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Name:	Smart system for the management and control of shift workers' circadian rhythms
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D2.2 Survey on the users' needs

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[1] L = Legal agreement, O = Other, P = Plan, PR = Prototype, R = Report, U = User scenario

[2] 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 *(coordinator)*	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
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Revision history

Rev.	Date	Partner	Description	Name
1	30-03-2017	ABACUS	First draft of the document	
2	17-04-2017	RKT	Improvement of section 2.2	
3	02-04-2017	ABACUS	Implementation of section 3	
4	03-04-2017	ABACUS	Complete draft of the document	
		Approved by FhP		

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Glossary

PSQI: Pittsburgh Sleep Quality Index

GDS: Global Depression Scale

SD: Standard Deviation

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1. Introduction

This deliverable represents the report document of the activities developed in T2.2 – Survey on user needs. Aim of these activities has been the evaluation of the health conditions of the night shift workers, and in particular the aspects related to sleep disorders. The assessment of these conditions will guide the development of the system, providing the basis for the identification of the users' needs the Clockwork system has to respond to and, thus, the functional specification for the system development.

The assessment has been conduced by means of a questionnaire that investigates the general health status of the subjects, the working conditions and working environmental factors, the sleep quality (using the sleep assessment test) and the depression level (using global depression scale). The questionnaire has been developed in tight collaboration with 2 external medical experts.

2. Protocol of the survey

In order to keep the data coherent among the different sites, and to extract meaningful information, a well-defined sample of users has been selected. In particular, the questionnaires was administrated tonight shift workers employed in health care.

The questionnaires had been administrated to a sample of 24 users (10 in Italy, 10 in Hungary, 4 in Portugal). Moreover, measurements of physical parameters (light intensity, level of noise, temperature) in the work environment were taken using the instrumentation and protocol of acquisition defined in section 2.2.

2.1. Questionnaires structure

The questionnaire is structured in 4 sections, aiming at investigating 4 different relevant aspects. In particular, the questionnaire investigates:

- **General data**: this section investigates the most important general parameters of the subjects (age, sex, weight, height), the eating habits (number of meals in one day, meals time), family medical history (cases of diabetes, hypertension, obesity, myocardial infarction, stroke, tumor, depression), previous and current pathologies (diabetes, hypertension, obesity, myocardial infarction, stroke, tumor, depression, gastric ulcer, duodenal ulcer), drugs regularly taken.
- **Work environment assessment**: in this section the main information about the user's job and working environment were collected. Such information included the job, number of years spent as night shifter, number of night shifts per week, night shifts duration. Also information about light intensity, noise level and temperature on the user's working environment were collected by the interviewer.
- **Sleep assessment:** the Pittsburgh Sleep Quality Index (PSQI) questionnaire has been used in this section in order to assess the user's sleep quality through a validated protocol.
- **Global Depression Scale:** the evaluation of the mood of the user was investigated through the Global Depression Scale (GDS).

The complete questionnaire is reported below in the English version.

CLOCKWORK QUESTIONNAIRE

General data

Age: _____

Sex: _____

Weight: _____

Height:_____

Number of meals in one day: _____

Meals time (for each meal): _____

_____

In your family there are cases of: ☐ diabetes ☐ hypertension ☐ obesity ☐ myocardial infarctio ☐ stroke ☐ tumor ☐ depression ☐ none

Pregress pathologies: ☐ diabetes ☐ hypertension ☐ obesity ☐ myocardial infarction ☐ stroke ☐ tumor ☐ depression ☐ gastric ulcer ☐ duodenal ulcer ☐ none

Current pathologies: ☐ diabetes ☐ hypertension ☐ obesity ☐ myocardial infarction ☐ stroke ☐ tumor ☐ depression ☐ gastric ulcer ☐ duodenal ulcer ☐ none

Are you assuming drugs with continuous use? If yes, list them_____

_____

_____

Work environment assessment

Job: _____

How long have you been working as night shifter (years)? _____

Number of night shifts per week (mean): _____

Night shifts duration (hours): _____

Sleep assessment

During the past month,

1. When have you usually gone to bed? _____
2. How long (in minutes) has it taken you to fall asleep each night? _____
3. What time have you usually gotten up in the morning? _____
4. A. How many hours of actual sleep did you get at night? _____

   B. How many hours were you in bed? _____

5. During the past month, how often have you had trouble sleeping because you:	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Have to get up to use the bathroom				
d. Cannot breathe comfortably				
e. Cough or snore loudly				
f. Feel too cold				
g. Feel too hot				
h. Have bad dreams				
i. Have pain				
j. Other reason				
6. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?				
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
9. During the past month, how would you rate your sleep quality overall?	Very good	Fairly good	Fairly bad	Very bad

Global Depression Scale

	YES	NO
1. Are you basically satisfied with your life?		
2. Have you dropped many of your activities and interests?		
3. Do you feel that your life is empty?		
4. Do you often get bored?		
5. Are you in good spirits most of the time?		
6. Are you afraid that something bad is going to happen to you?		
7. Do you feel happy most of the time?		
8. Do you often feel helpless?		
9. Do you prefer to stay at home, rather than going out and doing new things?		
10. Do you feel you have more problems with memory than most?		
11. Do you think it is wonderful to be alive now		
12. Do you feel pretty worthless the way you are now		
13. Do you feel full of energy?		
14. Do you feel that your situation is hopeless?		
15. Do you think that most people are better off than you are?		

This part has to be compiled by the interviewer

Intensity of light in the work environment (lx)_____

Intensity of noise in the work environment (dB) _____

Temperature in the work environment (°C) _____

2.2. Environmental measures

Measures in the workers' environment were taken over a period of one week, with a sample being collected every minute. Measuring tools were placed in the work environment, in a central location, and left unsupervised during the period of the data collection. The collected values were then averaged according to three periods of the day: daily, working hours (6:00 – 18h00), and night (18:00 – 6:00). Light intensity was recorded in terms of lux (lx), temperature in Celsius (°C), and noise was measured in decibels (dB). Given time constraints, in Portugal, data collection was carried out over a period of just 24 hours.
For practical reasons, the measurements of the physical environment (light intensity, noise, and temperature) in the different locations (Portugal, Italy, and Hungary) were carried out with the measuring tools available to the partner responsible for the task in each country.

3. Analysis of the collected data

3.1. Materials and methods

The data collected through the questionnaires have been transposed to common format, using Excel sheets, in order to unify the languages (Italian, Hungarian and Portuguese) and to elaborate the data.

General data

For the general data, the number of male and female subjects and mean values and standard deviation for the age, weight, height and number of meals data have been computed.

Work environment

For the work environment, the mean values and standard deviation of number of years spent as night shifter, number of night shift per week, night shifts duration has been calculated. Moreover, the jobs reported by the subjects have been reported together with the number of subjects doing each job. Finally, the environmental measures (temperature, light and noise) acquired during day hours and during night hours were reported for each site.

Sleep assessment

The sleep assessment has been performed by calculating, for each subject, the total score of the PSQI and the value of each of the components of the score [1]. The components of the score are the following:

- Component 1: subjective sleep quality
- Component 2: sleep latency
- Component 3: sleep duration
- Component 4: habitual sleep efficiency
- Component 5: sleep disturbances
- Component 6: use of sleep medication
- Component 7: daytime dysfunction

Mean and standard deviation of the PSQI score and its components over all the subjects has been computed.

Global depression scale

Global depression scale score has been calculated for each subject and the depression level has been evaluated as follow [2]:

- 0-4: normal
- 5-8: mild
- 9-11: moderate
- 12-15: severe

Mean and standard deviation of the GDS score over all the subjects has been computed.

3.2. Results

3.2.1. General data

The sample of users included 18 female and 6 male subjects. The mean values for the collected general data are summarize in **Table 1**

Table 1

Table 1 Mean (SD) of the subjects' general data

	Age [years]	Weight [Kg]	Height [cm]	Number of meals
Hungary	44.3 (12.7)	84.1 (21.7)	173.2 (10.7)	2.6 (0.5)
Italy	39.0 (12.4)	68.5 (13.8)	165.3 (11.3)	3.2 (0.9)
Portugal	47.8 (3.6)	61.8 (8.0)	164.8 (5.7)	4.7 (0.5)
Overall	42.7 (11.7)	70.7 (24.0)	168.5 (10.8)	3.2 (1.0)

The occurrence of the family pathologies listed in section 2.1 is reported in Figure 1.

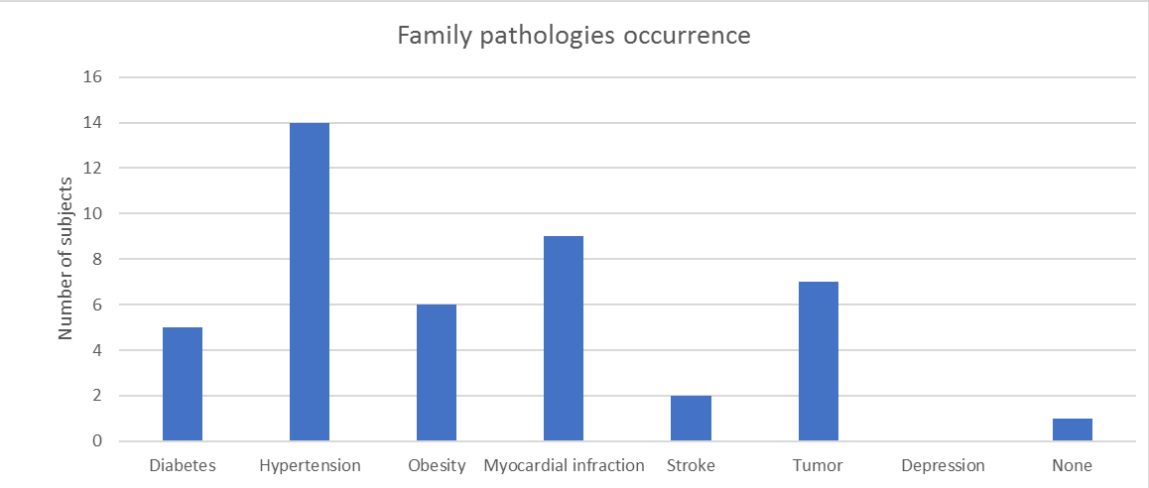

Figure 1 Family pathologies occurrence. For each pathology, the number of subjects reporting the occurrence in his/her family is shown.

For each pathology listed in section 2.1, the number of subjects that suffered the pathology and the number of subjects that are currently suffering the pathology is reported in Figure 2.

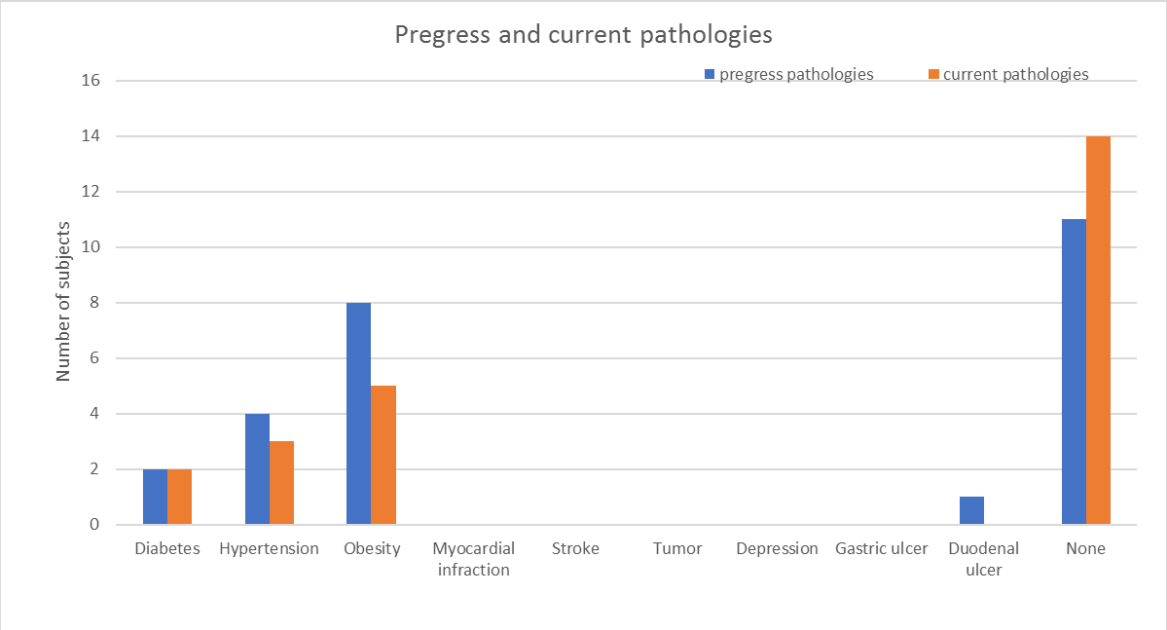

Figure 2 For each pathology, the number of subjects that suffered the pathology (blue bars) and the number of subjects currently suffering the pathology (orange bars) is shown.

3.2.2. Work environment

The sample of users included 14 nurses, 6 doctors, 2 ambulance drivers, 1 operator of funeral services and 1 office worker.

The data on the assessment of the work environment are reported in Table 2.

Table 2 Mean (SD) of work environment data for each country and for the complete sample of users

	Years as night shifter [years]	Number of night shifts per week	Night shifts duration [h]
Hungary	20.75 (12.9)	2.2 (1.2)	13.3 (2.0)
Italy	10.9 (8.5)	2.7 (0.8)	7.5 (3.1)
Portugal	25.2 (4.6)	4.3 (2.3)	11.25 (0.5)
Overall	17.14 (11.8)	2.7 (1.4)	10.6 (3.5)

The environmental measures recorded during day and night in the three sites are reported in Figure 3, Figure 4 and Figure 5.

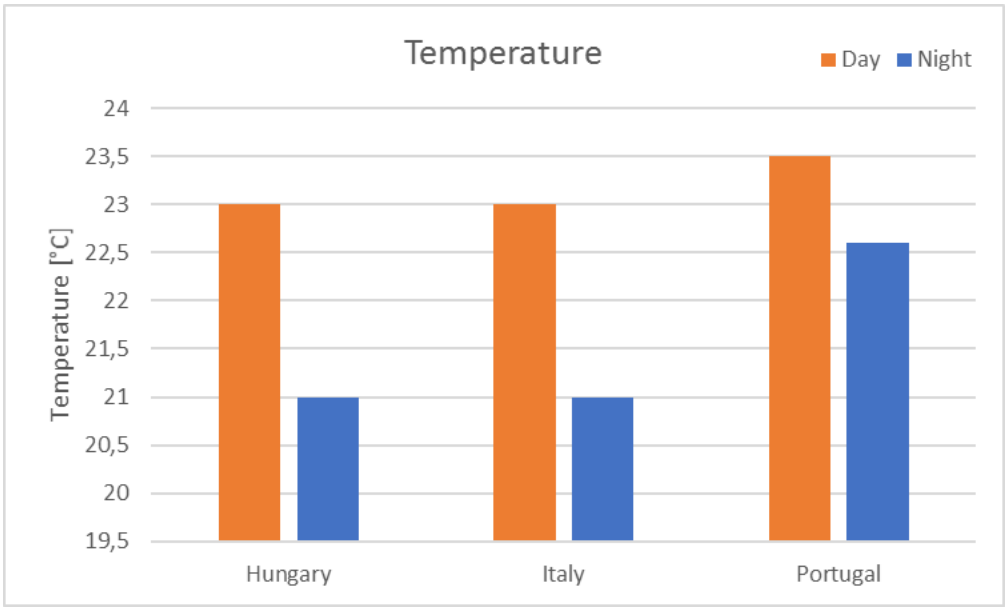

Figure 3 Mean temperature values during night and day in the three sites.

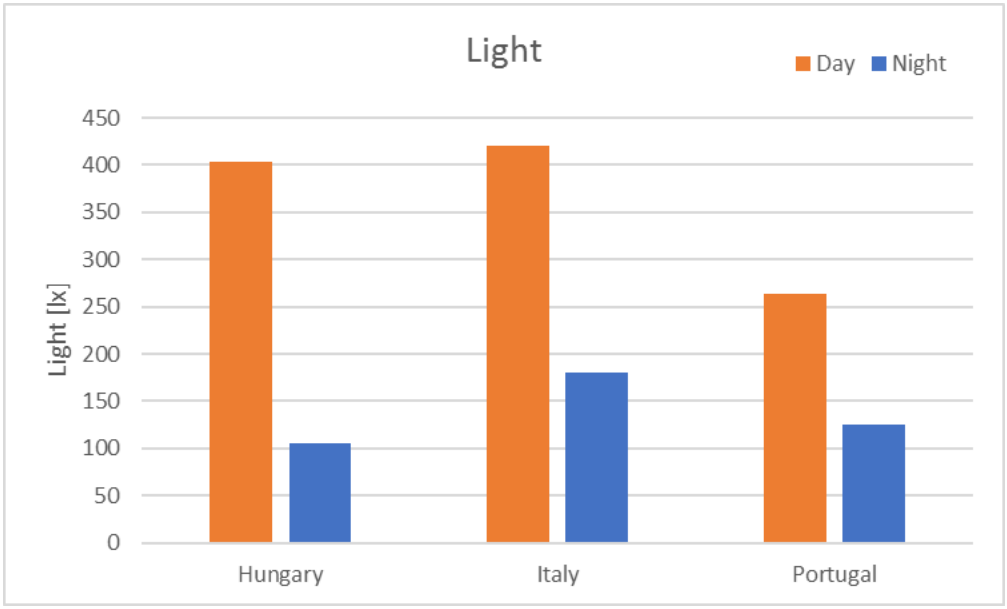

Figure 4 Mean light values during night and day in the three sites

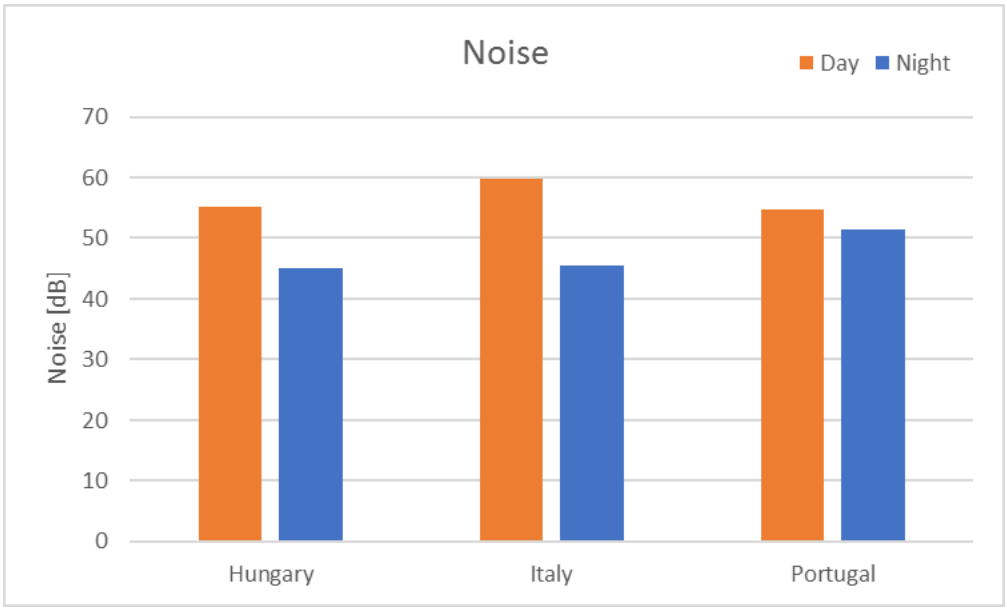

Figure 5 Mean noise values during night and day in the three sites

3.2.3. Sleep assessment

The mean value of the PSQI score and of each component over the whole sample of users is shown in Figure 6.

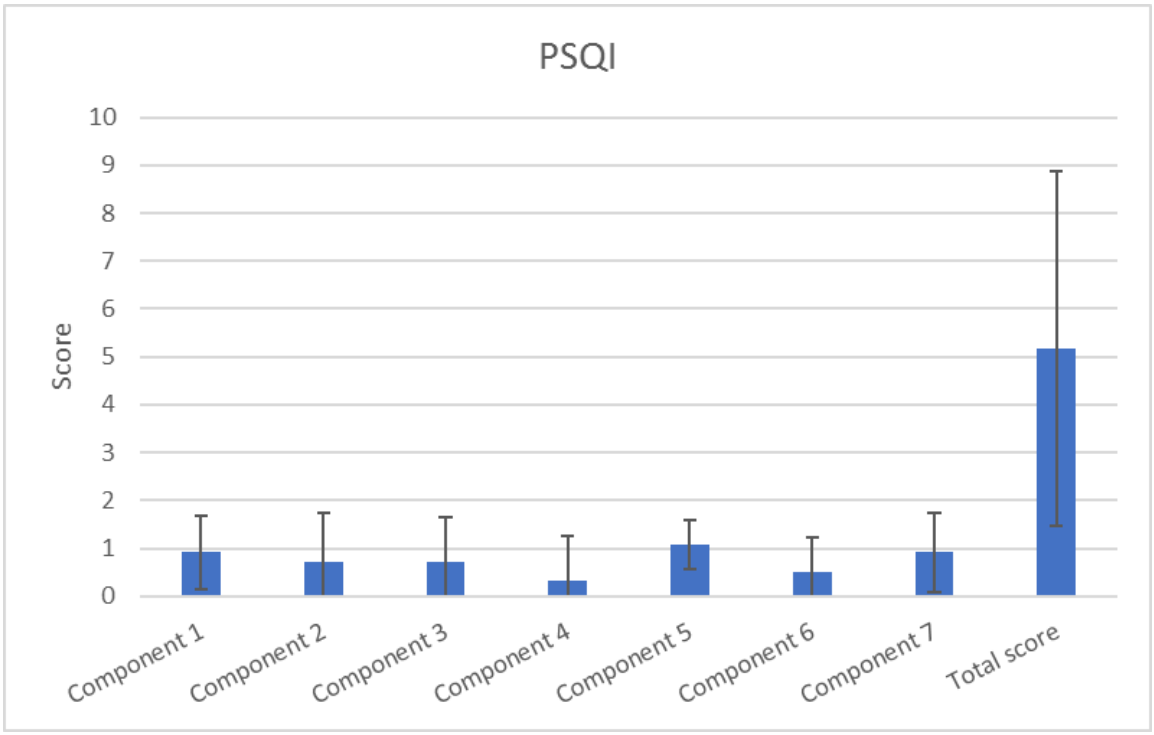

Figure 6 Mean values and SD of each component of the PSQI and of the total score.

3.2.4. Global depression scale

The computed mean (SD) value of the GDS score over all the subjects is 3.1 (2.9). 16 subject resulted to have a normal depression level, 7 subject resulted to have a mild depression level, 1 subject resulted to have a moderate depression level, 0 subject resulted to have a severe depression level (Table 3).

Table 3 Mean (SD) of GDS and number of subject with normal, mild, moderate and severe depression level for each country and overall.

	GDS	Subjects with normal depression level	Subjects with mild depression level	Subjects with moderate depression level	Subjects with severe depression level
Hungary	2.4 (2.7)	7	3	0	0
Italy	3.1 (2.9)	7	2	1	0
Portugal	5 (3.2)	2	2	0	0
Overall	3.1 (2.9)	16	7	1	0

4. Conclusions

In this deliverable, the modalities and tools for the investigation of the users' needs have been presented. A first quantitative analysis of the collected data has been implemented. The outcomes of this analysis will be used to perform a qualitative evaluation of the users' profiles in T2.6, with the collaboration of clinical experts.

Bibliography

1. Buysse, D.J., Reynolds, C.F., Monk, T.H., Berman, S.R., Kupfer, D.J., III, C.F.R., Monk, T.H., Berman, S.R., Kupfer, D.J.: The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 28, 193–213 (1989).

2. http://oscarcanada.org/oscar-users/emr-resource/templates/GDS.