical textile attachment technologies (Velcro / hook & eye attachment, press-fasteners etc.) and are attached and removed from the textile surface of a garment or shoes together with the UID. Varying the length of the textile cables enables optimal positioning of sensors (for best possible signal reception) and electronics (allowing for ergonomic considerations) using the same platform and universal components. Universality is further assured, by varying the number of electrical conductors in the textile ribbon to match a variety of sensor scenarios.

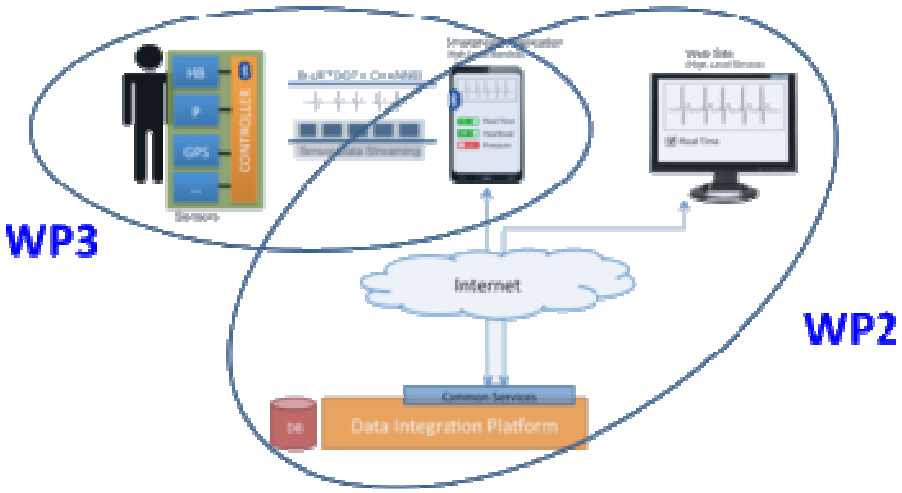
The textile platform and its system interfaces are outlined in the diagrams below.



As shown, the conductive textile ribbons that interface to a variety of different sensors are considered an integral part of the textile platform. Feedback is provided to end-users via a smart phone. Transfer of sensor data to a mobile device is facilitated by the textile integration platform.

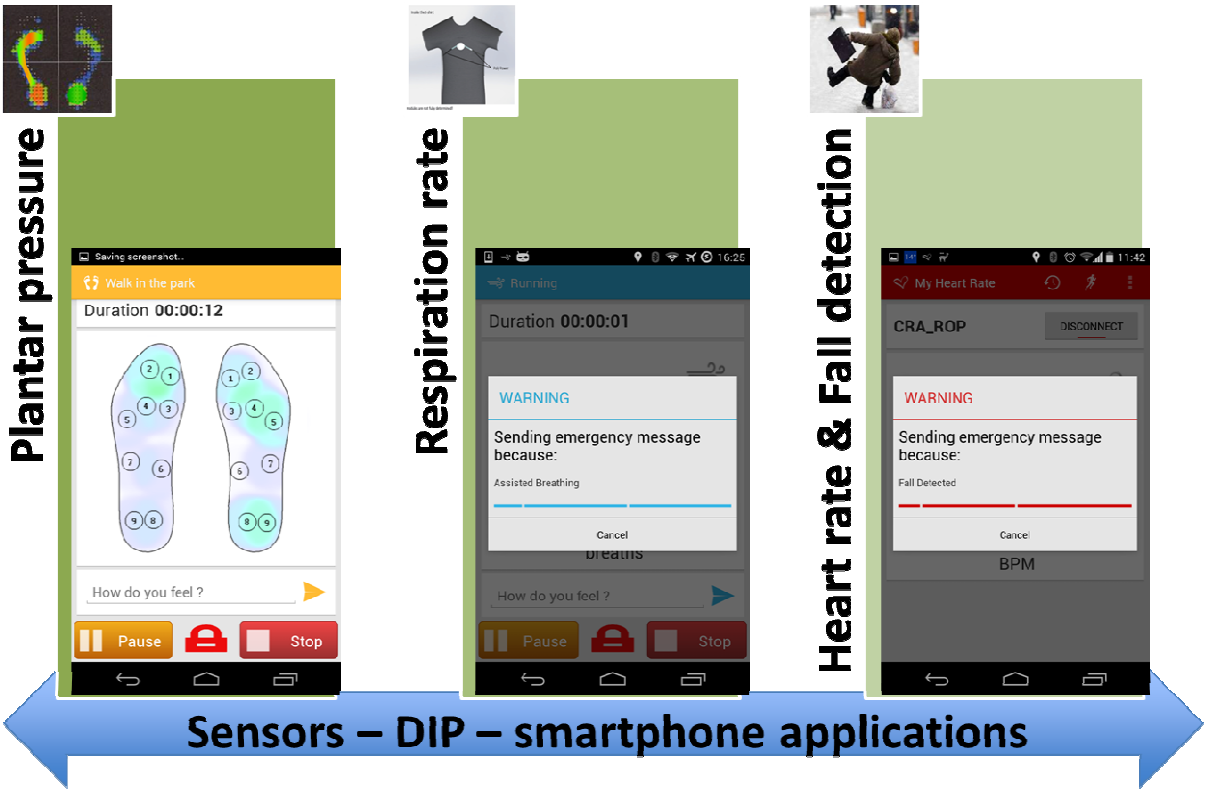
1.3.1.3 Customer-centric sensors-enabled value-adding platform services

Implementation of "**New innovative Services**" related to My-Wear representative Target Groups.



Data acquired from the user are managed by the sensor unit and transmitted wirelessly to a master unit (smart phone) forwarding data to the Data Integration Platform. Customer data are stored in DIP's database and made reusable for external applications.

Starting from the collection of outcomes of other tasks, the activities of the task required an integrated in-depth analysis and evaluation of each target group's needs and requirements according to the context of the product used (e.g. t-shirt, shoes, etc.), data to be monitored and identified sensors, taking into account the defined scenarios.

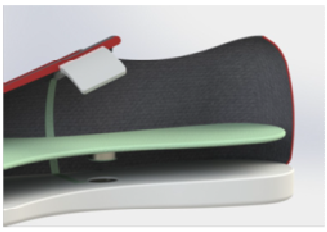
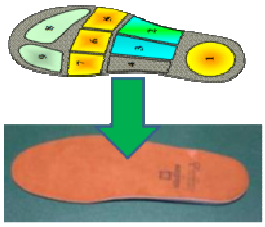
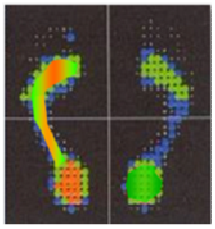


The outcome of this analysis is summarized with the identification and description of particular smart service application as practical benefits for the selected representative target groups.

Selected test cases

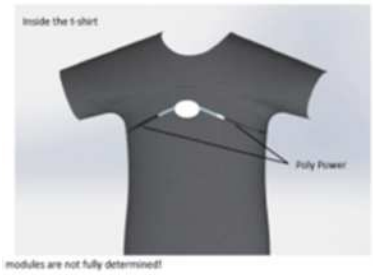
a. OBESE and DIABETICS

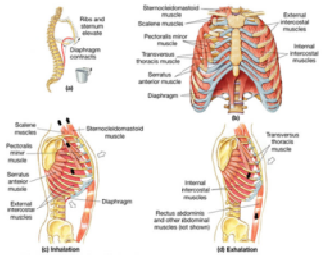
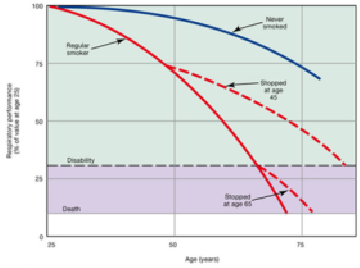
Shoes with Plantar pressure sensors for continuous monitoring of body weight evolution and overall weight distribution (to avoid irreversible changes on the user's musculoskeletal structure)

b. ELDERLY - Farmer

T-shirt with flexible Dielectric Electro-Active Polymers (DEAP) for monitoring of respiratory rate related to progressive degenerative condition of the respiratory system (emphysema) in older people due to aging, characterized by shortness of breath and an inability to tolerate physical exertion.

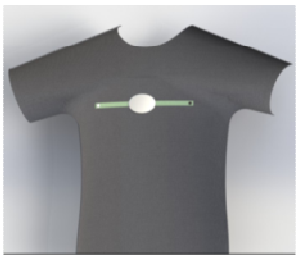


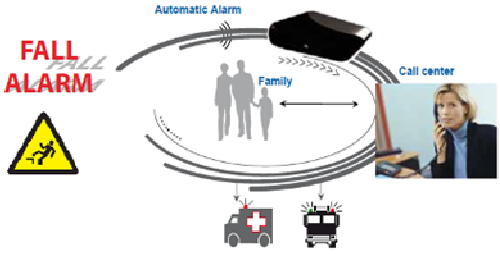

Respiratory Muscles


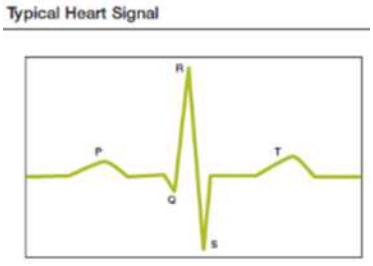
Aging and the Respiratory Performance

c. ELDERLY - Trekking

T-shirt with fall detection and heart rate sensors for continuous monitoring of fall events with possibility to control vital activities through heart rate and geographic localization (GPS tracking).





1.3.2 Adaptive production systems and processes

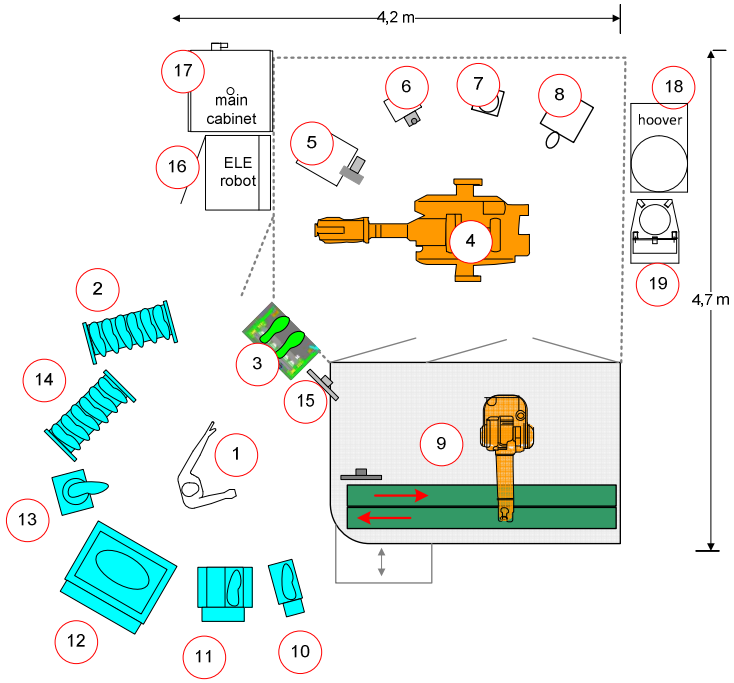
New adaptive production systems and processes for the realization of customized goods, which require both fast adaptation to customer requirements and synchronization of different manufacturing operations for the fully automated manufacturing of customized products through innovative operating machines and robotic applications, have been developed.

> ☞ The production phase can now benefit of specific innovations in order to conjugate personalization and fast production with cost aspects.

1.3.2.1 Robot cell for roughing and cementing

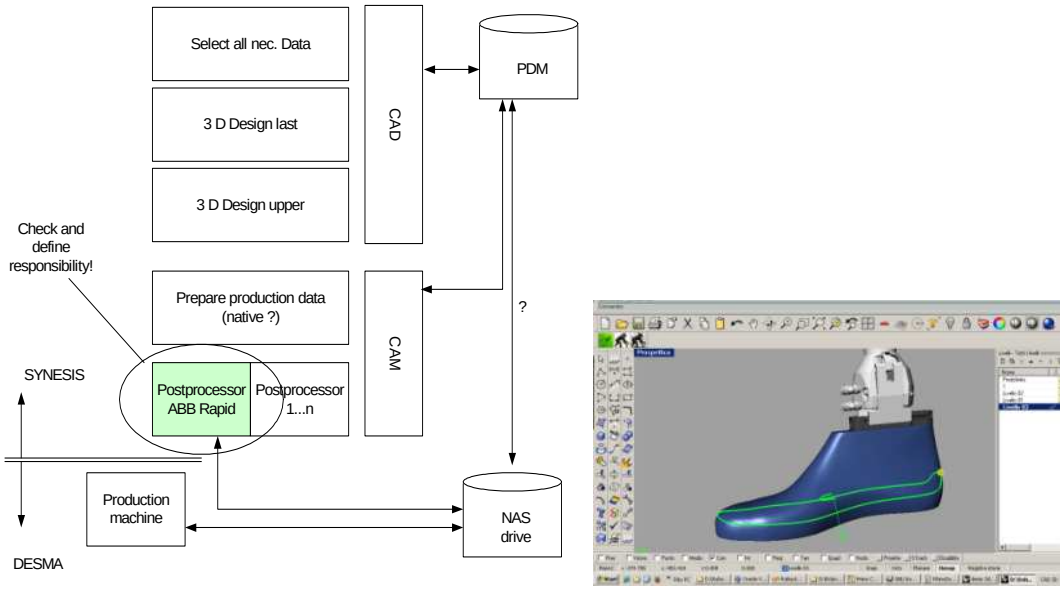
This development provided a new robot cell for flexible upper roughing/cementing as well as a sole treatment cell, increasing product quality and reducing processing time avoiding manual intervention.

1. Main operator
2. Shelfs for raw materials
3. Manual feeding station
4. Upper treatment robot
5. Bottom grinding station
6. Side roughing station
7. Cleaning dust station
8. Spraying cement
9. Sole cell
10. Manualy drying system
11. Activation station
12. Pressing station
13. Delasting station
14. Shelf for ready shoes
15. Operation panel
16. Cabinet for robot
17. Main cabinet
18. Exhaust station
19. Glue reservoir
20. Safety fences



1.3.2.2 Interface CAD/CAM

Traditionally the programmer / operator need approx. 20 to 60 min to create new robot programs for one style, as described before. One of the requirements is that an individual efficient sample production should be possible. The production of 30 pairs per hour is also required. It is not possible to teach or program all different upper material at the production machinery. Therefore one of the most important points in this WP 4 is the interfacing between the CAD and CAM systems with the gained data from the adaptive tool coming from T 4.1 The system structure is organized as following:



1.3.2.3 Prototypes developed

Upper treatments cell

Sole spraying cell

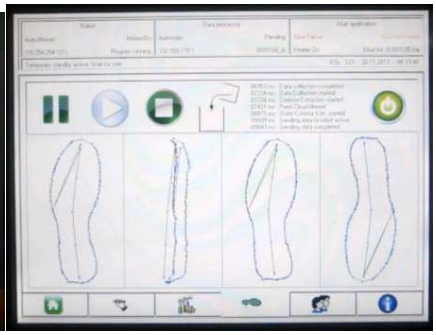
In these picture the new MyWear prototype for a 2 component sole treatment is shown.

The core technology of this cell is able to compensate the given tolerances in the unit soles. The programming of the robot paths is given automatically by the integrated scanner system with adapted software.

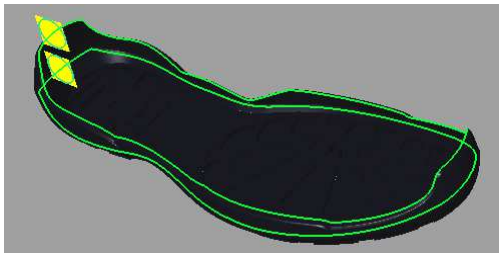
Furthermore, the following additional functions have been developed:

- Article navigation for elementary setups
- Further calibration methods to synchronize digitizing and spraying pattern
- Definition of limitations for treatment

Digitizing of sole



Generation of robot path



Virtual path at sole

Processed robot path

The integrated version of delivered prototypes have been installed as demonstration pilot plant in Base Protection.

1.3.2.4 New solution supporting flexible sole injection

This is a new injection process technology for the flexible sole injection customized to the particular needs of a foot, to conjugate savings in customization costs and reduction of setup times, thus enabling a more efficient accommodation of changes in the batch composition and reduced processing time for soling machine.

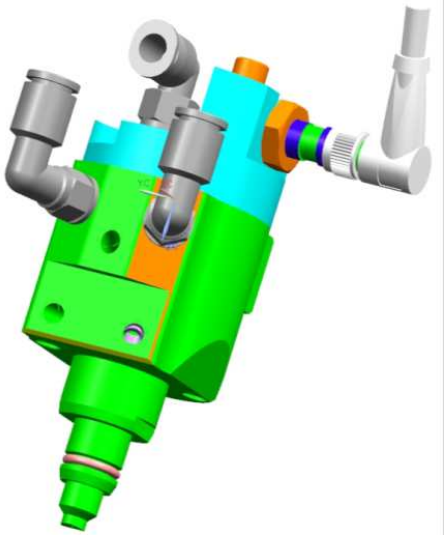
As the chemical composition of the Polyurethane in the state of the art systems is static, since it is given by the system setup and no flexible changes are possible. Due to the fact that according to main MyWear requirements for footwear a variable sole injection is essential, there is a need for a new controlling approach for a flexible set up able to provide different formulations by adjusting the additive's independently.

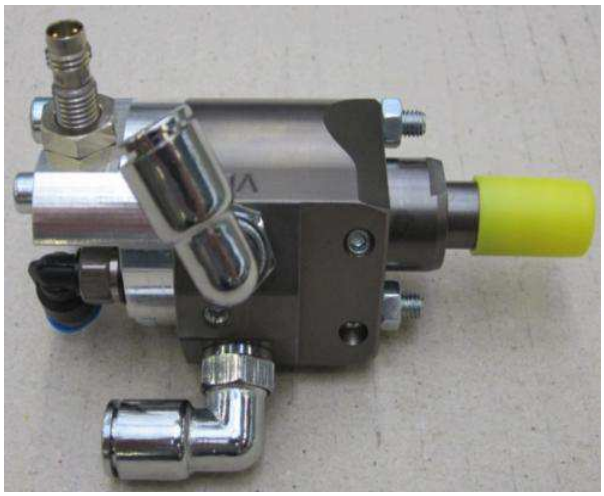
For this reason, a new additive cart has been developed and built.

The Additive carts carries a selected additive, like a blowing agent, crosslinker or UV stabilizer. The cart is equipped with a double jacket material tank, which is able to be temperature controlled and pressurized. Furthermore, there is the high accurate dosing gear pump with a very low pulsation, responsible for the precise metering of the additive.

An additive valve has been especially designed for low viscosity fluids with a standard diameter of the valve of 0.1 mm.

The additive valve can be opened or closed pneumatically. Since the injection of the additive is a key factor for the correct mixing, the control must observe the introduction of the additive. Therefore, the opening stroke as well as the injection pressure is measured and logged into a file.

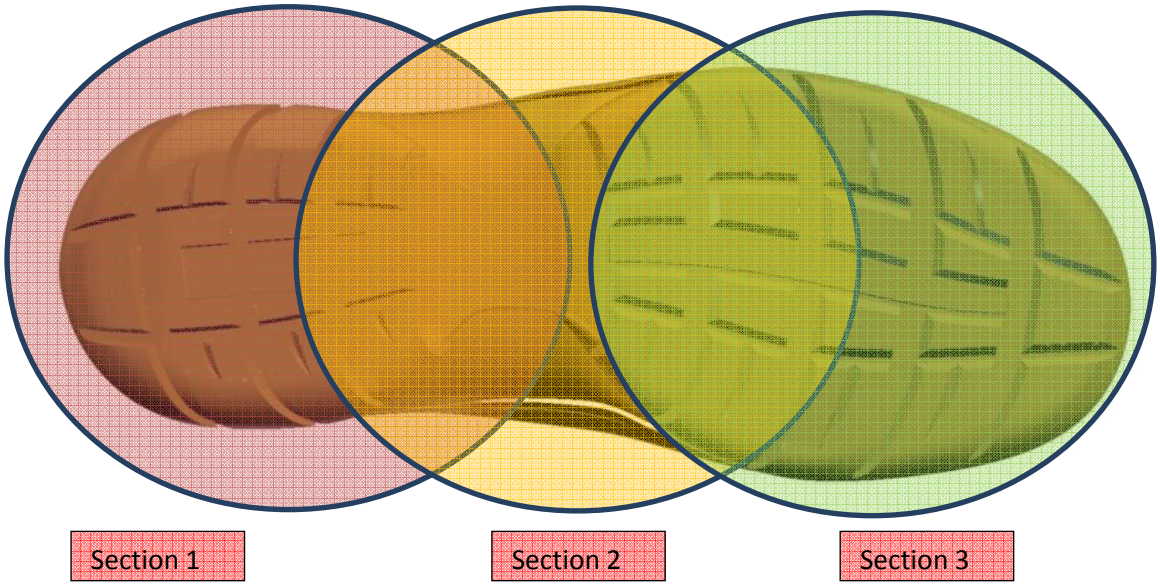




The prototype of this system was developed and installed as demonstration pilot for the validation session performed in Base Protection.

Software application

The existing machine software has been adapted in order to fulfil the overall control require by the new process technology. The article will be separated into three main sections maximum, where each section properties can be adjusted individually to the beforehand determined injection parameters



Article, divided into three independent injection sections

There will an overlapping of the three different liquid PU formulations at the injection process, but it is estimated that this circumstance creates a more comfort situation for the human foot, since there will be no choppy edges.

The following injection parameters have to be adjustable within each of the three sections independently from each other:

- Throughput of the components
- Throughput of the additives
- Mixing ratio of the components Polyol and Isocyanate
- Percentage of the additive related to Polyol within each section

1.3.2.5 Machine for integration of customized footbed in shoe models

Starting point for this task is the European Norm Constraints and performance over the final work shoe product are posed by EN standards (EN ISO 20345). The final foot bed customization will have to be compliant with:

- dimensional constraints
- type of shoe construction
- technical features
- delivery times and costs.

The aim of this task is to elaborate, design and prototype a new process/machine for providing customized foot bed, reducing overall foot-bed costs and engineering times by means of fast production techniques.
In the last months a new prototype of machine for production of customized footbeds has been developed.

Machine features:

- **Process typology**: 1 shot milling using multi tool approach
- **Milling tools:** 10mm diam. spherical tool
- **Process quality:** max step over (45°) 4mm → max distance between 2 milling tools for a global 1 mm surface roughness
- **Material type:** ethyl vinil acetate (EVA) with variable density
- **Raw block dimensions (LxWxH)**: 250x300x30mm
- **Working time:** 5/7 min./pz.

Technical features

- **Mechanical**
  - **No cooling system**
  - **No lubrication system**
- **Open LINUX RTAI control**
- **Rhinoceros CAM plugin**

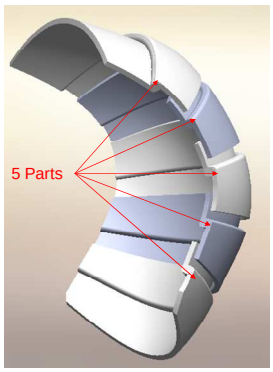
The prototype is installed within the ITIA-CNR R&D laboratory of Vigevano.

1.3.3 Light biodegradable materials and new integrated LCA methodologies”

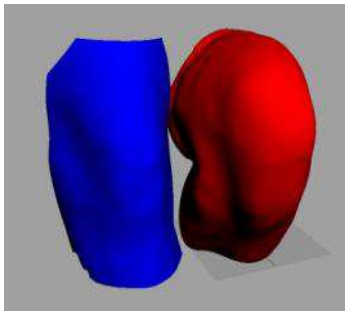
1.3.3.1 High performing biodegradable components for work wear and sport wear

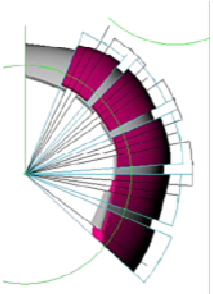
A new protective knee pad insert has been developed in order to be integrated in work wear, especially in pantsuits and jackets. Such elements is based on innovative plastic materials integrating traditional properties such as resistance to torsion and resistance to shock. Moreover innovative properties such as lightness, elasticity and biodegradation are integrated in new materials.

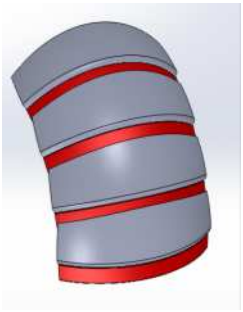
The concept: an advanced design for multifunctional products for promoting safety and comfort.



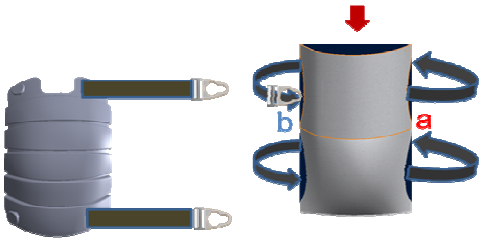
A fully personalized version is possible through an innovative manufacturing procedure: 3D printing.



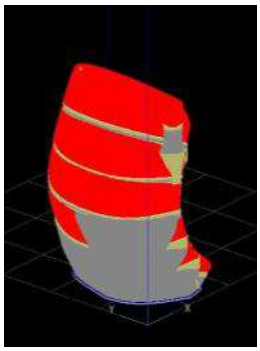




Engineering



Prototyping




Integration in pantsuits




Such new materials, being lighter and adaptable to different shape, can potentially be used in clothing sector thus promoting safety and comfort.

1.3.3.2 Innovative modular LCA and eco-design solutions for green products development and assessment

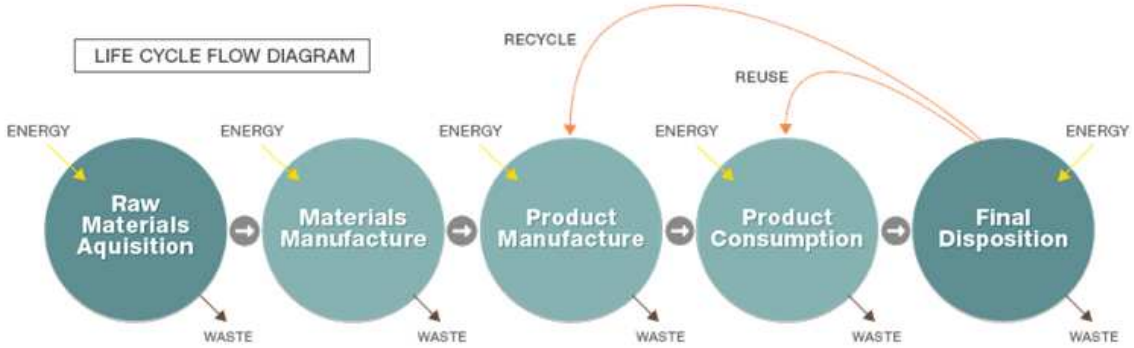
State of the art.

42 Eco-design Examples in the Footwear sector has been tracked in the last two years (2012-2013) Most Design actions are based on material design rather than on life Cycle tracking. Standard approaches in eco-design and environmental footprint tracking still miss to be applied.

102 Eco-labels which are applicable to the textile and footwear companies has been tracked. Most of them are not referred to the whole life cycle but on specific improvements. Most of them falls in type I and II ISO category which means they do not report environmental quantities to customer.

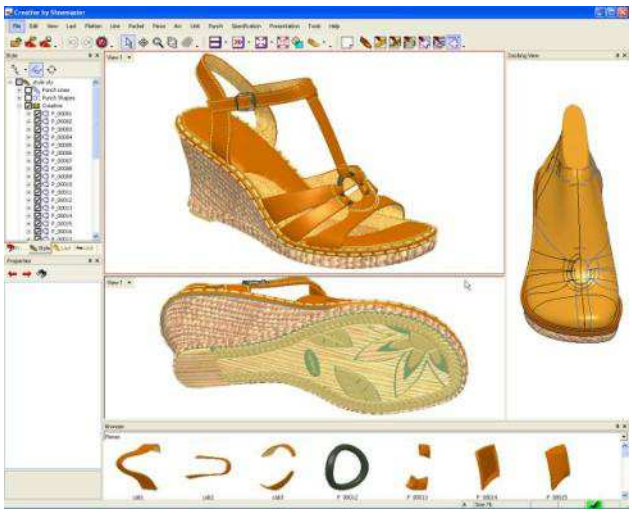
General aim of the task is not just the assessment of the final environmental footprint but also a support during the design phase.

Moreover, the LCA has had a real assessment of the environmental impact due to complex footwear and an effective outcome for the SMEs and Research community.

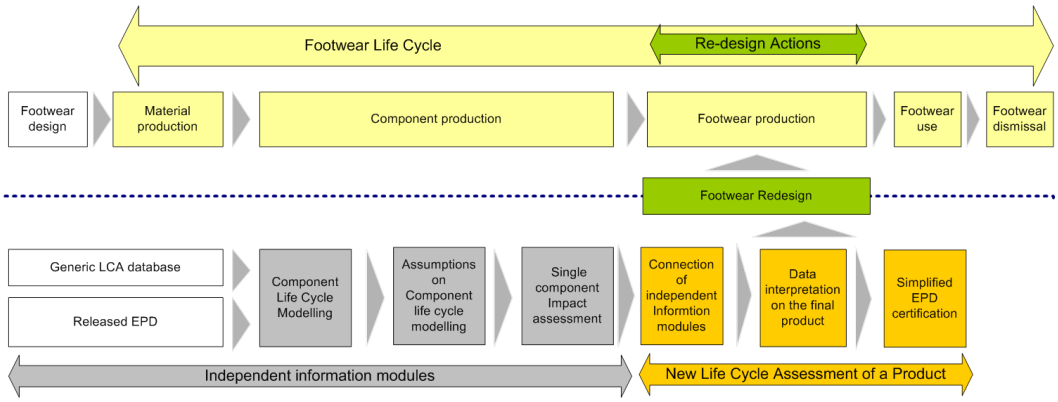


The proposed methodology

This specific methodologies aims at supporting the analysis of the environmental profiles of different materials and components in order to limit environmental impact of new work-wear and sportswear. Such methodologies could be integrated in design and PLM tools for shoe and clothing products.



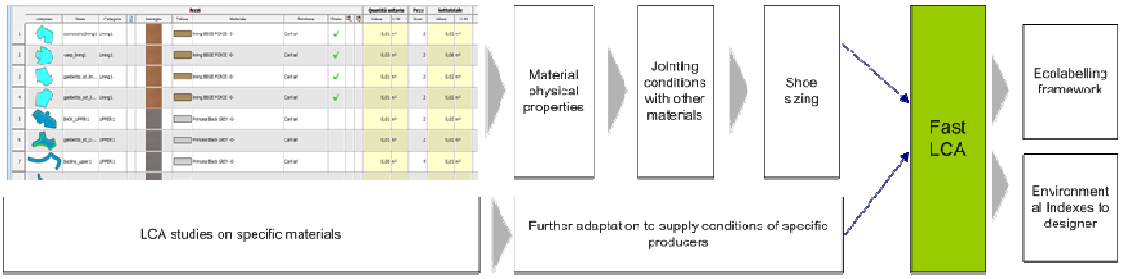
The link with the production CAD can enable a comparison of eco-efficient solution directly within the initial design of the footwear.



<u>Last Implementation</u>

Introduction of functions for Environmental impact assessment within CAD-PDM tools by

- Separate LCA studies on specific components
- Adaptation algorithms of Environmental profiles to physical features
- Link with update Eco labelling framework

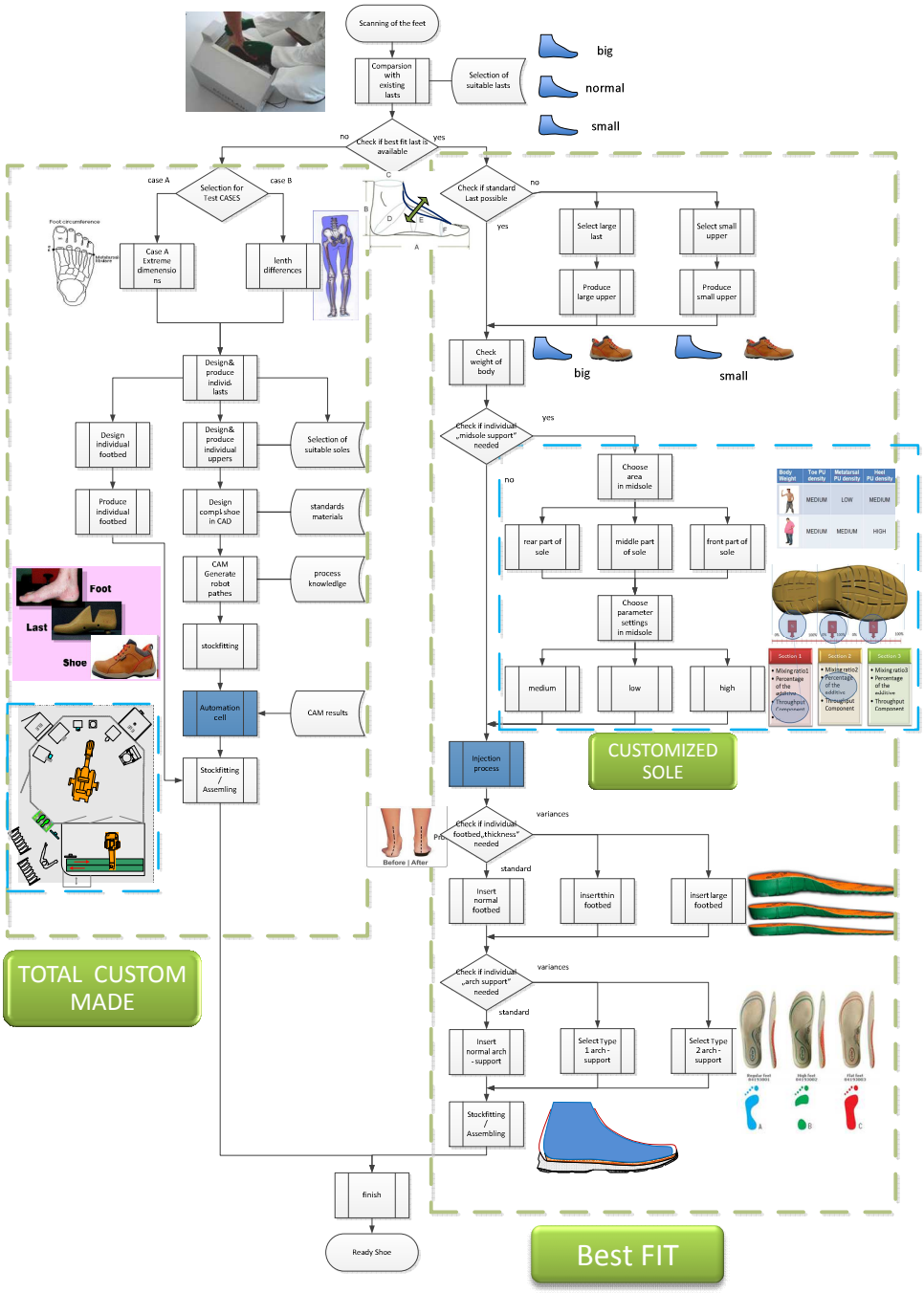


1.3.4 Industrial Pilots and Validation scenarios

1.3.4.1 Industrial pilot for the automatic production of customized, healthy and green safety shoes

An automatic pilot production line has been installed at Base Protection facilities, for the manufacturing of customised, green, safe, healthy and smart work shoes for the addressed target groups.

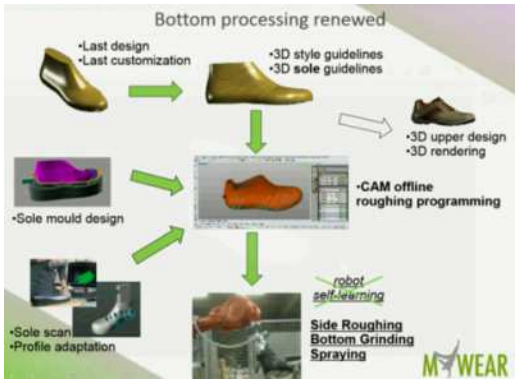
The Industrial Pilot for the automatic production of customized safety shoes consists not only of the hardware in form of productions machines, but it is also the algorithm to find the needs of the single person and to transfer them to a machine known code and customized process.

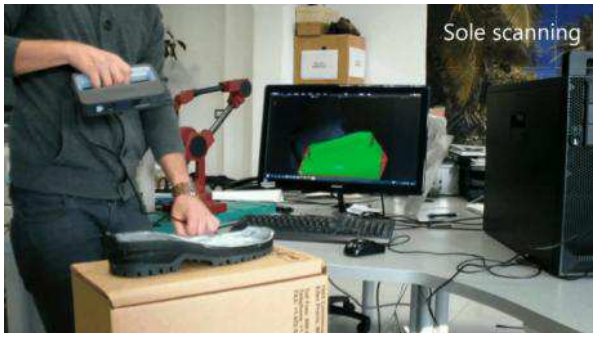


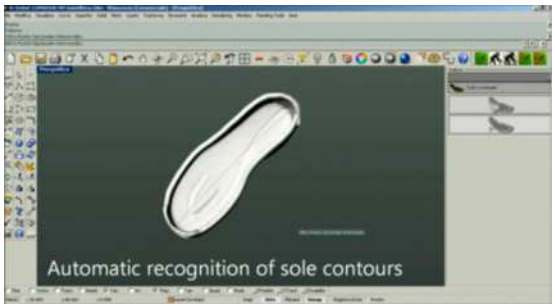
In fact there are three possible basic processes which can take care about the special need of a customer. The first one is the total custom made shoe, second the customized sole and third the best fit- the amount of customization decreases by number. The central task of the pilot is to find the right process for the current customer and to decide if it is case one, two or three.

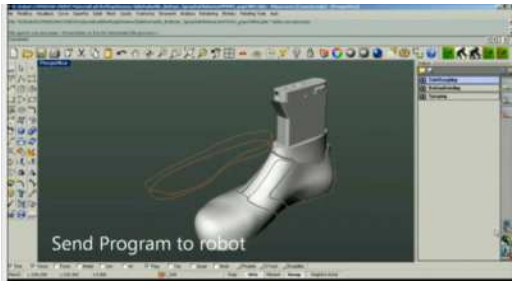
Such an industrial pilot bases on:

- An adaptive CAD/CAM solution to manage body morphologies and health customer information and to set up robot/machine parameters.



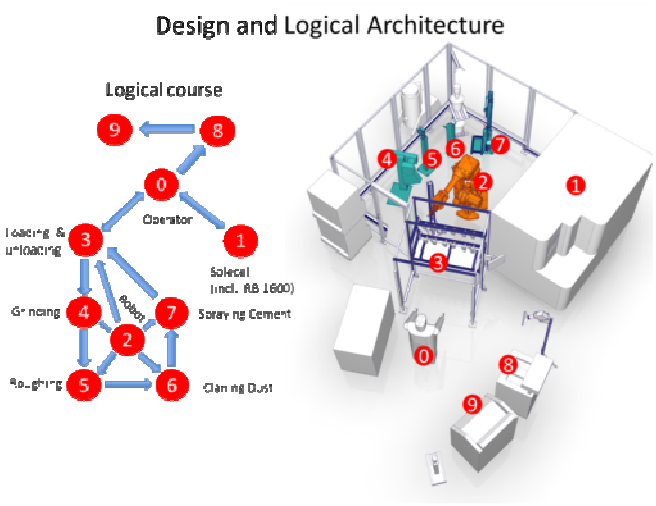






- An automatic Conveyer for a complete integration of machines and robots

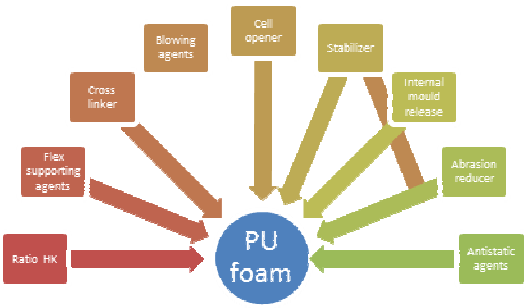
- New robot cells for flexible upper roughing/cementing sole



- New prototype supporting flexible sole injection

Equipment:

- ✓ Advanced additive dosing unit
- ✓ Special broad usage pump
- ✓ section dosing control



Flexible sole injection

- ✓ 3 sections per sole
- ✓ different positioning
- ✓ different properties by single section recipes
- ✓ usage of several additives
- ✓ reformulation in every section possable

- A new prototype machine for integration of customized footbeds in shoe models

1.3.4.2 Industrial pilot for the production of smart textiles

An innovative pilot production process has been developed for the manufacturing of smart textiles for work wear and sport for the addressed target groups.

Such an industrial pilot bases on the results of RTD packages and particularly on the results of WP3, and thus implement and demonstrate high tech solutions with reference to specific textile manufacturing processes, like mounting and connection processes which support the integration of textile circuitry in a variety of garment and shoes types.

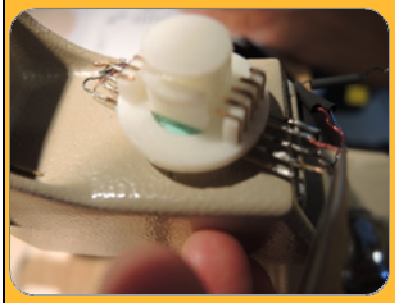
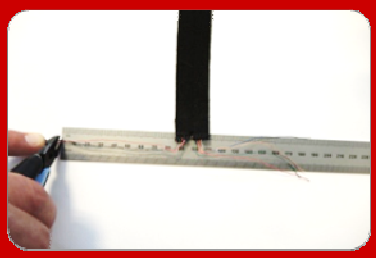
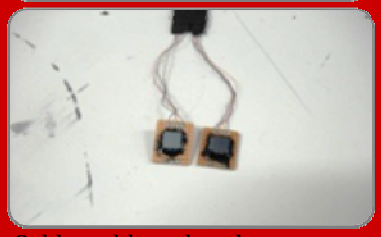
The pilot production flow is showed in the following table.

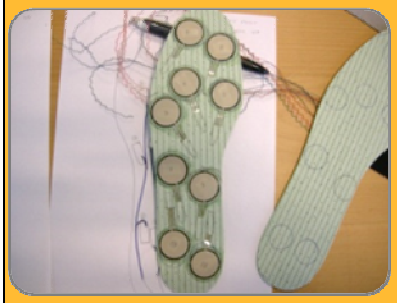
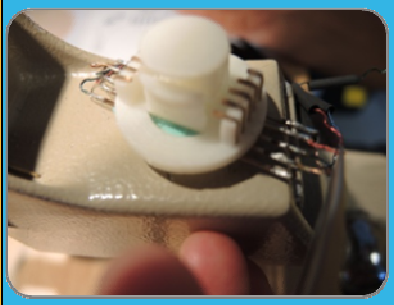
Ohmatex	Synesis	P&R, Citeve, BASE, Ohmatex	P&R, Citeve, BASE,	Supsi, Ropardo	Ohmatex	Ohmatex
Purchasing of component parts. Manufacturing of electronics sensor solutions mounted with textile cables. Mounting of textile cables to UID Core.	Silicone encapsulation of UID Manufacturing of 3D printed UID housing	Bonding and encapsulation of sensor solutions	Manufacturing of special and innovative T-shirts and socks	Coordination of software and smart phone application configuration	Configuration of PCBs and assembly in UID housing	Assembly and testing of finished sensor solutions

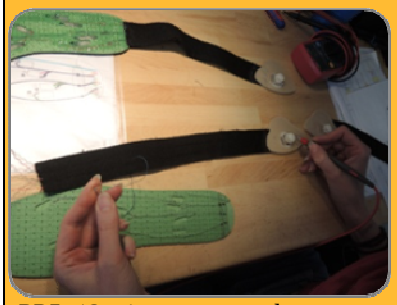
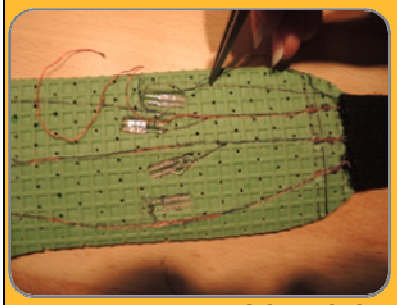
Order of process for each prototype

Plantar Pressure	Respiration rate	Heart rate and fall
Mounting of cable to UID core	Sensor bonding and encapsulation	Sensor bonding and encapsulation
Overmoulding of UID silicone	Mounting of cable to UID core	Mounting of cable to UID core
Sensor bonding and encapsulation	Overmoulding of UID silicone	Overmoulding of UID silicone
Configuration of PCBs and embedding software to the electronics mainboard		
Assembly and Mounting of housing		
System testing		
Delivery of customized garments	Delivery of customized garments	Delivery of customized garments
Attachment to garment	Attachment to garment	Attachment to garment

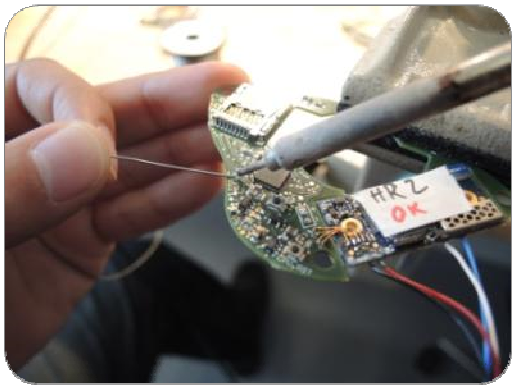
The production process flow for each prototype is illustrated below with vertical colour coding and pictures documenting each stage in the process.

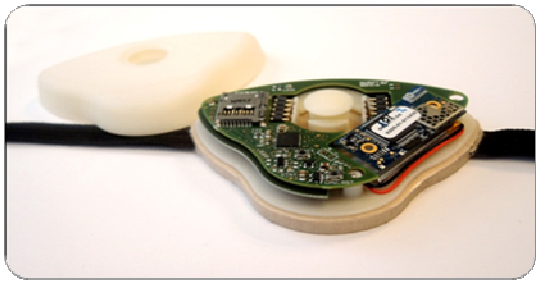
Plantar pressure (PP)	Respiration rate (RR)	Heart Rate and Fall (HR)
 PP1. Textile cable soldered to UID core	   RR1. Textile cable attached to Polypower sensor	 HR1. Two textile cables prepared for attachment to heart rate sensors   Solder cable ends to heart rate sensors (two sensors).

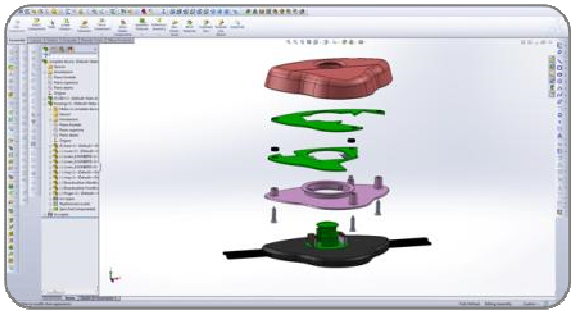
Plantar pressure (PP)	Respiration rate (RR)	Heart Rate and Fall (HR)
  PP2. Textile cable and snap connector positioned for overmoulding (Synesis) Overmoulding of UID silicone base.	   RR2. Textile bonding and encapsulation in Fabric (P&R/Citeve)	 HR2. Textile bonding (P&R/Citeve)
 PP3. Sole prepared at Ohmatex – sensors attached to sole according to template pattern	 RR3. Solder textile cable to UID core	 HR3. Coat sensors with silicone coating to protect and give better skin contact
 PP4. Wire cable with UID base returned from Synesis	 RR4. Overmoulding of UID silicone base (Synesis)	 HR4. Prepare ends for soldering to UID core

Plantar pressure (PP)	Respiration rate (RR)	Heart Rate and Fall (HR)
 PP5. 12 wires connected to underneath of sole.		 HR5. Overmoulding of UID silicone base (Synesis)
 PP6. Wires connected through the sole to the sensors on top side of sole.		 HR6. Mount conductive fabric to back of UID base
 PP7. Sole covered with textile to protect sensors.	 RR5. Sensor attachment to UID completed.	 HR7. Sensor attachment to UID completed.

Processes common to all three prototypes: assembly and mounting of housing







Mounting of UID and sensors to garments

Plantar pressure (PP)	Respiration rate (RR)	Heart Rate and Fall (HR)
 Insertion of plantar pressure sole to sock	  Attachment to T-shirt	  Attachment to T-shirt

1.4 Potential impacts, main dissemination activities and exploitation of results

Social phenomena like ***ageing***, increase of ***obese people*** and major sensitivity towards ***disabled*** and **diabetics people** *and eco-friendly products*, result into challenging specifications for personalized solutions for Sport and Work wear, where European manufacturers need new approaches to get the chance to fully exploit their excellence. The full adoption of customer-driven production methodologies and technologies is a key strategy to compete in terms of value-added, in the current market situation.

Looking at such strategic goals, four main areas have been mainly investigated:

- Developing new adaptive production systems & processes towards the production of customized goods
- Technologies for constant monitoring, over long distances, of customer bio-metric parameters.
- Integrated Data Platform, for customer data gathering and distribution;
- Efficient and monitored use of "light" biodegradable materials and integrated LCA methodologies

The transformation of theoretical objectives into concrete results has been achieved by selecting the specific target groups and their real needs through a statistical approach, using the official data of international health organizations. Furthermore a selection of existing technologies and process, close to the project scope, has been done to guarantee the right project addressing.

MYWEAR mission then has been to sustain the development of a new generation health, safe and ecofriendly customized work-wear and sportswear goods for elderly, disables, diabetics and obese people.

1.4.1 Dissemination

The dissemination of the foreground is mainly focused on informing the scientific, industrial and public users in the most progressive and advanced approaches and technologies of customization possibilities and benefits from their utilization. The adopted approach is schematically represented in the following picture:

The dissemination plan has mainly been conceived as:

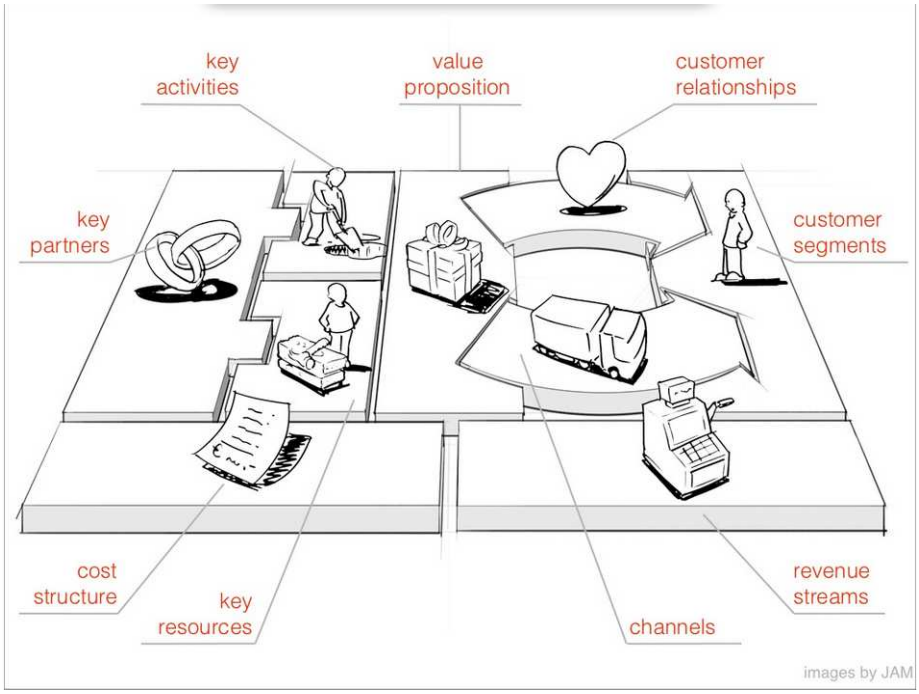
- Definition of an effective strategy and the identification of a compliant plan;
- Investigation and selection of the most suitable dissemination channels according to the defined strategy;
- Collection of fairs and conferences of interest for the project partners;
- Creation of a dedicated web-portal (http://www.mywearproject.info/) provided by BASE;

- Participation in a multi-project portal (http://www.mckn.eu/projects/mywear/) managed by SUPSI, focused on mass customization and on customer co-creation. The portal gathers other European projects such as Kumac, MC-500, S-MC-S, Dorothy, Remplanet, Servive and integrates the web-pages of Frank Piller's blog and of the MIT Smart Customization Group. The average audience of this websites is of 20 visitors/day, of which 32% are new visitors.
- Delivery of promotional material:
    - Flyer & Brochures;
    - Monthly Newsletters.
- Event participation

1.4.2 Exploitation

With the support of the exploitation and dissemination managers all the project partners have investigated on the business opportunities for a commercial development products and services resulting from the project.

Starting from the early rough ideas discussed during the Exploitation Strategy Seminar, offered by the Commission and held the 28th June 2013, at the end of the project 8 major results have been identified and described in terms of marketing potentialities and appropriate business models finalised to get major chance of success. For each of them a set of key points characterizing an appropriate New Business Model have been defined. This new market perspective in particular, starting from a Value Proposition characterization that highlights the innovative features developed in MyWear, clarifies what will be necessary to implement and probably change with respect to current business approaches used for similar products and technologies. This phase of the project has roughly referred to a quite formalized approach proposed by Osterwalder and that is schematically represented in the following figure:



Finally, for each result have also been identified IPR issues and risk analysis, needs for agreements and collaboration with the project partners as well as time horizons and the strategies needed for getting to marketable products or services.

The following table provides the list of the project results with major exploitation potentialities:

No	**Title**	**Description**	**Partner(s) owners**	**Partners(s) contribut.**
1	Monitoring system platform	Sensors, connectors and transmitters designed for long term wear, integrated into a special monitoring T-shirt, into safety shoes or socks, as a monitoring platform for respiration and, heart rate, plantar sensing and oxygenation measurement.	Ohmatex	Base, Longhi, P&R
2	LCA tools	Modular LCA database of footwear components to rapidly assess environmental performances of new product.	ITIA	Synesis
3	Smart integrated services	An integrated solution made of a Data Integration Platform (DIP) that serves as common data/logics layer and of distributed services aimed at supporting different users (patient, physician, etc.).	Ropardo,	Supsi, Base, Longhi, P&R, Ohmatex
4	New robot cells for flexible upper roughing	Innovative robotized cell for customized shoe production provided with a fully automatic generated CAD CAM modules	Desma	ITIA, Synesis, Base
5	Innovative system for a modular injection of polyurethane soles	Individual and automized injection of different Polyurethane systems as an extension of the already existing technology, “shot by shot” to “during the shot”	Desma	Base
6	Customized safety shoes	Safety shoes designed for very special needs in terms of best fit and arranged for sensors integration on demand.	Base	Synesis, ITIA , Desma
7	Sensor-based sportswear	Customized comfortable sportswear garments with biometric sensors integrated into textile materials (trousers and/or sweat shirt or T-Shirt) made with functional and technical knits and fabrics.	P&R	Citeve, Ohmatex
8	New milling Machine for footbed customised manufacturing	This technology supports a new process for integrating customized footbed in shoe model, reducing overall foot bed costs and engineering times by means of fast production techniques – 3D morphing and deformation	ITIA	Base, Synesis

2 Use and dissemination of foreground

2.1 Section A (PUBLIC)

The following table provides the list of the more relevant scientific publications:

A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES										
NO	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers[4] (if available)	Is/Will open access[5] provided to this publication?
1	MyWear: Customized green, safe, healthy and smart work- and sports-wear	C. Cafagna	Engineering, Technology and Innovation (ICE), 2014 International ICE Conference	2014	IEEE		2014	1-5	http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6871559&isnumber=6871527	no
2	Platform architecture empowering health and safe Product Service Systems for specific target groups.	G. Landolfi	Procedia CIRP, 2014	Vol. 21, 2014	Elsevier		2014	117-122	http://www.sciencedirect.com/science/article/pii/S2212827114007537	yes
3	Human-centric data model and data integration platform enabling personalized product service systems for healthcare	G. Landolfi	Engineering, Technology and Innovation (ICE), 2014 International ICE Conference on	2014	IEEE		2014	1-9	http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6871557&isnumber=6871527	no

[4] A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).

[5] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

The following table, on the other hand, provides a list of the most relevant events attended until the end of project while additional dissemination events have already been planned too:

A2: LIST OF DISSEMINATION ACTIVITIES

NO.	Type of activities[6]	Main leader	Title	Date/Period	Place	Type of audience[7]	Size of audience	Countries addressed
1	Exhibitions	CITEVE	Modtissimo	2013/Period I	PT	Industry	>250	Europe
2	Conference	BASE SUPSI SYNESIS ITIA	Public event on innovative technologies for consumer goods industry	2013/Period I	ES	Scientific community, industry	50-100	Europe
3	Presentation	BASE	Automated systems for safety shoes production	2013/Period I	ES	Scientific community, industry	50-100	Europe
4	Presentation	SUPSI	Customer-centric sensor-enabled services for intelligent clothing	2013/Period II	ES	Scientific community, industry	50-100	Europe
5	Workshop	BASE	Impact of the Factories of the Future PPP	2013/Period I	PT	Scientific community, industry, policy makers	50-100	Europe
6	Conference	CITEVE	Textile Clothing European Technology Platform Conference	2013/Period I	PT	Scientific community, industry, policy makers	100-250	Europe
7	Exhibition	ROPARDO	CeBit 2013	2013/Period I	DE	Industry	>250	Europe
8	Exhibition	BASE	Preventica	2013/Period I	FR	Scientific community, industry	>250	Worldwide
9	Exhibition	BASE CITEVE	A+A 2013	2013/Period II	DE	Scientific community, industry, policy makers	>250	Worldwide

[6] A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

[7] A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).

10	Exhibition	BASE	Preventica	2013/Period II	FR	Scientific community, industry	>250	Worldwide
11	Exhibition	CITEVE	ISPO Munich	2014/Period II	DE	Scientific community, industry	>250	Worldwide
12	Workshop	SUPSI	MyWear: vestiti e scarpe per l'attività sportiva (@ Sportech 2014)	2014/Period II	CH	Scientific community, civil society	100-250	Switzerland, Italy
13	Exhibition	ROPARDO	Mobile World Congress	2014/Period II	ES	Scientific community, industry	>250	Worlwide
14	Exhibition	ROPARDO	CeBit 2014	2014/Period II	DE	Industry	>250	Europe
15	Conferences	OHMATEX CITEVE	iTechStyle Forum (part of the Porto Fashion week)	2014/Period II	PT	Scientific community, industry, policy makers	100-250	Europe
16	Conferences	BASE SUPSI ITIA	Industrial Technologies 2014 Conference	2014/Period II	GR	Scientific community, industry	>250	Europe
17	Conference	SUPSI ITIA	CIRP Design Conference 2014	2014/Period II	IT	Scientific community, industry	25-50	Europe
18	Conference	SUPSI BASE	ICE Conference 2014	2014/Period II	IT	Scientific community, industry	100-250	Europe
19	Workshop	SUPSI	Embedded sensors, smart and innovative services for personalized products (@ International ICE Conference 2014)	2014/Period II	IT	Scientific community, industry	25-50	Europe
20	Exhibition	P&R	Eurobike 2014	2014/Period II	DE	Scientific community, industry	>250	Europe
21	Conference	BASE	Prosumer.net event	2014/Period II	BE	Scientific community, industry	50-100	Europe
22	Conference	BASE SUPSI	World Manufacturing Forum 2014	2014/Period II	IT	Scientific community, industry, policy makers	>250	Worldwide
23	Articles	BASE	Light-emitting socks and antibacterial fabrics – welcome to the new world of wearable tech (on H2020 Magazine)	2014/Period II	-	Scientific community, industry, medias	N/A	Worldwide

24	Articles	SUPSI	La testa nella nuvola e i servizi avanzati. (on Innovare magazine)	2014/Period II	IT	Scientific community, industry	N/A	Switzerland, Italy
25	Thesis	SUPSI	Human Body Data Model Design for Biometric and Health Customer Characterization in the Development of Customized Product- Services for Specific Target Groups	2013/Period I	CH	Scientific community	N/A	Worldwide
26	Videos	SUPSI	MyWear spot using StopMotion technique	2014/Period II	CH	Scientific community	N/A	Switzerland
27	Publication	SUPSI	Human-centric data model and data integration platform enabling personalized product service systems for healthcare	2014/Period II	-	Scientific community	N/A	Worldwide
28	Publication	SUPSI	Platform architecture empowering health and safe Product Service Systems for specific target groups.	2014/Period II	-	Scientific community	N/A	Worldwide
29	Publication	BASE	MyWear: Customized green, safe, healthy and smart work- and sports-wear	2014/Period II	-	Scientific community, industry	N/A	Worldwide
30	Web	BASE	http://www.mywearproject.info/project/project	-	-	Scientific community, industry	N/A	Worldwide
31	Web	SUPSI	http://www.mckn.eu/projects/mywear/	-	-	Scientific community, industry	N/A	Worldwide
32	Exhibition	BASE	Expo Protection (Paris)	2014/Period II	FR	Scientific community, industry	>250	Europe

2.2 Section B (Confidential)

2.1.1 Part B1

The following table provides synthetic information concerning the potential applications for patents and other kind of registration

B1: LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS, ETC.					
Type of IP Rights[8]:	Confidential Click on YES/NO	Foreseen embargo date dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant (s) (as on the application)
Patent potentialities	Y	not available	The bonding method used to connect the stretch sensitive Dielectric Electro Active Polymer (DEAP) to the textile wiring of the intrinsic textile integration snap connector may be patentable. The bonding method is the IP of P&R but Ohmatex would most likely make an agreement with the Danfoss PolyPower on exclusive rights to use the PolyPower in this kind of application.	Connection methods for wearable sensors	OHMATEX-P&R
Patent potentialities	Y		A solution for eliminating muscle artifact noise by two sensor strips on the torso combined with intelligent software algorithms could also be a candidate for IP protections. We have seen good results during the development and our internal laboratory tests. To initiate investments we will at least need to have the results from the user	Respiration Rate detection algorithm and sensor principle.	OHMATEX

[8] A drop down list allows choosing the type of IP rights: Patents, Trademarks, Registered designs, Utility models, Others.

			validations at hand.		
Patent potentialities	Y	not available	Individual and automized injection of different Polyurethane systems as an extension of the already existing technology, “shot by shot” to “during the shot”	Innovative injection system for polyurethane soles	DESMA
Patent potentialities	Y	not available	New milling machine for footbed manufacturing, exploiting the *star-gate* concept, meant as novel milling approach based on parallel use of different milling tools.	New process for parallel footbed manufacturing	CNR-ITIA
Standardization initiatives	N	not available	During the project MyWear was undertaken a certification path to create a proper framework to contextualize the environmental performance analysis for the safety shoes. In particular, ITIA and Synesis set up a path to introduce specific rules for the footwear which are used in the workplace. Such standardization type fall under the ISO 14025:2006. A specific PCR (Product Category Rules) has been created in order to address quantitative studies regarding the safety footwear life-cycle. The product category rules are used within the scheme EPD (Environmental Product Declaration) that accompanies different types of products and it has been already created for the leather shoes. The process of public discussion, integration of comments and technical review took almost two years. After such process the rule has become publicly available. As a further result at the end of the MyWear project the first LCA global certification on a safety shoes model will be achievable within the same research consortium.	LCA methodology and specific PCR (Product Category Rules) for safety footwear within the scheme EPD (Environmental Product Declaration) for leather shoes.	CNR-ITIA-SYNESIS

Part B2 (CONFIDENTIAL)

The following table provides synthetic information concerning the most relevant exploitable results developed within the project

LIST OF EXPLOITABLE RESULTS

Description of Exploitable Foreground	Exploitable Results	Sector(s) of application	Time to Market	Patents or other IPR exploitation Forms/Claims	Owner & Other Beneficiary(s) involved
Sensor system platform, is integrated into a special monitoring T-shirt rather than worn over existing clothing. **The T–shirt is then a monitoring platform for respiration or heart rate. The same monitoring system platform adapted to other sensors can be utilized in shoes for plantar pressure sensing.**	**Monitoring System Platform (sensors, connectors, transmitters)**	Companies offering Tele-monitoring health solutions and services. Sport and medical device companies and manufactures of work protection equipment.	1½-4 years after the finalization of the My-Wear project	1) The DEAP material used in the respiration rate sensor solution is commercially availableThe bonding and textile integration methods may be patentable. 2) A solution for eliminating muscle and movement artefact noise by two sensor strips on the torso combined with intelligent software algorithms could also be a candidate for IP protections.	Ohmatex (owner) (IPR1+2); Supsi (IPR2); Ropardo (IPR2); P&R (IPR1), Citeve (IPR1), Longhi (IPR1)
Modular LCA database of footwear components to rapidly assess environmental performances of new product since design phase. Innovation is due to industry based approach which is compliant both with design tools, PDM tools and Certification rules.	**LCA Tools and Methods**	Footwear companies, Designers	2 years	General data for materials are partially available through the public EPD and through private database which are integrated in general purpose LCA tools. No data have been developed for some specific phases.	CNR-ITIA (owner); Collaborations expected on two potential vertical implementations: 1) Base is expected to provide data on components which can be tracked for safety footwear; 2) Citeve can provide data on recyclable

					components.
A set of applications for mobile platforms providing an integrated solution based on a Data Integration Platform (DIP) that serves as common data/logics layer and distributed services aimed at supporting different type of users adopting wearable monitoring devices (patient, physician, etc.).	**Smart Integrated Services**	**End users**, which are patients belonging to different target groups who are involved in working or sport activities and the physicians who are in charge of their health monitoring. **Companies**, such as clothes and shoes producers who want to integrate in their products the sensors and related services. **Hospitals and other medical centres**, who decide to exploit the functionalities of the result as an alternative to standard monitoring services and centralized data handling.	2 years from project end	Exploitation potentialities to be further investigated. The development relies on open source libraries.	Ropardo (service platform owner); Supsi (DPI owner)
Integration of fully atomized generated CAD CAM modules into the novel robot cell for customized shoe production, like disabled persons.	**New robot cells for flexible upper preparation (roughing, spraying, etc.)**	**Footwear manufacturers** in European and other countries with high labour costs	3 – 5 years	The integration of the Software modules into the automation robot cell is a novel technology in the shoe industry and can be worth to be protected	(DESMA owner); Synesis- ITIA providers of CAD-CAM module
Individual and automized injection of different Polyurethane systems as an extension of the already existing	**Innovative system for a modular injection**	**Footwear manufacturers** in European and other	3-5	Investigation in progress for patent	DESMA

technology, “shot by shot” to “during the shot”	**of polyurethane soles**	countries with high labour costs			
New Line of smart safety shoes, designed for very special needs in terms of best fit and arranged for sensors integration on demand.	**New models of smart customisable safety shoes**	**People with health problem** concerning foots or with not common feet dimension.	2- 4 years from the project end	Still to be identified	Base (Owner)
Customized comfortable sportswear garments with biometric sensors integrated into textile materials (trousers and/or sweat shirt or T-Shirt) made with functional and technical knits and fabrics (breathable, moisture management and with UV protection, ...).	**New models of sportswear garments with biometric sensors**	Business towards **consumers belonging to TGs** to be developed jointly with companies offering Tele-monitoring health solutions	0.5 -1 years from the project end	Global garment design and location of sensors in the garment, as well textile integration method, may be registered as design & model by PRT	P&R (owner); Citeve for the fabrics and t-shirt components; Ohmatex, Ropardo, Supsi for the full monitoring system
New milling Machine for customised footbed manufacturing implementing a new process for producing customized footbed in shoe model, reducing overall foot bed costs and engineering times by means of fast milling techniques	**New Milling Machine for customised insole production**	Companies operating in the following sectors/markets: • **Orthopaedy** • **Workwear**	1 – 3 years from the project end	Investigation in progress for patent	ITIA – Synesis Owner

RELEVANT CHARACTERIZATION OF THE EXPLOITATION PLANS

RESULT	MAIN EXPLOITATION OBJECTIVES	IPR ISSUES
MONITORING SYSTEM PLATFORM (OHMATEX)	Ohmatex is looking for partners available to sustain economically (also jointly) further developments needed for get to reliable applications in footwear, garments and other industrial sectors. These additional developments for sure imply miniaturization and production cost reduction, as requested also from MyWear partners. Direct industrial use – possibly with protection of use of DEAP sensor technology for this application. Potential re-use of this technology as a stretch sensor in Ohmatex Edema stocking – potentially licensing rights to the textile attachment technology and software app. Explorative actions in the very preliminary phase have been started with DESMA for the joint development of specific solutions addressing the footwear industry.	Ohmatex is the sole owner of the IPR on the electronics and the textile cabling. IPR for the connector is jointly owned together with Synesis, and the algorithms IPR are shared with SUPSI. Future customers may be granted exclusive rights for exploitation of the platform for a specific sensor application or market. Detailed agreements then needs to be discussed with P&R as one of the potential customers of such technology for the set-up of a new line of sportswear.
MODULAR LCA TOOLS FOR FOOTWEAR COMPONENTS (ITIA-CNR)	During the project My-wear has been undertaken together with Synesis a certification path to introduce specific rules for the footwear which are used in the workplace. Such standardization type fall under the ISO 14025:2006. A specific PCR (Product Category Rules) has been created in order to address quantitative studies regarding the safety footwear life-cycle. The product category rules are used within the scheme EPD (Environmental Product Declaration) that accompanies different types of products and it has been already created for the leather shoes. After such process the rules have become public. As a further result at the end of MYWEAR project, the first LCA global certification on a safety shoes model will be achievable within the same research consortium. Base Protection is envisaged to be one of the first customer/partner for an industrial application.	Synesis is the partner that mainly developed the ICT support to the new LCA methodology. Any business initiative will be undertaken by the two partners together.
SMART INTEGRATED SERVICES (ROPARDO)	ROPARDO will invest in consolidating the know-how accumulated in the field of wearable devices integrated with the smartphone applications. The expertise obtained during the MyWear project will help at acquiring new	The DIP defined by SUPSI provides the data model basically used by Ropardo for the smart services applications. SUPSI claims would mainly consists on giving evidence of the scientific contributions to the development of the whole

	research projects but also commercial projects. ROPARDO then is interested in developing products, meaning new apps based on iOS and Android platforms that can be integrated with the wearable devices (smart watch, bracelet, socks, band with heart rate sensor for monitoring) existing already on the market: SAMSUNG, SONY, Apple, Microsoft, FitBit. The innovation feature will reside from being the app independent from the producer of the devices. But, to bring this new product on the market are necessary some investments related to the production area as well as sales knowledge (online).	platform. Beside this contribution, no patented technologies have been used and installed inside the mobile app and inside the data collection module.
NEW ROBOT CELLS FOR FLEXIBLE UPPER ROUGHING/CEMENTING (DESMA)	After the necessary improvement needed for an industrialized system, DESMA will go to the market with the robotized manufacturing cell. DESMA is seriously interested into the CAM solution developed by Synesis. It has been agreed to start a specific discussion in the early next year. This solution is really interesting for DESMA that is targeting a joint development.	Follow-up agreements to be reached with **Synesis** for joint industrialization actions and development plans related to the integration of the CAM module within the control system suite of the robotized cell.
NEW SOLUTIONS FOR FLEXIBLE INJECTION (DESMA)	DESMA has developed a new and innovative technology in order to create the possibility to overcome todays fitting problems for the production of personalized soles and polyurethane components in general. Based on a newly developed injection technology for using a broad range of different additives for modifying the material properties, there is now the option to react much more efficient on the needs for the different human needs. This result for DESMA is one of the most promising outcomes of the project and before any business exploitation this technology will be protected by an appropriate patent registration.	No specific contributions developed by other project partners. Just Base Protection has been involved for testing early outcomes and validate the technology for its potential applications in the footwear sector.
INNOVATIVE SAFETY SHOES (BASE PROTECTION)	Base Protection is going to launch a new model of safety shoes that will widely be based on the technologies developed in MyWear. The innovative features for these products will be the high level of customization and configuration options: different structural component variables (including different lasts, footbed thickness and plantar arch types)	Not applicable for Base Protection, since there are no thigh critical dependencies from other project results (owned by other partners) or any patented technologies.

	able to provide a quite wide range of 27 options for a fine selection of the best fitting measures. In order to put on the market such innovative type of products it is necessary to make some investments related both the production-logistic area as well as the sales structure. As far as concern the sales organization, the most important investment will affects a certain number of sales points that should be equipped with specific type of scanners and provided with qualified sales persons able to take the individual anthropometric measures for each end-user.	Some of the manufacturing technologies developed within the project by DESMA and ITIA-CNR could be adopted by Base Protection. In this case a special agreement based on the partnership in MyWear is envisaged. LCA tools developed by ITIA and Synesis can also be considered for an early adoption by Base Protection for a fine tuning of the methodology and software tools.
SENSOR-BASED SPORTSWEAR (P&R)	P&R is evaluating the concrete opportunities for the launch of an innovative line of sportswear integrating some of the wearable technologies developed in MyWear. In order to evaluate the business feasibility and market potentialities, it's necessary to have a reliable final product (costs and technical as well as functional features) and show it to end users for detecting the real acceptation possibilities. Another critical problem is the target price that at the moment, based on the input provided by Ohmatex, seems to be too high comparing with our competitors in market. P&R strategy will be to find a partnership with other company that is into wearable market, as it's more easy to reach this specialized market. The contribution of our partners in MyWear will be the decisive to reach a lower and competitive price that is one of principal points of this project. So the strategy depends on this and of course the time to go into market for the monitoring systems crucial to avoid competitors innovates that is very quick. P&R anyway, supported by CITEVE, has gained a very good experience on the design side of such innovative garment line (materials, functionalities, tec..) and in the future may decide to invest on this market trying to identify appropriate solution providers for the monitoring system components.	The launch of a new product line of t-shirts integrating the monitoring device is strictly related to the set-up of specific agreements of P&R with Ropardo, as far as concern the smart services on mobile platform (smartphone), and Ohmatex, as far as concern the supply of the sensor based platform. The agreement with Ropardo seems to be quite feasible, although an industrialization phase is still needed on the software platform. A more complex situation seems to be on the side of the hardware platform, where the agreement with Ohmatex would depends on the decisions on the time/cost of the further developments still needed basically finalized to get the level of cost and miniaturization required to compete with alternative solutions.
NEW MILLING MACHINE FOR CUSTOMISED FOOTBEDS	The new milling machine for footbed customised manufacturing represents both an intermediate output, in the strategy to provide more customized	No specific contributions developed by project partners.

(ITIA-CNR)	footbed, based on multilayer material sandwich, and tangible output to be engineered for further commercialization. The latter option will be considered in addressing orthopedic as well as sport centers, being these subjects the ones in charge of delivering to the (sport) consumer accommodative footbeds. An important aspect to be considered is a simple CAM package to be delivered together with the machine. This result for ITIA-CNR is one of the most promising outcomes of the project and before any business exploitation this technology will be protected by an appropriate patent registration.	