



Acronym: CLOCKWORK  
Name: Smart system for the management and control of shift workers' circadian rhythms  
Call: AAL Call 6 2013  
Contract nr: AAL-2013-6-055  
Start date: 02 June 2014  
Duration: 36 months

## D5.3 Dissemination Report (c)

Nature<sup>1</sup>: R

Dissemination level<sup>2</sup>: RE

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Partners involved (leader in bold): **CUF**, FhP, BCB, ABACUS, GZE

Authors: Rita Ralha (CUF), Francisco Nunes (FhP), Carlota González (BCB), Walter Baccinelli (ABACUS), Giada Dammacco (GZE)

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<sup>1</sup> L = Legal agreement, O = Other, P = Plan, PR = Prototype, R = Report, U = User scenario

<sup>2</sup> PU = Public, PP = Restricted to other programme participants (including the Commission Services), RE = Restricted to a group specified by the consortium (including the Commission Services), CO = Confidential, only for members of the consortium (including the Commission Services)

## Partner list

Nr.	Partner name	Short name	Org. type	Country
1	Fraunhofer AICOS ( <i>coordinator</i> )	FhP	R&D	Portugal
2	BCB Informática y Control SL	BCB	SME	Spain
3	KOHS PIMEX	KOHS	SME	Austria
4	Ab.Acus S.r.l.	ABACUS	SME	Italy
5	Grado Zero Espace	GZE	SME	Italy
6	RK Tech, Kft.	RKT	SME	Hungary
7	José de Mello Saúde	CUF	IND, End user	Portugal

## Revision history

Rev.	Date	Partner	Description	Name
1	10.12.2018	CUF	Updated with contributions from the partners	Rita Ralha
Approved by FhP				

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## 1. Introduction

This Dissemination Report intends to showcase all the dissemination efforts and initiatives accomplished by the Clockwork Consortium in order to raise awareness of the project and engage with potential partners and/or customers of the prospective Clockwork solution.

Dissemination initiatives can be carried out by each partner individually or by several partners together and will likely assume one of the following formats:

- Online through digital channels (such as a project website or social media accounts)
- Presence in industry conferences and events
- Scientific papers in journal and conference proceedings

## 2. Concluded dissemination initiatives

### 2.1. Online through digital channels

#### [January 2017] Clockwork's Website launch

An online website for Clockwork was created and is accessible at [www.clockworkproject.eu](http://www.clockworkproject.eu).

It offers information about the project, such as its description, objectives, obtained results (when available), expected impact and consortium partners. The website will be updated throughout the project's development, in order to accommodate new information, namely relevant output yielded from achieving major project milestones.

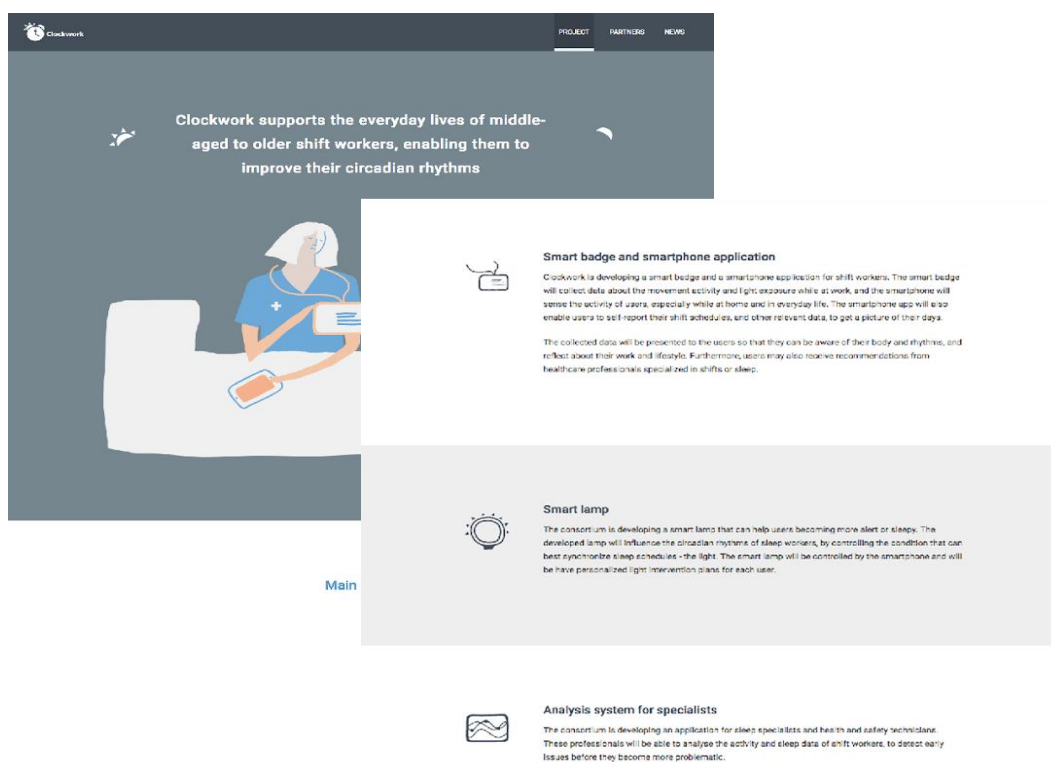


Figure 1 Snapshots of Clockwork's website landing page

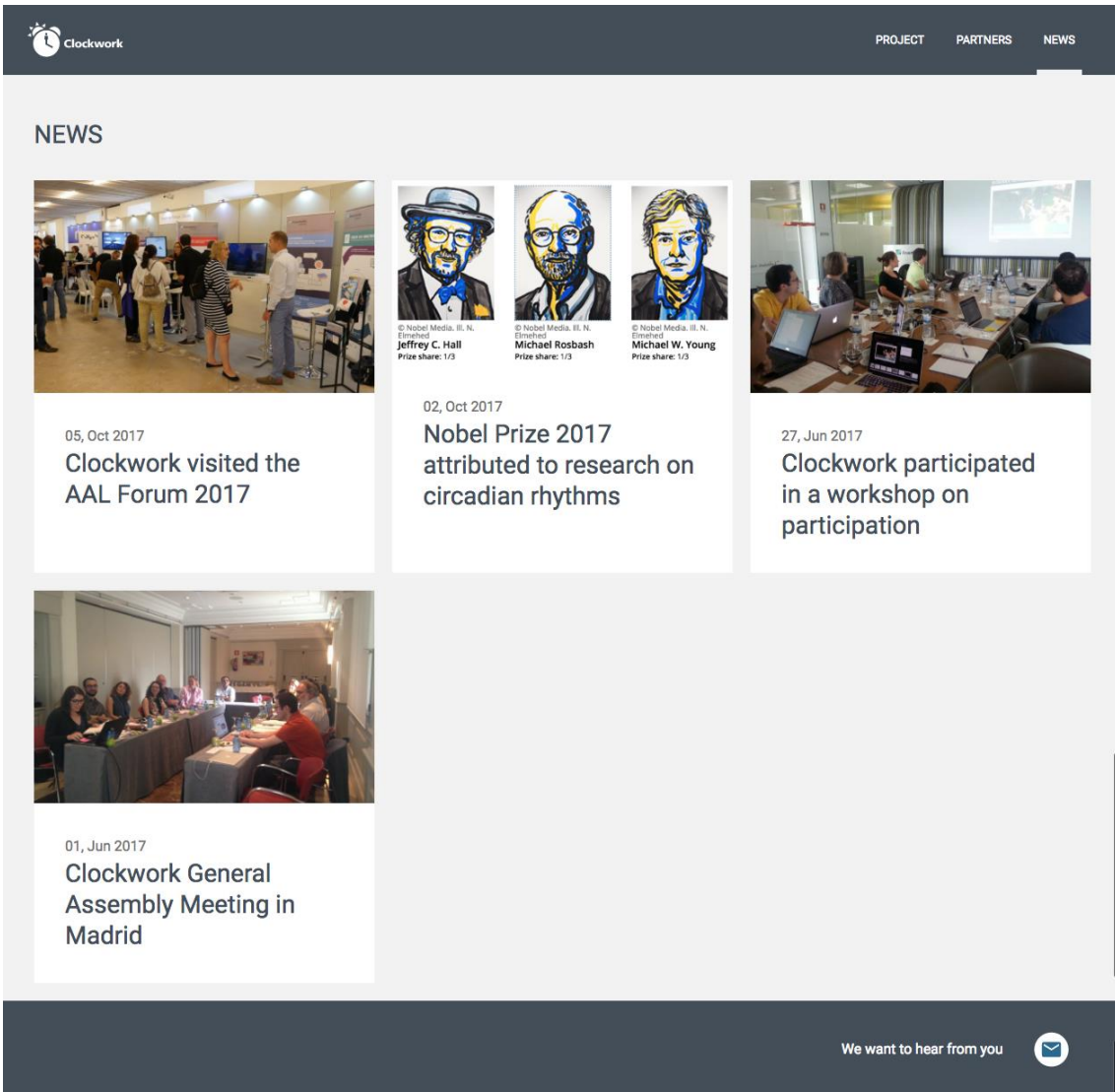


Figure 2 Clockwork's website news section

In December 2017, the website was updated to include a listing of the available Deliverables, in order to allow any visitor access concrete information on the project's progress.

[January 2017] Ab.Acus' website and Twitter account updates

Clockwork was disseminated through Ab.Acus' website and Twitter account.



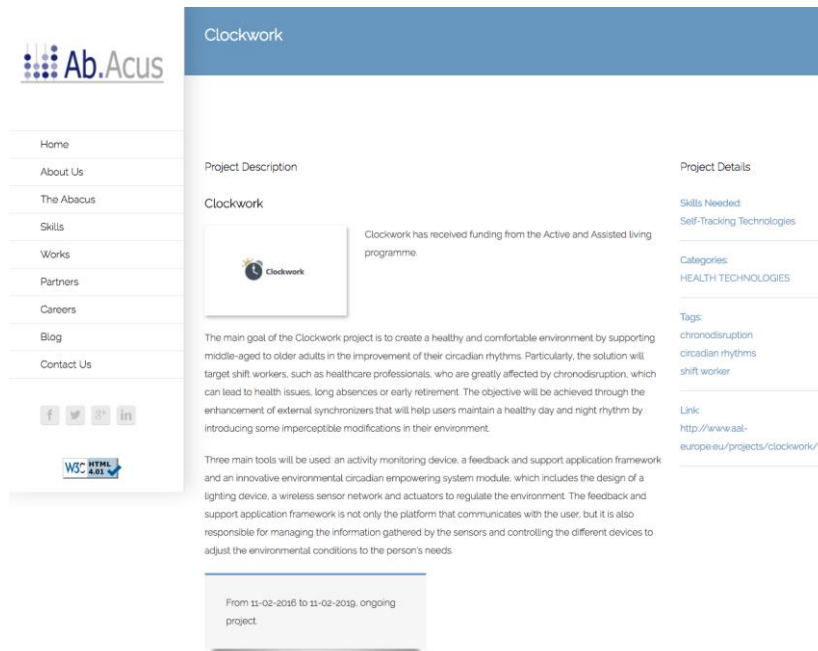


Figure 3 Ab.Acus' website update on Clockwork

### [January 2017] Grado Zero' website and social accounts updates

Clockwork was disseminated through Grado Zero's website and its several social media accounts, namely, Twitter (5716 followers), Facebook (5984 followers), Instagram (8806 followers) and LinkedIn (512).

### [June 2017] BCB's website and LinkedIn account updates

Clockwork was disseminated through BCB's, one of the Consortium's partners, website and LinkedIn account (350 followers).



Figure 4 BCB's website update on Clockwork

### [October 2017] José de Mello Saúde's internal Innovation Newsletter

Clockwork was disseminated to all the employees of José de Mello Saúde (CUF), on the Consortium's partners through the company's monthly Innovation Newsletter, which communicates innovative initiatives in which CUF is involved. The target audience was reached about 10,000 people.



#### **José de Mello Saúde como parceira em projeto de I&D com financiamento europeu**

A José de Mello Saúde integrou, no início de 2017, um projeto europeu de I&D designado Clockwork, financiado pelo Programa Active and Assisted Living (AAL), cujo objetivo é desenvolver um sistema de suporte e melhoria das condições de vida dos trabalhadores por turno. Através de dispositivos móveis, sensores e sistemas inteligentes de iluminação, o Clockwork irá recolher parâmetros da vida diária e profissional dos trabalhadores, propor ajustes de iluminação, bem como apoiar a auto-reflexão e auto-consciençialização dos mesmos. Para além de um segundo parceiro português (Fraunhofer Portugal), o projeto conta ainda com parceiros de Espanha, Itália e Hungria. Do lado da José de Mello Saúde, estão envolvidos a equipa de inovação, a Academia CUF e a Coordenadora do Centro de Medicina do Sono do Hospital CUF Porto, Marta Gonçalves.

Mais informação [aqui](#)

*Figure 5 Snapshot of Clockwork's article on CUF's Innovation Newsletter*

### [April 2018] José de Mello Saúde's Annual Report

Clockwork was included in José de Mello Saúde's 2017 Annual Report in the Innovation chapter as an example of one of the company's innovative R&D projects. The Report was made available online in April 2018 through the corporate website.

### [June 2018] News post on Fraunhofer's website

A news post was published on Fraunhofer's website about the project: Clockwork: The Solution that Supports Everyday Life of Shift Workers is Being Tested in Portuguese Hospitals [[https://www.fraunhofer.pt/en/fraunhofer\\_aicos/news\\_and\\_events\\_aicos/news\\_archive/Clockwork\\_the\\_solution\\_that\\_supports\\_everyday\\_life\\_of\\_shift\\_workers\\_is\\_being\\_tested\\_in\\_CUF\\_hospitals.html](https://www.fraunhofer.pt/en/fraunhofer_aicos/news_and_events_aicos/news_archive/Clockwork_the_solution_that_supports_everyday_life_of_shift_workers_is_being_tested_in_CUF_hospitals.html)].

### [June 2018] News post on eHealthNews.eu website

The previously listed news post was also published on eHealthNews.eu website [<http://www.ehealthnews.eu/development/5581-clockwork-the-solution-that-supports-everyday-life-of-shift-workers-is-being-tested-in-portuguese-hospitals>]

## [December 2018] News post on Clockwork website

A news post on Clockwork's Consortium final meeting was published on the Clockwork website [<http://clockworkproject.eu/2018/12/03/final-project-meeting/>], as well as on BCB's website and LinkedIn page [<https://www.bcb.es/reunion-en-budapest-del-proyecto-clock-work.html>]; <https://www.linkedin.com/company/bcb-inform-tica-y-control/>].

## 2.2. Industry conferences and events

### [June 2017] Workshop on Patients and Carers roles in Healthcare Tech

Fraunhofer hosted a workshop on the participation of patients and carers in healthcare technologies. The event gathered researchers from Austria, Denmark, UK, and Portugal, as well as a guest from the Council of the Primary Care Reform of the Portuguese Ministry of Health. The participants discussed their experiences in designing and evaluating healthcare infrastructures where patients and carers play an active role.

From Clockwork's side, Fraunhofer presented the initial concept of the smartphone application that will enable shift workers to be self-aware of their body and work schedules, and consequently act in a more informed manner towards their health.



*Figure 6 Workshop on Patient and Carers' roles in Healthcare Tech*

### [October 2017] AAL Forum

Fraunhofer AICOS, one of the Consortium's partners, presented Clockwork at the AAL Forum 2017 in Coimbra, from the 2-4 October. The event gathered 750 participants, among researchers, developers, designers, and users, interested in contributing to an active and healthy ageing.



Figure 7 Fraunhofer team at AAL Forum 2017

### [November 2017] Presentation to José de Mello Saúde's Social Responsibility Director

Clockwork was presented by Fraunhofer and CUF to additional elements of the latter company, namely its Social Responsibility Director.

### [November 2017] Presentation to Master students from the Faculty of Engineering of University of Porto

Fraunhofer carried out a presentation of Clockwork, along with an additional R&D project, to a group of Engineering Master students from Universidade of Porto.

### [February 2018] Presentation within the "LightingEurope" event

Grado Zero participated in an event of LightingEurope, the industry association that represents the lighting industry in Europe and presented Clockwork.

### [March 2018] Presentation within the "Light & Building" event

Grado Zero participated in "Light & Building", the world's leading trade fair for lighting and building services technology and will have the opportunity to present Clockwork, along with an additional R&D project.

### [June 2018] Presentation at “Ageing Futures” Conference

The Institute of Social Sciences at the University of Lisbon (ICS-UL) promoted an “Ageing Futures” Conference in which Fraunhofer presented the Clockwork project and distributed flyers.

### [July 2018] Presentation at "Ciência Viva" gathering

The annual gathering of scientists and research institutes in Portugal, “Ciência Viva”, happened in July 2018 and Fraunhofer participated presenting the Clockwork project and distributing flyers.

### [November 2018] Presentation to Work Psychologists

Fraunhofer presented Clockwork to a group of Work Psychology researchers from Portugal.

### [November 2018] Presentation at “Innovation Afterhours 2018”

Fraunhofer presented Clockwork at “Innovation Afterhours 2018”, an internal Innovation event from CUF. The solution was demonstrated and flyers distributed.



Figure 8 Fraunhofer team at “Innovation Afterhours 2018”

### [November 2018] Presentation at “Colaborar”

Fraunhofer presented Clockwork in the 7th anniversary of Colaborar, a network of senior participants that engage in research activities of Fraunhofer.

### [December 2018] Presentation to group of occupational health researchers

Fraunhofer presented Clockwork to a group of four researchers working on occupational health, collecting their opinions on the solution and its marketing direction.

### [December 2018] Presentation to Safemode

Fraunhofer presented Clockwork to a Safemode, a Portuguese occupation health company, more specifically to a group of Occupational health assessment technicians, in order to collect their feedback.



## 2.3. Scientific papers in journal and conference proceedings

[May 2018] Scientific paper on “Designing the Smart Badge: A Wearable Device for Hospital Workers”

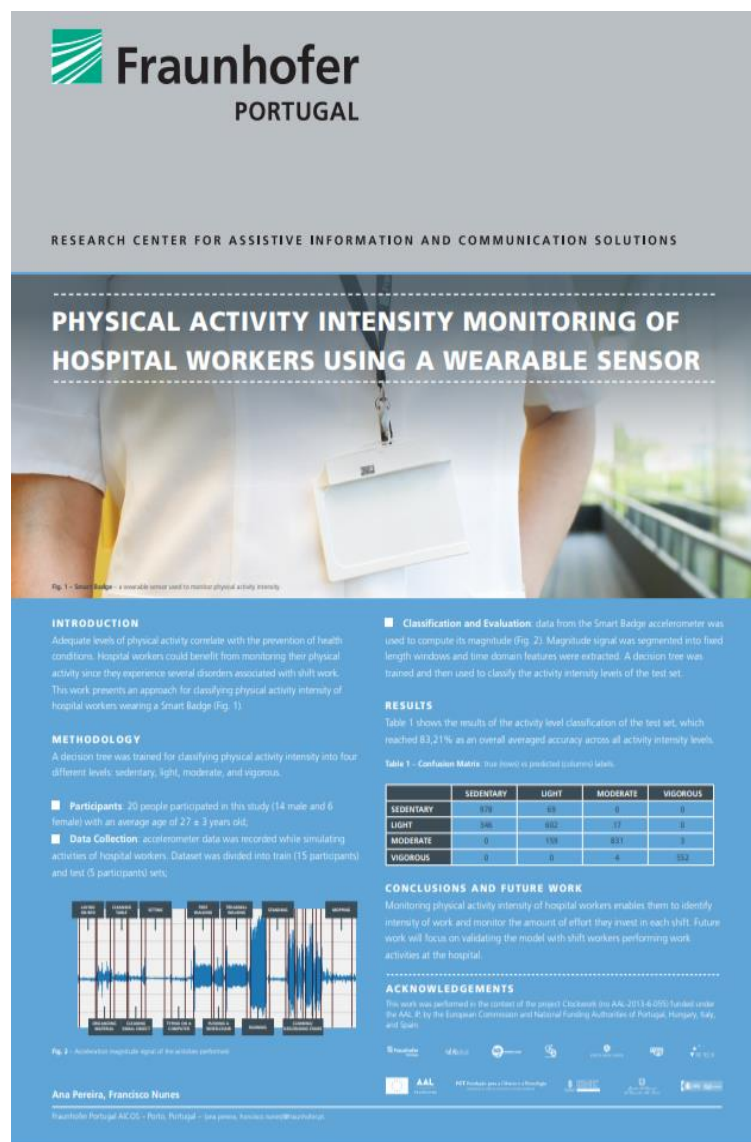
Fraunhofer published a paper on "Designing the Smart Badge: A Wearable Device for Hospital Workers" [Scopus, EUDL, DBLP, ACM DL and project website] and presented a poster at the 12th EAI International Conference on Pervasive Computing Technologies for Healthcare - PervasiveHealth 2018, NY, USA.



Figure 9 Fraunhofer's poster on “Designing the Smart Badge: A Wearable Device for Hospital Workers”

[May 2018] Scientific paper on "Physical Activity Intensity Monitoring of Hospital Workers using a Wearable Sensor"

Fraunhofer published a paper on "Physical Activity Intensity Monitoring of Hospital Workers using a Wearable Sensor" [Scopus, EUDL, DBLP, ACM DL and project website] and presented a poster at the 12th EAI International Conference on Pervasive Computing Technologies for Healthcare - PervasiveHealth 2018, NY, USA.



**Fraunhofer PORTUGAL**  
RESEARCH CENTER FOR ASSISTIVE INFORMATION AND COMMUNICATION SOLUTIONS

## PHYSICAL ACTIVITY INTENSITY MONITORING OF HOSPITAL WORKERS USING A WEARABLE SENSOR

**INTRODUCTION**  
Adequate levels of physical activity correlate with the prevention of health conditions. Hospital workers could benefit from monitoring their physical activity since they experience several disorders associated with shift work. This work presents an approach for classifying physical activity intensity of hospital workers wearing a Smart Badge (Fig. 1).

**METHODOLOGY**  
A decision tree was trained for classifying physical activity intensity into four different levels: sedentary, light, moderate, and vigorous.

- Participants:** 20 people participated in this study (14 male and 6 female) with an average age of  $27 \pm 3$  years old.
- Data Collection:** accelerometer data was recorded while simulating activities of hospital workers. Dataset was divided into train (15 participants) and test (5 participants) sets.

**Classification and Evaluation:** data from the Smart Badge accelerometer was used to compute its magnitude (Fig. 2). Magnitude signal was segmented into fixed length windows and time domain features were extracted. A decision tree was trained and then used to classify the activity intensity levels of the test set.

**RESULTS**  
Table 1 shows the results of the activity level classification of the test set, which reached 83,21% as an overall averaged accuracy across all activity intensity levels.

**Table 1 - Confusion Matrix:** true (rows) vs predicted (columns) labels.

	SEDENTARY	LIGHT	MODERATE	VIGOROUS
SEDENTARY	879	63	0	0
LIGHT	346	802	17	0
MODERATE	0	158	831	3
VIGOROUS	0	0	6	332

**CONCLUSIONS AND FUTURE WORK**  
Monitoring physical activity intensity of hospital workers enables them to identify intensity of work and monitor the amount of effort they invest in each shift. Future work will focus on validating the model with shift workers performing work activities at the hospital.

**ACKNOWLEDGEMENTS**  
This work was performed in the context of the project Clickwork (no AAL 2013-6-055) funded under the AAL IP by the European Commission and National Funding Authorities of Portugal, Hungary, Italy, and Spain.

**Fig. 2 - Acceleration magnitude signal of the activities performed.**

**Ana Pereira, Francisco Nunes**  
Fraunhofer Portugal AAL-00 - Porto, Portugal - ana.pereira\_francisco.nunes@fraunhofer.pt

Figure 10 Fraunhofer's poster on "Physical Activity Intensity Monitoring of Hospital Workers using a Wearable Sensor"



[November 2018] Scientific paper on "Supporting the Self-care Practices of Shift Workers"

Fraunhofer published a paper on "Supporting the Self-care Practices of Shift Workers" [Scopus, DBLP, ACM DL and project website].



*Figure 11 Presentation of paper at MUM.*