Active Older Adults @ Workplace

D5.02 – Operational Scenario Results

Project Deliverable

D 5.2 Operational Scenario Results

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1. Executive Summary

The Active@work system was tested in 2 pilot locations, each with their specific challenges: an outdoor pilot that focuses on gathering bio-parameters of blue-collar workers and an indoor pilot focused additionally on testing the collaborative module with white-collar workers. In this first phase of the pilot the main focus was on collecting data from the different devices used during the trial. For this, to succeed all components needed to be integrated and be robust enough to work without constant supervision of the Active@work team. As interaction with the end-user was still very limited during the pilots the user's feedback was mainly on the use of the different devices and their expectations of the system. The data gathered during the pilots was analysed to setup the algorithms used in the cognitive module. Based on the user feedback and issues that were encountered during the pilots, improvements have been identified that are planned for the next phase.

2. Introduction

This document describes the first phase of the two pilots in the Active@Work project. For each of the pilots the first phase allows us to test the technical integration between the different components and improve the system based on the feedback from the users.

3. Pilot overview

This document reflects the activities performed in WP5. This work package is devoted to deploy and evaluate the Active@work solution from the user and technical perspective in a real environment.

The main challenges of WP5 are:

- Organize and coordinate the pilot deployment (Spain and Belgium)
- Testing the pilot (two phases)
- Evaluate the pilot (user and technical perspective)
- Handle pilot improvements provided by WP3 Cognitive module and WP4 Collaborative and skill development module
- Provide feedback to the technical work packages related to the deployment and modules integration.
- Monitoring errors and missing parts encountered during the pilot phases to the technical work packages for their resolution.
- Define use case in more detail way

3.1. Description of pilots

In order to have the widest possible view over the Active@Work solution, two different pilots have been deployed. The first pilot comes from a Leisure park in Belgium which involves blue-collar workers, in particular the cleaning staff and the second pilot includes white-collar workers, of a Multinational company in Spain. This diversity in scenarios ensures that the needs from the end-users as well as legal and regulatory aspects are the most diverse, so the analysis results are not bound to a particular context, but should be applicable, in principle, to a wider range of other business cases.

The pilot deployment has been split in two phases, the first phase has been finished the 9th of December and the second one will start next year in January. (See section 3.2). This first phase consists of two different steps: (1) The piloting of the actual Active@work prototype and (2) the validation of the results by collecting feedback and providing it to the consortium for possible refinements.

For the Outdoor pilot the main goals in this first phase were:

- Gather data from a real-life environment (Heart rate, distance travelled, GPS position, nearby beacons, calories burned, body temperature)
- Test the Cognitive module
- Analyse the data and determine how we can use it.

For the Indoor pilot the main goals in this first phase were:

- Gather data from a real-life environment (Heart rate, distance travelled, GPS position, nearby beacons, calories burned, temp)
- Analyse the data and determine how we can use it.
- Test two modules (Collaborative Module and Cognitive Module)
- Receiving well-being notifications and advices from the Cognitive Module

3.2. Timeline

This section describes the timeline of the project that has been slightly changed with respect to the original planning that did not adequately foresee a sufficiently long test phase, allowing pilot organizer and end-users to work together with the technical staff to solve inevitable adjustment issues. Therefore, the first phase of the pilot has been started in M22.

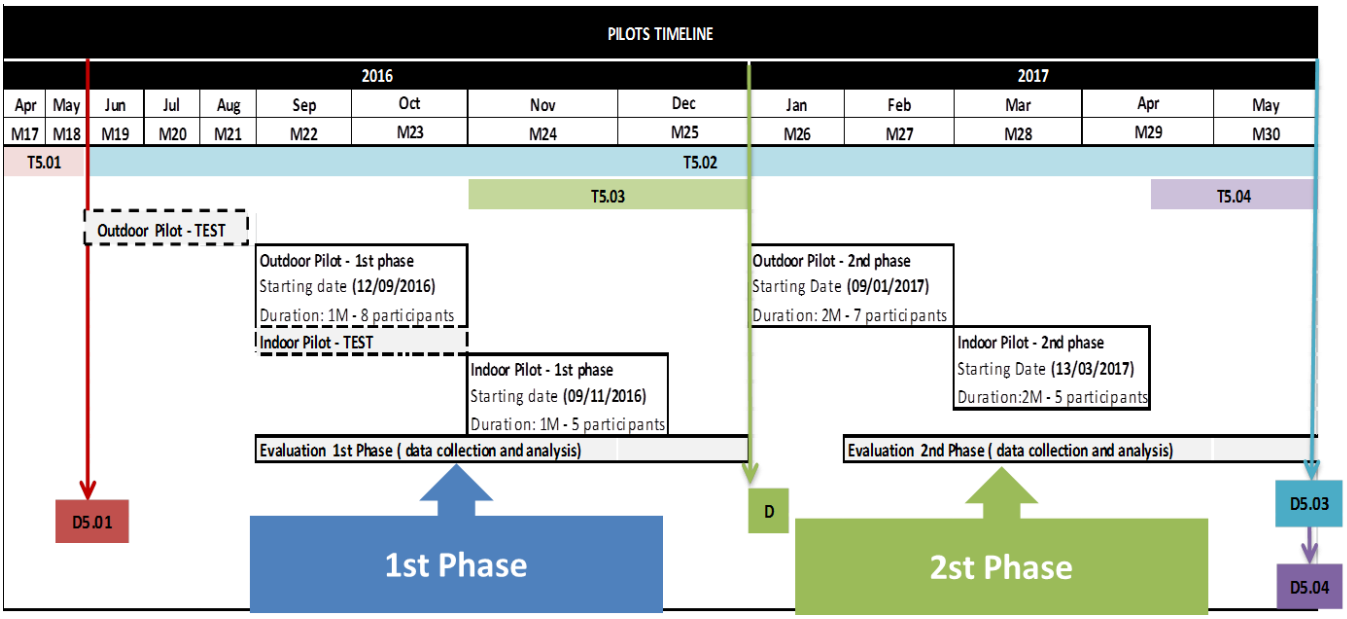


Figure 1 Timeline

According to the above figure, the pilots will be performed in two phases:

1. The first phase of the project has been started in M22. The outdoor pilot in Belgium has included 8 end-users with the main goals of gathering data from a real-life environment and analysing these data. The indoor pilot in Spain started in November (M24) and included 5 senior managers. Most of them are frequent travellers under a high amount of stress at work.

2. The second phase will start once the improvement activities and the prototype have been finished in M26. Both pilots will last around two months. After the end of the pilots, we will produce a final report with different evaluation aspects from the technicians and the end-users.

4. Outdoor pilot – phase 1

4.1. Initial setup

The Erperheide leisure park has a total of 619 visitor cottages. These cottages are divided in 5 zones for cleaning purposes and each zone contains 125 cottages. Each of these zones has one floor manager responsible for the cottages in this zone. The outdoor pilot involves one floor manager and 8 cleaning ladies in her group.

The equipment used:

- 8 Android smartphones
- 5 Microsoft Band II
- 20 beacons

The modules tested:

- Cognitive module (gathering data)
- Active@work platform at the server side.

Each of the cleaning ladies is equipped with a Microsoft Band 2 device and a paired smartphone device. All smartphones are equipped with a SIM card to transmit the gathered data over a 3G data connection. Each of the devices is connected to the Active@Work server through a username (active1, active2,…, active8). Beacons were installed in the technical rooms of some of the cottages as shown below. Each of the beacons is registered in the Active@work server as a beacon having a specific location on the map.

Figure 2 Beacon placement

When a cleaning lady entered a cottage to start cleaning she was instructed to place the smartphone in the center of the cottage. This would ensure a good connection to the wristband at all times.

Figure 3 Smartphone placement

4.2. Testing timeline

Before the tests started a short informative session was organized with the floor manager, HR manager and the cleaning staff that wanted to join the experiment. The cottages are cleaned on Monday and Friday between 9h and 16h.

Date	Comment
5 September	Information session with HR manager, floor manager and 8 cleaning ladies
9 September	Test day from 9h until 16h
12 September	Test day from 9h until 16h
16 September	Test day from 9h until 16h
19 September	Test day from 9h until 16h
23 September	Test day from 9h until 16h
26 September	Test day from 9h until 16h

The cleaning schedule for each of the cleaning days was also collected to know how to interpret the collected data.

4.3. User training

Because usage of the system for the cleaning ladies was limited to wearing the Microsoft Band 2 and keeping the smartphone nearby the training session was very short. All of the cleaning ladies managed to wear the band and keep the device nearby during their work hours.

4.4. Pilot monitoring and support

During the outdoor pilot at Centerparks Erperheide, the workers were equipped with a Microsoft Band 2 and smartphone running Android with a the Active@work application acting as a data gateway. The Microsoft Band collected the following bio-parameters:

- Heart rate
- Steps
- Calories
- Skin temperature

This data was collected at 5 second intervals, buffered on the smartphone and sent to the operational DB whenever an internet connection is available.

Additionally, the location of the people involved in the pilot was collected using the following two methods:

- Using the built-in GPS of the smartphone whenever available (less precise when indoors)
- By monitoring the connection of the smartphone to any of the Bluetooth Low Energy (BLE) beacons, installed in 20 of the cottages.

During the test IOS was present at the start and end of each testing day to deliver and collect the test devices. During this time, any questions could be asked but given the simplicity of the system there were no questions.

5. Indoor pilot – phase 1

The indoor pilot has been deployed in ATOS headquarters in Spain, with 5 end-users in the roles of senior management, most of them are frequent travellers under high level of stress at work and an age range between 40 to 55 years old.

The equipment used:

- 5 Android smartphones
- 5 Microsoft Band II (Sizes: 4L, 1M)
- 2 environment sensors
- 6 beacons

The modules tested:

- Cognitive module (gathering data and receiving well-being suggestions to the smartphone)
- Collaborative module (mentoring tool, and forum discussion)
- Unique Access Module
- Active@work platform at the server side.
- Skill development module (will be tested at the second phase of the pilot)

5.1. Initial setup

In this first phase, ATOS Indoor pilot includes; (1) Unique user access, (2) Cognitive module and (3) Collaborative module (the Skill development module will be included in phase 2).

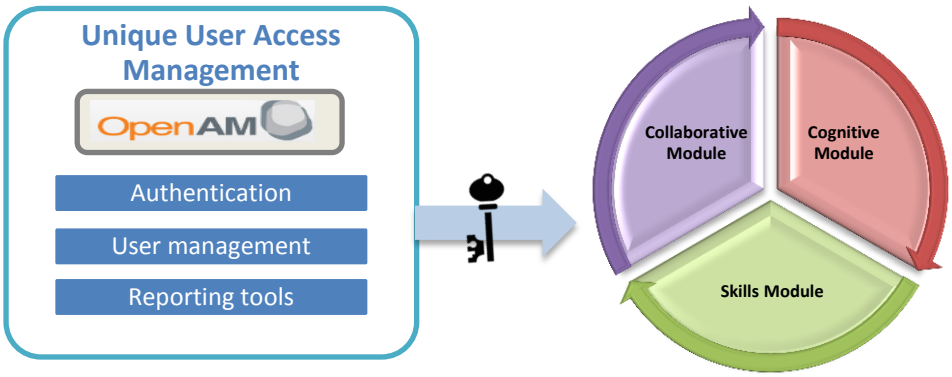


Figure 4 Virtual Assistant tool Main System architecture.

Any end-user in the Active@work platform must have:

1. A smartphone that includes the Active@work app.
2. Microsoft band that collects all the bio-parameters and sends them to the smartphone.
3. And finally, all end-users must be registered into Unique user access module, in order to access the platform, display his/her data collected and interact with other active users

Along with the equipment needed for each end-user, the beacons for indoor location and the environment sensors are placed along the ATOS 4th floor, as it is shown on the below figure.

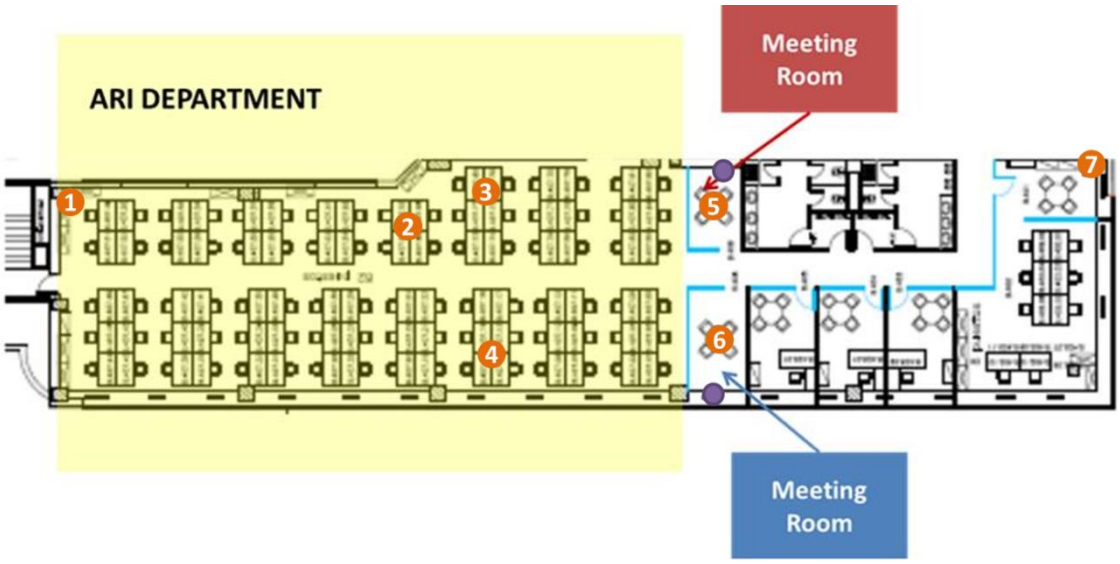


Figure 5 Indoor pilot 4th floor map

Unique user access module:

1. User registration: One OpenAM administrator must register any active user. Each user with active smartphone and Microsoft band has one linked user:

	Nombre
☐	active2 atwork xpto
☐	active3 atwork
☐	active4 atwork
☐	active5 atwork
☐	active6 atwork
☐	active7 atwork
☐	active8 atwork
☐	Active Demo User 1
☐	Active Supervisor

Figure 6 Active platform users

2. Along with the smartphone and the Microsoft band, the responsible gives credentials to each active user.

3. The Active@work user can access by using his/her credential to the Active@work platform and:
    a. Change his/her profile (full name and contact details) and
    b. Change his/her password

4. The Active@work user can access the Active@work platform and see data collected from device (smartphone and the Microsoft band).

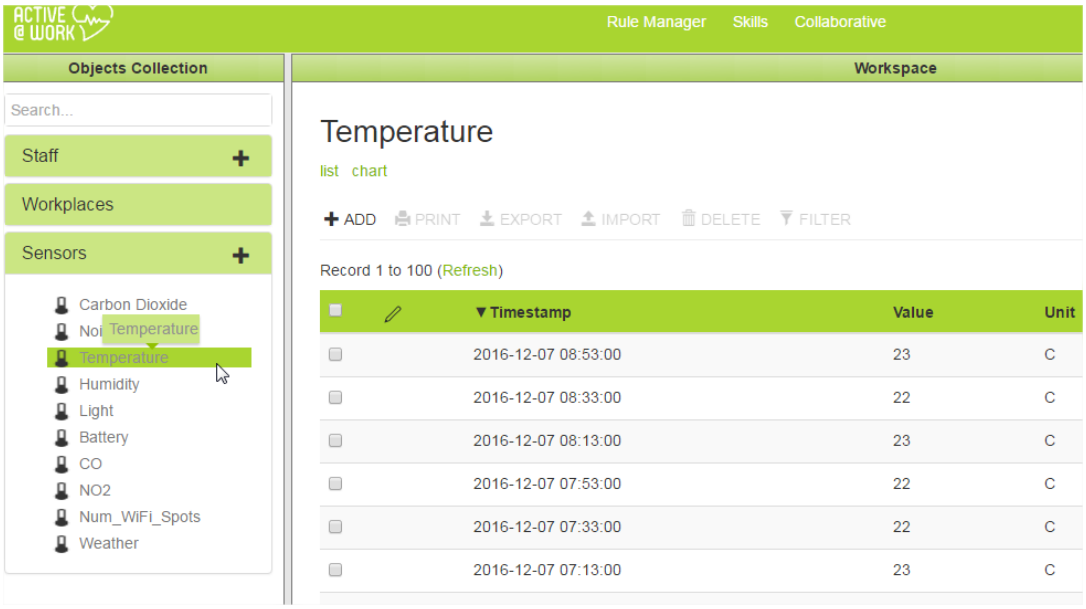


Figure 7 Main platform and logged user body temperature details coming from MS Band

Once all the components are configured, the cognitive module is able to automatically collect data from the band and display these data to the corresponding active user.

The technical configuration for all equipment (Microsoft band and smartphone) are fully described in the user guide Appendix 3.

5.2. Testing timeline

The following table reflects the timeline of the Indoor pilot in further detail.

NOVEMBER 2016				
7	**8**	**9**	**10**	**11**
- Testing and setting up the communications in all bio sensors and the smartphones - All Microsoft bands works perfectly.	- Testing the communication between the smartphones and the server - Testing the communication between the beacons and the server - Testing the unique access to the application	HOLIDAY	- Starting the Indoor pilot first phase - Two hours training for the end-users - Providing to the end-users the use guide.	- Starting monitoring 4 end-users. (9:00 am - 14:00 pm) - Equipment provided: Biosensor and smartphone. - Beacons placed around the 4th floor
14	**15**	**16**	**17**	**18**
- Monitoring 5 end-users. (9:00 am - 15:00 pm) - Different tests in the Collaborative module.	- Monitoring 4 end-users. (9:00 am - 15:00 pm) - Temperature sensor placed in the 4th floor meeting rooms	- Problems at the server side. No information received.	- Server problems is solved. - Monitoring 5 end-users. (9:00 am - 15:00 pm)	- Monitoring 3 end-users in ATOS premises. (9:00 am - 15:00 pm) - Monitoring 2 end-users at home.

21	22	23	24	25
- Monitoring 5 end-users. (9:00 am - 15:00 pm) -Focus group with HSG (3 hours) - Reception of another environment sensor that includes new measurements	- Monitoring 5 end-users. (9:00 am - 15:00 pm) - Creation of an excel file with the errors encountered and missing parts.	- Monitoring 3 end-users in ATOS premises. (9:00 am - 15:00 pm) - Monitoring 2 end-users at home. **- First Indoor pilot follow-up meeting**	- Monitoring 5 end-users. (9:00 am - 15:00 pm) - Installation of the new environment sensor. Materials needed: wifi gateway and UTP cable.	- Monitoring 3 end-users in ATOS premises. (9:00 am - 15:00 pm) - Monitoring 2 end-users at home.
28	**29**	**30**	**1**	**2**
- Monitoring 5 end-users. (9:00 am - 15:00 pm) - Problems encountered with the environment sensor installation. Atos does not allow plugging any router in the internal network. The solution is buying with a WIFI gateway with a SIM card. Postponed to the second phase.	- Monitoring with 3 end-users. (9:00 am - 15:00 pm).	Monitoring 3 end-users in ATOS premises. (9:00 am - 15:00 pm) - Monitoring 2 end-users at home. **- Second Indoor pilot follow-up meeting**	- Monitoring 5 end-users. (9:00 am - 15:00 pm) - Checking the indoor location at the server side.	- Monitoring 3 end-users in ATOS premises. (9:00 am - 15:00 pm) - Monitoring 2 end-users at home. - Well-being advices tested at the smartphone.
5	**6**	**7**	**8**	**9**
- Monitoring 5 end-users. (9:00 am - 15:00 pm) - Checking the temperature reception at the server side.	HOLIDAY	Monitoring 3 end-users in ATOS premises. (9:00 am - 15:00 pm) - Monitoring 2 end-users at home. **- Third Indoor pilot follow-up meeting**	HOLIDAY	- Monitoring 3 end-users in ATOS premises. (9:00 am - 15:00 pm) - Monitoring 2 end-users at home
12				
End of the Indoor pilot first phase				

5.3. User training

Training materials are an important part of any activity that involves the introduction of a new technology to users. The best approach to developing training materials is to understand the information needs of the users and prepare a training plan for them, thinking of available time and resources.

The training materials provided have been prepared according to the following premises:

- **Accurate**: Training materials should be prepared by qualified staff related to the project, updated as needed, and facilitated by appropriately qualified and experienced individuals employing appropriate training techniques and methods.

- **Adequate:** Materials must be adapted to the level of knowledge of the different audiences. If the training materials are only understandable to people with technical or scientific background or people who understands the jargon, then the material will not be useful.
- **Clear:** Training programs should be not only accurate and believable, but clear and understandable to the end-users in the pilots.
- **Practical:** Training materials should present information, ideas, and skills that end-users see as directly useful in their lives.

Before starting the indoor pilot, the Active@work team has prepared a user guide which includes instructions about the project modules and the use of the different sensors. For additional information about this user-guide see appendix 3.

Additionally, a training session was prepared at the beginning of the pilot. The details below:

Indoor pilot training session:

- Date: 10/11/2016
- Duration: 100-120 min
- Devices used: smartphone, Microsoft bands, beacons, and temperature sensor
- Training materials: Active@work user guide and Indoor pilot general information in Spanish

5.4. Pilot monitoring and support

Similar to the outdoor pilot, here too the people involved were equipped with a Microsoft Band 2 and smartphone running Android. The same bio parameters were collected. The major differences regarding data collection between this pilot and the outdoor pilot are:

- The location is only tracked using the indoor BLE beacons since the GPS signal is not available inside the ATOS offices
- Since the smartphones were not equipped with a SIM card for this pilot, the data is only sent when a Wifi connection is available. This is not a big issue since the people involved in the pilot were using the devices only inside the office anyway

In addition to the bio parameters and location, two environment sensors were also deployed on site.

- One simple sensor which communicates over the Sigfox protocol and which measures temperature
- One more complex sensor which communicates over Wifi and which measures temperature, humidity, light level, sound level, CO level, NO2 level and the visible wireless networks.

After ironing out some issues with the data collection no major technical or hardware issues were encountered. However, we did notice a challenging amount of missing data, due to the difficulty of the band getting an accurate reading of the heart rate and other measurements, and due to the sometimes-difficult connectivity of the smartphone with the internet. Measures to improve this will be taken and tested in the coming pilot phases.

On the other hand, related to support the end-users during the testing phase, a helpdesk has been established in ATOS that provides a single contact point to give the end-users the opportunity of asking any questions or comment any issues presented during the pilot phase. The person designated is reached via e-mail and phone from 9:00 to 15:00 pm five days a week and provides support on the basic level.

Additionally, other supporting activities have been performed at the Indoor pilots that are listed below:

- Definition roles and responsibilities of each partner toward the Indoor pilot support. The indoor pilot has at least one technical partners which will support the adaptation process from a technical level point of view
- Definition of a shared working document for technical partners to include errors encountered from the end-user and missing parts.
- Indoor follow-up meetings to monitor the status of the pilot.

Date	Partners Involved	Description
23rd November 2016	All technical partners (INOV, YAZ, IOS, SENS,ATOS)	– The purpose of this meeting was to discuss about the status of indoor pilot, first impressions, and errors encountered. – Presentation of the excel file to be shared between all of them, in which the errors encountered in the indoor pilot as well as the missing parts are listed
30th November 2016	All technical partners (INOV, YAZ, IOS, SENS,ATOS)	– Information about the status of the pilot – Excel file, error solved and missing parts finished
7th December 2016	All technical partners (INOV, YAZ, IOS, SENS,ATOS)	– Information about the status of the pilot – Excel file, error solved and missing parts finished.

6. Evaluation process

6.1. Technical Evaluation

The data collected during phase 1 of the outdoor pilot was used for an offline evaluation of data quality and a manual analysis of the patterns found in the behaviour of the people involved. These conclusions were incorporated into the algorithms of the cognitive module, which were deployed online during the first phase of the second pilot. The cognitive module was successfully generating notifications via email in case abnormal levels of heart rate vs. activity were detected. From a technical point of view, all issues encountered during the pilots have been resolved. A more long-term evaluation of the accuracy, usefulness and user satisfaction of these notifications will be done during the second phases of the indoor and outdoor pilots.

During the pilots a lot of technical issues were identified and resolved. Below a list is shows these issues:

Component	Issue	Comment
Login Access	Active1 cannot access, he/she is unauthorized	Reset the password to "12345678", This user may change it in his/her profile
Indoor Location	This module is missing in the new update	Enter the application with the supervisor user
Login Interface	The unique access module is not working	The login interface if already integrated and working as expected, when you try to access the URL: https://active.inov.pt/aaw-vat/ automatically the central system directs the connection to the logging interface (managed by the OpenAM).
Active@work System	The user tries to access the application via Internet explorer and nothing appears.	
Cognitive module - smartphone	The well-being alert message is missing in the mailbox.	
Cognitive module - smartphone	The user details in the smartphone seems to work correctly, but the skin temperature gives no real data as well as the calories and steps that are cumulative figures	This is normal. Skin temperature is lower than normal body temperature
Collaborative Module	To show the newest ideas when you enter the module.	
Collaborative Module	When we create an idea, the user of this idea is not visible so you never know who present the idea. The same happens with the user that replies	
Collaborative Module - Mentoring	Once we add a message to other user, it should have an advice in the application saying that you have received a message from a	

	specific user.	
Cognitive system	We do not know if the temperature sensor is working or not. There is no measurement at the server side.	1) WIFI sensor: integrated but no acceptance from ATOS IT to go on the network. Postponed till next iteration. 2) Sensolus STICKNTRACK sensor: sends data to operational DB

6.2. User Evaluation

This section is structured as follows: first, the result of user satisfaction evaluation is presented. These results are based on the feedback we got from the end-users in ATOS pilot. Second, based on the findings from study on end-users concerns about the adoption of Active@Work, which was presented in deliverable D 2.03.2, we detail on possible scenarios to prevent or manage those challenges.

6.2.1. Pilot Testing and Evaluation

The evaluation process has one major goal: to create through users' feedback a functional, useful and well-accepted product for the end-users. There, the focus lies on providing evidence that the system indeed benefits the end-user in specific aspect on his/her wellbeing and performance at work. The evaluation in this phase goes hand in hand with the development. The second phase with the main goal of prototype validation will be deployed in next phase.

6.2.2. Evaluation Measures

We used the questionnaire for the assessment of the interaction between Active@Work and end-users. In the following we will describe the measurements that are the foundation for designing the questionnaire.

In general, the evaluation process aims to measure the performance of Active@Work towards the specific needs of its end-users. In order to define the parameters of this process, we need to go back to the user requirements and needs analysis; each defined need and requirement becomes a dimension to which the success of the project is measured. In Active@Work, the initially defined user requirements (see D 2.03.2) set the framework for the evaluation and validation methodology. The D 2.03.2 synthesized a set of values or goals that we strive to achieve in Active@Work, which constitute the evaluation and validation goals.

Usability, unobtrusiveness, privacy and data security requirements, controllability, wearable device requirements, persuasiveness (motivation) are the main user requirements identified in the 2.03.2. Information quality, user experience and acceptance (health outcome, work outcome) were added, as they are crucial evaluation goals for Active@Work.

6.2.3. Results

Since the user interaction with the system in this phase of piloting was limited, the users' evaluation and feedback were not highly positive. However, they could foresee the benefit of the system and are willing to continue using the system.

The main concern of the users so far was the wrist band quality, which they found it a bit heavy and not comfortable to wear. In addition, they were not happy about the fact that the band runs out of battery very soon. In general, they believe that the system needs a great amount of efforts to be improved. They think the objectives are good but the system at this point is far from the ideal. The overview of how they ranked different functionalities and measurements is presented in the table below. The questionnaire detail is presented in appendix 1.

Questions	***1: not at all***	***7: very strongly***	**AVR**
Accuracy Active@work provides the precise information I need			3
Accuracy I am satisfied with the accuracy of Active@work			3.2
Content Active@work provides reports that seem to be about exactly what I need			3.6
Content: Active@work provide sufficient information			3.8
Timeliness: I get the information I need in time			4.4
Timeliness: I have to spend too much time correcting things with this system (efficiency)			3.8
Timeliness: The system provides up-to-date information			4.8
Ease-of-use Active@work is user friendly			4
Active@work is easy to use			4.8
Format: I think the output is presented in a useful format			4.4
Format: The information is presented in a clear format			4.6
The Active@work feedback (recommendations) is helpful			3.4
The Active@work feedback (alerts) is helpful			3.4
The system's response to errors is helpful			4.5
Constant connection and interaction with this systems increase my stress at work			2.8
The interaction with this system interrupts my work			1.6
The interaction with system distract me while I am working			2
Reading the characters on the screen is easy			5.6
The organization of information is clear			4.2
Sequence of screens is clear			4
The Use of colors and sounds is good			4
The training and support provided before and during system's usage was required			6
The training and support provided before and during system's usage was helpful			6
Overall, I feel continues use of the system would improve my physical health			5.6
Overall, I feel continues use of the system would improve my security and helps me to prevent accidents and injuries at work			4.6
Overall, I feel continues use of the system would influence my level of satisfaction and happiness at work			5.4
Overall, I feel continues use of the system would influence the quality of my relationship with my colleagues			6.2
Overall, I feel the system would improve my performance at work			5.4
Overall, I am satisfied with using Active@work			4.4
I would like to continue using the system			5.6

6.2.4. End-users Concerns and Possible Design Propositions

Privacy Risk Perception

Much of the value of the services offered by Active@Work rests on the confidential and personal data about the health, identity or communications of employees. The possibility that personal data generated by Active@Work might be used by the employer or a third party for discriminatory purposes threatens employees' privacy. Employees' perceptions of privacy risk could lessen the technology acceptance. In addition, organizations need to consider employee privacy when incorporating these systems into the workplace for their own legal protection. On the organizational side, decision makers must understand that a radical shift in the way employees think about these systems is needed. The adoption of this system is an incremental process of influencing individuals' perceptions of information privacy risk. In this process, the employees will need to be properly educated on what is and is not being monitored, what data is collected and how data is secured. Correspondingly, beyond the technical requirements, we seek to understand the effects of the different functionalities and features that may influence employees' privacy risk perceptions. Individuals' decisions regarding privacy involve a complex psychological process that engages multiple considerations(Li, 2012). Consequently, a variety of theories have been employed in the effort to gain a deeper understanding of the factors influencing individuals' privacy-related perceptions (Li, 2012). Procedural fairness (Lind and Tyler, 1988), social presence (Reis and Shaver, 1988), and social response (Short et al. 1976) theories are all models that have been adopted to illustrate the impact of institutional factors on individuals' privacy concerns. Grounded on these theories, different design propositions are formulated to influence the privacy risk perception of employees in the context Active@Work.

Procedural fairness, also known as procedural justice, refers to an individual's perception that a particular activity in which they are participating is conducted fairly (Lind and Tyler, 1988). Culnan and Armstrong (1999) found that the following constructs facilitate fairness: informing the individual about different activities of the interaction; seeking his or her consent to get involved in the activity; and providing s/he the power. It has been argued that procedural fairness is a strong predictor of organizational trust and commitment, which in turn enhances employees' motivation to work in favor of the organization (Cohen-Charash and Spector, 2001). Ambrose and Alder (2000) have argued that when organizations utilize monitoring systems that lead to perceptions of fairness, employees respond more positively. In the context of Active@Work design the specialization (or concretization) of the procedural fairness theory results in the following design proposition and corresponding design items:

Design Proposition: Active@Work should feature social fairness (notice, consent, and controllability of the employees'personal information) to reduce employees' privacy-based risk perception.

- Design Item 1: Noticing the employee regarding their personal data collection, use, dissemination, and maintenance
- Design Item 2: Seeking employees consent for the collection, use, dissemination, and maintenance of employees' data
- Design Item 3: Providing mechanisms for appropriate access, correction, and redress regarding Active@Work's use of employees' data

Social presence theory (Short et al., 1976) proposes that the elevated level of social presence through richer media increases trust and approval of the content communicated (Guerin, 1986). For the case of privacy risk perception, people generally feel a stronger level of trust when they engage in face-to-face or video-supported communication because it allows them to use signs such as eye contact, body gestures, and facial expressions. Adapting this theory to the context of Active@Work, the relevant design propositions for the context of Active@Work and the relevant design items would be the following:

Design Proposition: Richer media should be used instead of text-based privacy statements to reduce employees' privacy-based risk perception.

- Design Item 1: Using human embodiment (e.g., the supervisor) to announce the privacy statement.
- Design Item 2: Using a rich media (e.g., videos) to announce privacy policies in addition to the text version of privacy statements.

Finally, social response as another institutional factors adopted in information privacy literature is about the tendency to disclose in response to a prior disclosure which is known as the principle of reciprocity (Gouldner, 1960). In order to achieve this reciprocity for the case of Active@Work, it is important for employers to openly communicate and share how they are going to use the data for the benefit of employees – and not against them – and regularly communicate the outcome of their Active@Work use; they may influence their employees' privacy risk perception. The design proposition and the design items based on this theory would be the following:

Design Proposition: Active@Work should feature a medium that facilitates an open sharing and communication of an organization's approach to their use of Active@Work, to reduce employees' privacy-based risk perception.

- Design Item 1: Giving access to employees a demo of employers interface (dashboard) to follow which aspect of employee's health and his environment have been monitored and how it has been used.
- Design Item 2: Providing a list of actions that have been considered to be taken to improve the employees' wellbeing in the organization.

Work and Life Integration

Even though the goal of Active@Work is to reduce psychosocial risk factors, the integration of work and personal life through the use of this system could actually result in a work-to-life. The electronic integration between work and life is in contrast with an individual's preference to keep work life separate from private life. Work stress can cause employee burnout (Fisher and Gitelson, 1983) and diminished organizational commitment and performance (Jackson and Schuler, 1985). Therefore, it would be beneficial to identify approaches to managing and preventing these negative impacts of work-to-life conflict caused by adoption of Active@Work in organizational settings.

Role Conflict

Active@Work by altering the scope of activities in work domain make it difficult for individuals to balance their work and private roles, which cause role stress, triggered by role overload and role conflict. Role

conflict has been defined as incompatibilities among the employee's work environment demands, such as contradictory expectations or inadequate resources for performing tasks (Rizzo et al., 1970). The adoption of Active@Work could result in a role conflict in which an employee has to find a balance between conflicting work and leisure demands. Using Active@Work means an employee would use work-time to take care of his or her wellbeing, which is not a defined work task. Following the model of coping role conflict (Hall, 1972), two main coping strategy would be structural and personal role redefinition.

Structural role redefinition can be accomplished through "communication with [the] role sender and negotiating a new set of expectations, which will be mutually agreed upon." Within this step, organizations need to define how long interaction with the system is accepted. Personal role redefinition can be achieved through an attempt to change one's attitude towards role expectations by avoiding overlapping roles or setting priorities among and within them. It can be achieved by blocking Active@Work influences out of the accepted temporal border and, at the same time, allowing a controlled amount of flow for the necessary interactions (Clark, 2000).

Design Proposition: Organizations should define the temporal border for the use of Active@Work and clearly communicate it with employees.
Design Proposition: Active@Work should limit the interaction with employees to necessary alerts during work time.

- Design Item 1: noticing the employee about the limited time of interaction with system (e.g. checking the dashboard and other dedicated wellbeing features on the system).
- Design Item 2: limiting the Active@Work interaction with employees to necessary alerts during work time.

Work Interruption

While employees interaction with Active@Work through intentional acquisition (for instance, by checking their performance on their personal dashboard) is limited, they can still receive information without actively looking for it. This passive interaction (alerts, recommendations, re-minders, etc.) could demand non-work activities (e.g., taking a break, drinking water, competing with col-leagues, etc.), and thus would interrupt work-related tasks. Task interruptions has been also caused by interactions with Active@Work could cause technostress in the work environment (Mark et al., 2008). The repetitive interruptions can be distractive which add to cognitive effort may in fact lead to the almost automatic dismissal of most alerts, including those that are safety-critical (Wipfli and Lovis, 2010; Feldstein et al., 2004). To manage the work interruptions following the "Interruption Evaluation Paradigm" applied in human computer interaction (HCI) (Milewski, 2006; Dabbish and Baker, 2003; Szóstek and Markopoulos, 2006; Grandhi and Jones, 2010) the required functionality in the design of Active@Work is proposed. Interruption Evaluation Paradigm is the attempt of managing the interruptions based on factors of social or cognitive context of the person being interrupted, as well as factors related to the content of the interruption. It means the degree of alert-intrusiveness can be adjusted according to the alert's level of importance, allowing only the most severe warnings to interrupt work (Grandhi and Jones, 2010). Cognitive context includes all aspects that encompass the receiver's cognitive level of involvement in a task (Grandhi and Jones, 2010). Social context includes all aspects encompassing the receiver's immediate environment, as understood in a social sense; this would

include the place the individual is in, people present within that place, and the social nature of the activity occurring at that location (Grandhi and Jones, 2010). The design proposition and the design items based on adapting this paradigm to the application of Active@Work design would be the following:

Design Proposition: Active@Work should support the prioritization and filtering of interactions based on different levels of severity of the content (the relational context) and the employee's social and cognitive context, in order to reduce unnecessary interruptions.

- Design Item 1: automation of interruption management: filtering the low-severity alerts when employee is cognitively or socially overloaded. The high-severity alerts should be sent regardless of employees' social and cognitive context.
- Design Item 2: Putting the user in control of managing interruptions (e.g. the format, block the interaction in specific time)

Testing design principles applicability and effectiveness

The testable propositions can be evaluated by means of one particular instantiation. There are several prototyping techniques to instantiate a design architecture. Prototypes has been defined as the means for examining design problems and evaluating solutions (Houde and Hill, 1997). Choosing the right prototyping technique is dependent to what it is emphasizing. The prototyping techniques are vary from high fidelity "a finish looking (or –behaving) prototype" to low fidelity "rough ones such as storyboarding and paper-based prototyping". Low fidelity prototyping techniques are considered to be effective when the goal of the prototyping is to describe what an artefact could do for a user rather that how it would look (Houde & Hill, 1997). Therefore, a low fidelity prototyping is more effective in this study since the goal is to assess how the potential end-users of Active@Work examine the proposed design items.

In this research, storyboarding has been adopted as a low fidelity prototyping technique to instantiate the design architecture proposed by the hypothesized design items. Using storyboarding help to incline the focus of the audiences to the scenario communicated and not being distracted by technical and logistical details. In addition, stories can stimulate human imagination and help them to fill the details of stories, which probably the designers have not perceived. The focus of the story is on the users, what users do, what users perceive and what it all means to the user (Carroll, 2000).

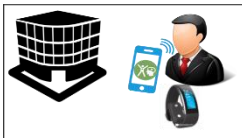
Storyboards provide a design space for narrative visualization of user's interaction with the system and the critical contextual aspects over time (Hackos and Redish, 1998). Key aspects of a storyboard are the inclusion of people, their actions and emotions, the depiction of time, the inclusion of text, and the level of detail (Truong et al., 2006). Storyboards include a setting or environment where the system is used (e.g. an office within an organization) (Curtis and Vertelney, 1990). Rosson and Carroll (2002) define a setting as "situational details that motivate or explain goals, actions, and reactions of the actor(s)". Another important aspect to communicate in a storyboard is the activity scenario, which represent high-level functionalities introduced by a system and how it will affect the user's current activities (Curtis & Vertelney, 1990; Truong et al., 2006). Then designers need to represent actions that will help users perceive, interpret and make sense of the proposed functionalities (Curtis & Vertelney, 1990; Truong et al., 2006).

The propositions can be tested based on their application in practice, as well as their ability to effectively satisfy the end-users concerns. In the following the results for both applicability and effectiveness tests are presented.

Social fairness

		
Active@work provides notice to Nico regarding the collection, use, dissemination, and maintenance of his personal data.	Active@work seeks Nico's consent for the collection, use, dissemination, and maintenance of his personal data.	Active@work provides mechanisms to put Nico in control of his data, like deciding who can have access, or limiting the collection of data regarding a specific aspect of his health by system.

Social response

		
Nico has started using Active@work when he is at work. He is concerned about how the organization is actually using his data.	Nico can check how the organization is using the employees personal and environmental data by reviewing the company's wellbeing dashboard.	Nico can also see the list of actions that have been considered to be taken or have been already taken to improve the employees' wellbeing in the organization, based on employees' personal and environmental data.

Social presence

		
At the introduction of Active@work, Anna, the head of department introduces the company's expectations of adapting Active@work and announces the Active@work privacy policy.	Anna lets the employees ask their questions regarding the data collection, use, dissemination, and maintenance by organization. Anna specifically articulates the purpose or purposes for which the data is intended to be used.	Later, Nico is sitting in his office and wants to start using Active@work. Before, he can review the privacy policy by either reading it or by watching a short video.

Interruption management

		
Even though Active@work can send alerts to Nico the whole day, Active@work sends non-interruptive alerts for low-severity interactions when Nico is not cognitively and socially overloaded.	Active@work filters low-severity alerts when Nico is cognitively overloaded or he is in a meeting based on his calendar.	When Nico's health is at stake, he receives the alert even though he is cognitively and socially overloaded.
In case of non-interruptive low-severity alerts, Nico can modify the way in which he is notified about receiving an incoming alert. Nico decides to receive these alerts via a flashing window and low ring volume without vibration.	In case of interruptive low-severity alerts, he can decide to receive the alerts without filtering them. He can also change these alerts to a silent notification on his smartphone.	In case of interruptive high-severity alerts, he can decide to receive the alerts by vibration on his wristband and on his smartphone without any sound.

Role Conflict

		
During the Active@work introduction session, Anna explains that the organization has assigned a specific amount of working time for exploring and interacting with the system.	Nico knows that he has some time to interact with the system. During this period of time he can check his dashboard, play games and socialize with colleagues, and other dedicated well-being features which are provided by Active@work.	Nico schedules half an hour in the morning and half an hour in the afternoon to use the system. At 10 am he opens his account and starts using it. After 25 minutes he receives an alert that his morning session will be terminated in 5 minutes and it is time to go back to work.
Nico is working but the quality of air is not good in the office. This can make Nico tired without noticing it. He receives an alert that he needs to open the window. During his regular working hours, Nico receives alerts like that when there is an immediate need.	In the time allocated by the company to use Active@work, he can have access to all the functionalities of the system.	In the working time not specifically allocated to Active@work, Nico's access to the system is limited to receiving alerts only.

Applicability Test

Data Collection

An applicability test was conducted using two focus groups, applying the applicability check method proposed by Rosemann and Vessey (2008). This method addresses three criteria for performance of the research outcome: importance, accessibility, and suitability. We selected two distinct groups of users of the principles. To recruit the end-users in the focus groups, following the applicability check method, one important criterion would be to ensure that end-users are familiar with the research object under examination. Therefore, within the context of Active@Work project, one focus group consisted of eleven system designers. The second focus group included the five business managers of ATOS. Each focus group lasted approximately ninety minutes; the discussion was guided by the presentation of each storyboard and complemented by the explanatory knowledge supporting it, as well as the prescriptive design propositions. The focus groups were centered on the end-users' impressions of the design propositions and addressed the three above-mentioned criteria of importance, accessibility, and suitability, as well as how they might be adjusted to better meet those criteria. To complement verbal feedback, evaluators were asked to rate all of the principles on a 1 to 5 scale, according to the three evaluation criteria.

The focus groups were audiotaped; also, the moderator of the focus groups took notes. As with all such recordings, the end-users were informed and their consent was requested. The recordings were transcribed verbatim. In order to systematically analyze the focus groups transcripts, we used open coding (Strauss and Corbin, 1998).

Result

Social presence: most of the evaluators found this principle important, accessible, and suitable. However, one evaluator said: "even though I can see the importance of this scenario, there will be some employees who even if you tell them and explain it to them that you are not going to harm them, their pre-assumption is that use of such systems is for the benefit of the organization and not the employees. I would say it depends on the culture of the organization, at least in our company. Me, as a manager, I have such experience. However, I would say with this scenario that at least you could gain the trust of some employees."

To reinforce this scenario, evaluators added two main points. First, they said: "while such launching sessions are required, it can be helpful not only to talk about the privacy policy but also present the existing regulatory documents and inform employees about their rights." Second, in addition to presenting the privacy policy and informing end-users about the legal responsibilities of the organization, it would be useful to talk about the benefits of employees using the system. "I would say that not only explaining how the organization is going to use the information but also presenting the potential benefits to employees [is important]. Benefits should be ahead of everything and [be used to] try to motivate them with other incentives." Other evaluators complemented this point by suggesting that the introduction of these systems should be an incremental process, starting with a pilot; then an effort should be made to display the benefits to the whole organization, and not only to the people involved in the pilot. Therefore, employers would gradually gain their employees' trust. "Before actual adoption of the system in a whole organization, it could be useful to have a pilot and people who were involved in this pilot could attend in this launching session and share the experiences and benefits they achieved by using the system, in an open discussion format."

Social response: all of the evaluators highly supported this scenario, emphasizing the importance of general transparency to the successful introduction of such systems in organizational settings. The evaluators again mentioned that scenarios like this might not result in full trust, but they are necessary for the incremental process of adopting such systems. "There are always some people who even if you show them what you do with the data, they think this is the part they are showing me but it is not everything."

For evaluators, this was one possible scenario that could lead to more transparency. "I think that scenarios like this are important, at least in the beginning. It shows that organizations are willing to [earn] trust. The more transparency, the better." Returning to the importance of demonstrating the benefits of this system to employees, one evaluator commented: "This gives more transparency and transparency is trust. In addition, it is ⋯ about bolding the benefits and showing the benefits to individuals. Like if you show them you are adapting the working environment to be a better place to work based on their data, then they can actually see the benefit."

However, even though the evaluators found this scenario important for gaining more trust, they were concerned with the feasibility from an organizational perspective. "If the company publicly announced their data and committed to report on this system, it would be an extra effort and responsibility; also, it would be an issue of liability, so maybe some companies would not commit to it." On the other hand, another evaluator highlighted the benefit of this scenario to their organization: "I think it is really useful for companies, because most companies need the wellbeing state of the art to show the insurance company or even for their social responsibility. I think it is even a good point to sell this product to companies, because a thing such as wellbeing state of the art is really getting more and more important."

Social fairness: the evaluators found this scenario to be the most vital of the options, specifically for reducing employees' concerns regarding privacy risks. "In my experience, to develop the healthcare application, this is the thing that is always demanded by users. The other scenarios can help improve trust, but this one is vital. I share my information, but I should be sure that any time I wanted, I could easily close the door. This is

the most important." However, evaluators said they could imagine that giving this complete power to users might reduce the value of the data to their employers. "Imagine if 20 employees are using the system and all restrict most of the measurements, then even aggregated data will not have value."

Adjusting the working environment: All of the evaluators agreed on the importance, accessibility, and suitability of this scenario from the company perspective. "As a team, we should be sure that there is no one spending three hours on this system. It should be limited. Do it at home or schedule it for another day." However, from a user's perspective "it could limit [their] freedom". One evaluator highlighted the importance of the first part of the scenario (communicating the organization's expectations regarding the time that should be allocated to active interaction with system). "It is crucial, because then employees know that the company gave them this time and nobody will tell them anything or judge them. If it is communicated, it can facilitate the process."

Minimizing the simultaneous overlap of roles: The evaluators reached an immediate consensus with regards to this scenario. There was full agreement on the necessity of receiving alerts and recommendations from the system throughout the day, while active interaction with the system was limited. They found the quality of this scenario to be dependent upon the other scenarios related to interruption management.
Automated reduction of excessive alerting also received the full consensus of the evaluators. While putting the user in control of managing interruptions was found to be complementary to the latter scenario, the only concern they had was with ease of use: "it should be simple, the configuration. User-friendliness is the only thing [that] worries me."

Taken together, the reactions from the evaluators differed significantly. There was immediate consensus regarding some principles' importance, accessibility, and suitability. For some other principles, however, more discussion was needed. While all the evaluators validated the applicability of principles. For the case of value tension principles, they could assume that these interventions cannot immediately eliminate the privacy risk perception. However, the important thing about the Active@Work adoption is to perceive it as an incremental process of motivating employees. Therefore, these interventions are assumed as prerequisites for introducing the Active@Work in organizational setting.

Effectiveness Test

Data Collection

In order to check the effectiveness of proposed scenarios from potential end-users' point of view, we carried out a global study. The survey was conducted online and involved 78 employees from different industry sectors. Out of the total sample, 44.78% were female and 50% male; 5.20% did not indicate a gender.

Half of the respondents ranged between 35 and 55 years of age. Approximately the respondents were mainly in engineering (24.35%) or IT-related (33.33%) positions. Most end-users were regular office workers (44.78%) or low-level managers (20.51%). The sample characteristics are summarized in the table below.

Characteristics	N	%	Characteristics	N	%
Gender			**Age**		
			Under 25	4	5.12
			26 to 35	32	41
Female	35	44.78	36 to 45	29	37.17
Male	39	50	46 to 55	9	11.53
n.a.	4	5.20	Over 55	1	1.2
Job Level			n.a	3	3.84
			Job Function		
Level executive (CIO, CTO, COO, CMO, etc.)	3	2.84			
Vice President	2	2.56	IT	26	33.33
Manager	11	14.10	Support Services	6	7.69
Associate	2	2.56	Marketing / Sales	7	8.97
Team Leader	16	20.51	Engineering	19	24.35
Team Member	35	44.78	Finance	2	2.56
Intern	2	2.56	Administration	5	6.41
Other	5	6.41	Other	12	15.38
n.a	2	2.56	n.a.	1	1.2

Results

In general, all the storyboards were assessed effective to intervene the privacy risk perception, role conflict and task interruption issues. In average the respondents assessed the effectiveness of all the storyboards higher than 3 in scale of 1-5 (1 being least effective, 5 most effective). among the three scenarios proposed to manage the privacy risk perception of employees, the procedural fairness received the higher ranking. Between the two proposed coping strategy to manage the role conflict, both received almost similar ranking. In managing the interruption, the automated interruption management was ranked highly. However, putting employees on control of the interruption was ranked higher. Based on respondents' assessment we can say that the potential end-users of systems such as Active@work validated the proposed interventions. The table below summarizes the results.

	Social Presence	**Social Response**	**Procedural Fairness**	**Role Conflict Structural Role Redefinition**	**Role Conflict Personal Role Redefinition**	**Automated Interruption Management**	**Manual Interruption Management**
Mean	3.42	3.55	3.98	3.37	3.40	3.51	3.89
Standard Deviation	1.01	1.08	1.019	1.15	1.12	1.14	0.98
Variance	1.03	1.17	1.03	1.34	1.26	1.30	0.96
Min	1	1	1	1	1	1	1
Max	5	5	5	5	5	5	5

7. List of improvements for the next phase

During the pilot we gathered both functional and technical feedback from the partners and from the end-users. Based on this feedback we compiled a list of improvements for each module to be included in the next phase of the pilots.

7.1. Cognitive module (smartphone and server side)

7.1.1. Activate notifications for all users

For the next phase all users should receive notifications in case their bio-parameters indicate stress.

7.1.2. Integrate a questionnaire

A brief questionnaire should be integrated into the main Active@Work website that asks the user w.r.t. stress. The following questions are to be included:

- What has given me the most energy at work today (what was the most fun part of my day)?
- When was this?
- What has cost me the most energy at work today (what was the least fun part of my day)?
- When was this?
- When did you feel most stressed today?
- When did you feel least stressed today?

Note that the time when the questionnaire was entered should also be stored, along with the user who entered the info.

7.1.3. Improve debugging information

During the pilots a lot of information was gathered by the mobile devices. It was difficult to determine if all smartphones were transmitting data and the system was operating as expected. To solve this extra information should be made available to the supervisor in the web interface.

7.1.4. Daily reset of some parameters

The end-users asked to reset the number of steps, distance and calories every day.

7.1.5. Add the unit in the overview of bio parameters

The end-users asked to show the unit of the values shown in the overview of bio parameters.

7.2. Skill module

7.2.1. Include default data

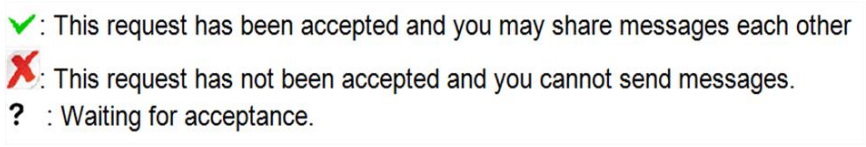
Include a list of courses and competences the user can choose from. This will make inputting the CV and courses one has taken easier.

7.3. Collaborative module, Mentoring tool

7.3.1. Ask for Mentoring

Ask mentoring: The staff may ask for mentoring. The system displays a list of available members as mentors (probably the first 10 (or less)). The staff may type name, position or tags in order to find the most suitable one. Once the user selects his/her mentor the system sends an alert to this mentor in order to let him/her know the request.

Mentoring acceptance: The mentor see all his or her requests and accepts them (or not):



Include **Mentoring tool as transversal module:** In this mode the logged user may know if he/she has a petitions or a new message at any time.

7.3.2. Integrate Mentoring tool with Skill module

Integrate Mentoring tool with Skill module in order to take advantage of user Skills (position, training, CV, etc.). This will help the user to select the most suitable person at any time.

8. Conclusion

Both pilots have concluded phase 1. The goal of this first phase was to test:

- the technical integration between the different components
- gather data for further fine tuning of the cognitive module
- gather preliminary feedback from users on the functionalities of the system

During this first phase the system has been used in two different environments to gather data from bio-parameters, gather end-user feedback and identify technical issues.

- No major technical issues were identified and any smaller issues was addressed
- A lot of data has been gathered and partners are exploring what data is usable in the second phase
- Feedback from users has been limited as the system is not yet interactive.

A clear list of improvements to be included for a second phase is available and the second phase of the pilots will focus more on the interaction with the end-users. We therefore expect the feedback from the end-users to be better after the second phase.

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10. Appendix 1

End-user Evaluation Questionnaire

Accuracy

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
Active@work provides the precise information I need	○	○	○	○	○	○	○
I am satisfied with the accuracy of Active@work	○	○	○	○	○	○	○

Content

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
Active@work provides reports that seem to be about exactly what I need	○	○	○	○	○	○	○
Active@work provide sufficient information	○	○	○	○	○	○	○

Timeliness

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
I get the information I need in time	○	○	○	○	○	○	○
I have to spend too much time correcting things with this system (efficiency)	○	○	○	○	○	○	○
The system provides up-to-date information	○	○	○	○	○	○	○

Ease-of-use

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
Active@work is user friendly	○	○	○	○	○	○	○
Active@work is easy to use	○	○	○	○	○	○	○

Format

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
I think the output is presented in a useful format	○	○	○	○	○	○	○
The information is presented in a clear format	○	○	○	○	○	○	○

Interaction

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
The Active@work feedback (recommendations) is helpful	○	○	○	○	○	○	○
The Active@work feedback (alerts) is helpful	○	○	○	○	○	○	○
The system's response to errors is helpful	○	○	○	○	○	○	○
Constant connection and interaction with this systems increase my stress at work	○	○	○	○	○	○	○
The interaction with this system interrupts	○	○	○	○	○	○	○

	1 – not at all	2	3	4	5	6	7 – very strongly
my work							
The interaction with system distract me while I am working	○	○	○	○	○	○	○

User Interface

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
Reading the characters on the screen is easy	○	○	○	○	○	○	○
The organization of information is clear	○	○	○	○	○	○	○
Sequence of screens is clear	○	○	○	○	○	○	○
The Use of colors and sounds is good	○	○	○	○	○	○	○

Training

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
The training and support provided before and during system's usage was required	○	○	○	○	○	○	○
The training and support provided before and during system's usage was helpful	○	○	○	○	○	○	○

Individual Impacts

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
Overall, I feel continues use of the system would improve my physical health	○	○	○	○	○	○	○
Overall, I feel continues use of the system would improve my security and helps me to prevent accidents and injuries at work	○	○	○	○	○	○	○
Overall, I feel continues use of the system would influence my level of satisfaction and happiness at work	○	○	○	○	○	○	○
Overall, I feel continues use of the system would influence the quality of my relationship with my colleagues	○	○	○	○	○	○	○
I think sometimes my boss does not know how hard working we are, using this system can give her/him the right impression	○	○	○	○	○	○	○
Overall, I feel the system would improve my performance at work	○	○	○	○	○	○	○

User Satisfaction

Please choose the appropriate response for each item:

	1 – not at all	2	3	4	5	6	7 – very strongly
Overall, I am satisfied with using Active@work	○	○	○	○	○	○	○

	1 – not at all	2	3	4	5	6	7 – very strongly
I would like to continue using the system	○	○	○	○	○	○	○

Did you find any problem while using Active@work?
Please write your answer here:

11. Appendix 2

Storyboards

Today, companies are starting to experiment with fitness trackers and other wearable devices as a measure to improve their employees' well-being at work. However, the application of these technologies might cause several unexpected tensions, in particular the loss of privacy against increased safety at work, conflicts because of private and business use of technology or fear of increased control by the employer.

In this survey, we investigate the possible approaches to manage and reduce these tensions in the context of a European Commission and Swiss State Secretariat for Education Research and Innovation funded project, named Active@work (http://www.activeatwork.eu/). The project aims at developing a sensor-based health monitoring system to promote and maintain high levels of physical, mental and social well-being of employees.

In this survey, different scenarios (expressed as short storyboards) are presented that describe different sources for tensions:

1) Information disclosure: Four storyboards for possible approaches to rise the benefit perception and reduce the risk perception of personal information disclosure by employees by using this system.
2) Role conflicts: Two storyboards for possible approaches to cope with role tensions (between work and leisure activities of employees).
3) Technostress: Two storyboards for possible approaches to manage work interruptions or "technostress" caused by the constant interaction of the system with employees.

We would appreciate if you rate the effectiveness of each storyboard and their importance for your work environment.

The findings of this study will allow us to deepen our understanding on the acceptance/resistance of sensor-based systems for occupational health issues and direct our work such that higher added-value for employees is created by the Active@work project.

Obtaining feedback from you as a potential user is vital to the design process of this system. Your responses are voluntary and will be confidential. Responses will not be identified by individual and will be deleted no later than one year after closure of the Active@work project. If you have any questions or concerns, please contact Maedeh Yassaee at +41 71 224 35 83 or maedeh.yassaee@unisg.ch.

We appreciate your collaboration and support in our research!

There are 21 questions in this survey

Personal Characteristics

Your gender:

*Please choose **only one** of the following:*

- ○ Female
- ○ Male

Your age group:

*Please choose **only one** of the following:*

- ○ Under 25
- ○ 26 to 35
- ○ 35 to 45
- ○ 46 to 55
- ○ Over 55
- ○ Other

Your Job function:

*Please choose **all** that apply:*

- ○ IT
- ○ Support services
- ○ Marketing/Sales
- ○ Engineering
- ○ Finance
- ○ Administration
- ○ Human resources
- ○ Other

Your Job Level:

*Please choose **all** that apply:*

- ○ President or CEO
- ○ Level executive (CIO, CTO, COO, CMO, etc)
- ○ Vice President
- ○ Director
- ○ Manager
- ○ Associate
- ○ Team Leader
- ○ Team Member
- ○ Intern
- ○ Other

Privacy: Social Presence

		
At the introduction of Active@work, Anna, the head of department introduces the company's expectations of adapting Active@work and announces the Active@work privacy policy.	Anna lets the employees ask their questions regarding the data collection, use, dissemination, and maintenance by organization. Anna specifically articulates the purpose or purposes for which the data is intended to be used.	Later, Nico is sitting in his office and wants to start using Active@work. Before, he can review the privacy policy by either reading it or by watching a short video.

Do you think this scenario would reduce the risk perception of personal information disclosure by employees when using this system?

Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Privacy: Social Presence

		
Nico has started using Active@work when he is at work. He is concerned about how the organization is actually using his data.	Nico can check how the organization is using the employees personal and environmental data by reviewing the company's wellbeing dashboard.	Nico can also see the list of actions that have been considered to be taken or have been already taken to improve the employees' wellbeing in the organization, based on employees' personal and environmental data.

Do you think this scenario would reduce the risk perception of personal information disclosure by employees when using this system?

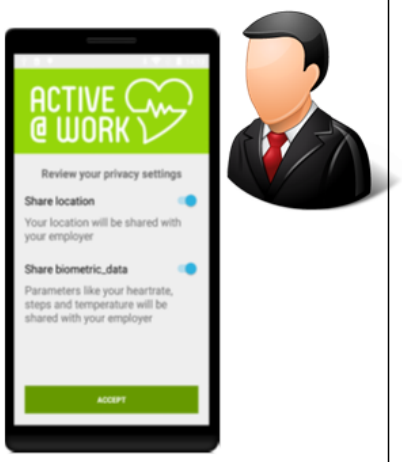
Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Privacy: Social Fairness

		
Active@work provides notice to Nico regarding the collection, use, dissemination, and maintenance of his personal data.	Active@work seeks Nico's consent for the collection, use, dissemination, and maintenance of his personal data.	Active@work provides mechanisms to put Nico in control of his data, like deciding who can have access, or limiting the collection of data regarding a specific aspect of his health by system.

Do you think this scenario would reduce the risk perception of personal information disclosure by employees when using this system?

Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Privacy: Incentive

		
Nico is still concerned about an invasion of his privacy by using Active@work. Anna assures him that he does not have to use the system, but doing so would allow him to benefit from some incentives.	Nico starts using Active@work. Every day that he uses the system and wears his band, he gets one point. After getting enough points, Active@work informs him about a few paid days off as a compensation.	After using Active@work for a while he decides to use his compensation days for getting a little rest.

Do you think this scenario would rise the benefit perception of personal information disclosure by employees when using this system?

Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Role Tension Coping: Adjusting the Working Environment

		
During the Active@work introduction session, Anna explains that the organization has assigned a specific amount of working time for exploring and interacting with the system.	Nico knows that he has some time to interact with the system. During this period of time he can check his dashboard, play games and socialize with colleagues, and other dedicated well-being features which are provided by Active@work.	Nico schedules half an hour in the morning and half an hour in the afternoon to use the system. At 10 am he opens his account and starts using it. After 25 minutes he receives an alert that his morning session will be terminated in 5 minutes and it is time to go back to work.

Do you think this scenario would reduce the role tension caused by using this system?

Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Role Tension Coping: Minimize Simultaneous Overlap of Roles

		
Nico is working but the quality of air is not good in the office. This can make Nico tired without noticing it. He receives an alert that he needs to open the window. During his regular working hours, Nico receives alerts like that when there is an immediate need.	In the time allocated by the company to use Active@work, he can have access to all the functionalities of the system.	In the working time not specifically allocated to Active@work, Nico's access to the system is limited to receiving alerts only.

Do you think this scenario would reduce the role tension caused by using this system?

Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Interruption Management: Automated Reduction of Excessive Alerts

		
Even though Active@work can send alerts to Nico the whole day, Active@work sends non-interruptive alerts for low-severity interactions when Nico is not cognitively and socially overloaded.	Active@work filters low-severity alerts when Nico is cognitively overloaded or he is in a meeting based on his calendar.	When Nico's health is at stake, he receives the alert even though he is cognitively and socially overloaded.

Do you think this scenario would help to manage the work interruptions caused by the constant interaction of the system with employees?

Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Interruption Management: Putting the User in Control of Managing Interruptions

		
In case of non-interruptive low-severity alerts, Nico can modify the way in which he is notified about receiving an incoming alert. Nico decides to receive these alerts via a flashing window and low ring volume without vibration.	In case of interruptive low-severity alerts, he can decide to receive the alerts without filtering them. He can also change these alerts to a silent notification on his smartphone.	In case of interruptive high-severity alerts, he can decide to receive the alerts by vibration on his wristband and on his smartphone without any sound.

Do you think this scenario would help to manage the work interruptions caused by the constant interaction of the system with employees?

Please choose the appropriate response for each item:

	1	2	3	4	5
Rate the scenario on a scale of 1-5 (1 being least effective, 5 most effective):	○	○	○	○	○

Please share with us your ideas about this storyboard

Please write your answer here:

Thank you

Thank you very much for your participation! After the study is finished, we would be glad to provide you with the results. If you are interested, please leave your email address in the field below.
Please write your answer here:

Thank you for your participation!

12. Appendix 3

End-user manual is delivered as a separate document.

(Active@Work - End User Manual_v1.0)