



# **ACTIVEADVICE**

DECISION SUPPORT FOR INDEPENDENT LIVING

**Decision Support Solutions for Independent Living using an  
Intelligent AAL Product and Service Cloud**

## **D2.1**

# **Baseline report on AAL advice, decision and authorization**

**Acronym:** ActiveAdvice

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# 1 Introduction

The evidence gathered by the Centers for Disease Control and Prevention (2007) suggests that up to up to 89 percent of older adults would prefer to age independently and in the comfort of their private households. With regards to their health status, family situation, motivation, interests and capabilities though, these older adults constitute a highly heterogeneous group, which means that new approaches and concepts are required to meet the great variety of needs these people have. In addition, throughout Europe, in different places yet with corresponding characteristics and consequences, the number of caregivers - both on a professional as well as informal level - is declining.<sup>1</sup>

Due to the above, several pan European initiatives were launched to promote and foster innovations which would allow financially affordable, life enhancing solutions.<sup>2</sup> The intent is to create a critical mass of research, development and innovation at EU level in technologies and services for ageing well in the information society, including the establishment of a favourable environment for participation by small and medium-sized enterprises (SMEs).<sup>3</sup> In 2007, the European Union accepted the action plan “Ageing well in the Information Society”. This plan also was the stimulus for the creation of the Ambient Assisted Living Joint Programme. The Joint Programme combines social, technological and business aspects and aims to develop new models of service delivery and care.<sup>4</sup> Nevertheless, in recent years there has been no consensus on a precise definition of AAL. There is the agreed understanding, however, that AAL must integrate ICT. The latter lays the ground for the paradigm of ambient intelligence (AmI). It is that “ubiquitous computing” that is a central feature of AAL.<sup>5</sup>

With respect to the term AAL, numerous definitions are currently in use among experts (ICT or social scientist have different takes on it). Laying the basis for the ActiveAdvice project the following considerations help to clarify the key elements of active and assisted living technology, of AAL. AAL encompasses concepts, products and services. New technologies and social surrounding are combined, aiming to improve quality of life; AAL attempts at supporting individuals in their ageing process. The goal is to increase the individual’s autonomy and self-confidence and also tries to support the formal and informal carers. Furthermore, it guarantees personal safety while everyday activities are eased and resources saved.<sup>6</sup> The DKE<sup>7</sup> understands AAL as a “hybrid product referring to a basic technical infrastructure in the home and services provided by third parties with the aim of continuing to lead an independent life in one's own home”. Most important though, is that AAL tries to create “...personalized continuity of care and assistance, dynamically adapted to the individual needs and circumstances of the users throughout their lives”.<sup>8</sup>

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<sup>1</sup> <http://project.icarecoops.eu/>

<sup>2</sup> *ibid.*

<sup>3</sup> <http://www.aal-europe.eu/about/objectives/>

<sup>4</sup> <http://www.aal-europe.eu> & <http://project.icarecoops.eu/>

<sup>5</sup> Weiser (1999)

<sup>6</sup> see van der Broek et al. (2010); Sixsmith & Gutman (2013); Memon et al. (2014); <http://www.aal-europe.eu/about/objectives>

<sup>7</sup> DKE (2012)

<sup>8</sup> Tazari et al. (2008, p. 1171)

Building on the above statement, Gassner & Conrad<sup>9</sup> added that AAL brings about the emanation of contemporary ICT based products and services that assist older adults at home, or at work, and ultimately improves the quality of life, thus reducing the reliance on others for constant assistance. Others too argued that the main goal of AAL is to apply technology that helps people with special needs to prolong their living in their preferred environments. Finally, AAL is simply described as independent living in a supported environment.<sup>10</sup>

Three areas of interest can be summarized: emergency treatment (prediction, detection, prevention), autonomy enhancement service (e.g. cooking, cleaning, medication, travelling) and comfort services (e.g. orientation, infotainment) further to be divided into indoor and outdoor assistance.<sup>11</sup>

The ActiveAdvice project applies an AAL understanding that promotes products that are either/or & both/and context - and situation-aware, pro-active, and adaptive as well as self-organizing.<sup>12</sup> AAL products thereby are stand-alone solutions or are integrated in services for older adults and their caregivers. The ActiveAdvice project also applies a rather wide AAL understanding and includes “innovations ranging from low-tech devices, such as walking canes to alarm systems to high-tech-solutions, such as fall detection systems or systems that automatically detect falls or monitor the health of the user”.<sup>13</sup>

## 2 Methodology

### 2.1 Task Work Package 2 – Deliverable 2.1

Work package 2 is the layout for the project. The aim is to identify and analyse studies, analyses, concepts and best practices on AAL advice, decision support and authorization systems. Deliverable 2.1 is designed to generate a comprehensive overview of the European situation. This Baseline report on AAL advice, decision and authorization serves the consortium as the basis for the further actions.

### 2.2 Analysis of Studies Research & AAL Landscape

#### 2.2.1 Review of Studies and Service Platforms

A set of keywords and concepts were identified to be searched for in selected scientific databases; parallel AAL, health care, ageing, etc. Websites and platforms were identified. Based on relevant keywords, selected databases were consulted and checked for recent publications. The search was not limited to just the European context as that would have yielded just few relevant articles or studies. Furthermore, it was of interest to learn from best practice, even when they are not based in Europe. Articles, websites and so-called platforms from the English, German and French speaking contexts

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<sup>9</sup> Gassner & Conrad (2010)

<sup>10</sup> Camarinha-Matos et al. (2015) & Weegh & Kampfel (2015)

<sup>11</sup> Nehmer et.al (2006, p. 44)

<sup>12</sup> Sabou et al. (2009)

<sup>13</sup> Weegh & Kampel (2015, p. 858)

were taken into account. Table 1 shows the data bases which were selected, as well as the numbers of hits and the timeline.

Data-base	Keywords (AND, OR...)	Hits	Date
Emerald Insight	AAL Services	909	25.03.2016
Emerald Insight	Ambient assisted living Services	1096	25.03.2016
Emerald Insight	Stakeholder Ambient Assisted Living	207	25.03.2016
Emerald Insight	Ambient Assisted Living Advice	331	25.03.2016
Emerald Insight	Stakeholder Telehealth	60	25.03.2016
JSTOR	Ambient assisted living Services	26167	25.03.2016
JSTOR	Stakeholder Ambient Assisted Living	1791	25.03.2016
JSTOR	Ambient Assisted Living Advice	15864	25.03.2016
JSTOR	Stakeholder Telehealth	29	25.03.2016
eMedien-Portal ZHAW-Hochschulbibliothek	AAL Services	7	25.03.2016
eMedien-Portal ZHAW-Hochschulbibliothek	Ambient assisted living Services	1	25.03.2016
eMedien-Portal ZHAW-Hochschulbibliothek	Stakeholder Ambient Assisted Living	0	25.03.2016
eMedien-Portal ZHAW-Hochschulbibliothek	Ambient Assisted Living Advice	0	25.03.2016
eMedien-Portal ZHAW-Hochschulbibliothek	Stakeholder Telehealth	0	25.03.2016
Web of science	AAL Services	567	08.04.2016
Web of science	AAL Rating and Feedback Features	0	14.04.2016
Web of science	AAL Feedback Types	8	14.04.2016
Web of science	AAL Social Features	14	14.04.2016
Web of science	AAL Trust in Digital and Human Advisory	0	14.04.2016
Emerald Insight	AAL Rating and Feedback Features	41	14.04.2016
Emerald Insight	AAL Feedback Types	126	14.04.2016
Emerald Insight	AAL Social Features	265	14.04.2016
Emerald Insight	AAL Trust in Digital and Human Advisory	3	14.04.2016
Taylor & Francis online	AAL Services	674	19.04.2016
Taylor & Francis online	AAL Rating and Feedback Features	71	19.04.2016
Taylor & Francis online	AAL Feedback Types	151	19.04.2016
Taylor & Francis online	AAL Social Features	348	19.04.2016
Taylor & Francis online	AAL Trust in Digital and Human Advisory	9	19.04.2016
JSTOR	AAL Rating and Feedback Features	6	19.04.2016
JSTOR	AAL Feedback Types	75	19.04.2016
JSTOR	AAL Social Features	422	22.04.2016
JSTOR	AAL Trust in Digital and Human Advisory	668	22.04.2016
JSTOR	Care and assistance services platform for elderly rating and feedback features	210	22.04.2016
JSTOR	Care and assistance services online advice platform for elderly	688	22.04.2016
Taylor & Francis online	Care and assistance services platform for elderly rating and feedback features	359	22.04.2016
Science Direct	Technologies d'assistance aux personnes âgées	75	17.05.2016



Google Scholar	Technologies d'assistance aux personnes âgées	6610	17.05.2016
Google Scholar	Assistance pour les personnes âgées	16600	17.05.2016
Jstor	Assistance Technologies pour les personnes âgées	679	17.05.2016
Science Direct	Assistance Technologies pour les personnes âgées	1620	17.05.2016
Google Scholar	Technologies Assistants Vieillissements	5400	17.05.2016
Science Direct	Technologies Assistants Vieillissements	68	17.05.2016
Taylor & Francis Online	Ambient Assisted Living	16998	17.05.2016
Google Search	Technologies assistants pour les agees	415000	17.05.2016
Cairn	Ambient Assisted Living	4	23.05.2016
Cairn	Assistance pour les personnes âgées	21166	23.05.2016
Cairn	Technologies Assistants Vieillissements	306	23.05.2016

**Table 1: Search History for Scientific Studies and other Publications**

In a next step search results were generated, by narrowing the search criteria and only include publications no older than 2013 and/or the geographic area (Europe, USA, Canada, and Australia).

Data-base	Keywords	Hits	Date
Web of science	Healthcare Services (in Europe)	408	03.05.2016
Web of science	Rating and Feedback Features	23	03.05.2016
Web of science	Feedback Types in Healthcare	106	10.05.2016
Web of science	Social Features Healthcare platforms	18	10.05.2016
Web of science	User advice healthcare platform	6	10.05.2016
Web of science	Personal advice online platforms	6	10.05.2016
Web of science	Web-based advice platform	15	10.05.2016
Emerald Insight	Rating and Feedback Features	57	13.05.2016
Emerald Insight	Feedback Types in Healthcare	22	13.05.2016
Emerald Insight	Social Features Healthcare platforms	12	13.05.2016
Emerald Insight	User advice healthcare platform	3	13.05.2016
Emerald Insight	Personal advice online platforms	21	13.05.2016
Emerald Insight	Web-based advice platform	29	13.05.2016
JSTOR	Rating and Feedback Features	37	13.05.2016
JSTOR	Feedback Types in Healthcare	461	13.05.2016
JSTOR	Social Features Healthcare platforms	33	13.05.2016
JSTOR	User advice healthcare platform	49	13.05.2016
JSTOR	Personal advice online platforms	250	13.05.2016
JSTOR	Web-based advice platform	24	13.05.2016
Web of science	Online user feedback healthcare	23	13.05.2016
Web of science	Virtual healthcare assistance	28	13.05.2016

**Table 2: Search History for Scientific Studies and other Publications between 2013 and 2016**

Over 100 articles were identified, and over 40 included into the final analysis. In addition, further 35 articles were included when it came to identify the most recent general developments in the social network and platform development context.



For the service platform investigation, a search was carried out for websites/portals/platforms that promote AAL technologies as well as elderly health care and general health care. Hits for the service-platform search were uncountable; thousands of references popped-up e.g. when searched with the keyword combinations of ‘senior advice’ or ‘elderly care advice’ (Table 3). A simple google search task therefore was not constructive.

Data-base	Keywords	Hits	Date
Science Direct	Technologies d'assistance aux personnes âgées	75	17.05.2016
Google Scholar	Technologies d'assistance aux personnes âgées	6610	17.05.2016
Google Scholar	Assistance pour les personnes âgées	16600	17.05.2016
Jstor	Assistance Technologies pour les personnes âgées	679	17.05.2016
Science Direct	Assistance Technologies pour les personnes âgées	1620	17.05.2016
Google Scholar	Technologies Assistants Vieillissements	5400	17.05.2016
Science Direct	Technologies Assistants Vieillissements	68	17.05.2016
Taylor & Francis Online	Ambient Assisted Living	16998	17.05.2016
Google Search	Technologies assistants pour les agees	415000	17.05.2016
Cairn	Ambient Assisted Living	4	23.05.2016
Cairn	Assistance pour les personnes âgées	21166	23.05.2016
Cairn	Technologies Assistants Vieillissements	306	23.05.2016

**Table 3: Search History for Platforms and relevant Websites**

First, articles and studies which discuss or introduce platforms as well as websites for older adults or healthcare issues in general were sought. In addition to the reports published by the European Union itself and other scientific bodies, the search for platforms was expanded to French speaking parts of the world such as Quebec (Canada), and English-speaking countries such as the USA and Australia. Finally, for the ICT-topics most recent posts and expert platforms have been consulted.

### 2.2.2 Data Analysis

The articles were analysed based on the qualitative method of thematic coding.<sup>14</sup> The analysis is based on short case descriptions and thematic coding; it is applied for the purpose of comparison.

In a first phase, the selected 70 articles were thematically assessed along the topics of

- Studies on AAL user information
- Platforms (discussed & evaluated in research/studies)
- User feedback and social features
- Digital support algorithms
- Authorization process.

<sup>14</sup> Flick (2009, p. 318ff)

For each article, the following information is available: topic, keywords, country, article name, source, additional notes/description, priority. Table 4 gives an idea of what the information was in the area of topic, keyword, and additional notes/description (see Appendix 9.1).

In the second phase, 42 articles were analysed based on a thematic structure (categories and codes) and almost 600 codes were assigned:<sup>15</sup>

- Platform (sub themes: usability, accessibility; user; examples; social media; technical info; general)
- Use of ICT (sub themes: algorithm, concept trust, pro trust, trust measurement, trust general)
- Advice & Feedback (subtopics: advice & decisions, rating, training, communication & interaction, forum & community, general, feedback)
- Technology in use (sub themes: stakeholder assumptions, general, negative use stakeholders)
- Study information (subtopics: methods of inquiry, project aim)
- Care (subtopics: health ICT developments, care giving challenges & problems, integrated care, healthcare services)
- Stakeholder (sub themes: stakeholder interaction, stakeholder in study, care givers)
- Technical aspects (subtopics: ICT in use in health care, impact of & reasons for the use of ICT, AAL Platform, technological issues, AAL Smart Homes, AAL features)
- AAL general (subtopics: new developments, AAL background, AAL definition)
- General information
- Service Ecosystem
- Technology general
- Literature references of importance

A total of twelve (12) service platforms were found and analysed in parallel. These platforms were evaluated based on certain predetermined criteria such as country of origin, stakeholders, type of services provided, promotion of ICT products, as well as accessibility of the platform. Following this initial evaluation, the service platforms were assessed based on the following critical criteria necessary for the purpose of AAL platforms: Usability, Feedback/Interaction & Area of Improvement. Moreover, an investigation was conducted to find out whether advice and training was provided to customers and if so, how it was conducted (see Appendix 9.2). The expert posts have been thematically assessed and the most important insights summarized; these insights constitute the starting point for further discussions in the project consortium.

### 3 Studies on AAL User Information Needs

Bjørkquist et al.<sup>16</sup> assumed for their research that innovative developments need to be based on “true user needs” and users’ systematic involvement. They speak of the need to identify ‘lead users’, based on their experience the needs of the rest of the target group can be assumed. Most critically however,

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<sup>15</sup> Nadi and Cassell (2004, p. 256ff)

<sup>16</sup> (2014, p. 4)

they ask the question whether in the context of telecare and telehealth lead users can be identified at all. A question we need to consider for AAL solutions too.

Other studies identify primary, secondary and tertiary end-users.<sup>17</sup> Primary end-users are older adults using AAL solutions. Secondary end-users are people using AAL solutions for the benefit of a primary end-user. They take advantage of such solutions to make their caring easier. Tertiary end-users are not directly in contact with AAL solutions. These are private or public organisations e.g. a hospital or insurance company which however benefit from increased efficiency or patient satisfaction, such as shorter hospital stays. Four aspects relevant for AAL-product and service designing need to be considered:<sup>18</sup>

- a) clearly define the value and how precisely a person can benefit from an AAL solution;
- b) make sure AAL- products and –services come along with the necessary support; marketing AAL- technologies needs to address areas where consumers’ experience inabilities rather than offering them support in areas where they themselves still can manage on their own;
- c) attractive design and ease of use is a key for acceptance; for older adults it has to meet a set of individual requirements as well as approved usability and accessibility standards; and
- d) facilitate positive experiences.

In addition, also other users rather than the primary users are regularly affected by the installation of AAL-solutions. Their requirements need to be taken into consideration when designing, promoting, and installing AAL solutions. For the ActiveAdvice platform secondary users need to be considered too; they are very often directly involved in the care process or monitor it remotely. While we would expect spouses to be the ones carrying most of the caring, the OECD for 2011 identifies children as the main care givers.<sup>19</sup> As a consequence AAL-solutions need to also attract these stakeholders as they most likely very often decide whether or not and which device best fits the needs of a parent.<sup>20</sup> But informal care providers themselves also seek to find advice on support strategies, there is a need to share experiences and information with fellow sufferers and a need to know more about support services. However, there is no explicit mentioning of AAL or specific requirements for technical advice. When asked explicitly, primary end-users identify seven favourite AAL-applications:<sup>21</sup>

- Saving energy/cost
- Enhancing comfort
- Improving health status
- Preventing hazards
- Acting as an alarm
- Supporting everyday activities
- Automation for one’s home

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<sup>17</sup> Nedopil et al. (2013)

<sup>18</sup> *ibid.* (2013, p. 18)

<sup>19</sup> OECD 2011 in Nedopil et al. (2013, p. 28)

<sup>20</sup> *ibid.* (2013, p. 30)

<sup>21</sup> *ibid.* (2013, p. 35)

In another study the most important services identified were: safety, particularly personal alarms, and the importance of social relations as a platform for coping with problems and well-being.<sup>22</sup> The older participants expressed their interest and need for a better access to information as well as training. However, they also expressed reservations about some new technologies.

Also professional care givers are important stakeholders in the AAL-context. However, too often they are considered only as experts for older adults' lives rather than for their working environments and situations.<sup>23</sup> In their professional reality they face many different and changing challenges as well as new job requirements. This is an important observation, as there are only limited opportunities for these stakeholders to inform themselves about AAL, train themselves on its technologies as well as empower them to introduce AAL-solutions into formal and informal care settings. It is also remarkable that the factors influencing professional care for older adults are unrelated to technological developments.<sup>24</sup> The secondary users, however, favour the monitoring and supporting options of AAL-solutions. Yet they also have requirements to technology; if used it should above all save time. Finally, there is another group which is in need of more AAL related information and which needs to become more actively involved into the development and distribution of these technologies. These are e.g. medical doctors, real estate developers, housing cooperatives, insurance companies, social services providers, and municipalities or governmental institutions. For them system designs and the need for parallel organizational innovations is of importance. The wish for more information on technologies is expressed by all stakeholders though; they frequently ask for funding information and expertise in that field – both accessible to end users and care providers. In this Norwegian example it was the request to establish not only a show home but also a central agency which is providing such information.<sup>25</sup>

## 4 Existing Platforms & Portals for Information and Solutions

In the following, the selected platforms are introduced. They have been evaluated based on usability, feedback/interaction and potential area of improvements evaluated. Finally, some general observations based on selected articles from the literature review are summarized.

### 4.1 Platforms under Review

#### 4.1.1 Aging Care (USA)

This platform seeks to promote ICT products on the website where ICT/Technical support products are directly promoted as "Senior Care Products". They are categorized into different headings and only address patients (elderly) as stakeholders. These categories are: (The Bathroom & Bathing, Bedroom & Sleeping, Medical Alert Systems, Mobility, Organization Tools, Personal Care & Dressing, Security, Safety & Falls, Vision & Hearing.

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<sup>22</sup> Bjørkquist et al. (2014, p. 9f)

<sup>23</sup> ibid. (2014, p. 10).

<sup>24</sup> Nedopil et al. (2013, Figure 12)

<sup>25</sup> Bjørkquist et al. (2014, p. 10ff).

**Summary:** This platform is very easy to use, does not offer instant feedback, but it does offer a forum where users can openly discuss AAL issues.

#### **4.1.2 National Association for Home Care & Hospice (USA)**

This platform promotes home care and hospice products and services. These are grouped into: Communications Technology, Computer Software, Computer Hardware, Data/Performance Measurement, Education and Training, Home Care Business Services, Insurance Services, Legal Services, Media, Medical Supplies, Office/Business Products, Telehealth/Technology.

**Summary:** This platform is not easy to use, it gives no form of feedback, and it could benefit from the inclusion of a user forum.

#### **4.1.3 Make it ReAAL (Europe-Denmark, Germany, Italy, Netherlands, Norway, Spain)**

This platform is still under construction and therefore does not offer any product promotion. However, it offers a list of some products and services, as well as vendor information.

**Summary:** It is very easy to use, it offers no feedback, and it looks like being a very useful platform when it is completed.

#### **4.1.4 Unforgettable (UK)**

The above platform offers assistive products and services. However, the range of products is limited to people living with dementia.

**Summary:** It is very easy to use, it does not offer instant feedback, and it could benefit from the inclusion of other AAL technologies.

#### **4.1.5 AALIANCE 2 (Europe)**

This site does not offer products, services or advice. It simply displays the latest scientific findings with regards to AAL.

**Summary:** This platform is not at all easy to use, does not offer feedback, and the website could be made a bit more user-friendly.

#### **4.1.6 Silver Eco (France, Belgium)**

This platform conducts promotion of AAL technologies directly on the site. It also links manufacturers directly with potential users. There is no user forum.

**Summary:** The platform is very easy to use, there is guaranteed feedback.

#### **4.1.7 Pour les personnes âgées (France)**

This platform does not promote products and services but rather focuses on giving advice and help to the aged and their family relations/caregivers. There is no user forum.

**Summary:** It is very easy to use, there is guaranteed feedback.

#### **4.1.8 Services Québec (Canada)**

This platform does not promote products and services but rather offers advice to older adults/caregivers using some predefined criteria of the most relevant information. There is no user forum.

**Summary:** It is not easy to use, does not give feedback.

#### **4.1.9 Independent Living (UK)**

It offers information and advice on products and services.

**Summary:** It is very easy to use, it offers delayed feedback, and finally it could benefit from the inclusion of a user forum where users and potential users could interact about the usage of the products and services.

#### **4.1.10 Parent giving (USA)**

Technologies are not promoted on the website. However, there are articles related to technology. There is no user forum.

**Summary:** It is quite easy to use, does not offer any form of feedback.

Two platforms have potentials becoming reference sites for the ActiveAdvice platform:

#### **4.1.11 Independent Living Centre (Australia)**

This site offers products and services concerning older adults, living and health. It offers direct advice to users and potential users. It also directly links users to manufacturers and provides articles and publications related to assisted living. There is no user forum.

**Summary:** This site is a model site for the purpose of this project since it provides a strong basis for decision support. It is very easy to use; it offers guaranteed feedback.

#### **4.1.12 Ooreka (France)**

On this site, technologies are generally promoted. Specifically, technologies for older people are addressed under "Family". Here, the stakeholders can select from a wide range of different gadgets available for old people. Secondly, a price range is also included for budgetary purposes. There is no user forum.

**Summary:** This site is very easy to use. It offers direct feedback.

Table 4 presents the most important characteristics of the selected platforms. Feedback/Advice or interaction in the manner of e.g. a forum is the exception. In addition, most do not meet the user needs in terms of usability or have a clear understanding of their stakeholders.

Platforms	Usability	Feedback/Interaction	Area of Improvement
Aging Care	Very easy	No instant Feedback / delayed Feedback	Inclusion of AAL Technologies
National Association for Home Care & Hospice	Not easy	No feedback	Inclusion of Forum
Make it ReAAL	Very easy	No Feedback	Completion of Website
Unforgettable	Very easy	No instant Feedback / delayed Feedback	Include AAL Technologies
AALIANCE 2	Not easy	No Feedback	Webside should be made easier to use
Silver Eco	Very easy	Feedback guaranteed	Include User Forum
Pour les Personnes Âgées	Easy	Feedback guaranteed	Include User Forum
Services Quebec	Not easy	No Feedback	Include User Forum
Independent Living	Very easy	Delayed Feedback	Include User Forum
Parentgiving	Easy	No Feedback	Include User Forum
Independent Living	Very Easy	Feedback guaranteed	Include User Forum
Ooreka	Easy	Direct Feedback	Include User Forum

**Table 4: Service Platform Analysis - Summary**

## 4.2 Studies on Platforms - Review and Summary

Out of almost 100 articles, less than one third dealt explicitly with the development and establishment of platforms and online information portals. And if the development of platforms was discussed at all, it was with respect to the individual living environment, where various different AAL devices have to be integrated, adapted to each other and some are meant to facilitate the interaction of various stakeholders in the care setting. Yet, none explicitly discussed a meta-AAL platform integrating services and products, expertise and different stakeholder perceptions nor is there anything like an EU-wide AAL marketing platform.

In the following, however, some of the key insights are presented and the authors also want to draw on the experience and knowhow in the fields of telehealth and e-health. Here service platforms with the attempt to integrate different stakeholders, promote self-management and guarantee online-support are more common. These case summaries provide some general insights:

- First, to learn about data safety, usability, and stakeholder involvement, peer support, network building and platform architecture, one is best advised to learn from the present e-health platforms.
- Second, guaranteeing interactivity is still a challenge.
- Third, stakeholder involvement asks for clear role understandings, responsibilities and communication logics.
- Fourth, personalized feedback and advice is not yet common; there are only few examples to learn from.



- Fifth, more people prefer to actively contribute rather than to only consume in the online environment.
- Sixth, trust (i.e. confidentiality and credibility) still is one of the biggest concerns.
- Seventh, hesitant but existing AAL-ecosystem development can be identified, yet, we still speak of prototypes rather than success stories.

E-health platforms aim to be interactive and in general offer education tools, peer support tools, online healthcare consultation as well as collaboration tools for different stakeholders and they also post most current information on health issues and treatment. They intend to link and empower stakeholders as well as expedite the exchange of information.<sup>26</sup> Already in 2008<sup>27</sup> an article describing a web-based platform that integrated databases, decision-making tools and geographic information systems was published. The system components then were an Http Daemon, database, decision support models, and a GIS. The authors consider the system

“a robust web-based portal/platform for environmental health tracking in Virginia. The system provides a variety of functions including: web-based data entry, secure and automated exchange of data between agencies, data visualization, automated data analysis and decision support, environmental health information dissemination and environmental health information infrastructure development”.<sup>28</sup>

Thereby Http requests are handled through an Http Daemon. The Daemon was described as “a program that runs continuously and exists for the purpose of handling periodic service requests that a computer system expects to receive”.<sup>29</sup> In that particular pilot, the purpose was to assess environmental health effects to help to formulate healthcare strategies. Therefore, mathematical models have been incorporated to the program.

The literature analysis has confirmed that the development of a platform that supports both sharing of information, knowhow and products as well as building up networks between different stakeholders is considered to be a challenging task. Furthermore<sup>30</sup>:

“Patients have special demands with regard to the dimensions of product, people, processes, and placement resulting from the special characteristics of good health. The health services as a product are generally provided from person-to-person and supported by product applications. These components are combined to form hybrid services. This means that these health care services consist of an intangible service with software and hardware components, which are provided with a focus on the users.”

As platforms annul the typical person-to-person interaction in health care, the user’s acceptance of it has to be a priority concern of developers and promoters. What is from a technological point of view possible and from the developer side assumed, must not meet the users’ needs. In that respect, “(F)or a service to be successful it must be provided under consideration of these criteria: the right good

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<sup>26</sup> Fowler et al. (2014)

<sup>27</sup> Li et al. (2008)

<sup>28</sup> ibid. (2008, p. 534)

<sup>29</sup> ibid. (2008, p. 535)

<sup>30</sup> Kriegel et al. (2013, p. 78)

(product or service), in the right quantity and quality, at the right time, and the right place for the right customer at the right price”.<sup>31</sup> A platform furthermore is not a stand-alone solution; it has to be part of a service logic. Moreover, data security, ethical and cultural issues as well as market development and legal regulations are of importance.

Often providers that offer smart services only focus on the technological features. Wunderlich et al. (2012)<sup>32</sup> argue that the user’s attitudes and beliefs when engaging with interactive services is vital. They present, in the context of smart interactive services, a framework that depicts four interaction beliefs that influence the user’s response during the service interaction. These are control beliefs (such as control over service counterpart (SC), transparency and control mechanisms), trustworthiness beliefs (SC reliability, SC goodwill and SC expertise), collaboration beliefs (role clarity, guidance from SC, self-efficacy and willingness) and social presence beliefs (social contact, personal communication)<sup>33</sup>. This model offers important aspects regarding the design of an interactive platform. Among other things the authors mention the applicability of their model in the area of health care services. Sheng and Zolfagharian (2014)<sup>34</sup> discuss how consumers participate with online product recommendation services. So called recommendation agents (RAs), that use collaborative filtering, content filtering and hybrid method algorithms, support consumers when searching and evaluating online based products on preferences and attributes. The results delineate two decisive points; on the one hand RAs have a negative effect on the perceived ease of use, however on the other hand they positively affect the consumers’ enjoyment. Increasing financial risks involved with purchasing decisions increases the negative effects of ease of use. Concluding from this ascertainment, when designing RAs, the ease of use (not too many questions) should be first addressed and then the focus should be laid on improving the usefulness and enjoyment when using RAs.<sup>35</sup>

Developments in the e-health context are of interest as there is the twin challenge of dealing with a huge amount of data while still aiming to provide personalized and individual support. This is e.g. most relevant for communities of chronic diseases. That is the case because, first, people with a chronic disease can profit from the experiences of others, and, second, they are better informed and better individual treatment can be provided. Nevertheless, they need to have their very individual situation to be taken in to consideration. Furthermore, early and timely intervention as well as self-management is of importance and is best brought to the people through online tools. The ‘Virtual Assistant System for Personal Health Management’ is a most recent project introduced.<sup>36</sup> The VASPHM serves as a framework which analyses self-management reports. Originally developed as a tool for self-management only, it today offers a browser-based and an interactive mobile application. It “provides more interactive interfaces for users to easily feedback their vital signs to the system. (...), users can quickly get the responses from the system as well. Most of the responses are suggestions for health management”.<sup>37</sup> Personal health management data are examined, the health risk is evaluated and personalized health services are provided. It clearly empowers the users and in automatically supervising and reminding them, has the potential for timely intervention. However, it used to lack the

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<sup>31</sup> *ibid.* (p. 78)

<sup>32</sup> Wunderlich et al. (2012)

<sup>33</sup> *ibid.* (2012, p. 11)

<sup>34</sup> Sheng & Zolfagharian (2014)

<sup>35</sup> *ibid.* (2014, p. 467)

<sup>36</sup> Tseng et al. (2015)

<sup>37</sup> *ibid.* (2015, p. 525)

personalized feedback and did not support the interaction of users. Only in a next step could prove that based on the VSAP framework individual, personalized feedback can be provided and interaction supported. They included among other things a personal health management module (PHMM), a real-time interaction module, a reminding app for mobile phones. PHMM and real-time interaction should guarantee in-time, interactive, integrated dealing with user's data and supervising them.<sup>38</sup>

The more interactive platforms are, the more users become providers of content "in the form of evaluations, recommendations, opinions, instructions, facts and experiences".<sup>39</sup> In a study on online contribution 142 articles were analysed; the role of users as providers were discussed in 110 of them. Obviously there is an interest to contribute rather than just to consume information from others. Fifty percent of all articles dealt with the various different motivations to contribute and discuss in which form people do so and the analysis of these articles also showed that contributions could be - in positive as well as negative manners - blogging, reviewing or message propagations. User-generated content also presents itself in the form of decision-making and product evaluation contributions. Finally, the others identified trust as still one of the most critical user/consumer issues.<sup>40</sup>

Also in the AAL context, attempts to develop platforms to better support older adults and their relatives as well as to better integrate them can be observed. However, even after a decade of projects in this field, we still lack this kind of platform. One reason might be that a health care ecosystem is a rather complex construct that involves many different stakeholders, with many different interests, needs and capabilities.

Furthermore, it is believed that people still find it difficult thinking of their supporting network being virtual rather than face to face. As a consequence, we also need to consider the use and active provision of content as discussed earlier is still a challenge for many people. In the AAL4ALL project "it is important to consolidate concepts in order to mobilize and align all the needed stakeholders. As such, one of the initial results of the project was the establishment of a conceptual architecture for AAL (...)".<sup>41</sup> Therefore the project was about the overall architecture of a service ecosystem for older adults. A 3-layer model was developed, with a so called logical hierarchical structure between the layers: from the lowest layer, the support-infrastructure layer, through the care and assistance service layer, to the AAL ecosystem layer (see Figure 1). This conceptual architecture helps to facilitate the evolution of the technology architecture of a highly integrated platform which meets very individual needs and allows personalized services. However, there is the critique that "only few of those have produced sustainable systems. Most frameworks focus only on a few aspects, ignoring the requirements of an entire AAL system as seen from different stakeholder and design perspectives".<sup>42</sup>

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<sup>38</sup> *ibid.* (p. 527ff)

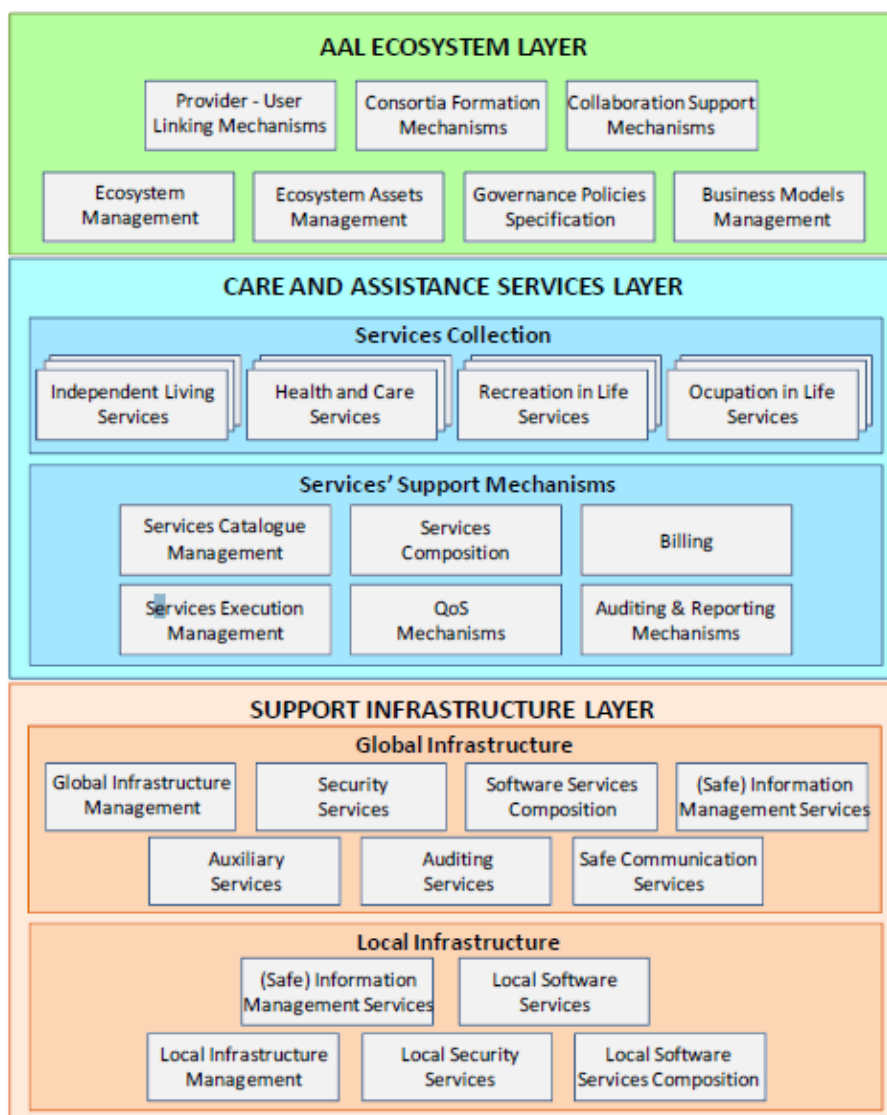
<sup>39</sup> Cummins et al. (2013, p. 177)

<sup>40</sup> *ibid.*

<sup>41</sup> Camarinha-Matos et al. (2012, p. 118)

<sup>42</sup> Memon et al. (2014, p. 4331)

Figure 1: AAL4ALL architecture



Source: (Camarinha-Matos et al., 2012, 121, Figure 2)

In the VDE report by Gassner & Conrad (2010) several projects with attempts to develop service platforms for older adults and their relatives were introduced. Hearcom<sup>43</sup> e.g. was a FP6 project funded between 2004 and 2009. In addition to other features, the intention was to provide information about equipment already on the market, and family members were meant to be able to find general information. The idea was that all services would be accessible through an e-platform. This platform was to be offered to the general public as well as experts. The 'hear companion' was meant to be a step-by-step support for people to access their own hearing and find their hearing aids.<sup>44</sup> The project site is still online; the step-by-step support presents itself as a set of pages which are accessible through

<sup>43</sup> <http://hearcom.eu/main.html>

<sup>44</sup> Gassner & Conrad (2010, p. 47)

predefined questions and answer sessions only. There is no personalized advice, no feedback or other marketing relevant information. The support is based on predefined scenarios.

In their comprehensive literature analysis on “Ambient Assisted Living Healthcare Frameworks, Platforms, Standards, and Quality Attributes” Memon et al.<sup>45</sup> also summarized some interesting insights for the AAL market and its developments. The overall healthcare IT industry, and with it the AAL community, has so far failed to facilitate the development of interoperable and affordable systems. Heterogeneous and open infrastructure platforms do not exist. The people affected, caregivers and governmental institutions are – so to say - still waiting to be guided through the variety of options and possibilities. There is definitely a need “for more open standards and open source solutions. Eventually, this could lead to more AAL services and devices being deployed at the existing end-user population, and more evaluation data reaching the AAL community, and thus provide the synergetic effects that are needed for the AAL vision to prevail”.<sup>46</sup>

Another observation relates to open source solutions. This is an issue in need for critical assessment. Users today know – although most might not be aware of that - that a) social networks share intellectual property and data on their systems, b) data about oneself or from a person is stored in many different places; if users want to share information they should know where to store and how to access; c) cloud services help to consolidate data from different sources; they are identified because of complex search algorithms, d) there are websites which support the users to not only find data on different sources put also from different devices, and e) virtual assistants promise a lot but do not support users sufficiently.<sup>47</sup> In summary, users are confronted with high complexity, which they hardly know how to manage; they need to develop trust and believe in reliable and trustworthy systems. As most of our online-activities take place through mobile devices, is there a need for a critical reflection on these issues. Lam et al.<sup>48</sup> focused on mobile devices and prototyped an open social platform. The key components were a ‘thingEngine’ and a ‘thingPedia’. The former supports users to access data across different devices and web services; the latter hosts all public interfaces to web-sites, device, and IoT apps. The prototype users saved their data on Omlet (an open chat app). Most importantly, compared to other social networks, Omlet does not own the users’ data. And communication data are only stored for two weeks; if users want them to be stored longer time they shift to other cloud systems e.g. Google Drive, Dropbox. Omlet also handles the authentication, the management, the notification and delivery of messages. Of interest is also the ThingTalk. It offers users an ‘if/when’ functionality. A trigger on one side, results in an action on the other side, e.g. if the weather app reports rain, an email or a short message reminds the user to take precautions.

What is going on in the ICT and AI world is impressive; however, there are authors who still request a better involvement of older adults in Web 2.0 social networks. Social network platforms are required to be more user-friendly. Interfaces still do not meet the needs of older people and in the worst case exclude them from communication and interaction. The Senior Social Network e.g. declared the following criteria as guiding principles: simple interface, extended interface, easy to feed and find, user based, user-generated content creation and exchange, interactive and entertaining, emotion over

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<sup>45</sup> Memon et al. (2014)

<sup>46</sup> *ibid.* (2014, p. 4331)

<sup>47</sup> Lam et al. (2016)

<sup>48</sup> *ibid.* (2016)

content, relationships, community-driven, person event promoter. Some of these features they included in their prototype and defined as must criteria are: on a IP multimedia subsystem (IMS) application server, web applications and databases should be hosted; they integrated a speech recognition server, used YouTube Data API to allow users to see videos and - through YouTube Upload Widget - to send or share videos. Users of the platform have to register.<sup>49</sup>

Finally, two platform projects are worthwhile to be looked at more closely: the AAL “We.Can platform” and - from the US - the “Virtual Healthcare Neighborhood”. In the Portuguese project “TICE.Healthy” research and industrial partners recognized the need for a platform “supporting applications in the health and quality of life”.<sup>50</sup> The “We.can platform” is based on the principles of service oriented architecture (SOA). “This platform intends to complement the existing clinical communication networks. Its main requirement is the support of informal and formal care providers, outside the hospitals’ wards, that, nowadays, do not have access to services providing structured information related with their clients.”<sup>51</sup> The main aim was to keep the stakeholders informed. However they also had to assure the following: “audit services responsible for verifying all interactions conducted among services and end users”; “authentication services to provide access to the information only to authorized services or end users”; “encryption services to enable secure communications of sensitive information” as well as “users identification services, enabling a unique identifier information distributed across multiple entities and systems”.<sup>52</sup> With respect to the “We.Can platform” architecture several problems had to be solved. First of all, the end-user group was expected to be rather heterogeneous. That has an influence on the usability, on access permissions and on the type of information provided. It is an interesting example for further investigations.

The “Virtual Healthcare Neighborhood” is a project initiated in the USA.<sup>53</sup> It is an interactive, low-investment website developed for the primary user group ‘informal care givers’ and in the pilot for a very regional audience. Through the platform the following services are offered:<sup>54</sup>

- data safety, which is secured by a firewall and a password-protected website; users sign in on a homepage
- healthcare support by peers (through blogs) and interprofessional actors (in person)
- includes educational modules for informal care providers
- informs about community resources
- allows users to upload pictures and share personal information.

The most crucial elements from a platform development perspective are educational modules, social support through blogs, and the community resources. Although a low budget project, that focuses the needs of a distinct care giving group and with a limited geographic stretch can it be of interest for the ActiveAdvice to learn more about the technological features.

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<sup>49</sup> Marcellino et al. (2015)

<sup>50</sup> Cardoso et al. (2014, p. 417)

<sup>51</sup> *ibid.* (2014)

<sup>52</sup> *ibid.* (2014, p. 418)

<sup>53</sup> Fowler et al. (2014)

<sup>54</sup> *ibid.* (2014, p. 830)

## 5 Social Networks and Platforms: Current Developments and Relevance for ActiveAdvice

Hereafter a summary review of potential technical and social features as well as of recent relevant network and platform developments is presented.

Let us set the scene:

“People – whether consumers or service suppliers – are complex agents, with highly diverse cognitive frameworks, values and attitudes, physical and emotional needs, and so on. Service systems are thus complex to model and manage – but they may also be resilient and innovative. People can be empowered to act in non-mechanical ways, responding to unexpected circumstances and collaborating to solve problems. They can be linked together in new ways through new information technology.”<sup>55</sup>

As discussed above, in the AAL-context many different stakeholders - even when bundled in user groups of customer (end-users), business, or government – could be considered so called lead users. Some AAL-solutions are used by all of them, others only by one user group. The complex user interface and the fast changing ICT reality constitute many challenges for the development and implementation of AAL-solutions in the market. Promoting these solutions, e.g. via a platform, means both, to take the different user group interests into consideration and to hold up with the technical changes to guarantee a sustainable offering. Again a look at the developments in the e-Health sector helps to better understand these dimensions. PHS (Personal Health System) Technology development and promotion faces two important challenges which are also of interest for AAL platform designers:<sup>56</sup>

1. Clients of the PHS are on the one hand users and on the other patients. They assume that the focus on users is ICT oriented - whereas the focus on patients is rather health oriented. This differentiation has a tremendous financial impact. Users will have to pay for themselves, whereas patients acquire the services on a predominantly reimbursed basis paid by either insurances or the state.
2. The multi-stakeholder approach takes time. If the focus of the products and services promoted through the PHS are senior people, it is not guaranteed that they can be directly accessed, as formal and informal care providers would often make decisions according to the needs of the older people.

### 5.1 Social Features

Facebook (social network site), Twitter (social media), YouTube (content community) are well known means to communicate with others, inform yourself and others, keep updated and evaluate respectively comment on events, people, products and services. In using that tools so called

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<sup>55</sup> Schartinger et al. (2015, p. 47)

<sup>56</sup> ibid. (2015, p. 51ff)



prosumers, well-informed, freely sharing their product experience, evaluating those of others and actively communicating with companies, have become known as a challenge to product and service providers. In that respect we need to clarify in the following some terms and concepts:<sup>57</sup> Social media are internet-based and build on Web 2.0. there are different categories such as blogs, content communities, social networking sites, collaborative projects, virtual game worlds and virtual social worlds.<sup>58</sup>

Let's have a closer look at applications called **collaborative projects**, "social media applications that enable the joint and simultaneous creation of knowledge-related content by many end-users - ...."<sup>59</sup> They are characterized by the main feature of user-generated content. Forums and message boards allow people to post messages, which usually cannot be edited by others. Review sites facilitate the exchange of feedback and rate products and services.<sup>60</sup> Some authors even recommend companies to present themselves on **Wikipedia** – for the European market however strict rules with respect to advertisement and presentation have to be regarded: "Wikipedia will often be the first site people check for information regarding a company; for small- and medium-sized firms, being on Wikipedia is seen as a sign of legitimacy."<sup>61</sup> Besides, Wikis are also recommended for an in-company context or between businesses. In a Spanish survey on the use of social media applications the Q&A option was considered most important for companies. Others stressed beside social networking sites, customer reviews and blogs, community forums, product suggestion boxes, product reviews and ratings. In this study social web tools have been used by larger companies to brand their products while smaller and middle sized companies provide customer service through them.<sup>62</sup>

**Blogs** on the other hand are authored by a person (or a group of people) and are later commented by others. Companies have started to closely look at this area as it is the sphere where they best learn in-time about customers' feedbacks, ideas, complaints etc. Companies are aware of the potentials: the opportunity to build up relationships with their customers and by that potentially foster a positive brand and firm image.<sup>63</sup> The use of social media definitely allows companies to closer interact with their customers. Besides observing customers from a virtual distance, which helps companies to better understand the needs and interests of them, the immediate responding to them and the facilitation of user-to-user-engagement needs to be considered as further most important features. When customers interact and discuss their positive and negative experiences companies of course run the risk that too many negative feedbacks start to affect the promotion of a product. However, they also have the chance to learn first-hand about how their product or service is perceived and accepted in the market.<sup>64</sup> Blogs "have become an important information communication medium"<sup>65</sup>. Blogs have turned out to become advertisement tools both when produced by customers (consumer blog) as well as by companies or experts in a field (expert blog). The latter are understood of being more reliable sources of information. Several studies have also confirmed that recommender systems – as used by

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<sup>57</sup> Okazak, Diaz-Martín, Rozano & Menéndez-Benito (2015, p. 419)

<sup>58</sup> Smailhodzic, Hooijsma, Boonstra & Langley (2016, p. 2)

<sup>59</sup> Kaplan & Haelein (2014, p. 617)

<sup>60</sup> ibid. (2014, p. 619)

<sup>61</sup> ibid. (2014, p. 621)

<sup>62</sup> Lorenzo-Romero, Constantinides & Alarco' n-del-Amo (2014, pp. 213-214)

<sup>63</sup> Mirchandani 2012 in Youngtae & Thoeni (2016, p. 23)

<sup>64</sup> Youngtae & Thoeni (2016, pp.29-32)

<sup>65</sup> Ho, Chiu, Chen & Papazafeiropoulou (2015, p. 346)

online stores – highly impact on purchasing activities of customers. Some would even stress that their impact is even higher than the one of customer or expert blogs.<sup>66</sup> Other authors summarize that in particular customer evaluation depends on different experience and search attributes of a product. And brand awareness influences customers in their decision making the first place. For experience products (in the field of health and fitness e.g.) expert opinions are considered most important. For products where information and attributes (e.g. price, lifetime) are easily to verify along the line of different blogs, various platforms etc. customer blogs are used more frequently for verification. There are different management implications of how and by whom to promote a product then:

“Select a blog type appropriate for the product. To promote experience products on blogs, enterprises could first consider expert blogs because typical consumer blogs are less persuasive to consumers. For search products such as cell phones, cameras, computers, and furniture, expert endorsements on blogs are more effective than celebrity endorsements are. Therefore, enterprises should search for experts on the internet, provide trial programs, and give rewards to attract well-known experts to write about their products and enhance the advertising effectiveness of the blog.”<sup>67</sup>

The more discussion and presence in the social media the higher the chance to be in-time informed about competitors. Yet, this is also the reason why many companies still hesitate to share and present themselves in social communities.<sup>68</sup>

Twitter is considered a **microblog**; tweets are reduced to 140 characters and recipients are not specified. Nevertheless, their effects are not to underestimate when it comes to learn about products and solutions.<sup>69</sup> **Forums** are another format for patients and customers to express their ideas, give feedback or find others with the same concerns. They usually contribute to several forums. There exist two underlying forum solutions: PhpBB (open source software) and vBulletin (licensed). They support a fixed order of forums and the user has to look for those of interest for him- or herself. There are no ranking functions however.<sup>70</sup> Of interest furthermore are platforms where people not only contribute but also upload other information, photos, videos. Wyrwoll summarizes them as **media sharing platforms**; Youtube is considered the most successful platform. Flickr on the other hand is promoted for pictures.<sup>71</sup> In **social networks**, such as Facebook, users are connected with each other; they are friends and willing participating or as in Google+ people are purposely integrated into a network – while they themselves do not have to confirm the connection: “For each publication users can specify to which circle they like to publish it.”<sup>72</sup>

In 2015 Evan LePage blogged (<https://blog.hootsuite.com/new-social-media-features-2015/>) about most recent social networks’ updates and changes. In the following table some social features developments which might be adapted to the ActiveAdvice platform are summarized (see Table 5):

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<sup>66</sup> ibid. (2015, p. 349)

<sup>67</sup> ibid. (2015, p. 359)

<sup>68</sup> Youngtae & Thoeni (2016, pp.29-32)

<sup>69</sup> Wyrwoll (2014, pp. 63-67)

<sup>70</sup> ibid. (2014, pp. 53-58)

<sup>71</sup> ibid. (2014, p. 63)

<sup>72</sup> ibid. (2014, p. 70)

New Features	Functionality / Changes
Pinterest – Pinning full articles	<p>“Whether you’re reading an article on your desktop or on your phone, you can click the Pinterest button and save the link to a board and check back whenever you feel like it.”</p> <p>It is not only for articles but also for links.</p>
Pinterest – Local search	Location and language qualifiers are included in the search function. You receive pin information about people who live where you live and talk the language you talk.
Facebook – Saved replies	Facebook more and more becomes a network for businesses, however did not address safety issues properly. “Saved replies are essentially canned responses to common customer service questions or issues on your Facebook page.” And further: “Should the need arise, these messages can also be edited for the particular situation a customer is in. Quick and clean: a perfect social media customer service experience.”
Facebook – Live-streaming video	“Live video can be a tool for garnering immediate feedback, getting a real-time look at events, or hosting off the cuff Q&A sessions. Facebook Live’s early testers’ found that live streams worked best for behind-the-scenes look at work culture or a preview of a new product or service.”
Twitter – Event targeting	<p>“Twitter is used as a second screen during millions of events, from the music festival in the park to the big tech conference downtown. Twitter’s new event targeting functionality allows brands to reach the users who are interested in and engaging around these events.”</p> <p>“Once you’ve identified the event (Twitter has a helpful calendar full of them), you can go into the Twitter ads platform, see what kind of attention these events earned last year (including the top performing Tweets, for inspiration), and activate your own ad campaign in just a few clicks.”</p>
Twitter - Polls	<p>Currently not used – and often criticized – does it have potentials. “That very fact, that not many businesses are using Polls, shouldn’t discourage you from using it. It should do the opposite, since your brand will stand out from the pack.”</p> <p>“This new feature is a valuable way to get inside of your audience’s heads, while creating a more engaging, participatory experience around your business on Twitter. Polls can be used as basic content research, allow you to engage followers around culture, plan events, contests and sales, and much more.”</p>

**Table 5: Changes in Social Media Features**

Finally, besides social media application and functionality also soft features need to be taken into consideration. When discussing online promotion and purchasing the obvious shift from the purely product promotion towards a customer experience (CE) needs to be closely looked at: “Therefore companies, rather than simply developing and offering products and/or services, aim to design and

communicate value propositions in order to create memorable favourable CEs.”<sup>73</sup> In other words, it is the comfort customers feel when doing online shopping which ActiveAdvice needs to take into consideration. In his study Klaus (2013) identified crucial functional attributes which determine online customer experience. Besides others, communication is a crucial one. Customer expect interactivity and responsiveness from the seller, that helps them to build up a relationship. And social presence is another attribute. His study and other results stress the need for platforms where customers find reviews and advice from other customers. Online shopping, evaluating and advice takes place in a fully virtual environment. Therefore, various interactive ways to present or in the words of Klaus “showcase” products and services should be taken into consideration.<sup>74</sup> And finally we also know that in social media play a more and more growing role in healthcare. The motivation of patients to use social media is considered to be three-folded. First, patients seek to find social support, second, they aim to emotional express themselves and third, they compare their situation with the one of others to evaluate their state of health. The increasing use of social media seems to influence the patient-healthcare professional relationships. Social media guarantees easier access and empowerment for patients.<sup>75</sup>

## 5.2 Feedback and Advice

Feedback mechanisms as well as navigation cues and advice from providers of products and services are important determinants of trust for the younger online shoppers - for Baby Boomers, however, the privacy cue has primacy.<sup>76</sup> An option to enhance the information retrieval in ActiveAdvice through user feedback is the inclusion of social media features dedicated to community exchange. This can support a user in decision making and resource selection processes. The following sections illustrate different approaches, deriving from different business models of the respective information platforms.

Another important observation concerns the active participation of consumers in general. Consumers become content producers when they comment on products and services online (electronic word-of-mouth -). In doing so, consumers become guides for others and significantly influence the purchasing decisions of others. A research conducted on information search on holiday topics confirmed that consumer-generated sites were well visited. It was assumed that this is because of the more specific, user-like and up-to-date information that the users expected to find - in contrary to marketer-generated and therefore less credible sites. Rating and giving advice is a favoured activity. Thereby consumers post positive as well as negative ratings. In summary the study carried out in the Netherlands confirms that eWOM plays a more important role for consumers in experience-determined sub-decisions. However, most authors recommend both eWOM as well as marketer-generated sites.<sup>77</sup>

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<sup>73</sup> Klaus (2013, p. 444)

<sup>74</sup> *ibid.* (2013, p. 449ff)

<sup>75</sup> Smailhodzic, Hooijsma, Boonstra & Langley (2016, pp. 7-12)

<sup>76</sup> Obal & Kunz (2013)

<sup>77</sup> Bronner & Hoog (2010); Okazak, Diaz-Martín, Rozano & Menéndez-Benito (2015)

### 5.2.1 Rating and Comments

The option to rate and comment on a piece of information is a common option in e-commerce applications. The online shop of the German instrument and score book retailer Thomann<sup>78</sup> is a best practice on the inclusion of social media features for customers. This is illustrated best when viewing a single product, i.e. a book with scores: The product page presents feedback from costumers, who bought the product, as a visual rating scale with five stars and as text review. Furthermore, the page presents the current selling rank in the category of the product and links it to related parts of the catalogue with product recommendations and a link list called “Smart Navigator”. The social features are completed with the option to share the product on various external social media platforms like Facebook or Pinterest, to enable further comments. Amazon is a commercial platform allowing customers to review and also rate products. Reviews are written texts; in most cases the length is flexible. Ratings provide the customer with pre-defined criteria to click. Amazon offers binary-scale rating in the terms of something is helpful or not. Ciao allows to further rat the degree of the service. Whether or not rating and review statistics are mare public or not varies a lot.<sup>79</sup>

### 5.2.2 Communication & Information

Communication in general and the exchange of information in particularly changed over the last years. Social media sites not only stand for new ways of communication but also set new standards.<sup>80</sup> This inevitably also has an effect on health care institutions to provide high-quality information over their own or other platforms. In summary, the crucial issue is, how to make sure that credible health care information is provided.

Institutions and providers must take multiple considerations into account and specific standards for health care information sharing have to defined. In terms of social media policies, the article lists three primary concerns 1) reputation, 2) privacy, 3) productivity. Based on that policy guidelines need to be formulated. Examples are given from health organizations that could be useful to formulate a policy guideline for ActiveAdvice.

### 5.2.3 Interaction & Collaboration

Taking social features to a higher level, information platforms like Stack Overflow or Wikipedia<sup>81</sup> foster an interactive community which collaborates to build up knowledge. The approach of Wikipedia is the creation of an open, comprehensive encyclopaedia platform by enabling any volunteer to contribute his or her knowledge in a wiki system, ever expanding the content. By employing web interface, user management, a version tracking and discussion feature, Wikipedia enables the collaborative creation of information and quality assurance among its users. Furthermore, researchers delved into the topic of quality improvement of content.<sup>82</sup>

In contrast to the aspiration of comprehensiveness, Stack Overflow aims to provide information based on problem definitions. As a service platform for programmers, Stack Overflow offers the users to

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<sup>78</sup> [www.thomann.de](http://www.thomann.de)

<sup>79</sup> Wyrwoll (2014, pp. 68-70)

<sup>80</sup> Gagnon & Sabus (2015)

<sup>81</sup> [stackoverflow.com](http://stackoverflow.com) and [www.wikipedia.org](http://www.wikipedia.org)

<sup>82</sup> Hu et al. (2007) and Stvilia et al. (2008)

submit obstacles faced with specific pieces of code, in order to enable overcoming those with the help of the volunteer community. Answers provided by other users can be commented and rated by everyone using the platform. In contrast to the rating scale, as it is used in the Thomann Online Store ([www.thomann.de](http://www.thomann.de)), Stack Overflow enables users to up- or down-vote answers, showing a total score for every answer. The user posting the problem can also select an answer as “best answer”. These two features then determine the order of answers presented to the audience.

#### 5.2.4 Direct File Exchange

Expanding the idea of sharing code snippets, the exchange of actual executable code files can be considered the next logical step. Two prominent examples are the platforms MATLAB Central<sup>83</sup> provided by Mathworks Inc. to support their software MATLAB and the code sharing site GitHub.<sup>84</sup>

MATLAB Central offers similar collaborative services like Stack Overflow<sup>85</sup>, but expands them on the one side by including an expert board, consisting of MATLAB employees, and on the other by a repository for user generated MATLAB code. The so-called File Exchange offers similar options for rating solutions like the Thomann Online Store<sup>86</sup> described above.

GitHub is primarily conceptualized as a web-based file-hosting system. Nevertheless, the platform offers collaboration features for developers that are interesting to be considered in the field of information retrieval and cooperative knowledge creation. GitHub offers users the management of file repositories, building on the versioning system Git.<sup>87</sup> This system enables the user to manage derivatives of codes (“forks”), creating them as a new instance independent from the original source (“branch”) with the option to recombine them again (“merge”).

#### 5.2.5 Digital and Virtual Advice

“The benefit of virtual agents in e-commerce is particularly relevant to the senior population (over 65 years) due to an age-related digital divide in e-commerce adoption owing to declining:

- **physical abilities** and out-of-home mobility leading to greater dependence on e-commerce; and
- **cognitive abilities** such as attention, working memory, processing speed, and visualization ability (Czaja and Lee, 2007).”<sup>88</sup>

Virtual agents can take various forms: **presentation agents** gather information from web sources, then restructure the information and present it to the user; pedagogical assistants guiding students through programs; **recommendation agents** give directions for making decisions; **customer service agents** provide product information or guide through online transaction processes.<sup>89</sup>

<sup>83</sup> [www.mathworks.com/matlabcentral](http://www.mathworks.com/matlabcentral)

<sup>84</sup> [www.github.com](http://www.github.com)

<sup>85</sup> [stackoverflow.com](http://stackoverflow.com)

<sup>86</sup> [www.thomann.de](http://www.thomann.de)

<sup>87</sup> [www.git-scm.com](http://www.git-scm.com)

<sup>88</sup> Chattaraman et al. (2011, p. 277)

<sup>89</sup> *ibid.*

Many studies confirm the strong impact of **virtual agents**. They “have the potential to address this age-related navigational need since they have been found to serve as effective navigational aids in complex and unfamiliar web and virtual environments by preventing the user from getting lost and disoriented”.<sup>90</sup> In the context of online-shopping, virtual assistants increase trust of older adults in the technology and the online-shopping process. Recent investigations have proved, however, that older adults appreciate the text-only assistance option and they do not desire social conversation during the shopping process. With respect to the online representation older adults perform more successfully in the shopping event when not distracted by a moving agent; and it seems that a male voice is easier to understand.<sup>91</sup>

### 5.3 Trust in Digital and Human Advisory

Trust is a key area of concern - and a rather complicated one.<sup>92</sup> Khvatova et al. (2016) argue that it is vital to have trust to build any kind of relationship or cooperation among users.<sup>93</sup> Consequently, if there is a lack of trust, users will be reluctant to share any knowledge themselves within a social network. Therefore, consumers need to trust the web site, the communication and finally the products themselves. If a web-designer fails to satisfy only one expectation, failure in total can be expected. Knowing how to build-up trust and identifying the drivers of online trust are key responsibilities. Trust in e-commerce compared to real life shopping experiences is even more complicated and challenging.<sup>94</sup> The latter conclude it is because “this medium uses a different look, feel, and interaction”, furthermore the environment is per se considered uncertain.<sup>95</sup> “Online trust occurs when expectations are met, information is believable and confidence is achieved from the consumer’s perspective.”<sup>96</sup>

Consumer trust is dependent on different conditions and is contradictory.<sup>97</sup> Consumer cohorts have different trust understandings and thereby reference systems. Studies have shown that one of the most important criterion, peer endorsement, has different impact on consumer behaviour depending on the national context. Women are believed to feel more uncomfortable with online purchasing than men and young people feel much more comfortable with online-shopping. Moreover, trust is more dependent on web site-interface variables rather than not. Providers brand strength, online expertise or web site familiarity were less influential. The presence of provider advice, privacy cues and community features have higher influence.<sup>98</sup>

In summary the web site design quality is a crucial trust building criteria and one that most influences people revisit. E-services for older adults need to take into consideration the potential impact of generational differences on online trust. In investigating two age cohorts, the digital natives - the Millennials, and the digital immigrants - the Baby Boomers, they learned that age is a critical dimension

<sup>90</sup> Rickel and Johnson (2000) *ibid.* p. 278

<sup>91</sup> Chattaraman et al. (2011, pp. 292-294)

<sup>92</sup> Cummins et al. (2013, p. 178)

<sup>93</sup> Khvatova et al. (2016)

<sup>94</sup> Obal & Kunz (2013)

<sup>95</sup> *ibid.* (p. 46)

<sup>96</sup> Bart et al. in Obal & Kunz (2005, p. 47)

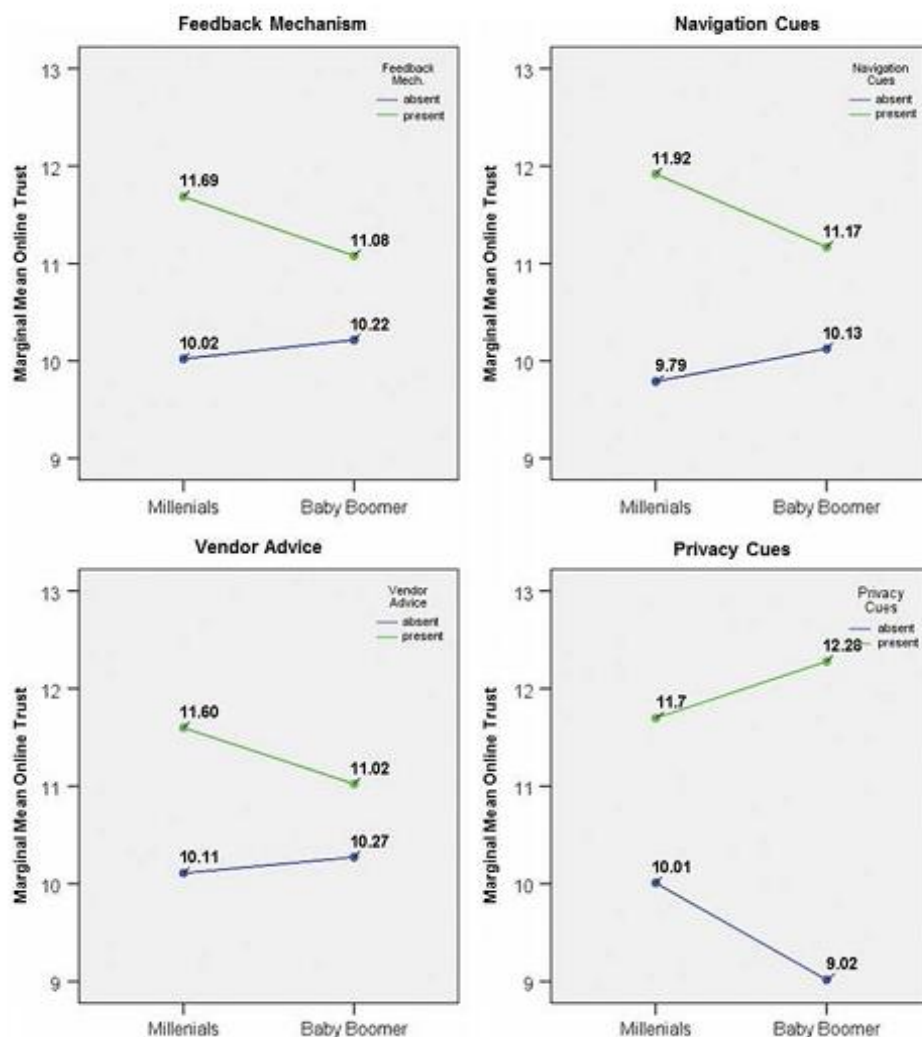
<sup>97</sup> *ibid.*

<sup>98</sup> Bart et al., 2005; McKnight et al., 2002; Liang & Lai, 2002; in *ibid.* (p. 48)



when it comes to online trust. “(..) consumers of e-services from different generational cohorts develop online trust in dissimilar manners.”<sup>99</sup> The Millennials value time and the saving of it. Navigation enabling a quick search of information and products, easy findings; shorter response times and quick delivery are highly valued. In contrast, the Baby Boomer appreciates security of their personal information; they only want to share that information that is absolutely necessary when purchasing online. Privacy cues are actively sought. Provider information is another critical aspect. While the younger people prefer having information about the product and the seller right on the site they want to do business with, Baby Boomers don’t trust the sellers’ promotional materials and are more likely to look for consumer feedback (see Figure 2). Microblogs have become interesting tools to interact with users and customers. The more problem-solving posts a customer could find, the more empathic for the company or the brand a customer becomes.<sup>100</sup>

**Figure 2: Profile plots for experimental scenarios**



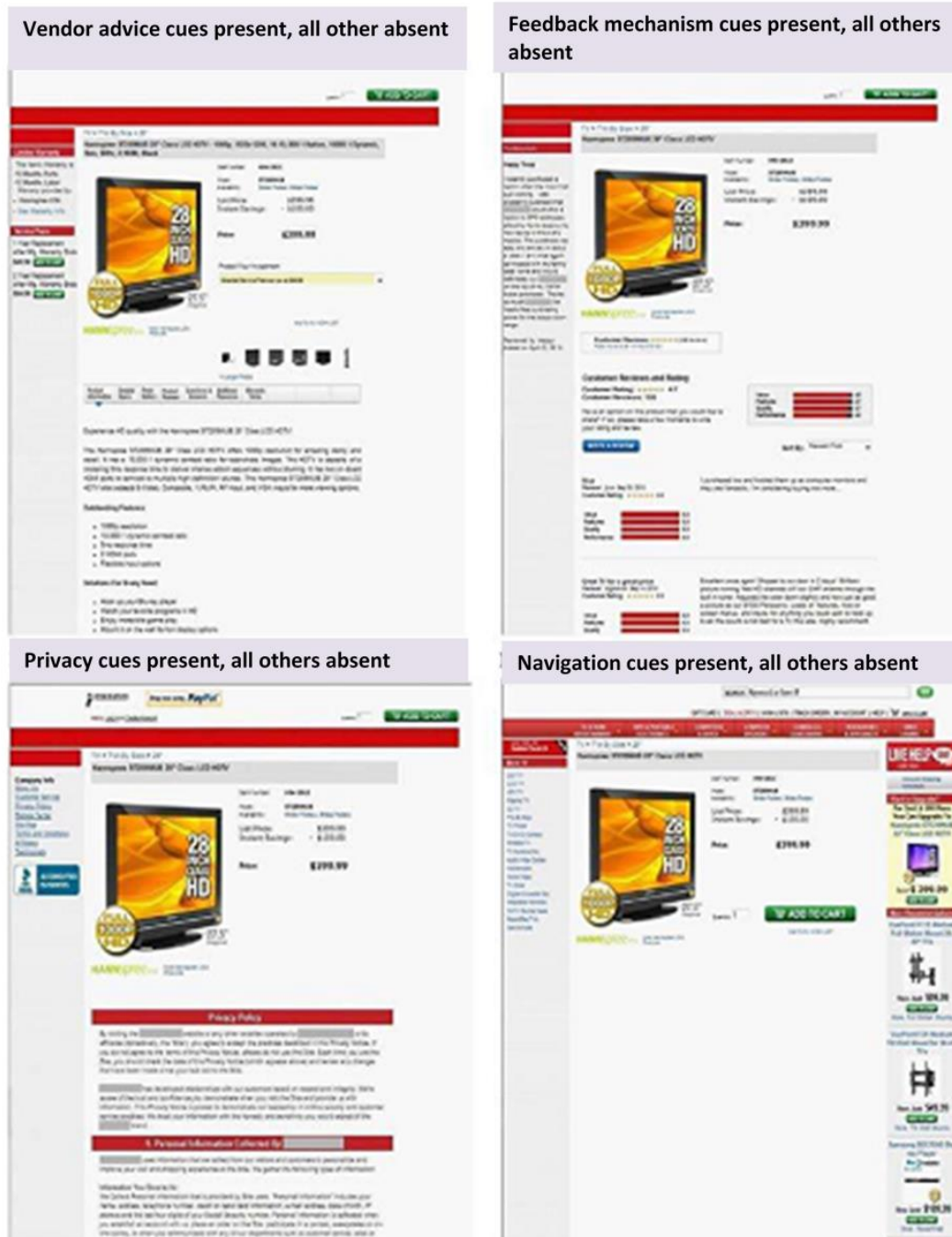
Source: (Obal&Kunz, 2013, 56, Figure 1)

<sup>99</sup> ibid. (p. 55)

<sup>100</sup> Coyle et al. (2012)

ActiveAdvice will also need to learn to understand how and why consumers attempt to consult the platform. Beside trust the psychological attachment to an online community is a strong driving force. Within a community one more easily asks for information, seeks advice or obtains feedback; and it was confirmed that “respondents are utilizing online communities more for need recognition and information searches than for evaluation of alternatives and post-purchase evaluation”.<sup>101</sup>

Figure 3: Sample of web site screenshots



Source: (Obal&Kunz, 2013, p. 61, Figure A1)

<sup>101</sup> Park & Cho (2012, p. 407)

## 5.4 Digital Support Algorithms

In order to provide the users with accurate and reliable results based on digital advisory, ActiveAdvice should use a sophisticated architecture. The design of the online platform will therefore rely on state of the art advancements in digital support algorithms to improve the success rate of advising the end-user on the AAL products or services the customer truly needs.

For the (near) future David Cearley, vice president and Gartner Fellow, summarizes:<sup>102</sup>

"Systems built on (graphics processing unit) GPUs and (field-programmable gate array) FPGAs will function more like human brains that are particularly suited to be applied to deep learning and other pattern-matching algorithms that smart machines use," and "FPGA-based architecture will allow further distribution of algorithms into smaller form factors, with considerably less electrical power in the device mesh, thus allowing advanced machine learning capabilities to be proliferated into the tiniest IoT endpoints, such as homes, cars, wristwatches and even human beings."

Algorithms are integrated in more and more internet-based applications; users hardly know of their existence.<sup>103</sup> However, without them, many online activities could not be carried out. In referring towards Latzer et al. (2014) nine groups of online services which rely on algorithms are summarized. These are search, aggregation, observation/surveillance, prognosis/forecast, filtering, recommendation, scoring, content production, allocation.<sup>104</sup> Critical voices stress their impact on the users' choices and as a consequence on their decision making. For the ActiveAdvice platform clear and transparent governance principles are to be laid out. These should address and reflect the risks of any biases and diminishing of variety, of manipulation, of censorship by intelligent filtering, of threats to privacy and data protection, of social discrimination, of violation of intellectual property rights, of abuse of market power.<sup>105</sup>

The following governance options are referring to changes in the market conduct of consumers, content providers and suppliers of these algorithmic services; and they should help to reduce user risks:<sup>106</sup>

Governance Option	Solutions
(Consumer) Technical self-help solutions	"Consumers can make use of tools for anonymization, such as Tor, Virtual Private Networks (VPN) or OpenDNS to protect their privacy or circumvent censorship."
(Consumer) Privacy-enhancing technologies (PETs)	"... for data protection, for example cryptography, cookie management and do-not-track technologies (browser)."
(Consumer) De-personalization of Services	These services help to reduce bias.
(Supplier) Product innovation	"Some news aggregators' business models integrate content providers, who receive compensation (e.g. nachrichten.de). To avoid privacy risks,

<sup>102</sup> <http://www.gartner.com/newsroom/id/3143521>

<sup>103</sup> Saurwein et al. (2015)

<sup>104</sup> ibid. (2015, p. 35)

<sup>105</sup> Latzer et al. (2014) in Saurwein et al. (2015, p. 37)

<sup>106</sup> ibid. (2015, p. 39ff)

	there are algorithmic services that do not collect user data (e.g. the search engine DuckDuckGo). Such product innovations – if successful – might also contribute to diversity and the reduction of market concentration.”
Technological Design	“Services such as ConsiderIt, Reflect and OpinionSpace are designed to avoid filter bubbles and bias by integrating elements of serendipity.”  Bias in so called recommender systems can be reduced with machine learning.
Company self-organization	“Suppliers of services that rely on algorithmic selection can commit themselves to certain “values” (Introna and Nissenbaum, 2000), such as search neutrality or the “minimum principle” of data collection (Langheinrich, 2001; Cavoukia, 2009).”  “Google, for example, announced the establishment of an ethics board (Lin and Selinger, 2014).”
Company self-regulation	“Typical instruments of industry self-regulation are: codes of conduct, organizational and technical industry standards, quality seals and certification bodies, ombudsmen and arbitration/mediation boards and ethic committees/commissions.”

**Table 6: Algorithm Governance Options**

## 5.5 Interactive Information Retrieval

Various measures, e.g. time-on-tasks or user satisfaction are applied to assess search processes and outcomes.<sup>107</sup> Measures might relate to user perceptions (of the results, the search experience or interface) or to user behaviour (see Table 6); the latter refers to what a user does when interacting with a system. The data from the searching and browsing process are collected with system log files.

In the underlying study the researchers analysed a set of data which was produced when people were interacting with an unknown interface; the participants were seeking for information. The aim was to learn about the relationship between perceptions and behaviour. Some of their key insights are presented here - though their results are preliminary:

- First, the type of data (text or image) have no influence on the UES structure.
- Second, they identified three different user types based on their query actions.
- Third, “(H)ow people searched and browsed through the images seems to be unrelated to their subsequent perception of the system. This may be attributed to user expectations about aesthetics and usability that limit the degree of variation among individuals”.<sup>108</sup>
- Fourth, user searching and browsing behaviour did not show any correlation with perceptions, e.g. focused attention or felt involvement. What and how people seek for online information doesn’t say anything about their engagement.
- Fifth, the users’ backgrounds and experiences are influential. This means, as a conclusion, that IIR evaluation on log file data needs more investigation.

<sup>107</sup> Zhuang et al. (2016, p. 293f)

<sup>108</sup> *ibid.* (2016, p. 302)

Variable	Definition
<i>User Perception measures -- the User Engagement Scale (UES)</i>	
Aesthetic Appeal	Perception of the visual appearance of interface.
Felt Involvement	Feelings of being drawn in and entertained in interaction.
Focused Attention	The concentration of mental activity, flow an absorption.
Novelty	Curiosity evoked by content.
Perceived Usability	Affective and cognitive response to interface/content.
Endurability	Overall evaluation of the experience and future intentions.
<i>User Behaviour measures</i>	
Queries	Number of queries used
Query Time	Time spent issuing queries following the links
Items viewed (Queries)	Number of items viewed from queries
Bookbag (Queries)	Number of items added to Bookbag from queries
Topics	Number of categories used.
Topics Time	Time spent exploring categories and following links
Items viewed (Topics)	Number of items viewed from categories
Actions	Number of actions (e.g., keystrokes, mouseclicks)
Pages	Number of pages examined
Bookbag Time	Total time spent reviewing contents of Bookbag.
Bookbag (Total)	Number of items added to the Bookbag
Bookbag (Topics)	Number of items added to Bookbag from category.
Task Time	Total time user spent on the task.

**Table 7: List of Perception and Behaviour Measures** – from Zhuang et al., 2016, Table 1, p. 297

In view of the potential visual problems older adults frequently face a Spoken Conversational Search System (SCSS) is an interesting development. This system provides a conversational approach and they, therefore, correctly stress the need to integrate both document search and conversational processes. Furthermore, they stress that the searching is an iterative, heuristic process, with no way to predict the user satisfaction or to know when the result meets the user's needs. Additionally, they assume that the search process is highly influenced by age, gender, experience, cognitive capacities, etc. Therefore, it seems to be easier to concentrate either on perceptions or behaviours. And they present the Tague-Sutcliffe's informativeness measure as the one that integrates both, i.e. assessing the performance of the system and the perception of the user at the same time.<sup>109</sup>

A meta-study conducted in 2003 explored four central models in IIR, dedicated to the study of human interaction. Each opens a different perspective on human information retrieval, which will be relevant to ActiveAdvice as well, as it aims to supply users' information needs:<sup>110</sup>

- **Stratified Model of Interactive IR:** This model accounts dimensions like environment and situation, user knowledge, goals and beliefs, as well as intent and tasks. Thus, there is no consideration on the factor time in Saracevic' model.<sup>111</sup>

<sup>109</sup> Trippas (2015)

<sup>110</sup> Robins (2000)

<sup>111</sup> Saracevic (1997)

- **Episodic Model of IR Interaction:** This model is based on differences in user knowledge on the search subject. The varying knowledge is supported by an episodic perspective.<sup>112</sup>
- **Interactive Feedback and Search Process Model:** Considering the cyclical nature of information retrieval, Spink explores the meaning of feedback between each new search inquiry. The volume and iterations of feedback between search cycles can vary as well as the number of search cycles in this model.<sup>113</sup>
- **Global Model of Polyrepresentation:** Ingwersen explores the broadest perspective on information retrieval, considering the IIR system, the user, the environment and time. Through increasing redundancy of multiple search inquiry outcomes, the outcome of the search will be more useful to the user.<sup>114</sup>

As all three of these models highlight the fact that multiple cycles of information retrieval over time are required to improve the search output, ActiveAdvice will encounter yet another issue: older adults' cognitive capabilities might decline over time, complicating extensive search tasks. Therefore, search tasks need meaningful support, i.e. through guided search and smart machine learning algorithms, as described in the following section.

## 5.6 Guided Search and Machine Learning

This chapter takes a closer look at Machine Learning (ML) algorithms that could serve as a basis for an interactive and smart ActiveAdvice platform. Machine Learning can be described as a method of making predictions based on the underlying data.<sup>115</sup> This means it is very much a data driven approach, relying on a combination of statistics, probability and optimization techniques.<sup>116</sup> In particular, Machine Learning is based on prediction algorithms. The critical measures of quality are time complexity, space complexity and sample complexity.<sup>117</sup> When implementing ML algorithms it will be important to understand which ML algorithms are suitable for a given task and what the strengths and weaknesses of each algorithm is.<sup>118</sup>

At the Gartner Symposium in October 2016 in Orlando David Cearley, vice president and Gartner Fellow, furthermore identified - besides other technology trends -, the shift from classical computing and information management to systems which learn autonomously, i.e. on their own. DNNs (deep neural nets) support to manage the high quantity and complexity of information.<sup>119</sup> In recent years the development of cognitive computers promises to better understand different data formats (structured and unstructured data). Its architecture includes predicative modelling, machine learning techniques and advanced reasoning to continuously improve its predictions.<sup>120</sup> Machines will learn themselves in their respective environments. This would have effects on developments in robotics, for

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<sup>112</sup> Belkin (1996)

<sup>113</sup> Spink (1997)

<sup>114</sup> Ingwersen (1996)

<sup>115</sup> Mohri, Rostamizadeh & Talwalkar (2012)

<sup>116</sup> ibid. (2012)

<sup>117</sup> Mohri, Rostamizadeh & Talwalkar (2012)

<sup>118</sup> Kubat (2015)

<sup>119</sup> <http://www.gartner.com/newsroom/id/3143521>

<sup>120</sup> Chen, Argentinis & Weber (2016)



virtual personal assistants and so called smart advisors. It would also influence the developments described earlier such as the example of Lam et al. (2016) and ThinkTalk.

In the following **Fehler! Verweisquelle konnte nicht gefunden werden.** several ML algorithm categories are presented together with a short description.

Machine Learning Algorithm	Description
Bayesian optimization	The main advantage is the reduction of complexity of the model and the data when using the Bayesian approach. The paper from Ghahramani (2015) discusses briefly the topic of Bayesian optimization. <sup>121</sup>
Time Series Prediction	When it comes to complex dynamic systems heuristics, finding the appropriate sampling rate can be useful. Frank, Davey and Hunt (2001) discusses the impact of using time series predictions. <sup>122</sup>
Decision Trees (Classification and Regression Trees)	<p>Decision Trees are a type of nonlinear predictive modelling. Generally speaking, it is a set of sequential tests, whereas attributes are selected one by one according to the demand of the situation.<sup>123</sup></p> <p>Decision Trees are useful for expert systems, speech and character recognition.<sup>124</sup> Decision Trees are especially good at breaking down complex decision-making processes into more comprehensible decision subsets. For example, classification and regression trees allow relationships between outcome and explanatory variables to be modelled.<sup>125</sup> It allows making “multiple or logistic regression, log linear models, analysis of variances, survival models, etc. ”<sup>126</sup> This type of ML algorithm can be used to support decision making based on a set of data. Safavian and Landgrebe (1991) illustrate how to design a Decision Tree Classifier.<sup>127</sup> The article introduces many further articles in the field of Decision Tree Classification. Additionally, the design methods of the tree structures are compared. In general, four basic approaches are described; bottom-up approach, top-down approach, hybrid approach and the tree growing-pruning approach. The paper also touches on the topic of NN (Neural Networks) in the context of Decision Tree Classifier and draws similarities and differences for classification techniques.<sup>128</sup></p> <p>Despite the advantages of Classification and Regression Trees, the predictive capability has to be improved by “combining separate tree models into” a so called “committee of experts”.<sup>129</sup> Furthermore, Kubat (2015) argues that smaller trees are to be selected which reduces irrelevant attributes and the danger of overfitting which will result in ‘noisy data’.<sup>130</sup></p>
Naive Bayes Classifier	The Naive Bayes Classifier can be applied for supervised learning applications. Lewis (1998) presents a method of this algorithm to model

<sup>121</sup> Ghahramani (2015)

<sup>122</sup> ibid. (2001)

<sup>123</sup> Kubat (2015)

<sup>124</sup> Safavian and Landgrebe (1991)

<sup>125</sup> Moisen (2008)

<sup>126</sup> ibid. (2008, p.582)

<sup>127</sup> Safavian and Landgrebe (1991)

<sup>128</sup> ibid. (1991)

<sup>129</sup> Moisen (2015, p.597)

<sup>130</sup> Kubat (2015)



	textual data in information retrieval. <sup>131</sup> However, according to Lewis (1998), the Naive Bayes models need to be further improved to be applicable for information retrieval. <sup>132</sup>
Hidden Markov Models	The Hidden Markov Model (HMM) is based on the probabilistic functions of the Markov Chains. The paper put forth by Rabiner (1989) offers a fundamental theoretical understanding of HMM, as well as providing practical details that allows the model to be used for a number of practical applications, such as prediction systems, identification systems and speech processing applications (deterministic and stochastic). The paper is especially detailed on describing how the HMM model can be applied for speech recognition. However, Rabiner (1989) clearly discusses the disadvantages associated with the HMM model, such as the problems in speech recognition with large vocabulary elements. <sup>133</sup>
Support Vector Machines	Support Vector Machines (SVMs) are part of Supervised Learning algorithms used for binary classification. The Support Vector Machine creates a hyperplane that separates the d-dimensional data in order to perfectly divide the data into two categories. The paper by Boswell (2002) gives a fundamental understanding of the algorithm, as also directions on how to best choose the right kernel implementing SMVs and a comprehensible description of optimization techniques. <sup>134</sup>
Fuzzy Logic	Acampora & Cosma (2015) present three algorithms; Fuzzy C-Means (FCM), FCM+ANFIS, and Simplified Fuzzy Adaptive Resonance Theory (SFAM). These algorithms are then compared in conjunction with two frameworks that are used for datamining textual reviews. <sup>135</sup> One of them being the Genetic Algorithm. The results suggest that the Genetic Algorithm has a positive effect on the performance and does not affect the three algorithms.
Neural Networks	<p>Neural Networks (NN) are based on a number of so called neurons (simple processing elements) which are all connected to each other. The way a NN functions is loosely based and modelled after what is the present understanding of biological NN. NN can be trained to perform tasks and are then capable of performing these based on new data they receive.<sup>136</sup></p> <p>The paper by Lei, Barzilay and Jaakkola (2016)<sup>137</sup> provides an approach to understand and verify decisions made by neural models and yet retain the accuracy of complex NN (which themselves allow to be used to make critical decisions). Furthermore, the model is applicable for user reviews of products or answers in user forums. A key point to realize is, that it is critical to ensure the credibility and transparency of decisions based on NN. The model presented is based on two modular components; the generator, that scores extracted sections of a text according to their length and coherence and an encoder, which maps text to tasks specific target values. Both components are trained in order to maximize the score of the text section and the prediction. The model can be used for</p>

<sup>131</sup> Lewis (1998)

<sup>132</sup> ibid. (1998)

<sup>133</sup> Rabiner (1989)

<sup>134</sup> Boswell (2002)

<sup>135</sup> Acampora & Cosma (2015)

<sup>136</sup> Liu (2009)

<sup>137</sup> Lei, Barzilay & Jaakkola (2016)

	Natural Language Processing (NLP) applications, such as multi-aspect sentiment analysis.
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**Table 8: List of ML algorithms**

### 5.6.1 Big Data

When it comes to performing a guided search a crucial aspect that has to be taken into consideration is the necessary data base itself in order to utilise ML. Ghahramani (2015) confirms this notion and argues that for ML systems data is essential in order to extract knowledge.<sup>138</sup> With the term Big Data the storage or access of data and the analysis of that data is understood.<sup>139</sup> Sometimes also the term Data Mining is used. Data Mining describes the process of extracting useful knowledge and insights out of data.<sup>140</sup> Indeed, Data Mining techniques use ML algorithms to extract and learn from the underlying data. For example, in order to understand behaviour processes of a group of customers it is possible to combine “data mining clustering techniques with sequence mining method”.<sup>141</sup> Thereupon decisions made by a certain group of customers can be better understood. A further example of Data Mining is presented by Ch'ng (2015).<sup>142</sup> It is referred to a so called social information landscape (SIL) as way of understanding users within a social networks. These virtual communities or social networks create within themselves large quantities of data. Ch'ng (2015) presents a way of mapping these interactions (connections between followers, active users, comments and conversations within a social network), which allows an automated process to collect, clean, collate and map multimodal, longitudinal data sets from social media.<sup>143</sup> Moreover this method can be applied to different types of user-generated contents. As it has been stated above, ML relies on the underlying data, in order to make actual predictions. With this in mind, when it comes to implementing advanced ML techniques for the ActiveAdvice platform it is important to possess a sufficient amount of data, in order for the ML algorithms to perform optimally. For this reason, it will be crucial to have enough user generated content that can be mined.

### 5.6.2 Case example

Teachable agents foster the interaction between generations. They have been used in a project on intergenerational communication.<sup>144</sup> The teachable agent asks the user simple questions – in that respective case about peoples’ biographies – and records their answers. The questions were imported from community-driven Q&A sites, and then were categorized and indexed with Apache Lucene. To let older adults, take part in young people’s life – e.g. their grandchildren – did they introduce a topic matching to the platform. Whenever a person’s post on Facebook e.g. fit the predefined topic, the person was asked to also post the same content on a silver assistant platform. For that they adopted

<sup>138</sup> Ghahramani (2015)

<sup>139</sup> Bello-Organ, Jung, & Camacho (2016)

<sup>140</sup> Nazem & Shin (1999)

<sup>141</sup> Seret, vanden Broucke, Baesens & Vanthienen (2014, p. 4648)

<sup>142</sup> Ch'ng (2015)

<sup>143</sup> *ibid.* (2015, p.1726)

<sup>144</sup> Borjigin et al. (2015)

the latent Dirichelet allocation (LDA) model. The self-learning model was trained to identify the various places of post distributions.

“Guided Search” is a term referring to the interactive search service of the photo platform Pinterest. Based on the users input, the system suggests relevant search terms in order to refine the query created. For every term entered, the algorithm updates the images in the result list and provides the user with further terms to be used to concretise the terms. With the Guided Search approach the Pinterests algorithm addresses the influences of human behaviour and language on the information retrieval processes, which was identified as crucial challenge to be tackled in IIR.<sup>145</sup>

## 6 Authorization and authentication Processes

For open social platforms for mobile devices e.g. Omlet is an option. It handles the authentication, the management, the notification and delivery of messages across devices and clouds. In this project the ThingEngine is introduced as a personal server. It works on behalf of the user. Not Siri can be approached but Sabrina. It functions as a personalized language assistant in the Omlet feed. It guarantees privacy.<sup>146</sup> However, a central issue for such service platforms is the authorization. In this process a user gives permission to store and use data. On <http://www.networkworld.com/article/2296774/access-control/seven-strong-authentication-methods.html> seven strong authentication methods for bank account management are described; most of them are known and users have experience applying them. Therefore, they may be of interest to be also applied for a service platform; see Table 9 for details:

Authentication Method	Characteristics
Computer recognition software	On one’s computer a small authentication software plug-in that places a cryptographic device marker onto the consumer’s computer, is installed. The authentication process takes place based on a password the user knows and the so called device marker on the consumer’s computer. The user only has to recall the user and password.
Biometric readers	Fingerprints and eye scans through a hardware device – which usually has to be bought by the user themselves.
Email / SMS one-time password OTP – One Time Password token	The user has a registered Email-address. Through this address does the user receive the second however one-time password. This one is constantly-changing.  However, the user needs to always have the token for the respective account.
Out of band	The user is known by an institution through a registered phone number. Once called a user has to verify him/herself by the means of a password.

<sup>145</sup> <https://about.pinterest.com/en/guided-search>

<sup>146</sup> Lam et al. (2016)

Peripheral device recognition	Using peripheral device recognition as a second factor is accomplished by placing a cryptographic device marker on a user's existing device such as a USB flash drive, an iPod, Smart Phone memory card and then requiring that device to be plugged into the computer when the user logs into the online banking Web site.
Scratch-off card	Using a Scratch-off card as a second factor is accomplished by issuing the user a card containing several PIN numbers that the user scratches off and then used only one time to log in. This is a lower-cost, one-time password option than tokens. <i>Yet, for future developments in the ICT context less adequate.</i>

**Table 9: List of Digital Authentication Processes Components**

Yet, the IC-Community by and large doubt that authentication through passwords will cease to exist for the following reasons: First, compared to other possibilities passwords are considered less reliable and second their management is problematic and third they are not save. But nevertheless, they are easy in dealing with. It is generally anticipated that the future solutions will be based on multi-factor authentication mechanisms. On <http://thenextweb.com/insider/2016/03/31/5-technologies-will-flip-world-authentication-head/#gref> five such potential authentication methods are introduced. One is KodeKey, which considers phone number and fingerprints sufficient for the authentication of a person. Users prompt with a fingerprint scan their identity. Launch-Key-authenticational services offer a second option. There is no personal information stored in the LaunchKey Engine but it applies a set of authentication methods to verify the user. Users can choose various combinations of methods at their discretion, if they want.

## 7 Conclusion & Outlook

Generally speaking, AAL systems still lack openness for sharing applications and algorithms - an important insight for ActiveAdvice to take into consideration. It has to keep in mind that not only the operability of the ActiveAdvice platform is at stake but also how and which AAL devices are promoted. In addition, the ActiveAdvice platform will also have to deal with the same challenges such as usability, reliability, data accuracy, cost, security, and privacy issues. Following Memon's et al. (2014) evaluation, one can expect that ActiveAdvice will fill a gap if it is able to guarantee support and supervision as well as reduce costs and provide information for the different stakeholders involved.

The AAL community currently fails to provide a majority of people with information, sufficient products, nor does it integrate and guarantee personalized support; and it fails the to integrate the many different information sources, services and products in one context. Furthermore, while projects generally are carried out in an international atmosphere, growing old and being in need of support is usually a rather local or regional experience. An interactive, highly flexible, approved and continuously updated platform needs to take that into consideration. ActiveAdvice would be well advised to less learn from past AAL projects and platform developments but instead more from other online communities and efforts. This to, on the one hand, support people with very specific needs in their regional context, but on the other, to give them access to an international community, know-how base

and up-to-date means. However, there are attempts to develop service platforms also within the AAL context e.g. in the HicMO project which from a technical point of view are of interest to have a closer look at. HicMo is a service-oriented system architecture. It attempts to combine smart objects and sensors, and to develop a flexible platform for user-centred services.<sup>147</sup>

On “<http://tech.eu/features/1472/health-startup-europe/>”, over 40 Health 2.0 platforms or app based start-ups are introduced. All aim to provide a selected on-line community with advice, information and service. Furthermore, tech.eu aims to keep an eye on the overall development within Europe. Beyond the AAL developments, platforms exist that might be of interest to look at when it comes to best provide their users with information, advice. <https://www.healthvault.com/ch/de> is a platform addressing patients, care givers and providers. It is a free personal health record that guarantees the secure storage of information and management of health information. And <https://ifttt.com/> has been mentioned in several articles; although privacy and authorisation was critically mentioned does it provides insight to some interesting features.

For the ongoing ActiveAdvice platform development it is recommended to keep in mind that the usage of the AAL platform highly depends on the acceptance, usability and usefulness. The different stakeholders might have different standards with that respect. Besides, taking into consideration the ISO standards 9241-110 is mandatory. And as Scharinger et al.<sup>148</sup> (2015, 52) elaborates, business models have to be developed very early in the innovation process and as clear value propositions drawn. However, this is a challenge, as we have rather complex service logics to consider.<sup>149</sup> For the ongoing development process ActiveAdvice might have a closer look on the We.Can platform development, on the smaller however successful projects such as the Virtual Healthcare Neighborhood as well as on Vitonet, which was launched in 2001 in Germany and since then has successfully informed about health related topics.<sup>150</sup>

Finally, an article published in 2014<sup>151</sup> refers to a shift in the perception and influence of physical and virtual realities. They assume a shift from engagement platforms to engagement ecosystems; the customer-firm interactions are changing. Engagement platforms are “purpose-built, ICT-enabled environments containing artefacts, interfaces, processes and people permitting organizations to co-create value with their customers”.<sup>152</sup> There are trends which oppose the very dominant perception of purely virtual service landscapes. With prominent examples e.g. Google or Microsoft do the authors prognosis the integration of virtual/physical environments into an engagement ecosystem (see Figure 4 and 5).

This engagement ecosystem consists of four engagement platforms where customers interact with the company. Also ActiveAdvice needs to take into consideration that shift from purely online, virtual interaction to an integrated logic. The concept as well as the framework of engagement ecosystems would be an appropriate guidance for further activities of the ActiveAdvice team.

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<sup>147</sup> Peruzzini & Germani (2015)

<sup>148</sup> 2015, p. 52

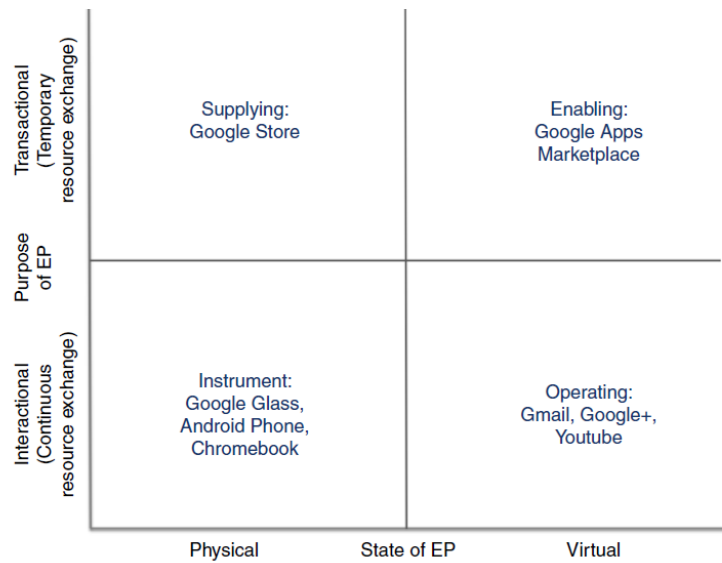
<sup>149</sup> Peters et al. (2015)

<sup>150</sup> Marschollek et al. (2007)

<sup>151</sup> Breidbach et al. (2014)

<sup>152</sup> Ramaswamy (2008, 2009); Ramaswamy and Gouillart (2010) in *ibid.* p. 596.

**Figure 4: Conceptual framework of Google's engagement ecosystem**



Source: (Breidbach et al., 2014, Figure 1, p. 601)

**Figure 5: Overview of EP archetypes: definitions and key characteristics**

EP Archetype	Definition	Key characteristics	Specific case-based illustrations
<i>Operating EP (OEP)</i>	Operating EPs enable firms to generate revenues by virtue of co-creating a perceived benefit during customer-to-firm, and/or customer-to-customer interactions	Facilitates interactivity and value co-creation with customers Designed to generate revenue for the firm through continuous exchange of resources May comprise specific online (virtual) and/or offline (physical) environments	Google: Gmail, YouTube Microsoft: Virtual retail stores
<i>Instrumental EP (IEP)</i>	Instrumental EPs enable customer to access a service provider's OEP. As such, possession or access to an IEP is a prerequisite for customers intending to co-create value with the firm	Physical EP that needs to be integrated with applications/software to experience the IEP's full potential Designed to facilitate the continuous exchange of resources within customer-to-customer, or customer-firm	Google: Chromebook (laptop), Nexus (tablet), Glass (headset) Microsoft: Surface Pro (tablet), Xbox (home entertainment), Windows phone (smart phone)
<i>Enabling EP (EEP)</i>	Enabling EPs are designed to facilitate transactional customer-firm exchanges, and are typically accessed by customers through IEPs	Virtual EP that supports OEP performance (e.g. allows customer to access specific applications/software)	Google: App Marketplace Microsoft: windowsstore.com
<i>Supplying EP (SEP)</i>	Supplying EPs provide a touch-point for customer-firm and customer-to-customer interactions, in order to shape prospective customers' experiences with IEPs	Facilitate the firm's transition from a purely virtual, to more integrative virtual/physical realms Experiential and interactive (resource exchange possible but not necessary)	Google: Prospective Google Store Microsoft: Physical retail stores (when first launched)

Source: (Breidbach et al., 2014, Figure 1, p. 602)

## 8 References

- Acampora, G., and Cosma, G. (2015). A comparison of fuzzy approaches to e-commerce review rating prediction. *Proceedings of International Fuzzy Systems Association (IFSA) and the 9th Conference of the European Society for Fuzzy Logic and Technology (EUSFLAT)*, pp. 1223 - 1230.
- Acampora, G., Cook, D. J., Rashidi, P., and Vasilakos, A. V. (2013). A survey on ambient intelligence in healthcare. *Proceedings of the IEEE*, 101(12), pp. 2470-2494.
- Baby Boomers. *Journal of Service Management*, Vol. 24 Iss 1 pp. 45 – 63.
- Belkin, N. J. (1996). Intelligent information retrieval: Whose intelligence? *ISI '96: Proceedings of the Fifth International Symposium for Information Science*. Konstanz: Universitaetsverlag Konstanz, pp. 25-31.
- Bello-Orgaz, G., Jung, J., and Camacho, D. (2016). Social big data: Recent achievements and new challenges. *Information Fusion*, 28, pp. 45-59. Retrieved 06.12.2016, from <http://www.journals.elsevier.com/information-fusion>
- Bjørkquist, Ch., Ramsdal, H., and Ramsdal, K. (2015). User participation and stakeholder involvement in health care innovation – does it matter? *European Journal of Innovation Management*, Vol. 18 Iss 1 pp. 2 – 18.
- Borjijin, A., Feng, K., and Shen, Z. (2015). A Teachable Agent for Intergenerational Private Social Networks. *International Journal of Information Technology*, 21(1). Np.
- Boswell, D. (2002). *Introduction to Support Vector Machines*. Retrieved from <http://dustwell.com/PastWork/IntroToSVM.pdf>
- Breidbach, Ch. F., Brodie, R., and Hollebeek, I. (2014). Beyond virtuality: from engagement platforms to engagement ecosystems. *Managing Service Quality*, Vol. 24 Iss 6, pp. 592 – 611.
- van de Broek, G., Cavallo, Ph. and Wehrmann, Ch. (eds.) (2010). *AALANCE Ambient Assisted Living Roadmap*. Amsterdam • Berlin • Tokyo • Washington, DC: IOS Press.
- Bronner, F.A. and de Hoog, R. (2010). Consumer-generated versus marketer-generated websites in consumer. *International Journal of Market Research*, Vol. 52 No. 2, pp. 231-248.
- Camarinha-Matos, L. M., Rosas, J., Oliveira, A. I., & Ferrada, F. (2012, October). A collaborative services ecosystem for ambient assisted living. In *Working Conference on Virtual Enterprises*, pp. 117-127. Springer Berlin Heidelberg.
- Camarinha-Matos, L., Rosas, J., Oliviera, A. I., and Ferrada, F. (2015). Care Services Ecosystem for Ambient Assisted Living. *Enterprise Information Systems*, 9(5-6), 607-633.
- Chattaraman, V., Kwon, W.-S., Gilbert, J. E., and Shim, Sh. (2011). Virtual agents in e-commerce: representational characteristics for seniors. *Journal of Research in Interactive Marketing*, Vol. 5 Iss 4 pp. 276 – 297.
- Chen, Y., Argentinis, E. Weber, G. (2016). IBM Watson: How Cognitive Computing Can Be Applied to Big Data Challenges in Life Sciences Research. *Clinical Therapeutics*, Vol. 38 Iss 4 pp. 688 – 701.



- Ch'ng, E. (2015). Social information landscapes. *Industrial Management & Data Systems*, 115(9), 1724-1751. doi:10.1108/IMDS-02-2015-0055
- Cardoso, C., Llerena Rodriguez, Y., Grade, M., Augusto, F., Queiros, A., Quintas J., and Pacheco Rocha, N. (2014). Platform to Support the Development of Information Services for Informal and Formal Care. In *Proceedings of the International Conference on Health Informatics*, pp. 417-421.
- Coyle, J.R., Smith, T., and Platt, G. (2012). "I'm here to help". *Journal of Research in Interactive Marketing*, Vol. 6 Iss 1 pp. 27 – 41.
- Cummins, Sh., Peltier, J., Schibrowsky, J., and Nill, A. (2014). Consumer behavior in the online context. *Journal of Research in Interactive Marketing*, Vol. 8 Iss 3, pp. 169 – 202.
- DKE. (2012). *The German AAL Standardization Roadmap*. Frankfurt: DKE German Commission for Electrical, Electronic & Information Technologies of DIN and VDE.
- Fatemeh, N., Skournetou, D., and De Reuver, M. "Establishing a Common Service Platform for Smart Living: Challenges and a Research Agenda." ICOST. 2011.
- Flick, U. (2009). *An Introduction to Qualitative Research*. Sage.
- Fowler, Ch., Haney, T., and Rutledge, C. M. (2014). An Interprofessional Virtual Healthcare Neighborhood for Caregivers of Elderly With Dementia. *The Journal for Nurse Practitioners - JNP* Volume 10, Issue 10, pp. 829.834.
- Frank, R. J., Davey, N., and Hunt, S.P. (2001). Time Series Prediction and Neural Networks. *Journal of Intelligent and Robotic Systems*, Vol. 31, pp. 91-103.
- Gassner, K., and Conrad, M. (2010). *ICT Enabled Independent Living for Elderly: A status quo analysis on products and the research landscape in the field of Ambient Assisted Living (AAL)* in EU-27. VDI/VDE Innovation und Technik GmbH. Studie für die Europäische Kommission, DG Information Society and Media, ICT for Health Unit, Berlin.
- Gagnon, K., and Sabus, C. (2015). Professionalism in a Digital Age: Opportunities and Considerations for Using Social Media in Health Care. *Physical Therapy*, 95(3), 406-414.
- Ghahramani, Z. (2015). Probabilistic machine learning and artificial intelligence. *Nature*, 521, pp. 452-459. doi:10.1038/nature14541
- Gosch, F. (2013). *Solutions to master the Demographic Change: Ambient Assisted Living*. Anchor Academic Publishing.
- Ho, Ch-H., Chiu, K-H., Chen, H., and Papazafeiropoulou, A. (2015). Can internet blogs be used as an effective advertising tool? The role of product blog type and brand awareness. *Journal of Enterprise Information Management*, Vol. 28 Iss 3, pp. 346 – 362.
- Hu, M., Lim, E.-P., Sun, A., Lauw, H. W., and Vuong, B.-Q. (2007). Measuring article quality in wikipedia: models and evaluation, p. 243.

- Ingwersen, P. (1996). Cognitive perspectives of information retrieval. *Journal of Documentation*, 52(1), pp. 3-50.
- Klaus, Ph. (2013). The case of Amazon.com: towards a conceptual framework of online customer service experience (OCSE) using the emerging consensus technique (ECT). *Journal of Services Marketing*, Vol. 27 Iss 6, pp. 443 – 457.
- Kaplan, A., and Haenlein, M. (2014). Collaborative projects (social media application): About Wikipedia, the free encyclopaedia. *Business Horizons* 57, pp. 617-621.
- Khvatova, T., Block, M., Zhukov, D., and Lesko, S. (2016). How to measure trust: the percolation model applied to intra-organisational knowledge sharing networks. *Journal of Knowledge Management*, 20 (5), pp. 918-935.
- Kriegel, J., Schmitt-Rüth, St., Güntert, B., and Mallory, P. (2013). New service development in German and Austrian health care – bringing ehealth services into the market. *International Journal of Healthcare Management*, 6:2, pp. 77-86.
- Kubat, M. (2015). *An Introduction to Machine Learning*. Heidelberg: Springer International Publishing.
- Lam, M. S., Campagna, G., Seo, J., and Fischer, M. (2016). A distributed Open Social Platform for Mobile Devices. *MobileSoft'16*, May 16-17 2016, Austin TX USA
- Lei, T., Barzilay, R., and Jaakkola, T. (2016). Rationalizing Neural Predictions. *arXiv preprint arXiv:1606.04155*.
- Leitner, P., Jäger, B., Wenzel, L., Rodlauer, R., Nastincova, S., Wanka, A., Zgud, J., Kolland, F., and Kryspin-Exner, I. (2015). *SmartCareBase*. Final Scientific Report.
- Leitner, P., Neuschmied, J., Ruscher, St., Kofler, M., Ates, N., Vigl, S., and Decarli, P. (2015). *TAALXONOMY*. Entwicklung einer praktikablen Taxonomie zur effektiven Klassifizierung von AAL-Produkten und Dienstleistungen. Guidebook - Study Report, Wien.
- Lewis, D.D. (1998). Naive (Bayes) at forty: The independence assumption in information retrieval. *Lecture Notes in Computer Science*, 1398, pp. 4-15.
- Lorenzo-Romero, C., Constantinides, E., and Alarcón-del-Amo, M.-del. C. (2014). Social Media as Marketing Strategy: An Explorative Study on Adoption and Use by Retailers. (This study is framed within Research Project with reference number ECO2009-08708, Ministerio de Ciencia e Innovación, Gobierno de España, 2009–2013). In: *Social Media in Strategic Management*. Published online: 11 Sep 2014; pp. 197-215.
- Li, L., Xu, L., Jeng, H. A., Naik, D., Allen, T., and Frontini, M. (2008). Creation of environmental health information system for public health service: A pilot study. *Springer Inf Syst Front* 10, pp. 531–542.
- Liu, B., and Liu, B. (2002). *Theory and practice of uncertain programming* (pp. 78-81). Heidelberg: Physica-verlag.

- Marcelino, I., Laza, R., and Pereira, A. (2015). SSN: Senior Social Network for improving quality of life. *aging*, 4, 5.
- Marschollek, M., Mix, St., Wolf, K-H., Effertz, Haux, B. R., and Steinhagen-Thiessen, E. (2007). ICT-based health information services for older adults: Past experiences, current trends, and future strategies, *Medical Informatics and the Internet in Medicine*, 32:4, pp. 251-261.
- Memon, M., Rahr Wagner, St., Fischer Pederson, Ch., Beevi, F. H. A., and Hansen, F. O. (2014). Ambient Assisted Living Healthcare Frameworks, Platforms, Standards, and Quality Attributes. *Sensors* 2014, 14, pp. 4312-4341.
- Mohri, M. Rostamizadeh, A., and Talwalkar, A. (2012). *Foundations of Machine Learning*. Cambridge: The MIT Press.
- Moisen, G. G. (2008). *Classification and Regression Trees*. Encyclopedia of Ecology Academic Press: Oxford (2008) pp. 582–588.
- Nadi, S., and Cassell, C., (2004). Using Data Matrices. In C. Cassell and G. Symon, G. (eds.), *Essential Guide to Qualitative Methods in Organizational Research*, pp. 271-287. Sage.
- Nazem, S, and Bongsik, S. (2014). Data Mining: New Arsenal for Strategic Decision-making. *Journal of Database Management*, 10 (1), pp. 39-42.
- Nehmer, J., Becker, M, Karshmer, A., and Lamm, R. (2006). Living assistance systems: an ambient intelligence approach. *ICSE'06 Proceedings of the 28th International Conference on Software Engineering*, ACM, New York, NY, USA (2006), pp. 43–50.
- Nedopil, Ch., Schaubert, C., and Glende, S. (2013). *AAL Stakeholders and their Requirements. A collection of characteristics and requirements of primary, secondary, and tertiary users of AAL solutions, and a guideline for user-friendly AAL design*. Knowledge Base. Ambient Assisted Living Association, Brüssel.
- Obal, M., and Kunz, W. (2013). Trust development in e-services: a cohort analysis of Millennials and Baby Boomers. *Journal of Service Management* 2013 24:1, pp. 45-63.
- Okazaki, Sh., Díaz-Martín, A. M., Rozano, M., and Menéndez-Benito, H. D. (2015). Using Twitter to engage with customers: a data mining approach. *Internet Research*, Vol. 25 Iss 3, pp. 416 – 434.
- Park, H., and Cho, H. (2012). Social network online communities: information sources for apparel shopping. *Journal of Consumer Marketing*, Vol. 29, Iss 6, pp. 400 – 411.
- Peruzzini, M., and Germani, M. (2015). A Service-Oriented Architecture for Ambient-Assisted Living. *Adv. Transdiscipl. Eng*, 2, pp. 523-532.
- Peters, Ch., Blohm, I., and Leimeister, J.M. (2015). Anatomy of Successful Business Models for Complex Services: Insights from the Telemedicine Field. *Journal of Management Information Systems*, Vol. 32, No. 3, pp. 75–104.
- Rabiner, L.R. (1979). A tutorial on hidden Markov models and selected applications in speech recognition. *Proceedings of the IEEE*, Vol. 77, Iss 2, pp. 257 - 286.
- Robins, D. (2000). Interactive Information Retrieval: Context and Basic Notions. *Informing Science*, vol. 3, no. Special Issue on Information Science Research.

- Sabou, M., Kantorovitch, J., Nikolov, A., Tokmakoff, A., Zhou, X. , and Motta, E. (2009). Position paper on realizing smart products: challenges for Semantic Web technologies. In: *2nd international workshop on semantic sensor networks 2009 (SSN09)* at ISWC 2009, 26 Oct 2009, Washington D.C., USA, pp. 135–147. Sixsmith, A., & Gutman, G. (2013). *Technologies for Active Aging*. Wiesbaden: Springer.
- Saracevic, T. (1997). The stratified model of information retrieval interaction: Extension and application. *Proceedings of the 60th Annual Meeting of the American Society for Information Science*, 34, pp. 313-327.
- Saurwein, F., Just, N., and Latzer, M. (2015). Governance of algorithms: options and limitation. *info*, Vol. 17 Iss, 6, pp. 35 – 49.
- Safavian, S.R., and Landgrebe, D. (1991). A Survey of Decision Tree Classifier Methodology, *IEEE Trans. Systems, Man, & Cybernetics*, Vol. 21 Iss, 3, pp. 660 – 674.
- Sharma, Sh., and Garg, Sh. (2016). Literature review on Web based training in workplace, 2010-2015. *On the Horizon*, Vol. 24 Iss 2 pp. 166 – 174.
- Edin Smailhodzic, E., Hooijsma, W., Boonstra, A., and Langley, D. J. (2016). Social media use in healthcare: A systematic review of effects on patients and on their relationship with healthcare professionals. *BMC Health Services Research*, 16:442. DOI 10.1186/s12913-016-1691-0
- Spink, A. (1997). Study of interactive feedback during mediated information retrieval. *Journal of the American Society for Information Science*, 48(5), pp. 382-394.
- Sixsmith, A., & Gutman, G. (eds.) (2013). *Technologies for Active Aging*. Wiesbaden: Springer.
- Schartinger, D., Miles, I., Saritas, O., Amanatidou, E., Giesecke, S., Heller-Schuh, B., and Schreier, G. (2015). Personal health systems technologies: Critical issues in service innovation and diffusion. *Technology Innovation Management Review*, 5(2).
- Sheng, X., and Zolfagharian, M. (2014). Consumer participation in online product recommendation services: augmenting the technology acceptance model. *Journal of Services Marketing*, vol. 28, no. 6, pp. 460-470.
- Stvilia, B., Twidale, M. B., Smith, L. C., and Gasser, L. (2008). Information quality work organization in wikipedia. *Journal of the American Society for Information Science and Technology*, vol. 59, no. 6, pp. 983–1001.
- Tazari, M., Furfaffi, F., Lázaro Ramos, J., and Ferro, E. (2008). The PERSONA Service Platform for AAL. Retrieved December 8, 2015, from <http://cs.gmu.edu/~jpsousa/classes/895/readings/1165.pdf>
- Trippas, J.R., Spina, D., Sanderson, M., and Cavedon L. (2015). Understanding the impact of length in web search results. Summaries over a Speech-only Communication Channel. *Proceedings of SIGIR'15*, pp. 991-994.
- Tseng, J. C., Lin, B. H., Lin, Y. F., Tseng, V. S., Day, M. L., Wang, S. C., ... & Yang, Y. C. (2015, November). An interactive healthcare system with personalized diet and exercise guideline recommendation. In *2015 Conference on Technologies and Applications of Artificial Intelligence (TAAI)*, pp. 525-532. IEEE.


- Weegh, H., and Kampfel, M. (2015). Acceptance Criteria of Ambient Assistant Living Technologies. *Studies in Health Technology & Informatics*. In C. Sik- Lányi, J. Hoogerwerf, K. Miesenberger and P. Cudd (eds.), *Studies in Health Technology and Informatics*, Volume 217, pp. 857-864. (Ebook)
- Weiser, M. (1999). The computer for the 21st century. *ACM SIGMOBILE Mobile Computing and Communications Review* - Special issue dedicated to Mark Weiser, 3(3), pp. 3-11.
- Wunderlich, N., v. Wangenheim, F., and Bitner, M. (2012). High Tech and High Touch: A Framework for Understanding User Attitudes and Behaviors Related to Smart Interactive Services. *Journal of Service Research*, 16(1), pp. 3-20.
- Wyrwoll, C. (2014). *Social Media. Fundamentals, Models, and Ranking of User-Generated Content*. Springer Vieweg, Wiesbaden.
- Youngtae Ch., and Thoeni, A. (2016). Social media: is this the new organizational stepchild? *European Business Review*, Vol. 28 Iss 1, pp. 21 – 38.
- Zhuang, M., Toms, E., and Demartini, G. (2016). The Relationship between User Perception and User Behaviour in Interactive Information Retrieval Evaluation. *Advances in Information Retrieval. 38<sup>th</sup> European Conference on Information Retrieval*, 20-23 March 2016, Padua, Italy, pp. 293-305.

## 9 Appendix

### 9.1 Article - Example

Topic	Keywords (AND, OR...)	Country	Article name or type of service	Source / URL / PDF	Data-base used	Additional notes/Description
ICT Services	AAL Services, ICT Services, Quality of life QOL	UK	The impact of ICT services on perceptions of the quality of life of older people	<a href="http://www.emeraldinsight.com/doi/abs/10.1108/17549451311313183#">http://www.emeraldinsight.com/doi/abs/10.1108/17549451311313183#</a>	Emerald Insight	In: Journal of Assistive Technologies Scientific Paper found in: Journal of Assistive Technologies
Medicine management system	Assistive technologies, AAL, Health behaviour change, Home technology, Medication management, Reminders	Finland, Spain	Expectations and user experience of a multimodal medicine management system for older users	<a href="http://www.emeraldinsight.com/doi/full/10.1108/JAT-10-2013-0031">http://www.emeraldinsight.com/doi/full/10.1108/JAT-10-2013-0031</a>	Emerald Insight	Targeted at older people and home care professionals, describes expectations of system and user experience findings from empirical qualitative field trial Scientific Paper found in: Journal of Service Management
Trainings, Advisory Methods Healthcare experience quality	Service quality, Customer experience, Healthcare, Feedback web site, Patient experience, Experience quality	UK	Healthcare experience quality: an empirical exploration using content analysis techniques	<a href="http://www.emeraldinsight.com/doi/full/10.1108/JOSM-10-2014-0265">http://www.emeraldinsight.com/doi/full/10.1108/JOSM-10-2014-0265</a>	Emerald Insight	Empirical work on systematic analysis of 200 cancer patient stories, published on healthcare feedback web site, 22 main categories and 51 sub-categories identified that underlie experience quality concept in healthcare, presented in classification framework (direct, indirect, and independent interactions) Scientific Paper found in: Housing, Care and Support, ISSN 1460-8790
Telecare Services	Telecare, Telehealth, Assistive technologies, Telemedicine, E-care, M-care	UK	Telecare, telehealth and assistive technologies: do we know what we're talking about?	<a href="http://www.emeraldinsight.com/doi/abs/10.1108/14608790200800023">http://www.emeraldinsight.com/doi/abs/10.1108/14608790200800023</a>	Emerald Insight	Paper discusses difficulties in understanding scope of telecare services and definitions of services, two service models are offered: 1) telehealth as an umbrella term to cover all telecare, e-care and m-care and telemedicine, 2) telecare alongside assistive technologies and telemedicine as one of three technology groups designed to make people more independent
Stakeholders	Elderly people, Communication technologies, Information technology, Stakeholder co-ordination, Organisational models, E-inclusion, Senior citizens, Stakeholder needs	UK	Mechanisms for stakeholder co-ordination in ICT and ageing	<a href="http://www.emeraldinsight.com/doi/full/10.1108/14779961111191066">http://www.emeraldinsight.com/doi/full/10.1108/14779961111191066</a>	Emerald Insight	Scientific Paper found in: Journal of Information, Communication and Ethics in Society, ISSN: 1477-996X Identifies, describes, assesses and compares various candidate multi-stakeholder mechanisms to improve stakeholder co-operation, strengths and weaknesses of stakeholder performing certain tasks and integrating particular types of stakeholder, response to various calls for closer stakeholder collaboration by the European Commission and other stakeholders, in order to improve the quality of life for older persons and to meet European social objectives Scientific Paper found in: Journal of Assistive Technologies, ISSN: 1754-9450
Digital assistive technologies	Digital assistive technology, Older people, Technology abandonment, Participatory development of technologies	UK	Process requirements for building sustainable digital assistive technology for older people	<a href="http://www.emeraldinsight.com/doi/pdfplus/10.1108/17549450200900019">http://www.emeraldinsight.com/doi/pdfplus/10.1108/17549450200900019</a>	Emerald Insight	The paper proposes a framework for process requirements to inform the decision-making of designers and implementers of digital assistive technologies, process requirements should facilitate the development of more adaptable user-centred systems, increase acceptance rate of digital assistive technology by older people

## 9.2 Service Platforms

Service Platform	Country	Stakeholders	Type of services provided	Promotion of ICT products	Open / Closed Platform	Additional notes	URL	Date	Done by	Usability	Interaction/Feedback Mechanism	Areas of Improvement
AgingCare	USA	Caregiver: (Family) Patient: (Elderly)	<b>Caregiver Forum:</b> (Support Groups, Ask a Question, Start a Discussion, Blog etc.) <b>Senior Living:</b> (Alzheimer's Care, Assisted Living, Continuing Care, Home Care, Home Safety, Independent Living, Living With Family, Nursing Homes, Rehabilitations Centre) <b>Caregiver Support:</b> (Caregiver Burnout, Caregiver News, Emotional Wellbeing, Family Relationship, Find Agencies on Aging, Find Geriatric Care, New to Caregiving, Physical Wellbeing, Tough Issues, Work and Life Balance) <b>Elder Care:</b> (Daily Care, Elder Abuse, End of Life & Hospice, Health Conditions, Senior Care Products) <b>Money &amp; Legal:</b> (Elder Law, Financial Matters, Frauds and Scams, Insurance Matters, Medicare and Medicaid, Paying for Care, POA and Guardianship, Tax Tips for Caregivers, Veterans Assistance)	Promotion of ICT products available on website. As part of "Senior Care Products" there are ICT/Technical support products directly promoted. They are categorized into different subjects and only address patients (elderly) as stakeholders. These categories are: (The Bathroom & Bathing, Bedroom & Sleeping, Medical Alert Systems, Mobility, Organization Tools, Personal Care & Dressing, Security, Safety & Falls, Vision & Hearing, etc.). The number of products can be increased, as senior products can be submitted to the website. There is also advice on different types of equipment available for elderly. As part of the forum ("Ask a Question") members of the website post information on products available.	Open or Free Login via Email or Facebook As a member you can participate in discussions, ask and answer questions, personalize the website, get newsletter subscriptions, share and exchange information (also with experts), connect with other caregivers		<a href="https://www.agingcare.com/">https://www.agingcare.com/</a>	01. Apr 15	Paul Schmitter	The platform is quite easy to use, it is easy to find information with clearly defined headings as well as colourful fonts	The platform is very informative with a lot of blogs and articles but there is lack of an instant feedback mechanism. Users can ask questions based on problems they face but response may come after some hours or a few days	Although this platform gives a lot of advice on elderly healthcare, it does not talk about AAL technologies as well as decision support. Also, users of the site without a valid login cannot enjoy certain services like asking of questions.
National Association for Home Care & Hospice	USA	Patients Communities Home care clinics Private healthcare companies / corporators Governmental organisations	<b>Meetings &amp; Education:</b> (Conferences, Web Events, Education Opportunities, etc.) <b>News:</b> (NAHC Report, Press Releases, NAHC & Affiliate Newsletters, Social Media, etc.) <b>Advocacy &amp; Policy:</b> (Legislative Action Center, Legal Services, Regulatory Issues, Research, etc.) <b>Resources &amp; Services:</b> (Home Care and Hospice Agency Locator, Caring Store, Career Center, <a href="#">Vendor Mail</a> , Advertising Opportunities, NAHC Mailing Lists, Home Care and Hospice Links) <b>Consumers Information:</b> (Home Care & Hospice Basics, Home Care & Hospice Locator, 2015 Home Care & Hospice Nurses Tell Their Stories, Home Care Nurses Tell Their Stories November is Home Care & Hospice Month) <b>Members:</b> (Membership Information, Manage Listserv Accounts, Manage Newsletter Accounts, Social Media Resources, Forum of State Association Member Resources, Member Resources, Member Profile)	Vendor Mail promotes home care and hospice products and services. These are grouped into: Communications Technology, Computer Software, Computer Hardware, Data/Performance Measurement, Education and Training, Home Care Business Services, Insurance Services, Legal Services, Media, Medical Supplies, Office/Business Products, Telehealth/Technology. For each product / service there is a short description of the vendor with a link to their website. The vendor mail doesn't seem to be aimed at the end users (for example elderly) directly. The services are aimed at home care providers.	Open or free login with a registered account NAHC-Membership gives access to forums, newsletters, social media, technical expertise network	Font size can be adjusted	<a href="http://www.nahc.org/">http://www.nahc.org/</a>	01. Apr 16	Paul Schmitter	This platform is not visually aesthetic as information is cluttered as well as small font sizes. It is not very user friendly.	This platform does not offer user interaction. However, it is quite informative and gives links to other important elderly health care sites	This site should include a means for user interaction such as a forum, medium for asking questions. It should also include information for decision making reading AAL technologies
Make it ReAAL	Europe (Denmark, Germany, Italy, Netherlands, Norway, Spain)	Webpage "Stakeholders", though currently under construction Categories are: Demand, Supply, Support Some of the identified stakeholders from "pilots" are: <i>Payers (Real Estate Company), Service Providers (welfare agencies, delivery service provider, welfare service provider, municipal nursing homes, municipal physiotherapists), Producers (pharmaceutical manufacturer, Tenants, relatives, caregivers, elderly people, general medicine doctors, regional network of CAAD, regional authorities, social health coordinator, social worker</i>	<b>Home:</b> (Demand, Supply Support) <b>About:</b> (Project Description, Plans & Deliverables, Applications, The Platform, Networking) <b>Pilots:</b> (Associated Pilots, Denmark, Germany, Italy, Netherlands, Norway, Spain) <b>Stakeholders:</b> (Demand, Supply, Support) <b>Press Room:</b> (Publicity Material, News, Events)	Site is still under construction. Therefore under Stakeholder > Supply there are no products yet promoted. As part of the "Pilots" there are Services and Products listed. Some of the vendors are listed, but no direct links are given.	Open	Website focuses on three areas: Demand, Supply Support. Currently ReAAL mainly has only information from the pilot-projects of each of the countries involved to offer. So far this website seems to be the most comprehensive attempt for promoting AAL-Solutions on a web platform. However this website is still not completely ready. The main part, the market place (as part of the Stakeholders) is not fully completed. ReAAL promises to promote standards, guidelines and open platforms for interoperable solutions. The goal is to have a framework in place to be able to analyse AAL-platforms on basis of varied guidelines and make recommendations. Therefore it aims at addressing the currently missing AAL ecosystem and interoperability of solutions rather than approaching stakeholders in an attempt to embed them into the ecosystem. This would mean allowing them to review and evaluate AAL products and solutions and receive bespoke advice. ReAAL could serve as basis to establish guidelines for the ActiveAdvice platform.	<a href="http://www.cip-reaal.eu/home/">http://www.cip-reaal.eu/home/</a>	05. Apr 16	Paul Schmitter	This platform is very user friendly with large font sizes as well as large icons. It is quite easy to navigate especially for the elderly who may have some vision impairment	The platform seems to be still under construction. It currently offers no possibilities for interaction with the users	This platform looks promising, but the website should be completed in order for users to reap its benefits



Unforgettable	UK	Patient: (Elderly with dementia) Caregiver: (Family members)	<p>There are numerous products offered over the shop. These can either be accessed via the "Advice" page or directly over the "Shop" page. The products can be searched through different categories, such as <i>Departments</i> (Activities, Bathing &amp; Grooming, Books &amp; DVDs, Care Home Products, Safety, etc.), via the different stages of dementia - <i>The Journey</i>, <i>Challenges</i> (Aggression, Getting Outside, Falls, Communication, etc.), via <i>Living Well</i> (Safe and secure, Healthy, Dignity, etc.) or via <i>Your Home</i> (Bathroom, Bedroom, Kitchen, etc.). The layout of the store resembles big online retailers like Amazon or Zalando. This gives a very refined user experience and is easy to navigate. Different stakeholders are not specifically defined and addressed. As part of the member registration the "relationship with dementia" is asked. However it seems as if the entire website is meant for Family members and individuals with dementia. The Advice page is very well designed and easy to understand and offers comprehensive advice.</p> <p><b>Home:</b> (Products from Shop advertised, Link to "Advice" and "Advice Center") <b>Advice:</b> (Dementia Advice / Advice Center, various topics on dementia; for example <i>Product Guides</i>, <i>Your Home</i>, etc.) <b>Shop:</b> (Products can be search either through <i>Departments</i>, <i>The Journey</i>, <i>Challenges</i>, <i>Living Well</i>, <i>Your Home</i>) <b>Community:</b> (Community Forums, Blog) <b>Our Story</b> Home News (Press News, Documents) Project (Project Summary, Project Partners, WP1 - 6 Results (Public deliverables, Gallery, Ambient Assisted Living market and business analysis, Best Practice, AALANCE 2008-2010) AA2 Events (AALANCE2 Final Conference, Joint EU/USA AAL Workshop, Joint EU/Japan AAL Workshop) Newsletter (Newsletter releases) Network Acteur Silver Eco: (Provides a list of manufacturers and allows the user to run a search using name of company, technology type or usage information) Produits &amp; Services: Allows the user to search for products &amp; services under the following headings: What - Search Based on Usage Function, Who - Search Based on Intended User, Where - Search Based on Location, How - Search Based on Type of Technology Repères: This allows manufacturers to upload information about their products/services and company information online. Newsletter: Allows for the reader to subscribe to their newsletter Annuaire: Allows the producers/manufacturers to upload their company location on the Silver Eco website</p>	<p>Open or free login with a registered account</p> <p>This website offers advice for individuals with dementia. They offer advice, a shop with specialised products and a community. The layout is well thought through, easy to navigate and to read.</p>	 <p><a href="https://www.unforgettable.org/">https://www.unforgettable.org/</a></p>	05. Apr 16	Paul Schmitter	<p>This platform is very easy to use with large font sizes as well as colourful background and text. It is suitable for people of all ages to use.</p> <p>It does not offer too much user information by way of blogs or instant feedbacks. However, it has a form that can be filled in case of questions</p> <p>It only focuses on people living with dementia and does not speak about AAL products in general.</p>
AALANCE2	Europe	Primary stakeholders (End-user, Family, Neighbours, Caregivers); Secondary stakeholders (Service-Providers); Tertiary stakeholders (Healthcare Providers); Quaternary stakeholders (Society / Policy makers, Insurance companies)	<p>There are no products or services offered over this website. Many stakeholders are described as part of the research or that are part of the AALANCE2 Network. As part of the WP3 - AAL markets and business models businesses that offer products are mentioned.</p>	<p>Open or part of the AALANCE2 Network This promises to connect stakeholders, inform and update about events and opportunities related to AAL sector, participation of workshops and studies, etc.</p>	<p>AALANCE2 does not aim at offering directly advice to any of the mentioned stakeholders. Its purpose is to present the scientific findings, news and events in regards to the AALANCE2 project. In that respect there is a lot of information available on the website. Though it is not easy to find and therefore largely inaccessible for most.</p> <p><a href="http://www.aalance2.eu/">http://www.aalance2.eu/</a></p>	08. Apr 16	Paul Schmitter	<p>This platform is not very user friendly. The aim of the site is not very clear although it offers very good information on the AAL projects</p> <p>It offers no interaction with users. It is purely informational.</p> <p>The website should be made more interactive with larger/bolder fonts as well as a clear guide to the various components of the sites.</p>
Silver Eco (Le Portail National de la Silver Economie)	France/Belgium	Seniors & Elderly People, Caregiving Family Members and Close Friends, Professional Caregivers, Manufacturers/Producers	<p>Promotion of AAL products is done directly on the site since there are various ways to run a search for a product/service. Secondly, the manufacturers are also able to directly upload their company information and services provided.</p>	<p>It is an open platform, and anyone can enter the website to look for the relevant information</p>	<p>Silvereco.fr is the French National Platform for Silver Economy. Silver Economy is part of the French department for the service of the aged. It is under the Ministry of Health &amp; Social Affairs. Silvereco.fr focuses on automotive technologies and largely on products and services for old people.</p> <p><a href="http://www.silvereco.fr/">http://www.silvereco.fr/</a></p>	17.May.16	Gyan Awuku-Sao	<p>It is colourful, interactive and easy to use. It provides an excellent search function that links the user to AAL technologies on the market as well as links to the manufacturers</p> <p>It is extremely informative and allows the user to choose from a plethora of options. It links the user directly to the manufacturer.</p> <p>Although there is a form for asking of questions, a forum can be concluded whereby users can interact with people of similar interest</p>
Pour les personnes âgées (Portail National d'information pour l'autonomie des personnes âgées et l'accompagnement de leurs proches)	France	Elderly/Old People, Close Family Relations	<p>Vivre à domicile: allows the user to choose among the following options; develop/alter residence to suit old people, relocation services, home sharing, home treatment, as well as other services such as food delivery, security and tele-assistance</p> <p>Vivre ailleurs temporairement: This function allows old people who live at home to find accommodation elsewhere for short periods</p> <p>Choisir un hébergement: This function offers advice to elderly people and their relatives on how to choose a place to live such as private retirement homes and medical establishments</p> <p>Aider un proche: This section offers advice to family members and caregivers on best practice involving how to care for the aged people.</p>	<p>This platform does not promote products and services but rather focuses on giving advice and help to the aged and their family relations/care givers</p>	<p>"Pour les personnes âgées" is a National Information Platform for autonomy for old people and their loved ones. It was commissioned by the French Ministry of Health and Social Affairs and the CNSA (Caisse Nationale de Solidarité pour l'autonomie) in June 2015. This platform basically serves as a rich information advisory source to old people and their caregivers. The platform is very interactive, it displays the most frequently asked questions as well as videos to help in decision making. It also offers users a hotline as well as emails with which to make enquiries.</p> <p><a href="http://www.pour-les-personnes-agees.gouv.fr/">http://www.pour-les-personnes-agees.gouv.fr/</a></p>	17.May.16	Gyan Awuku-Sao	<p>This platform is quite colourful and easy to navigate. It offers links to several import healthcare websites for the benefits of users</p> <p>It offers a hotline as well as email for enquiries. It also allows users to give their feedback on what they think about the platform and what could be changed about it.</p> <p>The platform could introduce a user forum where users where similar needs can discuss issues affecting them.</p>
Services Québec - Citoyens (Programmes et services pour les aînés)	Canada (Québec)	Elderly People/ Caregivers	<p>This platform does not promote products and services but rather offers advice to elderly people/caregivers using a predefined criteria of the most relevant information</p>	<p>This is an open platform and is thus freely accessible to the general public</p>	<p>This platform gives information on the different programs and services offered by the Canadian Government for its citizens. It is not interactive but it rather gives important information and links as to how to live well in the old age</p> <p><a href="http://www4.gouv.qc.ca/FR/portail/citoyens/gouvernement/aines/baies/accueil.aspx?cpq">http://www4.gouv.qc.ca/FR/portail/citoyens/gouvernement/aines/baies/accueil.aspx?cpq</a></p>	17.May.16	Gyan Awuku-Sao	<p>This platform is not very user friendly. It has scanty amount of information scattered across the page</p> <p>It offers neither feedback nor interaction with users, but merely offers links to other useful sites for the elderly.</p> <p>The site could be made more user friendly especially for the elderly, it can also introduce more interactive features like forums and live chats.</p>

Independent Living	UK	Private individuals (Family cares), Care Professional Buyers from hospitals, residential homes, clinics, etc. (physio, nurse, care manager, health professional)	<p><b>Independent Living Buyers Guide:</b> Bathroom, Bedroom, Daily Living, Disabled Children, General Household, Health &amp; Exercise, Lounge &amp; Kitchen, Mobility, Sensory Impairment, Telecare &amp; Communication</p> <p><b>Professional Buyers Guide:</b> Access (Sensory Impairment, Learning Disabilities), Bariatric, Care Bathroom, Care Beds, Community Transport, Health &amp; Exercise, Lounge &amp; Dining, Mobility, Patient Handling, Telecare &amp; Communication, Therapy</p> <p><b>Supplier List:</b> in alphabetical order</p> <p><b>News Centre:</b> Advice, Benefits, Industry News, Product Focus, Blogs, Podcasts, etc.</p> <p><b>Advice Centre:</b> Advice for Yourself, Home, Money, Benefits, Legal and Statutory</p> <p><b>Video Gallery</b></p>	Under the category "Telecare & Communications" products such as patient monitoring, telecare alarms etc. are offered. In the "Advice" section there is information on technology & equipment for maintaining independent living.	Open or free login with a registered account (Email address and password required)	<p>The main purpose of this web site is to provide advice and information on independently living. The page offers advice on products and services that make daily living and mobility easier for individuals with disability or impairment.</p> <p>Products are not directly promoted via the web site, but the links to the suppliers are provided. The products and services are thoroughly categorized and the easy to find. To each category there is a clear description on the topic and examples of products. Products can also be found in the suppliers list. Advice / news articles and blogs complement the advice offered on this site. Experts can be contacted via social media, email or phone. However there is no customer feedback integration or any sort of community exchange on specific products.</p>	<a href="http://www.independentliving.co.uk/">http://www.independentliving.co.uk/</a>	20.05.2016	Paul Schmitter	This site is very colourful and user friendly, and makes for easy navigation. It can be easily used by people of all ages.	Although, the site offers a wide range of products and services for independent living, it does not offer direct interaction and feedback with the user, although there is a form available for sending email messages.	The site could do with the integration of a customer advisory section as well as a forum where members can discuss their experiences with the use of the technologies
Parentgiving	USA	Elderly People/ Family Cares, Caregivers	<p><b>Products:</b> By Brand, or Category: (Bath Safety, Bedroom, Bed Rails, Daily Living, Incontinence, Lift Chairs, Medical, Plus Size, Scooters, Walking Aids, Wheelchairs)</p> <p><b>Buyers Guides:</b> Bathroom Safety, Bedding, Bedrail, Daily Living Aids, etc.</p> <p><b>Articles:</b> Aging in Place, Alzheimer's &amp; Dementia, Better health, Caregiving Essentials, Elder Care Crisis Driven, Home &amp; Bath Safety, Incontinence Issues, Nutrition necessities, etc.</p> <p><b>Resources:</b> Caregiver Resources, Checklists, Health Tips, News Flashes, What's New in the Store</p>	Technologies are not promoted on the website, there are articles related to technology. There is no information on AAL	Open, for purchasing products an account is necessary	<p>Foremost this web site is meant to sell products for elderly. The website is easy to navigate and products are categorized. For some of the products specific search criteria can be selected. Products can be reviewed and rated (1-5 Stars). Related items are displayed at the side. Advice is limited to the section "Learn", that offers information to a variety of topics. Personal support is offered via phone. Contact is also available via social media.</p>	<a href="http://www.parentgiving.com">http://www.parentgiving.com</a>	20.05.2016	Paul Schmitter	This site allows for easy navigation is quite user friendly, it offers a wide range of technology for independent living	Since this site is strictly for sale of products, it merely showcases products for sale but does not offer advice or feedback of any form	The website could integrate an interactive forum whereby users could share their user experience with others.
Independent Living Centre NSW	Australia	Caregivers, Community organisations, staff, volunteers, Disability support workers, Retirement village residents, Support groups, Students, Health professionals	<p>Client Service, Group Tours, Community Talks, Assistive Technology product categories, Assistive Technology advice, Training, Publications (handbooks, info sheets, journals, brochures, etc.)</p>				<a href="https://www.licnsw.asn.au/">https://www.licnsw.asn.au/</a>			This site is very interactive, colourful, and very useful to people of all ages. It offers direct advice to users on all aspects of assistive technologies although it does not sell the products directly	There is direct interaction with the users as well as a feedback section. Users are given the opportunity to ask any question they may have regarding these Assistive Technologies	This platform possesses a lot of good characteristics, and is very useful. However, a user forum could be integrated to allow users to share their user experiences.
Ooreka	France	The stakeholders cut across all aspects of society namely: subject experts, the elderly, family members, as well as young people	<p>Home Care: (Relocation, HVAC, Water &amp; Plumbing, Windows, Carpentry, Gardening &amp; Swimming Pools)</p> <p>Money: (Insurance, Banking, Retirement Planning, Real Estate, Local Taxation etc.)</p> <p>Family: (Home aids, Pets, Children, Internet &amp; Multimedia, Leisure)</p> <p>Health: (Pregnancy, Beauty, Well being, Skin &amp; Hair etc.)</p> <p>Law: (Human Rights, Justice)</p>	Technologies are generally promoted on the platform. Specifically, technologies for older people are addressed under "Family". Here, the stakeholders can select from a wide range of different gadgets available for old people. Secondly, a price range is also included for budgetary purposes.	The platform is open for general reading information, but to benefit from the expert advisory services it is necessary to create an account or to log in with one's facebook account	<p>Ooreka is a lifestyle platform based in France that seeks to empower stakeholders with information regarding the different aspects of livelihood. It also offers the opportunity for the user to surf through a large number of lifestyle articles, as well as to pose questions to the relevant experts. This platform tries as much as possible to link the user to experts within his/her own region for a more effective response. It is quite interactive in the sense that responses to questions are received in less than 48 hours</p>	<a href="https://www.ooreka.fr/">https://www.ooreka.fr/</a>	23.05.2016	Gyan Awuku-Sao	This site is quite straightforward and user friendly	It is very interactive and allows users to ask direct questions to experts within the specified field.	This platform will benefit from a user forum where users can share their experiences and frustrations online.