# Intelligent strategy development and recommendations:
# Using TechAbility Standards to improve support for disabled learners

## Knowledge Transfer Voucher Project Report

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TechAbility

# Introduction

Mainstream and specialist organisations supporting people with learning difficulties and disabilities struggle with awareness around effective strategy and use of assistive technologies (AT). There is often a technology-first approach, buying inappropriate equipment, rather than understanding what would be pedagogically effective – often due to a lack of guidance of how technology can be used effectively.

Educational outcomes are improved when students learn in an environment that provides a high standard of AT. To do this effectively involves combining infrastructure, tools, and expertise. When colleges cannot do this, it is often because they do not know where to start with making the changes necessary to attain this combination.

TechAbility has increased its engagement over the last three years by setting up a network of Assistive Technology Champions across specialist colleges/centres. TechAbility works through its Champions Network, training and consultation, but it is a challenge to find the right ways to support development of expertise and enhancement across the sector in a space where expertise is limited alongside continual advancements in technology.

The TechAbility Standards have been developed to address this and a version of an audit tool has been adapted for use by staff and organisations to audit their current provision, identifying areas for improvement. This does not have the ability to deliver individualised outputs. TechAbility wishes to develop these into an innovative solution that delivers personalised guidance.

The standards have multiple potential uses, as inspiration for improving provision, or more formally as an audit and basis for IT / AT strategy building. They can be integrated further into TechAbility's training and consultancy.

Existing research at The Open University's Institute of Educational Technology (Iniesto et al., 2023; Coughlan et al., 2024) explores how students can benefit from AI-based tools that provide advice and information sharing around disabilities through dialogue. This project draws on the understanding being built from those projects but with a focus on what can support staff and organisations to enhance their provision, using the TechAbility Standards as a foundation of guidance.

The project therefore aimed to:

- Develop and evaluate a first version of an intelligent approach to make the outputs of the TechAbility standards audit more useful and personalised, therefore supporting staff to better support disabled students.
- Provide an instructive and visually appealing representation of the output of the audit process through collaborative design work between TechAbility / Natspec and the OU.
- Provide TechAbility's Champions and clients with tailored guidance and recommendations that improve their strategies and uses of assistive technology and in turn improves the outcomes for disabled students in colleges.

A project timeline is included in Appendix iv.

# Conceptual design

Initial discussions within the team and with input from TechAbility's network led to high level decisions about the design.

While the potential for a conversational interface was explored, the priority was felt to be providing a useful report, tailored to each user, rather than a conversation around the Standards. Initial work described below also outlines challenges found in creating a conversational interface. A focus on creating the report also meant that the solution could take it's input from an existing prototype form created by TechAbility as a means to question users on their current position in relation to each standard, and focus on the output rather than the interaction with users.

In essence, the design aims to generate tailored guidance and recommended actions by checking the extent to which the organisation currently adheres to a set of standards. This appears to have wider potential as many quality enhancement or assurance processes entail a similar approach and can be similarly detailed and complex to follow. A simplified explanation of the design that was developed is as follows:

1. Take information about the Standards from the TechAbility website.
2. Reformat and save this information, so it becomes a knowledge base.
3. Develop instructions for ChatGPT to use this knowledge base to create a set of recommendations matching all areas covered in the Google form.
4. Recommendations checked for accuracy and stored for reuse.
5. Member of staff at the college / institution completes the TechAbility Standards Google Form.
6. Match the form answers to the recommendations and use ChatGPT to generate an executive summary.
7. Email the finished report to the TechAbility team for confirmation prior to sending on to the college.

The Standards are split into 12 themes such as assessment, appropriate devices and innovation, with multiple checkpoints within each of these themes. Further discussion considered how a solution could avoid overwhelming the user and split up or prioritise particular themes within the Standards, rather than providing too many suggestions or actions at once. While this was not implemented at this stage, it was envisaged that the process could be staggered, or focus on an initial set of priority standards with the others explored at a later date or by other means such as through a consultancy conversation.

## Solution development

This section explains the technical development involved in creating a prototype solution, including the tools and approaches that were explored and the decisions made to change direction or make refinements.

### Tools

The following tools and frameworks were used in creating the solution:

- **PHP - Laravel framework**: Used to host the algorithms developed for the process and email functionality.
- **MySQL**: Database for storage of various data for each of the processes.
- **OpenAI API via openai-php/client and openai-php/laravel libraries**: Used to leverage ChatGPT.

- **A web crawler - spatie/crawler:** used for gathering the content from TechAbility website.
- **Google API (google/apiclient library):** used for connecting to Google Forms responses via Google Sheets.

## Initial exploration of a conversational assistant approach (discontinued)

Given the short nature of the project, the aim was to focus on the production of tailored reports. However, in the initial phase of the project we explored the possibility of a conversational interface for capturing information from the user, rather than the existing form-based approach.

There is potential to produce a ChatGPT-based assistant that is instructed to ask questions prior to producing recommendations, and we are exploring this further through the Digital Access Advisor challenge project. However, limited initial work on this occasion concluded that the assistant was not able to intelligently decide which questions to ask to get a deep enough understanding before moving on to create recommendations. The assistant consistently jumped to creating recommendations too early in the conversation. Furthermore, feedback gained from champions at this stage of the project indicated that the Google form approach would be acceptable and that they were more interested in the recommendations than a dialogue-based approach.

## Knowledge Base Creation Process

To generate content for reports based on the Techability Standards and associated guidance, the website documentation for this was converted into a condensed format that could then be used with ChatGPT. This then became the source data that it was instructed to draw on when creating its responses.

Markdown, a lightweight markup language, was chosen to store the content due to its ability to retain of some basic semantics of the content whilst vastly reducing the document size from the HTML equivalent.

To generate this Markdown content the TechAbility webpages were first stored locally in their raw HTML format with the use of a website crawler to spider the website. We then sent each webpage to the OpenAI Chat API along with a tailored prompt to convert the relevant parts of the page content into Markdown that was then in turn stored locally.

Once all the TechAbility webpages had been converted into Markdown the final step was to amalgamate these pages into one file again in Markdown. This file then represented all the information in the TechAbility website and was attached to an OpenAI Assistants instance as the knowledge base for the generation of the recommendations.

There were pros and cons to using the Chat API in the conversion of website content into Markdown. The pros were that it was flexible and could summarise any web page. The cons were that it could take a long time for a large website and would have a cost associated. Because of these cons, for a similar project we opted to create a custom algorithm with awareness of website's page structure to directly convert the HTML into Markdown.

For both the Markdown content and recommendations generation there was also the possibility of hallucinations by the GPT model. This was mitigated by the local storage of these outputs to allow their review and editing if need be.

## Recommendation Generation

The Google Form asks questions related to each Standard and once complete provides data that can be used to understand the user and their institutions current status and areas for improvement. To

provide recommendations based on these responses, we created an OpenAI Assistants instance for use via OpenAI's API, which generates recommendations based on each question answered in the Google Form. This instance makes use of the knowledge base described in the previous section with the Markdown version of the TechAbility website combined into a single file uploaded to this Assistant.

Each question in turn is sent to this assistant with the prompt engineered to return a recommendation for this in a given format. Each recommendation is then stored locally in the database. This process is shown in figure 1 (below).

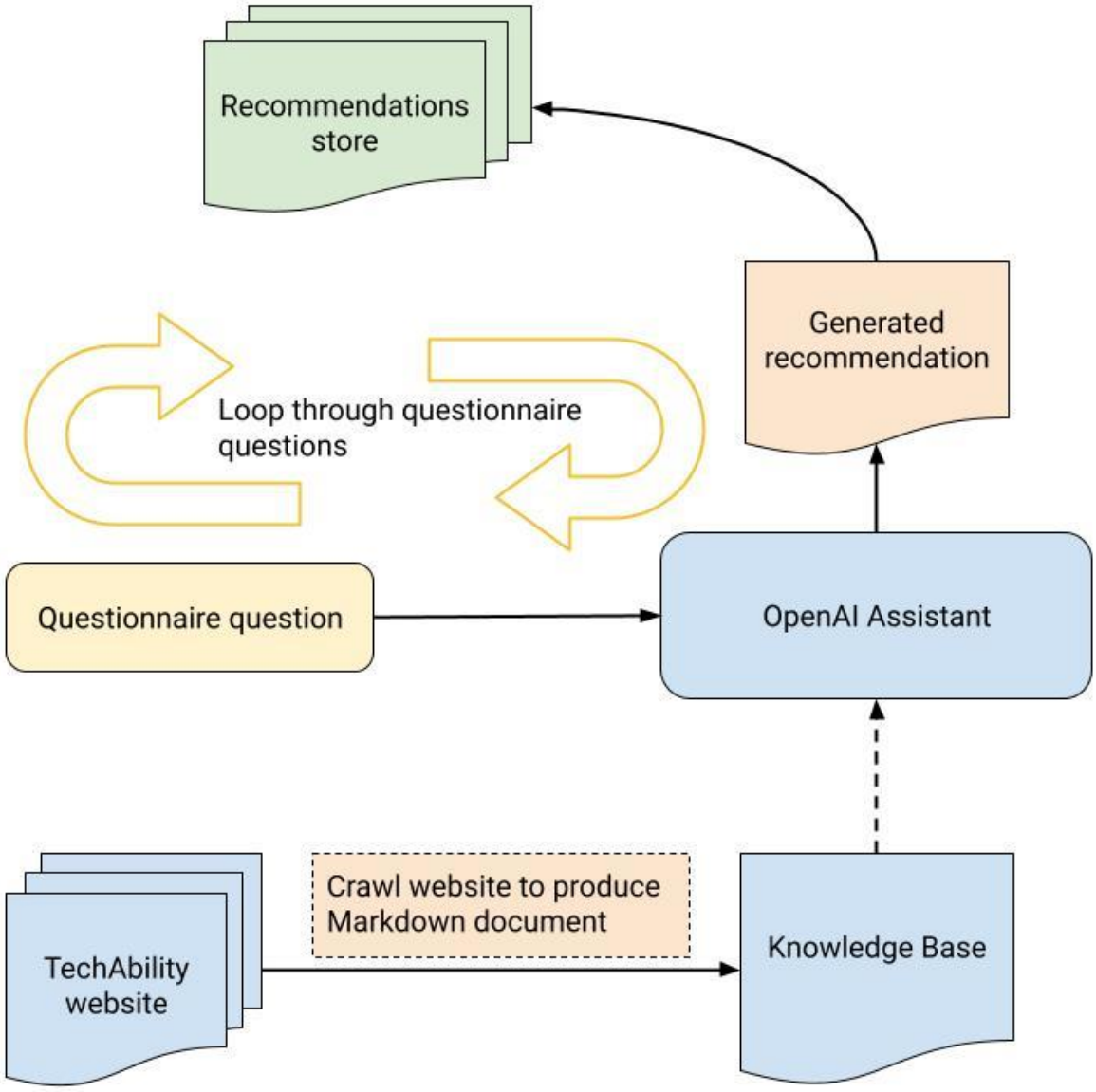



*Figure 1*

## Report Generation

Building on this foundation, a process was then created to generate a report automatically when a new response is received to the Google Form. This is achieved using the Laravel scheduling abilities to periodically check a Google Sheets instance where participants responses are stored, connected to the Google Forms instance.

On finding of a new response the following takes place:

- For each answer where the participant has indicated their organisation could do with help, the algorithm finds the correct recommendation.
- These recommendations are brought together and then an OpenAI API Chat instance is asked to generate an executive summary for the recommendations.
- The final report is converted to a Word document.
- This is then emailed to TechAbility for it to be reviewed before being sent onto the participant.

Figure 2 (below) illustrates this process.

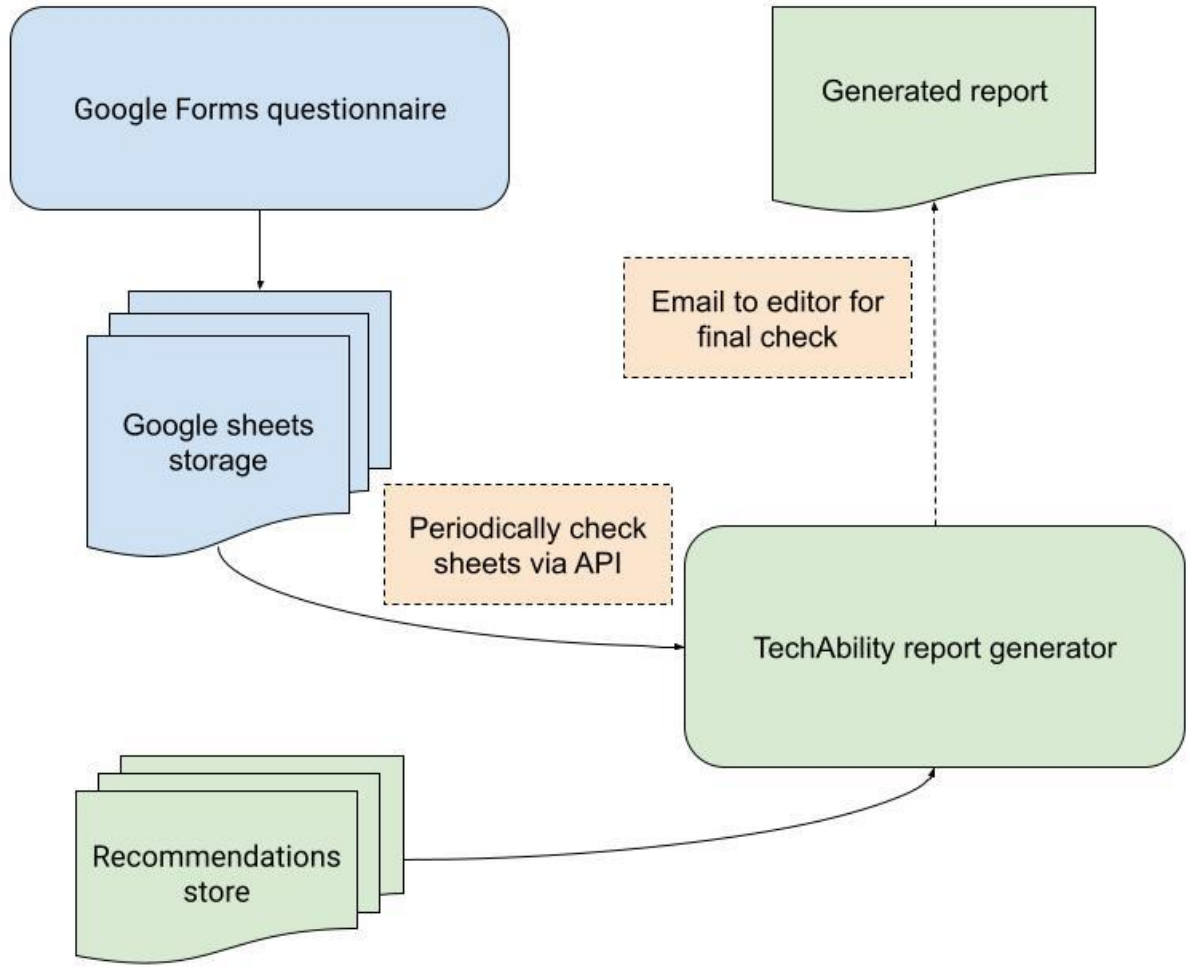



*Figure 2*

## Refinements to the generated reports

The initial reports produced what had been specified: detailed recommendations based on the input from the form, informed by the TechAbility Standards. Feedback from Techability suggested the following improvements:

- Accessible heading structure to improve document navigation, including a contents page at the beginning
- Headings to be clearly marked with the icon of the corresponding standard, giving visual cues as to what is covered in that section
- More use of negative space to help readability

- A header showing the organisations involved
- A title page to improve clarity of purpose and give visual cues
- An “Executive Summary” section, to give a brief overview of the recommendations in the report
- Better spacing to help readability and improve impact of text

It was anticipated that these changes may need to be completed after the end of the project but Open University responded by putting these recommendations straight into practice to generate a second version.

The resulting reports were much easier to read with marked improvements in accessibility. Standard headings were unable to be generated in this way, but hyperlinked text at the start created the same result.

## Evaluation

The project engaged with the Champions Network for initial input and then to get usage and feedback of the prototype approach. Feedback on the prototype from TechAbility was also captured as a means to direct the project activities and identify potential next steps.

### Engagement

- Nine colleges filled out the full Google Form
- Two additional colleges filled out selected sections of the Google Form
- Three of these colleges used the form and subsequent report following training related to the “Assessment” section of the Standards

Each of these colleges received a report generated by the tool that outlined which of the Standards they had met and what actions they could undertake to improve their provision.

The project questionnaire was answered by seven TechAbility Champions early in the project to help inform the development of the tool. It helped to answer the questions of whether to proceed with a tool based on a survey or a conversation with a bot, to understand which of the TechAbility Standards were the most relevant and to understand what the challenges are to high level AT provision. From this we decided to proceed with a questionnaire-based tool and considered the option of reducing the tool to dealing with a limited number of Standards. The full survey details can be read in Appendix ii.

Once we had our first reports developed by the tool we ran an update and engagement meeting with the TechAbility Champions. This consisted of an outline of the project so far, presenting the reports and gaining feedback from the TechAbility Champions of any further changes we needed to make. The details captured on the day can be viewed in Appendix iii.

### Feedback from TechAbility

Neil Harrod-Beck and Fil McIntyre met to review, and quality assure the output of the TechAbility Standards. The following is a summary of the feedback from their meeting.

- The report has successfully created detailed recommendations based on the input. It is well laid-out and the accessibility checker has come up with very little to change.
- It would be prudent to include some text at the start of the document to explain how it is generated, the limitations of the tool and the responsibilities of the author and reader of the report.

- It was felt that the report should be made shorter in future, certain points had been expanded much more than their original corresponding standard. It would be great if participants could select the level of detail that they require at the start
- Some quality assurance is needed. When covering good assessment practice the report made two suggestions next to each other that appeared contradictory:

    1 - "Choose a space that is quiet and free from distractions…"

    2 - "Conduct assessments in the actual context where the learners will be using the technology…"

- This is a little nuanced as generally it is good to have an initial quiet space to assess learners, but the ongoing process of assessing a learner means that it is good practice to assess them in the context of where they will use the technology.
- Conversely there is evidence of the AI tool improving on the original source information. Under the same section above the report suggests:

    "Collect feedback from learners post-assessment to refine and improve the appropriateness of the environments used."

This isn't from the original standards but seems like good practice.

- One recommendation highlighted a shortfall in the source materials. The report headed up a section called "Assessing Learner Needs for Accessible Document Formats" which appears to encourage an individual approach to accessible documents, whereas the reality is that it should be an organisational approach to making documents accessible as a standard – with adaptations for individuals happening where necessary.
- We were curious if the report would be the same if the process was run more than once with the same input. This would be interesting to test in future.

## Conclusions and next steps

This exploratory project has provided an opportunity to understand how generative AI might enable new solutions to auditing and training scenarios. In the spirit of knowledge exchange, it has led to greater understanding of sector-wide challenges around access and assistive technology support and how these might be addressed.

### Next Steps

It is intended that the tool be developed further and opportunities around it be considered. The following steps are not necessarily in the order that they would be explored, and some would necessitate overlap.

#### 1. Update the TechAbility Standards

This project has prompted a wider debate within TechAbility and the Assistive Technology community about the continued upkeep of the Standards.

The decision has been made within TechAbility that time should be put aside this year (2024) for an update of the TechAbility Standards – reviewing content, reviewing section headers, considering advances in practice/technology, and resources that can improve outcomes for those using the tool.

The process is planned as follows:

1. TechAbility produce an updated version of the TechAbility Standards
2. Reviews of this are invited from the wider Educational Assistive Technology community including the TechAbility Champions and particularly the Assistive Technology Network (ATN)
3. TechAbility produces a final draft based on this feedback and sets future review points

This update is important as there have been considerable changes to education delivery in recent years including improvements to remote delivery, adoption of mainstream accessibility tools and the introduction of AI.

## 2. Updates and Improvements to the Tool

Based on feedback from the TechAbility Champions and from within Open University/TechAbility the tool could be updated in several ways. There is further consideration needed, but these are the ideas that have come up during the project.

**Create a core set of standards for an initial tool**

This would make a prioritised, concise and easy introduction to improving assistive technology provision. This would help the tool be widely adopted and could be based on the standards that TechAbility believe would have the largest impacts while being relevant to all educational organisations. It could be a core of just seven to ten Standards. (See question 8 in Appendix ii)

**Make the tool Modular**

This means that after organisations have used the core standards, they can explore modules individually based on their priorities. The modules would correspond to the different categories of standards. This would make adoption of improved practice more manageable, rather than getting ovewhelmed with a comprehensive report with too many recommendations to be viable.

**Add organisational context to the tool**

Is this a large residential college or a small vocational provider? Does the organisation have a specialism in visual impairment, or do they have a variety of access needs for their learners? Do they want a short consideration of their AT provision, or an in-depth review? There are many different factors that affect the recommendations given to organisations, perhaps we can account for some of these with additional initial questions in the form.

**Consider input from professionals and the organisation**

Good practice with AI tools isn't about replacing human interaction altogether, but instead to consider which elements are best for people to focus their time and attention on.

For future iterations there could be further questions within the tool for the organisation to answer and perhaps text boxes to give more nuanced feedback and direction.

## 3. TechAbility Integration into Wider Support

A group of educational professionals tested using a section of this to help their understand of a course that TechAbility ran. In future it could be a standard part of TechAbility carrying out a consultation of the college and to help empower them to make their own changes with more considered interventions from professionals.

This would work particularly well if there was a core set of standards, it could become part of a campaign to ensure that all Natspec colleges meet these standards that will have the largest impact on Assistive Technology provision.

The TechAbility Standards has always been a tool to drive people towards resources, training and events that TechAbility and other providers produce. The tool can help in this regard by making the process easier and more targeted.

## 4. Wider Application of the Tool

Although the TechAbility Standards were developed for specialist colleges and Karten centres, the feedback from other educational organisations that the content widely applied to their contexts.

With this in mind, it would be interesting to pilot this tool with these other groups. Especially with the core set of standards as they are the ones that would apply to all organisations.

TechAbility and Open University have a history of collaboration with mainstream education and can explore the use of this tool with those they have previously worked with.

## Sustainability

In terms of sustainability there are two key areas that are to be maintained. The first is the TechAbility Standards, they need to be kept updated as there are advancements in Assistive Technology and wider changes to education. The second is the tool that has been created during this project and the latter requires that the former be maintained.

TechAbility approached the Assistive Technology Network to see if they would be interested in taking on the responsibility of a steering group for the TechAbility Standards. This proposal was enthusiastically accepted and they are now contributing to the rewriting and updating of the TechAbility Standards.

The website hosting the TechAbility Standards will continue to be provided by Natspec, so this will ensure that the knowledge base is available for the tool. TechAbility will ensure that the current Google form is maintained until a replacement will be produced, they will coordinate with Open University to ensure this changeover feeds into the tool.

The process for updating the knowledge base that will be used to generation updated recommendations based on the updated TechAbility Standards requires a series of CLI commands to be run, the documentation for which is contained as part of the technical output. These will need to be run manually once the TechAbility website has been updated. Once run the automated production of reports will continue using these updated recommendations.

A further technical requirement is the monitoring of OpenAI API changes and possible GPT model deprecation which would then require system changes to ensure continuing usage.

## Wider applications of the techniques developed in this project

The process of filling in a simple form, comparing this with a knowledge base using an AI tool to create a report is a process that could apply to many different scenarios in different contexts.

Let's take one indicative example. Within the specialist education sector this could be used for RARPA (Recognising and Recording Progress and Achievement.) which "ensures the quality of non-accredited learning programmes and learning opportunities within a programme that is in addition to a specific qualification." Source: https://www.et-foundation.co.uk/professional-development/special-educational-needs-disabilities/teaching-and-learning/rarpa/

There are five stages, each with a Self-audit Tool which makes it clear what needs to be achieved. The process could be used to create a short recommendation report for organisations to help them understand what they need to action.

## RARPA Stage One: Self Audit Tool

Use this self-audit tool to assess what you are already doing well and where you need to take further action.

| Stage One: Aims of the Learning Programme | | | | Action Required |
|---|---|---|---|---|
| Is there evidence that the aim of the learning programme meets local and national need? | | | | |
| Does the aim of the learning programme include learning opportunities relating to the four preparing for adulthood pathways? | | | | |
| Does the aim of the programme include opportunities to develop personal and communication skills, access work-based learning and focus on independent living and employment? | | | | |
| Does the aim of the learning programme enable learners to make progress towards personalised outcomes within EHC Plans that are challenging, aspirational and achievable? | | | | |
| Will the learning programme enable learners to reach their identified destination? | | | | |
| Do staff have the training and information they need to understand the programme aims and support prospective learners to make informed choices? | | | | |
| Is there information, advice and guidance available before enrolment that supports learners to make informed choices about which programme is best for them? | | | | |
| Has the admissions process identified all the learner's support needs and can they be met on the learning programme? | | | | |
| Can prospective learners find out about the programme from events, visits, taster sessions, links programmes and access to information that is accessible and relevant to them? | | | | |
| Have prospective learners been listened to and their views considered when offering a place on the learning programme? | | | | |
| Is the quality assurance process informed by feedback from pre-enrolment and admissions processes? Will this support continual improvement? | | | | |

No evidence requires attention  Requires development  Evidence of this informs planning and delivery

It may be that this is not considered necessary or useful in this circumstance, but it shows the wider application that isn't limited to the specialist education sector or even education in general.


# Acknowledgements

We would like to thank members of the Champions Network and Steering Group for engaging and giving thoughtful input to the project.

This project was supported by a Knowledge Transfer Voucher and we would like to thank Open University colleagues for their guidance and support to enhance the proposal and project idea.


# Appendix i: Definitions

## TechAbility Champions

The TechAbility AT Champions Programme is an initiative designed to support professionals working in specialist environments, specifically in organizations that are members of Natspec and Karten. The programme aims to create Assistive Technology (AT) champions who will be advocates for the effective use of technology to enhance the lives of learners or service users with special needs.

As an engaged group of professionals who fit the profile of beneficiaries of an AT audit tool it was decided to focus testing and feedback with the TechAbility Champions.

## Assistive Technology Network (ATN)

The assistive technology network is a community supported by Jisc and TechAbility for people working in further and higher education. It is a place to share experiences, ideas and resources.

This community is run by the sector, for the sector. It is for anyone working in further or higher education with an interest in assistive technology, at any level of experience, from beginner to expert.

Current members:

- Beth Winkler, access centre manager, Edinburgh College

- Fil McIntyre, manager and assistive technology lead, TechAbility
- Kellie Mote, subject specialist, Jisc
- Laura Hutton, subject specialist, Jisc
- Luiza Bell, assistive technologist, University of Bath
- Mike Walter, e-learning developer and AT trainer, Hartpury University and College
- Neil Harrod-Beck, assistive technology projects lead, TechAbility
- Pete Scorey, assistive technologist, University of Chester
- Piers Wilkinson, commissioner, Disabled Students Commission
- Rohan Slaughter, senior lecturer MSc educational assistive technology, University of Dundee
- Ros Walker, digital accessibility adviser, University of St Andrews

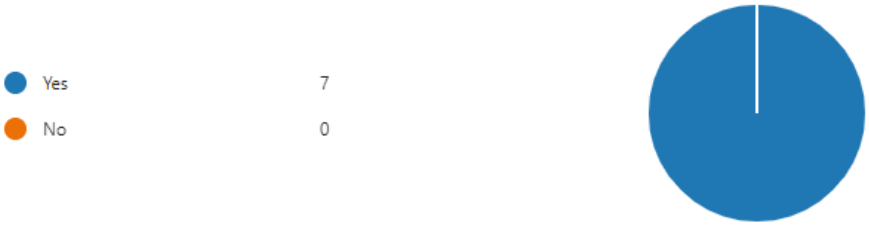
People working in non-profit organisations that support further and higher education are also welcome to join.

The community aims to support personal and professional development in education. A steering group of members from across the UK meets regularly to decide priorities and plan activities.

## Appendix ii: TechAbility Standards Microsoft Forms Survey

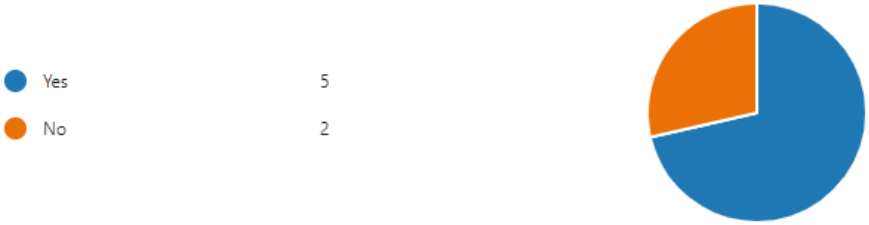
3. Are you aware of the TechAbility Standards?

More Details




4. Have you used the TechAbility Standards?

More Details



5. What did you use them for and how successful was this?

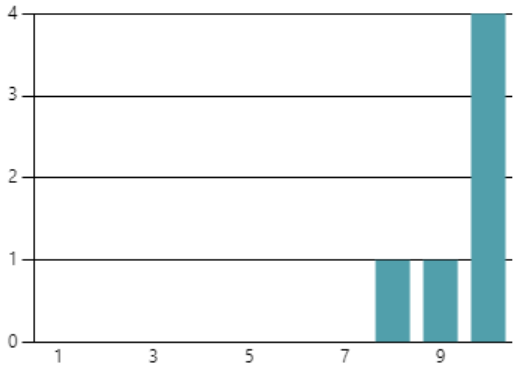
5 Responses

| ID ↑ | Name | Responses |
|---|---|---|
| 1 | anonymous | We use an adapted version as an annual audit tool across our 8 college sites |
| 2 | anonymous | To assess our digital standards and use them as a starting point for improving our AT provision |
| 3 | anonymous | Used it to look at where we were as a college |
| 4 | anonymous | Three years ago, I recorded a self assessment of our provision using the standards. This was a solo effort which allowed me to show management where we needed to improve our provision. This enabled me to justify changes that I have been making and asking others to make. More recently, we have a community of practice set up. One of the first tasks to complete is assessing our provision against the standards as a team. This is in the very early stages and so not much work has been done just yet. |
| 5 | anonymous | When i initially started in post for a baseline. Keep forgetting to review them! |

6. How useful would you find a tool that could guide you through the Standards and create intelligent recommendations? (10 being very useful)

More Details

9.50
Average Rating

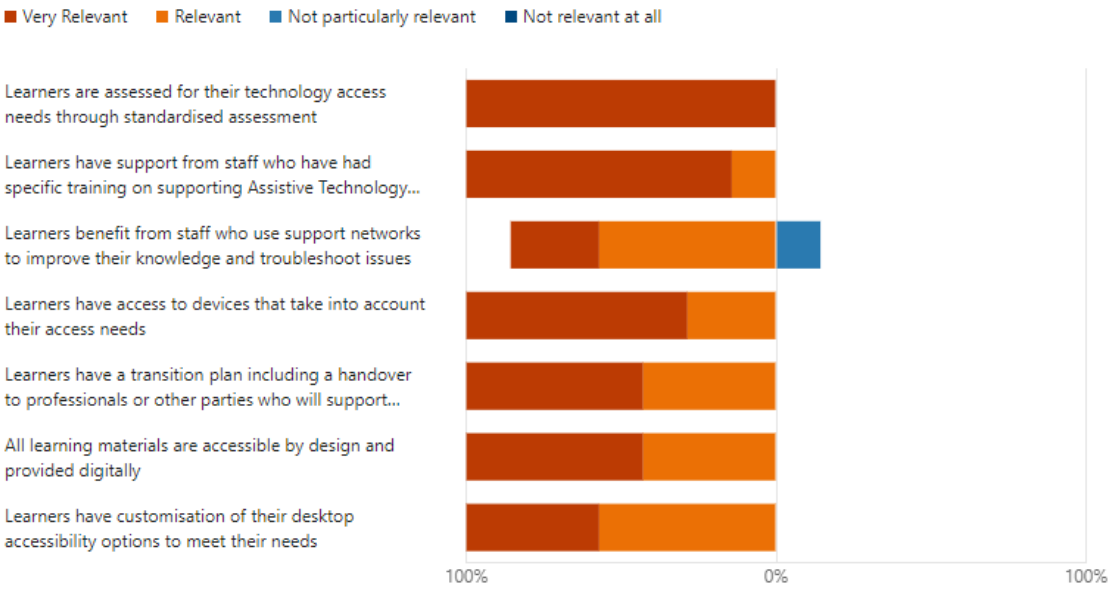


7. Would you prefer this tool to give recommendations based on a survey or a conversation with a bot?

More Details


8. Take a look at the following standards. In terms of good Assistive Technology practice, how relevant are these standards to your setting?

More Details



9. Are there any other TechAbility Standards that you think are particularly relevant to your setting?

6 Responses

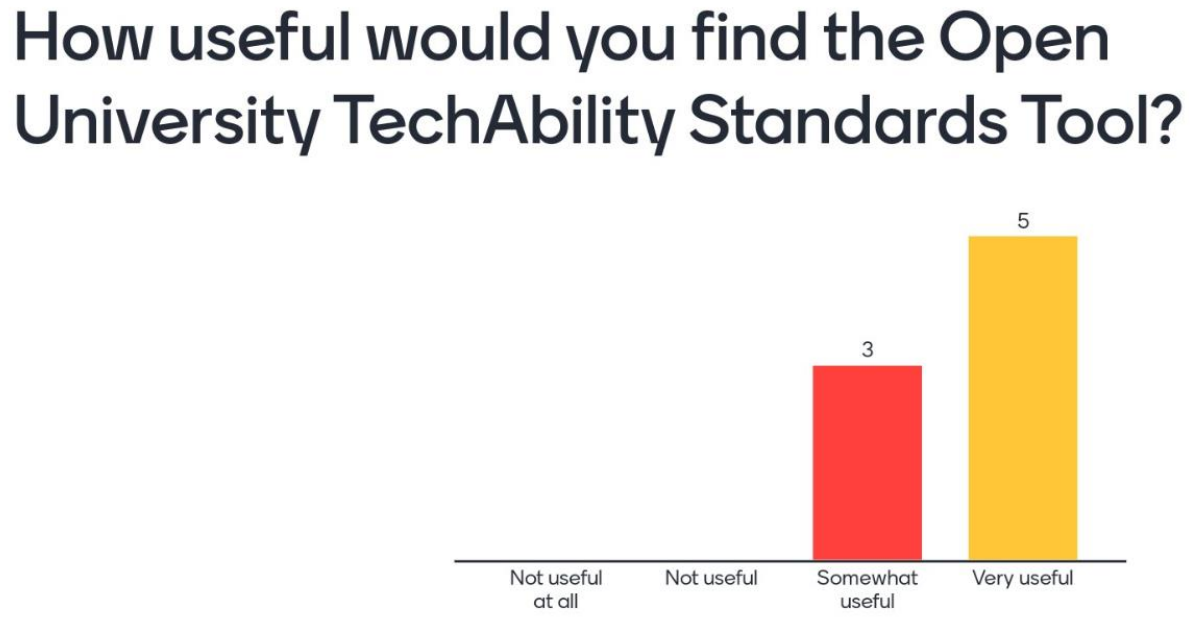
| ID ↑ | Name | Responses |
|---|---|---|
| 1 | anonymous | The majority are highly relevant to our specialist college setting |
| 2 | anonymous | Not at this moment |
| 3 | anonymous | NA |
| 4 | anonymous | All are very relevant |
| 5 | anonymous | I believe that all of the standards are relevant to my setting. |
| 6 | anonymous | i think its important to highlight the need for staff to observe AT specialist and enable other settings to visit to. |

10. What are the biggest challenges to high level AT provision in your organisation?

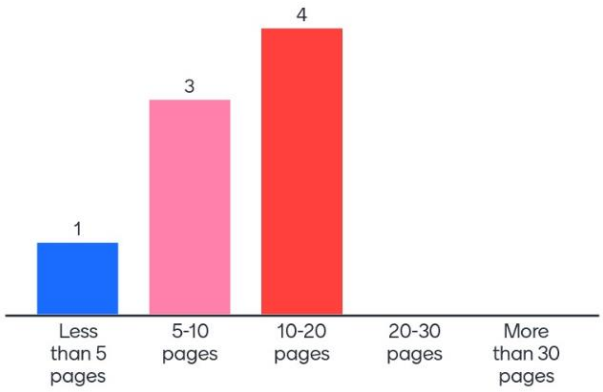
6 Responses

| ID ↑ | Name | Responses |
|---|---|---|
| 1 | anonymous | Funding, speed of provision, useability, staff confidence in own ability and their skills in teaching students how to get the best out of their AT, time for additional training. |
| 2 | anonymous | Staff recruitment and training to ever changing AT and learner needs. |
| 3 | anonymous | staff knowledge and cost |
| 4 | anonymous | Staff changing practice and adopting AT |
| 5 | anonymous | Staff awareness, staff training, funding, buy in from senior leadership |
| 6 | anonymous | Time, capacity (1 assistive technologist), buy in from staff, ongoing training, differing needs each year so difficult to pre-budget |

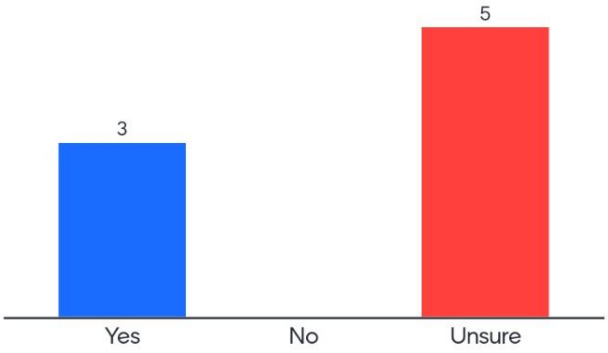
## Appendix iii: Mentimeter quesionnaire during feedback/engagement session



# What would be the best length for the report?




# Should the report be modular? (i.e. You fill in multiple but smaller questionnaires)




Mentimeter

## What would you change about the tool?

| | | | |
|---|---|---|---|
| Unsure, would like to try it out a few times first. | Unsure | I would like to see the report, but the process looks great. | Great tool that sounds like it would save time. |
| unsure at this moment | breaking into chunks, summary | Not being tied into using Google Docs. Our IT team doesn't like us using it and it gets flagged on the system. | Having an overall short report at the beginning of the document |

## Appendix iv: Project timeline and events

- 4th September 2023 – Project proposal meeting
- 21st September 2023 – Online area set up to collaborate on project
- 6th October 2023 – Project Introduction meeting
- 12th October 2023 – Project update meeting
- 19th October 2023 – Project update meeting
- 20th October 2023 – Project Questionnaire sent out to TechAbility Champions
- 3rd November 2023 – Project update meeting
- 20th November 2023 – TechAbility Standards update/workshop for Assistive Technology Network (ATN)
- 4th December 2023 – Project update meeting
- 8th January 2024 – Project update meeting
- 16th January 2024 – Project update meeting
- 8th March 2024 – Update and engagement meeting with TechAbility Champions
- 4th April 2024 – Project update meeting
- 26th April 2024 – Project update meeting
- 6th June 2024 – CALRG dissemination event: “Using AI and the Techability Standards to create tailored guidance for organisations to improve their assistive technology provision”