Designing an Assistant for the Disclosure and Management of Information about Needs and Support: the ADMINS project

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ABSTRACT

In this paper, we describe accessible design considerations for the Assistants for the Disclosure and Management of Information about Needs and Support project (ADMINS). In ADMINS, artificial intelligence (AI) services are being used to create a virtual assistant (VA), which is being designed to enable students to disclose any disabilities, and to provide guidance and suggestions about appropriate accessible support. ADMINS explores the potential of a conversational user interface (CUI) to reduce administrative burden and improve outcomes, by replacing static forms with written and spoken dialogue. Students with accessibility needs often face excessive administrative burden. A CUI could be beneficial in this context if designed to be fully accessible. At the same time, we recognise the broader potential of CUIs for these types of processes, and the project aims to understand the multiple opportunities and challenges, using participatory design, iterative development and trials evaluations.

CCS CONCEPTS

• **Computing methodologies** → Intelligent agents; • **Information systems** → Expert systems; • **Social and professional top- ics** → People with disabilities.

KEYWORDS

Conversational user interfaces, chatbots, virtual assistants, artificial intelligence, accessibility, participatory design

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1 BACKGROUND

Filling in online forms and applications is ubiquitous in modern life. This places a particular burden on people who have accessibility needs [1]. They are commonly required to provide detailed and personal information about themselves in order to access essential support for independent living and study. Those who are required to complete forms may have limited knowledge of the information or terminology expected of them and may not know exactly how to express their needs and conditions for these purposes. They could also benefit from suggestions based on the information they provide, which could help them immediately, rather than waiting for an application for support to be approved. Finally, after the form is submitted, they may need to communicate additional or changing needs at a later point. However, the repetition of information and form filling often required to achieve this can be inefficient and stressful.

The number of students who require accessibility support to be able to access tertiary education is increasing every year [2, 3]. However, in previous research, we found that the requirement to complete administrative processes by students with accessibility needs created multiple negative impacts, including the potential for negative effects on mental health, time available to study, and exacerbation of the person's disabilities [4]. Participants reported having to provide similar personal information in different situations repeatedly, and that the design of forms and documentation added complexity and did not offer them an effective way to express their needs.

Our research [4], also revealed that the most challenging processes were those that were intended to provide support and adjustments (i.e. applications for government or institutional disability support). These require complex individual circumstances and needs to be described accurately, but they depend on forms that use restrictive designs, generic medical categorisations, and assessment processes that can be time-consuming and stressful. In summary, for students with accessibility needs, form-filling (especially the typically static forms) is at best an unwanted burden, and at worst a barrier to accessing and succeeding in education right from the initial stages of their educational experience.

Meanwhile, other research suggests that conversational user interfaces (CUIs) present opportunities for users with accessibility needs [5–7]. CUIs can perform tasks for users based on commands

through online chat or interpreting human speech and responding via synthesised voices; allowing flexibility, personalisation of the experience and alternative modes of communication. CUIs could enable more efficient and effective access to support for people with accessibility needs. However, there is little research to date that explores how to design CUIs to be accessible [8], or how best to use them to support people with accessibility needs [9].

2 ADMINS

2.1 Context of the project

We are initially developing the ADMINS assistant in the context of The Open University (OU) UK, an online and distance university which currently supports more than 20,000 students who have declared disabilities. These students are our primary audience. The flexibility offered by online and distance education is attractive to many students with accessibility needs. For example, it enables them to take more time over their studies or to study from home [11]. Currently, the OU uses a combination of online forms and conversations with advisors to assess the needs of thousands of students who declare a disability, a process that is challenging and time-consuming both for the students and the institution. The form is designed to support students to report their needs and any existing strategies and technologies they use, but students have reported that they find it challenging [4] and form responses often lack detail. Conversations with expert human advisors are used to offer suggestions and build a more detailed and personal profile. However, some students do not take part in a telephone call, which adds to the challenges of providing all students with a timely and beneficial conversation about their support.

2.2 Overview of the design

To design the VA and its initial conversation flow, we analysed the current Disability Support Form (DSF) and examples of completed forms, together with a set of recorded telephone conversations between advisors and students. More than 46 recordings which have been analysed searching for patterns using a thematic analysis perspective. That has helped us to identify, for example, several key moments in the disability disclosure process where information from the student is required: (1) how disability might affects the university study, (2) alternative formats to study and (3) to work with tutors including tutorials and exam arrangements.

In addition, ADMINS is following a participatory-design approach [12], which involves both understanding our students' accessibility needs and preferences and the advisor experiences as experts in the conversations that we intend the assistant to be able to hold. Student consultants have been employed to provide substantial guidance to the project. We have run two workshops with a total of 13 students and 8 advisors participating. These included Wizard of Oz, brainstorming, visualisations, storytelling and reflective activities to discuss aspects of the design of the VA such as the conversation flow and persona.

The VA development flow includes concept modelling, prototype design, expert-based and user evaluations [13], for that reason, we have analysed the feedback from the workshops and student consultants in three critical design principles using thematic analysis from our notes: conceptual, conversational and personality:

- Conceptual design. The VA needs to provide clear user expectations of the actions that are possible to achieve through its use [14]. University forms are oriented to help staff to fill in the student's profile (i.e. the way questions are framed are advisor oriented) while the VA is student oriented.
- Conversational design. The importance of user engagement while designing the conversation in a CUI is well documented [15]. The role of the VA needs to be clear: as a mediator in the broader process of creating a profile and providing appropriate support. For that purpose, what the assistant has interpreted are presented back to the users at appropriate points. This also helps mitigate the risk that unexpected outcomes could emerge from the system misinterpreting user statements. It is also important to avoid triggering anxiety and to deal with conversation breakdowns. For example, the VA cannot assume that a pause means that no response is going to be given. Users may require extra time and the state of the conversation needs to be saved.
- Personality design. To be engaging and acceptable, the VA needs to present a friendly, empathetic and calm virtual 'personality' [16]. At the same time, it needs to represent the values of the institution – it should be gender-neutral, accommodate the diversity of disabilities in the audience, avoid bias, serve all its users, and use language with which the user is comfortable.

As a consequence of this research and participatory approach, the current VA design provides multiple communication modalities and alternative media options. Offering that personalisation allows students to adapt their experience when interacting with the VA and therefore supports accessibility. The assistant can, for example, provide multiple means of communicating the same information, following a universal design for learning (UDL) approach [16], including explanatory videos, text, or spoken words. As well as extra information through links to university or government resources, where students can expand their understanding of the terminology and find additional support outside the VA body of knowledge. Figure 1 shows several examples of the conversation at the current stage of the project including (1) disability disclosure, (2) tutor support and (3) tutorial adjustments. This scenario presents how the VA provides feedback on the user input and keeps an engaging conversation. The VA enables the users to provide information and access support via spoken or written dialogue to build the profile providing support suggestions.

The VA is being developed using Microsoft Azure technologies including the Language Understanding Intelligent Service (LUIS), used to recognise intents in user utterances, and a QnA maker to provide a knowledge base and responses to queries from the user. Voice I/O is available alongside text input and output to create an adaptable interface to conversations.

3 NEXT STEPS AND CONCLUSIONS

At this point in the project we are continuing to use various data sources including completed forms, conversation transcripts, and the participation of students and staff to design and train the VA, refine the conversation flow, and develop a substantial knowledge

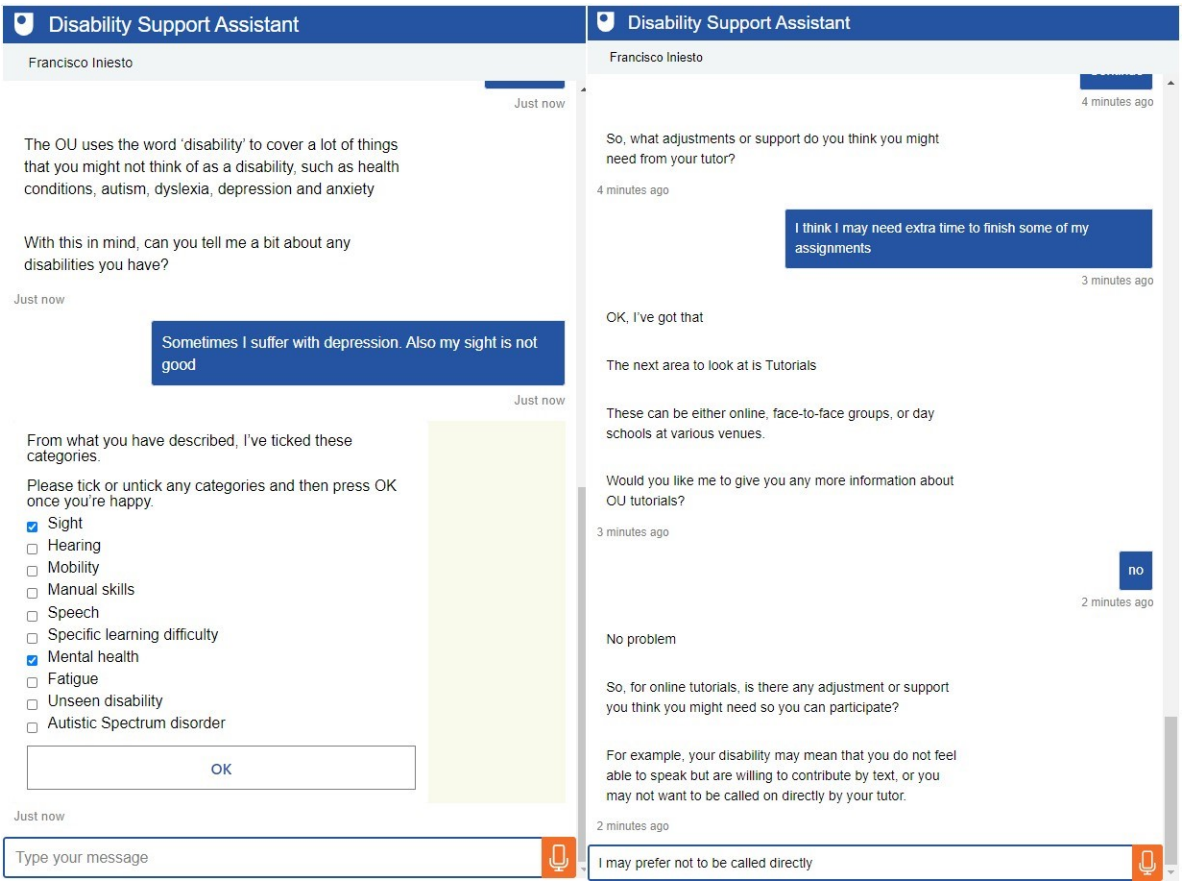

Figure 1: ADMINS VA scenarios on disability disclosure, tutor support and tutorial adjustments

base. The participatory approach in ADMINS supports ad-hoc testing with student consultants, which is being supplemented with formal trials with students who have diverse accessibility needs. A main trial will allow us to gather useful accessibility and UX feedback towards scaling this solution up. From the start of the project, we have engaged in explorations with other institutions about their disability support processes, in order to understand how ADMINS could be adapted and utilised in other institutions.

As there is as notably little research to date that explores how to design CUIs to be accessible [18], evaluating and improving the accessibility, usability and user experience (UX) of the VA is an important aspect of the innovation of the project. For the testing processes methods include researcher observations of users working with the VA in several scenarios; pre-and-post activity questionnaires often used in CUI research [19]; and semi-structured interviews to get in-depth qualitative information about accessibility barriers identified by users. Expert testers from beyond the project team have conducted accessibility evaluations to provide an external perspective.

Gathering profile information through online forms is commonplace in university processes through which people access support related to disabilities. VAs like ADMINS have the potential to better understand and support accessibility needs than is possible with a typical form. Beyond universities, online static forms are commonly used by governmental agencies and many other organisations who offer services to the public. Therefore, the approach taken in ADMINS could have much wider applicability. It is expected that CUIs are beneficial to people with accessibility needs. However, there has been very limited work to date to understand how to make these interfaces accessible or how they can be adapted to diverse user needs and preferences. This is therefore a gap in knowledge that the ADMINS project is also aiming to address through the design and evaluation process.

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