# **ACCESSIBILITY IN E-ASSESSMENT**

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### Abstract

E-Assessment offers many opportunities to broaden the range of tools at the assessor's disposal and thereby improve the overall accessibility of the assessment experience. In 2006 TechDis commissioned a report, produced by Edexcel, on the state of guidance on accessibility at the various stages of the assessment process - question design, construction of delivery software and so on. The findings from this report will be briefly presented, and discussion with participants will be held to ascertain priority areas for the development of guidance for the sector.

#### Introduction

In 2006 the JISC TechDis service commissioned from Edexcel via a tendering process the production of a document entitled "Accessibility in e-Assessment Guidelines", following consultation with the E-Assessment Group (membership listed on page 4 of the report), to examine the state of guidance for accessibility in e-assessment in the UK.

The purpose of the discussion session at the CAA Conference is to stimulate debate of the issues highlighted in the report, with the hope that some of the key stakeholders in this area might commission or fund further work to formulate the guidance that the report has established is required in the sector. While TechDis is willing, as part of its regular programme of activity, to coordinate this work in order to improve the provision of inclusive assessment in the UK, current funding models do not extend to the commissioning of a piece of work of this magnitude.

Your comments regarding the content of the report and its findings would be most welcome, either during the session itself, or via email at any time.

#### **Report Ethos**

This work is based upon the following convictions:

• E-assessment should be fundamentally more accessible than paper based assessment.

- Accessibility in the widest sense is a fundamental quality criterion for assessment and should be considered through the assessment lifecycle.
- Good practice in accessible design will help future-proof assessments.
- Accessibility design should be equally applicable to all assessments (the start of the process being consideration whether there is a reason why a particular assessment should not be made accessible for any reason!).
- Accessibility design should be a changing approach as technology and experience develop. Hence it is a holistic attitude and approach rather than compliance to a rigid checklist.
- No claims are made for the relative costs and benefits of upstream consideration of accessibility compared to post delivery modifications, but organisations are legally and morally obliged to demonstrate that their approach includes all reasonable steps.

### Principles for accessible E-Assessment

There are 4 key principles which should be applied to define e-assessment developers and providers working practices:

#### Principle of Anticipation

The developer should anticipate the variety of accessibility needs that may occur and seek to design in solutions to minimise the through life cost of accessibility.

### Principle of Reasonable Accommodation

One of the factors in assessing what is a reasonable adjustment is the overall resource available to the organisation. For example the DRC guidance recognises that capital budgets limit the timescale within which an organisation's existing facilities may be adapted, so it may be acceptable to only convert one building for accessibility if multiple training facilities are available. Therefore although an assessment provider may identify many steps that could be taken to improve accessibility, they may make reasonable judgements as to what is achievable in a given timescale.

### Principle of Ongoing Technology Change

It is recognised in the DDA that the continuous advances in technology means that over time new methods of providing accessibility will become available in either absolute or justifiable expense terms. Therefore there is a requirement on organisations to have a process of continuous review of their approach to accessibility.

## Principle of Corporate Responsibility

The responsibility for complying with the DDA rests with the organisation and hence its senior management. To ensure that all the individuals in an organisation make consistent efforts to comply with the Act, an organisation's management should ensure that there is a clear accessibility / anti-discrimination policy, training to ensure compliance and a monitoring / review process to check that the policy and training are being followed and are being successful in achieving compliance with the DDA.

It is the authors' belief that there is a legal and moral requirement upon Awarding Bodies and related organisations to have a demonstrable commitment to each of the 4 principles above. This must be demonstrated by the most senior management on down through the organisation. As each Awarding Body is in a unique position regarding adoption of e-assessment and the type and maturity of technology involved, each organisation must develop its own response to these principles.

# Practical steps towards accessible E-Assessment

To follow the key principles above, there are a number of practical steps a supplier of e-assessment products can take:

- 1. Develop/amend internal processes and procedures to reflect the accessibility "good practices" identified in the various accessibility documents and websites identified in the Codes of Practice.
- 2. Implement training, tools and product auditing to ensure that compliance with the processes and procedures is achieved.
- 3. Develop a "technology roadmap" for accessibility and produce a plan with resources and timescales to implement it. This is likely to include identifying a list of preferred accessibility tools and working with suppliers and customers to ensure their technical support and use. It may also include the development of tools to assist the processes and procedures from item 1.
- 4. Implement an ongoing review of the success and applicability of the above 3 steps on an annual basis.

### E-assessment development process

Different organisations will have unique development processes, which will vary dependant upon factors such as whether technical resources are in-house or subcontracted and the e-assessment is targeted to general or professional qualifications.

Consideration should be given to accessibility and usability issues at each stage. Organisations should review their working methods and own development processes but may wish to use the suggestions below as an initial model.

# Test Specification

In relation to qualifications the DDA makes a key distinction between an awarding body's duty to make reasonable adjustments to the assessment process and its right not to adjust the competence standards inherent in a qualification. The specification must (among other things) therefore address two key issues:

- Complete clarity on the competence standards underpinning a qualification and which of these are mandatory hence this establishes at the outset what justifications may exist for providing a non-accessible assessment,
- Definition of whether the competence standards require testing via eassessment. If this is not the case, alternative equivalent means of assessment (e.g. a paper assessment) may be considered as one method of ensuring accessibility.

# Development Team

A test development team for a major assessment is likely to be distributed, often drawn from more than one organisation (especially where on-screen content or delivery technology is subcontracted). It can typically include;

- Principal assessor
- Test specification author
- Test author
- Content producer
- Delivery platform provider
- Accessibility specialist

The consultation showed that most organisations feel satisfied that their internal processes for ensuring accessibility are robust and well practised and that upcoming changes to legislation are anticipated and will be addressed. This included most organisations having specialists to develop accessible versions of existing assessments. The most significant change for e-assessment (and arguably paper assessments!) is that these specialists should be involved at the initial stages onwards. A potential weakness is in multiple agency/organisation development where understanding of practices, capabilities and techniques may not be shared. It is recommended that once a team is identified, the

responsibilities of the parties are identified in writing and that where a team and / or the technology to be used are new, a joint capabilities training session is held. This ensures that:

- the specification takes full advantage of the capabilities (e.g. multimedia), whilst recognising any limitations (e.g. security lock-down limiting assistive software),
- the author and content producer agree on all relevant information required to define an item,
- the items are authored to take advantage of innovative capability,
- required developments to the content delivery platform are identified early.

The consultation suggests that this is currently an ad-hoc and sporadic process.

# Test Requirement Document

The test requirement document must capture the preferred assessment method and the requirements for accessibility. In particular, where the required competence standards indicate that the assessment cannot be made accessible to certain disabilities, this should be stated. Where accessibility is required consideration should be made at this stage whether it is through:

- the application of technology (assistive software and aids),
- other supportive measures (e.g. a reader or scribe),
- alternative means of assessment (i.e. a practical rather than simulated test).

Definition at this stage means that the requirements on the various members of the development team are clearly stated and development funds are spent on the identified areas of accessibility.

Where the specification calls for simulation care must be taken on two fronts:

- If the actual implementation is emulation then existing accessibility approaches may not work (e.g. an emulated software package in ICT testing may not support all accessibility functions available in the full package).
- The simulated environment may not be rich enough to reflect how individuals work in practice (e.g. a simulation cannot replicate the sense of touch to explore shape and texture).

Where simulation is specified the three options above for alternative assessment must be carefully considered.

In the specification, standards should be invoked with care. Invoking standards does not confer accessibility or a given level of quality. For example, a test item may be IMS QTI compliant, but that does not define how it will be displayed on-screen and hence how usable it is!

# Write test

The author should write the test with the specified assessment method and technical capability in mind. If the technology to be used is new to the author, they should be trained by the technology provider to understand the capability of the content and delivery system, and the information required by the content producer.

The principal difference to authoring the paper test is that a deeper level of description and detail is required to fully describe what is being tested, how it is to be tested, and how various elements of the technology should handle the test data:

- Where a qualification is only partially accessible due to the underpinning competencies required, a statement should be provided if a particular question is not to be accessible in certain aspects (for example an vocational test of electrical engineering may test that the candidate knows the wiring colour code, which will be fully accessible, whereas a practical test of recognition of colours and hence correct wiring cannot be made accessible to colour blind candidates through colour labelling).
- Stating the competencies being tested in an item ensures that the content producer does not provide unfair assistance through accessibility measures for example where a written comprehension should not have a voice-over.
- To reflect simulation or multimedia approaches, a storyboard may be most applicable.
- Where the data is available to the candidate in multiple forms (e.g. written, graphics, alt text and sound effects) each should be specified if critical to the equivalence of different methods of access.

This guidance is in addition to the general guidance produced by the regulators on issues such as use of appropriate language, representing diversity, avoidance of bias etc, which applies equally on-screen as to paper assessments.

# Write Mark scheme

Current JCQ guidance published on 6th September 2005 in response to the pending extension of the DDA to general qualifications, is that all qualifications should be allocated on the same mark scheme without exemptions and a

subsequent certificate indication. This means that the mark scheme should be written without consideration of the specified level of accessibility – that is where certain skills cannot be demonstrated by a person with a disability, a mark cannot be provided that excludes that skill (an indicated award).

This removal of any consideration is a rather perverse (and unintended) effect of the equality legislation and is likely to come under significant scrutiny and possible revision. One alternative is to ensure that qualifications are designed on a unitised basis where the units are designed such that one or more units may contain all elements relating to a competence that may by definition be inaccessible to some candidates.

There is a particular area of interest and uncertainty here with item bank based tests. Ultimately, if questions with varying degrees of accessibility can be argued to be an equivalent test of a competency, an Awarding Body may choose to create tests 'on the fly' from an item bank using accessibility criteria as one of the elements of the selection algorithm. This will only be possible if there is a rigorous mark scheme which ensures that the algorithm selects a fully representative test for candidates selecting an accessible option.

# Test QA Process

The first stage of QA assessment is to check that the test requirement fully reflects the test specification and to ensure that the test items are satisfactory in terms of validity, reliability and accessibility in its widest sense. The standard processes used for paper examinations are well practised and understood, and are a first stage for the on-screen QA process.

The requirement for on-screen is an extension of this process in that the QA process must also check that:

- The author has specified what accessibility options are not applicable due to competency requirements,
- Allowable accessibility options are fully specified,
- That the accessible version (i.e. voice-over, alt-text etc) is comparable for difficulty.

A key difference for on-screen authoring, as with software publishing in general, is that many pieces of independent code, each of which has a unique revision state, may be brought together to make a complete assessment. The awarding body with ultimate responsibility for the assessment must ensure that the organisation authoring this code has a suitable robust configuration control system in place which enables the tracking of each piece of code, including traceability of review comments and subsequent modifications. Each subsequent release of the assessment should then have a revision designation which enables the revision state of each element to be determined. This is not a unique issue for accessibility design, but is a necessary step to ensure that changes requested as a result of accessibility checks are tracked and properly implemented.

# Mark Scheme QA Process

The mark scheme QA process for on-screen assessment is essentially the same as for a paper assessment, however there are two key checks that should be undertaken:

- 1. If an on-screen assessment is to be marked automatically the mark scheme must define acceptable boundaries of data entry (for example are typographical errors to be penalised), so that a suitable marking algorithm may be developed.
- 2. The interaction of the mark scheme and the screen based interaction should be considered, such that the assessment does not become and inadvertent test of dexterity / motor skills through the allocation of marks for a solution that is not keyboard or switch navigable.

# On-screen authoring

Professional on-screen authoring organisations should be expected to have 'style manuals' which provide their authors with guidelines on how to develop items following good practice for both accessibility and usability. Key issues that should be addressed are:

- Ensuring there is good communication with the author should clarification of the specification or acceptability of approach be required.
- Train on-screen authors to recognise the impact their authoring decisions may make on item difficulty and comparability.

# Marking algorithm implementation

Following on from the consideration of the initial mark scheme design, a key aspect for any on-screen marking algorithm is to implement the specified level of robustness to candidate entries. Whilst straight-forwards for multiple-choice based knowledge tests, this may include such innovations as neuro-linguistic programming for the assessment of free text entries.

Also it is important that where the output rather than process is being assessed, the algorithm does indeed check output and does not use process as a proxy – for example some ICT tests mark 'process' and therefore fail to give marks when users use less common working methods for accessibility reasons.

### QA draft assessment

Each Awarding Body will develop their own quality assurance process in agreement with their technology provider (third party or in-house), which should explicitly checks that accessibility features are included and operating as specified, and that the validity and difficultly of the assessment is comparable for each alternative method of access.

#### User acceptance testing

Typically in accessibility much consideration is given to a purely technical review of accessibility. However the core of the exercise is to produce e-assessments that users find both meaningful and manageable. The only way to ensure this is through user trialling.

User trialling is a challenging and time consuming business which becomes much more so if attempts are made to trial with particular user groups, such as users of particular assistive devices and those with a particular disability. This should be addressed through a layered testing approach, with the e-assessment delivery engine, generic content (i.e. questions types) and specific content (i.e. actual questions) having different assessment regimes. For example whilst a delivery engine and generic question type may undergo testing for navigation using particular assistive technologies, once proven, this need not be repeated for each subsequent use of that question type.

Each Awarding Body should develop their own system of user testing and be able to demonstrate that there is a robust system of recording user comments (which will include centre staff), feeding back comments to authors and content producers, and tracing modifications to the assessment to maintain quality.

### Sign-off assessment

The assessment sign-off indicates that the level of checks considered reasonable within the awarding body's own QA process has been passed. The major issue for accessibility is that the majority of real accessibility testing will happen in the field, post sign-off whereas the sign-off and release process should allow for the collection of field usage data and the subsequent update of an assessment and feedback to authors and content producers.

### **Operational Roll-out**

Operational roll-out should comprise two distinct phases:

• Initial implementation in centres,

• Ongoing feedback and improvement.

The consultation suggests that the former is an effective process with centres. There are existing standards such as BS7988 which provide information on the generic standards that ICT test facilities must follow. Awarding Bodies and their technology partners further have guidelines on particular issues such as equipment specifications, staff training, required roles, defined points of contact, escalation routes etc, which this document does not seek to replicate.

However the consultation does indicate that the main area for potential improvement is the on-going feedback and improvement. The delegation of responsibility for applying adjustments to centres appears to have had the effect of limiting the flow of information on accessibility issues from the centres to the awarding bodies and their technology providers. It is not clear whether the low volume of requests for accessibility support from centres to Awarding Bodies reflects a high level of self capability or an indication that candidates are either being steered away from on-screen assessments by centres or choosing themselves not to enter for on-screen assessments.

If it is the former, then there is potentially a large body of evidence and skill on how to integrate accessibility technology, which could be collected and made available on a wider basis. If it is the latter, then there is a need to improve the communication.

The ideal approach is that centres should have a defined point of contact for accessibility issues and be encouraged to provide user feedback both on what does work and proves popular and what accessibility aids have been tried but failed to interoperate. This can then be used to create a knowledgebase to inform future developments and support other centres.

# Cost – benefit analysis

This report purposely avoids making statements as to the relative costs of alternative approaches, or what costs may be determined 'reasonable' in legal rulings under the DDA. However what is clearly not good practice, and demonstrates a poor culture of accessibility and usability is proceeding with a development of on-screen assessment and at a late stage of the process, calculating the cost of 'adding-in' accessibility features, comparing the cost with the 'expected' number of users (particularly if based upon past data on requests for modifications) and using this as a justification not to adopt accessibility options on the basis of a 'not reasonable costs' defence. Such an approach is poor on several counts:

• It perpetuates existing design approaches and stifles innovation,

- It assumes the past, with all the barriers to accessibility, is a good indication of how many people will aspire to qualifications in the future,
- It ascribes no value to the benefit of good usability to the wider population.

# Consultation Findings

During the development of this document, the authors consulted with a number of organisations including government agencies, awarding bodies and technology providers. In addition to what has been described above, the major points or issues are recorded below.

- 1. All parties consulted on e-assessment believed that there was a good level of understanding on the need to comply with the DDA, and that there was much generic (generally web-derived) assistance on onscreen accessibility techniques. There is an issue that knowledge of how to apply the legislation and case law to confirm the principles of application are both still evolving. The regular and wide sharing of such information, as it becomes available, would be most useful.
- 2. A possible means of sharing both best practice and emerging guidance and case law would be through an online forum for awarding bodies and technology providers. TechDis already provides considerable useful resources and an online forum could be created as an addition to that support.
- 3. 'Reasonable cost' justifications for not adopting measures to improve accessibility and usability typically do not allocate any 'benefit' value to the usability element of the cost-benefit calculation despite diverse surveys from an assessment of Tesco.com to Microsoft usability surveys indicating broad benefits from adopting good accessibility practice.
- 4. Awarding bodies are not technology specialists and interoperability issues (between assessment platforms, assistive software and technology) are continually changing as technology advances. Specialist centres are reportedly well placed to support individual students but there is little evidence of feedback into the platform or assessment design process. Also technology providers undertake adhoc testing for interoperability, but there is no formalised recording of interoperability or sharing of data. There is interest and potentially significant benefit in having a centralised organisation that has access to assistive technology and trained users that can facilitate compatibility and usability testing with trained users. This could provide a coherent UK lobby voice to major software suppliers, as well

as a central point of contact for learners, test centres and technology suppliers for information and support.

- 5. The issue of language as an enabler was raised in consultation the assertion being that it is typically an un-stated criteria. This is particularly the case in vocational qualifications and is significant for on-screen testing where many assistive aids are potentially available such as voice-overs, clear iconography, on-line dictionary, spell checker and thesaurus. There is an argument that the required level of language should be explicit, and the level of acceptable support be defined to avoid a disparity between an on-screen test and the 'equivalent' alternative practical or written test.
- 6. The point above may be linked to the apparent improvement in test results by moving from a paper test to an 'equivalent' on-screen test. Other reasons have been postulated such as a reduction in exam stress through a non-threatening environment and reduced distractions through presentation of a single question on-screen at a time. It is clear that there is a fine line to be walked between providing comparability and accessibility / usability. This area whilst not directly related to accessibility and usability is clearly important and would benefit from further research.
- 7. The assertion was made that integration between authors and content producers and design for accessibility is better in learning content and assessment for learning than in accredited qualifications – possibly through considerations of security and equivalence and possibly through custom and practice of existing development teams. There may be some benefit in looking to non-accredited test and content developers for good practice.
- 8. There are two wider inclusion issues for centres and learning providers to consider; how to encourage wider participation in learning and assessment and what the implications to moves towards e-learning and e-assessment means for those with no access or poor skills in ICT.
- 9. There are many standards relating to the technical aspects on-screen assessments and accessibility of web sites / onscreen material. However there are variations on how close to market they are, how they relate to functional specifications and whether there are contradiction between standards or significant gaps left to 'interpretation'. There is also not a known standard for accessibility testing of assessments most work in this area just relates to web design and therefore misses some significant aspects of assessment design such as security and reliability. The area of standards has not been significantly covered here and would merit further consideration.

- 10. The issues raised in consultation are primarily concerned with timed assessments. E-portfolios are used for accredited qualifications, but as this is typically output based (e.g. DiDA), reflecting a candidates normal working practices, there is considerable scope for learning providers to take individual measures for accessibility and hence e-portfolios in a general sense are not considered problematic. However the recent e-portfolio report for Becta highlighted that where an e-portfolio platform is mandated, many are poor on issues of accessibility, usability and inclusion!
- 11. The increasing use of technology reflects the wider world in which learners operate and the drive by awarding bodies to find a competitive advantage. Respondents to the consultation were generally satisfied with a 'light touch' regulatory approach, where Centres, Awarding Bodies and their technology partners put forward proposed approaches and their justification for using an approach, rather than asking the regulator to make sweeping rulings in advance of developments for example, in the development of innovative item banks, the exact rules for an algorithm to select questions and allow time based upon disability should be open to development and proposal rather than being prescribed.
- 12. As the current system delegates the responsibility for providing access to the test centres, there is little or no information collected or collated by the Awarding Bodies. This means that there is little centralised information on the level of use of various assistive technologies and whether improvements in design result in an increasing take-up of e-assessments by candidates with disabilities.

### Conclusion

This report raises some useful, interesting, and potentially contentious issues. The aim of presenting this report to the audience of the CAA conference is to stimulate debate and obtain feedback on the most appropriate way forward for TechDis in this area.