AAL Joint Programme – Call 6 - DoW

Description of Work (DoW)

Based on PartB

AAL-6-2013-64

Application areas:	Stress monitoring & response, traffic safety
Proposal full title:	Ambien**T** **R**esponse to **A**void **N**egative **S**tress and enhance **SAFE**ty
Proposal acronym:	Trans.Safe
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4	VAG Verkehrs-AG Nürnberg	VAG	SME / End-user	DE
5	MAN Truck & Bus AG	MAN	LSE / End-user	DE
6	Scuola Superiore Sant' Anna	SSSA	University	IT
7	konplan systemhaus ag	KON	SME	CH
8	Design LED Products Ltd	DLED	SME	UK

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Release History

Release Number	Date	Author(s)	Release description /changes made
V1	31 July 2014	Martin Biallas / HSL	- Budget updated - Changes in WP2 and WP5 (description, tasks, deliverables) - Change deadline of D3.1 - Defined lead for all deliverables
V2	17 November 2014	Martin Biallas/HSL	- Budget for YOUSE updated.(Including following changes in staff effort and effort per WP)
V3	6 January 2015	Martin Biallas/HSL	Added type of deliverable in WPs (e.g. “report”, “prototype”), documenting who is responsible for milestones.

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Section 1: Relevance and Scope

1.1 A short summary of the challenge addressed and the overall project idea

"More retirees want to work" – was a headline in the German news Tagesschau on 15/08/2012 after a study showed that the number of working people above the age of 65 had doubled within 3 years. At the same time the EU conducted a study (EWCS, 2010) which indicated that more than 22% of employees in the EU think that their health or safety is at risk because of their work. The percentage even increases considerably when the people asked become older and work in jobs with high personal and public risk and irregular working hours. This is especially true for physically and psychologically demanding working places in the transportation sector with high physiological stress potential (truck drivers, train drivers, taxi drivers, control room personnel etc.). Companies need to find ways to keep their experienced personnel motivated, fit and on duty while at the same time guarantee their personal and the public safety on the background of the on-going demographic change.

In Trans.Safe, we will develop a system to support senior workers who can and wish to stay actively longer in a job position with a high personal and public safety risks. The solution will help the senior workers and employees utilizing three mechanisms or steps:

(1) Stress parameter (overwork/under-challenge) measurement and real-time information: Trans.Safe will continuously and ambiently measure physiological relevant parameters and give direct and 'private' feedback about the personal well-being to the employee through a user interface. For example, the worker will recognise situations of overstress or under-challenge – which would both be risky in sudden case of a deviation from the normal operating procedure.

(2) Ambient stress response: Based on the collected data, a stress response will be triggered that actively supports the biology of the worker through calming or activating light as well as sound barriers and other measures. This will keep the stress levels healthy and the employee alert (e.g. calming light after stress situations, activating light if tired). This results in a safer environment.

(3) Evaluation, encouragement and work flow adaptation: Through a continuous monitoring and the corresponding feedback, the senior employee will get information about his/her performance curves throughout the day and be encouraged to take breaks or be active according to his/her personal preferences and physiological needs. Based on this, employees can develop coping strategies by adapting their working schedule according to their individual needs.

Trans.Safe will increase health, safety and well-being at work, making it possible for employees to stay active for longer and give peace of mind for the employer to hire and keep the older workforce.

Figure 1: Trans.Safe Application Scenarios

The Trans.Safe system will be developed in close cooperation with employers from different industries (i.e. its partners MAN, VAG) and employees (individual employees and work councils) in order to create a user-friendly and innovative real-time health-monitoring and health-activation micro-system applicable in different industries and cultures.

The benefits of Trans.Safe are manifold for seniors, employers and the society: **Seniors will benefit** regarding their health and safety in a variety of job positions, especially those under stressful and demanding conditions. The Trans.Safe system will support and empower these workers to stay in their jobs longer than hitherto while reducing their stress levels or activating them and thus increasing health and safety. Additionally the system will support these workers to individually manage their physical resources according to their personal characteristics, which should increase motivation due to more informed self-determination and less experience of failure. Employees will also benefit in their private time, as they better understand the dynamics of their physiological limits and will thus also be more aware in their leisure time - for a better work-life-balance (Crompton & Lyonette, 2006).

Employers will benefit, as they are able to keep their skilled elderly workers employed longer on the job. It will also help companies to structure the workload healthier and more efficiently, thereby reducing absence. Obviously, the system will also increase safety at work.

Society will benefit, as it will experience higher public safety due to the healthier working environments in jobs with high public safety risks. Furthermore, the society will benefit by reduced health care and pension costs, as people can stay longer and healthier in their jobs. Also, the system will secure work possibilities in times of demographic change.

Table 1: Summary Box

Summary Box: Relevance and General Idea of Trans.Safe	
Idea:	Support senior workers through individualized activation and tranquillization measures according to their personal stress levels at work, providing a healthier and safer work environment, empowering them to stay active and healthy at work for longer and increase public safety.
Target Group/s:	Senior workers in jobs with high health and public risks especially at physically and psychologically demanding working places in the transportation sector (lorry-, bus-, train drivers, people in control centres).
Model:	Combination of ICT sensors to measure physiological data, actuators to stimulate or calm stress at work and personalised real-time information feedback.
Innovation:	Combination of negative stress and under challenge monitoring and detection, real-time user information, direct stress response measures and workflow optimization that goes beyond the state of the art. • Fusion of unobtrusive, ambient low-cost sensor data to monitor stress-levels, whenever possible while minimizing direct physical contact to the worker • Algorithms to evaluate different sources and information of physiological data • Actuators of light and sound to directly response to the monitoring and react in critical situations at work through biologically activating light, sound, etc. • Mobile user interfaces with real-time feedback informing the worker about his current physical and physiological condition • Workflow optimisation by historical data analysis and personalised advice • Consider multi-person workplaces (e.g. central control room) as well as dynamic, mobile one-person workplaces (e.g. cockpit of a lorry) • Open interfaces to existing driver assistance systems in vehicles and information networks of control rooms to increase quality of monitoring and stress responses
Time-to-market:	Trans.Safe system available on the European market 2 years after project completion

1.2 Alignment with the call topic

The Trans.Safe project will develop an innovative ICT-based solution to support elderly people to stay in the work force longer and help employers to retain the knowledge and expertise of senior workers in the workplace. This will be done by innovatively combining existing technologies of sensors, user interfaces and stress response actuators (light, sound, etc.), for which new algorithms and user interaction concepts will have to be developed.

In order to make the user interaction as simple as possible, the user perspectives (especially the primary end users (elderly employees) and secondary end-users (employers)) will be professionally analysed and will influence the development of the Trans.Safe system throughout the whole project with methods of user integration, user centered design and universal design. Through the collaboration with different industries and cultures, the results of the project will be transferrable to different work environments and countries.

The Trans.Safe system will have several advantages for the primary end users, the secondary end users and the society. Specifically, the Trans.Safe project will make working in jobs with high public risks safer and healthier. Those kinds of jobs, like working as a truck driver, working in a control room of an airport or a train network, or also managing the safety of a power plant, are characterized by high stress dynamics. So on the one hand the stress levels can be extremely high during regularly happening deviations from the “normal operating procedures”. On the other hand there can be longer, monotonous working periods where there is not much activity and the concentration may decrease. In these calm times no activation through work is happening although the workers need to be alert all the time. These dynamics are especially straining for older people as they are more prone to experiencing stress and their health suffers more than those of younger employees. At the same time older employees have gained substantial skills, expertise and knowledge in managing critical situations over their working life so they have also become a valuable resource for employers, who want to keep them as long as possible.

With the Trans.Safe system, older employees will be able to stay on their workplace for longer, helping seniors, employers and the society with the three mechanisms explained in section 1.1: (1) measuring

and real time feedback, (2) stress response (3) evaluation and adaptation. Moreover, with Trans.Safe, the employees can easily transfer this knowledge about their stress experiences to their spare time activities. The senior employees will learn about their personal strengths (e.g. when are they comfortable doing specific tasks), making their purpose in the job more meaningful and increasing their motivation. Also, they will feel safer and more secure. Finally, the employees will be generally healthier as their average as well as peak stress levels both decrease.

As a result, employability of older people increases, benefiting employees and employers across a number of industries as well as the society as a whole. Employers, for example can employ older people for longer, retain their knowledge for longer in the organization and attract new employees when using Trans.Safe as they will be seen as promoting a healthy working life. For the society, health care costs will decrease. Finally, the industrial base in Europe will benefit from the smart, innovative Trans.Safe ICT solution and its services.

1.3 An example scenario

Manfred loved his job in the railway control center. He had been responsible for overseeing the trams and subways, checking their punctuality and reacting on any deviation for 30 years now. Of course, the computer controlled systems have eased his job a lot, but in case a vehicle braked down, an accident happened, the energy was cut or in any other unplanned circumstances, he needed to react fast and precise in order to prevent even worse scenarios. After all, the system had become so complex with all the interchanges and dependencies between the trains, that after every incident, it was extremely important and demanding to get things moving again as fast as possible.

With his many years of experience, Manfred's knowledge of the whole train network was admired by all of his colleagues. But with his increasing age, he was turning 62 this year, he was not sure whether he was still up for the job – it was stressful and sometimes he worried that his health was in danger. He loved his work but was afraid to make a mistake and with this putting the safety of others at stake.

He asked his boss for a job that was less stressful and was putting less people at risk. His boss contemplated, but then decided to install the self-monitoring health system Trans.Safe at Manfred's work place. Trans.Safe monitored the physiological performance and capabilities of Manfred and showed him exactly, when things became too stressful for him and recommended to take a break through a user-friendly graphical user interface. This way, Manfred could learn how to arrange his energy throughout the day with the good feeling to still support his colleagues with his knowledge, but also take care of his own health. At the same time, Trans.Safe controlled an ambient light- and sound-system that made use of the biological effect of light on well-being and controlled the sound that reached Manfred. At first Manfred wondered about this system, as it sometimes changed light colour and light intensity to supposedly activate Manfred when he was tired or calm him in stressful situations. But after a week, Manfred did not even take any notice of the changes of the light any more, but just felt more energized throughout his workday.

When his boss asked Manfred two months after the installation of Trans.Safe about his well-being, Manfred could only report that there is no need to replace him yet! Manfred even informed the boss about the new Trans.Safe model to be integrated into the tram cockpits. It would have the same positive effect on the drivers and with this reduce the stress of the control room personal even further.

1.4 Success parameters of the proposal

The Trans.Safe project must overcome several technical and ethical challenges in order to produce a product and service of value for an ageing workforce and their employers.

Regarding the technological challenges, four must be solved particularly:

1. **Measurement:** Selection of suitable physiological parameters and the according set of sensors to measure physiological stress and detect situations of overwork or under-challenge
2. **Validity:** Correct interpretation of physiological data specific to the workplace circumstances and individual capabilities
3. **Value:** Development of a system (i.e. the ambient light system, feedback system) that supports the worker in reducing stress and increasing well-being
4. **Usability:** Creation of a system with everyday usability, practicability (i.e. across different work places) and reliability

The following table provides some more specific descriptions of the success parameters:

Table 2: Technical Success Parameters

Challenge	Success parameter	Proposed Solution
Measurement: Artefacts	In order to get reliable and interpretable data, artefacts must be minimized in measuring physiological data.	Combination of existing and proven measurement methods for physiological data combined with new sensors and technologies (e.g. auto fluorescence, movement).
Measurement: Parameters	The data must be measured (and interpreted) in more than the two distinct states of "tired" and "not tired", as in most previous studies	Stress parameters need to be defined that can be clearly and reliably measured identified and interpreted under real life situations. A distinction of 3 to 5 classes is thinkable (similar to a traffic light).
Measurement: Real time measurement	The data must be measured and interpreted in real time, not offline like in most existing studies (i.e. after the measurement).	An ambient measurement system should be developed that is easily accepted by workers and is hence used. This is also possible through wireless connection of the sensors (e.g. EnOcean)
Validity: Interpretation of external parameters	External parameters influence the stress parameters, the measured stress parameters and the accepted stress parameters at the workplace. This has to be taken into account for the solution to be applied to a variety of work places.	In order to understand the physiological reaction of workers to different stress and external factors as well as the accepted stress parameters, physiological simulations, user integration (e.g. for the research of acceptance levels) and tests in real situations are necessary (e.g. what happens if the weather is really cold; what happens if the worker is stressed from private life).
Validity: Interpretation of intra-individual differences	The Trans.Safe system needs to take into account that stress levels and stress sensitivity vary throughout the day and the year for one person.	Physiological data of one person must be interpreted over a period of time together with environmental factors and the Trans.Safe system needs to learn the stress pattern of every worker.
Validity: interpretation of inter-individual differences	Inter-individual differences between stress tolerance and stress dynamics must be taken into account, as people experience stress differently.	Similar to the intra-individual differences, the Trans.Safe system needs to learn and understand different workers. For this, an identification of workers must be included in the system.
Value: Safety	The system needs to understand stress levels (e.g. tired, normal, stressed) earlier than the worker himself in order to control the light environment and give valuable feedback to the worker.	The value of the system regarding the increased safety needs to be measured through factual and experienced efficiency and effectivity of the worker and compared to a working environment without Trans.Safe
Usability: Every day user-friendliness	Mainly ambient, non-invasive sensors have to be used in order to reach high usability scores	The sensors must be selected so that they are ambient, can send their data wirelessly and have a high reliability.
Usability: Human Machine Interaction	The interaction between the worker and the system needs to be as simple as possible.	Through methods of user centred design as well as universal design, the project team will ensure that the human machine interaction is designed as barrier-free and fun to use as possible.
Usability: Applicability	The system needs to be applicable to various working environments and industries in order to be truly practical.	In order to ensure applicability throughout different workplaces and industries, the project already tests in three working environments: trucks/buses, control room and trains. Further, external experts are invited to participate in regular discussions expert groups.

Next to the technical success parameters, some ethical challenges must be met in order for Trans.Safe to be successful. Especially the measurement of physiological data touches the privacy of workers who have a right to keep any physiological deficits or personal experiences to themselves:

Table 3: Privacy and Ethical Success Factors

Success Factor	Proposed Solution
Privacy and protection of personal data of workers during the tests	Anonymize user data and physiological data and use the data only for the development of the system and not for evaluating the performance or the like of the workers. Only authorized people have data access.
Dialog with workers' unions	Further exchanges on the projects at MAN and VAG, will resume with the "Betriebsräte" (Companies' workers councils) as soon as the project starts.
Recruitment of workers with different profiles	Recruiting of workers for test purposes should be done through existing databases or workforce (e.g. MAN, VAG, YOUSE), while employees are not reimbursed specifically and specially recruited test persons shall be reimbursed for their time and effort (e.g. simulation phases).
Ethical processing of data in the finished Trans.Safe system	For the ethical processing of data, user research, legal research ethical research will be conducted in order to build the system accordingly. Furthermore, the workers' councils of the participating companies will be included in the development of the ethical guidelines.

Section 2: Quality of the Solution and the Workplan

2.1 Technology methodology

Innovation Process

For Trans.Safe to be user-friendly from the different end-user groups and stakeholders, the user centered design process will be applied. The goal of this user integration is to learn about needs, wishes, requirements and barriers from different perspectives in order to make the Trans.Safe as user-friendly, ethically acceptable and marketable as possible. This means especially that relevant users and stakeholders will be integrated throughout the innovation process with appropriate methods of user integration. For the purpose of this project, we differentiate between the primary end-user (i.e. senior workers), secondary end-users (i.e. employers) and tertiary end-users (e.g. health insurance, safety officers).

The methods of user integration and the specific user characteristics vary according to the different development stages. In earlier stages (i.e. idea phases), lead users of the senior workforce and employers will be recruited and integrated into the development of ideas, the analysis of needs and requirements through innovative methods (e.g. Picasso Puzzle, Walt-Disney-Method) as well as observed through contextual inquiry. This way, the specific wants, requirements and barriers of use will be identified and solutions developed together with the users. In the conceptual phase and evaluation phase, evaluation methods (e.g. systems-usability-scale, click-dummies) will be applied to learn about the best way of user interaction of the users with the Trans.Safe system as well as appropriate checklists (e.g. universal design for HMI design) and relevant norms (e.g. ISO 9241) used and observed. In this phase, also the ethical requirements and business requirements will be analysed through interviews and workshops with secondary and tertiary stakeholders.

In the testing phases, users will be selected depending on their specific needs who help to test the system in realistic (simulation) and real (work place) environments and their well-being measured (e.g. WHO-5 questionnaire on well-being), their work efficiency and the usability of the system (e.g. CrossGeneration Questionnaire). Finally, interviews and group discussions with secondary end-users will be conducted to develop the business and marketing models for Trans.Safe.

Technology Innovation

Trans.Safe will develop a stress monitoring, feedback and response system tailored to elderly employees that is not yet on the market. It is technologically challenging in several respects.

The Trans.Safe approach will combine existing prototypes and off the shelf products, a solid, flexible and adaptive data interface to gather, store and interpret physiological, motion and environmental data in a very effective, modular and flexible way. The proposed system goes beyond the current state of the art since it is based on mainly ambient, minimal invasive sensors for stress level measurement but still targets a high level of accuracy by combining sensors of different modality. As far as we know there are no stress measurement solutions available that include environmental and movement monitoring aside from physical monitoring. Further, the system setup is unique since no solutions could be found that control light and acoustics as a function of the current stress condition of the user.

The following short section each lists the state of the art of a technological innovation domain of Trans.Safe and comes up with the technological novelties and innovation potential of the integrated, unique Trans.Safe solution as seen from the perspective of the consortium today. A figure presenting an overview of the system concept can be found at the end of this section.

(1) Measuring and monitoring of stress parameters: Stress factors (e.g. working environment, work task, social situation) cause adaption reactions to humans, leading either to positive stress (eustress) or negative stress (distress). Eustress creates excitation level necessary for performing job-related tasks and generally increases attention and improves concentration of human. Distress is caused by stress factors which are annoying or overstraining. This results in a decline of job performance, both qualitative and quantitative, and for a longer period to burn-out syndroms, if no coping strategies are available. In our project we will detect eustress and distress. Commonly, physiological parameters like pulse, blood pressure, breathing, body temperature and sweating are used as indicators for stress which are then related to cognitive self-assessment in order to distinguish eustress from distress. In our project we use ambient sensors, such as sensing elements integrated in work place equipment and smart body-worn wireless devices, for unobtrusive physiological measurement at highly physical and stressful conditions (e.g. control rooms at airports, train systems or energy plants; driver's cabins of buses, trucks or trains). As a supplementary approach we use behavior measures like body motion, seating or standing position, and locomotion of employee as well as environmental measures like carbon dioxid concentration in a room resp. cabin as an indicator for respiration activity and therefore stress level, using similar measuring technology as well as smart room sensors (e.g. passive and active motion detection). Additionally, smart room

sensors are used to derive different parameters of movement activity in a room in order to register stress level in multi-person work places.

(2) Activity recognition algorithms: By means of environmental monitoring, physiological monitoring and movement monitoring the physiological data gathering system delivers heterogeneous sensor data both in the time domain (e.g. short term, real time data, vs. longer trends of environmental sensors) and in the sensing modality. Each domain and modality requires own data analysis and pattern recognition techniques in order to obtain meaningful, reliable and robust parameters that can give credible evidence on the stress level of the user.

By implementing an data analysis approach in several layers including a well-defined pre-processing and feature extraction layer as well as consistent interfaces towards the data gathering stage (DB) possible future enhancements will be granted. Within the higher layer of recognition algorithms that facilitate the gathered stress level features of the feature extraction layer, data fusion methods will be implemented in order to enhance the reliability of the stress level estimation by combining information of different sensor modalities and types. Reasoning and clustering will be used in order to gather parameters that allow the direct steering and actuating of the systems output channels.

The reasoning is innovative in the sense that it has to deal with data coming from minimal invasive sensors but targets a high level of accuracy for the detection of the stress level depending on the user's activity. Further it not only builds the basis for the user feedback in form of information on the user interface but also for the control of the corresponding stress response.

(3) Ambient stress response systems: Trans.Safe manipulates existing light and sound stimuli at workplaces for older persons in order to support decrease of distress (working overload), increase of eustress (cognitive performance), optimization of resting phases (recovery) and preventing of working underload as well as preventing of improper fatigue. The most important light quality parameters for the visible spectrum are luminous emittance and light color temperature. Other factors include illuminance uniformity, luminance distributions, light color characteristics and glare. Lighting parameters perceived over the eye have a clear impact on current psychophysiological activity level of human. In our project we dynamically adapt the environmental light intensity and light color temperature (e.g. 2600K to 74000K) at working places for older persons depending on current stress level of individual persons or groups of individuals. There are several studies which have proved that different luminous emittance and light color temperature have a positive impact on stress levels.

At multi-person workplaces (e.g. central control room) normally stress level concerns to workers and bystanders in similar ways according to the mood transfer hypothesis. Therefore dynamic light variations influence professional group members with common goals leading to necessary psychophysiological effects of individuals. These targeted effects concern to workrooms within buildings with insufficient distribution of daylight and to night work.

Within closed vehicle cabins drivers are continuously exposed to variable light stimuli inside and outside the cabin. The intensity and color temperature of strongly dimmed signal lighting at cockpit fittings and ambient cockpit lighting, especially during night, is dynamically adapted according to these lighting variations and current stress level of driver in our project. During resting phases lighting parameters of ambient cockpit lighting is adapted according to the current activity level of drivers and corresponding to the time of day in order to support the circadian rhythm. In case of preceding exceptional activation levels of driver an individually optimized light shower can be taken.

When considering noise and room acoustics, the most important parameters are sound pressure level and sound wave frequency. These parameters are crucial in creating supportive working environments, both in terms of supporting hearing and of reducing negative effects associated with sounds and noise. The negative effects of noise are associated with hearing impairment and increased levels of stress. In our project we implement sound manipulation at working places for older persons mainly by noise-cancelation (e.g. using active noise reduction for reducing unwanted sound) and using ultrasound signals (e.g. using sounds containing high-frequency components above the audible range), since different frequencies of sound waves significantly affect human psychophysiology and therefore have an impact on stress level. We are carefully inducing systematic ultrasound stimuli according to the current psychophysiological activity of individual workers or group members with common goals following social facilitation hypothesis which leads to better synchronizing of phasic excitation and therefore to a positive effect on human stress.

Within closed vehicle cabin active noise control is an allocated new approach for reducing unwanted sound. In our project we are following this approach by implementing a noise-cancellation speaker that emits a sound wave with the same amplitude than the noise but with inverted phase. Both waves combine to form an interference which results into a phase cancelation and therefore to a downsizing of those

frequencies ranges which are inducing psychophysiological distress reactions. Furthermore, we dynamically adapt the volume of sound output devices (e.g. radio, mobile communication) to the stress level of driver in our project.

(4) Real-time and mid-term information feedback on mobile user interface: Besides the non-intrusive sensors and the ambient stress response the user interacts with the system over a personal user interface (UI) running on a mobile device. The UI mainly provides 3 services to the primary end-user: (1) A private, intuitive, real-time feedback which directly informs him (e.g. over a traffic light presentation, smileys face etc.) about his/her current condition in terms of stress or distress. This information shall allow the user to better become aware of his state and may directly influence him positively. The system may also issue personalised suggestions how to relax or activate the worker in the current situation e.g. by showing him the way to the next rest stop and suggesting him to take a break etc. (2) A historical data view and a smart mid-term evaluation based on historical data as well as learning capabilities of the system will be able to coach the worker in terms of scheduling his work and taking appropriate measures to reduce average as well as peak stress levels. (3) Finally, the smartphone may be used to personalize the service, switch on an off certain services on demand etc.

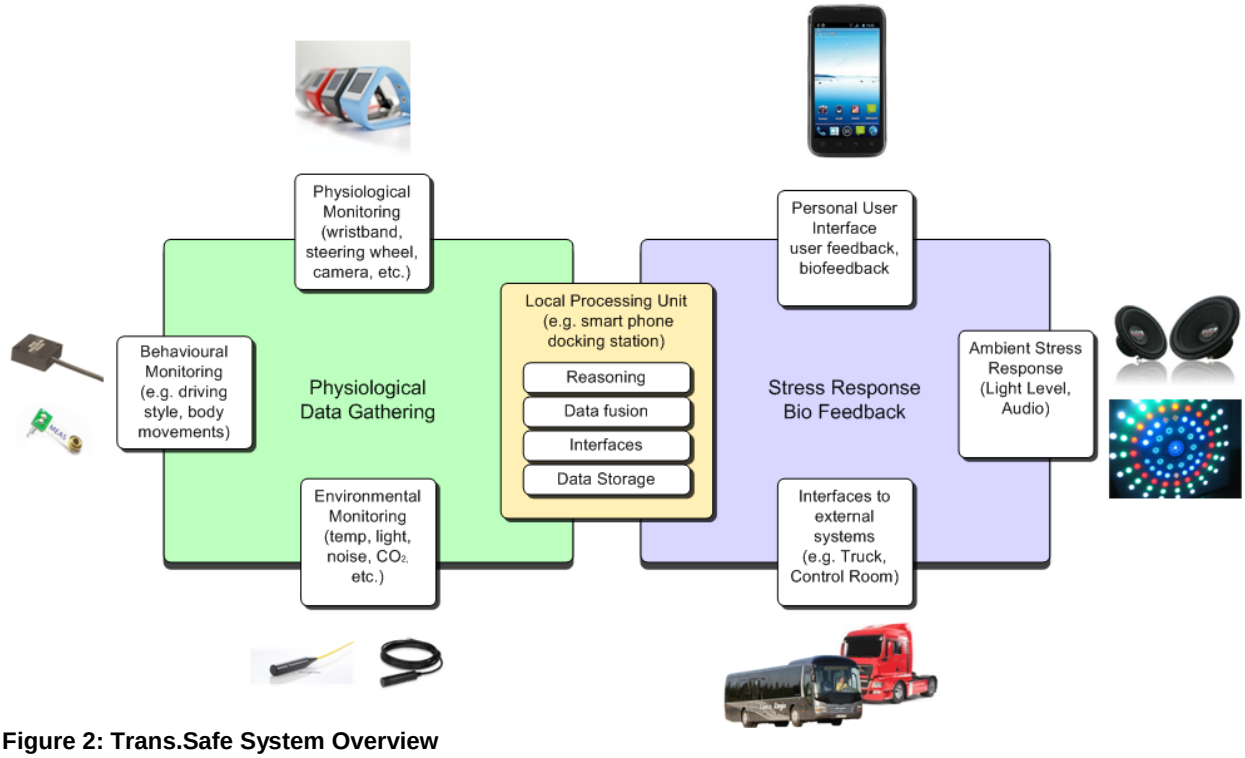


Figure 2: Trans.Safe System Overview

(5) Open interfaces to working environment: To improve the quality of all items described above so far, it is planned to equip the Trans.Safe with an open interface to access infrastructure available at the working place. Two examples:

- A building automation control system (BACS) to access the lights, control jalousies, gather information from temperature and carbon dioxide sensors or even change parameters of the HVAC system.
- An interface to the on-board sensors and assistance systems of a MAN truck allowing us to get parameter values of dozens of sensors built into the truck as well as look into further possibilities for stress responses (closing/opening the windows, turning on/off the radio, etc.).

The following figure presents a conception overview over the Trans.Safe-System summing up the 5 main parts described above. It seems important to say that the data is private and personal to the employee and will not leave the locally installed system.

2.2 Resources (expertise, infrastructure, etc.) needed

To achieve its objectives the Trans.Safe consortium draws upon a broad range of scientific, technical and market expertise, as shown in the following table.

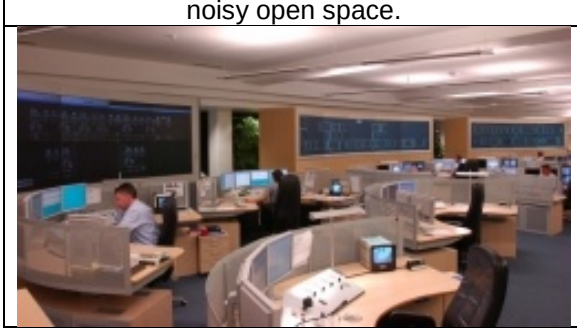
Table 4: Expertise of the consortium

	HSL	YOU	TIL	VAG	MAN	SSSA	KON	DLED
Project Management	+++	++	++	++	++	++	++	++
Requirements engineering	++	+++	++	+	+	++	++	++
Usability design	+	+++	++	+	++	++	+	++
Acquisition of physiological signals	+		++			+++	++	
Ambient stress response devices						++	+	+
Signal, data processing, algorithms	+++		+++		+	++	+++	++
Application design/Implementation	++		++		++	++	+++	++
System integration	+++		+++		++	++	++	+++
Evaluation and trials	+++	+++	+	+	+++	+++	+	+
Dissemination	+++	+++	++		+++	++	++	+++
Exploitation and business planning	++	++	++	++	+++		+++	+++

The most important resources are the end-users and their work environment. VAG and MAN support Trans.Safe with end-users and granting access to their workplaces (control centers, cockpits, see Table 5). Where end-user test-settings could pose a safety hazard, it is resorted to a simulated workplace environment (TUM). To create a working system, reliability and acceptance are crucial. The consortium addresses these requests by the selection of partners with expertise in the AAL domain, domotics, ambient sensor technology (TIL, HSL), psychophysiology, acceptance behavior (SSSA), signal processing, analysis (TIL, HSL, SSSA) and for the ambient light devices (i.e. stress response control) (DLED, SSSA). Research centers (YOU, TIL, SSSA, HSL) assure that the scientific-technical goals are achieved. Furthermore, the consortium has available competences In the realm of acceptance, usability and user centered design (YOU, TIL, HSL). The business perspective is provided by partners, which create business opportunities or have an interest to integrate the Trans.Safe system in their array of products (MAN, KON, DLED, TIL).

Many members of the consortium have a track record of participating in European research projects (YOU, TIL, SSSA, HSL) and HSL is currently the project coordinator in the EU-AAL JP Call 4 project “iWalkActive”. The needed expertise and infrastructure for Trans.Safe is perfectly covered by the consortium, which is well-balanced in terms of market driving Industry, end-user organizations and research institutions and which will maximize the impact of Trans.Safe.

Table 5: Example of resources available for the field tests (VAG, MAN)

VAG new control rooms (since 2005) in Nürnberg. 3 large screens per worker per shift, and noisy open space.	Example of truck at night. Lights contrasts play a role in the stressing conditions of truck drivers. Standards must be respected.
	

2.3 The perspective of the end-users

There are several end-user groups whose needs, wishes and fears will be analysed and integrated during the different phases of the project with different methodologies. Primary end users are senior employees of companies, while secondary users are mostly employers (who in most cases would need to acquire the system) and tertiary end users are other stakeholders such as the health insurance, safety officers and physiologists, who will decide to sponsor and endorse the system.

The goal of the Trans.Safe system is to provide older employees to stay in their job for longer by providing a healthier and safer work environment. However, the system needs to be user-friendly for it to be integrated into the daily routine and accepted, meaning it must be useful and easy-to use (e.g. through user interaction in the form of displays that has a high usability). Light that annoys and distracts from work will be experienced as a burden or a user interface that is hard to read to learn about the individual performance and well-being curve will not be used. Hence the learning about the user perspectives in different cultures and industries is of utmost importance to make Trans.Safe successful and useful for the employees and hence the employers and the society.

2.4 Pilot application

Trans.Safe will be piloted both in a realistic test environment through two truck simulation phases and in three real-life pilot applications in the VAG control room and in MAN trucks. The pilot applications will start by adapting the truck simulator of the associated partner TUM and testing Trans.Safe with 6 older test drivers within the first project phase to get first experiences and make first usability and validity learnings and checks. In this first pilot phase, also the physiological reactions will be analyzed and the results and learnings from this first pilot application will be integrated in the product development. In a second simulated test, about 6-8 months after the first pilot, 30 older test drivers will be recruited and the system will be tested with them each for up to 3 hours in the truck simulator. Only after the successful test of the validity, reliability and usability of the system in the simulator can Trans.Safe be built into the real work environments of trucks of MAN and the control room of VAG. In months 24-33 of the project, a longer term test will hence be conducted in the three realistic settings with real 30 senior workers at their work places (trains, truck and control room). Through the longer term test the four major success factors (see chapter 1.4.) measurement, validity, value and usability will be evaluated and optimized (e.g. does the efficacy of the ambient stress response work and does Trans.Safe optimize stress?).

With two realistic (i.e. truck simulation) and three real pilot applications (i.e. MAN truck and VAG control room), the system can be developed according to the real needs of ageing workers and their employees.

To ensure a high reliability and robustness of the Trans.Safe System, necessary for usage in the working environment, both in office or truck, it will be performed a multistep test process, as follows:

Table 6: Test steps to verify Trans.Safe in pilots

Step	Implementation	Remarks
1 – Pretest	~6 probands, with a short driving time in the simulator (~1hour)	Pretest in order to check (1) whether the sensors will work properly and (2) drivers' acceptance on the measurement methods.
2 – Quality Check	Quality Check of the measurement principle in a real truck/train environment	Perform tests on a test track to ensure that the sensors in use are not influenced by rough environment like bad road surface, different lightning situations e.g.
3 – System Test	Test of the final system in a driving simulator.	Check (1) effectiveness of the system (2) robustness of the system (3) driver acceptance. This test requires an extended effort because the drivers will be tested in two overload status, one due to high workload and another due to monotonous driving.

2.5 The exit strategy

In order to well establish the efficiency considering stress management at the workplace, the involvement of end users and employers for evaluation is vital to the project. Though the project will end at a scheduled date, in order to come to a project conclusion, the continued testing of the products involved will surely offer valuable information also for the future.

Therefore, at the project exit, participating end users and employers who/which so wish will be granted the right to keep the products they have been provided with for testing and evaluation. No end user involved in the project will lose the opportunity of the continued use of any product that has contributed to an improved quality of life for the single individual, as the end users have contributed to the result of the project.

Only in the event that the products provided for testing turn out to constitute a hazard, i.e. risk of personal injury, or decreased performance of the employee, they will no longer be available for continued use by the project participants out of security reasons.

2.6 Work plan (organisation of the project)

The figure below depicts the work flow with all workpakages and tasks planned for Trans.Safe. After the figure the major phases and activities of the project are shortly described.

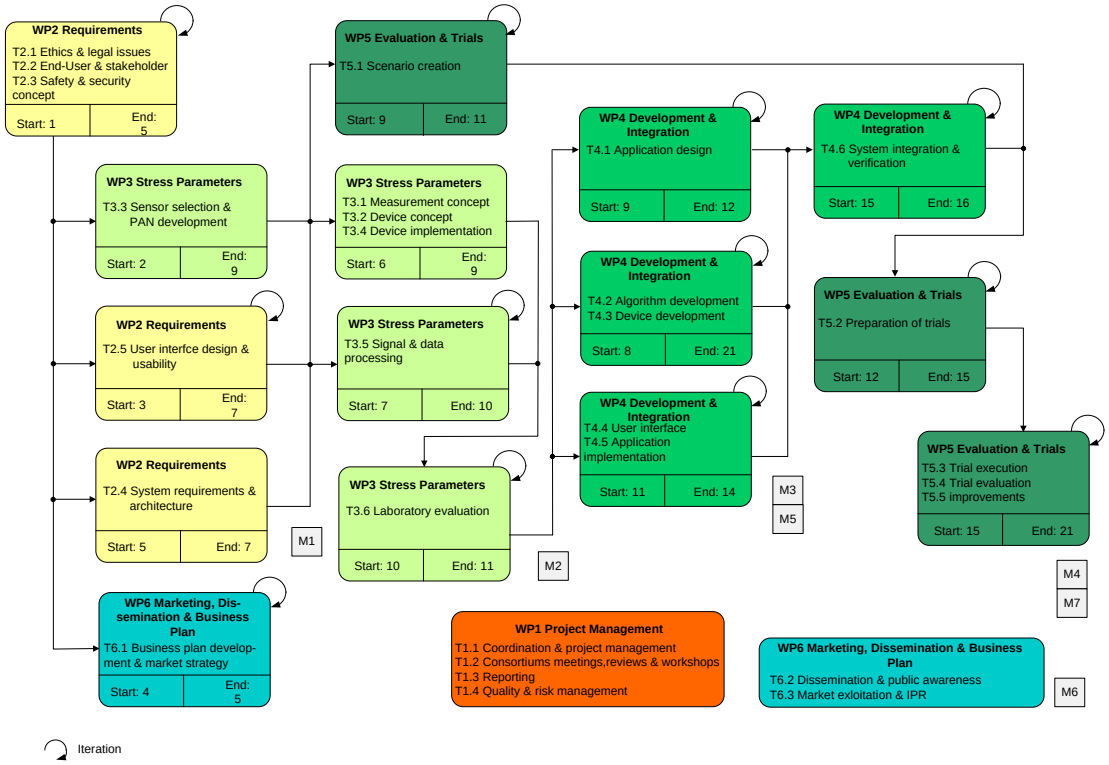


Figure 3: Trans.Safe Pert Planning

Initiation: The project starts with an initiation phase (WP1, WP2). During this phase, the kick off meeting will be scheduled, the administrative framework is set up, the ethical manual and the quality management plan are created as well as the risk management table, templates and guidelines etc.

Requirements: During the project's initiation, the main requirements engineering phase starts (WP2) involving end users and the other stakeholders producing a set of technical, ethical and safety requirements. After iteration one of the system trials, there is given explicitly the possibility to improve the requirements at the beginning of the second iteration.

Physiological foundation: There are plenty of ways to determine the stress level, and how changes in the ambiance (of a workplace) influence the stress level of a person. In WP3, the selection of the most appropriate sensors for acquisition of physiological signals is performed as part of iteration one. This core task is accompanied by the development and implementation of the ambient stress response devices. Refinements in regard to signal processing are scheduled also for iteration two.

Integration of prototypes: The scope of WP4 is to develop the application and to integrate all modules/requirements from proceeding WPs to provide the prototypes in both iterations. The process of improving the algorithms, sensors and the stress control device is continuously. Therefore it is possible to enhance the system promptly by results and lessons learned from tests and field trials.

Test: WP5 is dedicated to prepare, conduct and evaluate field trials with the Trans.Safe prototype system. Focus is on performing the trials in realistic environments. To avoid danger due to stressed subjects, in respect to themselves or other traffic participants, a simulator will be employed when necessary. Two major field tests are scheduled in the project.

Business Plan: The business plan development also takes place during two periods throughout the project. By coupling the development to the requirements engineering cycle and the final end user trials, business and service development is enabled have mutual exchange with other project teams.

Individual workpackage (WP) description

WP number	**1**		**WP duration:**			**M1– M36**		
WP title	**Project Management**							
Activity type	*MGT*							
Participant no.	1	2	3	4	5	6	7	8
Short name	**HSL**	YOU	TIL	VAG	MAN	SSSA	KON	DLED
Person-months	11	2	2	3.5	1	2	1	2

Objectives of the WP: To perform overall administrative, technological and financial project management, manage the overall communication with AAL CMU, AAL NCPs and other AAL project coordinators. Furthermore to assess the conformance of results to the workplan and objectives of the project and assuring the quality of technological work and deliverables content.

Description of work:

T1.1: Overall management (HSL, M1-M36) The overall management of the consortium is entrusted to the Steering Committee (SC), which includes representative of all partners and it is chaired by the Coordinator (PM). Periodic SC sessions will take place during plenary meetings every six months.

T1.2: Coordination of the consortium technical activities (HSL, M1-M36) General meetings and supporting constant communication amongst partners. Organization and management of the meetings are ensured by the Coordinator. The SC meetings may also take place outside of general meetings in case that urgent decisions need to be taken or by internet meetings.

T1.3: Contractual, legal, financial and administrative management (HSL, M1-M36) Carried out by all partners' administrative bodies. A specific session of the kick-off meeting is devoted to present all financial and administrative details and to set up common procedures. The Coordinator collects the annual cost-statement activities in order to submit periodic financial reports to the AAL-CMU.

T1.4: Internal communication infrastructure (HSL, M1-M36) For a transparent and effective communication among the partners, different communication channels are established. They are based on a project website, web-based on-line support and audio/video conference meetings.

Deliverables of the WP:

D1.1: Project Management Guidelines and project website (M3, HSL)
D1.2: Project Detailed work plan & Quality Plan (M4, HSL)
D1.3: Semester Progress Reports (M6, M12, M18, M24, M30, M36, HSL)
D1.4: Annual Progress Reports (M12, 24, 36, HSL)
D1.5: Final Report (M36, HSL)

WP number	**2**		**WP duration:**			**M1 – M25**		
WP title	**Requirements and User Centric Design**							
Activity type	*Research*							
Participant no.	1	2	3	4	5	6	7	8
Short name	HSL	**YOU**	TIL	VAG	MAN	SSSA	KON	DLED
Person-months	5	16	2	4	7	6	4	4

Objectives of the WP: This WP aims to provide the specifications for designing, developing and validating the Trans.Safe services and devices with appropriate end user acceptability and usability criteria. The main objectives will be to study, define and assess the end-user, and technical requirements of the Trans.Safe system, to design and organize the architecture of Trans.Safe services, making them useful, efficient and available for different industries and cultures, to design the user interface according to the needs and standards to study and define metrics and benchmarks for the evaluation of Trans.Safe in terms of acceptability and usability.

Description of work

T2.1: Ethics and Legal Issues (MAN, M1-M5) Given the fact that for the field tests personal data are captured, test persons have to be assured that these data are treated in a confidential manner. This workpackage will develop guidelines for the legal and ethical collection, analysis and presentation of physiological and other data necessary for Trans.Safe. MAN will take into account European law, RESPONSE3 criteria and will work with the support of the subcontractor BASt.

T2.2: End User and Stakeholder Requirements (YOU, M1-M3) We will first collect insights about the two planned test-sites, lorries and workplaces at the OCC of the VAG, in terms of interviews, photo documentation, shadowing and/or user diaries to understand the routines and needs of end-users and stakeholders, as well as common incidents related to stress or fatigue typical for these workplaces. These insights will be complemented by literature research and processed for the consortium to enable a common understanding of what problems to solve and what requirements to take into account when

implementing our Trans.Safe product (e.g. acceptance of different types of sensors, a gamification approach etc.).

T2.3: System Concept (YOU, M3-M5, M22-M25) In this deliverable, the nature of the planned Trans.Safe product is described from a user/stakeholder perspective (opposite to the technical description in T2.4) in terms of use cases. Suggestions for use cases will be collected from the stakeholders/end-users, and chosen by technical and financial feasibility within the consortium. The final choice of use cases will be edited in terms of user stories and presented to the stakeholders in workshops to make sure that the planned services are in principle accepted by the target groups. These final use cases will serve as the starting point for T2.4 and the technical research and development in WP3.

T2.4: Systems Requirements and Architecture (HSL, M5-M7) Starting from information collected in T2.2, the services will be organized and designed in order to have a structure which satisfies the defined requirements. Additionally, technical opportunities, barriers and framework conditions will be taken into account. The combination of these two views will be fundamental for guiding the design of Trans.Safe product and services and the definition of the scenarios for the experimentations.

Deliverables of the WP:

D2.1: Report on the ethics and legal issues (report, M5, MAN)
D2.2: Report on the Trans.Safe end-user/stakeholder requirements (report, M5, YOU)
D2.3: Report on the Trans.Safe concept (report, M5, M25, YOU)
D2.4: Report on Systems Requirements and Architecture (report, M7, HSL)

WP number	**3**		**WP duration:**		**M2 – M25**			
WP title	**Physiological Parameters Acquisition and Stress Response Device**							
Activity type	*Development and integration*							
Participant no.	1	2	3	4	5	6	7	8
Short name	HSL	YOU	TIL	VAG	MAN	**SSSA**	KON	DLED
Person-months	9	2	16	0	3	21	5	6

Objectives of the WP: The goal of WP3 is to develop an integrated system of environmental, behavioural and physiological sensors for stress level measurement and detection of intra-individual differences for two different test-settings (automotive & office). Emphasis on a very modular, expandable and flexible structure of the data gathering and stress response system will grant a long-term sustainability, which is mandatory for future use of the system. Existing middleware solutions for sensor data propagation, and optimal ways for algorithm/software execution and distribution will be evaluated and taken into consideration.

Description of work

T3.1: Stress level measurement concept (SSSA, M6-M12) Develops a concept for stress level monitoring based mainly on ambient unobtrusive sensors that can be integrated into the working environment. Representative indicators will be selected that give information on the environmental state, user movements and behavior, user physiology and on the direct stress level.

T3.2: Ambient Stress Response Device Concept (SSSA, **M6-M12)** A concept is developed that identifies different means to influence the stress level of the target group. The concept includes several approaches to control environmental influences on users such as environmental control via domotics, circadian control of light intensity and colour and/or control of noise level / acoustics. Control loops are designed with flexible adjustment of parameters for control algorithms (e.g. genetic algorithm) which can be modularly integrated into hierarchically structured sensor-actor-chain.

T3.3: Sensor selection and PAN development (TIL, **M2-M12)** Selection and evaluation of state of the art wearable and distributed sensor solutions for integration into the prototypes (e.g. movement sensors, environmental sensors, physiological sensors). Integration of the selected sensors into sensor networks (PANs), which are connected to a central processing unit.

T3.4: Ambient stress response device implementation (SSSA, M7-M12) Stress level manipulation is implemented with lighting and acoustic devices which are controlled via available bus systems for light and acoustics. Lighting devices and acoustic devices are selected according to the requirements at test-settings. Control signal results from real time analysis of stress measurements. Variations in light intensity an light colour follow European standards for lighting of work places and variation in sound intensity and sound frequency follow European standards for acoustics of work places.

T3.5: Signal & Data processing (SSSA, M7-M12, M22-M25) Development of a software layer holding algorithms for computation of higher-level abstract parameters that are used for further high level reasoning in WP4 and form the base for stress level analysis, and real-time biofeedback. Pattern recognition techniques are necessary to compute abstract parameters such as the heart rate variability, parameters of movement analysis, or other parameters (e.g. gaze detection). Optimization of process execu-

tion time by distributed algorithms (local / remote cloud). Development of interfaces for data propagation to higher layers in WP4.

T3.6: Laboratory evaluation (HSL, M11-12, M24-25) Laboratory trials are conducted to put all components into operation and to establish a stable system with validated sensor data quality. By means of a concise test plan including evaluation criteria and test sequence the data gathering system and stress response devices are evaluated focusing on technical performance and robustness.

Deliverables of the WP:

D3.1: Sensing and Stress level management concept and device (report, M12, SSSA)
The gathered results of Task 3.1 and 3.2 are described including the resulting concept papers.

D3.2: First prototype of data gathering and processing system (prototype, M12, TIL)
The deliverable contains description and documentation of the data gathering and processing system and the stress response device, including the results of the technical validation.

WP number	**4**		**WP duration:**		**M8 – M27**			
WP title	**Application Development and System Integration**							
Activity type	*Development and Integration*							
Participant no.	1	2	3	4	5	6	7	8
Short name	**HSL**	YOU	TIL	VAG	MAN	SSSA	KON	DLED
Person-months	19	4	9	1.5	9	7	19	8

Objectives of the WP: The objective of this work package is to realize the first prototype of the Trans.Safe system. Several steps are performed to achieve this. First, development of algorithm to determine stress level of employee, then development, design and implementation of the application with all modules (algorithms, sensor interfaces, ambient stress response device interfaces and user interfaces) and finally the system integration and tests.

Description of work

T4.1: Application Design (HSL, M9-M12, M22-M23) Within the boundaries of the requirements and architecture defined in WP2 and of the results of WP3, an application designs is developed. It considers the employment of the application in different workplace environments (i.e. control rooms, cockpits) and with different sensor and ambient stress response devices, respectively. The findings and designs are documented.

T4.2: Algorithm Development (SSSA, M8-M27) Derives an algorithm, which mathematically models the stress level by evaluating the physiological data acquired by sensors. An important sub-task is to improve the model to enable it to compensate for intra-individual and inter-individual changes in physiological signals. In addition, the algorithm computes output values, which will be used to control (through appropriate interfaces) the stress response devices.

T4.3: Sensor and Stress Response Control (TIL, M8-M27) Development of interfaces for the communication between sensors, stress response devices and the application. Analysis of potential improvement, optimization/adaption of the specification. Response time optimization by adapting the algorithm for use within local or remote cloud. Documentation of interfaces, potential optimization opportunities.

T4.4: User Interface Implementation (KON, M11-M14, M25-M26) Based on the findings of WP2, the user interface is implemented. It is expected, that there will be several user interface modalities depending on system configuration and work environments of the employees. Documentation of UI implementation.

T4.5: Application Implementation (KON, M1-M14, M25-M26) This task covers the implementation of the application as designed in task 4.1. Documentations of all components in one main document.

T4.6: System Integration and Verification (HSL, M15-M16, M27) All software and hardware components are integrated to form the first prototype of the Trans.Safe system. It will be tested thoroughly in laboratories to verify its functionality and to proof its compliance with the technical and stakeholder requirements. After test cases are written, tests are executed, documented and evaluated.

Deliverables of the WP:

D4.1: Main documentation, covering application designs including all modules (report, M16, M27, HSL)

D4.2: Prototype. Completely integrated and verified system with test documentation. (prototype, M16, M27, KON)

WP number	**WP5**		**WP duration:**		**M9 – M34**			
WP title	**Evaluation and Field Trials**							
Activity type	*Trials*							
Participant no.	1	2	3	4	5	6	7	8

Short name	HSL	YOU	TIL	VAG	MAN	SSSA	KON	DLED
Person-months	4	12	4	10.5	16	7	4.5	2

Objectives of the WP: Goal of the WP is to perform tests and experiments to evaluate Trans.Safe under practical conditions. The tests should be performed under realistic conditions (e.g. driving simulator at TUM) and under real conditions (test lorry and OCC). The WP should confirm the usability and reliability of the developed system.

Description of work

T5.1: Definition of experimental design (YOU, **M9-M11, M25)** Create a catalogue of scenarios to test Trans.Safe in a driving simulator, in test lorries, trains and in an OCC for public transport.
The implemented scenarios are based on the use cases as defined in WP2. In this task, the goal is to describe the experimental design of the field trials, adapted for a driving simulator / lorry and the OCC of the VAG. In other words, the procedure of the field trials is defined, including the potential manipulation of the workload level, the number of participants, the guideline and training material for the test moderators, as well as the preparation of a test catalogue (i.e. the measurement methods to be used in terms of questionnaires) to evaluate the effects of the Trans.Safe system.

T5.2: Preparation of Trials (Pilot system & User Training) (MAN, M12-M14, M26-M27) This task comprises: installing the test system in the test environment, checking the test system (technical tests), recruiting and briefing test persons and explaining goal, content of tests and test execution, as well as training the test attendants, executing pre-tests to check the test system, and finally setting up a time table for test execution (depending on shift models).

T5.3: Trial Execution (VAG, M15-M20, M26-M33) The subtasks consist of executing tests, logging test results, writing tests reports, and executing re-tests after first evaluation. Test will be conducted with VAG and MAN.

T5.4: Trial Evaluation (YOU, M16, M19-M20, M28, M31-M33) During this task the focus is on checking test results, evaluating test results, comparing the test results with the expected results, suggesting improvements for Trans.Safe and test execution, confirming whether the developed system is usable and reliable and writing the summary about tests and results.

T5.5: Improvements (HSL, M17, M21, M29, M34) Here, improvements of the Trans.Safe and test execution are conducted.

Deliverables of the WP:

D5.1: Test catalogue (report, M21, M34, YOU)
D5.2: Test schedule (report, M21, M34, VAG)
D5.3: Training material for test personnel and attendants (documentation, M21, M34, YOU)
D5.4: Test reports, Proposals for improvements, Confirmation of usability (report, M21, M34, MAN)
D5.5: Guideline for handling the Trans.Safe system in practice (documentation, M21, VAG)

WP number	6		WP duration:		M1 – M36			
WP title	Marketing, Dissemination and Business Plan Development							
Activity type	*MGT*							
Participant no.	1	2	3	4	5	6	7	8
Short name	HSL	YOU	TIL	VAG	MAN	SSSA	KON	**DLED**
Person-months	1.5	2.5	7	0	1.5	3	7	8

Objectives of the WP: To define a dissemination plan and realize dissemination activities of the project results, to determine the cost/benefits of the prototypes and to define a commercial exploitation plan of the project results.

Description of work:

T6.1: Business plan development and market (DLED, M4-M5, M28-M32) The business partners involved in the project will perform a market study at M12. Identification of the potential markets and target groups. Cases are going to be proposed for similar applications in different branches to have basics for future product development: 1) Selection of potential business cases, based on customer input collected at industrial and AAL events; 2) Implementation of similar use cases in different branches; 3) Small scale production of the new product.

T6.2: Dissemination and Public Awareness (MAN, M1-M36) This task will be initiated by the development of an agreed dissemination plan setting out the project approach to dissemination. Appropriate marketing material will be designed. A project website will be set up. The project will be presented at international and European conferences (such as the AAL Forum in Sweden in September 2013). Each partner will undertake dissemination according to the agreed dissemination plan. Trans.Safe can also interface to relevant and worthwhile standardisation mechanisms.

T6.3: Market exploitation and IPR management (MAN, M18-M21, M33-M36) Investigation of new business models, Cost / Benefits analysis, an Exploitation Plan and separate business plans. The defini-

tion of an exploitation plan will be realized in accordance with the Consortium Agreement according the following items: identification of the potential markets and target groups, analysis of the competitive environments, development of the business plan, assessment of benefits by end-users, establishment of commercial agreement among the partners. Possible target groups will be analysed and prioritised according to commercial attractiveness.

Deliverables of the WP:
D6.1: Progressive Dissemination Report (reports, M13, M25, DLED)
D6.2: Progressive Exploitation Report (reports, M13, M25, KON)
D6.3: Dissemination and Exploitation Report (report, M36, DLED)
D6.4: Business plan and market strategy (report, M32, KON)

Work package (WP) overview list

No.	WP title	Activity	Lead		PM	Start	End
1	Project Management	*MGT*	1	HSL	24.5	1	36
2	Requirements and user centric design	*RTD*	2	YOU	48.0	1	25
3	Physiological parameters acquisition, stress response device	*RTD*	3	SSSA	62.0	2	25
4	Application development, system integration	*RTD*	1	HSL	76.5	8	27
5	Evaluation and field trials	*DEM*	4	VAG	61.5	9	34
6	Marketing, dissemination and business plan development	*MGT*	8	DLED	30.5	1	36
	TOTAL				303.0		

Deliverables overview list

Del. no.	Deliverable name	WP	Nature/type	Dissemination	Delivery date
1.1	Project management guidelines, project website	1	Document, website	public	3
1.2	Project Detailed work plan & Quality Plan	1	Document	restricted	4
1.3	Semester Progress Reports	1	Document	public	Every 6M
1.4	Annual Progress Reports	1	Document	public	Every 12M
1.5	Finale report	1	Document	public	36
2.1	Report on the ethics and legal issues	2	Document	restricted	5
2.2	Report on the Trans.Safe end-user/stakeholder requirements	2	Document	restricted	5
2.3	Report on Trans.Safe concept	2	Document	restricted	5, 25
2.4	Report on Systems Requirements and Architecture	2	Document	restricted	7
3.1	Sensing and Stress management concept	3	Document	restricted	12
3.2	First prototype of data gathering system	3	System	restricted	12
4.1	Prototype documentation	4	Document	restricted	16, 27
4.2	Prototype	4	System	public	16, 27
5.1	Test catalogue	5	Document	restricted	21, 34
5.2	Test schedule	5	Document	restricted	21, 34
5.3	Training material for test personnel and attendants	5	Document	public	21, 34
5.4	Test reports, Proposals for improvements, Confirmation of usability	5	Document	restricted	21, 34
5.5	Guideline for handling the Trans.Safe system in practice	5	Document	restricted	21
6.1	Dissemination Report	6	Document	restricted	13, 25
6.2	Exploitation Report	6	Document	restricted	13, 25
6.3	Dissemination and Exploitation Report	6	Document	restricted	36
6.4	Business plan and market strategy	6	Document	restricted	32

Milestones overview list

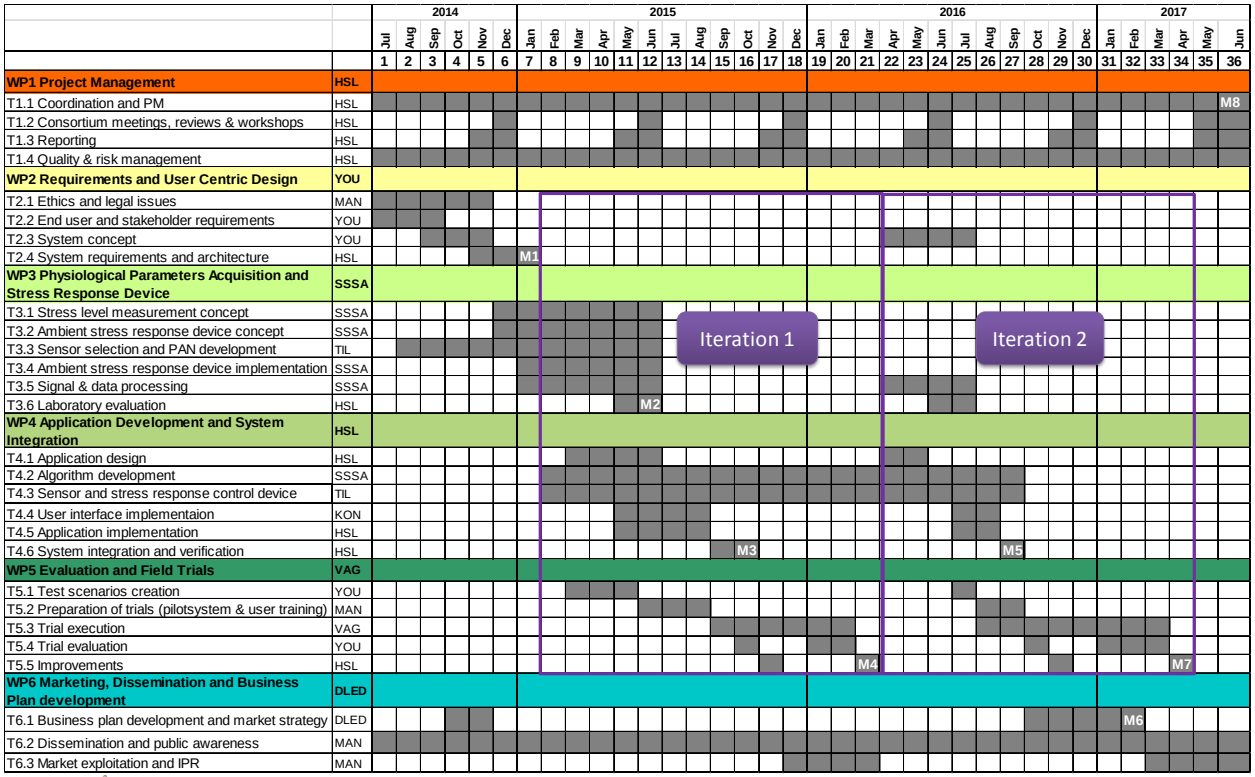
No.	Milestone name	Resp. Partner	WP involved	Expected date (project month)	Means of verification
1	Requirements, system architecture	HSL	2	7	D2.1 – D2.5

	accepted				
2	Sensor and actuator devices available	SSSA	3	12	D3.1, D3.2
3	Prototype finished (first iteration)	KON	4	16	D4.1, D4.2
4	Trials finished (first iteration)	MAN	5	21	D5.1 – D5.7
5	Improved prototype finished (2nd iteration)	KON	4	27	D4.1, D4.2
6	Business plan and market strategy available	DLED	6	32	D6.4
7	Trials finished (2nd iteration)	MAN	5	34	D5.1 – D5.7
8	Project successfully finished / Final Report	HSL	1	36	D1.5

Summary overview of staff effort in person months (pm)

No.	Participant		WP1	WP2	WP3	WP4	WP5	WP6	Total
1	HSL	HSL-iHomeLab	11	5	9	19	4	1.5	49.5
2	YOU	Youse	2	16	2	4	11.977	2.5	38.477
3	TIL	Telecom Italia	2	2	16	9	4	7	40
4	VAG	VAG	3.5	3.175	0	1.5	10.5	0	18.675
5	MAN	MAN AG	1	7	3	9	16	1.55	37.55
6	SSSA	Scuola Sup. S'A	2	6	21	7	7	3	46
7	KON	Konplan	1	4	5	19	4.5	7	40.5
8	DLED	DesignLED	2	4	6	8	2	8	30
Total			**24.5**	**47.175**	**62**	**76.5**	**59.977**	**30.55**	**300.7**
			8%	**16%**	**21%**	**25%**	**20%**	**10%**	**100%**

Table 7: Trans.Safe Gantt-Planning



Section 3: Consortium Quality and Project Management

3.1 Quality of the Consortium

The goal of Trans.Safe is to build and test an integrated stress detection and response system consisting of a variety of technologies fitting seamlessly to fulfil a real user need and get accepted. The 8 consortium partners from 3 countries bring in all the competences and infrastructure to make this happen: The access to the end users, the development of the electronics, sensors & control algorithms, mobile and embedded software development, lighting and sound know how, IT services, service middleware & context-sensitive apps, people and infrastructure to test it all in the laboratory and in a real truck and control room environment and last but not least create the impact for an initial market pull and distribution across markets.

A consortium that is in its competences only possible on an European level as it would not have been possible to realise the complete systemic idea on a national level. Thus the members were carefully chosen in order to realise of what is now our common vision: Trans.Safe. The distribution of the expertise of the partners within Trans.Safe is well balanced between end-users (VAG, MAN), large industrial partners (TIL, MAN) and SMEs (DLED, KON, YOU, VAG), and universities (HSL, SSSA). Additionally to the full consortium partners, the Trans.Safe project is supported by an associated partner and two subcontractors relevant for the success, who will support the project with their specific infrastructure (TUM) and expertise (BAS, FHM).

The table below summarizes the different partners' competences and roles which together form all the skills and commitments we need to build the Trans.Safe system:

Table 8: Partners, Competences and Role

Partner	Competences	Role
1 - HSL	Applied AAL research, project leadership, activity recognition algorithms, building & vehicle intelligence systems, embedded/mobile and application server software, automation, context-sensitive systems, laboratory testing environment, Member of EnOLL[1], integration skills	• Coordination & Project Management • Application design & development (lead) • Integration (lead) • Verification & validation (lead) • First lab & user tests in iHomeLab • Dissemination in iHomeLab • Support requirements, architecture, algorithms, UI and application development
2 – YOU	User-centred design (UCD) processes, product ergonomics, user involvement, usability testing, requirements analysis, user interface design	• User Centric Design process (lead) • User requirements analysis (lead) • User interface design and usability (lead) • Test scenarios and test evaluation (lead) • Product development
3 – TIL	Software engineering (mobile platforms, customer oriented services (Apps), GSM/WAN infrastructure), sensor technologies, system integration	• Algorithm development • Signal and data processing • Sensor selection, network development (lead) • Stress response development (lead) • First laboratory & user tests • Dissemination • Business plan development
4 – VAG	Excellent experiences in running a public transportation business, control room and bus/tram driver access	• Trial execution (lead) • User and stakeholder requirements analysis • Support business plan development and market exploitation
5 – MAN	Excellent experiences in designing, building and selling trucks and buses, trucks and driver access	• Safety and Security concepts • User and stakeholder requirements analysis • System integration and verification • Trial preparation, execution & evaluation • Support business plan development and market exploitation
6 – SSSA	Physiological parameter measurement, stress response know how, light/sound	• Stress level measurement concept (lead) • Ambient Stress Response development (lead)

[1] European Network of Living Labs

	and effects on humans, physiological aspects, User Centred Design, user interfaces and usability	• User and stakeholder requirements analysis • Trial evaluation • Dissemination
7 – KON	Experience in medical device design and development, measurement technologies, hard- and software engineering, mechatronics	• Application development (lead) • User interface implementation (lead) • Marketing, dissemination, business plan development (lead) • Support in requirements, sensor development, trial evaluation
8 - DLED	Experience in designing, building and selling integrated lighting systems solutions for a wide range of applications. The development of new human machine interface and display technology. Human factors, optics, electronics, firmware. Unique light tile technology to deliver ambient lighting solutions. Business planning, start-up funding, marketing, route to market, technology benchmarking, cost modelling, Life Cycle Analysis.	• Business plan and marketing (lead) • Benchmarking, cost modelling, economic and societal benefits • Ambient stress response solution • Lighting requirement specification • Lighting specification, design and development • Review of sensor solutions • Review of human machine interface solutions • System integration • System prototype installation • System testing and evaluation

1	iHomeLab – Hochschule Luzern, CEESAR	HSL	CH

Profile and previous experience: iHomeLab (www.iHomeLab.ch) of the Hochschule Luzern (HSL) is the leading research centre for building intelligence in Switzerland. Together with the support of its over 70 industrial partners, the iHomeLab team conducts funded applied research in the areas of ambient assisted living (AAL), human building interaction (HBI) and energy efficiency (EE). We actively take part in shaping new standards and technologies being a member of standards organisations (e.g. ZigBee Alliance, KNX Scientific) as well as focusing on user driven solutions being part of the European Network of Living Labs (ENoLL).

The iHomeLab team gained broad experience in conducting around 30 applied and cutting edge research projects, funded by national and international authorities and end user organisations. Previous or current participation in EU-AAL JP research projects in Call 4: iWalkActive (project coordinator), CONFIDENCE; in Call 5: RelaxedCare, YouDo, INSPIRATION, DALIA, Care4Balance; FP7: BUTLER (2011)

Roles of partner: HSL is Project Coordinator; WP leader of WP1 "Project Management" and WP4 "Application Development and System Integration" and main contributions in WP2 requirements, WP3 sensors and laboratory evaluation and field tests.

Short profile of staff members:

Alexander Klapproth is a professor in the Faculties of Electrical Engineering and Information Technologies and head of the iHomeLab. He is head and initiator of the iHomeLab – The Swiss Think Tank and Research Laboratory for Intelligent Living (www.iHomeLab.ch).

Rolf Kistler is a research group leader and senior researcher where he also received his degree in Electrical Engineering (Industrial Informatics). Currently, he is performing research and coaching projects in the field of networked systems with focus on AAL at iHomeLab.

Martin Biallas is a senior researcher at the Lucerne University of Applied Sciences. He holds a Dr. sc. ETH and is performing research in the field of building intelligence and smart homes with focus on AAL at the iHomeLab (www.iHomeLab.ch).

2	Youse GmbH	YOU	DE

Profile and previous experience: YOUSE is a company that helps in all innovation phases to really focus on usability, products ergonomics and the needs of users and consumers through professional user integration – particularly with elderly users. The firm was founded in 2009 and is managed by Dr.-Ing. Sebastian Glende and Dr. Christoph Nedopil. YOUSE supports research projects and innovative companies with expertise in user integration, usability engineering, user testing and user centered design. Through this form of user centered design YOUSE helps to develop new and user friendly products, and better services.

YOUSE has supported a variety of research projects and companies over the last years in user centered product development. In research projects, YOUSE is currently involved in several AAL-projects on EU-level and national level. Amongst others, YOUSE works in the EU-project ALIAS (robotics), Robot-Era (robotics) and GuidingLight (lighting systems) and supports the consortium with user requirements research and user testing and user integration. In 2009/2010, YOUSE conducted the AAL accompanying research on User Integration for the German Ministry of Research and Education, consulting and coaching 18 different AAL projects with User Integration tools.

Role of partner: WP leader of WP 2 "Requirements and User Centric Design" and main contributions in WP4 User Interface implementation, WP5 Test scenarios, execution and evaluation, WP6 Market.

Short profile of staff members:

Dr. Christoph Nedopil has researched user integration with the consultancy Oliver Wyman and numerous automotive producers and suppliers, wrote an extensive book on complexity management. He has worked in many research and industrial projects for user integration and user centered design with YOUSE.

Dr.-Ing. Sebastian Glende has gathered deep industry insights during his work for the car manufacturers Daimler and BMW Motorrad as well as with the software producer SAP. He led the Senior Research Group - a group of 20 senior citizens - engaged in the innovation process of products and services.

3	Telecom Italia S.p.A.	TIL	IT

Profile and previous experience: Telecom Italia offers technological infrastructures and platforms in which voice and data are converted into advanced telecommunications services - as well as the latest ICT and Media solutions.
Telecom Italia, TIM and Olivetti are the Group's main brands.

Being close to customers and technological innovation are the hallmarks of the Group, characterized by a streamlined organization that focuses on the quality of service, simple offers, attention to contact with customers and constant research activities in TILab laboratories.
Joint Open Labs (JOLs) are research and innovation laboratories created within university centres and are born from collaborations and agreements in specific fields of scientific and technological interest undertaken by Telecom Italia and the main Italian universities.

In this project, mainly two JOLs are involved, the Wellbeing and Health Innovative Technologies (WHITE) Lab in Pisa, and Smart Social Spaces (S-CUBE) Lab in Milan. WHITE focuses on sanitary processes management, tele-rehabilitation, and technologies for helping elderly keep an independent life, such as Ambient Assisted Living. S-CUBE focuses on new ways of communication and interaction, through smart devices, among people, objects, spaces, in real or virtual contexts (home, office, school, exhibitions etc.)
Telecom Italia aims at building a platform where different kinds of sensors can be connected, both wearable and ambient, and their data can be combined in order to provide a high level service. Stress management in working environments is a key example of such a service.

Role of partner: Main contributions in WP3 (PAN development) and WP4 (sensor and stress response control implementation), and WP5 (trial preparation).

Short profile of staff members:

Gianluca De Petris, PMP, has been involved for about 18 years in National and European Projects, both as Project and Work Package Leader, and in many internal research and development projects as a PM. Now is Director of the WHITE research laboratory, involving Scuola Superiore Sant' Anna as a privileged academic partner.
Massimo Valla, has been involved in National and European Projects, both as Project and Work Package Leader, and in many internal research and development projects as a PM. Now is Director of the S-Cube research laboratory in Milan, a Joint Open Lab, involving Politecnico di Milano as a privileged academic partner.

4	VAG Verkehrsaktiengesellschaft	VAG	DE

Profile and previous experience: VAG operates the public transport systems consisting of busses, trams and metros in the Nuremberg area. The VAG operates 100 metro trains, 50 trams and 275 busses. The VAG is responsible for all processes of operation and for maintenance of the infrastructure and vehicles.

The OCC operators and drivers have a high responsibility to ensure regular operation of all traffic systems as scheduled as well as to handle irregularities and delays. Especially in abnormal situations this personnel is requested to work in a safe and reliable way and to take the right decisions. It is expected to have all situations under control even those situations appearing unexpectedly.

Based on the high responsibility of the staff, consequences of changing processes or external circumstances will be checked continuously by the health and safety department as well as by the workers' council. The VAG reacted on the demographic change with a designated job position "demography management".

Role of partner: WP leader of WP5 "Evaluation and Field Trials", contribution to WP2 Requirements

Short profile of staff members:

Andreas May entered the VAG in the year 2001. He was involved in the automation project of metro lines U2 and U3 for nearly 11 years. Between 2008 and 2012 he was the responsible project manager or the entire project. During the project a staff concept and training concept had been developed and implemented in the company. In these concepts social aspects had also been considered. Since December 2012 Andreas May is the head of the OCC and responsible for the staff who is one of the target user group in this research project.

5	MAN Truck & Bus AG	MAN	DE

Profile and previous experience: Headquartered in Munich, MAN Truck & Bus AG is a leading international supplier of commercial vehicles and transport solutions. In fiscal 2012 the company, with around 34,400 employees, posted sales of more than 8.8 billion euros and sold more than 74,600 trucks and over 5,200 buses and bus chassis of the MAN and NEOPLAN brands. With its share of 17 %, the company retained second place in the European market for trucks over 6 tonnes in 2012. MAN maintained the lead in important markets such as Austria. MAN is the second strongest brand in the key volume market of Germany, and also in Poland, Portugal and Switzerland. Around 13 %of all buses newly registered in Europe in 2012 were of the MAN and NEOPLAN brands. This makes MAN Truck & Bus the third strongest market participant for buses over 8 tonnes in Europe.

Role of partner: Main contributions in WP2 Requirements, WP3 Integration & Verification, WP4 Test execution and evaluation

Short profile of staff members:

Walter Schwertberger Graduate engineer of electronic science from the University of Applied Sciences Munich, Germany. Joined MAN in 1993, working in advance engineering for Driver Assistance Systems. Since 2003 group leader "Central Division Research - Electronic Driver Assistance Systems".

Sven Kraus Study of automotive engineering at the Technical University of Munich. PhD in the field of autonomous driving with area of expertise in Controller Design and Situation Assessment. Since October 2010 member of Central Division Research - Electronic Driver Assistance Systems at MAN Truck & Bus.

Sebastian Völl Study of mechanical engineering at RWTH Aachen University. Experience in everyday business of commercial vehicles. Since 2012 development engineer for driver assistance systems in the research department of MAN Truck & Bus.

6	Scuola Superiore Sant' Anna	SSSA	IT

Profile and previous experience: The Scuola Superiore Sant'Anna (SSSA, www.sssup.it) is a public University in the sectors of engineering, medicine, agriculture, economics, law and political science. The Biorobotics Institute in Pontedera conducts theoretical and experimental research in biorobotics, a discipline characterized by a high degree of interdisciplinarity and was founded in January 2011 by Prof. Paolo Dario. Before 2011, the Biorobotics Institute was the ARTS Lab, that over the course of its 20-year history has been collaborating with the Municipality of Peccioli since 1995, on the topics of services to the elderly citizens, and built and consolidated a vast wealth of knowledge and expertise in the fields of Service Robotics, Humanoid Robotics, Neurorobotics, Bionics, Neural Interfaces, Assistive Robotics, Robotics for Neurorehabilitation, Gerontechnologies, Biomimetic Robotics. At present the Biorobotics Institute includes over 60 people. Furthermore the Institute of Management of SSSA will take part to the project. Among the initiatives carried out in Peccioli with the scientific and technical support of the ARTS Lab are the design of service centres for the elderly, the set-up of a domotic apartment for experimental research, the validation of assistive technologies and gerontechnologies, the experimental application of

rehabilitation technologies. The profile and model of the ARTS Lab make it deeply, and uniquely, suitable to pursue a large-scale initiative at the border of research and application, like Trans.Safe.

Role of partner: Main contributions in WP2 Requirements, WP3 Stress measurement & response

Short profile of staff members:

Prof. Paolo Dario He is currently a Professor of Biomedical Robotics at SSSA in Pisa. He is and has been Visiting Professor at prestigious universities in Italy and abroad. He was the founder and is currently the Co-ordinator of the ARTS Lab and of the CRIM Lab of SSSA. He is the Director of Polo Sant'Anna Valdera, the research park of SSSA. He is also Director of the Center for Micro-BioRobotics IIT@SSSA of the Italian Institute of Technology (IIT). His main research interests are in the fields of biorobotics, medical robotics, micro/nanoengineering. He is the editor of special issues and books on the subject of biorobotics, and the author of more than 200 scientific papers.

Dr. Filippo Cavallo has a PhD degree in bioengineering from CRIM Lab, SSSA. Since 2008 he was Post Doctoral Researcher at ARTS Lab and since 2013 Assistant Professor at the BioRobotics Institute. His fields of research are focused on ambient assisted living, wearable sensor systems, sensor networking, biomedical signal and event processing, home automation, tele-care. He is author of various papers on conferences and ISI journals.

Ing. Erika Rovini received the Master Degree in Biomedical Engineering. Since 2011 she has been research assistant at SSSA. Her fields of research are focused on ambient assisted living, biomechanical analysis, biomedical signal processing, experimental protocols and validation of systems to evaluate their acceptability by end-users.

Ing. Dario Esposito received the Master Degree in Electronical Engineering. Since 2011 he has been research assistant at SSSA. His fields of research are focused on ambient assisted living, assistive robotics, wearable sensor systems and sensor networking.

7	**konplan systemhaus ag**	**KON**	**CH**

Profile and previous experience: konplan is an engineering consultancy and development partner with a strong focus on medical devices and building automation. The company is certified according to ISO 9001 and ISO 13485. AAL is a strong focus in konplan's future business development strategy. Customers of konplan benefit from a broad experience in industrialising innovative ideas. Established international companies, as well as innovative start-ups trust konplan and their more than 30 engineers since it's foundation in 2007.

Role of partner: Main contributions in WP2 Requirements, WP3 Sensors and signal processing and WP4 application development and WP6 business development and marketing strategies

Short profile of staff members:

Andy Tonazzi, as the owner and CEO of konplan systemhaus ag, he offers his experience is sales and marketing, as well as an established network in the Swiss medtech market. He can represent konplan and the project consortium in organisations such as "Medical Cluster Schweiz", "Technologie Forum Zug" or "MCCS".

Samuel Farner, BU Manager, Dipl. Masch. Ing. and EMBA 10+ years of experience in engineering and project management for medtech applications. Most of his professional life, he was working in the medtech area, specialised in Lab Automation. After his carreer as a Development Engineer, he changed to the management of international M&A projects.

8	**Design LED Products Ltd**	**DLED**	**UK**

Profile and previous experience: Design LED is a technology SME located near Edinburgh, Scotland in the UK and formed in 2004. The company designs and has manufactured LED lighting products using their light-guide/LED technology patent portfolio. The company was a partner in the award winning, FP7 EU funded "Light-rolls" project and is now a partner in the SMARTLAM FP7 project. Design LED was the key R&D provider and participant in the 5 million euro, Scottish ITI funded project and was also a participant in a UK TSB funded project. They have also won a number of grants and awards (SMART, SCIS, TTOM) from Scottish and UK governments for LED/light-guide technology development.

The outcome of this project fits exactly with the future commercial roadmap of Design LED. Providing a full lighting system solution for a specific application will have more commercial value and business sustainability, than simply offering commodity light sources. This change is generic across the lighting industry and is enabled by solid state lighting. Therefore, as well as being a **lighting solution specifier**, de-

veloper, integrator and evaluator in the project, the company sees an important role in leading the investigation of the business model for exploitation and ultimately the business plan for commercial success of the project outcomes.
There is an opportunity for the company to explore how its own technology benchmarks with others providing ambient lighting solutions to reduce stress.

Role of partner: WP6 (Marketing, Dissemination and Business Plan development) Leader. Main contributions in WPs 2 Requirements, 3 Ambient response, 4 System integration and 6 Business plan.

Short profile of staff members:

Dr James Gourlay Technical Director/Chief Technology Officer. James Gourlay was Head of Section Assembly and Packaging with Microemissive Displays Ltd. He was a lecturer at Heriot Watt University and has had a range of research positions at a number of universities in the areas of Displays, Packaging, Microengineering, Optoelectronics and Optics. He has a PhD in Liquid Crystal Displays and B.Eng in Physics and Electronics. He has authored 13 patents and over 40 technical articles/papers.
Fraser Myron: Operations Director. Fraser has held a number of key manufacturing and outsource management positions in a range of electronic manufacturing and product companies, including, Solectron, Sun Microsystems, Creos, Indegovision, Hydrosense and Domino.

Associate Partner	**University of Applied Sciences Munich**	**FHM**	**DE**

Profile and previous experience:

The department of applied sciences and mechatronics under the Professor Dr. Herbert Plischke of the University of Applied Sciences in Munich, Germany, has extensive experience in physiological measurement and the biological impact of light on people at home and in their work environment.

Role of partner: Associated Partner. Participation in WP2, WP3, WP5

Motivation and role: FHM will give input on user requirements, physiological parameters for stress measurement, physiological effects of light.

Subcontractor	**Institute of Automotive Technology, TUM**	**TUM**	**DE**

Profile and previous experience:

The Technische Universität München (TUM) is the leading university in Bavaria, and an internationally recognized partner for outstanding research and teaching. The main topics of the future strategy of the Institute of Automotive Technologies shall include the fields of energy, mobility and infrastructure.

Role of partner: Subcontracted Partner. Participation in WP5

Motivation and role: Trans.Safe will use their expertise and the simulator to learn about user behaviour as well as the efficacy of the Trans.Safe system in a realistic pilot environment.

Subcontractor	**Bundesanstalt für Straßenwesen**	**BAS**	**DE**

Profile and previous experience:

BASt is a technical and scientific institute under the Federal Ministry of Transport, Building and Urban Development (BMVBS) in Germany. It provides the ministry with scientifically-backed decision aids for technical and traffic-related issues and plays a significant role in drawing up regulations and standards.

Role of partner: Subcontracted Partner, participation in WP2 (Requirements Engineering)

Motivation and role: Trans.Safe consortium will use their expertise and guidance regarding ethical and legal issues when using and analysing physiological data at the work place.

3.2 Project management

Key factors to any successful project are a well-structured project organisation, a clear and concise definition of the roles and responsibilities and a skilled project management. As can be seen from the figure, presenting the organisational structure of Trans.Safe, the project is based on 3 layers:

1. Steering Committee, Project Coordinator and the Advisory Board form the upper layer being responsible for all mayor decisions and the project management tasks.
2. The 3 working groups and their leaders focus on the content of the project managing the most important domains such as science & technology, end user involvement, ethics & privacy and dissemination and business aspects.

3. The work package leaders are responsible for the management & coordination, the quality of the work and for meeting the goals within the assigned work packages.

Steering Committee - The committee is the executive body of the consortium and has the overall management responsibility of the project. It is formed by 4 representatives of the consortium consisting of the 3 work group leaders and the coordinator iHomeLab. They have the responsibility for decisions on financial and strategic issues. The coordinator as organizer and chair of the committee will prepare and preside meetings ordinarily a minimum of three times per year. If the need arises, meetings will take place outside of those scheduled, at the request of any partner. The decisions of the steering committee will be voted by majority of the members each having one vote. The committee is responsible for: (1) decision making (2) reviewing, evaluating, assessing, tracking (3) coordinator support (4) conflict resolution

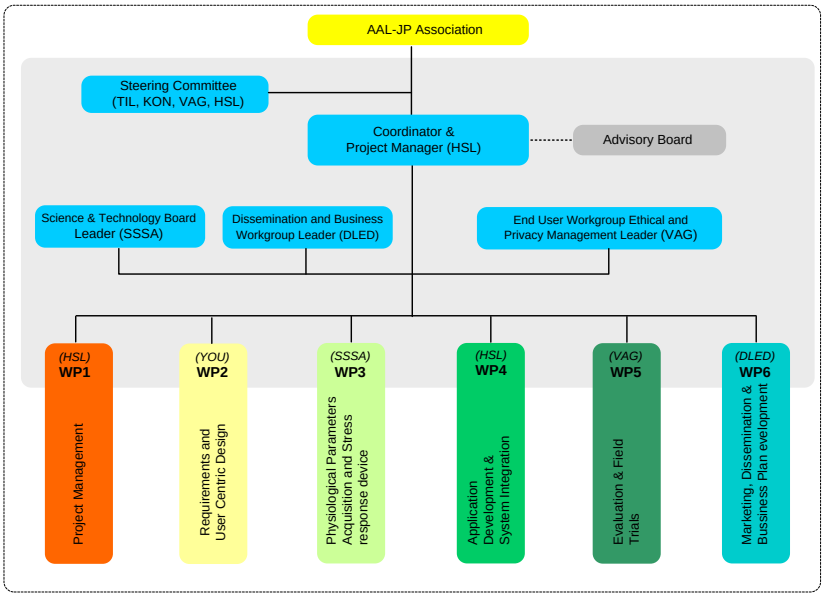


Figure 4a: Trans.Safe Management Structure

Project Coordinator - The project coordinator has the responsibility of the overall project management and coordination tasks under the supervision of the steering committee. The coordinator is the central contact point and information hub for all project stakeholders: the European Commission, the steering committee, the workgroup leaders and the work package leaders. He fosters a culture of quality and efficiency, in terms of time and resources promoting transparency and accountability amongst the partners regarding all aspects of the program. He actively cultivates the teambuilding process and also mediates in conflict situations. The tasks of the project coordinator include: (1) planning, scheduling (2) coordinating, communicating (3) monitoring, tracking (4) assisting, guiding.

Advisory Board - On a regular basis, the project coordinator involves an Advisory Board, consisting of representatives of the AAL National Contact Points and, conceivably, the AAL Board. Together they will discuss the progress, look at the processes, check the financial situation and identify improvements or handle potential project execution issues. The Advisory Board activities enforce the cooperation with related initiatives such as international, national or EU and AAL funded projects. Project reports and occasionally organised meetings will allow taking advantage of synergetic effects.

Besides these, Trans.Safe will introduce 3 expert workgroups handling several specific issues throughout the project. These workgroups will regularly hold meetings and advice the steering committee:

- **Science & Technology Board** - The science & technology workgroup consists of 5 members, the 3 scientific partners (TIL, SSSA, HSL) and 2 technology providers (MAN, KON). The Board aim is to assuring the scientific and technological objectives of the project are met.
- **End User Workgroup & Ethical and Privacy Management** - The group members consist of representatives of the 3 partners in Germany and Switzerland (YOU, VAG, MAN, SSSA) with direct end user involvement. They bring the end users into the requirements process, ensure the code of ethics and privacy, and are involved in the organisation and execution of the end user trials.
- **Marketing, Dissemination and Business Development Workgroup** - This group discusses researches and develops the marketing and business plan for Trans.Safe. The workgroup consists of the 4 enterprises (MAN, TIL, KON, DLED).

Work Package Leaders - Every work package (WP) is assigned a WP leader. He has the responsibility to ensure the technical objectives of his WP and that all planned tasks in his work package are completed on time and the outputs are delivered with the expected quality. The leader communicates with his task leaders, reports the WP progress, sends the deliverables and follows the milestones closely working together with project co-ordinator. WP leaders are taking decisions concerning their work package.

3.3 Contingency plan

Each work-package leader has identified the main risks, and already planned how to react, if an adverse event or series of events, would affect negatively the WP progress.

Table 9: Risk table and contingency plan

WP	Identified risk	Risk	Impact	Mitigation and contingency plan
1	Non-compliance of a partner	low	medium	The replacement could be achieved by using internal resources of the Consortium or by selecting a new partner
1	Non-compliance with the time schedule	low	medium	In case that, non-compliance with the time schedule is observed, a specific contingency plan will be taken in order analyse and to solve the advance or the delay. The problem can be a technical one, or a managerial one.
2	Delays in collecting enough end-users feedback to define requirements	low	medium	The partners have enough contacts to set-up cohorts of potential users, to minder this risk
2	Issues during integration of the solution into varying working environments	low	medium	UCD approach ensures integration from the beginning of the project.
2	Usability issues – negative influence of the system on the stress level of the users	low	high	UCD approach ensures usability of the solution from the beginning of the project.
3	The quality of the data collected would be far too heterogeneous	low	medium	A great effort will be done from the start to define precisely the end-users cohorts and select the most efficient physiological parameters for the project
3	Issues in validity of stress measurement approach	low	high	Ambient sensor selection is based on sound research and laboratory evaluation to ensure a valid sensing concept. By varying the ratio between body mounted and ambient sensors the performance can be increased.
3	Measurement Artefacts	medium	low	Combination of existing and proven measurement methods for physiological data combined with new sensors and technologies, Sensor data fusion and filtering.
4	Integration issues can occur here (classical software or hardware incompatibilities)	low	medium	The partners can rely on their strong engineering experience to detect quickly such problems, even anticipate and find solutions
5	Lack of commitment of end-users in the tests	low	medium	2 test phases iterations with the involvement of voluntary end-users are planned, which will be carefully explained to volunteers
6	Conflicts of interest	low	high	In case a conflict of interest occurs among the partners, the SC has to be informed and a meeting will be called if necessary
6	Business partners can be affected in their marketing plans by the economic crisis	medium	medium	The business partners know how to react to highly variable markets, and adapt their business plans accordingly

3.4 Ethical and legal issues

The members of the Consortium declare that the proposal conforms to current employment legislation and regulations in the countries where the research will be carried out. Moreover, the proposal conforms to relevant EU legislation such as

- The Charter of Fundamental Rights of the EU
- Declaration of Helsinki (World Medical Association - Declaration of Helsinki), latest version
- Directive 95/46/EC on the **protection of individuals** with regard to the **processing of personal data** and on the free **movement of such data"**
- Directive 2002/58/EC "**processing of personal data** and the **protection** of **privacy** in the **electronic communications** sector"

Nothing in the proposal stands in conflict with the opinions of the European Group of Advisers on the Ethical Implications of Biotechnology (1991-1997) and the opinions of the European Group on Ethics in Science and New Technologies (as from 1998).

3.4.1 Informed consent and data protection

Because of the decentralized construction of the consortium in the Trans.Safe project it can be necessary that personal data will travel across borders inside the EU and CH. As a result, data concerning the citizens of one member state are sometimes processed at other partners. Therefore, as personal data are collected and exchanged more frequently, regulations on data transfers become necessary and will be implemented and observed in the project. **It is stated explicitly that data will be transferred from one partner to another within the consortium only after it was made anonymous.** The international laws regarding data protection concerning good data management practices on the part of the entities that process data, called '**data controllers**', will be followed during the project. These include the obligation to **process data fairly and in a secure manne**r and to use personal data for explicit and legitimate purposes. National laws also guarantee a series of rights for individuals, such as the right to be informed when personal data have been processed and the reason for this processing, the right to access the data and if necessary, the right to have the data amended or deleted.

The member States of the EU were required to bring their national legislation in line with the provisions of the Directive by 24th October 1998. In addition, Directive 2002/58/EC specifically deals with the protection of privacy in telecommunications. This Directive states that Member States must guarantee the confidentiality of communication through national regulations. This means that any unauthorized listening, tapping, storage or other kinds of interception or surveillance is illegal.

To the degree pilot/field trials are conducted, this will be done in accordance with the highest ethical standards from Europe and the countries where these tests are to be conducted. To ensure that the information is easy to understand, all written information that is given to subjects has to be proved by experts on “Easy to Read” guidelines. **All collaboration with end-users will be based on an “Informed Consent Form” prepared before the project start.** Participants will get information in a way that is easy to understand. There has to be consent for all activities of each single participant to take part in the project. A cancellation of the participation is possible at any point and any time without giving a reason. There will be written information about the usage of all collected data.

3.4.2 Ethical approvals

All the necessary legal and ethical authorizations will be provided (if not yet available and needed) to the CMU in due course, before starting the phase of the project concerned by the authorizations themselves. **No trial will be performed without checking if approval by the ethical advisors and data protection authorities of the respective countries is needed and if so these approvals are obtained.** The pilot/field trials are for testing and validation purposes and will respect the following aspects:

- Subjects/patients will be informed volunteers;
- A formal informative consent will be prepared and signed by the subjects/patients;
- The re-examination of data is independent from the presence of the patient/subject;
- Data will be password protected to ensure privacy.

In particular as Behaviour Pattern are collected and processed, this will be checked against the Directive 95/46/EC and the collection will be registered if needed.

3.4.3 User Involvement Guidelines

The Trans.Safe project will use the 7 principles of FORTUNE for the user involvement:

Principle 1: Partnership - Co-operation is based on the idea of partnership.
Principle 2: User-Organisation Based - Users are members or representatives of an organisation.
Principle 3: Equal Payment - Users receive payments on the same basis as all other partners.
Principle 4: Accessibility - All project materials, communications and premises are made accessible.
Principle 5: Qualified Staff - Every partner has to provide qualified staff members.
Principle 6: Sound Plan - The project plan contains appropriate WPs and tasks of user participation.
Principle 7: Early Involvement - Users are partners from the very beginning of a project.

3.4.4 Publication and Analysis

The dissemination and publication of the results obtained are one of the primary aims of scientific researchers. The publication of the results involves the conflict between privacy interests of the individual participant and the need for free exchange between scientific experts. There are a number of good practice codes and regulations that guide the researcher in handling this conflict.
All partners in Trans.Safe will adhere to the **Declaration of Helsinki** (World Medical Association - Declaration of Helsinki). For statistical analysis, only data, which are made anonymous, are used and results

are only published as summary statistics to prevent re-identification for individual subjects. For public use of media created during user trials and workshops an informed consent will be used.

3.5 Available resources

The total costs of the Trans.Safe project is estimated as 3.7 M€ over 36 months with a requested funding of ~2.1 M€. A detailed cost overview is given in the table below.

Table 10: Resources for Trans.Safe

	HSL	YOU	TIL	VAG	MAN	SSSA	KON	DLED	
PM	**49.5**	**38.477**	**40**	**18.675**	**37.55**	**46**	**40.5**	**30**	
Personnel cost [€]	711'114	384'770	183'407	205'425	533'210	174'800	534'600	207'930	2'935'256
Overhead [€]	0	0	64'193	0	0	102'400	102'400	151'789	420'781
Personnel & Overhead [€]	**711'114**	**384'770**	**247'600**	**205'425**	**533'210**	**277'200**	**534'600**	**359'719**	**3'253'638**
Consumables [€]	13'000	7'200	10'000	19'400	12'000	15'000	13'000	16'200	105'800
Expenses Travelling Costs [€]	20'000	9'500	10'000	5'000	10'000	10'000	10'000	30'240	104'740
Infrastructure [€]	8'000	0	0	0	0	5'000	0	0	13'000
Subcontracting [€]	20'000	15'000	0	0	20'000	8'200	10'000	0	73'200
Other costs	**61'000**	**31'700**	**20'000**	**24'400**	**42'000**	**38'200**	**33'000**	**46'440**	**296'740**
TOTAL Budget [€]	**772'114**	**416'470**	**267'600**	**229'825**	**575'210**	**315'400**	**567'600**	**406'159**	**3'550'378**
Total Funding [€]	**386'057**	**312'353**	**93'660**	**80'439**	**345'126**	**236'550**	**283'800**	**243'695**	**1'981'680**

Personnel Cost: The major part are personnel costs for specifying, designing, developing and finally building and testing the Trans.Safe ecosystem which result from the human specialists working on the project listed (see chapters 2.2 and 3.1). But there is also actual hardware and software to be created for the Trans.Safe system, the services and the final trial prototypes and environment. Each partner has allocated a sum for subcontracting. Although practically every aspect of the system is covered by a partner of the consortium, access to a driving simulator (located at the TUM, Technical University Munich, see chapter 3.1) is indispensable for avoiding safety hazards in this project.

Travelling Costs: The travelling costs were calculated form a first rough meeting plan which lists the occasions (such as kick off, integration phases, trials) were physical presence of specific partners is critical to successfully reach the next milestone. A special budget was reserved for partners who publish scientific papers to attend conferences and exhibition sites.

Table 11: Trans.Safe Infrastructure

HSL	iHomeLab facility, building automation infrastructure, IT server infrastructure; electronics prototyping lab
YOU	Usability and ergonomics assessment tools/lab
TIL	Joint Open Laboratories of Research, mobile and fixed network infrastructure
VAG	End user organisation, field trials in office environment
MAN	Supplier of commercial vehicles, automotive electronics lab, field trial test vehicle
KON	Access to medical device market(ing), software development environment
SSSA	DomoCasa Living Lab and the Peccioli Robotics Innovation Facility
DLED	Lighting solution developer and lighting manufacturing
FHM	*Associate Partner.* Lab for physiological measurements
TUM	*Subcontractor.* Driving simulator
BAS	*Subcontractor*. Legal advice office

3.6 The Intellectual Property Rights management (IPR) and other legal issues

In accordance with the IP rules applicable to Ambient Assisted Living Joint Programme Projects published in 2011, all affairs concerning dissemination, access rights and use of knowledge and intellectual property will be covered in the Consortium Agreement. This Consortium Agreement will be based on the DESCA model.

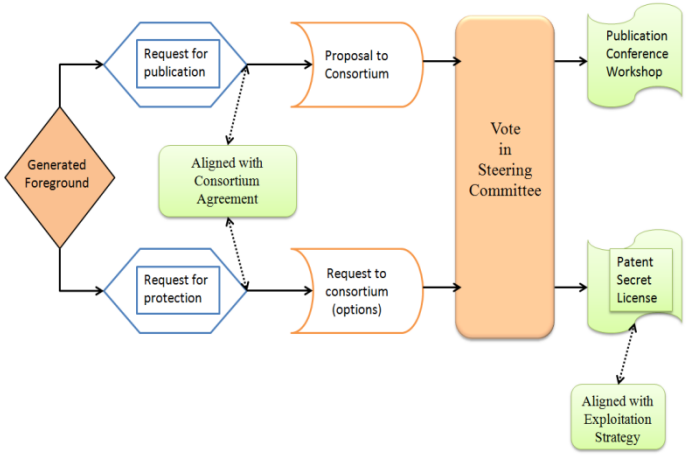


Figure 4b: IPR Strategy

A key tool for the knowledge management will be an IPR Directory, which is intended to give an overview over all background the project or its results are based upon and all foreground developed within the project.

This tool includes the status of all inputs of all partners (IPR background or foreground), and also input of sub-contractors (third parties). The IPR Directory will first include the partners' background as stated in the Consortium Agreement. It will be the role of the SC, the SC. & Tech. Board and of the Dissemination and Business Board to systematically identify potential exploitable foreground and to propose an exploitation route for it to the consortium. The IPR Directory will be maintained throughout the lifetime of the project by the SC as a basis to prevent conflicts and to ease business planning.

The Parties agree to respect their individual Background. All Background remains in the ownership of each Party providing the Background. Foreground shall be owned by the Party who carried out the work generating the Foreground, or on whose behalf it was carried out. The Parties acknowledge that Foreground created in the Project deliverables and Foreground in relation with the Trans.Safe system as laid out in the work plan shall be accessible to Parties and Third Parties as open source software unlike the user interfaces and services whose licensing will be subject to the decision of its owner(s), subject to the provisions of the IPR Directory.

Several members of the consortium have already been involved in EU and AAL projects before. Thus, we can draw from various templates for the Trans.Safe-CA. The Coordinator has an experienced lawyer in charge of drafting appropriate consortium agreements, depending on project and consortium needs.

Section 4: Potential Impact on Quality of Life

4.1 Improving Quality of Life for end-users

Increase health by reducing stress at the working place

Work conditions are in most places better today than ever before: Noise pollution, dirt, heavy manual work and accidents in the workplace could be strongly reduced thanks to technical developments and new work processes. At the same time however, daily work has become dominated by task fragmentation, highly flexible work processes and high time pressure (see German Federal Institute for Occupational Safety and Health, BAuA stress report 2012). Psychical stress often now substitutes physical demand, especially in the service-sector, while older employees suffer especially from time pressure and repetitive tasks (cf. BAuA, 2012). According to a report by the European Agency for Safety and Health at Work, "between 50% and 60% of all lost working days are related to it [stress]". As a result of this, the burn-out-syndrom is often seen as a public health risk, similar to the bore-out – stress caused by a lack of challenges and work. Trans.Safe hence wants to support employers and senior employees in their efforts to reduce stress at work and create a positive, safe and healthy work experience and hence reduce absent times of employees – which at the same time will reduce health care cost.

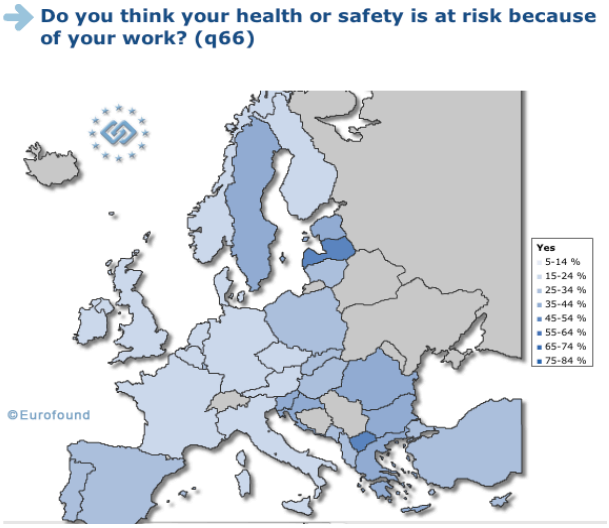


Figure 5: Feeling of security at the workplace (EWCS, 2010)

Increase security at the work place

Although EU guidelines did contribute to improve working laws in the EU-27, in 2010, 22,2% of all EU-15 workers had the feeling that their health and safety at work was at risk.

This feeling of insecurity depends on the actual work (e.g. stress, responsibility), as well as on personal factors. Especially senior workers experience a lower tolerance to stress compared to younger colleagues, which – according to the fourth European survey on working conditions (2010) – leads to increased safety and health risks for workers > 48 years.

Trans.Safe supports the perceived safety and security at work through continually measuring individual physiological stress, by giving feedback to the workers about their performance and performance potential in order for the workers to understand their physiological limits. Furthermore, Trans.Safe optimizes stress sensation through the ambient stress response (e.g. light, sound). This way, workers will have an improved self-consciousness about their performance while employers and the public can be ascertained that the work is carried out within healthy and safe "performance boundaries".

Improving employability for older employees

The demographic change in Western societies and particularly in Europe will change the work environments in three perspectives: People will need to work longer as in some countries young employees are hard to find; people will want to work longer as they feel healthy and want to participate in the active life; employers will need to find new ways to motivate, educate and care for older personnel in order to keep the knowledge, expertise and hence the competitiveness of their enterprises.

In order to make this demographic change possible at work, work stations need to be age-appropriate and need to be adaptable to changing performance potentials that come especially with age.

The Trans.Safe system will help to continually monitor performance and optimize individually and demand-related the perceived stress through the ambient stress response systems. This way, older employees will be employable for longer, reducing the consequences of the demographic change.

Using competence and experience of older employees

Demographic change will have a strong impact on scope and structure of future job markets. The overall population and the population in working age decrease dramatically. This, in order to maintain growth and public solidarity, older people need to be kept in occupation if possible. Senior workers are productive and motivated and have large competences and experiences. However, through decreasing physical abilities, older employees are sometimes seen as putting the performance of the company or team at risk. Trans.Safe provides an innovative solution at work that supports older workers especially in their practice of potentially risky tasks. Risks and stresses are individually defined – and the Trans.Safe system

measures the stress resulting from work load against the individual performance and gives feedback through a personal user interface and through the ambient stress response. This will help seniors to stay in their job for longer, making their competences available for longer.

4.2 The aimed service models

A solution to reliably measure stress, inform the employees and actively provide countermeasures is not yet on the market; neither for the transportation sector nor for any other safety and risky domain were it could be applied. The Trans.Safe solution therefore creates a new kind of product which brings new service opportunities for the business partners of the consortium and their customers.

- The system may be directly integrated in vehicles by the manufacturer (e.g. in the trucks of MAN) to provide a new driver assistance service complementary to the existing safety mechanisms or enhancing them.
- An autonomous version of Trans.Safe may be designed in a way in order to be retrofit to existing vehicles such as trucks, buses or trains.
- A version especially tailored to building environments may be installed in buildings and dedicated rooms such as a control room or also a special office environment where people with stress prone jobs work. In this case, the system may connect to the building network in order to access existing sensors and actors.

The table below highlights impacts of the project in the evolving service models of the business partners.

Table 12: Partner service models

Partner	Technology Innovation	Technology Employment	Re-organisation
VAG	Potential installation of new light systems or individual information equipment in the control room, shaped differently according to individual workers' needs	New sensors need to be installed, tested. They will provide information which will flow into for example the new ambient stress-less light or information systems	A higher level of autonomy of the senior workers is needed, and this will request adjustments and commitment of his hierarchy internal rules for pauses and resources for immediate personal support might need to be changed. The continuous control of public transport has to be ensured. Daily work has to be organized, that an equal work distribution is achieved.
MAN	Potential installation of new systems for detection of driver's overload in the trucks' cabins, shaped differently according to individual drivers' needs. Generating an output variable for adjusting operation modes of existing driver assistance systems or driver information systems to drivers' needs.	Existing sensors (e.g. : brake pedals) and new sensors might be combined to get enhanced robustness of the measurement in the vehicle. They will provide information which will flow into the new stress-less systems	A higher level of autonomy of the senior workers is needed, and this will request adjustments and commitment of his hierarchy (pauses own management). Internal rules for pauses might need to be changed but still have to be aligned with the traffic law regulations
TIL	Telecom Italia aims at building a platform where different kinds of sensors can be connected, both wearable and ambient, and their data can be combined in order to provide a high level service. Stress management in working environments is a key example of such a service.	A mid-level layer, which receives essential data from sensors, and processes with reasoning algorithms, in order to compute a combined stress measurement value. An application layer, which responds to stress level changes with specific countermeasures, such as ambient light modifications.	Telecom Italia plans to expand its product portfolio, focusing on providing new services and hardware bundles to generate additional benefits for new and existing mobile/fixed phone customers. Basic offer could be enriched with the results of this project, in order to provide the end user, in particular and elderly worker, with an offer tailored on his/her habits and needs. Results of Trans.Safe could also find its way into the own company to improve working conditions for elderly employees even further.
DLED	New integrated light system combined with sensors a) for	The new technology can be applied in new prod-	Production and expertise of workers needs to be developed to produce the

	trucks and for b) control rooms	ucts that can be sold in the respective industries (i.e. vehicles, control rooms) and possibly others.	integrated light system.
Konplan	Integrating such devices for the consortium, konplan will further level-up its mechatronic competence. The combination of building automation and medical applications is one of konplan's future strategic focuses.	Useful for further contracts in other settings. The results and the experience of this project cooperation will contribute to future innovation in other markets as well. (cross industry innovation)	Employees of the company might benefit from the results as well, especially in the offices of the company.
YOU	Better knowledge on physiological monitoring technologies, user test set-ups and better insights into technological development processes. Furthermore, knowledge on ergonomics at work.	The knowledge can be applied for offering services for user research with physiological data. Furthermore, YOUSE can provide a consulting service for ergonomics at work in demographic change.	Need to staff and educate personnel accordingly; adjust service offerings from user centered design to work ergonomics consulting.

4.3 Social and ethical impact

Added value for workers are: 1) higher personal safety, 2) improved perceived health, 3) optimised individual work burden, 4) improved own break-down of resources, and 5) improved learning curve through optimised work burden.

Added value for employers are: 1) Better staff management, 2) a system is in place to identify any source of excessive work burden and to prioritize their avoidance, 3) optimised input of workers with different working capacities, and 4) Micro-economic advantages.

Added value for the society are: 1) Higher public safety, 2) economies for the social security systems, macro-economic benefits: a) Working places preserved in the production system, b) Securing working places for seniors in front of the demographic change.

Added value for the consortium partners:1) For the end-user VAG, this will also mean productivity benefits, improved safety and better motivation of workers, 2) The business partners (DLED, MAN) will position themselves on new markets, and enlarge the range of its products and services in the market of assistive devices for seniors at work and physiological ambient aids based of working place optimization, 3) YOU will benefit from its participation increasing the range of his counselling expertise, for devices optimization strategies at the work place and 4) Scientific knowledge and publications produced (SSSA, HSL, DLED).

4.4 Other user segments - Stress intensive and safety-critical industries

Certain branches of industry are especially stress intensive, for example the transportation industry: truck drivers, train drivers, flight captains, skippers, air traffic controllers etc.. This industry has – together with gastronomy – the most irregular working times and the most night shifts. But unlike the gastronomy, working in the transporting field often provides not only personal, but also public safety risks. For example control of power plants, where mistakes can seriously harm many other people.

> A goal of the Trans.Safe project is to improve the safety at stress-intensive and safety-critical working places by optimizing the burden for the senior employees, and other employees at large. In order to do so, we want to perform an automated stress-detection and optimized workload investigation in the two generic environments "utility vehicles" and "control centers".

Section 5: Potential impact on Market Development

5.1 The business case

There are several business cases that can be developed out of this project and which can be pursued by the different business partners:

- production and sale of integrated light system (e.g. DLED)
- integration of light system into existing services for better market position (e.g. MAN, TIL)
- consulting on ergonomics at work in demographic change (e.g. YOU, KON)

- AAL services and solutions development and provision (e.g. KON)

Figure 6: Trans.Safe Business Model

MAN will lead a European Market study to determine the benefits of the prototype from a costs / benefits European perspective, using preliminary results from WP2 Requirement. Following is the methodology of this task:

1. For a given scenario and the known functionalities and capabilities of the current prototypes: what amount of costs could be saved for e.g. old people, caring institutions? Who can pay / invest in such devices? This advantage - costs analysis will help calculate a basis for the maximal prices of the different devices and their integration.
2. What other scenarios (different from the one above that has been quantitatively assessed) would also be possible with the given (or slightly further developed) technology?
3. How much would cost the production of the microphones of the car roof in a large scale production?
4. How much would cost the devices for the mobility, in railway stations and in the car?
5. Can acceptance, access and safety be measured?
6. What is the European Legal Framework for these new technologies? Will push the legal boundaries, for example concerning drivers safety?
7. What do the competitors propose?
8. Can the results be transferred to other sectors, e.g. rehabilitation, help to autonomy of young dependent people? We will develop different future scenarios to answer these questions.

The following table gives an overview of the business cases for the different business partners:

Table 13: Partner business cases

Partner	Business Case	Customers / Beneficiaries
VAG	VAG is a very good example of transport company which need to keep a detailed overview their complex network systems, and where senior workers bring an important competence, by being able to manage problems and deciding on the spot where to allocate priorities. As such, the installation of Trans.Safe can help to reduce workers' turnover and absence time through a stimulated healthiness at the workplace. Additionally, VAG can profit in hiring new employees as they are seen as innovative and caring for the health of their employees.	Employees
MAN	World-wide light and heavy truck and bus markets. , developing another competitive advantage to sell trucks. In Germany alone, about 350.000 new trucks and buses are bought, in Europe about 1,9 million. Consider-	Truck market Bus market

	ing every 20th truck will have a Trans.Safe system, this could mean a market potential of about 100.000 trucks – making an attractive market. MAN can use Trans.Safe to offer extra services as well through Trans.Safe.	Vehicle market
TIL	Telecom Italia already provides sensors as part of offers in fixed or mobile bundles (e.g. for home surveillance). Basic offer could be enriched with the results of this project, in order to provide the end user, in particular elderly workers, with an offer tailored on his/her habits and needs. Stress management can improve quality of life and work productivity, so first target and experimental users are expected to be TLI employees.	Home silver market Telecom elderly workers
DLED	The outcome of the project offers the opportunity to offer high value lighting solutions/products for a new a volume application with an expanding market. Partners in the project are effectively "end user" customers, so very valuable marketing information will be obtained by participation. The opportunity to integrate DLED technology into the system solution is very attractive and fits with the company's commercial/product roadmap. Therefore, DLED intent to lead the exploitation and business plan activities in the project. DLED will produce and sell the integrated light system. Alone the truck and bus market of Europe is attractive (see MAN) with potentially tens of thousands of light systems per year. Furthermore, the system can be fitted in different work (and private) environments, making the potential sale of the light system extremely attractive.	Truck market Bus market Vehicle market Boat market Control rooms (airports, energy stations) Senior homes Open offices
Konplan	European ICT market for developing mechatronic solutions for sensors	Swiss med-tech market, building automation market (sensors / actuators)
YOU	YOUSE will develop business models to provide consulting services for companies that need to adapt their work places to demographic change. This alone in Germany is a huge potential market, as most medium and large enterprises need by law and by their own needs to adapt their work places to higher safety and better ergonomics. Trans.Safe can help to give these companies a solution – where YOUSE will accompany these companies to install and implement these systems into their work organizations. Furthermore, YOUSE can offer a new business line in regards to physiological measurement of well-being that can be applied in the evaluation of human machine interaction concepts (physiological usability tests)	German and European Companies addressing ergonomics at work in regards to demographic change Companies looking for reliable physiological usability tests for HMI concepts (e.g. car industry, software industry)

5.2 Dissemination

It is essential that dissemination is high profile, regular and coordinates itself with "neighboring" activities in Europe to ensure cohesiveness of Trans.Safe research in Europe. Dissemination has three main audiences and all are addressed here. Prior to all dissemination, information will be approved by the Trans.Safe Steering Committee to ensure that data of potential relevance for exploitation is protected.

Table 14: Dissemination by partner type

Industry: Health bodies and Trade Unions
- MAN and VAG workers' councils ("Betriebsräte") - European Agency for Health and Safety at Work - Partnership for European Research in Occupational Safety and Health (PEROSH) is a Network of European research institutes aiming at strengthening European research in occupational safety and health (10 member states represented) - European Foundation for the Improvement of Living and Working Conditions - International Commission on Occupational Health (ICOH) organizes triennial World Congresses on Occupational Health - International Ergonomics Association - Annual meetings of the Human Factors and Ergonomics Society - Europe Chapter - European Trade Union Institute (ETUI) and their network of associated research institutes
Industry: Industry Managers
- EFFRA workshops - FP7 FoF annual meetings - 1 booth with prototypes at Hannover Messe 2015 and Cebit 2016 - "7. Tagung Fahrerassistenz in München", 2015 by TÜV Süd

- "DEKRA Symposium, Safety of Commercial Vehicles", 2016, by DEKRA - Co-exhibitor at the World MedTech Forum in Lucerne - Customers events at the iHomeLab in Lucerne
Scientific community
- Scientific and general dissemination: papers, conferences (AAL-Forum (http://www.aal-europe.eu/aal-forum-2013/), AAL-Infoday (on request), AAL-Kongress (http://www.aal-kongress.de/), workshops, media (Website), Health and Wellbeing at Work (http://www.healthatwork2013.co.uk/), seminar/workshops of the European Association of National Productivity Centres (EANPC http://www.eanpc.eu/p/MM00-01) - Exploitation: developed parts and / or the whole integrated solution are planned for exploitation as a new product after the projects end.

Presentations at international conferences: Conferences will be one of the primary mechanisms for dissemination to the global industrial and scientific communities. With partners presenting data at between 5 and 10 meetings a year around the world, this dissemination potential is important.
Peer review publication: All non-confidential data will be published in peer-reviewed journals. The consortium already holds an impressive track record in publication in several journals, the nature of the work intended within Trans.Safe ensures that the calibre of publications will be the highest and set international standards.
The general public:

- **Website:** A clear section of the website will be dedicated to the description of work for a non-scientific audience – it will describe the practical relevance of the research for industry. Trans.Safe
- **Press releases:** A standard form of dissemination, this will be valuable in bringing specific news to other companies, the general scientific press, policy makers and funding bodies – it will guide them back to the website where full information will be available.
- A specifically designed Trans.Safe **show case** will be presented to a broad audience in the iHome-Lab during the guided tours visited by over 2500 people every year.
- In the scope of field trials, participating end user will be informed by workshops.

Europe: The European wide exploitability is further supported by the **European Network of Living Labs (ENoLL)** (www.openlivinglabs.eu), as the research lab HSL is also active member of ENoLL. This international federation of benchmarked Living Labs (Europe and worldwide) counts currently over 320 members. The ENoLL community pursues a sustainable strategy for enhancing innovation on a systematic basis. The overall objective is to contribute to the creation of a dynamic European innovation system. ENoLL aims to support co-creative, human-centric and user-driven research, development and innovation in order to better cater for people's needs. Via this active and collaborative community we will be able to demonstrate the Trans.Safe project outcomes during knowledge and experience sharing dissemination activities throughout Europe.

5.3 Standards

We will employ relevant national standards for workplaces of the real pilot applications in our project derived from end-user organization and business partners (e.g. DIN, VDI) as well as reasonable international standards (e.g. EN, ISO) which have been adopted by national standards.

Standards for lighting of work places
CIE 196:2011 Guide to increasing accessibility in light and lighting.
CIE 158:2004 Ocular lighting effects on human physiology and behavior.
DIN SPEC 67600:2013 Biological effective illumination - Design guidelines.
DIN 5034-1:2011 Daylight in interiors - Part 1: General requirements.
DIN 5035-8:2007 Artificial lighting - Part 8
DIN SPEC 5031-100:2012 Optical radiation physics and illuminating engineering - Part 100
EN 1837:2009 Safety of machinery - Integral lighting of machines; German version
EN 12464-1:2011 Light and lighting - Lighting of work places - Part 1
EN 14255-2:2005 Measurement and assessment of personal exposures to incoherent optical radiation
ISO 8995-1:2002 Lighting of work places - Part 1
ISO 16817:2012 Building environment design - Indoor environment
VDI 6011-1:2002 Optimisation of daylighting and artificial lighting

Standards for acoustics at work places
DIN 45645-2:2012 Determination of rating levels from measurement data - Part 2:
ISO 11200:2012 Acoustics - Noise emitted by machinery and equipment
ISO 3382-3:2012 Acoustics - Measurement of room acoustic parameters - Part 3
ISO 4871:2009 Acoustics - Declaration and verification of noise emission values
ISO 11064-6:2005 Ergonomic design of control centres - Part 6
VDI 3766:2012 Ultrasound - Workplace - Measurement, assessment, judgement and reduction
VDI 2058-3:2013 Assessment of noise in the working area with regard to specific operations.

Standards for usability at work places
ISO 9241-11:1998 Ergonomic requirements for office work with visual display terminals - Part 11
ISO 9241-171:2008 Ergonomics of human-system interaction - Part 171
ISO 9241-410:2008 Ergonomics of human-system interaction - Part 410
ISO 20282-1:2006 Ease of operation of everyday products
ISO 16982:2002 Ergonomics of human-system interaction
ISO 26513:2009 Systems and Software Engineering
ISO 9126-1:2004 Software engineering - Product quality - Part 1

Standards for medical devices
ISO 13485 General standard regulation for medical devices
EN 60601 Safety and ergonomic design of electrical medical devices
ISO 14971 Risk management for medical devices
ISO 62366 Usability for medical devices

Approval Of Vehicles in the context of Driver Assistance Systems
UN-R 48: Regulation No. 48, with regard to the installation of lighting and light-signalling devices
UN-R 79: Regulation No. 79, approval of vehicles with regard to steering equipment
COMMISSION REGULATION (EU) No 347/2012 of 16 April 2012 implementing Regulation (EC) No 661/2009 for certain categories of motor vehicles with regard to advanced emergency braking systems
COMMISSION REGULATION (EU) No 351/2012 of 23 April 2012 implementing Regulation (EC) No 661/2009 lane departure warning systems in motor vehicles, Commission Recommendation of 26 may 2008 on safe and efficient in-vehicle information and communication systems: update of the European Statement of Principles on human-machine interface (2008/653/EC)
Response 3 Code of Practice for the Design and Evaluation of ADAS

Annex: Ethical “declaration” table

Table 15: Ethical “declaration” table

Ethics declaration of proposals in the AAL-Joint-Programme	Described on page or “not relevant”
How is the issue of informed consent handled?	Draft available before project start. See section 3.4 Informed consent
What procedures does the proposal have to preserve the dignity, autonomy and values (human and professional) of the end-users?	See section 3.4 data protection, ethical approvals, publication and analysis
If the proposal includes informal carers (e.g. relatives, friends or volunteers) in the project or in the planned service-model - what procedures exist for dealing with ethical issues in this relationship?	See section 3.4 ethical approvals, employee organizations will be involved (already informed) in the process and legal consultants (BAS)
If the proposal includes technology-enabled concepts for confidential communication between the older person and informal and formal carers, service providers and authorities – what procedures are planned for safeguarding the right to privacy, self-determination and other ethical issues in this communication?	See section 3.4 ethical approvals, publication and analysis
What "exit" strategy for the end-users involved in the project does the proposal have (in terms of end-users leaving the project during its implementation and after the project’s end)?	See also chapter 2.5 Participants have the right to exit at any time
How are the ethical dimensions of the solution targeted in the proposal taken into account? (Brief description of distributive ethics, sustainability et.al.)	See section 3.4 ethical approvals, employees organisations, legal consulting