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Evaluation of Elder-Spaces Platform, Services and Applications

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Abstract: Detailed results of the evaluation of the platform, the services and applications from both end-users and experts of the user organizations from various perspectives including usability, accessibility, ease-of-use, utility, effectiveness and more.

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Glossary

ACE	Access Control Entry
API	Application Programming Interface
APP	Application
ATAG	Authoring Tool Accessibility Guidelines
BCP	Business Continuity Plan
CSCM	Contact Store for Communication
CSS	Cascading Style Sheets
DRP	Disaster Recovery Plan
EN	European Norm
FDIS	Final Draft International Standard
HTML	HyperText Markup Language
ICT	Internet and Communication Technologies
IEC	International Electro-technical Commission
IP	Internet Protocol
ISO	International Standardization Organization
IT	Information Technology
iWiW	internet Who is Who
MS	MicroSoft
NGO	Non-Governmental Organizations
NVDA	Non Visual Desktop Assistant
OAuth	open standard for authorization
OCP	Operation Continuity Plan,
OS	Operating System
PDCA	Plan-Do-Check-Act
PR	Public Relations
QoL	Quality of Life
SLA	Service Level Agreement
SMTP	Simple Mail Transfer Protocol
SQL	Structured Query Language
SQuaRE	Systems and software Quality Requirements and Evaluation
TR	Technical Report
W3C	World Wide Web Consortium
WAI	Web Accessibility Initiative
WAI-ARIA	Accessible Rich Internet Applications
WCAG	Web Content Accessibility Guidelines

Executive Summary

Deliverable 6.3 “Evaluation of Elder-Spaces Platform, Services and Applications” comprises the results of Task T6.3 “Platform, Services and Applications Evaluation” and Task T6.4 “Techno-Economic Evaluation” within work package WP6 “Trials and Evaluation”.

Chapter 2 gives detailed results of the platform evaluation based on the six sub-characteristics of “ISO/IEC 9126-1” and their attributes. It contains evaluations from a pure technical point of view like the evaluation of reliability, efficiency, maintainability and portability, but also handles topics like functionality and usability. – The functionality provided by the platform is evaluated as adequate and completely fulfilling the requirements on a high level of accuracy. As specified, newly created contents visibility is set to private by default, providing adequate privacy to the users. The system is mature for productive use; the final bug count is nearly zero. Due to its prototypical character, the system is not completely tolerant to faults, but all processes needed for 24/7 operation were elaborated. For evaluation of Elder-Spaces usability the more suitable and detailed standard ISO 9241 was used. The results on usability were nearly perfect and the end users also stated a positive attitude concerning the platform. The overall performance is good and resources are used in an efficient way, the system proved to be stable, changeable and extendable. The web platform is portable, on the other hand, the applications developed for the MS-PixelSense depend on the very specialized hardware and therefore are not that easy to adapt.

Chapter 3 summarizes the results of the tests on accessibility of the platform and provides a final evaluation which also has an overall positive result. The platform is currently not fully compliant to WCAG2.0 Level AA, but overall a very good accessibility has been verified in the final test. Minor actions still have to be done to achieve WCAG2.0 Level AA conformance, which may act as a marketing argument in the future.

Chapter 4 describes the results of end user evaluations performed in Greece and Hungary, which confirmed a positive impact on the users’ self-esteem, satisfaction with their social lives and their handling of web-technologies in general. This indicates that the main objective of the Elder-Spaces project – building a platform, which is able to improve the users’ quality of life – was achieved.

Chapter 5 contains the evaluation results from a techno-economical point of view and points out that the platform is able to match all stakeholders’ interests. The key performance indicators are provided to be used for measuring the fulfilment of the business goals in productive use. Additionally ideas for applications were elaborated, which could further improve the benefits of using the Elder-Spaces platform.

The Elder-Spaces platform as it is by project end, is a prototype and should be further improved. Besides the necessary more technical actions, which have to be done before a productive rollout, some minor improvements of usability and accessibility should be done to have an outstanding platform for elder people compared to all other social networking sites among the web.

1. Introduction

1.1 Overview

Deliverable 6.3 “Evaluation of Elder-Spaces Platform, Services and Applications” comprises the results of Task T6.3 “Platform, Services and Applications Evaluation” and Task T6.4 “Techno-Economic Evaluation” within work package WP6 “Trials and Evaluation”.

The purpose of this document is to evaluate the platforms

- product quality, including functionality, reliability, usability, efficiency, maintainability, and portability,
- accessibility,
- reception by and impact on end-users,
- techno-economic opportunities.

Chapter 2 gives detailed results of the platform evaluation based on the six sub-characteristics of “ISO/IEC 9126-1” and their attributes. It contains evaluations from a pure technical point of view like the evaluation of reliability, efficiency, maintainability and portability, but also handles topics like functionality and usability.

Chapter 3 summarizes the results of the tests on accessibility of the platform and provides a final evaluation.

Chapter 4 describes the results of end user evaluations performed in Greece and Hungary regarding the platforms impact on the end users’ quality of life and mental health.

Chapter 5 contains the evaluation results from a techno-economical point of view.

1.2 Relation with other tasks and work packages

Deliverable 6.3 contains the evaluation of the platform specified in WP2 “Social Networking Services and Applications Specifications” and developed in workpackages WP3 “Development of ELDER-SPACES Middleware” and WP4 “Development of ELDER-SPACES Services and Applications” and integrated in T5.1 “ELDER-SPACES Platform Integration and Deployment” of WP5 “Integration and System Testing of overall ELDER-SPACES Platform”.

The evaluation by the end-users has been done during the user-trials within Task T6.2 “Conduction of User Trials and User Evaluations”, which were specified in Task T6.1 “Trial Protocols and Evaluation Metrics”.

More evaluations from various perspectives have been done by experts in Task T6.3 “Platform, Services and Applications Evaluation” and partially used results of the tests done within T5.2 “ELDER-SPACES Platform System Testing”.

2. Software-Quality

Software quality is defined in “ISO/IEC 9126-1:2000: Software engineering – Product quality”¹ and ISO/IEC 14598-1:1999: Information technology – Software product evaluation”². Figure 1 shows the relationship between both standards.

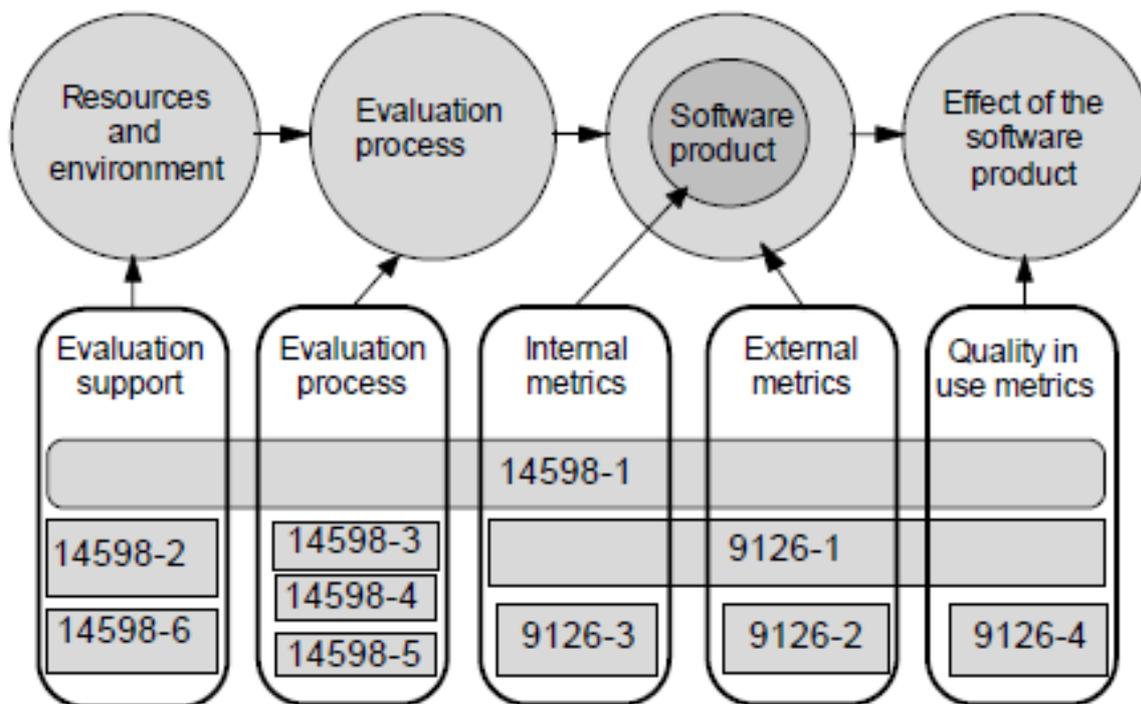


Figure 1: Relationship between ISO/IEC 9126 and ISO/IEC 14598 standards

Both standards are replaced by the series of standards in “ISO/IEC 25000 Software engineering – Software product Quality Requirements and Evaluation (SQuaRE)”³. The evaluation process is defined in: “ISO/IEC 25040:2011: Systems and software engineering – Systems and software Quality Requirements and Evaluation (SQuaRE) – Evaluation process”⁴. Ergonomic and usability aspects of software are also defined in the series of standards in “ISO 9241: Ergonomics of human-system interaction”.

For the purpose of the evaluation of the software developed in ELDER-SPACES the six main sub-characteristics of product quality, i.e. functionality, reliability, usability, efficiency, maintainability, and portability, as well as the results of this evaluation are described in the following.

2.1 Functionality (Byte/SLG)

2.1.1 Evaluation criteria

According to ISO/IEC FDIS 9126-1:2000, functionality is:

“The capability of the software product to provide functions which meet stated and implied needs when the software is used under specified conditions.”

Note that this characteristic focuses on the “what” rather than the “how”. The emphasis is placed on identifying the extent that the needs or the specifications are met when using the Elder-Spaces platform.

There are a number of attributes which specialize in different aspects of functionality:

- Suitability
(The degree to which the software provides the functions that are necessary for all intended tasks and user objectives)
- Accuracy
(The degree to which the results provided are in accordance to the expected output and to the necessary precision)
- Interoperability
(The capability to interact with other systems)
- Security
(The degree to which the software protects information and data from unauthorized access. Note that this applies also to data in transmission)
- Functionality compliance
(The level of adherence to standards and regulations in laws)

2.1.2 Results

In order to measure the sub-characteristics of functionality, we used the external metrics described in ISO/IEC TR 9126-2. These were adjusted to better fit the needs of the specific implementation. Mainly the definition of functions mentioned in the original document was adopted. In case of Elder-Spaces more interest laid in functionalities and actions performed within the platform, less in functions in the pure technical term. Evaluation was done after the completion of implementation, so it relies heavily on the final results of the functional tests and user input during the evaluation period.

2.1.2.1 Suitability

“Can the software perform the tasks required?”

The Elder-Spaces platform was specifically designed to meet the requirements set. The software is custom made and as expected, in the final evaluation it fitted all requirements. This sub-characteristic mainly applies when evaluating commercial software vs. the requirements of an interested party.

Table 1: Functionality - Suitability metrics results

#	Metric	Description	Result
1	Functional adequacy	Number of functions that are suitable for performing the specified tasks comparing to the number of function evaluated.	100%
2	Functional implementation completeness	Based on the results of functional tests. Measure missing functions that were detected with respect to requirement specifications.	100%
3	Functional implementation coverage	Based on the results of functional tests. Measure missing or incomplete or incorrect functions that were detected with respect to requirement specifications.	100%
4	Functional specification stability (volatility)	Number of functions that were changed after they were put in operation.	88,16%

There were a number of functionalities/actions that was updated after fist deployment, in order to fix bugs and implementation completeness issues. The total number of functionalities and corresponding actions tested were 76.

These functionalities were:

1. Select message recipients
2. Message wizard functionality
3. Select friends for event invitations
4. Select friends for group invitations
5. Registration
6. Cognitive recommendations
7. Fresh photos
8. Activity feed
9. MS surface login

2.1.2.2 Accuracy

“Is the result expected?”

Accuracy metrics intend to capture the frequency by which output in any form is different than expected. Be that with respect to precision of result or deviation from the expected output.

Accuracy metrics require accurate measurements throughout a period of operation, gathered by a number of users in order to provide some statistical value. This was not done sufficiently during the user trials, as user feedback was received in batches and thus it was not possible to count accurately occurrences for these metrics. What was done instead was to use qualitative feedback from testers during the final evaluation of the platform. They used a scale of 0 to 5, one indicating 0 indicating no encounters and 5 indicating high frequency of inaccurate results. There were three testers involved in this procedure.

Table 2: Functionality - Accuracy metrics results

#	Metric	Description	Result
1	Accuracy to expectation	Differences between expected outcome and actual result. The metric counts the encounters of such incidents over time	0
2	Computational Accuracy	Frequency of encountering inaccurate results (computations)	0
3	Precision	Frequency of encountering results with inadequate precision	0

The results are as expected, as the Elder-Spaces platform has limited content that could be inaccurate. Most of the information that is presented to the users are facts, input provided by users with no or little processing. Any inaccuracy in that part would mean functional errors which were corrected during the testing phase.

2.1.2.3 Interoperability

“Can the system interact with another system?”

Interoperability metrics intend to measure the success rate of data and command exchange between different software products. In our case, we regard as “other products” specific components which are built to be relatively independent from the main platform and specific interfaces, which have been designed for them.

These are:

- The MS Surface Application of Elder-Spaces, which can be viewed as a completely different product than the web platform.
- The Cognitive Recommendation module, which is hosted in a different environment.
- The two applications which are built for the Web platform but are not part of the common functionality.

Table 3: Functionality - Interoperability metrics results

#	Metric	Description	Result
1	Data exchangeability (based on interfaces)	Measures the percentage of exchange interfaces that are operating as specified	100%
2	Data exchangeability (User's success attempt based)	Count the number of cases where data exchange interfaces fail or produce inaccurate data	85%

The data exchangeability percentage reflects several problems that occurred mainly between the platform and the MS Surface application, or the Cognitive Recommendation module. Even after initial deployment, there were several instances where communication failed, either due to transmission issues or data exchange issues.

2.1.2.4 Security

“Does the software prevent unauthorized access?”

Security is a very broad subject. It reflects to software and hardware, data access and code execution rights. We demonstrate below the findings on the metrics proposed in ISO/IEC TR 9126-2:2002, but they are not adequate to provide solid evaluation of the subject.

Table 4: Functionality - Security metrics results

#	Metric	Description	Result
1	Access auditability	Evaluate how complete is the audit trail concerning user access to the system	100%
2	Access controllability	Count the number of illegal operations that were detected, compared to the number of illegal operations in the specifications	0%
3	Data corruption prevention	Count the occurrences of data corruption events	0%

Elder-Spaces is a prototype and as such, security has been addressed only to the most important issues that reflect to the user experience:

- User access
- User authentication
- Profile privacy
- Groups & events privacy

User access and authentication are considered adequate with respect to security considerations, as the platform uses the commercial standard OAuth2.0.

Profile privacy, groups and events are managed by system functionality and user configurable options. These functions have been tested and were verified. They are covered by #2 in the preceding table.

There are issues that were not addressed, as they would not affect the findings of this project, being too technical and of interest only when such a platform is released commercially.

Some of those aspects that were identified and should be included in future work are:

- Transmission security (currently data exchange is over http not https)
- URL hacking
- Direct access to the databases

2.2 Reliability (Origo)

2.2.1 Evaluation criteria

According to ISO/IEC FDIS 9126-1:2000, reliability is:

“The capability of the software product to maintain a specified level of performance when used under specified conditions.”

There are a number of sub-characteristics which specialize in different aspects of reliability:

- Maturity
(The capability of the software product to avoid failure as a result of faults in the software.)
- Fault tolerance
(The capability of the software product to maintain a specified level of performance in cases of software faults or of infringement of its specified interface.)
- Recoverability
(The capability of the software product to re-establish a specified level of performance and recover the data directly affected in the case of a failure.)
- Reliability compliance
(The capability of the software product to adhere to standards, conventions or regulations relating to reliability.)

2.2.2 Results

Elder-Spaces software is ready for production use. The site was continuously tested during the development and user test phases. The reported bugs and undesired behaviours are fixed; the platform is ready for mass usage.

2.2.2.1 Maturity

“Have most of the faults in the software been eliminated over time?”

During the development phase and live user testing run phase of Elder-Spaces a couple of qualified software testers checked the site and collected the bugs they found. Bug reports were also received directly from users via e-mail.

A detailed bug list was used for managing these bugs where all the bugs were reported with the following data:

- Date of report
- Current status
 - Open
 - In progress
 - Cancelled
 - Fixed
 - Verified fixed
- Description
- Reference (name(s) of unit(s) affected by the bug)
- Priority
 - Minor
 - Major
 - Critical
- Name and contact of the reporter
- Name of solver
- Date of solution
- Comment

The workflow shown in Figure 2 was used for bug fixing procedure.

On the flowchart

- parallelograms show the actions in the common bug list,
- yellow elements indicate the responsibility of the qualified tester team,
- green elements are the tasks of the developers

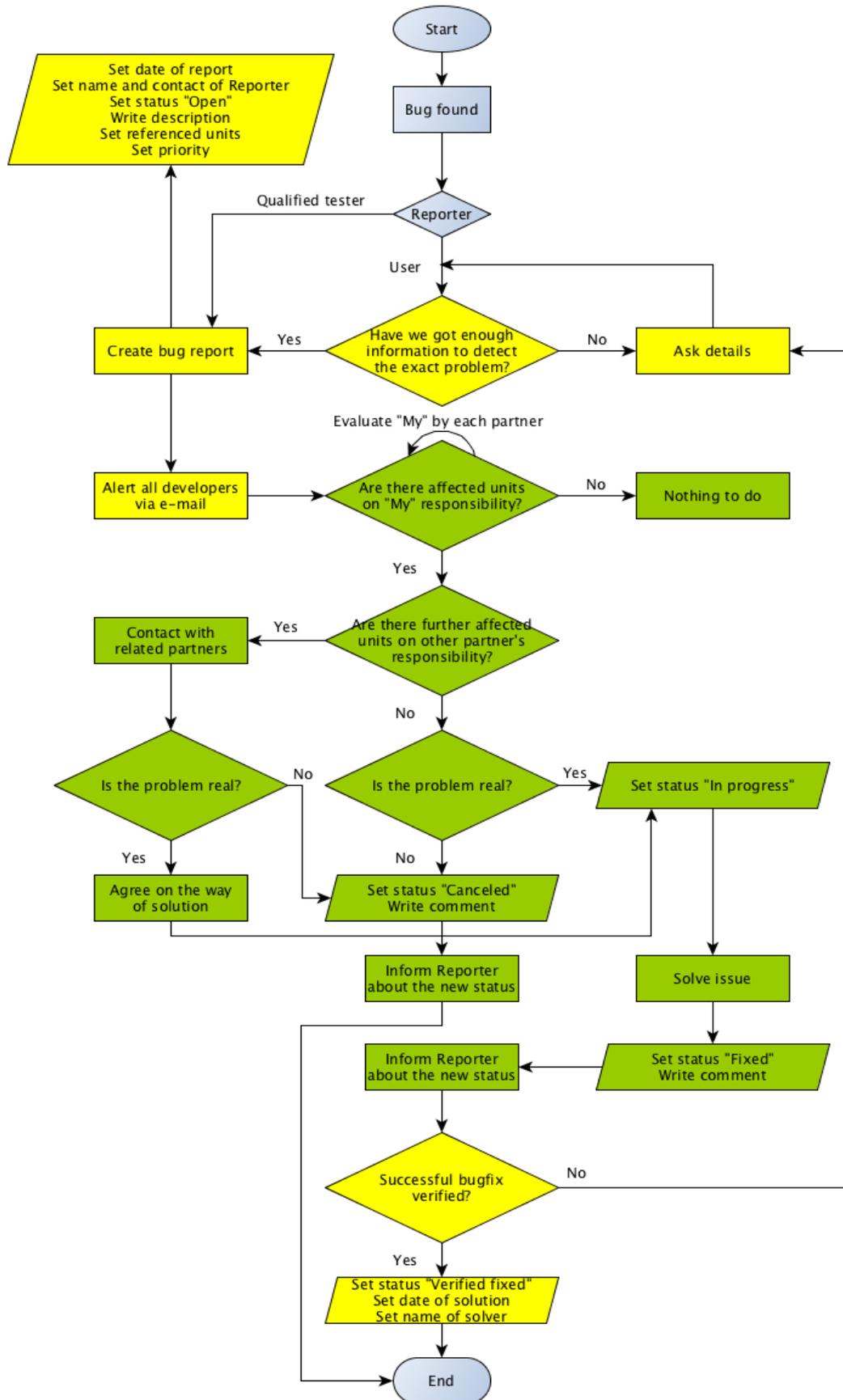


Figure 2: Results of Reliability - Bug handling workflow

In the Elder-Spaces project the development responsibilities were shared between partners by big functional units of the system. These units and the responsible partners are:

Table 5: Reliability - Unit responsibilities

Unit	Responsible Patner
API	ORIGO
Site template, header, footer	ORIGO
JAVA pages (log in, registration, change password)	ORIGO
Main page	ORIGO
Search	ORIGO
Applications	ORIGO
Static pages (help, sitemap, about, privacy, terms of use)	ORIGO
Cognitive recommendation	CYBION
Groups	CYBION
Events	CYBION
Profile	BYTE
Friends	BYTE
Messages	BYTE
Photos	BYTE
Feed	BYTE
Translation	Each partner of their own language

The following diagram shows the number of active (“Open” / “In progress” / “Fixed” statuses) bugs from our common bug list during the period of our project. A bug could get inactive from active if its status was set “Cancelled” or “Verified fixed”.

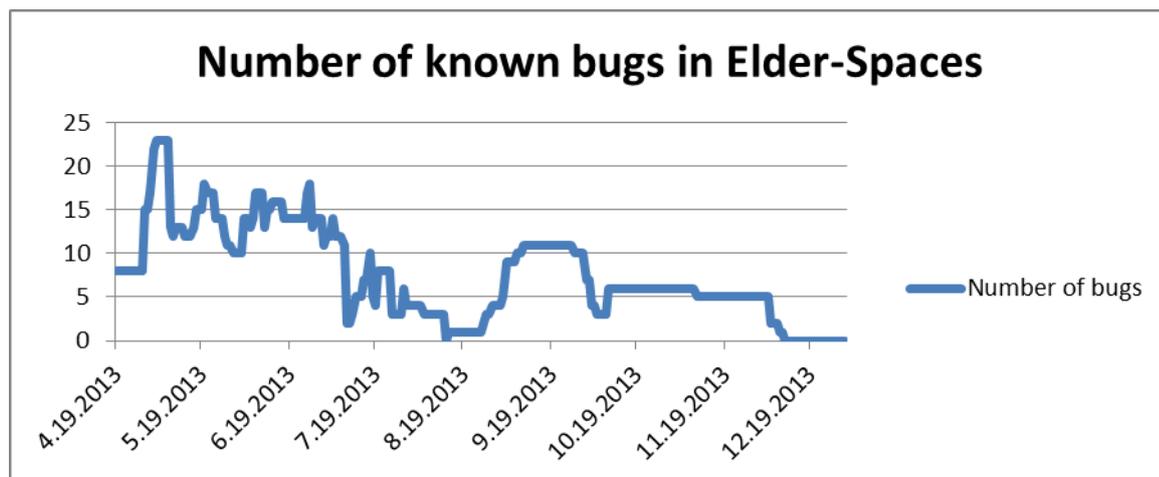


Figure 3: Results of Reliability - Number of known active bugs at the same time

All the developments were made via git commits. Git is a version and change tracking tool which makes the changes of the source code clear and understandable, provides developers an easy way of searching the cause of a given bug and enables dozen of developers to work together on the same product.

During the Elder-Spaces project developers generated around 700 commits of improvements and bug fixings. The Figure 4 shows the frequency of commits in Elder-Spaces.

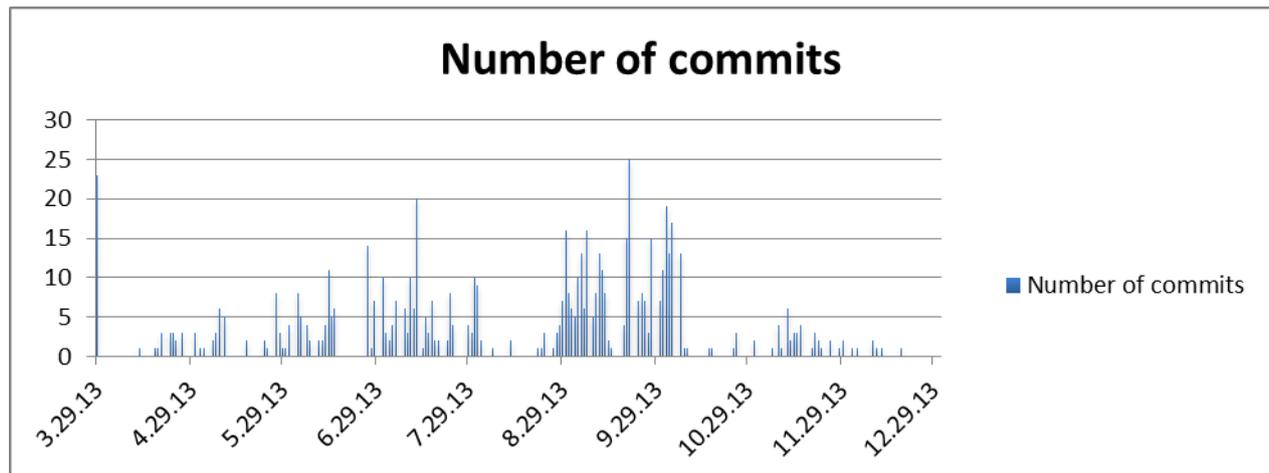


Figure 4: Results of Reliability - Frequency of Elder-Spaces git commits

2.2.2.2 Fault tolerance

“Is the software capable of handling errors?”

The Elder-Spaces platform handles many types of errors, but the production use could handle more errors to provide a clear operation in case of any possible error.

What Elder-Spaces is capable to handle:

Error prevention

- Initial state validation
- Tests of user input
- Tests of passed parameters
- Version Control

Error detection

- Impossible values
- Error flag
- Hardware fault or error conditions

Error recovery

- Report an error
- Set an error flag
- Where does the program go back? (occasionally solved)
- Aborting errors (occasionally solved)
- Recovery from hardware problems
- Missing disk

What Elder-Spaces could apply in productive use:

Error prevention

- Protection against corrupted data
- Protection against operating system bugs
- Protection against malicious use

Error detection

- Overflow
- Data comparisons

Error recovery

- Automatic error correction
- Where does the program go back?
- Aborting errors

2.2.2.3 Recoverability

“Can the software resume working and restore lost data after failure?”

Continuous working with high availability is important for Elder-Spaces site. During the production use a strict SLA (Service Level Agreement) should be applied and the system needs a DRP/OCP/BCP plan (DRP: Disaster Recovery Plan, OCP: Operation Continuity Plan, BCP: Business Continuity Plan). The DRP/OCP/BCP plan defines the actions, which should be performed in case of an unusual event (incident) damages the system.

2.2.2.3.1 SLA

We suggest the following SLA (Service Level Agreement) for the production use of Elder-Spaces:

- Operation time:
7 x 24 hours
- Time of planned maintenance:
Sunday 23:00 – Monday 04:00,
Thursday 00:00 – Thursday 06:00
- Time of notification before planned maintenance:
3 days
- Start of error-handling: <30 minutes
- Service availability (A) levels (within operation time, without planned maintenances):
 - Acceptable: $A > 99.5\%$
 - Warning: $99.5\% > A > 98.5\%$
 - Not acceptable: $A < 98.5\%$

2.2.2.3.2 Connection of Management, Operation and DRP/OCP/BCP planning

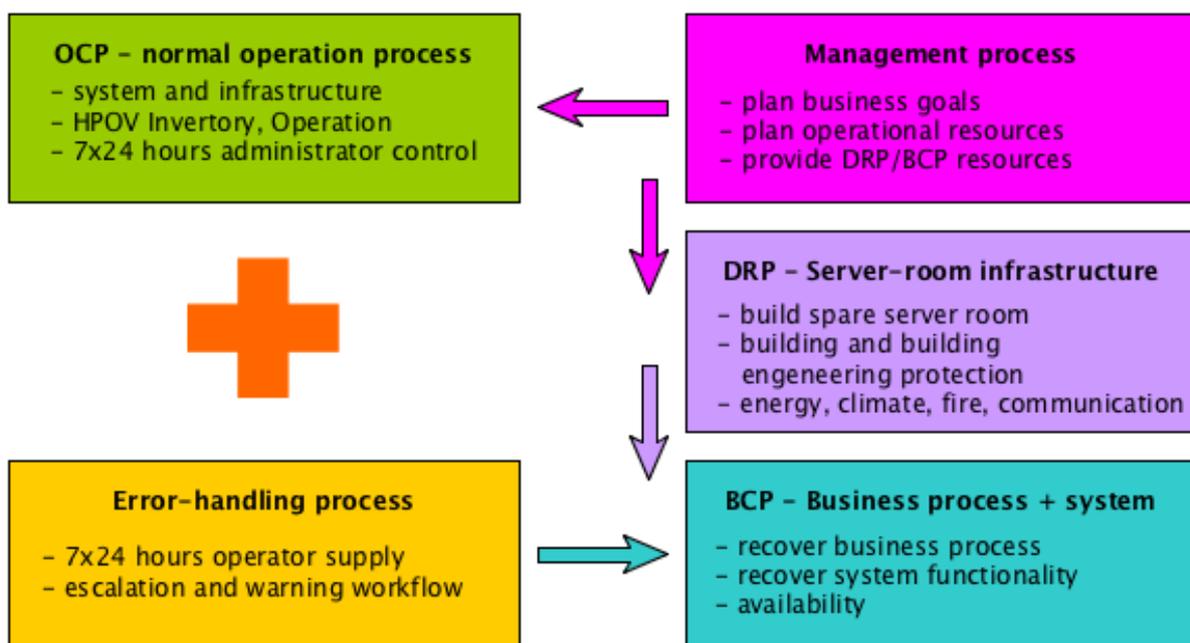


Figure 5: Results of Reliability - Connection of Management, Operation and DRP/OCP/BCP planning

2.2.2.3.3 DRP/BCP process

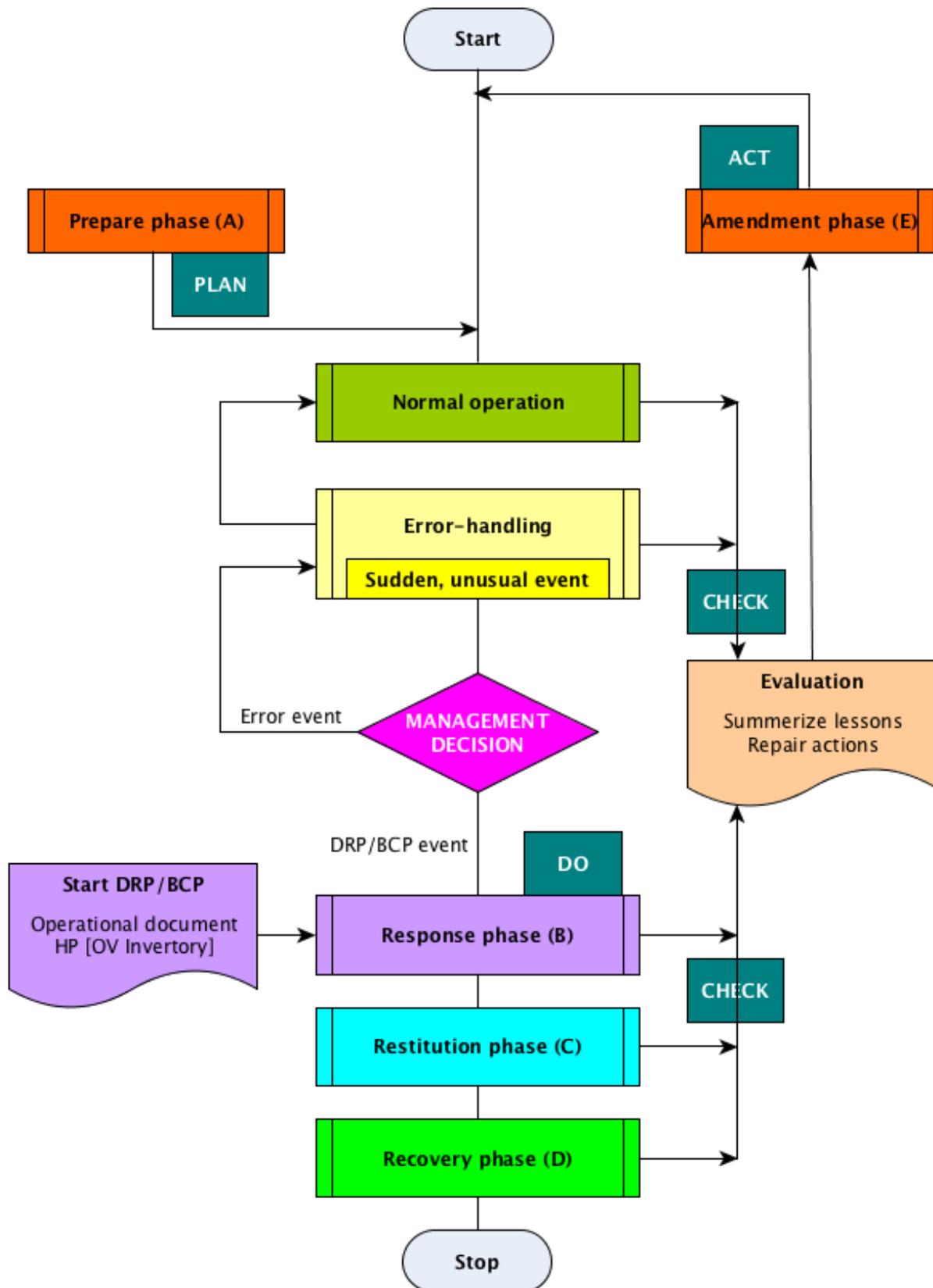


Figure 6: Results of Reliability - DRP/BCP workflow

2.2.2.3.4 DRP/OCP/BCP process phases

Preparation phase (PLAN, risk management)

This phase is for performing actions which could lower the damage effect of an unusual event (acquisitions, improvements, adopting procedure workflow, tests). Typically results in DRP/OCP/BCP plan and execution. /PDCA: Plan-Do-Check-Act/

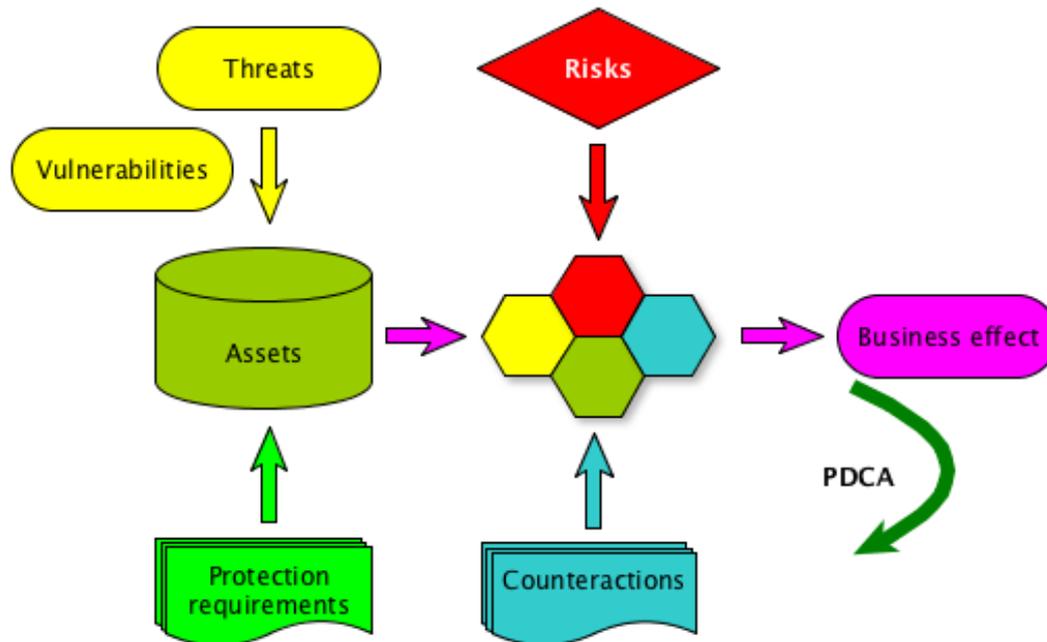


Figure 7: Results of Reliability - Risk management

Standby phase (normal operation)

This phase follows the preparation phase. In this phase the organisation is ready to handle an unusual event in an optimal way. Plans and related documents are done and supervised regularly, utilizing regular controls by tests. Due to necessary amendments and refinements there are periodic step backs to the Preparation phase.

Response phase (DO, Error-handling process, report, escalation)

This phase is a short – few hours – period after the unusual event in which the following actions perform:

- save people and values,
- alert the related staff who handle the unusual event,
- preliminary damage measurement

The main goals are:

- save human life
- minimize damage effect
- start recovery

Tasks of the operator service:

- Error, event detection
- Event determination, survey, record
- Define the level of error, unusual event
- Alert and inform related people or organisations
- Start (and perform if possible) of saving and error-handling processes
- Trace and handle error

Local tasks:

- Save people, use emergency exits
- Minimize damage consequences, perform saving process
- Measure loss and damage
- Confirm the level of error, unusual event
- Measure state of saving
- Decide about saving and error-handling
- Escalation
- Control error-handling

Restitution and conversion phase (Management, Business and Improvement processes)

In this phase the affected business processes and the actions that are providing alternative resources have to be performed. The goal is to bring the process operable again on a predefined minimal service level.

The vulnerability window defines the planned time that necessary for reaching the operable minimal service level.

Recovery phase (Management processes, Project inducement)

The purpose of this phase is assuring the affected business processes and resources on the original, usual way.

Organizational, informational tasks

- Inception of DRP management organization
- Announce DRP/BCP situation
- Actions of first-aid, people protection and supply, short PR information
- Set the place of management and recovery
- Call the necessary people for recovery
- Ensure DRP/BCP IT resources
- Organize the delivery of backend servers

Mandatory actions of recovering the system environment:

Basic Infrastructure

- Checking server room infrastructure, network connections
- Checking of codebase backup (JAVA code and configuration)
- Checking of basic software and images, preparation for install (operating system, web server, other components based on the Operational Documentation)
- Checking database backup, making the call which state to backup
- Checking database backup
- Configuring network devices, firewalls, preparing for server integration
- Initiating domain redirect to the new IP address
- Picking up backup servers from warehouse or other server room locations
- Mounting servers into rack-mounts
- Connecting servers to the network, power-on

CSCM Servers

- Mandatory first step, because the CSCM servers store the configuration of all other servers and these are responsible for managing the other servers installation
- Installing CSCM server (Operating system, basic software, configurations)
- Checking CSCM servers' IP address, external network connections, configuration
- Setting up and checking CSCM server configurations
- Restoring CSCM data from backup, checking

ZABBIX Servers

- Mandatory 2nd step, because ZABBIX servers are monitoring and handling all other servers
- Installing ZABBIX servers from CSCM (Operating system, basic software, configurations)
- Checking ZABBIX servers' IP address, external network connections, configuration
- Setting up and checking ZABBIX server configurations

ORACLE STORAGE

- Starting ORACLE STORAGE
- Setting up and checking ORACLE STORAGE server configurations
- Checking ORACLE STORAGE's IP address, external network connections, configuration

ORACLE Servers

- Installing ORACLE servers (Operating system, basic software, Oracle RAC, Enterprise Server)
- Checking ORACLE servers' IP address, external network connections, configuration
- Configuring ORACLE server and ORACLE STORAGE, checking connections
- Restoring ORACLE backup
- Starting ORACLE server, checking services
- Checking ORACLE connectivity

MEMCACHED Servers

- Installing MEMCACHED servers from CSCM (Operating system, basic software, configurations, program code)
- Checking MEMCACHED servers' IP address, external network connections, configuration
- Checking MEMCACHED server configuration with CSCM
- Setting up MEMCACHED servers in ZABBIX
- Setting up MEMCACHED servers in ACE

APP Servers

- Installing APP servers from CSCM (Operating system, basic software, configurations, program code)
- Checking APP servers' IP address, external network connections, configuration
- Checking APP server configuration with CSCM
- Setting up APP servers in ZABBIX
- Setting up APP servers in ACE

- Checking APP servers' internet connection
- Checking APP servers' ORACLE connection
- Checking APP servers' SMTP connection
- Checking APP servers' MEMCACHED connection

MEMCACHED upload

- Starting MEMCACHED uploading program on 2 appointed app-servers and checking on a 20 minutes basis! Finishing the program run is necessary for full start-up!

ORACLE MESSAGE Server

- Installing ORACLE MESSAGE server (Operating system, basic software, Oracle, Enterprise Server)
- Checking ORACLE MESSAGE servers' IP address, external network connections, configuration
- Checking ORACLE MESSAGE server disk enclosures
- Restoring ORACLE MESSAGE backup
- Starting ORACLE MESSAGE server, checking services
- Setting up ORACLE MESSAGE servers in ZABBIX
- Setting up ORACLE MESSAGE servers in ACE
- Checking ORACLE MESSAGE server's APP server connections
- Checking ORACLE MESSAGE server's APP server connections
- Checking ORACLE MESSAGE server's ORACLE server connections

WIWD Servers

- Installing WIWD servers from CSCM (Operating system, basic software, configurations, program code)
- Checking WIWD servers' IP address, external network connections, configuration
- Checking WIWD server configuration with CSCM
- Setting up WIWD servers in ZABBIX
- Setting up WIWD servers in ACE
- Checking WIWD server's ORACLE server connections

WIWD upload

- Starting WIWD uploading program on 4 WIWD servers and checking on a 20 minutes basis! Finishing the program run is necessary for full start-up!

IMAGE Servers

- Installing IMAGE servers from CSCM (Operating system, basic software, configurations, program code)
- Checking IMAGE servers' IP address, external network connections, configuration

- Checking IMAGE server configuration with CSCM
- Copying IMAGE image files from BACKUP (continuous)
- Setting up IMAGE servers in ZABBIX
- Setting up IMAGE servers in ACE
- Checking IMAGE servers' internet connection
- Checking IMAGE server's APP server connections
- Checking IMAGE server's ORACLE server connections

UPLOAD Servers

- Installing UPLOAD servers from CSCM (Operating system, basic software, configurations, program code)
- Checking UPLOAD servers' IP address, external network connections, configuration
- Checking UPLOAD server configuration with CSCM
- Setting up UPLOAD servers in ZABBIX
- Setting up UPLOAD servers in ACE
- Checking UPLOAD servers' internet connection
- Checking UPLOAD server's IMAGE server connections
- Checking UPLOAD server's ORACLE server connections

THUMBNAIL Servers

- Installing THUMBNAIL servers from CSCM (Operating system, basic software, configurations, program code)
- Checking THUMBNAIL servers' IP address, external network connections, configuration
- Copying THUMBNAIL ram-disk files from BACKUP
- Checking THUMBNAIL server configuration with CSCM
- Setting up THUMBNAIL servers in ZABBIX
- Setting up THUMBNAIL servers in ACE
- Checking THUMBNAIL servers' internet connection
- Checking THUMBNAIL server's IMAGE server connections

SEARCH Servers

- Installing SEARCH servers from CSCM (Operating system, basic software, configurations, program code)
- Checking SEARCH servers' IP address, external network connections, configuration
- Checking SEARCH server configuration with CSCM
- Setting up SEARCH servers in ZABBIX

- Setting up SEARCH servers in ACE
- Checking SEARCH servers' internet connection
- Checking SEARCH server's ORACLE server connections
- Uploading index files
- Running Lucene full index generation, monitoring the run on a 20 minute basis.
- Copying the ready index files onto 6 SEARCH servers, checking torrent setups.

MYSQL Servers

- Installing MYSQL servers from CSCM (Operating system, basic software, configurations, program code)
- Checking MYSQL servers' IP address, external network connections, configuration
- Restoring and checking MYSQL KEDVENCEK backup (dump)
- Restoring and checking MYSQL ST backup (dump)
- Restoring and checking MYSQL API backup (dump)
- Restoring and checking MYSQL API SWITCH backup (dump)
- Restoring and checking MYSQL ACTIVITY backup (dump)
- Restoring and checking MYSQL NOTIFICATION backup (dump)
- Checking MYSQL server configuration with CSCM
- Setting up MYSQL servers in ZABBIX
- Setting up MYSQL servers in ACE
- Checking MYSQL server's APP server connections
- Checking MYSQL server's MEMCACHED server connections

MQ Servers

- Installing MQ servers from CSCM (Operating system, basic software, configurations, program code)
- Checking MQ servers' IP address, external network connections, configuration
- Checking MQ server configuration with CSCM
- Setting up MQ servers in ZABBIX
- Setting up MQ servers in ACE
- Checking MQ server's MYSQL server connections
- Checking MQ server's ORACLE server connections

API Servers

- Installing API servers from CSCM (Operating system, basic software, configurations, program code)
- Checking API servers' IP address, external network connections, configuration

- Checking API server configuration with CSCM
- Setting up API servers in ZABBIX
- Setting up API servers in ACE
- Checking API servers' internet connection
- Checking API server's MYSQL server connections
- Checking API server's ORACLE server connections
- Checking API server's MEMCACHED server connections

PROXY Servers

- Installing PROXY servers from CSCM (Operating system, basic software, configurations, program code)
- Checking PROXY servers' IP address, external network connections, configuration
- Checking PROXY server configuration with CSCM
- Setting up PROXY servers in ZABBIX
- Setting up PROXY servers in ACE
- Checking PROXY servers' internet connection
- Checking PROXY server's API server connections
- Checking PROXY server's GADGET server connections

Deployment, verification

- Starting applications/interfaces, doing functional tests from intranet
- Verifying restored data
- Checking mobile interface
- Checking median interface
- Checking mobile data plan interface
- Verifying API functions
- Verifying PROXY functions
- Checking Origo applications
- Extensive checking of iWiW interface
- Handling errors immediately, communication with IT administrators, developers
- Stabilizing system operation, testing, checking resources
- Going live on the internet
- Checking live system from user aspects

Evaluation

- Overall evaluation of restore
- Re-evaluation after unfavourable evaluation results
- Decision about the repeat of the restoration process
- Informing leaders about the results of the restoration

Mandatory primary business actions

- Handle errors immediately, lead communication between teams
- Testing, checking resources
- Proper use of DRP/BCP environment, ensure minimal SLA
- Define and announce available services
- Define not allowed functions
- Inform users PR, communication

Close DRP/BCP recovery phase

- Evaluate the experiences of 24 hours operation
- Inform management about the end of recovery phase and the results

Evaluation, amendment phase (CHECK, ACT)

Lessons of the cause of the unusual event; counteractions against the spread of damage, and the evaluation of its effectiveness; formal actions for performing amendments.

2.3 Usability (FTB)

The usability of the Elder-Spaces platform was tested twice by experts, on the first prototype and once more on the final prototype. To validate the results an additional test with end users was done under laboratory conditions.

2.3.1 Evaluation criteria

Usability according to the product-oriented standard ISO 9126 is:

“The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions”.

According to ISO 9126 usability could be described in terms of:

- understandability
(the effort for the user to understand the concept(s) and practice of the software),
- learnability
(the effort for the user to learn functions and usage of the software),
- operability
(the effort for the user to operate the software),
- attractiveness
(attraction of the software for the user),
- usability compliance
(the level to which the software is compliant to norms and guidelines of usability).

For the evaluation of usability the more process-oriented definition of usability given in ISO 9241-110⁵ was found to be more helpful in user and expert tests of the Elder-Spaces platform.

According to the process-oriented standard ISO 9241-110 ‘usability’ is defined as:

“The extent to which a product can be used by specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”

According to ISO 9241 usability and the goals effectiveness, efficiency and satisfaction can be described in terms of:

- suitability for the task
(appropriate functions, minimization of unnecessary interactions),
- self descriptiveness
(understandability for user by feedback and help of the software),
- suitability for learning
(guidance of the user, goal minimization of time to learn practice/usage of software),
- controllability
(user control about navigation and dialogues),
- conformity with user expectations
(consistency, adaptable to user model),
- suitability for individualisation
(adaptability according needs and knowledge of the users),

- error tolerance
(tolerant to mistakes, easy error correction for users).

For proving this sub-characteristics a standardised survey, the “ISONORM 9241/110-S”⁶ was used in the evaluation of usability.

2.3.2 Results

The detailed results were reported in the corresponding Deliverables D5.2a and D5.2b. In Figure 8 the results of both tests are compared.

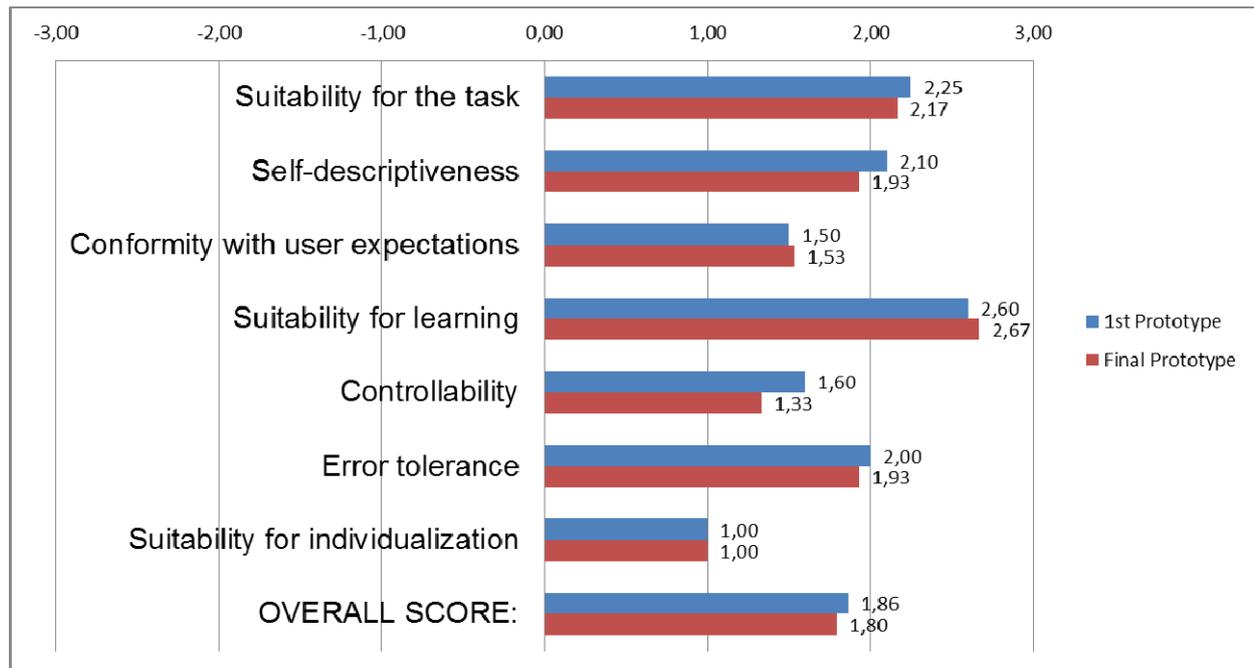


Figure 8: Results of Usability - Comparison of ISONORM results for first and final prototype

The main finding of this comparison is that there are no significant changes, because the usability of the platform was already good on the first prototype. The lower overall score in the second test may be caused by including a third tester and additional side effects, because the evaluation of usability and especially the scoring is based on subjective positions and impressions.

The deeper analysis reported in D5.2b illustrated a nearly perfect result as shown in Figure 9.

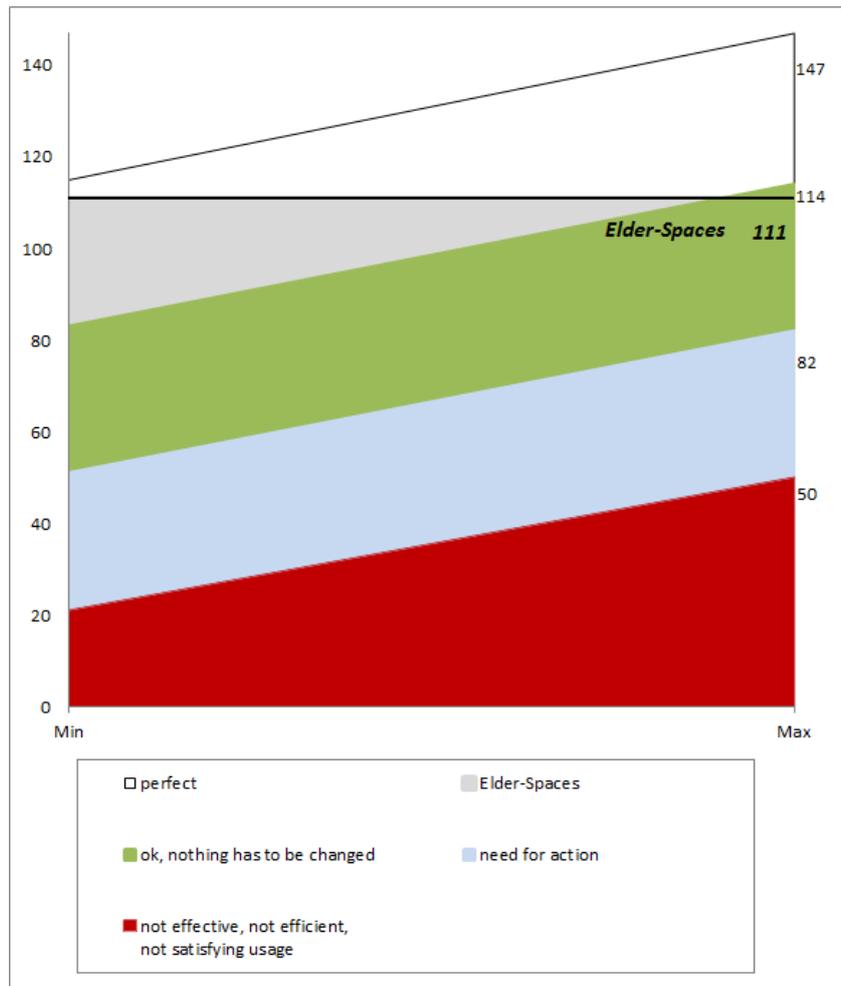


Figure 9: Results of Usability - Overall grading range of ISONORM-index (ISONORM-S)

In the following an overview of the summarized sub characteristic results of both evaluations is given.

Suitability for the task

Item 3 was excluded from the evaluation, because there are no tasks, which could be automated in Elder-Spaces. Although operating Elder-Spaces could not be easier, it did not get the full score on easiness because of the amount of functionality provided and the corresponding complexity. All mandatory input is really needed to facilitate the provision of cognitive recommendations based on profile information. The relatively low score on item 5 is caused by the fact that it is hard to get friends on the platform with a newly registered user, who has an empty profile. This could be easier within a social networking platform.

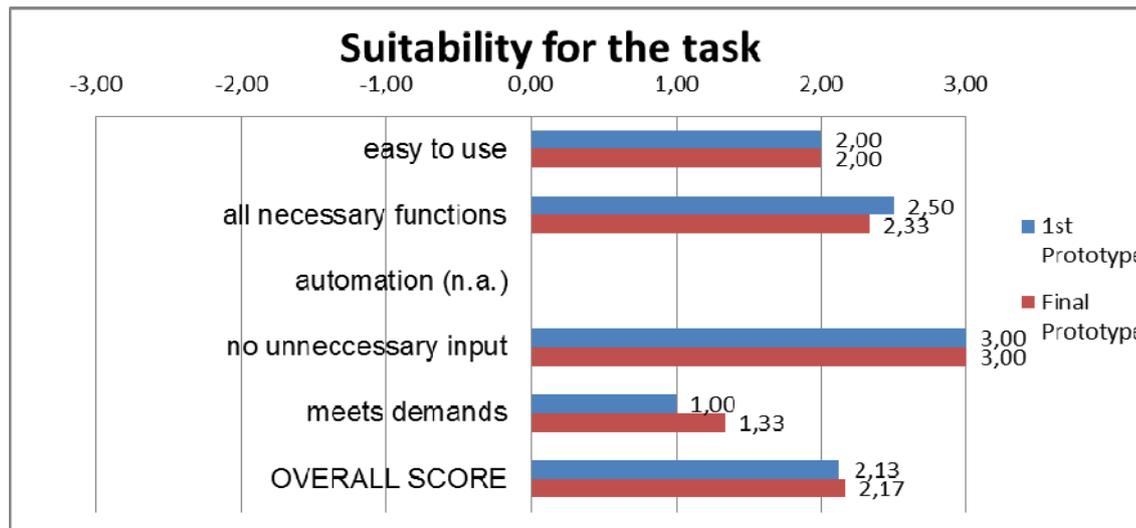


Figure 10: Results of Usability - “Suitability for the task”

Self-descriptiveness

The results mirror the fact, that self descriptiveness was one of the targets of the Elder-Spaces platform from the beginning and it was specified and implemented to be self-descriptive. The low score on item 3 is caused by missing marks on mandatory fields. These are marked only after trying to submit forms.

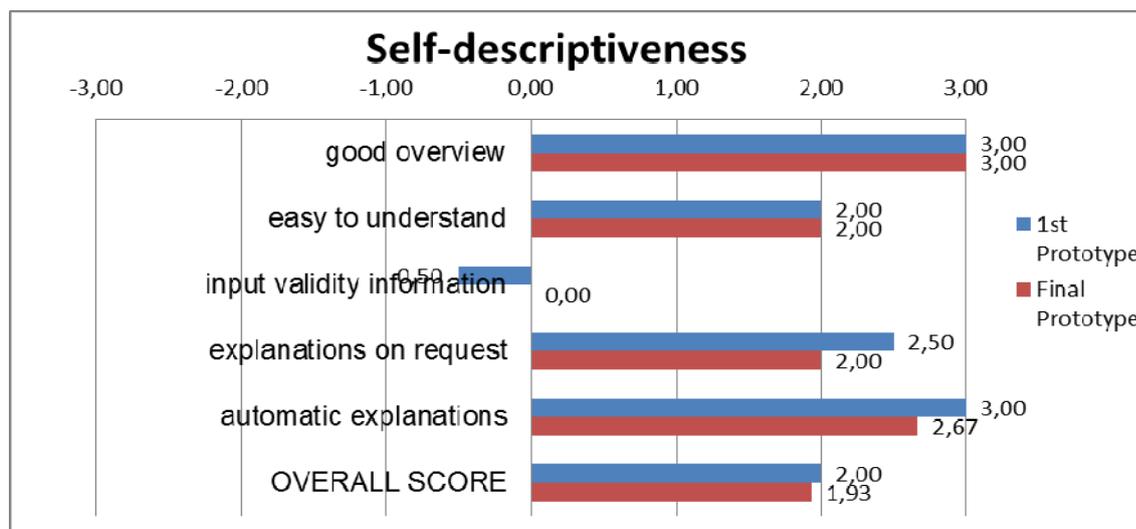


Figure 11: Results of Usability - "Self-descriptiveness"

Conformity with user expectations

Although using consistent principles over the whole platform, sometimes the behaviour is not comprehensible to un-experienced users mainly because no messages are provided concerning the success of an action. The changes are immediately set to the screen, but this could be overlooked by some users.

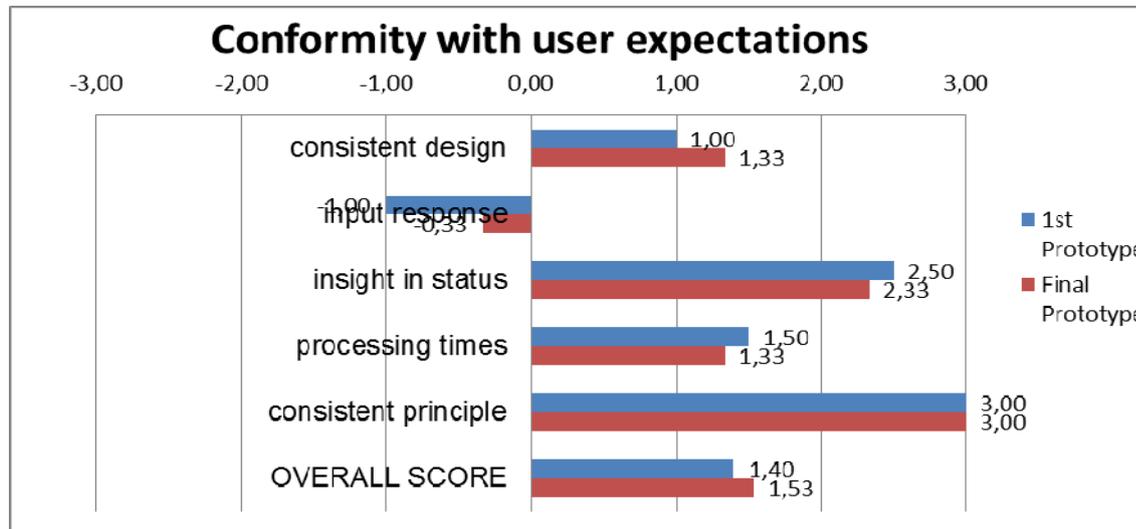


Figure 12: Results of Usability - "Conformity with user expectations"

Suitability for learning

Because of its low navigation hierarchies and waive of stimulus clutter and the need to memorize values between different screens, Elder-Spaces achieves a really good score in this sub-characteristic. Again it is shown that specification and development were done with usability in mind.

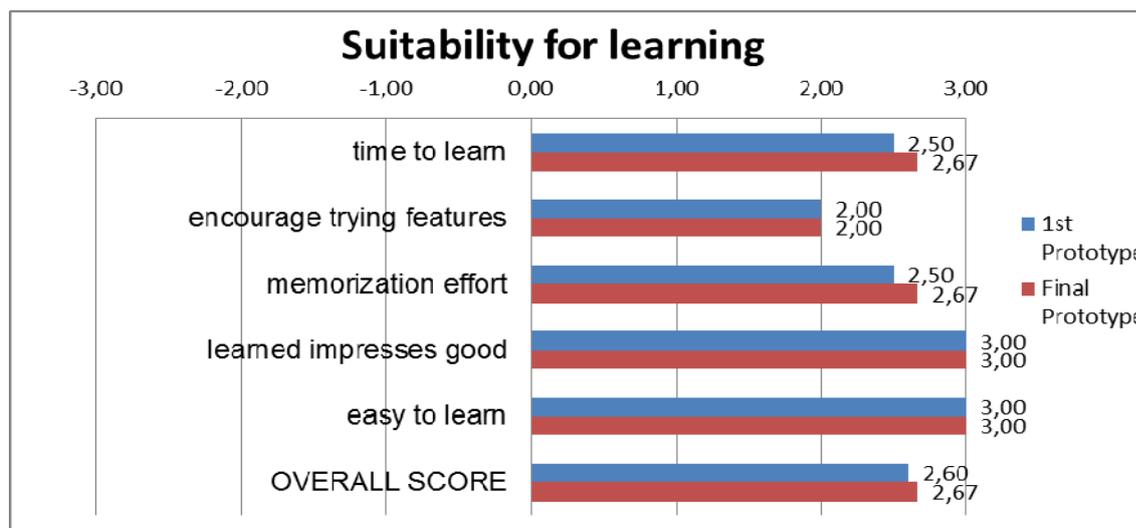


Figure 13: Results of Usability - "Suitability for learning"

Controllability

The overall score is mainly decreased by the missing customization opportunities of the presentation. Although this would be technically possible, it would have meant excessive use of JavaScript and corresponding accessibility issues especially regarding the order of the elements in the HTML-document and the visual order. Also the learnability of the platform would suffer from such functionality. The low score on item 1 is caused by the missing possibility to save messages whilst editing.

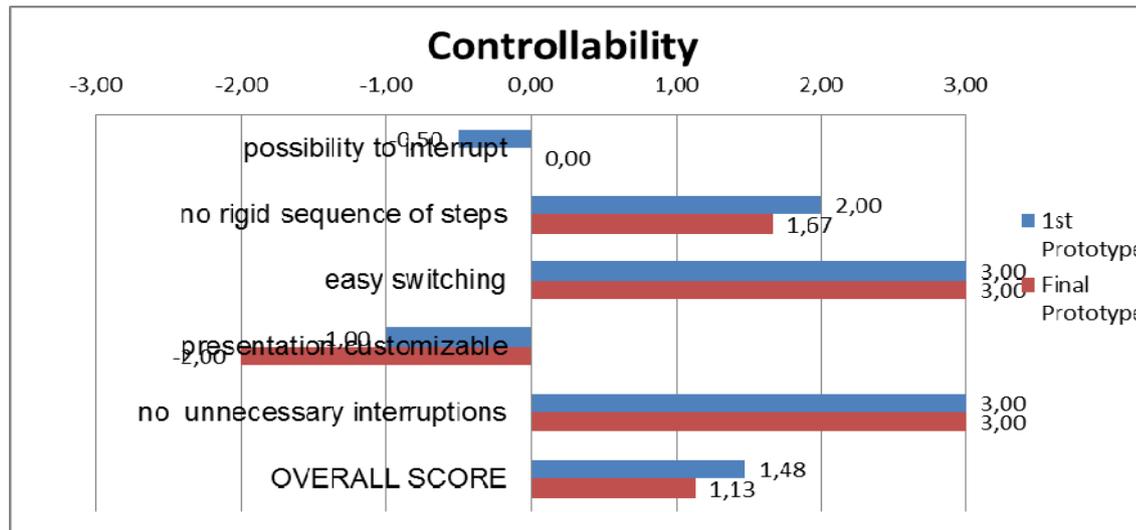


Figure 14: Results of Usability - "Controllability"

Error tolerance

The Elder-Spaces platform is tolerant to errors, but could provide more concrete hints on error prevention directly on input.

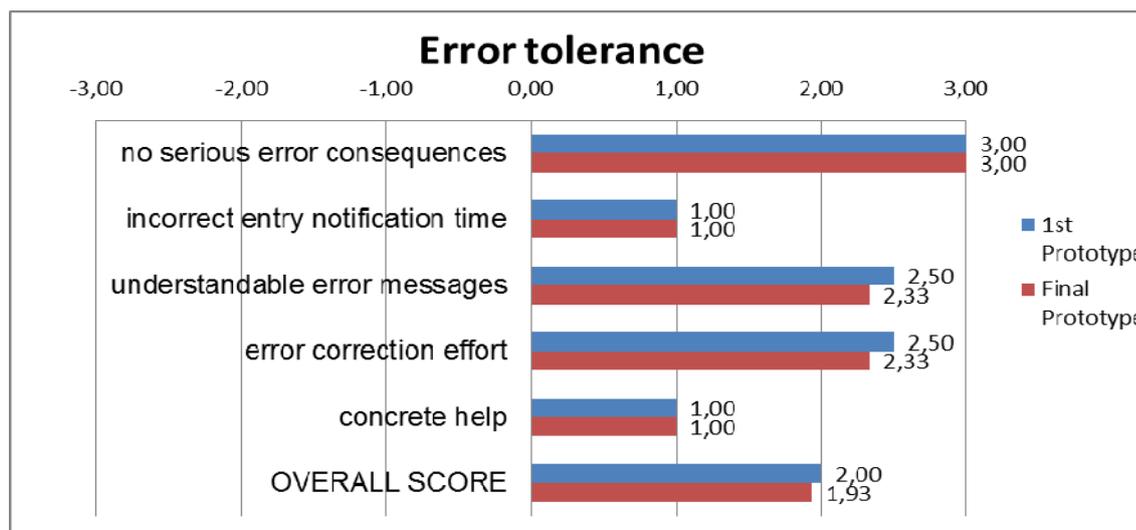


Figure 15: Results of Usability - "Error tolerance"

Suitability for individualisation

Most of the items of this sub-characteristic are not applicable to Elder-Spaces, because a social networking tool is more leisure-related and EN ISO 9241-110 describes principles for dialogues in a professional setting. The platform provides controls to adjust contrast and font-size, but for the reasons mentioned in “Controllability” no further adaptability was implemented.

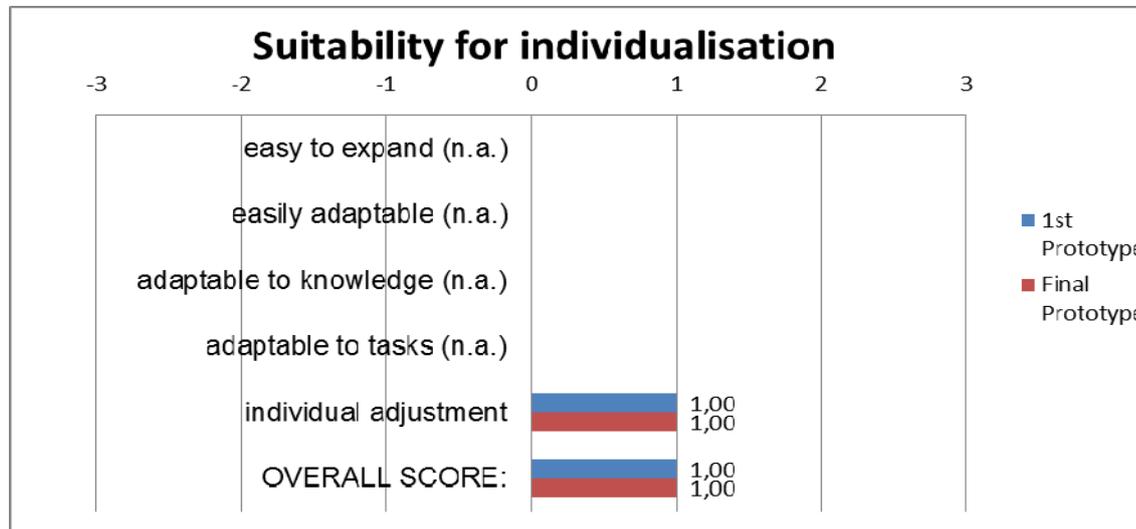


Figure 16: Results of Usability - "Suitability for individualisation"

2.3.3 Laboratory tests with end users

The end user tests performed on the final prototype and reported in detail in Deliverable D5.2b confirmed the findings of the experts, even if the more user friendly customized questionnaire was used, which was also used by the trial sites. Most items related to usability as displayed in Figure 17 are rated over the average. Just on item 8 the users' assessment was negative. This was mainly caused by too long terms in the German translation, which led to layout issues. The Hungarian language, which is set as default, irritated one user because he did not find the flag to change the language, respectively did not notice the functionality on clicking on the flag. This fact was explained to him and he used the platform without further issues, but apparently with a bad attitude concerning the platform.

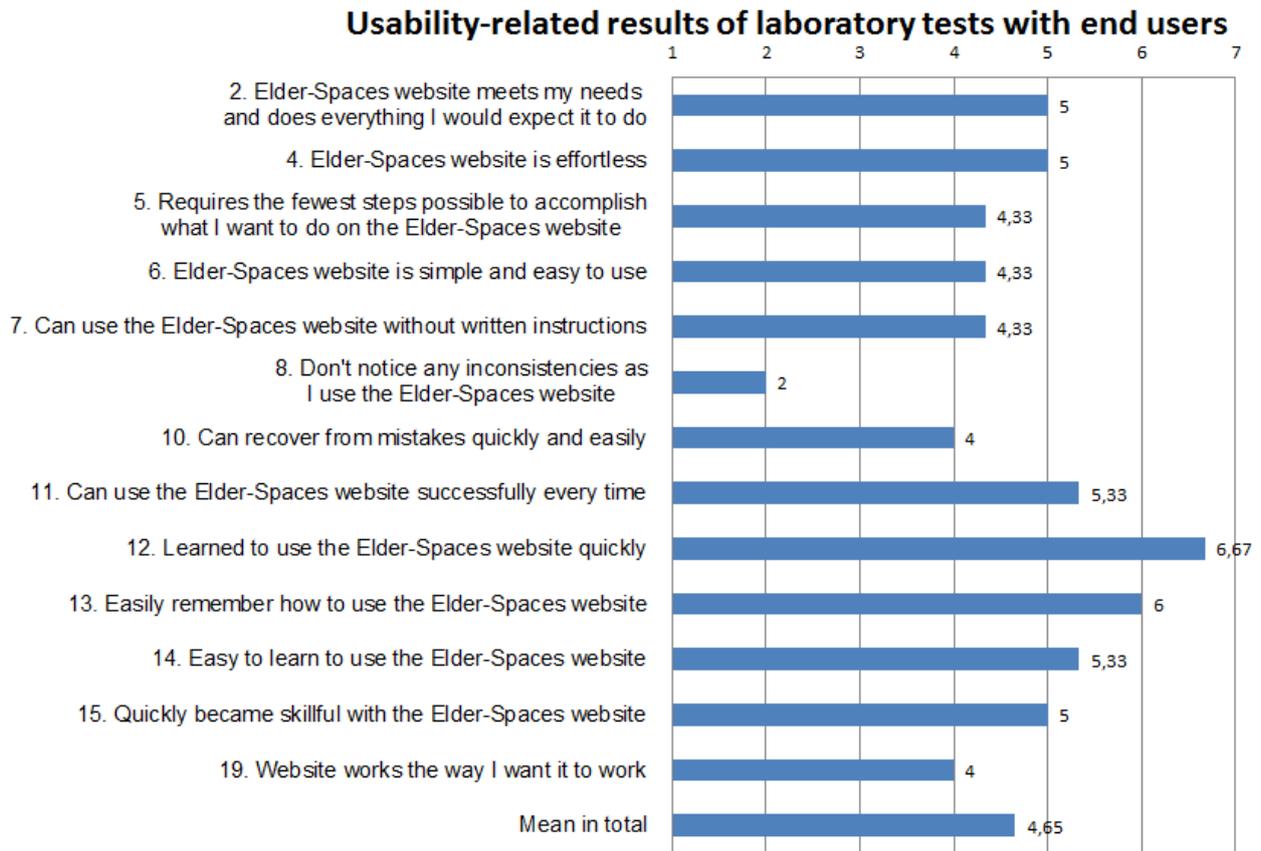


Figure 17: Results of Usability - Results of laboratory tests with end users

The questionnaire contained some more items, which were not part of ISO 9241-110, but provide an insight in the general compliance with the platform and could be assigned to the sub-characteristic “attractiveness” of ISO 9126. Also here the tendency is positive. The only negative mean-value on item 20 is because of the rating of one user.

Further results of laboratory tests with end users

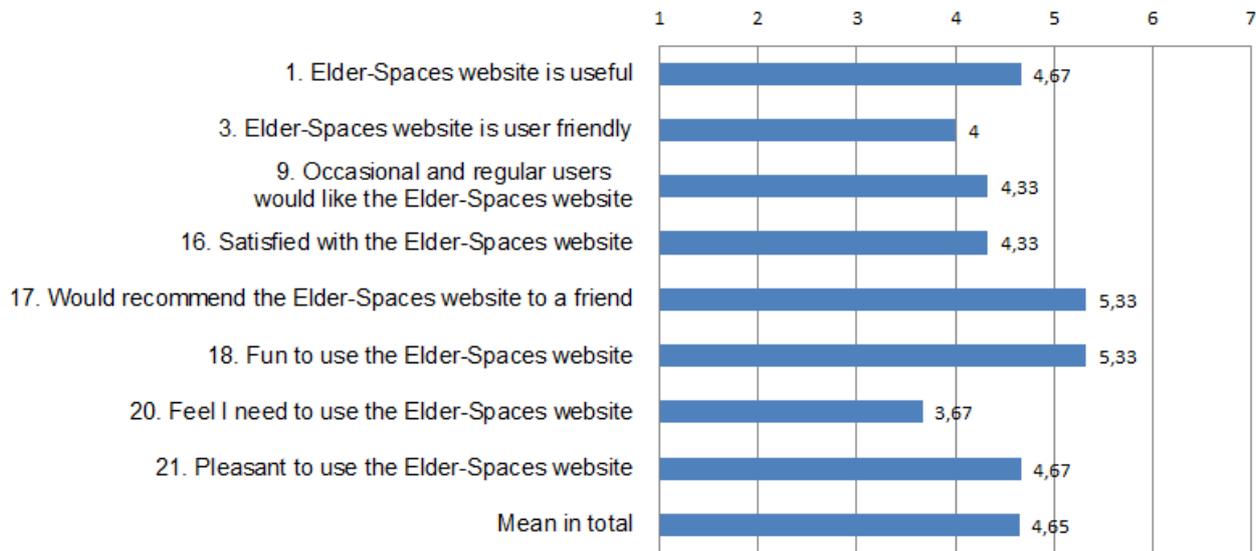


Figure 18: Results of Usability - Further results of laboratory tests with end users

Besides the answers to the questionnaire the users were observed whilst the fulfilment of given tasks. The fact that the users fulfilled 9 given tasks in less than half an hour with only one supportive action by the observers is also an indicator for user friendliness and good usability.

2.4 Efficiency (Origo)

2.4.1 Evaluation criteria

According to ISO/IEC FDIS 9126-1:2000, efficiency is:

“The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.”

There are a number of sub-characteristics which specialize in different aspects of reliability:

- Time behaviour
(The capability of the software product to provide appropriate response and processing times and throughput rates when performing its function, under stated conditions.)
- Resource utilisation
(The capability of the software product to use appropriate amounts and types of resources when the software performs its function under stated conditions.)
- Efficiency compliance
(The capability of the software product to adhere to standards or conventions relating to efficiency.)

2.4.2 Results

Since Elder-Spaces platform is virtualized to a 2 server infrastructure for its test run, measuring efficiency on this environment is inappropriate to evaluate the efficiency capabilities of a possible production version of the same site. The current server infrastructure is designed to handle maximum ~50 concurrent users. For the begging of production use the backend architecture should be designed for at least 3000 concurrent users.

Nevertheless measuring the current test environment is useful to check if there's any extraordinary behaviour of the site that have to be fixed.

The following results of Elder-Spaces efficiency tests are good, they show that the site is quick and uses its resources efficiently.

We used Pingdom (<https://www.pingdom.com/>) for efficiency tests. Pingdom is a recognized site efficiency measuring tool used by Google, Microsoft, Apple, Hewlett Packard and many other large companies worldwide.

2.4.2.1 Time behaviour

“How quickly does the system respond?”

Pingdom scored Elder-Spaces 77/100 with 1.95 seconds load time (from Amsterdam, Netherlands), and it rated Elder-Spaces faster than 71% of all the tested websites.



Figure 19: Results of Efficiency - Pingdom.com score

The waterfall diagram of loading Elder-Spaces in Figure 20 displays these results more detailed. It has to be mentioned that the results could be better, if the technique of CSS sprites would have been used to reduce the amount of resource requests and utilize browser side caching. This has not been done intentionally with respect to the accessibility feature of global resizing.



Figure 20: Results of Efficiency - Waterfall diagram

Page speed performance diagram:

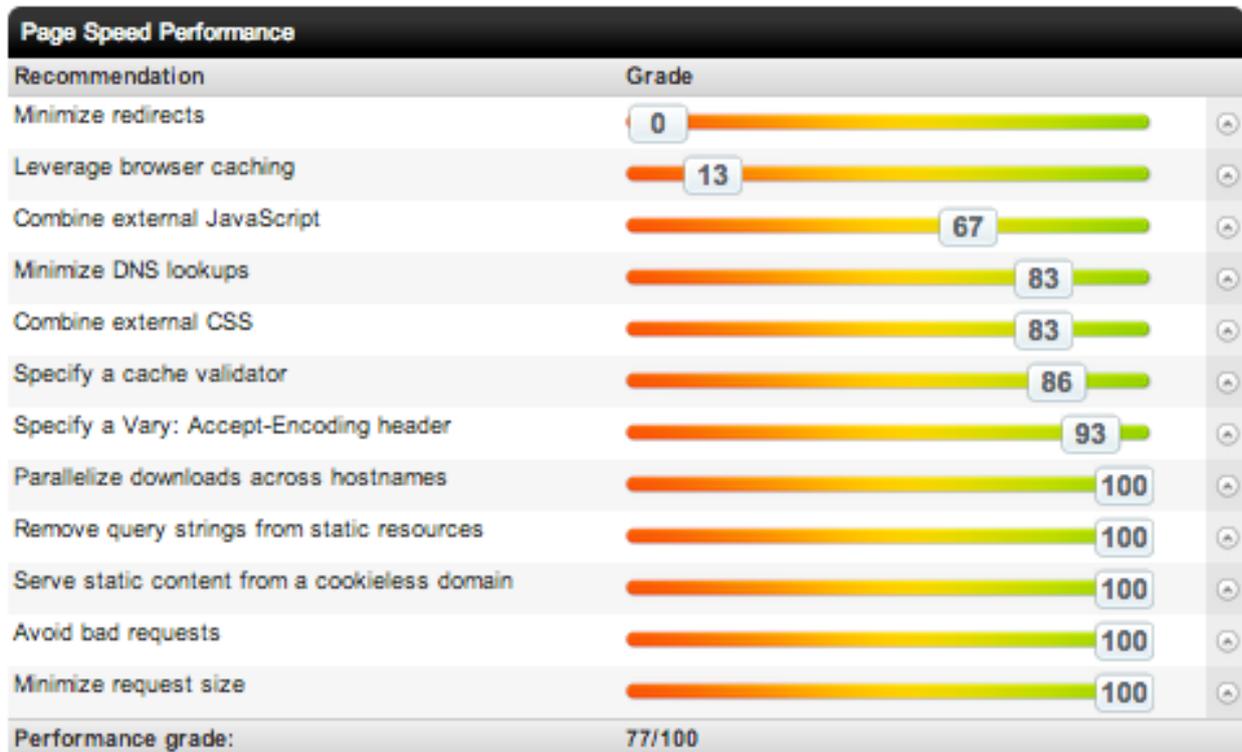


Figure 21: Results of Efficiency - Page speed performance diagram

2.4.2.2 Resource utilisation

“Does the system utilize resources efficiently?”

Time spent per content type:

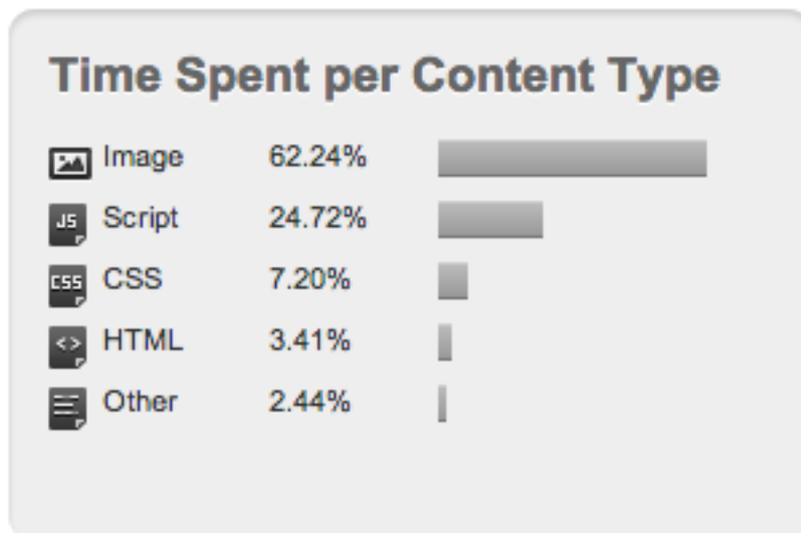


Figure 22: Results of Efficiency - Time spent per content type

Size per content type:

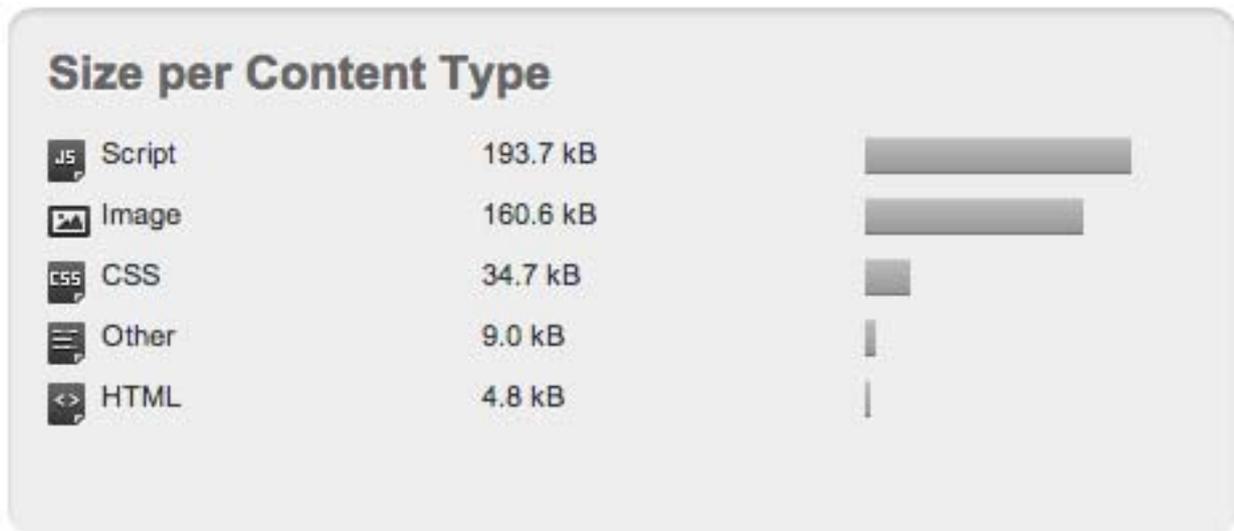


Figure 23: Results of Efficiency - Size per content type

Request analysis:



Figure 24: Results of Efficiency - Request analysis

2.5 Maintainability (Byte/SLG)

2.5.1 Evaluation criteria

Maintainability according to the ISO 9126 is:

“The capability of the software product to be modified. Modifications may include corrections, improvements or adaptation of the software to changes in environment, and in requirements and functional specifications.”

There are four main characteristics for measuring this attribute:

- Analysability
(The degree to which it is easy to identify the cause of a failure in the software)
- Changeability
(How easy it is to modify the software or parts of it)
- Stability
(What is the impact of changes to the software components?)
- Testability
(How easy is it to test the software?)

We used the metrics provided by ISO/IEC TR 9126-2:2002 in order to analyse further the abovementioned characteristics. Some of the metrics were adjusted to fit the available input we had and better fit the platform’s characteristics.

2.5.2 Results

2.5.2.1 Analysability

“Characterizes the ability to identify the root cause of a failure within the software.”

As any metrics maintained by the consortium regarding issue logging related to the dates that failures were reported and resolved, there is no data available about the time it took to identify the cause of an issue. To counter this, we used a quantitative scale to get this information from the people that performed these tasks during the user evaluation of the platform. Note that we are referring to the period between September until December 2013 and not before the initial launch of the platform.

Table 6: Maintainability - Analysability metrics results

#	Metric	Description	Scale	
1	Audit trail capability	This metric emphasizes on the audit information that is recorded after some system failure. How easy is it, based on the provided information for users or maintenance people to identify the operation that caused the failure?	There is no or limited information, operation is difficult to identify	There is more than enough information to easily identify the problem
2	Diagnostic function support	How capable are the diagnostic functions in supporting causal analysis? Can maintainer easily find cause of failure?	There is no help from diagnostic functions	All causes of failures can be identified by the existing diagnostic functions
3	Failure analysis capability	How effective is the diagnostic procedure? What is the percent of the unresolved issues?	The procedure is ineffective most issues are not resolved	The procedure is effective, all issues are resolved
4	Failure analysis efficiency	How long does it take for the maintenance personnel to resolve an issue? (average)	1 days	
5	Status monitoring capability	Can user identify specific operation which caused failure by getting monitored data during operation? Can maintainer easily find cause of failure by getting monitored data during operation	N/A	

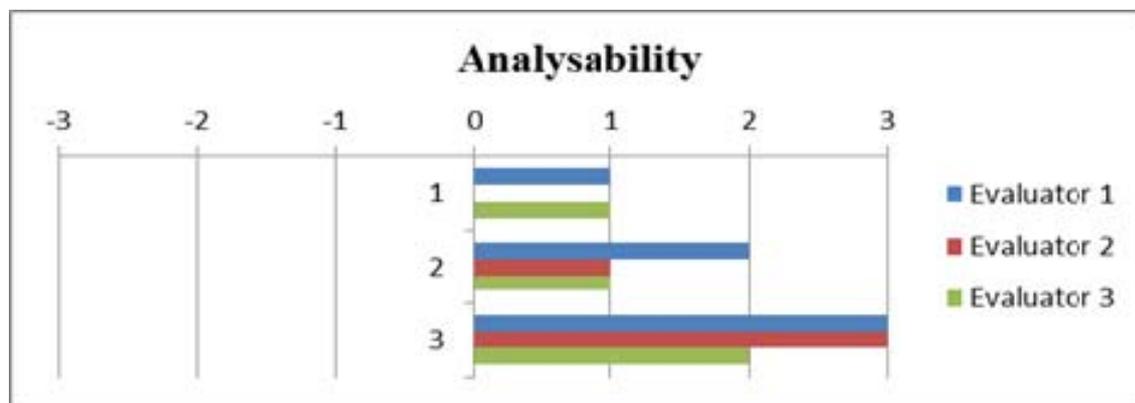


Figure 25: Results on Maintainability - "analysability"

Overall, audit information was often adequate, but was not enough to provide the developers with enough information to identify the cause of the problems. The system is stateless, and in most cases, it is important to know the scenario that is being executed by the users in order to come to a conclusion about what caused the problem. This was resolved by retrieving additional information and reproducing the error in monitored conditions.

Also, the average identification of the cause to one day is rather long for a live system. This was primarily reported, because it was often necessary to cooperate between two teams in different countries in order to identify the root of the failure, a procedure that was lengthy at some instances for reasons that are unrelated to the system.

Future work:

Additional auditing of the user actions should be considered for future commercial release of the platform.

2.5.2.2 Changeability

“How easy is to modify the software?”

Changeability in the case of Elder-Spaces refers to changes made by the developers (design, code and document).

In the following table, we have adjusted the changeability metrics to qualitative values. Again, the developers who carried out the support of the users’ evaluation provided the necessary feedback for these scales. As the system is not parameterized, metric #5 does not apply and was omitted.

Table 7: Maintainability - Analysability metrics results

#	Metric	Description	Scale	
1	Change cycle efficiency	Can the user's problem be solved to his satisfaction within an acceptable time scale?	Issues take too long to resolve (weeks)	Issues are promptly solved (hours)
2	Change implementation elapse time	Can the maintainer easily change the software to resolve the failure problem?	Changes take too long (weeks)	Changes are fast (hours)
3	Modification complexity	Can the maintainer easily change the software to resolve problem? (Front End)	Effort is too great (weeks)	Minimum effort required (hours)
4	Modification complexity	Can the maintainer easily change the software to resolve problem? (API)	Effort is too great (weeks)	Minimum effort required (hours)
5	Parameterised modifiability	Can the user or the maintainer easily change parameter to change software and resolve problems?	N/A	
6	Software change control capability	Is it easy to identify component versions and change code to resolve problems?	Change log data is non existent	Changes are logged and it is easy to identify component version

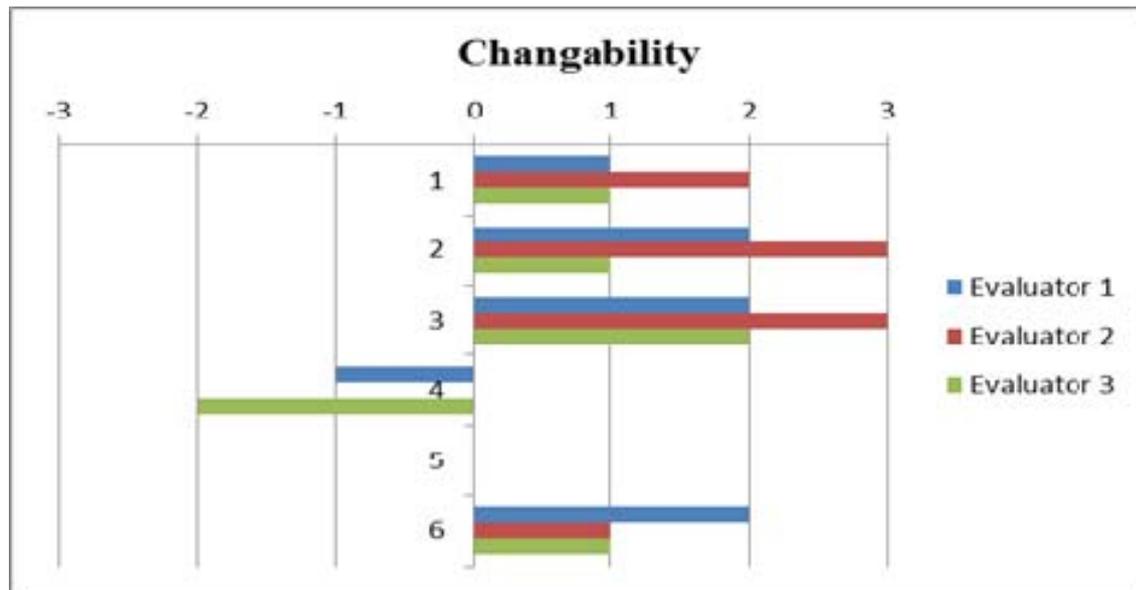


Figure 26: Results on Maintainability - "changability"

Overall, the perceived response to the user's problems was good. Any delays until the actual delivery of the change were caused usually because of testing or deployment delays.

There is a significant factor related to the effort of a change. It has to do with the nature of the changed component. As it is evident in Figure 26, any changes to the interface or the front-end code was relatively fast. These were short pieces of uncomplicated code that handled interaction with the user and minor data processing. Changes to the API, was a different matter. As APIs are used by a large number of components (an issue that rises again in "stability") it was necessary to increase the amount of testing before deployment. Also, these components are more complex and often required changes to the data layer as well. Such changes needed significantly more time than the front-end ones.

The good thing was that only a handful of API changes were necessary during the user evaluation period, so these changes did not affect the overall performance of the platform.

2.5.2.3 Stability

"Can the software continue operating after changes are made?"

This characteristic provides an insight to the interdependencies of the software components in the system. Changing or fixing one component may have adverse effects to other subsystems.

There were two metrics which provided measurements for the period of 110 days (September-December 2013).

Table 8: Maintainability - Stability metrics results

#	Metric	Description	Result
1	Change success ratio	Can user operate software system without failures after maintenance?	0,11 faults/day
2	Modification impact localization (Emerging failure after change)	Count failures occurrences after change, which are mutually chaining and affected by change	4,12%

Overall, the platform's results are good. It was not common for the system to exhibit failures caused by changes in the code and bug fixing patches. The fact that the system is modular by design and compartmentalized is one of the main reasons for this performance. Issues occurred in components influencing more than one sub system.

2.5.2.4 Testability

“How easy is to test the software?”

This characteristic measures the effort necessary to test existing and new code. Testing refers to functional testing, not unit tests performed by developers.

Table 9: Maintainability - Testability metrics results

#	Metric	Description	Result
1	Availability of built-in test function	Can user and maintainer easily perform operational testing without additional test facility preparation?	0
2	Re-test efficiency	Can user and maintainer easily perform operational testing and determine whether the software is ready for operation or not?	5 min/test
3	Test restartability	Can user and maintainer easily perform operational testing with check points after maintenance?	100%

With the exception of lacking build-in test functions, Elder-Spaces platform fares well with respect to testability. The principles it is built upon contribute to this. The system is stateless, so tests may start and stop at checkpoints without the need to repeat work. The small number of components that are possibly affected by a change in the code also allow for fast re-testing times.

2.6 Portability (Byte/SLG)

2.6.1 Evaluation criteria

Portability according to the ISO 9126 is:

“The capability of the software to be transferred from one environment to another”

This characteristic is viewed under Elder-Spaces as limited to software and hardware changes of the environment.

There are some characteristics that finer define this attribute:

- Adaptability
(This characteristic indicates the ability and effort for the software to adapt to different specified conditions)
- Installability
(The effort associated with the installation of the system to a specific environment)
- Co-existence
(The capability of the software to co-exist with other independent software in a common environment sharing resources)
- Replaceability
(The capability of the software to replace some other application)

For all of the portability characteristics, there is a significant difference on the perspective that they are viewed. Be that the user of the platform or the organization to which the platform belongs. In the following paragraphs, we will try to provide insight to both options where applicable.

The “replaceability” characteristic, does not apply to the particular software. It does not aim to replace some other application. The platform’s functionality is specific not generic. For this reason it is not included in the analysis that follows.

2.6.2 Results

Portability characteristics are viewed mainly from the users’ perspective. Meaning, how changes to the users setup affect the functionality of the software. There are two items to have in mind, the “software” is a web site available to users over a browser, but it is also a MS .net application available through a touch screen device.

With respect to server side, it is clear to everyone that the system is not highly portable, the installation and configuration procedure is extensive and system stability and adherence to required specifications is paramount.

2.6.2.1 Adaptability

“Can the software be moved to other environments?”

This characteristic refers to the ability of the software to adapt to different screen resolutions, hardware that it is running on (the client side), operating system changes etc. The metrics used for measuring adaptability were adjusted to a qualitative scale and filled by a team of three developers / analysts.

Adaptability of data structures has no meaning in the users’ case, as they do not get to interact with them in any way. Also, metric #3 is not applicable at this case, as users are individuals, they do not belong to an organizational structure. Such notions are not part of the design at all.

Table 10: Portability - Adaptability metrics results

#	Metric	Description	Scale	
1	Adaptability of data structures	Can the user easily adapt software to data sets in new environment?	N/A	
2	Hardware environmental adaptability (adaptability to hardware devices and network facilities)	Can the maintainer easily adapt software to environment? Is software system capable enough to adapt itself to operation environment?	No adaptability	Complete adaptability
3	Organizational environment adaptability (Organization adaptability to infrastructure of organization)	Can user or maintainer easily adapt software to environment? Is software system capable enough to adapt itself to the operational environment?	N/A	
4	Porting user friendliness	Can user or maintainer easily adapt software to environment? What is the related effort spent for a new installation?	No adaptability	Complete adaptability
5	System software environmental adaptability (adaptability to OS, network software and co-operated application software)	Can user or maintainer easily adapt software to environment? Is software system capable enough to adapt itself to operation environment?	No adaptability	Complete adaptability

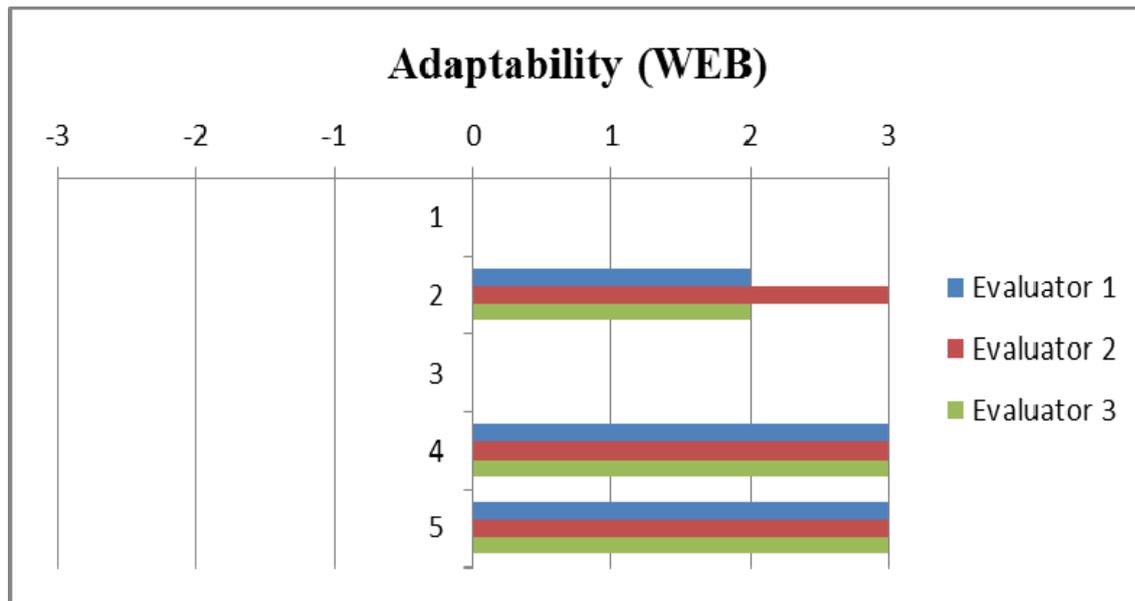


Figure 27: Results on Portability - “adaptability for the web platform”

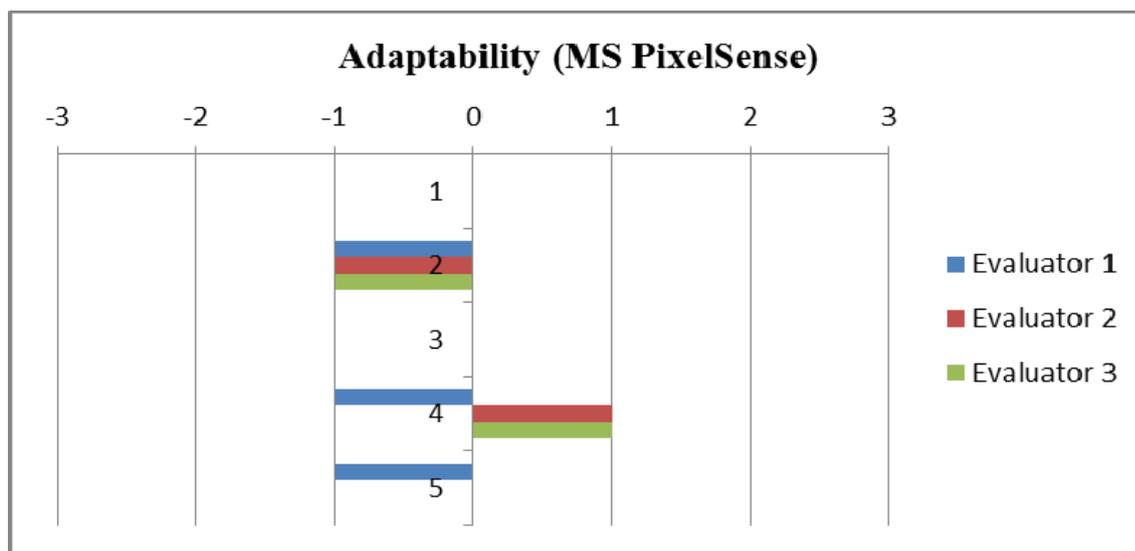


Figure 28: Results on Portability - “adaptability for the MS PixelSense application”

It is evident that adaptability is ideal for the web platform. Users require only a browser, irrespective of the OS or hardware that they use. There are some limitations deriving from accessibility features, which make minor presentation issues appear in extreme hardware setups like small monitors. In such cases, UI layout is not optimal and may require resizing to fit better in the screen.

On the other had, the MS PixelSense application is more demanding. Only certain hardware may use it – as tactile interface capability is a prerequisite. Furthermore, it requires .net framework to run, so any device whithout it is not compatible. These issues were known in advance and the goal was not to overcome them. The aim using the MS PixelSense is to evaluate it’s potential and with that other touch enalbed devices for natural interaction with the elderly.

2.6.2.2 Installability

“How easy it is to install the software”

This characteristic is viewed from the provider’s point of view. The Elder-Spaces platform is a complex application with specific requirements to both hardware and software. Instead of invoking the relevant metrics for this characteristic, we will present the findings straight away from the qualitative information we have and the experience in the initial setup.

In order to satisfy number of users required for commercial use, the “Elder-Spaces” platform needs to be installed in accordance to the installation specifications and to the exact environment that is specified. Deviations from these requirements will lead to errors in installation, and poor performance.

This is not commercial software to be distributed to a large number of people. It is intended to be installed once or to a few organizations at best. The installation procedure and the hardware specifications will have to be enhanced and adjusted to the intended number of users to be serviced.

2.6.2.3 Co-Existence

“Can the software co-exist in the same hardware or OS with other applications?”

Co-Existence from the user’s point of view is absolute. Both the WEB and the MS PixelSense application can share the hardware, OS, and resources with other software. The processing requirements of the browser or the MS .net application are minimized and other software may verified be run concurrently on the same machine.

With respect to the server installation, there may be cases where co-existence is possible, depending on network traffic and user utilization of the system. In all cases it is not recommended. Even if two systems may share resources, that will mean that the Elder-Spaces platform may not have available bandwidth, memory or CPU to satisfy users’ needs, thus providing a “slower” response to user requests.

3. Accessibility (FTB)

Accessibility requirements are defined in the series of standards in “ISO 9241, Ergonomics of human-system interaction” and accessibility especially in “ISO 9241-171:2008: Ergonomics of human-system interaction – Part 171: Guidance on software accessibility”⁷. This ISO standard addresses software considerations for accessibility that complement general design for usability as addressed by ISO 9241-110, ISO 9241-11 to ISO 9241-17, ISO 14915 and ISO 13407. A guidance on World Wide Web user interfaces can be found in ISO 9241 Part 151 (“ISO 9241-151:2008: Ergonomics of human-system interaction – Part 151: Guidance on World Wide Web user interfaces”⁸).

More common, especially for web accessibility, are the guidelines of the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C): Web Content Accessibility Guidelines (WCAG) 2.0, which are also published as “ISO/IEC 40500:2012 Information technology -- W3C Web Content Accessibility Guidelines (WCAG) 2.0”⁹.

The WCAG2.0 is also recommended for the accessibility of web content in “EN Draft EN 301 549 V1.0.0 (2013-02): Accessibility requirements for public procurement of ICT products and services in Europe”¹⁰ (Chapter 9 in EN Draft EN 301 549 V1.0.0) and is also the base for the recommendation for requirements for non-web-software (Chapter 11 in EN Draft EN 301 549 V1.0.0). The EN Draft EN 301 549 V1.0.0 is one of the main deliverables of the European Commission Standardization Mandate M 376, Phase 2 and is currently going to national vote under ETSI arrangements. The scope of EN 301 549 V1.0.0 is: “The present document specifies the functional accessibility requirements applicable to ICT products and services, together with a description of the test procedures and evaluation methodology for each accessibility requirement in a form that is suitable for use in public procurement within Europe”.

“Web Content Accessibility Guidelines (WCAG) 2.0 level AA” are taken as the relevant reference for the ELDER-SPACES-project. Details about the results of the accessibility tests are given in Deliverables D5.2a and D5.2b and summarized in Deliverable D4.5 and repeatedly displayed in Figure 29.

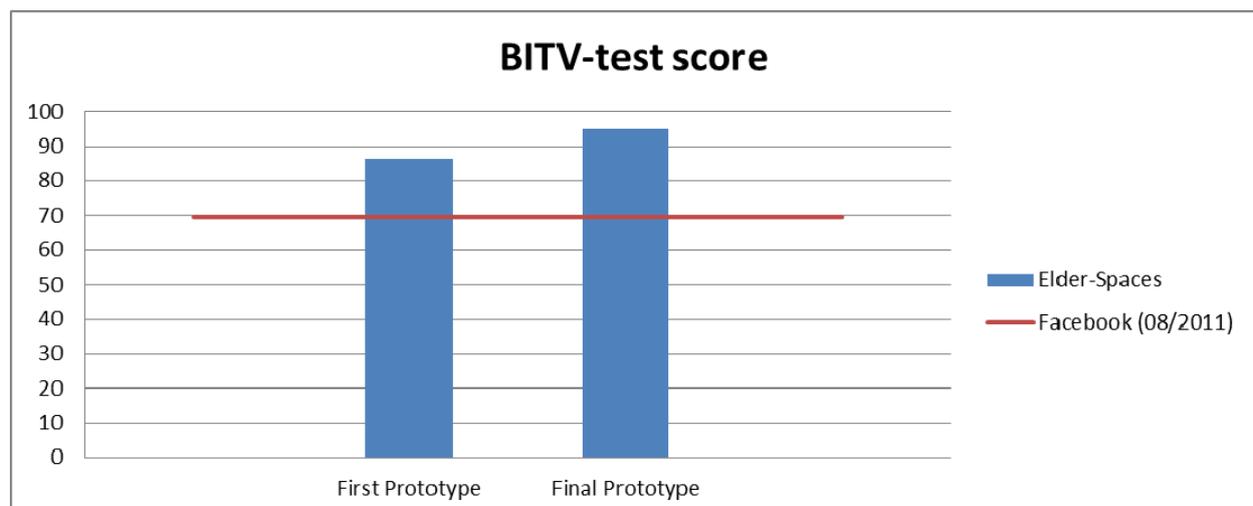


Figure 29: Results on Accessibility - Comparison of Test Results

As already mentioned in Deliverable D4.5, the score of 95 points in the final structured accessibility tests are very good. Accordingly, the platform provided a satisfying user experience using solely the keyboard and the screen-reader software NVDA, even if the use of forms is complicated by missing labels. Despite the overall good result in the test, WCAG2.0 level AA conformance cannot be claimed because of the following success criterion failures:

- F46: Failure of Success Criterion 1.3.1 due to using th elements, caption elements, or non-empty summary attributes in layout tables.
- F68: Failure of Success Criterion 1.3.1 and 4.1.2 due to the association of label and user interface controls not being programmatically determinable.
- F83: Failure of Success Criterion 1.4.3 and 1.4.6 due to using background images that do not provide sufficient contrast with foreground text (or images of text).

Furthermore the pages should be compliant to the W3C-HTML-specification. The current implementation has some findings in the validator mostly because of using deprecated element-attributes and CSS-code inside the body-element.

Relevant for further research are also the general requirements for the accessibility of hardware given in EN 301 549 V1.0.0; and relevant are also two further guidelines of WAI: the Authoring Tool Accessibility Guidelines (ATAG) and the Accessible Rich Internet Applications (WAI-ARIA).

4. Actual and potential impact derived from evaluation results

4.1 Social (e-Trikala)

The pilot evaluation involved questions which were answered by the users. A QoL questionnaire was completed in two separate time intervals, so as to evaluate the quality of life of the users prior their engagement to the project. The first was implemented in parallel to the conduction of the pilot operation and posed the baseline evaluation. According to this, the users were a little or not at all aware of Elder-Spaces project. The final evaluation involved users who actually used the platform and their quality of life was documented after the usage of Elder-Spaces platform for a period of three months.

The users were asked how often they conduct a series of activities, including social activities, usage of internet and physical exercise selecting between attendances to religious services, internet usage for other reason than work, sports or physical exercise and participation in social exhibition. Additionally, the users were asked whether they had actively participated in any demonstration or activity of political significance during the last 12 months. Another section of the questionnaire asked users to comment on their psychological status and how they feel socially by answering questions like “I’m optimistic about the future”, “I feel free to decide how to live”, “I rarely do things I really enjoy”, “I feel socially excluded”, “People look down on me due to my job/income”. This question made them self-evaluate themselves on how their quality of life according to their thought.

Moreover, users stated the frequency of the personal contact they had with relatives, friends or neighbours on a time basis. Users were also asked to state whether for some of their everyday activities they spent adequate time or they felt they needed more time as far as the contact with their members of the family, other social contacts, hobbies and volunteerism are concerned. More general, they had also to express their level of happiness as well as their satisfaction on different sectors of their life like education, current job (in case they have), current quality of life, residence, family life, health, social life, and last but not least Greek financial status.

The trial sessions that took place in Trikala in order to promote and get people to know Elder-Spaces platform was a rather challenging but also constructive procedure as most of the retirement groups are constituted with people over 55 who have low interest and motivation for using ICT. Apart from low interest, people lack knowledge and skills for ICT and internet use. A common difficulty during the registration process of a new user was the lack of email address which was a compulsory element. This problem was overcome by having provided one-to-one assistance in creating email account and giving to people the basic and fundamentals functionalities and concept of the use of an email account. As the platform was first launched some days before the start of the trials, there were some minor bugs and issues which appeared throughout the use of the site and discouraged users from active engagement. Nevertheless, the developer team was contacted in order for these bugs to be fixed. Apart from these, the general essence of the recruited users was rather encouraging in the end of the sessions.

According to the given QoL-questionnaires results it can be deduced that a web-based social network can have some a positive impact on users' social and psychological status as it can enhance everyday activities and act as a subsidiary mean of socializing and networking. It is undeniable that the use of Elder-Spaces platform can act a medium between real life and digital profile.

4.2 Psycho-social (Semmelweis)

The evaluation took place between September 1st and November 30th 2013. The included trial participants filled out a shortened version of the 2012 European Quality of Life Survey twice, first in the beginning of the trial period and second at the end of the trial period.

An analysis of the questionnaire results in relation to the Elder-Spaces site use can be found below:

Question 46c: I have felt downhearted and depressed.

Based on the questionnaire answers, those individuals who use the internet and email every day, never or very rarely felt themselves downhearted and depressed.

Question 46b: I have felt lonely.

Individuals who regularly used the internet and email have never or very rarely felt lonely during the trial period.

Question 45c: I have felt active and vigorous.

A large percentage of individuals who use the internet felt active and vigorous during the trial period.

Question 40: Could you please tell me on a scale of 1 to 10 how satisfied you are with each of the following items, where 1 means you are very dissatisfied and 10 means you are very satisfied?

Three quarter of the individuals who use the internet was satisfied with their social life within the three month of the trials.

Question 33: On average, thinking of people living outside your household how often do you have direct face-to-face contact with the following...

There was no major change in the number of personal meetings during the trial period. Individuals who use the internet regularly still reported meeting friends and relatives outside their households on a weekly, monthly basis.

Question 29g: I feel that the value of what I do is not recognized by others.

Individuals who use the internet on a regular basis uniformly answered „I do not agree” to this question both in the beginning and at the end of the three month trial period, which suggests that communication within the digital world improves the individuals' self-worth regarding their own actions.

Question 29f: Life has become so complicated today that I almost can't find my way.

Individuals who regularly use internet and email, as opposed to the majority, unanimously chose the: „Neither agree nor disagree” answer, which shows that for these individuals the information

society is not so complicate that they could not find their way towards other people and services. However, the answer could also suggest, that to find one's way among the immense amount of information could cause a difficulty for everyone.

Question 29e: I feel left out of society-

This question was answered in an obvious and homogeneous manner by the individuals who use the internet on a daily basis. They did not agree with this statement neither at the beginning nor at the end of the three month trial period.

Summary

Summing up, based on the answers received for the shortened version of 2012 European Quality of Life Survey, it is clear that there is a major distinction between the group of individuals who regularly use the internet and the group of individuals who rarely or never use the internet. The distinction of quality of life advantages within the group of 55+ internet users against the group of individuals who are not a part of digital society can be observed in three areas.

1. Those individuals who use the internet regularly possess a higher and more positive self-esteem and self-worth compared to those who did not fulfil the challenges of digital society.
2. Those individuals who use the internet regularly are satisfied with their social lives and other personal relationships as well as with the fact that others recognize and value what they do in life.
3. Those individuals who use the internet regularly find fitting in and finding their way appropriate and less difficult despite the complexity of digital society as opposed to individuals who rarely or never use the internet.

The Elder-Spaces research and development points out the fact, that a social website that is developed and groomed to match the needs, habits, competencies and opportunities of the 55+ generation may improve the individuals' social life, as well as, by acquiring the technology and knowledge needed for orienting themselves in a digital world it may improve their personal view on life and their future along with their self-esteem and self-worth.

5. Techno-Economical Evaluation (Cybion)

In this chapter the techno-economical evaluation is performed according to three directions.

First we check whether the final product fits the business model requirements. We also give some directions for the business model evolution, considering the first feedback on the platform.

Then, we show some performance indicators that can be used to provide an on-going 360 degrees assessment of the platform and its services.

Finally we suggest some possible improvements for the platform.

5.1 Compliance with business model requirements

In Deliverable D7.2 the market is described considering three categories of actors:

- Registered users for the services form the age group 55+ including people with cognitive or physical restrictions.
- Business entities. The market consists of companies with some willingness to spend their money on the platform or to establish affiliated services as partners: manufacturing and service providing companies which consider lucrative the 55+ cohort.
- Developers of social media applications. Applications can be developed and deployed very similarly to Facebook or iWiW. These applications could be downloaded for free or by paying small amounts of money.

At this stage of the project we can consider that these actors can be reached and be part of the eco-system of the platform

We can involve new categories of actors:

- Public and social bodies that could be interested in the Elder-Spaces project.
- Hardware producers creating devices targeted for elder people

Public and social bodies could be involved in two different ways:

- as Multipliers
- as Clients

As multipliers, they could support the dissemination of the product towards targeted users, recognizing it as a valuable tool for elder people and they could as well promote the platform towards other institutions. Among these multipliers we can include:

- Ministries (welfare ministry, health ministry)
- Territorial authorities (regions, municipalities)
- Retired people associations
- NGOs

As clients, according to their strategy, they could:

- Finance the development of new applications (monitoring health apps, for instance)
- Finance the creation of content (i.e. territorial related content for a municipality, sector related content for the health ministry)
- Support the operating costs of the platform
- Support the dissemination of the platform
- Organise some training and accompanying tutorial towards elder-people

Hardware producers could be another type of actors which is likely to become clients or partners of the Elder-Spaces platform. More and more hardware devices producers propose tablets designed for elder people. Basically, their interface is adapted to elder people (bigger characters) and the use of the device is simplified with applications already installed on the device and adapted to the needs of the elderly. Through a partnership with these hardware devices producers, the Elder-Spaces could be “installed” by default on these devices.

5.2 Key performance indicators

As the platform has just been launched, it is too early to assess its success from an economic point of view. For this reason, we propose hereafter a matrix of indicators that will be used as a dashboard to ensure a continuous monitoring and evaluation of the use of the platform and its economic viability.

Membership	Clients
Platform activity	Brand Value

Figure 30: Performance Matrix

The value of each macro indicator is calculated by a weighted average of each single indicator.

For each macro-indicator, we have a red/orange/green scale to indicate if the value is OK or problematic.

Membership

The membership indicators measure how much people are registered on the platform and how much people are actively using the platform. This is a crucial measure of the success of the project.

This macro indicator is calculated considering three sub-indicators:

- Number of registered users: Number of people effectively registered on the platform

- Number of active users (have entered more than three times on the platform during the last month)
- Registrations growth rate per month. In the first months the number of users and active users could be low, but a high growth of registrations would be the positive sign for the membership issue.

Table 11: Indicators values of membership

	Red	Orange	Green
Number of registered users	< 500 000	> 500 000 and < 1 500 000	> 1 500 000
Number of active users	< 100 000	> 100 000 and < 250 000	> 250 000
Registrations growth rate	< 10%	> 10% and < 20 %	> 20%

The Membership indicator is calculated as the average of the three sub-indicators.

Clients

The clients' indicators measure how many clients the platform has and provide insights on the financial income of the platform.

- Numbers of clients: number of companies, institutions, public bodies who have signed a contract with the consortium which is managing the platform.
- Number of apps present on the platform. A particular attention is given to the developers or software companies, which will deploy some applications on the platform. Indeed it will be a source of revenues for the platform. It will be also a way to attract users on the platform.
- Clients' growth rate per month. In the first months the number of clients could be low, but a high growth of registrations would be the positive sign for the commercial success of the platform. For that reason we consider not only the number of users but also the variation of it.

Table 12: Indicators values of clients

	Red	Orange	Green
Number of clients	< 20	> 20 and < 50	> 50
Number of apps	< 10	> 10 and < 50	> 50
Clients growth rate	< 10%	> 10% and < 20 %	> 20%

The Clients indicator is calculated as the average of the three sub-indicators.

Platform activity

The platform activity indicators measure whether the platform is actually alive, how many times people are entering it, whether they are active.

- Medium monthly login rate. This indicator provides us with an insight on the relationship the user has with the platform.

- Medium activity rate of the users on the platform between a login and a logout. We count as “actions” any “opening a section of the platform” (events, clubs, events...), “opening a message”, “writing a message”, “editing its profile” activities. Below 5 actions, a user only enters the platform, has a quick check, and leaves it.
- Average time spent on the platform for a single visit. This parameter is fundamental for potential announcers as it is correlated with the exposure to advertisement banners.
- Volume of content created. We count as content item each post, message, photos, news... inserted on the platform, whether it is by user, whether it is by the platform managers or third-party organisations.

Table 13: Indicators values of platform activity

	Red	Orange	Green
Medium monthly login rate	< 5	> 5 and < 20	> 20
Medium activity rate	< 5 actions	> 5 actions and < 15 actions	> 15 actions
Average time spent	< 3 minutes	> 3 minutes and < 7 minutes	> 7 minutes
Volume of content	< 5 000 000 items	> 5 000 000 items and < 25 000 000 items	> 25 000 000 items

The platform activity indicator is calculated as the average of the four sub-indicators.

Brand Value

The brand value indicators measure the value of the “Elder-spaces” brand. It is fundamental especially in the launch phase, to attract users and clients and reach a critical mass of users, content and income.

- Incoming links to the platform. We measure how many links on the Internet lead to the Elder-Spaces platform. This will influence the position of the platform in search engine results and bring potential users and clients on the platform.
- Number of social networks and social media items which are related to Elder-Spaces. This indicator is focused on the social sphere of the Internet and indicates how much “buzz” has been generated about the project. Twitter and Facebook, for instance, are places where influencers are providing and receiving information, thus it is momentous for Elder-Space to “appear”, to be present there.
- Number of citations on elder specialised internet content. The platform has to be recognised by the users, the commercial clients and also by the institutional bodies interested in Elder people, because they could support and promote the platform.

Table 14: Indicators values of brand value

	Red	Orange	Green
Incoming links	< 5 000	> 5 000 and < 40 000	> 40 000
Nb of social media items	< 3 000	> 3 000 and < 12 000	> 12 000
Nb of citations on elder specialised	< 1 000	> 1 000 and < 5 000	> 5 000

The value of each macro indicator is calculated by a weighted average of each single indicator.

For each macro-indicator, we have a red/orange/green scale to indicate if the value is OK or problematic.

The Brand Value indicator is calculated as the average of the three sub-indicators.

Examples of interpretation of the indicator matrix

Example 1:

Membership	Clients
Platform activity	Brand Value

There are a large number of users and the platform is active. Since the platform is lacking of clients and its image is still not very present on the media, the consortium should intensify the dissemination and marketing activities.

Example 2:

Membership	Clients
Platform activity	Brand Value

Even if the membership is satisfying, the platform is still not active. There are not enough clients and there is no presence of it on the main media. This is the scenario which could happen after an initial euphoria about the product. The consortium should then arise new interest about the platform by providing new functionalities or new tools in order to attract again the users to the platform, to create buzz on social and traditional media and, as a result of these activities, get new clients.

Example 3:

Membership	Clients
Platform activity	Brand Value

The users on the platform are very few but active and they have been probably attracted by the presence of brands on the media. This is characteristic of a “hype” phenomenon. The consortium should turn this positive phenomenon in something more lasting, focusing on attracting new users and clients. Another possibility could be trying to diversify the typology of users updating the platform content and functionalities in that direction, having in mind the needs of the clients in order to attract them.

5.3 Suggested improvements

The platform available today will necessarily evolve to meet the needs of the users and attract more clients. The improvements listed below could be the starting point for the evolution of the Elder-Spaces platform after its launch. The suggestions have been elaborated considering the first feedback on the platform use, and the new input collected related to the needs of elder people.

Usability

Concerning the usability, the main improvement suggested is related to tablets. It appears that tablets, more than PCs and smartphones, are well adapted to and well adopted by elder people. According to a study conducted by the PewResearch Center and published in July 2013, 18% of the people over 65 own a tablet. Besides, numerous devices are specially designed (with specific applications or standard applications redesigned for elder people) for elder people. Therefore, all the efforts on usability and the continuous improvements of the platform should mainly focus on tablets.

Applications

The Elder-Spaces platform will be kept alive and attracting if some new applications will be available through the platform.

The following are some of the possible applications that could be developed:

- **My Family** – gives the possibility to the user to create a mini social network with his/her relatives with updates and chat functions. It will provide functionalities similar to those you can find on any social networks.
- **My Doc** – lets the user keep in touch with medical assistants, nurses, doctors, medical staff thus saving his/her time.
- **My Pills** – reminds the user when he/she has to take his/her medicines. The user checks-in when he/she has taken a drug. A system of alert is set to alert the doctor or a relative if the medicines are not regularly taken.
- **My Guardian Angels** – lets the user meet and interact with volunteers willing to spend time online with elder people.
- **Texting** – to send simple text messages from a user device to the cell phones of any of your family, friends or caregivers that basically says "Hi, I'm OK".

- **Urgent alert** – a button is always available on the device to send an instant text message to the cell phone of the primary caregiver so that this can respond appropriately.
- **My Agenda** – offers the user to manage an agenda with his/her closest relatives, so that he/she is updated with events of his/her sons and, for example, his/her daughter can remember and recall him/her about appointments with the doctor.
- **My News** – will provide the user of the platform with relevant information extracted from the Internet. An advanced tool could screen the web and extract information that fit various topics of interest for elder people (retirement programs, health related issues, heritage, live with disabilities).
- **Premium hotline** – to receive assistance by phone on the use the platform and its applications.

6. Conclusions

Concluding the evaluation of the Elder-Spaces platform it has to be stated, that the platform developed within the project is a prototype. The technical evaluation activities are based on ISO/IEC 9126-1:2000, the standard defining product quality for software-systems.

First of all, the **functionality** provided by the platform is evaluated as **adequate** and **completely fulfilling the requirements** on a **high level of accuracy**. The **two different implementations** for the web and for the surface device **interact without problems** with each other and with the social cognitive recommendation sub-module. To collect data concerning the system's usage frequency a **logging system** was implemented, which **provides very good** opportunities for **auditing users' access**. The methods to provide privacy to the users were identified as adequate and secure. As specified, **newly created contents** visibility is set to **private by default**. The security mechanisms against illegal actions by hackers were not in scope in the prototype development and must be improved before productive use.

The high grade of the **system's maturity** is a result of the **well-structured development process** and was achieved by a defined bug-tracking and bug-salvation process combined with a reliable source code versioning system. The **final bug count** is **nearly zero**. Due to its prototypical character, the system is not completely tolerant to faults, but all **processes needed for 24/7 operation**, a Service Level Agreement, a Disaster Recovery Plan, an Operation Continuity Plan and a Business Continuity Plan were **elaborated**.

For evaluation of Elder-Spaces **usability** the more suitable and detailed standard ISO 9241 was used. The results on usability were **nearly perfect**. The only place for improvement is at information of input validity and input responses and the opportunities of presentation customisation. These **results** were also **confirmed by the laboratory tests** on usability performed with end users. The end users also stated a **positive attitude** concerning the platform.

The overall **performance** is good and resources are used in an efficient way, even if one technique for optimization, the utilization of CSS-sprites was not used with respect to accessibility.

The system proved to be **stable, changeable and extendable**. Most changes in the running system are not perceivable by the users. The analysis of errors could be eased utilizing some more technical logging. Error prevention could be implemented by utilizing automatic testing.

The **web platform** is **portable** and can **easily be adapted** to other hardware and software environments. The installation process is complicated because of many dependencies, but it can be installed on web servers already running other web-sites. On the other hand, the applications developed for the **MS-PixelSense depend on the very specialized hardware** and therefore are not that easy to adapt. But with some minor changes regarding the recognition functionality of the PixelSense-device it should also work on any touch-sensitive device running a Microsoft operating system.

The platform is currently not fully compliant to WCAG2.0 Level AA, but a **very good accessibility** has been verified by multiple experts. Minor actions have to be done to be able to claim the WCAG2.0 Level AA conformance, which may act as a marketing argument in the future.

The user trials done in Greece and Hungary utilizing items from the European Quality of Life survey confirmed a **positive impact on the users' self-esteem, satisfaction with their social lives** and their **handling of web-technologies in general**. This indicates that **the main objective** of the Elder-Spaces project – building a platform, which is able to improve the users' quality of life – **was achieved**.

Finally, the techno-economical evaluation not only pointed out that the platform is **able to match all stakeholders' interests**. Additionally it identified public and social bodies and also hardware producers specialized to products for elderly as multipliers or clients. The **key performance indicators** to be used for measuring the fulfilment of the business goals in productive use were identified and values were **provided** to give a measure of the grade of fulfilment. Additionally **ideas for applications** were elaborated, which could further improve the benefits the users have from using the Elder-Spaces platform.

The Elder-Spaces platform as it is by project end, is a prototype and should be further improved. Besides the necessary more technical actions, which have to be done before a productive rollout, like some changes in the server-setup, the implementation of additional security and logging mechanisms, some minor improvements of usability and accessibility should be done to have an outstanding platform for elder people compared to all other social networking sites among the web.

The individuals currently 55+ and especially the older **target group** will **benefit** by the ease-of-use of the platform **reducing prejudice against technology**, the **empowerment of social relationships, social activation** and thereby an **improvement** in their **quality of life**.

By the **demographic shift** towards an elder population in Europe, one can assume that the **market segment** of elderly users is **growing constantly** within the next decades and thereby also the amount of individuals already using social networking tools, needing to switch to a more accessible platform, will also increase.

References

- ¹ ISO/IEC FDIS 9126-1:2000: Software engineering — Product quality, International Standards Organization, Geneva, 2000
- ² ISO/IEC 14598-1:1999: Information technology — Software product evaluation, International Standards Organization, Geneva, 1999
- ³ ISO/IEC 25000 Software engineering — Software product Quality Requirements and Evaluation (SQuaRE), International Standards Organization, Geneva, 2005
- ⁴ ISO/IEC 25040:2011: Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Evaluation process, International Standards Organization, Geneva, 2011
- ⁵ ISO 9241-110:2006: Ergonomics of human-system interaction — Part 110: Dialogue principles), International Standards Organization, Geneva, 2006
- ⁶ Prümper, J., ISONORM 9241/110-S – Evaluation of software based upon International Standard ISO 9241, Part 110 (short version), HTW Berlin, 2009, accessed 18.12.2013, <http://people.f3.htw-berlin.de/Professoren/Pruemper/instrumente/ISONORM_9241_110-S_2010.pdf>
- ⁷ ISO 9241-171:2008: Ergonomics of human-system interaction – Part 171: Guidance on software accessibility, International Standards Organization, Geneva, 2008
- ⁸ ISO 9241-151:2008: Ergonomics of human-system interaction – Part 151: Guidance on World Wide Web user interfaces, International Standards Organization, Geneva, 2008
- ⁹ ISO/IEC 40500:2012 Information technology -- W3C Web Content Accessibility Guidelines (WCAG) 2.0, International Standards Organization, Geneva, 2012
- ¹⁰ European Commission, Draft EN 301 549 V1.0.0 (2013-02): Accessibility requirements for public procurement of ICT products and services in Europe. Mandate 376, European Commission Enterprise and Industry Directorate-General, Brussels, 2005, <<http://www.mandate376.eu/>>