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Author(s)	Jorien van Loon (CMC), Harm op den Akker (RRD), Tessa Beinema (RRD), Marijke Broekhuis (RRD), Lex van Velsen (RRD), Randy Klaassen (CMC), Merijn Bruijnes (CMC), Oresti Banos (CMC), Sofoklis Kyriazakos (iSPRINT), Konstantina Kostopoulou (iSPRINT), Alison Pease (UDun), Mark Snaith (UDun), Catherine Pelachaud (SU), Reshmashree Bangalore Kantharaju (SU), Donatella Simonetti (SU), Sita Ramchandra Kotnis (DBT), Rasmus Øjvind Nielsen (DBT), Álvaro Fides Valero (UPV), Vicente Traver-Salcedo (UPV)
Reviewer(s)	Dirk Heylen (CMC)
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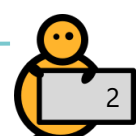
- University of Twente – Centre for Monitoring and Coaching (CMC)
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Abstract

This document contains a summary of results achieved in the first 18 months of the Council of Coaches project, covering the period from the kick-off meeting of the project in September 2017, to the release of the first and second demonstrators in May and November of 2018, up to the mid-point of the project in February 2019.

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Symbols, abbreviations and acronyms

CMC	Centre for Monitoring and Coaching
COUCH	Council of Coaches
D	Deliverable
DoA	Document of Action
DBT	Danish Board of Technology Foundation
EC	European Commission
iSPRINT	Innovation Sprint
M	Month
MS	Milestone
PM	Person Month
RRD	Roessingh Research and Development
RRI	Responsible Research and Innovation
SU	Sorbonne University
UDun	University of Dundee
UPV	Universitat Politècnica de València
UT	University of Twente
WP	Work Package

1 Introduction

This deliverable reports on the progress of the Council of Coaches project after the first 18 months. Section 2 provides a summary of the project including an overview of the work performed and a description of the major achievements of the project. Additionally, we explain the process of the demonstrator development and the choices that have been made in its regards. In Section 3, we describe the objectives of the project and report on how far we have come in terms of achieving them. After that, in Section 4, we describe for each Work Package the progress, initial results, any deviations from the project's Document of Action (DoA), the main achievements and the outlook for the next half of the project. Some tasks have reported all of their progress in their respective deliverables already. In this case, we refer to those deliverables, no additional technical progress will be reported here.

This Deliverable 1.4: First Periodic Report serves as the basis for the official project Periodic Report, to be submitted to the European Commission. In the periodic report there will also be an overview of the finances and the justification on the PM's and budgets. Given the public nature of the document no financial information is reported here.

2 Summary of Progress

2.1 Summary

Society is aging at a rapid pace. Our parents and grandparents are getting older than any generation before them, but in the meanwhile they develop many age-related impairments. They visit their doctor's office frequently, but would probably be happier not to. The doctors on the other hand spend many hours providing general care at huge costs, which could in many cases be taken over by technology. This would lead to care with more attention for the patient at lower costs.

Since everyone recognizes these benefits, many coaching applications have been developed in which an end user is being coached by a virtual coach for different kinds of ailments. In these kinds of applications the success rate depends heavily on the relation you, as the end user, will establish with the coach. The coach will need to build a personal connection with you and must know how to handle all kinds of tricky obstacles you can throw at the coach. If you are not really willing to change, you could place all kinds of linguistics roadblock, for which the coach is not equipped of dealing with.

Coach Anton: *"Let's take a look at your step count"*

User: *"No, I don't want to".*

You have clearly ended the discussion right there and then.

Researchers within the Council of Coaches project were wondering if there was a way around these roadblocks in coaching dialogue. How can we develop a virtual setting that can equip a coach to handle such cases? The solution can be found in a Council of Coaches. In this council, multiple virtual agents, each with their different personality, character, and speciality, take turns in a dialogue, while interacting with you. In our project we aim to develop a supportive virtual coaching team of two to five coaches that can help you with a range of health relation issues. A conversation with the coaches might now look like this:

Coach Anton: *"Hi, shall we take a look at your step count?"*

User: *"No, I don't want to."*

Coach Betty: *"Ok, I understand, let's go back to Anton later. Can you tell me what you have been doing lately?"*

Bringing multiple virtual coaches to a table also introduces a lot of challenges. First of all, the interaction between the coaches should feel natural and realistic to the end user. Therefore, the Council of Coaches project is developing tools to be able to adjust the body language of the coaches, such as gazing and gestures, to reflect natural discussions. For the coaching to have a convincing dialogue, the speech patterns used by the coaches should be adapted to the personalities of the coaches and the number of coaches as well.

Secondly, for the coaches to be convincing to the end user, the coaches will need to reflect certain their preferences. What these preferences are, and how we can develop a virtual agent reflecting these preferences is part of our research as well. Making one coach likeable to the end user is easy, making a virtual team likeable is another story. For example: Do we need four likeable coaches, or do we need one bad cop, to make the other ones look good?

Thirdly, how can we develop coaching strategies that can be applied by multiple coaches. Each coach will add something to the discussion, but who is in charge? And what if they contradict each other? When we send reminders to a mobile phone, do we need it from one coach specialized in the topic, or do we need an intervention on a larger screen by the entire council? From a technical point of view, the

challenge is: can we unobtrusively gather data on your behaviour, so the council doesn't have to bother you with asking all kinds of questions every time you meet. And can we then use this data as information in coaching strategies and dialogues between the coaches and the end user.

So far, the Council of Coaches project has been working on solving these questions, and many more. Research has been conducted into likeability and credibility of a coach and of a team of coaches. Speech patterns and conversations have been analysed and re-enacted by virtual characters. Body language of the coaches has been adapted to fit the *council* setting. A framework has been developed to analyse short term behaviour and all the different technical systems have been integrated to cooperate in bringing you the best user experience possible. The technical framework will be expanded into an Open Agent platform at the end of the project. Everything has been developed under the watchful eye of the Responsible Research and Innovation Team and the Exploitation manager to make sure the project can make a soft landing in society after its completion.

2.2 List of Achievements

We want to develop a coaching application that covers multiple coaching areas such as psychical, mental, social and cognitive aspects, suitable for elderly people with age related impairments, that is still very engaging to the user and will encourage them to keep on using the system in order to improve their quality of life. Our solution is a virtual coaching platform, where multiple coaches will coach you in an interactive and engaging way. Coaches you can bond with and coaches you trust with your sensitive data. We will take you through all the different aspects we are working on in order to achieve this ambitious goal, Firstly, several different subsystems will need to be developed and integrated. Before you even start doing the research, having multiple coaches on a screen is a prerequisite. Since the different partners worked with different systems to visualize these coaches, the different systems needed to be integrated. So far, we have established an integration between the University of Twente's ASAP platform with Sorbonne University's GRETA platform. GRETA, which was a single-character platform has been extended to support multiple characters in a single scene. A unity scene has been developed for the main user interface of the Home UI. In Figure 1 below, a conceptual architecture overview is given in which it is indicated which components are "ready", which are strictly under development, and which are still being conceptualized.

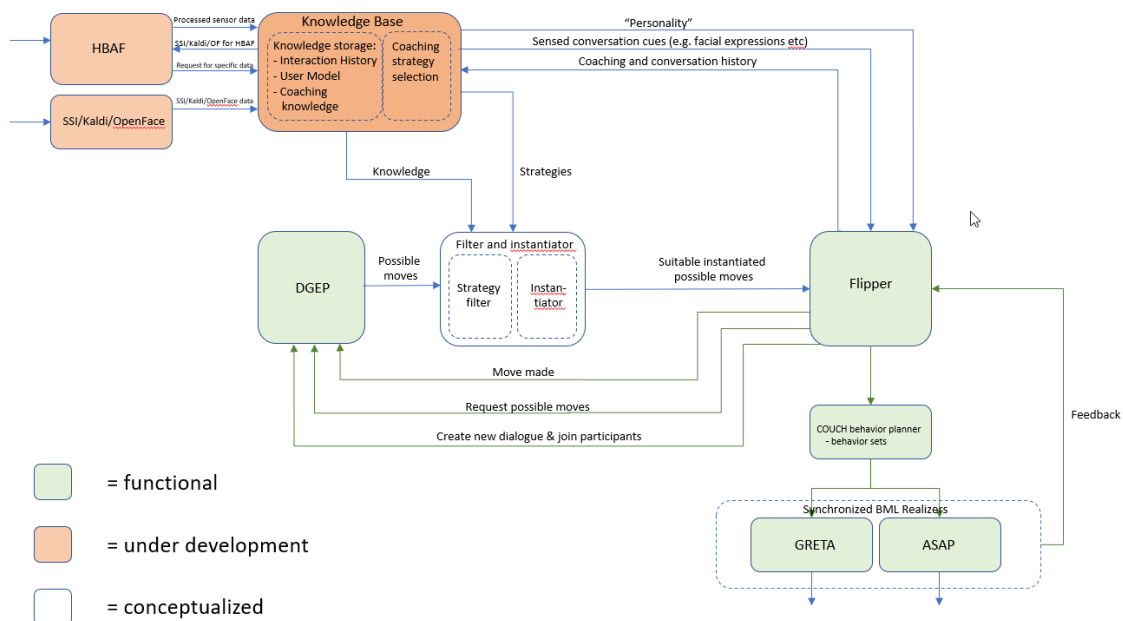


Figure 1: Conceptual architecture diagram from the time of writing this document.

To have believable characters on the screen, we have done several things. For the coaches to be believable they will need to act as if they are in a normal conversation, paying attention to the speaker, only looking away when bored or distracted. In the GRETA platform, gaze behaviours for multiple agents is now supported and implemented. It is based on an In-depth review of the existing multiparty models that are capable of handling turns using multiple virtual agents. Six basic characters have been developed. Their behaviours and traits will be mapped to the coaches and will be used to create a baseline of relatable characters that can be used to establish a relationship with the user. The user needs to be engaged and we have gained insight into the user's engagement through several studies that have been performed. This will be implemented in our engagement model.

For the coaches to be able to perform a dialogue, from a technical point of view, the DGEP platform, that generates the dialogues has been integrated with ASAP and Flipper. A dialogue and argumentation framework has been designed to fit in the overall Council of Coaches architecture. To establish an idea about how the dialogues would work in a multi coach coaching sessions, real life interactions between a patient and at least two medical professionals have been videotaped and analyzed. This has been used as input for the formal dialogue game, complete with locution, structural, commitment, termination and outcome rules.

Now that the coaches can speak, we need some content for them to talk about. We have been working on unobtrusively extracting user behavior from the sensors that can be integrated in the system. So far, we have been able to develop short-term physical, social, emotional and cognitive behaviour detection models. These have been evaluated preliminary and a first design of the Holistic Behaviour Analysis Framework has been integrated in the overall architecture. For the long-term behaviours, definitions have been established, and knowledge driven and data driven behaviour models are designed based on the short term physical and social behaviour models.

Once you have the user's behaviour, how can we use that to define a tailored coaching strategy. For this part, we are working on the knowledge base. An initial design has been made and is implemented. One of the hard problems is not how to store the knowledge that the coaches will base their advice on, but how to use it to develop a coherent coaching strategy among the different coaches. For this we have studied the literature and identified key knowledge components (parameters) required for successful and tailored coaching. We have developed the required theoretical framework for the automated coaching engine: *Coaching Goals – Coaching Strategies – Coaching Actions – Dialogue Actions*. And developed an initial set of concrete coaching actions that aim to bridge the gap between current and desired states in the area of physical, cognitive, mental or social status.

All the technical development, integration and research, is to actually help patients with age related problems. Therefore, we need to get input from three different sources to be able to tailor the final solution to the end user. Firstly, we have interviewed different stakeholders and based on those interviews developed patient journeys per patient group to describe how our technology can assist them in daily life and the role of the coaches in the different stages. We have set up a list a user requirements, gained from several different research methods, that will be used as input for the further development of the system. After both the technical demonstrator and the functional demonstrator had been developed, we have performed two rounds of user evaluations, the results of which are already incorporated in the system, or will be in future versions.

Secondly, even with all the input from the researchers and the end users, there might be other bigger (societal) issues at stake, such as privacy and trustworthiness. In the Council of Coaches project, special guidelines have been developed how to handle personal data in the project. Further emphasis is put on the privacy by design in the development of the technical system. With the different prototypes being evaluated by humans and the final evaluations due at the end of the project, we put special attention to

the information letters and consent forms of the participants. As an overarching theme in the project a Responsible Research and Innovation (RRI) vision was established in how the Council of Coaches project handles ethical issues within a project framework and how we can develop a coaching application within ethical, legal and societal boundaries.

In the development of the system, the third and final source of input that will influence the functional requirements and further development of the system, is the exploitation of the technology. During the project, we have started with identifying the different standards the project might make a contribution to as well as an inventory of the possible outcomes of the project. A first discussion was initiated about the different possible business models and insight was gained into the regulatory challenges that lie ahead of us.

Using these three different input sources, we established and prioritized a list of functional and technical requirements for the system.

All in all, we have established initial designs of all the important elements of the framework: the virtual appearance of the coaches, the body language and the spoken dialogues they will perform, the extraction of information from sensor data and the translation of that to behaviour information which can be stored in a knowledge base and used in a coaching strategy. All the different platforms and designs have been integrated into technical and functional demonstrators based on the functional requirements gathered by end user interview, ethical interventions and exploitation workshops.

2.3 Overall project choices

In the paragraphs below we will describe some bigger overall project choices we have made.

2.3.1 Demonstrator explanation

From a demonstrator point of view, the project is divided in a technical demonstrator development and a functional demonstrator development.

For the technical demonstrator: we are very pleased with the possibility to link the different platforms used by the different partners together. The different systems all have their own benefits and the sum of the different platforms provides a solid building ground from which we can support further development. Usually integration can be tripping stone in every project, but we are happy to report that this hurdle has been taken quite smoothly, thanks to fantastic cooperation from all partners. However, the processing power that is necessary for a proper functioning system with all platforms integrated is much higher than what would normally be used in a home PC. Therefore, testing our integrated system on (future) patient groups is more complicated than we originally expected. To prevent a negative experience for our end users in the final demonstration, more effort has been put in developing the functional demonstrator as well.

The functional demonstrator is a technically simplified version of Council of Coaches in which we can test the fundamental principles of the project, such as the group dynamics in convincing a patient, expressing different point of views or coaching strategies and bonding with patients to achieve higher levels of engagement. The different Work Packages' research is providing input for the functional demonstrator and can therefore be tested relatively easy without complicated state-of-the-art and error-prone technology.

In the remainder of the project's duration, our aim is to provide two separate, clear and distinct roadmaps for the functional and technical demonstrators, resulting in two core technical achievements of the project. The functional demonstrator will be a first prototype of "Council of Coaches as a Health and Wellbeing Product", of which we will demonstrate the effectiveness in the project's final demonstration trial. For the technical demonstrator we are in the process of creating a roadmap leading towards the

delivery of the Open Agent Platform – an open source platform that will allow researchers and developers to create their own multi-agent dialogue systems for various domains.

In Figure 2 below, the two pathways for the Functional and Technical demonstrators are shown. In the beginning of the project, still a single demonstrator was released as Milestone 2 (in May, 2018). After that point, the split between Functional and Technical demonstrators became clearer. At Milestone 3 (November 2018) the 2 different demonstrators were released and are described separately in the corresponding Deliverable D7.3 (Reidsma, et al., 2018). After each release of a demonstrator, an evaluation round occurs, with the first evaluation round focusing on both demonstrators and having been reported in Deliverable 2.4 (Tessa Beinema, 2018), while future versions of this series of deliverable is focusing on the Functional Demonstrators. As indicated in Figure 2, a continuous (lab-based) evaluation of the Technical Demonstrator continuous throughout the project, and both demonstrators and their respective evaluations influence the development of the other.

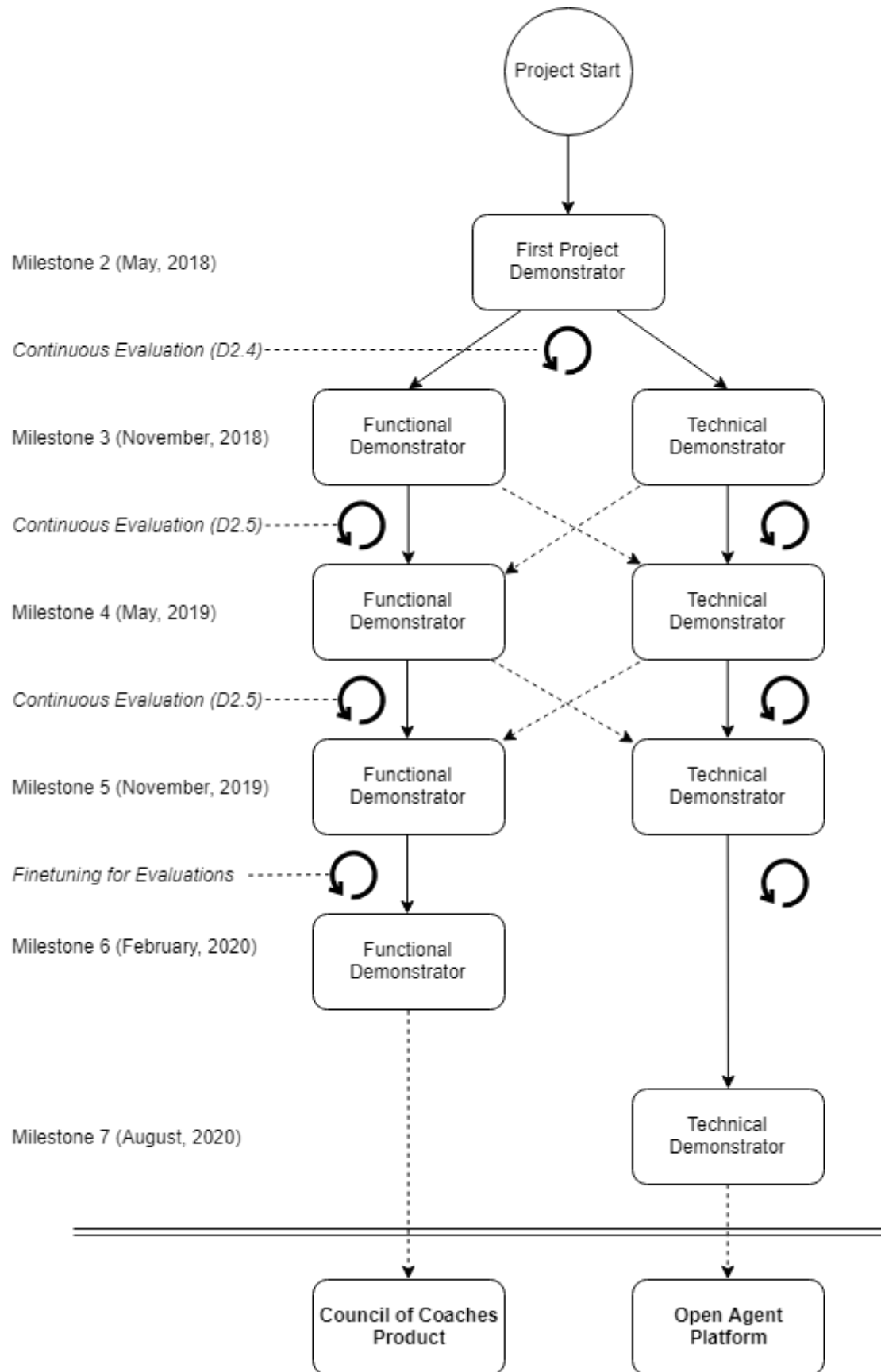


Figure 2: Functional vs Technical Demonstrators in the Council of Coaches project.

In order to create a coherent prototype, there is much more to do than just the functional and technical demonstrator. In modern development, integrating stakeholders' wishes, creating solutions for ethical issues such as privacy and thinking about exploitation even before any development start are key to developing a prototype that end users will actually use when developed into a product. In the Council of Coaches, we have tried to incorporate all those elements from the start of the project. All researchers are aware of the importance of these aspects and are taking them actively into consideration while developing their solutions.

2.3.2 Explanation on UI Input Modalities

During the proposal preparation phase of the project, there was a wish for end users to be able to interact with the Council of Coaches system through speech, just as in normal life when interacting with a coach. At the moment, the state of the art of language recognition is quite developed for dialogues on specific topics. However, when asking an open-ended question to an end user such as "How are you?" could already cause trouble. A very possible answer could be: *"Well, now you ask... my dog died yesterday. He was really old already, but now I have to get a new dog. Oh, and my knee hurts. I think I must have hit it somewhere. I just can't seem to remember where and when. It is getting blue already, do you think that's bad. Oh, and my sister called. But I wasn't able to answer the phone in time. Do you think I should call her back? I really don't want to because she goes on and on...."*

The current systems will not be able to handle these kinds of dialogues, let alone filter the useful information from the data. Therefore, we have chosen to start with possible input option the end user can click on. In a later stage the input options can be spoken out and recognized by the system.

2.3.3 Consent dialogue

During the development of the RRI vision and the implementation of the GDPR guidelines we found out that one of the most important aspects of both privacy and developing an app with personal information is about getting informed consent. Usually these consent forms are long information leaflets about what will happen to you as a patient. Now with the addition of the rights of a data subject, we feared that the information leaflet would only become longer. Since we are working with a group of elderly patients the information will need to be very clear and understandable. Otherwise, any consent they would give would be a mere signature on a page, instead of an actual consent.

To get actual consent, it would be best if participants could read the leaflet under supervision of a doctor, so they can ask any questions directly. Not all doctors will have this time available, but fortunately we are developing a dialogue system with which the end user can interact. Therefore, we have chosen to start developing a consent dialogue in which the end user will be explained what will happen when using the Council of Coaches, what their rights are as a patient and how the Council of Coaches will handle personal data.

Since this is not an activity that is directly described in the DoA, but one we thought was necessary from a privacy, RRI, and exploitation point of view, we have concrete plans for developing this dialogue. At the moment of writing no clear dialogue has been developed, but the work on this is ongoing.

3 Project Objectives

Below we outline the objectives of the Council of Coaches project as set out in the Document of Action, and as proposed in the original project proposal submitted to the European Commission in January of 2017. The objectives (highlighted in bold), are followed by a commentary describing the current state of achieving those objectives.

Objective 1 – The project will design, develop and evaluate a Virtual Coaching System (VCS) targeted at older adults that are undergoing life changing events that have a potential negative impact on physical, cognitive, mental, and/or social well-being as well as elderly users suffering from NCDs, specifically Diabetes or Chronic Pain. The main success criteria for the VCS will be its ability to aid the user in preventing expected negative effects on targeted domains (physical, cognitive, mental, social) and disease specific behaviours (medication intake, diet, coping with pain) measured using Huber’s holistic model of health (Huber et al., 2016).

The VCS that is being developed in Council of Coaches is a one of a kind virtual council. Where most coaching applications provide help to the end user on a one to one basis, the council will have multiple coaches readily at hand to assist the end user on the different domains necessary. The challenges for the Council of Coaches are multiple: how can the coaches (physically and linguistically) interact with each other in such a way that the end user benefits from the interactions. How can a coaching strategy be employed over multiple coaches? How can we compile a set of coaches that appeals to the end user, yet make them as diverse as possible? Challenges that are overarching when using multiple coaches instead of one.

The Virtual Coaching System that is being developed within the Council of Coaches project is a personal application that users will want to engage with a couple of times every week. From the very first interaction with Council of Coaches, users will be interacting with the system. At first, a virtual character will explain the purpose of the application, and help the user setting up his/her account including explaining the different privacy issues that arise from offering assistance and generating medical data. Then, users go through an interactive process of choosing which virtual characters will make up their personal council – based on their own health goals, or needs, or plain curiosity of what the coaches will have to offer. Then, entering the Council of Coaches main application, the user’s personal group of virtual coaches is there to greet the user, and introduce themselves, while also getting to know the user (and acquiring data on the end user in the meantime). Time will pass quickly, as everything is new, and the virtual characters are enthusiastically talking about themselves and their preferred methods of coaching. At the end of this first session, the user should be familiar with the process of interacting with the virtual coaches, and should have some ideas about which health topics to be working on.

When returning to the Council of Coaches, it is time to get serious. Each of the coaches has thought about a strategy on how to improve the user’s lifestyle, in terms of diet, activity, cognition, or social life. In this session, those strategies are discussed, and interactively fine-tuned to the user’s wishes. Personal goals will be set for the end user to achieve in the coming period.

Some days later, it’s time to see how the user has been doing. A quick text message from one of the coaches prompts the user to have another session. This time, the user is asked about his progress on the different goals. As it is sometimes difficult to keep track of all aspects of life, the user is offered some help in the form of sensors (to keep track of physical activity), and a food diary (for calorie intake). To assist the end user in their journey, the coaches will deepen their personal connection with the end user.

And so, it continues, from engagement, to setting health goals, to measuring progress, to feedback, to tips and tricks, all in form of light-hearted conversation with an interesting cast of virtual characters.

Slowly over time, the user is learning about the benefits of healthy living, learning about his own behaviour, and learning how to make positive changes – all while building a relationship with the virtual coaches.

Support in daily life is minimally invasive. A mobile phone application is used to unobtrusively track behaviours, and can be used to support e.g. digital diaries. Only on the initiative of the user can the coaches be reached, or in a very rare case as a reminder to come join a Council session.

This is our vision of the Virtual Coaching System that is the Council of Coaches. Progress towards this objective is underway and according to the project plan. Participatory design has started early in the project, having delivered a first set of requirements in M6. After this initial design and requirements milestone, user involvement processes have continued to deliver functional requirements. Simultaneously, the project plan is heavily focused on delivering functional demonstrators early, in order to start continuous evaluation as early as possible. This process has resulted in two iterations of prototype development and evaluation (between M9-M12 and between M15-M18). In these prototypes, the focus on multiple health domains is evident, with an initial set of coaches being available that cover physical activity, cognition, and diet.

At the midpoint of the project, there is a heavy focus on finalizing the use cases and target domains for coaching. With older adults, chronic pain and diabetes type 2 as three different target populations, and the desire to address a (subset of) a large number of domains – the scope of generating relevant content is large. As such, a current focus is on defining use cases that balance quality (can we engage users, and achieve health impact) and quantity (how many population sub-groups can benefit from the final demonstrator).

The objective is also to show impact. The process of designing the evaluation and impact assessment protocol has not yet officially started – although preliminary study designs have been circulated internally within the project consortium.

Objective 2 – The project will introduce the new coaching paradigm of the Council of Coaches. In this paradigm, the virtual coach is manifested in a group of virtual characters that each represents a different knowledge domain of the coach. Coaching sessions consist of an interactive group discussion between the user and several members of the council, in which the user and his behaviours are the main topic of discussion. This paradigm's success criteria are to significantly increase the engagement of the user with the system, and his willingness to actively participate in the coaching sessions.

In a way, this objective has already been reached. From the first functional demonstrators delivered by the project in M9 and M15, the Council of Coaches paradigm has been demonstrated in an interactive manner. In the first demonstrator, a group of coaches introduced themselves to the end users. Each coach elaborated on his/her specific topic. In the second demonstrator a motivation strategy is being defined and the relationship between the end user with the different coaches deepened. As a concrete example for the end user, a discussion between a diet coach and a physical activity coach has been created to assist users in deciding how they want to lose weight. During the evaluation studies, end users have shown a clear interest in the systems and engaged with the coaches.

In order to fully cover the objective, the project must demonstrate that this new paradigm of coaching can boast success in keeping users engaged and actively involved in the coaching. The protocol for the project's final demonstration is currently being designed, and the element of engagement will play a major role in its setup.

Objective 3 – In order to provide tailored communication and personalized/targeted coaching actions, the virtual coach must be able to gather a large amount of knowledge regarding the

primary user and his context. Traditional, unobtrusive on-body and in-home sensing technologies provide a basic level of information, but have limitations in the type of information that can be obtained. In order to sense the required psychological user related information, the project introduces the concept of the coach-as-a-sensor. Through the use of interactive dialogues, the coach will obtain knowledge about the primary user by engaging in interactions with the user. The success of the coach-as-a-sensor concept is based on its ability to obtain relevant information about the user in a way that is not achievable by state-of-the-art unobtrusive sensing technologies.

Significant progress is being made towards achieving this objective. At the time of writing, the project has set up two rounds of continuous end-user evaluation, evaluating the first prototype delivered in M9, and the second prototype delivered in M15. For these continuous evaluation rounds, the demonstrators were modified to include a mixture of interactive dialogue and questionnaires that were administered by the coaches. In this case, standardized questionnaires have been transformed into interactive dialogues – demonstrating a first version of the coach-as-a-sensor approach. When integration of the interactive dialogue prototypes with the project’s sensor framework is completed, additional functionalities of the coach-as-a-sensor will be implemented (e.g. asking about data).

Objective 4 – The project will emphasize deep character design based on sound theories from the video game and film worlds. The added value in terms of engagement will be measured and existing methods and guidelines (Isbister, 2006) (Sloan, 2015) will be adopted to the successful design of virtual characters in coaching contexts that have an impact beyond mere entertainment.

The design of characters is a creative process. From the research into methodologies of character design it can be concluded that there is practically little to work with, especially in the vastly novel area of virtual (health) coaches. Principles from video game design often do not apply to the Council of Coaches setting, making it hard to draw from the sources mentioned in this objective. Having said that, the project is addressing character design from a creative point of view – having designed a set of 6 virtual characters, three of which have made it into the latest demonstrators: Francois, the diet coach, Alexa the physical coach, and Helen the cognitive coach. Besides the creative efforts being performed, the project has delivered multiple fundamental studies on how various character attributes are being perceived by an end user – the results of which will be used to tailor the specific coaches to the end users in a personalised approach, therefore improving the engagement of the end user.

Objective 5 – The project will combine smart multimodal sensing technologies in order to seamlessly and opportunistically measure and model the user behaviour in a comprehensive fashion, including physical, cognitive, mental and social aspects. This holistic sensing and modelling approach not only aims at registering, analysing and inferring each determinant of behaviour in a user-centric manner but also mining the interactions among users and with their physical and virtual environment.

Efforts towards achieving this objective are in progress. The project has delivered the design and first implementations of the Holistic Behaviour Analysis Framework, which is currently being integrated into the project’s technical demonstrators. The first tests with sensing the physical and social state of the end user have been performed, by measuring steps, movement, and speed as well as nearby human activity (in the form of Bluetooth availability) and sensing locational noise. Additional sensors will be added to be able to unobtrusively detect end users’ measurements, such as a digital scale for weight and a skin patch to detect blood glucose levels. Current work is being performed on facial recognition and speech analysis sensors to detect the emotional state of the user.

Objective 6 – In order to accelerate open innovation and future developments in the domain of virtual coaching the project will develop the council of coaches on the principles of a generic coaching framework that builds upon and extends existing platforms such as FIWARE and universAAL to provide a set of protocols and definitions for generic, interchangeable virtual coaching modules. The generic coaching framework will be delivered as an open-source extension to existing platforms and the project will lay the groundwork for providing future support in the dissemination of this platform.

The Council of Coaches project foresees in delivering two separate software demonstrators that are referred to as the Functional Demonstrator and the Technical Demonstrator. The Functional Demonstrator is a software application (specifically, a web application) that is focused on demonstrating the proof of concept of Council of Coaches as a health and wellbeing coaching application. This Functional Demonstrator needs to be able to run, without errors, and providing an optimal user experience in a real ambulant end-user evaluation setting. The Technical Demonstrator on the other hand has very different requirements. This Technical Demonstrator will be used to demonstrate state-of-the-art technologies used for creating fully autonomous, fully animated, voice-driven, intelligent agents – with a lesser focus on content and topic of conversations. This Technical Demonstrator is planned to be released as the project's Open Agent Platform – a fully open source platform that other researchers and developers can use to extend and create their own multi-agent dialogue systems.

Progress in this objective is being made on the technical level, where important subcomponents of different project partners have been integrated (the University of Twente ASAP Platform works together with Sorbonne University's GRETA platform and the University of Dundee's Dialogue Game Execution Platform). Relevant existing standards are being used and extended wherever possible, including the use of and future release of an extended open source dialogue platform, and e.g. the core integration of Behaviour Markup Language (BML). The FIWARE and universAAL platforms have been analysed and relevant components are being reused – specifically FIWARE in the communication between sensor platform (HBAF) and the central Knowledge Base component, and universAAL for the integration of various types of sensors (digital scale, blood pressure sensor).

Besides the aforementioned technical achievements, the project is currently developing a roadmap on how to launch a successful open source Open Agent Platform in order to successfully complete this objective.

Objective 7 – COUCH will develop an ecosystem of services, along with a community of healthcare services providers (including health professionals) and innovators around the project's open coaching platform, as a means of sustaining and commercializing the project's results.

The work towards the Council of Coaches ecosystem has not yet commenced, and is part of the Roadmap to be created towards an Open Agent Platform, as mentioned above.

4 Work Packages

In the following subsections, the nine different work packages of the Council of Coaches will be addressed. An index is given below for convenience:

- WP1: Management (§4.1)
- WP2: Responsible Research and Participatory Design (§4.2)
- WP3: Coaching Strategies and Knowledge Base (§4.3)
- WP4: User Behaviour Sensing, Modelling and Analysis (§4.4)
- WP5: Dialogue and Argumentation Framework (§4.5)
- WP6: Human Computer Interfaces (§4.6)
- WP7: Continuous Integration and Demonstration (§4.7)
- WP8: Dissemination and Exploitation (§4.8)
- WP9: Ethics (§4.9)

For readability purposes, each work package description will start on a fresh page.

4.1 WP1: Management (CMC)

Main Achievements

The following main achievements result from this work package:

- All procedures are put in place: Administrative, financial, communication, quality control, risk management. Excellent communications throughout the project
- Technical progress has been established as is reported in the deliverables. All milestones have been reached in time.
- Distinctive project identity, both graphically and personally.
- Connection with other PM-15 project, standardization bodies and networks of excellence are established.
- Two Innovation workshops have been organised to create awareness of innovation and exploitation among the Council of Coaches researchers. Innovation Guidelines have been established.
- Consortium Agreement signed by all parties.

Planning

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T1.1	Coordination, general management	CMC	M1-M36
T1.2	Administrative, Legal and Financial Management	CMC	M1-M36
T1.3	Technical and Scientific Coordination	RRD	M1-M36
T1.4	Continuous Quality Control, Risk Identification and Mitigation Strategies	CMC	M1-M36
T1.5	Innovation Management	iSPRINT	M1-M36

4.1.1 T1.1: Coordination, general management

Participants

CMC, RRD, DBT, SU, UDun, UPV, iSPRINT

Objectives

This task groups all the activities to be carried out by the Project Coordinator and includes:

- a) maintaining contractual documents;
- b) issue of internal and contractual periodic reports;
- c) organising project launch (establishing procedures, project management methods and tools, organising project kick-off meeting) and follow-up (periodic project boards meetings, progress review, and conflict resolution);
- d) co-ordinating the timely production of deliverables and reports and maintaining the project archive;
- e) coordination of financial and administrative issues: establish and maintain financial records, coordinate financial statements submission by all project partners and audit certificates as needed, administer the EC financial contribution, and distribute partner shares according to the rules defined in the Grant Agreement and the Consortium Agreement;
- f) executing and controlling global expenses;
- g) providing assistance to individual partners on specific administrative issues. The task will centralize control of the project progress by ensuring administrative and contractual relationships both within the consortium and with the European Commission.

The Project Coordinator will assume responsibility for contacting the Project Officer, formulating propositions for possible modifications of the work plan, supervising contacts with all external organisations, and delivering all types of deliverables. An important key for project success will be ensuring effective collaboration and easy communication between partners and towards external entities, as well as ensuring that the project's RRI principles are executed. To this goal, this task will setup and manage several collaboration tools (e.g. internal collaboration and document sharing platform, mailing lists, virtual conferencing).

Progress

Communication – The project management is besides the regular responsibilities of the financial and administrative coordination, also the responsibility of effective collaboration and easy communication between the partners. This has been a focal point from the beginning, since communication is the oil in the project's machinery.

As the project management you lead by example. We aim for open, timely, and frequent communication in the project. This way we try to ensure nothing comes as a surprise and people will have enough preparation time for deadline and deliverables. We encourage new initiatives and try to make everyone feel heard. To facilitate this, we actively encourage everyone's participation in the different meetings. Since cooperation within the project is necessary on the most basic levels, we aim for all researchers communicating directly, not only through the Work Package leaders.

To establish good communication within the project several face-to-face meetings have been organised in the first year, starting with a 2 day Kick off meeting in November 2017 in Enschede. Further consortium meetings were held in March 2018 in Valencia, June 2018 in Dundee and in November 2018 in Enschede again. During the meetings, the partners all got to know each other and were eager to share their knowledge. Also, the technical integration weeks, where researchers got together to successfully integrate the different platforms (what has always been considered a big risk in the project) provided an efficient and effective way of collaboration. During these technical meeting there has always been an RRI "intervention" in which the RRI issues were further discussed and could be taken into account while developing the prototypes further. The technical integration weeks have been held in April 2018 and October 2018 in Enschede, as well as in March 2018 jointly with the plenary meeting in Valencia. In addition to the consortium meetings and the technical integration weeks, an additional RRI workshop and exploitation workshop have been organised by the responsible parties. At both these workshops several consortium members were present as well.

Since many tasks are assigned to many partners, and vice versa, many partners are assigned to a lot of tasks, we have planned bi-weekly overall project telco's where everyone can inform the rest of the project about their work and can ask questions. This has proven to a highly successful, and easy way to take away barriers between partners (the bi-weekly call has occurred continuously since the beginning of the project, only interrupted by Christmas breaks). Furthermore, many work packages have initiated their own telco's on regular intervals, depending on the perceived necessity.

Mailing lists have been set up, to mail the different groups easily. A Slack channel has been opened for internal technical communication and for day to day business during meetings, a WhatsApp group has been created.

An online collaboration platform has been established which ensured a swift sharing of documents, video's, and other data. We are aware of the different limitations online platforms have in terms of privacy and have therefore chosen a variety of means to cooperate. The day to day cooperation goes through Dropbox. However, since privacy is limited, any kind of datasets or other information that

contains personal data cannot be shared through this medium and has to be shared through a SharePoint platform hosted by the University of Twente, specifically designed for privacy purposes. After a year we ran into the limitation of Dropbox in combination with some universities administrative policies. The 2 GB limit was reached and people needed to buy a business account, which was not reimbursed by some administrations. To be able to keep using Dropbox, we started an archive of non-sensitive data on google drive. This way, all partners still have an easy to use, accessible way of sharing information, which respects the privacy of the end users and the financial situations of the researchers.

Deliverables – Another aspect of successful project management is submitting all deliverables in time. From the beginning this has been a focus point and the procedure for reviewing the deliverables has been communicated multiple times. So far, five deliverables have been submitted late. The first two deliverables were ready on time, but due to inexperience with submitting documents in the portal, were submitted three weeks late. Another two deliverables were late due to some very sad personal circumstances, whereas project management we chose for a more personal approach, instead of clinching to a hard deadline from which nobody would benefit. The last deliverable that was late (exploitation and standardization), was originally planned for May 2018 and has had a delay of six months, due to the content of the deliverable being not ready at such an early stage in the project. Furthermore, all deliverables were submitted in time.

Milestones – So far, all milestones have been reached in time. With the earlier described split between functional and technical demonstrator, even when time was really not on our side, we managed to deliver the demonstrators in time.

Project Presence – A very distinct project graphical style has been developed and is consequently used throughout the project. This has created a light and playful atmosphere, but at the same time a kind of identity for the researchers to feel at home with. So far, we have seen all researchers taking over the style and adding their own touches to it, from sign posts to baby gifts to a collection of new pictures.

In each project there are some rules and regulations that should be engraved in the researchers' memories, for instance, the dissemination disclaimer and the review procedure. For all those small but important titbits of information, we have developed a so called 2-page cheat sheet, where this information is gathered and can be easily found for researchers.

At the kick off meeting, all researchers received this cheat sheet and a limited-edition Council of Coaches coffee mug, that due to a lack of coffee, misspelled the word "coffee" Both can be put on your desk and will serve as visual reminders for researchers working on the project.

Organisation – As described in the project proposal, the project management consists of the following persons. Professor Hermie Hermens acts as coordinator for the project. Due to health reasons, professor Dirk Heylen has taken over the coordination of the project for some months, until Professor Hermens returned in January 2019. The day to day management of the project is done by Harm op den Akker from Roessingh Research and Development for the technical coordination and the administrative and process coordination is done by Jorien van Loon from the University of Twente.

Achievements

Up till this point in the project, the following achievements have been reached by the project management.

- Excellent communications throughout the project;
- An amicable and friendly atmosphere during meetings and in general;
- Active participation by all project partners, and through all levels of researchers;
- Timely submitting deliverables and milestones reached;
- Distinctive project style;

- Cheat sheet with important information.

Deviations from DoA

There are no deviations from the DoA at this point in time.

Outlook

From a management perspective, we foresee there might be some administrative issues with a possible Brexit. Although while writing, word came to us, that as long as the UK government pays in time, there may not be any new complications. But at the moment it is unclear what the definitive consequences will be. We do not foresee any issues with the financial part of the project. There might be some partners making a little shift in budget to transfer funds for travel expenses, since there were more face-to-face meetings than originally expected. From an administrative point of view any issues with Brexit may justify some adjustments, but we hope for the best. For a cooperation's point of view, we do not expect any trouble since most communications is online. In case of any unforeseen troubles with free travelling inside the EU, we will happily provide invitation letters for VISA to our researchers in the UK.

In terms of deliverables, we foresee the deliverables in which the prototypes are evaluated within 3 months of the delivery of a demonstrator being late. The 3-month period has proven to be a limiting factor in sometimes ambitious evaluations and we would rather have a proper evaluation and a late deliverable, then a timely deliverable with content lacking. We do wish to discuss this issue during the review meeting.

4.1.2 T1.2: Administrative, Legal and Financial Management

Participants

CMC

Objectives

This task comprises all tasks associated with the administrative and financial management of the project, including regular reporting to the EC, as well as monitoring of the progress and evolution of the various tasks. Furthermore, it will deal with IPR management issues, through maintaining and updating an IPR list and regulating IPR shares of the various contributors to the COUCH product, based on the level of their contributions and the background components that will contribute in the scope of the product's development and integration.

Progress

So far, the first reporting period is coming to a close. The administrative and financial management procedures are put in place to support the reporting in a timely fashion. The IPR list has been setup, but so far, no exploitable IPR has been generated. However, an overview has been created of possible exploitable outcomes of the project and this could lead to other IPR registries as well. Considering the legal management, the consortium agreement has been signed. The only legal issue that is still open is a data processing agreement between the partners as mentioned in the progress description on the ethics work package.

Achievements

The following achievements have been reached:

- The IPR list is being created.
- All financial and administrative procedures are put in place.
- Consortium Agreement signed.

Deviations from DoA

There are no deviations from the DoA at this point in time.

Outlook

A data processing agreement for processing personal data should be put in place, but we will wait until after Brexit, so the rules and regulations concerning British partners might be a little bit clearer.

4.1.3 T1.3: Technical and Scientific Coordination

Participants

RRD, CMC

Objectives

The task includes all the activities to be carried out by the Technical Manager and includes:

- a) Monitoring of the general scientific and technological evolution;
- b) Monitoring of the progress of scientific and technological developments carried out in COUCH;
- c) Identification and troubleshooting of technical problems;
- d) Liaison with related projects, standardization bodies and networks of excellence. The task includes also review and approval of technical reports and deliverables.

Progress

As the general communication and collaboration in the project is going well, so is the technical and scientific progress. The project has achieved major technological and challenging feats, mainly related to the integration of complex technical systems developed by various University partners. The project has a very high scientific output in terms of reporting the work done in the form of articles and conference papers.

Besides having clear work structures set out in the Document of Action, the project is focused towards the development of its main two technical solutions: The Functional- and Technical demonstrators. Early in the project, a clear vision for the functional demonstrator has been set out – a vision that is shared throughout the consortium and that is collectively refined at each of the plenary project meetings.

Achievements

The following achievements have been reached during the first reporting period of the project (M1-M18):

- Efficient collaboration and communication between technical partners.
- Provision of a clear “shared vision” of the Council of Coaches.
- Effective technical integration work, delivering rapid results.
- Effective scientific output, with strong collaboration between partners.

Deviations from DoA

There are no deviations from the DoA at this point in time.

Outlook

From the project management’s perspective, we will continue to create an environment in which individual members of the consortium can contribute with their own ideas, work and creative input to the shared vision of the Council of Coaches concept. We will continue to refine this vision for what the “Council of Coaches” application can do for our envisioned end-users towards the end of the project – striving to end up with a tool that can demonstrate engagement and effective coaching for the end users. Simultaneously, we will kick-off the process of creating a shared vision for the Council of Coaches Open Agent Platform – the project’s second main technical output, that is currently not defined clearly enough.

4.1.4 T1.4: Continuous Quality Control, Risk Identification and Mitigation Strategies

Participants

CMC, RRD

Objectives

The objective of this task is to continuously monitor the project's technical progress, identify risks incurred through the project's internal or external processes and define and update the risk mitigation plans. The task will establish and apply a number of quality and risk management processes, towards ensuring the quality of the project's results (i.e. software, prototypes, services, documents), while at the same time mitigating risks and undertaking relevant contingency actions.

Progress

The project management has implemented the quality assurance procedures as described in the *Deliverable 1.1: Quality Risk and IPR management* on how to handle the quality control aspects within the projects. A review procedure has been implemented and is being used for all deliverables. The Risk log is being updated by the management team and mitigation measures are being put in place if necessary. So far, there has not been a necessity to use them, fortunately.

Achievements

- Review procedure has been put in place and is being used.
- Risk management procedures are implemented and a Risk Log is being kept and updated.

Deviations from DoA

There are no deviations from the DoA at this point in time.

Outlook

We foresee no big risks in the future of the project. As a risk, the administrative issues surrounding Brexit is being identified and continuously being updated.

4.1.5 T1.5: Innovation Management

Participants

iSPRINT, CMC, RRD

Objectives

The main objective of the Innovation Management activity in the COUCH project is to monitor and control the process of creation of novel results with strong such as new ideas, algorithms, concepts, methods, products, services or applications that can be exploited through effective monitoring and controlling processes. In order to control and monitor the progress of the innovation management, an innovation management table is being maintained with detailed information on each exploitable deliverable. This activity will be supported by the exploitation management team of WP8.

Progress

In this reporting period, task T1.5 the project has delivered in M6 the Innovation Management Guidelines (D1.3), which describes the processes to monitor and support innovation outcomes that can lead into exploitation. In addition, innovation management telco's and workshop during physical meetings have taken place and produced tangible outcomes for the project.

Achievements

The main achievements of T1.5 have been the deliverable D1.3, Innovation Management Guidelines and the two workshops in Dundee and Enschede, during project plenary meetings. In Dundee the workshop has focused on a pitching session, to shape and focus the exploitable outcomes of COUCH, where in

Enschede the partners worked on the business modelling of the major outcome of the project, the COUCH system.

Deviations from DoA

There are no deviations from the DoA.

Outlook

The Innovation Management activity will continue the frequent calls and the workshops during the plenary meetings. The first physical workshop (Dundee, June 2018) was related to the pitching of exploitable outcomes, while the second one (Enschede, December 2018) was targeting the shaping of the business modelling of the main exploitable outcome. The coming workshops will include additional sessions focusing on co-creation for the joint exploitation with following topics: Unique Selling Points of Council of Coaches, Profit and Loss and financial forecasts, and a business plan capsule.

4.2 WP2: Responsible Research and Participatory Design (DBT)

Main Achievements

The following main achievements result from this work package:

- The Council of Coaches RRI vision was established.
- Five RRI workshops organised.
- A framework of higher-level requirements, aimed to ensure responsible research and to prioritize the research areas.
- Established the STIRRING methodology as documented in the internal reports from the RRI workshops (D2.1).
- Presentation about RRI issues in the COUCH project at the COMMA conference during Warsaw Argumentation Week, *Argumentation & Society 2018*, Warsaw, September 2018
- Elaborate patient journeys per patient group describing how the Council of Coaches technology can support patients with a chronic disease in multiple stages in their daily life and the roles of virtual coaches during these stages.
- Insights in user needs and requirements derived from multiple and mixed research methods, for all three primary end-user groups, leading to an initial set of user requirements for the technology innovation process
- User evaluation of the first functional prototype that serves as input for the design cycles.
- Additional user feedback on alternative functional prototypes (Low-fidelity demonstrator and a 2D/Web demonstrator) for improving and supporting the innovation process.
- Categorization of positive and negative aspects of the characters, background stories and roles of the virtual coaches, based on users' thoughts and opinions which are derived from focus groups

Planning

WP / Task	Title	Lead	Months
WP2	Responsible Research and Participatory Design	DBT	
T2.1	Developing a Shared Vision of RRI for the Council of Coaches	DBT	M1-M24
T2.2	Stakeholder Engagement Process	DBT	M1-M30
T2.3	User Needs and Continuous Evaluation	RRD	M1-M24
T2.4	Socio-Technical Integration	DBT	M7-M24

4.2.1 T2.1: Developing a Shared Vision of RRI for the Council of Coaches

Participants

DBT, CMC, RRD, SU, UDun, UPV, iSPRINT

Objectives

In this task, the objective is to develop a shared understanding and vision of what RRI means for the COUCH consortium as well as how this vision should be achieved in order for RRI to become fully embedded in the COUCH R&I processes. Imposing a pre-defined RRI-understanding top-down will neither induce sufficient ownership amongst the partners nor is such an approach suitable to accommodate project-specific requirements and conditions. It is a central consideration to ensure that the research and innovation process in the project follows the principles of Responsible Research and Innovation, implementing the framework laid out in the European Responsible Industry project (EU-FP7-609817). It is also a central consideration to ensure that the tools and coaching methods, as well as the actual R&I processes in COUCH, contribute effectively to the needs of future users and society at large and are aligned with societal values and ethical considerations.

Progress

The consortium laid the groundwork for the COUCH RRI Vision in a **two-day internal workshop** in Copenhagen in January 2018 by applying the RRI “Co-construction Method” (www.responsibility-navigator.eu), a deliberative methodology designed to create upstream reflection on research and innovation, and to facilitate related debate, negotiation and learning on how to implement RRI in the specific R&I processes. Rather than trying to deduce in a top-down manner the responsibilities that fall on the shoulders on the Council of Coaches consortium members from existing legal and ethical frameworks, the workshop attempted to stimulate bottom-up reflection within the consortium about which responsibilities arise naturally out of the ambitions of the project. At the workshop, the consortium members decided on an initial list of priorities and a rough plan for how to deal with them within the project. The inputs for this process of reflection included an overview of the RRI debate in general, suggestions for professional and ethical frameworks that might be relevant to the project, and inputs from stakeholders about the social and ethical concerns that might prove salient for the project. This workshop also provided the framework for *Deliverable D2.1: The COUCH RRI Vision* which provides the internal guidelines and the strategy for how the principles of RRI will be implemented throughout the project.

On March 5th and March 6th, 2018, the consortium held their first technical integration week in order to integrate the different platform systems. During this week, the Danish Board of Technology (DBT) facilitated **the first RRI-workshop** to support reflection on the four main RRI issues during this early-stage system development sprint. The workshop consisted of facilitated group work with the aim to integrate the RRI-issues further in the mindset and discussions of the technical partners. A small presentation was made by DBT to sum up on the different RRI-issues and stakeholder concerns for the people who were not present when the issues were identified in Task 2.1. The group was then divided into smaller groups, all with at least one member who was there when the RRI-issues were originally identified and engaged in debate around focused questions. Lastly, each group presented their issue(s) and view upon how to deal with the issue(s), to the rest of the technical experts and DBT. The presentations were discussed in plenum and the discussion was recorded.

The second RRI-workshop held at the University of Twente in Enschede on April 25th, 2018, in connection with COUCH’s second technical integration week. In the RRI team we were working on a sketch for the overall RRI procedure for the whole project period. Also, we were developing and advancing the individual interventions to take place along the way and planning ‘what to do next based on what happened last’ in a systematic manner. Since the process is empirically attentive and responsive, the exact content of each intervention needed to be planned in accordance with other developments and needs in the project, but the strategic map of where we were at and where we wanted to end up by month 36 was indeed possible to externalize. Methodically, we’re considering the course of the interventions as a *mechanics* – as punctual occasions for reflection where tacit knowledge can be put into words and said out loud in plenum. At this second workshop the RRI-process followed the developments-history and caught on to other COUCH tasks. Through the work carried out in Task 2.1, four major RRI-issues and a list of ‘sleeper issues’ were identified by the consortium and listed in D2.1. In Valencia the RRI-partners facilitated a structured reflection upon the RRI issues, which fed in to the first internal RRI report from Task 2.4. At this workshop we asked participants to reflect on a different set of issues that are in fact equally relevant to the RRI profile of the COUCH-project: The sleeper-issues. The name ‘sleeper-issue’ came into being as the structure of the initial RRI-workshop in Copenhagen in January (where the RRI-issues and sleeper issues were identified) did not facilitate enough time to dive deeply into the whole spectrum of issues that came up. Furthermore, at the consortium meeting in Valencia, many ‘sleepers’ were mentioned and debated as important at the present moment in time.

Therefore, in Enschede the sleeper issues were brought back into the picture. In addition to reflecting on the issues, we also asked participants to also consider: What are the remaining sleepers at this point?

The third RRI-workshop was held in Dundee on June 28th 2018 as part of the 3rd Council of Coaches plenary consortium meeting. The reason for this internal brief was to gather the information provided in a ready-to-hand form for use in deliverable 2.8 on the Council of Coaches Participatory Design Process. The workshop was designed to provide to serve two purposes at once. The primary purpose was to gauge the impact of the RRI activities so far on the decision-making processes within the Council of Coaches consortium. Such input would be necessary to ensure that the ongoing method development in task 2.4 was taking place from a well-informed starting point. A secondary purpose was to stimulate reflection within the Council of Coaches consortium on said processes, including reflection about the relative impacts of internal vs external factors on the decisions being made in the course of prototype development. In methodological terms, the bespoke method developed for this workshop was designed to elicit responses from consortium members about the factors influencing decision-making in their day-to-day work towards the objectives of Council of Coaches. In terms of scope, we decided to focus on the prototyping process, which at the point in time had just completed its first round. The first functional prototype had been completed, and planning for the next was high on the agenda of the consortium meeting. Focusing on the prototyping process would thus provide us with a discrete slice of project activity to look at. The exercise took place and was designed against the background of the method development work in task 2.4. In that context, the ancillary benefit of having this workshop would be to get a reality check on a perceived 'prioritization vacuum' in the RRI method being developed by our team.

October 8-12th, 2018, marked the week of the third technical Integration Week, which was hosted at the University of Twente. At this event the RRI-team rolled out **the fourth RRI-workshop**, where the focus was a beginning process of letting stakeholder perspectives inform the hardest issues at the given moment in time, as experienced from inside the project. As we were just beginning to prepare for our **second stakeholder workshop** (under T2.2 which will be held in Brussels, February 26th, 2019), we asked the participants to scrutinize their impressions of the state of RRI issues right now, hard nuts to crack, identification of what is needed and who may help. They were asked to imagine which persons, professions or organisations would be most valuable for them to draw into their decision-making and solution-work at the time, and why. Also, they were invited to reflect on which exact questions they would like to discuss with these people/professions/organisations. It is our objective to make all this happen at our second stakeholder workshop in February 2019.

Achievements

The following achievements result from this task:

- Background brief for building the Council of Coaches RRI vision.
- Deliverable D2.1 The COUCH RRI Vision.
- Internal report from the first RRI-workshop in Valencia, March 2018.
- Internal report from the second RRI-workshop in Enschede, April 2018.
- Internal report from the third RRI-workshop in Dundee, June 2018.
- Internal report from the fourth RRI-workshop in Enschede, October 2018.
- Presentation about RRI issues in the COUCH project at the COMMA conference during Warsaw.
- Argumentation Week, *Argumentation & Society 2018*, Warsaw, September 2018.

Deviations from DoA

There are no deviations from the DoA at this point in time.

Outlook

It has been the ambition of the RRI work to provide a basis for 'soft interventions' (Fischer & Rip, 2013) into the daily work of the project members and thereby to facilitate the implementation of RRI at the project level. This process has turned out satisfying.

The ongoing RRI work will result in a model for RRI work in eHealth innovation projects. This model will be in the shape of a step-by-step guide to explore and redesign RRI issues inside a project itself, and with users, stakeholders, experts and society; to stir reflection and continuous improvement; and to facilitate debate, negotiation and learning on how to implement RRI in specific R&I processes.

4.2.2 T2.2: Stakeholder Engagement Process

Participants

DBT, CMC, RRD, UDun, iSPRINT

Objectives

The objective of this task is to better align COUCH R&I with societal demands and values through a series of deliberative, co-constructive multi-stakeholder workshops. A series of altogether three interactive and participatory stakeholder workshops will be conducted. As part of the integration of outside perspectives, interviews with key stakeholders in three different countries are held prior to the workshops, in order to also allow for different cultural and social settings. The workshop concept allows for multi-stakeholder engagement and interchange of viewpoints from the consortium, industry, care providers, health professionals, policy-making and government, civil society and patient organizations. Issues to be discussed and negotiated include identification and assessment of risks and benefits, of conflicting values and interests, potential barriers to use, hazard identification, ethical, legal and social implications, professional needs, etc. In addition to the briefing notes from the workshops which have the purpose to inform the consortium, each workshop will be followed-up with an internal, lessons-oriented de-briefing of the consortium members in order to facilitate meaningful and effective integration of the workshop results in COUCH.

Progress

The first RRI workshop was held in Copenhagen in January 2018 (M5). It focused on the needs, problems, requirements, and possible social and ethical implications, which will provide value input and requirements for the design of functionalities.

The second RRI workshop will be held in Brussels in February 26th, 2019 (M18). The purpose of this workshop is to obtain stakeholder views on the responsibility of the project's tech and design choices. The focus of the workshop is action-oriented and will revolve around how the RRI issues are being tackled in the project. The participants will be informed about the project's aims and its RRI vision and how the project has sought to implement the RRI vision in the prototypes and the architecture. Responses will be gathered about: a) the substantial tech and design choices made and whether they hold up to stakeholders' expectations of a societal responsibility profile and b) the underlying approach for achieving responsibility and how it could be improved. The workshop will also provide feedback on the usability of the prototypes, and further discuss professional needs, ethical, legal and regulatory aspects that need to be taken into consideration in the innovation, or in the use of the service.

Achievements

At this point, the following achievements result from this task:

- Background brief for building the Council of Coaches RRI vision
- Deliverable **D2.2 Report on user and stakeholder needs and expectations**
- Interviews with key stakeholders in 3 countries for the first workshop (Denmark, Holland, UK)
- Interviews with key stakeholders in 3 countries for the first workshop (Germany, Norway, Ireland)

Deviations from DoA

The timing of the workshops was aligned so that the inputs can be used for the delivery of the three functional prototypes in M9, M15 and M21. However, in order to gather sufficient material for the participants in the second workshop, the timing of the workshop was postponed to M18, and the inputs will instead feed into prototype three.

Outlook

For the time being, the second workshop is the main event. Following the workshop, an internal, lessons-oriented de-briefing of the consortium members will be carried out in order to facilitate meaningful and effective integration of the workshop results in the third prototype.

The third RRI workshop will be held towards the end of 2019, probably in M25 or M26. The purpose of this workshop is to obtain stakeholder views on the responsibility of the project's exploitation plan. The workshop will inform stakeholders of the exploitation plans for the project's outcomes and how the RRI vision has been integrated with those plans. Responses will be gathered about: a) the substantial commercialization and legacy choices made and whether they hold up to stakeholders' expectations of a social responsibility profile and b) the underlying approach for achieving responsibility and how it could be improved.

4.2.3 T2.3: User Needs and Continuous Evaluation

Participants

RRD, CMC, DBT, SU, UDun, UPV, iSPRINT

Objectives

The main objective of this task is to gain insights in the needs of targeted (primary) end-user groups that serve as input for the technology innovation processes in WP3 to WP6. This task consists of two goals. The first is the elicitation of user needs and requirements from the three main patient groups (older adults with age-related impairments, patients with chronic pain and diabetes type 2). The second is a continuous evaluation process of the functional prototypes of the Council of Coaches system. There are three evaluation rounds, where the focus of the evaluation gradually shifts from technology acceptance (with low-fidelity prototypes) to usability and user experience (with high-fidelity prototypes), to the human-computer interaction in the final functional prototype. These evaluation rounds also serve to update user requirements and to collect redesign input.

Progress

This task runs from the beginning of the project (M1) until August 2019 (M24). Four deliverables result from this task, namely:

- D2.3: Initial user requirements (M12)
- D2.4: Evaluation results of the first functional prototype and updated requirements (M12)
- D2.5: Evaluation results of the second functional prototype and updated requirements (M18)
- D2.6: Evaluation results of the third functional prototype and updated requirements (M24)

Deliverables D2.3 and D2.4 were finished on schedule in August 2018 (M12). For the elicitation of user requirements, a longitudinal diary study was set up in which chronic patients (age-related impairments, chronic pain, diabetes type 2) were followed for four weeks. In Scotland, it was decided to utilize the National Diabetes Foundation for the recruitment of participants, as this would result in a high-quality sample. As a result, medical ethical approval needed to be obtained twice (internally and externally); a process that was confronted with several delays. In the end, these delays made the consortium decide to abandon this option for recruitment and to use a snowball/convenience sample instead, so as not to delay recruitment further. Additionally, we were confronted with an unexpectedly high degree of

participant drop-out. As a result, the study did not reach the minimally required sample size. Additional recruitment and data collection was done to reach the necessary number of participants. At the time of writing D2.3, data collection for the patients with chronic pain and diabetes type 2 was therefore not yet completed. The deliverable therefore provide only a brief summary of the main results of the diary study. During M13 to M16 we completed the full analysis of the diary study. Updated results and requirements are provided in D2.5.

Besides the diary study, D2.3 provides results of studies that the consortium performed in addition to the DoA to further strengthen our understanding of health coaching and to elicit user requirements from different perspectives and research methods. Sorbonne University conducted a quantitative study on the effects of virtual agent's gender, role and focus on user's perspective.

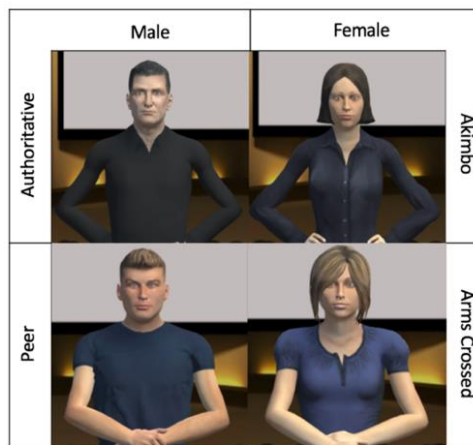


Figure 3: Four appearances modelled to fit authoritative and peer agent role.

Also, at the University of Dundee a role-playing video study was set up in which actors simulated an interaction between a patient and multiple medical practitioners. Last, D2.3 reports on the elicitation of the high-level requirements process.

Because of the aforementioned challenges in the diary study, D2.5 will also suffer a slight delay. This delay will not affect the development process of the technology, as the results were reported to the consortium in a timely manner.

Achievements

The following achievements result from this task:

- An initial set of user requirements for the technology innovation process (D2.3).
- Insights in user needs and requirements derived from multiple and mixed research methods, for all three primary end-user groups: older adults with age-related impairments, chronic pain patients and diabetes type 2 patients (D2.3).
- A framework of higher-level requirements, aimed to ensure responsible research and to prioritize the research areas. This framework was developed and further optimized during deliberation processes among the project partners (D2.3).
- Elaborate patient journeys per patient group that describe how the Council of Coaches technology can support patients with a chronic disease in multiple stages in their daily life and the roles of virtual coaches during these stages (D2.3).
- User evaluation of the first functional prototype that serves as input for the design cycles (D2.4).

- Categorization of positive and negative aspects of the characters, background stories and roles of the virtual coaches, based on users' thoughts and opinions which are derived from focus groups (D2.4).
- Additional user feedback on alternative functional prototypes (Low-fidelity demonstrator and a 2D/Web demonstrator) for improving and supporting the innovation process (D2.4).

Deviations from DoA

D2.3 describes multiple studies besides the diary study for the elicitation of user requirements. Also, in deliverable D2.4 additional demonstrators were developed besides the official functional prototype. These extra efforts help to accelerate the technical innovation process and to improve the quality of its outcome. Unforeseen issues in medical ethical permission and recruitment caused some delay in finishing D2.3 according. These issues have been solved.

Outlook

The coming months will focus on analysing the results of the second functional prototype evaluation (D2.5) and conducting the last evaluation round for the third functional prototype (D2.6). The completion of D2.6 will mark the end this task. Continuous efforts will be taken to keep the user needs and requirements in mind and updating these requirements if necessary. The experience with the deadline of evaluations after a demonstrator being very tight, bring us to expect that the deadline for D2.6 will probably not be reached in time. At the moment, we foresee a one-month delay in submitting.

4.2.4 T2.4: Socio-Technical Integration

Participants

DBT, CMC, RRD, SU, UDun, UPV, iSPRINT

Objectives

The purpose of this task is to guide and document the development of the COUCH RRI Vision and its implementation in the project. Drawing on the concept and methodology of socio-technical integration research (STIR), this task supports the integration of ethical and societal perspectives in the research processes conducted in the project. Social scientists from the consortium interacts directly with the scientists and engineers in the labs with the purpose of stirring reflection as well as complementing and sustaining the RRI-oriented activities in T2.2 and T2.3. The interactions are guided by semi-structured interaction protocols specifically designed to enhance reflection upon research decisions in the light of broader considerations, to support anticipation and responsiveness, and to bring in additional perspectives and stakeholder views. The aim is also to challenge the COUCH scientists and engineers to actively reflect upon potential outcomes of their work while it is being conducted in the labs, and to adjust research practices and research directions accordingly. The task includes the development of a socio-technical integration approach tailored specifically to the needs and the conditions of COUCH. This entails the development of the semi-structured interaction protocol, preparation and training of the social scientists, continuous formative evaluation of the process, and systematic documentation. For practical and logistic reasons, the STIR method adapted in this task follows a logic of reflexive monitoring in the form of mini-interventions. The task thus follows the same rhythm as the overall coordination of the project and is taken up in consortia meetings as well as in ongoing online coordination meetings when relevant and possible. By 'reflexive monitoring' is implied that the RRI team keeps monitoring progress and supporting ongoing reflexion about the meaning of the RRI vision as laid down in deliverable D2.1. By 'mini-interventions' is implied that the RRI team facilitates individual talks, mini-workshops, and distribute further analysis at strategic points in the project's development. This intensifies typically just before and just after the production of prototypes.

Progress

Reflexive monitoring:

- Introduction of the RRI Vision to the consortium and taking on-board feedback.
- A series of online negotiations about how the RRI issues should be prioritised at the given moment in time.

Mini-interventions:

- STIR interventions tied to the RRI workshops as reported under D2.1

Achievements

The STIR activities are documented in the internal reports from the RRI workshops as reported under D2.1.

Deviations from DoA

There are no deviations from the DoA at this point in time.

Outlook

The STIR activities continue but will be adapted to support the more 'hands-on' phases of development coming up. With STIR exercises we will keep looking back at the key RRI issues, but now at a level of much greater detail. Our role will thus change a bit. We will remain in our facilitating and supporting role, but we hope to get even closer to the actual work being done to deliver the prototypes and the architecture. We will be able to give the scientists and engineers relevant and useful feedback; help them navigate between what is easy to do, technically impressive, and societally responsible; and still facilitate reflected decisions and responsible work.

4.3 WP3: Coaching Strategies and Knowledge Base (RRD)

Main Achievements

The following main achievements result from this work package:

- Provide an initial set of definitions for key terminology used in WP3 and the project in general.
- Overview of relevant theories of behaviour changes and coaching methods, among which contextualization and framing.
- Identified key knowledge components (parameters) required for successful and tailored coaching.
- Set the required theoretical framework for the automated coaching engine: *Coaching Goals – Coaching Strategies – Coaching Actions – Dialogue Actions*.
- A set of example scenarios and coaching dialogues.
- An initial set of concrete coaching actions that aim to bridge the gap between current and desired states in the area of physical, cognitive, mental or social status.
- Provide an initial set of requirements, an overview of potential technologies and first design and technical framework of the Knowledge Base component.
- A shared knowledge base has been built and is being updated and extended with each prototype in which static and dynamic knowledge gathered through interactions with the user is used to tailor the suggested strategies and content of dialogues to the user.

Planning

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T3.1	Definition of Tailored Coaching Strategies	RRD	M1-M12
T3.2	Definition of Coaching Actions and Content	UDun	M4-M27
T3.3	Development of Shared Knowledge Base	RRD	M6-M27

4.3.1 T3.1: Definition of Tailored Coaching Strategies

Participants

RRD, CMC, DBT, UDun

Objectives

The objective of this task is to define the theoretical framework that will be used in the project that individual coaches will employ to plan their coaching actions. The coaching strategies will be based on established theories of behaviour change. This task will first deliver a functional requirement specification of the Shared Knowledge Base, and finally a literature-based model of behaviour change covering the domains of physical-, cognitive-, mental-, and social wellbeing as well as condition specific coaching strategies for Diabetes Type 2 and Chronic Pain.

Progress

This task has run from the start of the project (M1) throughout the first year, having finished in August of 2018 (M12). This task has delivered *D3.1: Initial knowledge base design and coaching strategies* in M6 and *D3.3: Definition of tailored coaching strategies* in M12 without delays.

Achievements

The following major actions have been achieved by the task:

- Provide an initial set of definitions for key terminology used in WP3 and the project in general (D3.1);
- Provide an in-depth overview of 13 different relevant theories of behaviour change (D3.1);

- Based on theories of behaviour change – provide an overview of 8 different relevant coaching methods (D3.1);
- Provide a literature-based overview of contextualization and framing methods used in coaching (D3.1);
- Identified key knowledge components (parameters) required for successful and tailored coaching (D3.1);
- Provide an initial set of requirements, an overview of potential technologies and first design of the Knowledge Base component (D3.1);
- Set the required theoretical framework for the automated coaching engine: *Coaching Goals – Coaching Strategies – Coaching Actions – Dialogue Actions* (D3.3);
- Provide an initial technical framework for determining tailored coaching strategies and delivering coaching actions (D3.3);

Deviations from DoA

This task has set out and worked towards achieving the objectives as described in the Document of Action and has achieved these in large parts. As concluded in D3.3, the planned objective of having a “final” definition of coaching strategies has proven too ambitious. The process of defining strategies is largely interwoven with the actual definition of coaching actions and content as being defined and implemented in T3.2 and T3.3 – as such, activities towards “finalizing” these coaching strategies are a continuing effort.

Outlook

The task has officially been completed. Continued efforts towards improving the tailored coaching strategies continue in the overall context of this Work Package 3.

4.3.2 T3.2: Definition of Coaching Actions and Content

Participants

UDun, CMC, RRD

Objectives

The objective of this task is to specify an initial set of coaching actions and content which will be used in the development of the first functional prototype. This will be based on the relevant parameters defined in T3.1, and the collection of real interactions between coaches and users.

Progress

This task has run from the start of the project (M1) until the end of May 2018 (M9). This task has delivered D3.2: Initial coaching actions and content without delays.

Achievements

The following major actions have been achieved by the task:

- A set of example scenarios that encapsulate ways in which patients might interact with the system (D3.2);
- A set of example coaching dialogues between patients and their health councillors (to show how insights from behaviour change literature can be incorporated in coaching dialogues and how behaviour change techniques can concretely be incorporated) (D3.2);
- An initial set of concrete coaching actions that aim to bridge the gap between current and desired states in the area of physical, cognitive, mental or social status for all target populations and specific health outcomes for the diabetes and chronic pain groups (D3.2);
- A set of guidelines for editing the living document D3.2 in order to add further coaching actions (D3.2).

Deviations from DoA

The primary objective of this deliverable was to specify an initial set of coaching actions and content, to be used in the development of the first functional prototype. As specified in D3.2, it was not our intention to provide an exhaustive and final list of coaching actions, but to instead act as a “living document” that will be revised and updated as the project continues, and the specific scenarios that the Council of coaches will need to handle become clearer and better defined. These revisions and updates will subsequently form the basis of D3.4 in M27.

Outlook

The task has officially been completed. Continued efforts towards improving the coaching actions and content continue in the overall context of this Work Package 3. As input to WP5, these formalized coaching actions will be translated into concrete advice, or argument statements that will be used to build up the repertoires of the individual virtual coaches.

4.3.3 T3.3: Development of Shared Knowledge Base

Participants

RRD, CMC, UDun, UPV

Objectives

The objective of this task is to construct a model of a shared knowledge base based on the relevant identified parameters from T3.1 and as well as the input from the user requirements gathering process in T2.3. The knowledge base will contain all the information regarding the users (User Model), their previous interactions with the Council of Coaches or individual coaches (Interaction Model), relevant identified contextual information (Context Model) and health specific parameters (Domain Models) for Diabetes Type 2 and Chronic Pain. Both user- and context models are partly static (e.g. gender, language) and partly dynamic (e.g. self-efficacy, stage of change), dependent on interaction topic, issues under discussion and context. For the technical implementation of the shared knowledge base, the project will explore the possibility of extending the FIWARE Orion Context Broker.

Progress

This task started in M6, and updates to the shared knowledge base have been made in M9 and M15, coinciding with two functional prototype releases. Further updates will follow at M21 and M27, with the remaining functional prototype release and the release of the technical prototype. In addition to the updates, the deliverable corresponding to this task (*D3.5: Shared Knowledge Base component*) is scheduled to be completed with the last update and will be a demonstrator.

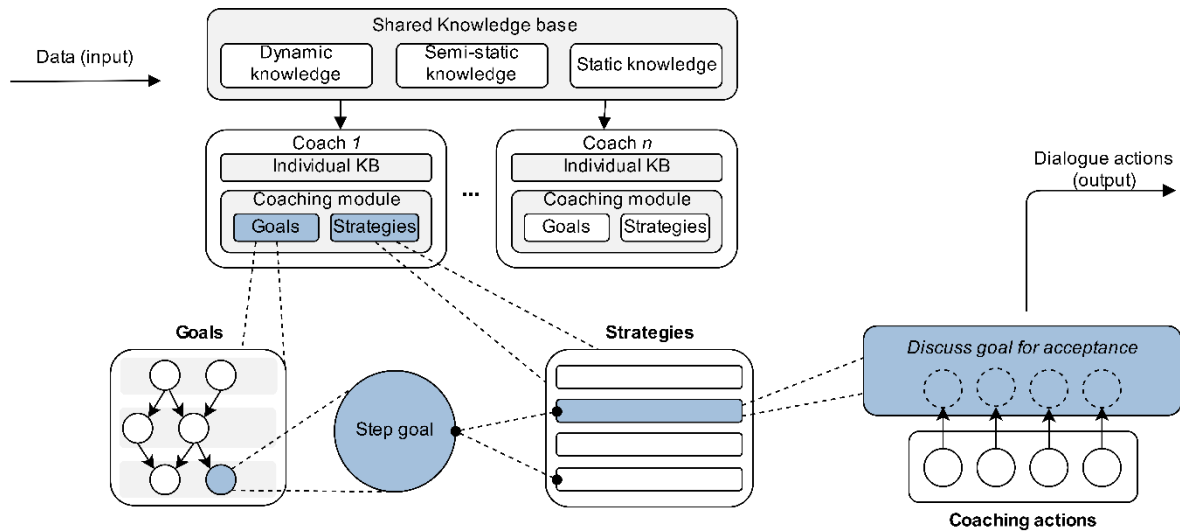


Figure 4: Initial design of the knowledge base.

Achievements

The following major actions have been achieved by the task:

- A shared knowledge base has been built and is being updated and extended with each prototype.
- Knowledge gathered through interactions with the user is stored in the shared knowledge base and is used to deduce dynamic constructs that were found relevant in T3.1 (e.g. user's motivation type).
- Static and dynamic knowledge is used to tailor the suggested strategies and content of dialogues to the user.
- The possibility of extending the FIWARE Orion Context Broker was explored. It was decided to develop FIWARE-compatible data models. Further integration may be studied.

Deviations from DoA

This task is still in progress and is still on track to implement the objectives as described in the DoA.

Outlook

On the short term, communication with other components will be established, starting with the Holistic Behaviour Analysis Framework, after which the Dialogue and Argumentation, and Agent Platforms will follow. Another step that will be made is in the area of client-server infrastructure and synchronisation. Furthermore, we will continue the iterative process of adding content and strategies, updating our models and increasing the amount of tailoring/personalisation.

4.4 WP4: User Behaviour Sensing, Modelling and Analysis (CMC)

Main Achievements

The following main achievements result from this work package:

- Set of definitions for key terminology used in WP4 and the project in general.
- In-depth review of sensing technologies to measure physical, emotional, cognitive and social behaviours.
- Initial set of requirements, use case specifications and first design of the Holistic Behaviour Analysis Framework component.
- Short-term physical, social, emotional and cognitive behaviour detection models.
- Preliminary evaluation of the short-term behaviour detection models.
- Software components implementing the developed short-term behaviour detection models
- Definitions for long-term behaviours or routines out of short-term behaviours.
- Knowledge-driven long-term behaviour detection model based on short-term physical and social behaviours.
- Data-driven long-term behaviour detection model based on short-term physical and social behaviours.

Planning

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T4.1	Inference of Short-Term Behaviours from Sensor Data	SU	M1-M15
T4.2	Identification of Long-Term Behaviours from Short-Term Information	CMC	M9-M21
T4.3	Automatic Detection of Behaviour Changes	CMC	M18-M27
T4.4	Evaluation of Holistic Behaviour Analysis Framework	RRD	M25-M36

4.4.1 T4.1: Inference of Short-Term Behaviours from Sensor Data

Participants

SU, CMC, RRD, UPV

Objectives

The objective of this task is to investigate and develop the necessary methods and tools for translating multimodal sensory data into short-term behaviours or primitives. The measurement of behaviour will be approached through both physical sensors (e.g., accelerometers for registering body motion, video for capturing facial expressions or audio for recording voice tone) and virtual sensors (i.e., coaches or virtual agents for sampling user experiences and feelings). The implementation of the sensor data collection will be conducted in this task. Machine learning and natural language processing techniques will be used for the definition of the short-term behaviour recognisers. This task will particularly contribute with the development of new enablers for recognising each domain of behaviour, namely physical, emotional, cognitive and social.

Progress

This task has run from the start of the project (M1) throughout the first year, having finished in November of 2018 (M15). This task has delivered *D4.1: State-of-the-art, requirement analysis and initial specification of the Holistic Behaviour Analysis Framework* in M6, *D4.2: Methods for inferring short-term behaviour from multimodal sensor data* in M12 and *D4.3: Short-term behaviour analysis prototype* in M15 without delays.

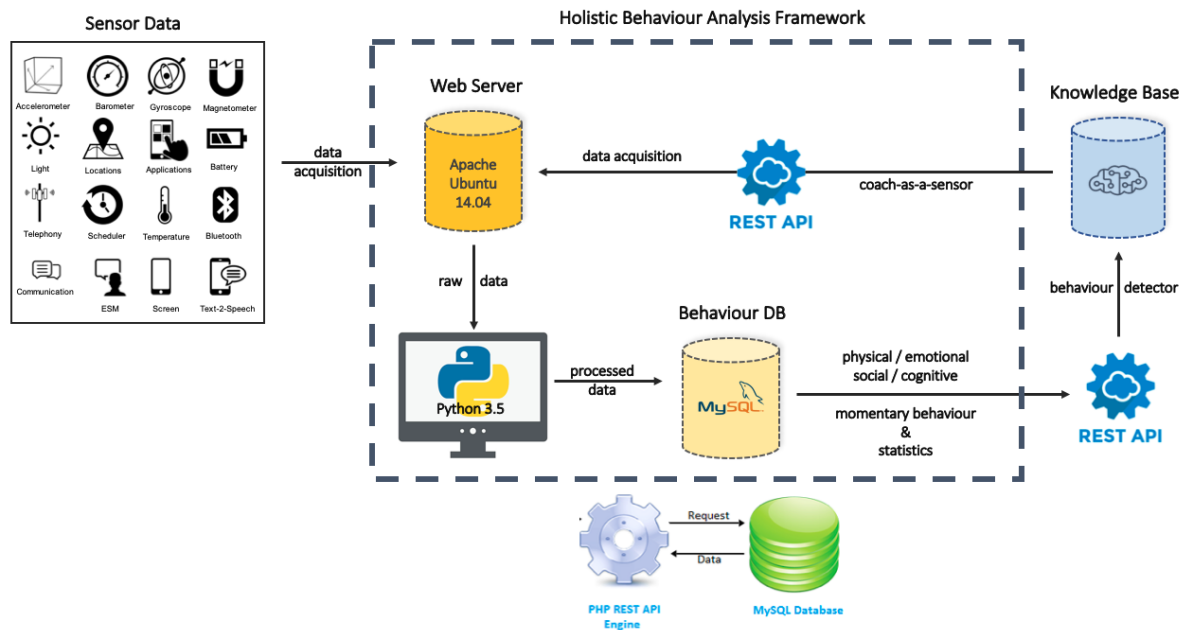


Figure 5: Operation flow of the HBAF.

Achievements

- Provide a set of definitions for key terminology used in WP4 and the project in general (D4.1);
- Provide an in-depth review of on-body and off-body sensing technologies to measure physical, emotional, cognitive and social behaviours (D4.1);
- Provide an initial set of requirements, use case specifications and first design of the Holistic Behaviour Analysis Framework component (D4.1);
- Identify relevant sensor data for the detection of short-term (a.k.a. momentary) behaviours (D4.2);
- Develop a momentary physical behaviour detection model based on accelerometer and GPS data to detect steps and some commonplace activities (walking, commuting, biking, tilting or remaining still - standing/sitting) (D4.2);
- Develop a momentary social behaviour detection model building on Bluetooth, call and SMS logs, and ambient noise data to detect social activeness / inactiveness (D4.2);
- Develop a momentary emotional behaviour detection model based on audio and video data to detect arousal and valence (D4.2);
- Develop a momentary cognitive behaviour detection model based on audio and video data from natural dyadic interactions to detect levels of user-coach engagement (D4.2);
- Perform a preliminary evaluation of all developed short-term behaviour detection models (D4.2);
- Build a software component that implements the developed momentary physical and social behaviour models (D4.3);
- Build a software component that implements the developed momentary emotional and cognitive behaviour models (D4.3);
- Developed three video demonstrators to showcase the operation of each developed software component (D4.3);

Deviations from DoA

This task has set out and worked towards achieving the objectives as described in the Document of Action and has achieved these in large parts. The originally provided description on Machine learning and natural language processing has been discarded. The original plan was to have real time speech recognition during the coaching sessions. During one of the consortium meetings, the researchers

present, all agreed on the state of the art of real time language recognition was not good enough to be used within the project. The freedom of speech, where an end user goes on a long rant about different topics, would lead to an extremely branched out tree of coaching options, that would probably decrease the quality of the specific advice and coaching strategies the coaches can provide. Therefore, we chose to limit the input option for the user to specific answers, that can be provided through a mouse click or through speech recognition. This way the coaching advice will be more to the point and therefor more valuable to the end user.

Outlook

The task has officially been completed. The developed models and software components will be thoroughly tested, updated and validated during the longitudinal evaluation of the Holistic Behaviour Analysis Framework in T4.4. Although no research on machine learning and natural language processing has been done so far, the HMI group is currently looking into recognizing emotions in speech. This is in a very early stage, but we plan to report on the progress in the next periodic report.

4.4.2 T4.2: Identification of Long-Term Behaviours from Short-Term Information

Participants

CMC, UPV

Objectives

The objective of this task is to research and develop the techniques for intelligently combining the behaviour primitives generated in T4.1 into more descriptive representations of behaviour. The combination or fusion process will be carried out in a temporal and conceptual level. The temporal fusion will allow to merge sequences of granular actions or primitives (e.g., gestures) into more general behaviour definitions (e.g., activities). This horizontal fusion will be performed over primitives of the same domain of behaviour (e.g., physical). The conceptual fusion will allow to unite cross-domain behaviours (e.g., activities and emotions) into more abstract representations of behaviour (e.g., routines or lifestyles). Topic models, probabilistic models and semantic models will be primarily used to fuse the behaviour information at both temporal and conceptual levels.

Progress

This task started in May of 2018 (M9) and will finish in May of 2019 (M21). This task has delivered *D4.4: Methods for inferring long-term behaviours from short-term behaviour information* in M18 without delays and it is expected to deliver *D4.5: Long-term behaviours analysis prototype* in M21.

Achievements

- Provide a set of knowledge-driven definitions for long-term behaviours or routines out of short-term behaviours (D4.4).
- Select relevant statistical and heuristic features to detect long-term behaviours (D4.4).
- Provide a brief overview of regression models relevant to identify long-term behaviours (D4.4).
- Develop a knowledge-driven long-term behaviour detection model based on short-term physical and social behaviours.
- Develop a data-driven long-term behaviour detection model based on short-term physical and social behaviours.
- Deployment of sensor data collection platform.
- Development of REST API to facilitate data exchange with other COUCH components.
- Interface with UniversAAL.

Deviations from DoA

This task has set out and worked towards achieving the objectives as described in the Document of Action and has achieved these in large parts. Long-term behaviours elaborate on short-term physical and social behaviours as these have been shown closely connected and relevant to the primary use cases of Council of Coaches (i.e., chronic pain, diabetes). The intention is nevertheless to extend the models to also comprise short-term emotional and cognitive behaviours whenever relevant.

Outlook

The task is currently ongoing. Next immediate steps involve the realisation of the software components that implement the developed long-term behaviour models. The developed models and software components will be thoroughly tested, updated and validated during the longitudinal evaluation of the Holistic Behaviour Analysis Framework in T4.4.

4.4.3 T4.3: Automatic Detection of Behaviour Changes

Participants

CMC, RRD

Objectives

The objective of this task is to investigate and develop the methods for automatically discovering relevant behaviour changes for a given user or group of users from the analysis of the long-term behaviours generated in T4.2. The analysis will consist of detecting changes between time periods (change detection), determining the significance of the detected changes (change assessment) and analysing the nature of the change (change explanation). Statistical multivariate analysis and regression techniques will be primarily used for the detection, assessment and explanation of changes.

Progress

Not started yet.

Achievements

No achievements to report.

Deviations from DoA

No deviations to report.

Outlook

Not applicable.

4.4.4 T4.4: Evaluation of Holistic Behaviour Analysis Framework

Participants

RRD, CMC

Objectives

The objective of this task is to assess the functional operation of the Holistic Behaviour Analysis Framework. The evaluation will be performed in real-world scenarios and it will particularly assess the reliability and resilience of each of the three core components of the framework (T4.1, T4.2 and T4.3).

Progress

Not started yet.

Achievements

No achievements to report.

Deviations from DoA

No deviations to report.

Council of Coaches

Outlook

Not applicable.

4.5 WP5: Dialogue and Argumentation Framework (UDun)

Main Achievements:

The following main achievements result from this work package:

- A corpus of analysed real-life interactions between a patient and at least two medical professionals.
- The design of formal dialogue games, complete with locution, structural, commitment, termination, and outcome rules, based on the analysed interactions Provide a design for the Dialogue and Argumentation Framework component that will fit into the overall Council of Coaches architecture.
- Integration of the Dialogue Game Execution Platform with ASAP and Flipper.
- Initial coaching dialogue game implementation, accepted for publication and presentation at the Computational Models of Argument (COMMA) 2018 conference.

Planning

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T5.1	Theoretical Model	UDun	M1-M12
T5.2	Abstract Model	UDun	M10-M21
T5.3	Computational Model	UDun	M18-M30
T5.4	Evaluation of Framework	RRD	M25-M36

4.5.1 T5.1: Theoretical Model

Participants

UDun, CMC, RRD

Objectives

The objective of this task is to develop theoretical foundations and a formal dialogue system. Using a corpus of real-life interactions, we will research and develop a flowchart of dialogue moves and from this a formal dialogue game. This will necessitate identifying locution rules, structural rules, commitment rules, termination rules and outcome rules.

Progress

This task has run from the start of the project (M1) throughout the first year, having finished in August of 2018 (M12). This task has delivered *D5.1: Dialogue and Argumentation Framework Design* in M6 and *D5.2: Design of Dialogue Game* in M12 without delays.

Achievements

The following major actions have been achieved by the task:

- Provide a design for the Dialogue and Argumentation Framework component that will fit into the overall Council of Coaches architecture (D5.1).
- A corpus of analysed real-life interactions between a patient and at least two medical professionals (D5.2).
- The design of formal dialogue games, complete with locution, structural, commitment, termination, and outcome rules, based on the analysed interactions (D5.2).
- Integration of the Dialogue Game Execution Platform with ASAP and Flipper.

Deviations from DoA

This task has set out and worked towards achieving the objectives as described in the Document of Action and has achieved these in large parts. During the analysis of real-life interactions (D5.2) it was found that pathos, logos and ethos were not found in measurable quantities such that they could be incorporated into the design of the dialogue game. This was something that could not have been foreseen prior to the gathering and analysis of the interaction data. This data has however allowed for the specification of dialogue games that accurately reflect the processes involved in a coaching session.

Outlook

The task has officially been completed. Continued efforts towards the development of the dialogue and argumentation framework continue in the overall context of this Work Package 5.

4.5.2 T5.2: Abstract Model

Participants

UDun, RRD, SU

Objectives

The objective of this task is to investigate moving from a formal dialogue system to a set of directed graphs, over which we can reason. We expect to use the Argument Interchange Format standard in the execution of our dialogue game to create argument maps which represent a collective knowledge base as a directed graph. Using established theories of argumentation, we will explore the construction of a shared theory that is accepted by the virtual coaches and the user at a given stage of the game.

Progress

This task has run from June 2018 (M10) and is currently ongoing until the end of May 2019 (M21). The first deliverable from this task, *D5.3: Methods and tools for moving from dialogue game to updating individual and shared knowledge bases*, will be delivered on-time at the end of February 2019 (M18).

Achievements

- Initial coaching dialogue game implementation, accepted for publication and presentation at the Computational Models of Argument (COMMA) 2018 conference.

Deviations from DoA

At present, there have been no deviations.

Outlook

This task remains in-progress until May 2019 (M21) and is currently on-schedule.

4.5.3 T5.3: Computational Model

Participants

UDun, CMC, SU, UPV

Objectives

We will embody both theoretical and abstract model computationally, in conjunction with WP5. This will involve, for example, specifying and executing the protocols developed in T4.1, using tools such as the Dialogue Game Description Language (DGDL) and the Dialogue Game Execution Platform (DGEP) (Bex et al., 2014). We will explore inducing abstract frameworks from the AIF structures created as a side-effect of executing the DGDL specification, over which we could then compute acceptability semantics to create the shared knowledge base.

Progress

Not started yet.

Achievements

Council of Coaches

No achievements to report.

Deviations from DoA

No deviations to report.

Outlook

The task will start in M19 (March, 2019).

4.5.4 T5.4: Evaluation of Framework

Participants

RRD, CMC, UDun

Objectives

We will develop methods for evaluating our resulting framework, focusing in particular on correspondence to real life coaching scenarios, logical viability and resulting knowledge bases. This will be a semi-automatic evaluation, with the aim of analysing the outputs of dialogues entirely between autonomous agents representing the individual coaches. Evaluating the dialogue framework as a standalone module will allow for fine-tuning before it is integrated with the user interface for full-scale simulations in WP7.

Progress

Not started yet.

Achievements

No achievements to report.

Deviations from DoA

No deviations to report.

Outlook

The task will start in Months 25.

4.6 WP6: Human-Computer Interfaces (SU)

Main Achievements:

The following main achievements result from this work package:

- Definition of platforms and key terminologies used in WP6.
- Development of a Unity scene for the main user interface of Home UI.
- Integration of ASAP realiser and Greta agents to interact in the same scene.
- Integration of the Dialogue Game Execution Platform with ASAP and Flipper.
- Extension of Greta platform to support multiple agents.
- Development of six virtual characters and mapping their behaviours and traits to create a baseline.
- In-depth review of the existing multiparty models that are capable of handling turns using multiple virtual agents.
- Support of gaze behaviours for multiple agents in the Greta platform.
- Implementation of an engagement model to detect user's engagement.
- Understanding user's perceived level of persuasion about the virtual coaches, accepted for publication and presentation at the Intelligent Virtual Agents (IVA) 2018 conference.

Planning

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T6.1	User Interface Framework for Home and Mobile	CMC	M1-M30
T6.2	Design and Creation of Virtual Agents	SU	M1-M20
T6.3	Modelling Group Interaction	SU	M6-M24
T6.4	Engagement Model	SU	M1-M30
T6.5	Simulation of Council of Coaching Sessions	SU	M16-M30

4.6.1 T6.1: User Interface Framework for Home and Mobile

Participants

CMC, RRD, SU, UPV

Objectives

Objective 1: Home UI – The focus in this task is the development of a “meeting room” in which the virtual coaches can be plugged in. The main User Interface for the Council of Coaches is the Home UI in which the primary user is able to interact with a group of virtual coaches. For the Home UI, the GRETA/VIB platform will form the basis of the technology platform, extending it with the capabilities of mixed-initiative multi-party dialogues between user and a group of 2 to 5 virtual coaches that can participate at the same time.

Objective 2: Mobile UI – The second objective of this task is to design and develop an easy-to-use, non-obtrusive mobile application that enables one-to-one user-to-coach interaction. This Mobile UI will be developed in such a way that it integrates with his/her own customary use of the mobile device. To reach this aim we will port the Greta/VIB platform onto Android mobile. The Greta/VIB platform is written in java and is integrated within Unity3D which is compatible with Android. In T6.1 we will develop the Server-Client connection between Greta/VIB (server) and Unity (Client).

Progress

A Unity scene is developed that functions as the main User Interface of the Home UI where users can interact with the council of coaches. Within the scene three agents controlled by ASAP realiser

(Kolkmeier, Bruijnes, Reidsma, & Heylen, 2017) and an agent controlled by Greta realiser (Ravenet, Cafaro, Biancardi, Ochs, & Pelachaud, 2015) exist. Both realisers have their own strong points and for that reason we would like to have access to both realisers and have the agents controlled by these realisers cooperate.

The ASAP realiser was turned into a multi-agent platform so it can control multiple coaches and the behaviours can be synchronised between the agents. Adaptations were made to BML to specify behaviour for a certain agent and to synchronise behaviour between such as gaze behaviour and turn-taking. First steps to integrate and synchronise behaviours between ASAP and GRETA were made.

The dialogue engine called Flipper 2.0 (van Waterschoot, et al., 2018) is used to integrate different components of the COUCH system. Flipper and DGEP can communicate to create a new DGEP powered dialogues where ASAP and GRETA powered agents can join the dialogue. Possible moves in the dialogue are generated by DGEP and translated into BML by Flipper. Flipper templates are used to generate UI buttons in the Unity scene where end users can select preselected user input. User input is fed back into the system. Different user evaluation test were executed as described in deliverable D6.3.

For the second objective we investigated different options for the mobile UI (deliverable D6.2), but we postponed the development of the mobile app. We first focused on the integration of different components of the system to facilitate the development of the mobile application.

Deviations from DoA

We combined ASAP and GRETA in the COUCH system. ASAP was not mentioned in the DoA. Since both realisers have their own strong points, we would like to have access to both realisers and have the agents controlled by these realisers cooperate.

We did not work on the development and implementation of the mobile application yet. Initial ideas were explored but we chose to work on the technical integration of all different components before starting to implement a mobile app. ASAP is now part of the COUCH system which should make it possible to run on Android devices (Klaassen, et al., 2013).

Outlook

We will continue the work on the development of the Home UI by integrating the HBAF data into our dialogues and user interaction. Coaching strategies and knowledge from the shared knowledge base should be integrated in the dialogues and user interactions. We will investigate the possibilities of using the Flipper dialogue engine for these integrations.

Now we have a clearer picture of the different components of the system and how these components are communicating we will start the implementation of the mobile app. We will investigate what kind of embodiment is needed if we want to use ASAP on an Android device.

4.6.2 T6.2: Design and Creation of Virtual Agents

Participants

SU, CMC

Objectives

The objectives of this task is to develop a tool to create virtual coaches with their own communicative and emotional characteristics. A virtual coach is defined by its sensibilities, behaviour expressiveness and behaviour lexicon i.e., (i) *Behaviours*: their types and their expressivity; (ii) *Emotional sensibility*: Agents will be defined by their tendency to feel certain emotions and thus display certain multimodal behaviours; (iii) *Attitude*: Social attitudes that evolve dynamically is displayed through the variation of the verbal and nonverbal behaviours of the agent; (iv) *Interactional sensibility*: Coaches will be defined

by the type of feedbacks they have the tendency to provide (acknowledgment feedback or more emotional feedbacks) and by their degree of empathy toward user's emotions.

Progress

This task has run from the start of the project (M1) throughout the first year, and will finish in April 2019 (M20). This task has delivered partially D6.2: Initial user interface design for Home UI and Mobile UI in M9 where initial virtual coach design was presented. The progress so far will also be reported in a deliverable D6.4: First Virtual Coach Design and Model due in M18.

Achievements

The consortium has developed a first "cast" of six characters for the virtual coaches: Helen Flores (Cognitive Coach), François Dubois (Diet Coach), Hank (Social Coach), Owen (Life Coach), Melissa (Mental Health Coach) and Alexa (Physical Activity Coach).



Figure 6: Character designs, from left to right Helen, Hank, Owen, Alexa, Francois, and Melissa.

The initial set of coaches are provided with a background story, physical description (appearance details e.g., build, height, skin, hair colour, clothes), mannerisms, strengths and weaknesses. These details have been reported in deliverable D6.2.

Further we started working on the behaviour characteristics for the agents to map their traits and attitudes to a baseline following Mancini's model of distinctive agents. So far, we have worked on two characters: Hank and Alexa which will be reported in D6.4.

Deviations from DoA

No deviations to report.

Outlook

This task is still ongoing. Currently, we are working on reporting the progress of the task in the upcoming deliverable D6.4. Next immediate steps involve mapping of the behaviours, attitudes, interactional and emotional sensibilities for all the developed coaches.

4.6.3 T6.3: Modelling Group Interaction

Participants

SU, CMC, UDun

Objectives

The objectives of this task is to model multiparty conversation behaviours. In particular, we will focus on turn-taking management and an associated dynamic group phenomenon i.e., cohesion. While indication of what the virtual coaches would say to whom and when will be provided by the dialogue framework (WP5), the turn-taking model will instantiate which behaviours the agents will display.

Progress

This task has run from the first year of the project (M6), and will finish in August 2019 (M24). The progress so far will be reported in a deliverable D6.4: First Virtual Coach Design and Model due in M18.

Achievements

We have conducted a literature review on the existing multiparty models and group cohesion models. Also, we have designed the annotation scheme for annotating the non-verbal behaviours that will be incorporated to facilitate turn-taking. The turn taking will also consider a higher-level group phenomenon which is cohesion. This is further categorised as task cohesion i.e., the performance of the group during task solving or decision making and social cohesion i.e., the behaviours of the group during social interactions. This will be reported in D6.4: First Virtual Coach Design and Model.

Previously the Greta platform supported a single agent only. An improvement was done to include multiple agents in the same environment. This will facilitate in developing a model to simulate group interactions. The work has been reported in D6.3: First Prototype description and evaluations of the virtual coaches platform (includes software documentation).

Deviations from DoA

No deviations to report.

Outlook

This is an ongoing task. In the upcoming months we aim to annotate and analyse the non-verbal behaviours associated with group conversations. Then the next step is to implement the model that will be able to handle turns in order to simulate a group of cohesive virtual agents interacting with each other. Finally, we will evaluate this model.

4.6.4 T6.4: Engagement Model

Participants

SU, CMC

Objectives

The objectives of this task is to develop strategies to ensure engagement of the elderly in his interaction with the virtual coaches. One of the aims of the virtual coach is to gather data on a user's state. This will be done during the interaction between the coaches and the elderly. Therefore, in this task we will endow the virtual agent with different strategies to ensure engagement for the interaction to last as long as possible. This will be done by the agents building rapport by providing feedbacks. The feedbacks will indicate that the agent is interested in the user's speech and is paying attention to what user says. Further, the agent will also be capable of providing emotional feedbacks depending on their degree of empathy.

Progress

This task has run from the start of the project (M1) throughout the first year, and will finish in February 2020 (M30). The progress so far will be reported in a deliverable D6.6: Final Virtual Coach Design and Model due in M30.

Achievements

To model the engagement level of the user in human-agent interaction, we have constructed a neural network using Keras toolkit with TensorFlow. The model was designed to use the facial actions units, the head rotation and the conversational state of the interaction to predict the engagement, arousal and valence level of the user. This has been reported in D4.2: Methods for inferring short-term behaviour from multimodal sensor data in M12 and D4.3: Short-term behaviour analysis prototype in M15.

To maintain engagement, we are integrating a backchannel model based on Bevacqua's backchannel model. This model includes a set of rules that indicate when a backchannel should be triggered. We will develop on this model to decide the type of backchannel depending on the agent's state and their specific characteristics (that are developed in T6.2)

Deviations from DoA

No deviations to report.

Outlook

The task is still in progress. So far we have worked on detecting the engagement in the user. The next steps would involve integrating a backchannel model that will be capable of triggering specific backchannels based on the agent and its characteristics to maintain user's engagement. The final step will be to evaluate this model.

4.6.5 T6.5 Simulation of Council of Coaching Sessions

Participants

SU, CMC

Objectives

The objectives of this task is to develop and evaluate a non-interactive presentation of our dialogue framework. This implements the notion of "dialogue as performance" where a user can passively watch agents argue without interacting themselves. The main idea of this task is to provide simulations of coaching sessions to the elderly. The simulation will go from scripted scenarios at the beginning of the project to fully interactive scenarios. Through this task we aim: (i) To test user interface and presentation styles at early stages of the development of the virtual coach dialogue framework; (ii) To test the functional design of the argumentation framework developed in WP4 and the interfaces with the GRETA/VIB platform for behaviour generation; (iii) To demonstrate the concept of COUCH as a 3D virtual environment where users can watch using a VR headset;

Progress

This task was planned to start from the second year of the project (M16) and will run throughout the second year and finish in February 2020 (M30). However, this task has started early and an initial evaluation study was conducted which has been reported in D6.2: Initial user interface design for Home UI and Mobile UI in M9. The progress will be reported in various deliverable throughout the project incrementally.

Achievements

This task started earlier than planned (M16). An evaluation study was conducted to understand the effects of status of the agent and persuasion techniques used by the agents on user's persuasion. We conducted this initial study where agents employed persuasive arguments about a very neutral and popular topic of discussion: movies.

From this study, we confirmed that using multiple agents to provide persuasive arguments is better than using single agents and that authoritative agents are perceived to be more credible and persuasive. Further we also observed a tendency where vicarious persuasion (where the aim is to persuade the audience rather than the person with whom a proponent is directly engaged in discussion) was effective.

Deviations from DoA

No deviations to report.

Outlook

This is an ongoing task. We plan to conduct several evaluation studies at the various stages of the project to understand the preference of the users, factors that influence and promote effective behaviour change and also the perception of the models developed throughout the project.

4.7 WP 7: Continuous Integration and Demonstration (UPV)

Main Achievements

The following main achievements result from this work package:

- Performed study on FIWARE and universAAL platforms looking for modules of interest. Created a Webinar on the topic and published it on the project's YouTube channel.
- Studied and agreed on a methodology for architecture formal definition: ARCADE. Trained partners on the ARCADE framework for our architecture definition.
- Defined an initial version of the architecture, including requirements, data models and interfaces (D7.1). This architecture has been continuously updated with any changes and additions to software modules developed in the technical WPs, including new requirements from user studies. These updates made are available as updates to the architecture repository.
- Set up the project repositories in GitLab for later publication as open source. Populated and initialized tools: requirements, issue boards, milestones, members, assignees...
- Set up an issue management process for the creation, tracking and resolution of issues, bugs, and requirement implementations based on the tools available in GitLab.
- Set up a development management procedure with periodic conference calls to report on progress, based on the development boards available in GitLab.

Planning

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T7.1	Technical Requirements, Specifications and Maintenance of APIs	UPV	M4-M30
T7.2	Development and Integration of the Functional Prototype	UPV	M6-M21
T7.3	Development and Integration of the Technical Prototype	UPV	M22-M36
T7.4	Final Demonstration	RRD	M25-M36

4.7.1 T7.1: Technical Requirements, Specifications and Maintenance of APIs

Participants

UPV, CMC, RRD, SU, UDun, iSPRINT

Objectives

This task defines technical requirements for the project's integrated demonstrator(s). The architecture reported in this task will adopt a loosely integrated modular approach, with a focus on clearly defined APIs. Another focus of this task is to select the relevant modules within the FIWARE and universAAL frameworks that will facilitate development and deployment. Finally, this task sets up the process of continuous integration and technical support.

Progress

This task started in M4 and will finish in M36, but the bulk of the effort was concentrated in the first period, until the release of the deliverable D7.1: *System architecture and design of APIs* in M9. The rest of the task is spread out until its finalization in M36, focusing on support and updates to the architecture and requirements.

Achievements

The following major actions have been achieved by the task:

- Performed study on FIWARE and universAAL platforms looking for modules of interest. Hosted a Webinar on the topic and published it on the project's YouTube channel.

- Studied and agreed on a methodology for architecture formal definition: ARCADE. Trained partners on the ARCADE framework for our architecture definition.
- Defined an initial version of the architecture, including requirements, data models and interfaces (D7.1). This architecture has been continuously updated with any changes and additions to software modules developed in the technical WPs, including new requirements from user studies. These updates made are available as updates to the architecture repository.
- Set up the project repositories in GitLab for later publication as open source. Populated and initialized tools: requirements, issue boards, milestones, members, assignees...
- Set up an issue management process for the creation, tracking and resolution of issues, bugs, and requirement implementations based on the tools available in GitLab.
- Set up a development management procedure with periodic conference calls to report on progress, based on the development boards available in GitLab.

Deviations from DoA

Some of the models of the architecture definition, as required if following the ARCADE methodology, are not yet completed. This is because it was difficult at the moment of publication of D7.1 to have a clear idea of the more complete and advanced models, such as deployment, which require implementation details that are not yet available in the development. As details are settled and implementation advances to more complete stages of the prototype, these models will be filled and published.

The intention of incorporating FIWARE and universAAL platforms has resulted in two different approaches: The data models used in Council of Coaches (in particular the Knowledge Base) are designed so that they are interoperable with FIWARE data models. Regarding universAAL, once the final system is complete, it will be made into a universAAL-compliant application by implementing the appropriate connectors and ontologies.

Finally, since the only official deliverable of this task, D7.1, was released in M9, some of the progress made afterwards in this task is tangentially reported in other deliverables in this WP (for instance, the definition of the issue management process, which is included in D7.3).

Outlook

The remainder of the effort of the task will be focused on two continuous lines of work:

- The architecture definition will be constantly updated to reflect changes and additions as they happen. Updates to the architecture are made available in the architecture repository in GitLab.
- Continuous Integration and Technical support will be provided according to the testing and issue tracking setup. This is expected to be more important towards the end of the task, when the demonstration period begins, since current issue resolution is more a responsibility of the ongoing development performed in T7.2 and T7.3.

4.7.2 T7.2: Development and Integration of the Functional Prototype

Participants

UPV, CMC, RRD, SU, UDun

Objectives

This task develops and maintains the functional prototype, which at first serves as a driver and testbed for the platform specifications as defined in T7.1. The functional prototype evolves across the planned milestones, starting with a working Wizard-of-Oz type prototype in M9. Then the functional prototype is constantly updated and expanded with features developed in WP3, WP4, WP5 and WP6, as well as input from user-engagement efforts in WP2. The functional prototype provides a realistic view of the

capabilities of the Council of Coaches applications. Its main purpose is to demonstrate the system's external behaviour, functionalities, and visual aspects.

Progress

The task started in M6 and will finish in M21. It is divided in prototype iterations, after which a deliverable reports the release of each prototype as a packaged software. The first two iterations have been completed and reported: D7.2 *Initial functional prototype* and D7.3 *Second functional prototype*. The third and final functional prototype before the completed system is ongoing.

Achievements

The following major actions have been achieved by the task:

- Uploaded initial codebase to GitLab repositories.
- Set up Technical Integration Taskforce, in charge of coordinating work of developers across technical WPs in order to integrate their progress into a cohesive prototype.
- Split development efforts between Functional Prototype and Technical Prototype. The Technical Prototype holds the current overall integrated system, which in some aspects may still be rough to be evaluated by end users in WP2. The Functional Prototype wraps the more stable inner modules with mock-up interfaces (starting with the so-called Wizard of Oz prototype) of evolving complexity, representing the idealized interfaces that users can evaluate.
- Held face-to-face workshops to coordinate efforts of the Technical Integration Taskforce and speed up development in a coordinated way.
- Development, packaging and release of the First Functional Prototype (D7.2).
 - Modified DGEP to support message-oriented architecture.
 - Send BML from Flipper and Behavior Planner, via ActiveMQ, into ASAP & Greta.
 - Full integration between DGEP, Flipper, ASAP and Greta.
 - Set of sample dialogues to be used in Initial Functional Prototype.
 - Enhanced representation and movement of coaches according to personality.
- Development, packaging and release of the Second Functional Prototype (D7.3).
 - Analyse results of evaluation of First Functional Prototype and identify new requirements.
 - Determine enhanced scenarios for Second Functional Prototype: concrete age-related scenario.
 - Inclusion of Greta agent into Unity scene along with embedded browser.
 - Enhanced sensor data gathering and native integration with FIWARE platform.
 - Design of data models and interfaces for the Knowledge Base
 - Conversion of Yarn to DGD L
 - Enhanced gaze behaviour

Deviations from DoA

The initial plan was to have a Functional Prototype that would eventually become a finalized Technical Prototype. However, because the development is performed in an integral way, these two efforts were set up in parallel: The Technical Prototype holds the current overall integrated system, which initially lacks some modules still in development, and in some aspects is still rough to be evaluated by end users in WP2. The Functional Prototype wraps the more stable inner modules at each milestone with mock-up interfaces (starting with the so-called Wizard of Oz prototype) of evolving complexity, representing the idealized interfaces that users can evaluate.

There was a delay in the delivery of D7.3 *Second Functional Prototype*. The delivery was delayed because of the work on a unified and simplified one-click executable installer could not be done, due to personal circumstances. Both the Functional and Technical prototypes in their planned status were available on

the expected date, but only as source code in the repository. It was the installer, instructions and attached documentation that was missing at that point. Therefore the delay in the delivery of D7.3 does not represent a delay in the development efforts.

Outlook

Development continues on the Functional and Technical Prototypes for the third version to be reported in D7.3. The division in these two lines continues to be useful, as well as the Technical Integration Taskforce, which will hold other workshops (to be determined).

4.7.3 T7.3: Development and Integration of the Technical Prototype

Participants

UPV, CMC, SU, UDun

Objectives

The output of this task is the final system prototype that will be used for the project's demonstration in T7.4. The final demonstration requires a fully working client-server architecture in order to facilitate real-time sensing and data collection and the connection between home and mobile based user interfaces. This task deals with the provisioning of the infrastructure that enables the running of the various modules defined and developed in WP3-WP6, developing and supporting the prototype's deployment.

Progress

This task has not started yet.

Achievements

This task has not started yet.

Deviations from DoA

This task has not started yet.

Outlook

This task has not started yet.

4.7.4 T7.4: Final Demonstration

Participants

RRD, CMC, DBT, SU, UDun, UPV

Objectives

This task designs the demonstration trial, considering medical ethical research issues and official approvals from committees. Then the full Council of Coaches system will be evaluated in a real-life setting, focusing on user experience and potential effect, with a non-experimental pre-test/post-test. The system will be deployed among 50 participants in the Netherlands and United Kingdom. Participants will be included based on pre-defined inclusion and exclusion criteria. User experience will be assessed qualitatively and quantitatively, and potential effect will be assessed by health-related factors. Participants will be asked to complete surveys before, during, and after interacting with the system. Systematic data from this activity will be used in large clinical-grade, regulatory-driven demonstrators for generating the evidence necessary for large scale uptake by health systems. To assess the effectiveness of the system, a micro-randomized trial (MRT) will be executed, which enables researchers to study proximal effects of specific intervention components, changes over time, and the factors that moderate those effects.

Progress

This task has not started yet.

Achievements

This task has not started yet.

Deviations from DoA

This task has not started yet.

Outlook

This task has not started yet.

4.8 WP 8: Dissemination and Exploitation (iSPRINT)

Main Achievements

The following main achievements result from this work package:

- Development of communication strategy.
- Early launch of project website and continuous update of content.
- Setup of social media channels and content creation, in line with the project's strategy.
- Creation of dissemination material.
- Submission and publication of scientific papers.
- Plans for standardization and exploitation.
- Iterative and systematic approach of the COUCH business model definition.
- Inventory of standards used in the project.
- Inventory of the possible exploitable outcomes of the project.
- Workshop on regulatory challenges and Opportunities organised.

Planning

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T8.1	Dissemination, Communication and Pre-Marketing Activities	iSPRINT	M1-M36
T8.2	Exploitation and Business Planning	iSPRINT	M25-M36
T8.3	Ecosystem Building of the Open Agent Platform	UPV	M25-M36
T8.4	Standardization Activities	CMC	M7-M30
T8.5	Training activities	RRD	M25-M36

4.8.1 T8.1: Dissemination, Communication and Pre-Marketing Activities

Participants

iSPRINT, CMC, RRD, DBT, SU, UDun, UPV

Objectives

Task T8.1 is related to the dissemination and communication activities, including publications in journals, presentations in conferences and exhibitions, establishing a strong presence in social and electronic media, participating in prominent events and more. A strategic plan will be developed from the start of the project, in order to detail the dissemination and communication activities in terms of specific dates, events, forums etc. Prior to this, T8.1 the task will deliver the project website to foster collaboration between consortium members and raise awareness about project activities.

Progress

The activities of T8.2 are progressing according to the plan with fruitful outcomes that support the awareness creation of the project. More specifically, the project follows a 3-step communication approach that focuses on the communication aspects, as a pre-planned and ongoing activity and continuously and gradually evolving process, far beyond the project consortium: (1) awareness raising, (2) dissemination, (3) exploitation. In the first reporting period the project has covered the 1st phase and is currently executing activities for of the 2nd period.

So far, the dissemination activities contained:

- 4 press releases
- 9 blog posts on the website
- 2 campaigns on the website

- 1 YouTube webinar
- 1 Facebook live interview
- 70 Twitter posts (142 followers)
- 35 Facebook posts (>3k users reached)
- 12 Google+ posts
- 19 LinkedIn posts
- 9 YouTube videos with >500 views
- 12 oral presentations
- 4 poster presentations
- 3 demonstrations/demo booth
- 4 workshops for external participants
- 1 mention in a radio show
- 1 mention in a newspaper
- 12 scientific publications
- 1 training activity
- 2 mentions during educational activities

Overall, the project has both excellent scientific and popular dissemination activities, and we estimate the total audience reached to be over 10.000 individuals.

Achievements

The achievement of T8.1 are listed below:

- On-time submission of deliverables D8.1, D8.2, D8.3.
- Development of communication strategy.
- Early launch of project website and continuous update of content.
- Setup of social media channels and content creation, in line with the project's strategy.
- Creation of dissemination material.
- Submission and publication of scientific papers.

Deviations from DoA

No deviations from the DoA to report.

Outlook

Task 8.1 will strengthen the communication activities in the direction of supporting exploitation activities of the project.

4.8.2 T8.2: Exploitation and Business Planning

Participants

iSPRINT, CMC, RRD, DBT, SU, UDun, UPV

Objectives

This task has the goal to align the exploitation plans of the partners towards an overall exploitation plan of the project. The execution of the overall exploitation plan of the project will be managed in this task ensuring exploitation of COUCH results as early as possible. As part of T8.2, the project's exploitable assets are specified, along with the exploitation modalities that each partners will employ in order to benefit from these assets. An exploitation agreement regulating IPR shares and the partners' relationships in the scope of the foundation will be also prepared. As part of the exploitation plans, the partners will also specify business plans for specific exploitable assets, including market analysis and financial analysis.

Progress

Even in the first year of the project, COUCH has identified key exploitable outcomes, as well as a strategy towards standardization and exploitation.

The project has organized a **workshop on “Innovation uptake in eHealth with patient-centeredness and gamification. Regulatory challenges and opportunities”**. The workshop was held on 7th November 2018 with the scope to brainstorm the status of the regulatory and ethical scenario in the context of eHealth and expose the state of the art of COUCH, jointly with two other EC projects. Experts from the industry and the regulatory environment discussed the process-to-market implications especially at the light of the Regulatory framework in the clinical research and uptake in the healthcare scenario.

Achievements

The achievement of T8.2 are listed below:

- Submission of deliverables D8.6 and D8.7
- Inventory of the possible exploitable outcomes of the project has been performed.
- Iterative and systematic approach of the COUCH business model definition
- Workshop on regulatory challenges and Opportunities organised.

Deviations from DoA

Deliverable D8.6 was submitted on M15, in order to include tangible outcomes of the exploitation and standardization efforts. The late submission has been agreed with the EC, in order to include more information that will be the basis for exploitation in the next months of the project.

Outlook

The exploitation plans for the different assets will be developed further.

4.8.3 T8.3: Ecosystem Building of the Open Agent Platform

Participants

UPV, CMC, RRD, SU, UDun

Objectives

Linked to the dissemination and marketing activities of the previous tasks, this task will focus on building a network of interested parties for the Open Agent Platform. This network will include developers, vendors, service providers and other stakeholders.

Progress

The task has not started yet.

Achievements

Nothing to report.

Deviations from DoA

No deviations to report.

Outlook

This task will start at Month 25

4.8.4 T8.4: Standardization Activities

Participants

CMC, RRD, UPV

Objectives

This task will focus on the project's contribution to standards. The goal of this task is to monitor standardization/pre-standardization activities that are linked to the activities of the project and ensure the compliance of the project results with existing standards or drafts. The task will work on innovation management through standardisation, by monitoring closely related standardisation activities and identifying gaps and missing links in current standards/drafts (especially related with eHealth/eCare solutions) and provide feedback to WP3, WP4, WP5 and WP6 for pursuing innovative research to address these shortages.

Progress

The progress in this task has been reported on in D8.6 and D8.7, the initial and intermediate plans for standardization. D8.6 has been delayed since the initial plans for exploitation that are described in the project were not completely developed at such an early stage in the project. Therefore, we chose to submit the deliverable in a later stage, when ideas have become more tangible.

For the standardization activities, an initial overview has been made that describes the different standards used in the project. Possible contributions to these standards have been listed in the initial plan. An update is provided in D8.7, however, since D8.6 was significantly delayed, this will not be a very significant update.

Achievements

- An inventory set up of the different standards used in the project.

Deviations from DoA

No deviations have been foreseen so far.

Outlook

The standardization activities will continue as planned. We aim to establish some contributions to standards in the e-health sector, as well as setting up an open agent platform with accompanying standards.

4.8.5 T8.5: Training activities

Participants

RRD, CMC, DBT

Objectives

This task will be devoted to raising awareness of the Open Agent Platform, including virtual coaching training in general and in the projects' solutions in particular. Relevant training materials will be developed, which will be used in the scope of both on-line training and face-to-face training of different stakeholders. As part of the task the project will develop online training resources (e.g., webinars), while at the same planning face-to-face training workshops (as illustrated in §2).

Progress

No progress has been made so far, since the task hasn't started yet.

Achievements

No achievements to report.

Deviations from DoA

No deviations from the DoA.

Outlook

The task will start in M25.

4.9 WP9: Ethics (CMC)

Main Achievements

The following main achievements result from this work package:

- Creation of awareness of ethical issues in the council of Coaches project.
- Council of Coaches guidelines on how to handle personal data have been created
- Privacy Impact Analyses has been performed
- Templates for informed consent forms have been created
- Design of the informed consent procedure.

Planning of Tasks:

WP / Task	Title	Lead	Months
WP1	Management	CMC	
T9.1	Human	CMC	M1-M12
T9.2	Protection of Personal Data	CMC	M1-M12

4.9.1 T9.1: H- Requirements No. 1

Participants

CMC, RRD, DBT, SU, UDun, UPV, iSPRINT

Objectives

The objectives as described in the DoA are:

- 2.1. Details on the procedures and criteria that will be used to identify/recruit research participants must be provided.
- 2.2. Detailed information must be provided on the informed consent procedures that will be implemented for the participation of humans.
- 2.3. Templates of the informed consent forms and information sheet must be submitted on request.
- 2.6. The applicant must clarify whether vulnerable individuals/groups will be involved. Details must be provided about the measures taken to prevent the risk of enhancing vulnerability/stigmatisation of individuals/groups.
- 2.9. Copies of ethics approvals for the research with humans must be submitted.

Progress

In some projects, the required ethics deliverables are treated as just another checkbox on a list. Once the content of the deliverable has been created, one can write it down and continue as before. However, in the Council of Coaches project, one of the aims of the project management has been to create awareness within the project about the ethical aspects of the project. Privacy and the vulnerability of our end users should be respected and taken into account when designing and testing our prototypes.

Incorporating these topics in the project has been a bit of a balancing act, especially because in WP 2, an RRI vision has already been created. Fortunately, as the project and the RRI vision came to ripen, it became clear that the deliverables as described in WP 9 were a nice start to several RRI discussions. In return, the awareness created through the RRI vision workshops was helpful in collecting the data necessary for the deliverables.

For the deliverable about studies involving human subjects, we asked everyone in the project to describe their test setups during the bi-weekly telco's. This way the entire team could provide feedback and, more importantly, learn from each other in how to set up a study involving humans the correct way. For the

deliverable, each team that has set up studies were asked to submit their information leaflets and consent forms. These were checked by the project management before being used in the testing.

If necessary, the partner that conducted the tests was asked to get ethical approval from their local ethical boards. In some cases, this has been granted, but in others it was not deemed necessary by the ethical boards themselves.

Achievements

Awareness has been created among the researchers in Council of Coaches on how to handle ethical issues in the project. An overview of all studies involving human subjects has been provided, including information letters, consent forms, and, if possible, ethical approvals.

Deviations from DoA

There are no deviations from the DoA.

Outlook

The Work Packages has finished with the submitting of the deliverables. However, together with the RRI researchers, the topics will be kept alive and discussed.

4.9.2 T9.2: POPD- Requirements No. 2

Participants

CMC, RRD, DBT, SU, UDun, UPV, iSPRINT

Objectives

The objectives as described in the DoA are:

- 4.1. Copies of opinion or confirmation by the competent Institutional Data Protection Officer and/or authorization or notification by the National Data Protection Authority must be submitted (which ever applies according to the Data Protection Directive (EC Directive 95/46, currently under revision, and the national law).
- 4.2. If the position of a Data Protection Officer is established, their opinion/confirmation that all data collection and processing will be carried according to EU and national legislation, should be submitted.
- 4.4. Detailed information must be provided on the procedures that will be implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation.

Progress

The first year of the project has been interrupted by the introduction of the GDPR on May 25th, 2018. It was our conscious decision to follow the rules and regulations as stated by the GDPR even before this law was enforced. This way we would create a uniform approach to personal data over time as well as over partners, since with the introduction of the law, all partners in the project would be submitted to it anyway.

However, the GDPR is no easy feat. Especially, with the collection of medical data as we are foreseeing in this project, we need to be really careful on how to handle these data. As project management we therefore translated the GDPR into guidelines within the project on how to handle personal data as well as possible. A privacy impact analyses has been conducted to see which aspects could be improved even further.

A “cheat sheet personal data” has been created, for everyone to hang above their desks. It is meant as a quick reference guide that researchers can easily use in their day to day life. This way, we have tried to give the GDPR as much attention as possible in the day to day practice. The deliverable in which the guidelines were discussed in more detail has been sent to all researchers to implement during their work. During the consortium meetings, several presentations have been held specifying the GDPR in general

and the specific project guidelines in particular. This way we could discuss specific topics, take away worries and educated everyone on how to handle personal data properly.

Together with the RRI researchers, through the RRI discussion in which privacy was and is a big issue, we worked on incorporating as much of the privacy aspects in the prototypes as possible. This has resulted in a clear idea on how to inform the end users about their rights as data subjects. This approach has been described in section 2.3.3 about the consent dialogue.

Each partner has had their approach to personal data (the general Council of Coaches approach) validated by their DPO, if these were appointed.

Achievements

We have created awareness on GDPR, personal data handling and privacy. Dedicated Council of Coaches Guidelines have been laid out in the deliverable and been printed in a "Personal Data Cheat Sheet". DPO approvals have been received. A solution towards the informed consent procedure has been developed.

Deviations from DoA

We have gotten in contact with the PO since some of the descriptions in the DoA were not quite clear to us. As discussed with the PO, point 4.1 as specified in the objectives could be disregarded. *All partners should seek approval from their local DPO's. In cases where that was not possible, expert advice should be obtained.*

Some of the partners did not have a DPO set up by the time we required the approvals. However, since all partners submitted the same set of information (description of the guidelines in the deliverables and the cheat sheet), we assumed getting extra expert advice would not be necessary, if the other DPO's had already given their approval.

Outlook

One of the comments from the DPO from Dundee was that a data processing agreement should be in place, when we want to share the data between the partners. This was not the case and even though everyone was working with the same guidelines it is still advised by Dundee's DPO.

However, after asking several legal departments we have not received any clear instructions on how to do so. Even worse, with Brexit around the corner (or not), we prefer to wait to see what the legal position of the UK is going to be and which regulations they will and will not follow.

This is still an ongoing point in the personal data discussion and we hope to solve it as soon as possible.

In the meantime, all datasets have been anonymized or pseudonymised in order to be able to share them between partners.

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