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Methodology to undertake innovation impact assessment of AAL Programme projects

Final report

Study on establishing a methodology to undertake Innovation Impact Assessment of AAL Programme projects

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Author(s):

Bastian Mostert MSc
Dr. Martijn Poel
Caspar Roelofs MSc
Tammy Sharp MSc
Dr. Peter Varnai

Reviewers:

Karina Marcus, AAL Association, Brussels
Geja Langerveld, ZonMw, The Hague
Theresa Chavarria, ISCII, Madrid
Gerda Geyer, FFG, Vienna

Publisher:

Ambient Assisted Living Association
Rue de Luxembourg, 3, 2nd floor
B-1000 Brussels, Belgium
Phone +32 (0)2 219 92 25
email: info@aal-europe.eu

About Ambient Assisted Living Association:

The Ambient Assisted Living Association (AALA) is organizing the Ambient Assisted Living Programme (formerly known as the Ambient Assisted Living Joint Programme). The AAL Programme aims at enhancing the quality of life of older people and strengthening the industrial base in Europe through the use of Information and Communication Technologies (ICT). Therefore, the AAL Programme is an activity that operates in the field of services and actions to enable the active ageing among the population.

The programme is financed by the European Commission and the 22 countries that constitute the Partner States of this Programme.

See more at: <http://www.aal-europe.eu/>

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Table of Contents

1. Introduction	3
1.1 Objectives and scope of the study	3
1.2 Study approach and structure of the report	5
2. Innovation systems and impact channels	7
2.1 Innovation systems	7
2.2 Impact assessment challenges	8
2.3 Research impact and innovation impact	9
2.4 Impact channels	10
3. State-of-the-art	12
3.1 Introduction	12
3.2 ARTEMIS Joint Undertaking	12
3.3 Eurostars	15
3.4 Assisted Living Innovation Platform (ALIP)	18
3.5 Tekes' Innovations in Social and Healthcare Services programme	19
3.6 Impact Assessment for Social Innovation (iA4SI)	20
3.7 Additional programmes and initiatives	22
3.8 Reflection on indicators and the data collection process	26
4. Intervention logic of the AAL (Joint) Programme	29
4.1 Mission, objectives and activities	29
4.2 Outputs, outcomes and impacts	30
4.3 Impact channels	32
5. Proposed set of indicators	33
5.1 Approach and terminology	33
5.2 Indicators	36
6. Data collection process	45
6.1 Start and frequency of data collection	45
6.2 Who should collect and provide the data?	46
6.3 How to motivate or mandate project partners to provide data?	46
6.4 Offline or online data submission?	47
7. Towards implementation	48
7.1 Developing an online data collection and reporting system	48
7.2 Options for the AAL Programme	49
Appendix A Draft survey questionnaire	51
Appendix B Draft guidelines for survey respondents	58

Table of Figures

Figure 1 Rationale for AAL Programme innovation impact assessment	3
Figure 2 Actors in an innovation system	7
Figure 3 Indicators used by ARTEMIS related to innovation impact of project	14
Figure 4 EUREKA and Eurostars indicators.....	16
Figure 5 ALIP (DALLAS) indicators	19
Figure 6 Tekes activities impact indicators	20
Figure 7 Indicators commonly used in Tekes programme evaluations	20
Figure 8 iA4SI indicators	21
Figure 9 RDI policy impact areas and indicators.....	23
Figure 10 Indicators taken from the ‘Beyond Patents and Publications’ study.....	23
Figure 11 Intervention logic of the AAL Programmes.....	31
Figure 12 Post-project innovation impact assessment cycle	46
Figure 13 Overview of most and least relevant indicators according to NCPs	61

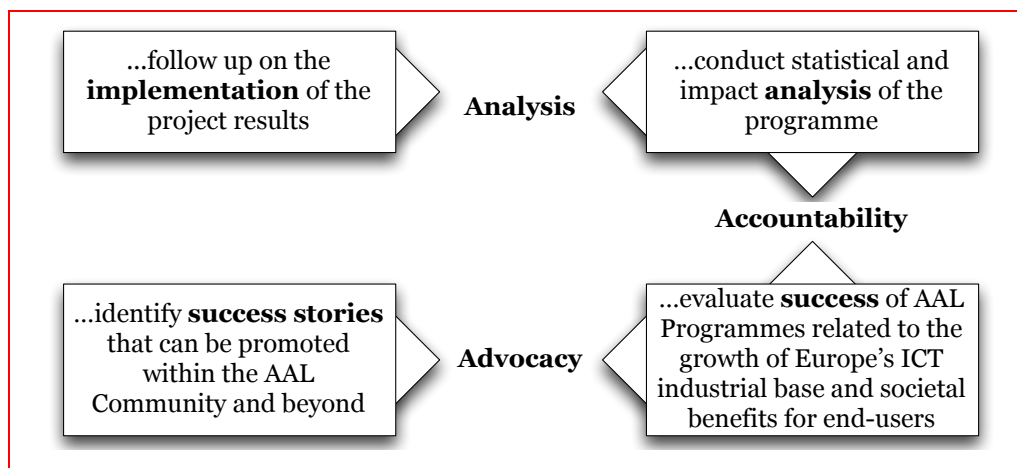
1. Introduction

1.1 Objectives and scope of the study

The Ambient Assisted Living Programme¹ monitors progress, outputs and results from its projects, through annual, midterm and final reports. To some extent, final reports include information about social and economic impact. However, it takes time before the results of research and innovation projects lead to social and economic impact. For instance, there are time lags between pilots and adoption of AAL solutions; between the commercial launch of an AAL solution and increased revenues; and between the adoption/use of an AAL solution and the impact on various types of users.

The AAL Programme, represented by the Central Management Unit, wants to extend its monitoring strategy by monitoring innovation impact *after* projects have ended. This should allow the AAL Programme community to analyse and increase its social and economic impact. Innovation impact assessment ('post project monitoring') should contribute to analysis, accountability and advocacy of the programme (Figure 1).

Figure 1 Rationale for AAL Programme innovation impact assessment



Source: Technopolis Group (2014), based on Terms of Reference.

Following the Terms of Reference of the assignment, the study provides recommendations on the methodology, guidelines and documents to integrate Innovation Impact Reports as part of the monitoring strategy of the AAL Programme. The emphasis is on Innovation Impact Reports at the level of projects, but the information should be aggregated to the level of calls and the AAL Programme in general. The exact definition of the structure of these reports and the way they will be implemented in the monitoring strategy of the AAL Programmes were part of this assignment.

The types of impact to be captured by Innovation Impact Reports need to be derived from the *intervention logic* of the AAL Programme (discussed in more detail in Chapter 4). In short, why and how should the programme lead to which types of impact? A first starting point is the mission of the AAL Programme: *to respond with ICT based solutions to the demographic challenges of an ageing population*. Second starting point

¹ Formerly known as the Ambient Assisted Living Joint Programme (AALJP).

is the ‘triple win’ as described in European Commission and AAL Programme documentation.^{2,3}

These high-level objectives are:

- A better quality of life for older persons and family;
- Increased efficiency and sustainability of the care systems;
- Strengthening the industrial base in Europe in ICT products and services for ageing well.

The three high-level objectives of the AAL Programme can be recognised in the set of topics and indicators that are currently used for monitoring impact *during* the course of projects. For example, project coordinators are invited to report on contributions to societal challenges and innovations (e.g. improvements implemented in the health and care system for older persons) and economic development and sustained competitiveness, including market replication of projects’ results (e.g. set-up of spin-offs, licenses, manufacturing, distribution/commercialisation agreements, number of jobs created and number of end-users benefiting from the results). Although the AAL Programme intervention logic and current monitoring activities emphasise social and economic impact, impact on knowledge is addressed too. For example, project coordinators can mention publications, patent applications and, at the intersection of knowledge and economic impact, patent licensing.

Whereas the annual, midterm and final reports address project output (such as prototypes, demonstrators, publications and events), process (e.g. project management and the AAL Programme procedures) and impact, the Innovation Impact Reports will focus on *impact only*. This includes direct impact (outcomes) for project participants and indirect impact on a wider group of stakeholders and on industries, users and health and care systems.

Direct and indirect impact may result from *research* activities and accumulation and codification of knowledge (e.g. in terms of patents) but also from *innovation* activities such as pilots, demonstrators, user studies, awareness raising and accumulation of codified and tacit knowledge (e.g. in terms of the number of end-users involved). The concepts of research and innovation are used to emphasise the relevance of the entire innovation process or innovation chain. In this respect, the scope of the AAL Programme is similar to Horizon 2020, the EU Framework Programme for Research and Innovation.⁴

To further clarify the terminology and scope of the study, it should be mentioned that the methodology to be developed consists of two elements:

- The set of innovation impact indicators;
- The data collection process.

² Kuneva, M. et al. (2010), Interim Evaluation of the Ambient Assisted Living Joint Programme.

³ AAL Joint Programme (2014), Ambient Assisted Living Joint Programme (AAL JP) Plan 2014-2020. 1–27.

⁴ Innovation can be considered a result of an innovation process: “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, work-place organisation or external relations” (OECD Oslo Manual, 2005, p.46). Most relevant for this study is the concept of *innovation activities*. This covers a range of activities that can potentially be addressed by support programmes such as the AAL Programme and Horizon 2020. “Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative, others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation” (OECD Oslo Manual, 2005, p.47).

In addition, the study discusses the main considerations and presents proposals for the guidelines and documents to be used. Because the study team recommends *online data collection*, the final report does not include documents/templates to be used but discusses the questions to be included in an online survey and the main implementation issues (e.g. confidentiality issues and data sharing).

1.2 Study approach and structure of the report

Chapter 2 summarises the main points of the *systems of innovation* concept. This concept has been successful in studies that explore the dynamics of innovation processes. Among the main messages are that innovation processes are inherently risky, iterative and that contributions are made by a variety of actors in several related projects. This leads to a number of challenges for impact monitoring and impact assessment. For instance, how to assess (and value) the balance between high and low impact projects; how to acknowledge time lags; and how to assess the contribution of individual projects and a portfolio of projects? Chapter 2 will also describe *impact channels*, i.e. the mechanisms via which programmes and projects can lead to impact.

Chapter 3 describes the *state-of-the-art* on innovation impact assessment, with a particular emphasis on social and economic impact (rather than output). A set of five European and national programmes has been analysed to explore the innovation indicators that are used and the processes that are used to collect data:

- ARTEMIS Joint Undertaking;
- Eurostars;
- Impact Assessment for Social Innovation (iA4SI);
- Tekes' Innovation in Social and Healthcare Services;
- Assisted Living Innovation Platform (ALIP).

Each of these initiatives contains a number of state-of-the-art elements. Moreover, each of these initiatives has similarities to the AAL Programme in that they are also Member State driven; combine research and innovation activities; have SME or end-user participation as key characteristics; and/or that they address health or ICT innovation. In addition, Chapter 4 will assess the indicators used in three additional European initiatives in the field of ICT and health.

Chapter 4 elaborates on the *intervention logic of the AAL Programme (2014-2020)* and the AAL Joint Programme as it was referred during the first phase (2008-2013). In addition to the mission and high-level objectives of AAL Programme, the specific objectives and the activities are commented on. A detailed overview of the intervention logic is essential for selecting a set of indicators that covers the different types of impact that are pursued and the mechanisms between programme/project activities, direct and indirect impact.

Chapter 5 proposes a *set of indicators* for the innovation impact monitor of the AAL Programme. The approach for selecting indicators is explained. Indicators should be Relevant, Accepted, Credible, Easy to use and Robust (RACER criteria). Relevance refers to indicators having a clear link with the intervention logic. Accepted refers to indicators already being used by other relevant initiatives or by the AAL Programme itself (e.g. in the template for the final project report) but also to acceptance by stakeholders such as AAL Programme National Contact Persons (NCPs). In an *online survey* and in a *workshop*, NCPs were invited to comment on a long list of indicators; to note indicators that are currently used at national level; and to suggest additional indicators. Input was provided from 15 NCPs from nine countries. The workshop with NCPs also addressed the Credibility, Ease of use and Robustness for a draft set of indicators suggested by the study team. Additional input regarding indicators was obtained by means of a survey of AAL Programme Board Members (the Executive Board, General Assembly and Advisory Board) and by interviewing six project coordinators.

Chapter 6 addresses the *process for data collection*. Topics include the use of online tools, frequency of data collection/delivery and incentives for project participants. Inspiration and suggestions were obtained via the analysis of state-of-the-art initiatives and the workshop, surveys and interviews mentioned above.

Chapter 7 discusses the main *implementation issues* and possible next steps

Appendix A presents the *draft survey questionnaire* to be used for collecting data from project participants. The draft survey questionnaire is customised for enterprises and requires adaptations for other types of participants (cf. routing). The draft survey questionnaire requires a thorough test or pilot implementation with project participants.

Appendix B contains the *draft guidelines* (including a glossary) for survey respondents.

Finally, Appendix C provides a summary of the results of the *survey among AAL Programme National Contact Persons and Board Members*. Appendix C also includes the survey questionnaire that was used.

2. Innovation systems and impact channels

2.1 Innovation systems

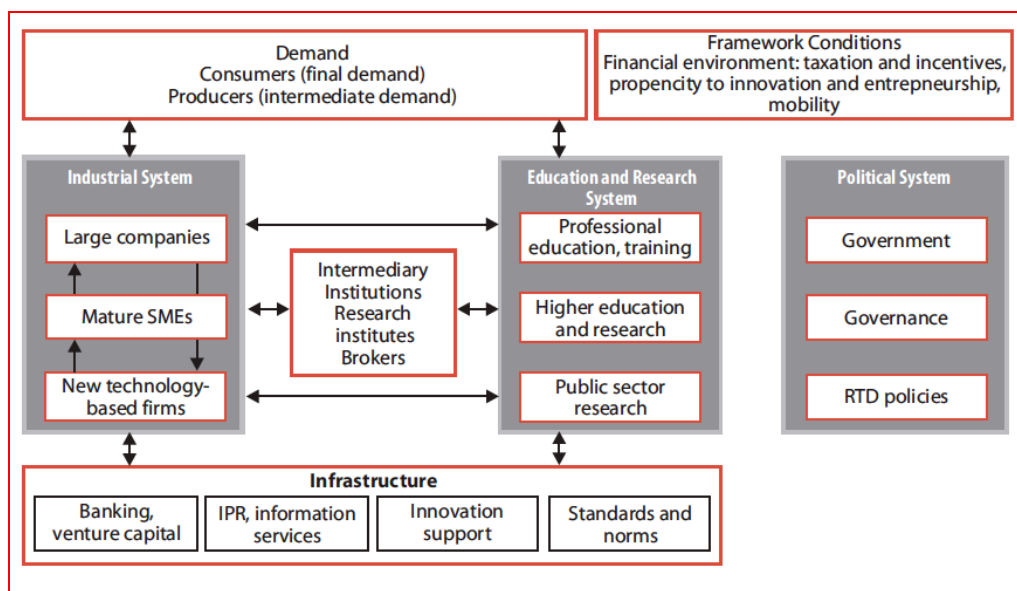
For many years a linear model of science and technology development, together with a view of innovation as an autonomous process, was the prevailing perspective on innovation. Research was done in universities and research institutes. Subsequently, the knowledge was used by companies who developed products and processes that were introduced to the market. This view has changed quite drastically over the last four decades. Now the vision prevails that technological and non-technological innovation are the result of social and economic processes, and thus not a deterministic process. In innovation processes there are numerous and frequent interactions and feedback processes between users and producers. This led to the rise of a systemic perspective, which starts with two related assumptions⁵:

1. First, innovation is a multi-actor process that depends on the interaction between similar and different types of actors.
2. Second, innovation has a systemic character, and is a result of complex interaction between actors and institutions (formal and informal rules, including framework conditions as well as targeted policy initiatives).

The most well known type of innovation system is the national innovation system. It captures the importance of the geo-political and policy aspects of processes of innovation. The interest in geographically delimited systemic analyses is primarily based on political considerations such as international or interregional competitiveness. In addition, innovation can be analysed from a regional, sectoral or technological perspective.

Arnold & Kuhlmann (2001)⁶ developed a typology of players and factors that may shape innovation processes (Figure 2).

Figure 2 Actors in an innovation system



Source: Arnold and Kuhlmann (2001).

⁵ Geels, F. W. (2002), Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case study. *Research Policy* 31 pp. 257-1273.

⁶ Arnold, E. and S. Kuhlmann (2001), RCN in the Norwegian Innovation System.

The rationale behind the public intervention in research and innovation lies in the presence of *systems failures* that impede creativity, effectiveness and efficiency of innovation systems and *market failures* that hamper private investments in socially desirable research and innovation activities.

In response, public support programmes can provide, among other things, financial support for research and innovation activities and support for collaboration between different types of actors. For instance, innovation may require collaboration between universities, public research organisations, SMEs and large enterprises upstream and downstream in the value chain (from software developers, component and device manufacturers to system integrators, service/solution providers and clients) and individual users (citizens, employees, etc.).

Moreover, collaboration may be needed to integrate the technological and non-technological aspects of an innovation, e.g. new technologies that require changes in organisational structures, work processes and business models.

Furthermore, collaboration among innovators and between innovators, policy makers and standardisation platforms may be needed to develop new standards, professional guidelines and regulations.

To acknowledge the systemic nature of innovation, and the role of various policy interventions, creates a number of impact assessment challenges.

2.2 Impact assessment challenges

How to assess the impact of research and innovation programmes on tackling societal challenges and meeting public objectives such as economic growth, environment and well-being? The systemic nature of innovation implies that it is difficult to measure the impact of research and innovation programmes, as impact can be indirect, especially when one wants to determine impact at the level of society. A substantial body of literature addresses measurement of the economic results of Research, Development and Innovation (RDI) at the level of research organisations, SMEs and large enterprises. The economic results and the pathways/channels to these results are researched and described in great detail (e.g. research that is commercialised by a spin-off or start-up). This body of literature often refers to societal impact as *long-term spillovers* and provides indications rather than evidence about these spillovers. Much less is known about the pathways/channels via which RDI-activities lead to these societal impacts (and the role of various actors, barriers, framework conditions, etc.). To some extent, this is due to the emphasis of many support programmes (and evaluation studies) on R&D rather than Innovation. Moreover, a shift is taking place in RDI policy thinking from an emphasis on economic value to wider societal value. As such, it is becoming more important to identify long-term societal impacts of research and innovation. There are many indicators and indices available for, on the one hand, society and wellbeing, and on the other hand, research and innovation activities. However, the link between these two worlds seems to be missing. In a recent report published by Tekes entitled *'Better Results, More Value: a framework for analyzing the societal impact of Research and Innovation'*⁷ it is stated that “*there are very few indicator-activities that genuinely link socio-economic impact factors to research and innovation and there are even less activities linking socio-economic impacts in specific areas to RDI activity*”.

To establish plausible links between RDI activities and societal impacts implies that numerous challenges have to be faced. Societal changes (social and economic) often results from several innovations and sources of knowledge. It is therefore difficult to *attribute* societal changes to a specific source or programme.

⁷ Tekes (2011), Better Results, More Value: a framework for analyzing the societal impact of Research and Innovation.

Furthermore, the complexity of the system makes it difficult to determine the *additionality* of a specific action or programme: the difference between doing nothing and performing the action. We distinguish between:

- *Input additionality* (e.g. how the AAL Programme leads to changes in a firm's RDI priorities, investment behaviour, etc.),
- *Output additionality* (e.g. the proportion of output that is created by the AAL Programme or by the combination between this programme and other RDI support programmes), and,
- *Behavioural additionality* (e.g. how the AAL Programme has changed a firm's subsequent behaviour in terms of seeking collaboration and involving end-users).

Additionality can to some extent be determined quantitatively, e.g. measuring whether participants in AAL Programme projects have invested more internal or private funding in RDI and whether the number of collaborations has increased. Qualitative methods have been developed to obtain additional insight. However, there is *no real counterfactual situation* to compare with. We don't know how the behaviour of participants in AAL Programme projects would have changed when they had not participated in this programme. It is seldom possible to develop a control-group with very similar organisations that did not participate in a programme for which the impact is being assessed (such as the AAL Programme) and that did not participate in similar programmes.

Also note that organisations can benefit from several RDI support programmes and a combination of internal and external RDI projects. Often, impact emerges from a *portfolio of projects* rather than one single project. Moreover, both qualitative and quantitative methods suffer from *time lag*. It generally takes a long time for impact to be created as a result of research and innovation programmes. Some pathways/channels may even take 15-20 years. It is hard to assess the impact that is created at a certain point of time when not all types of impact are apparent yet.

For measuring socio-economic impacts furthermore a clear definition is needed to know *how to really capture impacts in meaningful terms*: defining what to assess and developing adequate *indicators*. Also, various types of impact might overlap. Finally there is an issue of *comparability*: how to make the impact assessment approach suitable for comparison with similar or different situations? This requires consistent data collection methods, but at the same time, it is important to be flexible and adapt to the specific context of the support programmes to be assessed (objectives, actors, main technologies, details of funding schemes, etc.).

2.3 Research impact and innovation impact

Generally speaking, there are two types of impact assessments: assessments of research impact and assessments of innovation impact. This was already touched upon above. The great majority of current impact assessments fall under the category of *research impact assessments*. In short, the focus of these programmes is on research rather than innovation; the focus of impact assessment is on assessing the impact on the research community rather than society in general. Examples include impact assessments of the European Framework Programmes (FPs) and the assessment of European Joint Programming Initiatives.⁸ Other examples include national research assessments conducted in the UK within the Research Evaluation Framework, or in the Netherlands following the Standard Evaluation Protocol.⁹

⁸ H Acheson and M F G Baden-württemberg (2012), Review of the Joint Programming Process Final Report of the Expert Group, October 2012; Monitoring and Evaluation of EU Joint Programming - Neurodegenerative Diseases Research (JPND), April 2012.

⁹ REF (2011), Assessment Framework and Guidance on Submissions, 2011; REF (2014), Standard Evaluation Protocol 2015-2021.

Still, such research impact assessments measure the outputs but also the social or economic outcomes and impacts of research activities. Outputs may include new knowledge that is generated, but also new or improved products or services. Outcomes concern direct impact on project participants, whereas impact concerns indirect, long-term, behavioural impact on participants but also on other stakeholders and sectors, economies and societies at large. Examples of outcomes are the use of new knowledge in the research community or changed procedures by project participants (e.g. procedures at hospitals and care institutions) whereas examples of impacts would be an improvement in the Quality of Life of older persons, revenue growth in medical device manufacturers or the formation of new health policy. As such, research impact assessments not only cover the impact on the research community.

The AAL Programme is a *research and innovation programme* in the sense that it supports basic research (to some extent) but especially applied research and experimental development. There is a particular emphasis on pilots, demonstrators, user studies, awareness raising, contribution to policy and regulation and other activities that prepare for the commercial launch of products or processes. As mentioned in Chapter 1, the concepts of research and innovation are used to emphasise the relevance of the entire innovation process or innovation chain. Accordingly, *innovation impact assessments* provides substantial attention to the commercial market launch of new products and processes, adoption by users and economic and social impact. In addition, innovation impact assessments address knowledge accumulation, e.g. in terms of patents and collaboration between research organisations and other types of actors. As such, the difference between research impact assessments and innovation impact assessments is a matter of emphasis.

The impact assessment challenges mentioned above (time lag, attribution, etc.) are highly relevant for innovation impact assessment. For example, the impact of research and innovation activities on social changes may take decades and depends on the behaviour of a variety of stakeholders.¹⁰

2.4 Impact channels

An effective strategy to address impact assessment challenges is to identify impact channels. In short, via which mechanisms do outputs contribute to outcomes and impact? Researchers at the Science and Technology Policy Research Unit (SPRU) of the University of Sussex identified different and complementary channels via which research projects can lead to impact. Moreover, the impact channels perspective have been used to select indicators for tracking the process from research to social and economic impact (Martin et al., 1996; Salter et al., 2000; Salter and Martin, 2001; Scott et al, 2002; Martin and Tang, 2007). The impact channels have been developed in the context of science policy and research programmes. The channels are also relevant for research and innovation programmes. The six main impact channels are:

- Knowledge: technological and non-technological, codified and tacit, leading to new goods, services, processes or standards (K);
- Methodologies, instrumentation, software and other tools to be used in the R&D and innovation process (M);
- Research infrastructures: large-scale research and innovation facilities (R);
- Networks and social interaction between actors from different and similar disciplines, sectors and countries (N);
- Human capital: skills of researchers, developers, practitioners and end-users (H)
- Spin-offs, start-ups and high-growth SMEs (S);

¹⁰ Valovirta, Lehenkari et al. (2014), The Impact of Tekes Activities on Wellbeing and Environment.

The Knowledge impact channel is relatively broad, including contributions to knowledge, development of new goods, services and processes, and contributions to standardisation, guidelines, policy and regulation.

The analysis of the AAL Programme intervention logic (Chapter 4) will address which impact channels are most relevant for this specific programme. For these impact channels, indicators should be developed. In describing the indicators used by relevant other programmes (Chapter 3), the relevance of different impact channels will be addressed.

3. State-of-the-art

3.1 Introduction

This chapter describes the impact indicators, and the data collection process, used by five European or national programmes.

- ARTEMIS Joint Undertaking;
- Eurostars;
- Impact Assessment for Social Innovation (iA4SI);
- Tekes' Innovation in Social and Healthcare Services;
- Assisted Living Innovation Platform (ALIP).

Each of these five initiatives contains a number of state-of-the-art elements, e.g. the set of indicators for assessing European collaboration (ARTEMIS and Eurostars), the indicators for assessing social impact (Tekes and ALIP) and online data collection (IA4SI). Moreover, the five initiatives have similarities to the AAL Programme in that they also have SME participation and innovation as key characteristics; and/or that they address health or ICT innovation.

The study team conducted desk research and telephone interviews for these programmes/initiatives. In presenting the indicators, the relevant impact channels are indicated by the study team.¹¹ Moreover, a distinction is made between direct impact (outcome) and indirect impact (impact).

In addition, this chapter briefly discusses outcome and impact indicators in three other innovation impact assessments in the field of health and ICT:

- The EC commissioned methodology for assessment of environmental impacts of research and innovation policy;¹²
- The study 'Beyond Patents and Publications' that reflects on indicators for monitoring the impact of EU-funded research and innovation programmes in the field of ICT;¹³
- The set of indicators that is developed for the European Innovation Partnership on Active and Healthy Ageing (EIP-AHA).¹⁴

To conclude, Chapter 3 reflects on the indicators observed and the processes for data collection that are being used by other initiatives.

3.2 ARTEMIS Joint Undertaking

ARTEMIS (recently merged with ENIAC JU into ECSEL JU¹⁵) aims to tackle the research and structural challenges faced by European industry by defining and implementing a coherent Research Agenda for Embedded Computing Systems. The objective is to create an environment conducive to improving the industrial competitiveness of both large and small enterprises in the area of embedded computing systems. ARTEMIS manages and co-ordinates research activities through open calls for

¹¹ The concept of impact channels is introduced in Chapter 2.

¹² European Commission (2013), Assessing environmental impacts of Research and Innovation Policy.

¹³ Dinges, M., Poel, M. and N.S. Laugesen (2010), Beyond Patents and Publications: Performance Monitoring Indicators for ICT Research in the EU - Funded RTD.

¹⁴ European Commission, JRC-IPTS (forthcoming), Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing, preliminary reports on innovation and growth indicators, and on initial and new indicators (indicating health and sustainability indicators).

¹⁵ ECSEL is the acronym for Electronic Components and Systems for European Leadership.

proposals through a 10-year research programme on embedded computing systems. Funding is provided via a combination of EU funds (FP7) and national funding. With an industrial partner in the lead of the project, this results in so-called Tri-parted projects.

ARTEMIS' strategy is to ensure impact of its programme by adopting a market-oriented approach integrating science and product research, and by facilitating the collaboration of projects around topics of importance, in so-called Centres of Innovation Excellence (CoIE). Projects must include leading industrial partners and the proposal must include a strong business case showing a clear market analysis and plausible impact potential.

Essential in the ARTEMIS programme is the building of an *ARTEMIS community*, in which one of the consortium partners, a non-profit industry association, plays an essential role. The industry association undertakes many communication activities, organises annual conferences, and informal meetings, through which a sense of community and loyalty to the programme is established. Through this community building, and through the calls for proposals, collaboration of the projects around specific themes is facilitated, rather than projects operating individually. This has been essential to the success of the ARTEMIS programme.

There are no obligatory assessments of the impact of individual projects, other than the statutory reports mandated by the EC. While some efforts in this respect have been made in the past, this has proved unfavourable and difficult for various reasons. First, ARTEMIS is not interested in the impact of individual projects, but more in impact at the programme level. Second, it has proven very difficult to identify innovation impact indicators that apply to the different industries involved in the projects. Third, project impact assessments would impose too much additional administrative load on the projects. Fourth, projects are hesitant to provide impact information because this information often is commercially sensitive. Finally, there is no legal basis to motivate project participants to collaborate in such assessments.¹⁶

One of the reasons for ARTEMIS to invest in a “community feeling” is to increase collaboration of participants in project and programme monitoring. Collaboration with relevant industry associations is perceived as the key to build high trust relationships and a community feeling.

Engagement of relevant stakeholders does not stop with project-consortia. This approach can also be taken for improving post project innovation monitors, including the selection of indicators. It is important that monitors include indicators or parameters to which end-users can relate, in order to stimulate data delivery and to increase the use of impact monitors.

A-priori definition of relevant KPIs that constitute a clear definition of “impact” has proven difficult in ARTEMIS. It is suggested that parameters should be based on the strategy and targets of the programme. The parameters must be applicable to the various projects and easily measurable.

To engage the community in the analysis and reporting of these KPIs, it is important that the assessment is presented as a means of promotion and dissemination of their work. It is important to disseminate results on a relevant and aggregated level, to show the added value of the projects and of the programme. Ensuring that dissemination is done in an appealing fashion (e.g. a nicely designed book or website) is also important to generate willingness to participate.

Using this community approach, ARTEMIS has been successful in generating data on perceived project outcomes on a voluntary basis. The working group on metrics and success criteria for ARTEMIS has conducted a survey among project participants in 2011 and 2013. The survey aims not to identify success stories, but to monitor the achievements of the ARTEMIS JU Programme from a bottom-up perspective. The

¹⁶ Data from an interview with a former ARTEMIS director, on personal note.

survey contained indicators relating to strengths and weaknesses of the ARTEMIS programme, and indicators relating to the innovation impact of projects and the programme. The latter are summarised in Figure 3, including their relation to output, outcome or impact, and the relevant impact channel. The survey contained three themes:

- Theme 1: Focusing on common R&D agendas more effectively;
- Theme 2: Providing significant economic and social benefits;
- Theme 3: Successful results in the market.

The set of indicators reflects that ARTEMIS stimulates development of tools that can be used in the development of a range of new goods/services and processes. As such, the impact channel Methodologies is highly prominent. Depending on IPR and other factors, the new tools may be used by project participants and other organisations. As such, there is a potential for long-term impact.

Figure 3 Indicators used by ARTEMIS related to innovation impact of project

Theme	Sub-topic	Indicator	Output, outcome, impact	Impact channel
1	-	New partnerships with consortium members	Outcome	N
		New partnerships with other universities or companies	Impact	N
		Intention for continuation project	Outcome	N
		Interaction with / establishment of ARTEMIS CoIE	Outcome	N
		Intention for spinoffs, start ups	Outcome	S
		Continued SME cooperation	Impact	N
		Level of continued SME cooperation	Impact	N
		Alignment with other initiatives/programmes	Impact	N
		New business opportunities	Outcome	N/S
1	Internal impact on organisation	Larger/broader R&D scope	Outcome	K
		Tool evaluation & use of prototype tools	Outcome	M
		More efficient/effective solutions or design methods	Outcome	M
		Outsourcing of innovative activities	Outcome	M/N
		Increase of knowledge and/or experiences	Outcome	K
		New insights on how to handle certain R&D work	Outcome	H/K
2	Specific market	Proportion (%) of the application market on which the project has an influence	Impact	K
		Time to specific market	Impact	K/M
2	Business impact	Reduced development costs	Impact	M
		Reduced time-to-market	Impact	M
		Higher reliability	Impact	M
		Higher re-usability of components	Impact	M
		New ways of working	Impact	K/H
		New product(s)	Output	K
		New generations of product (s)	Output	K

Theme	Sub-topic	Indicator	Output, outcome, impact	Impact channel
2	ARTEMIS targets	Reduction cost of system design	Impact	M
		Reduction in development cycles	Impact	M
		Increased complexity with decreased effort	Impact	M
		Reduced effort/time for re-validation and re-certification	Impact	M
		Cross-sectoral re-usability	Impact	M/K
2	Results	Most important innovation	Output	K
2	Strategy	In-house innovation	Outcome	K
		3 rd party licensing technologies	Impact	K
		Size of R&D team	Outcome	H
2	Contribution to societal challenges	Impact in the field of Electric Car	Impact	Several
		Impact in the field of Health & Well-being	Impact	Several
		Impact in the field of Support of Ageing Society	Impact	Several
		Impact in the field of Future Factories	Impact	Several
		Impact in the field of Energy Efficiency	Impact	Several
		Impact in the field of Transport & Mobility	Impact	Several
		Impact in the field of Security and safety	Impact	Several
3	Application and tool prototypes/demonstrators	# Application prototypes/demonstrators	Output	K
		# Tool prototypes/demonstrators	Output	M
		# Open source tool prototypes/demonstrators	Output	M
		Use of tool prototypes/demonstrators	Outcome	M
3	Improvement through use of tools	Better requirements engineering	Impact	M
		Better integration in a tool platform	Impact	M
		Seamless modelling of the product in the different development phases	Impact	M
		Better tool interoperability	Impact	M
		Run-time fault handling	Impact	M
		Reduction in development time	Impact	M
		Improvement in reliability of product	Impact	M
		Reduction of redesign cycles	Impact	M
		Easier and/or faster certification	Impact	M
		Mastering increased complexity	Impact	M
3	-	Development of standards	Impact	K
		Contribution to Open Source Community	Impact	K/M
		Number of patents	Output	K
		Trials/field tests	Output	K
		Contribution to educational programmes	Impact	H

Source: Metrics and Success Criteria for ARTEMIS, 2013.

3.3 Eurostars

EUREKA's mission is to raise the productivity and competitiveness of European businesses through technology while boosting national economies on the international

market, while strengthening the basis for sustainable prosperity and employment. Eurostars is a joint programme between national funding bodies gathered within EUREKA - and the EU. Eurostars focuses on R&D-performing SMEs that wish to lead transnational collaborative research projects, with rapidly commercialised results.

EUREKA focuses on close to market, bottom-up, R&D-driven cooperation. Projects in all technological areas with a civilian purpose may be eligible for funding. Eurostars in particular provides funding and support to research-performing companies, especially SMEs. EUREKA individual projects and Clusters have a wider remit. Eligibility and selection criteria aim to target funding to where it will be most effective in furthering innovation, opening to new global markets and achieving greater business success.

Over the years, EUREKA has published a number of reports showing the impact of its funding. These have been based on external assessment by consultants as well as internal project monitoring by the EUREKA Secretariat. Moreover, a number of independent academic studies have been carried out on the impact of EUREKA projects. Many of these studies have been on a national level, but some have assessed impact across the network.

Data for the internal monitoring is collected from application forms completed by participants, as well as through Final Impact Reports (upon project completion) and Market Impact Reports (1, 2, and 3 years after completion). Template reports are sent via email, and feedback on projects is gathered from National Project Coordinators. No systematic data collection takes place while projects are on-going. Information is stored in a database and extracted for regular reporting, 3-4 times a year at Network meetings. For Eurostars, form completion is mandatory to be eligible for top-up European Commission funding. Additional funding is also made contingent on report completion for EUREKA individual projects in some countries. There is a recommendation that Market Impact Reports are made obligatory in National Funding Agreements, which is currently being implemented in an increasing number of countries.

The identification of success stories comes from EUREKA’s network of National Project Coordinators and Project Officers. In addition, success stories are identified through thorough review of data concerning additional turnover and jobs resulting from the RDI activities carried on during EUREKA projects.

Outcome and impact indicators vary slightly between different funding instruments. Figure 4 shows a list of indicators that is drawn primarily from EUREKA individual projects and Eurostars.¹⁷ Note the relevance of *achieved* as well as *expected* impact.

Figure 4 EUREKA and Eurostars indicators

Type of impact	Indicator	Output, outcome, impact	Impact channel
Increased knowledge and capacity to innovate	Improvements to existing products (achieved, expected, time to market)	Outcome	K
	Demonstrators, prototypes or pilot phase (achieved, expected, time to market)	Outcome	K
	New licences (no. achieved, expected)	Impact	K
	New patents (no. achieved, expected)	Output	K
	Publications (achieved, expected, time to market)	Output	K
	Improved/new knowledge of skills (achieved, expected, time to market)	Outcome	K

¹⁷ The five categories of impact are taken from the AAL Programme final report template, as there are differences between the EUREKA and Eurostars categories of impact.

Type of impact	Indicator	Output, outcome, impact	Impact channel
	New services (achieved, expected, time to market)	Outcome	K
	Pre-normative character (Y/N) and development of European/World Standards (Y/N)	Impact	K
	Patents filed (or on-going process) – potential value (Y/N)	Output/ outcome	K
	Type of IPR researched/applied for/granted	Outcome	K
Changes in business (collaborative) innovation processes and investments within enterprises	New (or improved) strategic industrial alliances (achieved, expected, time to market)	Outcome	N
	New processes (achieved, expected, time to market)	Outcome	K
	Improvements to existing processes (achieved, expected, time to market)	Outcome	K
	Improved management/quality of work (achieved, expected, time to market)	Outcome	K/H
Economic performance and sustained competitiveness	Per product/service/process spin-off - Market introduction year, investments undertaken/foreseen, turnover achieved/expected in 3 years)	Outcome	S
	Employment impact (FTE increase/safeguard, achieved/expected in 2 years), both overall and R&D-specific	Impact	K/S/H
	Research/PhD jobs	Impact	H
	Number of employees/FTEs/R&D FTEs/Turnover/R&D expenditure/Gross Earnings/Net Income/Balance Sheet total/Number of running projects/workload of R&D projects in man-years or FTEs/Number and value of Public Grants received	Output/ Outcome/ Impact	H
	Estimated additional turnover resulting from project (achieved, expected within 2 years)	Outcome	K
	Industrial exploitation expected (by this company, another company)	Impact	K/S
	Estimated additional resources required for results to reach market	Outcome	-
	Availability of internal/external funding	Outcome	-
	Change of company strategy	Outcome	K
	Change of users/market requirements	Outcome	K
	Manufacturing capability	Outcome	K
	Distribution network	Impact	N
	Contribution to/impact on policy making	Currently not assessed, but to be included in the future	-
Contribution to societal challenges	Employment impact (FTE increase/safeguard, achieved/expected in 2 years), both overall and R&D-specific	Impact	H
	Research/PhD jobs	Impact	H
	Employment increase outside organisation resulting from project (no.)	Impact	H/N
	Effect on environment/health of citizens/quality of life of citizens/safety /citizens protection /Internet/anti-piracy (beneficial or neutral)	Impact	Several

Source: EUREKA input

3.4 Assisted Living Innovation Platform (ALIP)

The Assisted Living Innovation Platform (ALIP) delivers a wide-ranging programme to enable the ageing population and those with long-term health conditions to live with greater independence. Innovate UK (formerly the Technology Strategy Board), the UK's innovation agency, launched the platform in 2007. Additional funding is provided by the Department of Health's National Institute for Health Research, the Engineering and Physical Science Research Council and the Economic and Social Research Council. ALIP addresses the challenges of assisted living in an environment with an ageing population where social and health care services are unsustainable.

ALIP is an example of an innovation-support measure, which adopts an innovation systems perspective. This Innovation Platform extends the Innovate UK's portfolio of support measures beyond the classic supply-side instruments like the Smart Scheme (provides funding to SMEs to engage in strategically important areas of science) and Collaborative R&D Funding Programme, to provide a more open and flexible response to the dynamic conditions characterising profound areas of social change such an ageing population and provide a more powerful means by which to catalyse innovation at both component and systems levels¹⁸.

There are a number of projects and programmes being run as part of ALIP and there is currently an evaluation underway of their largest programme Delivering of Assisted Living Lifestyles at Scale (DALLAS). The programme has a strong focus on the co-creation of services with members of the community and delivering lifestyles that both enable and empower people rather than focusing too narrowly on health related outcomes. More specifically, in relation to impact, the evaluation will be focusing on:

- Benefits to the individual i.e. friends family and informal carers;
- Benefits to the systems i.e. health and social care delivery and practices, housing, lifestyles and other cultural and organisational factors;
- Benefits to the UK economy.

To evaluate the impacts of DALLAS the evaluation team has proposed creating a toolkit. This is expected to take the form of an 'outcome toolkit', which will provide a set of validated indicators and possibly purposely-designed measures where required. It is expected that this will include quantitative measures used in human computer interaction, indicators developed in the health services research, and also include measures of wellness, well-being and quality of life.

¹⁸ Department of Business Innovation and Skills (2014), The Case for Public Support of Innovation, Annex A, Contribution to the UK Case Study for the OECD TIP System Innovation project.

Figure 5 ALIP (DALLAS) indicators

Indicator	Output, outcome, impact	Impact channel
Perceived ease of use	Outcome	K/M
Perceived usefulness	Outcome	K/M
User satisfaction	Outcome	K/H
Acceptability	Outcome	H
Mortality rates	Outcome	K
Hospitalisations	Outcome	K
EQ-5D (health and other QoL outcomes)	Outcome	K
Disease specific measures	Outcome	K
Level of Perceived Control	Outcome	H
Connectedness	Impact	N/H
Community	Impact	N/H
Collaboration	Impact	N/H
Choice	Impact	H
Contribution	Impact	N/H

The results of the ‘outcomes toolkit’ will be combined with user stories and developed into an assessment of ALIP’s impacts.¹⁹ The expected completion date for this evaluation is late 2015. More detail relating to the indicators being used in this evaluation are not yet available.

3.5 Tekes’ Innovations in Social and Healthcare Services programme

The aim of Tekes’ Innovations in Social and Healthcare Services programme (2008-2015) is to renew health and social services and increase business opportunities through innovative activities. The main goals of the programme are:

- Effective, customer-oriented health and social services;
- More extensive preventive actions;
- Diversified partnership and cooperation.

All programmes at Tekes are evaluated after they have finished, usually within some month’s time. The evaluation includes an impact assessment, and is usually carried out by an external party (consultancy companies). For this evaluation, grantees are usually very willing to participate, although participation is not mandatory. An evaluation including impact assessment of the Tekes Innovations in Social and Healthcare Services 2008– 2015 programme is planned for 2016, which will also include an impact assessment. Details of the impact assessment of this specific programme are not yet specified or available.²⁰

However, the programme has been included in the yearly evaluation of Tekes activities in 2014.²¹ The overall impacts on environment and wellbeing of the nine Tekes programmes were primarily assessed by means of the analysis of post-completion questionnaires of Tekes projects. In these questionnaires, 10 different indicators for impact were used (Figure 6). Some additional indicators that are commonly used in Tekes programme evaluations are summarised in Figure 7. The set of indicators reveals that Tekes intends to focus on social and economic impact (indirect impact), while

¹⁹ McGee-Lennon, Bouamrane, Barry et al. (2012), Proceeding of BCS HCI 2012 Workshops, Evaluating the Delivery of Assisted Living Lifestyles at Scales (DALLAS).

²⁰ Correspondence with Tekes programme manager.

²¹ Valovirta, Lehenkari et al. (2014), The Impact of Tekes Activities on Wellbeing and Environment.

information about direct impact (outcome) and output can be used to explore relevant impact channels ('make the case') that certain social and economic impact can be attributed to a specific project or programme.

Figure 6 Tekes activities impact indicators

Indicator	Output, outcome, impact	Impact channel
National competence level	Impact	K/H
Employment	Impact	K/H
Entrepreneurship	Impact	K/S
Internationalization of innovation activities	Impact	K/N
Regional development	Impact	Several
Economic renewal	Impact	Several
Condition of the environment	Impact	Several
Security	Impact	Several
Public services	Impact	Several
Health and social services	Impact	Several

Source: Technopolis analysis of Valovirta, Lehenkari et al. (2014), The Impact of Tekes Activities on Wellbeing and Environment.

Figure 7 Indicators commonly used in Tekes programme evaluations

Indicator	Output, outcome, impact	Impact channel
Number of new products/services developed	Output	K
Number of IPRs	Output/ Outcome	K
Number scientific publications	Output	K
Number of new start-ups	Impact	S
Employment at company	Impact	K/H
Turnover and competitiveness of the companies involved	Outcome	K
Creation of new networks	Impact	N
Spillover and exchange of new knowledge	Impact	K/N
Achievements of programmes' goals	Impact	Several

Source: Technopolis analysis of correspondence with Tekes programme manager.

3.6 Impact Assessment for Social Innovation (iA4SI)

Impact Assessment for Social Innovation (iA4SI) is an initiative that aims to develop a structured methodology able to evaluate the potential social, political, economic and environmental impacts of grassroots social innovation initiatives in society and to map the key characteristics able to determine a wider uptake of initiatives at the social level. This initiative is a Collective Awareness Platform (CAPs) project, co-financed by DG Connect through FP7. In CAPs, ICT systems leverage 'network effects' by combining open online social media, distributed knowledge creation and data from real-life

environments in order to create awareness of problems and possible solutions requesting collective efforts and enabling new forms of social innovation.²² The iA4SI platform not only includes a methodology to assess the socio-economic and political impacts of grassroots social innovation initiatives, but also translates the findings into a language that policy makers, entrepreneurs and citizens can understand.²³ When project coordinators of grassroots initiatives (and other types of social innovation projects) use the iA4SI tools regularly, this will provide them with valuable feedback for understanding and improving the impacts of their project as well as how their project is performing compared to other projects (e.g. in terms of technological innovation, user involvement and entrepreneurship).

iA4SI combines three tools allowing the triangulation of data to generate accurate information on impact:

- An **online Self Assessment Toolkit (SAT)** for project coordinators and partners provides data on outcomes and impacts for each CAP's project and provides the basic data on economic, social, environmental and policy impacts for the aggregated analysis of the domain. Through SAT, project managers will be able to run autonomously an assessment to compare projects at national levels and / or international levels.
- A **User Data Gathering Interface** which gathers information directly from the users of CAP projects participating in the assessment. It consists of a simple interface, which appears like an online questionnaire structured both for single users and organisations. Using this tool, project users will be requested to provide their opinion about the output / services they use and their potential impacts. In addition to basic information collected about project users, the data gathered through this tool will be used in an aggregated analysis of the domain.
- A **Citizen Engagement Platform** which is the main tool for engaging citizens through a system of voting in order to understand more about social innovation initiatives, approaches and opportunities and their potentiality in terms of take-up and impact.

The iA4SI consortium is working on a short list of indicators. The long list of indicators includes, for example, 67 indicators on social impact. Of particular relevance in the context of AAL solutions is that iA4SI distinguishes between different types of use, and different types of users.

Figure 8 iA4SI indicators

Indicator	Output, outcome, impact	Impact channel
Frequent and less-frequent users	Outcome	N
New users and users that stopped using the platform	Outcome	N
Male and female users	Outcome	N
Young and old users	Outcome	N
Users with high or low education levels	Outcome	N/H
Time spent by users	Outcome	N/K
Specific features of the platform e.g. communication between different types of user	Outcome	N
Trust e.g. users willing to share data	Impact	K/N/H

Source: Technopolis analysis of iA4SI information.

²²<http://ec.europa.eu/digital-agenda/en/collective-awareness-platforms-sustainability-and-social-innovation>

²³ <http://ia4si.eu/objectives/>

It is emphasised that the indicators should be as specific as possible, not just in the interest of data analysis but also in the interest of data collection. Participants should immediately notice that the indicators are relevant for their project.

Timing of data delivery and self-assessment is flexible. Project coordinators are invited to provide data every six months, or whenever the project thinks it is useful for planning their next step. At a central level, the iA4SI management will provide reports per theme and for the platform in general. Depending on data provided, this could be once per year.

In terms of motivating project coordinators (and other participants) to provide data, the main strategy is to let them get used to the online tool and develop ownership of the data, while the project is still running and while they still have clear incentives to inform the EC about project impact. iA4SI representatives are reluctant to oblige project participants to provide data and to use the tool. If this approach is taken, data would only be provided for accountability and marketing reasons. In short, to feed the EC and other organisations that provide funding. The main risk is that the impact will be exaggerated.

In the context of iA4SI it is emphasised that a helpdesk is an essential element of an online data collection and data sharing platform. Moreover, confidentiality should be explained clearly. The central organisation does not receive the data anonymously. They should earn this high trust level. Any subsequent use and publication of the data should be anonymous, e.g. by aggregating to the level of themes or the programme as a whole. Information about individual projects can be used, after permission, in success stories. It was mentioned that impact data need to be complemented with interview data, in order to write a coherent story about how a combination of activities leads to different types of impact (cf. impact channels).

3.7 Additional programmes and initiatives

As mentioned above, the scope of the study allowed for analysing three more initiatives/programmes: the EC commissioned methodology for assessment of environmental impacts of research and innovation policy; the study 'Beyond Patents and Publications' in the context of ICT research in FP7; and the monitoring framework that is currently being developed by the European Commission's Joint Research Centre. Below, the emphasis is on the indicators used.

3.7.1 Assessment of environmental impacts of research and innovation policy

This assessment methodology aims to link research and innovation policy to environmental impacts.²⁴ It addresses both intended and unintended outcomes and impacts of policies. The methodology separates the research and innovation system from the environmental eco-system, and seeks to identify pathways through which these systems are linked. It identifies several impact areas and indicators for the innovation system, as showed in Figure 9. Of particular interest for the AAL Programme are indicators for new or changed exchanges between public and private actors.

²⁴ Miedzinski et al. (2013), Assessing Environmental Impacts of Research and Innovation Policy.

Figure 9 RDI policy impact areas and indicators

Impact area	Indicators	Output, outcome, impact	Impact channel
Knowledge production and learning system	New/changed formal and informal exchange between/within public and private actors	Impact	K/N
Policy, regulation and governance system	New/changed public strategies and policies	Impact	K
	New/changed products and practices of economic and social actors (e.g. product design or changed R&I activities)	Impact	K
Social practice and consumption patterns	New/changed relations between individuals/organisations/artefacts/surroundings	Impact	K/N
	New/changed behaviours	Impact	K
Production system and business models	New/changed production processes/service systems	Impact	M/K
	Substitution of existing products/services	Impact	K
Technical infrastructures and built environment	New/modified products affecting infrastructure/built environment	Impact	K

Source: Technopolis analysis of Miedzinski et al. (2013), Assessing Environmental Impacts of Research and Innovation Policy.

3.7.2 ICT outcome and impact indicators

The study ‘Beyond Patents and Publications’ was commissioned by the EC to recommend on the indicators for monitoring and impact assessment of ICT research in Europe’s FP7.²⁵ The study identified the state-of-the-art outcome and impact indicators and their relevant impact channels (Figure 10). Of particular interest are the indicators for human capital and indirect economic impact such as increased revenues and increased productivity, resulting from new knowledge and launching new products or processes.²⁶

Figure 10 Indicators taken from the ‘Beyond Patents and Publications’ study

Category	Indicator	Output, outcome, impact	Impact channel
Business/Research capabilities	% of participating organisations achieving significant increase in innovation capabilities	Outcome	K/H
	% of participating organisations achieving significant improved use of ICT	Outcome	K
International knowledge position	Increased reputation/recognition in the scientific community	Outcome	K/N
	Changes in international rankings of institutes and involved companies	Outcome	K/N
	Changes in international rankings of institutes and involved companies	Outcome	K/N
Increased ability to develop product or process innovations	Increase range of goods or services	Outcome	K
	Replace out-dated products or processes	Outcome	K
	Enter new markets or increase market share	Outcome	K

²⁵ Dinges, M., Poel, M. and N.S. Laugesen (2011), Beyond Patents and Publications: Performance Monitoring Indicators for ICT Research in the EU - Funded RTD.

²⁶ The set of indicators also covers R&D investments. Increased private R&D expenses can be interpreted as an outcome of public support programmes (for organisations that participate in these programmes) and an impact on entire sectors (such as the ICT sector). In both cases, the assumption is that public support programmes increase rather than displace private investments.

Category	Indicator	Output, outcome, impact	Impact channel
	Improve quality of goods or services	Outcome	K
	Improve flexibility for producing goods or services	Outcome	K
	Increase capacity for producing goods or services	Outcome	K
	Reduced labour costs per unit output	Outcome	K
	Reduce material and energy costs per unit output	Outcome	K
	Reduce environmental impacts	Impact	Several
	Improve health or safety of your employees	Impact	Several
Capability to introduce different types of organisational innovations	New business practices	Outcome	K
	New methods of organising work	Outcome	K
	New methods of organising external relations	Outcome	K/N
Increased in-house creativity and skills	Software development	Outcome	K/H
	Graphic arts, design of objects, web design, engineering/applied sciences, mathematics/statistics/database management	Outcome	K/H
Other	Nr. and share of PhD and master graduates taking up employment with industry	Impact	H
	Existence of formal qualification and exchange schemes between participating organisations	Impact	H/N
	Nr. of researchers participating in qualification and exchange schemes	Impact	H/N
	The number of professional training courses, workshops for industry and end-users	Impact	H/N
	The number of training courses for programme participants	Outcome	H
	The attraction/retention of world class researchers	Impact	H
	Nr./% of project participants willing to cooperate again in research endeavours	Outcome	N
	Nr./% of project participants establishing joint research agendas	Impact	N
	Nr./% of project participants launching new market alliances	Outcome	N/S
	Nr. /% of project participants establishing joint training and qualification measures.	Impact	N/H
	Share of the ICT sector in the economy measured as a proportion of GDP and of total employment	Impact	K
	Growth of the ICT sector measured as a % change of value added at current and constant prices	Impact	K
	Ratio of the productivity level in the ICT sector with respect to the entire economy	Impact	K
	Productivity growth in the ICT sector	Impact	K
	Size and nominal growth of ICT markets (IT and telecom)	Impact	K
	Income gained through royalties/IPRs stemming from FP7-ICT	Outcome/Impact	K
	Gross value added of a firm	Impact	K
Exports of a firm	Impact	K	

Source: Technopolis analysis of Dinges et al. (2011), Beyond Patents and Publications: Performance Monitoring Indicators for ICT Research in the EU - Funded RTD.

3.7.3 European Innovation Partnership on Active and Healthy Ageing (EIP-AHA)

In the context of the Innovation Union strategy, the European Commission has defined a number of Innovation Partnerships that should increase European competitiveness and address societal challenges through research and innovation. Among the objectives of these partnerships is to increase collaboration and knowledge exchange between relevant initiatives that are spread across Europe.

One of the European Innovation Partnerships is on Active and Healthy Ageing (EIP-AHA). The triple win objectives of EIP-AHA are very similar to those of the AAL Programme, mainly because the triple win approach is derived from European Commission strategies. The EIP-AHA will pursue:

- Enabling EU citizens to lead healthy, active and independent lives while ageing;
- Improving the sustainability and efficiency of social and health care systems;
- Boosting and improving the competitiveness of the markets for innovative products and services, responding to the ageing challenge at both EU and global level, thus creating new opportunities for businesses.

One of the challenges of the EIP-AHA is to monitor progress towards these triple objectives, while taking into account that the many relevant initiatives use different sets of indicators for monitoring their output, outcomes and impact. The EIP-AHA is in the process of selecting common indicators, for which data can be used from a large number of relevant initiatives.²⁷

Regarding competitiveness and innovation, the following indicators have been included in the short list of indicators:

- Number of technologies and devices implemented, e.g. number of users;
- Number of implemented apps, games, e.g. number of users;
- Number of telehealth/telecare services implemented, e.g. number of users such as patients and older citizens;
- Employment: the number of jobs created;
- Employment: number of companies created and/or growth of companies.

Along the same lines, a short list of indicators for monitoring the first and second objective (in short: Quality of Life and sustainability of health/care systems).

- Health related Quality of Life, e.g. using the EQ-5D questionnaire that covers mobility, self-care, usual activities, pain/discomfort and anxiety/depression;
- Mortality;
- Risk factors such as blood pressure, cholesterol levels, glucose levels and body mass index (BMI);
- Frailty, e.g. chronic diseases and disabilities;
- Cognitive decline, e.g. memory;
- Functional status, e.g. ability to walk;
- Health and care resources use, e.g. number of visits to primary care and hospitals;
- Unit cost data, e.g. the costs of specific health interventions;

²⁷ European Commission, JRC-IPTS (forthcoming), Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing, preliminary reports on innovation and growth indicators, and on initial and new indicators (indicating health and sustainability indicators).

In addition, common indicators may be selected for mental health (in particular depression), nutrition and patient/user satisfaction.

Note that the set of indicators that is being developed has a clear emphasis on impact indicators. The EIP-AHA will monitor progress at European level. One of the challenges will be to attribute progress to relevant programmes/initiatives.

3.8 Reflection on indicators and the data collection process

3.8.1 Indicators

Although each set of impact indicators is developed or customised for each unique programme/initiative, it is possible to observe similarities between the indicator sets that are discussed above. These similarities or common practices will be taken into account when developing the set of indicators for monitoring the innovation impact of the AAL Programme.

- One of the similarities is the emphasis on three impact channels:
 - Knowledge: technological and non-technological, codified and tacit, leading to new goods, services, processes or standards (K);
 - Networks and social interaction between actors from different and similar disciplines, sectors and countries (N);
 - Spin-offs, start-ups and high-growth SMEs (S).
- Because the impact channel of *knowledge* is defined broadly, a variety of indicators is used to monitor how knowledge is being accumulated and how it leads to social and economic impact. Most prominently, there are indicators for new goods, services and processes that are developed and launched, based on new knowledge. Examples are new development tools and products (e.g. ARTEMIS), new software tools (e.g. FP7 research and innovation about ICT), new services (e.g. Eurostars) and new processes in organisations or in sectors (e.g. FP7-ICT and EIP-AHA). The description of products (goods and services) and processes reveals the widespread use of OECD and EC definitions (e.g. OECD's Oslo Manual).
- Moreover, there are indicators for monitoring whether and how new goods, services and processes are used by organisations and individuals. On the one hand, this concerns revenues and employment for the manufacturers and service provider that provide these products (e.g. in ARTEMIS and Eurostars). On the other hand, this concerns adoption and actual use by different types of users (e.g. in iA4SI) and how this leads to increased Quality of Life (Eurostars, ALIP, EIP-AHA). Often, a distinction is made between expected and achieved impact.
- A first distinct aspect of knowledge accumulation is *appropriability* by means of Intellectual Property Rights (ARTEMIS, Eurostars, Tekes programmes, FP7-ICT), reputation effects (FP7-ICT) and reduced time to market or first mover advantages (ARTEMIS). In the context of IPR, most initiatives focus on patents. In selecting indicators, distinctions are made between patents applied, patents granted, patent licensing, and revenues from patent licensing.
- Another distinct aspect of knowledge accumulation is contribution to *standardisation* processes. Indicators refer to technical standards and interoperability (ARTEMIS and Eurostars) and certification (ARTEMIS). Contributions to public policy are addressed in proposals to improve monitoring of innovation and environmental impact (see above).
- A third aspect of knowledge accumulation is that research and innovation projects often are part of a *portfolio or programme of projects*. This concerns the perspective of participants (e.g. universities, large enterprises and SMEs) but also the perspective of funding agencies and public support programmes. One of the challenges is to fund a coherent set of projects and to explore synergies. Only to

some extent, this is reflected in the indicators discussed above. For example, Eurostars uses an indicator for assessing the impact of a project on the availability of internal or external funding (for current and subsequent projects). ARTEMIS addresses the intention for continuation of projects. Note that so called portfolio effects can also be acknowledged in the operationalisation of indicators, e.g. by asking about the relative contribution of individual projects to certain outcomes and impacts.

- The impact channel of *networks* is monitored by means of indicators about new and continued collaboration (ARTEMIS, Eurostars, FP7-ICT, Tekes programmes). Continued collaboration with project partners and contributions to research agendas are indicators for structural changes in collaborative behaviour (cf. behavioural additionality). Note that collaboration can refer to collaboration between actors that are different or similar in terms of country, sector, private or public sector, size, etc.
- The impact channel of *spin-offs, start-ups and high-growth SMEs* is also covered by the set of indicators of ARTEMIS, Eurostars, FP7-ICT and Tekes programmes. To some extent, there are specific indicators for revenues or employment of spin-offs and start-ups (Eurostars, most explicitly).
- A fourth impact channel, *human capital*, is addressed in around half the initiatives discussed. Examples of indicators in Eurostars and in FP7 are increased capabilities, staff training programmes and the number of PhD students and graduates. Initiatives that focus on social and economic impact (e.g. ALIP and EIP-AHA) are developing indicators that address human capital of end-users.
- A fifth impact channel is mostly used in the ARTEMIS programme: *methodologies, instrumentation, software and other tools* that are used in the R&D and innovation process (M). Examples of indicators used are reduced design costs, development costs and reduced/shorter development cycles.
- Because the emphasis of the initiatives discussed above is on applied research and innovation rather than basic research, the sixth impact channel was not identified: *research infrastructures, i.e. large-scale research and innovation facilities* (R).
- The last two observations are that the initiatives combine *outcome and impact* indicators, while also combining *quantitative and qualitative* indicators (e.g. the number of patents, spin-offs and users but also descriptions of contributions to standardisation and Quality of Life).

3.8.2 Data collection process

The reflection on data collection processes used is relatively short because in many cases, the process is straightforward. In short: the funding agency or management of support programme collects data every year during the course of projects. The data collection and data analysis process can be delegated to consultants, especially for interim evaluations and ex post evaluation and impact assessments. Word or Excel templates or online surveys are distributed to project coordinators only or to all project participants. The exceptions and main points of attention are as follows:

- ARTEMIS and Eurostars have experimented with collecting data *after* projects have ended.
- ARTEMIS tried to engage project participants and increase their willingness to provide data, by investing in the ARTEMIS *community*. By means of events, newsletters, etc., members of the community are informed about relevant trends, research results, project successes, etc. An important role is played by industry associations as they already connect with many relevant actors.
- Eurostars has explored the *legal issues* of making it *mandatory* for project participants to provide data. The focus has been on data collection/provision during the course of projects. Because project funding is provided by national and

European programmes, one of the options is to have different regimes ('mandatory or not') at national and European level.

- *Confidentiality of data* is important because innovation impact is closely related to market opportunities and commercial interests. The organisation that collects and analyses the data should be trusted by project participants. In addition, data confidentiality should be respected by means non-disclosure agreements for confidential, non-aggregated data. Data should only be disclosed at an aggregated level.
- ARTEMIS experienced the importance of selecting indicators that *are specific and relevant* for the research and innovation community in a particular field. As such, stakeholders should be involved in developing the set of indicators.
- Several initiatives observed the importance of designing the impact assessment process as a *win-win* for project participants and funding agencies/programme management. The benefits for participants can include promotion and dissemination of their project and their project results via the programme website, books, case studies, etc. Participants also benefit from dissemination of results at aggregated, programme level. This implies advocacy of one programme vis-à-vis other research and innovation communities.
- iA4SI is experimenting with an *online tool* for data collection but also for sharing of data and analyses (e.g. update reports about calls) and for self benchmarking (e.g. comparing the outcome and impact of one project with the aggregated/average outcome and impact of other projects).

4. Intervention logic of the AAL (Joint) Programme

4.1 Mission, objectives and activities

4.1.1 Mission

For the AAL Programme we have developed the intervention logic presented in Figure 3 below (and in a separate Annex to this interim document, to increase readability and allow for printing in A3 format). Where relevant a distinction is made between the first phase of the programme (AAL1, Joint Programme, 2008-2013) and the second phase (AAL2, Programme, 2014-2020).

The overall mission of the AAL Programme is best described in the Interim Evaluation conducted in 2010 and which was commissioned by the European Commission, and in the AAL Programme Plan 2014-2020.^{28,29} The mission for AAL2 is equal to that of AAL1: to respond with ICT based solutions to the demographic challenges of an ageing population.

4.1.2 High-level objectives

The high-level objectives for AAL1 (Joint Programme) and AAL2 (Programme) are the same. They are described as the ‘triple win’ objectives in a communication from the European Commission on reinforcing the AAL Programme in 2014, in the EC commissioned final evaluation in 2013, and in the AAL Programme Plan 2014-2020.^{30,31} These high-level objectives are:

- A better quality of life for older persons: individual and family;
- Increased efficiency and sustainability of the care systems;
- Strengthening the industrial base in Europe in ICT products and services for ageing well.

4.1.3 Strategic objectives

Also the strategic objectives are similar between AAL1 and AAL2, focusing on: 1) the emergence of new products, services, and systems based on ICT solutions, 2) creating critical mass of applied research and innovation, and 3) optimizing conditions for industrial exploitations.^{1,4} However, AAL2 highlights even more the importance of user-oriented and interoperable solutions.²

4.1.4 Specific objectives

For AAL1 it is not clearly described how the programme aimed to meet the above mentioned strategic objectives. For AAL2 this is more clearly defined in the AAL Programme Plan 2014-2020.² The programme aims to:

- Ensure that end-users are involved from the start of all funded projects (e.g. through iterative design and development approaches);
- Promote a coherent European framework by 2020 to support development of common approaches;

²⁸ Kuneva, M. et al. (2010), Interim Evaluation of the Ambient Assisted Living Joint Programme.

²⁹ AAL Programme (2014), Ambient Assisted Living Programme Plan 2014-2020, pp.1-27.

³⁰ AAL Programme (2014), Action 78: Reinforce the Ambient Assisted Living (AAL) Programme.

³¹ Sharpe, M. (2013), Final Evaluation of the Ambient Assisted Living Joint Programme, doi:10.2759/361.

- Build supply/value chains across the public, private and third sector, especially targeting the needs of SMEs.

4.1.5 Activities

Both in AAL1 and AAL2 there are two types of funded activities: 1) Technological research, prototyping and piloting and dissemination activities, implemented via shared cost trans-national projects and 2) Supporting activities such as brokerage, programme promotion and networking activities (with strong emphasis on the Annual Forum).

Whereas the calls for proposals in AAL1 were more topic-specific, the AAL2 calls are more open and challenge driven.³² In AAL1, the focus was on the development of ICT products, services or systems (e.g. ICT products to increase social interaction). In AAL2 the focus will be on challenges and ways in which ICT can contribute to solutions. The first AAL2 call provides an illustration. The call is titled: “*An Ageing society faces an increasing need for care, how will ICT contribute to sustainable solutions?*”³³ The call aims for projects that address issues such as:

- How ICT-based solutions reconcile increased demand with limited resources;
- How ICT-based solutions increase and facilitate the supply of formal and informal care for older adults;
- How ICT-based solutions reduce the demand for care through prevention and self-management;
- How ICT-based solutions can support the shift towards better care at home and in the community.

4.2 Outputs, outcomes and impacts

AAL2 aims to expand and build upon the outputs from AAL1. The projects and supporting activities are expected to result in:

- Publications and Intellectual Property Rights (IPR);
- Leveraging of national resources;
- Strong networking effects, especially through the annual Forum;
- Stimulate industrial leadership at the project level;
- High participation of end-users (even more in AAL2 than in AAL1) and raising the awareness of the importance of involving end-users in the conception of products and services for older adults;
- High participation of SMEs;
- Cooperation and collaboration between the AAL Programme and other stakeholders.

These outputs are expected to contribute to the following outcomes:³³

- Critical mass of research, development and innovation;
- Good exploitation prospects for finished projects;
- Products, systems and services that can be tailored to the needs and desires of each user (even more in AAL2 than in AAL1);

³² Kuneva, M. et al. (2010), Interim Evaluation of the Ambient Assisted Living Joint Programme; AAL Programme (2014), Active and Assisted Living Programme Challenge-Led Call for Proposals 2014: Care For The Future.

³³ Ibid.

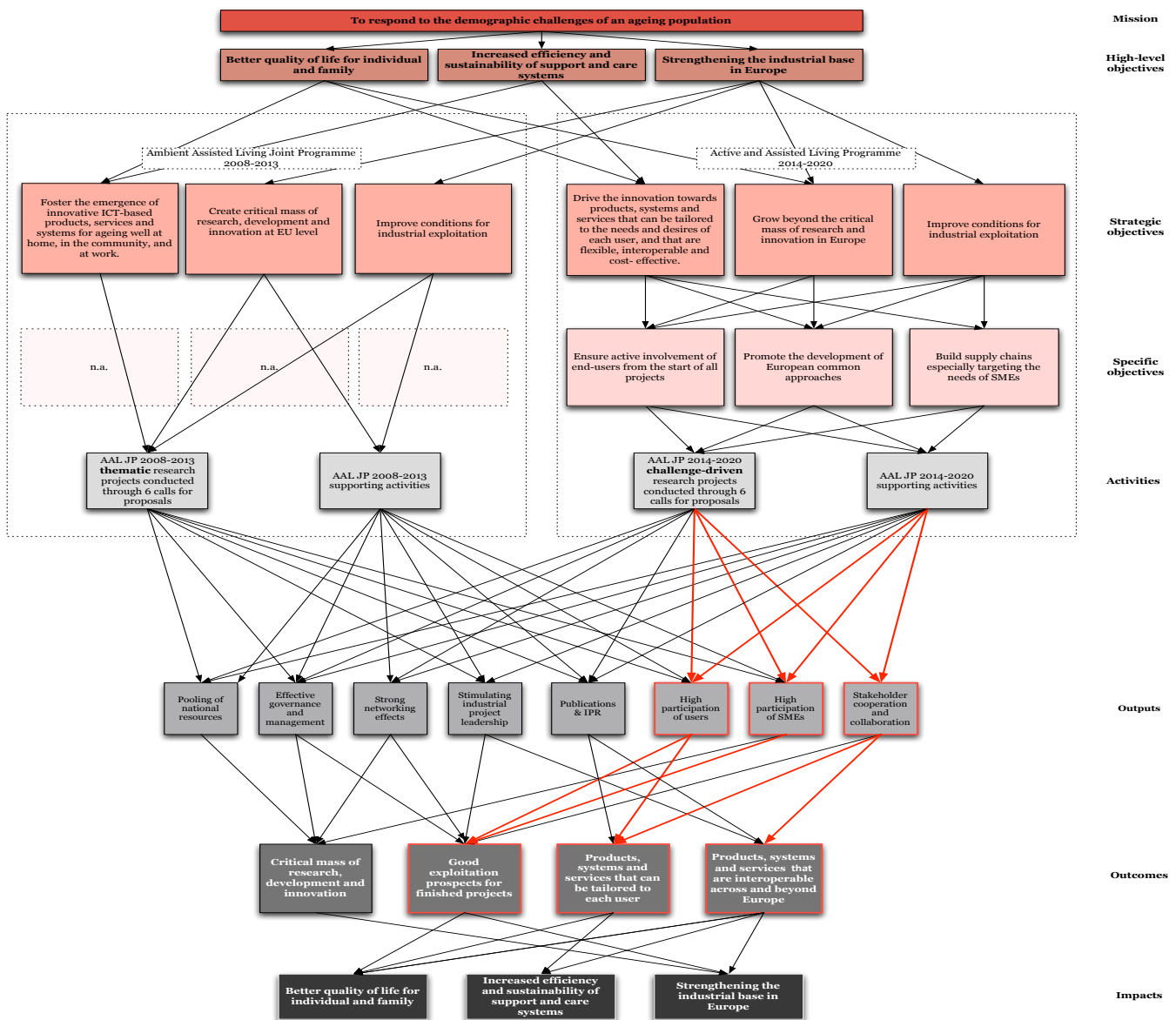
- Products, systems and services that can be customised to meet the varying social preferences and regulatory aspects across and beyond Europe (more so in AAL2 than in AAL1).

These outcomes should in turn contribute to the following impacts, addressing the high-level objectives:

- Better quality of life for individuals and family members;
- Increased efficiency and sustainability of support and care systems;
- Strengthening the industrial base in Europe.

The intervention logic of the AAL Programmes (AAL1 and AAL2) is schematically presented in the figure below.

Figure 11 Intervention logic of the AAL Programmes



Source: Technopolis Group (2014), based on strategic documents of the AAL (Joint) Programme.

4.3 Impact channels

The analysis above indicates that three impact channels are most relevant for the AAL Programme:

- Knowledge: technological and non-technological, codified and tacit, leading to new goods, services, processes or standards (K);
- Networks and social interaction between actors from different and similar disciplines, sectors and countries (N);
- Spin-offs, start-ups and high-growth SMEs (S).

The objectives and activities of the AAL Programme only touch upon the following three impact channels:

- Methodologies, instrumentation, software and other tools that are used in the R&D and innovation process (M);
- Research infrastructures: large-scale research and innovation facilities (R);
- Human capital: skills of researchers, developers, practitioners and end-users (H).

The set of indicators should cover the three main channels/mechanisms via which AAL Programme projects contribute to outcomes and impact.

5. Proposed set of indicators

5.1 Approach and terminology

Chapter 5 presents the proposed set of indicators for the Innovation Impact Reports to be used by the Ambient Assisted Living Programme.

The approach for selecting and developing indicators is based on the RACER approach. As the European Commission specified in its *Impact Assessment Guidelines*³⁴ indicators should fulfil the so-called RACER criteria. RACER is a framework applied to assess the value of indicators for use in policy making:

- Relevant – i.e. closely linked to the objectives to be reached
- Accepted – e.g. by staff and stakeholders
- Credible for non experts, unambiguous and easy to interpret
- Easy to monitor (e.g. data collection should be possible at low cost)
- Robust – e.g. against manipulation

The indicators developed during the study are tested against these RACER criteria.

Relevance for the intervention logic of the AAL Programme has been the *first* and main filter for selecting relevant impact indicators from the initiatives/programmes that are discussed in Chapter 3 (and for considering indicators suggested by stakeholders). As mentioned in Chapter 2, an intervention logic describes how specific steps (or changes) contribute to subsequent steps at a higher level of aggregation: from output to outcome to impact. Ideally, changes in each step or element of the intervention logic are described by indicators (e.g. from collaboration in projects, via increased access of SMEs to value chains, to improved conditions for industrial exploitation).

Chapter 2 also mentioned *attribution challenges*. Combinations of output may contribute to a number of outcomes. Combinations of outcomes may contribute to a number of impacts. To acknowledge the attribution challenges, the set of indicators should include *outcome and impact indicators* for the most relevant *impact channels*. As mentioned in Chapter 4, relevant impact channels of the AAL Programme are:

- Knowledge: technological and non-technological, codified and tacit, leading to new goods, services, processes or standards (K);
- Networks and social interaction between actors from different and similar disciplines, sectors and countries (N);
- Spin-offs, start-ups and high-growth SMEs (S).

Together, these impact channels explain how output and outcomes lead to social and economic impact such as increased efficiency and sustainability of support and care systems.

To ensure that indicators are *accepted* (the second RACER criterion), indicators should be already used or tested by relevant initiatives/programmes (Chapter 3) or they should be used or recommended by immediate stakeholders such as the AAL Programme (e.g. indicators in the final report template), NCPs and project coordinators. This not only ensures acceptance of indicators, it also increases efficiency in the data collection process. For example, there are clear benefits in using the same indicators for the AAL Programme and in national programmes in the domain of AAL.

The criteria *Credible, Easy and Robust* are relevant for selecting indicators but also for operationalisation of indicators. For instance, indicators can be made more credible and

³⁴ European Commission, 2005.

easy to use by providing clear definitions and examples, and by testing ease of use with project participants. Robustness can be increased by combining self-reporting (by project coordinators and project participants) with invitations to enclose underlying evidence (e.g. user studies) and by using indicators that are also used in official statistics and in large-scale surveys (this reduces the chances that self-reported data about impact is inflated). Robustness can also be increased by adding a declaration about the correctness and completeness of the data to be provided. This declaration should be signed by project participants that provide data.

Moreover, a consideration has been to balance *qualitative and quantitative indicators*. This allows for exploring why and how impact emerges (revealing details, nuances, synergies between projects, combinations of impact, uncertainties, etc.) and for measuring the impact of individual projects and calls (e.g. data that can be used to compare projects and calls).

Furthermore, the indicators should be effective in *surveys among project participants*, rather than surveys of actual and potential users, surveys of entire sectors, or consultations of independent experts. Starting point for the impact assessment is participation in a specific project. As such, the indicators should refer clearly to a project. One of the advantages of the project-driven approach is that unique survey invitation codes can be used, so it is clear which specific actors and which types of actors provide the data. Depending on the database of project participants of the AAL Programme, data analysis can benefit from information about the size of an actor (e.g. micro and small enterprises (<50 employees) medium-sized enterprises (51-250 employees) and large enterprise (>250 employees), country, region, sector, etc.

A last and important consideration is that the set of indicators should acknowledge not only the *variety of activities and output* of projects (such as components, devices and solutions/services) but also the *variety of participants* and other stakeholders. The main categories of participants are SMEs, large enterprises, end-users, research organisations (Research, Technology and Development organisations) and other actors. The AAL Programme differentiates between three types of end-users:

- A primary end-user is the person who is actually using an AAL product or service, a single individual, “the well-being person”. This group directly benefits from AAL by increased quality of life. This group can be represented by, for example, senior organisations that contribute their expertise to projects and that assist in identifying end-users that are willing to participate in pilots.
- Secondary end-users are persons or organisations directly being in contact with a primary end-user, such as formal and informal care persons, family members, friends, neighbours, care organisations and their representatives. This group benefits from AAL directly when using AAL products and services (at a primary end-user’s home or at a remote location) and indirectly when the care needs of primary end-users are reduced.
- Tertiary end-users are institutions and private or public organisations that are not directly in contact with AAL products and services, but who somehow contribute in organizing, paying or enabling them. This group includes the public sector service organizers, social security systems, insurance companies. Common to these is that their benefits from AAL solutions come from increased efficiency and effectiveness, which result in savings or by not having to increase expenses in the mid and long term.

The survey should acknowledge that different types of actors could have *different types of roles* in a project. For example, the main role of a formal care organisation such as a hospital may be that of end-user (e.g. participating in a technical test or a real-life pilot), whereas in another project a formal care organisation may focus on the development of new components or AAL solutions. Survey respondents have to be asked to clarify their main role in a project. This will have implications for the types of survey questions that are relevant. For example, IPR questions will be relevant to very few project participants with the role of end-users.

Lastly, the survey should allow for capturing outcomes and impact related to *AAL solutions* and the various *components*, building blocks or underlying technologies that are developed (and combined) in specific AAL Programme projects.

5.2 Indicators

COLLABORATION				
Indicator type	Qualitative (QL) and quantitative (QN) indicators	Acceptance: indicator type is used or recommended by	Credibility, ease of use and robustness	Relevance in terms of AAL Programme intervention logic
<p>1. Collaboration with end-users</p> <p><i>(outcomes and impact)</i></p>	<p>QL: sustainability of collaborations of enterprises or research organisations with end-users in research, development, pilot and continuous improvement activities</p> <p>QN: frequency of interactions (after the project) between enterprises or research organisations and end-users</p>	<p>NCP survey</p> <p>Other relevant initiatives</p>	<p>The introduction to this set of survey questions should refer to collaboration on the specific AAL solution or components that were <i>central to the project</i>, and collaboration on <i>other, subsequent</i> AAL solutions or components.</p> <p>The introduction to this set of survey questions should clarify the three types of end-users. Most relevant for indicator 1 and 2 are primary and secondary users. This should be addressed in separate questions. Moreover, it is possible to ask about continuation of <i>existing</i> collaborations (former project partners) as well as collaboration <i>in general</i> (cf. behavioural additionality).</p> <p>Phrasing of survey questions can be flexible in the sense that YES/NO answers are sufficient, while a 'please explain' box allows for providing details about motivation, examples, AAL solutions, etc. For example:</p> <ul style="list-style-type: none"> - After the project, did your organisation continue to collaborate with <i>primary end-users</i> (older persons whose quality of life is addressed) while testing, implementing or improving the AAL solution or components that were developed in the project? - Does this concern the <i>same</i> older persons (individuals) as the AAL project? - Does this concern <i>other</i> older persons (individuals)? - After the project, did your organisation continue to collaborate with <i>secondary users</i> (such as formal and informal care organisations) while testing, implementing, and improving the AAL solution or components that were developed in the project? - Does this concern the <i>same</i> secondary users (such as formal and informal care organisations) as the AAL project? - Does this concern <i>other</i> secondary users (such as formal and informal care 	<p>Quality of Life</p> <p>Efficiency and sustainability of support and care systems</p> <p>Industrial base in EU</p>

			<p>and SMEs, large enterprises and research organisations.</p> <p>These survey questions have to be rephrased for end-users or end-user organisations (routing). To also ask these questions to end-users or end-user organisations allows for checking whether different types of actors provide similar data about collaboration (cf. robustness of the indicators and the survey approach in general). Examples of questions for end-users are:</p> <ul style="list-style-type: none"> - After the project, did your organisation continue to collaborate with <i>SMEs</i> (former project partners) while testing, implementing, improving or scaling-up the AAL solution or components that were developed in the project? - After the project, did your organisation continue to collaborate with <i>large firms</i> (former project partners) while... - After the project, did your organisation continue to collaborate with <i>research organisations</i> (former project partners) while... <p>Again, the difference should be made between collaboration on the AAL solutions and components developed <i>in</i> the project, and collaboration on <i>other, subsequent</i> AAL solutions and components.</p> <p>In order to collect data for the quantitative indicator, answer categories can be used. For example: the number of end-users that an enterprise or research organisation collaborates with (<50, 51-99, >100), the frequency of contact, on average (1-5, 6-10, >11 times per year) and the scope of collaboration (e.g. research and innovation project, test panels, implementation partner, supplier-customer relation).</p>	
<p>2. Collaboration with end-user organisations such as senior organisations</p> <p><i>(outcomes and impact)</i></p>	<p>QL: sustainability of collaborations of enterprises and research organisations with end-user organisations such as senior organisations and associations of providers of informal care</p> <p>QN: frequency of interactions between enterprises or research organisations and end-user organisations such as senior organisations and associations of providers of informal care</p>	<p>NCP survey</p> <p>Other relevant initiatives</p>	<p>This set of survey questions should distinguish between:</p> <ul style="list-style-type: none"> - The specific AAL solution or components that were central to the project and collaboration on other, subsequent AAL solutions or components. - Continuation of existing collaborations (between former project partners) as well as collaboration in general (cf. behavioural additionality). <p>Examples of survey questions are:</p> <ul style="list-style-type: none"> - After the project, did your organisation continue to collaborate with <i>end-user organisations</i> (such as senior organisations and associations of providers of informal care) while testing, implementing or improving the AAL solution or components that were developed <i>in the project</i>? - Does this concern the <i>same</i> end-user organisations as in the AAL project? - Does this concern <i>other</i> end-user organisations? - After the project, did your organisation continue to collaborate with <i>end-user organisations</i> (such as senior organisations and associations of providers of 	<p>Quality of Life</p> <p>Efficiency and sustainability of support and care systems</p> <p>Industrial base in EU</p>

			<p>informal care) while developing, testing, implementing or improving <i>other, subsequent</i> AAL solutions or components?</p> <ul style="list-style-type: none"> - Does this concern the <i>same</i> end-user organisations as in the AAL project? - Does this concern <i>other</i> end-user organisations? <p>As mentioned above, the survey approach includes identification of the type of actor that is providing the data. The implication is that data is gathered separately for collaboration between end-user organisations and SMEs, large enterprises and research organisations.</p> <p>The questions have to be rephrased for end-users or end-user organisations.</p> <p>In order to collect data for the quantitative indicator, answer categories can be used. For example: the number of end-user organisations that an enterprise or research organisation collaborates with (1-2, 3-4, 5+), the frequency of contact, on average (1-5, 6-10, >11 times per year) and the scope of collaboration (e.g. research and innovation project, test panels, implementation partner, supplier-customer relation).</p>	
<p>3. Collaboration between enterprises and research organisations</p> <p><i>(mainly outcomes)</i></p>	<p>QL: sustainability of collaborations between enterprises and research organisations (former project partners)</p> <p>QN: frequency of interactions between enterprises and research organisations (former project partners)</p>	<p>NCP survey</p> <p>Other relevant initiatives</p>	<p>Again, this set of survey questions should distinguish between the specific AAL solution or components that were central to the project and collaboration on other, subsequent AAL solutions or components. The questions can focus on continuation of existing collaborations, i.e. collaboration between former project partners. The impact of the AAL Programme on collaboration between enterprises and research, more in general, is difficult to assess. This is mostly because there are several support schemes for stimulating research-industry collaboration.</p> <p>Phrasing of the question should be different for enterprises and research organisations. Examples of questions, for enterprises, are:</p> <ul style="list-style-type: none"> - After the project, did your organisation continue to collaborate with <i>research organisations</i> (former project partners) in the development or market launch of the AAL solution or components that were developed <i>in the project</i>? - After the project, did your organisation continue to collaborate with <i>research organisations</i> (former project partners) in the development or market launch of <i>other, subsequent</i> AAL solutions or components? <p>In order to collect data for the quantitative indicator, survey questions could refer to the number of former project partners that an organisation continues to interact with, the frequency of contact, on average (1-5, 6-10, >11 times per year) and the scope of collaboration (e.g. research and innovation project, marketing, implementation partner, supplier-customer relation).</p>	<p>Industrial base in EU</p>

<p>4. Partnerships to build value chains</p> <p><i>(outcomes and impact)</i></p>	<p>QL: former project partners that create or join value chains for AAL solutions</p>	<p>Other relevant initiatives</p>	<p>Here, a small set of survey questions could include:</p> <ul style="list-style-type: none"> - Did your organisation create a new value chain to launch the AAL solution or components (developed in the project) on the market? - How many former project partners are part of this value chain? From how many countries? - Did your organisation join an existing value chain to launch the AAL solution or components (developed in the project) on the market? - How many former project partners are part of this value chain? From how many countries? <p>These questions are also relevant for end-users as they can be involved in value chains (e.g. as downstream service provider for individuals). Phrasing of these questions for research organisations requires a reference to spin-offs. For example:</p> <ul style="list-style-type: none"> - Did your organisation (or a spin-offs) create a new value chain to launch the AAL solution or components (developed in the project) on the market? 	<p>Industrial base in EU</p> <p>Efficiency and sustainability of support and care systems</p>
<p>5. European common approaches</p> <p><i>(impact)</i></p>	<p>QL: contributions to European or international standardisation, certification, interoperability, guidelines and work practices</p>	<p>AAL final project report</p> <p>NCP survey</p> <p>Other relevant initiatives</p>	<p>Each type of project participant may have contributed to European or international bodies for standardization, certification, interoperability, guidelines (health, care, ethical) or work practices. A qualitative indicator is most effective as contributions can be manifold. Likewise, there is variety of standardisation fora, certification bodies, etc.</p> <p>The first survey question can be used to save time for actors that did not make this type of contribution (routing):</p> <ul style="list-style-type: none"> - In the last year, did your organisation made contributions to (and have direct interactions with) European or international bodies that pursue standardization, certification, interoperability, guidelines (medical, care, ethical) or work practices? (YES/NO) - If YES: please, describe your organisation’s contribution to (and interaction with) European international bodies by referring to the relevant bodies and the specific standardization, certification, interoperability or guidelines to which your organisation has contributed. <p>In the data analysis phase, data obtained via this survey question can be validated by analysing publicly available information about active members of relevant international bodies, working groups, etc. (cf. robustness of the indicators and the survey approach in general).</p>	<p>Efficiency and sustainability of support and care systems</p> <p>Industrial base in EU</p>

NEW SOLUTIONS, COMPONENTS and USERS				
Indicator type	Qualitative (QL) and quantitative (QN) indicators	Indicator type is used or recommended by	Credibility, ease of use and robustness	Relevance in terms of AAL Programme intervention logic
<p>6. New AAL solutions and components launched</p> <p><i>(outcomes)</i></p>	<p>QL: new AAL solutions launched and their main functionalities</p> <p>QL: new components launched and their main functionalities</p> <p>QN: number of new AAL solutions launched</p> <p>QN: number of new components launched</p>	<p>AAL final project report</p> <p>NCP survey</p> <p>Other relevant initiatives</p>	<p>This indicator and the set of survey questions should acknowledge the variety of outputs. A first distinction has been described above: the AAL solution(s) developed in a project and the various components, building blocks or underlying technologies that are developed (and combined) in a specific AAL Programme projects.</p> <p>Note that an AAL solution often is a bundle of a service and products, e.g. a health monitoring service that is bundled with end-user equipment.</p> <p>Survey questions are most relevant for SMEs and large enterprises but they may also be relevant for research organisations (e.g. services launched by a spin-off) and secondary end-users (e.g. professional providers of care services).</p> <p>Suggested survey questions are:</p> <ul style="list-style-type: none"> - The last two years, did your organisation commercially launch (i.e. launch on the market) an AAL solution that was developed in this specific project? (YES/NO) - The next two years, does your organisation plan to commercially launch (i.e. launch on the market) an AAL solution that was developed in this specific project? (YES/NO) <p>If YES to one these questions:</p> <ul style="list-style-type: none"> - Could you describe the AAL solution and their main innovations in terms of functionalities (in terms of reliability, flexibility, personalisation, interoperability, etc.)? - Could you assess the relative importance of the <i>AAL Programme project</i> for developing the AAL solution, compared to other support programmes and private investments? (answer categories: the AAL Programme project has been essential, important, relevant, of minor relevance, not relevant). <p>To set of questions related to components launched and their main innovations in terms of functionalities, should include examples of components (e.g. sensors, displays and software) and their main contributions to AAL solutions (e.g. reliability, interoperability, size, weight, etc.).</p> <p>In order to collect data for the two quantitative indicators, survey questions should refer explicitly to commercial launch during the last two years.</p> <p>Survey respondents can be invited to provide web links or references to (technical)</p>	<p>Quality of Life</p> <p>Efficiency and sustainability of support and care systems</p> <p>Industrial base in EU</p>

			studies that support their claims.	
<p>7. Users of new AAL solutions</p> <p><i>(mainly outcomes)</i></p>	<p>QN: total number of end-users of new AAL solutions</p> <p>QN: annual increase in the total number of end-users of new AAL solutions</p>	<p>AAL final report template</p> <p>NCP survey</p> <p>Other relevant initiatives</p>	<p>The questions for this indicator are only relevant for project participants that have commercially launched an AAL solution (routing, based on the answers provided to the questions on indicator 6).</p> <p>The introduction to these survey questions should repeat that only the perspective of the survey respondent's organisation is relevant. This allows for assessing which different organisations provide AAL solutions to which types of end-users. Suggested survey questions are as follows:</p> <ul style="list-style-type: none"> - Does your organisation provide the AAL solution to <i>primary end-users</i> (older persons whose quality of life is addressed)? (YES/NO) - Does your organisation provide the AAL solution to <i>secondary users</i> such as formal and informal care organisations and individuals that provide care? (YES/NO) - Does your organisation provide the AAL solution to <i>tertiary users</i> such as government agencies or insurance companies that coordinate health and care funding, regulations or guidelines? (YES/NO) <p>For each question answered with YES:</p> <ul style="list-style-type: none"> - Regarding this AAL solution for this specific type of end-users, what is the total number of users served by your organisation? - What is the annual increase in the total number of these users served by your organisation? (%) <p>Survey respondents can be invited to provide web links or references to third-party market reports or official corporate publications that support their claims.</p> <p>To some extent, independent market reports can be used to validate the data provided by project participants.</p>	<p>Quality of Life</p> <p>Efficiency and sustainability of support and care systems</p> <p>Industrial base in EU</p>

SOCIAL IMPACT				
Indicator type	Qualitative (QL) and quantitative (QN) indicators	Indicator type is used or recommended by	Credibility, ease of use and robustness	Relevance in terms of AAL Programme intervention logic
<p>8. Active and independent living</p> <p><i>(impact)</i></p>	<p>QL: impact of new AAL solutions on older persons to continue living actively and independently</p>	<p>Other relevant initiatives</p>	<p>Again, the questions for this indicator are only relevant for project participants that have commercially launched an AAL solution (routing, see indicator 6). This concerns organisations that provide AAL solutions to primary end-users (individuals) but also organisations that provide AAL solutions to secondary end-users (such as formal and informal care providers). Both groups of organisations will be knowledgeable about the benefits of AAL solutions for users.</p> <p>Depending on the length of the survey questionnaire, the questions for indicator 8 can also be asked to organisations that expect to launch an AAL solution within two years.</p> <p>Indicator 8 is relevant for linking the impact of AAL Programme projects on individual end-users to the impact on healthcare systems in general.</p> <p>A semi-open survey question will generate most valuable data:</p> <ul style="list-style-type: none"> - Could you describe how the AAL solution enables older persons to continue living actively and independently, e.g. in terms of connectedness with friends and family, mobility, continue providing contributions to the community and at work, minimising health and safety risks as well as pain/discomfort and anxiety/depression? <p>Survey respondents can be invited to provide web links or references to (user) studies that support their claims.</p>	<p>Quality of Life</p> <p>Efficiency and sustainability of support and care systems</p>
<p>9. Sustainable support and care systems</p> <p><i>(impact)</i></p>	<p>QL: impact of new AAL solutions on the sustainability of support and care systems</p>	<p>Other relevant initiatives</p>	<p>The approach for indicator 9 very similar to the approach for indicator 8 (see above).</p> <p>The suggested survey question is as follows:</p> <ul style="list-style-type: none"> - Could you describe how the AAL solution contributes to the sustainability of <i>support and care systems</i>, e.g. in terms of productivity, cost reductions (e.g. care homes), less visits to healthcare providers (doctors, hospitals, emergency rooms, etc.), coordination and quality of care? <p>Survey respondents can be invited to provide web links or references to studies that support their claims.</p>	<p>Efficiency and sustainability of support and care systems</p>

ECONOMIC OUTCOMES AND IMPACT				
Indicator type	Qualitative (QL) and quantitative (QN) indicators	Indicator type is used or recommended by	Credibility, ease of use and robustness	Relevance in terms of AAL Programme intervention logic
<p>10. Investments received for follow-on innovation activities</p> <p><i>(outcomes and impact)</i></p>	<p>QN: total value of financial investment received from <i>public</i> third parties for follow-on innovation activities</p> <p>QN: total value of financial investment received from <i>private</i> third parties to follow-on innovation activities</p>	<p>NCP survey</p> <p>Other relevant initiatives</p>	<p>This indicator acknowledges that AAL solutions and components can require follow-on innovation activities and additional funding. For example, a prototype or small-scale pilot in the context of an AAL Programme project may have to be followed by a large-scale pilot, demonstrator or by market introduction activities.</p> <p>The proposed survey questions to collect data are:</p> <ul style="list-style-type: none"> - What is the total value of financial investment received from <i>public</i> third parties for follow-on innovation activities? Examples are loans, grants and investments by public agencies. - What is the total value of financial investment received from <i>private</i> third parties to follow-on innovation activities? Examples are investments by venture capitalists, banks, business angels and incubators. <p>The analysis of survey responses to these questions can benefit from the questions to previous questions (e.g. the question whether a respondent's organisations is developing AAL solutions and/or relevant components, and whether a commercial launch has taken place or is expected).</p>	<p>Industrial base in EU</p>
<p>11. Intellectual Property Rights (IPR)</p> <p><i>(outcomes and impact)</i></p>	<p>QL: use of patents and other types of IPR</p> <p>QN: number of patents granted</p> <p>QN: annual revenues from patent licensing and exploitation of other types of IPR (such as copyright and trade marks)</p> <p>QL: reputation effects, reduced time-to-market and first mover advantages</p>	<p>AAL final report template</p> <p>Other relevant initiatives</p>	<p>This indicator is not relevant for end-users although a small number of secondary end-users may build up IPR.</p> <p>A qualitative survey question is required to explore the different ways in which innovators can appropriate the results of their innovation activities. The quantitative questions will have to be defined more narrowly.</p> <p>The proposed questions are:</p> <ul style="list-style-type: none"> - Could you describe how your organisation protects the results of the AAL Programme project, in terms of patents and other types of IPR applied for and granted (such as copyright and trade marks)? - If applicable, how many patents were granted? - If applicable, what have been the annual revenues (last year) from patent licensing? - If applicable, what have been the annual revenues (last year) from other types of IPR licensing (such as copyright and trade marks)? 	<p>Industrial base in EU</p>

			<ul style="list-style-type: none"> - Could you describe other ways of benefiting from the results of the AAL Programme, e.g. in terms of reputation effects, reduced time-to-market and first mover advantages? 	
<p>12. Creation of new companies</p> <p><i>(impact)</i></p>	<p>QL: activities of start-up and spin-off companies</p> <p>QN: number of spin-offs and start-ups</p> <p>QN: number of FTEs of spin-offs and start-ups and growth in the number of FTEs</p>	<p>AAL final report template</p> <p>NCP survey</p> <p>Other relevant initiatives</p>	<p>Data can be collected by means of the following survey questions, that are not relevant for end-users.</p> <ul style="list-style-type: none"> - Is your organisation a start-up, i.e. an enterprise that exists less than five years? <p>If YES: What is the number of FTEs of your organisation (last year) and what has been the annual growth in FTEs, over the last year?</p> <ul style="list-style-type: none"> - As a result of the project, did your organisation create any spin-offs? (YES/NO) <p>If YES: What is the name of the spin-off and could you summarise the activities of the spin-off?</p> <p>If YES: What is the number of FTEs of this spin-off (last year) and what has been the annual growth in FTEs, over the last year?</p> <ul style="list-style-type: none"> - Are you aware of a start-up, outside the project consortium, that commercialises project results? What is the name of this start-up and could you summarise the activities of this start-up? 	<p>Industrial base in EU</p>
<p>13. Revenues from new AAL solutions and components</p> <p><i>(outcomes and impact)</i></p>	<p>QN: current revenue generated from new AAL solutions</p> <p>QN: expected revenue growth from new AAL solutions</p> <p>QN: current revenue generated from relevant components</p> <p>QN: expected revenue growth from relevant components</p>	<p>AAL final report template</p> <p>Other relevant initiatives</p>	<p>Previous parts of the survey already allowed respondents to indicate whether their organisation commercially launched AAL solutions and/or relevant components that are developed in the project. Again, this information should be used for routing purposes, i.e. presenting the questions below only to organisations that launched AAL solutions and/or components.</p> <p>Data can be collected by means of the following questions:</p> <ul style="list-style-type: none"> - Last year, how many revenues did your organisation generate from the new AAL solutions developed in the AAL Programme project? - For these AAL solutions, what is the expected revenue growth over the next two years? (year 1, % revenue growth; year 2, % revenue growth). - Last year, how many revenues did your organisation generate from the new AAL related components developed in the AAL Programme project? - For these components, what is the expected revenue growth over the next two years? (year 1, % revenue growth; year 2, % revenue growth). <p>To some extent, independent market reports can be used to validate the data provided by project participants.</p>	<p>Industrial base in EU</p>

6. Data collection process

6.1 Start and frequency of data collection

The results of the survey among AAL NCPs and governance Board Members indicate a preference for *starting* data collection one year after an AAL Programme project has finished. This aligns with the discussion during the workshop with NCPs.

From the relevant initiatives that we studied, only Eurostars (under the umbrella of EUREKA) has implemented a post-project innovation impact assessment system. For this initiative, data is collected one, two and three years after projects have finished. This means that the AAL Programme can be among the early adopters of post-project innovation impact assessment, which is advocated by innovation policy experts and evaluators experienced with the limitations of assessing impact at the end of a project.

To start data collection 1 year after projects have finished implies that ‘the lines remain open’ between the project coordinators, project partners, the AAL Programme CMU and NCPs. Commitment by project partners is likely to decrease as more time passes by between the end of projects and the start of the innovation impact assessment. Moreover, to start data collection as early as possible allows for timely identification of success stories and indications about specific types of impact that are likely to emerge from individual projects and from types of projects (e.g. specific AAL programme activities and calls).

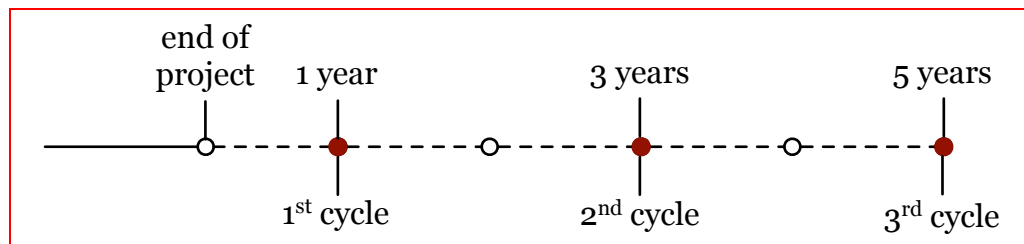
Based on this we recommend to start data collection one year after the projects have finished. The end date of the project is the delivery date of the final report by the project coordinator.

How often should data be collected? The majority of the NCPs and governance Board Members that responded to the survey request, prefer that data collection for the innovation impact assessment take places every year.

As mentioned above, Eurostars collects data on an annual basis for three years after projects have finished. Annual data collection is a well-established procedure for collecting data during the course of projects (by the AAL Programme, Horizon 2020, national programmes, etc.) and for a period of time it is reasonable to maintain a similar frequency in a post-project assessment. The downside, obviously, is that the project coordinator and project partners (as well as the AAL Programme CMU and NCPs) have to spend substantial resources on collecting data on a yearly basis compared to collecting data every two or four years. The trade-off between collecting relevant data and using resources efficiently also applies to the total period of data collection, e.g. to continue monitoring impact for a period of three, four or five years.

We acknowledge the advantages of annual data collection but we also acknowledge the importance of minimising the burden on project participants. We recommend collecting data one, three and five years after projects are ended (Figure 13). This schedule will reduce the burden on project participants, the AAL Programme CMU and NCPs that may support the process. It can be considered to focus data collection after five years on projects that already indicated impact after three years. This would further reduce the burden on stakeholders (cf. survey fatigue).

Figure 12 Post-project innovation impact assessment cycle



6.2 Who should collect and provide the data?

In the relevant initiatives that we studied, data collection was coordinated centrally. We recommend the AAL Programme to follow this approach through its CMU in coordinating data collection and involving the NCPs for updating the contact details of project partners and for stressing the importance of post-project innovation impact assessment. This can be achieved by distributing personalised emails to project partners to remind them about the timing of the expected provision of data by means of the monitoring system following the schedule presented in the previous section.

As for providing data, the results of the survey among NCPs indicate that the project coordinator as well as other project partners should be requested to provide data. NCPs and project coordinators stress that impact will be different for individual project partners, e.g. SMEs that succeed in launching new services and research organisations that continue collaborating with end-users. To collect data from each partner is consistent with the approach taken in evaluations and impact assessments for European programmes such as the 6th and 7th Framework Programmes.

The project coordinator has a special responsibility in updating the contact details of project partners. The monitoring system should allow for efficiently changing contact details. Note that the project coordinator may hand-over his coordinating role to a colleague that is involved in commercialisation or in follow-up innovation projects. Additionally, the partners do not have to be limited to the original project partners as there might be a new organisation or spin-off company involved in the phase of market introduction. The survey should ensure that relevant spin-offs are identified.

We recommend that the post-project innovation impact assessment system will be used to collect data from all project partners.

6.3 How to motivate or mandate project partners to provide data?

Ideally in order to have full commitment from all project partners, provision of data to perform innovation impact assessment would be *compulsory* and included in the Grant Agreement and other relevant contracts and can be implemented during the next round of calls for proposals. A lighter option would be to *stress* the post project impact monitor in all official documentation, without mentioning an explicit obligation for project participants. It should be investigated and put on the agenda of the AAL Management Board meeting to discuss the best options.

An important element to gain commitment by members of the Management Board is to show the benefits such an approach might have on different levels: the overall AAL Programme level as well as benefits for project partners. The benefits lie in the three rationales of impact assessment (as mentioned in Chapter 1): analysis, accountability and advocacy:

- The follow-up on the implementation of the project results (analysis);
- Statistical and impact analysis of the programme (analysis and accountability);

- The evaluation of success of the AAL Programme related to the growth of Europe's ICT industrial base and societal benefits for end-users (accountability and advocacy);
- The identification of success stories that can be promoted within the AAL community and beyond (advocacy).

Success stories and data about impacts that have been achieved through the AAL funded projects are crucial for accountability (a moral obligation) and especially for advocacy and management of the AAL Programme. Stakeholders in the AAL community have a shared interest in promoting their solutions and components towards public and private funding agencies, policy makers, and the general public. In order to have maximum result from the development of an innovation impact assessment system it is of utmost importance to involve project partners in finalising and testing the post-project impact system, to maximise its user-friendliness and efficiency, and to address any issues related to confidentiality. Usually the best strategy is to set up an independent and neutral platform that consolidates the data so that all actors enhance their market knowledge without giving too much individual information to their competitors.

There are some concrete examples that can be used to increase the benefits for the project partners, which will lead to increased willingness to commit themselves to providing relevant information. First, AAL could build up an alumni network, providing former participants with interesting and relevant information about on-going projects and results from projects of the past. This will make them feel part of a (AAL) community. The AAL Forum can be the platform to introduce this concept. Moreover, interviews with participants have shown that participants often aim to have more visibility as AAL experts. Therefore, it might be an idea to present enterprises, end users and research organisations and their projects on the website in an accessible manner (showcases, success stories); former participants can then use these resources for their marketing.

6.4 Offline or online data submission?

In order to increase the chance of participation of project partners in providing data on innovation impacts (and to increase data quality) a dedicated online platform is highly recommended by the NCPs. The following criteria are important in developing such a platform:

- User-friendliness;
- Easy and personalised access;
- Confidentiality and security of information;
- Presentation of information to project partners and other stakeholders.

7. Towards implementation

Research and innovation activities produce socio-economic impacts through direct and indirect pathways/channels that are geographically and temporally extensive. As we have seen, many projects take a further 3-5 years beyond the support provided by AAL to deliver a specific commercial outcome and impact. It is relatively straightforward to systematically gather data on outputs and measurable outcomes, however impact assessment raises questions about the traceability and attribution of funded projects. This is often addressed at the case study level and on occasions where investments are large enough and run for a sufficient period of time to look for effects in macro-data using various econometric techniques. Furthermore, the funding of cross-national projects with at least three countries involved as well as a combination of partners of SMEs, research bodies and user organisations provide an even larger measurement challenge. More specifically, the immediate and direct benefits derived by participants are likely to be commercially confidential making beneficiaries less likely to be forthcoming in reporting.

In the realm of public research and innovation, performance measurement and project monitoring systems tend to focus on the financial aspects of grants and the contracted outputs such as publications and patent applications. The annual progress and financial reporting system for AAL is an example of this. Similarly, the Eurostars programme, also discussed earlier in this report, has a web portal with infographics showing users basic programme statistics such as the numbers and value of projects, a search facility for projects and a support service for partner searches. The project monitoring system is based on an electronic template submitted to the Eurostar's Secretariat, which records progress in terms of milestones, time and costs. Participants are required to complete the template, which provides qualitative and quantitative data on project outputs, development plans and anticipated market impacts. This data is not reported publicly, however the Eurostars Annual Reviews present financial and activity data alongside case study examples to produce a narrative about programme highlights and future plans.

7.1 Developing an online data collection and reporting system

There are more complex systems in use such as the European Commission's research information system (CORDIS). This has been developed in its scope and functionality over successive EU RTD Framework Programmes and has arrived at a stage where there is now a comprehensive management information system with data on all funded projects, participants, expenditures and outputs. This is available to the Commission Services as a searchable facility, as necessary and to independent contractors on a restricted basis for programme evaluations. This system however, does not include outcome or impact data although it does include data on journals (impact factors), project success (the scientific officer's judgement as to whether a project's objectives were realised in part or full) and community interest (through the annual survey of National Contact Points). The data collection infrastructure for CORDIS has been developed substantially, with the launch of a new Participant Portal for Horizon 2020, which allows anyone to search for funding opportunities, partners, current projects as well as enabling applicants to upload proposals and participants to submit their technical, financial and monitoring reports directly online.

CORDIS is a bespoke tool that has been developed over a number of years with a significant budget at its disposal. Replicating a system like this even at a relatively modest level is probably beyond the reach of AAL, perhaps most critically because of the stronger leverage available to the EU RTD Framework Programme, which grants billions of Euros to contractors every year and will continue to do so for the foreseeable future.

With this in mind, and combined with the fact that many of the existing tools such as CORDIS data services rarely include impact data, it might be more appropriate for AAL to consider the development of a more modest tool such as iA4Si, already highlighted earlier in this report, particularly because of its novel approach to understanding and addressing the role of ICT on the lives of European citizens. iA4Si allows project

coordinators and partners to provide data on the outcomes and impacts during the life of a project and beyond and the use of a 'toolkit' comprised of an online self-assessment tool for project coordinators, a user data gathering interface and a citizen engagement platform enabling the triangulation of data on impact. The development of iA4Si is still at a relatively early stage with the benchmarking mechanism for the platform is not yet finalised, however such a 'toolkit' used to monitor impact would be a useful addition to AAL as well.

Whether AAL decides to develop its own bespoke platform for monitoring impact or instead decides to utilise and adapt an existing tool, there are a number of additional considerations, including:

1. Open data formats and confidentiality – the availability of data of online data collection and monitoring systems varies and the level of accessibility of AAL data needs careful consideration. It is clear that NCPs and project coordinators would require access to the system to review and submit data, however, whether project coordinators should have access to the same data for other projects, even on an aggregate basis, is debatable due to commercial sensitivities that might be contained within this data. In the absence of access restrictions, data submission by beneficiaries may well be influenced by the accessibility of the data submitted by third parties beyond what is already available for each project on the website.
2. Self benchmarking – to enable the comparison of individual projects which are similar or within the same call, a benchmark for projects needs to be considered using the indicators suggested in this report. This will enable NCPs and project coordinators to measure project performance and provide a baseline from which to measure project improvements as well as enabling a comparison with competing projects and allow strengths and weaknesses to be identified and compared. In doing self-benchmarking, the transparency of the data used to create the benchmark should be evaluated in terms of confidentiality. Therefore, aggregation and anonymisation of data may be needed.
3. Data analysis – one of the most important considerations in creating a monitoring system is to decide exactly what type of subsequent data analyses will be required in order to ensure that data collection and sharing systems are capturing the necessary information. Similarly, it is important to decide whether data analysis will be restricted to the AAL CMU or NCPs and users will be allowed to perform their own analysis. In some cases, external experts may be needed to analyse the data gathered in detail.

7.2 Options for the AAL Programme

Implementation of an online monitoring system is a clear demand from the user community and a best practice used by the management units of most modern funding schemes. Post-project monitoring requires the active participation of the past beneficiaries and this can be enhanced by creating a lively community around the common goals of the funders and beneficiaries. The AAL Programme unites actors in the ageing and well-being field where information technology is used to impact on the lives of individuals and groups. The common goals are thus to showcase and disseminate information about the solutions being developed through AAL funding, as well as to learn from the different projects and continually improve their efficiency and management. There are the following three basic options available for the AAL Programme to move from the template based data collection and analysis (used for monitoring projects as they run) to an online platform (for monitoring projects as they run and for three to five years after projects are ended).

1. Utilise or design a basic tool based on popular survey data collection platforms, such as SurveyMonkey or SnapSurveys. The advantage of such data collection systems is that they can be implemented relatively fast and at low cost. However, the corresponding data collection and data analysis options would be rather limited and may not provide the pay-back incentives that would be important for project

participants to contribute their data once the project receives no further AAL funding. As discussed above, both the AAL Programme CMU and NCPs on the one hand, and project coordinators and participants on the other hand would greatly benefit from a more integrated system where the data collection and analysis system is integrated with the AAL community website.

2. AAL already has an informative website that could well include an integrated data collection, analysis and sharing platform. This could be linked to a secure user space on the website where individual permissions are given to upload data in a customised environment, depending on the type of the project partner, coordinator or NCP. The data-gathering environment can be modelled on the survey systems mentioned above but would be integrated to the needs of AAL. Basic analysis and visualisation would also be possible, and could be extended in a gradual and sequential fashion. This option would require extra resources compared to option 1, but may strike a balance between quality and investments.
3. AAL develops (or builds on an existing) online system that would cater for the needs and requests of users to self-benchmark their activities against other AAL participants, segmented by countries / regions and type of solutions developed. This system requires a high degree of customisation that would be hard to achieve with adapting existing systems unless those are highly aligned with the original reporting structure and the new impact monitoring of AAL. This option may allow for internal networking and messaging among project partners and provide a search facility in the database of partners and projects. The analysis and visualisation surface would allow for the flexibility necessary to customise for the needs of individual users. This option represents the highest cost but also the possibility of a bespoke AAL system developed for the future.

The indicators developed in the current study, and the operationalization of data collection, analysis and aggregation of project outputs, outcomes and impacts must be tested with relevant project participants, NCPs and the AAL CMU in order to ensure a smooth transition to a new reporting and monitoring system. Demonstration and piloting of such activities is beyond the scope of the current study but strongly recommended to be conducted in the near future. The choice of a suitable option is however very much dependent on the timescale and budget available for the development of the AAL monitoring and reporting platform.

Appendix A Draft survey questionnaire

As explained in Chapter 5, the online survey will benefit from routing. There will be different questions and adapting terminology used for the type of AAL Programme project participants (type of organisation and main role in the project) and whether they collaborate with primary and/or secondary end-users; whether they are involved in AAL solutions and/or components; whether they succeed in or are preparing a commercial launch of AAL solutions and/or components; and whether they have applied for patents.

Appendix A presents the draft survey questionnaire for SMEs and large firms that collaborate with primary and secondary end-users; that collaborate with research organisations; that developed an AAL solution (rather than components); that have commercially launched this AAL solution; and that obtained a patent and other types of IPR. Note that this is the longest version of the survey. Also note that the survey can be adapted after piloting the survey with project participants.

Introduction		
0.1	Did your organisation participate in project [insert project name, taken from AAL Programme database]?	YES/NO [if NO, contact respondent to clarify]
0.2	Is your organisation an [insert type of organisation, taken from AAL Programme database]?	YES/NO [if NO, provide alternative options for type of organisation]
0.3	What has been the main role of your organisation in the [insert project name, taken from AAL Programme database] project?	Three options: - Research and development - End-user perspective - Other (please specify)
0.4	Is your organisation based in [insert municipality, taken from AAL Programme database]?	YES/NO [if NO, provide open question: location of your organisation]
0.5	What is the main sector of activity (industry) of your organisation?	Answer categories based on NACE classification
1. Collaboration with end-users		
1.1	After the project, did your organisation continue to collaborate with <i>primary end-users</i> (older persons whose quality of life is addressed) while testing, implementing or improving the AAL solution or components that were developed in the project?	YES/NO
1.2	Please provide an estimation of the number of primary end-users that your organisation collaborates with.	Answer categories: <50 primary end-users 51-99 primary end-users >100 primary end-users

1.3	Please provide an estimation of the frequency of these contacts.	Answer categories: 1-5 times per year 6-10 times per year >11 times per year
1.4	What is the scope of collaboration with primary end-users?	Answer categories: - Research and innovation project - Test panel - Implementation partner - Supplier-customer relation - Other (please specify)
1.5	Does this concern the <i>same</i> primary end-users (individuals) as the AAL project?	YES/NO
1.6	Does this concern <i>other</i> primary end-users (individuals)?	YES/NO
1.7	After the project, did your organisation continue to collaborate with <i>secondary end-users</i> (such as formal and informal care organisations) while testing, implementing, and improving the AAL solution or components that were developed in the project?	YES/NO
1.8	Does this concern the <i>same</i> secondary users (such as formal and informal care organisations) as the AAL project?	YES/NO
1.9	Does this concern <i>other</i> secondary users (such as formal and informal care organisations)?	YES/NO
1.10	Please provide an estimation of the number of secondary end-users (organisations) that your organisation collaborates with.	Answer categories: <5 secondary end-users 6-9 secondary end-users >10 secondary end-users
1.11	Please provide an estimation of the frequency of these contacts.	Answer categories: 1-5 times per year 6-10 times per year >11 times per year
1.12	What is the scope of collaboration with secondary end-users?	Answer categories: - Research and innovation project - Test panel - Implementation partner - Supplier-customer relation - Other (please specify)

2. Collaboration with end-user organisations such as senior organisations and associations of providers of informal care		
2.1	After the project, did your organisation continue to collaborate with <i>end-user organisations</i> (such as senior organisations and associations of providers of informal care) while testing, implementing or improving the AAL solution or components that were developed <i>in the project</i> ?	YES/NO
2.2	Does this concern the <i>same</i> end-user organisations as in the AAL project?	YES/NO
2.3	Does this concern <i>other</i> end-user organisations?	YES/NO
2.4	After the project, did your organisation continue to collaborate with <i>end-user organisations</i> (such as senior organisations and associations of providers of informal care) while developing, testing, implementing or improving <i>other, subsequent</i> AAL solutions or components?	YES/NO
2.5	Does this concern the <i>same</i> end-user organisations as in the AAL project?	YES/NO
2.6	Does this concern <i>other</i> end-user organisations?	YES/NO
2.7	Please provide an estimation of the number of end-user organisations (such as senior organisations and associations of providers of informal care) that your organisation collaborates with.	NUMBER
2.8	Please provide an estimation of the frequency of these contacts.	Answer categories: 1-5 times per year 6-10 times per year >11 times per year
2.9	What is the scope of collaboration with end-user organisations (such as senior organisations and associations of providers of informal care)?	Answer categories: - Research and innovation project - Test panel - Implementation partner - Supplier-customer relation - Other (please specify)
3. Collaboration between enterprises and research organisations		
3.1	After the project, did your organisation continue to collaborate with <i>research organisations</i> (former project partners) in the development or market launch of the AAL solution or components that were developed <i>in the project</i> ?	YES/NO
3.2	After the project, did your organisation continue to collaborate with <i>research organisations</i> (former project partners) in the development or market launch of <i>other, subsequent</i> AAL solutions or components?	YES/NO
3.3	How many research organisations (former project partners) does your organisation continues to interact with?	NUMBER
3.4	Please provide an estimation of the frequency of	Answer categories:

	these interactions, on average.	1-5 times per year 6-10 times per year >11 times per year
3.5	What is the scope of collaboration with these research organisations?	Answer categories: - Research and innovation project - Marketing - Implementation partner - Supplier-customer relation - Other (please specify)
4. Partnerships to build value chains		
4.1	Did your organisation create a new value chain to launch the AAL solution (developed in the project) on the market?	YES/NO
4.2	How many (and which) former project partners are part of this value chain?	How many: NUMBER Which: OPEN
4.3	From which countries?	Answer categories: EU-27 and other
4.4	Did your organisation join an existing value chain to launch the AAL solution (developed in the project) on the market?	YES/NO
4.5	How many (and which) former project partners are part of this value chain?	How many: NUMBER Which: OPEN
4.6	From which countries?	Answer categories: EU-27 and other
5. European common approaches		
5.1	In the last year, did your organisation made contributions to (and have direct interactions with) European or international bodies that pursue standardization, certification, interoperability, guidelines (medical, care, ethical) or work practices?	YES/NO
5.2	Please describe your organisation's contribution to (and interaction with) European international bodies by referring to the relevant bodies and the specific standardization, certification, interoperability or guidelines to which your organisation has contributed.	OPEN
6. New AAL solutions and components launched		
6.1	In the last two years, <i>did</i> your organisation commercially launch (i.e. launch on the market) an AAL solution that was developed in this specific project?	YES/NO
6.2	In the next two years, does your organisation <i>plan</i> to commercially launch (i.e. launch on the market) an AAL solution that was developed in this specific project?	YES/NO
6.3	In total, how many AAL solutions did your organisation launch or does it expect to launch (in the next two years) as a result of the AAL Programme project?	If YES to question 6.1 or 6.2 > ask questions 6.3 and 6.4 NUMBER

6.4	Could you assess the relative importance of the <i>AAL Programme project</i> for developing this AAL solution, compared to other support programmes and private investments?	Answer categories: The AAL Programme project has been: - Essential - Important - Relevant - Of minor relevance Not relevant
6.5	Could you describe one AAL solution and its main innovations in terms of <i>functionalities</i> (in terms of reliability, flexibility, personalisation, interoperability, etc.)?	OPEN
7. Users of new AAL solutions		
7.1	Does your organisation provide the AAL solution to <i>primary end-users</i> (older persons whose quality of life is addressed)?	YES/NO
7.2	For this AAL solution, what is the <i>total number of primary end-users</i> served by your organisation?	NUMBER
7.3	What is the <i>average annual increase</i> in the total number of primary end-users served by your organisation?	PERCENTAGE
7.4	Does your organisation provide the AAL solution to <i>secondary users</i> such as formal and informal care organisations?	YES/NO
7.5	For this AAL solution, what is the <i>total number of secondary end-users</i> (organisations) served by your organisation?	NUMBER
7.6	What is the <i>average annual increase</i> in the total number of secondary end-users (organisations) served by your organisation?	PERCENTAGE
7.7	Does your organisation provide the AAL solution to <i>tertiary users</i> such as government agencies or insurance companies that coordinate health and care funding, regulations or guidelines?	YES/NO
7.8	For this AAL solution, what is the <i>total number of tertiary end-users</i> served by your organisation?	NUMBER
7.9	What is the <i>average annual increase</i> in the total number of tertiary end-users served by your organisation?	PERCENTAGE

8. Active and independent living		
8.1	Please describe how the AAL solution enables older persons to continue living actively and independently, e.g. in terms of connectedness with friends and family, mobility, continue providing contributions to the community and at work, minimising health and safety risks as well as pain/discomfort or anxiety/depression?	OPEN <i>(an alternative is to use 8 to 10 answer categories)</i>
9. Sustainable support and care systems		
9.1	Please describe how the AAL solution contributes to the sustainability of <i>support and care systems</i> , e.g. in terms of productivity, cost reductions (e.g. care homes), less visits to healthcare providers (doctors, hospitals, emergency rooms, etc.), coordination or quality of care?	OPEN <i>(an alternative is to use 8 to 10 answer categories)</i>
10. Investments received for follow-on innovation activities		
10.1	What is the total value of financial investment received from <i>public</i> third parties for follow-on innovation activities? Examples are loans, grants and investments by public agencies.	FIGURE IN EURO <i>(to be considered, answer categories to reduce confidentiality issues)</i>
10.2	What is the total value of financial investment received from <i>private</i> third parties to follow-on innovation activities? Examples are investments by venture capitalists, banks, business angels and incubators.	FIGURE IN EURO <i>(to be considered, answer categories to reduce confidentiality issues)</i>
11. Intellectual Property Rights (IPR)		
11.1	Could you describe how your organisation protects the results of the AAL Programme project, in terms of patents and other types of IPR applied for and granted (such as copyright and trade marks)?	OPEN
11.2	If applicable, how many patents were granted?	FIGURE
11.3	If applicable, what have been the annual revenues (last year) from patent licensing?	FIGURE IN EURO <i>(to be considered, answer categories to reduce confidentiality issues)</i>
11.4	If applicable, what have been the annual revenues (last year) from other types of IPR licensing (such as copyright and trade marks)?	FIGURE IN EURO <i>(to be considered, answer categories to reduce confidentiality issues)</i>
11.5	Could you describe other ways of benefiting from the results of the AAL Programme, e.g. in terms of reputation effects, reduced time-to-market and first mover advantages?	OPEN
12. Creation of new companies		
12.1	Is your organisation a start-up, i.e. an enterprise that exists less than five years?	YES/NO
12.2	What is the number of FTEs of your organisation (last year)?	If YES to question 12.1 > ask question 12.2 and 12.3 FIGURE
12.3	What has been the average annual growth in FTEs, over the last two years?	PERCENTAGE
12.4	As a result of the project, did your organisation	YES/NO

	create a spin-off?	
12.5	What is the name of the spin-off and could you summarise the activities of the spin-off?	If YES to question 12.4 > ask questions 12.5 - 12.7 OPEN
12.6	What is the number of FTEs of this spin-off (last year)?	FIGURE
12.7	What has been the annual growth of this spin-off, in FTEs, over the last year?	FIGURE
12.8	What is the name of this start-up and could you summarise the activities of this start-up?	YES/NO
12.9	Are you aware of a start-up, outside the project consortium, that commercialises the AAL project's results?	If YES to question 12.8 > ask question 12.9 OPEN
13. Revenues from new AAL solutions and components		
13.1	Last year, what was the revenue your organisation generated from the new AAL solutions developed in the AAL Programme project?	FIGURE IN EURO <i>(to be considered, answer categories to reduce confidentiality issues)</i>
13.2	For these AAL solutions, what is the expected revenue growth over the next two years?	NEXT YEAR: PERCENTAGE YEAR AFTER: PERCENTAGE

Appendix B Draft guidelines for survey respondents

Introduction

The online survey questionnaire should be complemented by guidelines or pop-up information for survey respondents that seek background information about the objectives, approach and terminology of the survey. Appendix B contains building blocks for these guidelines for survey respondents.

Objectives

The objective of the Ambient Assisted Living Programme is to enhance the quality of life of older people and strengthen the industrial base in Europe through the use of Information and Communication Technologies (ICT). The Central Management Unit (CMU) of the AAL Programme monitors progress, outputs and results during the lifetime of its projects.

The CMU has decided to launch **post-project monitoring of the social and economic impact impacts** of its projects in order to follow up on the implementation of AAL Programme projects and evaluate the corresponding successes and challenges at the Call and Programme level. This analysis ('innovation impact assessment') will contribute to accountability and advocacy of the AAL Programme and provide a new platform for past AAL Programme participants to showcase and promote their AAL solutions as well as feed back on their achievements and experiences.

AAL Programme projects involve a large number of participants from different types of organisations that all play crucial but different roles in the process of developing AAL solutions for the older people. AAL Programme projects can be best assessed by the **individual participants** providing information about their continued roles and achievements in the period following the end of the formal AAL Programme project funding. This is due to the existence of the time lag between the research and development phase, the commercial launch and finally the adoption of AAL solutions by the end-users before the various economic and societal impacts become visible and measurable. The success of the overall AAL Programme will contribute to its sustainability and enable future researchers, developers and entrepreneurs to meet the challenges of the ageing demographics.

Types of project participants

The AAL project participants can be any of the following categories and hence the new survey will specifically address the particular contributions these organisations make to the AAL solution:

- **Research organisations**, also referred to as Research, Technology and Development organisations (RTD organisations) and including public research organisations (such as universities) and private research organisations;
- Large, medium and small **enterprises**;
- **End-users**.

The AAL Programme differentiates between three types of end-users:

- **A primary end-user** is the person who is actually using an AAL product or service, a single individual, "the well-being person". This group directly benefits from AAL by increased quality of life. This group can be represented by, for example, senior organisations that contribute their expertise to projects and that assist in identifying end-users that are willing to participate in pilots.

- **Secondary end-users** are persons or organisations directly being in contact with a primary end-user, such as formal and informal care persons, family members, friends, neighbours, care organisations and their representatives. This group benefits from AAL directly when using AAL products and services (at a primary end-user's home or at a remote location) and indirectly when the care needs of primary end-users are reduced.
- **Tertiary end-users** are institutions and private or public organisations that are not directly in contact with AAL products and services, but who somehow contribute in organizing, paying or enabling them. This group includes the public sector service organizers, social security systems, insurance companies. Common to these is that their benefits from AAL solutions come from increased efficiency and effectiveness, which result in savings or by not having to increase expenses in the mid and long term.

Note that primary end-users can be represented by associations such as **senior organisations**. These organisations typically aim at strengthening senior citizens' participation and active involvement in society, and may provide a pool of end-users to co-design, test and pilot new AAL solutions.

It is recognised that a specific type of organisation may have multiple **roles** in projects. The two main roles are developing new AAL solutions and components (e.g. providing research expertise) and participating as an end-user (e.g. hospitals that organise a user pilot or that participate as an end-user organisations). The survey questionnaire specifically addresses these issues and customises the questions to the types and roles organisations play in developing and commercialising AAL solutions.

Confidentiality

The AAL CMU envisages collecting data about the AAL Programme project directly from project participants three times in the five-year period that follows the AAL Programme funding via an online questionnaire. The collected data is primarily for the use of the AAL CMU and as such will be kept **strictly confidential**. It is however deemed useful to feed back aggregate results to project participants and indeed publish overall achievements and illustrative case studies on the AAL website.

AAL solutions and components

AAL projects may develop specific devices, products and/or services but more often a combination of these are bundled in order to deliver a real **solution** to enhance the quality of life of older people. Therefore the survey addresses any type of such solutions under the category of 'solutions'.

AAL Programme projects recognise the relevance of **components** that can be combined with other existing products and services to deliver innovative AAL solutions. A component can be any discrete device or software module of a system that can be used, re-used and adapted to the specific requirements of multiple AAL solutions.

Commercial launch

The ultimate goal of the AAL Programme is the commercialisation of the research and development of the AAL solution. This is referred to as **commercial launch**. The innovative solution may enter the market as a commercial proposition within 2 to 3 years after the end of the AAL project funding period. The real benefit to end-users and the impact of the solution can only be assessed when the solution is launched and adopted by the consumers.

Value chain

The AAL Programme aims at creating new and bespoke networks of organisations that deliver innovative AAL solutions from concepts through research and development to commercialisation. A **value chain** represents consecutive steps of activities that transform inputs, organise processes and include logistics, operations, marketing and sales of products and services.

Independent living and Quality of Life

The AAL Programme aims to increase independent living and, more in general, Quality of life of older persons. The AAL programme projects aim at enhancing the quality of life and maximising the healthy life years of citizens by providing technological solutions that allow them to live as **independently** as possible in the lowest intensity care setting consistent with their needs and wishes.

WHO defines **Quality of Life** as individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment.

Appendix C Questionnaire amongst NCPs and AAL Board Members

Summary of results

Figure 13 Overview of most and least relevant indicators according to NCPs

Category	Most relevant indicators	Least relevant indicators
Increased knowledge and capacity to innovate	<ol style="list-style-type: none"> 1. Access to end-user organisations such as patient associations 2. Collaboration between health care providers and enterprises 3. Collaboration between universities/research institutes and health care providers 3. Collaboration between universities/research institutes and enterprises 	<ol style="list-style-type: none"> 1. Number of publications in academic journals and conference proceedings 2. Insights into strengths and weaknesses of the innovation portfolio 3. Number of publications in business press, sector-specific magazines and popular press
Change in business, innovation processes and investments	<ol style="list-style-type: none"> 1. Substantial improvement (functionalities, quality, etc.) of existing products/services/processes 2. Number of end-user collaboration in the test, pilot and demonstrator phase of the innovation process 3. Number of new products/services/processes developed and launched 	<ol style="list-style-type: none"> 1. Level of investment in training programmes and exchange programmes for staff that is involved in developing and implementing new products/services/processes 2. Level of involvement in standardisation fora (technical standards, protocols, etc.) <i>[qualitative judgement]</i> 3. Number of patent applications
Economic performance and sustained competitiveness	<ol style="list-style-type: none"> 1. Contribution of new products/services/processes to increased profits 2. New export opportunities (national and international revenues) 2. Contribution of new products/services/processes to increased productivity (e.g. cost reduction) <i>[qualitative judgement]</i> 2. Prospects to growth in revenues, export, FTE, productivity and profits in the future <i>[qualitative judgement]</i> 	<ol style="list-style-type: none"> 1. Revenues generated from licensing of patents and other IPR 2. Differentiation in customer base (one large versus many small customers) 3. Increase of personnel (FTE) as a result of new products/services/processes
Contribution to/impact on policy making	<ol style="list-style-type: none"> 1. Increased collaboration with policy makers and public agencies regarding changes in the health and care system for older persons <i>[qualitative judgement]</i> 2. Development of new policy guidelines <i>[qualitative judgement]</i> 	<ol style="list-style-type: none"> 1. Number of policy workshops attended 2. Number of meetings with policy makers
Contribution to solving societal challenges	<ol style="list-style-type: none"> 1. Direct contributions to improvements made in the health and care system for older persons, e.g. in terms of quality of services, accessibility and productivity <i>[qualitative judgement]</i> 2. Estimate change in quality of life for citizens <i>[qualitative judgement]</i> 	<ol style="list-style-type: none"> 1. Estimated increase in productivity/employability of citizens <i>[qualitative judgement]</i>

Source: Questionnaire amongst NCPs (2014).

- The moment and frequency of collecting the information:
 - Starting the collection of information between 1 and 2 year after the project has finished, not in the first year and not later than three years after the project has finished.
 - The information should ideally be collected once a year.
- The target group (coordinators and/or partners) to collect the information:
 - All NCPs stress the importance of both project coordinators and partners to be responsible for the provision of information about innovation impacts. All partners have to contribute to the information collection process, with the project coordinator being responsible for sending the information to the AAL JP CMU.
- The template and system in place to gather the information:
 - The NCPs prefer either digital reports such as Word or Excel files or an online platform linked to the monitoring information of the projects to collect the information.
- Recommendations for implementing a system for innovation impact assessment:
 - Address the implementation of project results in practice (e.g. number of end-users) as well as capture innovation in economical terms (e.g. revenues);
 - Do not use too many indicators, but stick to a few key indicators and align as much as possible with internationally recognized innovation indicators (while using terminology that AAL-specific);
 - Make it simple and easy for coordinators and other project partners;
 - Another recommendation made was to not develop a formal system for all projects, but to follow up the promising projects, as these projects have information about impact;
 - Make use of an informal approach that includes open questions: “*what are you most proud of?*”, “*what is the most important thing you have achieved in the project?*”, “*how could you gain more impact?*” (but also include YES/NO and other questions that can be answered relatively quickly);
 - It is important to consider the policy makers point of view, and to involve them in the monitoring process/system. When implementing the system, it is good to have input on the different impact assessment plans at the national level and to study the meeting and divergence points.

Questionnaire for NCPs and AAL Board Members

The Ambient Assisted Living (AAL) Programme has recently commissioned an assignment to develop a methodology to undertake **Innovation Impact Assessment** of the projects funded by the programme. The assignment should provide the necessary methodology, documentation and guidelines to enable capturing innovation impacts as an expansion of the current monitoring strategy of AAL. Through a better insight into social and economic impacts, the AAL will be able to **identify success stories** that can be beneficial to the wider AAL community, to **evaluate the success of the programme** related to societal benefits for end-users and growth of Europe's ICT industrial base and to **follow up on the implementation** of the results.

The aim of this questionnaire is collect opinions, experiences and information on how to capture innovation impacts from activities funded by countries that participate in the AAL Programme.

The survey consists of the following topics:

- An overview of the current monitoring strategy of AAL
- The expected impacts of AAL Programme funded projects on different levels
- The identification of potential indicators capturing innovation impacts
- Procedural elements that are considered to be crucial in developing an impact assessment methodology
- Suggestions on how to successfully set up a system for innovation impact assessment

Specific questions for the National Contact Persons:

- The existence of national initiatives or programmes that form the national backbones for AAL
- The mechanisms in place to collect information on social and economic impacts of projects funded

When answering the questions in this questionnaire, the following aspects will be important to take into consideration:

4. The innovation impact assessment methodology will specifically focus on the period after the projects have come to an end. This methodology is therefore complementary to the current monitoring strategy of the AAL Programme.
5. The assignment will make use of existing information as much as possible. Therefore the questionnaire has been set up as an explorative tool.
6. Your opinions and experiences will be given a thorough consideration in the development of the Innovation Impact Assessment methodology.

1 - The current monitoring strategy of AAL

The development of a methodology for innovation impact assessment should be complementary to the already existing monitoring strategy of the AAL Programme. This strategy consists of three stages³⁵:

1. Annual reports of the projects funded, to be submitted by the coordinator two months after the end of the calendar year. The elements covered in the annual reports mainly focus on factual information.
2. Midterm review reports will be provided as a result of midterm review conducted by independent experts half way through the project. The review should provide the consortium with recommendations for the future of the project.
3. Final reports of the projects will be provided by the coordinators of all projects (both successful and unsuccessful) and cover a publishable summary of the projects' results. Furthermore the report contains detailed information on the project's results related to scientific/technical progress, the applied business model, the end-users targeted and economic results obtained (IPR, jobs created, dissemination activities, etc.).

Examples of the current indicators that are implicitly used by AAL by means of the different report templates can be clustered in the following categories:

- **Progress/outcome in technology innovation (scientific/technical)**
 - Technical achievements (e.g. demonstrators developed)
 - End-user services developed
 - Patents and other Intellectual Property Rights (IPR)
 - Contribution to standards
 - Publications
- **Progress/outcome in addressing end-user demands**
 - Type of end-users involved (primary, formal and informal secondary, tertiary end-users)
 - Total number of end-users involved (by type of end-user, gender, etc.)
 - Characterisation of end-users involved (age distribution, location, living situation, health status, socio-economic background)
- **Progress/outcome in value-creation models of AAL**
 - Technology transfer agreements and/or any other business deals achieved
 - Spin-offs set up
 - Number of jobs created
 - Estimated size of the target market and possible market shares to be captured
 - Estimated turnover

³⁵ Information on the monitoring strategy, including the templates for the different progress reports can be found on the website of AAL JP: <http://www.aal-europe.eu/documents-ressources/resources-for-project-coordinators/>.

2 - Personal details

First, we would like to learn about you and your involvement with AAL so that we understand better the responses in the following sections.

Please provide some personal details

- Name
- Organisation
- Country
- Involved in the AAL Programme since

3 - Expected impacts of AAL Programme funded projects

For each of the impact dimensions mentioned below, please provide specific examples of impact that are expected or achieved from projects funded by the AAL Programme?

- Increased knowledge and innovation capacity
- Changes in business (collaborative) innovation processes and investments within enterprises
- Economic performance and sustained competitiveness
- Contribution to/impact on policy making
- Contribution to societal challenges
- Other, please specify...

4 - Indicators capturing innovation impacts

For each of the five impact dimensions of the AAL Programme introduced in the previous question, a selection of potential indicators is listed. Please rate these indicators according to their relevance in capturing innovation impacts from AAL funded projects. Note that we focus on impact at the level of AAL projects. We acknowledge that the relevance of specific types of impact will be different for different types of participants in AAL projects (such as universities, research institutes, SMEs and health care providers). Relevance: very relevant, relevant, moderately relevant, of little relevance, irrelevant, no opinion/don't know.

Increased knowledge and innovation capacity

- Number of publications in academic journals and conference proceedings
- Number of publications in business press, sector-specific magazines and popular press
- Increased knowledge about innovation opportunities
- Collaboration between universities/research institutes and health care providers
- Collaboration between universities/research institutes and enterprises
- Collaboration between health care providers and enterprises
- Level of multi-disciplinary and inter-disciplinary research and innovation
- International collaboration
- Collaboration across business sectors (health, ICT, housing, construction, etc.)
- Access to end-user organisations such as patient associations
- Insights into strengths and weaknesses of the innovation portfolio
- Insights into strengths and weaknesses of the product/service portfolio

Please suggest additional indicators for capturing increased knowledge and innovation capacity due to projects funded by the AAL Programme?

Change in business, innovation processes and investments

- Increased amount of resources for innovation (FTE and budget) per source
- Higher level of involvement in innovation networks such as regional clusters and innovation platforms [*qualitative judgement*]
- Number of end-user collaboration in the test, pilot and demonstrator phase of the innovation process
- Number of end-user involvement in the research phase of the innovation processes
- Number of pilots and demonstrators
- Number of new products/services/processes developed and launched
- Platform developed with the potential for multiple products and services
- Number of products and services developed with multiple use by different consumer groups
- Substantial improvement (functionalities, quality, etc.) of existing products/services/processes
- Number of patent applications
- Number of patent granted
- Number of other Intellectual Property Rights
- Number of spin-off companies created
- Level of involvement in standardisation fora (technical standards, protocols, etc.) [*qualitative judgement*]
- Level of investment in training programmes and exchange programmes for staff that is involved in developing and implementing new products/services/processes

Please suggest additional indicators for capturing change in business, innovation processes and investments due to projects funded by the AAL Programme?

Economic performance and sustained competitiveness

- Revenues generated from new products/services/processes
- Differentiation in customer base (one large versus many small customers)
- Revenues generated from licensing of patents and other IPR
- New export opportunities (national and international revenues)
- Increase of personnel (FTE) as a result of new products/services/processes
- Contribution of new products/services/processes to increased productivity (e.g. cost reduction) [*qualitative judgement*]
- Contribution of new products/services/processes to increased profits
- Prospects to growth in revenues, export, FTE, productivity and profits in the future [*qualitative judgement*]

Please suggest additional indicators for economic performance and sustained competitiveness due to projects funded by the AAL Programme?

Contribution to/impact on policy making

- Number of meetings with policy makers
- Increased collaboration with policy makers and public agencies regarding changes in the health and care system for older persons *[qualitative judgement]*
- Number of policy workshops attended
- Development of new policy guidelines *[qualitative judgement]*
- Adaptation of existing policy guidelines *[qualitative judgement]*

Please suggest additional indicators for capturing contribution to/impact on policy making due to projects funded by the AAL Programme?

Contribution to solving societal challenges

- Number and type of end-users (primary, secondary and tertiary) benefiting from the innovation
- Estimate change in quality of life for citizens *[qualitative judgement]*
- Estimated increase in productivity/employability of citizens *[qualitative judgement]*
- Direct contributions to improvements made in the health and care system for older persons, e.g. in terms of quality of services, accessibility and productivity *[qualitative judgement]*

Please suggest additional indicators for capturing contribution to solving societal challenges due to projects funded by the AAL Programme?

If your indicator suggestions are partly based on positive experiences in monitoring of national, European or international programmes in fields that are relevant for AAL (ambient assisted living, ICT, health, etc.), please provide title(s) and web reference(s) for these programmes, if known.

5 - Procedural elements of an impact assessment methodology

What do you consider to be the ideal time to start collecting information for the assessment of innovation impacts (after the project has finished)?

- 6 months after the project has finished
- 1 year after the project has finished
- 2 years after the project has finished
- 3 years after the project has finished
- 4 years after the project has finished
- Other...

How often should this information be collected?

- One time only

- Every six months
- Once a year
- Once every two years
- Other...

Who should be responsible for the provision of the information about innovation impacts?

- The project coordinator of the project
- Both the project coordinator and partners of the project
- Other stakeholders...

What would be your preference in terms of a reporting system to collect the relevant information by ranking them 'most suitable/acceptable/least suitable'?

- Hard copy of the reports posted
- Digital reports such as Word and Excel files emailed
- Online platform linked to the monitoring information of the projects

Do you envisage potential barriers that would hinder the gathering of information about innovation impacts?

- Yes
- No

If yes, please specify the potential barriers:

What are your recommendations on how to increase the chance of gathering the impacts of the projects that have been funded but that have come to an end?

Did you perform or know about any innovation impact assessments of projects on the national level?

- Yes
- No

If yes, please provide the title(s) and web reference(s) for these programmes, if known.

Please provide any further suggestions on setting up a system for innovation impact assessment by AAL.

6 - Overview of national initiatives or programmes

-- only included in questionnaire to NCPs --

Please provide information on initiatives or programmes in your country that form the national backbones for AAL.

National initiative or programme - Example 1

- Name of initiative/programme
- Responsible organisation
- Website
- Name of contact person
- E-mail address of contact person
- Description of the initiative/programme

National initiative or programme - Example 2

- Name of initiative/programme
- Responsible organisation
- Website
- Name of contact person
- E-mail address of contact person
- Description of the initiative/programme

7 - Mechanisms to collect information on social and economic impacts

-- only included in questionnaire to NCPs --

Please describe the mechanisms/procedures that have been put in place to collect information on social and economic impacts?

What kind of systems and templates are in place to report on innovation impacts?

Please name the (type of) stakeholders that are involved in gathering innovation impacts?

8 - Conclusion

Do you have any further comments/remarks that are beneficial in developing a methodology for capturing innovation impacts?

Thank you for your contribution to this assignment.

technopolis |group| The Netherlands
Spuistraat 283
1012 VR Amsterdam
The Netherlands
T +31 20 535 2244
E info.nl@technopolis-group.com
www.technopolis-group.com