

SOCIABLE DELIVERABLE D9.4

“Public Final Activity Report”



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Revision History

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0.2	Stelios Pantelopoulos	SLG	31/10/2012	Information on the SOCIABLE Platform and the Pilot Operations
0.3	Stelios Pantelopoulos	SLG	09/11/2012	Technical Information about the SOCIABLE Platform, Lessons Learnt, Information from the Evaluation of the Pilots
1.0	Stelios Pantelopoulos	SLG	23/11/2012	Conclusions, Final Version

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Abstract

The present deliverable is the public, publishable final report of the project. It summarizes the project's achievements in terms of the SOCIABLE technology platform, the pilot operations and the clinical assessment of the SOCIABLE model. Furthermore, it outlines the main experiences and lessons learnt. Note that the information contained in this deliverable, summarizes information available in other key deliverables of the project, making however sure that the provided information can be made available in the public domain.

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1. SOCIABLE Project Overview

1.1 Project Summary: Consortium, Goals and Main Achievements

The SOCIABLE project is introducing, deploying and piloting a novel integrated ICT service empowering the elderly to improve their mental ability, while at the same time boosting their social interaction. The SOCIABLE service integrates human support and care services offered by care centers and specialized/expert operators, with state-of-the-art ICT services over leading edge surface computing technologies (Figure 1), notably (multi-touch) surface tables and (touch-based) surface personal computers. As part of the service, aged individuals engage in cognitive training and social interaction activities through the use of surface computers. Ergonomic multi-touch tables are used within the care centers, while surface computers (surface PCs) are employed for in-home based training activities.

The final version of the SOCIABLE platform comprises twenty-seven (27) cognitive training games, which cover different cognitive skills and are administered to the elderly users through the SOCIABLE surface computing platform. In addition to the 27 cognitive games, the platform includes a special play activity called «Book-of-Life», which emphasizes the social interaction of the elderly. Furthermore, the SOCIABLE platform comprises a set of tools that facilitate medical experts in the design, development and deployment of SOCIABLE sessions, as well as in the production of reports. Hence, SOCIABLE offers (through its platform) cognitive training and social activities ICT-based services to the elderly, while at the same time facilitating medical experts to monitor and supervise SOCIABLE play activities.

Up to date the SOCIABLE services have been deployed across seven pilot sites (including hospitals, care/leisure and day centers) in four European countries (Greece, Italy, Norway, Spain). These pilot sites are operated by end-user partners of the project, while they are supported by medical and technical partners of the project in terms of medical and ICT aspects respectively. In particular, health professionals supervise the SOCIABLE sessions, while technical experts provide the needed technical support and software updates to the SOCIABLE platform. The SOCIABLE service (and its pilot operations) targets three main elderly groups suffering from cognitive decline, including healthy elderly, elderly with Mild Cognitive Impairment (MCI) and elderly with mild Alzheimer's disease (AD).

Elderly from these user groups are involved in SOCIABLE sessions in two different ways/flavors:

- An informal way, which involves the engagement of the elderly in SOCIABLE sessions, without the application of the processes foreseen as part of the SOCIABLE study design and clinical protocol (such as the formal cognitive, functional and affective assessment of the subjects). However, following the conclusion of their sessions, elderly participants fill-in several questionnaires, including satisfaction surveys and leaker tests, with a view to providing feedback on their experience.

- A formal way, which involves the application of the SOCIABLE study design and clinical protocol, as part of a **multi-national, multicenter, randomized, placebo-controlled efficacy study**. SOCIABLE formal pilot operations (i.e. as part of the randomized study) involved more than 350 elderly users across the seven pilot sites. These individuals will use SOCIABLE from care centers or their homes. The results of the SOCIABLE study outlined above, will be processed in order to assess the effectiveness of the SOCIABLE approach, which could boost its applicability in cognitive training and social activation of elderly.

In terms of the formal pilot operations outlined above, the project has established and uses specific inclusion and exclusion criteria associated with the recruitment of elderly individuals to the SOCIABLE programmes. These criteria are based on relevant medical tests, which comprise the SOCIABLE battery for cognitive, functional and affective assessment of the elderly. Overall, the SOCIABLE pilot process is illustrated in

Figure 1 and involves the following steps:

- A cognitive, affective and functional assessment of the elderly, which is based on the SOCIABLE neuropsychological battery. The battery is administered to the elderly users prior to his/her inclusion in a SOCIABLE programme. The assessment of the elderly serves as a vehicle for classifying the elderly in one of the three SOCIABLE target groups, (normal/healthy elderly, elderly with MCI (Mild Cognitive Impairment), elderly with mild AD (Alzheimer's Disease) and deciding his/her inclusion in the programme. Furthermore, the neuropsychological tests result in an assessment of the cognitive skills of the elderly, which are used to shape the SOCIABLE games and exercises that are administered to the elderly user.
- Following the cognitive, functional and affective assessment of the elderly, and assuming the successful inclusion of the elderly in the SOCIABLE programme, the health professional carries out a number of preparatory activities towards the SOCIABLE sessions. These activities include briefing/training the elderly in the use of the SOCIABLE surface platform, while also preparing his/her sessions on the basis of the health record of the user.
- Execution of a SOCIABLE programme comprising several sessions. Each of the sessions involves cognitive training games and the Book-of-Life application for social activation. Furthermore, the elderly is given the opportunity to interact with other elderly via a set of communication applications and services. Overall, the typical duration of a programme is three months. In the scope of this programme the elderly attend to two or three sessions per week. The typical duration of a session is 60 min.
- A leaker test follows the completion of a SOCIABLE programme, in order to get elderly users' feedback on the procedure. This leaker test is an element of the users' evaluation of the SOCIABLE approach.
- A cognitive, functional and affective assessment of the elderly follows the leaker tests in order to access the positive effects of the programme on the elderly users.

- A follow-up assessment of the elderly, outside the scope of the programme, is carried out (approximately three months after the end of the programme) in order to evaluate/assess the longer term impact of the SOCIABLE intervention.

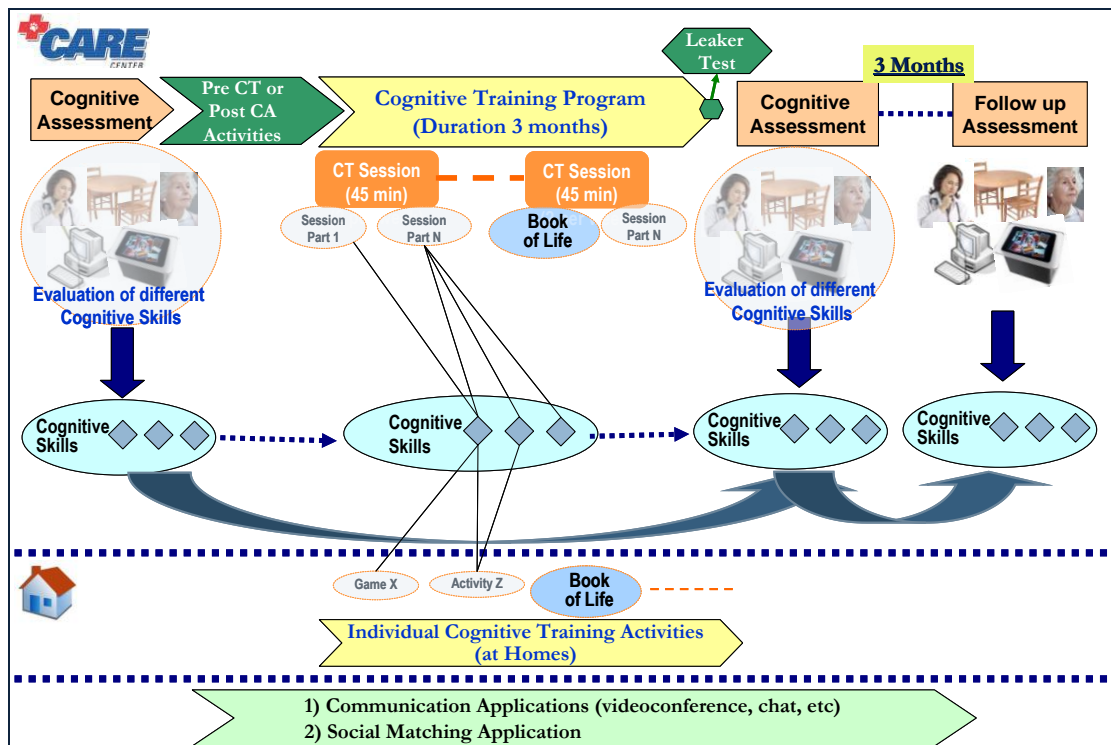


Figure 1: Overview of the SOCIABLE Pilot Process Concept

The project started May, 1st, 2009 with a duration of 42 months¹ (including a three months suspension period). The first period of the project emphasized the definition of the SOCIABLE services, the technical specification of the SOCIABLE platform and play activities, as well as the analysis of the main requirements of the elderly and the medical experts. Moreover, during the first period of the project, the partners have started the preparation of the pilot sites of the project, in terms of the establishment of the new processes, the installation and deployment of the relevant ICT infrastructures (including the surface hardware and the SOCIABLE software), as well as on the attraction and active engagement of elderly end users and medical experts.

During the second period of the project, the work has focused on the technical implementation, integration and testing of the SOCIABLE platform, the completion of the pilot sites preparation and most importantly the commencement of pilot operations. Hence, the second period of the project has signaled the successful conduction of pilot operations across all the pilot sites. Pilot operations have been intensified and evaluated during the third year of the project, which is described as part of this report.

¹ Based on the latest amendment of the SOCIABLE contract that incurred the time extension of the project till October 31st, 2012

The project has undertaken significant steps towards the sustainability of the project's platform, as well as its commercial exploitation. All partners have elaborated sustainability plans, business plans and marketing plans. Furthermore, they have endorsed an exploitation agreement, which regulates intellectual property shares and identifies rights and obligations associated with the commercial exploitation of the SOCIABLE platform and services.

The present report focuses on the description of the project's work and achievements during the third period 01/08/2012-31/10/2012 (M28-M42) of the project, where M1 signifies the project start). This is the last period of the project, during which SOCIABLE concluded its pilot operations, evaluated the pilot operations from a technical, financial, clinical and end-users perspective, finalized the SOCIABLE platform and undertook significant steps towards the sustainability, exploitation and commercialization of the project's results.

1.2 SOCIABLE in Numbers

The following table lists the main KPIs associated with the SOCIABLE project, including both the target values (set in the project's DoW document) and the values actually achieved.

Key Performance Indicator	Target Value	Achieved Value	Comments
Number of Elderly engaged in SOCIABLE programmes during the pilots	>350	>500	The project included over 350 elderly in the SOCIABLE clinical study. The total number of users (including butterfly users) exceeded 500
Number of cognitive games integrated in the SOCIABLE platform	25	27	The 27 cognitive games are listed in Deliverable D4.5
Improvement of the elderly cognitive, functional and affective assessment scores (comparing to the user of conventional paper & pencil methods)	Improvement of SOCIABLE elderly vs. a Control Group	Groups attending SOCIABLE cognitive training improved their cognitive status comparing to a control group	This outcome was derived based on the SOCIABLE clinical methodology (see deliverables D7.2a and D7.2b for more details)
Number of different elderly groups (formally defined) to participate in the	3	3	Over 100 elderly from all three groups (cognitive intact elderly, elderly with

pilots			MCI, elderly with mild Ads)
Pilot Sites Completing SOCIABLE programmes according to all common specifications	7	7	All pilot sites concluded pilot operations according to the provisions described in the clinical protocol of the SOCIABLE operations.
Positive ROI/IRR Financial Indicators for Private Organizations (taking also into account EC co-funding)	Acceptable ROI/IRR (relative to organization threshold)	Achieved for both end-users and integrators of the SOCIABLE services	An ROI analysis for service integrators can be found in deliverable D8.2 (for partners CEDAF and SiLO) Several end-users (including potential customers) have accepted the value of the SOCIABLE platform; Sales will commence shortly after the end of the project

Table 1: SOCIABLE KPIs (Key Performance Indicators)

As evident from the table, SOCIABLE has managed to research and in several cases to exceed the KPI values set to audit the project’s performance. In addition to these KPIs the project has set indicators associated with the dissemination activities. An exhaustive list of SOCIABLE dissemination activities is provided at the end of this document. The list demonstrates that most of the quantitative targets were in most cases achieved.

1.3 Main Lessons Learnt

The main lessons learnt from building and deploying the SOCIABLE platform, as well as from the pilot operations of cognitive training activities based on surface computers are:

1) Regarding the use of surface computers for cognitive training:

- Surface computers, notably multi-touch surfaces can create novel ergonomic and motivating environments for executing cognitive training activities that will be appealing to the elderly.
- Computer-based cognitive training can facilitate health professionals towards better managing cognitive training sessions and patients' assessments. The vast majority of health professionals that were actively involved in the project assessed positively the SOCIABLE services.
- Cognitive training based on surface computing infrastructures is clearly beneficial to demented elderly. This is proven through the elderly testimonials, but also

based on the assessment scores collected in the scope of the SOCIABLE clinical trials.

2) Regarding the developed applications and offered services:

- Elderly users are very keen on building their autobiography using the «Book-of-Life» applications. Results have shown that this activity improves their social activation.
- Different levels of difficulty for the cognitive training games can serve the needs of different target elderly groups (i.e. suffering from different forms of mild dementia).

3) Regarding service deployment & operation issues:

- The delivery of SOCIABLE services within both surface table and surface PCs provides good control over the total-cost-of-ownership of a SOCIABLE solution, thereby ensuring the potential ROI (Return-on-Investment). Surface tables are a viable option for care/day centers and hospitals, while SurfacePC/TabletPCs facilitate in-home deployments.
- The SOCIABLE services are appealing to care services organizations. The project has early on received numerous expressions of interest from care services organizations.
- A significant number of games (at least 25) are needed during a three-month session, otherwise sessions tend to become boring for the elderly participants.

Following paragraphs provide more details regarding key aspects of the SOCIABLE project.

2. The SOCIABLE Platform

2.1 Overview Description

The SOCIABLE ICT based model to the cognitive training and social activation of the elderly is empowered by the SOCIABLE ICT platform, which comprises the SOCIABLE software. The latter runs over commercial hardware, notably surface tables and surface/tablet PCs. In the sequel we provide more information about the SOCIABLE platform and its capabilities.

The (final) version of the SOCIABLE platform that was produced in the project (and currently deployed across all SOCIABLE pilot sites) consists of:

- A baseline software/middleware infrastructure (running over the surface table and surface PC), which enables session management and personalization for end-users (including login processes), deployment of games as bundles/modules, as well as mixed reality support for the SOCIABLE games.
- A framework for secure confidential and authorized access to the personal data, which are stored in the platform. The development of this framework was mandated by the ethical management requirements of the project.
- A device synchronization framework enabling the seamless synchronization between the SOCIABLE terminal devices and client applications with the main server (and related databases) of the care center.
- The back-office application, enabling medical experts to manage patient data and configure the SOCIABLE training sessions.
- An implementation of the Book-of-Life (BoL) application, which is the primary play application for the social activation of the elderly as part of the SOCIABLE programmes.
- A set of cognitive training games, which are administered to the elderly in the scope of SOCIABLE compliant cognitive training sessions. The final version of the platform includes twenty-seven games in total.

2.2 SOCIABLE Baseline Middleware Infrastructure

2.2.1 Shell Implementation

The SOCIABLE platform implements customized surface shells for the SOCIABLE end-users. These shells allow end-users to use the SOCIABLE platform in a transparent way, as soon as they login to the platform using their accounts. The login process is supported based on two modalities namely: (a) login based on username and password and (b) login based on tagged objects (i.e. cards) which have pattern of dots visible in infrared affixed to it. Based on the user's login, the shell implementation identifies the user's role and presents the appropriate screens and applications.

2.2.2 Packaging and Deployment Paradigm

The platform provides an implementation of the SOCIABLE packaging and deployment paradigm, which allows game bundles to be deployed on the platform. The implementation provides support for game deployment descriptors i.e. specialized configuration files that point to the required resources (accompanying the game) and enables the game deployment and localization. This implementation endows SOCIABLE with the modularity characteristics.

2.2.3 Mixed Reality Support

As part of the SOCIABLE platform, support for mixed reality interactions was implemented. Such interactions enable end-users to blend physical world items (e.g., cards, pens, devices) with the virtual/digital world of the SOCIABLE platform. The SOCIABLE platform provides support for the use of tagged items (interchangeably with the virtual/digital items). This support has been exploited in several cognitive games. Support for mixed reality and tagged objects is also provided as a horizontal library that is part of the SOCIABLE platform infrastructure, which enables its use across multiple games.

2.3 SOCIABLE Synchronization Framework

2.3.1 Synchronizing SOCIABLE Client Devices with the Care Center Database

The SOCIABLE platform implements a mechanism for synchronizing client devices (i.e. tabletPCs and surface PCs) possessed by SOCIABLE elderly users with the Care Center database. The rationale behind this synchronization is to render the process of initializing and updating the client devices as seamless and transparent (to end users) as possible.

3.3. SOCIABLE Secure Data Access and Confidentiality Framework

In order to support the ethical management requirements of the project, SOCIABLE has implemented functionalities for secure access and confidentiality management of patients/elderly data stored/managed within the SOCIABLE platform. In particular, the interim version of the platform incorporates the SOCIABLE Secure Data Access and Confidentiality Framework, which ensures that no personal data are stored in the SOCIABLE databases, including local databases and the database of the care center. Within these databases, users are identified and managed (e.g., in terms of their sessions, shells etc.) on the basis of an identifier. The various identifiers are mapped to patient names using a paper record (e.g., in the form of (<Patient Name>, <Identifier>)), which is securely stored (i.e. locked) in a place where only the leading medical expert of the pilot site has access. In order to facilitate the operation of this anonymization mechanism, end-users make use of their (personal) login card (i.e. tag). The "id" of the patient is mapped to the dots of the login card, thereby safeguarding its login in the platform (i.e. no user without login card could login). The organization and conduction of the SOCIABLE pilot operations has made use of

this framework in order to ensure compliance with ethical management requirements.

3.4 Cognitive Training Games

The final version of the SOCIABLE platform comprises the following list of cognitive games:

Identifier	Cognitive Training Game Title
1.	Hide and Find
2.	Puzzle
3.	Analogies
4.	Lost in the city
5.	My Home
6.	Synonyms
7.	Antonyms
8.	Guess Who
9.	Find the Pairs
10.	Take Away Menu
11.	PictureSort
12.	Do you remember your Order
13.	Travelling in Europe
14.	Remember the design
15.	Similarities
16.	Who belongs Where
17.	Incomplete Grids
18.	Copy of Figure
19.	Be a Piano Player
20.	Train Guidance
21.	Domino
22.	Remember the melody
23.	Symbol Addition
24.	Differences
25.	Hit The Target - MR ²
26.	Who belongs where? - MR ³
27.	Remember the Design

Table 2: List Cognitive Training Games Integrated in the Final Version of the SOCIABLE Platform

Each game features its own scenario, graphics, workflow and functionality. A detailed description of the various games is provided in the scope of WP3 and WP4 deliverables of the project.

² Mixed Reality Game – Available on Surface Tables only

³ Mixed Reality Game – Available on Surface Tables only

3.5 Book-of-Life

The "Book of Life" application is a personal diary, containing life experiences, emotions and thoughts. This diary is created by the elderly through the SOCIABLE ICT platforms. Through the book of life, users are able to share information about their life (e.g., photos, sounds) with other users. The book serves as both a collective memory and an individual memory.

The main objectives of this application are:

- To enhance self-concept and self-esteem, improve mood states, and prevent social isolation.
- To find other users with the same kind of hobbies, interests, etc.
- To help the elderly to improve his/her communication capabilities and/or increase the number of his/her social contacts.
- It can be used as a trigger to encourage reminiscence of past events, which elderly feel very comfort to discuss about, since these are the ones they more efficiently remember. These memories can be used by the medical expert to connect past and present.
- It can be used to encourage verbal expression and discussion.

Each book has 4 different chapters, corresponding to different life stages (infancy, adolescence, adult, maturity). In each chapter the application presents a set of questions that the user could answer for working reminiscence. Moreover, the application makes possible the customization of the content of the different chapters in the following way:

- Photos: the user can select the photos more meaningful to him/her and, furthermore, introduce his/her personal photos.
- Sounds: as in the photos case, the user can choose the sounds more meaningful to him/her and, besides, it is possible to include personal ones.

The list of chapters and subchapters is presented afterwards:

- CHILDHOOD
 - Family
 - Place of Birth
 - School
 - Hobbies
 - Friends
 - Holidays
 - Other personally meaningful events
 - Major events at that time

- ADOLESCENCE
 - Family
 - Institute/College
 - Hobbies
 - Friends

SOCIABLE: Motivating platform for elderly networking, mental reinforcement and social interaction

WP9- Project Management

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- First love
- First job
- First time living alone
- Military service
- Holidays
- Other personally meaningful events
- Major events at that time

- ADULT

- Family
- Marriage
- Children
- First Home
- Coping with hard times
- Achievements
- Hobbies
- Friends
- Work
- Holidays
- Other personally meaningful events
- Major events at that time

- MATURITY

- Family
- Grandchildren
- Marriage
- Children
- Retirement
- Achievements
- Hobbies
- Friends
- Coping with hard times
- Travels/Holidays
- Other personally meaningful events
- Most important lessons learned from life

3.6 Back-Office Application

The back-office application supplies all features needed to manage the SOCIABLE services, both from the standpoint of the system administrator and the medical expert, including features to manage users and patients' data, games, training programs and "Book of Life".

Through the back-office application the medical expert will access to:

- Patient management
- Training program management (including customization of game difficulty level)

- Patient Social activation management

The administrator will access to:

- Game management
- Back-office users and permissions management
- Generic Management (Care centers, cities, region, country, etc.)

The back-office application consists of two parts:

- A web application, the "Back-office Console", used by medical expert and administrator to manage all parts of the system described above.
- A core of services (implemented in a web-service) used by all applications: Games, Book of Life and Back-office console.

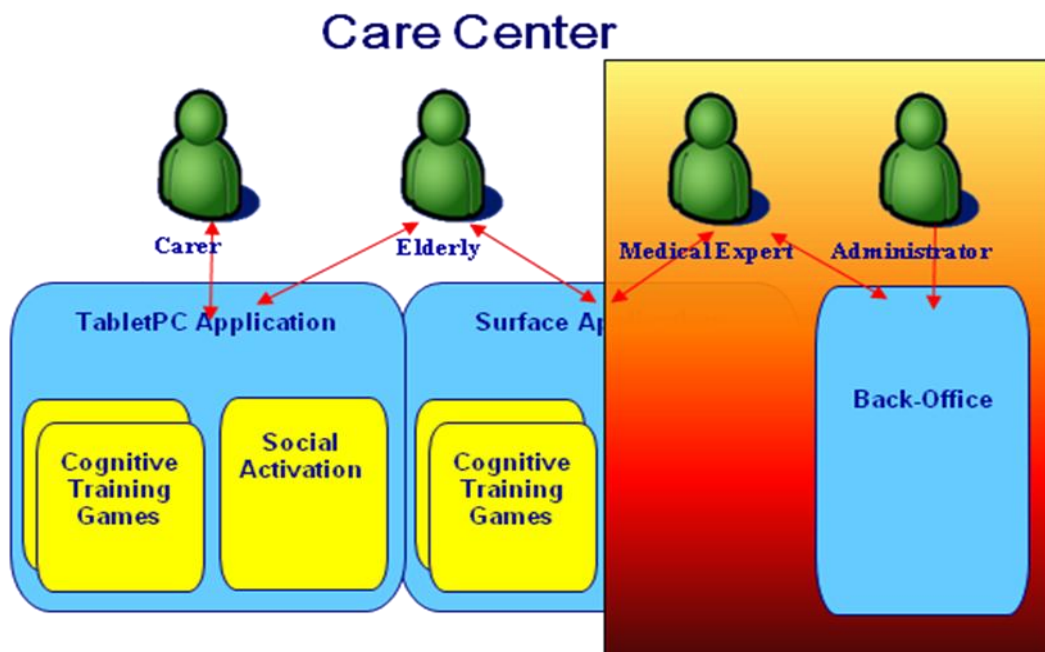


Figure 2: Positioning of the Back-office application in the SOCIABLE platform applications architecture

The back-office includes the following parts:

- Game management:
 - ✓ Resources customization (images, texts, sounds)
 - ✓ Setting of difficult levels
- Training program management:
 - ✓ Creation of the program
 - ✓ Creation of activities of the program and association with games.
- General management (user, permission, etc.)
- Localization in English, Greek, Italian, Norwegian and Spanish.

The main activity of the back-office application is the creation of the training program and its training session. Each training program includes sessions which could be performed in the care center or at home. Each session consists of activities that include the execution of a game or a social activation activity. To define an

activity, the medical expert selects a game for the elderly defining a specific difficulty level, depending on the cognitive skills of the elder.

After the execution of the activity by the elder, the medical expert can examine the result of the performance.

The configuration of social activation services consists of two features:

- uploading multimedia contents on the system (images, sounds and texts), contents that will be available to patients and medical experts for the use in the book of life;
- specifying characteristics of a patient (hobbies, friends, relatives).

The console of the back-office also provides the tools for monitoring the elderly performance and trends of cognitive skill levels.

In particular, the application provides a few Reports to support the management of activities and Graphs of the results of the games execution.

Each report and graph can be printed and exported in excel and pdf format.

The main Reports available are related to:

- List of the scheduled sessions for one or all patients ("Scheduled Sessions")
- List of training results for a patient ("Training Results")
- Printing of cards for the login in the Surface ("User Cards")

The Graphs provide:

- the score of games execution for each patient ("Patient Game Performance")
- the cognitive skill level of a patient during the training ("Patient's Cognitive Skill ?")
- performance in games targeting Memory for each users group
- performance in Assessment for each users group
- performance in TMT (Trail Making Test) for each users group.

3. The SOCIABLE Pilot Operations

3.1 Description of the SOCIABLE Pilot Operations

The SOCIABLE pilot operations were originally planned on the basis of the design of the SOCIABLE study. The SOCIABLE study design specified the protocol of the SOCIABLE clinical trial, on the basis of specific inclusion/exclusion criteria, number of elderly/patients to be involved, as well as specific techniques for the statistical analysis of the results. A detailed presentation of the SOCIABLE study design has been performed in the scope of earlier deliverables D5.1 and D6.1 and is therefore out of the scope of the present deliverable. The following table (Table 3) presents the planned distribution of elderly/patients across the various pilot sites, as included/specified in the original study design. Note that 348 patients/elderly was the target number of patients as part of the original planning of the study. The figures also depicted the distribution of the users across the three groups of elderly/patients, namely cognitive intact elderly aged 65+ (Group A), elderly with mid cognitive impairment (Group B) and elderly with mild Alzheimer’s disease (Group C). The detailed definition of these three groups is provided in deliverable D2.1, along with relevant inclusion/exclusion criteria.

		CARE CENTER			HOME				TOTAL
		A: NH	B: MCI	C: AD		A: NH	B: MCI	C: AD	
Country	Pilot Site				Total per site			Total per site	TOTAL
Greece	HYGEIA S.A	6	20	18	44	4	6	6	60
Greece	SPC - Khfissia	56			56	4		4	60
Italy	Commune Forli	10	20		30	4	10	14	44
Italy	Morgagni Pierantoni		40		40		10	10	50
Italy	FSL			40	40			6	46
Norway	Trodheim			44	44			4	48
Spain	PREVI S.L	20			20	20		20	40
	TOTAL	92	80	102	274	32	26	16	348

Table 3: Distribution of elderly/patients across the SOCIABLE pilot sites according to the initial study design

The SOCIABLE pilot operations protocol specified also the detailed process of involving a patient/elderly in SOCIABLE sessions, including relevant inclusion and exclusion criteria. The latter criteria were specified on the basis of the SOCIABLE neuropsychological battery for cognitive, functional and affective assessment, which is presented in detail as part of deliverable D2.1.

2.1 Pilot Operations Scheduling

The SOCIABLE clinical trial/study protocol specified the number of patients per SOCIABLE site, as outlined above. Accordingly, each pilot sites planned for the inclusion of those patients as detailed in SOCIABLE D6.1. The planning was performed in the scope of four cycles of SOCIABLE sessions, which mapped to quarterly periods (i.e. three-month period). The objective was to include an almost equal number of patients/elderly per pilot site per quarterly period. In practice

several sites experience deviations from this objective i.e. they end-up involving many more patients in one quarter comparing to other quarters. The main reason for this deviation was the fact that some sites experienced difficulties in involving the planned number of users. Furthermore, seasonal issues (e.g., inability to carry out pilot operations in August), weather issues and technical issues (e.g., problems with the operation of the surface table) contributed also to several deviations. Moreover, the organization task has been very challenging given the need to involve a control group (i.e. for comparison with the participants to the pilot sessions), which was assessed in analogous intervals yet they did not participate in the SOCIABLE study.

In general the (almost) quarterly planning of the SOCIABLE pilot operations proven to be a very good practice, since it provided/imposed specific control milestones where the pilot operations (at each one of the sites) were reassessed and adapted to emerging conditions. Indeed, most of the pilot sites exploited the quarterly assessment as a means to adapt their planning with a view to meeting the target number of users. In cases where such adaptations were not possible, the consortium had to escalate the issue at the project management level, which dealt with the issue on the basis of revisions to the study design, as well as on the basis of reallocating users from one partner to another. Note that these practices were part of the project’s risk management and contingency planning strategies.

2.2 Main Issues and Deviations

Given the quarterly (re)planning and adaptation of the pilot operations scheduling, in the sequel we present/report the evolution of the pilot operations at the various sites for the various (almost quarterly) cycles (Q1, Q2, Q3, Q4).

Following tables illustrate the number of elderly users that have (successfully) participated in the SOCIABLE pilot operations during the first three quarters of formal pilot operations (Q1, Q2, Q3). Specifically:

- Table 4 illustrates the number of elderly users involved in pilot operations during the first quarter of the SOCIABLE pilots (Q1).
- Table 5 illustrates the number of elderly users involved in pilot operations during the second quarter of the SOCIABLE pilots (Q2).
- Table 6 illustrates the number of elderly users involved in pilot operations during the third quarter of the SOCIABLE pilots (Q3).

	Group A	Group B	Group C	Care Center	In-Home	Individual	In-Groups	Drop-Outs	Total
TRONDHEIM	0	0	0	0	0	0	0	0	0
HYGEIA	0	1	2	3	0	3	0	0	3
COFO	7	2	0	9	0	3	6	2	9
AUSL	0	12	0	12	0	3	9	1	12
FSL	0	0	12	12	0	3	9	0	12
PREVI	10	0	0	5	5	7	3	1	10
SPC	15	0	0	15	0	6	9	0	15
TOTAL	32	15	14	56	5	25	36	4	61

Table 4: Number of Elderly Users that were involved in pilot operations during the first quarter (Q1) of formal pilot operations (during the calendar period May11-July11)

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	Group A	Group B	Group C	Care Center	In-Home	Individual	In-Groups	Drop-Outs	Total
TRONDHEIM	0	0	3	3	0	0	3	0	3
HYGEIA	2	6	4	9	3	9	3	8	12
COFO	11	1	0	12	0	2	10	1	12
AUSL	0	15	0	14	1	6	8	0	15
FSL	0	0	12	8	3	5	6	1	11
PREVI	10	0	0	5	5	7	3	1	10
SPC	15	0	0	15	0	9	6	0	15
TOTAL	38	22	19	66	12	38	39	11	78

Table 5: Number of Elderly Users that were involved in pilot operations during the second cycle/quarter (Q2) of formal pilot operations (during the calendar period Sep11-Dec11)

	Group A	Group B	Group C	Care Center	In-Home	Individual	In-Groups	Drop-Outs	Total
TRONDHEI	0	1	4	5	0	5	0	1	5
HYGEIA	3	11	7	19	3	17	5	4	22
COFO	8	6	0	5	9	9	5	1	14
AUSL	0	12	3	12	3	4	8	0	15
FSL	0	0	10	7	3	4	6	0	10
PREVI	10	0	0	5	5	7	3	3	10
SPC	15	0	0	14	1	6	9	0	15
TOTAL	36	30	24	67	24	52	36	9	91

Table 6: Number of Elderly Users that were involved in pilot operations during the third cycle/quarter (Q3) of formal pilot operations (during the calendar period Dec11-Mar12)

	Group A	Group B	Group C	Care Center	In-Home	Individual	In-Groups	Drop-Outs	Total
TRONDHEIM	0	1	7	8	0	5	3	1	8
HYGEIA	5	18	13	31	6	29	8	12	37
COFO	26	9	0	26	9	14	21	4	35
AUSL	0	39	3	38	4	13	25	1	42
FSL	0	0	34	27	6	12	21	1	33
PREVI	30	0	0	15	15	21	9	5	30
SPC	45	0	0	44	1	21	24	0	45
TOTAL	106	67	57	189	41	115	111	24	230

Table 7: Total Number of Elderly Users that were successfully involved in pilot operations cycle/since the beginning of formal pilot operations (calendar period May11-Feb12)

In terms of the planning and the evolution of the pilot operations during the first three quarters, the following remarks are important:

- Pilot sites COFO, PREVI, SPC, AUSL and FSL have abided by their pilot operations plans, in terms of the number of users involved.
- COFO has had some issues with the inclusion of users from Group B (MCI), but in agreement with the partners' in-charge of the study design, it has compensated for this based on the inclusion of Group A elderly instead.
- HYGEIA did start with a lag, but managed to fully execute its plan for the second quarter (Q2). In Q3 it has intensified efforts towards achieving its planned (total) numbers. The assessment of HYGEIA's situation during the reporting period, showed that the sites is on track for recruiting the required/planned number of patients. Note however that HYGEIA has the most significant number of drop-out patients, comparing to the rest sites where very few drop-outs took place.
- TRONDHEIM was clearly lagging behind of the targeted numbers. Therefore, TRONHDEIM created an action plan for remedying the significant lags. The plan included activities towards recruiting users from neighboring centers. However, the assessment of the situation at the pilot site during the end of the reporting period (i.e. end of Jan12) reveals that the site has problems including the specified number of Group C users for the following main reasons:

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- The fact that Group C is the most difficult group to recruit, among the three SOCIABLE groups. This was observed at all pilot sites. However, in the case of municipalities (such as TRONDHEIM) the problem is more evident, since they do not deal with Alzheimer patients (as a primary activity).
- The initial delay created an important gap, which could not be easily remedied in the remaining period, despite the efforts of TRONDHEIM and the improvement in the rate of recruitment.

These remarks are also illustrated in Figure 3, which depicts the status of the pilot operations at the end of the third cycle and how this compares to the original planning of the pilot operations. Note the total numbers of users involved (including drop-outs) was overall very close to the planned numbers.

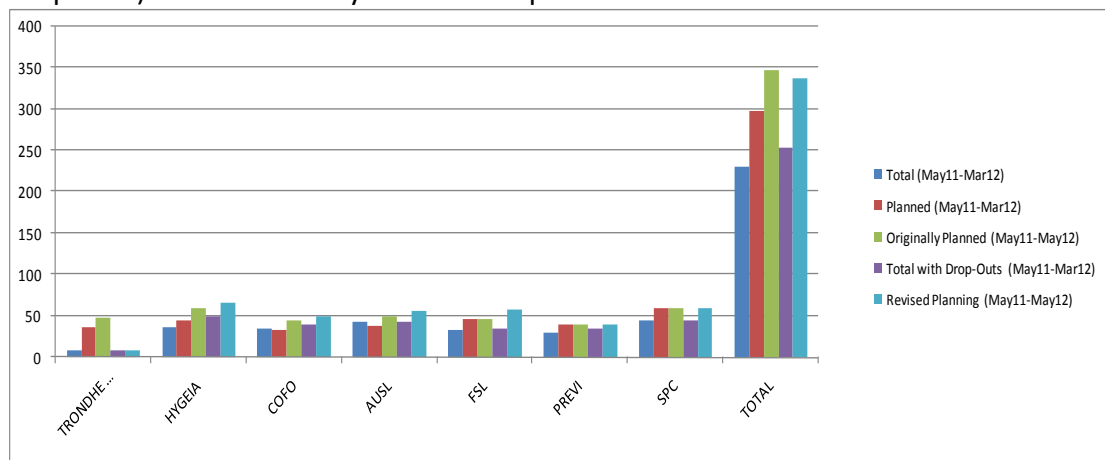


Figure 3: Comparison between the planned number of elderly users to be involved in the pilot operation and those actually involved

On the basis of the above remarks and the relevant assessment of the situation by the SOCIABLE partners, the consortium has activated a set of remedial actions which are outlined in the following paragraph.

The assessment of the situation regarding the progress of the study had led the consortium to consider the activation of remedial actions according to project’s risk management planning (which is illustrated at later sections of the report). In particular, the consortium decided to increase the number of patients (GroupB, GroupC) to be involved in the study at the hospitals of the consortium (FSL, HYGIEIA, AUSL) in order to compensate for the fact that TRONDHEIM could not recruit Group C users. Furthermore, it was agreed that COFO will also carry out an increased number of sessions (more Group B patients) in collaboration with AUSL, which will help in the recruitment. The relevant changes will be carried out in a way that ensures the validity of the study design. The following tables depict the changes in particular:

- Table 8 lists the number of patients included in the study as part of the original design of the SOCIABLE study, where TRONDHEIM was expected to recruit/involve in the study 48 Group C users.

- Table 9 lists the number of patients included in the study as part of the revised design of the SOCIABLE study, where HYGEIA and AUSL have undertaken to include six Group C users each, while a greater number of Group B users are assigned to COFO and FSL. Note that the study has been revised from the statistical of SOCIABLE in order to be able to render/result in meaningful analysis. As part of the revision, the total number of Group C users has been reduced, while the total number of Group B patients has been increased. Furthermore, the total number of the patients to be included in the study has been slightly reduced.

	Group A	Group B	Group C	Care Cente	In-Home	Total
TRONDHEIM	0	0	48	44	4	48
HYGEIA	10	26	24	44	16	60
COFO	14	30	0	30	14	44
AUSL	0	50	0	40	10	50
FSL	0	0	46	40	6	46
PREVI	40	0	0	20	20	40
SPC	60	0	0	56	4	60
TOTAL	124	106	118	274	74	348

Table 8: Total Number of Users to be involved in pilot operations according to the original SOCIABLE Study Design (INITIAL PLANNING)

	Group A	Group B	Group C	Care Center	In-Home	Total
TRONDHEIM	0	0	8	8	0	8
HYGEIA	10	26	30	50	16	66
COFO	29	21	0	36	14	50
AUSL	0	50	6	46	10	56
FSL	0	12	46	52	6	58
PREVI	40	0	0	20	20	40
SPC	60	0	0	56	4	60
TOTAL	139	109	90	268	70	338

Table 9: Total Number of Users to be involved in pilot operations according to the revised SOCIABLE Study Design (REVISED PLANNING)

Moreover, the following table shows the differences between the original and revised planning for each one of the sites involved:

PLANNED (MAY 11)	Group A	Group B	Group C	Total
TRONDHEIM	0	0	48	48
HYGEIA	10	26	24	60
COFO	14	30	0	44
AUSL	0	50	0	50
FSL	0	0	46	46
PREVI	40	0	0	40
SPC	60	0	0	60
TOTAL	124	106	118	348

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PLANNED (FEB 12)	Group A	Group B	Group C	Total	Difference
TRONDHEIM	0	0	8	8	-40
HYGEIA	10	26	30	66	6
COFO	29	21	0	50	6
AUSL	0	50	6	56	6
FSL	0	12	46	58	12
PREVI	40	0	0	40	0
SPC	60	0	0	60	0
TOTAL	139	109	90	338	-10

Table 10: Comparison of the patient involvement per site between the revised and the original study design (HYGEIA, COFO and AUSL will involve 6 more patients, FSL 12 more patients, while TRONDHEIM will involve 40 less group C patients)

Note that the above tables refer to the elderly/patients that were decided to be involved in SOCIABLE as part of the revised study design and the need to analyze the results on the basis of a clinically sound methodology. The revision of the methodology has also taken into account the results of the interim analysis of the assessment scores, which manifested that the SOCIABLE treatment had less significant effects on Group B (MCI) users. Based on this fact, the revised version of the study includes more Group B users than planned. The purpose is to have a higher probability in obtaining significant results on the effect of the SOCIABLE study on Group B, given that such significant results have up to date been obtained for Group A and Group C.

In addition to these patients the pilot sites decided to include butterfly users, while TRONDHEIM carried out additional sessions (according to the SOCIABLE procedures) with group A patients. Overall, the total number of elderly involved in SOCIABLE far exceeded the number of 350 users that is quoted in the project's Annex1 to the contract (Description of Work document). **As a last note, and following reviewers' suggestion, the consortium (through partner FSL) included 10 more Group C (elderly/patient) users, in order to ensure the involvement of 100 Group C patients in the SOCIABLE study.**

Based on the decisions outlined in the previous paragraph, as well as the relevant revisions to the study design, the following tables illustrate the numbers of elderly involved in the fourth/last cycle of pilot operations (April12-July12) (Table 11), as well as the total number of elderly involved throughout the duration of the pilot study (Table 12). Furthermore, Figure 4 compares the different figures per pilot site i.e. planned figures (according to both the original and the revised planning) to actual/achieved figures (including elderly that completed the study and drop-outs).

	Group A	Group B	Group C	Care Center	In-Home	Individual	In-Groups	Drop-Outs	Total
TRONDHEIM	10	2	2	14	0	14	0	2	14
HYGEIA	0	11	4	14	1	10	5	3	15
COFO	3	12	0	4	11	7	8	3	15
AUSL	0	12	3	12	3	4	8	1	15
FSL	0	12	21	33	0	6	27	1	33
PREVI	10	0	0	5	5	7	3	0	10
SPC	15	0	0	14	1	9	6	0	15
TOTAL	38	49	30	96	21	57	57	10	117

Table 11: Number of Elderly Users that were involved in pilot operations during the fourth cycle/quarter (Q4) of formal pilot operations (during the calendar period Apr12-July12)

	Group A	Group B	Group C	Care Center	In-Home	Individual	In-Groups	Drop-Outs	Total
TRONDHEIM	10	3	9	22	0	19	3	3	22
HYGEIA	5	29	17	45	7	39	13	15	52
COFO	29	21	0	30	20	21	29	7	50
AUSL	0	51	6	50	7	17	33	2	57
FSL	0	12	55	60	6	18	48	2	66
PREVI	40	0	0	15	20	28	12	5	40
SPC	60	0	0	58	2	30	30	0	60
TOTAL	144	116	87	280	62	172	168	34	347

Table 12: Number of Elderly Users that were involved in pilot operations during all cycles of formal pilot operations (during the calendar period May11-July12)

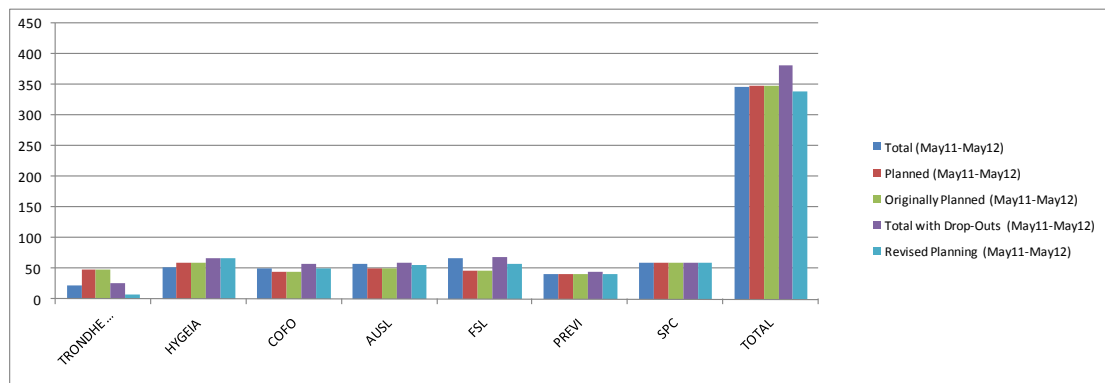


Figure 4: Total Number of Elderly/Patients involved in the SOCIABLE Pilot Operations (all four cycles)

Note that the above figures concern the number of patients involved according to the (revised) SOCIABLE protocol. The total number of involved users (including the drop-out) is the target number set by the revised protocol. As already outlined, the consortium partners involved numerous additional users that participated as butterfly users (i.e. without following the processes of the SOCIABLE protocol). Only TRONDHEIM included 22 butterfly users, in addition to several Group A users that were not taken into account in the scope of the statistical analysis. Note that the tables above include the 10 additional Group C users that were involved through FSL in order to ensure the involvement of a minimum of 100 Group C users in the scope of the SOCIABLE pilot operations.

3.2 Lessons Learnt from the Pilot Operations Process

The SOCIABLE pilot operations have been the core activity of the project, which was associated with several medical/clinical, ICT and management aspects. Clinical aspects are related to the SOCIABLE clinical study, which was the main part of the pilot operations. ICT aspects are related to the deployment and use of the SOCIABLE surface computing platforms across the various pilot sites of the project. Finally, management aspects are related to the need for planning and monitoring the evolution of the pilot operations, while at the same time managing quality and key risks. As a result, the conduct of the SOCIABLE pilot operations has been a quite complicated task with a host of medical, technical and management implications.

In order to deal with this complexity, the SOCIABLE partners (notably the pilot sites) have prepared in advance for the pilots (as part of WP5 of the project), while they have also created elaborate plans of the pilots (including plans for the participation of specific numbers of elderly and health professionals). Despite this early and elaborate planning, the project had to deal with significant deviations from the original plans. This deviation were caused by a variety of factors/incidents, including technical failures, problems with recruitment processes, whether conditions, drop outs, as well as revisions to the protocol of the SOCIABLE clinical study. Some deviations were minor and could be remedied on the basis of slight rescheduling/reprogramming of some sessions. However, there were also more serious deviations which demanded revisions to the SOCIABLE study. These more serious deviations were directly associated with the recruitment issues, and more specifically with the fact that municipalities (i.e. municipal care centers) experienced problems in recruiting patients with mild cognitive impairment and mild Alzheimer's disease (i.e. Group B and Group C). This problem was not observed in hospitals (such as FSL, AUSL and HYGEIA), which have in general access to many more demented elderly comparing to municipal care centers and/or day centers.

Despite recruitment and other issues, SOCIABLE managed to gracefully complete the pilot operations, with the involvement of the planned number of elderly/patients. This success was largely due to the continuous monitoring and adaptive planning processes that were adopted and applied throughout the lifecycle of pilot operations. As part of these processes the status of the pilot operations was regularly assessed and related remedial plans were activated.

Note that the SOCIABLE study involved control groups as a means of assessing comparatively the effects of the SOCIABLE based cognitive training. The inclusion of control groups incurred additional effort for assessing patients within the control group, as well as for comparing their performances with elderly/patients participating in SOCIABLE cognitive training. This additional effort and complexity however should not be considered an integral element of the SOCIABLE ICT-based cognitive training model. We expect that the elimination of this effort will facilitate the wider deployment and adoption of the SOCIABLE cognitive training model during the commercialization and sustainability phase of the project.

The pilot operations were positively assessed by the various stakeholders, including the care services providers, the participating health professionals, as well as the elderly/patients. All pilot sites reported the reception of positive feedback from the participants, which pave the ground for the wide penetration and the successful adoption of the SOCIABLE model as part of the project's exploitation plan.

In addition to the overall assessment of the pilot operations outlined above, the various reports and experiences of the pilot sites have lead to the following lessons learnt:

- **1st Lesson Learnt – Back-up technical solution required:** Technical issues are inevitable where ICT programmes and devices are used. They can range from hardware failures to software problems, and they can have an adverse impact on

the graceful completion of the pilot operations. Therefore, care services providers need to have a back-up technical solution enabling the reliable completion of the sessions. The SOCIABLE experience has shown that Tablet/Surface PCs can provide an appealing and low-cost solution for the case of failures/problems associated with the surface table.

- **2nd Lesson Learnt – Drop outs:** There are several reasons that could lead a patient/elderly to abandon a SOCIABLE programme. These reasons could be other conventional causes associated with the schedule and/or the attitude of the elderly, yet they could also be associated with the SOCIABLE platform (e.g., the lack of acceptance of the electronic service). Care services providers and health professionals need therefore to establish policies and course of action for dealing with drop outs.
- **3rd Lesson Learnt – Patients Recruitment (Group B, Group C):** The inclusion of patients from SOCIABLE groups B and C (i.e. patients with mild cognitive impairment and mild Alzheimer’s disease) is not trivial. The percentages of such patients in conventional day/care center seem to be rather low. Therefore, inclusion criteria associated with these groups are very restrictive and could make the process of designing/executing relative studies rather difficult.
- **4th Lesson Learnt – Balancing Group and Individual Sessions:** Care services providers should balance the amount of individual sessions to the amount of group sessions on the basis of the medical (human) resources that they have available.
- **5th Lesson Learnt – Number and diversity of games:** A rich collection of games (featuring different topics and difficulty levels, while targeting different cognitive skills) is required for the offering of a SOCIABLE programme. Experience showed that when the elderly play only a small set (e.g., less than 12 games), they can easily get bored. The final number of SOCIABLE games (i.e. more than 25 games) is a good starting point to alleviate this problem.
- **6th Lesson Learnt – Planning Sessions in Advance:** Care services providers should plan SOCIABLE programmes and session in advance i.e. prior to the commencement of the first session of a SOCIABLE programme. This advance planning facilitates the organization of the programmes, while allowing for remedial actions in the case of problems/incidents.
- **7th Lesson Learnt – Full electronic management of cognitive training sessions:** Thanks to the back-office module, health professionals can use the SOCIABLE platform in order to realize the full electronic management of the cognitive training sessions. Such a management increases efficiency and productivity.

The above best practices should be taken into account by care services providers (e.g., hospitals, day centers, care centers) wishing to offer SOCIABLE compliant cognitive training services. Some of these are also useful towards producing later versions of the SOCIABLE platform, which will boost the commercialization/exploitation of the project’s results.

4. Clinical and Stakeholders Assessment of the SOCIABLE Platform

In following paragraphs we summarize the assessment of the SOCIABLE pilot operations from a clinical perspective, while at the same time reporting on the feedback received from the various stakeholders. More details on these assessments can be found in the respective SOCIABLE deliverables.

4.1 Summary of Clinical Assessment

Overall, in mild Alzheimer's disease and during its prodromal phases, i.e. the Mild Cognitive Impairment, the SOCIABLE intervention had a positive effect on global functioning, as expressed by the MMSE score. Additionally, we observed a positive effect on memory and executive functions, which were the two cognitive functions that were the ones most actively treated during the training. Patients showed an improvement in social as well as in functional abilities. The latter are an indirect evidence of efficacy of the training that corroborate its effects. Mood showed an opposite trend getting worse after training, probably due to the increase of self-consciousness related to the improvement of cognitive functioning.

All the cognitive functions of healthy elderly were improved after training, and in particular memory, language, praxis and executive functions. Moreover, they showed a follow-up effect during the rest period after training in memory and a positive trend in language. This was not the case of Alzheimer's Disease patients.

In conclusion, these results indicate that SOCIABLE is an effective intervention suitable for patients suffering from MCI and mild AD. Additionally, SOCIABLE has also been proven to be useful for cognitively intact elderly as a means of cognitive decline prevention. In this latter case, the treatment, could be administered not necessarily continuously, but also spaced out with periods of rest since we demonstrated that the effect of the training in healthy subjects remains three months after the end of the intervention.

4.2 Assessment from Stakeholders

The SOCIABLE evaluation processes have focused on the analysis of feedback derived from the SOCIABLE users and stakeholders, including elderly end-users, medical experts, health professionals and caregivers. Feedback from these stakeholders has been received on the basis of appropriate questionnaires, during the SOCIABLE pilot operations.

The analysis of results revealed a very positive evaluation of the SOCIABLE platform and services in terms of several aspects. Most elderly participants (to the SOCIABLE formal pilot operations) confirmed that the SOCIABLE platform is ease to learn and use, while also being pleasant and acceptable by end users. Furthermore, they perceived an improvement in their mood and cognitive state. At the same time, «butterfly users» (i.e. elderly that experienced SOCIABLE without participating in SOCIABLE programmes) confirmed a positive experience in terms of a quick learning

curve and an ease of use. The positive effects of the SOCIABLE services were also confirmed by care givers, who experienced a positive effect on the elderly/patients they take care of. Moreover, the vast majority of medical experts stated their positive opinion about SOCIABLE, both in terms of its added-value for their patients, but also as a tool facilitating the planning/organization of the cognitive training sessions that they supervise.

Overall, the qualitative questionnaires showed also that all subjects involved in SOCIABLE (users, caregivers and medical experts) had a positive impact from the use of the SOCIABLE platform. Results from the analysis on neuropsychological tests were confirmed by the positive subjective feeling of improvement of mental, social skills and mood. Moreover, SOCIABLE platform was felt to be easy to learn to use, although age and educational level influence this aspect. Finally, all subjects were willing to pay to use the platform at least per package (24 sessions).

The SOCIABLE platform has been assessed as easy to learn and use by elderly users (both participants to the SOCIABLE clinical study and butterfly users). SOCIABLE has overall achieved an improvement to the mood and cognitive status of the elderly, which has been certified by both the elderly and their caregivers. This improvement is also in-line with the results of the clinical evaluation. Moreover, the analysis of the PIADS tests/scale illustrated a positive impact of the SOCIABLE platform on the elderly feelings of ability, adaptability and self-esteem. SOCIABLE has also received a positive assessment from medical experts as well, since they perceived the SOCIABLE platform as a useful tool for configuring/planning and evaluating cognitive training sessions.

Apart from confirming the main findings of the interim evaluation, the final evaluation has also revealed some additional results, concerning the impact of the characteristics of the different users in the satisfaction and ease of use associated with the SOCIABLE platform and services. For example, it was found that the educational level of the users was a decisive factor associated with the ease of use and the learning curve associated with the SOCIABLE platform i.e. elderly with higher education could easier learn how to use the platform. Furthermore, it was also observed that MCI patients could easier use the platform comparing to AD patients, which health elderly appeared more willing to pay for its use.

Another interesting remark is that SOCIABLE has made all the subjects that used it to feel more comfortable with the use of the ICT, leading also to an increased use of computers comparing to the period before their SOCIABLE experience.

The country of the elderly did not seem to have a significant impact on the results. However, a great improvement to the mental abilities of Greek and Spanish patients was witnessed, probably due to the involvement of larger number of healthy elderly in those two countries. Likewise the overall impact of the platform was observed in MCI patients (comparing to the other two groups), probably due to the higher impact of the cognitive deficit in these early prodromal stages of the disease.

5. SOCIABLE Business and Sustainability Strategy

5.1. SOCIABLE Commercialization and Sustainability Planning

The SOCIABLE partners' commercialization and sustainability plans have been centered round the SOCIABLE ICT platform and associated cognitive training services paradigm, which are the main exploitable outcomes of the project. Each SOCIABLE partner has its own individual plan for the exploitation, sustainability and wider use of the project's results. Technical partners (i.e. ICT companies) SLG and CEDAF have concrete business plans for the exploitation of the SOCIABLE platform, which involve sales of the platform to various public and private care services providers (e.g., hospitals, care centers, municipalities, associations of demented patients, advocacy groups). These business plans foresee penetration in specific markets towards selling the SOCIABLE platform and related support and consulting services. On the other hand, the SOCIABLE technical partners UPV and AIJU adopt a rather moderate strategy against commercial exploitation, mainly due to the fact that they are non-profit organizations. Hence, they intend to support the efforts of SLG and CEDAF, without however undertaking their own dedicated efforts towards exploiting SOCIABLE in a commercial context.

The various care service providers of the consortium have different exploitation goals from the technical partners. Their primary objective is to continue to use the SOCIABLE platform in order to offer ICT based cognitive training services to demented patients and elderly suffering from a cognitive decline. Therefore, instead of a business plan, care service providers (COFO, SPC, TRONDHEIM, AUSL, FSL, HYGEIA) have created sustainability plans, which specify how they will continue to offer SOCIABLE services, as well as how many patients they plan to involve in SOCIABLE in the coming five years and how.

In addition to establishing their individual exploitation and sustainability plans, the SOCIABLE partners have collaborated towards specifying joint exploitation modalities. SOCIABLE is a joint collaborative effort, which has produced joint IPR (i.e. notably the SOCIABLE platform). Therefore, the partners have finalized an exploitation agreement, which regulates joint exploitation including the rights and obligations of the various partners. As part of this agreement, partners have also elaborated an IPR sharing proposal, which is based on objective criteria, and its final (legal) endorsement by all partners is in progress. The agreement and the relevant IPR sharing proposal are endorsed and legally signed by all partners, which permits for the direct activation of the partners' business and sustainability plans.

5.2. Learn More and Purchase SOCIABLE

SOCIABLE is available for purchase and deployment at various sites including hospitals, care centers, day centers. A home edition is also available. In order to purchase SOCIABLE, or even to obtain commercial information please contact the project coordinator:

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