

COGNIVITRA

D1.1 – CO-CREATION RESULTS

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GLOSSARY

ABBREVIATION	DESCRIPTION
CRISH	Co-Creating Innovative Solutions for Health
AAL	Ambient Assisted Living
KoM	Kick of Meeting

Executive Summary

This document describes the achieved results during the execution of Task 1.1, as it is illustrated in the Description of Work. In particular, to involve organizations in the co-creation process, for the understanding phase, the requirements analysis is made and the end-users needs are evaluated using a special set of approaches provided by AAL (Active Assisted Living Association). This process will cover the User-centred Design and Value Proposition testing. For User-centred Design, we will adopt the "Persona" method, which directly involves all participants (end-users, end-user support organizations and consortium companies) with an intermediate effort rate. In this method, archetypes of each user are specified. For instance, to determine their demographic characteristics, it is reasonable to provide information such as lifestyle, interests, life class, affinity with technologies. For Value Proposition, testing it will be adopted the methods proposed by the Lean StartUp methodology to gather business requirements.

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1. Introduction

System design can be done in two different approaches. The first approach can be done based on each individual's needs and indeed it is a user-centred design while the second one is based on more general methods i.e. one-sized-fits-all designs. Co-creation as an individual's needs approach encourages the customers to actively participate in developing the planned product. Co-creation could be well compared with feedback control methods in control systems. In control system, feedback controller always checks some quantities as outputs and according to the value of outputs, it tunes input quantities to keep the system stable. Likewise, in co-creation design, the experience, collaboration, education and resourcefulness of the end-user are continuously monitored and sent back to utilize in the final product. Therefore, such a product can be more practical and user-friendly to their users in comparison with products do not benefit from any users' collaborations. Co-creation methodology have been applied in various areas like health to resolve or alleviate some disorders, problems, syndromes. In this regard, considering the mentioned advantages, co-creation is also utilized in developing the CogniViTra project. It is obvious that such close collaboration and communication between the designers and end-users could lead to increasing the chance of success of the final product and making it a good value.

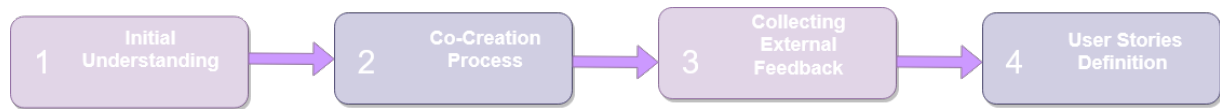
Co-Creation is a process recommended by AAL Association and EIT Health. This process led to good results in the past projects such as CaMeLi, CogniWin and ROSE for example, where the progress of the project was validated by potential users.

The involvement of all the stakeholders for the Understanding phase started in the preparation for the proposal where relevant testimonies were collected close to the professionals that work close to people with dementia diseases and his family. This process will cover the User-centred Design and Value Proposition testing. For User-centred Design, we will adopt the "Persona" method, which directly involves all participants (end-users, end-user support organizations and consortium companies) with an intermediate effort rate. In this method, archetypes of each user are specified. In this direction, their demographic characteristics such as lifestyle, interests, life class, and affinity with technologies are determined. For Value Proposition testing we will adopt the methods proposed by the Lean StartUp methodology to gather business requirements.

In preparation for Co-Creation some elements participate in CRISH course, promoted by EITHealth that brings together key stakeholders, including patients and informal caregivers, to learn to engage, co-create and co-design bench-to-bedside research projects and healthcare innovative projects through patient experience, responsible research and innovation, translational medicine, entrepreneurship, reciprocity and co-design. This course is focus in health and it provides a bunch of methodologies to help the co-creation process, it provides some tools like interviews, workshops, questionnaires, patient's stories, organize hackathons, fab labs, design thinking, etc.

In the meeting, we use some of those tools to help us to define a better approach to lead CogniViTra to its users.

1.1. Co-Creation process in CogniViTra



First step: Initial understanding was done in Proposal stage using Literature Review and previous Background Knowledge from experts in the consortium, these inputs help to formalize the initial description of Personas (at proposal stage).

Second step: Consortium exercise that takes the input from first step and further develops the understanding of the problem by designing a Value Proposition and formulating Test Cards to formalize the initial description of User Needs.

Third step: Gathering external feedback at a public event with the participation of relevant stakeholders. We prepared a generic questionnaire that combined aspects of the concept and value proposition of CogniViTra and collected feedback at AAL Forum 2019 in Aarhus, Denmark, which in 2019 coincided with the EIP-AHA assembly event.

Fourth step: Analysing the information from three previous steps and reformulating any required assumption in the project. Concluding the co-creation with the description of User-Stories (US) in the format of Gherkin Scenarios and a summary table that links US to Needs and Personas.

2. Literature Review and Background Knowledge (Personas)

As it has been mentioned in the previous section, co-creation is a customer-centre method and it should be determined firstly what the customer value is and then how it should be created and developed. To address these two issues in the CogniViTra project, different end-users of the final project have been determined and their concerns, expectation and experiences have been heard and then responded in the project. Specifically, in this project three main end-users are considered i.e. patient, health-care professional and informal care-giver and their demands, wishes and concerns have been heard and addressed in the CogniViTra project.

In this direction, and to have wider perspective on how the system should be designed and implemented, four personas are considered and their stories are reviewed. Peter is an elderly man who was recently diagnosed with cognitive impairments and his son Kevin is a Graphic Designer. Luís is Peter's doctor and Patricia is a psychologist therapist from health care.

2.1. Patient

Peter, aged 70 years, is living with his wife in their apartment and experienced more and more cognitive problems beside the heart problems he already had. Recently, Peter was diagnosed, in the hospital, to be at risk of developing dementia and should start attending regular appointments for cognitive training. This came as a shock to Peter, his wife, and the rest of the family. Peter and his wife want to stay independent as long as possible, thus started to search for psychosocial therapies to increase his well-being and potentially delay the disease progress. Furthermore, Peter has a regular check at his cardiologist every 3 months. Unfortunately, Peter lives far from the hospital, and had to travel 2 hours for his 30 minutes psychosocial session and 15 minutes check-up with the cardiologist. This travel alone was already a challenge to overcome. In addition, travelling alone was becoming increasingly difficult, so his wife started to accompany him. Peter loved his house, and the therapy room in the clinical setting was unfamiliar to him, which distracted him from his therapy. Both Peter and his wife started to wonder if it was possible to have some of these therapies at home, in his own safe and familiar environment. The couple also inquired about the possibility to do these more often, and in accordance to their schedule. They discussed this with their psychologist Patricia at the hospital. The timing could not have been better. The hospital had just started to work with CogniViTra, a cognitive training tool extended with physical stimulation features that can be used at home. With this tool Peter could do the training programs he used to do in the hospital at home, in a much familiar and convenient environment. With the interface and advanced natural interaction, the training sessions are automatically adapted to his training level. With CogniViTra he can perform daily exercises for cognitive training combined with some physical exercises, which he used to do in the training session at the hospital more sporadically. When he visits the hospital for his regular check-ups, the information from CogniViTra is used to monitor his progress on the training program. Peter

and his wife found this solution improved Peter's well-being and disease monitoring, while allowing them to keep their independence and social life habits.

2.2. Professional Health Care

Luís is a 38 years old medical doctor, lives in Lisbon and is married. Luís has worked at a central Lisbon hospital for the last 12 years. His specialty is family medicine and although his patients are from all ages, seniors tend to be more common as they have more health-related problems and need closer monitoring. Having senior parents himself and knowing the challenges they face; he has always tried to give special attention to the older patients.

Luís believes that his patients' quality-of-life is reasonable and that there is room for improvements. First of all, he strongly feels that the government should invest more in helping this population, in every aspect they can. In particular, solutions regarding daily life activities support and medication intake assistance could have a positive impact in seniors' health and daily life. Regarding this kind of patients, he also frequently detects some early symptoms of dementia and he feels lack of methods to fight this disease and retard his impact in elderly daily life.

Luís uses a PC with internet connection at work most of the time. He uses systems for clinical activity support (like SAM or SAPE) and does information research. Therefore, he has extended technological knowledge and knows how to take full advantage of the systems.

For Luís, the use of ICT in the hospital has improved many processes that were previously complicated and time consuming, in particular the integration of patient information and the communication between multidisciplinary teams and with the patient himself. ICT also provides a good support on screening, counselling and referring patients to other specialties. Nevertheless, in his opinion the amount of equipment available at the hospital is still low and their workload prevents them from taking full advantage of the systems. He supports the direct contact with patients and thinks that spending too much time using his computer at a consult could negatively impact his relationship with the patient.

Regarding his aged patients Luís contact a colleague. Patricia is psychologist in a Health Care facility specialized in treat patients with dementia. Patricia shared with him some exercises that could retard the progression of dementia and mentioned in particular one system that allow her to connect with patients: through CogniViTra she prescribes exercises to the patient and follow remotely his progression.

Patricia is a fifty-year-old psychologist, she has worked for the last 22 years. She specialized in psychologist for patients with dementia. She is a very dedicated professional and is always willing to try whatever could make her a better therapist. Patricia has scheduling problems and the system has represented a significant improvement because allow her to reduce the moments of contact with patients but, make that moments more effective because she can completely focus on each patient a time.

2.3. Informal Caregiver

Kevin is 33 years old, lives in Porto, is single and he works as a Graphic Designer.

Kevin lives alone in an apartment in the centre of Porto. He has a degree in Design and works as a graphic designer at a marketing company. He earns enough to live an independent and satisfactory life. He is a very caring son, who constantly worries about his parents' health, and therefore tries to visit them as often as his work allows him to do it.

Kevin was more relaxed when he realized that his father could use a system at home that allows him to exercise physically and cognitively, and he himself can follow his father's evolution and detect problems earlier. Every day Kevin checks if his father does the exercises and how he evolves.

3. Value Proposition

The second step of the Co-Creation process took place mostly during the kick-off meeting (KOM) that took place beginning May 2019 in Coimbra, Portugal. The purpose of the meeting was not only to launch the project but also to bring together all stakeholders to discuss the project's needs and their complexity. The discussion issues, doubts and conclusions are documented here to lead the work into the effective solution.

The exercise allows the consortium to understand the major concerns for each stakeholder and clarify the problems that will appear during the implementation. Some questions came to the discussion, they will be very helpful to keep the concentration on the most important points for everyone involved in building the solution.



FIGURE 1 - VALUE PROPOSITION EXERCISE

This exercise helps to position CogniViTra in the market and its role in people's lives. During this session the participants follow the diagram represented in figure below to identify value that this project could represent to its customers.

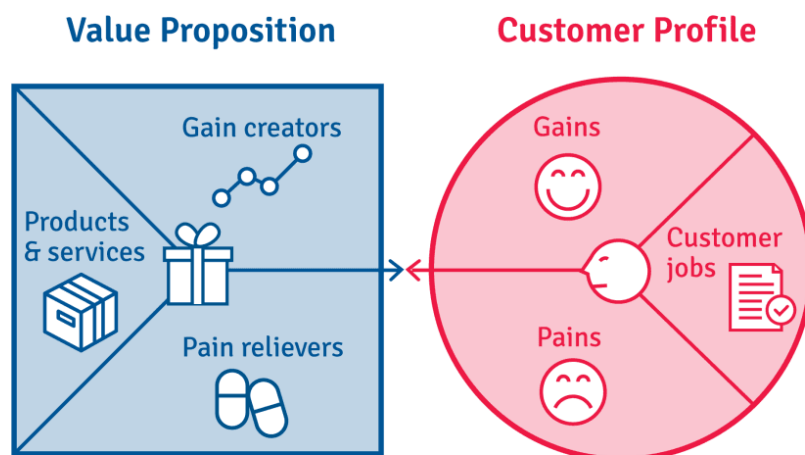


FIGURE 2 - VALUE PROPOSITION CANVAS

3.1. Value Proposition Canvas (Patient)

Customer Profile	
(Patient)	
Customer jobs <ul style="list-style-type: none"> Perform cognitive stimulation activities 	Gains <ul style="list-style-type: none"> Better integration between health and care institutions Guidance
	Pains <ul style="list-style-type: none"> Strong division between service care and health Lack of tools to perform cognitive activities Typical resources using pen and paper Reimbursement schema for these activities (cognitive training) Costly for the patient Only institution have the resources to perform therapy After therapy resources are sparse Difficulty on using computers (e.g. login, ...) Technical difficulties with movement track End of training
Value Proposition	
Products & services <ul style="list-style-type: none"> Service for cognitive and physical training remotely supported by a professional 	Gain Creators <ul style="list-style-type: none"> Do it at home Remote supervision by a professional Cognitive and physical training Reduce the costs with transports Be more proactive, be part of the solution Increase physical activity Interactive system to promote engagement and adherence to training Part of the system can be a home installation (device and connection)

	<ul style="list-style-type: none"> Combining cognitive and physical training
	<p>Pain Relievers</p> <ul style="list-style-type: none"> Reduce cost associated with travels Can be used after therapy at institution Helpdesk

3.2. Value Proposition Canvas (Care Professionals)

Customer Profile	
(Care Professionals, Care homes, Care center, Community level institutions (day care center, nursing home, hospitals with day care facilities))	
<p>Customer jobs</p> <ul style="list-style-type: none"> Deal with patients daily providing health and social care Care patients with mild dementia 	<p>Gains</p> <ul style="list-style-type: none"> Networking with peers to exchange experiences
	<p>Pains</p> <ul style="list-style-type: none"> Need more human resources to treat the increase number of patients Lack of tools to perform cognitive activities Low digitalization makes time consuming in assessment/evaluation
Value Proposition	
<p>Products & services</p> <ul style="list-style-type: none"> Maintain functionally Train professional Cognitive training Increase physical activity Professional supervision to support the elderly training 	<p>Gain Creators</p> <ul style="list-style-type: none"> Proof of accountability (evidence of benefits to the patients)
	<p>Pain Relievers</p> <ul style="list-style-type: none"> Reporting on results, feedback to professional Training to staff

3.3. Table of User Needs

Identifier	User Needs	Personas
N-001	Reduce the number of visits to the hospital.	Elderly
N-002	Cognitive and physical training more often.	Elderly
N-003	Reduce the costs associated with travels.	Elderly
N-004	Home monitoring.	Elderly / Professional / Informal Caregiver
N-005	Remote supervision by a professional.	Elderly / Professional
N-006	Increase physical activity.	Elderly
N-007	More efficient follow up by the professional	Professional
N-008	Improve the number and types of services related with cognitive a physical stimulation.	Professional
N-009	Increase the time and quality of face-to-face consultations.	Professional
N-010	Manage a larger number of patients.	Professional
N-011	Daily monitoring of patients.	Professional
N-012	Analyse the impact of the system in people.	Professional
N-013	Informed follow-up on his relative by checking the exercises performed through the system.	Informal Caregiver
N-014	Easy and secure way to logged in the system	Elderly / Professional / Informal Caregiver
N-015	Slow the progression of dementia.	Elderly
N-016	Evaluate the impact of this kind of training in the evolution of the disease.	Professional

4. Validation with external stakeholders

4.1. Value Proposition Testing

One of the exercises that the consortium developed during the KoM was the Test Card Strategyzer. These cards are composed by four steps:

- Hypothesis
- Test – how can it be tested
- Metric - what measures can validate the hypothesis
- Criteria – what's the threshold to consider successful

The participants discussed the hypothesis and worked on the verification of the hypothesis i.e. how it could be verified, measured and what criteria should be defined, if it passes the test.

4.1.1. Test Card #1

Hypothesis: "Cognitive and physical training should be provided at institutions in the community, combining institution-based with home-based activities"

Test: "Ask if the institutions have the same need and are willing to pay for it and how they will fund it"

Metric: "Hours of human resources available for the other task initially and after a year of using it"

Criteria: "They are willing to upgrade the number and the type of services which are related to cognitive and physical stimulation"

Test Card Strategyzer

Test Name: _____ Deadline: _____

Assigned to: _____ Duration: _____

STEP 1: HYPOTHESIS

We believe that COGNITIVE & PHYSICAL TRAINING SHOULD BE PROVIDED AT THE INSTITUTIONS IN THE COMMUNITY, COMBINING INSTITUTION-BASED WITH HOME BASED ACTIVITIES Critical: ⚠️ ⚠️ ⚠️

STEP 2: TEST

To verify that, we will ASK IF THESE INSTITUTIONS HAVE THE SAME NEED AND ARE WILLING TO TRY FOR IT HOW WILL THEY RUN IT Test Cost: 📊 Data Reliability: 📊

STEP 3: METRIC

And measure HOURS OF HUMAN RESOURCES AVAILABLE FOR THIS TASK T=0 T=1 YEAR FROM NOW WHAT REMOTE SERVICES ARE BEING PROVIDED Time Required: ⌚ ⌚ ⌚

STEP 4: CRITERIA

We are right if THEY ARE WILLING TO UPGRADE THE NUMBER AND TYPE OF SERVICES RELATED TO COGNITIVE & PHYSICAL STIMULATION

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FIGURE 3 - TEST CARD 1

4.1.2. Test Card #2

Hypothesis: "Within the field of neurology which is related to cognitive deterioration needs a new line of treatment and CogniViTra could be a new stage of treatment for the patients"

Test: "Ask if CogniViTra could be interesting for Health systems and particularly Neurology department for both public and private health practices"

Metric: "Cost for professionals"

Criteria: "Most of the care professionals think that they need some new treatments to help them"

Test Card

Test Name

Assigned to

Deadline

Duration

STEP 1: HYPOTHESIS

We believe that

El campo de la neurología relacionada con el deterioro cognitivo necesita una nueva línea de tratamiento y Cognivitra podría probar ser una etapa más del tratamiento para estas personas.

Critical:

STEP 2: TEST

To verify that, we will

- ~~Propuesta de~~ Necesitamos saber si Cognivitra sería del interés del Centros de Neurología y del Sistema de Salud (público y privado)

Test Cost:

Data Reliability:

STEP 3: METRIC

And measure

- Cost for professionals.

Time Required:

STEP 4: CRITERIA

We are right if

- 70% of core professionals think that they need some new treatment to help them.

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FIGURE 4 - TEST CARD 2

4.1.3. Test Card #3

Hypothesis: "The low digitalization would be time-consuming for the community population"

Test: "Ask how many hours/€ the professionals (therapists/management) are spending on digital problems"

Metric: "The relation €/hour in 10 professionals"

Criteria: "50% of them said that they spent more time that they should"

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Test Card Strategyzer

Test Name	Deadline
Assigned to	Duration

STEP 1: HYPOTHESIS

We believe that COGNIVITRA

THE LOW DIGITALIZATION WILL BE TIME-CONSUMING

OF THE COMMUNITY FORUMS

Critical: ▲ ▲ ▲

STEP 2: TEST

To verify that, we will ASK HOW MANY HOURS/E

THE PROFESSIONALS (THEORISTS/MANAGEMENT) ARE SPENDING

ON DIGITAL PROGRAMS.

Test Cost: = [] [] [] Data Reliability: [] [] []

STEP 3: METRIC

And measure HOW MANY THIS (€/H) IN 10 PROFESSIONALS

Time Required: ⌚ ⌚ ⌚

STEP 4: CRITERIA

We are right if 50% SAY THAT THEY SPENT MORE

TIME THAT THEY SHOULD.

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FIGURE 5 - TEST CARD 3

4.2. Preparing Validation with external stakeholder at AAL Forum 2019

Based on Test Cards, a questionnaire was prepared for AAL Forum 2019. This questionnaire includes some demography questions to profile the participate and other related with the system listed below.

What type of profile do you fit better?

- I would use this myself for cognitive and physical training

- I would suggest this to a family member or a friend
- I would use this in my professional activities
- I would adopt this in my organization so my staff could use it
- Other

What do you consider to be the two most important topics that COGNIVITRA should solve?

- Extend the clinical setting to home
- Remote follow-up by health care professional
- Closer follow-up from family and informal carers
- Increasing the number of training sessions
- Reducing the costs with transportation to clinical settings
- Other

If COGNIVITRA was already available in the market, how much would you be willing to pay for the solution (per user per month)?

- 0 €
- 1 - 25 €
- 25 - 50 €
- 50 - 75 €
- Other

Finally, the questionnaire ended with an open question to seek for suggestions and comments to CogniViTra system and how it can be improved.

4.2.1. AAL Forum 2019 Questionnaire results

During the event, the system was tested by 57 participants from 16 different countries, located specially in Europe. In figure 6 we present the distribution of participants by country of origin.

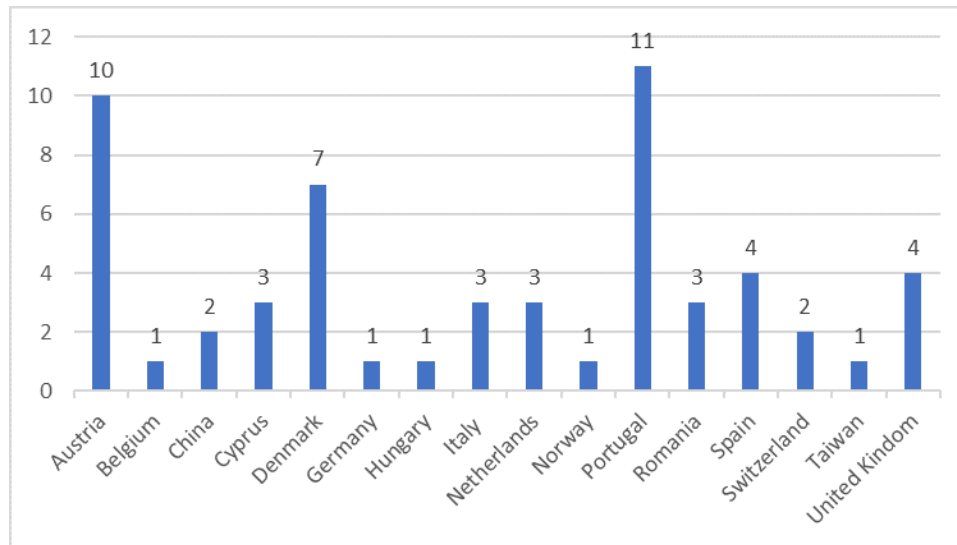


FIGURE 7 - DISTRIBUTION OF PARTICIPANTS COUNTRIES

The sample was selected according to consecutive recruitment. The average age was 41.5 years ($SD = 11.4$) and the oldest participant was 66 years and the youngest was 24 years. Regarding the gender, 32 participants (56.1%) were male and 25 (43.9%) were female. Figure 1 shows the test setup in the AAL Forum 2019, and participants testing the prototype.



FIGURE 8 - TEST SETUP

Most of the participants ($n=53$) referred that they would use or suggest the utilization of CogniViTra. Of those, six participants (10.5%) referred that they would use it themselves for cognitive and physical training, while 23 (40.4%) mentioned that they would suggest this to a family member or a friend. Besides that, 14 participants (24.6%) mentioned the intention to use it on their professional activities, and 10 (17.5%) would adopt CogniViTra in their organization so other staff members could use it. The distribution of participants expectation of use is detailed in figure 9.

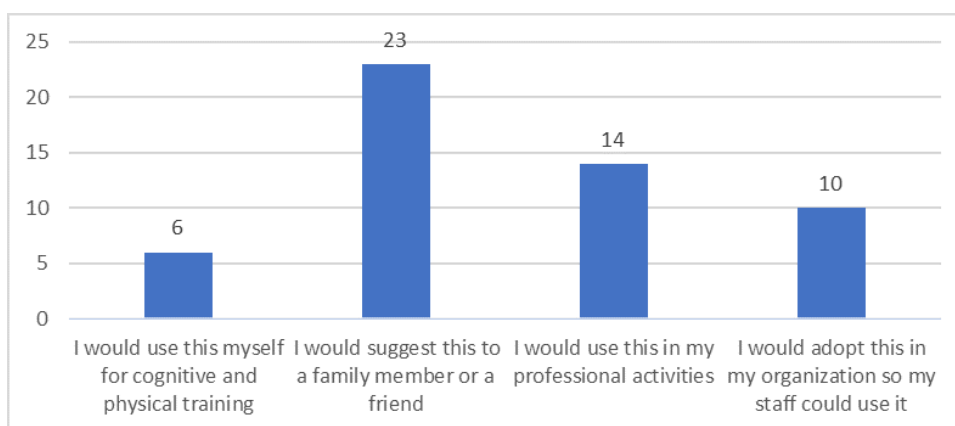


FIGURE 10 - PARTICIPANTS EXPECTATION OF USE

Regarding the aspects that the participants considered to be the topics that CogniViTra helps to solve, the most valued was the possibility to remote follow-up by health care providers (26.9%), followed by the possibility to extend the clinical setting to home (24.1%) and increasing the number of training sessions (22.1%). The less valued aspects were the reduction of the costs with transportation to clinical settings (11.5%) and the closer follow-up from family and other informal careers (15.4%) (Figure 11).

Participants were also inquired about how much would they be willing to pay for the CogniViTra (per user per month), if it was already available in the market (Figure 12). Thirty-four participants (59.7%) answered that a value till 25 euros would be acceptable, while 15 participants (26.3%) would be willing to pay between 25 and 50 euros, and five would pay between 50 to 75. Two participants (3.5%) mentioned that CogniViTra should be free for the user, and the license should be paid by local authorities, health care systems or other services that provide support to the community, and one participant said that the value should be calculated based on the number of patients an institution is caring.

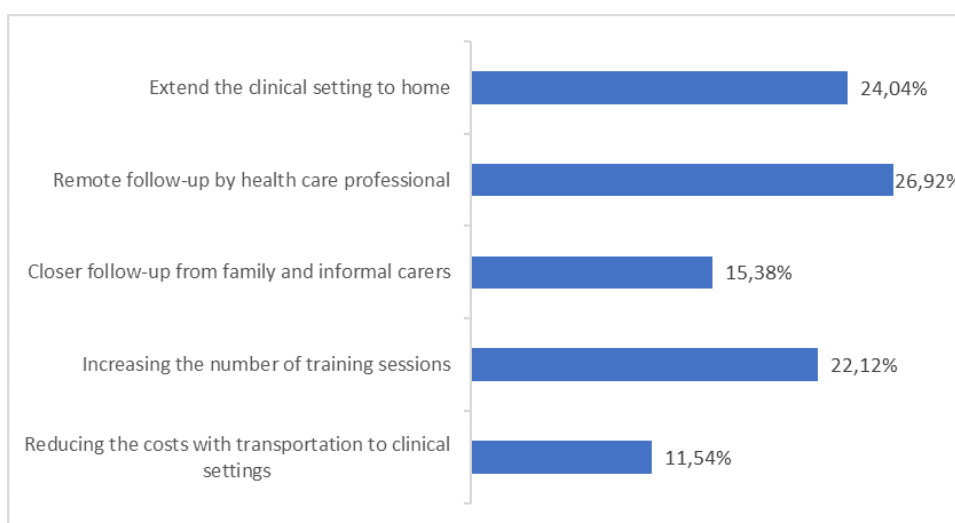


FIGURE 13 - VALUED ASPECTS ABOUT THE SYSTEM

Participants made relevant comments and suggestions about the CogniViTra prototype. The comments were positive and encouraging further developments. The suggestions focused on the difficulty level, the system response performance, the intuitiveness of icons and instructions, the user interaction, the exercise duration, and on the inclusion of a suggestion to drink water. The participants' comments and suggestions are transcribed in the table below.

Comments transcription	<ul style="list-style-type: none"> • Good brain training; • Great work; • Good;
Suggestion transcription	<ul style="list-style-type: none"> • Number of games adjusted difficulty; • It could be quicker to change the question after answering the first; • More interesting images and more intuitive instructions; • Maybe some shorter tests (20 was a bit much); • Include more levels; • Ad a suggestion to drink a glass of water; • Perhaps the virtual coach could say cheers or otherwise suggest the user to remember to drink something.

Most suggestions were in line with the requirements previously defined for the CogniViTra and were already planned to be implemented in future versions of the prototype.

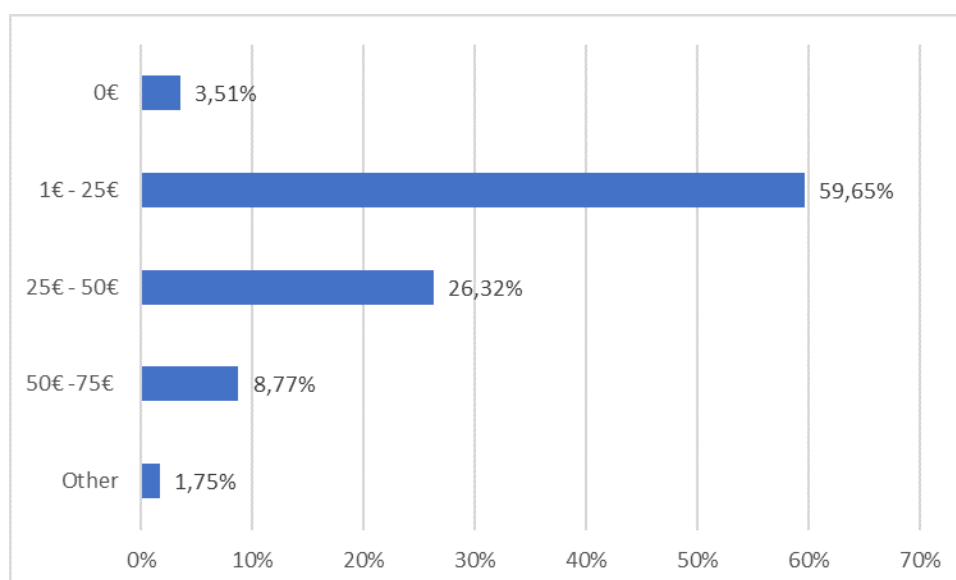


FIGURE 14 - PRICE THAT PARTICIPANTS WERE WILLING TO PAY FOR THE SYSTEM

5. User Stories

Upon concluding the collection of feedback, CogniViTra consortium gathered the main conclusion into "User Stories" to allow better understanding of the needs and setting the bridge for further development stages (e.g. design, requirements analysis and technical specifications). The main set of "User Stories" are described here following the Gherkin Scenario format.

US 001 - Authentication

Scenario: The patient wants to access CogniViTra system;

Given: The system has a biometric reader to unlock the access;

When: The Patient put his finger on the biometric reader;

Then: Access to his personal area;

And: The exercises prescribed by the therapist.

US 002 - Cognitive and physical training

Scenario: The patient needs to perform regular exercise;

Given: The system CogniViTra allows his therapists to prescribe exercises to his patient;

When: The patient logged in the system;

Then: Access to the prescribed exercises;

And: Perform the exercises

US 003 - Home Monitoring

Scenario: The therapists prescribe exercises to his patient;

Given: The system CogniViTra allows his therapists to prescribe exercises to his patient;

When: The therapists logged in the system;

Then: Access to the patient profile;

And: Prescribe the exercises to the patient;

When: The patient performs the exercises;

Them: The therapists could check the patient performance.

US 004 - Reduce cost in transports

Scenario: The patient needs regular monitoring;

Given: The patient lives far from the Hospital and has to travel more than a 1 hour for 20/30 minutes consultation;

When: The therapist recommends the use of CogniViTra to perform his cognitive and physical training;

Then: The patient could reduce the travel cost for medical appointments by 75%.

US 005 – Remote adjustment of treatment

Scenario: The patient has access to CogniViTra System and can perform his exercises according to the medical prescription;

Given: The therapist prescribes exercises to the patient;

When: The patient logs in to the CogniViTra system and then he is notified to perform the exercises;

Then: The patient finishes the set of exercises;

When: The therapist accesses to patient profile;

Then: He checks how the session occurs;

And: Adjusts the next set according to that.

US 006 - Increase physical activity

Scenario: The patient performs the CogniViTra exercises;

Given: The exercises could be played by doing different postures;

When: The game asks for the posture according to the answer;

Then: The patient performs the posture;

And: The game carries on according to that.

5.1. Mapping User Stories to User Needs

User Stories	User Needs
US01	N-014
US02	N-002, N-006
US03	N-002, N-004, N-006, N-008, N-015
US04	N-01, N-03
US05	N-02, N-04, N-05, N-06, N-07, N-10, N-11, N-12, N-13
US06	N-02, N-08

6. Conclusions

This process allowed to consolidate perspectives from different parts, namely, from doctors, caregivers, professional caretakers, patient, developers and health administrators, and allowed to identify ways to solve the problem and pave the way to build a complete solution that will address the stakeholders needs and expectations.