Living Labs and Open Toolkit for the co-design of accessible IT systems and tools

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Author(s)	Ioannis Poultourtzidis
Reviewed by	Joe Cullen
Approved by	Panos Bamidis, Project Coordinator

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LIST OF ACRONYMS

Acronym	Description
PwCD	People with Cognitive Disabilities
AUTH	Aristotle University of Thessaloniki
ARC	Arcola Research LLP
NUIG	National University of Ireland Galway
UCP	Catholic University of Portugal

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1 EXECUTIVE SUMMARY

The LIVE IT is a collaborative project, based upon co-authoring and participatory activities. It relies mainly to the end-users' community participation in the project outputs creation, development and improvement. Following a bottom-top process it avoids enforcing solutions to the community and ensures that solutions have the approval of end-users. Using the "trial and error" method it turns PwCD to co-developers, thus ensuring their voices are being heard and that they shape the main pathway to accessible outcomes that are pretested and preapproved regarding their effectiveness, efficiency and usability.

Following and assessing the participation of end-users throughout the project lifetime is essential and is monitored during each co-activity. It is a part of the success of the LIVE IT project, and it is related to its innovative outcomes. Maintaining a good flow to end-users' feedback requires multi-staged interactions and communication system. Their constant participation is on the spot of the LIVE IT project and is being conducted through many channels. The consortium organized a total of 4 Webinars, 5 Hackathons, a Final Conference, 4 National events, all these apart from the 7 Co-creation Labs set up to the 4 countries of the consortium (Greece, UK, Ireland and Portugal). Each activity had the sole purpose of reaching out to populations that are interested in the project and could help shape and simultaneously benefit directly or indirectly from the research being done through LIVE IT. End-users, policy makers, researchers, IT community and content designers are some stakeholders that the consortium aimed to contact and engage.

Co-creation Labs were the heart of the production steps, the place where decisions were made after consultation and observations of PwCD that offer the basis of solutions provided in the Open Toolkit. The Webinars and National Events had a more dissemination capacity since they were less participatory and more informative around the state of the art and current findings in the field and via the project working packages. Finally, the project Hackathons were the main feedback collecting stage. Hackathons kicked-off right after the Open Toolkit was uploaded in the Azure platform. Since then, all of the updates, upgrades and improvements made, were based upon Hackathons' feedback – they are essentially the test-area of the toolkit, thus offering the fuel for moving it forward, improving it and upgrading it into a final accessible, inclusive and acceptable product.

The Hackathon Outcomes report includes the description of actions implemented in the Hackathons to validate the toolkit, collected feedback and teams' contribution descriptions along with the appraisal of Hackathon activities and procedures from attendees and participants.

2 INTRODUCTION

2.1 PURPOSE AND SCOPE

This document aims to provide insight on Tasks 4.3 Hackathons and 4.4 Outcome evaluation and gather evidence regarding the efficiency of the Hackathons in the overall project development and implementation. Hackathons are basically evaluating the Open Toolkit while raising awareness and disseminating the project, and the consortium is setting up processes to evaluate the Hackathons and their framework. Hackathons themselves have a methodology that is followed and will be later in this document presented, along with all monitoring tasks that form the evaluation roadmap.

2.2 INTENDED AUDIENCE

This document should be used as a reference by:

- European Commission
- all consortium members of LIVE IT
- interested third parties

2.3 STRUCTURE OF THE DELIVERABLE

The report presents:

- Hackathon definitions, aims and objectives of our Hackathons (section 3)
- Participating teams' demographics presentation (section 4)
- Feedback analysis (section 5)
- Hackathons' takeaway, survey and winners (sections 6,7 and 8)
- Conclusion (section 9)

2.4 RELATION TO OTHER WPS & TASKS

The Hackathon Outcomes (D4.3) is a report that covers all Hackathons' activities and the evaluation of outcomes. All work packages and tasks are related to the Hackathons and the evaluation of the project results. The Hackathons are linked to the Open Toolkit and the

experimentation with features and functions embedded into it. Hackathons include activities and steps that require experimentation with the product to be able to interact and craft an opinion, rate it, criticize it and ask for improvements. The toolkit itself is based on WP1 and the state-of-the-art and literature review of digital accessibility of PwCD and WP2, the Lifeworld Analysis, the co-creation labs and the interviews / focus group discussions that collected user lived experiences to form the basis of the toolkit creation and further development (WP3).

3 LIVE IT HACKATHONS

3.1 HACKATHON DEFINITIONS

The term “Hackathon” combines the words and terms “hacking” and “marathon” (Briscoe & Mulligan 2014). It implies an intense, uninterrupted, period of programming, in which people produce a working software prototype in a limited amount of time (Komssi et al., 2015). Hackathons may also be referred to as game jams, design jams, hacking festivals, hack days, design sprints and codefests (Briscoe & Mulligan, 2014). A common interpretation of the word “hack” is in reference to a “cybercrime”, e.g., an explanatory programming. The term “marathon” refers to a prolonged, race-like event. As a result, Hackathons can be interpretated as a tech-centric, speed design event (Flus & Hurst, 2020).

At these events, participants work in small groups to ideate, develop and present -to a rearranged form- a solution to a problem (Flus & Hurst, 2020). The purpose of Hackathons as well as the procedure and practices can vary among researchers and users however, the main structure, purpose and characteristics are quite common. Hackathons can and have been used in a wide variety of contexts and for different purposes, including education, networking and to accelerate innovation (Flores et al., 2018). The duration of Hackathons can vary; they can run continuously over 24-36 hours, for shorter periods of time over a span of weeks, months or even years (Truyen 2016; Taes & Colangelo, 2017; Hölttä-Otto et al., 2018; Rennick et al., 2018; Taylor et al., 2018; De Oliveira et al., 2019; Richterich, 2019). In software companies the existing approaches typically take weeks, if not months, whereas a Hackathon usually takes only few days, not including pre- and post-Hackathon activities and celebrations (Komssi et. al., 2015).

As far as some common characteristics and structure are concerned, Hackathons typically start with a short presentation of the project, the event goals, design, challenges as well as the sponsors, schedule and prizes. The theme of the event can either be announced before the event or it can be announced at the start of the event. For the scopes of Hackathons, small teams can be formed. The ideation and team building are common structure characteristics of Hackathons. There is no strict pattern of team building; teams can be formed before the event,

based on relationships, collaborations, partners or during Hackathons (e.g., participants with the same interests, project ideas and skills). As a result, team building, as a core part of Hackathons, can be organized either online or in person. After team building, participants organize themselves, for them to develop their ideas (Kommsi et. al., 2015). The members of each team can work systematically, build prototypes, develop brainstorms to present their work.

In addition to team building, a review of Hackathons revealed that participants follow divergence-convergence patterns in their design process (Flus & Hurst, 2020). In most cases Hackathons facilitate a design process to provide some guidance to participants as well as, encourage more successful design and learning outcomes. As a matter of fact, the event structure requires some additional emphasis in those activities, such as finding and getting to know both team members and problems to solve and preparing for the solution pitch and demo.

Participants in Hackathons can also vary among experts and researchers from different scientific fields. By design, Hackathons enable collaboration between different experts (Frey & Luks, 2016). Different team members may have different subject matter knowledge - and consequently different scientific point of view. However, research on the impact of the diversity of experts in Hackathons is limited and inconclusive (Legardeur et al. 2020). There is an assumption regarding the relationship between Hackathon's theme and domain and one's level of expertise in the relevant domain; experienced software engineers will be better prepared to complete a software design project or provide innovative proposals and ideas within the Hackathon environment, in comparison to non-experts. There is an argue though, that there can be a "Hackathon expertise"; the more someone attends and participates in Hackathons, the better and more valuable knowledge he gets. Those who have attended plenty of times, have an advance understanding of how to approach Hackathons. As a result, those different levels of Hackathons experience can reflect differences in design activities (Flus & Hurst, 2020). As Hackathons are becoming more and more valuable and common practice among living labs and other innovative research activities, participating in Hackathons reflects the ability of researchers to gain knowledge and be able to participate in up-to-date activities.

In addition to the characteristics of Hackathons, it is vital to mention that despite the diversities, they are usually well-structured events. Hackathons usually have a starting and stopping date and time, between which, all participants work together in organized teams and focus solely on creating a demo-able version of their ideas and perspectives (Komssi et. Al., 2015). At the end of the Hackathons, teams can present their ideas in front of an audience, either virtually or with physical presence. The aim is to demonstrate and present innovative ideas, which will provide solutions to problems and scopes of the project / theme of Hackathon. The most successful demos are comprehensive and can establish the key aspects of a novel idea. After the presentations of those ideas and the rush of all these days' work, as well as the post-Hackathons celebrations, there is a competition for the evaluation of their work. The prize of the "best / most innovative idea" can vary widely among Hackathons' organizers. In some

cases, the best and most promising ideas may receive funding for further development. In other cases, the prize can be technological tools or equipment for participants' research activities - especially in cases in which each team represents a Lab / University / Academic Department etc. The prize offers an extra motivation to participants and its aim is to reward their intensive, hard work.
Hackathons effectively reflect the need to develop and transform an idea into something concrete and demonstratable in a very short period. The core characteristics of Hackathons - noisy environments with many participants - reveal some challenges regarding studying design cognition and methodologies. However, Hackathons retain great potentials for design activities, especially under conditions of time pressure; within Hackathons the incubation time of research ideas and solutions can be reduced, and different levels of domain and design expertise can appear. For these reasons, Hackathons retain their unique utility and their promising opportunities in future design research activities.

3.2 THE LIVE IT HACKATHONS

The project was obliged to host 5 virtual Hackathons during its lifecycle. This number is not easy to meet because of logistics, dissemination, methodology to be followed and organisation of material and activities. Nevertheless, the LIVE IT team managed to get through it with success, having retrieved valuable feedback accomplishing the Hackathons' task. The Hackathons in the project did not follow the usual 1 long session to provide results, but a tailored to PwCD version. It was identified through discussions in prior to Hackathons co-creation Labs that our main targeted population might lose focus and interest after about 45 minutes. Therefore, the session could not be 8 or 6 hours long, not even 4 hours, it should be limited to not more than 1 hour. The solution crafted for this issue was to spread each Hackathon in a 1-week activity, where participants would meet with the project team only twice, once to get instructions and once more to share results. Also, each Hackathon had each own theme to focus on, namely:

1. Facilitating authentication and online forms
2. Processing heavy text-based and cluttered pages
3. Understanding and interpreting numerical, text and graphics information
4. Handling complex interfaces, multi-stage tasks and limiting interruptions
5. Accessible support and instructions.

3.2.1 The methodology

For the LIVE IT Hackathons methodology to be explained, a description of the procedures was as follows:
Hackathons consisted of 3 phases.

1st phase

The 1st phase was always an online session that lasted for approximately 1 hour (the LIVE IT team tried to keep it as short as possible, but less than 1 hour was almost impossible), in which all participants had some time to introduce themselves and their team if they wanted, the consortium to present the LIVE IT project to participants, to explain the objectives of the Hackathon and give instructions and guides about the contest. Then, time was given for any questions, regarding tasks in the upcoming days (during the actual Hackathon). During this phase, every section was translated to all 3 consortium countries "on the fly" by team members. Starting from the 3rd Hackathon, the consortium realized that it would be of great benefit for participants to offer the instructions part directly in local languages (English, Greek and Portuguese and decided to create Breakout rooms during the sessions. Therefore, each 1st session of the 3rd, 4th and 5th Hackathon was implemented for its first half with live translation, then turned to Breakout rooms with each LIVE IT partner facilitating and presenting in native languages. In the breakout rooms, participants also felt more comfortable to ask any questions and seek for guided advice. Eventually, about 10 minutes before conclusion, everyone returned to the main room to close the session and kick-off the Hackathon. Concerning the participating teams, it was observed and, advised where possible and necessary, that each team consisted of caregivers, teachers and family members also apart from PwCD. A special school team from Greece was formed for example by 5 people: 2 teachers, 1 social expert and 2 students. Of course, individuals, families and groups of friends were also welcomed to join and take part by forming their own team and contribute to the LIVE IT aims.

2nd phase

The 2nd phase lasted for 1 week. All participants took their own time and followed their own schedules to experiment with the toolkit. It was requested by them to use our toolkit, which, during the first 4 Hackathons, was populated only with tools that facilitate people in activities related to the theme of each specific Hackathon, and observe what they liked, what they did not like, what worked fine and what was not functional, what they would change in order for the toolkit to be even better, while they kept notes of ideas that could potentially make the toolkit more inclusive, accessible and functional. These observations could be presented to the LIVE IT team in any convenient form, either in text, image, screenshot, draw, handwritten explanation, sketch or presentation in PowerPoint. For this task to be completed, each team could spend as much time as they felt comfortable with per try, and then repeat the next day, for as many iterations as needed for them to understand the toolkit and its features and different functions, identify errors and deficits or weak points and to create a suggestion, proposal or idea to share. Participants were advised to use a specific Template to facilitate them in data collection and observing activities (provided through a google doc), although it was understood quite early that teams were not that comfortable with following specific pathways, confirming a similar finding of the co-creation labs.

3rd phase
The 3rd phase was the final session with a duration of approximately 1 hour (again, the LIVE IT teams always tried to keep it as short as possible and follow the audience's needs). Each team had some minutes to present their findings, share their experience and interaction with the toolkit, and of course present their suggestion / idea with which they would participate in the contest. In the case that a participating team was not comfortable presenting or not comfortable with the English language, they could of course send us their presentation and we would present it for them. After the presentations, the consortium would choose the best 3 ideas based on three criteria, Innovation. Documentation and Presentation (more about the selection process on section "4.5 Criteria for selecting the winning teams"). This selection was conducted in a breakout room created during the session. While team members voted and discussed on presentations, representatives of the consortium (team members) remained in the main room with the participants and conducted discussions about the toolkit and the participants' experiences or initiated games that could help with relaxation. Eventually, the consortium presented the top 3, which were awarded with 1 tablet each (in the case that individuals or non-PwCD teams won, they indicated a school / association of the field of their choice). The 3 tablets cost a total of around 1000 Euros per Hackathon. At the end of the Hackathons, a questionnaire was given to participants to answer about their opinion on their involvement in the development of solutions and the co-creating value.

3.2.2 The value of Hackathons in LIVE IT

Implementing sessions of Hackathon in the LIVE IT project was based upon the obvious benefits that would enhance the outcomes and improve their validity. Among these collaborative direct activities, Hackathons offer speed and flexibility in result creation while they ensure the validation of the generated value (with the participation of not only "special" but also end users). Also, Hackathons worked as an accelerator tool, helping the project to move onwards by the interactions with all these communities. Particularly the PwCD community received additional benefits such as the promotion and enjoy of a cooperation culture (they operated in teams), but also a healthy competition culture (there was an award). Added to these, it is safe to mention the co-creation / co-design customer-centric approach that Hackathons have in their nature.
In more practical perspectives, attending a Hackathon is a good way to learn more things, showcase talents and share experiences or passions, or, sometimes, challenges and obstacles management. At the same time, Hackathons are vehicles to knowledge acquisition or understanding of existing knowledge, transmission of this knowledge and its exploitation, its application for a goal or a common initiative, or just for the development of one's personal network and the possibility of being awarded.
In the LIVE IT project, Hackathons facilitated the project to reach some specific goals. Initially, to help in addressing accessibility challenges for people with known difficulties which was done

through end-user data collection. Next, hackathons helped with the validation they offer by collecting feedback and improve results using the actual end-users' suggestions. This way, they ensured the usefulness and functionality of the toolkit. Apart from these, hackathons also helped in the effort to reach more people and announce the results. The decision to implement Hackathons to the LIVE IT project was successful due to the similar natures of the project and hackathons in general. LIVE IT must create almost personalized material, tailored to users' needs while Hackathons are by nature also user centered. Both are interdisciplinary to operate successfully and fulfil their scopes, since hackathons need a set of different originated knowledge and insight to craft a final result and LIVE IT has also engaged a set of experts and diverse researchers to frame the accessibility matter from various perspectives. They both are specific and production oriented, with no abstract outcomes but with a defined delivery schedule and a structure to follow. Another similar element is the brainstorming and experimentation they include which aims to turn participants into creators or co-creators of the end results into this bottom-top approach where end-users contribute to outputs. Finally, the repetitive and continuous nature they share to maintain a dynamic improvement of previous versions of products or outdated products they seek to upgrade.

3.2.3 The Hackathons demographics

A total of 37 teams / participations in 5 Hackathons, coming from:

Table 1 - Teams' origin

Origin	**Teams**
Ireland	5 teams
UK	7 teams
Portugal	11 teams
Greece	14 teams
Design for All Europe	1 team
	38 teams

The allocation of teams' participation in the 5 Hackathons is as follows:

Table 2 - Number of teams participated in each hackathon

Hackathon	**Teams**
1st Hackathon	6 teams
2nd Hackathon	9 teams
3rd Hackathon	12 teams
4th Hackathon	4 teams
5th Hackathon	7 teams
	38 teams

3.2.4 The Hackathons' general feedback

Teams coming from diverse backgrounds such as the researchers' community, students, experts, PwCD, caregivers or family members and associations in the field have experimented with our toolkit and the recommended tools according to each Hackathon theme and gathered their experiences. No previous knowledge was needed, and actually, the feedback was more valuable especially when no technical background was present to the end-users, or any facilitator present in the team. The team has collected numerous ideas and upgrade recommendations to improve the toolkit and its usefulness and acceptability.

Many of the proposals made by participating teams have already been implemented or are in the process of being implemented in the platform, making the toolkit more accessible, more functional and more user-friendly, but more important, closer to what end-users visualise.

The LIVE IT team gave 3 tablets to the 3 best ideas of each Hackathon for their contribution to the work and effort of the project (either organizations, associations, schools, families, individuals, researchers or students). If the winner was not already a school of special education or an association in the field of cognitive disability, the winner would define a school of their choice to receive the tablet. These tablets were used for Hackathon purposes to facilitate the interactions of participants with the LIVE IT toolkit during these activities. The tablets remain property of the institutions of the consortium and were given to the premises of participating organizations temporarily to use and familiarize themselves more with the LIVE IT output, contributing to the sustainability of the project.

Users presented a large spectrum of feedback to the consortium, varying from appearance, layout and interface issues / suggestions to language problems, technical issues and functions to be added along with tools' recommendation and tools' sorting and filtering. A more detailed feedback clustering is presented in the following table. Some ideas have been implemented, some are to be implemented and, finally, some will not be successfully implemented during this project but should be taken into consideration for new relevant future projects towards this direction.

Table 3 - Teams' feedback to the Open Toolkit

Problem	Potential solutions	Status
Appearance		
The LIVE IT Logo is tiny	Increase size	Solved
No info on what the toolkit is for or how to use it	Introductory information in text, video and audio format, human or AI support	Not solved
Font size is too small, both heading and body of text	Make adjustable by user, have in large size as standard	Solved

Font style	Make adjustable by user, have in Open Dyslexic font as standard	Not solved
Font colour	Make adjustable by user	Solved
Background is white	Make adjustable by user	Solved
Lack of visuals	Widgets, images, sign language	Solved
Buttons/links are unclear	Underline text buttons to make clear they are a link	Solved
Images/icons are too small	Make larger or adjustable	Solved
Contrast	Increase of the contrast (use of frames with darker color), so the functionalities are displayed distinctly.	Solved
Layout		
Layout doesn't make clear the best way to navigate	A more considered design will enable users to make a journey through the toolkit. Navigational structure needs to be user friendly with intuitive icons and arrow to direct users. Voice navigation could be added for those who have difficulty understanding even this very basic menu design.	Not solved
Layout is not interesting/appealing	Consider interactive and multimodal content	Not solved
Things are too close together	Have more space between tools/content	Solved
Toolkit selection and type of tool should be next to each other (side by side)	Tools navigation	Solved
The cookies bar should be moved in the lower part of the page, because there are functionalities hidden	The cookies bar does not seem to be responsive. In smaller screens the text should be wrapped in the next line and the Accept Button should not be moved	Solved
Language		
Lack of language options	Easy to switch content to different languages	Solved
Too much text/information - dense text	Option for summary or detailed text, supporting images. Easy to read version of the toolkit – break text up with images/videos	Solved

Language is too complex	Option for summary or detailed text, supporting images. Easy to read version of the toolkit	Solved
No option for audio descriptions	Audio options in different languages and accents	Not solved
Specific Advisor Tool Feedback		
Drop down menu is not user friendly	Consider alternative ways of filtering, for example, multiple choice buttons	Not solved
No info on what each type of tools is/means	Option to click on heading for more details (audio or text based). Small image/logo of each tool that represents in short, what it does	Not solved
Limited filtering options	Enable users to filter the results by a variety of grouping options, for example cost, language, free/paid, user need, rating. One suggestion is as follows: The first thing users would do is answer a series of simple questions to establish what their needs are. These would have multiple choice answers. Users would have the choice to read and/or hear the questions. Ideally there would be a chatbot doing this. Or even better an interactive virtual receptionist (avatar)* The questions would enable the list of tools to be narrowed down to those that meet the user's needs. Example questions: What device / browser are you using, what OS? What challenge / problem do you need to solve? difficulty reading / difficulty with speech and grammar / difficulty with time management / problems with numbers etc. / free or paid tools Once you've answered the questions you enter your virtual library. Here you have access to a range of tools which you can test without the need to download / install / buy them. There is a chat room where you can communicate with others The chatbot (Helpdesk) is available to offer help and support, including access to tutorials.	Not solved
Unclear information on each tool	If tools were available and preloaded in the library even better (and safer)	Not solved

Unclear which tools are free or paid	Have this indicated next to each tool	Not solved
What does rate mean?	Choose a word more easily understood	Solved
Rate button is red	Choose a color suitable for the colorblind	Solved
Focus button	"Since we aim to provide the user with a tool, the most focused icon, button or link should be the one that leads to the tools itself"	Solved
Icons (app logos) are too small	make them bigger/adjustable	Solved
Icons (app logos) are not links to info	insert link to app page	Solved
Tools should be ordered by rating (best to worst)	Tools' order	Solved
Star rating is unclear and too small	Larger emoji rating tool	Solved
How do we know why people rated the way they did?	Users may find interesting to add comments as well. You may add another tab named "Add comment (optional)"	Not solved
There is no way to prevent a user from rating again.	Users need a login?	Solved
After rating it is not efficient to immediately change the position based on the rating of the tools because in this case a user can re-rate the same tool.	Rating presentation	Solved
"Top 5" could be the default value, and if user wants to see all tools they can choose "All". Consider showing the "Top 5" in a different section.	Top 5 as default	Solved
In the tab all, you could add a scroll bar.	Scroll bar	Solved

You can only see the results in a list	Add grid view option	Solved
"I did wonder how the top 5 lists were curated so it would be good to know what criteria was used to determine top 5."	Top 5 explanation	Not solved
Does 'disability' need to be repeated in each tool description?	Decrease use of word disability	Solved
It's unclear how to submit tools	Submit tools clarification	Solved
Tools navigation	"...when you click on the name of the tool it should bring you to more information and then you've the link there to go onto the website. It would be less buttons and an easier flow."	Solved
The toolkit is complicated to use	The Toolkit should open in a new window. The app 'more' button too could open in a new window.	Solved
Tools require download and installation	-The advisor tool could be an online space to spend time trying tools, sharing findings and ideas with others and getting support and guidance	Solved
Arrangement	-Could be arranged according to relevance to issues, browsers, OS, platform or Access Tech (Android, iPhone, Apple iOS, Windows, Chrome, Edge, Firefox and so on)	Not solved
Number results	Number the results	Not solved
Empty sidebar	Remove empty sidebar or add functionalities in it	Solved
Capabilities		
No support	Live chat with help	Not solved
No clear way to communicate with other participants	Contact other participants/users	Solved
No way to communicate with experts	Contact special educators or experts, input from experts	Solved

No clear or easy way to share tools	An easy copy and paste button/function	Not solved
Videos		
Do they have subtitles?	Subtitles	Solved
Are they clear and concise?	Clarity	Solved
Are there enough?	Include more videos with captions, especially to show users how to interact with the toolkit	Solved
Technical issues		
On every load/refresh the sidebar is slowly transitioning	Consider removing hamburger trigger	Solved
Empty sidebar	Remove empty sidebar or add functionalities to it	Solved
Consistency	Create consistency and use common UI elements	Solved
Site doesn't meet Web Content Accessibility Guidelines	Check against Web Content Accessibility Guidelines	Solved
More button	"When I clicked more and then returned to the tools list, it didn't go back to the category I was browsing, and I had to reload each time.	Solved
When you choose a category and press Go Back Button it returns you to the start and you have to re-choose the category.	You could rename the button to “Back to main screen” and add another one for “Back to results”	Not solved
Consistency	Create consistency and use common UI elements	Solved
HTML5 semantic elements	Use HTML5 Semantic elements for proper code structure.	Solved
ARIA use	Use Accessible Rich Internet Applications (ARIA) set of attributes to improve accessibility for people with disabilities	Solved

When rating is done it is not useful to throw you to “More”	After rating	Solved
"The 3 lines beside the logo at the top are do not really do much. For me, they just make the logo smaller which is not necessary."	Remove them	Solved
The Notification (bell) icon does not seem to be working.	It should be either hidden when there are no notifications, or the user should be redirect to a page with past notifications.	Solved
What’s missing?		
No link to social media channels	Links to YouTube, Instagram, FB, Linked in need to be added	Solved
"I think each section should also show people how to use built in accessibility tools on their devices."	Built-in accessibility features	Not solved
"One thing I thought was missing was showing people how to access the features already on their devices. Until I did an assistive technology course a few years ago, we weren't using our iPads to full potential at all as regards accessibility."	Access features guide	Not solved
There should be a loading spinner added, so the user is acknowledged that the search is being processed.	Loading spinner	Solved
Browser extension	Make the Toolkit an extension for browsers, with all the features available in the same place.	Not solved
Safety		
VPN	Free VPN could help due to concerns about hacking vulnerability cyber security	Not solved

Installing app	Installing apps from a trusted source (in the virtual workspace with pre-loaded apps as a starting point perhaps)?	Not solved
Virtual space	Virtual safe trusted space	Not solved
Makerspace		
No link to YouTube	Add link to YouTube	Solved

4 PARTICIPATING TEAMS

4.1 TEAMS AND THEIR ALLOCATION TO EACH HACKATHON

4.1.1 1st Hackathon

The Hackathons started right after the first operating version of the toolkit was uploaded in the Azure platform. The first Hackathon was conducted from the 13th to the 16th of December 2021, and it was the only one with a three-day duration. Parallel indirect feedback we received was that three days are not enough for people to experiment and get familiar with our toolkit and the tools offered for each specific hackathon theme and the consortium decided to extend the experimentation phase of each Hackathon to a one-week duration.

The 1st Hackathon was populated by 6 teams, namely 1 Portuguese team coming from the ADFP foundation (supports young adults with disabilities among others), 1 Irish team that was a family with a member with cognitive disability and 4 teams coming from Greece. The Greek teams varied from a special education school (EEEEK Alexandreias) to the AMEN organisation (elderly care) located in Cyprus, EPSEP Ioannina (quality of life of people belonging to special social groups service provider) and a postgraduate researchers' group called Promesip.

4.1.2 2nd Hackathon

The 2nd Hackathon was the first one with one-week duration and was held from the 28th of January 2022 to the 4th of February 2022. For this specific Hackathon, the consortium took provision of a more oriented experimentation with the toolkit according to the specific theme of this Hackathon, which was *"Dealing with heavy text-based and cluttered pages".* To meet this need, the LIVE IT team identified ~40 websites and shared them with participants. This was meant to facilitate users by having them a prefixed experimentation area and have a more coherent experience among different teams. Provision was made to the different languages of participants, therefore the consortium shared Greek websites to Greek participants, Portuguese websites to Portuguese participants and English / global to English speaking participants (UK and Ireland). These websites were only a recommendation and participants could of course ignore it and use websites that they struggled with in the past, or others that make sense to them to put to the test

The teams that participated in the 2nd Hackathon were: four Portuguese teams, one being the ADFP foundation again, one being the CECD center (specialised support in the areas of education, training, employment, occupational activities, health and home support), and two more teams coming from CBN (Colegio de Ensino Especial – Colegio Bola de Neve - special needs school in Lisbon). Also, from Greece two teams participated, the AMEN organisation and

Promesip students again, while Ireland was represented by one consolidated team (consisted of one Education postgraduate student with Dyslexia, one undergraduate Computer Science student with ADHD and one postgraduate physics student with Dyslexia. Finally, the UK had two teams participating, created in the Bristol co-creation lab from local participants in LIVE IT activities.

4.1.3 3rd Hackathon

The 3rd Hackathon was conducted from the 11th to the 18th of February 2022, and it was the first one to be conducted in all 3 consortium languages. The LIVE IT team members concluded that it would be of benefit if they translate the session "on the fly", making sure that all participants feel they are participating. This way, not only descriptions were given in all three local languages (Greek, Portuguese and English) ensuring they are understood, but at the same time, participants could join in conversations (using their local language and then translated to English by team members) ask questions and feel connected to the activity of the Hackathon.

Teams participating the 3rd Hackathon were: four Portuguese teams known from previous Hackathons (ADFP foundation, two teams from the CBN and one team from CECD), three Greek teams (EEEEK Alexandreias, Promesip and EPSEP Ioannina), one consolidated team from Ireland consisting of the NUIG access center, FIT ICT talent pipeline and Dyslexia Ireland) and two British teams (Bristol co-creation lab participants and Neurodiversity Learning that provides services for young people with special educational needs).

4.1.4 4th Hackathon

The 4th Hackathon was conducted from the 28th of February to the 4th of March 2022. It was once again held in English mainly but with live translations and, also, a part of the first session was in Breakout rooms. To shed some light into this process, the first introductory / explanatory session would begin in English, with everyone participating introducing their teams if they felt comfortable, with the option to speak in their local languages. Necessary translations would be occurring live. Then, at about the halfway of the session's total time (approximately and according to the agenda when reaching 30 minutes in the session), the host (always the Aristotle University of Thessaloniki) would create two Break out rooms, one for Portuguese speaking people and one for Greek speaking people and would assign participants accordingly, while leaving the rest (English speaking) in the main room. This breakout room part

would last for about 15 minutes, where people would comfortably continue the discussions in their native languages, ask questions and get to know each other. Finally, the last 15 minutes of the session would be occurring again in the main room, where the session would be concluded, and the Hackathon would begin.

The 4th Hackathon had representation from all four consortium countries, having the ADFP team representing Portugal, special education teachers' team from Ireland representing Ireland, EPIONI (Greek caregivers' network) from Greece and a consolidated British team (with co-creation lab participants coming from London and Bristol (SCT and A2ndVoice plus).

4.1.5 5th Hackathon

The 5th and final Hackathon was conducted from the 20th to the 27th of May 2022. This Hackathon was supplemented by the help of the EIDD Design for All Europe, which run a parallel Hackathon, or better a parallel strand of the Hackathon, along the usual LIVE IT one but following the same procedures (although did not last one week but one long session). The EIDD strand of the Hackathon was more oriented to a validation of the Open Toolkit in general.

Participating teams were, as mentioned, one team consisted of a working group of four PwCD, a web designer and a web developer, two Greek teams, one being the AMEN organisation, the other being the NIMIA (students' team), a team from Ireland consisted of 3rd level students (aged from 20 to 53 with dyslexia, autism and ADHD), a team from Portugal (CBN) and two British teams (one from an individual person with cognitive disabilities related to the general IT section and the other team a Bristol co-creation participants team).

4.2 FEEDBACK COLLECTED BY TEAMS

Each team followed its own schedule and at its own convenient time interacted with the Open Toolkit of the project. Based on this experience, teams drafted presentations on improvements of tools and the Open Toolkit. The consortium mentioned in each Hackathon introductions that no idea is worse than the rest, no idea has more value than the rest. Every participant is a winner, every user is a winner, and, eventually, PwCD are the beneficiaries of the process followed in Hackathons, because the LIVE IT project will be able to improve its main outcome and thus be more inclusive and user-friendly. Feedback collected from Hackathons was indeed

valuable and important and has transformed the Open Toolkit since the release of the alpha version back in December. Most of the ideas presented in Hackathons are implemented in the Open Toolkit, while some could not be implemented due to a large spectrum of experts that would be required to develop them, due to GDPR issues and ethical concerns that may be linked to such improvements or due to lack of time for such upgrades.
The individual feedback that each team has produced is presented in the next chapters. As expected, there is overlapping and repeated motives. Also, many teams have participated in more than one Hackathon, providing different feedback each time.

4.2.1 ADFP Foundation

The ADFP Foundation participated in the 1st, 2nd, 3rd and 4th Hackathon. The ADFP Foundation team gave the following feedback:
1st Hackathon: Suggestion was made to provide translations and text to speech with the use of a button and also audio options for blind. Also, a cross-platform set of buttons (digital and physical) with functions to enable translations and start reading. Finally, the team stated that the tools presented in the Toolkit were useful and helped them complete daily tasks.
2nd Hackathon: Feedback was given on two specific tools, Helperbird and Total Ad Block with positive and negative aspects mentioned, and also a proposal for the Toolkit to make it an add-on to browsers with all features integrated.
3rd Hackathon: Information provided in the Open Toolkit is too much, but on the same time it misses some important things, such as what essentially each tool does and what is the most suitable one. Also, some tools require registration to access. The idea is to have bigger tools' logos, followed by a simple text description and perhaps an audio button (text to speech).
4th Hackathon: Easy Reading tool feedback was given, focusing that there is no Portuguese language option, and that content replacement did not work but ruler option was very helpful. Regarding the Open Toolkit, they asked for a Portuguese version, and tools' categories to be presented in images.

4.2.2 AMEN organisation

The AMEN organisation participated in the 1st, 2nd and 5th Hackathon. The team gave the following feedback:
1st Hackathon: The team proposed the involvement of professionals in the support of individuals through the Open Toolkit, the offering of a networking opportunity for organisations to exchange good practices and the expert digital support from volunteers. Eventually, the toolkit could be the channel for communication, education, availability, mutuality, responsibility, flexibility and adaptiveness.

2nd Hackathon: Although the AMEN team identified some positive features of text to speech tools, they dislike the robotic voice, the lack of variety in translation options and compatibility issues across different operating systems.
5th Hackathon: They proposed an Interconnected Activity Scheme to be applied and implemented in the Toolkit for interactions between professionals / experts and residents / patients / PwCD.

4.2.3 EEEEK Alexandreias special needs' school

The EEEEK Alexandreias special needs school participated in the 1st and 3rd Hackathon. The team's feedback is presented below:
1st Hackathon: Positive feedback was given on the Open Toolkit, but voice navigation feature could be added. A proposal was made to search the possibilities to integrate the toolkit in public services, in education to facilitate the digital literacy and familiarisation and in places that PwCD may need help navigating, such as public buildings, public transport or shopping malls. Finally, the possibility to train the educators in such digital tools would be beneficial.
3rd Hackathon: The feedback was focused on the need of PwCD by the special educators of EEEEK to maintain their motivation in the interaction. Also, feedback from end-users was given to a set of tools with a preference in reading and writing assets and text from and to speech. At the same time, teachers commented in the interactions of PwCD with the tools and the LIVE IT toolkit based on their observations, which was mainly focused on the relation between the severity of the diagnoses and the usefulness of the digital tools, the importance of the help provided by caregivers / family members during these interactions and, especially for the speech to text tools the provision of a word prediction feature because of articulation problems of children and users.

4.2.4 EPSEP service provider

The EPSEP service provider participated in the 1st and 3rd Hackathon. The collected feedback was:
1st Hackathon: EPSEP proposed to keep the simple design and the small amount of graphic and written information to the Open Toolkit. A second point was made regarding the navigation path of the website, specifically to turn the most focused icon provided in the platform to a link to the tool itself, and not the description, rating and video. Finally, it was also suggested to involve and train caregivers to the use of such platforms to facilitate them in helping PwCD in their own interactions.
3rd Hackathon: It is suggested to add instructions to the Open Toolkit, it could be a short video. Another point is that there is the need from caregivers to support and help during the digital interactions from PwCD with moderate / severe cognitive impairment and, specifically Dementia, when people with primary Dementia and mild symptoms could interact better and

independently for their daily tasks. Also, they praised the role of the toolkit in familiarizing populations with the digital world, expand knowledge and get in contact with experts through the stakeholders' database and the makerspace to discuss on Guidelines and have an online discussion with chatbots or live chat to connect to specialists.

4.2.5 Irish family

The Irish family participated in the 1st Hackathon. The team offered feedback on a couple of tools relevant to the theme of the Hackathon, namely Avira which received no negative comment, Android scanner which has too much text and Access Angel which is unfortunately not free to use, and the toolbar and icons are not up to date but has a great feature that reads text from photos or the camera of a tablet or a smartphone and could be useful because it links the real world with the digital asset.

4.2.6 Promesip students

Promesip students participated in the 1st, 2nd and 3rd Hackathon. The team offered the following feedback:
1st Hackathon: The general feedback is that it is an easy-to-use platform with easy access to information. Then, the feedback was focused on technical issues and layout improvements that could be implemented, such as font sizes / font weights, alignments of texts and other website elements, images ratio corrections, underlining of buttons to clarify the call-to-action capacity, elements that are hidden due to interface source code errors, adding counters to the ratings, fixing the website head title, erasing a notification bell that was pointless, a cookies bar malfunction, some contrast issues and some more technical suggestions.
2nd Hackathon: A presentation of the colour theory, harmony and colour wheel was made in order to be considered to be implemented in the Open Toolkit to offer better colour combinations, followed by some technical suggestions / correction, the use of the "Go Back" button, the addition of a comments' field, a prevention system for users not to be able to rate more than once for each tool, the appearance of the top five tools of each subcategory as a default option instead of presenting all of them and the addition of a grid way of tools' viewing and some filtering options.
3rd Hackathon: This feedback of Promesip was once again a technical one with technical recommendations and some developmental corrections, contrast issues and the use of web accessibility evaluation tools to assess the level of the website accessibility. This presentation of Promesip included a "speech to text" app that recognises some key words from a user's dictation and tries to link them to specific relevant accessibility tools. For example, the user could dictate "airport", and then the Speak It app would recommend the user to use a set of apps relevant to that, such as Google maps to view the airport and options to go there, Uber to get a taxi, public transportation apps to view the schedules etc.

4.2.7 Bristol co-creation lab participants

The Bristol co-creation lab participated in the 2nd, 3rd and 5th Hackathon giving the following feedback:

2nd Hackathon: Feedback collected from the British co-creation lab team was about various elements, one being the recommendation of the Liquid Mode app from Adobe, which adapts PDFs to more readable and easily navigable documents. Another feedback was possible solutions to dense and long complex text and website, such as the listing of articles and elements to appear one at a time while scrolling down, colour change, size font change, the offer of abstracts or even titles for paragraphs, provision of symbols and images to explain content, a feature to highlight key words, read aloud options and a button that could enable all these mentioned features or a selection of them on any page the user is. Another important point was made about the realism of text to speech voices so that they are more emotional and not that robotic and even the possibility of technologies that could read lips. Feedback was also given about features that could blur the rest of the screen and let the text the user is reading highlighted or fade the background out, but the most important call was the fact that simpler websites need to be developed, websites with symbols, pictograms, images, animations, less text, or at least provision of simplification tools integrated in the websites, content culturally appropriate, easy to use buttons, visual and audio options, safety options for protecting vulnerable users from inappropriate or unsafe content and misinformation. Additionally, participants from the Bristol co-creation lab team stated that they would love more training and help, not only about technology and digital skills, but also about social life, work / life and internet balance and ways to reduce cognitive overload. Finally, a strong message was sent out when participants mentioned that they ignore the existence of such digital tools and they are willing to use them, as long as someone could train them.

3rd Hackathon: Participants asked for more filtering options in the Open Toolkit, customisable features (font size, colour, style) and supporting images. Also, there was a tool idea for customising any website and for changes to remain saved for future visits on this website. Customisation would include removing pictures, ads, animations and videos, drag and drop items of the website, change of font sizes, styles and colours and the change of background colours and schemes and the removal of busy backgrounds or unnecessary details. Another suggestion for the Open Toolkit was to add video call option for help and support, add other languages for people not speaking English, add audio options for people who cannot read, add descriptions to categories and subcategories of tools, the change of the star rating system to an emoji rating system and using less text wherever possible.

5th Hackathon: This feedback from the Bristol co-creation lab was about the navigation flow in the Open Toolkit. Participants mentioned that they are sometimes lost and do not know where they are in the process, what will happen next, also they feel anxious about words' meaning and where the lead. For this problem, a solution proposed would be to add a simple video

instruction, or a step-by-step manual for the basic functions of the Open Toolkit and a visible sitemap to help with understanding each page.

4.2.8 CBN special needs' school

The CBN special needs school participated in the 2nd, 3rd and 5th Hackathon. The collected feedback is presented below:
2nd Hackathon: The CBN team suggested to replace the star rating system to an emoji rating system, the possibility of a Portuguese version and instructions to what each tab is for, what the user can do by using it.
3rd Hackathon: The CBN team suggestion was the provision of video presenting each challenge, what this challenge means and possible solutions to these challenges because PwCD not always understand their condition or how it is called.
5th Hackathon: Participants tend to forget their passwords, and when using password managers, they tend to forget their password manager master password. They are also unaware of their difficulties and would not know or like searching for new tools. Therefore, it would be great if they could use a tool that identifies what challenges they face and show possible solutions. To that purpose, a virtual personal assistant would be of use, with the feature of keeping notes on the user profile and inform him that he / she for example usually forgets passwords and that the field could be saved and prefilled automatically. Likewise, the virtual personal assistant could identify other challenges, such as difficulties in reading long texts due to dyslexia. In this case, when the screen shows a long text, the assistant could automatically offer the option to read the text aloud. This assistant could keep track of users' activity to build a personal profile and could keep track of results to suggest solutions accordingly and based on interactions.

4.2.9 CECD center

The CECD center participated in the 2nd and 3rd Hackathon. CECD proposed in each Hackathon:
2nd Hackathon: The CECD team gave feedback on Microsoft Narrator, Text Help: Read and Write, CBoard, HelperBird, Total Ad Block, Liquid Mode and Minimal Consent with both positive and negative comments. Microsoft Narrator was very useful, but it lacks of an automatic change of paragraph, Text Help: Read and Write includes easy to read icons and an appealing toolbar but there exists no Portuguese version, CBoard is also useful but no available in Portuguese, Helperbird is useful but requires download and installation and is confusing due to too many options integrated, Total Ad Block is very useful because "ads are boring and distracting our focus" but is a paid tool, Liquid Mode is helping by increasing font sizes making text easier to read but is characterised as unintuitive and unclear and finally, Minimal Consent is also nice but requires the Opera Browser and instructions should be in larger font size. The

final idea is about the development of a tool that could make subtitles slower and longer visible in the screen.
3rd Hackathon: The CECD team focus in some layout comments on the Open Toolkit, font sizes, tools' icon sizes and emojis' rating system size while feedback was also given regarding the descriptions of tools which should have less information, the recommended tools' list should be sorted by ratings and the tool logo should link to the tool itself. Also, while using Alexa and Google Assistant, the team noted that, while they are free, they have no ads, and are useful to make quick searches, it often does not recognise the dictations.

4.2.10 Irish team (students with cognitive disabilities)

The Irish students team participated in the 2nd Hackathon. The Irish students' team experimented with the Open Toolkit and gathered a couple of layout comments, such as font sizes that could be a little bigger, they liked the lack of many colours and distractions, but also proposed a comments field to be added. They liked the advisor tool and the recommendation of many tools to try for their challenges and it was stated that it is good to be able to view reviews from others looking for similar helping suggestions. In some specific tools' appraisal, the team thought that Snap and Read is difficult to navigate and the option to slow the speed of the reader should be visible, they would also like to have at the same time the options to make font bigger, but a supporting video or something visual would be even better to help focus more. Also, the team does not like the voices used. Assessing some display helpers, HelperBird received positive feedback about the dyslectic font, but it is disliked that more features and upgrades are available only in the paid version. It is noted that it would be better if HelperBird could be integrated with a text to speech tool so that users could read along with the readers. Also, problems emerge when some PDFs' fonts cannot be changed, and the fact that people usually copy paste texts to MS Word if they want it to be read aloud.

4.2.11 Neurodiversity Learning

The Neurodiversity Learning team participated in the 3rd Hackathon. The team focused in the lack instructions on what to do, therefore could use a video call for support. Also, a changeable font size and type for the visually impaired, the use of sign language for communication, visual instructions, other languages apart from English for the website and audio options was given as feedback. The stars' rating system was compared to a better emoji rating system, and the descriptions should contain less information and simplified text to increase accessibility. The main feedback was about familiarisation with technologies and digital tools and to have an as possible personalised approach to enable a wide variety of individuals to engage.

4.2.12 Irish team (NUIG access centre, FIT ICT talent pipeline and Dyslexia Ireland)

The Irish team of NUIG access centre, FIR ICT talent pipeline and Dyslexia Ireland participated in the 3rd Hackathon. The team suggested to use Hive layout when selecting challenges and then to present the recommended tools instead of dropdown menus and lists, to include more tools' grouping options, to include more videos with captions, the changing of fonts and colours to balance between being engaging and accessible and also have a clear method for submitting new tools.

4.2.13 EPIONI (Greek caregivers' network)

The EPIONI network participated in the 4th Hackathon. The EPIONI network team recommended to use black-grey and some blue since these colours do not tire and do not distract attention, to have gaps between menus to be distinct and have white background with spaces to help with the content presentation. Also, they praised the need for clear options with easy symbols and explanations to be given through images, melodies or videos. The EPIONI team is suggesting the DeepL translator, while mentions that Google Calendar is indeed a nice tool, though it requires a lot of training from people with ADHD to be able to use its various valuable features and learn it, actually, they refer to an old cell phone calendar application that was very effective because it was very simple – "I could easily put a title and date / time. Now windows open and ask for information – it is way more complicated". Finally, it would be better if video descriptions where possible for everything, even categories and challenges, narration available for every information, melodies playing when hovering above buttons and images describing tools.

4.2.14 Irish special education teachers

The Irish special education teachers team participated in the 4th Hackathon. The team actually stated that the Toolkit may be too simple for older kids or teenagers and that it would not be very attracting to them. An indirect feedback collected was the fact that, people cannot easily identify when something is an error caused by the website, or an error caused by their browser / device. Therefore, it is essential to provide content with minimal errors because otherwise it may be confusing and possible solutions / answers more difficult to be defined. Another important point is the need for familiarisation of people with accessibility tools already embedded in their devices and some instructions on how to use them – sometimes it is not that necessary to download / install a new tool, a functional and high-quality tool is already pre-installed in devices. Finally, suggestions were made to add reminders to rate tools that were used by users, to view whether tools are free or need payment and video descriptions of tools.

4.2.15 British SCT and A2ndVoice Plus

The British SCT and A2ndVoice team participated in the 4th Hackathon. The British team reported that expertise and prior knowledge is required to use the Toolkit, even though it is as simple as possible. That is because many tools require download and installation. It would also be better if everything opens in a new window and not on the same. Also, it is requested to provide with a free VPN service to help with concerns about hacking vulnerability and cyber security, a virtual workspace with preloaded / preinstalled applications and navigational structure to be user friendly with intuitive icons and arrows to direct users. Another point was made regarding the Open Toolkit functions such as creating a user profile through a questionnaire filled in by users with questions to establish what their needs are using multiple choice answers, either written or by using a chatbot, or ideally an interactive virtual receptionist (avatar). Throughout this process, the list of tools could be narrowed down to those that meet the user's needs and then, a virtual library could be presented including a range of tools, a chat room to communicate with other users and a helpdesk available to offer help and support and access to tutorials.

4.2.16 EIDD Design for All Europe team

The EIDD Design for All Europe network team participated in the 5th Hackathon. The team mentioned the need of training and support of users, especially PwCD, the need of translation of the Open Toolkit using APIs if necessary, such as the DeepL, the importance of step-by-step instructions to tools, the use of chatbots for support but also to help with daily digital tasks, such as understand incomplete sentences. Also, FAQs are considered as a good element, especially if the section is supported by explanatory pictures, so would online tutorials and training on the tools' functions conducted by a trainer, depending on the complexity of the tools also incorporating some exercises with specific objectives and tasks. Another point was made in the importance of videos' length and the possibility of dividing videos into smaller chapters.

4.2.17 NIMIA students' team

The NIMIA students team participated in the 5th Hackathon. The main feedback collected from the NIMIA team was the development of a section for education purposes, to facilitate educators to teaching digital abilities and skills to PwCD.

4.2.18 Irish 3rd level students' team

The Irish 3rd level students team participated in the 5th Hackathon. A key point of this feedback is that raw information or raw content, though useful resource to others may be not that useful for PwCD, information should be as easy as possible to access and just providing "links with

information needed being included somewhere in there, is like sending a whole book to search for just a paragraph of information needed". It is also mentioned that FAQs are useful in "simple jargon" and with as many heading to be easy to follow, they should not include long texts and could be easier if images and diagrams were included. A point was made also for videos and how they prefer videos with no ads, no breaks and no recommendations on the sides that distract, human voices instead of Text to speech robotic voices and high-quality captions that follow smoothly the video – they also referred to the "Khan Academy" but with more resources and larger community.

4.2.19 British individual

A British individual with cognitive disabilities participated in the 5th Hackathon. The presentation of a British individual PwCD from the IT field is about the process of the creation of a WordPress webpage. The created website has information on five Hackathons integrating relevant presentations from all participating teams. This effort could help with the web-authoring digital skills' capacity acquisition and building.

4.3 CRITERIA FOR SELECTING THE WINNING TEAMS

For hackathons, participants form teams for brainstorming solutions and suggestions on tools and the user-friendliness and usability of the toolkit. All proposed solutions are considered and offer valuable feedback on the further development of the outputs of LIVE IT. The best three (3) ideas are awarded with a prize from the Hackathons' committee (project members). A set of criteria are established for the process of selection to be objective and accurate.
The criteria stand on three pylons: Innovation, Documentation and Presentation. In specific, the committee will evaluate each idea in terms of how innovative and prototype it is. How it affects the toolkit and the impact for the users. This is the most important criterion.
Following that, the documentation of each idea will be evaluated. How clearly it defines the problem and how well descriptive it is. This is crucial for the committee to understand the issue descripted and how it may be addressed by the presented suggestion.
Finally, a good presentation will act as a booster in terms of classification. A good presentation is explanatory for everyone to understand the idea, not only the committee but other participants too. A well-designed and polished presentation of ideas is taken also into account.
Following these criteria, the table to be used for voting and selecting the top three (3) ideas is Table 1 as presented below.

<u>Evaluation of Hackathons entries:</u>
1. Idea - be innovative and suggest a solution to the need or problem found
2. Implementation - to be a practical proposal and creative

3. Design - consider the UI / UX (user interface / user experience)
4. Presentation - the proposal should be clearly defined, and the problem should be resolved

Table 4 - Rating the presented ideas

Name of the LIVE IT project member				
Partner				
Team's title	**Innovation - 20**	**Documentation - 20**	**Presentation - 20**	**Total - 60**
				0
				0
				0
				0

The actual voting tables from Hackathons are presented in the tables below.

1st Hackathon:

Table 5 - Irish Family

Project member	**Innovation - 20**	**Documentation - 20**	**Presentation - 20**	**Total - 60**
Giannis	17	18	19	54
Savvas	19	20	20	59
Katerina	19	20	17	56
Lina	18	18	18	54
Sara	18	18	18	54
Miana	18	20	19	57
Greg	18	18	18	54
				388

Table 6 - ADFP

Project member	**Innovation - 20**	**Documentation - 20**	**Presentation - 20**	**Total - 60**
Giannis	17	16	17	50
Savvas	17	16	16	49
Katerina	18	16	17	51
Lina	16	17	16	49
Sara	17	16	15	48
Miana	18	17	17	52
Greg	18	16	17	51
				350

Table 7 - AMEN

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	17	16	16	49
Savvas	16	17	16	49
Katerina	15	17	16	48
Lina	16	18	16	50
Sara	17	16	17	50
Miana	16	17	16	49
Greg	17	16	16	49
				344

Table 8 - EEEEK Alexandreias

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	16	15	15	46
Savvas	15	16	15	46
Katerina	16	16	16	48
Lina	16	15	15	46
Sara	16	16	16	48
Miana	16	16	15	47
Greg	15	15	16	46
				327

Table 9 - EPSEP Ioannina

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	15	16	16	47
Savvas	15	16	16	47
Katerina	16	15	15	46
Lina	15	16	16	47
Sara	16	15	15	46
Miana	15	16	15	46
Greg	15	16	15	46
				325

Table 10 - Promesip

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	15	14	16	45
Savvas	15	14	17	46
Katerina	14	15	17	46
Lina	14	14	16	44
Sara	15	15	16	46
Miana	14	15	17	46
Greg	14	15	17	46
				319

2nd Hackathon:

Table 11 - Promesip

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	17	18	19	54
Savvas	19	20	20	59
Katerina	19	20	17	56
Lina	18	18	18	54
Sara	18	18	18	54
Miana	18	20	19	57
Greg	18	18	18	54
				388

Table 12 - CECD

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	16	17	17	50
Savvas	17	16	16	49
Katerina	15	15	18	48
Lina	16	16	17	49
Sara	18	15	15	48
Miana	17	16	16	49
Greg	18	16	16	50
				343

Table 13 - Bristol1

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	17	16	17	50
Savvas	17	16	16	49
Katerina	16	16	17	49
Lina	16	17	16	49
Sara	16	15	15	46
Miana	15	16	17	48
Greg	16	16	17	49
				340

Table 14 - ADFP

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	17	16	15	48
Savvas	15	16	16	47
Katerina	16	16	15	47
Lina	15	15	16	46
Sara	17	17	17	51
Miana	16	16	17	49
Greg	16	16	16	48
				336

Table 15 - Irish students

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	16	16	17	49
Savvas	14	15	15	44
Katerina	15	16	16	47
Lina	16	16	16	48
Sara	15	15	13	43
Miana	15	16	16	47
Greg	15	16	16	47
				325

Table 16 - CBN2

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	18	16	16	50
Savvas	15	14	12	41
Katerina	15	15	13	43
Lina	17	15	16	48
Sara	16	15	13	44
Miana	18	16	16	50
Greg	16	15	16	47
				323

Table 17 - Bristol2

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	14	14	13	41
Savvas	14	14	12	40
Katerina	14	15	13	42
Lina	15	15	13	43
Sara	15	15	13	43
Miana	16	16	17	49
Greg	16	16	16	48
				306

Table 18 - CBN1

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	16	14	12	42
Savvas	16	14	12	42
Katerina	13	15	11	39
Lina	14	14	13	41
Sara	17	15	13	45
Miana	17	15	15	47
Greg	17	15	13	45
				301

Table 19 - AMEN

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Giannis	12	13	14	39
Savvas	11	10	12	33
Katerina	10	11	14	35
Lina	12	12	14	38
Sara	13	15	14	42
Miana	14	15	15	44
Greg	14	15	15	44
				275

3rd Hackathon:

Table 20 - Promesip1

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	18	54
Giannis	18	18	18	54
Miana	17	18	18	53
Sara	18	19	18	55
Savvas	17	18	19	54
Stavroula-Lina Makroglou	18	19	18	55
Amy	18	18	18	54
				379

Table 21 - Promesip2

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	18	54
Giannis	17	17	17	51
Miana	17	17	17	51
Sara	19	19	18	56
Savvas	16	18	17	51
Stavroula-Lina Makroglou	19	19	19	57
Amy	19	19	19	57
				377

Table 22 - Neurodiversity Learning

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	17	53
Giannis	17	18	17	52
Miana	17	18	17	52
Sara	18	19	16	53
Savvas	18	17	18	53
Stavroula-Lina Makroglou	17	17	17	51
Amy Arc	18	18	17	53
				367

Table 23 - Irish team: NUIG Access Centre, FIT ICT Talent Pipeline, Dyslexia Ireland

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	17	17	52
Giannis	18	17	17	52
Miana	17	18	17	52
Sara	17	15	16	48
Savvas	17	18	17	52
Stavroula-Lina Makroglou	17	17	17	51
Amy	18	17	17	52
				359

Table 24 - CBN2

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	17	17	18	52
Giannis	16	16	18	50
Miana	17	17	18	52
Sara	17	17	18	52
Savvas	17	16	18	51
Amy	17	16	18	51
Stavroula-Lina Makroglou	16	16	18	50
				358

Table 25 - EPSEP Ioannina

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	16	17	17	50
Giannis	17	17	17	51
Miana	16	17	17	50
Sara	17	17	17	51
Savvas	18	16	17	51
Stavroula-Lina Makroglou	18	18	18	54
Amy	16	17	17	50
				357

Table 26 - EEEEK Alexandreias

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	17	17	17	51
Giannis	16	17	16	49
Miana	16	17	17	50
Sara	17	16	17	50
Savvas	17	16	16	49
Stavroula-Lina Makroglou	16	17	16	49
Amy	17	16	17	50
				348

Table 27 - Bristol

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	17	16	16	49
Giannis	18	16	16	50
Miana	17	16	16	49
Sara	17	15	15	47
Savvas	17	16	16	49
Amy Arc	17	16	16	49
Stavroula-Lina Makroglou	17	18	16	51
				344

Table 28 - CBN1

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	17	16	16	49
Giannis	16	15	16	47
Miana	17	16	16	49
Sara	17	15	17	49
Savvas	15	16	16	47
Amy	17	15	16	48
Stavroula-Lina Makroglou	16	15	16	47
				336

Table 29 - ADFP

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	16	15	16	47
Giannis	16	16	16	48
Miana	16	15	16	47
Sara	16	16	16	48
Savvas	16	15	17	48
Stavroula-Lina Makroglou	16	16	16	48
Amy	16	16	16	48
				334

Table 30 - CECD

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	16	16	17	49
Giannis	15	16	15	46
Miana	16	15	16	47
Sara	16	16	17	49
Savvas	15	15	16	46
Stavroula-Lina Makroglou	15	16	15	46
Amy	16	16	16	48
				331

4th Hackathon:

Table 31 - British

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	19	19	19	57
Giannis	20	19	19	58
Miana	20	19	19	58
Sara	20	20	19	59
Savvas	19	20	20	59
Stavroula-Lina	20	20	20	60
Amy	20	19	19	58
				409

Table 32 - Irish special education teachers

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	19	19	19	57
Giannis	19	19	18	56
Miana	19	19	19	57
Sara	18	19	18	55
Savvas	18	18	18	54
Stavroula-Lina	19	19	19	57
Amy	19	19	19	57
				393

Table 33 - ADFP

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	19	19	18	56
Giannis	18	18	18	54
Miana	19	19	19	57
Sara	19	19	19	57
Savvas	18	19	18	55
Stavroula-Lina	19	19	19	57
Amy	19	19	18	56
				392

Table 34 - EPIONI

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	19	18	18	55
Giannis	18	18	18	54
Miana	19	19	19	57
Sara	18	18	18	54
Savvas	17	18	18	53
Stavroula-Lina	18	18	18	54
Amy	19	18	18	55
				382

5th Hackathon:

Table 35 - EIDD

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	18	54
Giannis	18	18	18	54
Miana	17	17	17	51
Sara	17	17	17	51
Savvas	17	17	17	51
Stavroula-Lina	18	18	18	54
Amy	17	16	16	49
Clare	17	16	17	50
				414

Table 36 - CBN

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	18	54
Giannis	17	17	17	51
Miana	17	17	17	51
Sara	17	17	17	51
Savvas	17	17	17	51
Stavroula-Lina	17	18	17	52
Amy	16	17	18	51
Clare	18	17	17	52
				413

Table 37 - BRISTOL

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	18	54
Giannis	16	16	17	49
Miana	17	17	17	51
Sara	18	18	18	54
Savvas	16	16	16	48
Stavroula-Lina	16	16	18	50
Amy	17	16	16	49
Clare	17	16	17	50
				405

Table 38 - UK INDIVIDUAL

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	18	54
Giannis	16	16	16	48
Miana	17	17	17	51
Sara	17	18	18	53
Savvas	16	16	16	48
Stavroula-Lina	16	16	17	49
Amy	16	17	16	49
Clare	17	16	17	50
				402

Table 39 - IE 3rd LEVEL STUDENTS

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	18	18	18	54
Giannis	16	17	17	50
Miana	17	17	17	51
Sara	16	16	16	48
Savvas	16	16	16	48
Stavroula-Lina	16	17	17	50
Amy	15	16	17	48
Clare	16	16	17	49
				398

Table 40 - NIMIA

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	17	16	16	49
Giannis	14	15	14	43
Miana	14	14	14	42
Sara	15	15	15	45
Savvas	14	13	14	41
Stavroula-Lina	14	14	14	42
Amy	14	14	14	42
Clare	15	15	15	45
				349

Table 41 - AMEN

Project member	Innovation - 20	Documentation - 20	Presentation - 20	Total - 60
Greg (Arc)	14	14	14	42
Giannis	14	14	15	43
Miana	14	14	14	42
Sara	16	16	16	48
Savvas	14	14	14	42
Stavroula-Lina	14	14	14	42
Amy	14	15	14	43
Clare	14	15	15	44
				346

5 FEEDBACK ANALYSIS

The feedback collected from five Hackathons offers data regarding mainly the Open Toolkit but other accessibility tools also. In this section, light will be shed in raw data and some insight generated by this data.

5.1 FEEDBACK ANALYSIS

5.1.1 Ideas per Hackathon

Starting with Figure 1, we see information about ideas crafted in each of the five Hackathons. This is irrelevant to how many teams participated in each Hackathon, since ideas and feedback does not depend by the number of teams – each team provided more than one feedback in each participation. We could also note here that teams' participation per Hackathon were as follows: 1st – 6 teams, 2nd – 9 teams, 3rd – 12 teams, 4th – 4 teams, 5th – 7 teams.

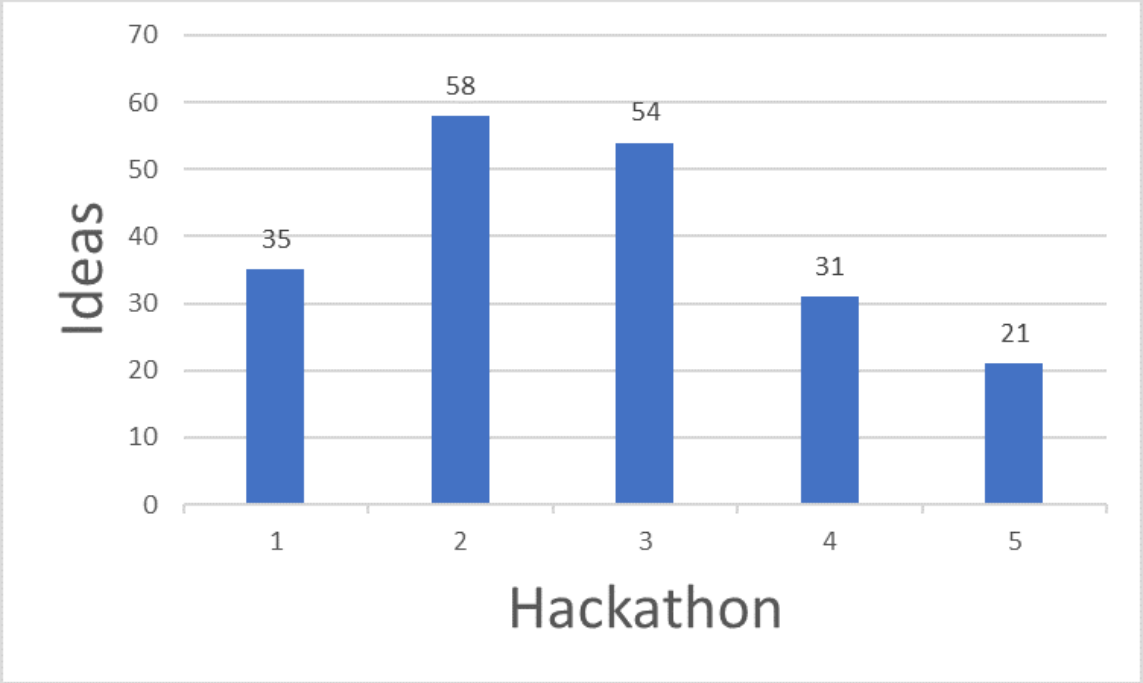

Figure 1 – Ideas per Hackathon

5.1.2 Attitude of ideas

Ideas presented by teams could be interpreted as positive feedback, negative feedback or neutral / suggestion type of feedback. We consider as positive the feedback that praises an element already implemented, feedback that agrees with a function or a choice developed and implemented or a successful assessment that makes users feel fine with the existing product. Negative is considered all feedback that records unsuccessful interactions of users with tools or some of its elements and the toolkit or some of its elements. Either it is accompanied with a request or suggestion for an improvement, the negative comment is noted and characterized as such. Finally, neutral or suggestion, is considered the feedback that is neither good or bad, it is just an identification or a note to be further considered, and specific suggestions made regarding a specific tool, the toolkit or an element of these but rather as a proposed improvement and not as an essential and necessary amendment. This attitude is presented in Figure 2 below.

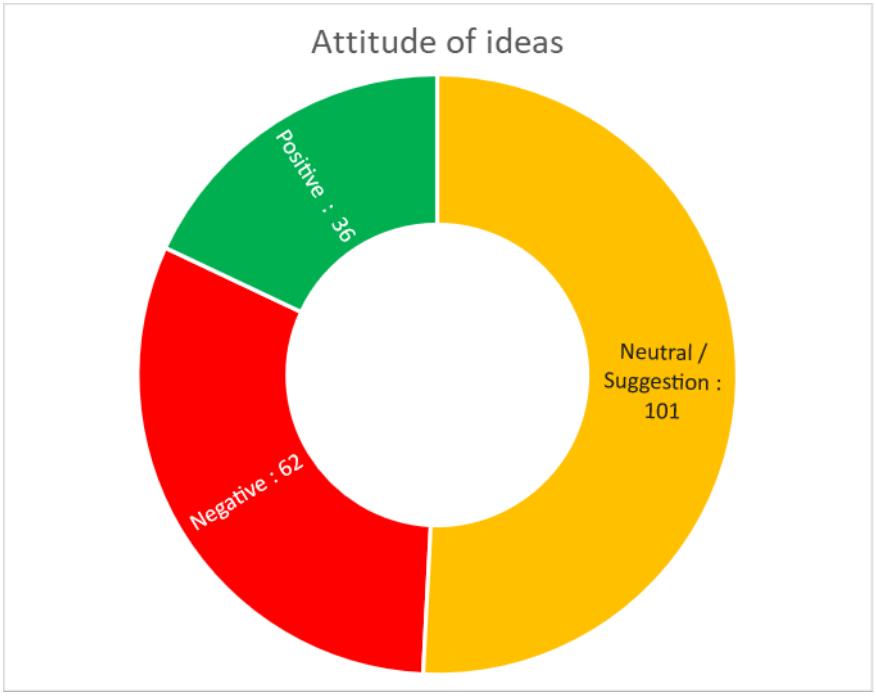

Figure 2 – Attitude of ideas

5.1.3 Ideas' target

Teams participating in the Hackathons were instructed in the way to participate in the activities during the first sessions of each Hackathon. There, in English and also in local languages, detailed instruction was given about the steps that should be followed during the days of experimentation with the Toolkit and with the tools relevant. At the same time, the LIVE IT

consortium recognised that difficulties that participants could face and indeed did face in relation to their interactions. Based on this observation, the team decided to allow participants to freely interact and experiment with tools and the Open Toolkit and keep notes on their findings. This has an impact on data collection, but most importantly keeps participants engaged, happy to be involved and, actually, happy to come back and join in Hackathons again. This is the reason why ideas collected were not equally targeted to the various tools integrated in the Open Toolkit and the Open Toolkit itself. Tools' feedback was collected through the co-creation labs though, therefore it is a positive outcome that Hackathons did offer feedback to the Open Toolkit as well. Figure 3, 4 and 5 show ideas' attitude to the various specific tools, the Open Toolkit and tools clusters (i.e., "text to speech tools should not have robotic voices but human voices") and then presented altogether.

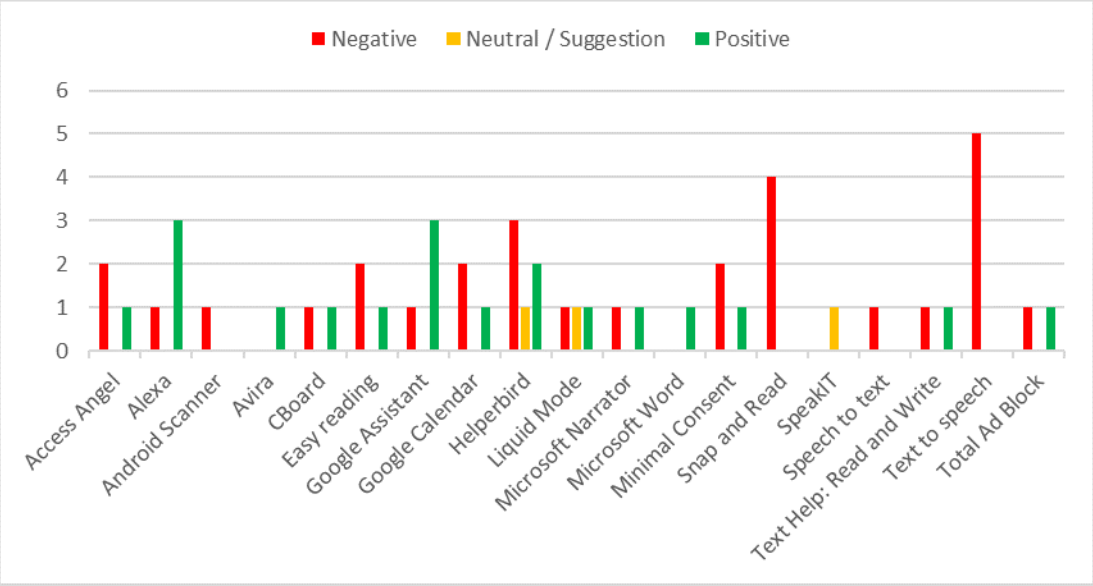

Figure 3 – Ideas' target for specific tools

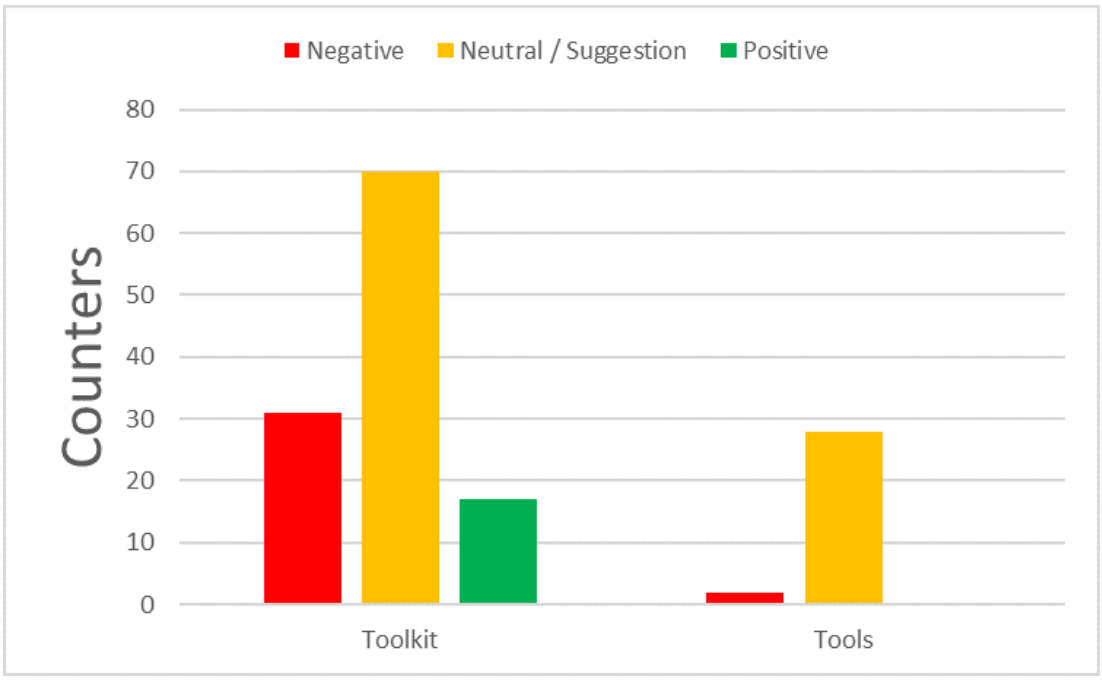

Figure 4 – Ideas' target for Toolkit and tools clusters

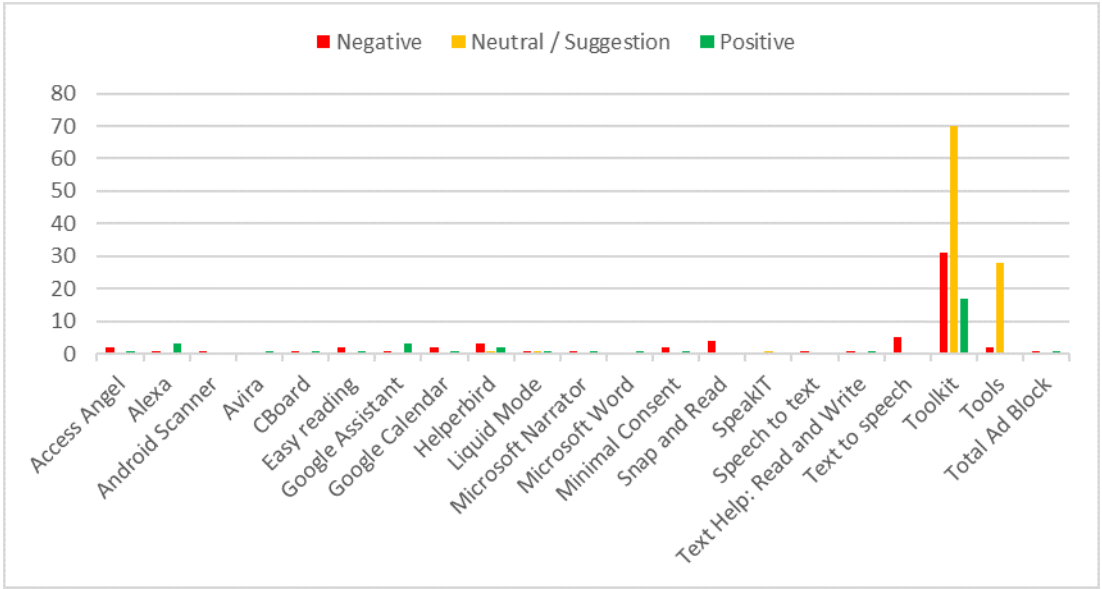

Figure 5 – Ideas' target

5.1.4 Stakeholders' attitude

Hackathons were populated by many diverse teams, coming from different countries, differentiating in their types, i.e., there were individuals, families, researchers, PwCD, associations in the field, organisations in the field, service providers etc. Their participation varied from just once to four times. The feedback they gave helped the project to improve the Open Toolkit and create a database of recommendations. The attitudes followed by the participating teams in all their Hackathons are presented below in Figure 6.

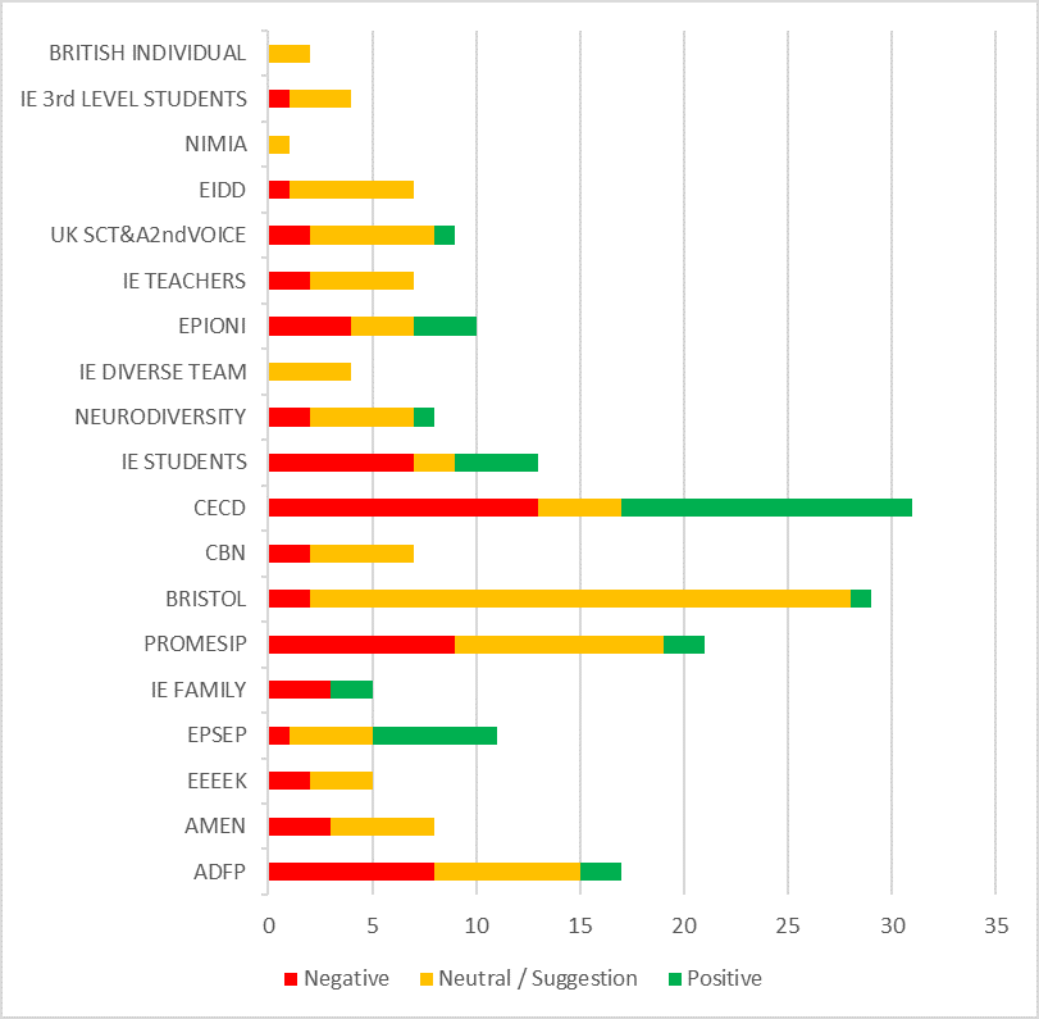

Figure 6 – Teams' attitudes

5.1.5 Attitudes per feedback cluster

Feedback collected from Hackathons was clustered to some basic pylons and was coded to help with sorting and with ensuring consideration. Clusters identified were namely, Compatibility, Content, Exploitation, Function, Language, Layout, Usability. These clusters were created based upon raw feedback collected in order to create pools of feedback with common content. Compatibility refers to issues related to different platforms or operating systems and malfunctions created because of this. Content refers to texts, descriptions, abstracts or other comments that would require some adjustment on the content of an element itself. Exploitation is the cluster of feedback that includes ideas for future use and ways to exploit the object of the comment, either Toolkit or another tool. The Function cluster includes all comments and ideas that refer to the edit of an existing function or the addition of a function that solves a situation. Language refers to issues created because of language use, usually because a digital assisting tool is offered only to an English version and not local languages. As Layout is labelled every idea that is related to fonts, graphics, alignments, sizes, colours and presentation approaches of digital content. Finally, Usability is used to tag comments made regarding the ease or difficulty in operating a tool and ways to enhance or facilitate this interactive digital experience. This clustered feedback is presented in the following Figure, Figure 7.

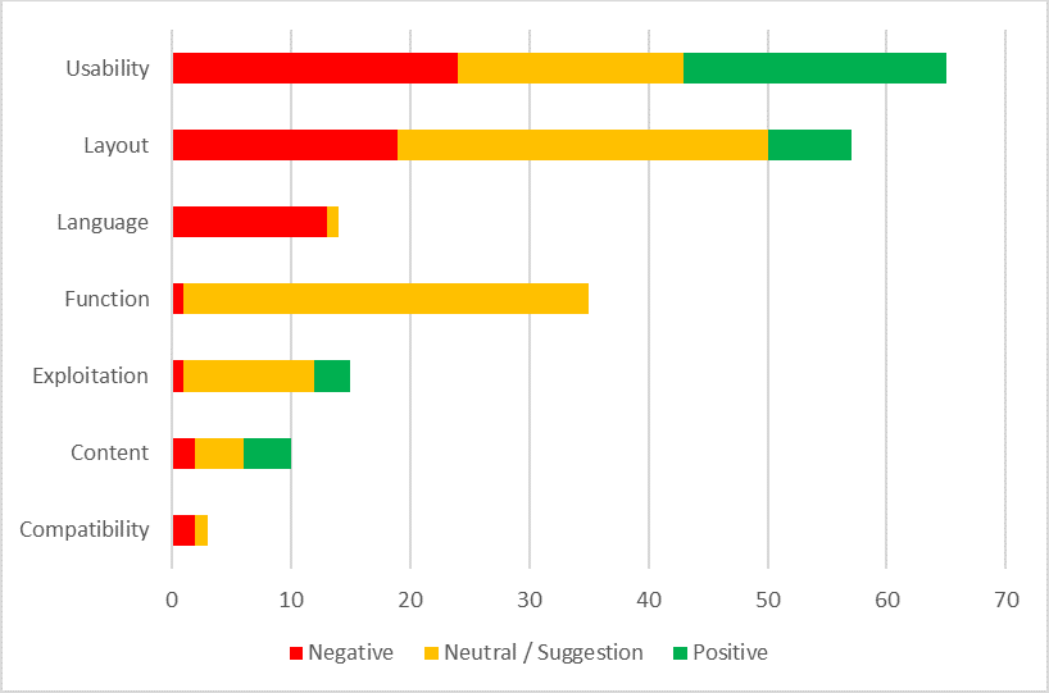

Figure 7 – Clustered feedback attitudes

5.1.6 Ideas' clustered

Finally, collected feedback consists of ideas. These ideas were sometime overlapping each other, some were more often encountered, other not that often. In order to identify importance of some ideas, repeatedly reported ideas have been consolidated and are presented in Figure 8.

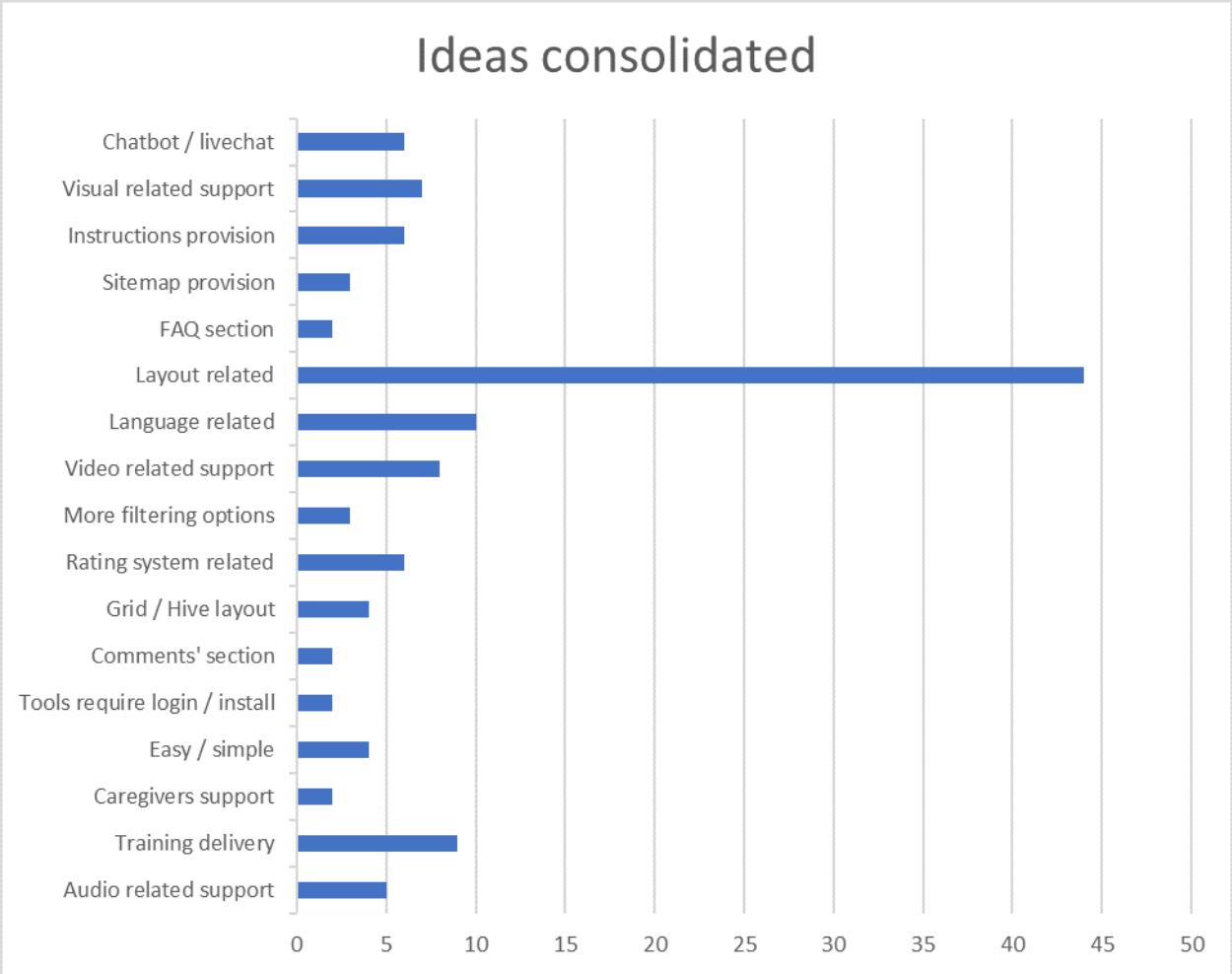

Figure 8 – Ideas consolidated

5.1.7 Raw feedback table

A feedback table based on ideas and presentation crafted from each participating team of each Hackathon is presented below in Figure 9.

Table 42 - All feedback data from Hackathons

Data source	Stakeholder	Qualitative data	Target	Cluster	Attitude
1st Hackathon	ADFP	Toolkit to be offered in more languages	Toolkit	Language	Negative
1st Hackathon	ADFP	Tools with text to speech functions with the use of a button	Tools	Function	Neutral / Suggestion
1st Hackathon	ADFP	Toolkit audio options for blind	Toolkit	Usability	Neutral / Suggestion
1st Hackathon	ADFP	Tools with cross-platform set of buttons	Tools	Compatibility	Neutral / Suggestion
1st Hackathon	ADFP	Toolkit the tools presented were useful	Toolkit	Usability	Positive
2nd Hackathon	ADFP	Toolkit make it an add-on to browsers with all features integrated	Toolkit	Function	Neutral / Suggestion
3rd Hackathon	ADFP	Toolkit information provided is too much	Toolkit	Content	Negative
3rd Hackathon	ADFP	Toolkit information provided misses some important things	Toolkit	Content	Negative
3rd Hackathon	ADFP	Toolkit some tools require registration to access	Toolkit	Usability	Negative
3rd Hackathon	ADFP	Toolkit tools to have bigger logos	Toolkit	Layout	Negative
3rd Hackathon	ADFP	Toolkit tools with simple text description	Toolkit	Content	Neutral / Suggestion

3rd Hackathon	ADFP	Toolkit audio button (text to speech)	Toolkit	Function	Neutral / Suggestion
4th Hackathon	ADFP	Easy reading no portuguese version	Easy reading	Language	Negative
4th Hackathon	ADFP	Easy reading content replacement did not work	Easy reading	Usability	Negative
4th Hackathon	ADFP	Easy reading ruler option very helpful	Easy reading	Usability	Positive
4th Hackathon	ADFP	Toolkit to be offered in more languages	Toolkit	Language	Negative
4th Hackathon	ADFP	Toolkit tools' categories in images	Toolkit	Layout	Neutral / Suggestion
1st Hackathon	AMEN	Toolkit to involve professionals for individual support	Toolkit	Exploitation	Neutral / Suggestion
1st Hackathon	AMEN	Toolkit networking opportunity for organisations	Toolkit	Exploitation	Neutral / Suggestion
1st Hackathon	AMEN	Toolkit expert digital support from volunteers	Toolkit	Exploitation	Neutral / Suggestion
1st Hackathon	AMEN	Toolkit to be exploited as a multipurposed channel	Toolkit	Exploitation	Neutral / Suggestion
2nd Hackathon	AMEN	Text to speech tools to have more realistic human voices instead of robotics	Text to speech	Usability	Negative
2nd Hackathon	AMEN	Text to speech lacks in variety of translation options	Text to speech	Language	Negative
2nd Hackathon	AMEN	Text to speech compatibility issues across different operating systems	Text to speech	Compatibility	Negative

5th Hackathon	AMEN	Toolkit to be a workspace for interactions between professionals and PwCD	Toolkit	Exploitation	Neutral / Suggestion
2nd Hackathon	BRISTOL	Liquid Mode app recommendation to easily navigate and read long and complex PDFs	Liquid Mode	Usability	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to sort articles to appear one after the other while scrolling down	Tools	Function	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to change colours in long dense websites	Tools	Layout	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to change font sizes in long dense websites	Tools	Layout	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to generate abstracts or titles for paragraphs in long dense websites	Tools	Content	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to provide symbols and images that explain content in long dense websites	Tools	Content	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to highlight key words in long dense websites	Tools	Content	Neutral / Suggestion
2nd Hackathon	BRISTOL	Text to speech tools to have more realistic human voices instead of robotics	Text to speech	Usability	Negative
2nd Hackathon	BRISTOL	Tools to be able to read lips	Tools	Function	Neutral / Suggestion

2nd Hackathon	BRISTOL	Tools to blur background and help user focus on text reading	Tools	Layout	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to highlight text being read	Tools	Layout	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to be taught regarding their functionalities	Tools	Usability	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to help reduce cognitive overload	Tools	Usability	Neutral / Suggestion
2nd Hackathon	BRISTOL	Tools to raise awareness - PwCD ignore their existence	Tools	Exploitation	Neutral / Suggestion
3rd Hackathon	BRISTOL	Toolkit to add filtering options in the tools' tab	Toolkit	Function	Neutral / Suggestion
3rd Hackathon	BRISTOL	Toolkit to have customisable font size, style and colour	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	BRISTOL	Toolkit to have supporting images	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	BRISTOL	Tools to customise any website and save the preferences for future visits	Tools	Layout	Neutral / Suggestion
3rd Hackathon	BRISTOL	Tools to remove pictures, ads, animations, videos, drag and drop feature to websites' elements	Tools	Layout	Neutral / Suggestion
3rd Hackathon	BRISTOL	Tools to remove busy backgrounds and unnecessary details	Tools	Layout	Neutral / Suggestion
3rd Hackathon	BRISTOL	Toolkit to have video call option for help and support	Toolkit	Function	Neutral / Suggestion

3rd Hackathon	BRISTOL	Toolkit to be offered in more languages	Toolkit	Language	Negative
3rd Hackathon	BRISTOL	Toolkit audio options for blind	Toolkit	Function	Neutral / Suggestion
3rd Hackathon	BRISTOL	Toolkit to add descriptions to categories and subcategories	Toolkit	Function	Neutral / Suggestion
3rd Hackathon	BRISTOL	Toolkit to change the rating system to emoji	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	BRISTOL	Toolkit to keep written information to a minimum	Toolkit	Content	Positive
5th Hackathon	BRISTOL	Toolkit to help with the navigation focus and flow	Toolkit	Layout	Neutral / Suggestion
5th Hackathon	BRISTOL	Toolkit to have a visible sitemap to help understand the website	Toolkit	Layout	Neutral / Suggestion
5th Hackathon	BRISTOL	Toolkit to have instructions for the basic functions	Toolkit	Function	Neutral / Suggestion
5th Hackathon	BRITISH INDIVIDUAL	Tools to create web content	Tools	Usability	Neutral / Suggestion
5th Hackathon	BRITISH INDIVIDUAL	Tools to help with web-authoring and build digital skills' capacity	Tools	Usability	Neutral / Suggestion
2nd Hackathon	CBN	Toolkit to change the rating system to emoji	Toolkit	Layout	Neutral / Suggestion
2nd Hackathon	CBN	Toolkit to be offered in more languages	Toolkit	Language	Negative
2nd Hackathon	CBN	Toolkit to have instructions for the basic functions	Toolkit	Function	Neutral / Suggestion

3rd Hackathon	CBN	Toolkit to have video presenting each challenge	Toolkit	Function	Neutral / Suggestion
5th Hackathon	CBN	Tools password managers require people to remember a master password to log in	Tools	Usability	Negative
5th Hackathon	CBN	Tools to identify their problems and automatically recommend possible solutions	Tools	Function	Neutral / Suggestion
5th Hackathon	CBN	Tools to create virtual personal assistant	Tools	Usability	Neutral / Suggestion
2nd Hackathon	CECD	Microsoft Narrator is very useful	Microsoft Narrator	Usability	Positive
2nd Hackathon	CECD	Microsoft Narrator lacks automatic change of paragraph	Microsoft Narrator	Function	Negative
2nd Hackathon	CECD	Text Help: Read and Write includes easy to read icons and an appealing toolbar	Text Help: Read and Write	Usability	Positive
2nd Hackathon	CECD	Text Help: Read and Write offers no portuguese version	Text Help: Read and Write	Language	Negative
2nd Hackathon	CECD	CBoard is useful	CBoard	Usability	Positive
2nd Hackathon	CECD	CBoard offers no portuguese version	CBoard	Language	Negative
2nd Hackathon	CECD	Helperbird is useful	Helperbird	Usability	Positive
2nd Hackathon	CECD	Helperbird requires download and installation	Helperbird	Usability	Negative

2nd Hackathon	CECD	Helperbird is confusing due to too many options integrated	Helperbird	Usability	Negative
2nd Hackathon	CECD	Total Ad Block is useful	Total Ad Block	Usability	Positive
2nd Hackathon	CECD	Total Ad Block is a paid tool	Total Ad Block	Usability	Negative
2nd Hackathon	CECD	Liquid Mode is useful to easily navigate and read long and complex PDFs	Liquid Mode	Usability	Positive
2nd Hackathon	CECD	Liquid Mode is unintuitive and unclear / complex	Liquid Mode	Usability	Negative
2nd Hackathon	CECD	Minimal Consent is useful	Minimal Consent	Usability	Positive
2nd Hackathon	CECD	Minimal Consent requires the Opera Browser	Minimal Consent	Compatibility	Negative
2nd Hackathon	CECD	Minimal Consent should have instructions in larger font size	Minimal Consent	Layout	Negative
2nd Hackathon	CECD	Tools to make subtitles slower, with smoother flow and longer visible in the screen	Tools	Function	Neutral / Suggestion
3rd Hackathon	CECD	Toolkit to fix font sizes	Toolkit	Layout	Negative
3rd Hackathon	CECD	Toolkit to fix font types	Toolkit	Layout	Negative
3rd Hackathon	CECD	Toolkit to change the rating system to emoji	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	CECD	Toolkit to keep written information to a minimum	Toolkit	Content	Positive

3rd Hackathon	CECD	Toolkit to present tools sorted by ratings	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	CECD	Toolkit to have the tools' logos to link to the tool itself	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	CECD	Alexa is free	Alexa	Usability	Positive
3rd Hackathon	CECD	Alexa has no ads	Alexa	Usability	Positive
3rd Hackathon	CECD	Alexa is useful for quick searches	Alexa	Usability	Positive
3rd Hackathon	CECD	Alexa does not recognise dictations often	Alexa	Usability	Negative
3rd Hackathon	CECD	Google Assistant is free	Google Assistant	Usability	Positive
3rd Hackathon	CECD	Google Assistant has no ads	Google Assistant	Usability	Positive
3rd Hackathon	CECD	Google Assistant is useful for quick searches	Google Assistant	Usability	Positive
3rd Hackathon	CECD	Google Assistant does not recognise dictations often	Google Assistant	Usability	Negative
1st Hackathon	EEEEK	Toolkit to add voice navigation	Toolkit	Function	Neutral / Suggestion
1st Hackathon	EEEEK	Toolkit exploitation in public services	Toolkit	Exploitation	Neutral / Suggestion
1st Hackathon	EEEEK	Tools' digital training of PwCD	Tools	Function	Neutral / Suggestion
3rd Hackathon	EEEEK	Toolkit end-users need help of caregivers	Toolkit	Usability	Negative
3rd Hackathon	EEEEK	Speech to text problems with articulation and word prediction	Speech to text	Usability	Negative

5th Hackathon	EIDD	Tools' digital training of PwCD	Tools	Function	Neutral / Suggestion
5th Hackathon	EIDD	Toolkit to integrate DeepL for translations	Toolkit	Language	Neutral / Suggestion
5th Hackathon	EIDD	Toolkit to be offered in more languages	Toolkit	Language	Negative
5th Hackathon	EIDD	Toolkit to have instructions for the basic functions	Toolkit	Function	Neutral / Suggestion
5th Hackathon	EIDD	Toolkit to include a chatbot or live chat	Toolkit	Function	Neutral / Suggestion
5th Hackathon	EIDD	Toolkit to have a FAQ section with explanatory pictures	Toolkit	Usability	Neutral / Suggestion
5th Hackathon	EIDD	Toolkit to integrate online courses conducted by a trainer to a variety of tools, including tasks and exercises	Toolkit	Exploitation	Neutral / Suggestion
4th Hackathon	EPIONI	Toolkit to offer black-grey version	Toolkit	Layout	Neutral / Suggestion
4th Hackathon	EPIONI	Toolkit to maintain some gaps between menus	Toolkit	Layout	Positive
4th Hackathon	EPIONI	Toolkit to maintain white background	Toolkit	Layout	Positive
4th Hackathon	EPIONI	Toolkit to use easy symbols and explanations through media	Toolkit	Layout	Neutral / Suggestion
4th Hackathon	EPIONI	Toolkit to integrate DeepL for translations	Toolkit	Language	Negative
4th Hackathon	EPIONI	Toolkit to be offered in more languages	Toolkit	Language	Negative
4th Hackathon	EPIONI	Google Calendar is useful	Google Calendar	Usability	Positive

4th Hackathon	EPIONI	Google Calendar requires training	Google Calendar	Usability	Negative
4th Hackathon	EPIONI	Google Calendar should be simpler to use	Google Calendar	Usability	Negative
4th Hackathon	EPIONI	Toolkit to offer visual instructions	Toolkit	Usability	Neutral / Suggestion
1st Hackathon	EPSEP	Toolkit to keep design simple	Toolkit	Layout	Positive
1st Hackathon	EPSEP	Toolkit to keep small amount of graphics	Toolkit	Layout	Positive
1st Hackathon	EPSEP	Toolkit to keep written information to a minimum	Toolkit	Content	Positive
1st Hackathon	EPSEP	Toolkit to focus to be given to tools themselves	Toolkit	Layout	Neutral / Suggestion
1st Hackathon	EPSEP	Toolkit caregivers to be trained to such tools and the platform	Toolkit	Exploitation	Neutral / Suggestion
3rd Hackathon	EPSEP	Toolkit to add video instructions	Toolkit	Function	Neutral / Suggestion
3rd Hackathon	EPSEP	Toolkit end-users need help of caregivers	Toolkit	Usability	Negative
3rd Hackathon	EPSEP	Toolkit helps people familiarise with the digital world	Toolkit	Exploitation	Positive
3rd Hackathon	EPSEP	Toolkit helps expand knowledge	Toolkit	Exploitation	Positive
3rd Hackathon	EPSEP	Toolkit helps get in contact with experts	Toolkit	Exploitation	Positive
3rd Hackathon	EPSEP	Toolkit to include a chatbot or live chat	Toolkit	Function	Neutral / Suggestion
5th Hackathon	IE 3rd LEVEL STUDENTS	Toolkit to have a FAQ section with explanatory pictures and simple jargon	Toolkit	Exploitation	Neutral / Suggestion

5th Hackathon	IE 3rd LEVEL STUDENTS	Text to speech tools to have more realistic human voices instead of robotics	Text to speech	Usability	Negative
5th Hackathon	IE 3rd LEVEL STUDENTS	Tools for videos to stop ads, breaks and other distractions	Tools	Function	Neutral / Suggestion
5th Hackathon	IE 3rd LEVEL STUDENTS	Tools to make subtitles slower, with smoother flow and longer visible in the screen	Tools	Function	Neutral / Suggestion
3rd Hackathon	IE DIVERSE TEAM	Toolkit to use a Hive layout for challenges and recommended tools	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	IE DIVERSE TEAM	Toolkit to offer visual instructions	Toolkit	Usability	Neutral / Suggestion
3rd Hackathon	IE DIVERSE TEAM	Toolkit to have customisable font sizes, styles and colours	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	IE DIVERSE TEAM	Toolkit to offer a clear method of submitting new tools	Toolkit	Function	Neutral / Suggestion
1st Hackathon	IE FAMILY	Avira only positive feedback	Avira	Usability	Positive
1st Hackathon	IE FAMILY	Android Scanner has too much text	Android Scanner	Usability	Negative
1st Hackathon	IE FAMILY	Access Angel is not free to use	Access Angel	Usability	Negative
1st Hackathon	IE FAMILY	Access Angel has toolbar and icon not up to date	Access Angel	Usability	Negative
1st Hackathon	IE FAMILY	Access Angel has a feature to read text from photos or the camera of a device	Access Angel	Usability	Positive

2nd Hackathon	IE STUDENTS	Toolkit to fix font sizes	Toolkit	Layout	Negative
2nd Hackathon	IE STUDENTS	Toolkit to fix font types	Toolkit	Layout	Negative
2nd Hackathon	IE STUDENTS	Toolkit to keep design simple	Toolkit	Layout	Positive
2nd Hackathon	IE STUDENTS	Toolkit to keep small amount of graphics	Toolkit	Layout	Positive
2nd Hackathon	IE STUDENTS	Toolkit to add a comments' section	Toolkit	Function	Neutral / Suggestion
2nd Hackathon	IE STUDENTS	Snap and Read is difficult to navigate	Snap and Read	Layout	Negative
2nd Hackathon	IE STUDENTS	Snap and Read option to slow the speed of the reader should be visible	Snap and Read	Layout	Negative
2nd Hackathon	IE STUDENTS	Snap and Read to add a feature to make fonts larger	Snap and Read	Layout	Negative
2nd Hackathon	IE STUDENTS	Snap and Read has robotic voices	Snap and Read	Usability	Negative
2nd Hackathon	IE STUDENTS	Helperbird has good dyslectic font	Helperbird	Usability	Positive
2nd Hackathon	IE STUDENTS	Helperbird has good features but only in the paid version	Helperbird	Usability	Negative
2nd Hackathon	IE STUDENTS	Helperbird should be integrated with text to speech tools for users to be able to read along with readers	Helperbird	Usability	Neutral / Suggestion
2nd Hackathon	IE STUDENTS	Microsoft Word is the most used read aloud tool because of its simplicity.	Microsoft Word	Usability	Positive

4th Hackathon	IE TEACHERS	Toolkit is too simple for older kids and teenagers - not very attracting to them	Toolkit	Layout	Negative
4th Hackathon	IE TEACHERS	Toolkit with no errors	Toolkit	Usability	Neutral / Suggestion
4th Hackathon	IE TEACHERS	Tools with no errors	Tools	Usability	Neutral / Suggestion
4th Hackathon	IE TEACHERS	Tools to raise awareness to people - PwCD ignore their existence	Tools	Exploitation	Negative
4th Hackathon	IE TEACHERS	Toolkit to add reminders to users to rate tools they used	Toolkit	Function	Neutral / Suggestion
4th Hackathon	IE TEACHERS	Toolkit to add video instructions	Toolkit	Usability	Neutral / Suggestion
4th Hackathon	IE TEACHERS	Toolkit to show whether tools are free or not	Toolkit	Function	Neutral / Suggestion
3rd Hackathon	NEURODIVERSITY	Toolkit to have video call option for help and support	Toolkit	Function	Neutral / Suggestion
3rd Hackathon	NEURODIVERSITY	Toolkit to have customisable font sizes, styles and colours	Toolkit	Layout	Neutral / Suggestion
3rd Hackathon	NEURODIVERSITY	Toolkit to integrate the use of sign language	Toolkit	Language	Negative
3rd Hackathon	NEURODIVERSITY	Toolkit to be offered in more languages	Toolkit	Language	Negative
3rd Hackathon	NEURODIVERSITY	Toolkit to offer visual instructions	Toolkit	Usability	Neutral / Suggestion
3rd Hackathon	NEURODIVERSITY	Toolkit audio options for blind	Toolkit	Usability	Neutral / Suggestion
3rd Hackathon	NEURODIVERSITY	Toolkit to change the rating system to emoji	Toolkit	Layout	Neutral / Suggestion

3rd Hackathon	NEURODIVERSITY	Toolkit to keep written information to a minimum	Toolkit	Content	Positive
5th Hackathon	NIMIA	Toolkit to offer a section for education purposes to facilitate educators to teaching digital skills to PwCD	Toolkit	Exploitation	Neutral / Suggestion
1st Hackathon	PROMESIP	Toolkit is easy to use	Toolkit	Usability	Positive
1st Hackathon	PROMESIP	Toolkit offers easy access to information	Toolkit	Usability	Positive
1st Hackathon	PROMESIP	Toolkit to fix font sizes	Toolkit	Layout	Negative
1st Hackathon	PROMESIP	Toolkit to fix font types	Toolkit	Layout	Negative
1st Hackathon	PROMESIP	Toolkit to fix elements' alignments	Toolkit	Layout	Negative
1st Hackathon	PROMESIP	Toolkit to fix images ratios	Toolkit	Layout	Negative
1st Hackathon	PROMESIP	Toolkit to fix underlining of buttons to help with the call-to-action capacity	Toolkit	Layout	Neutral / Suggestion
1st Hackathon	PROMESIP	Toolkit to fix hidden elements due to source code errors	Toolkit	Layout	Negative
1st Hackathon	PROMESIP	Toolkit to add counters to the ratings	Toolkit	Layout	Neutral / Suggestion
1st Hackathon	PROMESIP	Toolkit to fix website head title	Toolkit	Layout	Negative
1st Hackathon	PROMESIP	Toolkit to erase a notification bell with no use	Toolkit	Layout	Negative

1st Hackathon	PROMESIP	Toolkit to fix a cookies bar malfunction	Toolkit	Layout	Negative
1st Hackathon	PROMESIP	Toolkit to fix contrast issues	Toolkit	Layout	Negative
2nd Hackathon	PROMESIP	Toolkit to adopt colour theory	Toolkit	Layout	Neutral / Suggestion
2nd Hackathon	PROMESIP	Toolkit the use of the "Go Back" button	Toolkit	Function	Neutral / Suggestion
2nd Hackathon	PROMESIP	Toolkit to add a comments' section	Toolkit	Function	Neutral / Suggestion
2nd Hackathon	PROMESIP	Toolkit provision to stop double ratings	Toolkit	Function	Neutral / Suggestion
2nd Hackathon	PROMESIP	Toolkit to change the appearance of the top five and rest of recommended tools	Toolkit	Layout	Neutral / Suggestion
2nd Hackathon	PROMESIP	Toolkit to add a grid way or viewing tools	Toolkit	Layout	Neutral / Suggestion
2nd Hackathon	PROMESIP	Toolkit to add filtering options in the tools' tab	Tools	Function	Neutral / Suggestion
3rd Hackathon	PROMESIP	Speech to text app "SpeakIT" tool developed by Promesip to show tools relevant to words dictated	SpeakIT	Usability	Neutral / Suggestion
4th Hackathon	UK SCT&A2ndVOICE	Toolkit requires prior knowledge	Toolkit	Usability	Negative
4th Hackathon	UK SCT&A2ndVOICE	Toolkit is as simple as possible	Toolkit	Layout	Positive
4th Hackathon	UK SCT&A2ndVOICE	Toolkit offers tools that require download and installation	Toolkit	Usability	Negative
4th Hackathon	UK SCT&A2ndVOICE	Toolkit to open everything in new windows	Toolkit	Layout	Neutral / Suggestion

4th Hackathon	UK SCT&A2ndVOICE	Toolkit to provide a free VPN service	Toolkit	Usability	Neutral / Suggestion
4th Hackathon	UK SCT&A2ndVOICE	Toolkit to provide a virtual workspace with tools preloaded / preinstalled	Toolkit	Usability	Neutral / Suggestion
4th Hackathon	UK SCT&A2ndVOICE	Toolkit to help with the navigation focus and flow	Toolkit	Layout	Neutral / Suggestion
4th Hackathon	UK SCT&A2ndVOICE	Toolkit to include a chatbot or live chat	Toolkit	Function	Neutral / Suggestion
4th Hackathon	UK SCT&A2ndVOICE	Toolkit to offer an interactive virtual receptionist to narrow down the tools that meets users' needs	Toolkit	Function	Neutral / Suggestion

5.1.8 Feedback conclusion

Following the feedback collection, we can extract some findings. The most eye catching, and obvious finding is that when people are interacting with a tool or a platform, Layout and Interface are the first things that will be commented. It is safe to presume that PwCD would also prefer, actually more than people with no cognitive disabilities or impairments, clear contents, simple layouts, layouts that are coherent, with spaces between elements, with not much text and with visual or audio supporting. It is tiring for people with a set of diagnoses, it is confusing or distracting for others and not attracting to almost none.

This is followed also by a good number of feedback regarding the issue of languages. Very often, developers create tools for the majority of people, who are considered to speak or be able to speak English. That is not true though, if we consider that there is a significant amount of population excluded from learning English, either because it is not their local language, or because of financial inability or cognitive difficulty. These are the people that are most excluded, since they are initially excluded when digital content is created in a non-accessible way, but then they are once again excluded from the use of accessibility tools that should take them into account but also ignored them. People with cognitive disabilities face enhanced difficulty operating tools in other languages than their native.

Digital skills acquisition and building is a very important topic raised by these Hackathons and was reported many times. Training delivery provision is being asked, training of PwCD directly but also training of educators and caregivers in ways to enable them in training PwCD and being able to transfer knowledge and teach digital capacities. Training delivery was asked in different

approaches, either as offering courses through the Open Toolkit, either as using the Toolkit as a media to offer courses to educators, or as a direct request of PwCD to be trained in all these tools that were recommended to them through the Advisor Tool but had no opportunity to understand them and be able to use them successfully and to their full extend.

Audio / visual and video related support was a common feedback collected. People interacting with digital technologies would expect less required physical interaction due to technological innovations. The same way PwCD would expect to have to do less when interacting with the digital world, meaning having to read less, write less, interpret less, presume less. Every step should be easily found and the whole digital interaction process should flow smoothly. Audio / visual support is considered as a positive improvement, so that people must be less physically expected to invest – texts should be read aloud, contents should be interpreted to images or animations, processes and instructions should be offered in short easy videos, not long texts with no examples and explanatory visual elements.

Rating system represents a broader area of development. The specific feedback was to change the rating system from a stars' system to an emoji system. This feedback though, includes a thesis on how things meant to be interpreted and how they are interpreted. Cultural differences, differences in processing symbols and meanings may lead to malfunctions, such as the Open Toolkit rating system failed to achieve its scope. It was reported that people often did not understand the purpose of these stars, or when they understood that they are supposed to provide their direct feedback to each tool using the stars, they could not tell whether 1 star meant good and 5 star bad or the other way around. Therefore, it was requested by teams that the rating system should be changed to an emoji, since it is more straightforward what each emoji means.

Summing up less encountered but certainly also valuable and important feedback that was taken into consideration and should be kept in mind by developers and content creators in the future, clear instructions for what the next actions is, where does the whole process lead, what is required from end-users to do, troubleshooting etc. is high in peoples' needs during their digital interactions. To this end, visible sitemaps could help with the navigation of users, but also live chat with support or helpdesk is also reported, along with the provision of chatbots that could be used in many ways for accessibility. Initially, they could be used to identify challenges and problems a user face, then it could work towards a profile creation for future reference, it could be used as a helpdesk or, finally it could offer tutorials and access to instructions and learning courses.

6 HACKATHONS' TAKEAWAY

6.1 1ST HACKATHON: FACILITATING AUTHENTICATION AND ONLINE FORMS

No raw data was produced during the hackathon; no recordings or transcripts exist because hackathon teams worked on their own time and did not record their work sessions or, any existing data is already presented in co-lab data summaries. Teams that worked on their own time without a LIVE IT partner present did not record their work sessions or produce transcripts. Teams that worked with a LIVE IT partner did so within co-lab sessions, so any recordings or transcripts are part of the co-lab data summary.

The presentations of teams' contributions were given during the live closing session in December 2021. These presentations exist online in an accessible format on a website created by a UK participant. The website link to the 1st Hackathon presentations is: **Link**

Participating countries: Ireland, Greece, Portugal

Irish Team: secondary student with dyslexia and a teacher

The team explored three tools that were listed on the LIVE IT Open Toolkit for the purposes of the first hackathon: Avira, Android Scanner, and Access Angel. The team recommended that Access Angel be updated to allow for the reading of text on posters, signs, and other locations not on a screen. The Irish presentation can be found by following this link: **Link**

The request for a text-to-speech tool that could read hard copy meeting agendas handed out during meetings, signs encountered during day-to-day offline life, and non-screen-based text occurred frequently during the project.

Greek Team 1: AMEN, health care professionals from a non-profit society in the area of cognitive disability

The team proposed the creation of a multidisciplinary electronic support platform for individuals by health professionals.

Greek Team 2: PRO.ME.SIP, university students with knowledge of programming and cognitive disability

The team conducted an in-depth analysis of the accessibility, usability, and functionality of the LIVE IT Open Toolkit. They recommended multiple improvements for the LIVE IT Open Toolkit. Recommended improvements focused on the landing page, results list, how the Toolkit title appears on browser tabs, Toolkit icons, and UI/UX improvements.

Greek Team 3: EPSEP, a non-profit society for psychosocial research and intervention to improve the quality of life of people with psychosocial problems

The team conducted an analysis of the usability of the LIVE IT Open Toolkit. They recommended improvements for the results list.

Greek Team 4: EEEEK, a school for students with cognitive disabilities

The team used the LIVE IT Open Toolkit with students with cognitive disabilities and their caregivers. The team recommended that voice navigation be added to the Open Toolkit. They also recommended producing an "easy to read" version of the Toolkit website.

All four Greek team presentations can be found at this link: **Link**

Portuguese Team: ADFP, a non-profit that works with students with cognitive disabilities

The team explored the use of translator and text-to-speech tools. Their first challenge was to issue a certificate for their COVID-19 vaccination and proceeded with provided ideas: request that a translation button should be present integrated in websites and not have to use external apps or buttons in menus. Even better, a translator that could start reading content aloud with the press of a physical button in keyboards.

Overall Themes from Hackathon 1:

1) The dual goals of exploring, improving and/or creating new tools AND piloting the Open Toolkit produced vastly different hackathon contributions. Some teams focused on exploring and improving existing tools. Some teams focused on the Toolkit itself.
2) Making text accessible is essential, which is not a new finding. However, it is still an issue.

6.2 2ND HACKATHON: PROCESSING HEAVY TEXT-BASED AND CLUTTERED PAGES

No raw data was produced during the hackathon; no recordings or transcripts exist because hackathon teams worked on their own time and did not record their work sessions or, any existing data is already presented in co-lab data summaries. Teams that worked on their own time without a LIVE IT partner present did not record their work sessions or produce transcripts. Teams that worked with a LIVE IT partner did so within co-lab sessions, so any recordings or transcripts are part of the co-lab data summary.

The presentations of teams' contributions were given during the live closing session in February 2022. The presentations can be found by following this link: **Link**

Participating countries: UK, Ireland, Greece, Portugal

UK Team 1: An adult in academia with cognitive disability that impacts reading

This one-person team explored a tool not listed on the LIVE IT Open Toolkit at the time of the hackathon: Adobe Liquid. The tool was subsequently added to the Open Toolkit. The presenter highlighted the issue that most PDFs used in education and academia are fixed layout and visually overwhelming. Text-to-speech tools often cannot help with full scholarly article files, for example. The presenter proposed an Adobe Liquid Chrome Extension. An Adobe Liquid Chrome Extension could help with PDF files not being made consistently and/or adequately accessible.

The problem of PDFs not being accessible in full was a major theme across all co-labs.

UK Team 2: 3 Bristol co-lab participants and 5 London co-lab participants, all with multiple cognitive disabilities

The team visited text-dense websites that they would typically visit in day-to-day life during co-lab sessions with LIVE IT co-lab facilitators. The team recommended several improvements to existing websites. First, they requested on-demand options for altering the appearance (removing hyperlinks, background colour, font, font colour, spacing) and accessing text (icons, sounds, pictures, live text-to-speech) that did not require additional programs/applications/extensions and additional processing on their part. Second, they requested virtual reality accessibility tools that mirror real life interactions and relied on culturally relevant audio and visual options rather than text.

Additionally, the team explored the tools on the LIVE IT Open Toolkit. Some of the tools were not open access or free, so they could not be used. The tools that could be accessed were helpful.

All UK team contributions can be found by following this link: **Link**

The need for quality audio and visual versions of information that is of the same quality as the text information is another major theme across all co-labs.

Irish Team: third level students with dyslexia or ADHD

The team explored the usability of the LIVE IT Open Toolkit and selected tools from the Toolkit to use while completing coursework during the week. They recommended some slight changes to the way the Open Toolkit operated, like having the results show up in a new tab so that everything did not disappear when navigating. They used Snap & Read and Helperbird. They recommended a new tool that combined the capabilities of Snap & Read and Helperbird. For example, one team member wanted the Open Dyslexic font option with the Helperbird tool and the support of the text-to-speech from Snap & Read. Additionally, one team member did not feel supported by either tool, because they need audio and visual (non-text) options for taking in information. The Irish team presentation can be found at this link: **Link**

Greek Team 1: AMEN, health care professionals in the area of cognitive disability

The team explored the usability of the LIVE IT Open Toolkit with caregivers and selected tools to use with people with cognitive disabilities and their caregivers. While exploring tools, they encountered a few challenges. First, the voices for the text-to-speech tools, especially the open access ones, were very robotic. Second, translation options were limited and many tools only function in English or a very limited number of languages. The Greek team presentation can be found at this link: **Link**

Robotic voice complaints were very common across all co-lab locations when using text-to-speech tools.

Translation and language challenges became a major theme for this project. This is an urgent matter.

Greek Team 2: PRO.ME.SIP, university students with knowledge of programming and cognitive disability

The team explored the LIVE IT Open Toolkit from a technical and design / layout / interface aspect and proposed a list of suggestions for improvement.

Portuguese Team 1: ADFP, a non-profit that works with students with cognitive disabilities

The team explored tools listed on the LIVE IT Open Toolkit with students with cognitive disabilities. They explored Total Ad Block and Helperbird. They also explored the usability of the Open Toolkit with students with cognitive disabilities. They requested improvements in two areas. First, they requested tools that work more seamlessly with their primary language, Portuguese. Second, they requested open access or free features for all because some of the features that would have been very helpful were behind a paywall. Additionally, they requested

an Open Toolkit browser extension that would make recommended tools available without having to visit another website.

Portuguese Team 2: CECD, a school for students with cognitive disabilities

The team explored tools listed on the LIVE IT Open Toolkit with students with cognitive disabilities. They explored Microsoft Narrator, Text Help: Read and Write, CBoard, Helperbird, Total Ad Block, Liquid Mode, and Minimal Consent. The most common challenge was that the tool did not work in Portuguese. If the tool was available in Portuguese, the second most common challenge was needing to download and install something prior to using the tool or encountering barriers to smooth and continuous text-to-speech operation. The Portuguese team contributions can be found by following this link: **Link**

Translation and language challenges became a major theme across all aspects of this project. This is an urgent matter.

Portuguese Team 3: Colegio Bolo de Neve, secondary students with cognitive disabilities

The team experimented with the LIVE IT Open Toolkit and also the feature of voting for enlisted tools. They struggled understanding the voting system and the rating scale from 1 to 5, therefore they suggested the use of an emoticon rating system.

Portuguese Team 4: Colegio Bolo de Neve, secondary students with cognitive disabilities

The team explored the LIVE IT Open Toolkit and the ease of use. They focused on providing a Portuguese version for people that do not speak English, and also providing some guides on what the next step in each action of the user of the Open Toolkit process should be.

Overall Themes from Hackathon 2:

1) Language and translation challenges are extremely relevant for the European context and are largely unaddressed by open access and free tools. Essentially, most tools only function in one language (English) or a very limited number of languages.
2) There is a pressing need for quality text alternatives that communicate the same ideas as the text-based materials that currently dominate society.
3) PDFs still present many accessibility challenges.

6.3 3RD HACKATHON: HANDLING COMPLEX INTERFACES, MULTISTAGE TASKS AND LIMITING INTERRUPTIONS

No raw data was produced during the hackathon; no recordings or transcripts exist because hackathon teams worked on their own time and did not record their work sessions or, any existing data is already presented in co-lab data summaries. Teams that worked on their own time without a LIVE IT partner present did not record their work sessions or produce transcripts. Teams that worked with a LIVE IT partner did so within co-lab sessions, so any recordings or transcripts are part of the co-lab data summary.

The presentations of teams' contributions were given during the live closing session in February 2022. The presentations can be found by following this link: **Link**

Participating countries: Participating countries: UK, Ireland, Greece, Portugal

UK Team 1: Bristol co-lab participant with multiple cognitive disabilities

One of the participants in the Bristol co-design lab submitted a presentation (1 slide) for this hackathon. The participant used the LIVE IT Open Toolkit and selected tools from the Toolkit to use during the co-lab scenarios. User feedback about the Open Toolkit included two main points. First, more filtering options are needed for the Open Toolkit website, especially to filter out tools that are not open access or free to use. Second, the Open Toolkit needs more supports for accessing the text on the website via built in options for changing font and font size and images to go with the text. User feedback about the tools was that none of the tools did what the participant really wanted, which was seamless customisation of all websites without having to access multiple tools.

UK Team 2: London co-lab participants, supported by Neurodiversity Learning

This team explored the LIVE IT Open Toolkit and also used some of the tools listed in the Toolkit with people with cognitive disabilities. The team presented recommendations for the Open Toolkit to increase accessibility of the Toolkit. The team also presented reviews of two tools from the Toolkit: Speechify and Helperbird. For the Open Toolkit, the team recommended revising the text so that it was less jargon-y and academic sounding. Additionally, the team recommended non-text additions to the Toolkit website such as YouTube videos to go with all text descriptions and icons to help with navigation. For the two tools, Speechify and Helperbird, the participants liked that Speechify allowed for physical books to be scanned and that Helperbird had many easy-to-use tools for accessing text on the screen.

Both of the UK team presentations can be found within a single slide deck which is posted on this webpage: **Link**

Irish Team: stakeholders who work with students with cognitive disabilities at the school and national levels

This team explored the LIVE IT Open Toolkit from the perspective of professionals who recommend resources for students with cognitive disabilities. The team provided feedback on the layout and the features of the LIVE IT Open Toolkit. Their feedback supported that of the people with cognitive disabilities on other teams. First, they recommended more interactive and multimodal content on the Toolkit website. Second, they recommended a variety of grouping mechanisms for the tools. Third, they recommended including video explanations of the tools. The Irish team presentation can be viewed by following this link: **Link**

Greek Team 1: EPSEP, a research group focused on supporting people with brain injury and dementia

This was the only team to explore the LIVE IT Makerspace, which is a component of the Open Toolkit. They recommended using the Makerspace as a place to share ideas about supporting people with dementia.

Greek Team 2: EEEEK Aleksandrias, a school for students with cognitive disabilities

This team explored the LIVE IT Open Toolkit and also used some of the tools listed in the toolkit with students with cognitive disabilities. The tools used are: Google Chrome, Microsoft Edge, Text from to Speech, Microsoft Speech to Text, AutoCorrect Windows 10, Coloradd-color identification, Visual Keyboard, Access Angel, and Contrast Checker. With all tools, this group found that students required the support of special educators to use the tools. Additionally, they recommended improving speech to text tools to include a predictive feature or a feature to help students who did not articulate words the way the tool expected them to be articulated.

Greek Team 3: Promesip, university students with knowledge of programming and cognitive disability
This team once again provided feedback on the usability and accessibility of the LIVE IT Open Toolkit website. They also shared an accessibility tool they were developing. They created two separate presentations, which are listed on the Greek page for Hackathon 3 on the hackathon website (link copied below). The Open Toolkit feedback focused on two areas: the main sidebar on the website, and a web accessibility evaluation for the website. The tool presentation for

their tool, Speak It, which takes in audio from live spoken words or an audio file and uses the audio to return suggested accessibility tools based on keywords within the audio.

All Greek team presentations can be found by following this link: **Link**

Portuguese Team 1: ADFP, a non-profit that works with students with cognitive disabilities

The team explored the LIVE IT Open Toolkit with students with cognitive disabilities. The team found that the Toolkit was difficult for students to use because each page had too much information, it was difficult for them to see what each tool does, they were unsure of how to select the most suitable tool, there were very few open access tools, and language was an issue. They recommended using icons, visuals, and videos on the website.

Portuguese Team 2: CECD, a school for students with cognitive disabilities

The team explored the LIVE IT Open Toolkit with students with cognitive disabilities. The team also used Alexa/Google assistant with the students. Their presentation included recommendations for improving the Toolkit and feedback on Alexa/Google assistant. For the toolkit, they recommended increasing the font size and icon size and that the icons should be active links. Additionally, they recommended using less text to convey information. The team feedback on Alexa was mostly positive.

Portuguese Team 3: Colegio Bolo de Neve, secondary students with cognitive disabilities

The team explored the LIVE IT Open Toolkit and suggested provision of videos presenting challenges and recommended solutions.

The Portuguese team presentations can be found by following this link: **Link**

Overall Themes from Hackathon 3:

1) The dual goals of exploring, improving and/or creating new tools AND piloting the Open Toolkit produced vastly different hackathon contributions. Some teams focused on exploring and improving existing tools. Some teams focused on the Toolkit itself.
2) There is a need for high quality modes of communication on the web that do not rely on text. When text is absolutely necessary, it needs to be compatible with screen readers and other accessibility tools.
3) Language and translation challenges are extremely relevant for the European context and are largely unaddressed by open access and free tools. Essentially, most tools only function in one language (English) or a very limited number of languages.

6.4 4TH HACKATHON: UNDERSTANDING AND INTERPRETING NUMERICAL, TEXT AND GRAPHICS INFORMATION

No raw data was produced during the hackathon; no recordings or transcripts exist because hackathon teams worked on their own time and did not record their work sessions or, any existing data is already presented in co-lab data summaries. Teams that worked on their own time without a LIVE IT partner present did not record their work sessions or produce transcripts. Teams that worked with a LIVE IT partner did so within co-lab sessions, so any recordings or transcripts are part of the co-lab data summary.

The presentations of teams' contributions were given during the live closing session in March 2022. The presentations can be found by following this link: **Link**

Participating countries: Participating countries: UK, Ireland, Greece, Portugal

UK Team: London and Bristol co-lab participants with multiple cognitive disabilities

This presentation was a joint effort between participants in the London and the Bristol co-labs. The participants explored the LIVE IT Open Toolkit in their respective co-labs. Feedback about their "dream advisor tool" aligned with the Irish stakeholder feedback on the Open Toolkit from Hackathon 3. Users should answer a few questions that would then guide the website in producing a list of recommended tools. They also recommended including a virtual receptionist. They recommended a more real, immersive, and interactive experience, and this would rely on virtual reality. Their presentation can be viewed by following this link: **Link**

Irish Team: special education teachers who work with primary school students with cognitive disabilities

This team explored the LIVE IT Open Toolkit from the perspective of teachers who work with students with cognitive disabilities. They used the Open Toolkit at work for a week. The team provided feedback on the layout and the features of the LIVE IT Open Toolkit. They recommended that the Toolkit include a clearly denoted list of what tools and features are already on which devices by default. Other feedback about the Toolkit was the same as stakeholder feedback provided in Hackathon 2 and Hackathon 3 about layout, navigation, and features. The Irish team presentation can be viewed by following this link: **Link**

Greek Team: EPIONI, a group that works with students with cognitive disabilities (ADHD)

This team explored the LIVE IT Open Toolkit and some tools listed on the toolkit with people with ADHD. The tools used were Google Translate and Google Calendar. Their presentation

included general recommendation for the design of tools for accessibility: clear options, easy symbols, colours that won't tire the eyes, icons and pictures, and videos. Their presentation also included feedback on the usability of the Toolkit. Their recommendations were similar to others in previous hackathons, such as providing a multimodal experience via the Toolkit website. They recommended including sounds in addition to icon, picture, and video information. The Greek presentation can be found by following this link: **Link**

Portuguese Team: ADFP, a non-profit that works with students with cognitive disabilities

The team explored the LIVE IT Open Toolkit and one of the tools listed in the Toolkit (Easy Reading) with students with cognitive disabilities. They created a presentation that includes recommendations for tools like Easy Reading and the Open Toolkit. First and foremost, the Easy Reading tool did not include Portuguese, and the tool was not able to function on Portuguese websites. Additionally, the students used the Open Toolkit and struggled with it, because the Toolkit is not available in Portuguese as of this hackathon. The Portuguese presentation can be found by following this link: **Link**

Overall Themes for Hackathon 4:

1) There is a need for high quality modes of communication on the web that do not rely on text. When text is absolutely necessary, it needs to be compatible with screen readers and other accessibility tools.
2) Language and translation challenges are extremely relevant for the European context and are largely unaddressed by open access and free tools. Essentially, most tools only function in one language (English) or a very limited number of languages.
3) Virtual reality should be employed and explore more for accessibility purposes.

6.5 5TH HACKATHON: ACCESSIBLE SUPPORT AND INSTRUCTIONS

No raw data was produced during the hackathon; no recordings or transcripts exist because hackathon teams worked on their own time and did not record their work sessions or, any existing data is already presented in co-lab data summaries. Teams that worked on their own time without a LIVE IT partner present did not record their work sessions or produce transcripts. Teams that worked with a LIVE IT partner did so within co-lab sessions, so any recordings or transcripts are part of the co-lab data summary.

The presentations of teams' contributions were given during the live closing session in March 2022. The presentations can be found by following this link: **Link**

Participating countries: Participating countries: UK, Ireland, Greece, Portugal

Participating organisation/Co-occurring conference: Design for All

UK Team: London and Bristol co-lab participants with multiple cognitive disabilities

This team addressed the hackathon theme in three ways. First, they continued to explore the LIVE IT Open Toolkit. Second, they held brainstorming sessions to sketch out what the ideal type of support and instructions could look like. Third, a team member, Julia, created the hackathon website linked throughout this report. Their presentation focused primarily on providing recommendations for online support and instructions. They recommend programming multiple routes for navigation to avoid puzzle-like scenarios for finding information. They also recommend signposting, progress bars, breadcrumbs, and embedded instructions and guidance. Their presentation can be viewed by following this link: **Link**

Irish Team: Third level students with Dyslexia, ADHD, or Autism

This team addressed the hackathon theme in two ways. First, they provided feedback on Weebly, a web authoring tool used as part of an existing assignment in their course, to meet the project goal of addressing web authoring. Second, they used tools from the LIVE IT Open Toolkit during the course of their day-to-day activities for a week and explored the options for online support and instructions. Their recommendations focused on text and video resources. Text resources need to be clearly structured without jargon and with FAQ's. Video resources that are of the same quality as assigned text materials are extremely useful but hard to find via free and open access tools. Their presentation can be viewed by following this link: **Link**

Greek Team 1: NIMIA, a group with knowledge of programming and cognitive disability

This team explored the LIVE IT Open Toolkit and provided recommendations for improving the Toolkit. They recommended the development of a mobile app. They recommended incorporating voice recognition and supports for those with cognitive disabilities associated with hearing issues.

Greek Team 2: AMEN, health care professionals in the area of cognitive disability

This team presented about the Interconnected Activity Scheme.

Both Greek presentations can be viewed by following this link: **Link**

Portuguese Team: Colegio Bolo de Neve, secondary students with cognitive disabilities

This team worked towards the hackathon goals via the exploration of two scenarios from the co-design lab: email login and reading articles. Students with cognitive disabilities and their teachers used the LIVE IT Open Toolkit to select tools such as password managers or read aloud tools. Students experienced challenges when searching for and selecting tools. Additionally, students experienced challenges when setting up or downloading/installing tools. To address these challenges, the students recommend creating an Accessibility Personal Assistant. The Accessibility Personal assistant should be virtual, on-demand, personalised, and able to learn from the user. This team's presentation can be viewed by following this link: **Link**

Design for All Team: four people with cognitive disabilities (18-26yr old), 1 web designer, 1 web developer

The team explored the LIVE IT Open Toolkit and made recommendations for improving the Toolkit. First, they noted the need for more fluid and instantaneous language support and translation. To help with this, they recommended DeepL. Second, they noted the need for multimodal contend. They recommended including video and live support options. Third, they noted the need for a humanised chat bot. Fourth, the noted the need for a FAQ. Finally, they provided some additional feedback on the features of the advisor tool. Their presentation can be viewed by following this link: **Link**

Overall Themes from Hackathon 5:

1) There is a need for high quality modes of communication on the web that do not rely on text. When text is absolutely necessary, it needs to be compatible with screen readers and other accessibility tools.
2) Language and translation challenges are extremely relevant for the European context and are largely unaddressed by open access and free tools. Essentially, most tools only function in one language (English) or a very limited number of languages.
3) Virtual reality should be employed and explore more for accessibility purposes.
4) There is a need for instantaneous and personalised help and support.

6.6 OVERALL HACKATHON TAKEAWAYS

The following are a list of the major challenges that need to be addressed. They are listed in order of the number of times they were mentioned during the hackathons.

1) Language and translation challenges are extremely relevant for the European context and are largely unaddressed by open access and free tools. Essentially, most tools only function in one language (English) or a very limited number of languages.

2) There is a need for high quality modes of communication on the web that do not rely on text. When text is absolutely necessary, it needs to be compatible with screen readers and other accessibility tools.
3) PDFs still present many accessibility challenges. Is this a training issue for those producing PDFs? The hackathon data suggests yes.
4) There is a need for instantaneous and personalised help and support.
5) Virtual reality should be employed and explore more for accessibility purposes.

Accessibility by default is still not a reality, and it should be. The burden of accessibility should not rest on those who do not fit the neurotypical mold. Designers and developers, if working from a neurotypical point of view, need to design with people with cognitive disabilities.

7 HACKATHONS' SURVEY

Hackathons received their own feedback in direct ways, through comments from participants and assessment conducted live or after the conclusion of Hackathon in discussions with teams, but the team also run a Hackathons' survey to collect participants' opinion and create an evaluation. As expected, not all participants were attracted in engaging themselves in another interaction, which was a common theme encountered in the LIVE IT activities, either co-creation labs, either Hackathons or Webinars. People participated to the activities of the project in their free time and even after reassurance that the survey would not take more than three minutes to fill in, not many did. Nevertheless, valuable data is collected even if not at the desired extend and is presented below. All answers were from individuals that participated in our Hackathons and not teams through representatives. Therefore, if all individual attendees would fill the survey in, we would expect around fifty (57) answers (nineteen (19) different teams with an average of approximately 3 individuals per team). Having this number in mind, the received 31 responses seem sensible, since participants in the more severe spectrum of diagnoses would not be engaged into filling it in and these teams would be inevitably represented through a caregiver, teacher or family member.
Figure 9 shows participants' origins and is quite representative of participations, though Ireland and Portugal had in reality a bigger portion of attendance than what is shown in the pie, presumably their participants were less attracted in filling the survey in. As expected, participants mainly came from the consortium countries since there existed the main pools of engaged people.

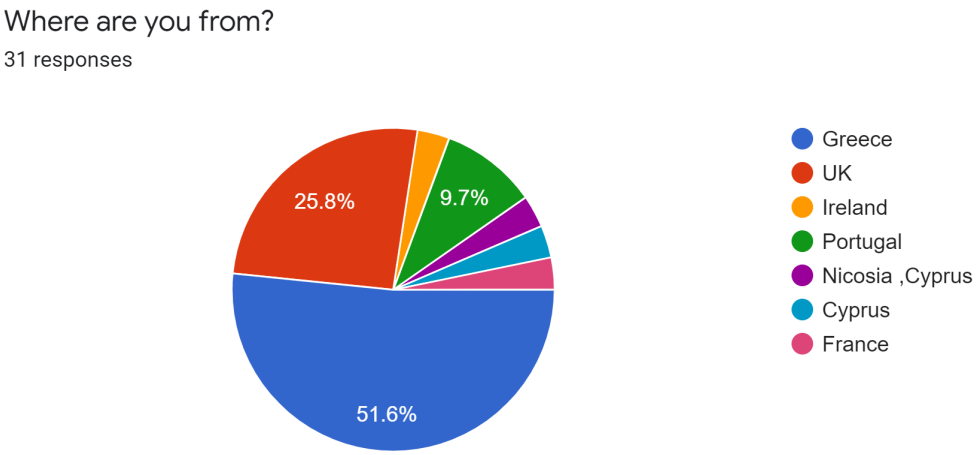

Figure 9 - Participants' origin

Figure 10 shows how many of past Hackathons the responder participated in. This survey was open until the end of the 5th Hackathon, therefore the maximum number of Hackathons a

responder could answer in this question was four (4). This graph also confirms the understanding of the consortium about teams returning to the LIVE IT activities and their desire to contribute. Actually, almost half of the responders (15 out of 31 responders) participated in three (3) or four (4) Hackathons, while six (6) attended two Hackathons and ten responders participated in one Hackathon.

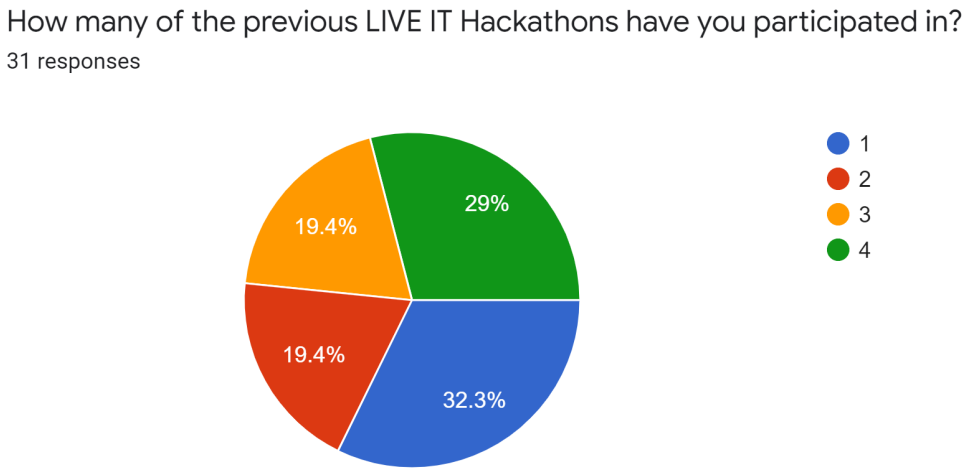

Figure 10 - How many previous Hackathons have you participated in?

Figure 11 shows the desire of responders to attend to the 5th and Final Hackathon of LIVE IT. Regardless of whether they attended one or more Hackathons, they tended to show interest in participating again. 24 out of 31 individuals replied that they would attend the 5th Hackathon.

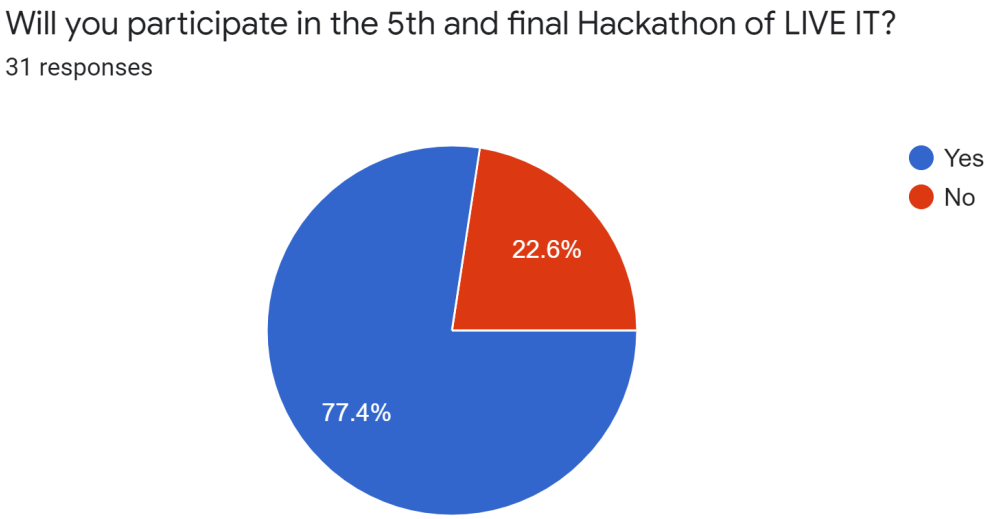

Figure 11 - Will you participate in the 5th and Final Hackathon?

Figure 12 shows whether individuals or their teams managed to come up with an improvement idea during their involvement in our Hackathon activities. Six (6) responders did not craft an idea, while twenty-five (25) of them did.

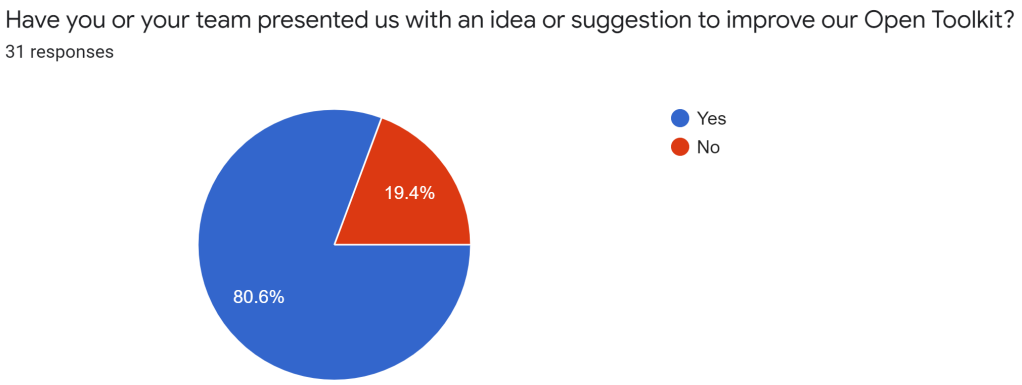

Figure 12 - Have you or your team presented us with an idea or suggestion?

Figure 13 presents whether the participation in Hackathons contributed to the development of the Open Toolkit of the LIVE IT project through the perspective of the responders / attendees in Hackathons. In this Likert scale, 1 meant “Not at all” and 5 meant “Very much” as shown in the question view of the form. 64,5% of the responders thinks that their participation helped in a great level, while another ~20% was neutral and only a ~15% thinks that their contribution is not that important.

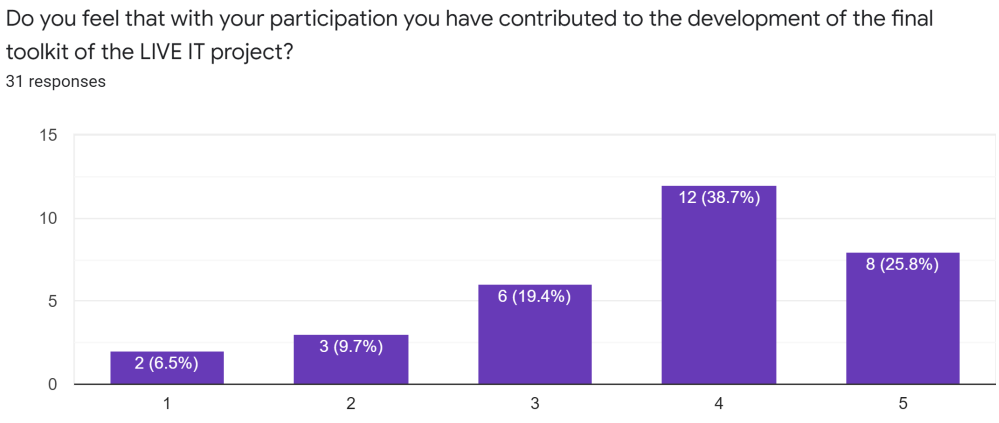

Figure 13 - Do you feel that you have contributed to the development of the Open Toolkit?

Finally, Figure 14 shows the perspective of responders regarding the efficiency and effectiveness of Hackathons conducted during the LIVE IT project. In this Likert scale, 1 means “Not at all” and 5 means “Completely” as shown in the question view of this form. No responder thinks that they were ineffective and inefficient, a 10% believes that they were not that effective and efficient, 26% has a neutral attitude and 20 out of 31 responders (64,5%) thinks that our Hackathons was very efficient and effective or completely effective and efficient.

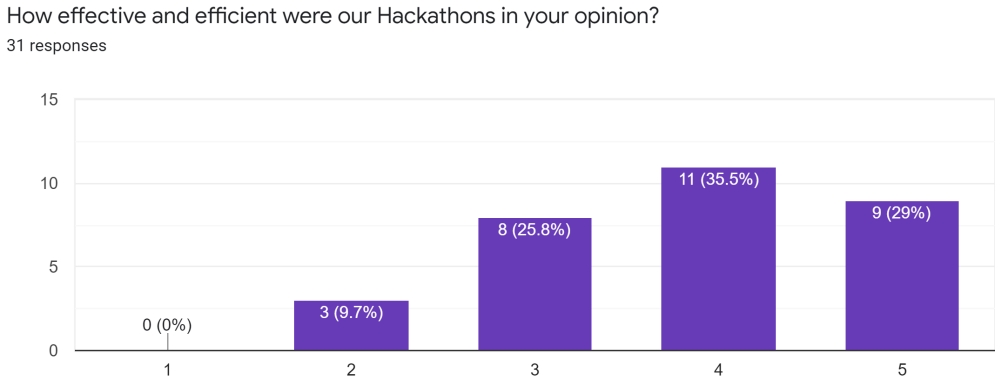

Figure 14 - How effective and efficient were our Hackathons?

8 HACKATHONS’ WINNERS

The first four (4) Hackathons had 3 winners each, giving out 3 tablets per Hackathon to be used temporarily for project purposes and the familiarization with the toolkit. As shown in the voting tables of each Hackathon, the 1st Hackathon’s winners were the AMEN organisation, the Irish family that decided to give the prize to the St. Jarlath’s College and Centro Social Comunitário Dr. Jaime Ramos, the 2nd Hackathon gave prizes to Promesip students that gave the tablet to EEEEK Alexandreias special needs’ school, the Disability Murals project and the CECD center for education with citizens with disabilities. Winners of the 3rd Hackathon were Promesip that gave the tablet to EPSEP Ioannina, the Neurodiversity Learning and the consolidated Irish team consisted of NUIG access center, FIT ICT talent pipeline and Dyslexia Ireland that gave the prize to the Donaghpatrick National School. The 4th Hackathon awarded the Stockwell park community, the Dyslexia Association Ireland and Centro Infantil de Miranda do Corvo. Finally, the 5th Hackathon will give out 4 tablets in total, won by the EIDD team, the CBN (Colegio Bola de Neve), the Bristol co-creation labs participants and the British individual. At the time of the

composition of this Deliverable, awards of the 5th Hackathon are still to be sent and will be sent as soon as the four (4) mentioned winners decide in which school or accessibility association they will give the tablets to. All above-mentioned tablets were used for Hackathon purposes to facilitate the interactions of participants with the LIVE IT toolkit during these activities. The tablets remain property of the institutions of the consortium and were given to the premises of participating organizations temporarily to use and familiarize themselves more with the LIVE IT output, contributing to the sustainability of the project.

9 CONCLUSION

The LIVE IT project has conducted five Hackathons stretched in time to 6 months, from December 2021 to May 2022. In the meantime, the Open Toolkit was constantly being improved and more functions were implemented based upon feedback collection. Many problems were identified through these activities, other were expected while others may have not been. Some of the findings of the feedback refer to problems and issues that could be fixed and solutions exist or could be developed, but unfortunately, some cannot be that easily addressed. The more severe a diagnosis of cognitive disability is, the harder it is for solutions to be offered.

The takeaway message collected from Hackathons should be the realisation that, at least with existing accessibility tools, PwCD are still dependent to their caregivers on a great level. There are of course many inclusive tools, and much effort is being currently put into creating more and more tools in more accessible approaches and this is great. It is also, though, the case sometimes that developers tend to forget some practical problems, such as, even though an application is user-friendly and accessible, it requires installation or log in, or a password to run or just to know which icon to press to start its function. Caregivers remain by their side, and this creates problems with their independence, their self-esteem and also their privacy. The IT community should keep in mind all these themes when building the digital world, whose citizens are PwCD also.

Eventually, the digital world should be constructed in such a way that accessibility tools would be pointless and would not be required in the first place.

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