

## MARKET APPEAL REPORT

*(regarding the concepts of the AGEDESIGN project, following the presentation meetings with companies, research centres, universities, investors and other stakeholders)*

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## 1. Premise

The project consists of joint research activity (Veneto-Salzburg) oriented to the definition, development and testing of new “design concepts” of products and services for the ageing population: the main objective of the project is to provide suitable tools which in the near future can help the improvement and preservation of health and wellness for elderly people, and to prevent the emergency of physical and psychological issues.

The project starts from the definition of four research lines, then collected in three main issues to address considering the state of art of elderlies' lifestyle in both Italy and Austria. The research continues with the identification of the “design brief”, then developed into the “design concepts” that will be realized in form of “kits” to be tested in laboratory and in an external environment with real users. The demonstrative panel of end-users is selected in both the regions for the check of the usability of the kits, composed of wearable devices and supporting software running on smartphones. The completion of the research implies the validation of the outcoming systems, the verification of the market appeal and the drafting of possible implementation of the research. The aim of the resulting kits is supporting the users to adopt a healthier lifestyle in a home-based environment.

The present document introduces the research areas addressed by the AGEDESIGN project, focusing on the design of the wearable devices by distinguishing them with the differentiation of the research lines of reference.

The first section describes the research lines and the premises for the brief, the following sections concern the process that drove from the brief to the concept development. Each section addresses the sketching phase, the definition of the electronics and the modeling, to synthesize the results into the prototypes of which consists AHAMS, the final kit subjected to the users.

The last section presents the development of the QUALIFEDESIGN platform.

## 2. Agedesign Concepts

The future of wearable devices integrates existing technologies at affordable prices, encouraging the adoption of health monitoring technologies in everyday life. These facilitate home assistance during the performance of physical activities inside and outside the home perimeter in a friendly way, becoming tools that look like fashionable accessories and clothing which collect and manage specific physiological and behavioral data. By the term “design brief” we intend here the specification of the typology and the characteristics of the products on which the researchers have worked to address the four research lines introduced in the AGEDESIGN Project Agreement. The characterization implies the study of technical components, ergonomic aspects, performance, aesthetics and the interaction expected.

Despite the identification of four research lines into the Interreg Ita-Aus Agedesign agreed document (vascular circulation, muscular control and balance, sensory abilities and dehydration), the preliminary research phase has driven to the identification of two research lines as similar and addressable with the same technology: to avoid the design of products with analogous functions and features, “muscular control and balance” and “sensory abilities” have been merged in a single research line (Table 1). Once defined the typology of sensors the partners agreed upon the design brief to combine three aims – muscular control, balance and sensory abilities into a unique smart tracksuit. Eventually, the design brief and the concepts developed into the project are two:

- *vascular circulation and dehydration;*
- *muscular control, balance and sensory abilities;*

The first approach to the research lines has been oriented to a general identification of the physical parameter to monitor in order to get the relevant data that give an overview on the user’s situation. The users have been identified as persons over 65, with an healthy lifestyle and without existing pathologies: they might have familiarity with diseases such as diabetes, high or low pressure, hypertension, arthritis, sarcopenia

but they have not been diagnosed with any of these; therefore the use of medical terms in the development of the project shall not imply the treatment of the user as a patient but the goal of the research is to develop a product, or a series of products, that address the lifestyle of different personas in a programme of prevention of any disease that can occur in connection to the ageing process. The wearable devices designed through the project will provide support to the users for reaching a healthier lifestyle in an home-based environment, therefore they won't be registered as medical devices.

The second step after the identification of the parameters has been the research on the existing technologies that monitor such parameters. The decision to work towards the prevention of the disease instead of the treatment of the same has oriented the researchers to exclude the technologies that require invasive monitoring techniques. A brainstorming phase was necessary to understand and define aims and electronic components for each project's lines.

A list of possible sensors to use for the development of the project has been provided by SFRG and PLUS in the document "First sensors assessments" shared with the partners in June 2017.

The details of the two research concepts will be exploited in the following paragraphs.

**Table 1 - Definition of the design concept (WP3.2)**

Research lines	Vascular circulation	Dehydration	Muscular control and balance	Functional abilities
Design Brief	to monitor heart beat and detect cardiac anomalies	to monitor the dehydration during the day	to monitor physical activities, lack of balance and loss of muscular tone	to monitor the lack of balance during physical activities
	Photoplethysmograph	Bioimpedance sensor	Inertial measurement units sensors	Inertial measurement units sensors

↓

Concept	wristband + hub	smart suit

## 2.1 Vascular circulation and dehydration concept

The dehydration and circulation monitoring kit consists of the wristband and the hub.

The wristband is designed to fit a variety of wrist dimensions, following a one-size-fit-all dynamic, therefore the holes distributed on the strap allow the regulation of the adherence of the sensor to the skin. The hub comes in a single size and it is designed to allow further implementations to become a telemonitoring deck.



**FIG. 1 - The final version of the wristband and hub**

## 2.2 Muscular control, balance and sensory abilities concept

The motion control kit is composed of a suit and a set of sensors. The suit prototypes have been produced in Male version, sizes M and L, and Female version, sizes S and M. As a result of laboratory testing conducted by the SRFG and PLUS partners, the IMUs were reduced to a number of 6 sensors for each user.



### 3. Presentation to entrepreneurs, innovators and investors

The following meetings were conducted by engineer Donato Bedin in collaboration with the project team of the IUAV University of Venice to understand the best way to further develop the results of the AGEDESIGN project, as well as the potential and their market appeal.

1. Presentation meeting of the AGEDESIGN concepts to the Rotary members of Vicenza on Maj 9, 2019
2. Investor meeting with SERVICE MED SPA, in Bussolengo Via dell'Agricoltura, 38, (VR) - Maj 27, 2019;
3. Meeting with the staff of Friuli Innovazione (Udine) on 16-07-2019 to transfer the results of the AGEDESIGN project and evaluate the possibility of further meetings directly with potential investors;
4. Meeting at Veneto Innovazione Mestre (VE) 10 September 2019 to insert the project within the EEN Network;
5. Meeting at APINDUSTRIA VICENZA on 30-09-2019;
6. Meeting at the UNIVERSITY OF VERONA - MOTOR SCIENCE FACULTY on 8-10-2019;
7. Participation in the B2B of Trieste on the occasion of the "Meet in Italy for Life Sciences 2019", held in October 2019 at Punto Franco Vecchio Magazzino Molo IV, Trieste;
8. Meeting with INN.IMPRESA s.r.l in Padua on 28-11-2019.



9. PARTICIPATION IN THE WORKSHOP "RESEARCH, INNOVATION AND NEW ICT CHALLENGES FOR BIOMEDICAL" Thursday 19 December 2019, - Chair: prof Luigi Rovati

Likewise, on the Austrian territory, the results of research on the measurement and control of movements obtained with AGEDESIGN have been promoted by Salzburg Research and PLUS on multiple occasions.

1. Meeting for dissemination purposes with Mag. Manfred Feichtenschlager, Head of Department of Social Work at Hilfswerk, (Salzburg/Austria) and Michèle Zlöbl, Paramedic at Red Cross Austria on 27.11.18.
2. Exhibition at Salzburg Sports Physio Symposium (SSPS) 2019 on 10.-11.05.19 with over 200 participants and 20 companies/exhibitors that are closely related to the health care and health improvement sector.
3. Project presentation in the Ambulatorium Nord (outpatient rehab center) in Salzburg with the owner Dr. Edith Huber and four employees (September 20th, 2019). The Ambulatorium Nord is a rehabilitation center specialized in cardiovascular health.
4. AgeDesign was represented in a booth at the "Smart Living Forum" during the "Innovationskongress 2019" in Villach/Austria. The main focus of the forum was healthcare topics in general (focus on ambient assisted living/AAL), with about 1000 visitors to attend the congress itself. Visitors (students and industry) during the Smart Living Forum were mostly regional and from the DACH region, with interests from Italy as well.

## 10. Interests found and important indications learned

Following the meetings and exchanges of information, interesting attentions were found to the AGEDESIGN concepts, which bode well for future developments. Some of them are given below as examples.

- After the meeting with Veneto Innovazione, the AGEDESIGN project was added to the EEN network for partner research to continue further developing the concepts after the end of the project.

There were two interests in the project respectively from:

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Helbling Technik is an innovation and engineering service provider with deep expertise in the development and industrialization of medical products class III & software class C. Our 350 engineers, MDs/PhDs are among the fastest to deliver functional and approved products.

It innovates and develops prototypes, proof of concepts and systems for commercialization. It runs feasibility studies and manage R&D. Additionally, it develops software for simulations, actuators, sensors, data gathering & processing algorithms.

It follows a business case centered approach and does not claim interest in IP.

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INSTITUT "JOŽEF STEFAN"

Profile: TOIT20191017002: New active and healthy ageing monitoring system for athletes

Expression of interest (made on 30 Oct 2019 6:15:35 AM )

The company markets the SAVVY ECG, that is an ALL-IN-ONE MEDICAL DEVICE for ECG monitoring - Atrial fibrillation (AF, AFib) - Prevention against Cryptogenic stroke (TIA). The device is a LONG TERM - (500 charging battery cycles - one cycle is up to 7 days).

SAVVY ECG was developed in cooperation with R&D team of Parallel and Distributed Systems Laboratory, Department of Communications Systems at Josef Stefan Institut.

*Ongoing contacts with both companies are held by Prof Chiapponi of the IUAV.*

- After B2B in Trieste, contacts continued with the CBA Group of Rovereto (TN) Italy, leader in integrated software solutions for the assistance and care of the elderly, which is interested in the

dehydration measures developed with the AGEDESIGN project. Contacts have been made with Sara Turrini and CBA's Research and Development manager and will continue in 2020.

- Interesse per i concept AGEDESIGN è stato dimostrato da Inn.Impresa di Padova (dottoressa Alfonsa Martelli) per verificare la possibilità di sviluppi collaborativi sui temi AGEDESIGN in funzione di nuovi progetti a finanziamento UE e regionale, specie con il cluster RIBES. La Rete Innovativa Regionale, RIR RIBES-Nest, riconosciuta dalla Giunta Regionale del Veneto con dgr 1697 del 2016 nasce per agevolare la crescita e lo sviluppo attraverso l'interazione tra settori tradizionali e settori emergenti che gravitano intorno all'Ecosistema della Salute e dell'Alimentazione Smart.

Interest in AGEDESIGN concepts has been demonstrated by Inn.Impresa of Padua (doctor Alfonsa Martelli) to verify the possibility of collaborative developments on AGEDESIGN issues in relation to new EU and regional funded projects, with the involvement of the RIBES cluster. The Regional Innovative Network, RIR RIBES-Nest, recognized by the Veneto Regional Council with dgr 1697 of 2016, was created to facilitate growth and development through the interaction between traditional sectors and emerging sectors that gravitate around the Ecosystem of Health and Smart food.

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- Further discussion for new project development about AGEDESIGN concepts, are been pushed on with the elderly care giver ISRAA di

Treviso (dr Oscar Zanutto). They intend to investigate the possibility of using the AGEDESIGN concepts to facilitate the management of the elderly when they temporarily leave rest homes.

*ISRAA-Istituto per Servizi di Ricovero ed Assistenza agli Anziani- Institute for Elderly Hospitalization and Assistance Services*

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- After the Meeting for dissemination purposes with Mag. Manfred Feichtenschlager, Head of Department of Social Work at Hilfswerk, (Salzburg/Austria) and Michèle Zlöbl, Paramedic at Red Cross Austria, emerged the possibility to integrate the AgeDesign smart suit with their facilities for model flats. A good starting points for future collaborations.
- Concerning the project presentation in the Ambulatorium Nord (outpatient rehab center) in Salzburg, the health professionals in the audience were especially intrigued by the idea of monitoring patients' compliance with a prescribed exercise regimen. Furthermore, they appreciated the data-driven approach that can help them to monitor patients' progress objectively.
- After the "Smart Living Forum" during the "Innovationskongress 2019" in Villach/Austria, one interesting contact from "Techpark Südtirol" (Bozen/Italy) is noteworthy as it could result in further collaboration.  
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**What was learnt from the market appeal meetings and related discussion is very important and reveals aspects to take into account for further AGEDESIGN concepts deployment and new further research.**

- a- In general there has been an interest for motion detection systems that are simple to wear and use, which can be used for a variety of exercises and which, in addition to being functional to programs for maintaining physical efficiency, communicate with more complex protocols of care and rehabilitation.
- b- The presentation of AGEDESIGN project to the owners and employees of the Outpatient Rehab Center for Cardiovascular Diseases <https://www.ambulatoriumnord.at/> in Salzburg shows how the concepts AGEDESIGN integrated with other sensors, could help the patient to continue the training program after the rehabilitation phase (the rehabilitation program aims to restore the health and fitness of patients to the best possible extent in the 1-6 month intervention period). An important step that indicates possible directions for AGEDESIGN concepts application.
- c- There was great interest regarding the exercise data recording. Some manufacturers considered how to connect the IMU-based sensor technology directly to the screens of fitness equipment instead of an additional app (cell phone/tablet). Some exhibitors during the exposition, in which AGEDESIGN motion capture and recording system was showed, were amazed at how inexpensive, miniaturized, and equipped with high storage capacities these sensors are. There was enthusiasm for easy integration into clothing without impairing the movement requirements, but still capturing relevant movement properties.
- d- The measurement of dehydration remains an open chapter, especially for the elderly. Up to now there is still no measurement and alert system that is easy to wear and use and which, at the same time, ensures acceptable levels of accuracy and reliability. The concept developed with AGEDESIGN certainly places itself in a sector

of high demand for solutions for the elderly and its configuration distinguishes by responding to the most significant needs that have been found on the market.

- e- A good interest has emerged for the platform, developed by the IUAV University of Venice, for the control of human health parameters, which communicates with mobile APPs connected to the monitoring sensors worn by the user and with a small easy-to-use domestic HUB, that physically allows to expand the physiological measurements that can be made at home, in addition to those provided with the bracelet.
- f- there is a world of applications of the measures of physiological parameters and of movement, different from the medical one of rehabilitation and personal care, that are less stringent as regards the parameters of acceptability and requirements for the recognition of their normal use. These can be widely contaminated by findings developed with medical research. These are the fields of ergonomics and human-machine interaction, which belong to different sectors, such as manufacturing, logistics, maintenance, heavy mechanics, to name a few. AGEDESIGN findings can be interesting for these sectors both in the monitoring of physical effort and in the study of solutions aimed at reducing fatigue and the risk resulting from out of limit physical effort.
- g- During the meetings, the importance that AGEDESIGN concepts can have in the life insurance world also emerged, in the sense that their application for monitoring the physical state of the person could be a condition for lower insurance expenses. The equivalent of the black box for a car insurance. Of course, this requires the development of service organizations, which support the use of these wearable concepts in a widespread and reliable way, in co-branding with well-known insurance companies. This aspect also emerged from the meetings of the Austrian partners with organizations interested in

the care and guarantee of life of the person. The thoughts regarding the possibility to monitor the physic exercises of an elderly often went in the direction of the collaboration with the insurance companies. For example, the amount of the self-contribution for various medical expenses could be linked to the compliance of the given exercise programs. The project would allow with few extensions of the collection of such personal data additional interesting results.



## 11. Program of further actions and possible developments

The interest in the dissemination and further development of the functionality of the AGEDESIGN concepts does not stop with the end of the project but continues with a view to maximizing the results achieved with the project.

The AGEDESIGN themes are fully included in the objectives of the new BIOMEDICAL cluster that the IUAV University of Venice is about to start in 2020. Within the Cluster, companies interested in forming a RIR - Regional Innovation Network- are currently being identified, capable to present projects on biomedical topics and in particular on the development of devices for active and healthy aging on the basis of the AGEDESIGN results.

An opportunity to involve Veneto Region companies in the development of new applications, that can capitalize on the know-how and results, achieved with the AGEDESIGN project, is represented by the publication of calls for the financing of research and development projects. One of the funding option sponsored by Veneto Region is represented by the line "1.1.4 - Research and development projects by regional innovative networks of enterprises or by clusters of Veneto enterprises" under the POR FESR 2014-2020 funds. The related Call will be published not before February 2020.

In this regard it should be emphasized that in Veneto there is a RIR, called RIBES - INNOVATIVE NETWORK FOR THE HEALTH ECOSYSTEM AND THE SMART FOOD, which brings together companies that develop product for the health chain, from food to personal care. Contacts and discussions are being opened with members of the RIR board by University IUAV - Industrial Design and Multimedia and CPV Foundation.

Another opportunity, to be carefully evaluated, will be represented by the forthcoming release, in the first half of 2020, of the Veneto

Region call for tenders, that funds the use of researchers in companies, by drawing on the 2014-2020 ERDF POR funds. Being able to involve private companies in the continuation of the development of the AGEDESIGN discoveries through the funding of researchers who could work at the IUAV Industrial Design and Multimedia University, would truly represent a great chance for SMEs in the VENETO Region.

Two other POR FESR financing lines in the Veneto region to finance further developments of AGEDESIGN, also looking at the possibility of creating a start-up to enhance the AGEDESIGN concepts, could be “3.5.1 A - Creation of manufacturing SMEs and Services” and the “2.2. Digitization of the P.A.”, foreseen the last POR FESR 2014-2020 calls. In fact, an important sector for the application of services based on the AGEDESIGN concepts is represented by equivalent public and public organizations, which deal with the care of the elderly by providing food, accommodation and medical assistance. Contacts are in progress with these organizations, in particular ISRAA of Treviso, to decline the use of the AGEDESIGN concepts in relation to specific new services for elderly guests.

Collaboration between universities and between universities and industrial districts is also bearing fruit. In fact, it emerged the opportunity to give a thesis by Prof Rovati of the University of Modena with the collaboration of the IUAV University of Venice and the Re: Lab company of Reggio Emilia, with the aim of investigating and finalizing possible solutions regarding some of the problems that arose during the development of the AGEDESIGN concept for dehydration measurements with sensors placed on a wrist strap. The possibility of presenting the results of the AGEDESIGN project in one of the next events scheduled in the Biomedical district of Mirandola in Emilia Romagna for 2020 was also taken into consideration.

Following the numerous one-to-one discussions held by Salzburg Research during the Salzburg Sportphysio Therapy Symposium with representatives of companies such as SüssMed <https://www.suessmed.com/>, Storz Medical Alliance <https://www.storzmedical-alliance.de/>, Synaptos <https://synaptos.at/> and others, further single meetings are foreseen with someone of such companies in the first part of 2020 year, to go into more details concerning AgeDesign suit and sensor technologies for recording motion parameters during selected training exercises.

The network and the network of international contacts that emerged with the development of the AGEDESIGN project, is making it possible to expand the spectrum of AGEDESIGN concepts through EU-funded projects, such as H2020, Life and AAL. The related calls are under consideration by the project partners, in particular the CPV Foundation and the IUAV University of Venice. Contacts are also underway with the University of Modena and The European Platform for Sport Innovation (EPSI) through Prof Medardo Chiapponi of IUAV University in Venice.