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User Interfaces & Cognitive Social Search

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Abstract: Overview and high level description of the functionalities of Elder-Spaces, specification of the principles of the user-interface(s), and specification of the cognitive social recommendations engine.

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Glossary

AAL	Ambient Assisted Living
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
CAPTCHA	Completely Automated Public Turing tests to tell Computers and Humans Apart
CSS	Cascading Style Sheets
HTML	Hypertext Markup Language
ICT	Information and Communication Technology
iWiW	Internet Who is Who
KAPI	Open Centre for Elderly Protection (Greek “ΚΑΠΗ”)
PC	Personal Computer
QoS	Quality of Service
RFC	Request for Comment
RSS	Really Simple Syndication
UI	User Interface
URL	Uniform Resource Locator
WAI-AGE	Web Accessibility Initiative: Ageing Education and Harmonisation (EU project)
WCAG	Web Content Accessibility Guidelines
WP	work package
YAML	Yet Another Multicolumn Layout

Executive Summary

Deliverable D2.1 “User Interfaces & Cognitive Social Search” comprises the results of Task **T2.1 “Specification of User Interfaces, Cognitive Social Search and Personalization”** within work package WP2 “Social Networking Services and Applications Specification”.

D2.1 is directly based on the results of work package WP1 “Requirements and Use Cases”.

Its purpose is

- to give an overview and a high level description of the functionalities of Elder-Spaces,
- to specify the principles of the user-interface(s) of Elder-Spaces, and
- to specify the cognitive social recommendations engine.

The most relevant outcomes of WP1 for the specification are summarized in chapter 2 “Conclusions from the requirements analysis”.

Chapter 3 contains a “Brief high level description of the functionalities” in a structured way. It takes into account the Use Cases, as described in D1.3 “Scenarios, Use Cases and Target User Groups”, as well as the functionalities of “Games and Events Management”, “Intergenerational Activities” and “Structured Training and Lifelong Learning” to be specified in more detail in the corresponding tasks T2.2–T2.4.

Chapter 4 “User Interfaces” describes the general concept of Elder-Spaces user-interfaces, including usability criteria, special UI elements and devices as well as accessibility features (with respect to the main target group of elder people).

Chapter 5 summarizes the design principles of “Content personalization”.

Chapter 6 specifies the “Cognitive Social Recommendations” system which will form one of the outstanding features of Elder-Spaces.

1. Introduction

1.1 Overview

Deliverable D2.1 “User Interfaces & Cognitive Social Search” comprises the results of **Task T2.1 “Specification of User Interfaces, Cognitive Social Search and Personalization”** within work package WP2 “Social Networking Services and Applications Specification”.

Its purpose is

- to give an overview and a high level description of the functionalities of Elder-Spaces,
- to specify the the principles of the user-interface(s) of Elder-Spaces, and
- to specify the cognitive social recommendations engine.

The most relevant outcomes of WP1 for the specification are summarized in chapter 2 “Conclusions from the requirements analysis”.

Chapter 3 contains a “brief high level description of the functionalities” in structured specification templates, comprising title, description, involved users, related use cases, scenarios, and applicable interface devices.

Chapter 4 “User Interfaces” describes the general concept of Elder-Spaces user-interfaces. The selection and description of usability criteria, special UI elements and devices focuses on the main target group of elder people. Although a general “accessibility” according to WCAG is desired, the accessibility concept of Elder-Spaces UIs takes care of and gives priority to the needs of the main target group of elder people, characterized by combinations of multiple, but mild limitations (e.g. lower vision, harder of hearing, reduced dexterity, reduced cognitive and memory abilities) rather than extreme limitations (e.g. blind, deaf, single-switch usage, illiterate, cognitive impairment).

Chapter 5 summarizes the design principles of “content personalization”.

Chapter 6 specifies the “cognitive social recommendations” system which will form one of the outstanding features of Elder-Spaces.

1.2 Relation with other tasks and work packages

D2.1 is directly based on the results of work package WP1 “Requirements and Use Cases”.

The high level specification of the Elder-Spaces functionalities takes into account the Use Cases, as elaborated in WP1 and described in D1.3 “Scenarios, Use Cases and Target User Groups”, as well as the functionalities to be specified in more detail in the corresponding tasks of WP2: “Games and Events Management” (Task T2.2), “InterGeneration Services” (Task T2.3) and “Structured Training and Lifelong Learning” (Task T2.4). It will also help to structure the work in tasks T6.1 “Trial Protocols and Evaluation Metrics” and T6.3 “Platform, Services and Applications Evaluation” of WP6 “Trials and Evaluation”.

The general concept of Elder-Spaces user-interfaces, including usability criteria, special UI elements and devices, accessibility features, and draft user-interfaces will be used to do the development tasks of WP4 “Elderly friendly User Interfaces and Cognitive Search”.

1.3 General considerations

In the development of the Elder-Spaces functionalities, the following general characteristics shall be thoroughly preserved:

- **Performance** is the responsiveness of the system, measured in the time required to execute some function. For example: “What is the expected response time for each use case going to be?” – “Will bad performance dramatically affect usability?” – “How must the system perform?”
- The **security** quality attribute must also be defined during this phase. Some of the questions that must be answered to design the system correctly as it relates to security include “How critical is the system?”, “What is the expected impact of a security failure?”, “If there have already been security failures, what was their impact?”, “Are there any known vulnerabilities?”
- A system's **modifiability** refers to its receptiveness to change.
- **Reusability** is the ability of a software asset to be used in different application contexts without modification.
- A component's **integrability** is its ability to communicate with other systems.
- A functionality's **testability** relates directly to its overall quality. A functionality that is not easily tested will be low-quality functionality.
- **Availability** measures the time between failures and how quickly the system is able to resume operation after a failure.
- **Reliability** has to do with the system's capability to maintain a level of performance for a stated period.
- A system's **portability** relates to its ability to run on multiple platforms.

2. Conclusions from the Requirements Analysis

The specification of the added-value services, the user-interfaces, the Cognitive Social Search and personalization, and the applications that will be implemented are based on the analysis of the end-user requirements, the social network provider requirements, the social service provider requirements, and the application developer requirements, as elaborated in WP1.

The end-user requirements analysis collected and analysed requirements from end-users with respect to the envisaged applications and services of the Elder-Spaces platform and incorporated the relevant research. The summary of the quantitative and qualitative research of that task is given below.

The results of the qualitative research conducted by E-Trikala are the following: The elderly people in the Elder-Spaces project target group answered that they expect from the social site features, designed specifically for them, which help them to share contents and pictures easily, to exchange information about various topics of interest for them including their profession, and to acquire such experiences with the help of the platform that will bring them closer to the other generations.

The quantitative research was conducted by Origo, using its own social site iWiW. This site was created before the appearance of the Facebook, so the product is also ahead of Facebook in terms of a product lifecycle curve, which means it has already entered the decline phase. Facebook is currently in the maturity phase. As an operator of a social networking platform, Origo also has practical experience in the operation and business sustainability of social sites, which is crucial for the AAL projects, too.

The quantitative research studied the entire user base of iWiW and the key target group's usage habits with respect to the Elder-Spaces project. The study revealed that the 55+ user group generates the greatest activity with the following functions: sharing multimedia content (images), sending messages and viewing the profile pictures and profile sites of friends. Compared to the above, events, groups and news functions generate close to nil. It is also interesting how the spread of the internet influences the use of the social sites among the elderly users. This also means that in the studied period many new internet users entered the market.

The application developer requirements analysis collected and analysed requirements associated with the actual operation of a social networking service and provided requirements associated with the development and integration of added-value applications. In the document we summed up from the point of view of the application developer on what tools and with which functions the elder-friendly Elder-Spaces platform can be implemented and what is needed for a 3rd party application to get to the given platform (e.g. iWiW, Facebook).

3. Brief High Level Description of the Functionalities

To identify a specific description of the services, a high level description should be structured at first place. For this reason, the functional and non-functional requirements that were previously developed are preserved in a concrete way, in order to have a sufficient quality scenario. Each component-based functionality supports a specific quality of service (QoS) level to support the quality attributes necessary to deliver a fully functioning system. Defining the quality of services as rigorously as possible increases the chance that the system will satisfy the users' needs.

3.1 Authentication / authorization

Basic Functions Description	
Title	Authentication
Description	Its goal is to identify the user.
Users Involved	Authenticated Users
Related Use Cases	UC_002_LOG
Scenarios	User Bob wants to use an Elder-Spaces application. Therefore he needs to access the platform. He enters his username and password and has already reached all the functions of the platform.
Interface Device	Web, Surface

3.2 Profile management

Application Description	
Title	Profile management – amend profile characteristics
Description	The aim of the profile management is to change at will any characteristic that the user assumes is not valid at that time describing their status. A potential house moving leads to the alteration of the address fields of the user’s profile, a change of the existing e-mail or even the upload of a different profile photograph are only a few aspects of the profile management.
Users Involved	Authenticated Users
Related Use Cases	UC_002_LOG, UC_006_EDIT, UC_010_UPLOAD, UC_014_MANPROFILE, UC_015_ADDAPPPROFILE, UC_018_DEACTPROFILE
Scenarios	<p>User Tania has recently moved to another neighbourhood. She logs in the platform and goes to the profile management section. There she alters the old house postal address with the new one and saves this alteration.</p> <p>Due to the fact that for the last three weeks her priority was to move to her new apartment, she decides to change her old profile photo, uploading a new one taken by her husband displaying her holding two small boxes while moving. She visits the management page, browses the “photo-upload” field and finally uploads her chosen photo. Furthermore, she feels that a new motto should accompany her profile depicting a major change in her routine, which she is able to do so in the corresponding field of her profile management page.</p> <p>After staying for a week in her new home, she still feels tired and tries to relax throughout the platform’s usage. Thus, she searches through the available applications and decides to use three which she finds interesting and mind relaxing. Next time she visits her profile management page the three applications are shown in a section in her home page under the indication ‘recently used’.</p>
Interface Device	Web

3.3 Friends/ social management

Application Description	
Title	Social management – manage inter-friend relationships
Description	The aim of social management is to establish, develop and manage relationships amongst the platform’s existing users. They can send invitations and messages to one another commenting any existing functionality of the platform; events, groups, applications, intergenerational activities, etc. Consequently, the users may reply to any type of message, remove themselves from a registered activity or even remove a user from being their friend.
Users Involved	Authenticated Users – existing friendship between two users
Related Use Cases	UC_002_LOG, UC_007_SEND, UC_104_EVCREATE, UC_204_GRCREATE, UC_107_EVINVSSEND, UC_109_EVEREMOVES, UC_117_INTERACTINVSSEND, UC_207_GRINVSSEND, UC_307_FRINVSSEND, UC_407_MSGSEND, UC_008_INVRESPOND, UC_009_GRREMOVES, UC_309_FRREMOVES, UC_011_MESREAD, UC_111_MESREPLY, UC_211_MESDELETE, UC_012_COMMENT
Scenarios	<p>User Bob is very excited with the recent music festival which was conducted in his town and wishes to share his feelings with his friends through the platform. He logs in and sends a message to Paul and Bill, his two best ‘Elder-Spaces’ friends, depicting the fact that it was one of the best summer events of the last decade in their town. Paul replies back and agrees with his friend, expressing his regret he could not attend. Bill also agrees, and proposes to find as many friends as possible via the platform, in order to ask from their local authorities to organize such events at least twice per year and not only every summer.</p> <p>Thus, Bob creates a group “Organize Music Festivals” and starts sending group invitations to his friends list. His two friends follow his example with their own friend list. After a month since the creation of the group, 87 friends have replied positively and only one was negative to this perspective. In fact, this user removed Bob from his friends list, because he belongs to the opposition of the City Board and would not like to be involved to such an activity which could have impact on his political career. Another friend moved to another city too far away to visit the festivals and leaves the group.</p> <p>The 86 remaining ‘followers’ have interchanged amongst them over 500 messages emerging from this initiative and have reached that also a winter music festival is conducted. Bob creates corresponding events on the platform for each particular event</p>

	and invites all group members to remind them about it and to discuss a meeting point on the festival area. By declaring participation or not, everyone knows, whom could be met and is able to make the decision concerning participation with respect to that information. It is assumed that this fact has led to the creation of new friendships and the establishment and development of new relationships.
Interface Device	Web

3.4 Messaging

Basic Functions Description	
Title	Messaging
Description	The purpose of this function is to enable the users to correspond digitally without entering a mail system.
Users Involved	Authenticated Users
Related Use Cases	UC_407_MSGSEND, UC_011_MESREAD, UC_111_MESREPLY
Scenarios	<p>User Bob decides to contact Jane, a former colleague, because he wants to invite her to work as consultant for his current firm. He searches for Jane on Elder-Spaces with the help of the cognitive search function and invites her to join his circle of friends. Jane confirms the invitation, so they can exchange mail. Bob writes a letter to Jane right away.</p> <p>The Messaging function can be reached from the main site. He clicks on the Messaging icon and on the Messaging site on the New Mail link. He enters Jane's name in the address line.</p> <p>In the subject field he writes the subject of the message and types the actual message in the message field. When he is ready, he clicks on the Send button. When Jane accesses the platform the next time, she gets Bob's mail.</p>
Interface Device	Web

3.5 Travel memories

Application Description	
Title	Event focus application
Description	The elderly-friendly virtual playground Travel Memories can engage elderly people in online social activities. Users can add comments, organize events and exchange memories about travels.
Users Involved	Authenticated Users
Related Use Cases	UC_504_TRAVELMEMCREATE, UC_305_TRAVELMEMVIEW, UC_305_TRAVELMEMEDIT, UC_311_TRAVELMEMDELETE, UC_404_ALBUMCREATE, UC_405_ALBUMVIEW, UC_406_ALBUMEDIT
Scenarios	<p>User Bob has found some pictures about a holiday in Turkey 15 years ago, and wants to share them with those friends with whom they holidayed together. He accesses Elder-Spaces and finds Travel Memories among the applications. He uploads the photos in the application, marks Turkey on the map and those friends on the social site with them they holidayed together. The friends will learn about the event through Elder-Spaces feed and event notification. They can also mark on the map the places they visited.</p> <p>Thanks to these shared old memories friends who have not seen each other for ages can get back closer to one another again, and can also meet personally the people with whom they spent their holidays together years before.</p>
Interface Device	Web, Surface

3.6 Media management

Basic Functions Description	
Title	Share pictures
Description	The purpose of the function for the user is to share pictures with friends to promote his social activity and involvement in social communication. Pictures can be uploaded to groups and events as well.
Users Involved	Authenticated Users
Related Use Cases	UC_010_UPLOAD
Scenarios	<p>User Bob accesses the platform and goes to the pictures function from the main menu. Can be accessed from the top menu. Not tab structure, because only focuses on pictures. At the top of the site the title of the page appears, to the right Upload new picture.</p> <p>Uploading new images: Bob clicks on the New Image button and selects the album where he wants to upload the image, or creates a new one. Then he selects the image to be uploaded and then by clicking on upload, he starts the upload process. The action will get into the newsfeed, so friends will be notified about the new upload.</p>
Interface Device	Web

3.7 Events

Application Description	
Title	Event management – autograph session
Description	Events can be created, edited, viewed and cancelled. Users can recommend events and send invitations to each other. It is possible to declare or withdraw participation intention. A list of participants is shown. The users are able to add comments and multimedia-content regarding the events.
Users Involved	Authenticated Users – Members of a particular friend list
Related Use Cases	UC_002_LOG, UC_104_EVCREATE, UC_105_EVVIEW, UC_107_EVINVSEND, UC_008_INVRESPOND, UC_106_EVEDIT, UC_109_EVEREMOVES, UC_010_UPLOAD, UC_011_MESREAD, UC_111_MESREPLY, UC_012_COMMENT
Scenarios	<p>User Peter is a big fan of the British author Terry Pratchett. In the newspaper he reads that an autograph session is planned in a little bookstore in his town. He already knows some other fans nearby but wants to spread the date to a bigger audience that may be interested. So he creates an event in the fan group, of which he is a member since a couple of years. When asked for privacy settings, he sets it to public. As location he enters the address of the bookstore. Afterwards he sends an invitation to all his friends. Jonah, Alicia and George are currently online and immediately notified about the invitation. They declare their participation immediately by clicking on the corresponding button. Some of them are not available on the date and declare even that by a click, some of them adding a cause in form of a comment. Other friends and also guests follow. After some days it becomes obvious that there will be not enough room in the bookstore. Peter informs the shopkeeper about this issue, which rents a bigger room for the event. Peter changes the location on the platform and the participants are notified. Some of them withdraw their participation, but the autograph session is a big success.</p> <p>After the session Peter adds some photos. Most of the other users catch the opportunity to thank Peter for the tip and load the best of their taken photos up to the system as well. Some of the photos are really funny and frequently commented providing a lot of laughter.</p>
Interface Device	Web

3.8 Intergenerational activities

Application Description	
Title	Intergenerational activities – Tell about your past
Description	Although the event described in section 3.7 is already an activity with participants from different generations, events can also be created explicitly as intergenerational activities. These are not public and need a moderator to guard the access. The core functionality is the same as described above.
Users Involved	Authenticated Users – One in Moderator role
Related Use Cases	UC_002_LOG, UC_114_INTERACTCREATE, UC_115_INTERACTVIEW, UC_117_INTERACTINVSEND, UC_008_INVRESPOND, UC_011_MESREAD, UC_111_MESREPLY, UC_012_COMMENT, UC_115_INTERACTVIEW, UC_204_GRCREATE
Scenarios	User Michaela leads a history class in secondary school. This semester's topic is the World War II. She plans to get her pupils in touch with eyewitnesses. The class has already a group on the networking platform, where Michaela creates an intergenerational activity called 'Excursion to a senior residence'. The participation is mandatory and all pupils declare theirs'. The pupils have an interesting exchange with some elderly users. The residence leader tells Michaela that some of the elderly are members of the social network platform and Michaela asks them to join her classes group. Most of them agree and tell her their usernames to get an invitation to the group. Michaela uses a computer in the residence, logs into the system and does the invitations. The elderly agreed to them and thereby they were able to carry on their discussions with the pupils. Because the relationships between the generations are enriching to both sides, Michaela decided to create a cooperation group between the school and the senior residence, which led to many joyful mutual visits to conduct different activities together.
Interface Device	Web, Surface

3.9 Lifelong learning

Lifelong learning involves a number of applications within Elder-Spaces, such as games, groups etc. For the purpose of this section, we emphasize on structured lessons provided within the platform.

Application Description	
Title	Lifelong learning – Course on use of ICT
Description	<p>Users will have a number of lessons available, from which to choose from and participate at their own pace. Depending on the lesson, they can also include test to evaluate the user's understanding of the topic.</p> <p>There will be a list of available lessons, grouped by category, from which to choose. Also, each user will have a list of the lessons they are currently taking.</p> <p>Each lesson can have both text and multimedia content to present and elaborate on a subject.</p>
Users Involved	Authenticated Users
Related Use Cases	UC_015_ADDAPPPROFILE
Scenarios	<p>Basilis is 70 and has difficulties in using computers. With the help of a social worker in the KAPI he visits, he logs into his newly created Elder-Spaces account and navigates to the lifelong learning page. He adds the application to his profile, as prompted by the system and gains access to the lessons.</p> <p>Assisted by the social worker, he searches for a beginner's lesson in ITC. He selects to participate in an introductory lesson on using Computers and the Web, in order to learn the basic skill that he will need to explore Elder-Spaces platform and socialize with his friends, participate in events and even get in touch with his grand children living in another city.</p> <p>He enters the lesson and reads the content. There are also videos that show how to perform each action. After each chapter, there are some exercises he can try.</p> <p>When he is done, he pauses the lesson and navigates to another application. Later, he returns to the lessons and the one he is participating is displayed in a list, to make it easier to find it and continue.</p>
Interface Device	Web

3.10 Cognitive games

Games can have a positive influence on the psychology and cognitive ability of a person. It is a fun way to train one's brain and also interact with others, should the game allows for multiplaying. In this section, we present an example of such a game. Depending on the type of games, the rules on how to play differ, but the general principle governing the interaction is more or less similar.

Application Description	
Title	Games, Find the pairs
Description	The aim of the game is to match the images of the dealt cards. Cards are dealt with the picture hidden. The gamer selects two cards and they are flipped to reveal their images. If the images match the cards disappear and the gamer continues. If the images do not match, the cards are flipped back with the picture side hidden.
Users Involved	Authenticated Users
Related Use Cases	UC_015_ADDAPPPROFILE
Scenarios	<p>User Bob has logged in Elder-Spaces and is looking to play a game. He is using the Surface, to interact with Elder-Spaces.</p> <p>From the Game menu, he selects "Find the pairs". This is the first time he access this game, so he is prompted to add it to his profile, which he does.</p> <p>As the game starts, he can select to read the instructions or play the game. He selects to play the game and then he is prompted to select the difficulty level he desires.</p> <p>He selects "Normal Difficulty" and the game starts. 16 cards are dealt with the picture hidden. He is prompted to select two pairs.</p> <p>He taps a card and it is flipped over. It shows a boat. He taps another card and as it flips over, it has a picture of a house. A message displays "No match" and the cards are flipped back down. He selects a new card and as it flips it shows a boat. He now flips the first card and he makes a pair. A message congratulates him and the cards are discarded. He continues to select cards until the board is cleared.</p> <p>He is presented with his score and a congratulations message.</p> <p>He is then prompted if he wants to play another game or return to the games menu.</p>
Interface Device	Web, Surface

Application Description	
Title	Games, Puzzle
Description	The aim of the game is to place the pieces of a puzzle in their correct place and complete the image
Users Involved	Authenticated Users
Related Use Cases	UC_015_ADDAPPPROFILE
Scenarios	<p>User Bob has logged in Elder-Spaces and is looking to play a game. He is using the web, to interact with Elder-Spaces.</p> <p>From the Game menu, he selects “Puzzles”. This is the first time he access this game, so he is prompted to add it to his profile, which he does.</p> <p>As the game starts, he selects the instructions to read how to play the game. Then he selects the difficulty level (number of pieces) and the image he wants to play.</p> <p>The game starts and all the pieces are around the empty canvas of the puzzle. He clicks with the mouse on one of the corner pieces. The piece is selected and moves along with the mouse pointer as he moves the mouse. He places the piece it in the correct position, by clicking on the empty position in the canvas, where the piece is placed.</p> <p>He selects the next piece in the same manner and places it. The position is wrong and the piece is not placed in the canvas. He reads a message that this is not the correct position and he should try another. He decides to take another piece. He moves the selected piece outside the canvas of the puzzle and clicks once. The piece is dropped to the empty space along with the other pieces.</p> <p>He then selects a new piece and places it in the correct position. Eventually, he completes the puzzle.</p> <p>He is presented with a congratulations message and sees the image completed.</p> <p>He is then prompted if he wants to play another game or return to the games menu.</p>
Interface Device	Web, Surface

4. User Interfaces

The User Interface plays a key role regarding the user acceptance of Elder-Spaces. User perception on both, aesthetics and the provided usability, weigh heavily on users' accepting and participating in the Social Network.

Achieving usability is a complex process and one must take into account several factors. Particularly for the intended audience of Elder-Spaces, we have to take into consideration the specific needs and impediments of the elderly, as described in Deliverable 1.2. Additionally, the UI has to provide the required functionality necessary for satisfying all the needs for implementing the functionalities and applications intended for Elder-Spaces. Also any constraints or additional functionality derived from the devices to be used has to be taken into consideration. For a system like Elder-Spaces the facilitation of the capabilities of the platform, the minimization of errors and the achievement of a high degree of perceived user satisfaction is important.

4.1 Usability criteria

The following usability aspects are given a high priority:

- Easy to learn
- Response rate
- Error handling & user assistance
- Mental load
- Enjoyment
- Functionality

Easy to learn

This criterion has to do with the complexity of the interface and the time it takes a novice user to learn to use the provided functionality. Taken into account that elder users may have little experience with computers and may also have mental impediments that encumber attempts to learn how to use something new, it is of vital importance to make sure that the UI is easy to learn and also to provide additional assisting messages to help users navigate and to perform tasks.

Response rate

This criterion is rather less important than the other mentioned. Finishing a task quickly is not a primary success factor, as users are not performing work related tasks, but they use Elder-Spaces for entertainment and socializing. Having stated this, speed should not be overlooked, as too slow responses will eventually lead to a negative perceived user experience.

Error handling & user assistance

Avoiding errors, as related to the tasks the users undertake, is another contributing factor, perhaps which affects most of the others mentioned here. Users will make errors when trying to perform a task and there is always the probability of an unexpected error in the system as well. It is important to provide guidance to users when they fail to perform a task. Such guidance must be complete and understandable by the users. Information on what happened, what was the mistake and possible suggestions on how to overcome it in a language that is simple and clear will be necessary to assist users.

Furthermore, proactive assistance on how to perform a task, following the same general guidelines can also prevent errors and enhance the user experience. Such assistance is most valuable to non-regular users for whom certain tasks will not be familiar.

Mental load

This characteristic has to do with the amount of information displayed to the user. As an interface becomes more complex, having different types of interface elements and information sources, the mental strain on the user increases. For the intended user group of Elder-Spaces, mental load has to be kept to a low or minimum level. As we expect mental impediments to be present, as well as taking into consideration that most users are not going to be expert computer users, we need to lower the mental load to the users in order to reduce the stress from trying to find the relevant information or use the functionalities of the system.

Another aspect to this issue can be addressed by maintaining consistency throughout the UI. Using the same elements and maintaining certain homogeneity to the interface, users will have fewer elements to learn and the consistency of the UI elements can decrease the need to think about their functionality, as they become more familiar.

Enjoyment

Enjoyment may be one of the key criteria in this system, with respect to user acceptance and engagement. It is one of the goals of the system and plays a definite role on users revisiting the social network and participating.

Enjoyment is not only perceived from relevant activities like playing online games within Elder-Spaces, but also by participating with other members to activities, groups, events etc. In this sense, the interface has to facilitate un-cumbersome interaction to the user allowing them to interact with other users and take advantage of the features of Elder-Spaces without taxing over the interface trying to perform an action, or getting frustrated by difficulties in user interaction and errors.

In this sense, the interface has to be as assistant as possible, feeling transparent and allowing the user to enjoy the social network without worrying about usage issues. Of course, we have to take into consideration that enjoyment is highly subjective and may differ widely between users. In any case, regarding UI, our focus has to be to design it in such a way as to maximize the effect of the provided functionality, so that the essence of the provided features may influence the perceived feeling and not the implementation for accessing them.

Functionality

The majority of the users of the system will have similar rights with regard to functionality. Most of the functionality provided in Elder-Spaces is available to authenticated users. Only few actions are restricted to Moderators or Administrators. The main focus has to be on providing such an interface, that users with different levels of experience in using such a system may be able to make use of as much of the provided functionality as possible.

A main differentiation between users may well be the degree of computer literacy, or experience in working with computers. An issue that can be addressed in the personalization of the user's profile may be the amount of assistance or help that the system provides to the users in order to make it easier for them to perform different tasks. Experienced users may find too much assistance cumbersome or annoying, while novice users will find useful even step-by-step instructions on how to complete a task.

4.2 UI elements/ devices and operation/ interaction methods

Elder-Spaces will be implemented as a web site, accessible via web browsers. There are two categories of devices to provide access to the site:

- personal computers, tablets and/or laptops,
- tabletop surface.

For both types of devices, the majority of the interface elements are the same.

The major differences that have to be taken into consideration for the user interface have to do with the tabletop device which:

- provides a larger screen area,
- accepts tactile input,
- does not have a physical keyboard.

UI elements are divided into the following categories¹:

- Control elements
- Process elements
- Dialog box and message elements
- Input device / interaction elements

4.2.1 Control elements

Navigation Controls

Navigation is divided into two categories.

- Main navigation. A top level menu that provides navigation to main features of Elder-Spaces, like groups, events, games etc.
- Secondary Navigation which will provide function-specific controls, related to the selected top level group.

Navigation elements are:

- Menu bars, clearly indicating the main groups of functionalities available to the users. The “Home” selector has to be prominent in the top level navigation control to provide for easy access to the “starting point” of the system.
- Buttons, clearly separated and spaced to avoid confusion and with alternative text description to assist novice users understand their functionality. Buttons can have text or images. In both cases they have to be clear, descriptive and uniform throughout the interface.
- Links can be used to redirect users to specific content, but they can also be difficult to elder people to notice, so when used it has to be in such a way that is clear to the users that they provide functionality and of what type.

Input Controls

There exists a large variety of input controls, able to cover different types of input. It is important to maintain uniformity throughout the interface, on what kinds of controls are used for each action.

Note that depending on the medium, we have to take into consideration differences in available controls and implementation capabilities. As pointed out in the following table, tabletop design relies more on buttons and images rather than on complex control elements².

Table 1: Preferred control elements of tabletop- and web-interfaces according to input category

Input Category	Preferred Control (Web)	Preferred Control (Tabletop)
Yes / No Selection	<ul style="list-style-type: none"> • Radio buttons • Pair of Buttons using tick (√) and X 	<ul style="list-style-type: none"> • Pair of Buttons using tick (√) and X
Small number of choices in fix list, where the user can select only one	<ul style="list-style-type: none"> • Drop down box with the list of selections, allowing only one selection which will be visible in the box after selection 	<ul style="list-style-type: none"> • SurfaceListBox • SurfaceCheckBox
Free text input	<ul style="list-style-type: none"> • Input box allowing free text. For messages or larger input it should be extended to more than one line 	<ul style="list-style-type: none"> • SurfaceTextBox
Selection of multiple items from a list (i.e. list of friends to send a message to)	<ul style="list-style-type: none"> • Selection box with two windows to “move” the selected values from the list of choices to the selection list. 	<ul style="list-style-type: none"> • SurfaceListBox
Selection of multiple items from a short list of choices	<ul style="list-style-type: none"> • Selection box with two windows to “move” the selected values from the list of choices to the selection list. • Check Boxes 	<ul style="list-style-type: none"> • SurfaceCheckBox
Date selection	<ul style="list-style-type: none"> • Calendar control 	<ul style="list-style-type: none"> • Date can be selected from a series of buttons representing different date parts

The following figures show examples of the mentioned input controls

Input Box

This control is used for entering text. It can accommodate both short and long messages. Typed characters will be left aligned, black and it is possible to use both small and caps while typing.

Last Name

Figure 1: Input Box

Radio Buttons

This control presents a number of choices from which only one can be selected. Radio buttons are to the left of the selection text and the text that follows is left aligned and uses both uppercase and lowercase letters.

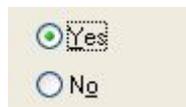


Figure 2: Radio Buttons

Check Boxes

This control is used for selecting more than one item. Selection items may be placed in a tabular format – as in the example below – or in a list. Text is left aligned and uses both uppercase and lowercase letters. The background colour of the selected layout has to provide for high contrast and adhere to the accessibility requirements.

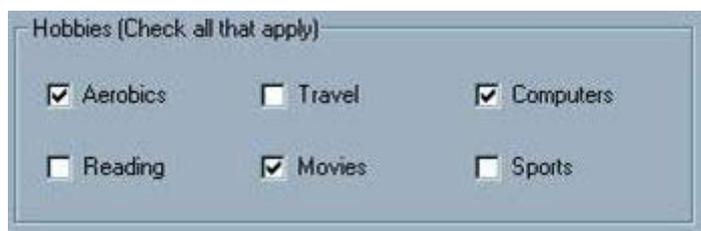


Figure 3: Check Boxes

Yes/No Buttons

This control provides for easy to understand selection and approval method.



Figure 4: Yes/No Buttons

Drop Down List

This control provides a selection of items from which only one can be chosen. It is important to avoid, if possible, the use of scrollbars in the selection list, as this makes it harder for elder people to use it.



Figure 5: Drop Down List

Selection Box

This control is used for selecting one or more items from a list. It can be used to select message recipients for example and provides for reduce typing by the user. Selecting from this control is a good way to avoid input mistakes.

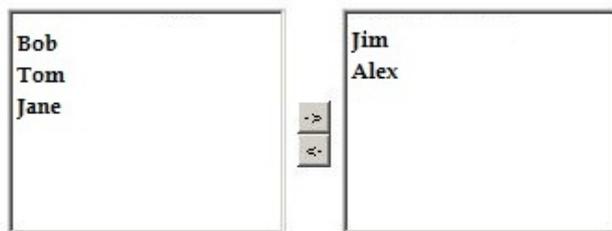


Figure 6: Selection Box

Calendar Control

This control provides an easy and intuitive way for inputting dates. Only one date can be selected and the navigation between months and years is relatively easy.



Figure 7: Calendar Control

Surface Text Box

This is a control similar to its web textbox equivalent. When users touch the box, a virtual keyboard appears below and allows for typing. There are two forms of the keyboard, the regular alphanumeric and the numeric keypad.



Figure 8: SurfaceTextBox Control

Surface List Box

This control allows users to select from a list of items that are always visible. Using “single-selection” users may only select one item from the list.

This control may also be used for a larger number of possible choices, compared to Surface Check Box.

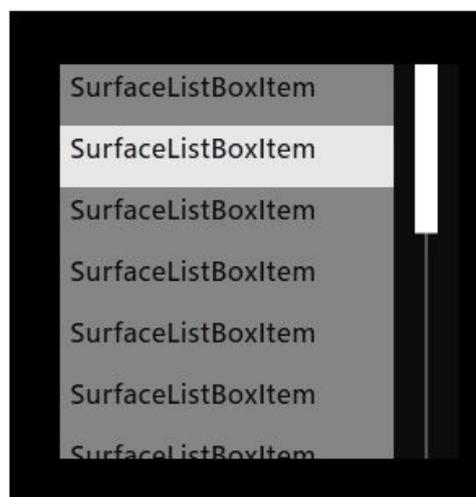


Figure 9: SurfaceListBox Control

Surface Check Box

This control can be used to select from mutually exclusive choices (only one selection allowed) or from independent choices (multiple selection).

It is recommended for selecting from a small list of items.



Figure 10: SurfaceCheckBox Control

4.2.2 Process standards

Process standards define the way processes within the system should look like and which of the elements described so far can be used.

One of the aims of the interface is to keep interaction simple with minimum complexity as to visual stimuli. In that respect, processes must be kept simple without multiple subtasks that would require complex visual representations.

The standard design should include a title and depending on the task a short description to assist users as to what they should do. Following that, a list of editable fields should follow in a list grouped vertically. Required information should be on top and marked accordingly while optional fields should follow in the end.

When possible, predefined options will appear to minimize the need to type and reduce errors. Radio buttons, drop down lists and check box items can be used in this respect.

Title

Comments and instructions

Field 1 *:

Field 2 *:

Field 3 *:

Field 4 *:

Field 1:

Field 2:

Multiple Select Data

Check Box 1

Check Box 2

Check Box 3

Check Box 4

submit **cancel**

Figure 11: Form layout

Finally, buttons for submission or cancelation need to be placed at the end of the form. Acceptance and rejection or submission and cancelation need to be clearly separated. (The entire available length of the box has to be used to separate the two options in order to avoid errors.) Furthermore, it is important to use descriptive names in the buttons we use to assist users understanding the role of each button.

Note that extensive forms should be avoided in the tabletop applications. Text input should be kept at a minimum, as the virtual keyboard that is available for typing is not recommended for long text typing.

4.2.3 Dialog boxes and messaging

Elder-Spaces will be implemented as a web site, so dialog boxes will not be used by the system. Any communication with users will be done by forms or other elements embedded in the pages of the site.

For short notifications, read only message boxes may be needed; but their use should be minimized as much as possible (requirement #56 in Deliverable 1.2. summary). Descriptive information on user's actions will be provided in the pages they are interacting with reducing the need for pop-ups as much as possible.

4.2.4 Input device / interaction

Input devices are classified into two categories, depending on the device used to access Elder-Spaces:

Web browsers in desktops and laptops

There are two ways for users to interact, either by mouse, or by using a keyboard.

For inputting text, keyboard is the preferred interaction method.

For navigation and selection activities, the mouse is the preferred method of interaction with the computer.

Tabletop surface

As mentioned, the tabletop does not provide a physical keyboard. Should text have to be entered, a virtual keyboard has to be implemented and used to type letters. In any case, this alternative is useful for short texts only.

Instead of mouse, the tabletop accepts tactile input, so this will substitute mouse functionality.

Clicking will be replaced by tapping. As double click is not easy to simulate in tactile input, the system will be designed in such a manner as to require only single click actions.

Drag and drop will be implemented by actual dragging an object from one position to another.

We summarize the supported actions in the following list:

Table 2: Summary of actions supported by tabletop-devices

Select / Execute	Tap with one finger on an object or button (also holding is applicable to some cases, see the example below)
Move / Slide	Touch with one finger on an object and while touching it, drag the finger so that the object moves to the desired location
Browse	When the user has a series of objects to choose from in a line layout, browsing between them is achieved by touching the list of objects at any point and dragging them towards the desired direction, until the object that interests the user appears.
Resize	Touch an object with two fingers – or both hands - and drag them in an expanding or shrinking manner, the object will follow suit (provided it is a resizable object)
Rotate	Touch an object with two fingers – or both hands - and while keeping one stable, rotate the other to the desired position
Rotate and Resize	It is possible to perform rotate and resize as one move, combining the above moves.

We present the visual representation of the actions mentioned³.

Select

Tap – Press and then release

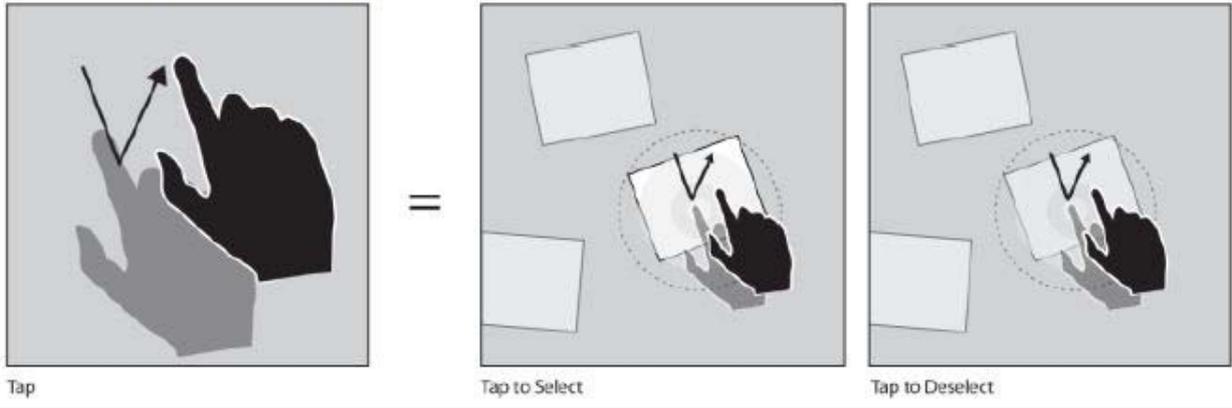


Figure 12: Select on tabletop-devices

Execute

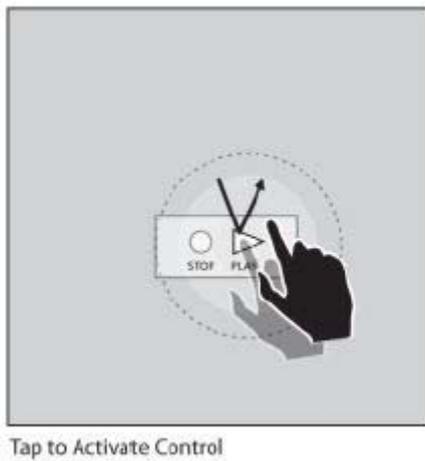


Figure 13: Execute on tabletop-devices

Holding for selection or execution

Hold – Press and then hold

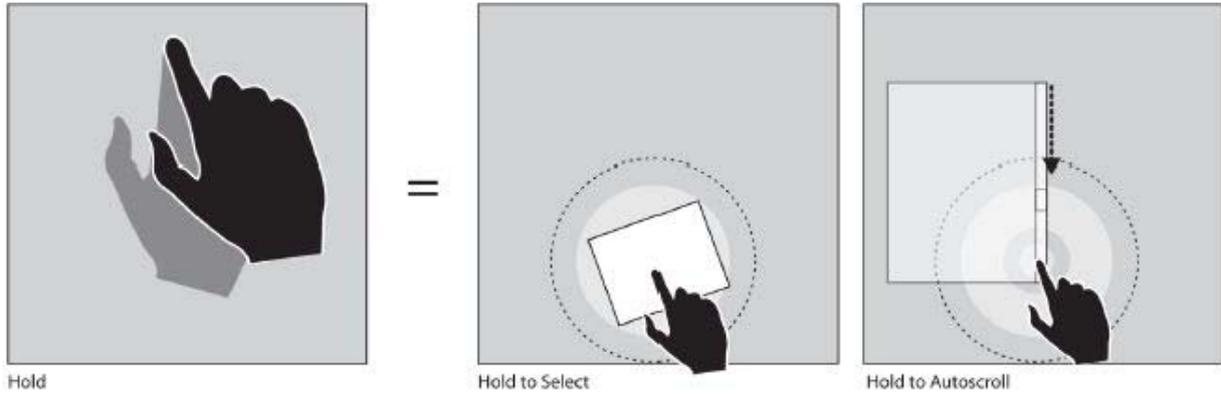


Figure 14: Holding on tabletop-devices

Move / Slide

Slide or push – Move the object under your finger with a sliding or pushing action

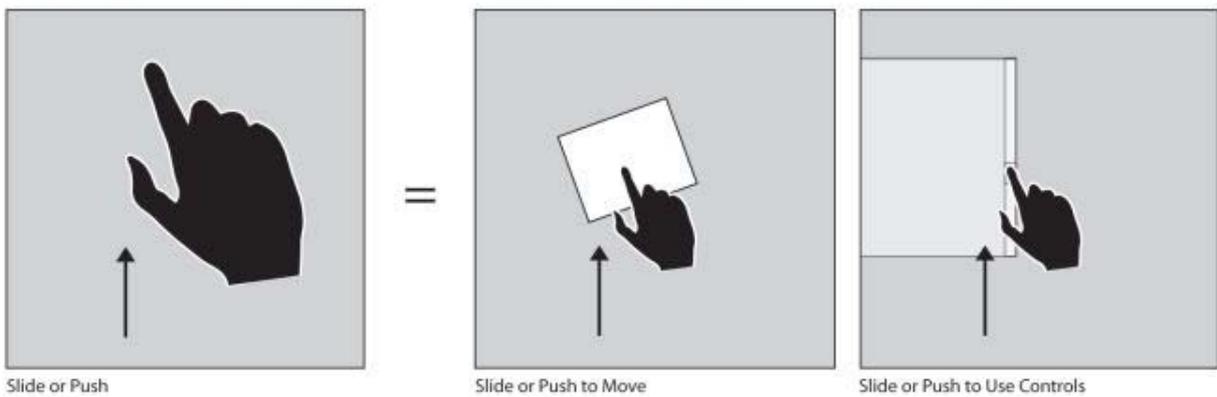
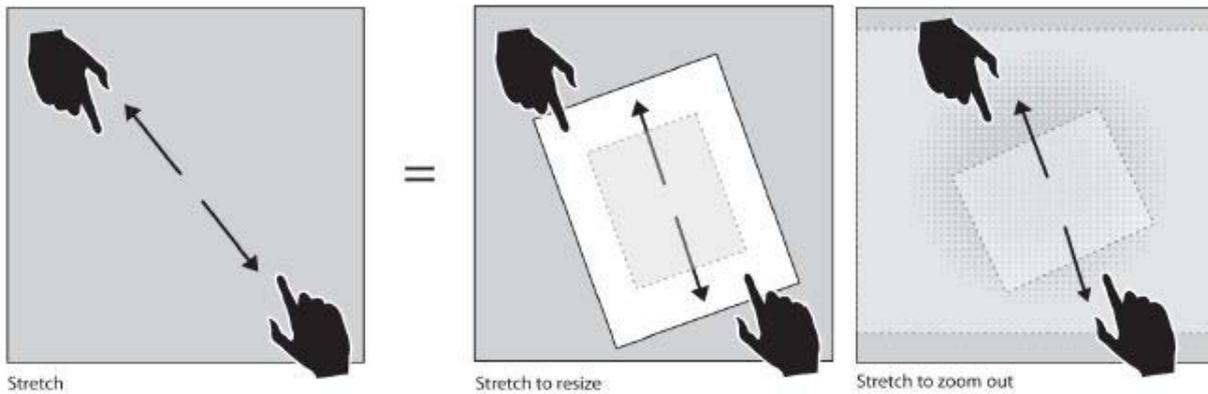


Figure 15: Moving/Sliding on tabletop-devices

Resize

Stretch – Move fingers apart with two hands



Shrink – Bring fingers together with two hands

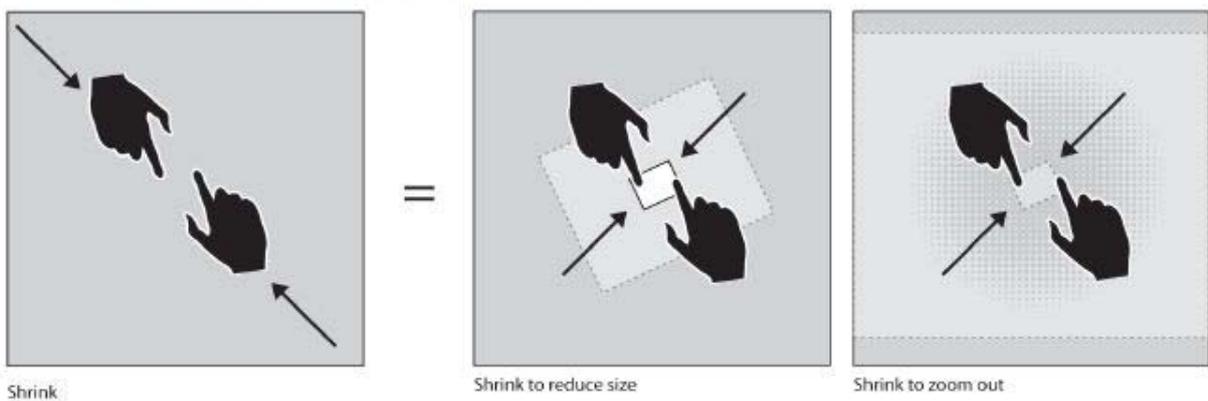


Figure 16: Resizing on tabletop-devices

Rotate

Pin turn – Pin the object down with one finger while the other hand drags the object around the pinned point

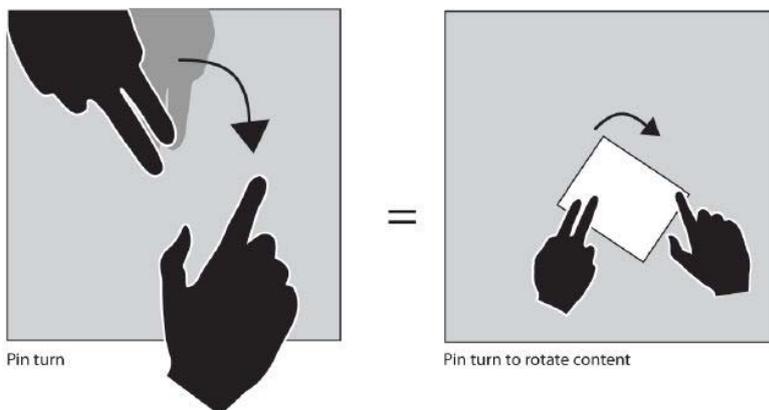


Figure 17: Rotating on tabletop-devices

Web browsers in tablets

The interaction on tablet-PCs is, similar to surface-devices, based on tactile input on the screen. To select an element, the user has to tap on it. Drag and drop actions can be achieved also similar to operating surface-devices by tapping and holding an element and then dragging it to the desired location. Depending on the device a stylus is needed for interaction. Even the support of multi-touch actions depends on the device.

4.3 Accessibility features

The recommendations of WAI-AGE should be implemented with respect to the diversity of user capabilities. To ease the development, the usage of a CSS-framework like YAML (Yet Another Multicolumn Layout)⁴ is recommended. The following section will handle the recommendations derived from the WAI-AGE literature review⁵ and will follow the structure of the WCAG2.0 guidelines⁶. It is divided into the four key principles:

- perceivable,
- operable,
- understandable, and
- robust.

Not all WCAG2.0 guidelines are considered; but at least conformance level “A” should be targeted. The numbers of the WCAG2.0 techniques⁷ to meet the recommendations are listed in brackets, if applicable. Because of multiple approaches to meet the requirements, consideration of the referenced WCAG2.0 is highly recommended.

4.3.1 The feature “perceivable”

4.3.1.1 Non-text-content

For content that is not textual, a textual alternative should be provided. This concerns primarily images and objects but also ASCII-art and emoticons. Because of user created content cannot be controlled this should only be applied to the systems core elements. Whenever the information can be displayed as textual content, the usage of images should be avoided.

Images used solely for decoration purposes (C9)

Images that have no informational or control function should be added via CSS

```
body { background: url('/images/background.jpg') repeat; }
```

Provide “alt”-attribute values (H2, H24, H35, H36, H37, H53)

The “alt”-attribute should generally be filled for all image resources. If the image contains words that are needed to understand the content, these have to be provided.

```

```

Same applies to graphical control elements.

```
<input type="image" name="submit" src="submit.gif" alt="Submit" />
```

And also applies to graphical links. If the link target is the same, the links should not be separated.

```
<a href="nextPage.htm">
  
  Go to the next page
</a>
```

Areas in image maps, which will be important for the world map of the travel memories application

```

<map id="map" name="map">
  <area shape="rect" coords="75,75,100,100"
    href="a_country.html" alt="A country" />
  <area shape="rect" coords="75,100,100,125"
    href="another_country.html" alt="Another country" />
</map>
```

Applets

```
<applet code="a_game.class" width="300" height="300" alt="a game">
  a game
</applet>
```

Objects

```
<object classid="http://www.elderspaces.eu/script.py">
  <p>long textual description of the object and its purposes. </p>
</object>
```

The “longdesc”-attribute (H45)

According to RFC1866 the maximum value length for among others the “alt”-attribute is 1024 characters⁸. If these are not enough to provide an adequate description, also the “longdesc”-attribute may be used. It consists of a URL which leads to an html-page that contains the long textual description.

```

```

4.3.1.2 Text and text containers

Use CSS for specifying text format (C22)

To keep the system flexible regarding the visual appearance

Size units (C14, C17, C28)

The use of em as size unit must be preferred, absolute size units like pt and px must be avoided.

Fonts (C12)

The font must be sans-serif; minimum size must be 12-14pt, which is 1.1-1.2 em.

```
body{ font-family: Arial, Helvetica, sans-serif; font-size:1.2 em; }
```

All textual elements, even input elements and links must have a size defined in per cent

```
input, label, legend, select, textarea, p, div, span, a { font-size:100%; }
```

Even radio buttons and checkboxes must support relative sizes

```
.radiobuttonAndCheckboxClass { width: 1em; height: 1em; }
```

Layout of text containers (C20, G146, G179)

To increase the reading and interaction efficiency of users with particular reading or vision disabilities, it should be possible to set the amount of text per line to 80 characters or less. Horizontal scrolling must be avoided. To achieve this, the size unit em should be used as described above. Furthermore the following recommendations should be considered.

All layout element width and height must be defined in per cent. A liquid layout must be used.

```
anyDiv { width: 60%; }
```

It must be ensured that no content or functionality is lost when the text is resized and the text containers must not change their width.

```
p, div, span { overflow: scroll; }
```

or

```
p, div, span { overflow: auto; }
```

Support resizing of text on each page (G178)

Each page must provide controls to resize the textual content. Elder-Spaces may implement an extra page to set look and feel.

Appropriate text alignment (C19, G169, G172)

All textual content should be properly aligned either to the left or to the right.

```
p, div, span { text-align: left; }
```

If the text is justified for some causes, a mechanism must be provided to remove the justification.

Line spaces and paragraph spaces (C21, G188)

The user must be able to increase the spaces between lines and even between paragraphs. This can also be achieved by personalization on a settings page for the look and feel.

```
p.normalLineHeight { line-height: 100%; }
p.normalParagraphSpacing { margin-bottom: 2em; }
```

Use semantic mark-up for emphasizing text

Emphasizing text should be done by using semantic mark-up tags. To use underlined text is not recommended because it can be mistaken with links.

```
<em>emphasized text</em>
<strong>strong text</strong>
<cite>Citation</cite>
<blockquote> Blockquote </ blockquote >
<sub>subscribed text</sub>
<sup>superscripted text</sup>
```

4.3.1.3 Colour and contrast

Provide information not only by colours (G14, H92, G111, G182, G183)

If colours are used to convey information additionally an alternative medium has to be provided. This may be text, patterns or symbols.

Support overriding of colour settings regarding main content by user agent (C23, C25, G148, G156, G175)

Support user agent's feature to override main content's text background and foreground colour settings. Therefore the colours for the main content must not be specified in code or CSS. It is allowed to specify the border-colours.

Alternatively colours may be defined by the user by a configuration tool on each page or on the look and feel page in order to provide sufficient contrast even if the user agent does not support overriding of colour settings.

Sufficient contrast ratio (G18, G145, G174)

According to the WCAG2.0 the minimum contrast ratio for text or text inside an image up to 18pt size or 14pt size when bold is 7:1. If the text is bigger, a contrast ratio of 4.5:1 is suitable.

If the background colour is black or white additional to a text size larger than 18pt or 14pt in bold a contrast ratio of 3:1 should be provided.

To be avoided

Blue and green should not be combined with black, fluorescent colours should also be avoided. Patterned background may lead to contrast issues and should therefore also be avoided.

4.3.1.4 Links

Links are the most used controls to navigate in a website. To facilitate the user to handle them, some measures must be taken.

Visual appearance

To make the links distinguishable from the rest of the content and to keep well known standards

they should be blue and underlined. Have the focus should be clearly marked; already visited links should have a changed colour. Furthermore links should also satisfy the requirements put to text in chapter 4.3.1.2.

Explain the link target (G91, H30)

The text of a link should be descriptive and its purpose should be clearly explained. If images are used as links, the considerations of chapter 4.3.1.1 have to be taken into account.

Put links following each other into lists

If links are directly following each other they should be provided as lists to keep them distinguishable.

```
<ul class="navigation">
  <li><a href="friends.html">Friends</a></li>
  <li><a href="groups.html">Groups</a></li>
  <li><a href="events.html">Events</a></li>
  ...
</ul>
```

4.3.1.5 CAPTCHA tests

As already stated in D1.1, “CAPTCHA” is the abbreviation for “Completely Automated Public Turing tests to tell Computers and Humans Apart”. As the name expresses, it is used to ensure that the actor on the system is human and not a malicious piece of software, also called “bot”, which aims to spread unwanted messages.

CAPTCHA tests are a special challenge in respect of accessibility. Most today’s CAPTCHA tests consist of obscured images that are hard to solve even for younger and experienced users. Due to the different capabilities of the users and the relative big complexity of the CAPTCHA-topic there are some alternative approaches to guard the system against abuse by bots.

CAPTCHA tests in WCAG2.0 (G143, G144)

According to WCAG CAPTCHA tests should have an alternative. If a test including images is provided, the page should also contain a test that bases on audio and vice versa. Both of them should provide a text description that explains its purposes.

Even small mathematical tasks or knowledge questions are possible tests. It has to be taken into account that the provision of too many alternatives will increase the complexity for the end users. Therefore two additional security mechanisms are introduced, which make the use of CAPTCHA tests obsolete.

Response time

A simple way to get a hint if the actor filling a form is human is the time needed. A machine processes forms very fast, whilst form filling by human users will take a while. So any form that is filled too fast can be considered as automatically filled.

Honeypot

The functional principle of a honeypot is to lead an automatic actor in a trap. The whole division containing the form elements acting as the trap is masked out by CSS-definition. Users that have CSS disabled see the hint that this field must not be filled. If the field is filled the submit-action leads to a page indicating that the field was filled with the option to go back to the form with all data still present. Most programmers of malicious software do not make the effort to handle such issues making this approach a quite secure way of reducing spam.

HTML:

```
<div class="nospm">
  <label for="contact_spm" id="contact_nospm">
    Please do NOT fill following field
  </label><br>
  <textarea class="inputbox" id="contact_spm" name="nospm">
  </textarea>
</div>
```

CSS:

```
. nospm { display: none; }
```

4.3.1.6 Dynamic content updates

If parts of the content are updated dynamically, the user's attention must be drawn to the changes. This can be done by a border that highlights the new entry for a short time or with an acoustic signal. It is also possible to provide a button to update the content on explicit request.

4.3.2 The feature “operable”

4.3.2.1 Considerations on keyboard-only users

As already mentioned in D1.1 the use of a mouse can be challenging to elder people due to reduced fine motoric skills. To make the usage possible even without using a mouse the system should support the navigation by keyboard.

Focus order of interactive elements must correspond to content order (C27, G59, H4)

To enable comfortable keyboard navigation the focus order must be in a logical relationship to the content. The standard focus order demands on the HTML-Mark-up. So, if the position of any element on the screen is set by CSS other than in mark-up, the navigation by keyboard is messed up.

All functions must be accessible by the keyboard (G90, G202, H91, SCR2, SCR20, SCR35)

The whole site functionality must be accessible by using solely the keyboard. This means all navigation and control elements as well as client-side JavaScript-functionality. To meet the latter, event handlers for both mouse and keyboard have to be implemented redundantly:

Click:

```

```

Hover:

```
<a href="http://www.elderspaces.eu" onmouseover="doSomething();"
onfocus="doSomething();" onmouseout="undoSomething();"
onblur="undoSomething();" >
```

Mousedown/up:

```
<p onmousedown="doSomething()" onkeydown="doSomething()">Click here</p>
<p onmouseup="doSomething()" onkeyup="doSomething()">Click here</p>
```

Additional it has to be mentioned that none of the standard keys used for navigation should be used as event triggers. The tabulator key, backspace and the arrow keys must keep their standard behaviour.

Keyboard traps must be avoided (G21)

It must be ensured that no content element traps the keyboard's tabbing functionality. Therefore it may be necessary to implement a specific function to leave focus when the tabulator key is pressed.

Enable the user to skip parts of the page (G1, G123, G124, H50, H69, H70)

To facilitate the keyboard-only users to reach the content in a fast and easy way, it is necessary to add links on the top of the page that lead directly to the main content areas. Thereby the user does not need to tab through the whole navigation menu or advertisement banners on every page to get to the desired content block. In most cases this will be the main content.

The technique to achieve this is to set the links far to the left by CSS and hide them from the users until they get focus. The links lead to anchors set on top of the content.

To implement such functionality the following code provided on the homepage of James Thatcher⁹:

HTML:

“

```
<div class="skipnav">
  <a href="#maincontent">Skip to main content</a>
  <a href="#sitemap">Skip to footer site map</a>
</div>
```

“

CSS:

“

```
.skipnav { text-align: left; }
.skipnav a { position: absolute; left: -10000px; width: 1px; height:
1px; overflow: hidden; }
```

```
.skipnav a:focus, .skipnav a:active { position: static; left: 0; width:
auto; height: auto; overflow: visible; text-decoration: underline; }
```

“

Alternatively links can be set on top of content blocks that lead directly to the beginning of the next content block.

```
<a href="#content">to main content</a></p>
<h2>1st level navigation menu</h2>
<ul>
  <li><a href="#2nd_level">to 2nd level</a></li>
  <li><a href="/destination">A destination</a></li>
  <!-- more menu entries -->
</ul>
<h2 id="2nd_level">2nd level </h2>
<ul>
  <li><a href="#3rd_level">to 3rd level </a></li>
  <li><a href="/destination">A destination</a></li>
  <!-- more menu entries -->
</ul>
<h2 id="3rd_level">3rd level</h2>
<ul>
  <li><a href="/destination">A destination</a></li>
  <!-- more menu entries -->
</ul>
```

4.3.2.2 Navigation

Link to the start page on every page

On every page of the site a link to the start page should be provided on a prominent position, for example in the top left corner.

Additional navigation elements (G63, G65)

To navigate the website in multiple ways the user can be supported by a couple of technical solutions. It is recommended to provide a breadcrumb trail on top of the main content. A site-map should also be provided. The navigation menu should not be animated and indicate the current location on the site.

Descriptive page title (G88, H25, G127)

The page title is very important for the user to indicate which page he is currently watching. If the page is bookmarked the title is the proposed name for the bookmark. So it is also useful to retrieve information for later use.

The page title should be descriptive, meaningful and short. It should give a hint to the site the

page belongs to and should be unique on the site.

The title can be set by the title-element in the head-section of the page.

```
<head>
  <title>Current page title - Elder-Spaces</title>
</head>
```

Hierarchical structure of headings (G141)

Use standard tags like <h1>, <h2>, <h3>, etc. in a logical order to structure to the document.

4.3.2.3 Predictable behaviour

Any unpredictable behaviour of the site may lead to irritation and frustration. To maintain the users' feeling of security and self-esteem the system should react as expected.

Browsers' standard functionality

The standard functionalities of the browser should not be disabled or overridden. For example there are several methods to disable the browser history. Because this is an important and often used function it must be supported by the system.

Automatic page refresh

Page refreshes without any user action will lead to uncertainty regarding the initiation of the action. Because of the reasons mentioned above automatic page refreshes must be avoided or if absolutely necessary done after informing the user.

Pop-Ups and new windows

Even pop-ups and opening new windows or browser-tabs may disturb the user experience and lead to irritations. Therefore they should also be avoided.

4.3.2.4 Visual effects to be avoided

To prevent stimulus clutter, blinking or animated content, either textual or graphical, should generally be avoided. Animations should only be displayed, if explicitly requested.

4.3.3 The feature “understandable”

User guidance and support

To provide information on the usage of the website pages containing help, FAQs and contact information should be included. Also context-sensitive help, e.g. on form completion and a glossary should be provided where appropriate.

Consistent user interface

To maximize the learnability and minimize irritations the user interface should be consistent on all pages. Elements that are contained on multiple pages, e.g. the navigation menu, should have

the same layout, position, order, labelling and behaviour.

Content (G86, G103, G153)

Short pages should be used. The most important information should be written on top.

Short sentences with active in common language should be used. If complex content is used, an additional text containing the information in easy language should be provided.

Complex information can also be enhanced by adding appropriate graphical explanations.

4.3.4 The feature “robust”

4.3.4.1 Standard-conformance

When creating accessible web-content some standards have to be taken into account. Firstly it is important to keep the mark up and the style sheets W3C-conform. To check the conformance the W3C-Consortium provides several online validators for (X)HTML, CSS, RSS etc. on <http://validator.w3.org>. The strict variant is recommended and is declared by the following code on the beginning of the page’s source:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN"
"http://www.w3.org/TR/html4/strict.dtd">
```

4.3.4.2 Conformance with expectations

As already mentioned in chapter 4.3.2.3 it is important to avoid irritation of the user. The system should react as expected, which includes the provision of information in HTML. There should be no need of downloading material and by that changing the context. If additional technologies like CSS and JavaScript are not supported by the user’s browser, the page should not change its functionality. Even non-standard actions like double-clicks or right-clicks for other than standard browser-functionality are not recommended.

4.3.5 Login page and registration

The login page should follow a “design for all” approach and use a large font-size and high contrast by default. The control elements should be grouped logically and reduced to the necessary (as displayed in Figure 18):

- a unique header and page title
- a text explaining the user the possible options on the page in clear and active language providing clearly marked links
 - to registration page
 - to password recovery page
- a labelled input field for input of the user name
- a labelled input field for input of the password
- a clearly marked submit button

Figure 18: Possible layout of login screen

4.3.6 Forms

Forms are a special challenge to most inexperienced users. To make them as usable as possible, some measures can be taken.

Instructions (G184)

The users should be informed about the objective of the form and get hint on how to fill it on top of the form. If there are many fields on the form that need the same specialized data format, this can be explained here. Maybe a screencast with an example of the form competition can be included.

Labelling (H44, H65, G131, G162)

A unique label describing clearly the purpose of the form field should be provided. Therefore the HTML-label-element should be used before the input element. This can be above or on the left side.

```
<label for="surname">Surname:</label>
<input type="text" name="surname" id="surname" />
```

This technique is suitable for all textual input fields. On radio buttons and checkboxes the labels have to be assigned behind the input element providing a description of the value.

```
<input type="checkbox" id="terms" name="terms" />
<label for="terms">I agree to the terms of use</label>
```

Radio buttons should provide a description of their topic before and the various values as labels behind them.

```
<span>Gender:</span>
<input type="radio" name="gender" id="male" value="male" />
```

```

<label for="male">Male</label><br/>
<input type="radio" name="gender" id="female" value="female"/>
<label for="female">Female</label><br/>

```

If a button is used to perform an action directly associated with the input field, e.g. a search field, also the button must be clearly describing its purpose and be positioned right after the input field to indicate the connection.

Grouping (H71)

If the data of the fields is logically associated, e.g. the address data, it should also be grouped optically by using a fieldset with a declarative legend.

```

<fieldset>
  <legend>Postal Address</legend>
  <label for="street">Address:</label>
  <input type="text" id="address" name="address" />
  <label for="zip">Zip Code: </label>
  <input type="text" id="zip" name="zip" />
  <label for="city">City: </label>
  <input type="text" id="city" name="city" />
  <label for="country">Country: </label>
  <input type="text" id="country" name="country" />
</fieldset>

```

If a big group of radio buttons is used, they should be grouped by using the fieldset and the legend element as described below.

```

<fieldset>
  <legend>Gender</legend>
  <input type="radio" name="gender" id="male" value="male" />
  <label for="male">Male</label><br/>
  <input type="radio" name="gender" id="female" value="female"/>
  <label for="female">Female</label><br/>
</fieldset>

```

Data formats

If specialized data formats are required, this information should be explained in the label.

```

<label for="time">Time (HH:MM)</label>
  <input type="text" name="time" id="time" />

```

Mandatory fields (H90)

If form fields are required for successful filling a form, this information must be provided to the user. This can be done by a textual addition to the labels, e.g. “(required)”, or by an asterisk. The usage of the asterisk to indicate mandatory fields must be explained in the introductory instructions on top of the form.

```
<label for="email">E-Mail (required):</label>
  <input type="text" name="email" id="email" />
```

4.3.6.1 Possible layout of the registration form

Figure 19 shows a possible implementation of the registration form with respect to all foregoing considerations. The important information is written on top of the form with a standard conformant link to a screencast explaining the completion of the form step by step in detail. Also the fact that the mandatory fields are marked by an asterisk is indicated in the introductory text. The fields change the colour to white when receiving focus and the link-text contains a hint that the link will open a new window.

Although all used accessibility features the sheer mass of information requested on one screen may distract users. A guided dialogue asking for input of the fields step by step with the opportunity to go back and forward could prevent this.

Registration

Explanatory text on form fulfilment, optionally with a link to a [screencast \(opens new window\)](#) demonstrating the completion.

Required fields are marked by an asterisk.

Surname *:

Firstname *:

Nickname *:

Country *:

City *:

Gender:

Male

Female

E-Mail-Address *:

Password *:

Repeat Password *:

Terms and conditions:

Please read the [Terms and conditions \(opens new window\)](#) and check the box, if you accept them.

I accept the terms of use *

Figure 19: Possible layout of registration form

Error handling

Despite the measures described above there is a possibility for input errors. If an error occurs, the user has to be informed about the source of that error and about the actions to be taken to solve it. Like all important informative texts even the error message should be provided on top of the form and should be emphasised. In very complex forms a link to the input field where the error occurred may be provided. Furthermore the affected field could be emphasised by a coloured frame. Figure 20 displays an example of error handling.

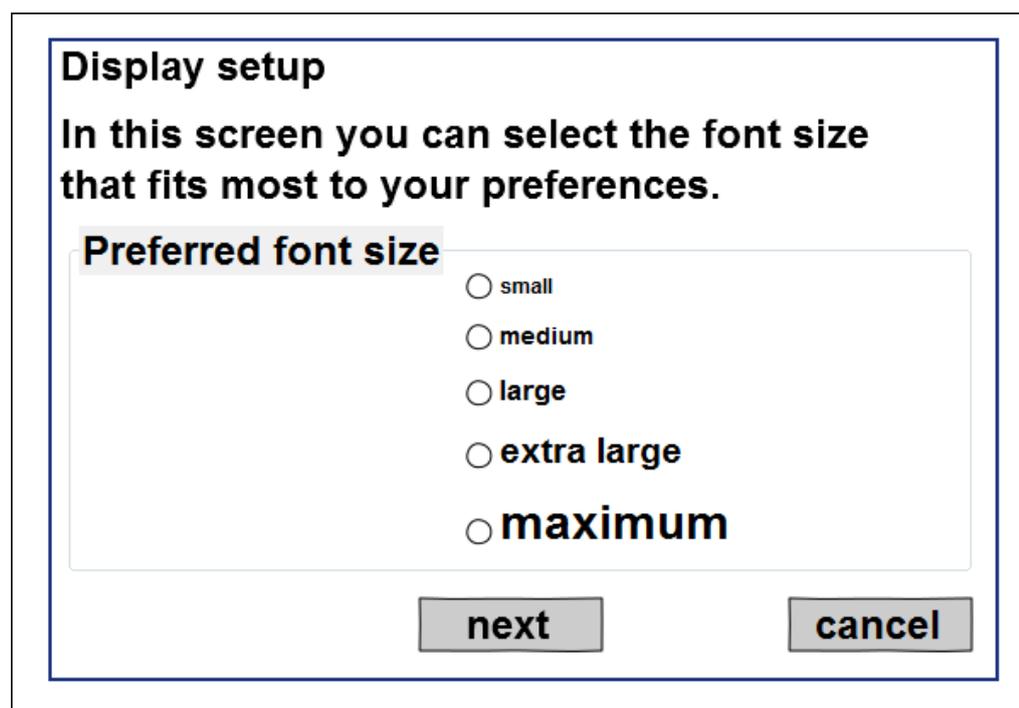
The image shows a registration form titled "Registration". At the top, there is a red error message: "Please insert your [firstname](#) and try again." Below this, the form contains several input fields: "Surname *" with the value "Someone", "Firstname *" which is empty and highlighted with a red border, "Nickname *" with the value "SomeD", "Country *" with a dropdown menu showing "Germany", "City *" with the value "Wetter", "Gender:" with radio buttons for "Male" and "Female", "E-Mail-Address *" with the value "Someone@Anywhere.com", "Password *" with masked characters, and "Repeat Password *" also with masked characters. At the bottom, there is a section for "Terms and conditions:" with the text "Please read the [Terms and conditions \(opens new window\)](#) and check the box, if you accept them." and a checked checkbox for "I accept the terms of use *". At the very bottom, there are two buttons: "submit" and "cancel".

Figure 20: Possible layout of registration form with error handling

4.3.7 Use of wizards

When a new user has registered he should first get the opportunity to configure the accessibility features guided by a wizard, where he can set the font size, line space, the colour scheme and the amount of animated content and graphics step by step by selecting the options by example.

Figure 21 shows how the first screen of such wizard may look like. On the next screen the selected font size should already be used. The values may be saved in the systems database as well as in a cookie to be restored on next visit of the site.



The screenshot shows a window titled "Display setup". Inside the window, the text reads: "In this screen you can select the font size that fits most to your preferences." Below this text is a section labeled "Preferred font size" which contains five radio button options: "small", "medium", "large", "extra large", and "maximum". At the bottom of the window, there are two buttons: "next" and "cancel".

Figure 21: Selection of the font size

4.3.8 Considerations on users of screen readers

If the features specified above are realized then the needs of users of screen readers are met, too.

4.3.9 Considerations on tabletop-devices

Most of the requirements mentioned so far also apply to tabletop-devices. Additionally it has to be mentioned that scrollbars and the need for double clicks should be avoided. With respect to the challenges a virtual keyboard evokes, user input by typing must be reduced to a minimum by providing lists to select from or sliders to set numerical values. Even if the tabletop-devices provide much space, there are minimum size requirements to the interaction elements. So a button should have at least 11.43 mm in the square and the minimum spacing between two buttons should be between 3.17 mm and 12.7 mm.

4.4 UI design concept

Acknowledging that most of the potential users of Elder-Spaces platform would be elderly, the User Interface should be as simple as possible. Large buttons, mild colours, colour combinations, contrast, brightness and general layout should be compliant to the international standards for elderly users, which have already been specified above.

One key element would be to provide help at any part of the platform. The elderly should be guided throughout all existing procedures, from the most generic to the relatively most complex ones. They should feel secure in their quests and acknowledge that they will have the system's guidance in all their navigation activities.

The main functions and applications should be as distinctive as possible. The buttons which lead to the functionalities, games or to the interaction with other users should be direct and easy to follow. There should be set a maximum of steps (e.g. two steps or two 'clicks-away') for a user to enter a service, and a corresponding threshold for more 'complicated' characteristics, which should be conducted in four or less steps.

Furthermore, the accessibility to one's profile should be one 'click-away', giving them the opportunity to proceed to changes at will, fast and targeted. In the same sense, the interaction with the platform should be targeted and clear, as no ambiguities should exist regarding the platform's functions.

Finally, it would be preferable to include functionalities for disabled people regarding the accessibility, so as to broaden as much as possible the potential user audience. Thus, optical zoom and sound navigation messages should accompany each (or at least most of the) different functionalities of Elder-Spaces platform.

In all aforementioned preferable characteristics, the user interface should be adjusted to all the envisaged means of using the platform (PC, smartphone, Surface PC, etc.).

5. Content Personalization

It is of high importance that the content will be personalized, especially in terms of ease-of-use and privacy. More specifically, the level of easiness and complexity of using someone's account should be adjusted according to the user group in which someone belongs in, as each age has different needs and different capabilities. In other words, the personalization lies in the familiarity and the level of Information and Communication Technology (ICT) skills that the user has.

Furthermore, the privacy is a crucial factor as the notification of the information should be primarily configured and customized by the user. At first the system should maintain the higher level of privacy. Only if the user wishes to level it down should it be reduced. In this way, the user has the control of the account while the platform proves its trustworthiness. Each one of the selected actions that will occur in the platform will be automatically recorded and analysed.

The objective of content personalization is to provide some kind of information to the user, tailored specifically for the individual interests.

In the Elder-Spaces context **Cognitive Social Search functionalities** should allow users to easily search personalized information and platform entities, based on the relations, interests and activities of the user. The objective of this functionality is to propose data to the user and to stimulate the users through a new added value recombination of the existing data of the platform. In this context the **recommendation systems** gained importance: the user will not need to actively search for content but the system will automatically address the needs of the user and suggest interesting resources. This kind of process adds value to the platform supporting the users in finding new content in order to find new friends, participate to events or to Elder-Spaces groups. Indeed recommendation systems are a new way of receiving information that takes advantage of connected data. Recommendation systems minimize the interaction of the user with the system to actively search for information and enhance also the usability of the system by elderly users.

Designing and implementing the Cognitive Social Recommendations, instead of Cognitive Social Search will allow the platform to automatically suggest personalized content to the Elder-Spaces users. The approach of the Cognitive Social Recommendation is defined in the following section.

In the Elder-Spaces platform the personalisation will be focused on custom made recommendations: As the user profile takes shape and is enriched with user's explicit and implicit data, the system can exploit it and suggest the user some resources that can be relevant to the user's intent.

Here we illustrate some of the key-principles of a recommender system that a user model should support:

- **Heterogeneity of user characteristics** – User model should be expressive enough to fulfil the requirements of any kind of user: age, sex and interests.
- **History aware** – Past interactions of the user with the system should be taken into account to build the current representation of the user.
- **Inferring of implicit assumptions** – Using the current set of user claims as a knowledge base it should be possible to extract implicit knowledge that could be hidden in the profile, performing generalisation and inclusion of concepts and giving the user the chance to discover knowledge.
- **Privacy of data** – The data saved in the user profile should be anonymized and under the ownership of the user himself.
- **Extensibility** – The data model should provide a formalism to increase its extensibility and be able to represent different things.

Each user's profile is updated periodically according to the activities carried out by the user. This update takes place just in case the activities affect the user's profile, such as in the case of membership in a group or new expression of interest for a topic or the participation to an event.

6. Cognitive Social Recommendations

The Cognitive Social Recommendations system will be in charge of exploiting all the knowledge acquired from the system concerning the users and the resources. The objective of this system will be to couple the users with the resources through the knowledge base. Recommendation algorithms should take advantage of user changing profiles and of all knowledge the system acquired about the user: what the user is interested in and which activities they perform on the platform. The system will finally deliver highly relevant recommendations to each user, supposing that they can be interesting for them in a precise context.

Cognitive Social Recommendations functionalities will be based on a social semantic layer that will elaborate activities of the users on the platform to return profiled results. The system relies on iWiW API to collect information related to the user's activities and resources from the platform. Recommended information is returned by the Cognitive Social Recommendations functionality as web-services: in this way it will be possible to integrate them in different applications and media.

Recommendations will be calculated enriching the user interests with the activities of the user on the platform and with the contents they produce. To reach the goal the following main entities have been defined:

- **User:** users of the platform
- **Groups:** groups of users created in the platform, based on common interests or activities
- **Events:** real events created by users of the platform

A set of applications will be based on Cognitive Social Recommendations functionalities. Some services examples are:

- **Groups:** Group recommendations functionality has been designed in order to allow the user to become a member of several groups and actively participate in their activities. The idea behind the functionality is quite simple: to provide users with groups that may be interesting for them. This functionality is crucial, considering the target users of the platform. In fact it can help to facilitate the user interacting with other users of the platform, and also for the platform usage itself, for users who do not have a great familiarity with the practices of social networks. This process takes place through a complex matching algorithm that allows you to make relevant proposals to user choices.

For example: A group is suggested based on the user's interests and of the social network to which the user is connected, such as the subscribed list of groups, the games and events in which they participated. For example, if a user inserts in the individual interests the category "Games" and participated to a Scrabble game event in the past. The system can recommend a group of players of "Scrabble" and because of their relationships with a social network that includes several people that are registered to the group "players of Scrabble - municipality of Trikala", this will be the first proposed to the user among the dozens of existing groups on the platform of the game "Scrabble". In fact one of the criteria that will follow the system will be to propose the closest entity in function of its social network.

- **Events:** This functionality will provide the user with a list of events that corresponds to the user's interests and which are congruent with the user's geographical location. Event recommendations will be based on the user's profile and social network.
- **Friends/social management:** A central activity in the use of social networks is creating contacts with persons known or not. Young users are extremely easy to create contacts through the Internet while the older may have greater difficulty and also be reticent to establish new contacts. The functionality offered by Cybion, based on the specificity of the target users, user profiling and analysis of their activity on the platform will suggest appropriate contacts to the user. The functionality developed by Cybion will connect the user with others who have a similar profile (age, interest) and have a similar activity on the platform (page views, groups) or live in the same geographical area.

6.1 Data flow

The data to be processed are made available in two ways:

- **Update Mode:** On a periodic basis, iWiW will communicate activities and content related to the profile of the user. The objective is to obtain data related to each user in order to collect relevant information to create the user's profile and the social graph. It will catch the changes introduced on some entities of the platform: users, groups and events. Part of the published content, the most relevant to the user such as new friends, posts, groups will be selected to create the individual profile.
- **Recommendation request:** When the user accesses to see recommendations (user, groups, news or events), the service is requested with the user_id of the current user. The user profile is initially analysed and reported to the closest concepts and it generates a query which is expanded by adding other keywords extracted from the profile that is performed on the content contained in the platform.

6.2 Recommendation engine approach

A recommendation engine helps a user find novel and interesting items within a pool of resources. The Elder-Spaces Cognitive Social Recommendations system will be based on a knowledge base which will connect user profiles with other entities. There are numerous types of recommendation algorithms and a graph can serve as a general-purpose substrate for evaluating such algorithms.

Recommendation results will be calculated on the basis of social semantic techniques, applying statistical algorithms to analyse the textual content and also exploiting the knowledge derived from the social graph of the user who ran the search. Statistical algorithms will allow a language independent text analysis.

In this way the amount of knowledge collected can be exploited in various different ways for recommendation goals. From a single connection between a user and a resource which has been declared interesting, the system can follow the connections between concepts and find out other resources by following linked relations achieving unpredictable and excellent results.

7. Conclusions

D2.1 describes the results of the first constructive step in a multi-step development process:

It gives an overview and a high level description of the Elder-Spaces functionalities, based on the analysis of the requirements and use cases elaborated in WP1.

It describes the elements and design concept of the user-interface. Special attention is given to practical and realistic aspects of usability and accessibility, always having the main target group in mind: elderly people.

It also specifies the general features of content personalisation and of the Cognitive Social Recommendations system.

So, D2.1 is the basis for the following specification steps to be done in tasks T2.2–T2.4 and for the UI development work in WP4.

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