DECISION

Subject: **Memorandum of Understanding for the implementation of the COST Action "Network on Privacy-Aware Audio- and Video-Based Applications for Active and Assisted Living" (GoodBrother) CA19121**

The COST Member Countries and/or the COST Cooperating State will find attached the Memorandum of Understanding for the COST Action Network on Privacy-Aware Audio- and Video-Based Applications for Active and Assisted Living approved by the Committee of Senior Officials through written procedure on 24 March 2020.

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MEMORANDUM OF UNDERSTANDING

For the implementation of a COST Action designated as

COST Action CA19121
NETWORK ON PRIVACY-AWARE AUDIO- AND VIDEO-BASED APPLICATIONS FOR ACTIVE AND ASSISTED LIVING (GoodBrother)

The COST Member Countries and/or the COST Cooperating State, accepting the present Memorandum of Understanding (MoU) wish to undertake joint activities of mutual interest and declare their common intention to participate in the COST Action (the Action), referred to above and described in the Technical Annex of this MoU.

The Action will be carried out in accordance with the set of COST Implementation Rules approved by the Committee of Senior Officials (CSO), or any new document amending or replacing them:
a. "Rules for Participation in and Implementation of COST Activities" (COST 132/14 REV2);
b. "COST Action Proposal Submission, Evaluation, Selection and Approval" (COST 133/14 REV);
c. "COST Action Management, Monitoring and Final Assessment" (COST 134/14 REV2);
d. "COST International Cooperation and Specific Organisations Participation" (COST 135/14 REV).

The main aim and objective of the Action is to design privacy-aware solutions to support older, impaired, and frail people in their daily life as well as to increase the awareness of the ethical, legal, social, and privacy issues associated to audio- and video-based monitoring in private spaces. This will be achieved through the specific objectives detailed in the Technical Annex.

The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 112 million in 2019.

The MoU will enter into force once at least seven (7) COST Member Countries and/or COST Cooperating State have accepted it, and the corresponding Management Committee Members have been appointed, as described in the CSO Decision COST 134/14 REV2.

The COST Action will start from the date of the first Management Committee meeting and shall be implemented for a period of four (4) years, unless an extension is approved by the CSO following the procedure described in the CSO Decision COST 134/14 REV2.

OVERVIEW

Summary

Europe faces crucial challenges regarding health and social care due to the demographic change and current economic context. Active and Assisted Living (AAL) are a possible solution to face them. AAL aims at improving health, quality of life, and wellbeing of older, impaired and frail people. AAL systems use different sensors to monitor the environment and its dwellers. Cameras and microphones are being more frequently used for AAL. They allow to monitor an environment and gather information, being the most straightforward and natural ways of describing events, persons, objects, actions, and interactions. Recent advances have given these devices the ability to 'see' and 'hear'. However, their use can be seen as intrusive by some end users (assisted persons, and professional and informal caregivers.)

The General Data Protection Regulation (GDPR) establishes the obligation for technologies to meet the principles of data protection by design and data protection by default. Therefore, AAL solutions must consider privacy-by-design methodologies in order to protect the fundamental rights of those being monitored.

The aim of GoodBrother is **to increase the awareness on the ethical, legal, and privacy issues associated to audio- and video-based monitoring and to propose privacy-aware working solutions for assisted living**, by creating an interdisciplinary community of researchers and industrial partners from different fields (computing, engineering, healthcare, law, sociology) and other stakeholders (users, policy makers, public services), stimulating new research and innovation. GoodBrother will offset the "Big Brother" sense of continuous monitoring by increasing user acceptance, exploiting these new solutions, and improving market reach.

Areas of Expertise Relevant for the Action	Keywords
● Electrical engineering, electronic engineering, Information engineering: Computer vision ● Computer and Information Sciences: Ethics of computer and information sciences ● Computer and Information Sciences: Cryptology, security, privacy ● Clinical medicine: Geriatrics and gerontology	● Active and healthy aging ● Privacy ● User acceptance ● Computer vision ● Audio signal processing

Specific Objectives
To achieve the main objective described in this MoU, the following specific objectives shall be accomplished:

Research Coordination
● Promote the sustained collaboration between and across multiple disciplines, by involving researchers and companies from the different areas involved in audio- and video-based AAL systems; as well as other stakeholders, i.e. end users, policy and decision makers, advocacy groups.
● Support a multidisciplinary, multi-cultural, multi-societal, gender- and age-based analysis of user acceptance.
● Analyse ethical, legal, and data protection issues, by examining the data protection obligations of monitoring technologies for AAL; also create and promote guidelines to drive the design of privacy-compliant solutions addressing the GDPR obligations.
● Disseminate and communicate privacy-aware AAL technologies among the stakeholders, via the publication of conference and open-access journal papers and the organisation of activities for public engagement to increase user awareness and gather relevant input, and target events attended by industry-related stakeholders.
● Provide a strategic research and innovation roadmap to policy and decision makers and funding bodies, by proposing a certification on ethical and legal compliance of AAL services.

● Foster collaboration with the industry and service providers, facilitating the route to market.

Capacity Building

● Establish a common multidisciplinary forum of researchers from a variety of disciplines and at different career stages (experienced researchers and ECIs), SMEs, large companies, end users, service providers, and policy and decision makers, to progress in the design of ethical-aware AAL systems.

● Foster the research by providing a curated repository of software and data, establishing guidelines to acquire audio and video data sets following ethical and legal requirements; also collect and promote the collection of public data sets to address this research gap.

● Support the future leadership of ECIs, facilitating their mobility via STSMs, their multidisciplinary training, and their participation in research programmes, in order to develop their expertise and abilities; and establish a mentorship programme so that experienced researchers could advise and guide the ECIs.

● Support the research in Inclusiveness Target Countries and Near-Neighbour Countries, by organising and supporting events in those countries in order to enhance their research force and outcomes and increase their visibility among the local institutions, funding bodies, industry and the general public.

TECHNICAL ANNEX

1 S&T EXCELLENCE

1.1 SOUNDNESS OF THE CHALLENGE

1.1.1 DESCRIPTION OF THE STATE-OF-THE-ART

Currently, 30% of 65 to 80 years old require long-term care. This percentage reaches 50% for those over 80[i]. EU Member States spend a quarter of their GDP on social protection[ii]. These expenditures present a significant economic opportunity related to the needs of the population over 50, i.e. the Silver Economy[iii]. According to Euromonitor[iv], the Silver Economy will reach $15 trillion by 2020 globally.

Active and Assisted Living (AAL) technologies and services are a possible solution to address the crucial challenges regarding health and social care resulting from demographic changes and current economic conditions. AAL systems aim to improve quality of life and support independent and healthy living of older and frail people. AAL monitoring systems are composed of networks of sensors (worn by the users or embedded in their environment[v,vi]), processing elements, and actuators that analyse the environment and its occupants to extract knowledge and to detect events, such as anomalous behaviours, launch alarms to tele-care centres, or support activities of daily living. Therefore, innovation in AAL can address healthcare and social demands while generating economic opportunities.

The last years have witnessed the development of audio- and video-based devices with improved processing capabilities, heightened quality, wireless data transfer, and increased interoperability with Internet of Things (IoT) devices. Off-the-shelf products such as Amazon Echo, Google Home, Nest Cam have been adopted for everyday use for human-computer/environment interaction, streaming, recording, or video summarisation. Cameras and microphones can offer more intelligent solutions for AAL but may be considered intrusive by some end users (assisted persons[vii], and professional and informal caregivers[viii].) However, users acceptance would increase if they were deemed more beneficial in terms of improved medical safety and care provision, while respecting privacy.

Coincident with the aforementioned commercial trend, research on the use of these devices for AAL has considerably increased in the last years, as audio and video make it possible to monitor an environment and gather information, being the most straightforward and natural ways of describing events, persons, objects, actions, and interactions. Moreover, recent advances in computer vision, speech analytics and audio fingerprinting have given these devices the ability to 'see' and 'hear', functionally evolving to become 'smart'. This advance has led to the development of intelligent systems that are not only able to stream in real time, but also extract useful information from audio and visual data to analyse actions, activities and behaviours from that stream. Additionally, the use of smart speakers support a bidirectional interaction so that the user could receive information from the system.

Cameras and microphones have been been applied to diverse AAL solutions[,ix,x,xi,xii,xiii] supporting active and healthy ageing e.g. gait analysis, fall detection and prevention, rehabilitation, social communication, personal assistants, promotion of healthy lifestyles, physiological monitoring, and support to caregivers. However, their use is currently restricted to research works with limited presence in the market due to the special characteristics of homes, where occlusions created by unconstrained and usually cluttered spaces difficult video analysis, the concern that smart speakers are secretly recording everything that is said; and, mainly, because of the ethical, legal and privacy associated issues. This has been

exacerbated by the news that big companies were listening to customer voice recordings without authorisation in order to train their speech recognition systems.

There have been studies analysing users' views about what, when, and how data can be collected and processed, and who can be the recipient of data in AAL systems. One of the users' main concerns about the use of AAL technologies and services is related to the possibility of collecting data, to whom it will be disseminated and how it will be used[xiv]. Therefore, even if users may recognise the benefits of using AAL systems, they may reject them because of privacy concerns or complexity of use. However, they may lower their privacy requirements if their health status is poor[xv], and they would probably accept cameras and microphones if they would help them[xvi]. Users also have serious concerns about data delivery without consent, illegal access, and financial-related issues.

The General Data Protection Regulation (GDPR)[xvii] establishes the obligation for technologies to meet the principles of data protection by design and data protection by default. Therefore, AAL solutions must consider privacy-by-design methodologies in order to protect the fundamental rights of those being monitored. De-identification is a key approach for privacy protection, by concealing, removing or replacing sensitive data, in order to support core privacy goals like anonymity, unlinkability, minimal disclosure of personally identifiable information, as well as information security[xviii,xix,xx]. However, de-identification can often affect the utility of the data. Where de-identification methods are not appropriate, alternative techniques and strategies must be relied upon as potential responses to legal requirements. Here, the application of legal automation to "hard wire" relevant laws into computer code is one such possibility. The application of a Data Protection Management System can further be relied upon to record data processing operations, manage data flows and assist with data breach management.

1.1.2 DESCRIPTION OF THE CHALLENGE (MAIN AIM)

The current model of institutional long-term care provision means an unbearable burden for the European health and social care systems. Therefore, changes are urgently needed in how care and assisted living are provided. AAL is a means to transform care provision by allowing older people to self-manage their healthcare and to enlight families demanding caregiving tasks at home. The Silver Economy offers an opportunity for innovation that GOODBROTHER will exploit.

While monitoring technology for public security is relatively mature, attention is now focused on the use of this technology as an adjunct to, or combined with equipment to offer AAL services. Acceptance of such technologies is also low because they create a sense of Orwellian "Big Brother" surveillance. The aim of the GOODBROTHER Action is **to design privacy-aware solutions to support older, impaired, and frail people in their daily life** as well as **to increase the awareness of the ethical, legal, social, and privacy issues associated to audio- and video-based monitoring in private spaces**.

GOODBROTHER embraces the Responsible Research and Innovation (RRI) approach, by engaging an interdisciplinary community of researchers and industrial partners from different fields (computer science, engineering, healthcare, law, business, psychology, sociology) and other stakeholders (end users, policy and decision makers, advocacy groups, public services); by considering gender balance in the consortium, and the gender, cultural, ethical and social dimensions in the research and innovation (R&I) on AAL technologies; and by promoting transparency and accessibility of the research and its outcomes with an important number of activities of public engagement and open-access dissemination. This will allow GOODBROTHER to offset the "Big Brother" effect by increasing user acceptance, exploiting these new technologies and services, and improving market reach.

The outcomes of GOODBROTHER will allow the design of privacy-aware AAL systems, leading to a breakthrough in the development of solutions for intelligent and self-adaptive environments with the aim to support independent living for everyone and, in particular, for the people who require the constant attention of a carer, allowing a better quality of life and greater efficiency of their care.

1.2 PROGRESS BEYOND THE STATE-OF-THE-ART

1.2.1 APPROACH TO THE CHALLENGE AND PROGRESS BEYOND THE STATE-OF-THE-ART

There is a paucity of knowledge about the fragile limits between the wish to live independently at home feeling safe and secure on the one hand, and the feeling of loss of control and the disliking of intrusion in private spheres on the other hand. The investigation of functional requirements but also the acceptance of these systems as well as emotional barriers in the home environment is for all persons,

but especially for frail seniors of key importance. In contrast to the advanced technological innovations in solutions to be implantable in homes, the knowledge about the human factor is still considerably underdeveloped. Aspects of humans' technology acceptance, the detailed study and the willingness to accept technology within living spaces as well as the individual usage motives and barriers are mostly disregarded or underestimated. As any successful rollout of such sensitive technologies requires the acceptance of users, research should also consider the way these technologies meet users' needs with respect to privacy, dignity, and their requirements for as useful perceived smart home technologies.

There are currently a number of research projects developing audio- and video-based AAL solutions and some others analysing users' acceptance of those solutions. There are also some companies starting to transfer previous expertise in video-surveillance for security in order to offer safety at home, in care homes, or in hospitals; policy makers (e.g. the Care Quality Commission in the United Kingdom) establishing recommendations for the use of cameras in care homes[xxi]; some US states approving the use of monitoring technologies in assisted living communities; and service providers consulting the support to these systems[xxii]. However, most of these initiatives have a limited scope, as they are constrained to specific countries, AAL services, or population sectors.

The collaborative approach allows this Action to be characterised by three research "pillars": user-driven research, transdisciplinary working, and evidence-based responsible research and design, where all the participants will play significant roles. GOODBROTHER provides a stimulating environment to nurture international, interdisciplinary and intersectoral cooperation among these stakeholders, in order to create significant contributions to progress beyond the state-of-the-art in different aspects:

- **Comprehensive analysis of social responsibility issues.** GOODBROTHER will study the ethical, social, and privacy issues associated to the use of cameras and microphones in private environments, which currently hinder the deployment of these systems due to low user acceptance. In these spaces, where mostly only one person would be present (e.g. an older person living alone), user identification might not be an issue; concerns are more related to the disclosure of what is said, appearance (e.g. if the person is dressed/naked) and behaviour. It will also be of interest if the feeling of being monitored can be implemented such that users' needs in terms of protection and dignity are respected.

- **Guidelines for creating privacy-aware AAL solutions.** A document will be published with guidelines stating the requirements that need to be considered by researchers and developers of audio- and video-based AAL systems. These guidelines will specify the ethical, legal and privacy issues linked to these systems and how to integrate them in the design. Starting points include but are not limited to previous works on Data Management Plans, impact analyses of privacy, ethics and data protection (PIA, EIA, DPIA) and interactive diagnostic modules. This will ensure that significant factors, such as those related to culture, varying national policies, and different environmental contexts will be taken into account in the resulting technologies.

- **Privacy-aware video-based AAL systems.** Collaboration between experts in data analytics and privacy preservation methods, and experts in privacy and ethics will foster the development of systems that follow privacy-by-default and privacy-by-design approaches. As a result, new methods for online analysis of audio and video will be developed, considering the privacy issues related to the acquisition, processing, storage and transmission. These methods also need to address additional issues (e.g. multiparty privacy[xxiii], re-identification) in scenarios with multiple persons having different individual privacy preferences. Moreover, the Action will also explore the possibilities offered by the latest technology in order to embed the privacy-preserving and encryption techniques in the microphones and cameras.

- **Reliability.** AAL applications require a high level of reliability in order to reduce the number of incorrect responses (e.g. false alarms) as well as to ensure that private data is not disclosed, increase users' trust and reduce the stress of caregivers. Although the final deployment of these systems differs according to the service that they offer, they use similar processing techniques. Therefore, advances in any of these techniques may significantly contribute to more robust and accurate results for other applications.

- **Repository of software and data.** GOODBROTHER will create a repository of audio- and video-based monitoring software. Initially, it will collect existing AAL solutions and data. Later, it will be extended as a result of the activities carried out by the Action. This repository will be particularly useful for Early Career Investigators (ECIs), facilitating the development of early prototypes, and

for Inclusiveness Target Countries (ITCs), which may not own the resources to initiate or develop research. Paramount is the need for data benchmarks recorded for long periods under real conditions. There is a current lack of audio and video data sets fulfilling these requirements. The Action will also publish guidelines to acquire such data sets under legal compliance, will share experiences, and will promote the creation of data sets to establish a benchmarking framework.

GOODBROTHER will contribute to bridging the gap between end users' requirements and AAL solutions, by establishing mechanisms to ensure a fluent interaction between the experts understanding the gamut of ethico-legal issues linked to monitoring technologies; and those developing privacy-aware and ethical AAL technologies and services. The scientific and technical innovations will lead to robust and reliable systems, which will provide more valuable and trustworthy services for end users; disrupting not only current monitoring solutions for AAL but many other audiovisual services offered for private environments, as security, person-environment interaction, and gaming. These synergies will facilitate development and deployment, speeding up the route to market for these AAL solutions.

1.2.2 OBJECTIVES

1.2.2.1 Research Coordination Objectives

- **Objective 1. Promote the sustained collaboration between and across multiple disciplines.** The Action will involve researchers and companies from the different areas involved in audio- and video-based AAL systems: computer vision, audio processing, healthcare, ethics, law, health economics, and assistive technologies. GOODBROTHER will also involve other stakeholders, i.e. end users, policy and decision makers, advocacy groups, in order to address the issues associated with these AAL applications, which limit their acceptance by users. The Action will organise activities, e.g. Working Group (WG) meetings, conferences, workshops, training schools, and Short-Term Scientific Missions (STSMs), in order to exchange relevant knowledge among the participants.

- **Objective 2. Support a multidisciplinary, multi-cultural, multi-societal, gender- and age-based analysis of user acceptance.** Each individual has their own personal perception about what is private and under which conditions private information may be made available to others. This perception may differ due to gender, social and cultural background, health status, or other personal factors. Therefore, a comprehensive analysis of these issues linked to audio- and video-based monitoring will be carried out, involving academics, end users, healthcare professionals, and advocacy groups, in order to obtain an intercultural acceptance cartography of these technologies. This analysis will guide the design and development of privacy-aware AAL systems.

- **Objective 3. Analyse ethical, legal, and data protection issues.** GOODBROTHER will examine the data protection obligations of monitoring technologies for AAL. Such systems collect a large amount of audio and video data of those individuals seeking to benefit from them. The storage, use and transfer of these data must comply with rigorous data protection laws, particularly, the GDPR. Hence, the Action will create and promote guidelines to drive the design of privacy-compliant solutions addressing the GDPR obligations.

- **Objective 4. Disseminate and communicate privacy-aware AAL technologies among the stakeholders.** The Action will promote the publication of conference and open-access journal papers in order to disseminate its outcomes. This will increase the impact of GOODBROTHER in the research community. There is also a lack of awareness among other stakeholders, i.e. service procurers and providers, end users, and policy and decision makers, about the current state of audio- and video-based technologies and their application to AAL. GOODBROTHER will organise activities for public engagement to increase user awareness and gather relevant input. Additionally, the Action will target forums and fairs, and other events attended by industry-related stakeholders.

- **Objective 5. Provide a strategic research and innovation roadmap to policy and decision makers and funding bodies.** Knowledge generated during the Action will serve to prepare a strategic research agenda in this multidisciplinary area, which may be adopted by European/national policy makers and funding bodies. GOODBROTHER will propose a certification on ethical and legal compliance of AAL services that would be applicable across the Member

States. The Action will also lay the groundwork for the creation of an organisation in charge of granting this certification.

- **Objective 6. Foster collaboration with the industry and service providers, facilitating the route to market.** While research in audio- and video-based solutions has progressed significantly in the last years, the presence of solutions in the market is very limited. Most of the developments do not exceed the Technology Readiness Level (TRL) 5. The Action will provide mechanisms to facilitate interaction with key industry and services to enhance adoption, sustainability, and scalability of reliable technologies, e.g. Industry Days and STSMs of ECIs in the industry. GOODBROTHER will promote the cooperation in joint R&I projects between researchers, industry partners and service providers. These activities will contribute to reaching TRL 6 to 9.

1.2.2.2 Capacity-building Objectives

- **Objective 7. Establish a common multidisciplinary forum.** GOODBROTHER will constitute a network of researchers from a variety of disciplines and at different career stages (experienced researchers and ECIs), SMEs, large companies, end users, service providers, and policy and decision makers, to progress in the design of ethical-aware AAL systems. The Action will foster the exchange of knowledge, ideas and solutions, creating interdisciplinary WGs working alongside in order to fulfil its aim. The Action will organise specific dissemination and communication activities, and it will provide a website and social media updated with relevant information, in order to involve other stakeholders and reach the general public.

- **Objective 8. Foster the research by providing a curated repository of software and data.** Researchers in GOODBROTHER work in different AAL applications. However, most of these applications share similar processing stages: data acquisition and pre-processing, feature extraction and recognition. Making accessible their software will facilitate and speed up the development of privacy-aware robust and effective solutions. Another relevant current problem is the lack of audio and video data, acquired in real family or care homes, for validating longitudinal AAL studies. Hence, the Action will establish guidelines to acquire those data sets following ethical and legal requirements and will collect and promote the collection of public data sets to address this research gap. Besides, many research groups and companies worldwide have limited resources, either to develop software from scratch or to obtain quality data to validate their developments. GOODBROTHER will then support research by joining the EC Open Research Data Pilot, and making public this software and data to the R&I community.

- **Objective 9. Support the future leadership of ECIs.** GOODBROTHER will attract a mass of ECIs, facilitate their mobility via STSMs in either research institutions or companies, their multidisciplinary training, and their participation in research excellence programmes, e.g. Marie Skłodowska-Curie or ERC, in order to develop their expertise and abilities, paving the way to their future leadership. The Action will also establish a mentorship programme so that experienced researchers could advise and guide ECIs in their research and career paths.

- **Objective 10. Support the research in Inclusiveness Target Countries (ITCs) and Near-Neighbour Countries (NNCs).** The Action will consider the different capacities in research across Europe and neighbouring countries. Therefore, GOODBROTHER will organise and support events in those countries in order to enhance their research force and outcomes, and increase their visibility among the local institutions, funding bodies, industry and the general public. GOODBROTHER will also promote the involvement of participants from ITCs in the management bodies of the Action, and prioritise their participation in the training schools and STSMs. Additionally, the Action will provide ITC Conference Grants so that participants from ITCs could attend relevant conferences.

2 NETWORKING EXCELLENCE

2.1 ADDED VALUE OF NETWORKING IN S&T EXCELLENCE

2.1.1 ADDED VALUE IN RELATION TO EXISTING EFFORTS AT EUROPEAN AND/OR INTERNATIONAL LEVEL

Several European programmes support research and innovation to address the societal challenges of health, demographic change and wellbeing, and more secure societies: Horizon 2020, Ambient Assisted Living Joint Programme, European Innovation Partnership on Active and Healthy Ageing, EIT Health, More Years Better Lives Joint Programming Initiative, and Erasmus+. However, the projects funded by these programmes have limited coverage in terms of AAL applications, technologies used, diversity of end users, and countries. GOODBROTHER, as a trans-European networking instrument, will overcome these limitations. In fact, many proposers in the Action are already involved in projects under those programmes, and their outcomes will be contributed to GOODBROTHER. Therefore, this Action will serve as a means for collaboration, knowledge exchange, dissemination, and exploitation at the European level. Additionally, the participation of non-European research institutions, networks of stakeholders, and associations on assistive technologies will contribute to having relevant input and impact worldwide.

Some projects in AAL (e.g. FAIRLESS, MOBECS, CAMELI, GameUp, PAAL, CAPTAIN) have dealt with the use of cameras or microphones for specific AAL applications or the ethico-legal issues linked to their use. Under EU Framework programmes, some projects, such as ADDPRIV, ADVISE, INDECT, SAPIENT, SMART Prevent, VANAHEIM, have addressed video-based monitoring and its ethical and legal issues, but they were limited to public security. Other projects, e.g. Dem@Care and SEMEOTICONS, have used cameras and microphones for AAL in homes, hospitals or nursing homes, considering ethics and the legislation of different countries. However, they did not specifically address audio-visual privacy protection. Some FP7 projects, as SENIOR and SAPIENT, focused on ethico-legal matters and user acceptance of ICT and monitoring technologies in general. GOODBROTHER will analyse the outcomes of these projects and will extend and concretise for the use of microphones and cameras in private spaces. There are also some COST Actions partially related to the topics addressed in GOODBROTHER (intelligent environments, data protection, video and audio analytics): CA16226 – Indoor living space improvement: Smart Habitat for the Elderly, CA16116 – Wearable Robots for Augmentation, Assistance or Substitution of Human Motor Functions, and CA15222 – European Network for cost containment and improved quality of health care.

The Action will establish collaborations with these active projects, especially with the COST Actions, which are complementary to GOODBROTHER; the European Institute of Innovation and Technology's Knowledge and Innovation Communities IET Digital and IET Health, and the European Innovation Partnership on Active and Healthy Aging in order to cooperate and organise joint activities, creating relevant synergies and reducing costs. GOODBROTHER will also liaise with initiatives for ethics and AI, such as the High-Level Expert Group on Artificial Intelligence of the European Comission, the OECD Council on Artificial Intelligence, or Partnership on AI.

GOODBROTHER will be the largest and broadest attempt to address the challenges of using cameras and microphones as part of AAL systems. This Action includes all the different groups of stakeholders involved in AAL –older persons, formal and informal caregivers, care providers, researchers, industry, policy makers– from across Europe and proposers from other continents. Moreover, GOODBROTHER contribute with their expertise from five out of the six OECD Fields of Science and Technology: natural sciences, engineering and technology, medical and health sciences, social sciences, and humanities. Hence, GOODBROTHER will be unique due to its transdisciplinary, transnational, and intersectoral composition, and its potential global network of collaborators. It will have unprecedented access to international data and multi-cultural user groups to drive the design and utility of new AAL solutions. GOODBROTHER will ensure that significant factors, such as those related to culture, varying national policies, and different environmental contexts will be taken into account. These factors would be impossible to incorporate without the proposed partnerships.

2.2   ADDED VALUE OF NETWORKING IN IMPACT

2.2.1   SECURING THE CRITICAL MASS AND EXPERTISE

GOODBROTHER is initially supported by participants from 28 countries across Europe (including 14 ITCs) and four International Partner Countries (IPC) (Canada, Japan, Brazil, and United States). The rationale for this initial Consortium is to gather expertise, not only technological but related to the differences in the legislation and perception of privacy by different societies. From the initial set of Action proposers, two-thirds proceed from academia or research institutions, half of them approximately with technological expertise and the other half in healthcare, psychology, law, economics, … The remaining third of proposers in GOODBROTHER is composed of other stakeholders (associations of end users, healthcare professionals, industry, advocacy organisations, policy makers) from across Europe, whose contribution

is paramount to achieve the objectives of the Action. Gender expertise is also included in the Consortium, while gender balance amongst all participants is being strived for.

Regarding the industry, GOODBROTHER includes a large company and 12 SMEs that develop technologies for health and wellbeing or solutions for data analytics, or that are involved in the provision of health and care services. The Action also incorporates SMEs and eight NGOs that analyse the social, ethical and legal impact of monitoring technologies, and advocate for the rights of persons. The involvement of users in the Action is ensured with the participation of international organisations that support the use of new technology among older people and are very active in EU-funded research projects. GOODBROTHER also incorporates government and standards organisations.

The proposers currently participate in tenths of European and national R&I projects in areas linked to GOODBROTHER. Additionally to the ECIs initially involved in the proposal, the participants supervise or work in the Action topics with more than 150 PhD students and post-docs in their institutions, who will benefit from the training schools and STSMs.

This initial Consortium ensures a critical mass of participants to achieve the objectives established by the Action. Furthermore, GOODBROTHER will include activities (see Section 2.2.2) to incorporate new participants in order to build a world-leading network of stakeholders interested in privacy-aware AAL applications. Additionally, the Action will invite ad hoc participants who could contribute to specific activities, e.g. training schools, conferences, and workshops.

2.2.2 INVOLVEMENT OF STAKEHOLDERS

As presented in the Ambient Assisted Living Strategic Research Agenda[xxiv] delivered by the AALIANCE2 Coordination Action, the main groups of AAL stakeholders are:

- Primary stakeholders: older persons, their families, informal caregivers;

- Secondary stakeholders: care providers, voluntary associations;

- Tertiary stakeholders: industry, vendors; and

- Quaternary stakeholders: policy makers.

This diversity is already considered in GOODBROTHER where partners included in each of these groups, with different experience, and working across Europe are participating. The Action is also involving international organisations that will contribute to maximising the impact of GOODBROTHER. Moreover, a number of activities will be organised to involve new stakeholders, which could join the MC, participate actively in the Working Groups, or being occasional participants in specific activities.

Every year GOODBROTHER will participate in European, national and regional events attended by most of the relevant stakeholders, organising special sessions and workshops, in order to increase the awareness of topics addressed by the Action and strengthen the involvement and collaboration with newly interested individuals, entities and companies. GOODBROTHER will also promote the involvement of the industry, addressing SMEs particularly, with the organisation of "Industry Days" where companies will exhibit and present their products. These events will take place together with other activities of the Action in order to enhance the interaction with research, service and end users groups. GOODBROTHER will also encourage STSMs in companies, via either participants in the action or third parties.

GOODBROTHER will also organise "Users days" at the local, national and European level in order to involve more organisations of older people and informal and formal caregivers, particularly in those areas where the Action had no participating end-user organisations. This involvement would be very relevant in order to gather valuable input regarding different cultural and societal perception of privacy.

The Action will also develop several activities (roadmap for research and innovation on the use of cameras and microphones in private spaces, guidelines for the design and development of privacy-aware systems, and the proposal of an ethico-legal certification of AAL applications) to address specifically service providers, policy makers and funding bodies.

As it was previously mentioned, one of the objectives of the Action is to create a repository of software tools and data sets to facilitate further developments. In order to promote this repository, GOODBROTHER will organise different competitions for solutions using it. Some of the competitors will be selected in

order to present their work and results in specialised research events. These competitions will facilitate the interaction of researchers and the industry in the Action.

2.2.3 MUTUAL BENEFITS OF THE INVOLVEMENT OF SECONDARY PROPOSERS FROM NEAR NEIGHBOUR OR INTERNATIONAL PARTNER COUNTRIES OR INTERNATIONAL ORGANISATIONS

Having proposers from several continents will facilitate the introduction of GOODBROTHER in those geographical areas. The scope of the analysis of user acceptance of audio- and video-based AAL solutions will not be limited to Europe but it will also include inputs from other cultures. Although, as it happens across Europe, the perception of privacy would be different across each continent, it is already beneficial to incorporate proposers from Asia, North America, and South America. GOODBROTHER expects that the initial proposers in each country will facilitate the dissemination in those continents and the involvement of other participants. Additionally, GOODBROTHER intends to incorporate NNCs to the Action in order to obtain knowledge about their cultures, promote research and innovation in those countries, and facilitate collaboration between research institutions and companies in those countries and their European counterparts. Moreover, GOODBROTHER will encourage and sponsor the participation of ECIs from those countries in order to carry out STSMs in European organisations.

The participation of Canada is relevant as there is an open alliance in research and innovation with the EU, via H2020, the AAL and the More Years Better Lives programmes. H2020 also includes specific collaborative calls with Japan and Brazil in the areas of robotics, big data, IoT, and AAL. Hence, this links will be relevant for future partnerships in joint research proposals.

In the case of Canada, the link with AGE-WELL, Canada's technology and ageing network, is very important for GOODBROTHER, as it includes more than 500 researchers and trainees across 37 different Canadian research institutes. This organisation also includes over 200 industry, not-for-profit, and government partners. This link will facilitate contribution, dissemination, and further collaboration with a large number of institutions.

GOODBROTHER, through an initial proposer from the United States, has strong links with the International Society for Gerontechnology, the largest international organisation specialising in gerontechnology, with members around the world. As in the case of AGE-WELL, these links will contribute significantly to the impact that GOODBROTHER may have not only in Europe but worldwide.

3 IMPACT

3.1 IMPACT TO SCIENCE, SOCIETY AND COMPETITIVENESS, AND POTENTIAL FOR INNOVATION/BREAK-THROUGHS

3.1.1 SCIENTIFIC, TECHNOLOGICAL, AND/OR SOCIOECONOMIC IMPACTS (INCLUDING POTENTIAL INNOVATIONS AND/OR BREAKTHROUGHS)

GOODBROTHER will bridge the gap between the technical developments in monitoring for AAL and the ethico-legal issues related to the use of cameras and microphones in private spaces. Moreover, outcomes from GOODBROTHER will benefit other services offered in private environments, as security, human-environment interaction, or gaming.

In the short term, i.e. in the four years of duration of the Action, GOODBROTHER will influence the audio- and video-based AAL research and stakeholder community by:

- Enhancing interactions between technological researchers, experts in privacy, social and legal matters, industry, end users, and other stakeholders. This will be achieved by establishing a cooperative forum for multi-national and multi-disciplinary teams, currently disaggregated;

- Defining synergies among the research community, enhancing their scientific and technological capacities, leading to collaborations in terms of joint publications and new R&I projects. GOODBROTHER plans to submit 40 publications and 10 research proposals with three or more partners during the duration of the Action;

- Consolidating the future leadership of ECIs by improving their exposure to multi-disciplinary training (summer schools will be held every year), STSMs in relevant institutions and industry (indicatively 10 per year), attendance to conference (via ITC Conference Grants), and mentoring by experienced researchers;

- Assisting research and innovation in trustworthy AAL systems, by analysing the ethical, legal, gender, and social issues to be considered; how to consider multiparty scenarios; and by publishing, in major journals, position papers and guidelines for the development of compliant technologies and services;

- Facilitating the development and validation of new privacy-aware solutions by providing guidelines for the consideration of ethical and legal requirements, integrating privacy by default and by design, and by creating a curated repository of relevant data sets and software;

- Increasing awareness of the different stakeholders by collating, reviewing, integrating and disseminating the outcomes of the Action; and

- Supporting European and national policy makers and funding research bodies, by establishing a roadmap for research and innovation in this area, and a certification on ethical and legal compliance of audio- and video-based AAL applications.

All the activities carried out in GOODBROTHER, and the achievement of the objectives established for the Action will lead to long-term (beyond the four years of the Action) scientific, technological and socioeconomic impacts, and:

- Contribute to addressing the societal challenge of the demographic change by providing cost-effective solutions to support older people, their carers, and public or private healthcare providers;

- Increase users' acceptance of audio- and video-based technologies in home environments. This will facilitate the route to market of these solutions due to an easier adoption by users;

- Establish Europe as a leader in the development of privacy-aware AAL monitoring systems, fulfilling the compliance for data protection by design and by default set up by the GDPR;

- Support and promote the research in AAL in ITCs and NNCs;

- Foster the creation of competitive spin-offs, start-ups and SMEs. GOODBROTHER will organise meetings with venture capital and angel investors to support fund raising; and

- To make sure that Europe is at the forefront of the new market opportunities that the Silver Economy offers, while respecting the citizen's privacy.

3.2 MEASURES TO MAXIMISE IMPACT

3.2.1 KNOWLEDGE CREATION, TRANSFER OF KNOWLEDGE AND CAREER DEVELOPMENT

GOODBROTHER is centered on responsible research and the consideration of ethical, legal, and social implications of technology development. In times in which technology developments – fostered by the huge and tremendously fast evolving innovations through modern information and communication technologies – enter private spheres and come into close contact with individual, private, and intimate activities, it is mandatory that any technology is carefully developed and balanced within societal, cultural and individual values, and norms. The new concepts of healthcare monitoring systems within ambient living environments should be suited to support users individually (i.e. according to the users' profiles and needs), adaptively (i.e. in accordance with the age-related changes and/or depending on health status), and sensitively (i.e. corresponding to the living conditions under all circumstances).

A coherent, user-centered design of health-supporting devices integrated in home environments would result in ambient technology which is not only functional in an engineering way of thinking, but also addresses the users' fundamental needs in terms of unobtrusiveness (non-stigmatizing design), ease of use, perceived usefulness, and overall usability. Especially in case of AAL and smart health systems, this is a vital precondition in order to define best practices or assess and evaluate consequences, responsibilities and impacts of technology for the countries, the society, and the users.

Beyond the normative aspect and the impact of policy in the design and development of privacy-aware AAL solutions, GOODBROTHER strongly votes also to include a bottom up process and to ask those persons, older and frail adults, for which these technologies are designed. Such an approach not only makes it possible to foster confidence and trust in the technology as being privacy-protective but it also avoids costly future retrofits.

GOODBROTHER will be able to provide guidelines and a cultural acceptance cartography of audio- and video-based AAL solutions, which will be relevant for different stakeholders. Following these guidelines, GOODBROTHER will promote a certification and intends to establish discussions with standardisation organisations so that it could be considered for future development of AAL technologies and services.

GOODBROTHER will organise a Training School every year (starting in Year 2). These schools will bring together lectures from different disciplines, what will provide a holistic training to the attendants, mainly PhD students and postdoc researchers. They will take place in locations with different cultural/societal backgrounds, inviting local organisations in order to gather pertinent inputs. The schools will be organised together with the meetings of the MC in order to facilitate interaction between ECIs and experienced researchers, fostering mentorship activities. In order to facilitate the attendance to the training schools and any other Action activity, GOODBROTHER will provide childcare support, as far as possible.

The Action will implement a programme for STSMs, proposed and periodically updated by the Training Committee. GOODBROTHER will promote visits of ECIs to relevant laboratories in order to cooperate in research, acquire new knowledge, and validate developments. This will be particularly interesting as some proposers own facilities with state-of-the-art technology. The Action will also promote STSMs in industry organisations in order to expose ECIs to other sectors, so that they could consider both academic and non-academic career opportunities. The Action will grant funding according to the quality of the scientific mission but also considering other aspects. For instance, GOODBROTHER will favour STSMs of women, partners from ITCs, and STSMs in the industry. The Action will fund at least 10 STSMs per year and will provide ITC grants for interested applicants to attend related conferences.

Close collaboration with the industry is key to the exploitation of the developments derived from GOODBROTHER. "Industry Days" will be organised jointly to the training schools and the meetings of the MC. This will enhance interaction between industry and researchers, which may lead to cooperation, e.g. STSMs, secondments, joint research projects, or commercialisation. In order to support exploitation, potential investors will also be invited to attend these events to raise funding. Cooperating not only with the industry but also with end users, service providers and procurers, and policy makers, will allow GOODBROTHER to address the socioeconomic challenges of the demographic change.

The provision of a curated repository of software and data will facilitate the development and validation of new AAL solutions. This is particularly relevant for SMEs, small research institutions, and researchers in ITCs and NNCs, as they may not have enough technical resources to address the challenge of designing and developing solutions that could be transferred to the market and adopted by the users.

3.2.2 PLAN FOR DISSEMINATION AND/OR EXPLOITATION AND DIALOGUE WITH THE GENERAL PUBLIC OR POLICY

The main dissemination and exploitation objectives of GOODBROTHER are outlined below. The focus will be to make all stakeholders aware of the potential applications of the use of cameras and microphones in private spaces for AAL, and to increase user acceptance by addressing the associated social, ethical, and legal issues. GOODBROTHER will incorporate a Dissemination Committee, made up of a Coordinator, a Deputy Coordinator, and representatives from academy, industry, service and end-user groups. This Committee will periodically define, support and promote different activities: conferences, workshops, competitions, training schools, joint publications, white papers, position papers.

- **Website and social networks.** The first activity will be to design and develop a website showing relevant information and news about the Action, as well as for providing a place where all the released documents could be easily accessed for any interested stakeholders. While this website will serve as a long-term repository of information, profiles in social networks and a newsletter will be created in order to engage with the general public on a continuous basis to favour interaction and mutual influence. To support this, a digital dissemination protocol will be established. The targets for each dissemination activity are presented in the next table.

Dissemination channel	Performance indicator	Target
GOODBROTHER website	Number of visits Monthly visitors increase	100/month 5% over the previous month
Twitter	Followers	1000
LinkedIn	Group members	300
Newsletter	Issues	3/year
Social media campaigns	Number of campaigns	4

- **Conferences and workshops.** The Action will organise an annual *GOODBROTHER Workshop* during the first three years, jointly with main research events held in Europe. Each year the Action will target a conference related to a specific area in GOODBROTHER: the Privacy Enhancing Technologies Symposium in Year 1, the ACM International Conference on Multimedia in Year 2, and the Conference of the Association for the Advancement of Assistive Technology in Europe (AAATE) in Year 3. This will increase the dissemination across the research communities in those disciplines. In the last year (Year 4), the Action will organise a *GOODBROTHER Final Conference*. Books of abstracts and proceedings of these events will be edited and published.

- **Events with stakeholders.** The previous conferences are mainly attended by the research community. Therefore, the Action will also target other European and local events that are organised by and focused on the other stakeholders, i.e. industry, service providers, end users, policy makers, and government representatives; for instance, AAL Forum, European Summit on Digital Innovation for Active and Healthy Aging, AAL Austria Summit, Spanish National Congress on Technologies for Accessibility, ForITAAL (Italian Forum on Ambient Assisted Living). The Action will target at least four of these events per year.

- **Public engagement activities.** The Action will organise events in order to engage the general public (e.g. Science Week Ireland, Fête de la Science in France) and to disseminate the findings in GOODBROTHER to make the public aware of audio-and video-based AAL technologies and services. Moreover, two "Users Days" every year will be carried out in collaboration with local, national and European organisations of older people, on dementia awareness, or on patient advocacy, to gather relevant information about user acceptance.

- **Publication of position papers, white papers and guidelines.** At the beginning of the Action, WGs 2 and 3 (see Section 4), will review the state of the art in the areas of audio- and video-based monitoring in private spaces and audio/visual privacy methods, respectively. These reviews will facilitate the delivery of white papers in both areas. As a result of the close interaction of these WGs with WG1, a position paper will be delivered in the second year analysing the issues associated with this monitoring. This position paper will be continuously reviewed and updated with the work carried out in GOODBROTHER, and the input gathered from organisations and end users across Europe in order to publish, at the end of the Action, specific guidelines that could be considered by decision makers responsible for technology and service procurement, provision, research and innovation.

- **Research publications.** Interaction among participants in the Action will also foster multi-disciplinary works, which will be published in major journals and conferences. Granting open access in order to increase outreach will be key to this approach. Participants also have large experience on editing books and special issues in high-impact journals. Devoted publications on audio- and video-based technologies, privacy awareness, and users' acceptance will promote research in these areas worldwide. It is expected that most of, if not all, the STSMs lead to research publications. The targets for each type of publication are presented in the next table.

Dissemination channel	Target
Conference papers	20
Journal papers	20
Special issues in relevant journals	2
Edited books	2

- **Repository of software and data.** Development and validation of new services will be enabled by creating a curated public repository of software and data. There is not currently any data set including videos of people behaving normally in their homes for long periods of time. The size of

available data sets is small and, most of them, with actors simulating usual behaviours. This makes difficult the validation of research, as the systems are trained with limited data, which is insufficient to learn behaviours. Hence, there is a need to develop a data benchmark assessment framework. GOODBROTHER will also publish recommendations on how to record a data set addressing ethical and legal aspects. The repository of software will be of interest for the research community, facilitating developments, as most audio- and video-based techniques share common processing stages. Although it is not compulsory for COST Actions, GOODBROTHER will join the EC Open Research Data Pilot, establishing a Data Management Plan in the first semester of the Action, in order to make findable, accessible, interoperable, and reusable all the data generated. Moreover, GOODBROTHER will contact IoT-related initiatives as FIWARE and UniversAAL for the integration of outcomes of the Action.

4 IMPLEMENTATION

4.1 COHERENCE AND EFFECTIVENESS OF THE WORK PLAN

4.1.1 DESCRIPTION OF WORKING GROUPS, TASKS AND ACTIVITIES

GOODBROTHER will be organised in five intertwined WGs in order to achieve the planned objectives:

- WG1. Social responsibility: Ethical, legal, social, data protection and privacy issues.

- WG2. Privacy-by-design in audio and video data.

- WG3. Audio- and video-based AAL applications.

- WG4. Curated repository of software and data.

- WG5. Dissemination and exploitation.

Specific meetings will be carried out between WGs in order to transfer knowledge across them, providing inputs for further activities.

WG1. Social responsibility: Ethical, legal, social, data protection and privacy issues	
Experts from diverse disciplines will analyse the ethical, legal, data protection and privacy issues associated with the use of cameras and microphones in private spaces, and how to manage multiparty privacy preferences. They will also study the differences according to gender and cultural/societal background in the perception of these issues. This WG will establish the core requirements that AAL solutions must fulfil to consider ethico-legal issues and to integrate privacy by design and by default. Those requirements will set up the guidelines for the technical WGs (WG2, WG3 and WG4)	
Objectives	- Review the current European and international legislation and the ethical issues that underpin this on the use of audio- and video-based monitoring in private environments - Study the differences in the perception of privacy depending on the culture, society, gender and age of the users, and analyse the situations and conditions in later life, i.e. occurrence of a fall, which may affect that perception - Investigate the potential benefits and barriers of AAL technology adoption for people in need of care - Support the development of privacy-aware monitoring systems by a continuous exchange of knowledge with technological participants in the Action - Promote the consideration of ethical, legal, privacy and gender matters in the design of AAL solutions - Set guidelines in order to facilitate the design, development, validation and installation of trustworthy AAL systems. Following these guidelines will be the basis for a certification process. - Inform other WPs on the ethico-legal requirements in the design and development of AAL solutions

Outcomes	White paper on ethical, legal and gender issues linked to audio- and video-based monitoring (Year 1), position paper (Year 2), guidelines on the design and development of ethical-aware monitoring systems (Year 4), joint journal and conference publications, joint project proposals to international funding bodies, progress reports (yearly), reports from WG meetings and STSMs, and proceedings of the GOODBROTHER *Workshop*.
Milestones	WG meetings (every quarter, alternating face-to-face and remote meetings), GOODBROTHER *Workshop* held in conjunction with a main conference on ethics and privacy (Year 1), STSMs (yearly), training schools (yearly).

WG2. Privacy-by-design in audio and video data	
This WG will bring together researchers and industry involved in the design and development of methods to ensure privacy in audio and video data. These include a variety of mechanisms for de-identification of audiovisual data in order to protect privacy while maintaining a certain degree of intelligibility in them, which could be used to recognise events and activities in a supervised (by a carer, non-automated) manner.	
Objectives	- Review the state-of-the-art of the methods to ensure privacy in audio and video data - Analyse the capabilities/limitations of the different audio- and video-based devices and current methods to ensure privacy - Exchange knowledge in order to obtain more robust methods, which follow privacy-by-default and privacy-by-design principles, for privacy preservation - Integrate users privacy preferences in order to design context-aware solutions that are adaptable to different privacy requirements and scenarios - Foster the collaboration among participants in R&I projects
Outcomes	White paper on audio and visual privacy preservation (Year 1), joint publications, joint project proposals to international funding bodies, software demonstrators, progress reports (yearly), reports from WG meetings and STSMs, and proceedings of the GOODBROTHER *Workshop*.
Milestones	WG meetings (every quarter, alternating face-to-face and remote meetings), GOODBROTHER *Workshop* held in conjunction with a main conference on multimedia research (Year 2), STSMs (yearly), training schools (yearly)

WG3. Audio- and video-based AAL applications	
This WG will bring together researchers and industry working in different aspects of audio- and video-based AAL solutions: applications (e.g. recognition of activities of daily living, fall prevention and detection, human behaviour analysis, behaviour and lifestyle profiling, food intake monitoring, physiological monitoring, rehabilitation, personal assistants), integration with other technologies (e.g. robotics, smart cities, big data), health economics, and business models. This WG will use the guidelines emanating from WG1 and the methods for privacy preservation proposed in WG2 in order to adapt available AAL systems and to develop new AAL solutions compliant with users requirements and the legal regulation.	
Objectives	- Review the state-of-the-art of audio- and video-based monitoring technologies and potential applications for AAL - Study of the economic opportunities of these applications in the Silver Economy - Exchange knowledge on different computer vision, audio processing, and artificial intelligence techniques used by the participants in order to find commonalities, which could lead to the development of more robust, accurate and reliable systems - Integrate knowledge from WG1 and WG2 in the design and development of AAL applications - Foster the collaboration among participants in R&I projects
Outcomes	White paper on audio- and video-based solutions for AAL (Year 1), joint publications, joint project proposals to international funding bodies, software demonstrators, progress reports (yearly), reports from WG meetings and STSMs, and proceedings of the GOODBROTHER *Workshop*.
Milestones	WG meetings (every quarter, alternating face-to-face and remote meetings), GOODBROTHER *Workshop* held in conjunction with a main conference on AAL or assistive technology (Year 3), STSMs (yearly), training schools (yearly)

| **WG4. Curated repository of software and data**	
This is a WG with a major interest for participants in both WG2 and WG3, as they will be able to exploit software available in this repository to improve their developments. Moreover, they require extensive data benchmarks, currently unavailable, to validate their developments. Therefore,	

	researchers from those WGs with the required facilities and equipment to record data sets will collaborate to create and curate this repository. They will also be supported by researchers in WG1 to establish the guidelines to create these data sets.
Objectives	▪ Review currently available audio and video benchmarks for AAL applications ▪ Facilitate the development of new privacy-compliant AAL systems by sharing software that could be used by the research community ▪ Collect and organise those data sets ▪ Foster the acquisition, following ethical and legal aspects, of new data sets for longitudinal studies or specific AAL applications ▪ Promote open data, open access publications and open source among the research community ▪ Encourage the use of the repository
Outcomes	Data Management Plan (Year 1), technical report with a review of currently available data sets (Year 1), initial repository of software and data (Year 2), final repository (year 4), progress reports (yearly), and reports from WG meetings.
Milestones	WG meetings (every quarter, alternating face-to-face and remote meetings), recording of new datasets, research competitions (Year 2 and Year 4), STSMs (yearly), training schools (yearly)

WG5. Dissemination and exploitation	
This is a central WG in the Action in order to increase the impact among the different stakeholders. Users' trust is paramount so that audio- and video-based AAL applications reach the market, as well as policy makers, service providers and procurers need to be aware of the available solutions.	
Objectives	▪ Disseminate the outcomes of the Action among the research community ▪ Promote innovation and collaboration with the industry ▪ Organise events to engage other stakeholders ▪ Foster the collaboration with other research projects and COST Actions ▪ Promote a certification on trustworthy AAL applications
Outcomes	Website, social networks, newsletters, leaflets, brochures, progress reports (yearly), reports from WG meetings, reports from dissemination activities, and proceedings of the GOODBROTHER Final Conference.
Milestones	WG meetings (every quarter, alternating face-to-face and remote meetings), public engagement activities, special sessions in events, Industry Days, Users Days, GOODBROTHER Final Conference (Year 4), networking with other research projects and COST Actions.

Participants in the Action will be invited to join one or more of these WGs according to their expertise and interest. Each one of the WGs will have a Leader and a Deputy Leader in charge of managing the activities of the WG and reporting to the MC. Additionally, project management and supervision will be addressed by the Management Committee (MC), which will also coordinate and implement its activities in order to achieve the goals established in this Action. During the First MC Meeting, the members of the Core Group (CG) will be elected. This CG will be composed as follows:
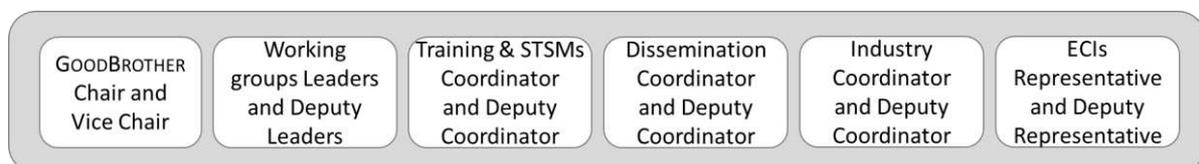
This structure and the members of the CG may be modified by the MC during the Action if it is considered necessary. Gender balance will be considered in this management structure and all the activities carried out by the Action, particularly STSMs, training schools and workshops. Understanding that the expertise in GOODBROTHER can be grouped into two major areas: technological and social sciences, the Leader and Deputy Leader for each one of the responsibilities in the CG will be selected from different areas, unless it is unfeasible. Additionally, in order to emphasise the participation of the members of the ITCs, the Action will encourage their participation in the CG, ensuring that they lead or co-lead some Working Groups and other committees (e.g. dissemination, training and STSMs).

4.1.2 DESCRIPTION OF DELIVERABLES AND TIMEFRAME

The following table shows the major deliverables planned for the Action. Other deliverables are introduced and described in Sections 3.2.2. and 4.1.1.

Major deliverables	Date
D5.1. GOODBROTHER Website	Year 1
D1.1. White paper on ethical, legal and gender issues linked to audio- and video-based monitoring	Year 1
D2.1. White paper on aural and visual privacy preservation	Year 1
D3.1. White paper on audio- and video-based solutions for AAL	Year 1
D4.1. Data Management Plan	Year 1
D4.2. Technical report with a review of currently available datasets	Year 1
D1.2. Position paper on ethical, legal and gender issues linked to audio- and video-based monitoring	Year 2
D4.3. Initial repository of software and data	Year 2
D1.3. Guidelines on the design and development of ethical-aware monitoring systems	Year 4
D4.4. Final repository of software and data	Year 4
D5.2. Proceedings of the GOODBROTHER Final Conference	Year 4

4.1.3 RISK ANALYSIS AND CONTINGENCY PLANS

Any risk envisaged by the interdisciplinary profile of GOODBROTHER and the establishment of a common language will be addressed and avoided as this mutual understanding is one of the priorities of the Action, e.g. the training schools will have a balanced set of participants from the different disciplines, both as speakers and as attendees, which will help to mitigate this risk. Additionally, some of the participants have a multidisciplinary background, what will facilitate communication.

The initial participants in the Action currently lead or participate in relevant European, international, and national projects in areas linked to GOODBROTHER. They also supervise a significant number of PhD students and post-docs in their institutions. Therefore, the proposers foresee limited risks regarding attendance and active participation in the training schools, workshops, conferences and STSMs.

The Core Group (CG) will prepare and implement a contingency plan and will continuously monitor the performance of the different WGs in terms of involvement of participants, activities organised, publications, and degree of fulfilment of the objectives of the Action. The Leader of each WG will be supported by a Deputy Leader in order to facilitate the coordination tasks. Additionally, the initial proposers in GOODBROTHER have deep expertise in their respective research areas and experience in collaborative research projects. Therefore, they have experience in detecting and addressing risks. Potential risks are presented in the following table:

Risk	Chance	Risk mitigation
Low participation in training schools and STSMs	Unlikely	Increase the promotion of these activities among the ECIs and other participants. Stimulate attendance by increasing the number and amount of grants. Collaborate with other COST Actions and other EU training programmes (Marie Skłodowska-Curie Innovative Training Networks) in the organisation.
Problems in mutual understanding between experts from the different disciplines	Possible	Incorporation of new participants with multidisciplinary background and specific meetings among multiple WGs in order to facilitate communication, and promotion of interdisciplinary research
Deliverables and milestones are delayed or not of high quality	Possible	The Action will invite experts and end users throughout the duration of the project, which may complement and collaborate in achieving the objectives. Increase management activities to ensure timely delivery and quality.
Conferences or workshops are not accepted for organisation adjunct to main international events	Possible	GOODBROTHER would target different events of similar relevance to ensure acceptance. Some GOODBROTHER proposers chair relevant conferences.
Industry, end users, and policy makers are not engaged enough	Possible	Promote their participation, prioritising the attendance to industry-led events, and increasing the number of

Risk	Chance	Risk mitigation
		communication and public engagement activities. Increase engagement promoting these activities through networks and associations participating in GOODBROTHER
Recommendations by WG1 on ethico-legal issues limit the developments to be carried out in WG2, WG3 and WG4	Likely	Specific meetings will be held to establish compromises between members in those WGs. Ethico-legal requirements should not hinder innovation but rather drive the design and development of technology in such a way that they respect fundamental rights. The Action will propose practical solutions to balance privacy and intelligibility depending on the AAL service

4.1.4 GANTT DIAGRAM

The duration of the Action will be four years starting with the First MC Meeting when the members of the Core Group will be elected. The work in the different WGs will begin after that meeting. The GANTT Diagram below shows the dates for the main activities and deliverables. The idea is celebrate during the same dates the meetings of the MC, the training schools, the "Users Days", and the "Industry Days", so that interaction among participants is increased and costs are reduced. The dates and locations for the events may be slightly modified subject to other events with which GOODBROTHER intends to co-locale the workshops, final conference and research competitions, but they will be selected well in advance to ensure high attendance and to reduce costs.

	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
WG1. Social responsibility: Ethical, legal, social…	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
D1.1. White paper on ethical, legal and gend…				■												
D1.2. Position paper on ethical, legal and ge…								■								
D1.3. Guidelines on the design and develop…																■
1st GOODBROTHER Workshop				■												
WG2. Privacy-by-design in audio and video data	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
D2.1. White paper on aural and visual privac…				■												
2nd GOODBROTHER Workshop								■								
WG3. Video-based AAL applications	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
D3.1. White paper on audio- and video-base…				■												
3rd GOODBROTHER Workshop											■					
WG4. Curated repository of software and data	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
D4.1. Data Management Plan		■														
D4.2. Review of available data sets				■												
D4.3. Initial repository of software and data						■										
D4.4. Final repository of software and data																■
Research competitions							■	■							■	■
WG5. Dissemination and exploitation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
GOODBROTHER Website	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
GOODBROTHER Final Conference																■
D5.3. Proceedings of GOODBROTHER Final C…																■
Working Groups face-to-face meetings	■		■		■		■		■		■		■		■	
GOODBROTHER management	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Management Committee meetings	■			■			■			■			■			■
Short Term Scientific Missions			■		■		■		■		■		■		■	
Training schools				■				■				■				■
Users Days				■				■				■				■
Industry Days				■				■				■				■

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