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Glossary

Acronym	Meaning
bpm	Beat Per Minute
ICT	Information and Communicaton Technologies
MCI	Mild Cognitive Impairment
UTAUT	Unified Theory of Acceptance and Use of Technology
NCP	National Contact Point

References

1. *Large-scale physical activity data reveal worldwide activity inequality.* **Althoff, Tim.** 2017. Nature 547.7663.
2. **Kosecki, Danielle.** How Much Sleep Do Fitbit Users Really Get? A New Study Finds Out. *Fitbit.* [Online] <https://blog.fitbit.com/sleep-study/>.
3. *User Acceptance of Information Technology: Toward a Unified View.* **Venkatesh, V., Morris and Davis.** pp. 425-478, s.l. : MIS Quarterly, 2003, Vol. 27.

1. Introduction

The tasks related to this deliverable are going to perform a deep analysis and evaluation of the trials for each of the prototypes envisaged in the project with two aims. The first is to refine the protocols and procedures of the evaluations where necessary. The second is to provide relevant and qualified feedback to the requirements engineering process. This means that any underlying sentiments of user expressions have to be clarified and confirmed with the end-users so as to arrive at an approved set of feedbacks for the requirements process to incorporate into the set of requirements. This information will also be made available directly to the development WP (WP3) to ensure that any development related suggestions are directly taken into account.

In addition to the above mentioned, this document contains an explanation of the procedures followed for the gathering of data from end-users in Spain, Hungary and the Netherlands as well as a clarification of the methodologies used in each of the prototypes.

2. Methodology

When designing the methodology for the evaluation and validation of the functionalities offered by the different prototypes envisaged in CoME, one of the most important factors was the selection of a random sample of the population under study in order to ensure that significant data is achieved.

Because of this, three different trials sites have been defined for CoME in Spain (IRBLL), Hungary (PBN) and The Netherlands (CON), where different samples of the population we are interested in have been taken, i.e. the one defined in D2.1 User Involvement Plan:

- **Seniors older than 60 years** who want to carry out a **healthier lifestyle** or seniors that are worried about their health or seniors already have experienced some initial signs of deterioration (main target group);
- **Formal caregivers** (doctors, nurses, etc.) who require communication tools and other devices to **help the monitoring of the seniors** and delve into the behaviours that give rise to MCI initial signs;
- **Informal caregivers** (family members, friends etc.) of those seniors who are involved in their care and want to support them to carry out a healthier lifestyle.

CoME offers three different interfaces for each of these target groups so their needs could be covered. In order to get specific data from each of them, each of these interfaces will be tested by the target group they are directed to, through an evolutionary and iterative process that will enable the creation of a more complex, complete and suitable prototype each time. This iterative process will consist on the design and development of a certain prototype as well as its validation by the target groups defined above with the aim of gradually refine this solution in coming prototypes ensuring the final delivery of the best and most suitable solution for CoME.

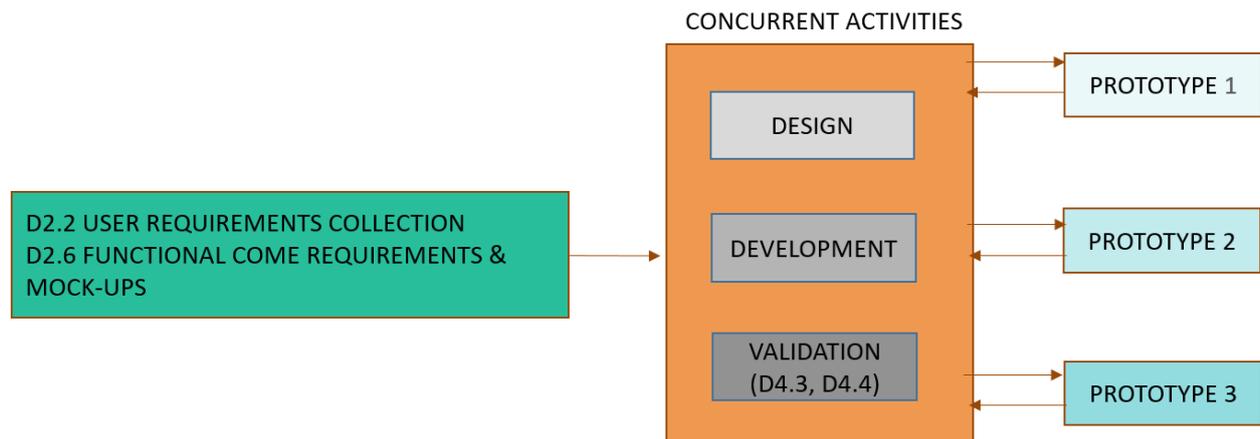


Figure 1 Evolutionary process followed in CoME

The scheduling of this iterative process is listed below with the different evaluation periods (seniors could use the CoME platform as well as the fitness bracelets for a longer period of time between the evaluation periods too):

1. Evaluation of the first prototype: the one reflected in this document.
2. Evaluation of the second prototype:
 - a. First Sprint: 18.10.2017 – 15.11.2017
 - b. Second Sprint: 15.12.2017–28.02.2018
3. Evaluation of the third prototype:
 - a. First Sprint: 07.03.2018 – 18.04.2018
 - b. Second Sprint: 18.07.2018 – 17.09.2018

2.1. *Distribution of trial participants*

As mentioned previously, due to it was not possible to cover all the populations we were interested in CoME, i.e. seniors, formal and informal caregivers around Europe, a **random sample 320 end-users** composed of **200 seniors, formal and informal caregivers from Spain (IRBLL) and 120 from Hungary (PBN)** was selected in CoME.

Within the project CON plays a crucial role in the design and development of the concept of the avatar interaction. In order to get a more hands-on experience and get better insight into the design of the CoME platform, CON proposed to be involved in small pilot tests. Due to the experience they have with the design and development of such tools for these end-users, and the variability that new geographical locations add to the sample, the proposal was successfully received by IRBLL and PBN so they were engaged in parts of the field trials with minimal numbers of participants and results from small tests to be reported as optional additions to the main results from IRBLL and PBN.

2.2. First prototype and planned numbers of end users

In the framework of the first prototype only the senior interface was created, however, end-users organizations involved in the project (IRBLL, PBN and CON) tried to get feedback not only from seniors, but also from formal and informal caregivers in order to get a more complete picture of the existing sections and functionalities of the platform.

The numbers of participants per end user organizations (countries) in the first prototype were:

- IRBLL (Spain): 30 seniors – 15 informal caregivers – 15 formal caregivers
- PBN (Hungary): 13 seniors – 13 informal caregivers – 5 formal caregivers
- CON (The Netherlands): 3 seniors

It is important to remark that all seniors participating in this evaluation of the first prototype were healthy seniors or seniors with some health problems, e.g. pulmonary emphysema, diabetes, overweight, etc., that did not prevent them from enjoying independence on the daily living activities. Despite this “cognitive health” approach, in the coming prototypes, seniors with some cognitive impairment like MCI, will be involved in order to evaluate the functionalities of the platform for this population, especially after the integration with MyGuardian.

Below, the tables for the number of users involved by type of population in each for each of the testing periods envisaged in the project (currently only Prototype 1) are shown:

Number of seniors testing:

Organization		IRBLL		PBN		CON		TOTAL
Test period		non-MCI	with MCI	non-MCI	with MCI	non-MCI	with MCI	
First prototype	First sprint	30		13				43
	Second sprint	30 (same ones than in the previous sprint)		13 (same ones than in the previous sprint)		3		46

Total number of seniors testing in this period was 46.

Number of informal caregivers testing:

Organization		IRBLL		PBN		CON		TOTAL
Test period								
First prototype	First sprint	15		13				28
	Second sprint	15 (same ones than in the previous sprint)		13 (same ones than in the previous sprint)				28

The total number of informal caregivers testing in this period was 28.

Number of formal caregivers testing:

Organization		IRBLL		PBN		CON		TOTAL
Test period								
First prototype	First sprint	15		5				20
	Second sprint	15 (same ones than in the previous sprint)		5 (same ones than in the previous sprint)				20

The total number of formal caregivers testing in this period was 20.

2.3. Setup of the trials

The methodology that will be used in the setup of each of the trials will consist on the creation of three different test phases for each prototype: pre-trial, testing trial and post-trial.

1. Pre-trial phase

Pre-trial meetings are one of the most important parts of any testing process. In these meetings, members of end user organizations aimed to give proper knowledge in short time to the group of end-users involved in order to provide an introduction to them how to use the wearables and how to handle the CoME platform. This had to be done in the shortest time possible and in an easy and friendly way with the aim of not losing the attention and interest of the senior (and/or his/her informal caregiver, if participating too).

Joint sessions and 1 on 1 meeting were arranged by the end user organizations to inform the end users joining to the tests about the participation. However, the setup of bracelets as well as the provision of useful information about them ideally required of more 1 on 1 meeting with end users in order to really ensure the highest level of autonomy and satisfaction during the testing phases with them. These sessions were usually around 30-45 minutes long.

Every time that a senior (and his/her informal caregiver) wanted to participate, the process below was followed by the end user organization:

1. Presentation and information about CoME tests
2. Informed consent to be signed, if the end user agreed to participate
3. Distribution of the wearable device
4. Information about the wearable and set it up together
5. Fill in the CoME pre-trial questionnaire (socio-demographic data, let the end users try the use cases and observe the process in order to get to know their specific needs and possible barriers)
6. Give the end user contact data, in case problems could arise.



Figure 2 Pre-trial phase with Hungarian end-users

2. Testing trial phase

Once the end-users were set-up with the smart watch and the CoME platform, in the testing phase, the end-users experienced CoME platform by testing and evaluating it at home in a real life setting. During this period, the end-user organisation researchers were ready to help the seniors whenever help was needed.

3. Post-trial phase

The post-trial meeting also can be done with joint sessions and 1 on 1 meetings too.

Use of specialized questionnaires was very well needed here to measure the level of satisfaction of the different type of end users separately.

1. Seniors:

The questionnaires for seniors were focused on aspects related to their specific needs.

The questions were about:

- a. Measuring process and monitoring
- b. Perceived health and self-health management
- c. Functionalities, design and usability of the CoME platform

2. Informal caregivers:

The questionnaires for informal caregivers were mainly focused on get insights from the seniors' experience, and then retrieving their personal feeling about the usefulness and usability. The questions were:

- a. Questions about their connection with their senior
- b. Questions about how the senior seemed to feel like since started with the testing
- c. Questions about the platform itself

2. Formal caregivers:

The questionnaires for formal caregivers were focused on the functionalities, usefulness and usability of the platform.

- a. questions about the idea itself
- b. questions about the platform itself

It was needed to hold at least one joint session with all the involved seniors to share their experiences together and stay motivated to be active in the testing.

Of course, the questionnaires compiled by the end user organizations did not measure only the level of satisfaction, but also gave insight into the improvements and new functionalities that could better fit their needs.

3. The evaluation process for the first prototype

The current and following sections include a summary of statistical reports and results derived from the evaluation of the first prototype after the setup of trials with end-users in Hungary, Spain and The Netherlands (following releases of the deliverable will include the results of the second and final prototype). These results were gathered by personnel from IRBLL, PBN and CON with experience on validation and testing with users, that have thoroughly assessed and determined the usability and veracity of this data by comparing it to different “control” datasets/results like e.g., the recent Nature article(1), available from Fitbit itself (2) or even available from online “data donation” services like OurDataHelps.org¹.

It is important to mention that although some of the results gathered in this deliverable were already reported in the previous Need Analysis phase, it’s important to repeat them again due to the big size of the sample for this phase as well as the statistics of the new end-users who joined after the need analysis phase. Variables related with the profile of users, i.e. socio-demographic questions and others related with Internet using habits that were already retrieved in the Need Analysis Phase, were asked only to newly involved end users.

However, also new questions were added. These new questions have had as basis the UTAUT (Unified Theory of Acceptance and Use of Technology) model(3) –a set of original questionnaires brought by CON (Priscilla Esser) that aim to assess the capabilities and resistances shown by users in the use of modern technology through observation and interview questions.

It is important to remark that despite having the same basis and following the same setup for trials, different questionnaires were used in the post-trial phase of the first prototype by each end-user organization because of the representative nature of this prototype. The fact that most functionalities of CoME were in a very initial phase for this first prototype made that the questionnaires were focused on the experiences and feelings of the users with the platform and wearable devices rather than functionalities. Thus, different questionnaires were designed by each partner in order to catch the specific economic, gender and social conditions of people in Spain, Hungary and The Netherlands that could affect the way in which they perceive CoME.

For the upcoming prototypes, unified questionnaires are to be adopted by all end-user organizations based on the experiences that the consortium gathered during the testing process of the first prototype of CoME, agreed among all partners. These questionnaires will evolve along trials to adapt to the functionalities of each prototype, will follow a quasi-experimental process, with pre-post interventions to assess the direct impact of the CoME platform and how the variable answer changes before and after the exposure of the subject to the experimental intervention.

Although CON would originally not participate and act in the project as an end-user organization (they only worked with some informal caregivers in the need analysis phase), they still performed tests with a small group of seniors in order to gather first-hand experiences from

¹<https://ourdatahelps.org/>

them. This way, the organization has a better insight in the end-user needs in order to tailor the services properly to the needs of the elderly. CON is also involved and contributing to the results of the measurement performed mainly by the end-user organizations (IRBLL and PBN) at the same time.

4. Conclusions of the first prototype

One of the most interesting and positive aspects we found during the evaluation of the first prototype was that there is a need for an application not only from seniors, but also from the side of their worried caregivers, which is targeting to achieve a better general health with prevention methods.

Almost all of the seniors got very enthusiastic about the self-monitoring part and it really seemed like they had no or not much problems with wearing the fitness bracelets and sharing their general health-related data. It is also mentionable that the charging process seemed to be no problem for the participants, especially after a first practice held with end user organizations together.

The motivation was present in the case of most of the participants and even after that short time of the trials (1-2 month(s) only) quite a lot of seniors felt like they were already in a better shape now due to the use of the CoME platform (for example in Hungary, 7 seniors already thought that they improved with their health since the trials started). In other words, CoME platform achieved the aimed goal by motivating users to improve their health behavior.

Regarding to the CoME platform, the appearance of it was really well received as we could see also from the numbers and the shared experiences not only by the seniors, but by the informal and formal caregivers too. This part has the biggest relevancy for now, because the nature of the platform is only representative in this first prototype, so the functions could not be really tested, only the main baselines and ideas.

Except this representative nature of the platform (of course it caused some misunderstanding in that phase), the biggest negative things for end users were the language/translation related problems and the system of the menu (had more parts, which could only be reached from multiple parts of the platform). It was under the impression that it was not integrated enough for a potential senior user or sometimes not even well-suited enough for some informal caregivers (there are older ones too in this group and some of them were not very confident with using modern technology). Minor usability findings during the test provided a good indication on how to improve the flow and user experience that will be integrated in the second prototype.

The next phase will consist on improvements based on the user findings, which includes the translation, the system of the menu, as well as the minor usability aspects, and new functionalities will be developed, which will be tested after the first sprint of the second prototype.