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Learnings from the 2019 and 2020 AAL Impact Assessment

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Table of Contents

1 Introduction

1.1 Context

We are at the cusp of a longevity revolution! People aged 65 years or over make up the fastest-growing age group, while the share of the population under age 25 is declining.[1] Between 2019 and 2050, the number of 'older adults' (those aged 65+) globally is projected to more than double. The share of older adults is projected to increase from 9% to almost 16% of the population by 2050.[2] In the European Union (EU-27), the share of older adults was already at 20% in 2019 and is expected to grow to almost 30% by 2050.[3] Much of this increase is driven by the share of the 'very old' age groups (those over 80+) growing from less than 6% of the population in 2019 to almost doubling by 2050.[4]

These demographic trends will have far-reaching consequences, posing both challenges and opportunities for policy and decision makers, in myriad domains. On the one hand, the impacts of population ageing include increased demand for both health and care (to maintain and improve the wellbeing and quality of life of older people), increased pressure on the working age population in terms of required social expenditure and services, effects on skills and capacity in the labour market, and risks to fiscal sustainability, among others. On the other hand, growing old should be celebrated as an achievement of progress, as older people can continue to provide valuable contribution to their families, communities, the society and economy as a whole. To foster opportunities, the European Commission (EC) has been implementing a policy of 'active ageing', promoting the creation of age-friendly environments and independent (healthy and secure) living for as long as possible.[5] The EU's policy response to ageing includes the development of the 2012 guiding principles for active ageing[6], the Active Ageing Index[7], initiatives such as the European Innovation Partnership in Active and Healthy Ageing, and funding through programmes such as EaSI, ESF, and Horizon 2020.

In particular, the EC has been co-financing the Active and Assisted Living (AAL) Joint Programme with Member States and other participating countries since 2008. The Programme's aim is to support projects developing innovative ICT-based solutions for active ageing and to close the gap between basic research and market uptake. Since its inception, the Programme has funded over 220 projects that are contributing to a critical mass of research, development and innovation at EU level for market-ready AAL solutions. In addition, the Programme

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[1] World Population Prospects (2019). Available at: https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf

[2] ibid

[3] Population structure and ageing. (2020) Eurostat. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing

[4] ibid

[5] See: https://ec.europa.eu/social/main.jsp?catId=1062

[6] See: http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2017468%202012%20INIT

[7] See: https://www.unece.org/population/aai.html

implements a range of support actions designed to create an ecosystem of AAL stakeholders in Europe, provide business training and support to organisations developing AAL solutions, and inform investors about the AAL sector to help attract follow-on funding for AAL projects.

1.2 Need for Impact Assessment

The AAL Programme has been running for more than ten years and the first wave of its projects (initiated between 2008-2013) were concluded more than four years ago. All funded projects had the aim to go to market with their solutions within 2-3 years after project completion and ultimately contribute to healthy ageing, wellbeing and independent living of older adults.

Evidence is needed to determine the extent to which the portfolio of AAL projects and support activities have been positively contributing to achieving the programme's objectives and facilitate learning from the successes and ongoing challenges.

Therefore, the AAL Association commissioned the Technopolis Group in 2018 to develop an AAL Impact Assessment Framework and to collect evidence on outcomes and impacts of the AAL Programme. The impact assessment has been conducted in annual cycles. The current report summarises evidence gathered in 2019 and 2020 about the progress of the formerly AAL-funded projects.

1.3 Approach to the AAL Impact Assessment

The scope of the Impact Assessment (IA) covers outcomes and impact emerging from completed projects and support actions related to calls between 2008-2018. This represents, in total, 200 projects that were funded in the first and second phase of the AAL Programme.

The first round of data collection took place in 2019 (2019 IA) and explored the impact emerging from the phase I of the programme, i.e. projects funded via calls between 2008-2013. It employed a survey questionnaire and data was collected for 52 projects out of a total of eligible 151 projects for that period. A second round took place in 2020 (2020 IA) to collect data via survey from the same group of projects as well as from projects from calls 2014-2018. This new round collected data from 38 AAL projects from all calls between 2008 and 2018. The limited number of responses in 2020 is likely a consequence of the ongoing COVID-19 pandemic. Across the two impact assessments, there was a degree of overlap between projects on which data was collected, resulting in combined information on a total of 85 unique AAL projects.

The survey evidence was complemented with data from a series of interviews with representatives of AAL projects that had launched a solution to the market; as well as interviews with General Assembly (GA) members of the AAL Association and national representatives of the AAL Programme to understand better the impact of support activities on the AAL ecosystem across Europe.

1.4 Limitations

The data collected via the surveys from 85 projects (43% of total) potentially underestimate the outcomes and impact stemming from the AAL projects funded between 2008-2018. However, it is also possible that the majority of the benefits of the AAL Programme were realised by a rather small number of funded projects and these might have preferentially responded to our survey request. It is thus uncertain what fraction of the benefits were actually collected in this impact assessment. Due to the potential for positive response bias, it was not possible to 'gross up' figures to account for the overall impact of the AAL Programme. This limitation applies in particular to the historic AAL calls between 2008-2013.

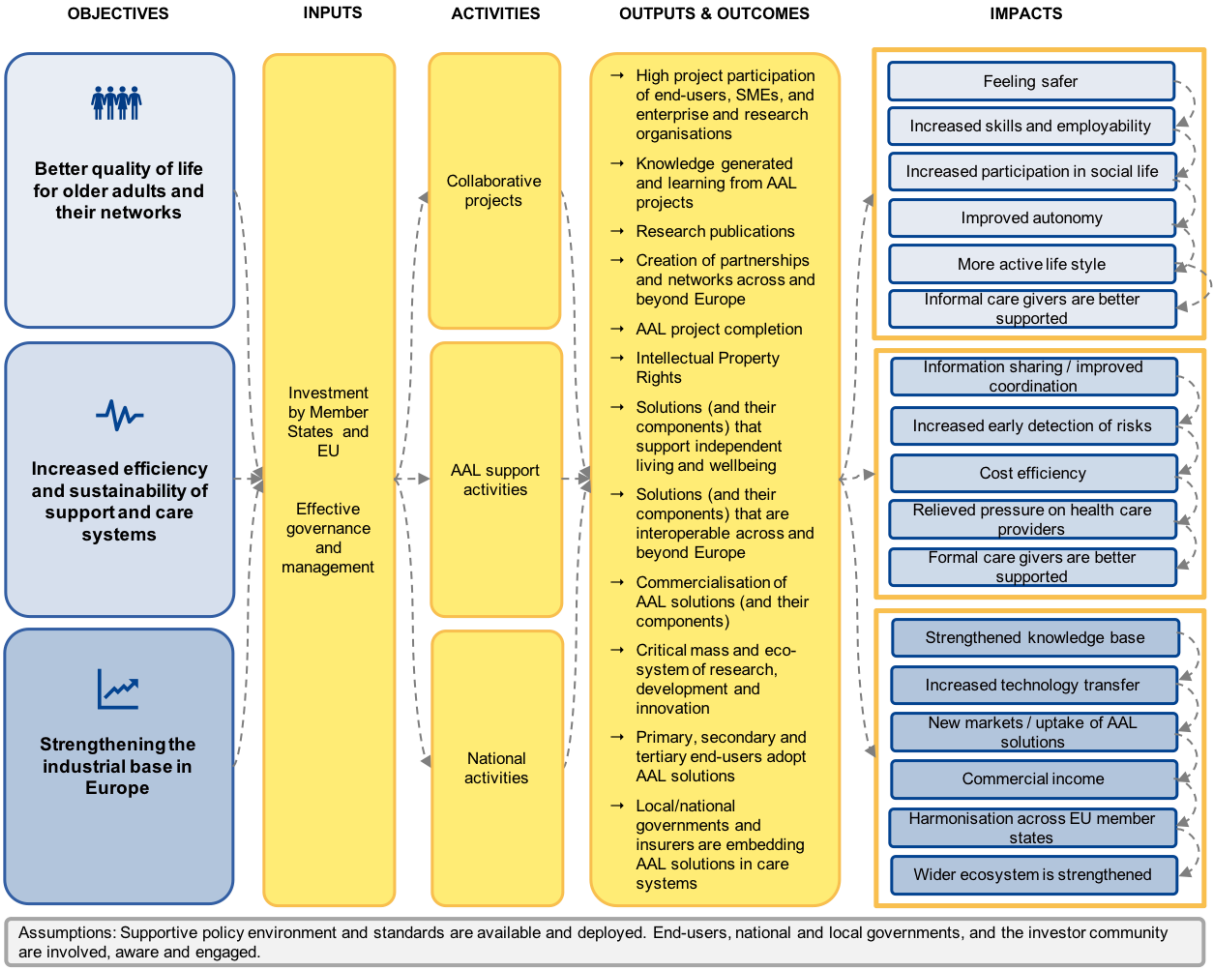
A second limitation is that data obtained from survey and interviews are based on self-reporting, without an opportunity to cross-validate factual information. Testimonials represent perceptions and qualitative assessment of how and to what extent the AAL solutions are making a positive overall contribution, without baseline or an objective scale regarding the changes the individual projects and the programme overall made.

1.5 AAL Impact Assessment Framework

The evidence collected builds on an AAL Impact Assessment framework that was specifically designed to capture the outcomes and impact according to the AAL Programme logic model (Figure 1). Each funded project is thus expected to address one or more impact dimensions linked to the programme's declared high-level objectives:

1. Improving quality of life for older people and their networks (individuals, family and friends)
2. Supporting increased efficiency and sustainability of care and support systems
3. Strengthening the industrial base in Europe.

Figure 1 AAL Programme logic model



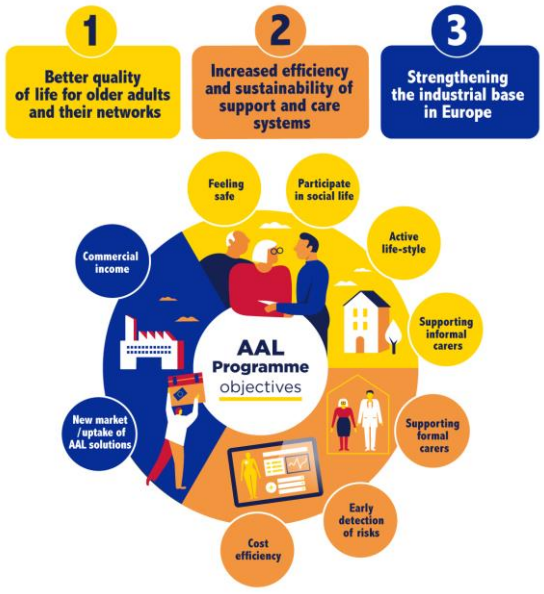
2 Key results from the Impact Assessment

2.1 High level findings

Overall, the Impact Assessment shows that the solutions developed with support from the AAL Programme contribute to deliver value in multiple areas of life. Proactive end-user involvement throughout the life of the projects (from design to testing) has helped to bring solutions to market that specifically address the needs of users. Furthermore, the AAL Programme has helped lay the foundation for new market segments that are inclusive of the wishes and needs of older people. In addition, the Programme's support actions have actively contributed to the creation of a nascent ecosystem, currently closely linked to the supply side via the AAL Programme, of start-ups and business, researchers, policymakers and public officials, care organisations, and older people with their families and support networks. The demand side contribution to the ecosystem of public and private insurers and investors are however lagging behind.

Figure 2 shows the three impact dimensions of the AAL Programme and associated impacts that the impact assessment has explored. Across the portfolio of projects, we find solutions that promise meaningful change to the lives of older adults and their networks and to formal carers, touching upon each of these impact dimensions. The analysis in the following sections follows these impact dimensions and is based on data collected across the two rounds of consultations unless stated otherwise.

Figure 2 Overview of the impact of AAL solutions developed



2.2 Improving quality of life for older adults and their networks

Enabling healthy and active ageing requires a life course approach and relies on health and digital literacy of individuals and communities to prevent poor health and unhealthy

behaviours before they begin.[8] These in turn help to mitigate health inequalities, extend working lives, and maintain and improve quality of life of people as they age. There a number of underlying factors that need to be addressed including safety and autonomy at home, social connectedness and inclusion, engagement in the workforce, mental and physical health and support to older people's network and informal carers. The AAL Programme has successfully supported the development and market launch of several solutions that address these quality of life aspects, which are discussed below.

2.2.1 *Feeling safe*

One of the ambitions of the AAL Programme is to stimulate the development of solutions that can help older people *feel* safe, especially in their own homes. This is relevant as environments that were previously safe may no longer be suitable to the needs of older people. Falls in particular are a major cause of injury-related hospital admissions, years lived with disability, and death among the older people in Europe.[9] This raises the importance of age-friendly environments and solutions that can prevent, monitor and report accidents such as falls. Equally important is the perception of increased physical safety and feeling of reduced vulnerability for older people's quality of life.

The impact assessment has identified **23 solutions** that are intended to promote feelings of safety through protection from physical and emotional harm. Not only do these enhance the confidence of older people, they also provide peace of mind to their carers. The solutions developed though the AAL Programme include fall detectors as well as devices that assist people in tasks around the house or in the external environment. **Over 31,500 people** have been reported to already use these solutions. Past users of the developed solutions have noted that:

> *"It would be helpful to have these types of technology available so that it is possible to remain independent later in life. The HAPPY AGEING system offered the user a sense of safety in my own home"– Case study HAPPY AGEING (2019)*

Another solution developed to contribute to older adults feeling safe is HalloZorg, a web application that helps to form a care network around users who need help with their daily health and care routines. Older adults feel particularly insecure when their cognitive and/or physical health is impaired. The creation of a safety net around vulnerable older adults helps them to feel safe and cared for, and contribute to them living independently longer.

2.2.2 *Participation in social life*

Participation in social life is a core aspect of enhanced quality of life and it entails interaction with others through common activities, including communication via the internet. A recent

[8] Promoting Healthy Ageing. (2019) OECD. Available at https://www.oecd.org/g20/topics/global-health/G20-report-promoting-healthy-ageing.pdf

[9] Accidents and injuries statistics. (2020) Eurostat. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Accidents_and_injuries_statistics

research shows that older people suffer from social isolation more than any other age group and likely not to engage in social activities, with significant geographical variations across Europe.[10] Furthermore, less than one fifth of people aged 65-74 participated in social networks in 2018 in the EU-28.[11] This is a concern since older people want to feel that they 'count' and are part of a community. Older people also need to feel free from stigma when interacting with others, to reduce their sense of vulnerability.

The AAL Programme aims to increase or maintain the level of social interaction of older people through the use of ICT solutions and has supported the development of **20 solutions** such as (virtual) forums and platforms where older people can meet and interact with other people as well as ICT devices that enable older people to more easily contact friends and family. Data collected in the impact assessment shows close to **29,000 people** making use of the solutions developed in the AAL Programme designed to maintain and improve an active lifestyle. One user testimonial illustrated that:

> *"Through the Motion sessions, I discovered that exercising together with other adults is fun and I built long lasting social links with other Motion participants" – Case study Motion (user tester)*

EmmaHome is an example of such a solution, and is a sensor-based assistance system for older adults at home which can be operated using voice commands. Different smart home sensors and services can be connected to the base platform. Emma can also help older adults to enhance their social lives through the ability of the platform to read out text message sent by a friend or a family member. This sort of social function is particularly useful when the older adult does not have a smartphone. In addition, user feedback received on the solution in the context of the lockdown brought about by the COVID-19 pandemic was very positive as it allowed isolated older adults to stay in contact with their friends and family, helping them feel less lonely. Solutions with these kinds of functionalities are highly relevant as recent research has showed that those people that avoid loneliness report lower dissatisfaction and less anxiety.[12]

Emma
Die flexible Lebensassistenz

2.2.3 *Active lifestyle*

People with physical and/or cognitive limitations have difficulties to practice self-care and make it challenging for them to live independently. Active lifestyle contributes to preventing ill health (e.g. by reducing the risk of non-communicable diseases) and improving and/or maintaining overall physical and non-physical health of older people. However, only a third of people aged 75 or over in the EU-28 spent at least three hours on physical activities on a weekly

[10] Loneliness – an unequally shared burden in Europe. (2018) JRC Policy Brief. Available at: https://ec.europa.eu/jrc/sites/jrcsh/files/fairness_pb2018_loneliness_jrc_i1.pdf

[11] Ageing Europe – statistics on social life and opinions. (2019) Eurostat. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Ageing_Europe_-_statistics_on_social_life_and_opinions

[12] Life Dissatisfaction and Anxiety in COVID-19 pandemic. (2020) JRC. Available at: https://ec.europa.eu/jrc/en/publication/life-dissatisfaction-and-anxiety-covid-19-pandemic

basis in 2017.[13] In terms of non-physical activities such as attending cultural and sporting events, only about half of people aged 65-74 and a third of people aged 75+ had attended at least one such event in the preceding year in 2015.[14] To counter physical and cognitive decline, the OECD has argued for policies promoting physical activity, lifelong learning and skills development as well as encouraging people to stay engaged in their communities, as a means of combatting social isolation, maintaining engagement and good health.[15]

The AAL Programme has helped develop **12 solutions** that, amongst others, help older people navigate and orient themselves, wearable devices helping people to move, as well as serious games measuring cognitive development and supporting older people in their daily activities and/or workflows. The impact assessment collected evidence showing well over **13,000 end-users** engaging with these solutions, one of which noting that one of the solutions:

> *"…gave me the opportunity to train with others in the privacy of my own home" (2019 Case study on 'Motion').*

The impact assessment also yielded evidence of AAL solutions that help improve non-physical activities of older people. SeniorWeb, for example, aims to stimulate participation and self-development of older adults in digital communities. They can attend online courses, create online collaborative projects and ask for bespoke support. SeniorWeb helps older people to remain active and engaged via the internet, which is particularly important when their mobility is reduced. In Switzerland and the Netherlands, the project has already helped older adults to use digital technologies and become more active and independent on the internet. seniorweb

2.2.4 *Supporting informal carers*

Independent living at home and in the community largely depend on the support of family and friends and other informal carers. The role of informal carers is however widely underappreciated. The UN Economic Commission for Europe (UNECE) has estimated that the vast majority of all care needs (70% to 95%) are covered by the unpaid labour of informal carers, forming "the backbone of the long-term care provision" for older people.[16] It has been reported that informal carers are typically impacted in their professional and personal lives and often face stress and lack access to appropriate support measures.[17] Besides, older people themselves do not want to be a burden on their family and network.

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[13] Ageing Europe – statistics on social life and opinions. (2019) Eurostat. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Ageing_Europe_-_statistics_on_social_life_and_opinions

[14] Ibid.

[15] Promoting Healthy Ageing. (2019) OECD

[16] UNECE Policy Brief on Ageing No. 22. (2019) United Nations Economic Commission for Europe. Available at: https://www.unece.org/fileadmin/DAM/pau/age/Policy_briefs/ECE_WG1_31.pdf

[17] Working and caring: Reconciliation measures in times of demographic change. (2015) Eurofound. Available at: https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef1534en.pdf

Therefore, supporting family and friends in providing care for older people is a core ambition of the AAL Programme. AAL solutions aim to help them by relieving some of the pressure they face in the provision of care. The impact assessment has identified **13 solutions** that are providing support to **25,500 end-users** of which **over 5,000 are informal carers themselves**. The types of solutions funded by the AAL Programme include devices that inform informal carers about the wellbeing or whereabouts of (vulnerable) older people as well as tools designed for their training purposes.

For illustration, Verbatim de la Bien Traitance (VBT) is an educational game aimed at informal carers to learn about the risk of inadvertently hurting or mistreating an older person. With VBT, informal carers become equipped with the appropriate language and behaviour to provide care and knowledge about situations that may pose a risk of abuse. It also includes a burnout resilience tool that is expected to prevent carers' exhaustion by spotting elevated risk and signposting them to appropriate help and resources. By preventing burnout, informal carers extend the period they can provide informal care within the home environment, contributing longer independent living and enhanced quality of life for older adults.

2.3 Increased efficiency and sustainability of support and care systems

The development of AAL solutions that enable active ageing and thus improve the quality of life of older people also fulfils an important role in contributing to the enhanced efficiency and sustainability of existing support and care systems. This is a key aspect of future fiscal stability as health expenditure is expected to markedly increase (both in absolute terms and as % of GDP) as a result of the demographic shift. Projections for the EU show that under a "healthy ageing scenario" (that is all future gains in life expectancy are spent in good health) expenditure growth is reduced to only a fifth compared to a pure "demographic scenario" where age-specific morbidity rates do not change over time.[18]

Given these trends, it is critical that AAL solutions are developed that contribute to early detection of risks and prevention of ill health so that older people can continue to maintain their autonomy and independence in their home for longer. These positive trends can take pressure off the care and support systems, essentially representing a 'negative infrastructure'. However, with declining physical and mental abilities, care needs of older people are increasing, and become more complex and challenging to manage, eventually requiring long-term care provision. AAL solutions can therefore also target formal care settings, enabling those facilities to function more efficiently and reduce the associated cost of care. In the following sections the contribution of AAL-funded projects to these aspects are discussed in some detail.

2.3.1 Early detection of risks

The use of technology-based solutions can be particularly useful to detect health risks early. These include risks of fall, onset of dementia, and other forms of health deterioration and frailty. The value in early detection of risks is two-fold. First, it enables early intervention which can help

[18] 2018 Ageing Report: Policy challenges for ageing societies. European Commission. Available at: https://ec.europa.eu/info/news/economy-finance/policy-implications-ageing-examined-new-report-2018-may-25_en

to reduce the proportion of older people falling below the 'disability threshold'[19] and thus it delays older people moving early to more intensive (e.g. round-the-clock monitoring) care facilities. Second, in formal care setting, these solutions can improve quality of care and reduce pressure on health and care systems.

The AAL Programme supported the development of **6 solutions** designed for the early detection of risks that were used by **over 21,000 end-users**. One of these solutions is Fearless,

which looks to avoid falls through preventative measures. For instance, Fearless detects if a person is getting up or standing up, and then it can switch on lights and request carers' support, helping to reduce the risk of falls. In the event of a fall, Fearless automatically alerts carers and nursing staff without requiring any action from the fallen person, or wearing of any sensors on the body. Cogvis primarily designed Fearless with formal care setting in mind. Thus far, hospitals, care homes, first aid organisations have been the main users of Fearless. These institutions integrate Fearless into their existing alarm and emergency call systems.

Another AAL solution, Sensara has also displayed positive outcomes of risk detection in care homes, nursing homes and institutions. The improved safety of residents through the early monitoring of risks gives carers more control over how to help clients rather than having to respond to emergencies.

2.3.2 *Supporting formal carers*

The workforce in Europe however will be under increasing pressure in the coming decades as we go from having three working-age people for every older person (65+) to only two.[20] This decline will affect the number of formal carers (qualified professionals) and thus their ability to provide quality care for a growing number of dependent older people. Long-term care needs and associated costs will skyrocket.[21]

Therefore, more support to formal carers (including care organisations) is needed to provide more effective and efficient care and thus alleviate some of the pressures of care provision. The impact assessment has collected evidence on **13 solutions** developed through the AAL Programme that were (partly) designed to support formal carers. These include information sharing platforms, solutions enabling remote monitoring, and solutions providing coordination where multiple carers are involved. Altogether, just under **26,000 end-users** have been reported to interact with such AAL devices of which approximately **5,500 were formal carers.**

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[19] Active Ageing: Good health adds life to years. (2012) WHO Regional Office for Europe. Available at: https://www.euro.who.int/en/health-topics/Life-stages/healthy-ageing/publications/2012/policies-and-priority-interventions-for-healthy-ageing

[20] Ibid.

[21] Relationship-Based Home Care: A sustainable solution for Europe's elder care crisis. (2018) Global Coalition on Aging. Available at: https://globalcoalitiononaging.com/wp-content/uploads/2018/06/RHBC_Report_DIGITAL.pdf

One of these solutions is 'SafeMove', an all-in-one tool based on a system of sensors that offers a number of solutions to ensure the safety and wellbeing of people living with early-stage dementia. SafeMove is a system that connects to a TV screen to operate and a computer to store data locally, providing data protection. Data however can be shared in real time with relatives and medical staff for monitoring purposes. Therefore, Safemove does not only have an impact on older adults with early stage dementia, but it also provides support to their carers. For example, changes to every routines and habits (e.g. drinking liquid, or taking medicine) can be detected and this information is then shared with carers. This supports formal carers by enabling more effective monitoring as well as improving the level of care they can provide through analysis of SafeMove user behavioural data.

2.3.3 *Cost efficiency*

Organisations bringing AAL solutions to the market need to consider the cost efficiency of their product for end users. A solution may be adding value by providing better quality care and/or by helping customers lower their overall costs. A successful offer brings value to the end-users while taking into account affordability for customers and their willingness to buy at different price-points.

The 2020 AAL impact survey questionnaires were designed to collect evidence on how organisations validate and demonstrate the value of their solution (against other available solutions) to users, customers and investors. The vast majority of respondents however indicated that they had no formal evidence on this aspect. There were only two exceptions: one project where qualitative evidence was collected from users and another where quantitative cost efficiency of the solution was calculated as direct benefit to a care organisation. Note that the majority of these technology solutions may not fall under the EU medical device legislation and hence formal evaluation of safety and effectiveness may not be required.

2.4 Strengthening the industrial base in Europe

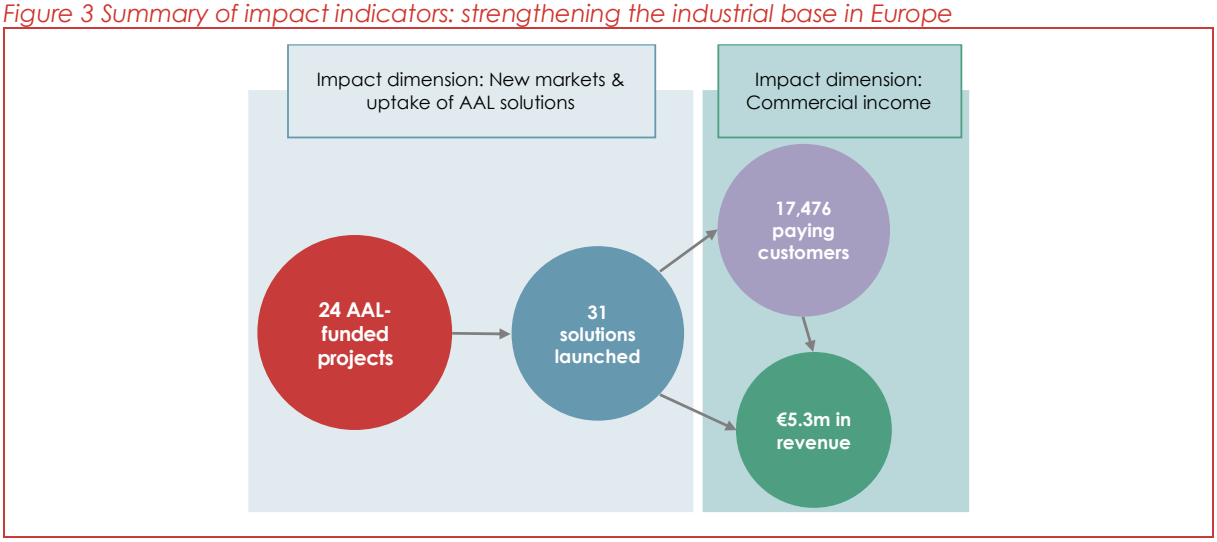
Overall, the impact assessment of the AAL Programme has identified 24 projects that reported to have launched 31 AAL solutions/components on the market as a result of the AAL project funding.[22] The rate of AAL-funded projects that successfully launched solutions on the market is thus conservatively estimated to be 12%, considering a total of 200 funded and completed projects as a base.

Further data disclosed in the consultations for 17 AAL solutions has showed that these attracted close to 17,500 paying customers[23] and have generated €5.3m in revenue in the last year. There have been further non-monetizable results that contribute to strengthened industry, including business training (AAL2Business), opportunity to pitch to investors (AAL Market Observatory) and networking within the emerging ecosystem and access to key stakeholders (AAL Forum).

[22] See Appendix A for an overview

[23] For one project, the respondent reported erroneous response that we were unable to revise hence the number of total paying customers reported here is understated.

Figure 3 Summary of impact indicators: strengthening the industrial base in Europe



Source: 2019 IA and 2020 IA. Technopolis Group.

The types of solutions brought to market include innovative devices for use in the home, e.g. a fall sensor and communication system; platforms designed to bring communities together including dedicated platforms for formal carers; collaboration platforms for informal carers; collaboration platforms for the wider community; and matching platforms connecting demand and supply. It also includes solutions that ensure self-care of older adults. By supporting the development of these solutions, the AAL Programme has helped to lay the foundation for new market segments that are inclusive of the needs and wishes of older people and their networks.

Figure 4 Map of countries where AAL solutions/components were developed and originally launched

Source: 2019 IA and 2020 IA. Technopolis Group

The 31 AAL solutions and components developed were brought to market in 13 different countries across Europe, i.e. in Austria, Denmark, Italy, France, Germany, Greece, Hungary, the Netherlands, Norway, Poland, Romania, Spain, and Switzerland. Figure 4 shows the countries where these solutions/components were developed and launched. While, the figure does not capture scale up in international markets, there are examples of projects that have expanded internationally. For instance, 2PCS and SafeMove are now also available on the market in the Netherlands and Anne4Care (DALIA) has been introduced in the German market.

2.5 Barriers to market

There are still several challenges to bring AAL solutions successfully to market. These can broadly be grouped to barriers related to finance and commercialisation, user acceptance, market fragmentation and policy/regulatory issues. Based on these groups, 64% of reported barriers can be classified as issues in finance and commercialisation, 14% as market fragmentation, 9% as policy and regulatory issues, and 13% as user-acceptance issues. In terms of specific barriers, the top barrier highlighted by AAL project participants were challenges in developing a business plan/case for setting out how to reach customers and offering the product or service at an affordable price. The lack of available follow-on external funding to bring the AAL solution to market was another key challenge for many. Others reported having experienced difficulties in ensuring user acceptance of ICT-based solutions. The full list of barriers identified by survey respondents can be found below.

Table 1 Barriers and challenges to enter markets

	Concepts from the AAL Market and Investment report	**Impact Assessment Survey data**	**Total (N=74)**
	Business model	Challenges in setting-up a business-plan for commercialisation	**23%**
	Financial resources	A lack of (external) funding in order to bring solutions to market	**22%**
	Users' technical skills	Difficulties in ensuring user acceptance of ICT-based solutions for older people	**13%**

Source: 2019 IA and 2020 IA. Technopolis Group.

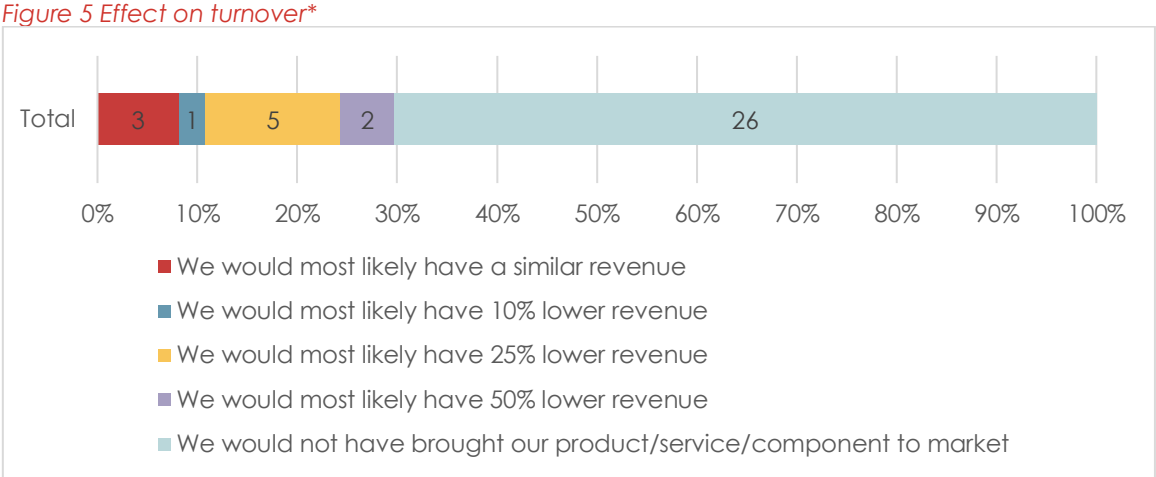
2.6 Additionality and added-value of the AAL Programme

Survey data also highlights that the AAL Programme has helped overcome barriers to market and offered project participants an international network for collaboration:

- Over 90% of survey respondents indicated that the AAL Programme promoted collaboration and networking across the EU and helped companies access the right skills markets
- 70% of the survey respondents stated that without AAL funding they could not have brought their solution to market
- 67% of respondents felt that their learnings were not only relevant to their region but would also be of value to other regions, countries and the EU overall

The AAL Programme has had direct influence on project participants' ability to bring their solution to the market (Figure 5). Most stated that they would not have been able to do so without the AAL Programme, while others claimed that it would have been possible but their sales would most likely have been lower.

*Figure 5 Effect on turnover**



* Without the AAL Programme, would you have brought your solution/component to market?
Source: 2019 IA and 2020 IA. Technopolis Group.

The added value of the AAL Programme can also be seen in its role to support national/regional AAL ecosystems and networks and links these across Europe via hundreds of projects and support actions. The AAL Association currently has 18 member countries, mostly from Europe but also including Taiwan and Canada. Interviews with national representatives highlighted the clear impact of the AAL Programme within their countries, but they also see further opportunities in strengthening the catalytic effect of the AAL Association in a multitude of ways. In particular, it was highlighted that further engagement could focus more explicitly on creating communities of practice and supporting the emerging ecosystem with end-users, SMEs, investors, and public authorities. Together, this will help bridge the gap between existing supply and latent demand.

3 Concluding remarks

The AAL Programme has been running now for more than ten years. This provides a unique opportunity to look back and take stock of what has worked and why and learn from examples where projects encountered challenges. The current Impact Assessment represents the first in a series of steps aimed at measuring the emerging impacts of the programme.

3.1 Context

In 2008 the market for ICT-enabled solutions to meet the needs of older people essentially did not exist. This was due to several underlying issues that the fledging Active and Assisted Living community faced at the time. There was a deficit at multiple levels: skills, technology readiness, and societal and business awareness relevant for tackling an ageing society. Supply and demand sides were not joined up because older people and their needs and wishes were not met by a market producing inclusive solutions. Perhaps paradoxically this was an opportune time to start a publicly-driven programme and try to address this 'market failure'. While the

activities delivered by the AAL Programme and other initiatives across Europe during the past twelve years have changed the innovation landscape and have recognised the central role of older adults in the process, many important aspects of the AAL market is still under-developed.

The ongoing COVID-19 pandemic unexpectedly revealed the urgent need for working AAL solutions globally. Since the virus particularly adversely affects older adults, many need to self-isolate physically. However, the need for social interactions, communications, sharing and coordinating their care are more important than ever. This new situation undoubtedly boosted the need and opportunities for AAL solutions globally. The AAL Programme has supported the development of a number of viable solutions: EmmaHome, for example, enables older adults and informal carers to book grocery shopping, so they can be supported when isolating and/or not able to leave the home, while still enabling them to communicate with friends and family in a virtual setting. Solutions that can help monitor (and inform about) the wellbeing of older adults remotely, such as Fearless, also offers help to both the older adults and their carers, often in care homes, as it reduces the need for direct physical contact, while limiting the risk of fall. In addition to reducing the need for hands-on care, solutions such as SafeMove can also support physical activity and provide assistance and entertainment. Other solutions are still in development but are expected to help with personal hygiene and self-care at home, in care facilities and public places. The smart assistive toilet solutions, developed by iToilet and Toilet4Me projects, will provide older adults enhanced autonomy, safety and participation in social life.

3.2 A snapshot of impacts from the AAL Programme

The 2019 AAL Impact Assessment focussed on the impacts emerging from the first phase of the AAL Programme, associated nominally with 153 projects launched over six calls between 2008-2013. The 2020 AAL Impact Assessment sought to collect additional data on those projects as well as data from the second phase of the AAL Programme (2014-2018), collecting data on 38 projects that were completed by Spring 2020. This means that, to date, a total of 85 projects (or 43% of projects overall) have been included in the Impact Assessment. The AAL Programme has progressively complemented project funding with important support activities. These including business training (AAL2Business) to 86 projects since 2013, opportunity for 26 companies to deliver 37 pitches to 27 investor organisations in 2017 and 2018 (AAL Market Observatory[24]) and annual networking events within the emerging AAL ecosystem and access to key stakeholders (AAL Forum). More recently, the bi-annual Smart Ageing Challenge Prize galvanised hundreds of innovators across the EU and associated countries to solve challenges in the AAL space.

Overall, the Impact Assessment suggests that at least 1 in 8 AAL-funded projects (12%) has led to market launch of a solution or component. This is a conservative estimate as it uses actual data from the 85 surveyed projects only out of the total of 200 AAL-funded projects in this period. This assumes that other projects did not progress to market launch. Nevertheless, there is an ongoing effort to collect further data in particular from the second phase of the AAL Programme. Note also that some launched solutions benefit from multiple AAL projects; for example, Hallozorg is connected to two AAL projects: MyGuardian and Care4Balance.

[24] AAL Market and Investment Report: Summary (2018) Technopolis Group. Available at: http://www.aal-europe.eu/wp-content/uploads/2019/02/Technopolis-AAL-Market-report-SUMMARY-181224.pdf

Based on data collected for 17 of the 31 solutions, AAL-funded projects generated a minimum of €5.3m in revenue in the previous year. While it is modest compared to the total funding (including co-funding) into AAL projects between 2008-2018 of €589m, the annual revenue linked to AAL-funded projects has grown significantly compared to data collected in an earlier AAL review in 2015[25]. There has also been a marked shift in the pattern of paying customers between 2015 and 2019/2020: while five years ago the main paying customers were reported to be providers of care and welfare services, housing and municipalities, now individuals (older adults) are seen as the dominant group of paying customers.

To put these figures into context, we note that historical data indicates that only 10-20% of all investments lead to value creation and positive return on investment. According to Eurostat data, the survival rate of EU start-ups in the ICT sector drops from 85% (in year 1) to 60% (by year 3) to 51% (by year 5). If we consider the market potential of the 24 projects that have already resulted in the commercialisation of solutions (not counting the projects that indicated planned product launch), the data suggests that the AAL Programme is punching above its weight. Of course, total revenue at this stage (for the 17 projects where financial data could be gathered) remains relatively low and it may signal that changing customer behaviour is a more protracted process. It also means that some of the solutions developed may ultimately not be commercially viable. Until revenues of AAL solutions do pick up, the sustainability of many start-ups is at risk and further public sector investment into AAL innovation would be needed.

Beyond increasing user numbers of AAL solutions and growing financial revenue, almost all AAL projects resulted in the creation of enabling knowledge and vital networks for future projects and potential solutions to be deployed beyond the country where the solution was originally developed. Many of the AAL solutions identified so far cover a range of AAL impact dimensions for better quality of life of older adults (i.e., feeling safe, participation in social life, promoting active lifestyle [physical and non-physical], supporting informal carers); and for increasing the efficiency and sustainability of support and care systems (mainly through supporting formal carers and detecting risks early for older people).

3.3 Learnings and possible future directions

The AAL Programme has undergone continuous learning and improvement cycles since 2008. The first wave of calls for proposals explored a variety of themes from chronic conditions, social interactions, independence, mobility and managing older people's daily lives at home and at work. Early projects started from a low baseline and focussed on more research than development. This reflected the level of maturity of the community in the early years. There was a clear deficit in skills and technology readiness as well as societal and business awareness to meet the challenges of ICT-enabled solutions to meet the needs and wishes of older people.

Over the years, the external conditions also contributed to a more positive environment. Technological progress enabled higher quality data generation and analytics, with higher speed at a lower costs. Engineering and social sciences are increasingly joined up, leading to more focus on inclusive design principles in curricula. Policy narrative also moved from 'societal obligations' to recognising the value of wellbeing of older people (i.e. extended independent living and healthy life years represent increased social cohesion between generations,

[25] Impact Assessment Information Gathering for the Ambient Assisted Living Joint Programme. Technopolis Group (2016) Available at: http://www.aal-europe.eu/impact-assessment-information-gathering-for-the-ambient-assisted-living-joint-programme-december-2016

reduced costs for the national health and care systems, and a positive contribution to labour markets). This has resonated with the AAL's objectives and the programme later focussed on specific challenges and integrated solutions.

The AAL Programme has created a proof of concept in Europe that ICT-enabled solutions can deliver real social and economic value. The programme has progressed technologies and solutions relevant for older adults to market entry by providing funding that bridge the gap between research and commercialisation. It Introduced multi-disciplinary and participatory approaches in the co-design, testing and implementation of innovative solutions. It also supported knowledge sharing, built confidence and trust, and created value networks across stakeholder groups and industry sectors. It also raised the profile for AAL solutions in the investor community via pitching events across Europe.

Nevertheless, there are remaining challenges that need to be tackled head on so that past and current investments are realised. It is clear that 'technology-push' will fail and mature technologies need to be packaged in services in the relevant social contexts. More objective data need to be collected about AAL solutions so that buyers (in the private and public sector) and investors appreciate the potential of the solution to be deployed at scale. While interoperability challenges are being tackled in Europe, scaling up AAL solutions will remain difficult due to cultural and regulatory diversity. All these issues can only be resolved if the current silos across academia, industry and end-users, as well as investors and payers are eliminated.

Potential avenues to address some of these challenges in a future funding programme:

1. Promote the creation of an EU-wide "learning health and care system" that ensures that data on older people and/or their carers directly inform future research and innovation efforts

- Broker connections between solutions developers and public buyers (local governments and insurers) as well as private investor community
- Help shape national agendas through NCPs on ageing well
- Participate in discussions about governance arrangement around consent, ethics, data privacy, protection and access.

2. Build on the existing AAL community and knowledge base and link those up with other EU networks to create a broader and deeper ecosystem for ageing well

- Create leverage effects by linking up with other aligned initiatives that have established networks at local, regional and EU levels, connection to users and the private sector. Such examples may include EIP on Active and Healthy Ageing, EIT Health, JPI MYBL and the European Connected Health Alliance.
- Break up silos across academia, industry, end-users, public authorities and private payers
- Galvanise existing communities for digitally-enabled ageing well solutions
- Build confidence and trust in the new value networks across stakeholder groups and industry sectors.

3. Create more flexible funding instruments

- It is acknowledged that 'small collaborative projects' are now available as seed funding to explore new ideas or collaborations. It would also be useful to offer a follow-on funding stream for completed projects that require resources for testing business models and market entry.
- Consider introducing a commissioned funding stream where priority topics become the subject of a challenge. The call topics would be defined by public buyers that have specific

(mid-term) needs. In turn, these public buyers would commit to co-fund the project and/or procure the solution once developed to required specification.

- Consider introducing funding for test-bed projects that aim to demonstrate the value of a solution to buyers and end-users via systematic testing, for example about cost-efficiency of a solution.
- Consider introducing funding for teams that aim to learn about solutions developed in another region, then adapt and adopt those for their own region. This requires exploring the key ingredients of good practices and transferability and scalability criteria.

4. Adapt criteria for future proposals

- Support proposals where technological expertise, social science/ethnography and behavioural economics are better integrated. This will ensure that human-centred technology is developed that would 'land' in a receptive environment and reach markets faster.
- Promote inclusive design principles in product development to broaden the market appeal for solutions developed. Narrow focus on older people and ageing was shown to be counter-productive as 'older people' themselves represent a heterogenous customer group and branding products to older people may appear stigmatising. Focus on abilities instead.

5. Continue to provide valuable support actions

- Continue with support actions that complement funded project activities to ensure that research and innovation budgets are utilised efficiently.
- Continue promoting pitching events where innovators and (public and private) investor can meet and network.

Appendix A KPIs of the AAL Impact Assessment

A.1 Improving the quality of life for older people and their networks

Table 2 Impact indicators – Better quality of life for older people and their networks

Impact category	Indicator	Total end-users (2019 & 2020 IA)
Feeling safe	Number of end-users using an AAL solution that is intended to promote a feeling of safety and self-confidence	31,650 (N=23)
Participation in social life	Number of end-users using an AAL solution that is intended to increase/maintain interaction with other people	28,940 (N=20)
Active life-style	Number of end-users using an AAL solution that is intended to improve/maintain an active lifestyle (physical or non-physical)	13,397 (N=12)
Supporting informal carers	Number of end-users using an AAL solution that provides informal carers support. This includes • Older adults • Informal carers • Formal carers	25,507 (N=13) • 15,720 • 5,210 • 4,577

Note that the total end-user numbers are not additive as a solution may be relevant to multiple impact categories. The number of solutions is indicated in parentheses.

A.2 Supporting increased efficiency and sustainability of care and support systems

Table 3 Impact indicators – Increased efficiency and sustainability of support and care systems

Impact category	Indicators	Total (2019 & 2020 IA)
Supports formal carers	Number of end-users using an AAL solution that offers them support. This includes: • Older people • Informal carers • Formal carers	25,937 (N=13) • 16,270 • 4,210 • 5,457
Early detection of risks	Number of end-users using an AAL solution that enables the early detection of risks	21,232 (N=6)

Note that the total end-user numbers are not additive as a solution may be relevant to multiple impact categories. The number of solutions is indicated in parentheses.

A.3 Strengthening the industrial base in Europe

Table 4 Impact indicators - strengthening the industrial base in Europe

	Impact category	Indicator	Total (2019 & 2020 IA)
	New markets / Uptake of AAL solutions	Number of solutions/components are launched on the market	31
		Number of paying customers in the previous year	17,476 [Data for 17 solutions]
	Commercial income	Value of revenue/turnover in the previous year by solutions developed through AAL funding	€5.3m [Data for 17 solutions]

Note that four respondents to the 2020 IA, who had already participated in the 2019 IA, provided updated market figures for 2020 in relation to five solutions.

Appendix B List of AAL projects that contributed to the impact assessment

Call	Responding projects	Projects that launched an AAL solution
2008	8	ROSETTA
2009	10	HOPES, Co-LIVING, ConnectedVitality, NoBits, SeniorChannel
2010	9	2PCS, CAREatHOME, MyLife, FEARLESS, MobileSage
2011	14	CONFIDENCE, E-MOSION, MOBILE.OLD, MyGuardian, SAFEMOVE
2012	15	CarerSupport, Care4Balance, DALIA
2013	11	PEARL, ExpAct, Fit4work
2014	8	
2015	2	
2016	2	
2017	1	
2018	4	HELP ME BRUSH, Toilet4me
Unknown (respondent did not wish to disclose project name)	1	
Total	**85**	**24**

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