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Del No 6.1

Title: User Needs

DRAFT 1

NOTES

I have highlighted the heading of sections that need to be updated by WP 1 and 2 in yellow

I have highlighted the heading of sections that need to be updated by the developer survey results in pink.

Introduction

D6.1 Description: Parametrization of user needs: Research, identify and prioritize user needs including needs of end users, developers, and businesses. This will include identifying what engines, standards and API's are needed to support the desired functionality. Data will be

collected from partners, key stakeholders, the advisory board and the inclusion think tank via reviewing research, questionnaires and interviews. Note that user needs will change and increase as the work from the above work packages progress throughout the project.

This deliverable reports on measures to collect, coordinate and transfer user needs in the project and between the WPs for a harmonised approach to reach the best usability level possible for Easy Reading.

The core set of user needs is from WP1 where new methods and tools for the involvement of users with cognitive disabilities are developed and used in order to allow personalisation of content and interaction to diverse requirements when working at and with the original content of:

- Individual users with cognitive disabilities (“end users”)
- Formal and informal service providers in supporting personalisation at the digital original
- Web engineers and content developers in making content and interaction ready for personalisation for cognitive disabilities.

User groups to be considered

The needs of the following user groups will be included

- People with cognitive disabilities: Accessing, using and working with original content (WP1)
- Service providers and care staff
 - Formal (professional organisations)
 - Informal (family, friends, neighbours) (WP1)
- Developers (Web) / Content Authors: Requirements for general web development to allow EasyReading to work with content and to allow personalisation.
- Developers of engines and tools that need to be integrated
- Business
- Education: Allow didactical approaches to work with mainstream content and to use mainstream content during teaching and learning
- Governmental Social Services: Easy to install, use and providing of EasyReading as a solution in a region, cross-organisations and in inclusive settings.

Procedure of gathering of user needs

In the development of software products, an appropriate requirements analysis is the first important step in the overall development process and the basis for suitable software design. The quality and usability of the system as well as the completeness of the system functions depend heavily on the results of the requirements analysis.

The aim of the needs analysis is to identify and analyse the needs of potential users, organisation involved and participating developers as completely as possible and corresponding to the real needs.

Developers and potential strategic partners have their own needs, they need to be able to integrate their services with the framework and have the support they need to do so. We need to support both their development style and their way of doing business. To this end we created a developer survey, which we circulated to the most relevant developers. We also polled the advisory board, and had discussions with other potential stakeholders as our platform developed.

People with cognitive impairments, which represents the primary target group of end users in the Easy Reading project, have very heterogeneous abilities and limitations. These special characteristics are not only relevant for the developed software but also bring special challenges for the requirements analysis.

The Easy Reading project is exemplary in its objective to involve the user group of people with cognitive impairments in the design and development process right from the start and to understand and consider their needs at every stage of the process.

In order to achieve this goal, the methods established in the areas of participative design and user-centered design were examined and evaluated for their appropriateness for the target groups. As a result, a new method called IPAR-UCD was developed within WP 1 that is appropriate for people with cognitive disabilities. A main pillar in this methodology is to develop and compile rules of cooperation where following aspects were considered to be particularly important (See Deliverable D1.3):

- **Integrity, honesty and trust** : Integrity and honesty towards oneself and towards others is a prerequisite for productive cooperation. Integrity is indispensable for trust. **Honesty** includes, besides the correct reproduction of results accompanying the research process, self-observation and reflection of personal requirements.
- **Reliability, respect and helpfulness**: A reliable, respectful working style, as well as helpfulness is expected of all team members.
- Further important aspects identified were the **general accessibility and understandability of all documents, processes and forms of communication relevant to the project.**

Following these aspects people with cognitive disabilities were included in the development process and also in the gathering of user needs.

Goals

The following goals are identified:

Goal: Identify specific needs of people with cognitive disabilities in terms of personalised access to the digital original

Methods: In the first months of cooperation within the inclusive research team, it became evident that it is very important to get to know each other and to develop a common basis for research and development. It also became evident that the special characteristics of the target group lead to a much more time-consuming execution of the individual work steps than originally planned.

For the collection of the functional and non-functional requirements of the user group the methods card sorting, photo documentations, diaries, focus groups and observations were used. Team members with cognitive impairments were asked to present their favourite sites, report on problems with the general accessibility of websites and define and evaluate relevant support options. Using the Card Sorting method, the reported problems, solutions and support options and needs were grouped and prioritized.

In the next step, the standard methods for the collection of user requirements were examined to determine whether they can be applied effectively within the framework of the Easy Reading project. In particular, the methods of collaborative workshops, focus groups, card sorting, photo documentation, diaries, think-aloud protocols, and observations have been tested applied in research teams with people with cognitive impairments. Methods that can only be used to a limited extent or in adapted forms were cognitive walkthroughs, games and storytelling.

The results showed that most methods can also be applied in the inclusive research team of the Easy Reading project, at least in certain project phases.

Methods: The following methods for gathering and analysing requirements of end users were selected after the evaluation phase:

§ **Focus group:** A focus group shares their thoughts, feelings and attitudes towards an already existing software product or prototype. This is especially useful as input for new software systems as feedback from users identify useful features and problems in existing systems. The focus group is a moderated group discussion. First, the topic/task of the session is determined. Usually 6-10 peer researchers or potential target group members participate in a session. They share their attitudes and thoughts, for example about an existing software product or prototype. These results help to review existing

concepts and to gain new ideas and input for new software systems. A moderator chairs the session by providing help, asks questions, sums up and makes sure that the focus is not lost during the discussions. This method can be used in any phase of the UCD.

§ **User stories:** This method provides an alternative to the focus group. The requirements of the user are collected at the beginning of a development by user stories of himself and formally documented to identify the extent of a system. In doing so, the user goals and intentions are e.g. noted on an index card. In the simplest case, these can be just one or two sentences. Then, a priority is given by the peer researcher (from 1 to 5 where 1 is the highest priority, or by employing a high, medium, low scale).

§ **Use cases:** Here, peer researchers can have a voice from the user's perspective. They can report on their real-life experiences and share their thoughts on what applications of a system or product they needed. This specifies the requirements for a system and defines the features that the system should have for the end users. The functional variety of a product or software is broken down into understandable and related units. Use cases are also an instrument to find out who should use the product and what the product should do for the user.

§ **Storyboard:** Storyboards use illustrations/images that are shown one after the other, for example to visualize an interactive media sequence in advance. It illustrates interactions between a person and the product or software. Peer researchers are then able to use these images to contribute their own ideas and views on the required features of the software or product.

§ **The Easy Cognitive Walkthrough:** This method is a modified version of the cognitive walkthrough method - a procedure in which end users, as experts, with or without the support of a test moderator, perform tasks with the product that were previously described as a typical task, taking into account the expected knowledge and skills of the target group. Each step is analysed by the co-researchers from the perspective of another user and thus problems and required features should be identified.

§ **Observation:** By observing and analysing end users while interacting with the framework, requirements for new features and user interface paradigms can be deducted. Users will be given a task to perform with the help of the framework – for example to get help for a certain paragraph of a predefined webpage. While performing the task the users are observed in the following ways:

- Video analysis: Participants are recorded while performing the task with a camera
- Input logging: Keyboard, mouse and touch events are logged

- Focus logging: With the use of an eye-tracker, the gaze of participants is logged in order to keep track of focus areas.

§ **Rapid Prototyping:** The framework allows to create user interfaces and components and combine them with functionality with very little effort. By this prototypes of new interfaces and user interface concepts can be implemented and tested.

Where we are: The first methods have been tested and evaluated with the co-researchers within the project. Testing the different methods with end-users showed that a requirement analysis with the target group is feasible and that the people with cognitive disabilities are reliable interview partners which are quite capable of expressing their needs in this way. Based on this, the user needs analysis regarding the easy reading framework has been done.

Goal: User needs when automated or supported mechanisms of understanding the level of comprehension, confidence, anger,

Methods: The methods for reaching this goal include:

- Input from WP1 and W2 - analysis and verification
- Observation and interviews
- Logging and Tracking data analysis
- Think Aloud Testing
- Focus group discussions

Where we are: User needs analysis, verification, enrichment and formalisation for the user profile and knowledge base development for personalisation (adaptation, annotation, translation of content and interaction)

Goal: A formalised data structure for storing preferences and needs as well as personal understandable content (symbols, pictures, words / text blocks, presentation preferences, ...)

Methods: The methods for reaching this goal include:

- Desktop studies on formal methods for user needs storage
- Input from WP1, WP2 and WP3 - analysis and verification
- Observation and interviews
- Think aloud testing
- Focus group discussions

Where we are: The data model was developed and implemented within the framework. This model is now tested within the framework to support content adaptation annotation and translation.

Goal: Utilizing the collected user needs for engine selection, development, adaptation and validation

Methods: The methods for reaching this goal include:

- Desktop studies on state of the art in user needs addressed in engine development
- Input from WP6 (collected user needs overview) - analysis and verification
- Input from advisory board

Where we are: The user needs for engine selection were collected and feed now into framework development and implementation of engines. Developer user needs were also gathered through partners from the advisory board and a wider developer survey. The result of this was integrated into the framework architecture.

Goals: A comprehensive and harmonised set of requirements and needs, which is usable and extendible in the agile development process of the project

Methods: The methods for reaching this goal include:

- Collecting requirements from developers and business partners from the consortium partners
- Collecting requirements from hackathon participants
- Collecting requirements for w3c working group members and similar stakeholders
- Input from WP1, WP2, WP3, WP4; feedback from all these WPs on collected user needs and in particular from WP5

Where we are: User needs from end users, external developers and end user organisations has been collected. Once the general user tests start in autumn and external developers contribute to the framework, we expect that additional requirements and user needs will emerge.

Goal: Business & Government User Needs Gathering

Methods: In Germany, various dissemination activities were used to assess the needs of institutions and government agencies. The Easy Reading project was presented at events of various state and federal authorities (e.g. Inclusion Days of the Federal Ministry of Labour and Social Affairs, Meeting of the Disability Advisory Council of the NRW State Government, Meeting with the Inclusion Commissioner of the NRW State Government). Similar activities happened in Israel.

A survey is currently being developed in which the basic attitude towards accessibility as well as the planned measures and the necessary support are to be recorded within the framework of the European Accessibility Act adopted this year.

Based on this survey, the list of needs and requirements will be expanded as the project progresses.

Advisory board members have also been polled to discuss and gather needs and requirements in two advisory board meetings. Phone interviews have been held with other potential stakeholders such as microsoft and google, and User1st.

Texthelp (consortium Member) is a commercial software company serving the Workplace and Education sectors, providing software for people with cognitive impairment. Texthelp contacted a range of businesses in the UK and Ireland to discover the needs of businesses and business employees that relate to cognitive impairment.

Where we are: User needs gathered. More needs will be gathered as described above.

Findings

Summary of Business User, Local Government and Employee Needs

Key findings summary :

- A large segment of the adult population are functionally illiterate. A study performed in the UK and commissioned by the UK government found that functional illiteracy impacted 16% of the population. This segment of the population is difficult to reach with web services, and so the move to e government is blocked by this problem.
(Adult Literacy in Britain, Office for National Statistics, 1997)
- If people cannot use the web, they revert to phone or in person services which are much more expensive for government and business to serve.
(SOCITM study - <https://www.socitm.net/files/download/26>)
- Many people are unaware of the availability of assistive technology, free or commercial, and also lack the skills and confidence to install assistive technology. (Gartner Study <https://www.gartner.com/doc/2593617/market-trends-new-technologies-benefit>)
- It would be beneficial to build the cognitive supports into websites so that people can just use them without needing to install anything.
- Staff / Employees are embarrassed about disclosing cognitive impairments - how can any support tools be delivered to staff in a sensitive manner?
- Business & Government decision makers are becoming more aware of the benefit of having a neurodiverse workforce.

User Needs in Business & Government :

- General needs
 - Besides the wish to make the Easy Reading Tool available for the customers, possibilities to make single functions directly available via the website of the institution were requested.
 - The user interfaces must be barrier-free and it should be possible to integrate already used tools.
 - In addition to functions that improve the cognitive accessibility of websites, functions that support the special needs of hearing-impaired or deaf-blind users are desired.
 - In order to ensure a meaningful use and an extension of Easy Reading Framework by further tools, comprehensive user and developer trainings and tutorials have to be designed developed and executed.
- Staff and end users with Dyslexia might
 - Need help with reading and comprehension
 - Need help with Report Writing, and written communications to prevent spelling errors and grammar errors.
 - Need help with structuring and organizing information
 - Need help with planning
- Staff and end users with ADHD have :
 - Problems sustaining attention - provide annotation / underlining tools.
 - A need for simple page layouts to minimise distraction and maintain focus
- Staff and end users with Autism
 - Content should be distraction free
 - Content needs to have simple layout and presentation
 - Content should avoid idioms - they can be taken literally
- Staff and end users who struggle with cognitive load are negatively impacted by :
 - Web pages that are too long
 - Web pages that have complex layouts
 - Web pages with a difficult to consume writing style
 - Web pages with mature or specialist vocabulary
 - Webpages with Jargon
- People reading in a second language
 - May benefit from translation tools
 - May benefit from a picture dictionary
 - Would benefit from simple and easy to understand text in short sentences.

Summary of user needs for developers

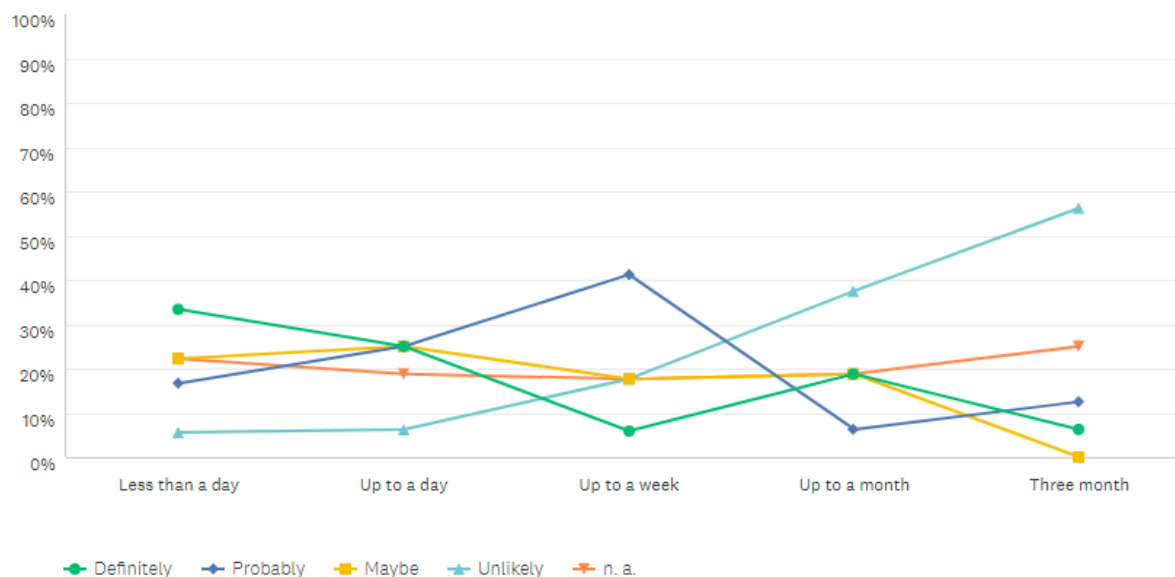
A developer survey was sent out via the advisory board, relevant W3C groups and small AT developer groups.

The initial response was 23 survey from the developers. The developers who completed the survey have a real interest in integrating their service with the EasyReading framework.

When asked about the amount of time developers would spend integrating with the Easy Reading Framework, “definitely” was the most likely response to “for up to a day”, “probably” was the most common response for “up to a week”, and “up to a month” was unlikely. The project should therefore aim for typical integration time to take up to a day, with a maximum of a week.

How much developer time would you spend integrating with the Easy Reading Framework?

Answered: 19 Skipped: 4



Over 95% were comfortable or very comfortable with using JSON. Other platforms that were preferred had a maximum of three requests (out of 23) making JSON a clear preference

Just over half the responses require continuous contact with their server, and about 80% have a significant client side component.

REST was the preferred API methodology

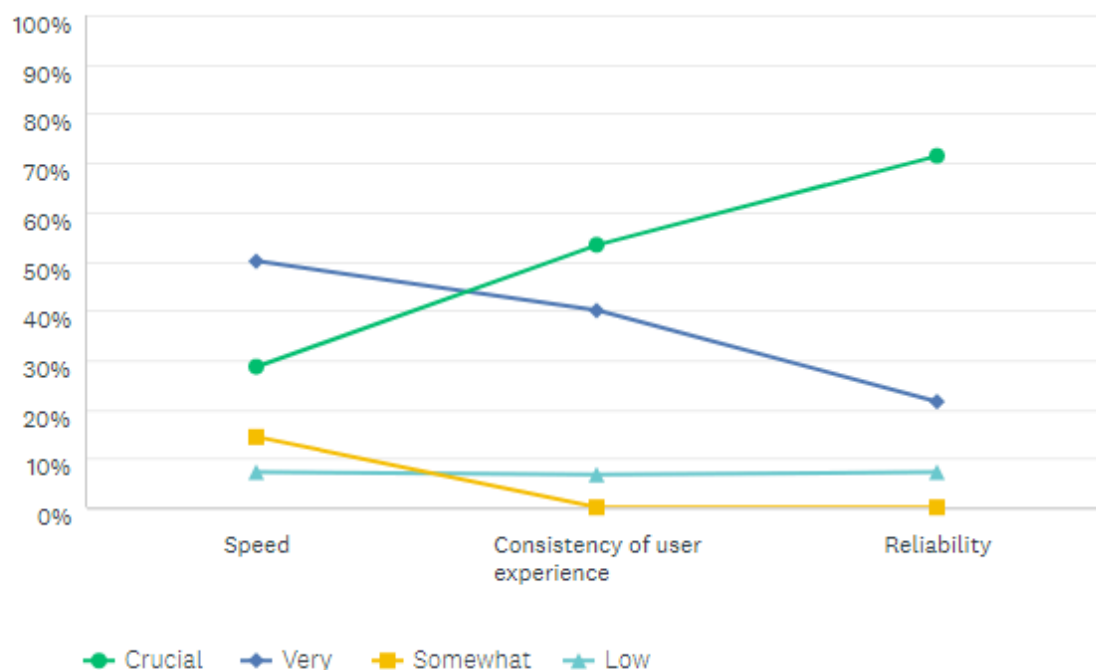
User settings and preferences that are supported include AT support and personalized colors

Reliability, consistency of user experience and speed were considered crucial or very important by over 80% of all respondents, with reliability being the most crucial (over 70%) followed by

consistency (over 50% felt it was crucial) and just under 30% felt that speed was crucial. Thus reliability was determined to be the most important feature.

How important is the following to your users?

Answered: 15 Skipped: 8



AT compatability, WCAG 2.x AA.conformance and a good UX were also requested as important. There was a request for support for Django (a Python library) and React, and one request for GPII, JSON, RDFa, Copyleft and GitHub.

Working examples and a getting started document were the most used and most requested type of support. Full documentation, FAQs and email support were also popular. Some people saw chat support as important, but few reported actually using it.

90% used API keys (although about half the users skipped this question). Server traffic requirement they can expect in a peak hour varied from supposedly unlimited, 36000 - 40000 requests, 10,000 requests and 12 requests. The number of subscribers also varied hugely from 25 million to 100 to 1.

We are continuing to gather survey at hackathons and dissemination events, so results will be reviewed again in three month to see if there is more we need to support. Up to date results can be viewed at <https://de.surveymonkey.com/stories/SM-HZ7PXXFV/>

Technology provider and partner feedback: Engines and tools that need to be integrated

From inside the consortium we gathered the following additional needs:

1. Engine will have frequent upgrades. This needs to be supported
2. Engines will have their own user preferences and configuration
3. Easy compatibility with both server side functions and client side functions
4. Local client files (helper file)
5. Familiar serialization formats such as JSON
6. Clear documentation and step by step instructions
7. A getting started document
8. Testing environment for new engine features.
9. Test suite so they can tell if it is successfully integrated such as three test pages with expected results of other engines
10. Way to integrate their test cases into the test suite
11. A platform for getting feedback and data regarding the frequency of the engine use by users.

Requirements for content providers

1. Automated tools to provide much of the rich semantics
2. Workings with preferred authoring tools (no need to change authoring environment)
3. Familiar formats
4. Test suit such as test pages and validation tools

Note these may not be possible in the funding period but should happen via standardising the vocabulary via the W3C.

Summary of requirements for developers from consortium members

Thinking, researching, planning, supporting and implementing cognitive accessibility at least at the three levels “General Mainstream”, “Personalized Services” and “ATs to (re)present and tools for support or automation of the generation, enrichment or translation of information” asks for the following indispensable prerequisites:

1. Design / development / authoring has to provide semantic rich content, which is machine-readable and automatable for personalization and content adaptation / annotation / translation. As this is a key asset for improving usability in general, we expect Cognitive Accessibility to be part of and based on a next level of personal Web usability.

2. Service practice has to take up the potential of digital technology in service and care provision with the goal of independent access to as much as possible of the original content. Making digital tools and content/tool personalization part of therapy, training and education is indispensable for improved Cognitive Accessibility and exploiting the digital potential.
3. New AI based ATs for content adaptation / annotation / translation for Cognitive Accessibility are needed which use tracking and profile building for content adaptation/annotation/translation to integrate the actual and changing the status of the user and his service infrastructure. This includes R&D in automated (tracking) but in particular also IT supported human-supported and -reflected profile building and continuous adaptation for transfer in diverse life context under the control of users.

Summary of end user needs and requirements regarding framework functionality

In the inclusive research team, in which Peer-Researchers with cognitive impairments in the sense of participative software development are involved in all phases of development, the following functional requirements have been identified:

- Read aloud function
- Image support for unknown words
- Alternative input with pictures/symbols
- Configuration wizard
- Adjustable formatting
- Adjustable Text Color
- Adjustable size of texts
- Alternative input with gestures
- Chat bot
- Word suggestions for text input
- Texts in plain text / easy to understand
- Preparation of text summaries
- Adjustable voice output speed
- Highlighting of the current search term

For a first prototype, which is currently under functional testing by the inclusive research team, the read-aloud function, image support for unknown words, synonym search, adjustable

formatting, adjustable texts, simple text, alternative pictures, color adjustment, text enlargement and line spacing enlargement have been implemented.

Summary of user needs for framework configuration

User tests were performed in the wire frame concept of how to set up easy reading, add tools to the toolbar and change the settings of each tool.

Wireframes were produced with Axure rp. There were eight test subjects whereof one had reading disabilities and three were sight impaired. They were given tasks/scenarios to perform in the wireframe and encouraged to think aloud while performing them. Eye tracking was used, and the sound was recorded.

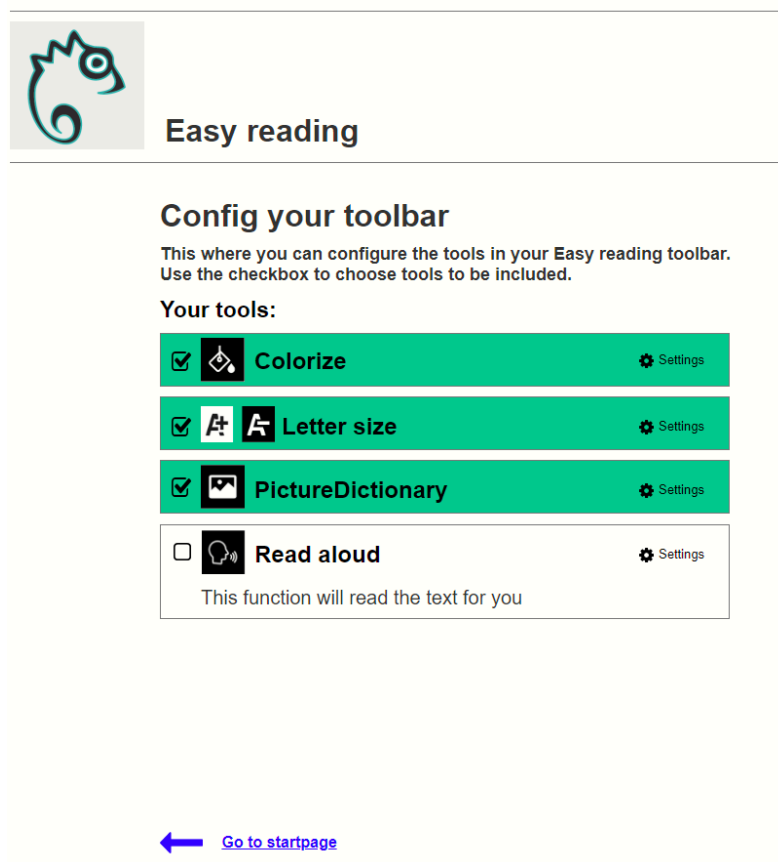


Figure 1: Screenshot of one of the wireframe used

The wireframes were evaluated with end users, and the results and elicited requirements fed into the development of the framework configuration user interfaces (see figure 2).

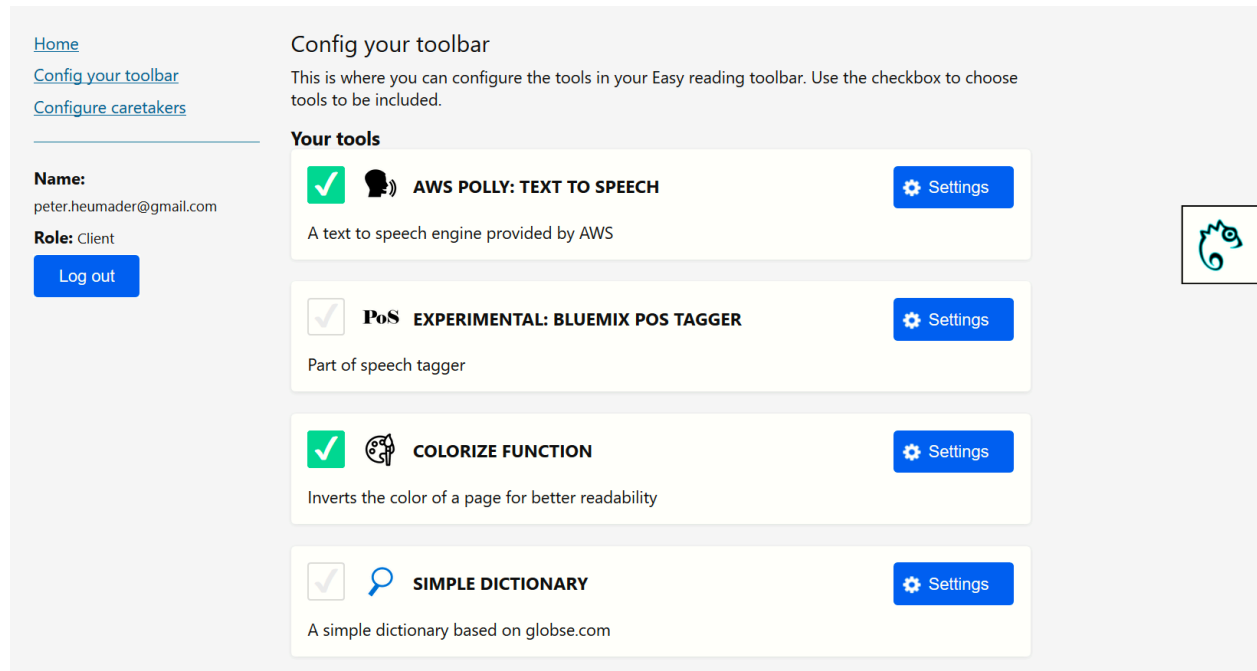


Figure 2: Framework configuration user interface

There were several insights which led to changes of the concept accordingly. The most important ones were.

- Terminology: The word “function” was used and most of the test users expressed that the meaning of the word wasn’t clear to them. A few proposed using the word tool instead.
- Consistency: When a function is added you access the config page by clicking on the function name or “Configure the function” button. It is an accessibility (WCAG) issue that links leading to same place always will be named in the same way.
- In the concept there were uncertainty about how to add a function, whether to add first and change settings after or the other way around. In some cases, this created an uncertainty whether the function was added or not.
- Feedback: Everyone stated that they lacked feedback when pushing the “Save” button on the function configuration page. Nothing happened, neither message nor visible change, which made the use uncertain if the changes have been saved.

Other requirements (misc)

Wcag 2.1 conformant AA-AAA, Supports AT , COGA conformant

Conclusions

From our analysis, most of the user needs regarding framework functionality can be addressed if the first round of engines include the following tools:

- read-aloud function
- image support for unknown words
- synonym search
- adjustable formatting
- adjustable texts
- simple text
- alternative and personalized pictures
- reduced content
- color adjustment
- text enlargement and line spacing enlargement

The most important requirements for end users regarding the framework configuration are:

- Consistency in the user interface
- Easy to understand terminology
- Instant feedback when something changes
- Accessibility (WCAG2.1)

For developers, that want to extend and contribute to the framework, the following user needs are considered as the most important:

- Integration can rely on JavaScript/JSON knowledge only. Ideally typical integration will take up to a day, but not more than a week.
- Support should include: API keys, both client side and continues server support, and a full range of traffic.
- The interface should include: AT compatibility, WCAG 2.x AA.conformance and a good user interface
- The project should provide for developers: Worked examples, test page and a getting started document and email support first and then full documentation and FAQs

The most important requirements for business and government organizations are:

- The framework should be easily available and easy to install
- Should work on their website
- possibilities to make single functions directly available via the website of the institution were requested.

- The user interfaces must be accessible (WCAG 2.1) and it should be possible to integrate already used tools.
- In addition to functions that improve the cognitive accessibility of websites, functions that support the special needs of hearing-impaired or deaf-blind users are desired.

Del No 6.1

Title: User Needs

DRAFT 1

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Consortium partners	Kompetenznetzwerk (KI-I), Austria Technische Universität Dortmund (TUDO), Germany In der Gemeinde Leben gGmbH (IGL), Germany FUNKA Nu AB (FUNKA), Sweden Texthelp Ltd (TEXTHELP), United Kingdom VÄSTRA GÖTALANDS LÄNS LANDSTING (DART), Sweden GEIE ERCIM (ERCIM), France AHTENA I.C.T. Ltd (ATH), Israel
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Executive Summary

This is an early draft of deliverable 6.2, with the full deliverable being due on month 18.

It addressed user needs and how the project will research, identify and prioritize user needs including needs of end users, developers, and businesses. Data will be collected from partners, key stakeholders, the advisory board etc. Note that user needs will change and increase as the work

from the above work packages progress throughout the project.

These needs help us identify what engines, standards and API’s are needed to support the desired functionality.

The present document is a deliverable of the Easy Reading project which is funded by the European Union’s Horizon 2020 Programme und Grant Agreement #780529.

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Introduction

D6.1 Description: Parametrization of user needs: Research, identify and prioritize user needs including needs of end users, developers, and businesses. This will include identifying what engines, standards and API's are needed to support the desired functionality. Data will be collected from partners, key stakeholders, the advisory board and the inclusion think tank via reviewing research, questionnaires and interviews. Note that user needs will change and increase as the work from the above work packages progress throughout the project.

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The core set of user needs is expected from WP1 where new methods and tools for involvement of users with cognitive disabilities are developed and used to allow personalisation of content and interaction to divers requirements when working at and with the original content of

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The Easy Reading project is exemplary in its objective to involve the user group of people with cognitive impairments as Peer-Researchers right from the start and to understand and consider their needs at every stage of the process.

In order to achieve this goal, the methods established in the areas of participative design and user-centered design were examined and evaluated for their appropriateness for the target groups.

User needs definition based on the end user involvement and development of IPAR-UCD in WP1

In order to be able to conduct inclusive research and development with a user group as Peer-Researcher who was not previously involved in development and design processes, it is necessary to develop and compile rules for collaboration. Therefore, in a first step, the most

important prerequisites and rules for good cooperation were gathered in guided discussion groups together with the team members with and without impairments. The following aspects were considered to be particularly important (See Deliverable D1.3):

- **Integrity, honesty and trust** : Integrity and honesty towards oneself and towards others is a prerequisite for productive cooperation. Integrity is indispensable for trust. **Honesty** includes besides the correct reproduction of results accompanying the research process, self-observation and reflection of personal requirements.
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Goal: Specific needs of people with cognitive disabilities in terms of personalised access to the original

Methods: In the first step of cooperation within the inclusive research team, it became evident that it is very important to get to know each other and to develop a common basis for research and development. It also became evident that the special characteristics of the target group lead to a much more time-consuming execution of the individual work steps than originally planned.

For the collection of the functional and non-functional requirements of the user group the methods card sorting, photo documentations, diaries, focus groups and observations were used. Team members with cognitive impairments were asked to present their favourite sites, report on problems with the general accessibility of websites and define and evaluate relevant support options. Using the Card Sorting method, the reported problems, solutions and support options and needs were grouped and prioritized.

In the next step, the standard methods for the collection of user requirements were examined to determine whether they can be applied effectively within the framework of the Easy Reading project.

The results showed that most methods can also be applied in the inclusive research team of the Easy Reading project, at least in certain project phases.

In particular, the methods of collaborative workshops, focus groups, card sorting, photo documentation, diaries, think-aloud protocols and observations can be applied in research teams with people with cognitive impairments.

For the collection of the functional and non-functional requirements of the user group the methods observations, photo- and video documentations, diaries, focus groups and card sorting, were used.

For example team members with cognitive impairments were asked to present their favorite sites, report on problems with the general accessibility of websites and define and evaluate relevant support options. Using the Card Sorting method, the reported problems, solutions and support options and needs were grouped and prioritized.

Detailed information on the results of method analysis can be found in Deliverable D1.3.

The IPAR-UCD methodology is still being developed within the Easy Reading project and will be further refined in the course of the project.

User needs analysis following an agile development process of new and innovative user interface concepts at the digital original

Goal: User driven development process in cooperation with WP1

Methods: After desktop research, the following methods for gathering and analysing requirements of end users were selected:

§ **Focus group:** A focus group shares their thoughts, feelings and attitudes towards an already existing software product or prototype. This is especially useful as input for new software systems as feedback from users identify useful features and problems in existing systems. The focus group is a moderated group discussion. First, the topic/task of the session is determined. Usually 4-6 peer researchers or potential target group members participate in a session. They share their attitudes and thoughts, for example about an existing software product or prototype. These results help to review existing concepts and to gain new ideas and input for new software systems. A moderator chairs the session by providing help, asks questions, sums up and makes sure that the focus is not lost during the discussions. This method can be used in any phase of the UCD.

§ **User stories:** This method provides an alternative to the focus group. The requirements of the user are collected at the beginning of a development by user stories of himself and formally documented to identify the extent of a system. In doing so, the user goals and intentions are e.g. noted on an index card. In the simplest case, these can be just one or two sentences.

§ **Use cases:** Here, peer researchers can have a voice from the user's perspective. They can report on their real-life experiences and share their thoughts on what applications of a system or product they needed. This specifies the requirements for a system and defines the features that the system should have for the end users. The functional variety of a product or software is broken down into understandable and related units. Use cases are also an instrument to find out who should use the product and what the product should do for the user.

§ **Storyboard:** Storyboards use illustrations/images that are shown one after the other, for example to visualize an interactive media sequence in advance. It illustrates interactions between a person and the product or software. Peer researchers are then able to use these images to contribute their own ideas and views on the required features of the software or product.

§ **The Easy Cognitive Walkthrough:** This method is a modified version of the cognitive walkthrough method - a procedure in which end users, as experts, with or without the support of a test moderator, perform tasks with the product that were previously described as a typical task, taking into account the expected knowledge and skills of the target group. Each step is analysed by the co-researchers from the perspective of another user and thus problems and required features should be identified.

§ **Observation:** By observing and analysing end users while interacting with the framework, requirements for new features and user interface paradigms can be deduced. Users will be given a task to perform with the help of the framework – for example to get help for a certain paragraph of a predefined webpage. While performing the task the users are observed in the following ways:

- Video analysis: Participants are recorded while performing the task with a camera
- Input logging: Keyboard, mouse and touch events are logged
- Focus logging: With the use of an eye-tracker, the gaze

§ **Rapid Prototyping:** The framework allows to create user interfaces and components and combine them with functionality with very little effort. By this prototypes of new interfaces and user interface concepts can be implemented and tested.

Where we are: The first methods have been tested and evaluated with the co-researchers in within this project. Testing the different methods with end-users showed that a requirement analysis with the target group is feasible and that the people with cognitive disabilities are reliable interview partners which are quite capable of expressing their needs in this way.

User needs analysis, verification, enrichment and formalisation in the process of defining tracking and reasoning mechanisms (measurable criteria definition) for better supporting and automating personalisation of content

Goal: User needs when automated or supported mechanisms of understanding the level of comprehension, confidence, anger, ... might lead to disturbance, distraction, ...

Methods: The methods for reaching this goal include:

- Input from WP1 and W2 - analysis and verification
- Observation and interviews
- Logging and Tracking data analysis
- Think Aloud Testing
- Focus group discussions

Where we are: User needs analysis, verification, enrichment and formalisation for the user profile and knowledge base development for personalisation (adaptation, annotation, translation of content and interaction)

Goal: A formalised data structure for storing preferences and needs as well as personal understandable content (symbols, pictures, words / text blocks, presentation preferences, ...

Methods: The methods for reaching this goal include:

- Desktop studies on formal methods for user needs storage
- Input from WP1, WP2 and WP3 - analysis and verification
- Observation and interviews
- Think Aloud Testing
- Focus group discussions

Where we are: User needs elicitation, verification and application for the development and use of automated or support content adaptation, annotation and translation -

Goal: Selecting from and using the collected user needs for the engine development and adaptation; verification, test, feedback

Methods: The methods for reaching this goal include:

- Desktop studies on state of the art in user needs addressed in engine development
- Input from WP6 (collected user needs overview) - analysis and verification

Where we are: Collection and coordinating user needs development, studies, analysis, verification, enrichment and formalisation from WPs

Goals A comprehensive and harmonised set of requirements and needs, which is usable and extendible in the agile development process of the WPs

Methods: The methods for reaching this goal include:

- Collecting requirements from developers and business partners from the consortium partners
- Collecting requirements from hackathon participants
- Collecting requirements for w3c working group members and similar stakeholders
- Input from WP1, WP2, WP3, WP4; feedback from all these WPs on collected user needs and in particular from WP5

Where we are: Initial user needs collected. More user needs will be collected from ongoing from hackathon and other sources

Business & Government User Needs Gathering

Texthelp (consortium Member) is a commercial software company serving the Workplace and Education sectors, providing software for people with cognitive impairment. Texthelp contacted a range of businesses in the UK and Ireland to discover the needs of businesses and the business employees that relate to cognitive impairment.

Where we are: User needs gathered. More needs will be gathered from the advisory board

User groups to be considered

The needs of the following user groups will be included

- People with cognitive disabilities: Accessing, using and working with original content
- Service providers and care staff
 - Formal (professional organisations)
 - Informal (family, friends, neighbours)
- Backend functionalities for updating/adding content
- Concept Coding framework: structured alternatives for selection or automatic invocation

- Developers (Web) / Content Authors: Requirements for general web development to allow EasyReading to work with content and to allow personalisation.
- Developers of engines and tools that need to be integrated
- Business
- Education: Allow didactical approaches to work with mainstream content and to use mainstream content during teaching and learning
- Governmental Social Services: Easy to install, use and providing of EasyReading as a solution in a region, cross-organisations and in inclusive settings.

User needs collected so far

Business User & Local Government needs & Employee needs

Key findings summary :

- A large segment of the adult population are functionally illiterate. A study performed in the UK and commissioned by the UK government found that functional illiteracy impacted 16% of the population. This segment of the population is difficult to reach with web services, and so the move to e government is blocked by this problem.
(Adult Literacy in Britain, Office for National Statistics, 1997)
- If people cannot use the web, they revert to phone or in person services which are much more expensive for government and business to serve.
(SOCITM study - <https://www.socitm.net/files/download/26>)
- Many people are unaware of the availability of assistive technology, free or commercial, and also lack the skills and confidence to install the assistive technology. (Gartner Study <https://www.gartner.com/doc/2593617/market-trends-new-technologies-benefit>)
- It would be beneficial to build the cognitive supports into websites so that people can just use them without needing to install anything.
- Staff / Employees are embarrassed about disclosing cognitive impairments - how can any support tools be delivered to staff in a sensitive manner?
- Business & Government decision makers are becoming more aware of the benefit of having a neurodiverse workforce.

User Needs in Business & Govt :

- Staff and end users with Dyslexia might

- Need help with reading and comprehension
- Need help with Report Writing, and written communications to prevent spelling errors and grammar errors.
- Need help with structuring and organizing information
- Need help with planning
- Staff and end users with ADHD have :
 - Problems sustaining attention - provide annotation / underlining tools.
 - A need for simple page layouts to minimise distraction and maintain focus
- Staff and end users with Autism
 - Content should be distraction free
 - Content needs to have simple layout and presentation
 - Content should avoid idioms - they can be taken literally
- Staff and end users who struggle with cognitive load are negatively impacted by :
 - Web pages that are too long
 - Web pages that have complex layouts
 - Web pages with a difficult to consume writing style
 - Web pages with mature or specialist vocabulary
 - Webpages with Jargon
- People reading in a second language
 - May benefit from translation tools
 - May benefit from a picture dictionary
 - Would benefit from simple and easy to understand text in short sentences.

Summary of user needs for developers

Technology providers: Engines and tools that need to be integrated

1. Engine will have frequent upgrades. This needs to be supported
2. Engines will have their own user preferences and configuration
3. Easy compatibility with both server side functions and client side functions
4. Local client files (helper file)
5. Familiar formats such as JSON
6. Clear documentation and step by step instructions
7. A getting started document
8. Testing environment for new engine features.
9. Test suite so they can tell if it is successfully integrated such as three test pages with expected results of other engines
10. Way to integrate their test cases into the test suite

11. A platform for getting feedback and data regarding the frequency of the engine use by users.

Requirements for content providers

12. Automated tools to provide much of the rich semantics
13. Workings with preferred authoring tools (no need to change authoring environment)
14. Familiar formats
15. Test suit such as test pages and validation tools

Note these may not be possible in the funding period but should happen via standardising the vocabulary via the W3C

User needs and requirements for developers

Thinking, researching, planning, supporting and implementing Cognitive Accessibility at least at the three levels “General Mainstream”, “Personalized Services” and “ATs to (re)present and tools for support or automation of the generation, enrichment or translation of information” asks for the following indispensable prerequisites:

1. Design / development / authoring has to provide semantic rich content, which is machine-readable and automatable for personalization and content adaptation / annotation / translation. As this is a key asset for improving usability in general, we expect Cognitive Accessibility to be part of and based on a next level of personal Web usability.
2. Service practice has to take up the potential of digital technology in service and care provision with the goal of independent access to as much as possible original content. Making digital tools and content/tool personalization part of therapy, training and education is indispensable for improved Cognitive Accessibility and exploiting the digital potential.
3. New AI based ATs for content adaptation / annotation / translation for Cognitive Accessibility are needed which use tracking and profile building for content adaptation/annotation/translation to integrate the actual and changing status of the user and his service infrastructure. This includes R&D in automated (tracking) but in particular also IT supported human-supported and -reflected profile building and continuous adaptation for transfer in diverse life context under control of users.

End user needs and requirements from WP 1 and 2

In the inclusive research team, in which members of staff with cognitive impairments in the sense of participative software development are involved in all phases of development, the following functional requirements have been identified:

- Read-aloud function
- Highlighting of current search word
- Customizable color of texts
- Customizable size of texts
- Image support for unknown words
- Alternative input with pictures/symbols
- Alternative input with gestures
- Chat-Bot
- Configuration Assistant
- Word suggestions for text input
- Texts in Plain Language / Easy-to-read
- Generation of text summaries
- Adjustable speed of speech output
- Adjustable formatting

For a first prototype, which is currently under functional testing by the inclusive research team, the read-aloud function, image support for unknown words, synonym search, color adjustment, text enlargement and line spacing enlargement have been implemented.

Other requirements (misc)

Wcag 2.1 conformant AA-AAA

COGA conformant

Conclusions

From our analysis, most of the user needs can be addressed if the first round of engines include:

- Text simplification, (IBM Content clarifier)
- Changes in linespaces and format (Athena and Microsoft API)
- Text to speech with highlight function (Texthelp)
- Chat-Bot (IBM) – This may not be useful for unknown content
- Image support for unknown words (IBM? Microsoft API?)
- Alternative input with pictures/symbols (Athena)

This should enable us to incorporate most of the end user needs.

We are using JSON and Jnode and will be providing much of the developer tools requested such as getting started and clear documentation and some test pages.