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## AccessDesign: An inclusive co-design toolkit for the creation of accessible digital tools.

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# AccessDesign

## An Inclusive Co-Design Toolkit for the Creation of Accessible Digital Tools

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**Abstract.** Existing toolkits and resources to support co-design are not always accessible to designers and co-designers with disabilities. In this paper we present a study based on an innovative co-design programme, in collaboration with St John of God Community Services, where 3rd year computer science students work with service users with intellectual disabilities to create digital applications together. We conducted a series of co-design focus group sessions involving the service users who were previously involved in the co-design collaboration with SJOG Services and TU Dublin. The data collected during these design sessions has been integrated to form an accessible design toolkit through a series of iterative workshops. This toolkit is intended to generate a sustainable resource to be reused in the programme at TU Dublin but also in the wider community of inclusive design.

**Keywords:** Co-design, Inclusive Design, People with intellectual disabilities.

## 1 Introduction

Co-design is a methodology where the user participates in the process as an active co-designer [1]. The collaboration between the researcher and the co-designer goes further than the practice where the user is invited to participate in the processes of gathering and evaluating requirements, it is through this collaboration that they give value to the product or service by creating more meaningful experiences for the users [2]. The wide recognition of the role of co-design in improving the design of products has resulted in several studies investigating collaboration between researchers, stakeholders, and co-designers, primarily in medical and technology use.

Co-design is an important participatory approach to the field of Human Computer Interaction. However, to achieve genuine participation among all stakeholders may require time and resources that are not always available in industry and academic projects. Additionally, projects that claim user-centred and participatory approaches to technology design can become technology led rather than user driven [3]. Participatory design approaches are particularly important for the creation of inclusive technologies as a way for developers to understand the lived experiences of those that they are designing for.

TU Dublin and St John Of God Community Services run an innovative co-design programme where computer science students work with service users to create digital applications together [4,5]. This programme has generated a rich source of tacit knowledge on specific design tasks, methods and approaches that work well for both students and co-designers with intellectual disabilities. Preparation, communication, empathy, respect, vision and realism have been identified as key components to successful co-design projects [4]. The collaboration has also highlighted a need for accessible design resources and training materials for both students and co-design participants.

## 2 Co-design Tools

### 2.1 Extracting Tools from State-of-the-Art Literature

A literature review was conducted to find tools to assist in the digital co-design workshop for people with intellectual disabilities. The literature review was carried out using the Elsevier database and Google Scholar. The keywords used in the search equation were classified into two categories: 1) Co-design and 2) Co-designers; the Co-design category was broken down into words such as co-design process, co-creation, co-creation process, participatory design and participatory research; while the Co-designers category was broken down into keywords such as co-creators, co-creators with intellectual disabilities, and co-designers with intellectual disabilities. The selection of articles began with the inspection of titles that could be related to the review topics, followed by the analysis of the abstract. Then, the articles that contributed to the knowledge of the research topic were chosen. The final review was completed with 16 scientific articles.

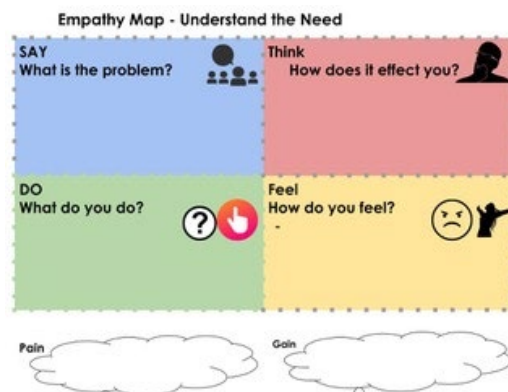
This phase identified tools such as semi structured interviews [6–10], surveys [6,10], cultural probes [9,11] personal diaries [11], participant observation [9], service mapping [12], ethnographic cases [7], workshops [7], focus groups [13,14], meetings [8,15], and emotional mapping [8].

While the above literature highlights useful research methodologies that have been applied to participatory design with people with intellectual disabilities, Colin Gibson et al., [16] acknowledges there is a lack of guidelines to support researchers in the co-design process. There are numerous guidelines and practical resources and toolkits in the fields of design thinking and user experience (UX) design that support co-design activities (IDEO <https://www.ideo.com>, D School; <https://dschool.stanford.edu/resources>, Service Design Tools <https://servicedesigntools.org/>). While many of these resources are valuable tools for designers to understand and adopt a participatory

approach, the resources are not always accessible or appropriate for designers or co-designers with disabilities. For example, people with intellectual disabilities may have difficulties with literacy and have challenges with tasks and interactions that require reading and comprehension while drawing and graphics-based tasks are not accessible to people with visual impairments. Furthermore, existing resources are not always appropriate for software developers or co-design participants without training in the field of UX or interaction design.

## 2.2 Extracting Tools from Design and Tacit Knowledge

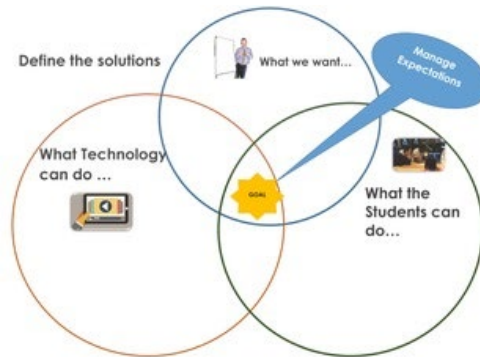
Based on the literature outlined above and our previous co-design work, a set of tools were created or adapted for the focus groups sessions keeping in mind the characteristics of our co-designers to be able to extract all their expertise and needs. For this adaptation, two overarching principles were implemented:



**Fig. 1.** Empathy Map

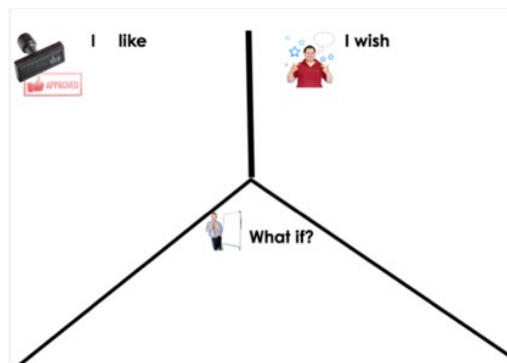
1. Use of simple English. All text from the tools was reviewed by the user expert from SJOG and was re-written using simple terms and sentences: nouns were avoided, and sentences were broken down into simpler grammatical structures.
2. Providing visual aids. For each tool, every field was supported by an image (photos or icons) to help overcome literacy limitations (see Figures 1 to 3).

“The Empathy Map” (Figure 1), adapted from the D-School toolkit, includes realistic pictures, simple text and a quadrant layout to make it more accessible for co-designers. “Managing expectations” (Figure 2), following the same design principles, is meant to bridge the gap between what end-users need and what developers (computer science students) are capable of doing.



**Fig. 2.** Managing Expectations

Unrealistic expectations by the co-designers was highlighted as a specific issue by designers and lecturers during individual interviews in a previous study [17]. This tool was implemented to assist in tackling this issue and to assist in providing realistic expectations of the resulting product for the co-designers.



**Fig. 3.** I like, I wish, What if

“I like, I wish, What if” (Figure 3) adapted from the D-School toolkit, includes realistic pictures, simple and large text to encourage co-designers to give detailed feedback.

### 3 Co-creating the Toolkit with Co-designers

Co-designers, are the experts of their own lived experience in co-design, and it is essential that their opinions are heavily weighed, as the connotations of co-design research directly impacts on them.

In order to ensure the active inclusion of the SJOG service users in the cocreation of the toolkit, five one-hour focus groups were organised in order to co-create the toolkit; one for every phase of design thinking (Empathise, Design, Ideate, Prototype, Test) as proposed in Hasso Plattner Institute of Design [18]. All focus group sessions had the same format, with some slight variations taking place between the sessions in terms of

design process content. We focused design sessions on an online personal planning tool that all participants were familiar with and that required a redesign. Participants for the focus groups (n= 20) were recruited from St. John of God Liffey Services, and (n=5) students and lecturers who previously participated in co- design activities.

In the following sections we present the tools and methods that drove our design sessions, which were honed and iterated on based on feedback from co-design participants.

### **3.1 Accessible Ethical Procedures**

One barrier to involving individuals with intellectual disabilities in co-design is the complexity of the consent process. Therefore, we highlight the importance of an accessible protocol to engage individuals with intellectual disabilities to focus groups, and the proposed protocol focuses on co-designing accessible technologies. In this study, participants with intellectual disabilities taking part in focus groups, self-recruited through a gatekeeper, after reading a modified (highly visual), easy to read (included images, colour formatted) information leaflet and consent form that the gatekeeper sent to them. There was a timeframe of a week allowed for an opportunity to reflect and ask questions before deciding if the individual wishes to participate. The consent letter also advised the participant to discuss their decision with their family members and support staff.

### **3.2 Engaging and Accessible Design Session Plans**

During each focus group participants worked together on a design challenge using co-design tools to create a user interface design or give feedback on an existing design. Where SJOG participants were asked questions, they were minimally intrusive and straightforward, balanced questions around the co-design process, implementing question tools provided during the sessions to assist in answering. For each session, we created a set of slides and screens to share designs and structure each session. While we did not create a script for co-design facilitators to follow, we did open each sessions with introductions and a recap from any previous sessions. We also reiterated the meaning of co-design and highlighted some ground rules for the sessions. For example:

- “Everyone is equal”
- “There are no bad ideas!”
- “Feel free to speak and give your ideas.”
- “We value everyone’s contribution”

### **3.3 “Empathy Map”**

Empathy maps were primarily used during the inception of the co-design process, to precisely target the problem faced by co-designers, for the designers to improve or build on. There is a tendency for co-designers to be unwilling to state flaws or issues, in part, to not dismay the interface designers. The empathy map assisted in addressing this core



issue, by almost providing an allowance by the co-designers to directly state the problem they feel. At times, this tool was found to be slightly abstract by both computer science students and SJOG co-designers and special attention in explanation may be attributed to the “what do you do?” quadrant. Empathy maps were found to be useful for reflection on co-design sessions and as method to sum up feedback at the start of a new design session.

### 3.4 “I Like What If” and “Define the Solution”

During the co-design workshops, where initiating a response to a co-design question was challenging for some co-designers or putting forward their opinion was difficult, despite comprehension of the question. It was evident that the tools, such as the I Like What If (Fig X) and Define the Solution (Figure X), provided a framework to guide the answers of the co-designers with intellectual disabilities, whilst including their own thoughts and opinions. Furthermore, it provided a tool for the interface designers to accessibly engage with the co-designers, when they may have felt stuck or at an impasse during a design stage.

### 3.5 “Guessing Games”

There was also the development of a new form of co-design tool, founded on previous experiences of co-design, that was executed as a “guessing game” (see Figure 4), this was an engaging method to extract functional information for the designers (particularly useful for visual or auditory information – which stimuli were clear and relayed the message or meaning the designers wanted e.g., icons – log in/out button etc.), whilst the co-designers were curiously engaged about understanding or “guessing” the images presented sequentially. This provided a non-influenced method of extracting the co-designers' thoughts on items without providing leading information on the item in question.



Fig. 4. Guessing Game

### 3.6 Facilitator Prompts

A commonly occurring issue in within qualitative data collection is biasing individuals or influencing their answers whether knowingly or not, this can be even more pronounced in more vulnerable populations. One solution to this is to make sure to invite co-designers with intellectual disabilities to offer their opinions and feedback before anyone else to avoid biasing their reactions and suggestions. “Another feasible solution we have found, inspired by the ‘Do-It-Yourself Guide [19], is an easy to use table of neutral- nonbiased questioning methods, see Table 1 below. This can reduce facilitators use of leading questions. Why?” is a really important prompt and design question for facilitators to pose to try to understand co-designers perceptions of early prototypes and

to elicit more detailed feedback. Finally, the facilitators found it important to non-bias the initial questions asked to the co-designers. For example, instead of using questions such as "Do you like?/ What do you not like?", which can cause a leading answer. A more revealing approach occurred by phrasing the questions as "What do you think?" or "How did you find?"

**Table 1.** Neutral- nonbiased questioning methods

<b>When this happens:</b>	<b>Try this:</b>
Co-designers respond "I like it" to the question what do you think of feature X/icon X?	Ask "Can you tell me why you like it" to try to elicit a more detailed response
If co-designers say "I agree with [another person/participant]"	Ask "Why do you agree/disagree"? Or "Can you tell me about why you agree/disagree?"
A participant makes a comment, and you are not entirely sure of the meaning	Rather than inferring or guessing the meaning of what the participants has said, try repeating back their comment to clarify and phrase as a question to try to get more meaning/clarification.
If you ask a question to the group and do not get any response	Rather than ignoring this or moving on, initially, try adjusting the question to make it more comprehensible (no response may mean little understanding or an unwillingness to provide a wrong answer). If there is still no response, then perhaps, try going around the table or virtual meeting by calling out names and asking people to contribute

## 4 Conclusion and Future Work

Despite the numerous successes of co-design, the tacit knowledge gained from real-life co-design experiences has not been formally recorded nor tested. The tools presented in this paper form a collection of methods that have been successfully applied and validated by co-designers with intellectual disabilities. This work will help future co-designers identify which tools are the most feasible to work within projects that seek to develop products or services for end-users with intellectual disabilities or other user groups with diverse capabilities and requirements. For example, we plan to apply these tools in the design of an assistive application for persons with mild dementia to enable them to manage activities of daily living in order to live independently at home. An accessible toolkit will allow persons with dementia to articulate their needs with respect to activities of daily living and to co-design and co-create assistive technology with software developers to help monitor and maintain these activities while living at home. As this toolkit evolves we would like to invite a wider cohort of participants to include people with sensory and physical disabilities, UX practitioners and accessibility experts to further develop and evaluate the materials.

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## References

1. FONTYS. A multi-stakeholder co-creation platform for better access to Long-Term Care services. 2017. p. 1–73.
2. Phillips A, Morgan G. Co-production within health and social care - The implications for Wales? *Qual Ageing Older Adults*. 2014;15(1):10–20.
3. Rogers Y, Marsden G. Does he take sugar? Moving beyond the rhetoric of compassion. *Interactions*. 2013;20(4):48–57.
4. Bourke D, Boland S, Bourke P, Gilligan J. A Co-Design Partnership to Develop Universally Designed ICT Applications for People with Intellectual Disability. *Univers Des High Educ Transform Congr Oct -2nd Novemb 2018, Dublin Castle* [Internet]. 2018 [cited 2022 May 1]; Available from: <https://arrow.tudublin.ie/unides18pap>
5. Gilligan J. Using MOOCAP Open Educational Resources to support Universal Design and Accessibility initiatives in Computer Science programmes in Ireland’s first Technological University. In: *AAATE 2019 Conference – Global Challenges in Assistive Technology: Research, Policy & Practice*. Bologna, Italy; 2019. p. s35–6.
6. Carr ECJ, Patel JN, Ortiz MM, Miller JL, Teare SR, Barber CEH, et al. Co-design of a patient experience survey for arthritis central intake: An example of meaningful patient engagement in healthcare design. *BMC Health Serv Res* [Internet]. 2019 [cited 2022 May 1];19(1). Available from: <https://doi.org/10.1186/s12913-019-4196-9>
7. Greenhalgh T, Procter R, Wherton J, Sugarhood P, Hinder S, Rouncefield M. What is quality in assisted living technology? The ARCHIE framework for effective telehealth and telecare services. 2015 [cited 2022 May 1]; Available from: <http://dx.doi.org/10.1186/s12916-015-0305-8>.
8. Gustavsson SM, Andersson T. Patient involvement 2.0: Experience-based co-design supported by action research. *Action Res*. 2019;17(4):469–91.
9. Kalma A, Sitbon L. Understanding Older Adult Values through Technologies Used for Crafting; *Understanding Older Adult Values through Technologies Used for Crafting*. 2020 [cited 2022 May 1]; Available from: <https://doi.org/10.1145/3441000.3441027>
10. Rathnayake S, Moyle W, Jones C, Calleja P. Informatics for Health and Social Care Co-design of an mHealth application for family caregivers of people with dementia to address functional disability care needs. 2020 [cited 2022 May 1]; Available from: <https://www.tandfonline.com/action/journalInformation?journalCode=imif20>
11. Dewsbury G, Sommerville I, Bagnall P, Rouncefield M, Onditi V. Software Co-design with Older People BT - *Designing Accessible Technology*. In: Clarkson J, Langdon P, Robinson P, editors. London: Springer London; 2006. p. 199–208.
12. LaMonica HM, Davenport TA, Ottavio A, Rowe SC, Cross SP, Iorfino F, et al. Optimising the integration of technology-enabled solutions to enhance primary mental health care: a service mapping study. *BMC Health Serv Res* [Internet]. 2021 Dec 1 [cited 2022 May 1];21(1):1–12. Available from: <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-021-06069-0>
13. Austin EJ, Lee JR, Ko CW, Kilgore MR, Parker EU, Bergstedt B, et al. Improving the impact of clinical documentation through patient-driven co-design: experiences with cancer

- pathology reports. *BMJ Heal Care Inf* [Internet]. 2020 [cited 2022 May 1];27:100197. Available from: <http://informatics.bmj.com/>
14. Miller JL, Teare SR, Marlett N, Shklarov S, Deborah •, Marshall A. Support for Living a Meaningful Life with Osteoarthritis: A Patient-to-Patient Research Study.
  15. Ní Shé É, McCarthy M, Thornton S, Doran T, Smith F, Milton J, et al. Enabling public, patient and practitioner involvement in co-designing frailty pathways in the acute care setting. [cited 2022 May 1]; Available from: <https://doi.org/10.1186/s12913-019-4626-8>
  16. Gibson RC, Dunlop MD, Bouamrane MM. Lessons from Expert Focus Groups on how to Better Support Adults with Mild Intellectual Disabilities to Engage in Co-Design. 2020 [cited 2022 May 1]; Available from: <https://doi.org/10.1145/3373625.3417008>
  17. Aswad E, Murphy E, Fernandez-Rivera C, Boland S. Towards an inclusive co-design toolkit: perceptions and experiences of co-design stakeholders. In: to appear in the Proceeding of ICCHP-AAATE 2022. Lecce, Italy; 2022.
  18. Plattner H, Hasso Plattner Institute. An introduction to Design Thinking. Process Guide. IInstitute Des Stanford [Internet]. 2010 [cited 2022 May 1];1–15. Available from: <https://dschool-old.stanford.edu/sandbox/groups/designresources/wiki/36873/attachments/74b3d/ModeGuideBOOTCAMP2010L.pdf%0Ahttps://www.aaas.org/event/project-2061-workshop-understanding-and-using-next-generation-science-learning-goals>
  19. Krug S. Rocket Surgery Made Easy: The Do-It-Yourself Guide to Finding and Fixing Usability Problems. 2010.