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Adapting online learning resources for all: planning for professionalism in accessibility

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Online resources for education offer opportunities for those with disabilities but also raise challenges on how to best adjust resources to accommodate accessibility. Automated reconfiguration could in principle remove the need for expensive and time-consuming discussions about adaptation. On the other hand, human-based systems provide much needed direct support and can help understand options and individual circumstances. A study was carried out within an EU-funded accessibility project at The Open University (OU) in parallel with studies at three other European universities. The study combined focus groups, user-testing, management consultation and student survey data to help understand ways forward for accessibility. The results reinforce a holistic view of accessibility, based on three factors: positioning the university as a positive provider to disabled students; developing processes, systems and services to give personal help; and planning online materials which include alternatives. The development of a model that helps organisations incorporate professionalism in accessibility is described, though challenges remain. For example, a recurrent difficulty in providing adequate self-description of accessibility needs implies that a completely automated solution may not be attainable. A more beneficial focus, therefore, may be to develop systems that support the information flow required by the human "in the loop."

Keywords: inclusion; students with disabilities; services; personalisation; evaluation; virtual learning environments; EU4ALL

The challenge of accessibility

Access to learning is identified as a right supported by legislation such as the UK's Equality Act of 2010. In essence, these require educational institutions to:

- not discriminate against a disabled student on the basis of their disability;
- make "reasonable adjustments" to meet disabled student needs in all aspects of their education;
- be proactive in anticipating the needs of disabled students.

However, accessibility in education has for some time been recognised as a problem. For example, Borland and James (1999) report that disabled students are demotivated by feeling "invisible" or unimportant within higher education and hindered by negative attitudes from staff and peers (Quick, Lehmann, and Deniston 2003).

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This can lead to some disabled students not declaring their disability for fear of jeopardising their learning experience (Hall and Tinklin 1998). The use of online resources has the potential to provide further tools to help improve access. Resources themselves may be reconfigured to suit particular accessibility needs, assistive technologies integrated in learning systems and systems designed to help track the needs of users and the accommodations that help meet those needs. However, as observed by Seale and Cooper (2009), specific tools designed for accessibility need to operate alongside more generic tools and the blending of these depend on various factors including the experience and capabilities of the teacher and learner.

Online learning has several characteristics that make it a suitable way to aid the provision of learning to the marginalised and those with disabilities. This "promise afforded by online learning technology" (Kinash, Crichton, and Kim-Rupnow 2004), in terms of supporting multiple needs, is balanced by the need to design to use that affordance. For example, the approach of Universal Design for Learning (CAST 2011) suggests that to improve accessibility three factors need to be addressed:

- multiple means of representation: a variety of ways of acquiring information and knowledge;
- multiple means of expression: alternative ways of demonstrating what they know;
- multiple means of engagement: challenging learners in different ways.

While technology is not essential in addressing these factors, it can make "on-the-fly individualisation of curricula possible in practical, cost-effective ways" (CAST 2011, p. 9), and so is particularly well suited to designing a range of accessible needs. In an online environment,

- profiles of learners can be developed;
- users have control over their own environment;
- variations in material can be integrated.

Thus, learning technologies can bring flexibility and adaptability to higher education, empowering disabled learners, improving access and making the experience of education more equitable (Evans 2002; Klein *et al.* 2003; O'Connor 2000). However, online learning can also provide additional barriers through expectations of the users' the ability to interact with systems, rapid changes in technologies and the plethora of options available both to the developers and users of online systems. If learning technologies fail to adequately accommodate disability, they can undermine motivation and reinforce feelings of isolation and misrecognition. As Katseva (2004) notes, "technology is a double-edged blade." What is clear is that unless such needs are deliberately considered then opportunities are missed and users can find themselves excluded from learning, and indeed from other ways to use online systems to assist them in their lives.

In this paper, we consider how systems can be designed that help both educators and learners to describe accessibility requirements and the accommodations and alternatives that are available to address them. The basis for the study is a project funded by the European Union Framework for Accessible Lifelong Learning (EU4ALL) (Boticario *et al.* 2006) to consider the services needed, implement prototypes and then pilot them in a range of university contexts. One of those contexts

was The Open University (OU), itself a member of the EU4ALL consortium, where a series of connected user tests, focus groups and interviews took place over the winter of 2010/2011. The study at the OU took a broad approach, being less a test of particular technologies and more a study of how a large-scale organisation already serving many disabled students could review its systems and recognise how to understand its services and the way they may be improved.

The Open University

The OU is the largest higher education institution in the UK, offering flexible distance learning. It has approximately 250,000 students, typically learning in their own time using course materials, online activities and content, web-based forums and optional tutorials (online and face-to-face). The OU has a policy of Open Access; there are no academic prerequisites to starting studies with the university. Therefore, students start their studies with a wide range of prior learning experiences. The OU has significant experience of making online materials accessible (Cooper 2006) and is the largest provider of higher education for people with disabilities in Europe, currently supporting the learning of more than 13,000 students with a declared disability.

Over the last 10 years, the OU has invested heavily in the adoption of online learning approaches and technologies. It has also built up considerable support systems to help disabled students but remains under pressure to mainstream the service and incorporate new solutions as they become available. Solutions are often in part technical but founded on human-based systems to provide much needed direct support and help those involved understand the options and individual circumstances.

European Union Framework for Accessible Lifelong Learning

The EU4ALL project (2006–2011) was a major European Union funded eInclusion project. Its remit was to research and then develop ways to make Life Long Learning at Higher Education level accessible to disabled people. The consortium was composed of 13 organisations from eight different countries bringing a range of skills and requirements.

The first year of the project consisted of extensive background research including surveys of how, and to what extent accessibility is addressed in universities across Europe with some comparisons with Australia, Canada and the USA. The Austrian Social Science Research Institute, Centre for Social Innovation (CSI), led this work. This early work produced a 4 Stage Model of Professionalism in Accessibility. This model as summarised in Figure 1 (Montandon, Arjona, and Weiermair 2010) sets out the different levels of response that an institution can make towards accessibility. It captures actions that might be taken but also encourages moves towards greater professionalism and the embedding of approaches to accessibility. The model proved a good basis for the evaluation work at the OU and is revisited in the discussion section of this paper.

The implementation element within EU4ALL developed approach based on services designed to help students, and to help staff support learners, these were then developed in software as "eServices" that could integrate with different learning environments. As a large-scale provider to disabled students, the OU formed an important case study to understand both the Model of Professionalism and the

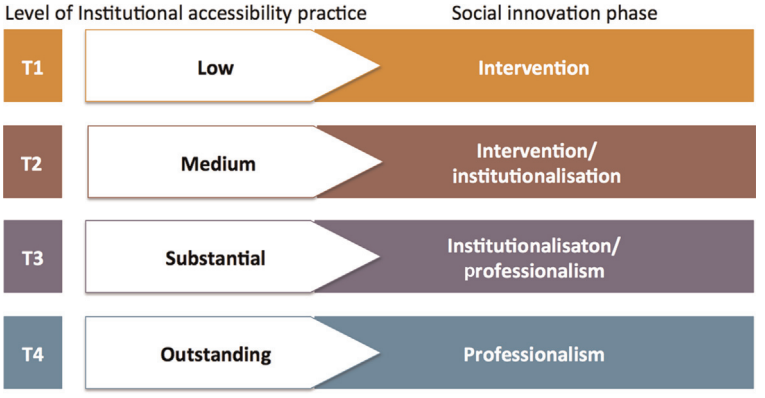

Figure 1. Social phases.

value of services. The services that were selected for stakeholder evaluation with current students and staff at the OU were as follows:

(1) *Content personalisation*: Supporting variation in content selection and presentation depending on information about the learner.
(2) *Accessibility information service*: A module based service to capture and reveal information about the adjustments that were possible for a module and those that might be needed to meet particular accessibility needs.
(3) *Loan kit service*: A service to support the lending of assistive technology while learners were waiting for their own equipment.
(4) *Assessment for Accessibility*: A service helping with the follow-up on assessments for accessibility needs of new students and to support feedback on equipment loaned to students.

The implementation and operation of these services are not described in detail in this paper. The overall approach was of eServices that could then be called and integrated in a flexible way. A dissemination site, http://www.eu4all-project.eu/, gives access to the software, training materials and guidance to institutional implementers. Across the consortium pilot sites included Universidad Nacional de Educación a Distancia (using the dotLRN learning environment), Universidad Politécnica de Valencia (Sakai), Instituto Politécnico de Leiria (Moodle 2), as well as the OU (Moodle 1). Some of these studies have been reported elsewhere (Boticario *et al.* 2012).

Evaluation methodology

Evaluation activities at the OU combined examination of the end-user experience of interacting with the services designed by EU4ALL together with examining the implications of adopting the EU4ALL approach to accessibility across the institution. We sought in particular to identify how such a model, and its breakdown into services, could help educational institutions advance in the way they approached accessibility. The specific implementations were therefore treated as exemplars, and feedback that enabled their improvement was an important side effect but the primary aim was to understand how existing approaches might be evolved to meet

student, staff and institutional needs. To achieve this, services were compared with existing provision; the potential impact on course production/delivery was explored; and factors, which are likely to influence adoption of the framework, were identified. The approach drew on established evaluation methods that consider tools in the context of an activity theoretic view across multiple stakeholder views of the system. The ways in which such a view aids evaluation design and communication are explained further in McAndrew, Taylor and Clow (2010). The implementation of the evaluation followed an illuminative evaluation approach (Jones *et al.* 1996; Parlett and Dearden 1977). Illuminative evaluation is an open-ended method that can identify important issues relating to the impact of the framework as a whole on "a network or nexus of cultural, social, institutional, and psychological variables" (Parlett and Dearden 1977, p. 15). Data was triangulated from sources including stakeholder focus groups, observed laboratory studies and a remote learner survey.

It should be noted that a potential further source of evaluation data is the use of the services on live modules. However, the use of prototype software raises ethical issues in itself and was felt premature as part of this study. Such an approach also would focus on software capability, while the OU was interested in a wider evaluation and understanding of approaches to accessibility. The later scheduling of trials at other partner sites and the different structure of materials used in blended situations did enable testing of the complete EU4ALL system (Boticario *et al.* 2012).

Evaluation data sources

The main sources of data used in considering the EU4ALL system at the OU were focus groups, laboratory-based user studies and a remote survey. The structure of each of these is given below followed by a summary of the results from the studies. An important aspect reflected in the discussion that follows is to then consider the overall framework of operating services to support accessibility and the planning process.

Focus groups

Focus groups provide an effective approach to gathering data through shared discussion (Morgan 1988). For this study, we established focus groups across a range of stakeholders. The stakeholders involved in accessibility are itself a potential issue. We follow Seale (2006, p. 3) by seeking to include disabled students, lecturers, learning technologists, student support services, staff developers and senior managers, but also add students without a declared disability and those outside the organisation. The focus groups were conducted by a member of staff who had not been involved in the development of the software to maintain conceptual and practical distinction between raising awareness of the framework with the different stakeholders and the validation of the framework. Moderator feedback was kept to a minimum. The format allowed the different stakeholder groups to explore ideas, opinions, and views after they had interacted with the prototypes. In addition, the focus group discussions were directed with reference to the research questions, which guided the project. All focus groups took place in the Observation Room at the Institute of Educational Technology, allowing easy recording of the sessions.

The six focus groups (see Table 1) were chosen to represent different interest groups, each with an important role to play in addressing accessibility.

Table 1. Breakdown of focus groups.

	Group	No.	Participants	Focus
FG1	Internal stakeholders	5	Student services, administrators and advisors	The range of services offered and relationship with existing practices
FG2	Technical experts	5	Professor researching inclusion, development and support experts	Implementation of personalisation and eServices
FG3	Disabled students	10	Students with declared disabilities: 2× visually impaired 2× hearing impaired 3× other cognitive disability 3× mobility impaired	Student views regarding the perceived benefits and drawbacks to the system, ease of use, and suggestions for improvement
FG4	Non-disabled students	5	Current students who have not declared a disability	Broader applicability of personalisation and benefits that go beyond those intended specifically for disabled students
FG5	Senior management	7	Directors and heads of services	Impact on decisions about future adoption of approaches to accessibility
FG6	External stakeholders	5	Invited representatives from UK Higher and Further Education sector who support disabled students	Locate the evaluation findings from within the OU to the wider educational context

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Laboratory-based user studies

Laboratory studies allow testing of the prototypes in practice and give more direct and individual feedback on the operation. The process included an orientation session, observed use of the system recorded using an observation protocol and structured debriefing. Think-aloud was encouraged but not enforced, and recordings were made on two cameras, one of which captured screen activity while the other recorded the user actions. The recordings were then available to help in both the feedback session and subsequent review. The programme took place out between November 2010 and December 2010. Twelve evaluation sessions were planned, but only seven were carried out due to participant non-attendance caused in part by unusually bad weather during the evaluation period. Seven OU students took part: one was visually impaired, three were hearing impaired, one was mobility impaired and three declared a specific learning impairment (such as dyslexia).

A scenario-based structure (Carroll 2000) took participants through the kind of tasks that students (or prospective students) might be required to perform. The three scenarios followed the lifecycle of an OU module: inquiry, personalisation and feedback. The Content Personalisation activities made use of content from an existing OU short course entitled *Studying Mammals: Life in the Trees* (OpenLearn 2012). This includes both text and multimedia content, including a short film about meerkats and arboreal mammals. The course materials were taken from the OpenLearn website which makes learning materials available to a wide audience for free. It included text, video recordings and simple learning objectives with content and web presentation evaluated against the WCAG2 checkpoints prior to use (Petrie and Bevan 2009). Services were populated with example data to allow users to perform simple administrative (and other) functions. None of those who took part in these activities elected to use their own assistive technologies, though large (46 inches) plasma screens monitors were used where the user had reported a visual impairment.

Remote learner survey

The focus groups and user evaluation activities required disabled students coming into the laboratories to interact with the prototype or to be demonstrated the system. To broaden the base of those consulted, a remote survey of disabled students was conducted to learn more about the perspective of distance learners. Researchers on the EU4ALL project designed the survey that was then managed through the OU Student Survey Team. This meant that the contact lists matched to the overall profile of disabled students at the OU, and recruitment of respondents and conducting the survey online used robust processes. A total of 244 students were invited to take part, and 80 of them completed the survey. The same overall sample was used to find participants for the disabled student focus group and the lab-based studies, both of which required a physical visit to the OU campus resulting in a sample geographically based in the South East of the UK. Participants were excluded from taking part in the survey if they had already been involved in other aspects of the EU4ALL evaluation. Of those who completed the survey, 15 (18.75%) describe themselves as having a hearing impairment; 30 (37.5%) describe themselves as mobility impaired; 14 (17.5%) as visually impaired; and 21 (26.25%) as having a learning difficulty such as dyslexia (see Figure 2).

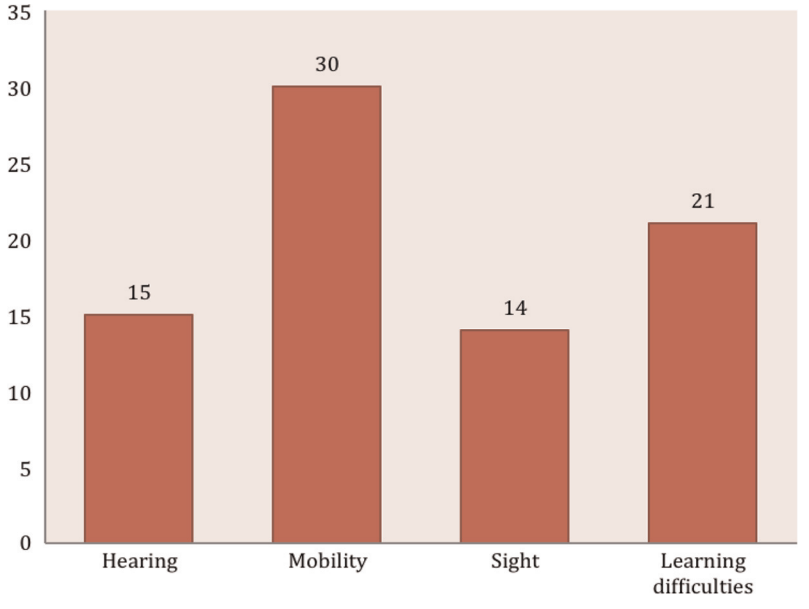

Figure 2. Profile of students taking remote learner survey.

A screencast which demonstrated each of the services used in the lab studies was recorded and made available online. Students were invited to complete the survey online after watching the video.

Results from OU study

Illuminative evaluation is not restricted to quantifiable information and is primarily concerned with description and interpretation rather than measurement and prediction. Transcripts and video data were analysed via a combination of recursive abstraction and hermeneutic analysis, guided by the overarching EU4ALL research questions. Researcher bias was accounted for by having two researchers carry out the analysis separately and then reviewing and comparing their notes together, reaching agreement on those results which were thought to be significant. In reporting these results within the project, a detailed breakdown was provided across each focus group and related to the original research questions and the services designed by EU4ALL. The lab studies then provided a way to judge readiness of particular services and the survey responses help to judge the willingness of students to engage with particular services. The results are presented here in a summarised form to draw out emergent themes and illustrate them with responses across the data set and corroborate those findings with data from the survey.

Results: focus groups

Overall, the focus groups involving learners (FG3, learners with declared disabilities, and FG4, those without any declarations) brought out a great deal of enthusiasm for giving students more control over the way that learning content is presented:

> I think it is brilliant. [FG3 participant]
> Not just for people with disabilities – it's for everybody. [FG4]

The staff representatives [FG1, FG2 and FG5] were also positive. Perhaps not surprisingly, they also tended to express greater concern about the implementation and potential consequences:

> There is no reason for not doing this. [FG1]

was balanced with

> It sounds great, but you've got to worry about the impact in terms of producing the materials to support this. [FG2]

The potential value to all learners was a common theme. This suggests that any services should automatically be offered to every student, partly on the basis that many are reluctant to admit that they have a disability and partly as benefits may be independent of the declared disability. This came out from both disabled and non-disabled students commenting on personalisation:

> From the student point of view, are there any disadvantages? [FG3]
> I think everybody should have these options. Only they can make the choice whether they've got problems reading the txt or problems seeing. [FG4]

Staff also showed this view with one senior manager saying:

> If we get it right for disabled students we are far more likely to get it right for everybody. [FG5]

For the overall concept of eServices, there was a feeling that such services need to be part of the operation of an online university:

> We have all registered with some sort of disability ... you would have thought that this information would be kept to hand and we don't have to go explaining ourselves again. [FG3]

This also showed in willingness to engage with perhaps the obvious benefit to the individual supported by recognition of the way in which such a system can help all involved:

> I would want this service because I would want to help other people. [FG3]
> Having that information up front might have affected whether I took a course or not. [FG4]

There was some concern about the difficulty of an individual knowing the sort of information that would be required in order for the system to work effectively:

> I think essentially we're coming down to a difference between trying to deal with something using a database system ... compared to actually talking to a human being who will ask you the right questions. [FG4]

A staff member who identified a potential tension between offering learners control and the legal framework that applies in making reasonable adjustments expressed a different perspective on the same concern:

> Reasonable adjustment is a legal requirement. If a student operates our system poorly and then doesn't get their entitlements under the law is the student at fault? Could they still sue the university? [FG1]

The external stakeholder group (FG6) were very interested in the approach but expressed some concern that they were not yet ready for all that such systems might offer:

> This is a tool through which we can fulfil our duty, through which we can start becoming proactive [and] demonstrate our equality commitment. [FG6]
> If every course is designed, set up and made with all the resources available on the internet that has individual learner choices, then actually the disability advisor role would be completely different. [FG6]

The distinctiveness of the OU was commented upon; however it is worth noting that across the EU4ALL consortium, there has been implementation in both distance learning and conventional universities.

> The Open University have a very different system with regard to how the students are supported ... we are very much geared to needs assessment and DSA [Disabled Student Allowance] and the students get lost in that. [FG6]

Results: laboratory-based user studies

Most users expressed familiarity with the presentation of the content personalisation system because of the integration with the standard Moodle presentation. However, because of this similarity, some users expected to be able to navigate the pages in the same way when, in fact, there are some differences between the usual experience of the learning environment. These problems were not serious, but some users needed help to log in. Most users needed some explanation of the different forms of adaptation available. It is likely that simplifying the interface or giving more visual cues (tooltips, etc.) would improve understanding. There was a clear preference among users for a visual Graphical User Interface (GUI) over textual presentation. Adaptations themselves were typically successful. One user's preference was to be able to access both transcript and subtitled video simultaneously: the system cannot presently accommodate this. One user wanted to have an intermittent delay built into recorded media to give them the time to make notes without having to stop the playback. All users expressed considerable support for the principles of Content Personalisation.

Finding the correct way to describe accessibility needs within the information service is a matter of striking the right balance between functional, biomedical, social and pedagogical description. The six categories used in the prototype reflect the largest six categories in the OU classification of disability.

Some thought six categories was too many while others thought it would be sufficient for them. One notable complaint was that this way of presenting the information does not take into account the changing or intermittent nature of some peoples' disability.

Results: remote learner survey

Eighty current UKOU students who have declared a disability completed the survey. The overwhelming majority (more than 93%) of those surveyed thought that Content Personalisation was a good idea. Only one student (who was visually impaired) disagreed, with three unsure. When invited to reflect on the personal relevance of Content Personalisation, more than 85% felt that it could help them to study (see Figure 3). Those who were mobility impaired were less likely to feel this, while all hearing-impaired students who took part felt that it could help them.

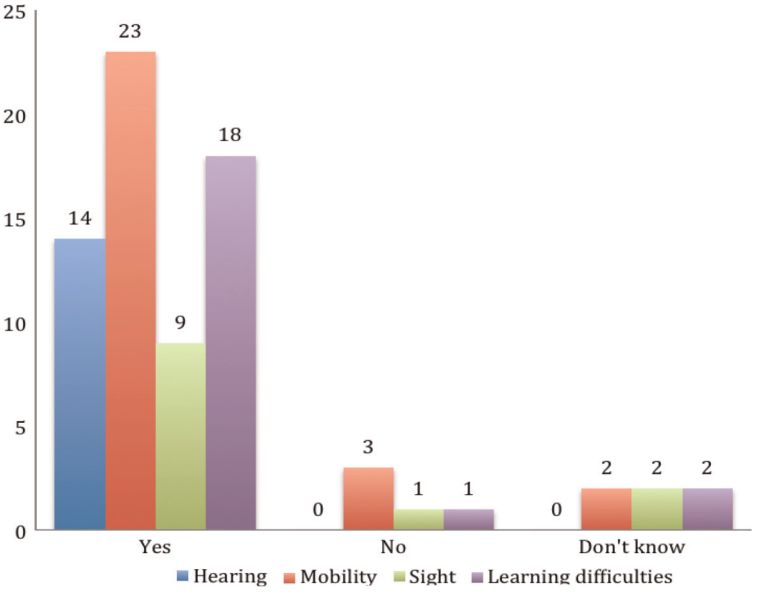

Figure 3. Responses to the question "Do you think that content personalisation could help you to study?" analysed by disability.

Most concerns were around learning how to use the system or with computer use more generally construed. (Interestingly, most users thought they would be fine, and thought that users with other disabilities might experience problems.)

The main advantages of EU4ALL Content Personalisation were identified as self-provision, flexibility particularly in relation to fluctuating symptoms, both aiding study and being conducive to study. Comments were generally positive, with some clear expressions of enthusiasm. The main concerns were that there might not be adequate technical support, or that an excessive amount of time might be involved in administration, or in learning how to use the system. Few were concerned about the accessibility of the system, though some dyslexic students expressed concern about the amount of text involved.

There was a strong preference among those who took part in the survey for manually chosen adaptations, this was in contrast to those who took part in lab-based evaluation activities. Over 90% of the sample participants wanted to be able to choose content for themselves. No hearing-impaired students expressed a preference for automatic selection. Most of those surveyed (around 85%) said that they wanted to be able to access content in its original, unadapted format. Those with audio or visual impairments were less likely to want to access unadapted content. The governing view of the value of the services balanced by the challenge of using the system was expressed by one participant when asked to describe expected advantages and disadvantages:

> advantages are giving a student the option to study with the preferences set to their needs. Disadvantages are that students may find the set up complicated. [Survey]

When asked about whether they thought that non-disabled students would benefit from content personalisation, over 85% of the sample mirrored findings from the other evaluation activities by suggesting that they would. An overwhelming majority

(more than 96%) of those surveyed felt that increasing the availability of information pertaining to course accessibility was welcome. When asked about the presentation of disability information within the service, 60% of the sample felt that we were asking for the right kind of information about disability. There were not many who disagreed: most of the remainder (about a third) answered "don't know." This pattern was repeated consistently across disability profiles.

Most of those surveyed (over 80%) wanted to have both direct access to course accessibility information and have an advisor able to make recommendations. Mobility-impaired students were most likely to prefer to access the data without an advisor. There was clear preference though for accessing information about loan kits through the web. Just over half the sample prefer to receive information about course accessibility as a web-based report, with just under a quarter preferring to speak to an advisor on the telephone and the remainder preferring to communicate with an advisor through email. Differences in the type of disability seem to have an influence here: almost 70% of those with a specific learning difficulty (typically dyslexia) preferred a web-based report while none preferred to use email. No hearing-impaired students preferred to use the telephone to contact an advisor. Overall, the web-based report was the most popular way of accessing this information, even though it involved no direct contact with an advisor.

Around 15% of the sample had experience of the existing Loan Kit Service at the OU, with hearing-impaired students the most likely to have used the service. The data seems to show quite clearly that the provision of assistive technologies for disabled students is such a highly valued service that improved access would be very much welcomed. Feedback was also thought to be of value with 56% saying they were "very likely" to complete the feedback form and 39% saying they were "somewhat likely." Most (40%) thought that the best time to solicit feedback on the use of assistive technologies was halfway through a course. Three quarters of those surveyed thought that the using the feedback service could have an impact on their own learning. Some users remarked on the lack of opportunities for feedback under the existing loan kit system, and most thought that feedback was vital to improving provision for disabled students.

Discussion and conclusions

The discursive nature of the evaluation activities brought the EU4ALL project to the attention of a wide range of stakeholders. Bringing both the technology prototypes and the framework as a whole to the attention of these groups provided a way of raising accessibility issues with those involved in the process, and also a method for evaluating the potential impact of the framework at the OU. From a software standpoint, a number of design considerations have been identified through the evaluation programme. Broadly speaking, the need for a holistic, working system that can accommodate a diverse range of user preferences has been demonstrated. However, many recommendations were made, both general and specific. The idea of a more visual or graphical interface came up often. The user interface needs to be adaptable, and capable of displaying information in a range of formats and styles. Giving users the experience they want seems to involve giving them control over aspects of the learning environment that may go beyond what is normally expected by an end user. A number of interesting changes to the personalisation system were proposed. Some of the more unusual include building a delay into multimedia

playback and allowing for multiple simultaneous content adaptations. This clearly shows the benefit of involving those with disabilities in the design process.

There remain issues regarding the description and presentation of disability within the framework. The way that the adaptations are described and which are thought suitable for which users, were confusing to some. Describing disability is both medically complex and politically sensitive, and striking the balance between simplified descriptions of disability, which promote system usability, and detailed data about accessibility needs within the ontology needs more work. However, managerial concerns about labelling disability or imposing uniformity were not borne out by the data gathered from disabled students, who seem content with approximate descriptions if they believe they stand to benefit. There seems to be a case for saying that rather than focusing on the description of the user the ontology should focus on describing the materials themselves. But it remains unclear whether students would make sense of these descriptions.

The importance of the personal relationships that exist between disabled students and the staff who support them was a theme that emerged repeatedly and with concerns being raised from both sides. Changes, which could impact the nature of this relationship, need to be gradual and iterative.

Other notes of caution concerned creating unrealistic expectations of provision for disabled students and the threat of viewing all pedagogical or disability support as technological support. Conversely, from a student perspective it was clear that many students are highly dependent on the support they receive. Successful integration of the software solutions seems to depend on revising the organisation of both course design and support services across the institution.

One important finding that came out of the evaluations was the suggestion that EU4ALL could be of great benefit to students (or potential students) who do not identify as disabled, both in terms of providing content in ways which suit lifestyles or learning preferences, but also in terms of promoting awareness about disability and the services provided by the university.

In light of these comments, it is important to bear in mind that a great deal of enthusiasm for the EU4ALL initiative was expressed over the course of the evaluations. Almost everybody endorsed the idea and the approach, and the OU culture was shown to be highly supportive of disabled users. Indeed, the final focus group (external stakeholders) seemed to support the OU's view of itself as a leader in promoting both accessibility and distance learning.

For the EU4ALL framework as a whole, we can say that all those who took part in these activities saw the relevance to their own roles. Furthermore, the far-reaching implications of adopting the framework came to light in a number of areas, including the consequences for legacy curricula, course development and lesson design; the changing roles of supporting staff; the need to ensure users have adequate training and IT skills; the culture change required to promote proactive consideration of accessibility; and revising the way that information about disability is shared between stakeholders. One participant in a focus group described the degree of change involved as "changing the organisational DNA."

Accessibility has a broad impact that means that as well as systems and software organisations need to consider the policy and indeed philosophy of the organisation towards how it meets the challenge of accessibility. This is captured in the Four-Stage Model of Professionalism in Accessibility (Montandon, Arjona, and Weiermair 2010) shown in Figure 1 and expanded in Table 2. The model can help reflection on

Table 2. Model of professionalism in accessibility.

Intervention	Intervention/institutionalisation	Institutionalisation/professionalism	Professionalism
Low level of accessibility practice (T1)	Medium level of accessibility practice (T2)	Substantial level of accessibility practice (T3)	Outstanding level of accessibility practice (T4)
• Responsibility and roles unclear, ambivalent • Low awareness by senior management • Low level of accessibility practice • Weak legal frameworks	• Low awareness and responsibility of management, accessibility no priority • Considerable activity for students with disabilities by single persons • Existing practice not institutionalised • Ad hoc solutions to ad hoc problems • Weak legal frameworks	• Responsibility of senior management clear, accessibility a priority • Community of Practice with high level of institutionalised processes • Strong legal requirements	• Responsibility clear • High priority of accessibility • Institutional processes and stakeholder involvement • Development of policies • Evaluation of implementation • Legal framework strong driver

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organisational direction and offers a way for an institution to benchmark itself against four tiers from initial intervention to professionalism.

This model was used explicitly in discussion with a range of stakeholders at the OU including senior managers, disability service providers and IT specialists. The consensus of the self-rating process is that the OU is currently at the institutional/professional boundary in this model (T3) though some of those working directly on accessibility were more cautious that aspects of T3 remain to be embedded. Overall there are strong aspirations to reach the highest level of professionalism of its accessibility processes (T4). The UK has a strong legal framework, and this is a driver in the OU that has led to responsibilities and a community across the university working on accessibility. Some of The key identified deficits were the need to more fully embed the addressing of accessibility in the core process of the university; a requirement for a clearer definition of responsibilities across the organisation; and partial and localised evaluation of accessibility implementation.

In terms of impact, the evaluation activities discussed above need to be understood within the wider context of ongoing reviews of accessibility policy at the OU. The evaluation approach took place alongside planning and initial stages for a refreshed response to accessibility. An internal action programme Securing Greater Accessibility (SeGA), launched in early 2010, to reconsider accessibility policy and process across the OU as a whole. This includes a review of where responsibility for different aspects of accessibility reside across the institution, redefining departmental and staff roles, workflow and legal compliance as well as technological solutions for improving access and the management of the way accessible solutions are provided. The findings described above were fed back into strategic and policy discussions, including a revised approach to web accessibility standards, an improved workflow for course production and the introduction of accessibility training to be included in induction and progressive staff development. In the following year, several steps have been taken to improve processes and increase the professionalism of the response to students.

Many of the senior managers and technical experts who play a prominent role in SeGA took part in the relevant focus groups, and, as a result, were able to assess the relevance of the framework from their own perspectives. The various elements of the framework, which accord with the recommendations of the SeGA plan, may be understood as a form of validation for the framework represented to the stakeholders through the implementations and evaluations. A similar approach to considering the need to address is presented in the recent publication by the British Standards Institution, BS8878:2010 (BSI 2010), *Web accessibility – Code of practice*. This is being used alongside the four-stage model and SeGA to promote increased levels of professionalism in addressing accessibility at the OU.

The consultation aspect of the evaluation allowed identification of the implications of adopting the framework in the following areas:

- *Legacy curricula*: the need to accurately describe and manage adaptation.
- *Availability of accessible content*: validation against standards such as WCAG 2 and providing alternatives as necessary.
- *Course development and lesson design*: appropriate representation and recording of decision points.
- *The changing roles of supporting staff*: options for support and the tools that help them.

- *The need to ensure users have adequate training and IT skills*: linked to guidance and standards influenced by EU4ALL.
- *The culture change required to promote proactive consideration of accessibility*: related to the levels of institutional readiness identified in the EU4ALL framework.
- *Sharing information about disability between stakeholders*: modelled on services that enable adaptation, recording and tracking.

The studies underlined the value for all students in addressing accessibility, but also that there are indeed no "Magic Fairies and accessibility dust" (Seale 2006, p. 1) that would enable automated provision of accessibility. Technology has an important role to play in exposing information to the learners and allowing them to express their preferences and feel in control. For staff, the same technology can help in retaining information and tracking the decisions that are made. The framework encourages a move towards professionalism in accessibility services. The renewed plans at the OU as it implements its SeGA project shows how such approaches can strike the right balance between digital augmentation and the human element in providing accessible services.

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