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Deliverable D1.2
Social Network Provider and Application Developer Requirements

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** *Nature of the Deliverable*: P= Prototype, R= Report, S= Specification, T= Tool, O= Other

Abstract: Collection and analysis requirements from end-users, with respect to the envisaged applications and services of the Elder-Spaces platform, as well as will incorporation of relevant research. Establishment of a set of comprehensive end-user requirements associated with the use of social networking by seniors.

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Glossary

AAL	Ambient Assisted Living
AB testing	Test method - an original version (A) is tested against a changed one (B)
API	Advanced Programmers Interface
APP	Application
ARIA	Accessible Rich Internet Applications
ATAG	Authoring Tool Accessibility Guidelines
B2B	Business to business
CRF	Conditional Random Field
CSS	Cascading Style Sheets
EP	Emission Probability
EU	European Union
FAQ	frequently Asked Questions
FOAF	Friend of a Friend
FQL	Facebook Query Language
GUMO	General User Model Ontology
HMM	Hidden Markov Model
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
ICT	Information and Communication Technologies
IE	Information Extraction
ILSE	Interdisciplinary Longitudinal study of adult age
IPTV	Internet Protocol Television
IR	Information Retrieval
IT	Information Technology
iWiW	Internet Who is Who
JAPE	Java Annotation Processing Engine
L2R	Left to Right
LSVM	Latent Support Vector Machine
LTAG	Lexicalized Tree Adjoining Grammar

MDA	Mechanics, Dynamics and Aesthetics
MUC	Message Understanding Conferences
NLP	Natural Language Processing
NPO	Non Profit Organization
OS	Operating System
PHP	Hypertext Preprocessor
POS	part-of-speech
REST	Representational State transfer
RPC	Remote Procedure Call
RSS	Really Simple Syndication
SAP	System Analysis and Program Development AG
SRL	Semantic Role Labelling
SSGI	Social Services of General Interest
SSL	Semi-supervised learning
SVM	Support Vector Machine
TP	Transition Probability
TV	Television
UAAG	User Agent Accessibility Guidelines
UI	User Interface
UIE	Unsupervised Information Extraction
US	United States (of America)
WCAG	Web Content Accessibility Guidelines
WP	Work Package
XML	Extensible Markup Language

Executive Summary

Deliverable D1.2 "Social Network Provider and Application Developer Requirements" comprises the results of Tasks T1.2 "Social Network Providers Requirements" and T1.3 "Application Development Requirements".

The background and the requirements concerning the social networking platform of three main institutional stakeholder groups are analysed and described in detail – from the different perspectives of the stakeholders, i.e.:

(1) *Social network platform providers* who technically and commercially run the platform system – including state of the art and situation of iWiW, Facebook and some other platforms, as well as techno-economical and operational aspects (see chapter 2);

(2) *Social service providers* who may use the platform for information or communication purposes within their social services – including an analysis of the relevant parts of the social and healthcare service system as well as the perspective in relation to the demographic shifts in European societies (see chapter 3); and

(3) *Social network application developers* who provide special applications for elder people for the networking platforms (see chapter 4) – including a detailed state of the arts description of user interface aspects as well as main applications for elder users.

Chapter 5 gives a "Description of applicable social network platforms, incl. interfaces", especially of iWiW and Facebook, and by this describes the main general features of the two social network platforms to be considered in the ELDER-SPACES project.

Chapter 6, which gives a "Summary of Requirements" of the stakeholders, is set up in such a way that *each requirement short description* can be directly referenced in the future specifications in WP2.

With its background descriptions of the different institutional stakeholders, D1.2 provides also a basis for tasks T7.3 "Exploitation Plans" and T7.4 "Market Analysis and Business Plan".

1. Introduction

1.1 Overview

The development, operation, and usage of social networking platforms for elder people involve a number of different stakeholders. The most important ones are:

- the target end-users, i.e. elder people (as described in D1.1 "End-User Requirements"),

- the social network platform providers who technically and commercially run the platform system (see chapter 2),

- social service providers who may use the platform for information or communication purposes within their social services (see chapter 3), and

- social network application developers who provide special applications for the networking platform (see chapter 4).

This document describes separately the requirements of the institutional stakeholders in the corresponding chapters. In order to give a good understanding of the requirements and also with respect to a future commercial provision/usage of the ELDER-SPACES social networking platform, also the backgrounds of the different stakeholders are analysed and described in detail.

Due to the fact that the *same thing*, i.e. the social networking platform, is looked at from the *different perspectives* of different stakeholders, there is some redundancy in the descriptions. The project consortium regards it as important to make this redundancy explicit in this stage of the project.

Chapter 5 gives a "Description of applicable social network platforms, incl. interfaces", especially of iWiW and Facebook, and by this describes the main general features of the two social network platforms to be considered in the ELDER-SPACES project.

Chapter 6, which gives a "Summary of Requirements" of the stakeholders, is set up in such a way that *each requirement short description*

- includes direct references to the more explaining sections in this document, and

- can be directly referenced in the future specifications in WP2.

1.2 Relation with other WPs

In combination with the other documents of WP1 "Requirements and Use Cases", D1.2 provides direct input for the specification phase of the project, i.e. WP2 "Social Networking Services and Applications Specification", especially for task T2.1 "Specification of User Interfaces, Cognitive Social Search and Personalization".

With its background descriptions of the different institutional stakeholders, D1.2 provides also a basis for tasks T7.3 "Exploitation Plans" and T7.4 "Market Analysis and Business Plan".

2. Social Network Platform Providers' Requirements

2.1 State of the art / analysis of current situation of iWiW and other platforms

2.1.1 State of the art

We use the expression "state of the art" in the following meaning: "incorporation of new ideas and the most up to date knowledge in order to make advancements in the already existing knowledge".

This paragraph discusses in detail the levels on which "state of the art" can be implemented for social networks in the Elder-Spaces project.

- Content level: contents serving the reintegration of elder people into the society and local communities

- Technological level: the Elder-Spaces platform using the most up-to-date technological solutions available today

- Design: design that is easy to see for elder people

- Usability: clear interface that is easy to interpret for elder people

- Marketing: marketing plans focus directly on product development and customer service. Special marketing campaigns specifically targeting elder people

- Customer service: flexible and fast customer management

- Product development: on-going usage pattern monitoring, AB testing, fact reactions

- Business planning

2.1.2 Current situation of iWiW

iWiW recently has 2.7 million active users, 40% of Hungarian internet users can be reached. It has 4,66 million registered users – 15,000 new users every month, 86 million photos – 20 million comments related to photos, 150,000 pages – 10,000 commercials, 2.7 million active users, 700,000 public profiles, 940,000 social news readers. iWiW has 450,000 daily visitors, 800,000 - 1.2 million visitors use the most visited functions every week. Every third iWiW visitor checks frequently their own personal profile page, 700,000 public profiles were made, visiting rates of these pages increased by 40%.

2.1.3   Multiplatform iWiW

Mobile audience is rising day after day. 175,000 users visited m.iwiw.hu in January 2012, and 80,000 have downloaded the mobile APP.

Our development plan includes renewal of the mobile platform and optimization for iWiW IPTV and tablet.

Figure 1: Different platforms of iWiW

2.1.4   Facebook vs. other social networks

Currently Facebook has 800 million active users, this figure is steadily increasing, and thus it will definitely capture leading position in the field of local social networks. In Hungary it was in October 2010 when Facebook took the No 1 social site position from iWiW according to Google trends data as displayed in Figure 2[1].
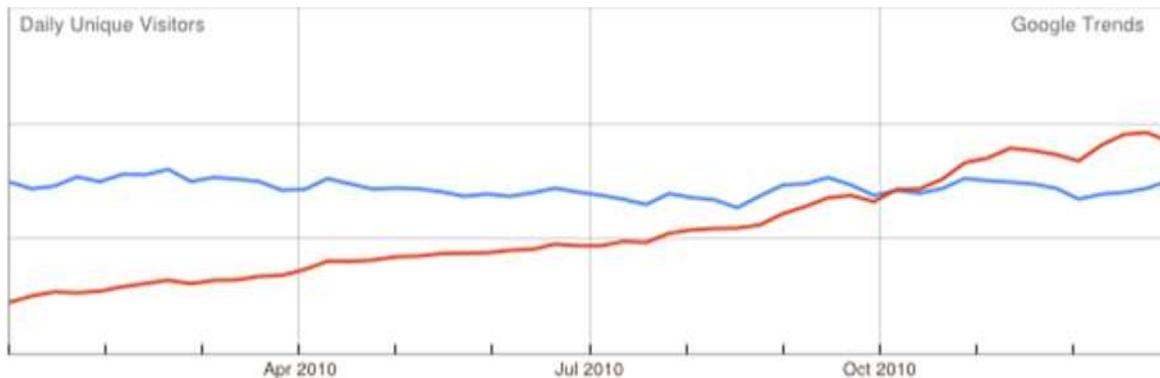
Figure 2: Daily Unique Visitors of iWiW (blue) and Facebook (red) in Hungary 2010

In June 2011 Hyves (Netherlands) was also pushed to 2nd place as seen in Figure 3[2].
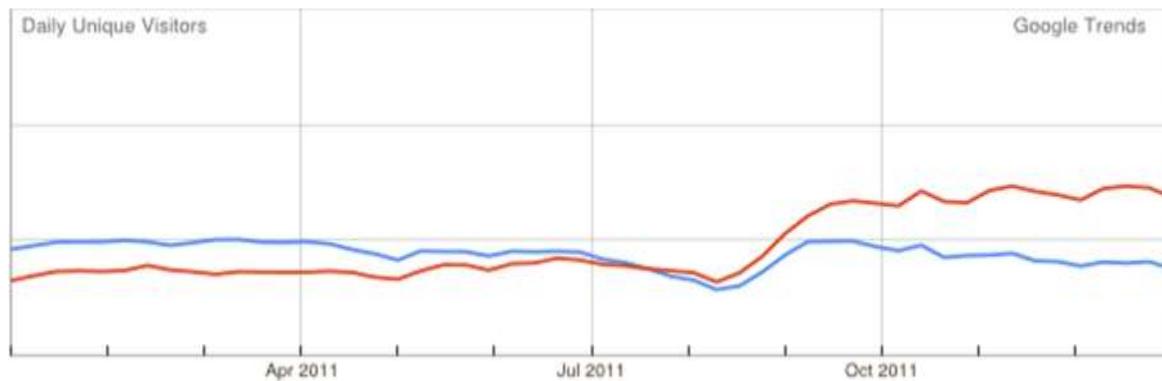
Figure 3: Daily Unique Visitors of Hyves (blue) and Facebook (red) in Netherlands 2011

In Europe Facebook is dominating.

In Russia the most popular site is Odnoklassniki, the second most popular is V Kontakte that is said to be a Facebook clone. This means that Facebook is only on 3rd place.

A comparison of figures on the last years shows that while in 2009 a total of 16 key social sites were operating in Europe, by 2010 it fell to 11, and in 2011 only 6 remained.

The "World Map of Social Networks" (Figure 4[3]) prepared by **Vincenzo Cosenza** excellently reflects how Facebook is gaining space on the international market, and also allows for a conclusion as to the impact of Facebook gaining space on the local social network. The map shows a total of 136 countries; by now out of them in 126 countries Facebook captures first position among the most popular social networks.

The map clearly shows how the continents are "getting blue".
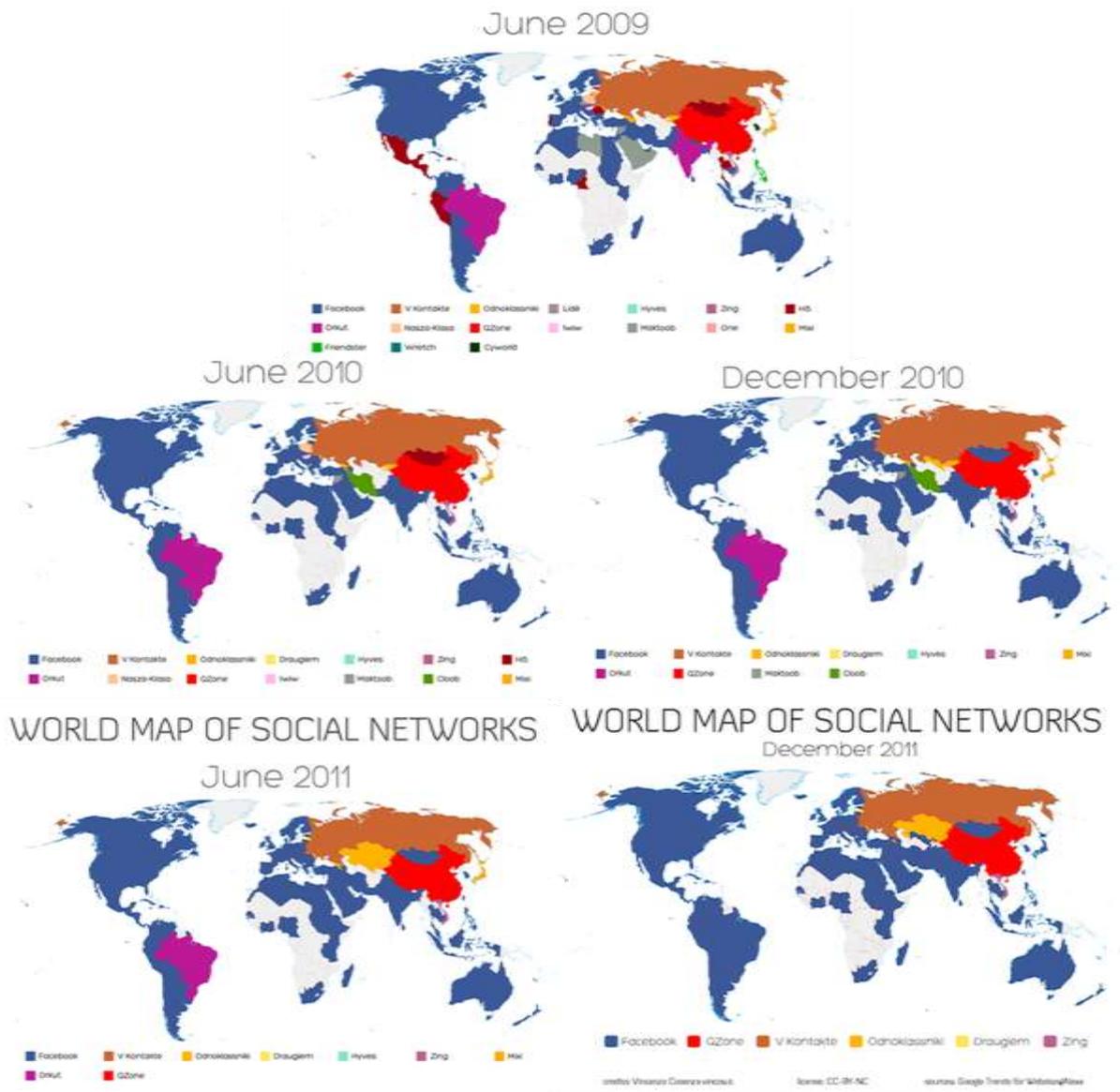
Figure 4: World Map of Social Networks 2009-2011

Table 1[3] shows the three most popular social sites in 22 countries in May 2012. It clearly reflects that out of the countries surveyed it is only China and Russia where Facebook does not have the most users.

Table 1: Most popular sites in 22 countries

May 2012			
Countries	SNS #1	SNS #2	SNS #3
Australia	Facebook	LinkedIn	Twitter
Austria	Facebook	Badoo	Twitter
Belgium	Facebook	Badoo	LinkedIn
Brazil	Facebook	Orkut	Badoo
Canada	Facebook	LinkedIn	Twitter
China	Qzone	RenRen	Rengyou
Denmark	Facebook	LinkedIn	Badoo
Finland	Facebook	LinkedIn	Twitter
France	Facebook	Badoo	Skyrock
Germany	Facebook	Wer-kennt-wen	StayFriends
Hungary	Facebook	iWIW	Twitter
India	Facebook	Orkut	Twitter
Italy	Facebook	Badoo	Twitter
Japan	Facebook	Mixi	Twitter
Netherlands	Facebook	Hyves	Twitter
Norway	Facebook	LinkedIn	Twitter
Portugal	Facebook	Orkut	LinkedIn
Sweden	Facebook	LinkedIn	Twitter
Russia	Odnoklassniki	V Konatkte	Facebook
Spain	Facebook	Tuenti	Badoo
United Kingdom	Facebook	Twitter	LinkedIn
United States	Facebook	Twitter	LinkedIn

2.1.5 Analysis of other platforms

This section presents the analysis titled "State of the Web 2011"[4] prepared by Wakoopa. The research covered 10,000 internet users in Denmark whose internet usage patterns were examined. The key finding of the analysis is that the search market is dominated by Google, while the social site market is by Facebook. The search function attracts more individual visitors, but users spend more time on social sites.

The analysis of 27 million visits found that 18.5% of all visits targeted search (Figure 5). The second most popular function is email sending with 11.8% share, social sites achieved 3rd place with 11.4%. News and buying were 4th and 5th, respectively, on the popularity list.

Danish users spend the most time on social sites, and although in July 2011 Facebook overtook Hyves, users still spend by one minute more on Hyves than on Facebook. Facebook visits have an average duration of 14 minutes, while Hyves reaches 15 minutes. The average visiting duration on Google plus is 6 minutes, on Twitter 4 minutes, on LinkedIn 3 minutes.

What Google loses on social sites, regains it in searching. Out of Danish users 95.8% use Google for searching, Bing is second placed with 2.4%. The key in the success of Google in searching is with high probability that it offers local contents and products to the users. The most frequent search word in Denmark was "hyves", while the second most frequent was "facebook". Out of the Google products half of the visits targeted Google Maps, 36% used mailing.
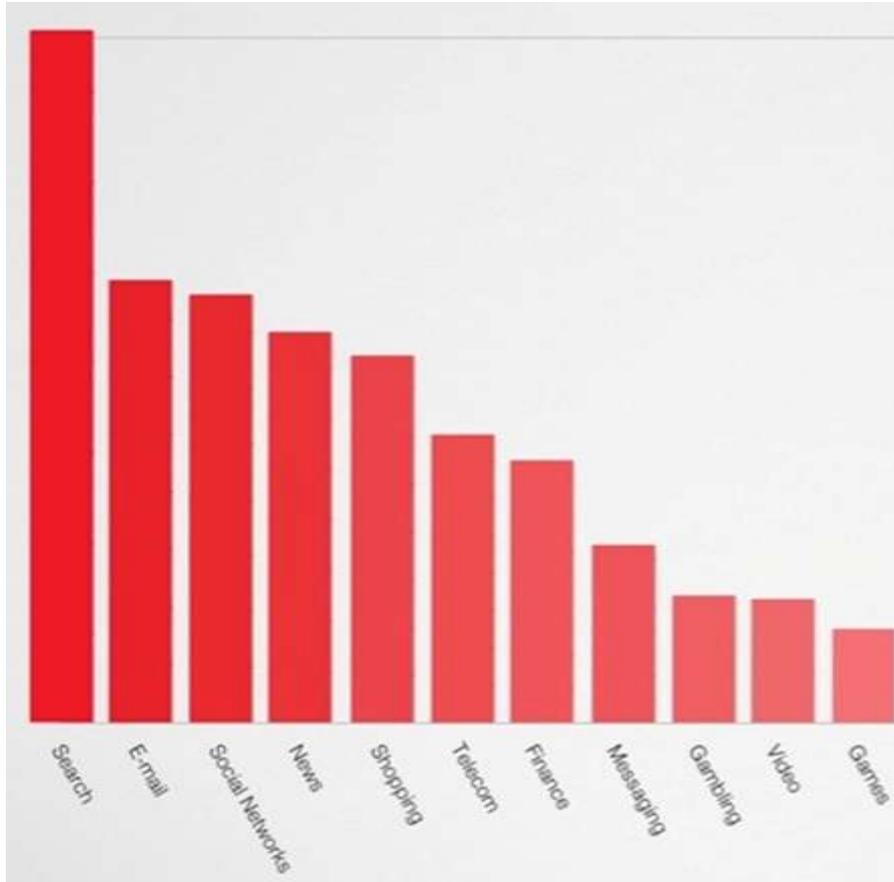
Figure 5: Shares based on the total number of visits in 2011

2.2 Statistics on user involvement

2.2.1 EU

2.2.1.1 Introduction

During the last three years (2008-2010) the EU percentage of individuals (household and individuals) using the internet regularly (at least once a week) has grown constantly: from 56% in 2008 to 65% in 2010 (Figure 6[5]).
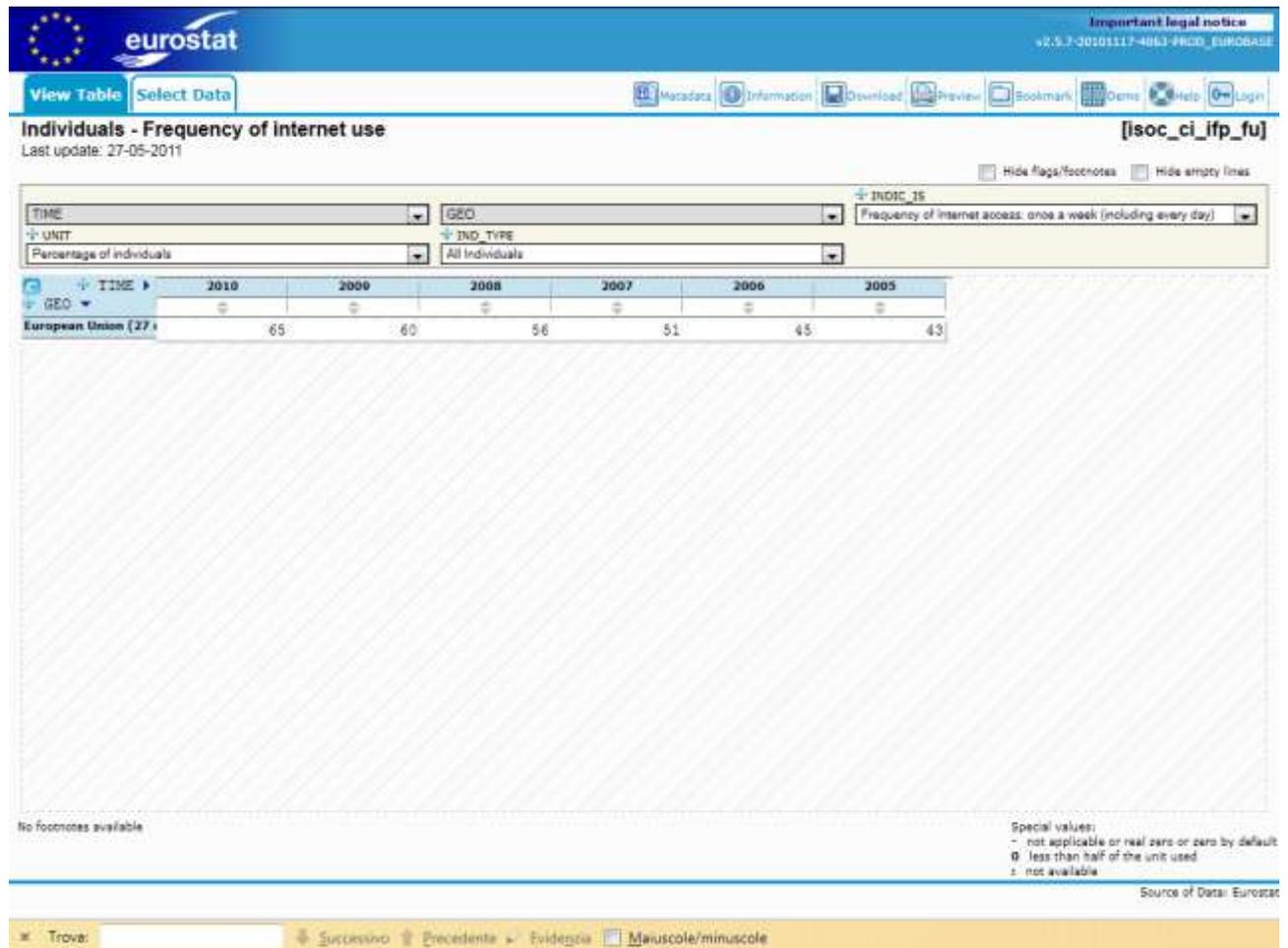
Figure 6: Eurostat data, individuals using internet regularly per year

In 2010 the lowest share of regular internet users is in the age group 55-74 (Figure 7[6]), by the way the percentage increased in the last 3 years from 29% in 2008 to 37% in 2010 as shown in Figure 8[5]:
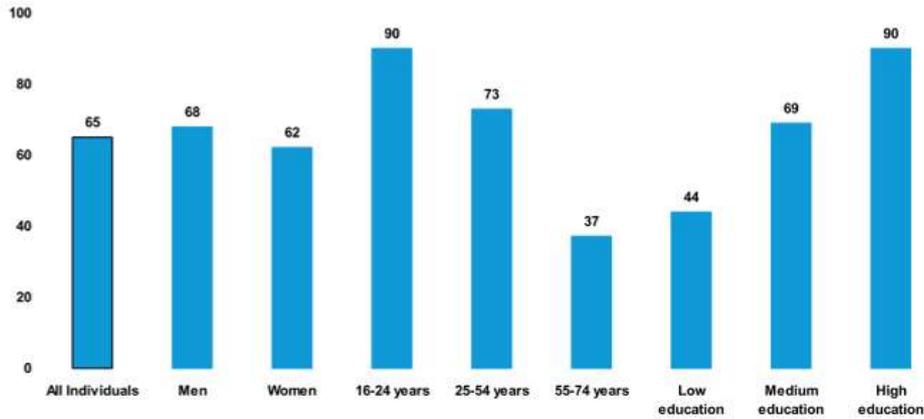
Figure 7: Eurostat data, EU individuals using internet regularly per age group in 2010

Figure 8: Eurostat data, individuals in the 55-74 age group using internet regularly per year

According to the Eurostat data, the individuals in the 55-74 age group which use the Internet most are those having a high level of education, 74% in 2010 (Figure 9[5]).
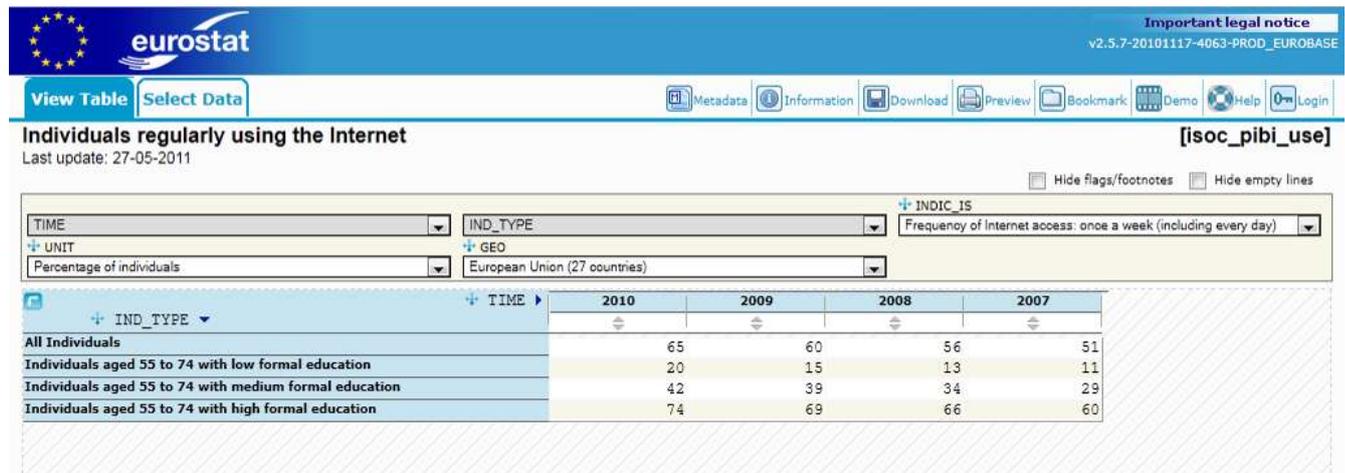
Figure 9: Eurostat data, individuals in the 55-74 age group using internet regularly per level of education

According to the usage type, the analysis highlighted that the elderly's usage of the Internet consists in general communication activities, mainly sending and receiving emails (35%) but also reading news and online newspapers (19%), whereas the participation to social media and the active contribution to the User-Generated Content universe is very low, 7% and 8% respectively especially if compared to the other age groups, such as the 14-24 years old individuals of whom the 75% takes part to the Social Media actively (Figure 10[5] and Figure 11[5]).
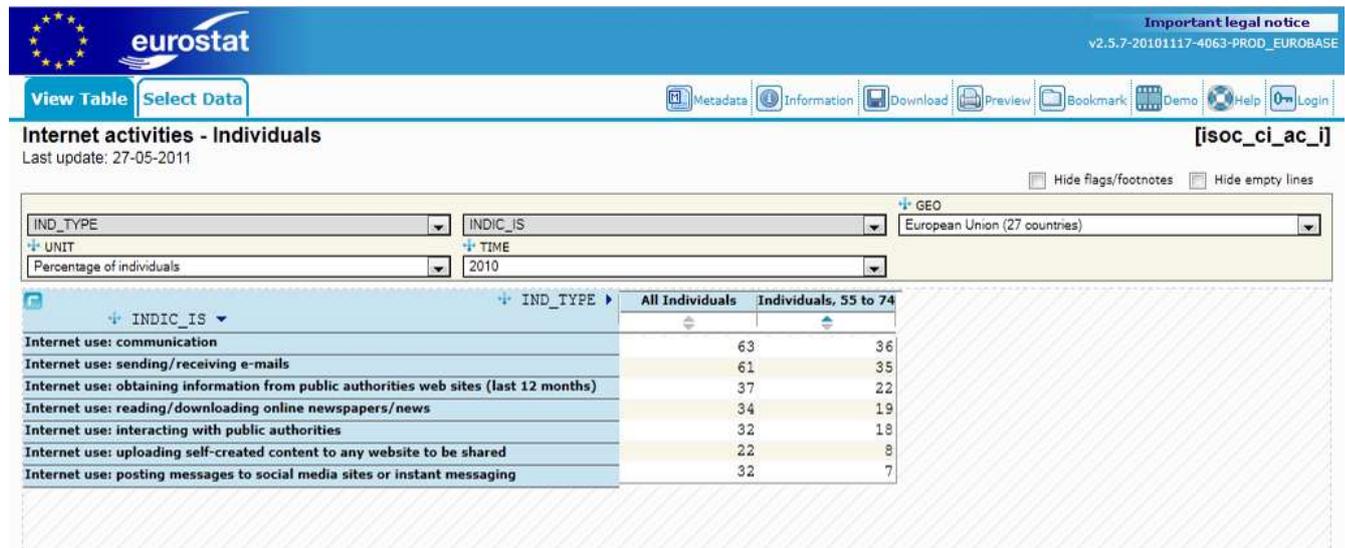
Figure 10: Eurostat data, individuals in the 55-74 age group using internet regularly per usage type

eurostat

View Table | Select Data

Metadata | Information | Download | Preview | Bookmark | Demo | Help | Login

Internet activities - Individuals
Last update: 27-05-2011

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INDIC_IS	IND_TYPE	GEO — European Union (27 countries)
UNIT — Percentage of individuals	TIME — 2010	

INDIC_IS / IND_TYPE	Internet use: uploading self-created content to any website to be shared	Internet use: posting messages to social media sites or instant messaging
All Individuals	22	32
Individuals, 16 to 24 years old	47	75
Individuals, 25 to 34 years old	33	51
Individuals, 25 to 54 years old	23	33
Individuals, 35 to 44 years old	22	30
Individuals, 45 to 54 years old	14	20
Individuals, 55 to 64 years old	10	10
Individuals, 55 to 74 years old	8	7

Figure 11: Eurostat data, individuals in the 55-74 age group using internet regularly per Web 2.0 usage type (content creation and social media participation)

2.2.1.2 The Elderly and the Social Media

As stated by the InSites Consulting research "Social Media around the World 2011", the social networks' worldwide population now accounts for more than 1 billion people.

Entering into the details of the Social Media usage the data shows that it is increasingly a pursuit for the elderly. In Europe as in the US the smallest population according to age using the social network is represented by the elder. Nonetheless the elder are the segment that grew most significantly in the latest years.

According to the data retrieved by Pew Research Center and published in August 2010 half (47%) of online adults *aged 50-65* used social networking sites whereas within the class *over 65* the percentage using social networking sites lowered to 26%.

Nonetheless the percentage of internet users adults *over 50* using the social networking sites has significantly grown in one year and nearly doubled: the *50-64 age-class* grew from 25% in April 2009 to 47% in May 2010[7] and the over 65 grew from 13% in April 2009 to 26% in May 2010 (Figure 12[7]).

Social networking use continues to grow among older users

The percentage of adult internet users who use social networking sites in each age group
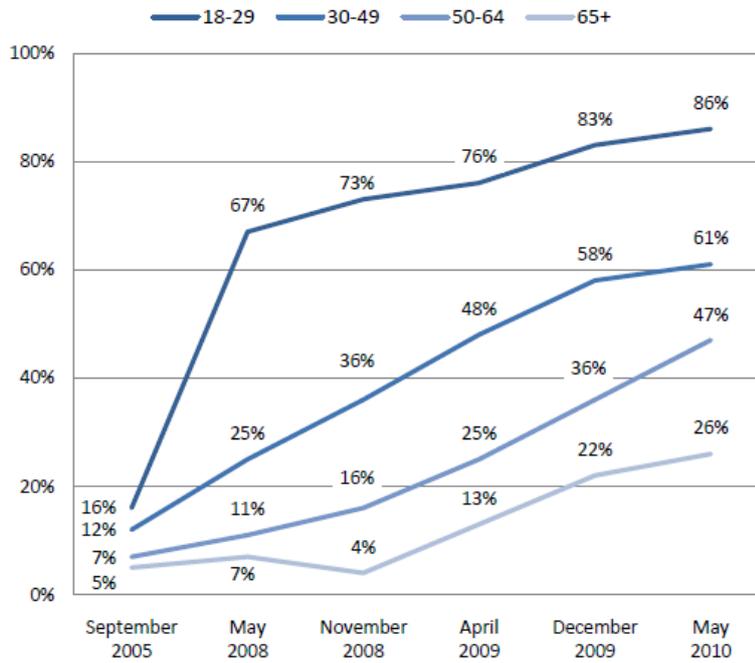
Source: Pew Research Center's Internet & American Life Project Surveys, September 2005 - May, 2010. All surveys are of adults 18 and older.

Figure 12: Pew Study data, US individuals using social networking growth graph per age class

In this context, even if the email still represents the main way for the older people to use the internet and to keep contact with friends/relatives/colleagues in European countries (Figure 10[5]) as well as in the US (Figure 13[7]), social networking is likely to improve its ranking as it is being increasingly perceived as a way to communicate and keep contact with others and as the Internet literacy of the elder is growing: one out of 5 (20%) online adults *aged 50-64* from the Pew Research Center Study declared they use social networking sites on a typical day.

A Typical Day: Where social media use fits in

The percentage of adult internet users who do each activity in each age group

■ 18-29 ■ 30-49 ■ 50-64 ■ 65+

Activity		
Twitter or status update service	18% / 9% / 6% / 3%	
Use online classifieds	14% / 13% / 6% / 5%	
Social networking site	60% / 39% / 20% / 13%	
Do any banking online	27% / 30% / 22% / 19%	
Get news	44% / 45% / 42% / 34%	
Send or read email	62% / 67% / 60% / 55%	

0%   20%   40%   60%   80%
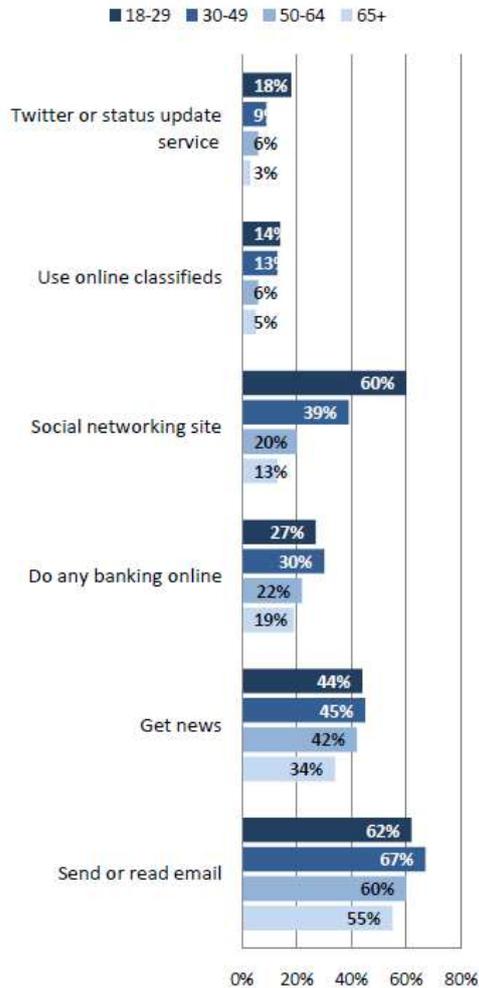
Source: Pew Research Center's Internet & American Life Project,
April 29-May 30, 2010 Tracking Survey. N=2,252 adults 18 and older.

Figure 13: Pew Study data, US individuals' usage type by age class in 2010

Facebook population, the greatest social networking media in the world, mirrors the above stated situation. According to some specific research related to Facebook based on US users, the elderly represent still the smaller population, in 2009 and 2010 (Figure 14[8] and Figure 15[9]) by the way this segment is the one that grew fastest, recording a 922,7% growth in 12 months from 01/04/2009 to 01/04/2010 (Figure 15[9]).
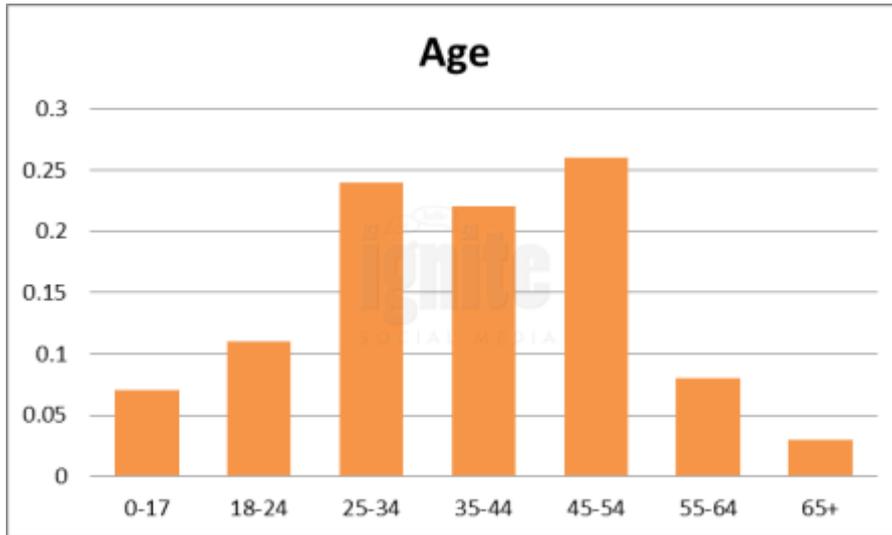
Figure 14: IgniteSocialMedia data: Facebook Age Breakdown in 2010

	As of 1/04/09		As of 1/04/2010		
Gender	**Users**	**Percentage**	**Users**	**Percentage**	**Growth**
US Males	17,747,880	42.2%	43,932,140	42.6%	147.5%
US Females	23,429,960	55.7%	56,026,560	54.3%	139.1%
Unknown	911,360	2.2%	3,126,820	3.03%	243.1%
Total US	42,089,200	100.0%	103,085,520	100.0%	**144.9%**
Age	**Users**	**Percentage**	**Users**	**Percentage**	**Growth**
13-17	5,674,780	13.5%	10,680,140	10.4%	88.2%
18-24	17,192,360	40.8%	26,075,960	25.3%	51.7%
25-34	11,254,700	26.7%	25,580,100	24.8%	127.3%
35-54	6,989,200	16.6%	29,917,640	**29.0%**	328.1%
55+	954,680	2.3%	9,763,900	9.5%	**922.7%**
Unknown	23,480	0.1%	1,067,780	1.0%	4447.6%
Geography	**Users**	**Percentage**	**Users**	**Percentage**	**Growth**
New York	1,622,560	3.9%	2,934,580	2.8%	80.9%
Chicago	797,040	1.9%	1,803,620	1.7%	126.3%
Los Angeles	636,160	1.5%	2,166,840	2.1%	240.6%
Miami	627,840	1.5%	1,113,540	1.1%	77.4%
Houston	560,520	1.3%	1,361,820	1.3%	143.0%
Atlanta	535,300	1.3%	1,967,720	1.9%	**267.6%**
Washington DC	526,460	1.3%	1,429,760	1.4%	171.6%
Philadelphia	498,220	1.2%	1,181,760	1.1%	137.2%
Boston	440,500	1.0%	872,460	0.8%	98.1%
San Francisco	264,460	0.6%	583,460	0.6%	120.6%
Current Enrollment	**Users**	**Percentage**	**Users**	**Percentage**	**Growth**
High School	5,627,740	13.4%	7,989,620	7.8%	42.0%
College	7,833,280	18.6%	3,521,900	3.4%	-55.0%
Alumni	4,756,480	11.3%	32,350,260	31.4%	580.1%
Unknown	23,871,700	56.7%	59,223,740	57.5%	148.1%
Interests	**Users**	**Percentage**	**Users**	**Percentage**	**Growth**
Sex	72,100	0.2%	844,600	0.8%	1071.4%
Drugs	25,440	0.1%	28,800	0.0%	13.2%
Rock and Roll (Music)	3,901,600	9.3%	1,375,080	1.3%	-64.8%

Contact: Peter Corbett, Peter@iStrategyLabs.com
Source: Facebook's Social Ads Platform

Figure 15: iStrategyLabs Analysis: 55+ segment growth in 1 year (01/04/2009 - 01/04/2010)

The over 55 segment growth is represented mainly by women (as of data referring to the US Facebook in 2009)[10] and its trend is consistent with the general trend of Facebook total population in 2010, where more than 60% of the population is constituted by women (Figure 16[10])
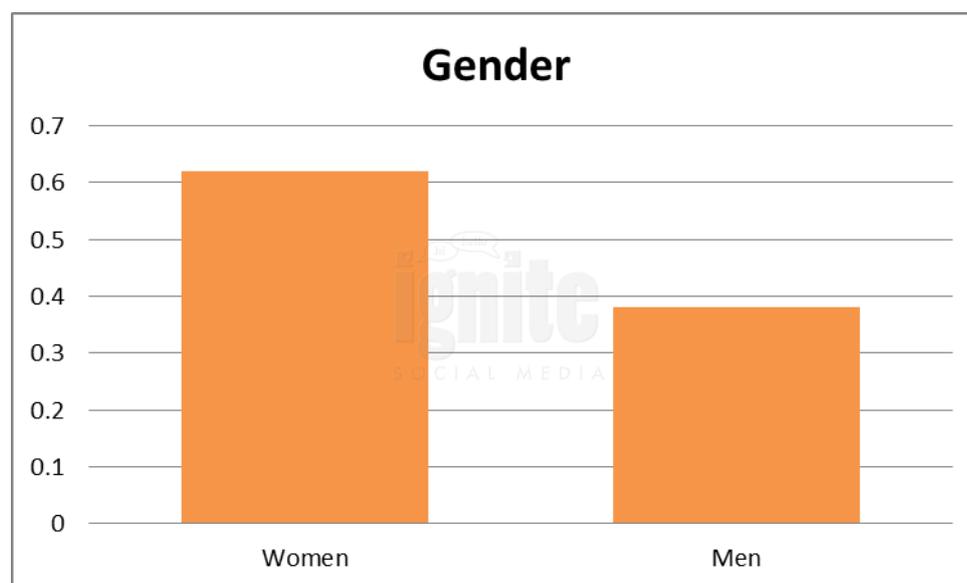
Figure 16: IgniteSocialMedia data: Facebook population in 2010 per gender

2.2.1.3 Reasons for social networking

People using social networking platforms connect with their offline friends and discuss about offline experiences. Also for the elder the social networking is increasingly turning to be a way to manage their daily communications, sharing links, photos, videos, news and status updates with a growing network of contacts.

In the case of the elderly, the main drivers for social networking are[7]:

- reconnecting with friends,
- sharing information on disease and the related difficulties,
- bridging the generational gap.

The benefits are numerous as according to the Pew Survey[7] the social networking users are likely to reconnect with friends which can provide a powerful support network during retirement or when embarking on a new career: The 64% of social networking users have searched for information on old friends.

As the "disease" driver is concerned, the survey highlights how the elderly are more likely to live with chronic disease, therefore they look for others sharing the same problems to get new information or simply relief from their pains and concerns.

2.2.1.4 Focus on Facebook

As reported by "Social Media around the World 2011" research, the most famous Social Network in the world is Facebook whose awareness is close to 100%. Forecasts say that

Facebook is also bound to stay the first, since 60% of the interviewed do not want any new social network and 93% are happy with what they have.

Also the elderly mainly use Facebook and LinkedIn when social networking, as reported in the Pew Survey: Half of online adults ages 50-64 say they are member of Facebook and LinkedIn.

On Facebook there are numerous groups aggregating the older people. The driver for aggregation is mainly represented by age with a prevalence of small groups up to 35 members.

The lifecycle of these groups is short: only few groups animated by elder people resist over time.

The main reasons observed are:

- inactivity of the members for a long time,
- slowdown of the initial enthusiasm.

Nonetheless there are a limited number of members that are continuously trying to stimulate the other to participate and frequently express their wish for having "more life" in each group.

The groups' trend is to comment over elder life and its positive/negative aspects, generally interwoven with the members' open wish to overcome loneliness by chatting with someone and finding new friends.

In the Italian groups members connect to Facebook simply to wish good-morning/night to the other members which could be an indicator of people wishing to overcome a state of solitude. Most of them like to share memories from the past or to tell others about their fitness activities. Related to the number of posts, the most discussed topics are kitchen/sharing recipe and lyrics.

Women are very active and present on Facebook. The search retrieved numerous groups and personal pages restricted to women, for instance:

- FOR WOMEN ONLY, OVER 60 ♥ http://www.facebook.com/pages/FOR-WOMEN-ONLY-OVER-60-/328619246603
- Ladies over 60 http://www.facebook.com/pages/Ladies-over-60/145526175510117
- Fit Women Over 60 http://www.facebook.com/pages/Ladies-over-60/145526175510117
- Beautiful Over 60 http://www.facebook.com/pages/Beautiful-Over-60/213887361962485

This situation is consistent with the overall general trend of Facebook with relation to elder people (see "The Elder and Social Media" paragraph above) were the women are identified as the growing segment. In the aforementioned groups, the most favourite topics are beauty/health and fitness strategies.

Below follows a synthesis of a sample of groups retrieved both in Italian and English language:

Table 2: Synthesis of a sample of groups retrieved both in Italian and English language

Name and URL	Langu-age	Mem-bers	Aggre-gation topic	Main topics discussed
OVER 60!!! http://www.facebook.com/group.php?gid=33795533533	ITA	394	Age	Greetings (good morning/night) Comments on elder life Comments on past experiences/childhood/adolescence Sharing personal grieves/losses Lyrics
SESSANTENNI E PIU' SU "FACEBOOK" http://www.facebook.com/group.php?gid=44077648879&v=wall	ITA	379	Age	Greetings (good morning/night) Kitchen/Recipes Lyrics Comments on elder life Comments on everyday life/events Facebook utility Vacations/Travels
Over 50 http://www.facebook.com/group.php?gid=45518345298	ITA	216	Age	Greetings (good morning/night) Comments on elder life Comments on everyday life/events/politics Sharing life experiences/hobbies Reading Politics Charity
Over 50 http://www.facebook.com/group.php?gid=40624667132	ITA	66	Age	Comments on elder life Fitness
Quelli che hanno più di sessantanni (aperto anche ai cinquantenni) http://www.facebook.com/group.php?gid=46070722930&v=wall	ITA	16	Age	Memories Direct meetings Facebook/PC usage
Hams over 60 http://www.facebook.com/group.php?gid=349727425734&v=wall	ENG	84	Radio + Age	Comments on elder life
Singles Over 60 http://www.facebook.com/group.php?gid=54067335984&v=wall	ENG	32	Dating	Dating Friendship
Women Over 50 http://www.facebook.com/group.php?gid=26539201113	ENG	192	Age	Comments on elder life (pros/cons/advices) Health / Beauty Sharing personal grieves/losses (divorce) Sharing life experiences/hobbies After retirement leisure and jobs

2.2.1.5 Conclusions

The results of the study contributed to the profiling of the targeted users for the Elder-Spaces platform and to define accordingly the main requirements the platform should have from the Social Network providers' perspectives.

Synthesizing the study findings, the Social Network provider addressing the over 55 users should:

- consider that the most likely user of the networking applications is profiled as follows:
  - gender: a woman
  - level of education: medium/ high level of education
  - profession: retired
- satisfy the main reasons for elder people networking, i.e.:
  - connecting with friends to overcome loneliness/powerful support network during retirement or when embarking on a new career;
  - sharing useful information on health issues;
  - sharing information related to hobbies
- builds activities on topics like: cooking, beauty and healthcare
- builds activities on offline experiences
- take into account the main weakness of observed groups of over 55 aged people: their short lifecycle due to a rapid slowdown of incentive and motivations.

Last, but not least, that Facebook cannot be ignored as being the social network mainly used by the elder people.

2.2.2 Greece

2.2.2.1 Introduction

Computer usage and Internet access are growing the last years in Greece, both in terms of individuals and households. We are to introduce at first some general information regarding these aspects, and then we will proceed with the relationship of elderly and the social networking in Greece.

2.2.2.2 Demographic data in Greece regarding new technologies / internet

According to the "Hellenic Statistical Authority", from 2006 to 2010 there is a growth of 10.8% in computer use and 15.5% in internet access, as shown in Figure 17[11].

Computer use and Internet access: (1st quarter 2006 – 2010)
(% of individuals)
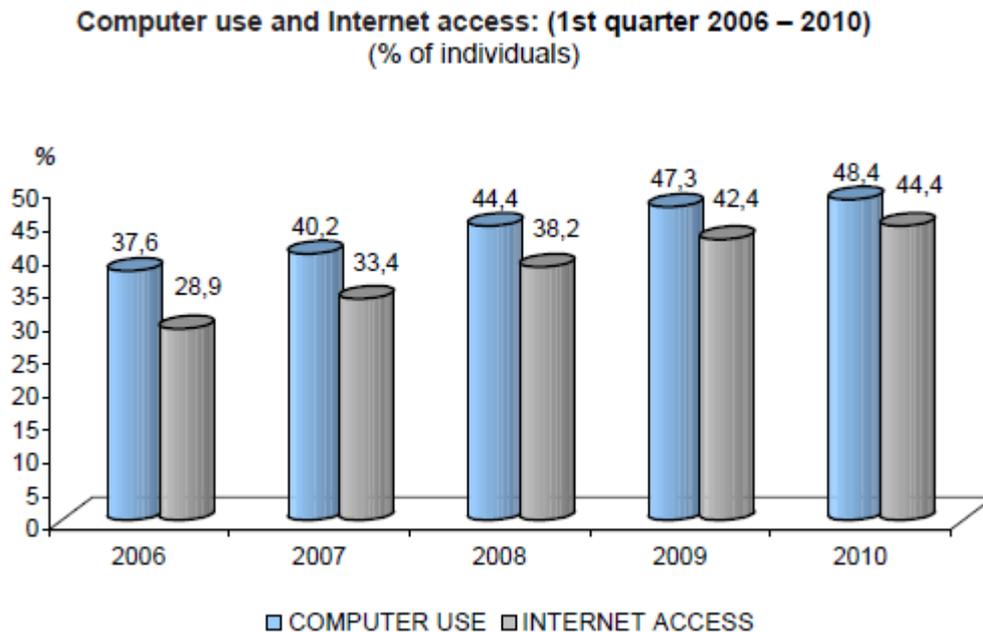
Figure 17: Computer Use and Internet Access, Greece, 2006-2010

Trying to explore which groups of people in Greece are using internet, we can see Figure 18[11].
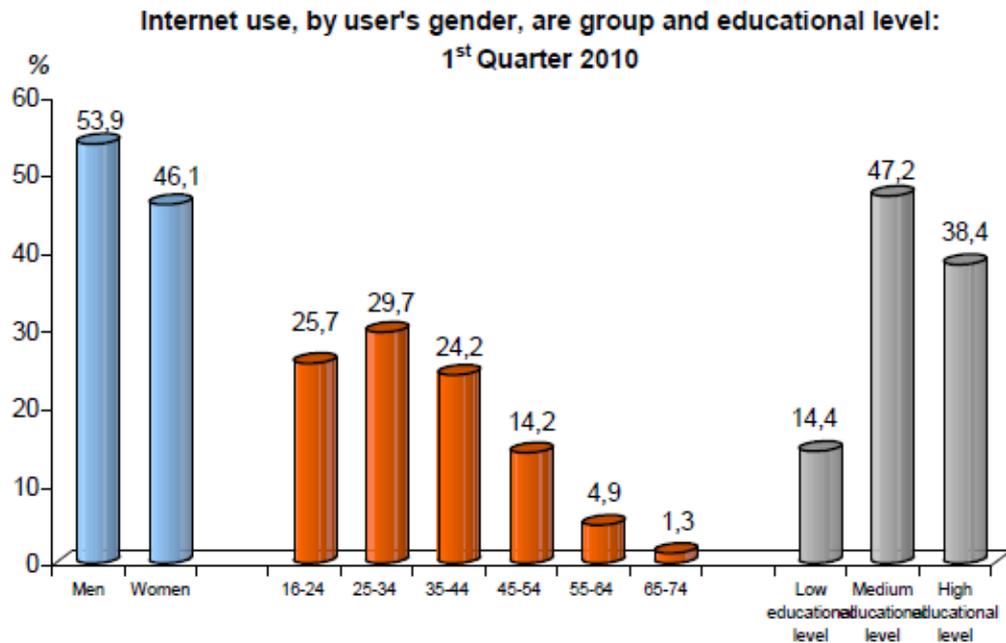
Figure 18: Internet Use by gender, age and educational level, Greece, 1st Quarter 2010

The most usual profile is that of a male aged around thirty with medium educational level. Regarding the age groups that concern our project, 55 plus, there seem to be relatively low internet use, as only 6.2% of total users belong to this age group.

In Figure 19 the frequency of internet access is depicted. Since 2006, it is constantly growing.
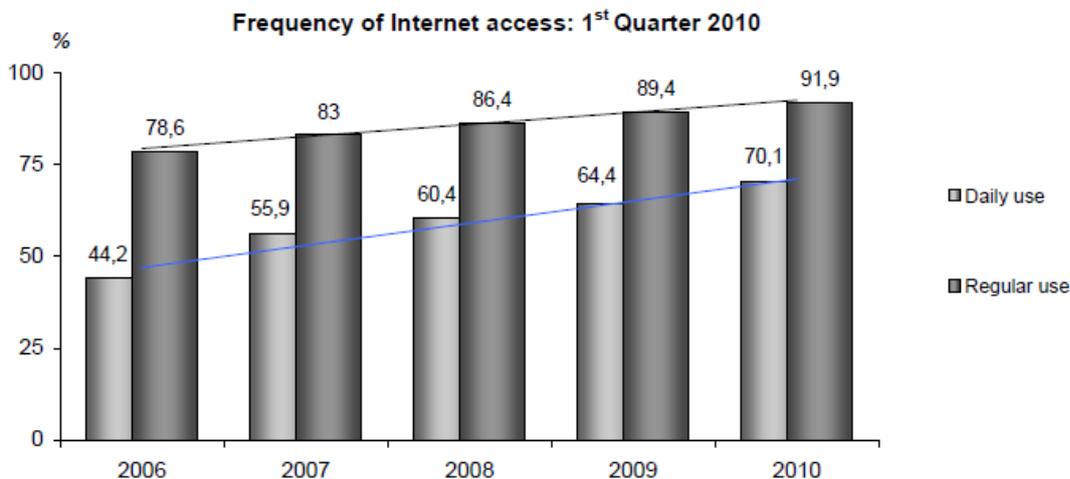
Figure 19: Frequency of internet access, Greece, 1st Quarter 2010

Another important aspect is the means used to access internet. Nowadays there is a growing trend in using mobiles and smart phones in order to achieve this. In Figure 20 the correlation with gender, age and education is displayed.
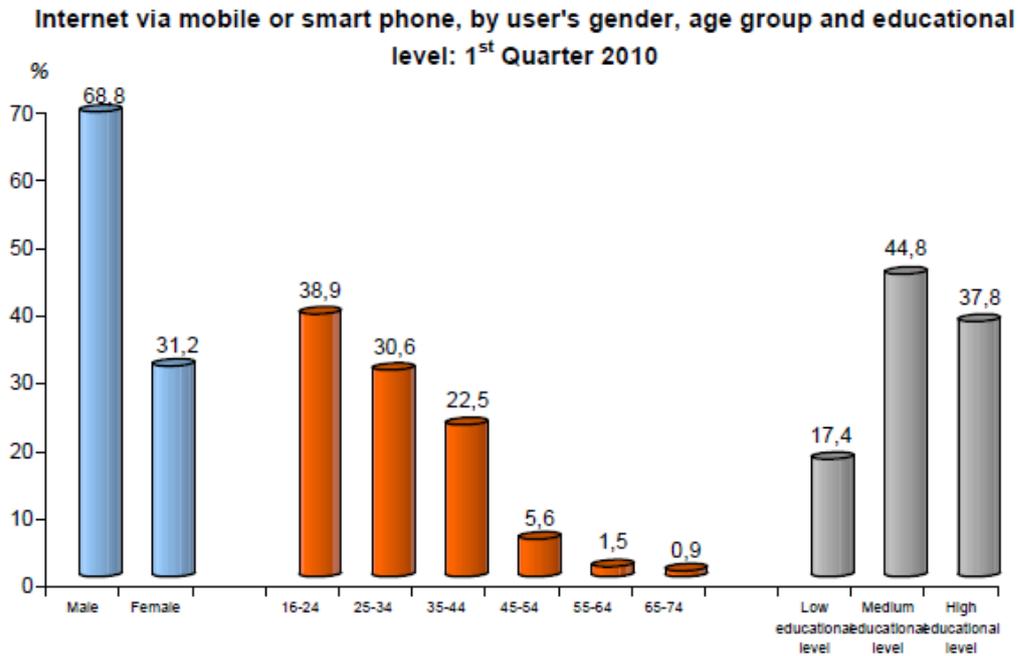
Figure 20: Internet via mobile or smart phones by gender, age and education, Greece, Q1 2010

Here, the dominant profile is that of a young male aged around 20 of medium educational level. For the age group of 55 plus, this way of accessing internet is quite infrequent (only 2.4% for this category).

As far as households are concerned, since 2006 there is a growing trend in computer and internet access, and a rapid one on broadband connections. This fact is clearly depicted in Figure 21.
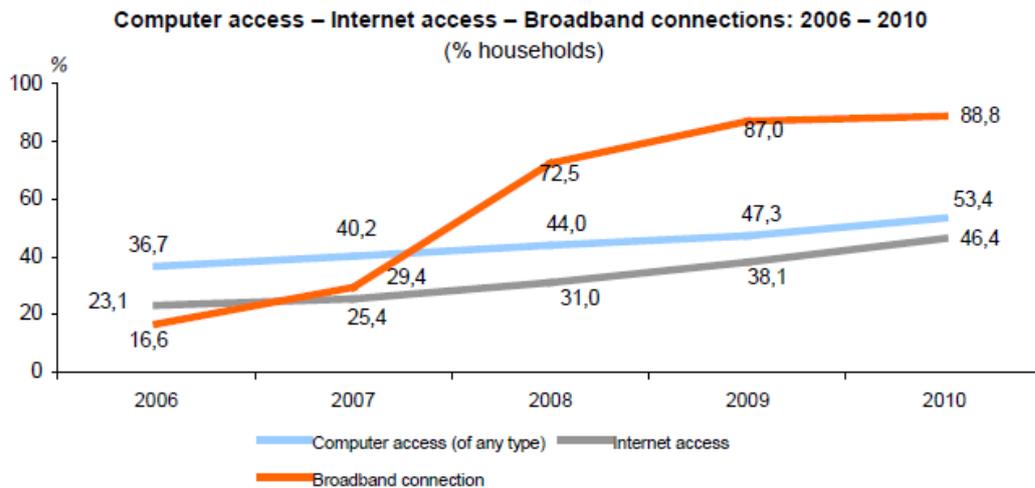
Figure 21: Computer/Internet access, broadband connections, Greece, 2006-2010
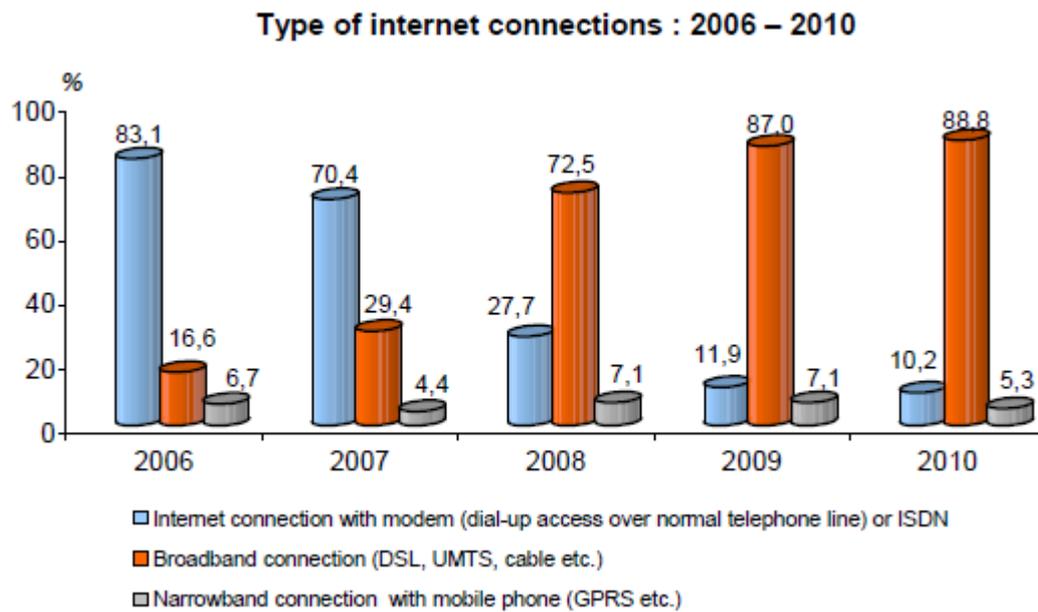
Figure 22: Growing trend of broadband connections, Greece, 2006-2010

Dealing with the main reasons for not having internet access at home, Figure 23 and Figure 24 are quite self-explanatory.
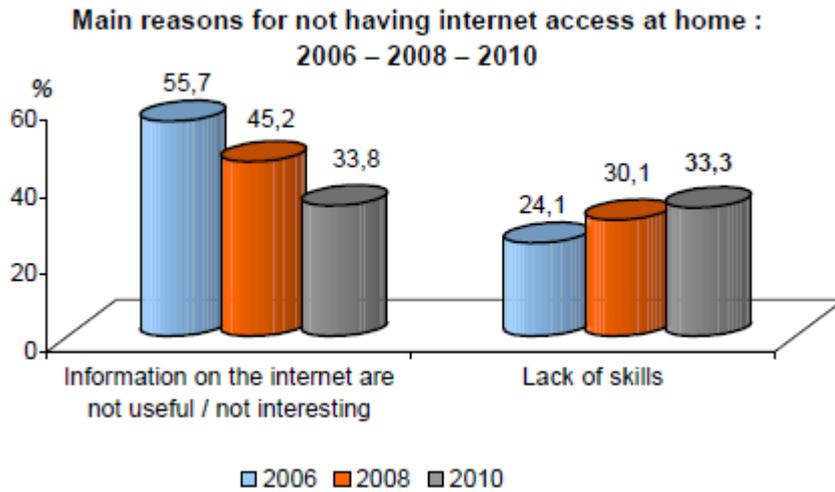
Figure 23: Main reasons for not having internet access at home (1/2), Greece, 2006-2010
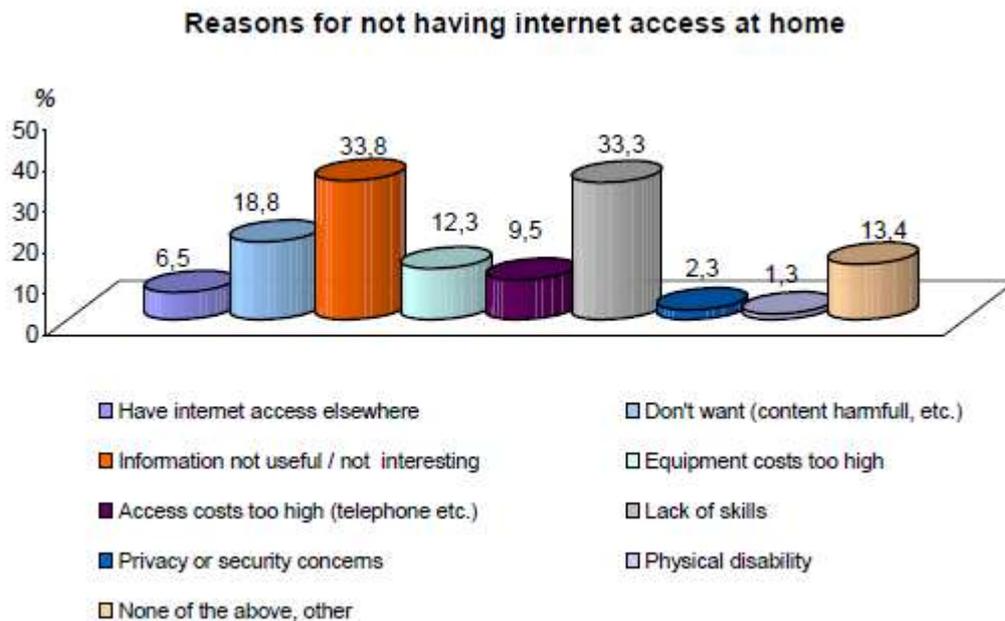
Figure 24: Main reasons for not having internet access at home (2/2), Greece, 2010

2.2.2.3 Social Networking in Greece

Besides the use of technology and internet, in Greece social networking is also growing in terms of users either on Facebook or Twitter. For the scope of this report, we have collected data only for Facebook.

Figure 25: Main statistics for Greek users of Facebook

From Figure 25[12] many statistics may be extracted, regarding the use of Facebook in Greece. We are to present the most valuable for our project:

1. In total 3,385,800 users (until 22 June 2011) are using Facebook in Greece, that is the 68.64% of general online Greek population.

2. The percentage of the Greek audience in regard to the global audience is 0.49%.

3. For the age group 55-64 there are recorded 59,840 users, meaning 1.8% of the overall Facebook Greek users.

4. For the age group 65+ there are recorded 61,880 users, meaning 1.8% of the overall Facebook Greek users.

5. So, for our concerning age group of 55+, we get the figures 121,720 for users and 3.6% for the overall percentage.

6. 1,858,080 users (55.8%) are male and 1,473,400 users (44.2%) female.

In Figure 26[13] the age growth trend in Greek users of Facebook, as measured in May 2010, is displayed.
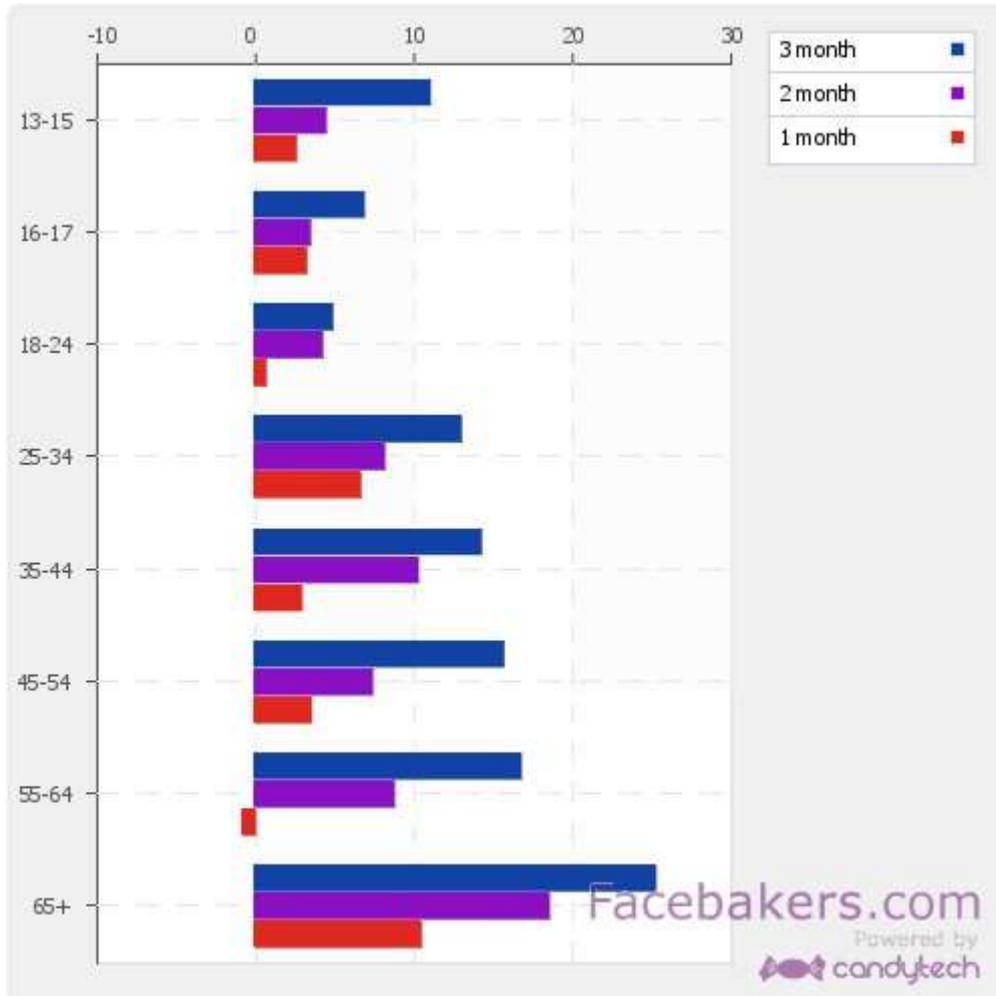
Figure 26: Age Growth trend in 1, 2 and 3 month timeframe in Greece

2.2.2.4 Conclusions

From our survey, we have not located many active initiatives in Greece regarding the age group 55+.

We have also not located any applications in Facebook which target only people above the age of 55.

Most of the active groups in Facebook, which have over 100 members, refer to all ages and not strictly to ages 55 plus.

Nevertheless, there are a few groups in percentage that their audience is limited to people aged over 50/55.

2.3 Scientific challenges and technical requirements

2.3.1 Social network providers' point of view

Creating and operating a social site targeting elder people involves numerous scientific challenges for the professionals that create and operate the site. In addition to the technical solutions great challenges lie also in finding out what makes a site attractive to elder people, which functions elder people need, and which functions are available for them only on these sites.

The social network provider needs to find an answer to the question how to translate user and sales demands to product development.

Content

- interesting for elder people, content related to age

Useful functions

- Patient logbook, medicament logbook that can be viewed by the physician

- On profile pages place of residence can be highlighted so that elder people can contact each other not only virtually, but also physically.

- Involving patient communities in the site so that they can discuss arising problems by chatting, on Skype.

- Social events should be accessible on the site.

- Integrating the social service systems: elderly homes, day-care centres, how people can get access to them

Organizing aid for physical problems

- Elder people's playground: a novelty, dedicated to elder people that helps physical exercise, with many benches to help elder people meet.

- Churches: churches play an active role in service supply to elder people: support them with programs, service supply and other aid

- Hospice

- Online space for voluntary helpers and elder people needing aid: elder people can obtain information about help they need: cleaning, shopping, tree cutting, transport to physician, while voluntary helpers can register.

Aid for psychological crisis problems

- Prevention, aid not only for physical but also for psychological crisis problems: elder people have a high suicide rate

Applications against mental degeneration

- logical tasks, Sudoku, crossword puzzle
- functions for reliving personal experiences: gathering memories about school, workplace, travel

Knowledge base with practical information: "Good to know"

- Contact points of social aid services
- Preparing for decease, arranging things while having a sound mind
    - determining who will inherit when there is no lawful heritor
    - administrative matters connected with burial, clothes, coffin,
    - last will, determining whether he/she should be kept alive unconsciously in the case of given diseases
- Presenting legal regulations, e.g. that laws exist in Hungary allowing relatives to stay in the hospital by the side of a dying patient.

Subtenancy agency service

- moving nurse to the home of patient needing care, e.g. for placing the infusion each day

How can we convert needs (sales & users) into product development?

- social network market research specifically for the 55+ age bracket (end user requirement)
- basis of the development has built on the analysis of recent users social network usage
- navigation paths, analysis of statistics

2.3.1.1 Technical requirements, basic functions of social sites

The basic tool of social sites is contacts and the contacts net. The site user obtains information shared by their contacts, this information makes the site content personal for them. That is why the user decides who to accept as contact, whose shared information they want to obtain. Contacts and the contacts net created from them constitute the basis of a social site.

2.3.1.2 Other basic tools

One-on-one interactions: a major tool for the users to build and keep their contact net is to have "personal" interactions with others. Various forms of "personal" interactions exist on social sites. Such forms include messaging, chatting, the "like" function and commenting.

One-multiple interactions and multiple-one information flow: the objective of one-multiple interactions is to enable users share information with a specified group of their contacts, while the objective of multiple-one information flow is to enable users obtain information about the contents generated by their contacts. Functions that can be used for this purpose include feed, clubs, forums, events.

2.3.2   Developers' point of view

Based on the conceptual pillars and user requirements we have identified two main technical perspectives and challenges in the design and development of the Elder-Spaces platform:

1. the specification and implementation of a flexible, powerful social networking infrastructure, and

2. the creation and maintenance of an evolving set of social applications, administrative utilities, knowledge-based widgets, which will improve the older people experiences from using social networks

In this section we have identified and analysed the technical requirements and the technological considerations with regard to the implementation of the Elder-Spaces platform from the point of view of the social infrastructure providers and stakeholders and application developers.

2.3.2.1 Social Applications Design Patterns

As already stated, the Elder-Spaces Platform involves a social networking infrastructure (serving as the platform's backbone) and several social applications for promoting interaction among users, their communication activity. Several approaches have been identified for developing and deploying applications in social networks. However, most social application designs have the same structure: application data, social data, and a template are combined to provide a rendered view to the end user.

In a social network, like the proposed Elder-Spaces platform, these components can come from several places:

- Client-Side applications can use JavaScript to render data into a template;

- social networks can store both social and application data; and

- server-side applications can take advantage of databases and server-side frameworks to produce rendered output.

The following paragraphs provide an overview of three social applications' design patterns, corresponding to different application typologies and technological configurations.

Social Mashup

A social mashup is a lightweight application which runs inside of a social network. Because such applications do not rely on a server, they typically scale extremely well but may be limited in terms of data storage and/or processing.

Social Application

A social application runs inside of a social network but relies on an external server for processing and rendering data. These applications can provide advanced functionality but may run into scaling problems when they become very popular. Social applications can be created using a variety of technologies, including HTML, JavaScript, CSS, Flash, PHP, Python, Java, Perl, .NET, or Ruby.

Social Website / Social Mobile Application

Social websites and social mobile applications run outside of social networks but consume social data through REST or RPC APIs. Users of these apps can grant access to their data using authentication protocols without needing to add an application on a social network.

It was also defined that the social networking applications including the concept based semantic research will be designed and implemented basing on both mechanism and APIs (Application Programming Interface) able to support the various users' sessions, the adding/modification and cancellation of users, data listing and access to related metadata.

A list of API have to be defined and implemented for granting an high designing level of the Elder-Spaces platform with reference to data model, data Access services, the supported functionality and the interface.

The basic requirements for the social networks have been identified: Friends List, geocoding, member profiling, contacting functionalities, but also:

- customized and searchable contents - adaptation of all the contents to the specific needs of the targeted users and on their individual preferences. Accessibility of the contents through searching functionality. (This aspect will be specifically carried out within WP3 and WP5 during the semantic research related tasks.)

- web-based infrastructure – the infrastructure needs to be based on modules and application accessible from the web.

- presence of Community functionalities – such as photo galleries, forums, polls.

Consequently, the above-mentioned conceptual pillars imply that the proposed Elder-Spaces platform is going:

- to address both the user/social and the object oriented perspectives;

- to allow the user to perform also stimulating activities through innovative stimulating applications for enhancing social interaction and overall increasing quality of life and well-being of older adults;

- to enable the intelligent delivery of resources to users through the social and concept based search.

2.4 Techno-economical and business requirements

Considering the smartphone, tablet, IPTV usage patterns of the given target group, a social site designed for elder people must be a multi-platform product. Developing the product on a new platform always requires additional investment.

2.4.1 Elder-Spaces platform product development steps

- Finalizing and testing the concept

- Developing the marketing strategy (sales & communication)

- Profitability analysis (investment & operation)

- Performing the product development

- Market testing (research, pilot)

- Market introduction
  - social network market research specifically for the 55+ age bracket (end user requirement)
  - basis of the development has built on the analysis of recent users social network usage
  - navigation paths, analysis of statistics

2.4.2 Business requirements

In the Elder-Spaces project our main goal is to develop a sustainable business from the AAL project results.

To enable the provision of a financially stable service, we can consider the following financial models. Although earlier the general business model was to capture the highest possible number of visitors, then we will see how to make money out of it; today the world of internet is working differently.

2.4.2.1 Display advertising

Display & text advertising: Earlier revenue sources were display advertisements and text advertising. This has changed, now more opportunities exist for revenue generation. However, sites living on display advertising work against their own visiting because the higher the visiting rate of a site is, the higher the number of clickthroughs to an advertiser's banner will be.

Examples are iWiW, yahoo, nyt, Washington post.

2.4.2.2 Freemium model

This solution offers basic functions free, while pay functions also exist. The largest online gaming and partner finding services use this model. The greatest challenge is to find a balance between free services offered to users and services for which they are ready to pay.

Examples are LinkedIn, Flickr, Vimeo.

Figure 27: Payment-page for additional services on Csajok és Pasik

2.4.2.3 Affiliate model

This model is based on turnover channelling; the affiliate partner pays for the turnover, for clickthroughs and purchases. This model is used in most cases for sites with high turnover, and for boosting start-up services.

E.g. iWiW main page

Figure 28: Affiliate model example on iWiW-main page

2.4.2.4 Virtual currency

It can be the most frequently used revenue source for gaming.

Example: Farmerama
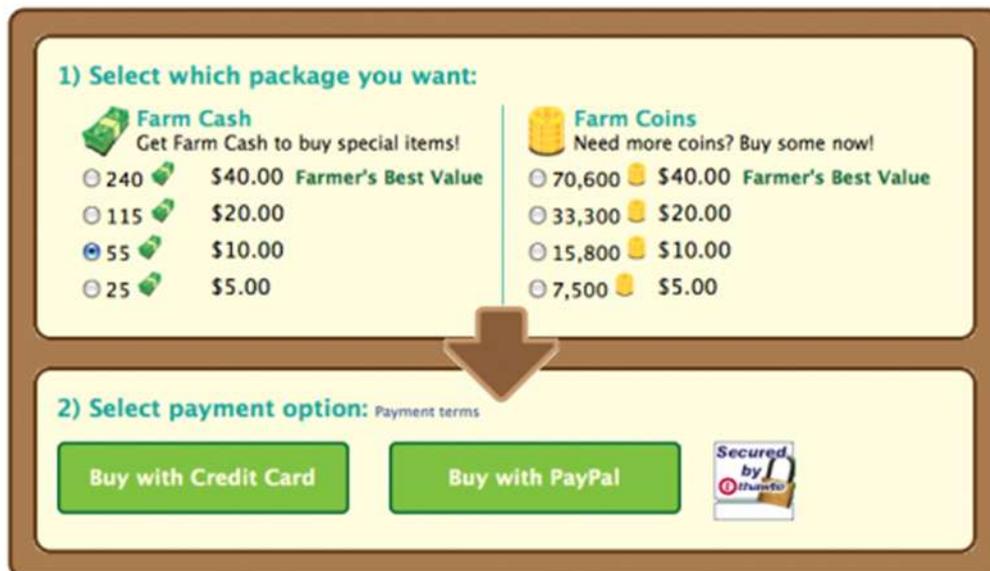
Figure 29: Payment-page for Farm Cash on Farmerama

2.4.2.5 Subscription model

The subscription model offers the given service subject to monthly or annual subscription. Various forms of this model exist:

- subscription for a fixed service,

- subscription for unlimited use of a service,

- subscription for the basic service, surcharges for premium services.

2.4.2.6 Branding certain elements within an application

A design is made for a given application during a campaign period.

Example: Coca Cola iWiW campaign

Figure 30: Coca Cola iWiW campaign

Coca Cola sponsored the "Send a drink" application on iWiW. This way users sent 168,000 sponsored Bacardi Cola drinks to 763,000 friends, which is a really amazing figure. What is even more shocking is the total presence of the brand: the Coke related content was displayed on more than 14,000,000 occasions within the "Send a drink" application in the campaign period. The Coke Club logo and campaign message was displayed on monitors on a total of 18 million occasions.

2.4.2.7 Pay per click ads

Pay per click is an advertising service where the advertiser pays for the banners which guided the users to the advertiser's website. It is financially much more advantageous for the advertiser than conventional banners when settlement is based on display of the banner.

Examples: Google, Facebook

2.4.2.8 Sponsored stories on Facebook

It is a special Facebook advertising form connected to Pages. When "liking" a page the feed element entered in the user's feed is sponsored, i.e. edited by the owner of the page, with picture and description.

2.5 Operational requirements

2.5.1 Operational distribution or deployment

Elder-Spaces will be hosted in ORIGO's iWiW clone web site.

As a web site, it will be able to access it through Web Enabled TV sets with the appropriate network connection.

Furthermore, Elder-Spaces will be available through the Microsoft Surface tabletop. Applications specifically designed for this device will be pre-installed before deployment.

2.5.2 Audience Profile

The Elder-Spaces social network should provide the means for enhancing social interaction between elder people using the platform, younger people joining in intergenerational activities and professionals caring for the elder.

By increasing the involvement of elder people in new activities, socializing and exchanging experiences, this social network aspires to improve the quality of life for its users.

Users should be able to socialize, interact online and offline, exchange experiences, knowledge and communicate. The system should provide entertainment and a diverse collection of activities and events which will keep them engaged and enhance their social interactions.

This social network has to be accessible from:

- Web browsers
- Microsoft Surface 2.0

2.5.3 Performance and related parameters

This system is primarily intended for socializing, entertainment and education. It is not an enterprise application, so performance is mainly related to response speed.

Measures have to be taken to ensure that both processing power and bandwidth allocation is sufficient for short text and multimedia content. Of course, one must take into account that user's internet connection has a definite effect on perceived performance. In this section we emphasize mainly on the systems response rate.

- Response time of simple functions should be under the 5 second threshold.
- Searching can be a complex procedure but should be concluded in a matter of seconds.
- Multimedia content should be available also in a matter of seconds.

A relative large and fast storage system should be used to ensure that there is adequate space to store user's data and mainly multimedia content (photos, videos, etc.). Data recovery speed is also important as it directly affects perceived response speed.

Data Clean-up and maintenance of the underlying structures should be an issue, as it will be important to maintain a constant performance level as perceived by the users. Automatic

schedules and monitoring KPIs related to the data stored will be necessary to maintain and monitor in order to ensure smooth operations and a constant service level.

It is important to setup and maintain an automated mechanism for monitoring system performance.

- Web statistics are a useful way to monitor most of the system's high level performance (user wait times, bandwidth utilization, number of new/recurring users, attrition rates, conversion rates etc.).

- Internal audit and error checking. The system can inherently maintain records of major user actions and an even more detailed error log. Information of user behaviour in the site and particularly failures to achieve an objective need to be gathered and processed to enhance the system's performance and effectiveness.

- Quality engineers' input. A testing / quality assurance team should participate in the social network, interact with users and experience the system first hand. Such a team will provide accurate feedback on potential issues of performance degradation or other problems.

- User feedback. It is always important to allow users to express issues they may have with the system. There should be such mechanisms in place to allow users to express any issues they encounter on site's operations and such items should be evaluated and resolved accordingly.

Capacity

Capacity refers to two aspects that influence performance:

- The number of concurrent users that can be supported by the system.

- The amount of data that the system can store and process.

The system should have adequate resources to satisfy both. Furthermore, the system should be scalable to adjust to additional users and their related traffic.

Availability

The system should be available to users 24/7. As utilization increases, so does the requirements for additional failsafe and the need arises for clustered and distributed systems that can maintain high levels of availability. Besides hardware redundancies, software has to be designed in such a way as to support clustering and a generalized distributed architecture.

Fault Tolerance – Robustness

The system has to be able to endure individual component failures. The system layout should minimize the effect of single component failures. If recovery should not be possible, users need to receive a friendly message indicating that the issue is being handled.

Data recovery is not a critical issue in this case, as this is not an enterprise system and such costs may not be justified. What is important is to be able to restore the system to a stable state and have it available to users with a minimum delay.

Security

Security has to be balanced between the need for secured exchange of information and respective costs related to measures and practices followed.

Common practices like HTTP over ssl may be excessive in this case, as there are no particular sensitive data transmitted. Authentication is probably the single point where security is necessary, having to send an encrypted password and verify the user.

Auditing

Internal subsystems have to maintain change and audit logs. Any information exchanged has to be time stamped and logged. Audit logs should be used to resolve incidents if necessary, but as mentioned earlier, can also be used for monitoring and enhancing system performance.

2.5.4 Operational life cycle:

Expected Usage

The system will be used on a daily basis by users who will continue to participate in the community for years. As a result, there will be a constant increase in the amount of data generated by each user.

A large proportion of that information will be relatively obsolete with the passage of time (all event related data, old messages, etc.). It will be necessary to archive information – old data rarely used – but in such a way that they remain available to the users, if they should search for them.

The heaviest workload will be created by images and other multimedia content. It is necessary to use thumbnails or low resolution images were possible, in an effort to reduce the traffic caused by multimedia as much as possible.

One must also take into account the growth rate of registered and concurrent users. Also, as time passes, the number of inactive users will rise, be that from users losing interest or of users that become incapable of using the social network due to severe age impediments. Both factors influence the system's workload and should be taken into consideration for archiving and data maintenance.

Maintenance

Maintenance issues involve preserving data, using backups, but also refining and updating system components, indexes, storage utilization etc. to ensure stable performance as data and users increase.

Backup procedures and other maintenance operations should be setup to safeguard the smooth operation of the system. Loss of transactional data is not a critical factor – as it would be in an enterprise system for example – but data loss can contribute to users' frustration and will have negative impact on system's acceptability.

A final safeguard that needs to be addressed is the need for a disaster recovery option. There has to be a process for maintaining operations if an unforeseen event occurs in the main facility that hosts the system.

System Expandability

Furthermore, there should be specific procedures for adding new functionalities and expanding system's capabilities. The existing infrastructure provided by iWiW should cover the need for testing new components in a sand box environment before deployment.

Validation and final certification should also be necessary to ensure that third party surface applications are also verified for integration to the Elder-Spaces Surface application.

As far as individual components are concerned, the system has to be designed in such a way as to minimize the impact of changes. Expanding or replacing a component should not affect overall system performance. Components have to be isolated, so that any changes or upgrades do not cause unforeseen damage to other components.

Platform compatibility – Scalability

The system has to run on the selected ORIGO's infrastructure, as well as the Microsoft Surface table top. Moreover, it has to be able to expand in order to handle increases in usage and storage requirements. That calls for horizontal and vertical scalability. Expanding the capabilities of the system should be a matter of adding more hardware.

Interoperability

By this term we imply the ability of components to be invoked by any potential system client. There are two issues to be covered in this content:

- Payload and protocol. All services must provide an interface and a standard payload format. That format must be understood by all other clients of the system.

- Loose coupling: components and services must have minimum dependencies. Exchange of information and collaboration between components should be done using standard XML documents. Thus maintaining a uniform way of communication throughout the platform and reducing dependencies between components.

Documentation

In such a distributed system, comprised of different loosely connected services and components, it is most important to maintain high level of documentation. Among the most important issues are:

- Service reference

- Error Handling

- Data Structures

Testing

Testing has to be structured and methodical as this will be a distributed system, individual components have to be tested and verified. Automated tests and/or specific test scenarios have to be provided for every component. Documentation, versioning and reliability of each component will affect the final integration testing of the complete system.

2.5.5 Required professionals

Product development & product management team:

- product manager: responsible for product development, business planning, ensuring performance of the marketing strategy

- marketing & brand manager: responsible for the product in terms of marketing and communication, performing the marketing strategy, 3rd party cooperation

- customer service: responsible for administration of customer requests received

- application support manager: responsible during technical implementation of the application for ensuring the fastest and smoothest integration

- sales manager: responsible for product sales

- designer

Technical team:

- operation team

- site builder

- junior, senior java developer

- IT project manager

- database consultant

3. Social Service Providers' Requirements for Guided Communities in Social Networks

3.1 Social services for the elderly

3.1.1 Definition

*"**Social service**, also called welfare service, or social work, any of numerous publicly or privately provided services intended to aid disadvantaged, distressed, or vulnerable persons or groups. The term social service also denotes the profession engaged in rendering such services. The social services have flourished in the 20th century as ideas of social responsibility have developed and spread."* [14]

There is currently no officially consented definition of 'Social Services of General Interest' (SSGI) in the EU. In a background paper of the 3rd Forum on Social Services of General Interest the trial of a definition is done:

"No binding legal text defines social services of general interest (SSGI). Nevertheless, we can consider that SSGI are activities supplied by the public authorities or entrusted by them to private entities, to which missions of general interest are entrusted for the purpose of social protection, social and territorial cohesion, national solidarity and implementation of fundamental rights.

According to the Commission, beyond health services themselves, SSGI can relate two major groups:

• Statutory and complementary social security schemes organized in various forms (mutual or occupational organizations) covering the main risks in life such as those linked to health, ageing, occupational accidents, unemployment, retirement, disability;

• Other essential services provided directly to persons. These services that play a preventive and social cohesion role consist of customized assistance to facilitate social inclusion and safeguard fundamental rights.

Beyond this breakdown, the difficulty of establishing a definition has led the Commission to identify "organizational characteristics" of SSGI as follows:

• they operate on the basis of the solidarity principle, which is required, in particular by the non-selection of risks or the absence, on an individual basis, of equivalence between contributions and benefits;

• they are comprehensive and personalised, integrating the response to differing needs, in order to guarantee fundamental human rights and protect the most vulnerable;

• they are not for profit, in particular to address the most difficult situations and are often part of a historical legacy;

• they include the participation of voluntary workers, expression of citizenship capacity;

• they are strongly rooted in (local) cultural traditions. This often finds its expression in the proximity between the provider of the service and the beneficiary;

• *an asymmetric relationship between providers and beneficiaries, that cannot be assimilated with a 'normal' supplier/consumer relationship and requires the participation of a financing third party."* [15]

In 2007 the Commission of the European Communities characterized social services as follows:

"Social services are often meant to achieve a number of **specific aims***:*

– they are person-oriented services, designed to respond to vital human needs, in particular the needs of users in vulnerable position; they provide protection from general as well as specific risks of life and assist in personal challenges or crises; they are also provided to families in a context of changing family patterns, support their role in caring for both young and old family members, as well as for people with disabilities, and compensate possible failings within the families; they are key instruments for the safeguard of fundamental human rights and human dignity;

– they play a preventive and socially cohesive role, which is addressed to the whole population, independently of wealth or income;

– they contribute to non-discrimination, to gender equality, to human health protection, to improving living standards and quality of life and to ensuring the creation of equal opportunities for all, therefore enhancing the capacity of individuals to fully participate in the society.

These aims are reflected in the ways in which these services are organised, delivered and financed:

– in order to address the multiple needs of people as individuals, social services must be comprehensive and personalised, conceived and delivered in an integrated manner; they often involve a personal relationship between the recipient and the service provider;

– the definition and delivery of a service must take into account the diversity of users;

– when responding to the needs of vulnerable users, social services are often characterised by an asymmetric relationship between providers and beneficiaries which is different from a commercial supplier / consumer relationship;

– as these services are often rooted in (local) cultural traditions, tailor-made solutions taking into account the particularities of the local situation are chosen, guaranteeing proximity between the service provider and the user while ensuring equal access to services across the territory;

– service providers often need a large autonomy to address the variety and the evolving nature of social needs;

– these services are generally driven by the principle of solidarity and are highly dependent on public financing, so as to ensure equality of access, independent of wealth or income;

– non-profit providers as well as voluntary workers often play an important role in the delivery of social services, thereby expressing citizenship capacity and contributing to social inclusion, the social cohesion of local communities and to intergenerational solidarity." [16]

Furthermore, the social services of general interest are divided into economic and non-economic services.[16] For a complete overview of the services used by elderly people, even commercial services, as e.g. Health Care Industries and Health Trade Professions, are considered.

3.1.2 Classification

Social services can be distinguished in many ways, but the boundaries are not fixed:

- by economic activities (Eurostat),

- by type of their main tasks (social, medical, therapeutic),

- by location of execution (stationary, ambulant, remote),

- by provider (public, commercial, non-profit, private).

Eurostat classifies human health and social work activities as shown in Figure 31[17].
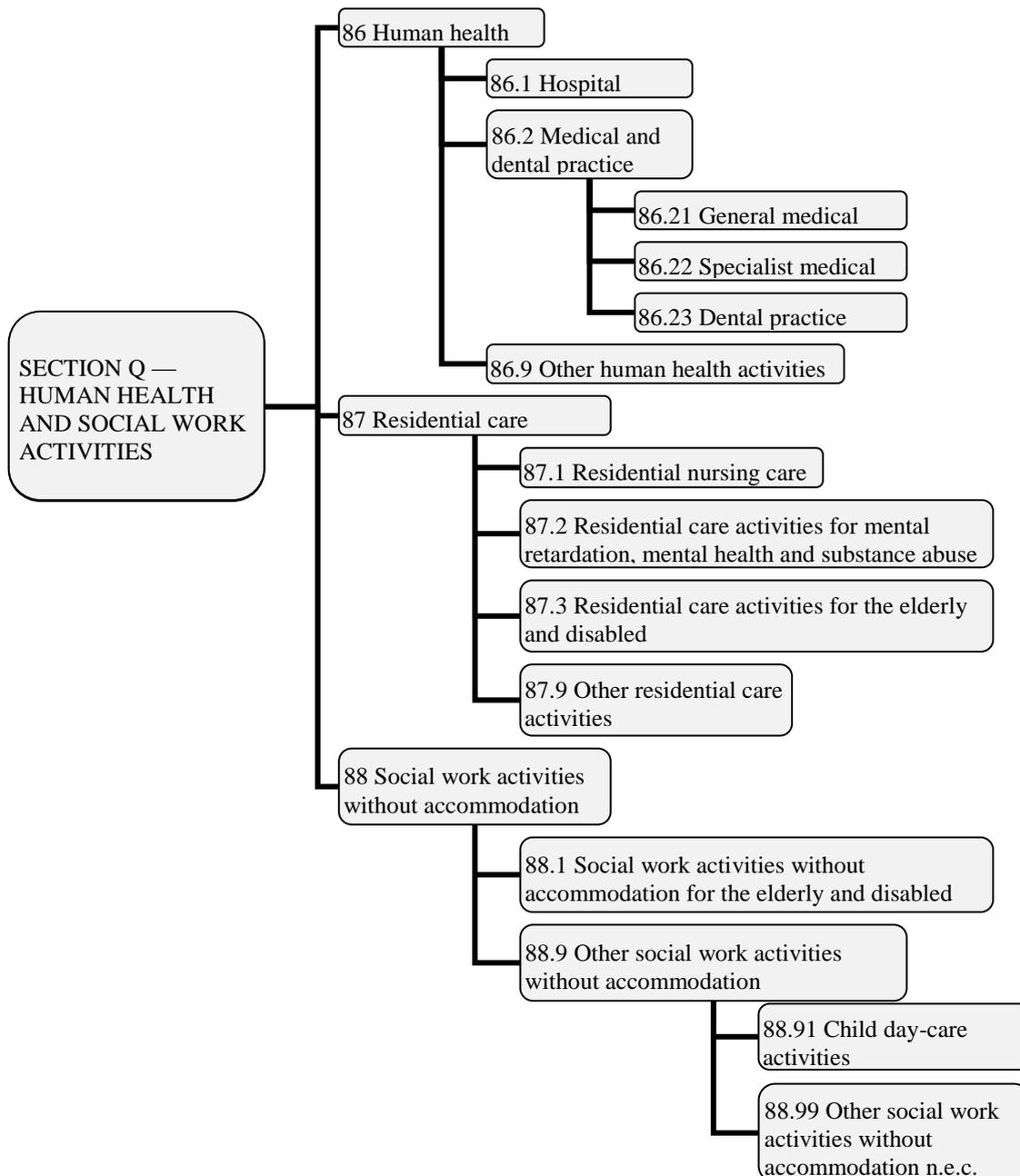
Figure 31: Classification of human health and social work activities

To specify the term 'social service' more precisely, Table 3 displays a typology by type and location of the social services limited to the scope of services which are generally used by elderly people. As mentioned above, there may be overlaps. For example self-help groups could cover social as well as medical issues or a medical pedicurist visits even residents of nursing homes.

Table 3: Typology of social services used by elderly people

	Social care	**Medical care**	**Therapeutically care**
Stationary	Residential care homes Residential groups Day-/Night care (for non-residents)	Hospitals Psychiatric wards Nursing homes Rehabilitation centres Respite care Palliative and terminal care	
Outpatient	Housekeeping service Transportation service Meals on wheels	Outpatient Care	Medical pedicure Medical masseurs
Resident	Self-help groups Centres of consulting	Doctors' offices Dental practices Self-help groups Pharmacies Medical stores	Physiotherapists Speech therapists Occupational therapists Remedial teacher Psychotherapists Naturopaths
Emergency	emergency pastoral care	emergency medical service emergency call services	

3.1.3 Market analysis

3.1.3.1 Demographic Factors

As shown in Figure 32[18], the percentage of elderly people (65+) within the EU is increasing, whilst the percentage of economical active people is decreasing.

The resulting effect to social-care and health-care systems across Europe will be a massive growth of the market.
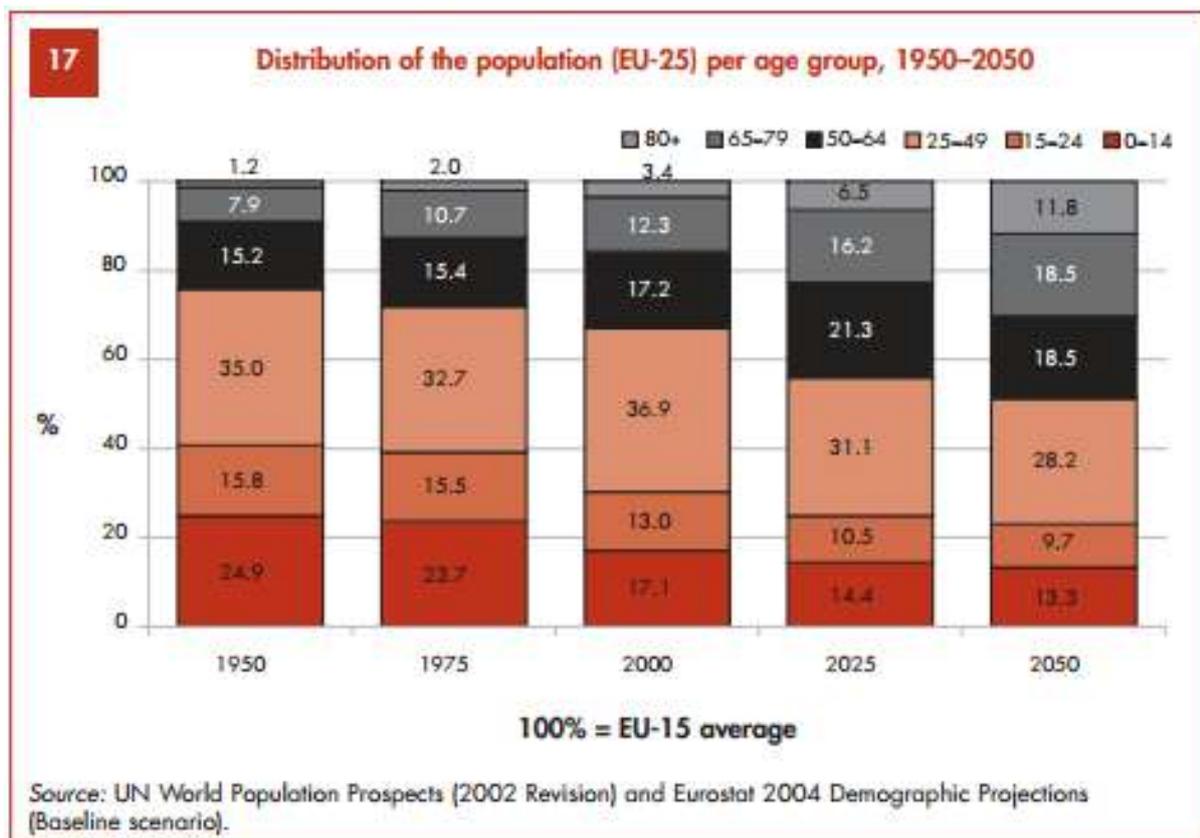
Figure 32: Distribution of the population (EU-25) per age group, 1950–2050

3.1.3.2 Structure of social service providers in Germany

Professional social services in Germany are offered by providers in different legal and organizational forms[19]:

Public providers:

- social insurance carriers,
- cities, administrative districts and municipalities as regional providers,
- the federal states and communal organizations as trans-regional providers.

Welfare – 6 head associations of free welfare and their associated organizations mostly subdivided into:

- major district organizations

- minor district organizations

- local organizations

- churches and religious communities

- other non-profit welfare-organizations.

Private commercial providers:

- individuals, that work on account (e.g. medical doctors, psychotherapists)

- small businesses (e.g. private outpatient care) and

- bigger (social) businesses with multiple branches (e.g. private residential care homes).

And there are also many private non-commercial providers of social services like relatives, neighbours and volunteers, who may even get public financial support.

3.1.3.3 Competition and market share

The sector of social services in Germany is based on the principle of subsidiary. That means the fact, that most social services are provided by welfare-organizations that are financed by the government and sponsors. Just in the case, that there is a lack of this provision, public organisations will provide the service. This is the cause for the very small share of the public providers on the left side of Figure 33[20], which illustrates the market share and the customers-per-institution-ratio in outpatient and residential home care.
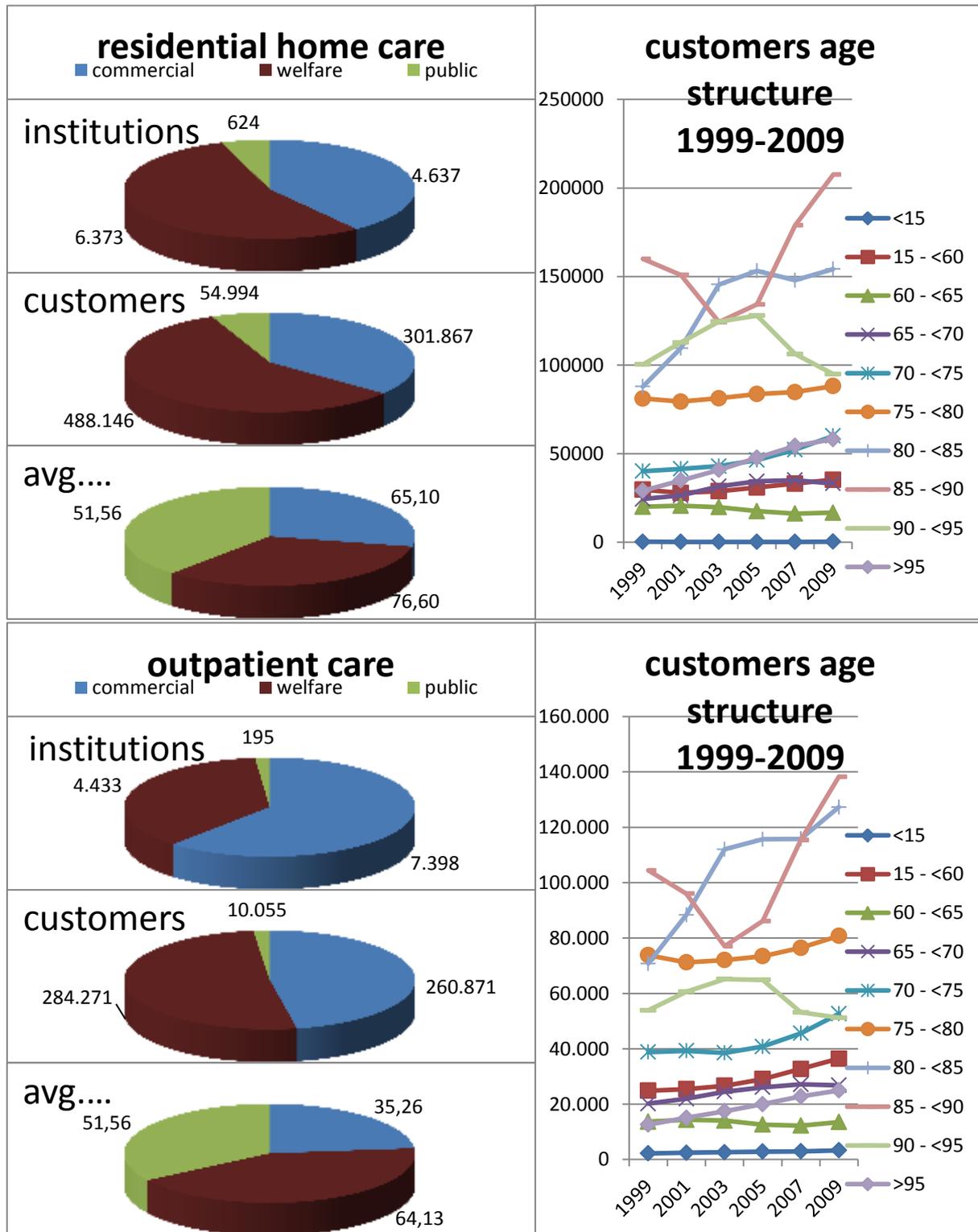
Figure 33: Market share and customers age structure in residential home care and outpatient care in Germany

The decrease of the number of 85-<90 year old customers since 1999 and the decrease of the number of the 90-<95 year old since 2005 (both born in 1915) is explained by the decline in population during the First World War as shown in Figure 34[21]. The blue line expresses the born

alive and the red-dotted line expresses the deceased persons (in 1000). It may also be concluded, that an increase will happen to the group of 90-<95 year old, similar to the 85-<90 year old since 2003.
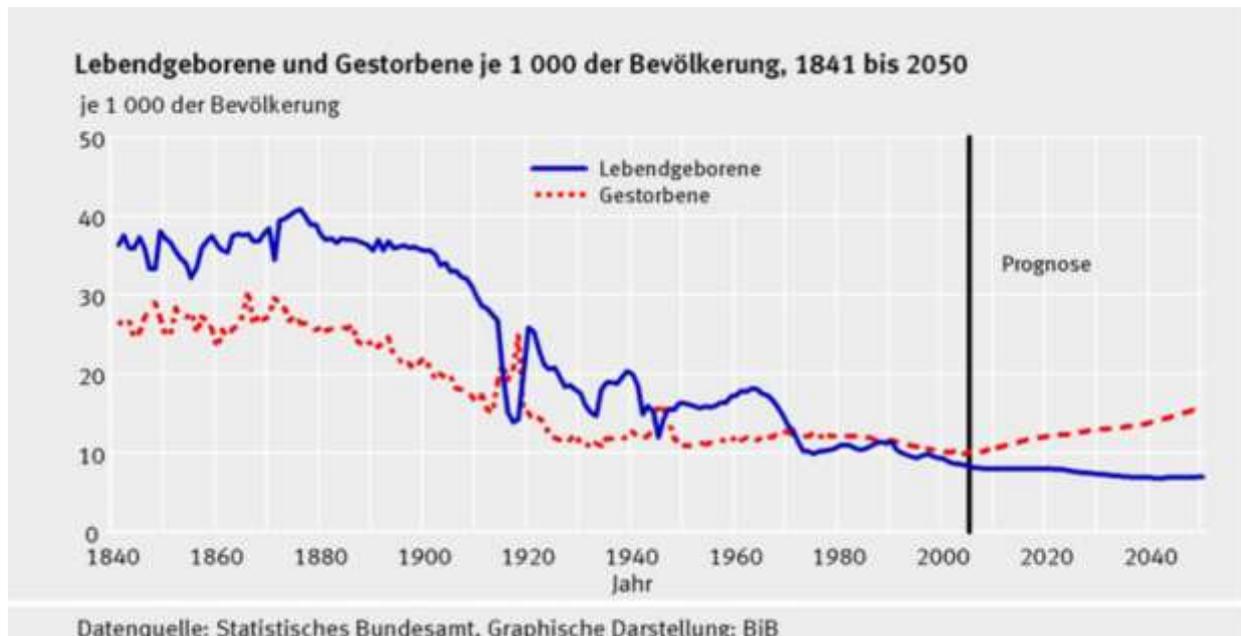
Figure 34: Born alive and deceased in Germany since 1840

3.1.3.4 Personnel

An indicator for growth in the social and healthcare system is the employment rate. As seen in Figure 35, the number of employees in both healthcare and social work are increasing continuously from 2000 to 2010. In Figure 36 the calculated growth rates are showing an increase of 67.36% on geriatric nursing and of 67.05% on social work[22].
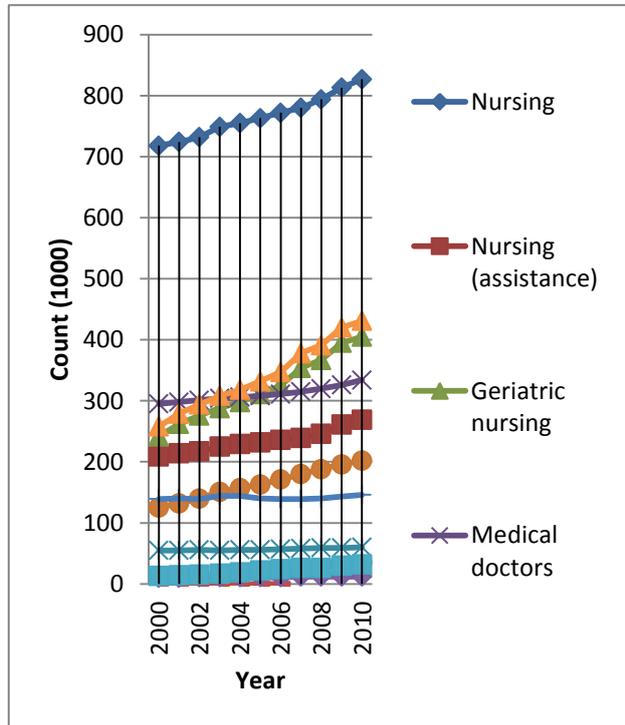
Figure 35: Health personnel in Germany 2000-2010
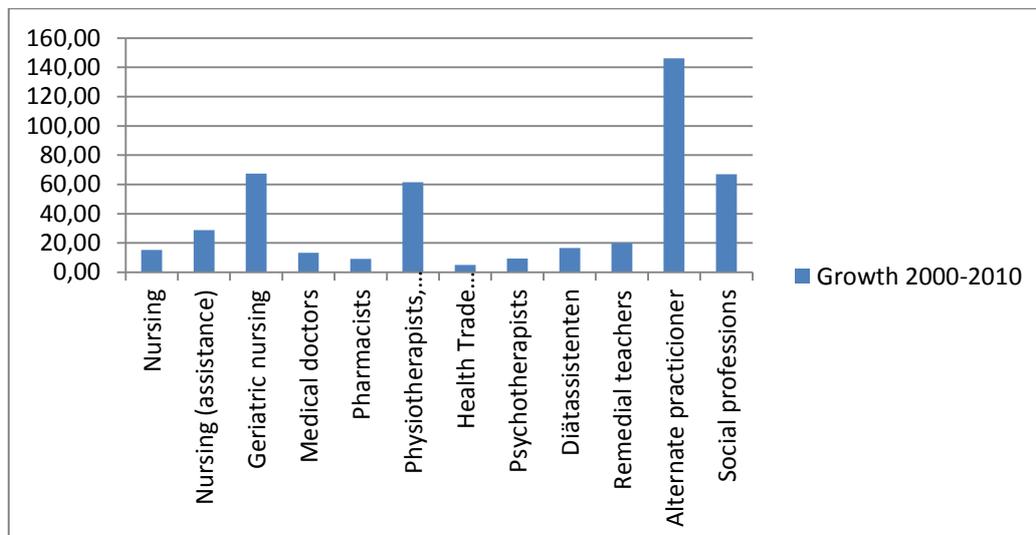
Figure 36: Growth rates of health personnel in Germany 2000-2010

Before consideration of the structure of employment for example of nursing as the biggest employment segment in social services, it must be mentioned, that in July 2011 the general

compulsory military service was suspended[23] and thereby also the duty of an alternative civil service. For compensation, the 'federal volunteer service' was established[24]. An evaluation of the future impact of this measure to personnel situation in social services is, due to missing data, currently not possible.

As shown in Figure 37[25], most types of employment have an increasing count confirming the global trend mentioned above, especially the part-time employees. This may be due to the fact, that most of the employees in nursing are women, which mostly need to accomplish additional private tasks like child-care, elderly-care and household in general besides their professional work.
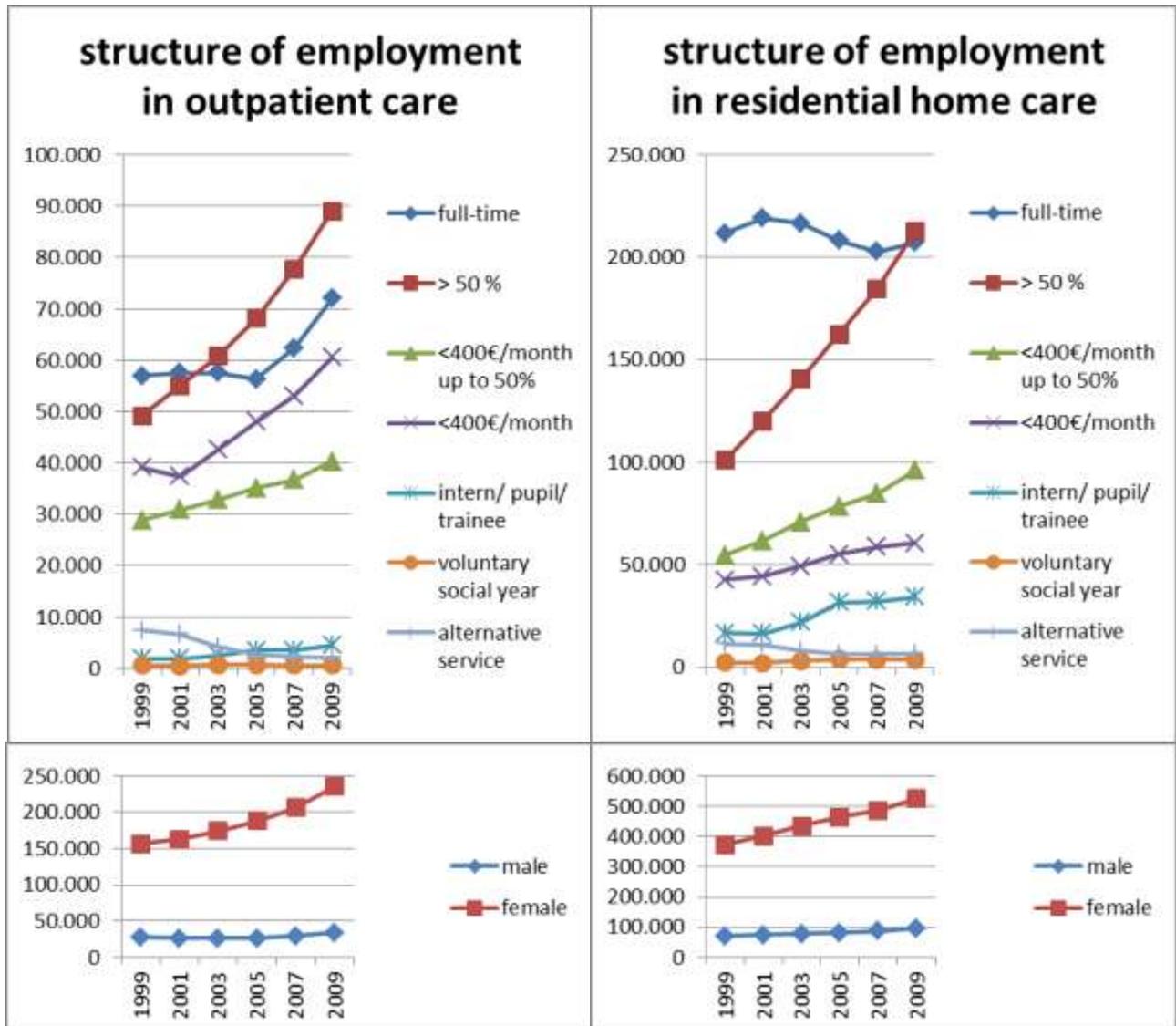
Figure 37: Structure of employment in outpatient and residential home care

3.1.3.5 Targeted group

The group of customers of social services for elderly people are as heterogenic as the services themselves. It ranges, regardless of age, from healthy, mobile and independent persons that visit a dental practitioner two times a year, up to multi-morbid, bedridden and fully dependent persons living in nursing homes.

3.1.3.6 Health situation

According to a study done in 1994 by Infratest, referenced by the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth in the first report about the situation of care facilities and the care of the residents[26], residents of care facilities are, compared to the corresponding reference group in private households, suffering disproportionately from chronic diseases and multi-morbidity.

- 57% of the chronic ill residents suffered from impairments of the musculoskeletal system. This proportion was significantly lower only in the group of 60 to 79 year old persons.

- With 44% the second most frequently mentioned were cardiovascular diseases. The prevalence was increasing with age: from 20% for those under age 60 to about 50% for those over 80 years.

- About one-third (39%) of all respondents were incontinent, the oldest most often with 48% and the 60- to 79-year-olds with 27%.

- Almost every fourth resident had visual impairments or was hearing impaired or deaf, and the very old were much more affected.

- One in three of under-60s suffered from speech disorders, often associated with other serious diseases. In the 90-year-olds, the proportion fell to only 8%.

- Almost 12% suffered from the ramifications of a stroke.

- Multi-morbidity increases with higher age. The under-60s suffered on average from 2.8, the over-80s from 3.4 diseases or disabilities.

The survey also makes statements about the incidence of mental and emotional disorders in nursing homes. Over half of residents (53%) were affected of these. The proportion of the under-60s was at 70%. Nearly 30% suffered from dementia, 36% of the 90-year-olds. In second place (17%) were other mental disorders (e.g. schizophrenia or severe depression), which seemed to occur in the younger more likely than older. Also, behavioural problems such as agitation or propensity to violence and addictions were more common in the under-60s than for those over 80 years.

3.1.3.7 Social situation

The Federal Ministry for Family Affairs, Senior Citizens, Women and Youth mentions in its handbook of home supervision, that existing studies show that the lion's share of the services actually provided services in the homes are nursing care. However, services that are not primary care or treatment, so communicative and social care services only play a minor role. This is one reason for the often deficient quality of life of residents[27]. This is especially true for people, whose social care is not provided by relatives.

In a research project on behalf of the ministry the role of relatives has been considered in detail. Therefore a survey among 233 relatives was done. According to an estimation of the employees 86 % of the residents had relatives, whose degree of kinship is distributed as displayed in Figure 38[28].
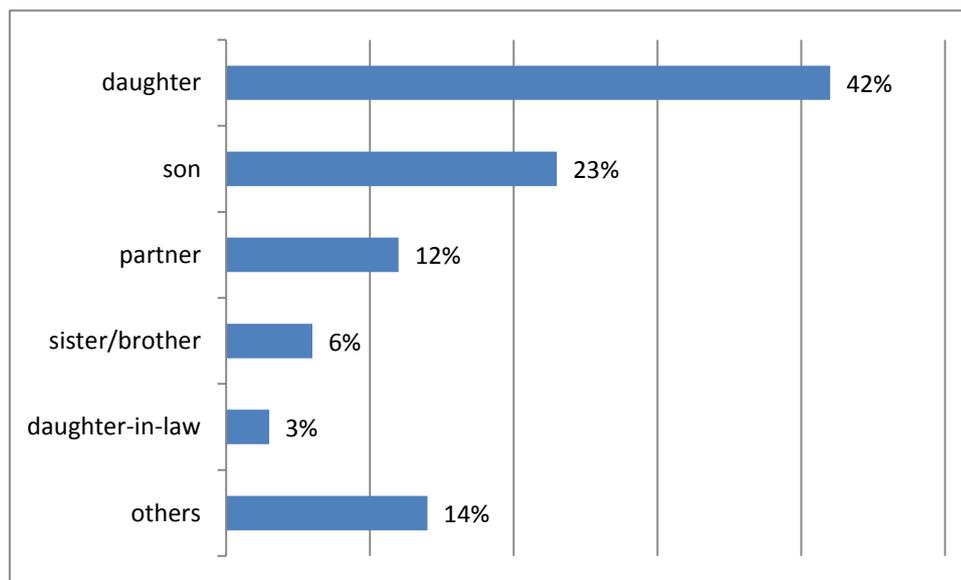
Figure 38: Distribution of the degree of kinship of the interviewed relatives

Two out of three of the interviewed relatives were women. The group of partners splits in 8% spouses visiting their husband and 4% husbands visiting their spouses. The low percentage of the partners-group is possibly due to impaired mobility of the partner or to the fact that the partner is living in the same resident care home or even to the death of the partner. Most of the visitors were the children of the residents.

The frequency of visits is an indicator for the intensity of the relation. As shown in Figure 39[28], most of the partners are visiting their relatives daily. As mentioned above, the commonest visitors are the children. 29% of them are visiting their relatives daily, 69% once a week. An average visit lasts about 2 - 3 hours.
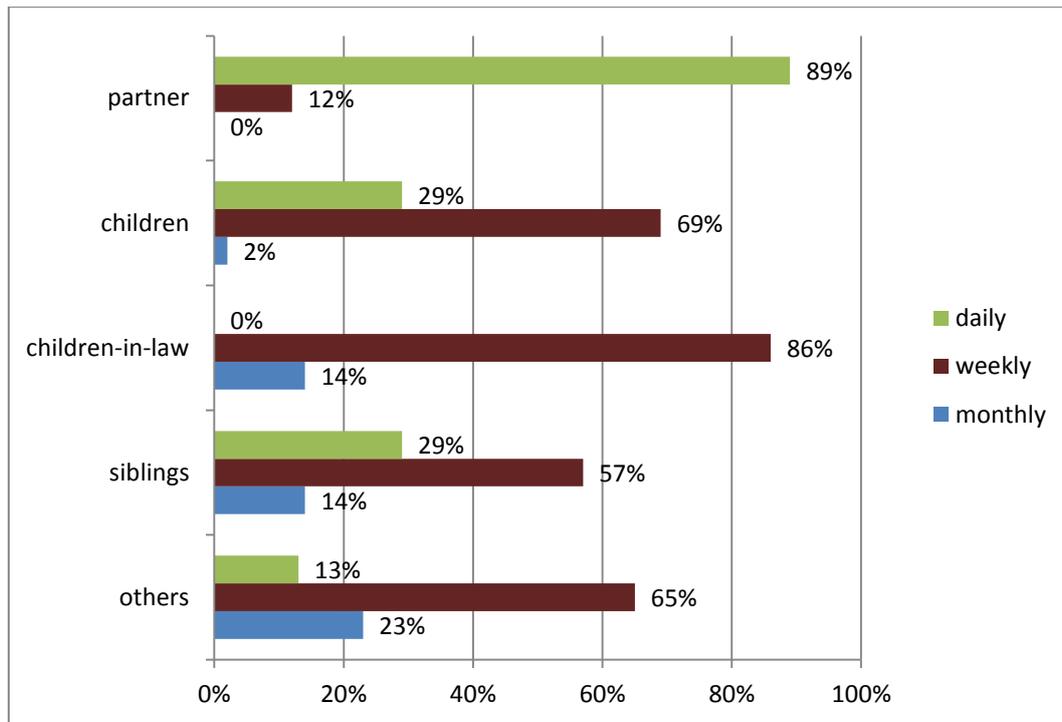
Figure 39: Frequency of visits by degree of kinship

The combination of the considerations above implies a lack of social care for the majority of the residents.

3.1.3.8 Financial situation

The income situation of elderly people in Germany is generally not that bad, the disposable income of men over 70 living alone is bigger than the average income of all men in private households in Germany, as displayed in Figure 40[29].
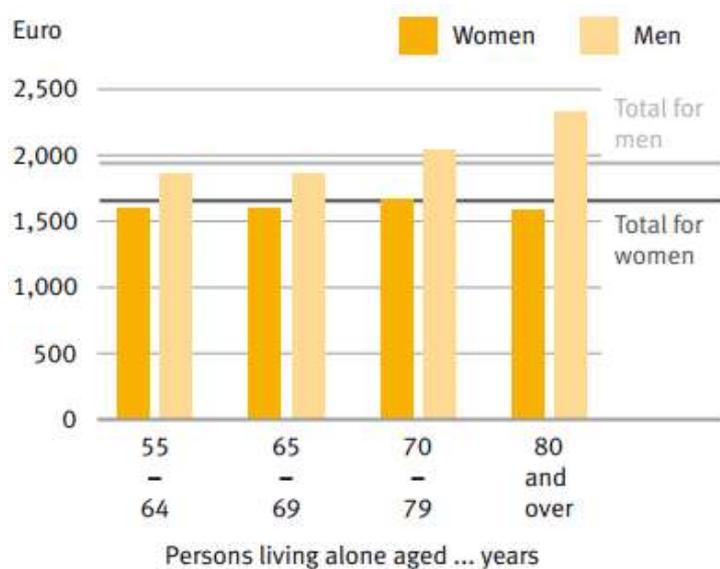
Figure 40: Disposable income of men and women living alone – monthly average, 2008

If one considers the situation of childless couples as displayed in Figure 41[29], the monthly income rates decrease by age due to retirement of both family members, but are still comfortable.
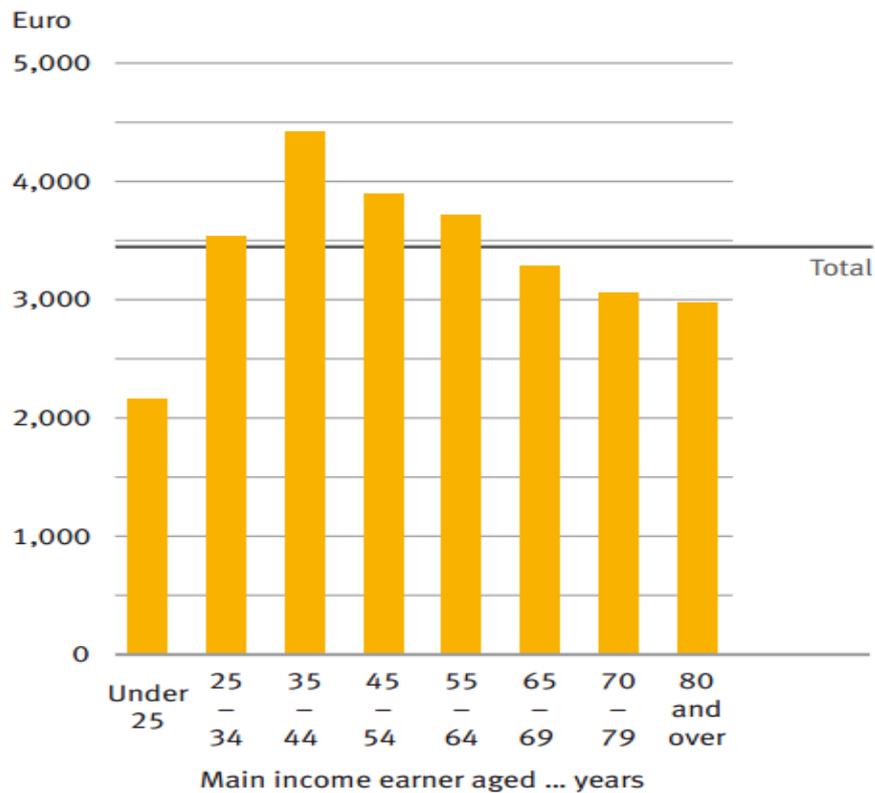
Figure 41: Disposable income of childless couples – monthly average, 2008

The risk of poverty increases with the need of long-term care. The mean prices without specialized care vary from 2348.07 € at the lowest level of care to 3247.55 € at the highest level of care[30].

The prices for specialized care, e.g. at dementia, artificial respiration or vigilant coma vary from 2717.34 € to 6957.28 € (including a mean investment grant of 375 €)[31], from which the nursing care insurance fund pays 1550 € for the most extensive type of care[32].

This means monthly costs of 1167.34 € up to 5407.28 € for people in need of specialized care, which takes some of the elderly, especially woman, into the need of supplementary social benefits.

3.1.3.9 Elderly people with migration background

In the first report about the situation of care facilities and the care of the residents by the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth also the situation of elderly people with migration background is considered. It is mentioned, that this target-group lacks necessary knowledge about the elderly care system, which notably aggravates the access to it. Among older immigrants a major divergence exists between the wishes concerning their care and the possibilities to realize them. It should be noted that the interviewed migrants hope and wish to get care and support provided by their descendants, but the majority no longer unconditionally assumes to be able to assure comprehensive care services by family members. The lack of awareness about the regular health care system and the spectrum of offerings for the individual support and care (ambulatory and mobile social services, assisted living, residential care, etc.) is noticeable. According to the investigation only rudimentary knowledge of nursing homes exists in this group. Stereotypical clichés of these facilities as "inhuman detainment institutions" is often dominating. Even culturally sensitive care services and ethnic living-groups in nursing homes do not appear to be able to eliminate fundamental concerns about stationary care. Those who have dealt with this subject underline the benefits of a culturally sensitive care, especially in order to facilitate understanding. Also, a greater sensitivity and responsiveness to the specific needs of migrants is granted to nurses with an immigrant background. The majority of respondents, however, do not want ethnicity-specific care, which is equated with separation and exclusion in old age. This assessment indicates the need to understand culturally sensitive care as a form of care and support considering all the backgrounds of their clients in a sensitive manner, including the German.

Overall, the interviews done as part of the scientific investigation carried out a lot of scepticism and aversion to residential care facilities, while support by outpatient services to secure a home care as an alternative in case of failure of the family network receives greater acceptance.[26]

Taking into account the inclusion of elderly people with migration background and limited national language capabilities, multiple languages should be supported.

3.1.3.10 Use of ICT

The access to computer devices depends partly on the living situation. Persons living in private residences may have their own device that is fully customized and equipped with assistive technology according to their needs.

Even residential groups, residential care or nursing homes may be equipped with some devices adjusted to the needs of elderly people and have employees who are able to support the elderly using them. Maybe particular residents have their own devices. If not, there is still the option to visit internet cafes that are provided especially to seniors, too.

In future, even more persons in care homes will have their own devices, as today most residents have their own TV in their room.

But as the provision of assistive technologies cannot be generally assumed, the highest level of technically possible accessibility must be ensured by the system. The requirements concerning usability and accessibility are described in chapter 4.2.

3.1.4 Future development of the social and healthcare system

The demographic development implies the future challenges as mentioned in „Active ageing and solidarity between generations – A statistical portrait of the European Union 2012" by the European Commission:

„Many of the challenges that arise from population ageing are universal and include:

• pressure on public budgets and fiscal systems;

• strains on pension and social security systems;

• adjusting the economy and in particular workplaces to an ageing labour force;

• possible labour market shortages as the number of working age persons decreases;

• the likely need for increased numbers of trained healthcare professionals;

• higher demand for healthcare services and long-term (institutionalised) care;

• potential conflict between generations over the distribution of resources" .[33]

Most of the elder people who need assistance or care get help in a domestic context by the family. In the medium to long term, the growing proportion of care-dependent persons stands against a decreasing potential of persons, who can provide the care. This is due to decreased rates of birth and fertility, less and later weddings, higher rates of divorces, changes in family cycle, more people living alone, growing labour participation by women, less labour force potential and increased job mobility. Even men, who are a low percentage of caregivers, in future need to combine paid work with caring for family members, partly because fewer women are willing to give up their vocational work, as mentioned in the final report of ILSE, an interdisciplinary longitudinal study of adult age[34].

Regarding to the demographic development and the longer life expectancy, the rate of persons with dementia who need very specialized and time-consuming care will increase.

These challenges will massively affect the work of social service providers. An increasing amount of professional work in social and healthcare system has to be done by a decreasing number of working age persons. This can partly be compensated by immigrant caregivers, but even there are limitations due to the worldwide demographic development.

So there is a high demand of supportive services to empower elderly to live longer in their own households and to increase effectiveness of social and healthcare provision. Elder-Spaces will contribute to this by its communication features, but has the potential to provide even more support with additional applications as described in chapter 3.2.3.

3.1.5   Social services adaption needs

3.1.5.1 Deepening of social embedding

Brigitte Reiser, expert in stakeholder-management, emphasises the necessity of social embedding for non-profit organizations in a newsletter of the National Network for Civil Society as follows:

During the past, in times of Web 1.0, there were comparatively little actors, which presented content on the Internet, new applications of Web 2.0 enabled users to publish without prior technical knowledge texts, videos, audio files and photos on the net. The user changed from the consumer to the producer of content, so that the traditional relationship between the organization and users − the former published and the user is the passive recipient of information − is obsolete. This creates new challenges and chances for non-profit organizations. Static web pages without interaction options for the users are always counter-productive, same as a top-down communication style, taking the user seriously as an equal partner. Also the desire must be dismissed, to control the discussion on their message and their products. What image of an organization in public exists is determined by the users, who can publish and disseminate their opinions concerning an organization on the internet.

In addition to these changes, querying the traditional methods and attitudes in non-profits, social media offers many opportunities for non-profit organizations enabling them to connect with its stakeholders (clients, members, employees, volunteers, donors, etc.) via blogs, communities, forums, wikis and short message services like Twitter. The connections to stakeholders form the social capital of non-profits. From these relationships, a non-profit organization attracts resources such as: voluntary commitment, donors, political support, information, know-how, service partners, etc. It is important to go beyond the limits of their own environment and search for supporters who have not yet been in focus.

The social capital of a non-profit organization will be marketed much more than before in the future, because it allows conclusions about the acceptability, effectiveness and stability of an institution. For external donors such as the public sector, industry and private donors and sponsors, the question of the social embedding of a non-profit organization will be an important decision criterion. The future of the non-profit sector is not in the close connection to the state, but in networking with the society. And this networking can now be achieved through social media.[35]

3.1.5.2 Expansion of demand-oriented forms of housing and care

Parallel to the individualisation of life forms the care facilities of the future will converge individual and private housing. The demand for so-called "new forms of living" increases. In the future there will be more hybrid forms of outpatient and inpatient care and smooth transitions.

The traditional form of organization of care facilities must be further developed to date. Many positive examples show that care facilities are already adapting their processes to the model of private housing. Flexible, demand-based and small-scale supply arrangements in the local environment meet the needs and desires of people in need of care.[26]

Especially the increase of persons in care facilities suffering from dementia requires necessary changes.

The combination of suitable (holistic) care concepts and architectural design of environment usually leads to a much improved situation for both residents as well as for the staff. The qualification of the personnel is a crucial factor in the implementation of innovative forms of care. Currently a significant portion of the nursing staff does not have adequate knowledge of specific dementia treatment and care structures. Here appropriate training measures are needed.

Forward-looking forms of care are even attractive for residents who are not suffering from dementia and not at least for the personnel.[26]

3.1.5.3 Encouragement of voluntary work

Voluntary work must be facilitated. Therefore

- regular and extensive information,
- open communication,
- fixed contacts,
- continuous companionship,
- regular discussion groups,
- regular training measures,
- involvement in everyday life,
- the possibility of participation,
- appreciation, and
- training and supervision for employees

are needed.[28]

3.2 Social service providers and social networks

3.2.1   Non-profit organizations (NPOs) and social media

Karin Kiefer, Master of Arts in media management, analysed the usage of social media by 60 non-profit organizations working in environmental protection, international activities and social services, and published her results on her blog[36]. In the following, the results are summarized.
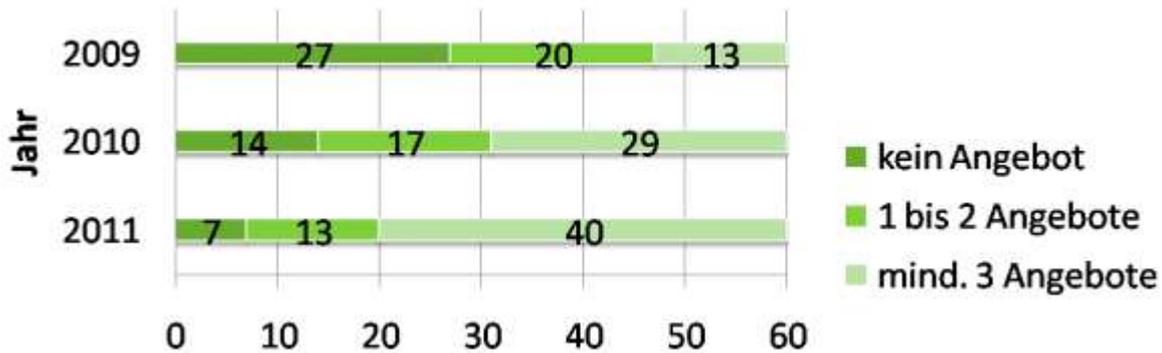
Figure 42: Count of social media profiles by non-profit organizations 2009-2011

Figure 42[36] shows that in the last few years an increasing number of NPOs began using social media and some of them even multiple social media systems. As displayed in Figure 43[36] the mostly used systems in the sample were YouTube, Facebook and Twitter.
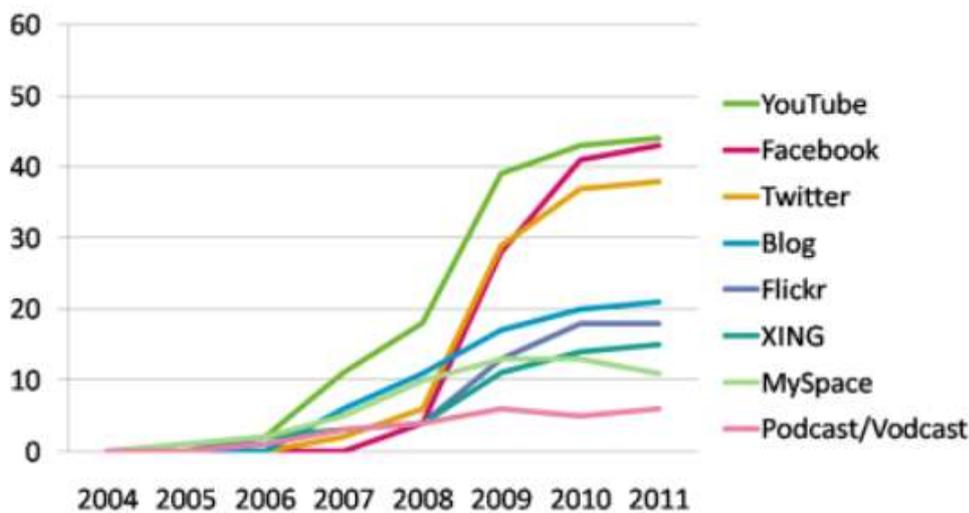
Figure 43: Distribution of social platform usage by non-profit organizations 2004 - 2011

3.2.2   Benefits of social network platform usage

3.2.2.1 Social service provider benefits

There are many possible benefits that a social service provider could achieve by using social networking systems due to the fact that these systems are primary communication platforms.

So the internal communication, by now often paper-form based, could become faster and more efficient in many areas. Even the services could get more efficiently managed and provided. Cooperative actions in public relations, politics or relief efforts could be planned and things like events or resource pooling could be managed between the local subdivisions of a provider or even between completely different service providers.

But also the use for external communication involves many potential benefits. The membership in a social networking system could increase transparency and by that confidence. This may influence the decisions of possible customers, job candidates, volunteers and donators. Early contact to potential future clients can be established and maintained and by regular assessments of the living situation the service provision can be adapted promptly and demand-oriented. Adequate and fast intervention could be provided, if critical situations like the loss of spouse or medical issues like exacerbation of cognitive disorders occur.

Direct feedback from the stakeholders could be used for improvement and extension of quality or for developing completely new services. By interconnection with other providers of social services bigger communities can be created to get more weight in political participation processes.

At least the provision of ICT to the customers of care facilities will in future become a quality feature and maybe a criterion for the choice of the appropriate care facility.

3.2.2.2 Benefits to national economy

By provision of a new communication channel to the elderly people isolation could be prevented and the treatment costs of its ramification would decrease. The empowerment of the elderly to stay longer independent in private housing will take the pressure out of the market for long-term care and reduce the related costs. By motivating the elderly to do vacations and excursions an increased demand for tourism products can be expected and by motivation to use the internet in general, even the number of sales in internet-shops may increase, which raises the national earnings by sales tax.

3.2.2.3 Commercial benefits

As mentioned above there may be a boost to internet economy, depending on the impact of Elder-Spaces. The platform can also be used for demand-oriented advertising by offering products that meet the users' profiles gathered by the semantic analysis described in chapter 4.4.

3.2.3   Additional opportunities of application

3.2.3.1 Guided communities

Groups in social networking systems could be used for a wide variety of purposes in social service providers' daily work.

They may be set up by top-level organizations to bundle their local subdivisions for confidential internal communication, but also for public purposes as marketing, fundraising and public relations.

Care facilities, stationary as well as outpatient, may use groups to bundle clients, their relatives and employees for management purposes, e.g. food or working plans, event planning, polling to improve quality etc. There could also be a public room for image cultivation.

Even groups regarding to a single client, including relatives and the interdisciplinary professional team could be established to enhance communication concerning observations, preferences, requirements and measures to be taken and to empower the relatives to provide care on a higher level of professionalism by consulting experts in particular situations.

Because of the private nature of the exchanged information the possibility of membership control must be given and an unintended public publishing must be impossible.

3.2.3.2 Social services and social network platform usage in the context of AAL environments

On the website of the Ambient Assisted Living Joint Programme, the objectives of AAL are described as follows:

"The concept of Ambient Assisted Living is understood as
- *to extend the time people can live in their preferred environment by increasing their autonomy, self-confidence and mobility,*
- *to support maintaining health and functional capability of the elderly individuals,*
- *to promote a better and healthier lifestyle for individuals at risk,*
- *to enhance the security, to prevent social isolation and to support maintaining the multifunctional network around the individual,*
- *to support carers, families and care organisations,*
- *to increase the efficiency and productivity of used resources in the ageing societies."*[37]

In Figure 44[38], the main topics of AAL are shown in context.
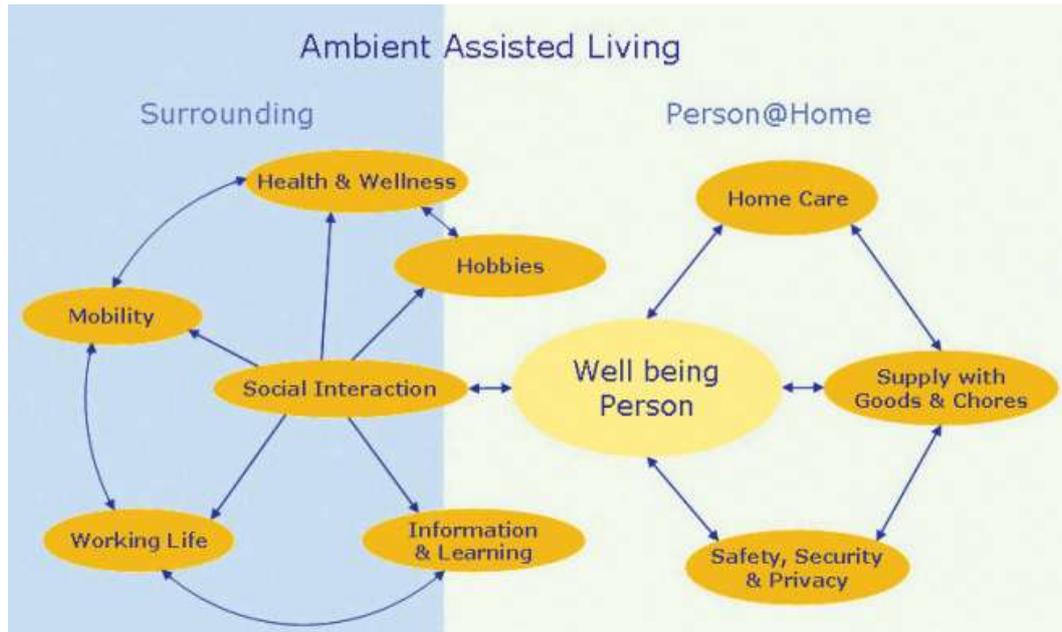
Figure 44: Topic groups of Ambient Assisted Living

The Elder-Spaces project has its focus mainly on the social interaction and the surrounding topics, but it has also the potential to support the other topics.

So the home care may be supported by guided communities as described in the chapter concerning guided communities above.
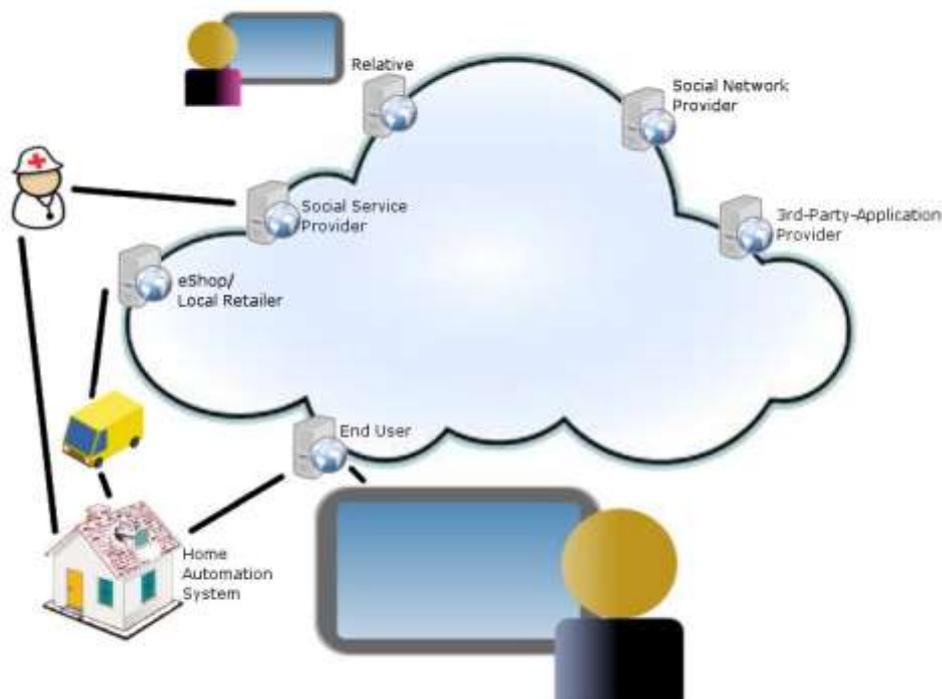
Figure 45: Additional possibilities of Elder-Spaces in the AAL Context

The supply with goods and other services may be supported by including e-commerce applications provided by retail traders and local deliverer services to the social networking system.

Even home automation or home media systems running on a local machine may be included by their web interfaces, to enable the user to satisfy all their needs regarding to their social network and environment by using a single interface on a single device. This decreases the complexity and by that increases accessibility.

Safety and security, especially of persons with mild cognitive impairments, can be enhanced by inclusion of a person tracking application to a closed, client-centred group, keeping self-determinism and freedom at a high level of security by adequate intervention in risk situations. Also, a fall detection system could use the security and notification features of the platform to inform about a possible accident.

These approaches have been considered already from a different perspective in other projects of the AAL Joint Programme. Most of them have a social networking component integrated to the home-based ICT, like "Agnes"[39], "Aladdin"[40] or "Inclusion Society"[41] for example.

3.2.4   Organisational requirements

To create the possibility of internet usage by the residents of a nursing home requires some organisational and financial efforts:

- An appropriate location has to be found.

- A network infrastructure has to be set up, if not already existing.

- An investment in hardware and software has to be done.

- Assistive technologies have to be set up, where necessary.

- One or more persons responsible for administration, support and data security must be found.

- The personnel have to be qualified continuously.

- The end-users have to be motivated, trained and supported continuously.

3.2.5   Ethical and legal considerations

The usage of ICT in care facilities can be a blessing or curse. Indeed there are many benefits to be expected by activating the residents' motivation and mental resources. But using a social networking system even involves some potential dangers. Private data is collected, which could be abused and the platform could even be misused for bullying or defamation, as already mentioned in the ethical recommendations of the SeniorProject:

"In an ICT world, trust is the central concept in data protection. The reason is that the centrality of individual consent and user empowerment prevalent of both the e-privacy directive & data protection do not tally well with the condition of older persons who live in positions of power asymmetry or dependency. Applications used by senior citizens should be as reliable as trustworthy telephone companies have been for years to the minds of telephone users. ...

Frail people are in need of comfort, security, dignity, and also privacy. Therefore, there is a

need to find a balance between the need for care, help or assistance by others which derive from the condition of dependency in old age (which calls for reasonable supervision on an old persons life) and the need to protect older dependent persons from arbitrary or unlawful interference with their privacy, family home or correspondence, or to the attacks upon their honour or reputation."[42]

The European Commission lists the risks of social networking on their homepage:

*"**Cyber-bullying:** broad range of behaviours including harassment of minors by people who know them. Harassment can involve the circulation of photographs, rumours or gossip (true or false), [...] behaviour which would be distressing or hurtful [...] .*

***Violation of privacy:** problems associated with minors supplying personal information online by which they could be identified, identity theft, wrongful selling of user databases to third parties, spam, phishing.*

***Exposure to harmful content** such as pornography or sexual content, violence, or content inciting to self harm (suicide, eating disorder, etc).*

***Grooming:** befriending a minor to prepare them to accept inappropriate behaviour (including for sexual purposes). Although the likelihood of such a risk is considered by many researchers as low, it is potentially the most severe risk and a source of high concern."[43]*

The WHO defined Elder Abuse as follows:

"Elder Abuse is a single or repeated act, or lack of appropriate action, occurring within any relationship where there is an expectation of trust which causes harm or distress to an older person"[44].

Care facilities are in a guarantor position to the residents, and therefore they have the duty to protect the residents from any harm, even the risks listed above. Measures to prevent the exposure to the issues listed above must be taken, e.g. content filtering or monitoring of activities.

On the other side, the use of ICT and especially of social networking platforms will give publicity to the elderly and therefore a medium to react against abuse by publishing their problems.

Reflecting the legal implications of care facility residents using social networking platforms leads to consideration of the legal issues and risks regarding social networking systems in general.

There are currently many discussions about data protection and ownership of the data in social networking systems and in the web generally. The users leave a trace on every activity they do in the web and lose control about the data that is available about their person.

To empower the users' rights, the European Commission proposed a reform of the European Data Protection Rules in January 2012, which shall help to improve personal data protection. The expected benefits are listed as follows:

"A reinforced 'right to be forgotten' will help people better manage data protection risks online: people will be able to delete their data if there are no legitimate reasons for retaining it.

Wherever consent is required for data to be processed, it will have to be given explicitly, rather than assumed as is sometimes the case now. In addition, people will have easier access to their own data and be able to transfer personal data from one service provider to another more easily.

There will be increased responsibility and accountability for those processing personal data: for example, companies and organisations must notify the national supervisory authority of serious data breaches as soon as possible (if feasible, within 24 hours)..

People will be able to refer cases where their data has been breached or rules on data protection violated to the data protection authority in their country, even when their data is processed by an organisation based outside the EU.

EU rules will apply even if personal data is processed abroad by companies that are active in the EU market. This will give people in the EU confidence that their data is still protected wherever it may be handled in the world."[45]

Since most social network providers get out of the legal liability concerning user generated content by their terms of use[46], users are legally liable regarding their published content. This may lead to violation of copyright laws, litigations because of infringing, defaming or threatening.

It has to be considered that the legally safe expression of consent to the terms of use by cognitive impaired persons is questionable.

4. State of the Art and Application Developers' Requirements

4.1 User interface

4.1.1 Considerations related to specific needs of the elderly

When developing software for elderly users, it is important to take into account the effects on aging, be those physical in nature or cognitive. In this section, we will present some of the most common impediments which influence interface design and general SNS design of functionality.

4.1.1.1 Issues related to vision

Along with aging, people suffer from a variety of conditions which must be taken into consideration when designing a user interface. Such can be:

- loss in static and dynamic visual acuity (a metric of the spatial resolution of the visual processing system, the ability to distinguish details),

- the reduction in the range of visual accommodation (the distance on which they are able to focus),

- decrease in contrast sensitivity (the ability to see details at low contrast levels),

- slower dark adaption (ability of the eye to adjust to various levels of darkness and light),

- lower colour sensitivity (perceive colour differences),

- greater problems related to glare,

- reduced peripheral vision.

Such visual decrements make it hard for older people to distinguish small details, letters and buttons. It will be also difficult to identify useful information in complex or clouded screens. Colour selection is also important in order to avoid combinations that are difficult to differentiate, like blue-yellow or green-red. High contrast is also advisable and simpler, interfaces are necessary to increase ease of use and avoid unnecessary distraction.

Text should use larger than normal fonts, avoid close spacing between both characters and lines[47].

Having mentioned all of the above, one must still take into account the physical boundaries of the hardware available. Screen size and resolution must be taken into account in order to avoid situations were over magnified objects or letters create an unusable screen layout or too much complexity by adding many scroll bars[48].

Some additional guidelines are presented following the recommendations in "Cognition, technology and games for the elderly: An introduction to ELDERGAMES Project"[49] and "Human Factors and Aging: Identifying and Compensating for Agerelated Deficits in Sensory

and Cognitive Function"[50]

- Increase the illumination of environment of task context
- Increase the levels of luminance contrast by 2 – 6 times
- Minimize the need to use a device excessively close to the eyes
- Adapting the font size to a minimum of 12 (preferably 14) points
- Minimizing glare
- Minimize dependency upon peripheral vision
- Adopt marking strategies to enhance motion perception
- Use great colour contrast
- Optimize legibility of spatial forms

4.1.1.2 Issues related to hearing

Ageing also affects the ability of people to hear clearly or isolate specific conversations. We have to take into account that older people usually have:

- declined auditory acuity (especially for pure and high frequency tones),
- problems in binocular hearing, making it hard to localize sound.

As a result, it is difficult for older people to understand synthetic speech, because it is often distorted. Lower frequency tones should be favoured over higher pitch sounds. Additionally, it is advisable to avoid the combination of background noise (music, sound effects) with speech or other audible signals. Such recommendations are of particular use to games.

Some additional guidelines are presented following the recommendations in "Cognition, technology and games for the elderly: An introduction to ELDERGAMES Project"[49] and "Human Factors and Aging: Identifying and Compensating for Agerelated Deficits in Sensory and Cognitive Function"[50]:

- Increase stimulus intensity.
- Control background noise.
- Avoid using high-frequency sounds. Older people find lower frequency tones (500–1000 Hz range) easier to hear (when considering non speech signals).[51]
- Avoid long-term exposure to high levels of noise (i.e. 88dB or greater).
- Combine text or other means to complement speech or audio signals.

4.1.1.3 Issues related to motion

Motor impairments, and particularly those related to hand usability, can be diverse. Still, one must take into account that older people often exhibit:

- slower response times,
- decrease ability in maintaining continuous movements,

- problems with coordination,

- reduced flexibility,

- greater variability in movement.

Such issues make it difficult to handle a mouse and perform precision tasks. We must also take these problems into account, especially in relation to the tabletop interface, which will utilize a multi-touch interface. Small buttons and moving interface elements will be difficult for older people and should be avoided. More over non-functional areas around buttons are useful to avoid users pressing two buttons at the same time.

4.1.1.4 Issues related to cognition

Besides physiological impediments, declining cognitive ability is also a key factor that must be taken into account:

- attention process

- working memory

- discourse comprehension

- problem solving and reasoning

- memory encoding and retrieval

Providing simpler language and use familiar terms and working mechanisms that people can relate to easier. Use the same interface principles in the entire design if possible. Avoid the need to remember information through multiple screens. The design in general should be simple and as intuitive as possible. Although in the near future, more and more elder people will have increased contact with technology and computers, still a large portion has limited or no experience using them. This lack of exposure makes it difficult for elder people to understand the conceptual model of how this technology works. Things that may seem obvious to experience users are not in this case and appropriate guidance and/or automation should be employed to assist and simplify operations.

We include some additional guidelines on the issues of cognitive impediments:

- Stimulus "clutter" should be minimized. Task-irrelevant information may be especially distracting to older observers. Additionally, remove information as soon as its usefulness has expired.

- Present visual information in smaller "chunks". Present fewer stimuli distributed within a smaller spatial frame may support improved visual performance. Note that one must avoid causing crowding effects by packing messages to close together.

- Use well-established perceptual features when developing schemes to highlight text or graphical stimulus materials

- Minimize the need to develop new perceptual skills. Exploit perceptual skills developed earlier in life, as they appear to be well preserved into very old age

- Provide positive feedback in order to decrease stress and increase self-confidence.

- Inform the users where they are, where they have been and what the next possible steps are.

4.1.2 Other general guidelines – considerations

4.1.2.1 UI Complexity

When designing user interfaces for elder people, one must take into account that scaling down can be more effective than providing an abundance of options and functionalities. Emphasis must be given to ease of use[51] and providing a simplified interface with enough functionality but avoiding the confusion of too many alternatives.

An example of the mentioned complexity can be seen in Figure 46, where the number of options in the well-known program "Microsoft Outlook Express" is presented[47].
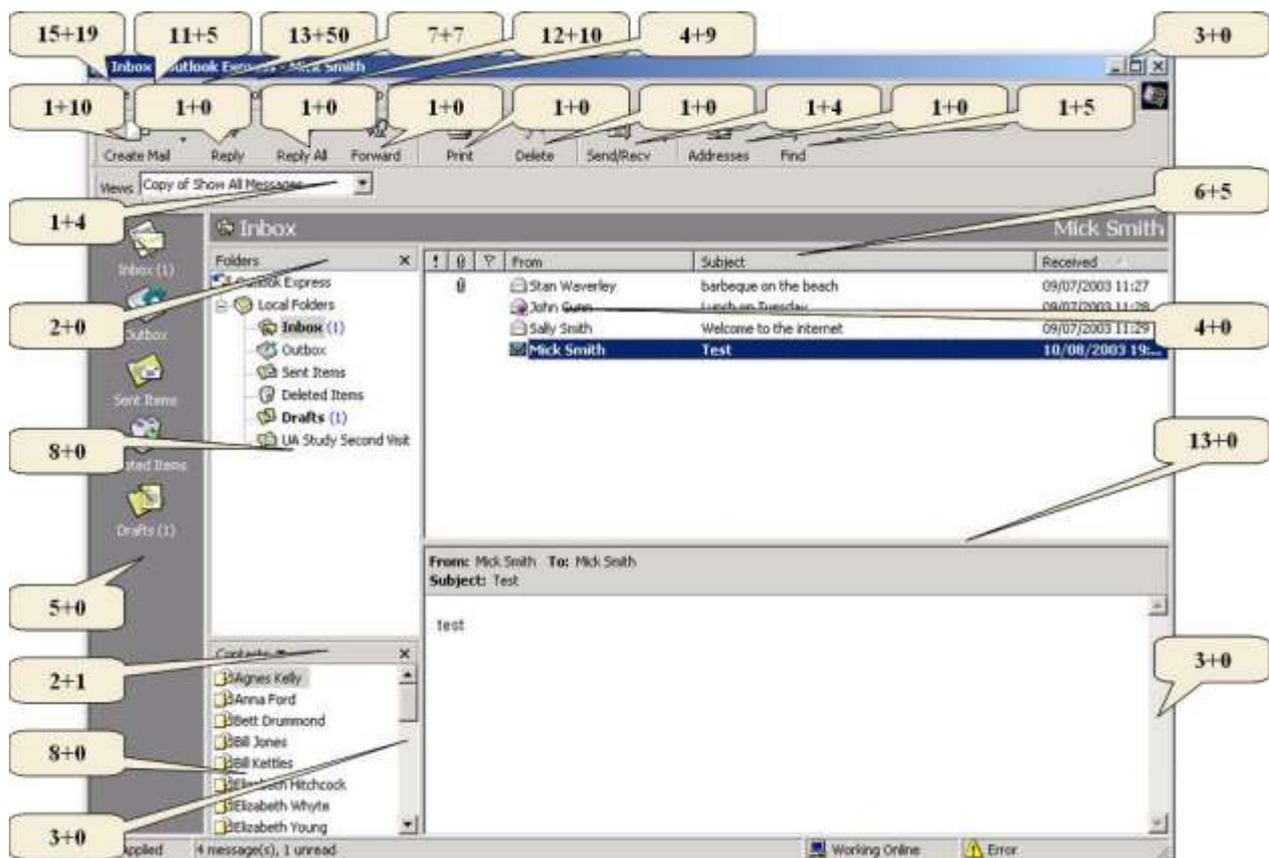
Figure 46: Complexity indicator in Microsoft Outlook Express

In this figure, the tremendous complexity of a well-known email system is displayed. The labels refer to the number of options available. If we take the example of the File Menu label, (15+19) it indicates that there are 15 options available on the first layer of the menu and 19 other available deeper in the menu structure. Such an example is indicative of the clutter that we need to avoid when designing interfaces for elder people. By reducing alternative functionalities and scaling down the number of options available to users, it is possible to deliver a simple interface able to provide the necessary functionality without all the bells and whistles that confuse and discourage elder users from using a system.

4.1.2.2 Assumption of background knowledge

One other issue that must be pointed out is that we should avoid making the assumption that users have a working knowledge of modern computer systems. Most applications follow several predefined conventions which enable users to capitalize on the experience they have working with one software and be able to transfer those skills to others using similar conventions. (Using double click to execute or right clicking on an item to produce a submenu are some examples.)

Working with multiple windows can also confuse older users, by clicking on a background window instead of the one they are working with, can "lose" the area they are working on, disturb their concentration and add to the frustration of performing a task. Small messages at the bottom of the screen are usually available in most systems, but still they provide little, if any, assistance to older users who generally miss them.

4.1.2.3 Computer anxiety

Computer anxiety can be defined as generalized emotional distress or the tendency of an individual to be uneasy, apprehensive or phobic towards current or future use of computers[52]. Elderly people who have little or no interaction with computers in their adult life exhibit signs of Computer anxiety which acts as a barrier to computer and social networking system use.

As the number of elder people who have previous experience in working with computers increases, this factor will be less influencing. Still, measures to alleviate this condition should be taken, in the form of training, better resources and user support.

4.1.2.4 Personalized interfaces

As mentioned by David Zejda[53], a social networking system should allow for deep personalization. One may personalize interfaces, use novel interface devices such as tabletops, tablets and other modular devices. Audio interfaces are yet another alternative, as they promote the feeling of closeness compared to the written word, varying from highly discreet to open audio.

Common personalization of the user interface should be available to users. Enlarging fonts and other elements, selecting default audio levels and selecting additional assisting notes and aids are some of the options that can reduce the effects of elder people impediments and enhance the social networking system experience.

4.1.2.5 Functionality guidelines

We present a set of additional functionality related guidelines, as they are proposed in "Cognition, technology and games for the elderly: An introduction to ELDERGAMES Project"[49]:

- Reduce the offered operations to avoid excessive interface complexity.

- Minimize the trees of options, in order to avoid the presence of layered menus ("invisible" options which users tend to forget about).

- Realize specific keyboard alternatives to mouse "Drag and drop" functionality, as the use of mouse can be complicated to elders.

- Provide immediate feedback about any selection on screen in order to simplify the understanding of the correctness of the operations.

- Maintain the consistency of the appearance and functionality throughout the interface in order to minimize confusion when a user navigates through different screens.

Additionally, in order to assist and maximize the learning process of elder users to new elements of the interface, one should consider:

- Rely on familiar aspects of the activity.

- Minimize the number of interface elements.

- Maximise the interface consistency.

- Use all-new items for new tasks (to avoid confusion with already learnt actions).

- Provide readily available information on how to complete a task, avoiding older people to have to guess or memorise long series of operations.

- Focus on documentation, available helps, error messages and manuals, in order to help users to recognize errors and possible breakdowns. Elder people are very likely to make errors during the execution of a task. It is important for the system to provide information about the error, its consequences, and resolving strategies.

- Try to use labels and language close to what users might use for the same tasks, capitalizing on the users' past experience and knowledge. Examples like "write" instead of "compose" an email are indicative of the impact that such small changes might have on user acceptance and understanding of the system[47].

4.2 Usability and barrier-free accessibility

As already mentioned in chapter 4.1.1, elder people suffer from different age-related sensorial, motoric and cognitive impairments, which can make the access to web-content difficult for them.

With respect to the aims of the European Commission's e-inclusion efforts it is desirable to make the system as accessible as possible (barrier-free), ensuring that "no one is left behind"[54].

Also the United Nations mention in their "Convention on the Rights of Persons with Disabilities" that measures have to be taken to "ensure that private entities that offer facilities and services which are open or provided to the public take into account all aspects of accessibility for persons with disabilities"[55]

And even the Web Accessibility Initiative states that "websites and tools that are accessible to people with disabilities are more accessible to older users as well."[56]

But the heterogeneity of the Elder-Spaces target group has to be taken into account. Especially the healthier elderly could be deterred by a user interface, which is kept too simple. To prevent this, a personalization of user interface concerning the accessibility features should be possible as already mentioned in chapter 4.1.2.4. To support an easy setup a wizard should be provided.

4.2.1 Resources concerning usability and accessibility

The probably most common resources concerning the accessibility of web-content are provided by the Web Accessibility Initiative of the World Wide Web Consortium:

Web Content Accessibility Guidelines (WCAG)

"Following these guidelines will make content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these. Following these guidelines will also often make your Web content more usable to users in general." [57]

Authoring Tool Accessibility Guidelines (ATAG)

"Adoption of these guidelines will contribute to the proliferation of Web content that can be read by a broader range of readers and authoring tools that can be used by a broader range of authors." [58]

Accessible Rich Internet Applications (WAI-ARIA)

"WAI-ARIA, the Accessible Rich Internet Applications Suite, defines a way to make Web content and Web applications more accessible to people with disabilities. It especially helps with dynamic content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies." [59]

User Agent Accessibility Guidelines (UAAG)

"A user agent that conforms to these guidelines will promote accessibility through its own user interface and through other internal facilities, including its ability to communicate with other technologies (especially assistive technologies). Furthermore, all users, not just users with disabilities, should find conforming user agents to be more usable.

In addition to helping developers of HTML browsers and media players, this document will also benefit developers of assistive technologies because it explains what types of information and control an assistive technology may expect from a conforming user agent." [60]

A very extensive requirement specification[61] has also been created in the project MyUI, which focuses on the dynamic adaption of user interfaces based on a user model updated in real-time.

4.2.2 Compiled recommendations by the WAI-AGE literature review

As part of the WAI-AGE project the initiative did a literature review including over 220 resources especially on web accessibility for older people and compiled the given recommendations grouping them into the categories perceivable, operable, understandable and robust as follows:

"Perceivable

- Use 12-14pt text size

- Use relative units for text and layout

- Provide text size adjustment link

- Use a sans serif font

- Avoid bold body-text (except for emphasis)

- Avoid underlined text (do use for links)

- Avoid text in all capitals (use proper case)

- Left justified text (with L2R scripts)

- Use increased line spacing

- Provide sufficient (high) contrast

- Avoid blues and greens with black

- Avoid fluorescent colours

- Use dark text on light background

- Avoid patterned backgrounds

- Use HTML rather than images or multimedia for text-based information

- Provide 'white space' page margins

- Avoid horizontal scrolling

- Do not indicate required form fields with just an asterisk - use text

- Ensure links are blue and underlined

- Ensure links change colour after visit

- Ensure links are visibly different when they have focus

- Combine images and links with the same destination

- Present links as lists

- Clearly separate links

- Links should be large in size

- Provide a text equivalent for images

- Provide captions and/or transcripts for video and animations

- Don't use co lour alone to portray information

- Use style sheets for presentation and layout

- Provide a linear alternative to pages using table layout

- Make search results visible in normal view-port

- Make sure the user notices small page changes/updates

Operable

- Avoid moving (and scrolling) text
- Use static menus (not fly-out / pull-down)
- Provide clean pages; avoid clutter; avoid irrelevant material to the main content
- Clearly separate links
- Don't disable the "back" button(don't break the browsers history functionality)
- Provide "breadcrumbs"
- Provide true home page link on all pages of site
- Ensure the 'search' function covers whole site
- Ensure the 'search' function is labelled
- Avoid blinking content
- Avoid animations (unless requested)
- Do not automatically refresh pages
- Use device-independent event handlers
- Ensure logical tabbing order
- Provide clear links
- Provide a site-map
- Provide a navigation menu
- If pop-up windows used, then the full message is displayed
- Undertake user testing

Understandable

- Avoid text in all capitals (use proper case)
- Left justified text (with L2R scripts)
- Provide Previous/Next page links (where appropriate)
- Avoid pop-ups or new windows
- If pop-up windows used, then the full message is displayed
- Provide Help &/or FAQ's for the site
- Provide instructions for form completion
- Provide clear error messages for forms
- Accommodate misspellings, hyphens and common variations within forms
- Provide clear/consistent branding on all pages
- Provide an "About us" and/or "Contacts" page

- Ensure search function is tolerant of misspellings

- Ensure the 'search' function is labelled

- Use an active voice for writing

- Use short sentences and paragraphs

- Use short pages

- Provide consistent navigation

- Write clearly with important information at the start

- Include a glossary(especially for technical terms)

- Only use icons and graphics that are relevant to the topic or that aid comprehension and understanding

- Ensure search query is repeated on search results page

- Group like information

Robust

- Use valid code

- Avoid making users download documents (provide material as HTML where appropriate)

- Pages should function without scripting support

- Consider page download speed - create 'small' pages

- Do not require 'double clicks'" [62]

4.3 Tabletop specific considerations

Tabletop technology is new, but showing great potential as an alternative interface to social networking systems. Having a larger active area available to users and multi-touch capability, it provides an excellent means for interacting with social networking systems. Particularly for elder people, it can provide a platform for social interacting, both through social networking systems but also in assisting face-to-face social interaction[63], as they provide the means for more people interacting with the same screen at any given time. Furthermore, they provide a "natural" approach to the interface, by touch or multi-touch screens, which are much easier for users to manipulate and learn, without having the drawbacks of using a mouse as described in the user interface section.

4.3.1 General considerations

One can classify the methods of interaction with a touch screen device, and a tabletop in particular, into three ways[64]:

1. single user interacting with a device;

2. multiple users interacting with one device but at different times (i.e. taking turns in using it);

3. multiple users interacting with one device at the same time.

All three options can be available to users through the Elder-Spaces platform, each one providing different stimuli and different socializing opportunities.

When designing the interface for tabletop devices, one must take into consideration the impediments described in the user interface section of this document. In contrast to interfaces designed for desktops and laptops, touch screen devices tend to utilize many of the suggested guidelines for elder people.

The use of virtual buttons, which are usually large enough to be pressed by a finger instead of a mouse pointer, is a good example. Items are larger thus making them easier to see and select. Also since they are virtual buttons, much less strength is necessary in order to press them. Furthermore, the user does not have to divide their attention from the screen to the keyboard or mouse in order to complete a task. This way such interfaces require less concentration and have a much lower strain on the user's cognitive abilities, relieving some of the stress that is resulted from the interaction with the device.

4.3.2   Touch screens vs. other pointing devices

It is interesting to evaluate the different media, in order to examine the usefulness and strong points of each one. Generally, the suitability of each device depends mainly on the intended task. A starting remark can be that touch screen interfaces are more suitable for inexperienced users and simple tasks (mainly point and click) while traditional keyboard and mouse interfaces are favoured by experienced users and tasks that require extensive typing [65,64].

Although Shneiderman[66] described the advantages and disadvantages of touch screen versus pointing devices already in 1991, these still hold today and can be used to evaluate both types of interfaces.

Advantages:

*   Touching a visual display of choices requires little thinking and is a form of direct manipulation that is easy to learn.

*   Touch screens are the fastest pointing device.

*   Touch screens have easier hand-eye coordination than mice or keyboards.

*   No extra workspace is required as with other pointing devices.

*   Touch screens are durable in public access and in high-volume usage.

The disadvantages include:

*   Users' hands may obscure the screen.

*   Screens need to be installed at a lower position and tilted to reduce arm fatigue.

*   Some reduction in image brightness may occur.

*   They cost more than alternative devices.

It is generally agreed that the advantages outweigh the disadvantages when considering older people as users. One of the significant factors in favour of using touch screen devices is the significant reduction of anxiety towards computers experienced by users who trained with a

touch screen as opposed to no reduction by users who trained with keyboard[67]. This is a significant factor for the acceptance of the system.

4.3.3 Touch screen design guidelines

Following the usability website of SAP's Design Guild, we present some of the more noticeable design guidelines with respect to touch screen and tabletop interfaces ([48,64]).

With respect to general guidelines, five golden rules are proposed:

1. Speed – Make sure that the application runs fast.

2. Intuitiveness – Make the user think as little as possible about the meaning of objects and the functionality of the system.

3. Choices – Scale down the application, provide minimum set of choices, by selecting what is important.

4. Guidance – Provide user guidance as much as possible. Use text, sounds and images to assist in performing tasks. Provide feedback to encourage and verify actions.

5. Testing – Make sure that adequate testing is done before deploying the application

There are some additional more specific guidelines to consider:

4.3.4 Screen layout

Touch screens and tabletops in particular provide the advantage of a large screen area. This feature enables designers to use large input and output features. Menus, buttons, selectors, as well as content (text, image or video) can be enlarged and easy to see. Larger font sizes (12pt) are recommended.

Also both the layout and the size of buttons impact the user-screen interaction. Larger buttons are easier to see and assist in target selection. Buttons should be at least as large as a finger width. Grouping of items is also important, as the user has to move their hand about to perform relative tasks. One more issue has to do with consistency. When grouping elements, or designing menus, one has to try to be consistent throughout the application, but also make an effort to avoid unnecessary navigation and clutter in the screen with unnecessary objects.

Colour is another important variable. It is not preferred for grouping of elements as elder users often exhibit vision impediments as described earlier. Instead, text, spacing and the use of frames are preferable alternatives for such tasks.

Finally, with regard to the background colour scheme, it is recommended to avoid black or other dark colours, because they highlight finger prints and increase glare, making it especially difficult for older users to see the screen.

4.3.5 Data entry

As mentioned already, touch screens and tabletops are not ideal for extensive data entry tasks. A virtual keyboard is a well-established method for typing in such devices, but it is not recommended for extensive typing as the arm can become fatigued rather fast. Alternatives to using a virtual keyboard are the selection of predefined values and the provision of buttons and sliders for increment/decrement values.

One other solution, particular to the tabletop is the use of a physical keyboard where possible.

4.3.6   Buttons and menus

As mentioned earlier, tabletop and touch screens in general are best suited for point and select interaction. Buttons are the most suitable object for such actions. Taking into account that the intended user group will be elder people, according to the consolidated information by Caprani et al.[64], the recommended dimensions are: 20 mm by 31.75 mm where the minimum button size should be a square of 11.43 mm.

Button spacing is recommended between 3.17 mm and 12.7 mm.

Furthermore, text, colour and icons can help users identify a button. Text in buttons should be clear and easy to read (i.e. sans-serif, 16pt), making sure that terms which are used are clear and/or familiar to users. Alternatively common, recognizable icons can also assist.

There is one disadvantage with virtual buttons that has to be addressed. There is no tactile feedback that the button is pressed, something that can cause confusion to the user. There are several ways to counter this, changing the colour of the button is one, taking always into account that elder people with impaired vision may not discern such a change, so careful selection of colour scheme is necessary. Additionally, audio or text messages can be used to provide feedback that the button was pressed.

Finally, menus are a common way of navigating a system. It is recommended that menus are kept short and when displayed, all items should be visible, thus to avoid making users having to remember about hidden functionality. Another guideline suggests that different menu groups (e.g. main and secondary menus) should be distinguished by their shape and style.

4.3.7   Complex controls

Complex controls are generally items to be avoided in tabletop or general touch screens. The use of lists and tables are more suited for higher precision input devices, like a mouse.

Scrollbars are also difficult to use in touch screens and there is evidence that older people find them particularly difficult to use[68]. Along with scrollbars, double clicking on a touch screen is one of the most problematic functions and should be avoided. Instead of scrollbars, other methods may be utilized to assist users see an extended screen. Buttons for moving the surface up and down (depending on the orientation of the screen), or gestures such as swiping the screen are such alternatives. One must take into consideration that for large surfaces, swiping is an action requiring more effort compared to the same action in a smaller device like a mobile phone.

Finally, familiar gestures such as using a finger or a pointing device to draw an X for deleting or a tick ✓ to save an item have been found to be compatible with older users.

4.3.8 Other considerations

Some additional recommendation that should be noted:[63]

- There exists a need for customization, users need to be able to enlarge easily interface components, assisting both in seeing better and reducing the need for finer motor control.

- The overall interface design has to focus on learnability and memorability. Elder users need a system that is easy to learn. Familiar actions, images and language can assist users to learn faster. Also an effort has to be made to maintain consistency throughout the system, so that the same principles adhere and make it easier to remember how to operate it. Making the interface and functionality predictable is even better although harder to achieve. Distinguish between different tasks, use completely new icons and buttons for new functionalities.

- Take into account the physical aspect of the interaction with the interface. Tabletops have the advantage of a larger area. But this can also become a disadvantage, if the area is too large for users to reach objects on the screen.

4.3.9 Proven methods of interaction with tabletops

In this section we present some proved methods of interaction between elder people with tabletop applications. These functions are focused on image manipulation, something that can be adopted in the Elder-Spaces project, since photo sharing is a popular activity in most social networking systems.

These actions were presented for photo sharing.[63]

4.3.9.1 Select

Selecting an image is accomplished by physically touching it. The corners of the image and its boundary are highlighted. Effectively the image is divided into two parts, the corners and the centre of the image (which is the entire image except the corners). This method imitates a familiar situation were a printed picture is mounted into small pouches or slots where the corners of the image are placed. These corners will later be used for additional actions on the image.

4.3.9.2 Move

Moving an image is one of the fundamental actions that can be performed. Displaying, sending or sharing a photo requires some kind of movement (to or from an album or a group of users etc.). To move a photo, users need to place their finger in the centre of the image and move it. The image will be translated following the movement of the finger.

4.3.9.3 Rotate / Resize (Rosize)

This is a complex function which was named Rosize, in an effort to achieve simpler interaction with the users. Rosize makes it possible to maintain the appearance of a particular point on a photo being "stuck" to the participant's fingertip (as it is for move). To activate, a user touches the image in one of the photo corners (with or without a select) and slides their finger over the

surface. The photo is rotated and resized concurrently such that the location on the photograph of the initial touch continually remains beneath the user's finger, as in Figure 47: the centre of the image remains fixed and the image rotates and resizes, following the point marked X under the user's finger.

(a) A reducing rotate/resize gesture

(b) An enlarging rotate/resize gesture
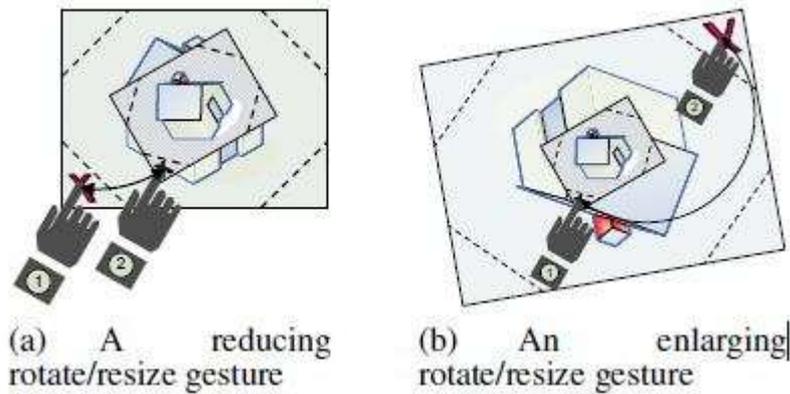
Figure 47: Rosize example

It is possible to distinguish the two operations and to create a new resize function by using a multi touch gesture.

4.3.9.4 Copy

To copy a photo, a user must first be touching in the "centre" then add a second finger near the first. As they slide one finger away from the other, a duplicate of the photo is produced, as shown in Figure 48. Once both fingers are released, the two photos behave as if they were completely separate.
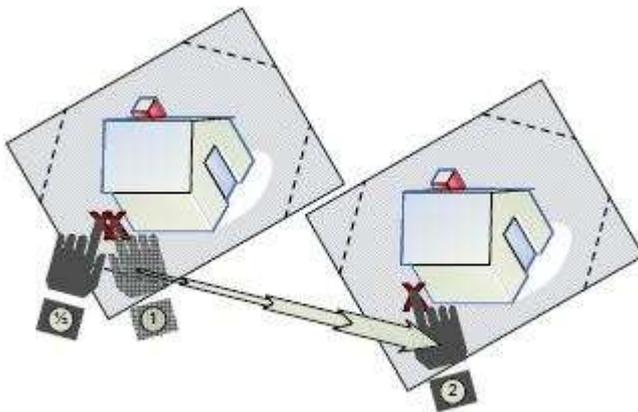
Figure 48: Copying an image – multi touch gesture

4.3.9.5 Delete (Black Hole)

The Black Hole provides functionality for deleting but also frees screen space without providing a definitive, irreversible delete operation. The Black Hole is a semi-translucent photo with swirls as shown in Figure 49. It is always shown in front of other photos and can be manipulated as a typical photo but cannot be copied or moved. Objects moving towards its centre become smaller and translucent. Objects in its centre are hidden. Similar to the recycle bin in windows, it provides a safe disposal function that can be reversed.
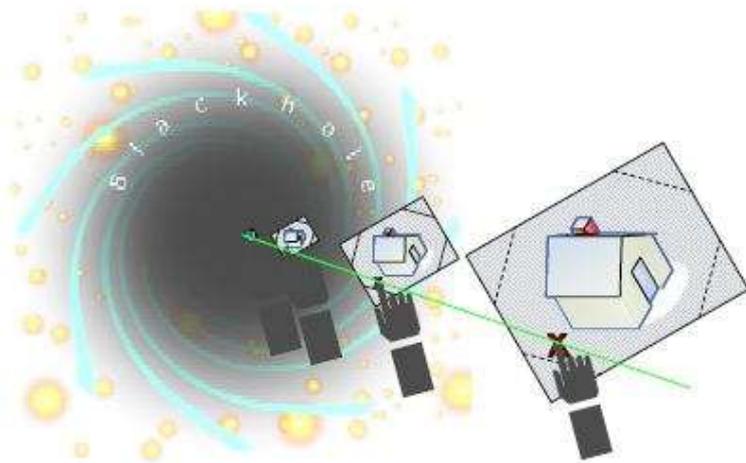
Figure 49: The Black Hole and deleting an image

4.4 Cognitive social search and content personalization

4.4.1 Introduction

The term social search appears between 2004 and 2005 and it is a term that emerged with the explosion of the social networks such as Facebook. According to McDonnel et al 2011 *"social search refers to the ways in which social media services and systems can be used to enhance and expand use of searches on the web"*[69]. It can be done using information, relations and activities of users and it is based on sophisticated approaches that combine human intelligence with computer algorithms.

Social search is an integral feature of social networking applications and of Elder-Spaces applications as well. A target made of older people must be addressed with highly intuitive and efficient search techniques in the scope of building social graphs, community building, training and other applications. Elder-Spaces needs to offer advanced search functionalities based on "concepts" and on personalization of contents rather than conventional text search and data mining techniques. The foundations of the social search are the personalization technologies: personalization gained significance in the 90s, with the boost of large-scale computing networks

which enabled the deployment of services to massive, heterogeneous, and less predictable end-consumer audiences. As the number of services and the volume of content (text and multimedia; public, commercial and personal) in these networks keeps growing, personalization is more than ever a critical enabler in helping users managing capacity and complexity, and helping vendors (content providers, managers, brokers, distributors, technology providers) to reach their target audience and attain a competitive edge. Social network content involves a large amount of unstructured data: in its raw form, the data has limited value since we can do little activities with it beyond keyword search. Keyword searches indeed often return results that include many non-relevant items (false positives) or that exclude too many relevant items (false negatives). Elder-Spaces will make use of concept based search aiming to deploy technologies that augment social intelligence in the platform. The idea behind the concept based search is to operate on semantic concepts and to maximally exploit the semantic information available, reducing to syntactic search only when necessary, i.e., when no semantic information is available. Concept search can be used to provide users with access to content such as news, games, and resources coming from a variety of unstructured data. Unstructured content analysis methods for knowledge acquisition are based on information extraction techniques needed to extract key concepts from each resource analysed.

4.4.2   User preferences modelling

A model of user preferences allows a system to appropriately decide whether a resource (a possible friend, a document, a game) is interesting for a user or not. User profiling is the base of a content delivery system. To improve the user satisfaction for results retrieval the research community worked on mining and understanding user interests and describes it with a reasonable mode.

This is an area where multiple research examples, primarily in e-learning, have been presented. However, the field still lacks concrete standardization of the user and context representation for both local and distributed applications, as different solutions have been formulated.

Lin et al.[70] present a new mechanism describing and updating user interest model to realize personalized information service. Castellesi, et al.[71] used ontology to improve the efficiency of personalized information retrieval and a framework is put forward which includes relationship measuring, user interest expressing and automatically updating. Zeng[72] added time axis into user interest model to distinguish short-time interest from long-time interest and discover the periodic interest change. They suppose that User Modelling is unfit for describing this kind of dynamic user interests and tastes, so they put forwards the user dynamic interest description model based on multi-granularity interest space to resolve the problem. A different approach is presented by Gasparetti and Micarelli[73], where the Search of Associative Memory model is used to represent the human memory processes of learning and retrieval when interacting with information sources. This model is applied in the context of Internet browsing activities. The evaluation shows interesting results in comparison with a standard user modelling approach.

4.4.3   User profile contents

In different state-of-the-art personalization techniques[74], user profiles have been designed to include both static and dynamic information, information that needs to be entered by the user (e.g. personal data), and information that is automatically acquired by the system. Some of these designs even allow the user to inspect and edit them at any time. We should make a distinction between what is saved explicitly in the profile and what is implicit, like usage history: This source can be seen as an implicit form of user model, since it will include all the user's activities in the system. Typically, just the user profile update module will access the usage history of the system, in order to extract a high-level synthesis that will be persisted in the explicit profile.

The explicit part of user profile contains information about the user's interests in the system's resources (documents, songs, events, and so on). Different systems choose, as we will explain in the following section, the appropriate model for their specific purpose, describing resources in terms of their content or in terms of the preferences the community has about them.

In literature there are several ontologies to semantically represent users' interests and relations and to interpret user profiling data, common semantics user profiling statements are needed. Possible formats for user profiles include the General User Model Ontology (GUMO)[75] or Friend of a Friend (FOAF)[76].

GUMO is designed according to the approach of dividing basic user model dimensions into triples. The user modelling research community had the need to share a commonly accepted top level ontology for user models, and GUMO answered exactly to this. Using GUMO it is possible to collect the user's dimensions that are modelled within other user-adaptive systems like the user's heartbeat, the user's age, the user's current position, the user's birthplace or the user's ability to swim.

FOAF (Friend of a Friend project) is a flexible ontology used for describing people, their relationships and their activity and defines an open, decentralized technology for connecting social websites, and the people they describe. FOAF permits to share and to inter-connect information from diverse sources. A large set of properties is dedicated to the definition of a user profile: "family name", "nick", "interest", and it has been designed as a lightweight and extensible vocabulary. Incomplete by design, a number of extensions emerged since its introduction in 2001, covering a broad range of application specific requirements.

4.4.4   Analysis of unstructured data

Many applications increasingly involve a large amount of unstructured data. In its raw form, the data has limited value since we can do little activities with it beyond keyword search. Consequently, over the past decades, significant efforts have focused on the problem of extracting structured information from such data. Figure 50 shows a chart which offers an overview of the information differentiation among structured and unstructured.
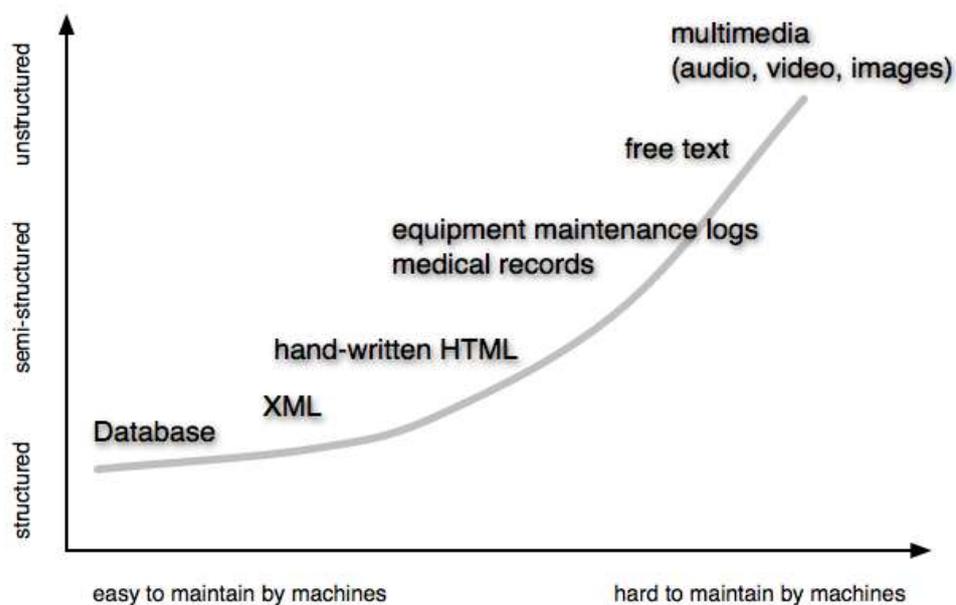
Figure 50: Unstructured information chart

The most spread technique in the knowledge acquisition field is Information Extraction (IE): it is the process of extracting from free text specific facts in a given target domain. For example, in extracting information about companies key elements to be extracted are the company address, contact phone, fax numbers, and e-mail address, products and services, members of the board of directors and so on.

4.4.4.1 Information Extraction Methods

The field of information extraction has been fuelled by two major US international evaluations efforts, from 1987 until 1997 the Message Understanding Conferences and since 2000 the Automatic Content Extraction Evaluation. European efforts include the 2004 PASCAL Information Extraction Challenge[77].

Information extraction pulls facts and structured information from the content of large text collections (without the user specifying a particular query in advance). Information extraction is a low-cost approach to natural language processing to extract specific noun sets and information matching specific syntax and semantic templates. Tasks carried out during information extraction are named

- entity recognition, which consist on the identification and classification of different types of names in text;

- co-reference resolution, which is the task of deciding if two linguistic expressions refer to the same entity in the discourse;

- semantic role recognition, which deals with the recognition of semantic roles to sentence constituents (e.g. agent, goal); and

- relation extraction, which identifies relations between entities in text.

There are two main approaches to the development of IE systems:

- Knowledge Engineering: mainly based hand-crafted systems which rely on language engineers to design lexicons and rules for extraction.

- Machine-Learning: these systems can be trained to perform one or more of the IE tasks and can extract knowledge from text. Learning systems are given either an annotated corpus for training or a corpus of relevant and irrelevant documents together with only a few annotated examples of the extraction task, in this case some non-supervised techniques such as clustering can also be applied.

Rule-based information extraction is a process by which structured objects are extracted from text based on user-defined rules. The compositional nature of rule-based[78] information extraction often allows rules to be expressed over previously extracted objects. Rule-based systems can be based on gazetteer lists – lists of keywords which can be used to identify known names (e.g. *New York*) or give contextual information for recognition of complex names (e.g. *Corporation* is a common postfix for a company name) and cascades of finite state transducers which implement pattern matching algorithms over linguistic annotations (produced by various linguistic processors).

A typical information extraction system, such as ANNIE of the University of Sheffield, is implemented by using a cascade of finite-state grammars. Based on such mechanism, it is possible to identify the units of words, complex words, basic phrase group, co-reference resolution, identifying event structures etc., in text. Rule based systems consist of a cascade of modules such as: sentence splitter, word segmentation, part-of-speech (POS) tagging, name entity extraction, noun group, extraction and event extraction. In GATE the JAPE (Java Annotation Processing Engine) engine is used as the basis of the extraction modules. The task of developing the extraction functions is therefore to define the regular expressions of the respective extraction objects.

Automatic Learning approaches are split in three main groups:

- supervised learning

- semi-supervised learning

- unsupervised learning

Supervised learning is a machine learning technique for deducing a function from training data. The training data consist of pairs, typically vectors, of input objects, and desired outputs. Supervised machine learning is the search for algorithms that reason from externally supplied instances to produce general hypotheses, which then make predictions about future instances. The goal of supervised learning is to build a concise model of the distribution of class labels in terms of predictor features. The resulting classifier is then used to assign class labels to the testing instances where the values of the predictor features are known, but the value of the class label is unknown. Supervised methods, however, require large amounts of annotated training data that is expensive and difficult to obtain. Weakly supervised approaches[79], on the other hand, aim to obtain classifiers using much less human-labelled data, by bootstrapping a large set of automatically labelled data from a very small set of labelled instances.

Semi-supervised learning (SSL) is a class of machine learning techniques that make use of both labelled and unlabelled data for training – typically a small amount of labelled data with a large amount of unlabelled data. Within machine learning, SSL approach to classification receives

increasing attention. While demonstrably effective, both rule-based and supervised machine learning approaches to IE customization pose too high a burden on the user. Semi-supervised learning approaches may in principle offer a more resource effective solution but are still insufficiently accurate to grant realistic application. An interesting approach of Tratz[80] demonstrates that this limitation can be overcome by integrating fully-supervised learning techniques within a semi-supervised IE approach without increasing resource requirements.

Unsupervised learning is a class of problems in which the system seeks to determine how the data are organized. Symbolic learning techniques which learn rules or dictionaries for extraction have been applied in information extraction and are also called Unsupervised Information Extraction (UIE) systems. Because UIE systems do not require human intervention, they can recursively discover new relations, attributes, and instances in a scalable manner. When applied to massive corpora such as the Web, UIE systems present an approach to a primary challenge in artificial intelligence: the automatic accumulation of massive bodies of knowledge. In particular, they provide the opportunity to create domain-independent knowledge-based systems. However, several technical challenges stand in the way. An unsupervised methodology for Word Sense Disambiguation, called Dynamic Domain Sense Tagging has been presented by Basili[81].

Unsupervised IE systems such as KnowItAll ([82],[83],[84]) and TextRunner[85], Banko and Etzioni[86] have demonstrated that at Web scale, automatically-generated textual patterns can perform UIE for millions of diverse facts. KnowItAll, which has been developed at the University of Washington, is an autonomous, domain-independent system that extracts facts, concepts, and relationships from the Web. KnowItAll takes a domain-specific set of predicates as input that represent classes or relationships of interest. The predicates supply a symbolic name for each class (e.g. "MovieActor"), and also give one or more labels for each class (e.g. "actor" and "movie star"). These labels are the surface form in which a class may appear in an actual sentence. In a bootstrapping phase the labels are used to instantiate extraction rules for the predicate from generic rule templates. TEXTRUNNER is a fully implemented system that extracts relational tuples from text.

The tuples are assigned a probability and indexed to support efficient extraction and exploration via user queries. TEXTRUNNER extracts a far broader set of facts reflecting orders of magnitude more relations, discovered on the fly.

Statistical machine learning approaches to information extraction include the use of:

- Hidden Markov Models (HMM);
- Support Vector Machines (SVM);
- Conditional Random Fields (CRF);

With HMM the information extraction task is cast as a tagging problem where given a sequence of input words *w1….wn* the system[87] has to produce a sequence of tags *t1…tn* where *wi* are observations and the *ti* are hidden states in the HMM. The model is defined in terms of transitions between states (ti, tj) (with associated transition probability TPij) and emission of symbols by states (ti, wj) (with emission probability EPij). Probabilities are estimated using for example the expectation-maximization optimisation technique using a training corpus. Decoding of a solution given the input sequence is achieved using efficient searching algorithms such as the Viterbi algorithm. HMM have been used in many IE applications including extraction of information about technical papers (paper title, author, journal, abstract, etc.). HMM have the

particular advantage of giving the probability of a particular tagging sequence which could be used as an indicator of the confidence of the system. The model needs to be adapted for the extraction task.

SVMs are very competitive supervised models for information extraction[88]. SVM cast the IE task as a binary classification problem (each label gives rise to a binary classification problem). SVMs try to find a hyperplane in the vector space of instances that maximally separates positive from negative instances. Finding the hyperplane corresponds to an optimisation problem. In Cherry[89] is the first application of LSVMs (Latent SVMs) to NLP: they train a LSVM for language modelling which uses latent parse trees. Liu et al.[90] use latent support vector machines (LSVM) for the Semantic Role Labelling (SRL) task using these latent Lexicalized Tree Adjoining Grammar (LTAG) features. Their experiments on the PropBank-CoNLL'2005 dataset show that this method obtains a significant result: 89.59% F1 score on this task.

CRFs[91] are state of the art techniques for IE and tend to do better than other classification methods. Nguyen et al.[92] formulate the problem of semantic tagging as a sequence learning using a conditional random field models (CRFs). They represent a tree structure of a given sentence in which syntactic and semantic information are integrated in that tree. The learning problem is to map a given input sentence to a tree structure using a structure support vector model. Conditional Random Fields (CRFs) constitute a popular and effective approach for supervised structure learning tasks involving the mapping between complex objects such as strings and trees. An important property of CRFs is their ability to cope with large and redundant feature sets and to integrate some form of structural dependency between output labels. For example, in POS[93] tagging a CRF can easily model the fact that adjectives tend to precede nouns in English. However, the excellent performance of structured models comes at a computational cost: inference in loopy graphs requires approximate inference, and even for sequences, there is a quadratic dependence on the number of tags.

4.4.4.2 Knowledge acquisition evaluation methods

Many Natural Language Processing technology tasks such as Information Extraction are traditionally evaluated using Precision, Recall and F-measure. These metrics have a very long-standing tradition in the field of IR. For example, they have been used in large-scale IE evaluations such as MUC[94] (Message Understanding Conferences) and CONLL ([95,96]).

In this case, evaluation is carried out for IE systems by comparing the templates produced automatically by an extraction system with templates for the same texts produced by humans. The evaluation can be fully automatic. Thus analysts produce a set of filled out templates or keys using a computer tool to ensure correct formatting and selection of fields. The automatic system produces its templates in the same form and a scoring program then produces sets of results for every slot. Most of the systems evaluations are based on giving one point score for every slot correctly filled (Correct). Spurious slots (S) are also counted, these are slots that are generated, and filled, despite there being no information in the text, and slots with incorrect fills (I). The total number of correct slots (TC) in a template (or key) is also known. These numbers allow two basic scores to be calculated: PRECISION and RECALL.

Precision measures the number of correctly identified items as a percentage of the number of items identified. It means that it measures how many of the items that the system identified were actually correct, regardless of whether it also failed to retrieve correct items.

Recall measures the number of correctly identified items as a percentage of the total number of correct items. In other words, it measures how many of the items that should have been identified actually were identified, regardless of how many spurious identifications were made.

The F-measure is often used in conjunction with Precision and Recall, as a weighted average of the two.

False positives are also a useful metric when dealing with a wide variety of text types because they are not dependent on relative document richness. With false positives we assume the relative number of entities or annotations of each type to be found in a set of documents. Another solution to evaluate an IE system is to use error rate, which is the inverse of Precision, and measures the number of incorrectly identified items as a percentage of the items identified.

4.5 Communication

Communication with other users using messages or media sharing is one of the most common features of most social networking systems. The motivation for communicating is as diverse as the people who participate in a social network. Users communicate to meet new people, reconnect with old friends, exchange ideas, find love, build their self-esteem etc. The great majority of such messages are of an ephemeral nature and often there is no need to respond.

Seniors, do recognize that they have a lot to gain for social networking systems as they are in an age group which is most prone to loosing social ties and isolation as a result of physical or mental impediments and retirement from employment. Communication through social networking systems offer easy communication tools which can help increase the social interaction with loved ones and even expand their cycle of friends by reconnecting them with lost acquaintances or by creating new ones[52].

Communication in social networking systems can be differentiated by the rate and direction of change in a conversation, or conversational velocity[97]. Such a term can be used to differentiate between conversations made with all parties synchronously exchanging messages online, or others like blogging for example that do not have such characteristics but a conversation may progress through periodic exchange of longer messages over an initial incentive.

Communication can be achieved through a variety of functionalities in a social networking system:

- Messaging. Much like an email, only having significantly simple interface and range of functionalities. Users can select from their friends list one or more recipients and type a message

- Announcements. Users can type short messages in their profile wall which are visible to their friends or other people, depending on their security preferences

- Photo – Media sharing. One of the most popular activities in social networking systems. When designing for elder users, simplicity and ease of use are some characteristics that most studies stress out. Photos have a particular significance to elder people, both as a media for reminding past events and people but also as a means to stay in touch with family and friends.

- Group conversations (forum). Such communication is usually specific on the interests of the group that is hosting it. Because of the apparent relevance to the users' common interests it can attract large number of participants.

- Blogs. In contrast to chats and messages, blogs tend to have a longer life expectancy. Messages tend to be longer and no synchronous presence is needed for exchanging of ideas and views

- Chat. Chatting is extremely popular with younger users, but less common among elder people who often rely on more conventional means for making long conversations about daily events.

4.6 Events management

Social networks are incorporating Event Management applications to facilitate added valued services to their users. Although there are specialized web sites and other applications (like www.envite.com, http://www.punchbowl.com/, http://party.myevent.com/ and others), leveraging on the information available in a social networking system can have additional benefits to users. Facebook for example launched in 2009 new functionality to assist users plan online or offline events[98].

As with most things about social networks, the way this capability is going to be used resides with the users themselves. Just like in Facebook, Elder-Spaces can leverage on the intended senior user pool and in combination with other people either users of the site or other social networking systems can assist in announcing and planning of events. Such events can be offline activities, thus promoting intergenerational activities with other family members, or organized learning endeavours among elder uses of the social networking system.

4.7 Games

4.7.1 Games in relation to elder users – motivations and influence

Digital games hold the potential to enhance seniors' leisure time and social connectedness, and provide a mental and even physical workout.

According to a focus group study performed by Nap[99], all seniors mentioned that they played digital games for fun and relaxation. Enjoyment seems to be a primary contributing factor, which is also common to younger players as well.

Another motivation was found to be an underlying need to escape. Be that from sorrow felt after the loss of a loved one, or just to get some private time.

Some of the participants considered the challenge or the suspense to finish a game, or to beat a high score and to improve one's skills as important motivators to play. Accomplishing such tasks resulted in enjoyment and a measure of pride. On the other hand, failing to do so resulted to frustration and irritation. Yet those negative feelings were short-lived and just made

participants eager to try again.

Other motivation was the need to stay in touch with society and give meaning to the day. There was also the motivation, or perhaps the "excuse" for playing, to exercise the brain and/or one's reflexes.

Another interesting finding is that seniors who had experience with digital games longed for the chance to play similar games as those they had played with in the past.

One general finding was that elder people showed strong emotional reactions and had negative perceptions about violence in digital games. Such negative reactions were triggered by past memories from personal experience in wars.

Other studies, like the one by Gamberini[49], show that games can help elder people improve both social purposes and mental states. They propose that the possibility of "successful aging" is related to the person's ability to adjust, reshape thoughts and goals in order to cope with the difficulties derived from the elderly condition, like the consequences of retirement. Besides trying to expand the life expectancy of seniors, we must also try to improve the living conditions of those individuals. Games can have a positive effect towards this goal.

Games and entertainment technology in general, can have positive effects on human behaviour, like:

- general development, especially with regard to cognitive abilities (while exercising the use of logic, memory, problem solving skills etc.);

- collaborative and pro-social behaviour, an issue of particular interest in social networking systems like Elder-Spaces;

- healthcare and therapies (phobia, hyperactivity etc.).

Participation in entertainment activities could be very helpful for the maintenance of cognitive skills. Additionally, gaming practice for elderly people can also stimulate social interaction and participation, enhance perceptual – motor skills (hand-eye coordination, dexterity and fine motor abilities), even transferring of the skills acquired in games to everyday tasks (like automobile driving).

In relation to Elder-Spaces, games that promote socializing and even intergenerational activities as described in the respective chapter of this document can provide excellent candidates. As mentioned by IJsselsteijn[51], although many digital games can be played alone, digital gaming has become an increasingly social activity. Furthermore, combining such games to alternative interface systems like tabletops[100] can further enhance the experience and provide an even more direct way for improving social presence, as well as promoting intergenerational activities.

One other interesting aspect of digital games is that they can be used for learning purposes. These "Serious Games" as they are referred to Pandeliev[101], do not have as primary purpose to entertain, but they aim in education, physical fitness and improving the retaining mental capabilities as described in the chapter corresponding "Structured training and lifelong learning".

4.7.2   The MDA Framework

One widely accepted framework for game design is that proposed by Hunicke[102], called MDA which stands for "Mechanics, Dynamics and Aesthetics".
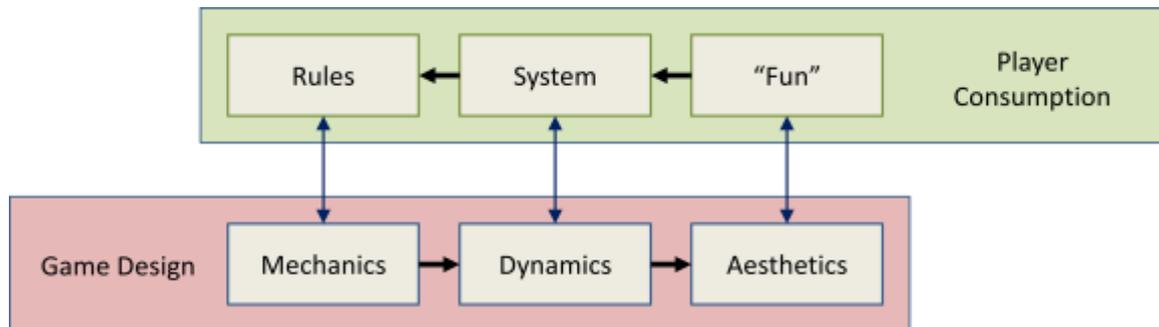
Figure 51: MDA conceptual diagram

The framework can be summarized as displayed in Figure 51:

- The MDA framework takes into account two different perspectives of the same object (the game). That of the player, who "consumes" the product and the one by the Game designer who creates it. Both actors have different perspectives which should be considered when working with games. Actors perceive each component differently, but in fact it is the same thing.

- Mechanics – describe the particular components of the game, for a designer these are data representation and algorithms. For the gamer, those are the rules of the game.

- Dynamics – describe the run time behaviour of the mechanics, responding to the user's interaction. This is the system for the player.

- Aesthetics – describe the user experience, the emotions felt by the player during their interaction. Which is the fun in the game from the gamer's point of view.

One fundamental idea of this framework is that games are more like artefacts than media. By this the authors express that the content of the game is its behaviour and not the actual media that is produced by the software. Games intend to build behaviour via interaction. This way of thinking can produce clearer design choices and analysis to all levels of design and development.

One important aspect with relation to end-user-experience is a classification of the aesthetics. An indicative taxonomy is presented, in an attempt to use more directed vocabulary when describing a game:

1. Sensation   Game as sense-pleasure

2. Fantasy   Game as make-believe

3. Narrative   Game as drama

4. Challenge   Game as obstacle course

5. Fellowship   Game as social framework

6. Discovery   Game as uncharted territory

7. Expression   Game as self-discovery

8. Submission   Game as pastime

Naturally, games really derive their "fun" from just one classification item. A combination of several attributes characterizes games in more clear terms. For example, games like "The Sims" can be classified as Discovery, Fantasy, Expression and Narrative. The combination of these elements appeals either to different players or to the same players at different times and make the game "fun".

4.8 Structured training and lifelong learning

4.8.1 Learning through games

Although there is a great variety of products aiming in self-improvement or gaining of a new skill or a craft, such as memory and speed reading books, language training, cooking etc., very few have been marketed in digital game form. There is a recent trend however which capitalizes from technological advances and the expressed interest of the public to create such 'Serious Games' as they are known[101].

The definition of 'Serious Games' is not strict. It encompasses any game that does not have as its primary or only purpose to be entertaining. Of course apart from educational games, this term is broad enough to include military software used for tactical or training simulations, disaster response games, online worlds like Second Life, exercise games such as Wii Fit and other.

With respect to the Elder-Spaces social networking system, mental fitness games can be of interest and beneficiary to elder users. Such games train cognitive abilities like memory, planning and visual-spatial awareness. As presented by Heeter[103], games that are too easy for a player offer little benefit. Games should be hard enough in order to provoke new neural connections, but not excessively, to discourage the user. It is important to maintain a flow in the game. Challenges should be introduced gradually. Game designers need to balance the fun side of the game, it has to be entertaining in order to retain the player, but in the same time has to be challenging to appropriate levels. Those levels are hard to identify as different people can have significant differences in their cognitive abilities, even if they are in the same age group.

4.8.2 Other learning and teaching opportunities

Furthermore, elder people aside from possible physical or cognitive impediments, they pose a significant capital of knowledge and in many cases wisdom, accumulated by experience during their lives. They are more than eager to share this with others, either younger people but also of the same age groups.

Participation in Elder-Spaces can become the means for facilitating such an outlet were older people can share their experiences, teach others and/or younger people skills and knowledge that they may have (for example gardening, cooking and other hobbies). A social networking system like Elder-Spaces can provide functionalities such as posting lessons in appropriate user groups, teaching others how to perform tasks or develop skills. Elder people can take pride in their work

and also the engagement itself can be beneficiary to them as well, making them feel productive and active again.

Older people can also use communication and event management functionalities to arrange offline events where they can teach younger people skills and techniques. One such example can be tutoring groups or engaging in sport activities as coaches.

4.9 Intergenerational activities

4.9.1 Promote Intergenerational activities using Games

Over the years, a new trend called "intergenerational games" has emerged. It involves game play between children and adults. Such games can enhance social bonding between different generations and provide the means to overcome and bridge social differences. Such games currently exist and can be played by any age group – Snakes, Ladders and Ludo are some of them. One must always take into consideration the distinct gaming and user requirements that different age group have, as mentioned in previous sections.

Such games can provide an even better social experience when played using a tabletop device[100]. Looking at the results from Mahmud's 2010 work[100], such a layout can result to improved social engagement during the game. Communication between team members and opponents is significant. A contributing factor to increase social interaction was the rules of the game. One should keep in mind when designing a social game, that rules should have the appropriate elements which will maximize social interaction of all players. Such elements could be guessing, uncertainty of the game situation, incorporating both, cooperation and competition, etc.

One proven concept in designing intergenerational games is the enhancement of existing games by adding technology, while making sure that rules and game integration remains simple. Note that younger players, most noticeably children, tend to be much more competitive and less willing to adopt. So when designing such games, one should keep in mind the preferences of children.

4.9.2 Other opportunities

Other forms of Intergenerational activities can combine the offered assistance of volunteers or other structured social care organizations. By gaining access to Elder-Spaces social networking system they can participate or initiate events as described in the paragraph corresponding to event planning either on- or offline. They can participate in multiplayer games, where the use of tabletop systems in nursing homes or public care facilities can be used to promote socializing with such individuals.

4.10 Reusable application elements and Web2.0 mash-ups

4.10.1 General

Mashups are web applications that integrate multiple data sources or APIs into one interface. They are interactive web applications able to create new and innovative services. They have the ability to gather information and functionality which may reside outside the organization boundaries of the application and merge them to provide a new service.[104]

Mash-up applications consist of three parts:

- The content provider: This is the source of the data, which are made available through APIs and established web protocols like: RSS, REST and web services.

- The mashup site: This is the actual web application that provides the new service using data sources not controlled by it.

- The client's web browser: This is the user interface of the mashup, as perceived by users. The outputted information is generated by the web browser using client side code like JavaScript or Kolwole. Employing client side code provides the additional benefit of better scale out of these applications, since there is reduced need for server side processing.

4.10.2 Classifications

Depending on the provided functionality, mashups can be divided into four general categories:

- Mapping mashups: Such mashups provide visualizations on maps about a variety of subjects. The abundance of data containing geographic information, in conjunction – originally – with the introduction of the Google Maps API, were two significant factors that gave this category a tremendous momentum and perhaps made it one of the most recognizable among users.

- Video and photo mashups: Multimedia content can be used in conjunction with other information to create novel applications. As long as social networks or other sources of enriched information on the multimedia exist, that allow it to be combined with other data, new applications arise. Such an example is the combination of photographs with relevant metadata (location, description, time and date etc.) with the lyrics of a song to produce a new multimedia product, a mosaic of relevant photos accompanied by the song.

- Search and shopping mashups: Such mashups are not new, the same functionality was delivered by other means (screen scrapping applications, B2B technologies etc.) to provide consumers with comparative aggregated price data on products. Mashups provide for a more structured and reliable way of getting these results. Large retails facilitate this by developing and exposing the appropriate APIs to be integrated to this mashup category.

- News mashups: News sources had also created alternative applications using RSS functionality, in order to disseminate news feeds. Syndication feed mashups can aggregate news feed with user's preferences and provide over the web personalized versions of the newspapers, according to the user's preferences.

Besides the aforementioned classifications, mashups can combine any kind of available information to provide novel, interesting applications. When end users brainstorm on such applications[105], the great majority tends to come with map or news related ideas. Still, other propositions include sports mashups, which is one of the most interesting domains for entertainment.

4.10.3 Mashup editors and technical perspective

Originally, in 2007 there was a "battle" between the big three companies (Microsoft, Google and Yahoo) over their mashup editors. Currently, only Yahoo continues to provide its mashup editor (Yahoo pipes: see Figure 52 for a simple example which also demonstrates a simple mashup layout) as the other two have been discontinued. Google has incorporated the creation of mashups in its App Engine (python) functionality. Other companies provide specialized editors to add value to their products and offered applications (i.e. Intel's "Intel MashMaker", HCM Mashup Builder from HR Cloud Solutions[106] etc.).

When considering users' ideas and propositions from a technical point of view, it appears that ideas with less initiative tend to prefer mashups related to people, while others of higher initiative prefer more complex and information rich mashups, which provide greater development challenges. As a result, one defers that perhaps two different sets of tools are necessary in order to support these implicit sub-populations of end-users.
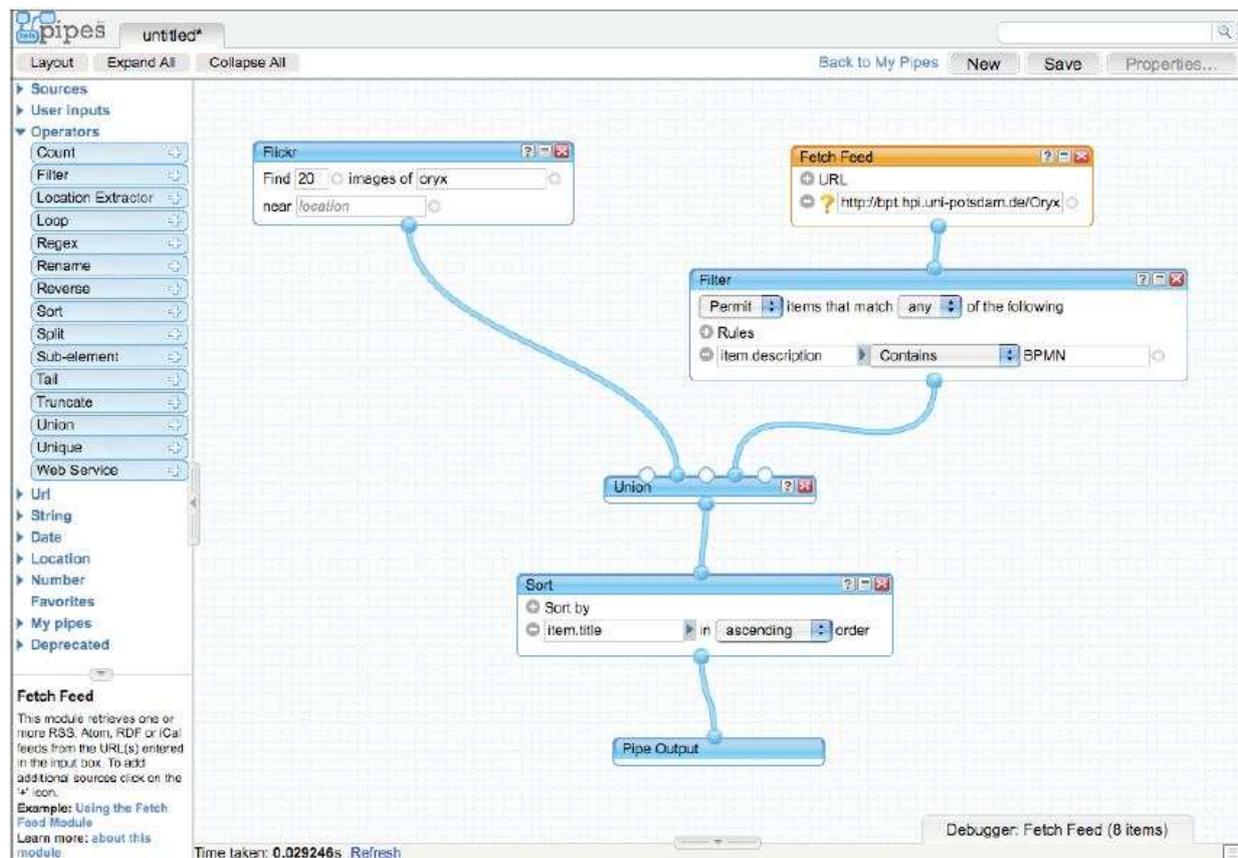
Figure 52: Yahoo Pipes Mashup Editor and a simple mashup layout

4.11 Data security and protection

Data security and privacy are issues that concern all social networking systems and can become entrance barriers for new users, particularly those with little or no experience with computers.

Trust in the provider that handles users' personal information is important. Studies reveal the influence of privacy and security issues on member participation and maintenances of friendship connections[52].

Online social networks are both vaster and looser than their offline counterparts. It is possible for somebody's profile to be connected to hundreds of peers directly, and thousands of others through the network's ties. People often share directly or indirectly much personal information. Besides general demographic data, like age, gender, location etc., users disclose interests, political preferences etc. An early study on Facebook[107] indicates that over 70% of users are willingly disclosing all the above categories. Such information makes social networking systems valuable troves of demographic data for marketers. If one takes into account that lots of private contact information is also made available, the potential value of the data stored in social networking systems increases even further.

Social networking systems usually provide several privacy levels, but as Gross[108] points out, that only a small number of users actually change the default privacy setting of their profiles. As more people can have access to private information, the risk – either physical or cyber – increases. Such treats can vary from identity theft, to online or physical stalking. Also one should consider embarrassment to price discrimination and blackmailing.

Furthermore, it becomes easier for third parties to compile digital dossiers about users' behaviour both online and in the real world.

5. Description of applicable social network platforms, incl. interfaces

5.1 iWiW social network platform

5.1.1 Key functions

- Friends
- Feed
- Messages
- Notices
- Pictures
- Search
- Anniversaries
- Events
- Clubs
- Small ads
- Forums
- Voting
- Potential Friends function
- Chat
- Social News
- Social Shopping
- Applications (gadgets)
- External applications (sites)
- Plugins
  - Club plugin
  - Events plugin
  - Sharing plugin
  - Like plugin
  - Comment-like plugin
  - Voting plugin

5.1.2   Network structure
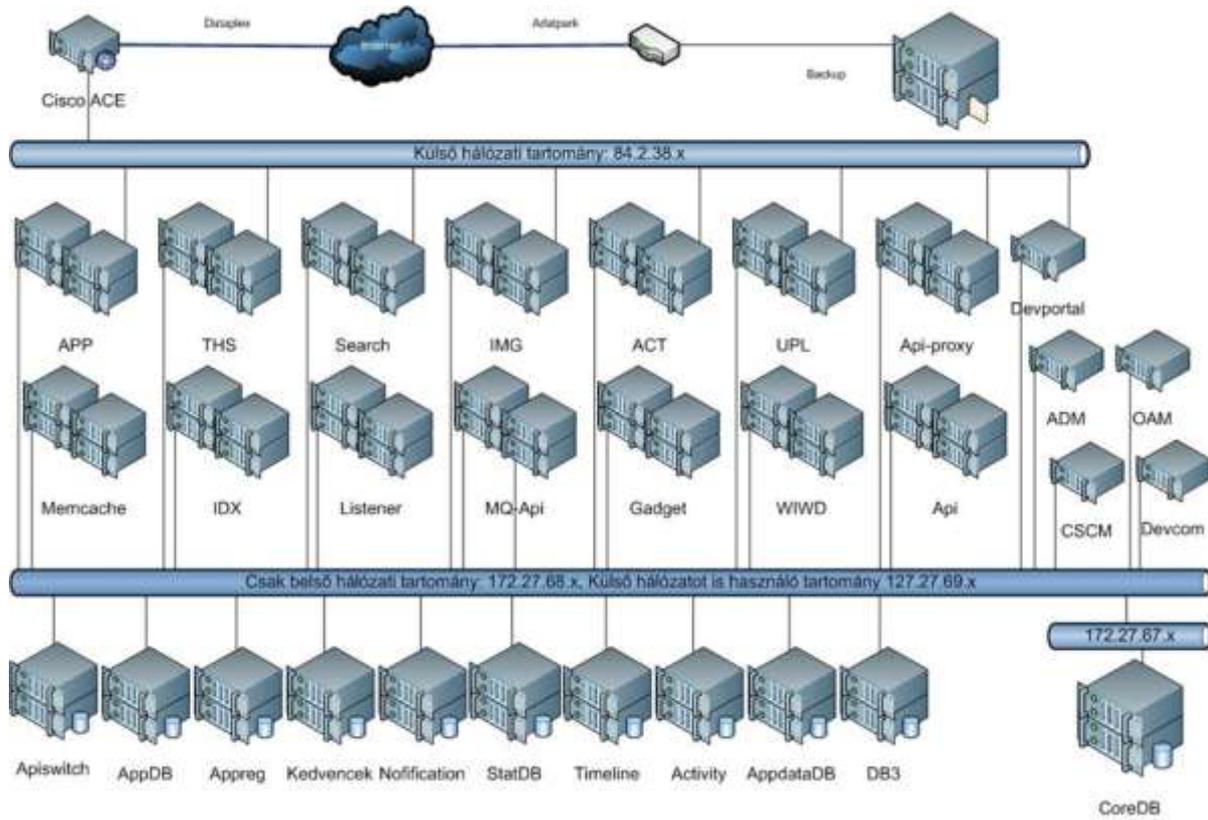
Figure 53: Overview of the iWiW-network structure

5.1.3   Logical components
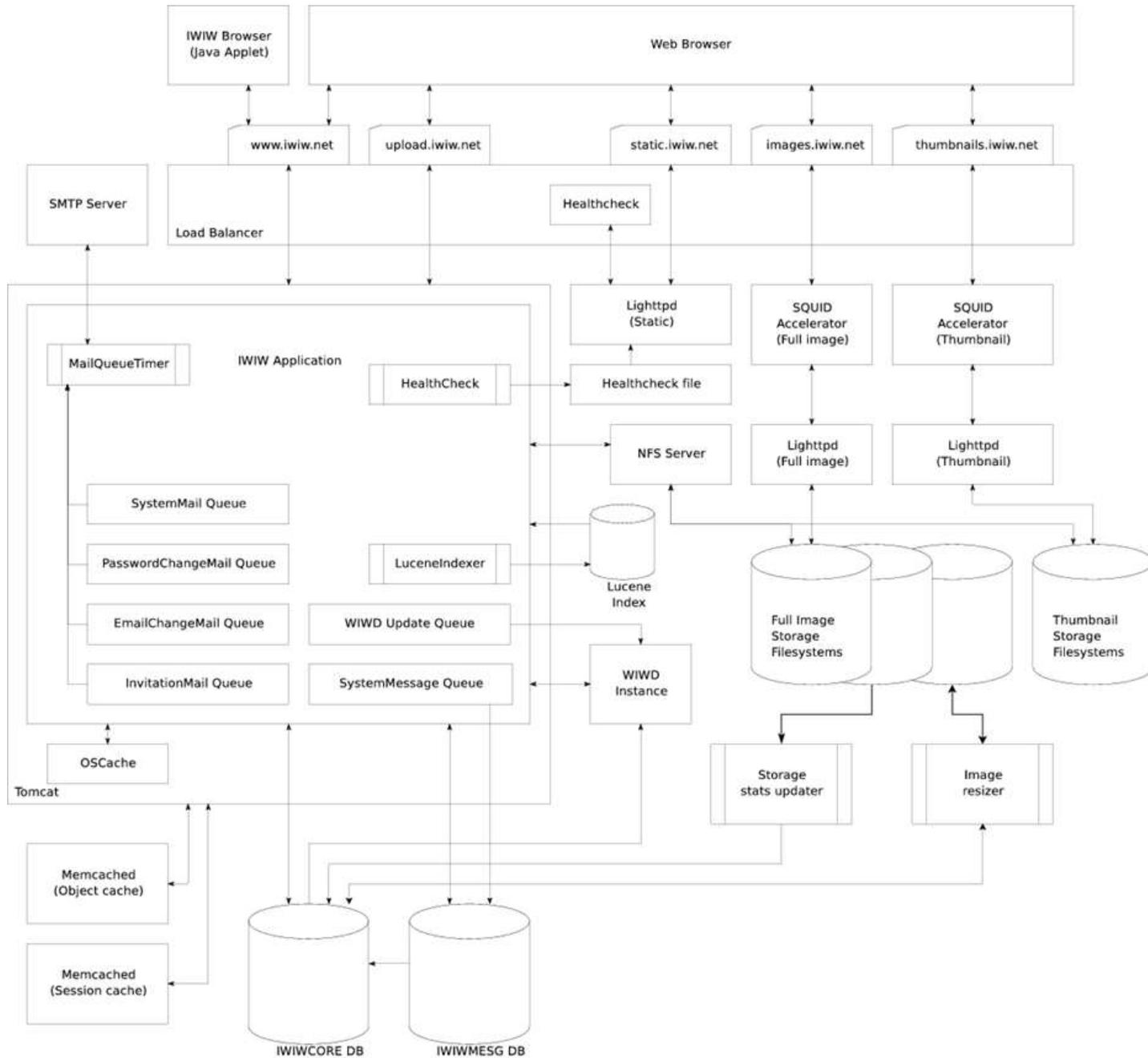
Figure 54: Logical components of iWiW

5.1.4   Related sites

adm.iwiw.hu – admin interface for iWiW

approval.iwiw.hu – iWiW clone site where in-house developments are made and tested

5.1.5   3rd party development facilities

There are 4 sites for 3rd party developers for iWiW:

- http://dev.iwiw.hu/ – Developers' Portal where external developers can manage their applications (gadgets) and external services (sites)

- http://sandbox.iwiw.hu/ – Sandbox. This is an iWiW close site where external developers can test the applications and external services developed by them. Each developer registration includes also a sandbox registration with 300 test users. http://dev.iwiw.hu/wiki/index.php/iWiW_Homokoz%C3%B3

- http://dev.iwiw.hu/wiki – Developers' guide site for external developers with all the information that are needed for developing an application or external service for iWiW.

- http://dev.iwiw.hu/forum – Developers' forum where external developers can discuss their questions and problems encountered while developing for iWiW.

5.1.6   APIs

iWiW interfaces implement the Opensocial 0.9 standard. The following interfaces are available on iWiW:

5.1.6.1 APIs using 2-legged OAuth (Core 1.0 - http://oauth.net/core/1.0a/) standard

API serving the applications (gadgets). It has two types of implementation:

- Gadgets API - JavaScript based implementation
  - documentation:
    - http://dev.iwiw.hu/wiki/index.php/GadgetsSpec
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/Gadgets-API-Specification.xml
- Social API - REST based implementation
  - documentation:
    - http://dev.iwiw.hu/wiki/index.php/SocialApiSpec
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml

Services accessible through Gadgets API and Social API:

- People service
  - documentation:
    - http://docs.opensocial.org/display/OSD/Opensocial.Person+%28v0.9%29#Opensocial.Person%28v0.9%29-Methods
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.1
  - available data:
    - id
    - name (familyName, givenName, formatted)

- displayName
- thumbnailUrl (profile picture redimensioned to 64x64 pixels)
- profileUrl
- hasApp
- nickname
- gender
- currentLocation (country, locality)
- utcOffset
- languagesSpoken
- accessible users:
  - OWNER profile data
  - OWNER FRIENDS profile data
  - VIEWER profile data
  - VIEWER FRIENDS profile data
  - any user's profile data, when their ID is known

- Activities service
  - limitations:
    - Supports exclusively activity creation (but not querying and listing).
  - documentation:
    - http://wiki.opensocial.org/index.php?title=Opensocial.Activity_%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.3

- Appdata service
  - documentation:
    - http://wiki.opensocial.org/index.php?title=Opensocial.DataRequest_%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.4

- Messages service
  - limitations:
    - Supports exclusively the creation of notification type messages (querying, listing, but not other types).
  - documentation:
    - http://docs.opensocial.org/display/OSD/Opensocial.Message+%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.10

5.1.6.2 APIs using 3-legged OAuth standard

Access to these services is possible through "three-legged" OAuth authentication according to the OAuth 1.0 and OAuth 1.0a standards. External services using these interfaces:

- Connect API - public interface for external developers
  - documentation:
    - http://dev.iwiw.hu/wiki/index.php/ConnectApiSpec
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml
  - available services:

- People service
  - limitations:
    - Only those users can be accessed who have authorized access by the given application (that means e.g. from among the friends too!).
    - No personal data can be queried on users that connected anonymously, except their anonymous ID and the flag indicating the anonymity (anonymous=true). Anonymous users are not shown in the friends list either.
  - documentation:
    - http://docs.opensocial.org/display/OSD/Opensocial.Person+%28v0.9%29#Opensocial.Person%28v0.9%29-Methods
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.1
  - available data:
    - id
    - name (familyName, givenName, formatted)
    - displayName
    - thumbnailUrl (profile picture redimensioned to 64x64 pixels)
    - profileUrl
    - hasApp
    - nickname
    - gender
    - currentLocation (country, locality)
    - utcOffset
    - languagesSpoken
- Activities service
  - limitations:
    - It can be used only when the user authorized the given application to send activity.
    - Authorization is checked synchronously, if no authorization is given the response is HTTP 403 (forbidden).
  - documentation:
    - http://wiki.opensocial.org/index.php?title=Opensocial.Activity_%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.3
- Messages service
  - limitations:
    - It can be used only if the addressee user authorized the given application for access (asynchronously checked).
  - documentation:
    - http://docs.opensocial.org/display/OSD/Opensocial.Message+%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.10

- Portal API - interface primarily used by internal, e.g. mobile developments. This means an extension of the Opensocial 0.9 standard with iWiW specific data and services.

- available services:
  - People service
    - limitations:
      - returns only the fields authorized by the owner – the queried user – for the current user according to iWiW authorization levels: private / viewing only by friends / public data
    - documentation:
      - http://docs.opensocial.org/display/OSD/Opensocial.Person+%28v0.9%29#Opensocial.Person%28v0.9%29-Methods
      - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.1
    - available OS standard data:
      - aboutMe
      - activities
      - addresses
      - age
      - birthday
      - books
      - currentLocation
      - displayName
      - emails
      - gender
      - hasApp
      - interests
      - id
      - jobInterests
      - languagesSpoken
      - movies
      - music
      - name
      - nickname
      - pets
      - phoneNumbers
      - profileUrl
      - profileVideo
      - quotes
      - thumbnailUrl
      - tvShows
      - updated
      - utcOffset
      - IsOwner
      - IsViewer
    - available iWiW specific data:
      - lastLogin
      - yearOfBirth
      - monthOfBirth
      - dayOfBirth

- monthOfNameDay
- dayOfNameDay
- maidenName
- friendsCount
- relation
- RelationType (self, friend, pendingIn, pendingOut)
- connectionPendingCount
- unreadMessageCount
- birthDayCount
- nameDayCount
- aol
- blog
- icq
- msn
- skype
- freetimeInterests
- registrationDate
- settings
- thumbnail2Url
- Album service
  - limitations:
    - writing functions are not supported on the album
  - documentation:
    - http://docs.opensocial.org/display/OSD/Opensocial.Album+%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.5
- MediaItem service
  - limitations:
    - writing functions are not available, except uploading pictures for messaging
  - documentation:
    - http://docs.opensocial.org/display/OSD/Opensocial.MediaItem+%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.6
- Activity service
  - limitations:
    - activity writing and reading is supported
  - documentation:
    - http://wiki.opensocial.org/index.php?title=Opensocial.Activity_%28v0.9%29
    - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.7.3
- Messages service:
  - limitations:

- Messages match the OpenSocial privateMessage definition, can be managed according to the processes defined therein. Only personal messages can be accessed via the iWiW Portal API interface!
    - documentation:
        - http://docs.opensocial.org/display/OSD/Opensocial.Message+%28v0.9%29
        - http://opensocial-resources.googlecode.com/svn/spec/0.9/REST-API.xml#rfc.section.10
- Anniversaries service:
    - description:
        - non OS standard service
        - used for querying friends having birthday or name day
- Events service
    - description:
        - non OS standard service
        - API service connected with the Events function on iWiW
        - can be used to query events where the user has INVITED, YES, NO, MAYBE RSVP status
        - the user's RSVP status can be modified for a given event

5.2 Facebook social network platform

5.2.1 General Information

Facebook is the number one social networking system and number two following Google globally.[109] Until 2005 it was only available to university students. After that, it opened up to high school students and companies.

Initially characterized for its simple and easy to use basic social networking system features, user profiles included photos, some personal information, some friend's pictures and a mini feed. From the start Facebook hosted photos and allowed interaction on them (tagging, commenting etc.), as well as other multimedia content.

Besides user profiles, it allowed for the creation of groups on any subject. With respect to communication, users could send private messages, write on the "wall" of their profiles (or their friends') public messages and poke other users. Among other features, Facebook provides an Events feature that members can use to organize offline meetings of any sort.

In 2007 Facebook allowed third party developers to create small programs which could be integrated into user profiles. This provided Facebook with an abundance of new features which could be used to customize the overall appearance of a profile[110].

5.2.2 Development of third party applications for Facebook

Facebook provides extensive documentation and tools for developers who wish to use the platform and create new applications[111]. In Figure 55[112] we show the basic building blocks of Facebook.
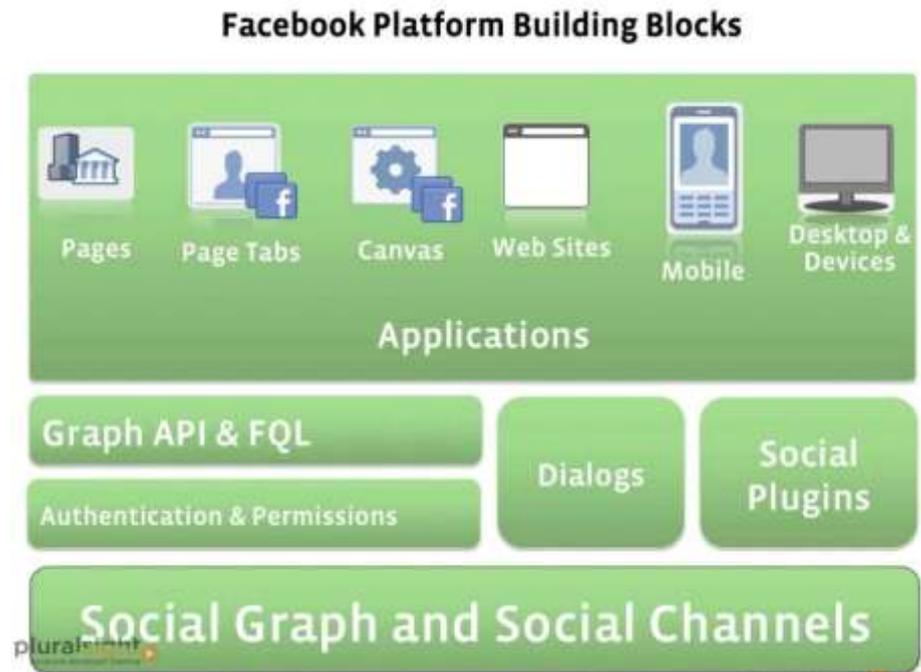
Figure 55: Facebook Platform Building Blocks

The core of the social networking systems is the social graph, which contains all the available objects in Facebook, user information and interactions. Developers can create new applications in a number of different formats, be that Pages, Page tabs, Canvases, Web Sites, Mobile and Desktop or other devices.

Any of these applications needs an API in order to interact with the social graph. There are three options available:

- Dialogs (social Design). This is a way of thinking about product design in a manner that puts the social experience at the core of the process. One can use existing features to create a new product experience, leveraging the three core elements in Facebook:
  - Community, the people that we know and trust
  - Conversation, the various interactions in our communities
  - Identity, each one's sense of self as seen by the community.
- Social Plug-ins. Reusable objects that provide access to the social graph and can be added to third party applications, pages, web sites etc. Such plug ins are
  - News feed (communicates information to Facebook users using the like button, Feed Dialog or the Feed Graph Object which provides for customized experience for publishing the users' news feed).
  - Requests, a tool to invite other users to the integrated application.

- Automatic channels. These reusable applications provide some distribution automatically, as people use the embedded application. Each of these channels is designed to help to engage users and, through specific algorithms, display the best content for each user. Currently, these channels are:
  - Bookmarks. Create a bookmark of the application on the user's profile for ease of access
  - Notifications. Provides prominent but lightweight heads-up about interesting changes to content which is relevant to the users.
  - Dash boards. These are display groupings divided into two groups (games and apps) where they can be suggested to other users through their social networks
  - Usage Stories. Provides information on actions performed by friends related to the application. It is targeting users who do not use the application yet.
  - Search. After exceeding the threshold of 10 users, applications are automatically submitted to Facebook search index. That way, users can search for this application.

- Graph API & FQL (Facebook Query Language) combined with the authentication and permissions API. The graph API provides access to user's information (graph details). Such access is only granted after successful authentication. The authentication module provides this service, allowing an application to know the identity of a Facebook user and grants access to that identities' graph information. The Facebook Platform uses OAuth 2.0 for authentication and authorization.

6. Summary of Requirements

This section gives a concise summary of the requirements from different perspectives of the different types of stakeholders, extracted from the different parts of this document.

Remark: Some of the touch-screen device specific requirements are considered as general requirements because of their general applicability.

6.1 Techno-economical

In Table 4 the requirements are summarized, which belong to the operation and maintenance of the system and are mostly non-functional. Some of them are functional, but do not handle functionalities that are provided to the end users.

Table 4: Summary of techno-economical requirements

No	Requirement	related / similar to No	derived from section
1.	The infrastructure must be web-based.		2.3.2.1
2.	The infrastructure must be flexible and powerful.		2.3.2
3.	The system must be available to users 24/7		2.5.3
4.	The system should be scalable		2.5.3
5.	Response time of simple functions should be under the 5 second threshold.		2.5.3
6.	Searching should be concluded in a matter of seconds.	5	2.5.3
7.	Multimedia content should be available in a matter of seconds.	5	2.5.3
8.	Web statistics should be collected.		2.5.3
9.	Records of major user actions and an even more detailed error log should be maintained inherently.		2.5.3
10.	Internal subsystems have to maintain change and audit logs.	9	2.5.3
11.	A testing / quality assurance team should participate in the social network		2.5.3
12.	Users should be able to express issues.		2.5.3
13.	Backup procedures and other maintenance operations should be setup.		2.5.4
14.	The system has to be able to endure individual component failures.		2.5.3
15.	Clustering and a generalized distributed architecture have to be supported.		2.5.3
16.	Automated tests and/or specific test scenarios have to be provided for every component.		2.5.4
17.	There should be specific procedures for validation, final		2.5.4

No	Requirement	related / similar to No	derived from section
	certification and adding new functionalities		
18.	High level of documentation has to be maintained.		2.5.4

6.1.1 Content

Table 5: Summary of requirements related to content

No	Requirement	related / similar to No	derived from section
19.	Content must be interesting for elder people.		2.3.1
20.	Content should be related to age.		2.3.1
21.	A knowledge base with practical information should be provided.	19	2.3.1

6.2 Technical

Following tables list the general technical requirements the system has to fulfil. These are aimed mainly at the development process of the system.

Table 6: Summary of general technical requirements

No	Requirement	related / similar to No	derived from section
22.	Use thumbnails or low resolution images were possible.		2.5.4
23.	A REST or RPC-API with reference to data model, data access services, the supported functionality and the interface must be designed and implemented.		2.3.2.1
24.	All services must provide an interface and a standard payload format.	23	2.5.4
25.	An authentication protocol must be provided.		2.3.2.1
26.	The usage history of the system must be accessible.		4.4.3
27.	Content must be accessible through search functionality.		2.3.2.1
28.	Information must be archived, but remain available to the users if they should search for them.		2.5.3
29.	Multiple locales should be supported.		3.1.3.9
30.	Screen sizes and supported resolutions of end-user-devices must be taken into account.		4.1.1.1
31.	Testing of applications must be possible before deployment.		4.3.3
32.	The possibility of deploying two sets of slightly different		4.10.3

No	Requirement	related / similar to No	derived from section
	applications for different user needs should be possible.		
33.	Use style sheets for presentation and layout.		4.2.2
34.	Use device-independent event handlers.		4.2.2
35.	Use valid code.		4.2.2

6.2.1   Functional

Table 7: Summary of requirements concerning functionality

No	Requirement	related / similar to No	derived from section
36.	Friends lists.		2.3.2.1
37.	Geocoding.		2.3.2.1
38.	Member profiling.		2.3.2.1
39.	Photo galleries.		2.3.2.1
40.	Forums.		2.3.2.1
41.	Polls.		2.3.2.1
42.	Common personalization of the user interface should be available to users.		4.1.2.4
43.	Contents must be adapted to specific needs and personal preferences of the end-user.	42	2.3.2.1
44.	Personalization of user interface concerning the accessibility features should be possible.	42	4.2
45.	To support an easy setup of the accessibility features a wizard should be provided.		4.2
46.	Advanced search functionalities based on "concepts" and personalisation must be provided.		4.4.1
47.	The possibility to control group-membership must be provided.		3.2.3.1
48.	Training, better resources and user support should be provided.		4.1.2.3
49.	Appropriate guidance and/or automation should be employed to assist and simplify operations.		4.1.1.4
50.	Text, sounds and images must be used to provide as much user guidance as possible.	49	4.3.3
51.	The users must be informed where they are, where they have been and what the next possible steps are.	49	4.1.1.4
52.	Readily available information on how to complete a task must be provided.	49	4.1.2.5
53.	Only use icons and graphics that are relevant to the topic or that aid comprehension and understanding		4.2.2

No	Requirement	related / similar to No	derived from section
54.	Multiple windows must be avoided.		4.1.2.2
55.	Provide instructions for form completion.		4.2.2
56.	Accommodate misspellings, hyphens and common variations within forms.		4.2.2
57.	If an error occurs, information about the error, its consequences and resolving strategies must be provided.		4.1.2.5
58.	Provide clear error messages for forms.	57	4.2.2

6.2.2 Usability

Table 8: Summary of requirements related to the usability of the user interface

No	Requirement	related / similar to No	derived from section
59.	Ensure links are blue and underlined.		4.2.2
60.	Ensure links change colour after visit.	60	4.2.2
61.	Ensure links are visibly different when they have focus.	60	4.2.2
62.	Combine images and links with the same destination.	60	4.2.2
63.	Present links as lists.	60	4.2.2
64.	Clearly separate links.	60	4.2.2
65.	Links should be large in size.	60	4.2.2
66.	The number of interface elements must be minimized.		4.1.2.5
67.	The offered operations must be reduced to avoid excessive interface complexity.	66	4.1.2.5
68.	The trees of options must be minimized, in order to avoid the presence of layered menus.	66	4.1.2.5
69.	A minimum set of choices must be provided by selecting, what is important.	66	4.3.3
70.	Menus should be kept short and when displayed, all items should be visible.	66	4.3.6
71.	Use static menus (not fly-out / pull-down).		4.2.2
72.	Different menu groups (e.g. main and secondary menus) should be distinguished by their shape and style.		4.3.6
73.	Provide consistent navigation.		4.2.2
74.	Provide true home page link on all pages of site.	73	4.2.2
75.	Provide a navigation menu.	73	4.2.2
76.	Ensure logical tabbing order.	73	4.2.2
77.	Provide "breadcrumbs".	73	4.2.2
78.	Provide Previous/Next page links (where appropriate).	73	4.2.2

No	Requirement	related / similar to No	derived from section
79.	Include a glossary (especially for technical terms).		4.2.2
80.	Provide a site-map.		4.2.2
81.	Provide Help &/or FAQ's for the site.		4.2.2
82.	Provide an "About us" and/or "Contacts" page.		4.2.2
83.	Immediate feedback about any selection on screen must be provided.		4.1.2.5
84.	Feedback that a button was pressed should be provided by changing the colour of the button or audio or text messages.	83	4.3.6
85.	Completely new icons and buttons must be used for new functionalities.		4.3.8
86.	Don't disable the "back" button (don't break the browsers history functionality).		4.2.2
87.	Ensure the 'search' function is labelled.		4.2.2
88.	Ensure the 'search' function covers whole site.	87	4.2.2
89.	Ensure search function is tolerant of misspellings.	87	4.2.2
90.	Make search results visible in normal view-port.	87	4.2.2
91.	Ensure search query is repeated on search results page.	87	4.2.2

6.2.3 Accessibility

6.2.3.1 Vision

Table 9: Summary of requirements related to vision

No	Requirement	related / similar to No	derived from section
92.	Glare must be minimized.		4.1.1.1
93.	Black or other dark colours should be avoided, because increase glare.	92	4.3.3
94.	Avoid patterned backgrounds.		4.2.2
95.	Great colour contrast must be used.		4.1.1.1
96.	Provide sufficient (high) contrast.	95	
97.	The levels of luminance contrast must be increased by 2 – 6 times.	95	4.1.1.1
98.	Use dark text on light background.	95	4.2.2
99.	Colour combinations that are difficult to differentiate, like blue-yellow or green-red, must be avoided.	95	4.1.1.1
100.	Avoid blues and greens with black.	95	4.2.2

No	Requirement	related / similar to No	derived from section
101.	Avoid fluorescent colours.		4.2.2
102.	Colour should not be used for grouping elements.		4.3.4
103.	Do not use colour alone to portray information.	102	4.2.2
104.	Close spacing between both characters and lines must be avoided.		4.1.1.1
105.	Use increased line spacing.	104	4.2.2
106.	Font size should be a minimum of 12 (preferably 14) points.		4.1.1.1
107.	Use 12-14pt text size.	106	4.2.2
108.	Use relative units for text and layout.	106	4.2.2
109.	Provide text size adjustment link.	106	4.2.2
110.	Use a sans serif font.	106	4.2.2
111.	Avoid bold body-text (except for emphasis).	106	4.2.2
112.	Avoid underlined text (do use for links).	106	4.2.2
113.	Avoid text in all capitals (use proper case).	106	4.2.2
114.	Avoid moving (and scrolling) text.	106	4.2.2
115.	Left justified text (with L2R scripts).	106	4.2.2
116.	Enlarging interface components must be possible in an easy way.		4.3.8
117.	Text in buttons should be clear and easy to read. Alternatively common, recognizable icons should be used.		4.3.6
118.	Provide a text equivalent for images.		4.2.2
119.	Use HTML rather than images or multimedia for text-based information.		4.2.2
120.	Dependency upon peripheral vision must be minimized.		4.1.1.1
121.	Provide 'white space' page margins.	120	4.2.2
122.	Legibility of spatial forms must be optimized.		4.1.1.1
123.	Do not indicate required form fields with just an asterisk - use text.		4.2.2
124.	Provide a linear alternative to pages using table layout.		4.2.2
125.	The environment of task context should be illuminated.		4.1.1.1
126.	Marking strategies should be adopted that enhance motion perception.		4.1.1.1

6.2.3.2 Hearing

Table 10: Summary of requirements related to hearing

No	Requirement	related / similar to No	derived from section
127.	Acoustic stimulus intensity should be increased.		4.1.1.2
128.	High-frequency sounds should be avoided.		4.1.1.2
129.	Long-term exposure to high levels of noise (i.e. 88dB or greater) should be avoided.		4.1.1.2
130.	Text or other means should be combined to complement speech or audio signals.		4.1.1.2
131.	Provide captions and/or transcripts for video and animations.		4.2.2

6.2.3.3 Motion

Table 11: Summary of requirements related to motion

No	Requirement	related / similar to No	derived from section
132.	Moving interface elements should be avoided.		4.1.1.3
133.	Avoid horizontal scrolling		
134.	Small buttons should be avoided.		4.1.1.3
135.	More over non-functional areas around buttons should be used.		4.1.1.3
136.	Keyboard alternatives to mouse "Drag and drop" functionality must be provided.		4.1.2.5

6.2.3.4 Cognition

Table 12: Summary of requirements related to cognition

No	Requirement	related / similar to No	derived from section
137.	The same interface principles must be used in the entire design, if possible.		4.1.1.4
138.	The consistency of the appearance and functionality throughout the interface must be maintained.	137	4.1.2.5
139.	Provide clear/consistent branding on all pages.	137	4.2.2
140.	Interface and functionality must be predictable.	137	4.3.8
141.	Interface design must focus on learnability and memorability.		4.3.8
142.	Familiar actions, images and language must be used.		4.3.8
143.	Simpler language, familiar terms and working mechanisms that people can relate to easier should be used.	142	4.1.1.4
144.	Write clearly with important information at the start.	142	4.2.2

145.	Use an active voice for writing.	142	4.2.2
146.	Use short sentences and paragraphs.	142	4.2.2
147.	Use short pages.	142	4.2.2
148.	Labels and language close to what users might use for the same tasks must be used.	142	4.1.2.5
149.	Perceptual skills developed earlier in life should be exploited.	142	4.1.1.4
150.	Well-established perceptual features must be used when developing schemes to highlight text or graphical stimulus materials.	142	4.1.1.4
151.	Stimulus "clutter" should be minimized.		4.1.1.4
152.	Provide clean pages; avoid clutter; avoid irrelevant material to the main content.	151	4.2.2
153.	Avoid blinking content.	151	4.2.2
154.	Avoid animations (unless requested).	151	4.2.2
155.	Visual information should be presented in small "chunks".	151	4.1.1.4
156.	Information must be removed as soon as its usefulness has expired.	151	4.1.1.4
157.	Group like information.		4.2.2
158.	An appropriate distance between messages must be given to avoid crowding-effects.		4.1.1.4
159.	Avoid text in all capitals (use proper case).		4.2.2
160.	The need to remember information through multiple screens must be avoided.		4.1.1.4
161.	Make sure the user notices small page changes/updates.		4.2.2
162.	Do not automatically refresh pages.		4.2.2
163.	Avoid making users download documents (provide material as HTML where appropriate)		4.2.2

6.2.3.5 Touch-screen specific

Table 13: Summary of requirements related to touch-screens

No	Requirement	related / similar to No	derived from section
164.	Scrollbars should be avoided.		4.3.7
165.	Double clicking should be avoided.		4.3.7
166.	Familiar gestures such as using a finger or a pointing device to draw an X or a tick should be used.		4.3.7
167.	Minimum button size should be a square of 11,43mm.		4.3.6
168.	Button spacing should be between 3.17 mm and 12.7 mm.		4.3.6
169.	Alternatives to using a virtual keyboard like the selection of		4.3.5

No	Requirement	related / similar to No	derived from section
	predefined values and the provision of buttons and sliders for increment/decrement values should be provided.		

7. Conclusions

In Deliverable D1.2 the consortium collected and analysed requirements associated with the actual operation of a social networking service for older adults, and we provided requirements associated with the development and integration of added-value applications over the Elder-Spaces social networking infrastructure. We reached the goal to analyse and elicit the technical, technological, scientific and techno-economical requirements regarding the operation of the Elder-Spaces network, especially from the social network providers' perspective and the application developers' and integrators' perspective.

Considering the outcomes of the analyses, we have included most of the information in our current Elder-Spaces Social Network Provider and Application Developer Requirements document. In D1.2 we comprise "Social Service Providers' Requirements for Guided Communities in Social Networks" which details the definitions of Social services for the elderly, the requirements of the Social service providers and social networks. The unit about the State of the Art and Application Developers' Requirements details the User interface, usability, barrier-free accessibility, tabletop specific considerations, cognitive social search, content personalization and event management. The last part of D1.2 collects and analyses the applicable social network platforms, such as iWiW and Facebook, and the summary contains the techno-economical and technical requirements of the Elder-Spaces platform.

According to the internet usage analysis that was found in the reviewed period, the usage focused into three main functions: targeted search, email sending and social sites. Facebook is dominating in the field of social sites in Europe, and gaining space on the local social networks. The most popular features of the social network sites are the profile, content sharing, friends, messaging, searching and events. The results of the study contributed to define accordingly the main requirements from the Social Network providers' and the Application Developers perspectives.

This document is shaped to pose the basis of the current Elder-Spaces project and trigger the conduction of all forthcoming deliverables and tasks, with the cooperation of the whole consortium.

Annex

Table 14: Average fees for residential care in Germany

Fees for residential care[30]			
level of care per day	1	2	3
nursing charges per day	44,17 €	58,57 €	73,74 €
- thereof training levy per day	0,53 €		
board and lodging per day	20,62 €		
investment costs per day (base: 9117 facilities with given investment costs)	12,40 €		
total costs daily	77,19 €	91,59 €	106,76 €
total costs per month	2.348,07 €	2.786,08 €	3.247,55 €
source: BKK PflegeFinder			
state: 21.05.2012			
base: 10477 residential care facilities			
Increased fees for particular clients (e.g. dementia, artificial respiration or vigilant coma) were not included in the analysis, if indicated explicitly. Cases with zero values (except for training levy) were not counted in the average calculation and each 5 lowest and highest values were considered as outliers and excluded from the calculation.			

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