

**Accessibility in e-Assessment Guidelines
Final Report
Commissioned by TechDis for the
E-Assessment Group and
Accessible E-Assessment Forum
Report Prepared by Edexcel**



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Accessibility in e-Assessment Guidelines**Final Report****16th August 2006**

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1 Scope and Intentions

TechDis is working with the E-assessment Group¹ to produce guidelines for inclusion and accessibility within e-assessment. These guidelines are intended to provide overarching guidance to awarding bodies and software suppliers / developers designing new qualifications that include e-assessment, and to centres involved in delivering those assessments. They will be recommended to the QCA and the four UK countries for adoption as national guidance. This document provides the collated guidelines developed by Edexcel and 3Square Solutions under contract to TechDis, in consultation with the E-assessment group.

It is worth noting that the scope of this work is specifically on-screen timed assessments leading to qualifications (i.e. examinations – it excludes formative assessments and other types of e-assessment such as e-Portfolio).

Please note that while every effort has been made to ensure the accuracy of information in this report, the authors are not qualified legal advisers, and the advice and recommendations provided in relation to legislation and its interpretation should be treated accordingly.

1.1 Intended Audience

These guidelines are primarily aimed at all organisations involved in the design and development of e-assessments for the UK. This is considered to include:

- Regulatory Authorities
- Awarding Bodies
- E-assessment delivery platform suppliers / developers
- Assessment designers
- Assessment authors
- E-assessment content developers

As a secondary audience, these guidelines will also be of interest to individuals and organisations responsible for the day to day application of accessible e-assessment solutions. As such this report will also be of interest to:

- Assessment centres
- Local Authorities
- Academic institutions

Whilst written specifically for the UK market in terms of legislative and regulatory requirements, this report will be of interest to overseas suppliers to the UK and international assessment organisations interested in good practice.

1.2 Purpose

The methods and practices of assessment either through paper or practical tests have a long history and a well developed body of practice which is firmly embedded in the UK assessment market. This includes the practices for providing accessibility measures such as readers, scribes, large print copies

¹ The E-assessment Group comprises representatives from awarding bodies (Edexcel, AQA, City and Guilds, OCR), FAB, QCA, SSAT, LSC, DfES, Becta and the JISC. It provides advice and guidance to the DfES on e-assessment.

of scripts, tactile diagrams etc, which are principally applied post assessment development by centres and assessors. The rise in the use of ICT for assessment purposes, which is hereafter generically referred to as e-assessment, is altering the normal practices of assessment, examples being:

- Tests delivered 'on demand' rather than to large pre-planned cohorts
- Tests generated 'on-delivery' from item banks
- Automated marking with instant or near-instant feedback on results to candidates
- Multimedia tests incorporating audio, video, colour and complex user interactions

The capabilities of computer based delivery offer the opportunity for an enriched, engaging and more valid testing experience than paper based tests (with validity improving due to more authentic items and being able to assess a broader range of skills and knowledge). Also, tests which use more than one form of communication to convey meaning are potentially more accessible to candidates than paper or practical tests. However whilst the changes introduced by e-assessment described above place pressures on existing regulation and practice, they also place pressure on accepted practices of post-development measures of accessibility. For example:

- For a test to be accessible on demand, an assessment system must have built in accessibility features and demographic data regarding the candidate's use of those features stored within the assessment delivery system. It is not acceptable for a candidate to spend the first 10 timed minutes of an assessment configuring the display to their required settings.
- For a test to be generated on demand from an item bank and subsequently marked automatically, rules must already be in place regarding whether all questions are equally accessible, and, if not, what rule will apply regarding issues such as extra time or selection of questions to ensure that candidates all sit tests which are equal measures of their ability.

The common factor in such measures is that consideration must be:

- a) made early in the assessment design process, and
- b) cover the assessment content and the content delivery system.

This document provides guidelines for a sample e-assessment lifecycle and what measures can be taken at each stage by relevant parties to maximise the accessibility of the final assessment.

1.3 Underpinning Beliefs

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.

1.4 Intentions

Different organisations are at varying stages of maturity with respect to e-assessment and this document provides an aspirational framework, which it is hoped organisations will work towards adopting. As processes and technologies develop and improve this document should be updated to reflect updated practices, based upon ongoing consultation.

This document is also provided to the QCA and the 4 UK nations for consideration of adoption as national guidance and an input to consultations on future changes to regulation.

It is worth noting the very substantial negative effects that can occur from inappropriate actions taken as a (sometimes inaccurate) result of the legislation, as has been evidenced with e-Learning to some extent. Progress is often slowed substantially, the costs of production may rise dramatically, and rich, interactive learning and assessment experiences are reduced to “lowest common denominator” forms to meet the needs of all learners. This is not the intention of the legislation, and care should be taken that the aspirational nature of this document not become a straightjacket which impedes the development of e-assessment.

1.5 Contributors

The authors contacted the following individuals and organisations during consultation and would like to thank all direct contributors for their input to this document, as well as the contributions from further unnamed reviewers within each organisation.

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2 Context

This section identifies the legislation that affects the provision of products and services in the UK and sources of information on the interpretation and implementation of that legislation. It then further focuses on the particular legislative status of education and e-assessment (noting previous work made available to the E-assessment group, which has covered the wider field of e-learning, including formative assessment, which can be classified as a service and is currently more covered by UK disability discrimination legislation than statutory testing).

The following section then makes recommendations on steps to be taken by providers of e-assessment products to ensure their own compliance. This advice is aimed at 3 key audiences; Awarding Bodies, technology providers and assessment centres. Whilst the E-assessment group is primarily representing Awarding Bodies, all 3 parties must act in co-ordination to produce the most accessible e-assessment solutions, hence having a single document to address all 3.

This section is not a definitive statement of the current legal position in the UK but key source documents² were reviewed and revised by a specialist lawyer at Cobbetts in Manchester. Due to the recent nature of much of the legislation and pending further changes there is not yet a significant body of case law to draw upon, and hence the suppositions in this report may be modified by future court rulings.

Within this report the following definitions are used (further definitions are given in the glossary in section 5);

disability

A physical or mental impairment which has a substantial and long-term adverse effect on a person's ability to carry out normal day-to-day activities

discrimination

Discrimination by a provider of services can be either:

Unjustifiably treating a disabled person, for a reason which relates to his/her disability, less favourably than others to whom that reason does not (or would not) apply; or

Unjustifiably failing to comply with a legal duty to make reasonable adjustments to practices, policies, procedures or physical features (e.g. of premises) which make it impossible or unreasonably difficult for disabled persons to make use of the services provided

2.1 Applicable Legislation

There are 3 key pieces of legislation in the UK which create the framework for disability rights in the UK:

The Disability Discrimination Act 1995 (as subsequently amended)

The Disability Rights Commission Act 1999

The Special Educational Needs and Disability Act 2001.

There is also the potential for individuals who fall outside the scope of these pieces of legislation to seek protection from discrimination using the Human Rights Act 1998, although this possibility is not examined further here.

² 'Accessibility Issues for E-Learning and E-Assessment Applicable Legislation and Guidance Issue 1, 31st January 2005' (Report for Skills for Life Convergence Project) & 'Convergence Project, Strand 2, Component 1.9 Improved Accessibility Final Report'

2.2 Development of the legislation

The key legislation in the UK defining the obligations of the public and private sector in providing goods and services to disabled people is the **Disability Discrimination Act 1995** referred to hereafter as “the DDA”. It should be noted that the DDA makes no distinction between provision for which there is a charge and that which is free – both carry an obligation for non-discrimination (although there are some exemptions for voluntary and charitable organisations).

For E-assessment the key sections of the DDA are Part II (Employment), Part III, ss.19-21 (which relate to the prohibition of discrimination in relation to goods, facilities and services, the meaning of “discrimination” in this context, and the duty of providers of services to make adjustments), and Part IV (Education).

Part II of the DDA imposes upon employers, including those in the E-assessment business, the obligation not to discriminate against disabled people in the search, selection and on-going employment of staff.

When the DDA first came into force companies with fewer than 20 workers were exempt from Part II, but this exemption was removed on 1st October 2004.

Also exempted were qualification bodies, but again this exemption was removed on 1st October 2004, for qualifications leading to a trade or profession. The only exemption remaining was for general qualifications (GCSE, A, AS levels).

When first enacted, Part III section 19 (5) provided an exemption from sections 19, 20 and 21 in respect of education which is funded, or secured, by a “relevant body” or provided at-

- (i) an establishment which is funded by such a body or by a Minister of the Crown; or
- (ii) any other establishment which is a school as defined in section 14(5) of the Further and Higher Education Act 1992 or section 135(1) of the Education (Scotland) Act 1980.

A “relevant body” is defined as:

- (a) a local education authority in England and Wales;
- (b) an education authority in Scotland;
- (c) the Funding Agency for Schools;
- (d) the Schools Funding Council for Wales;
- (e) the Further Education Funding Council for England;
- (f) the Further Education Funding Council for Wales;
- (g) the Higher Education Funding Council for England;
- (h) the Scottish Higher Education Funding Council;
- (i) the Higher Education Funding Council for Wales;
- (j) the Teacher Training Agency;
- (k) a voluntary organisation; or
- (l) a body of a prescribed kind.

Section 19(5) imposed a requirement for schools, further and higher education establishments to provide prescribed reports on the facilities and procedures in place to enable access and service provision to disabled people and progress in improving this provision. It also imposed the terms of the DDA on the Teacher Training Agency in exercising their functions through an amendment to section 1 of the Education Act 1994 (establishment of the Teacher Training Agency).

Therefore, for a period, given the exemptions in the DDA, it appeared that only e-assessment products which operated wholly in the private sector, e.g. corporate / professional qualification systems, were affected. Since the DDA covers the conduct of businesses in their dealings with the

public, where an assessment business deals directly with the public i.e. offering an on-line service, the business has the duty to ensure accessibility. However, in the case where a business to business service is provided, i.e. a service supplied to a school, the school would have the duty to ensure accessibility (but before 1st October 2004 would benefit from the exemption under section 19 (5)).

This apparent gap in anti-discrimination legislation was largely closed by the Special Educational Needs and Disability Act 2001 (SENDA). This Act significantly widened the scope of Part IV of the DDA, extending it to cover all publicly funded (or part funded) educational establishments and services. Note that any education services not covered by Part IV (a wholly private college for example) are still covered by Part III of the DDA.

With the extension of the terms of Part II of the DDA (Employment) on 1st October 2004 and the implementation of SENDA, all areas of e-assessment excluding general qualifications appeared to be covered. This final loophole was closed by the Disability Discrimination Act 2005. The bill was passed into law on 7th April 2005, but the provision relating to general qualification bodies does not come into force until September 2007. Regulations will define which qualifications are covered and revised guidance will be published on how to apply the regulations. At the time of writing, whilst initial draft guidance has been published, the final draft regulation and guidance is not available for review. The scope is expected to be comparable to the regulation and guidance relating to professional and trade qualifications bodies, where the only reason not to make reasonable effort to make an assessment accessible is because a particular disability will make it impossible to attain the required competency standard (e.g. extra time cannot be allocated for a shorthand test as speed is a core competency).

Hence all stages of education and all types of assessment are now covered, or shortly to be covered, with an apparently consistent level of cover and level of responsibility for Awarding Bodies, technology providers and assessment centres.

The implications of the DDA were examined in the Regulatory Impact Assessment which seeks to estimate the non-recurring and recurring costs of compliance with the Act. It is interesting to note, that, given the period during in which the DDA was drafted and legislated, there is no mention within the Act itself or in the Regulatory Impact Assessment to on-line services. However this omission does not mean that such services are exempt from complying with the DDA.

Note that there is considerable guidance on the scope and evolution of the applicable legislation available from the Disability Rights Commission (See <http://www.drc-gb.org/>). In the autumn of 2007 this will be incorporated into a single rights commission, The Commission for Equality and Human Rights (CEHR) which will bring together existing equality bodies for sex, race and disability and cover new areas of discrimination law including sexual orientation, religion and belief, and age. It will also have human rights within its remit. The legislation to formally constitute the CEHR is before parliament and is due to be passed into law in 2006.

2.3 Scope of the DDA

As the purpose of this section is to consider the impact of the DDA on the design and implementation of e-assessment products, no further consideration is given to the employment implications of the Act, except in the case of trade bodies and qualifications organisations where there are implications for assessment regimes.

The DDA is founded on the underlying principle that all suppliers of goods and services must undertake to ensure that no disabled people are “treated less favourably” for a reason connected with their disability, or “substantially disadvantaged” by a failure to make a “reasonable adjustment” to allow for that disability. Such less favourable treatment / failure to make reasonable adjustments is (unless justifiable) discrimination, in legal terms.

In practice this means that service providers must take reasonable steps to:

- ensure that disabled people are not treated less well than non-disabled people (e.g. by charging them more for the services simply because they require special arrangements to enable them to access the service);
- change a policy, practice or procedure which makes it impossible or unreasonably difficult for disabled people to make use of their services;
- provide an auxiliary aid or service if it would enable (or make it easier for) disabled people to use the services;

and, where a physical feature makes it impossible or unreasonably difficult for a disabled person to use the service, to:

- remove the feature; or
- alter it so that it no longer has that effect; or
- provide a reasonable means of avoiding it; or
- provide a reasonable alternative method of making the services available.

The responsibility for compliance rests with “responsible bodies”, which means in practical terms that companies or public organisations will be held responsible for an individual employee’s discriminatory actions unless able to demonstrate that they have taken “reasonable” steps such as publishing anti-discrimination policies and guidelines and implementing training based upon such guidance.

It is interesting that, in the impact assessment undertaken by the government, there is no mention of the cost of training or policy development in the cost of compliance!

3 Guidelines

There is substantial information available to scope and clarify the DDA in the form of regulations and codes of practice. This is also supplemented by guidance from the regulators in the UK. Rather than repeat that material here, references to the material are provided in Section 6 for further reading. This section seeks to summarise the principles that must be followed to provide accessible assessment and then provide generic guidelines that can be customised by individual organisations to suit their methods of working.

3.1 Principles for Accessible e-assessment

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

1. 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.

2. 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.

3. 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.

4. 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, but the remainder of section 3 provides a suggested framework that organisations may wish to aspire to.

3.2 Practical Steps to compliance

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.

3.3 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. Therefore for illustration the authors provide a generic e-assessment development process in figure 3-1.

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

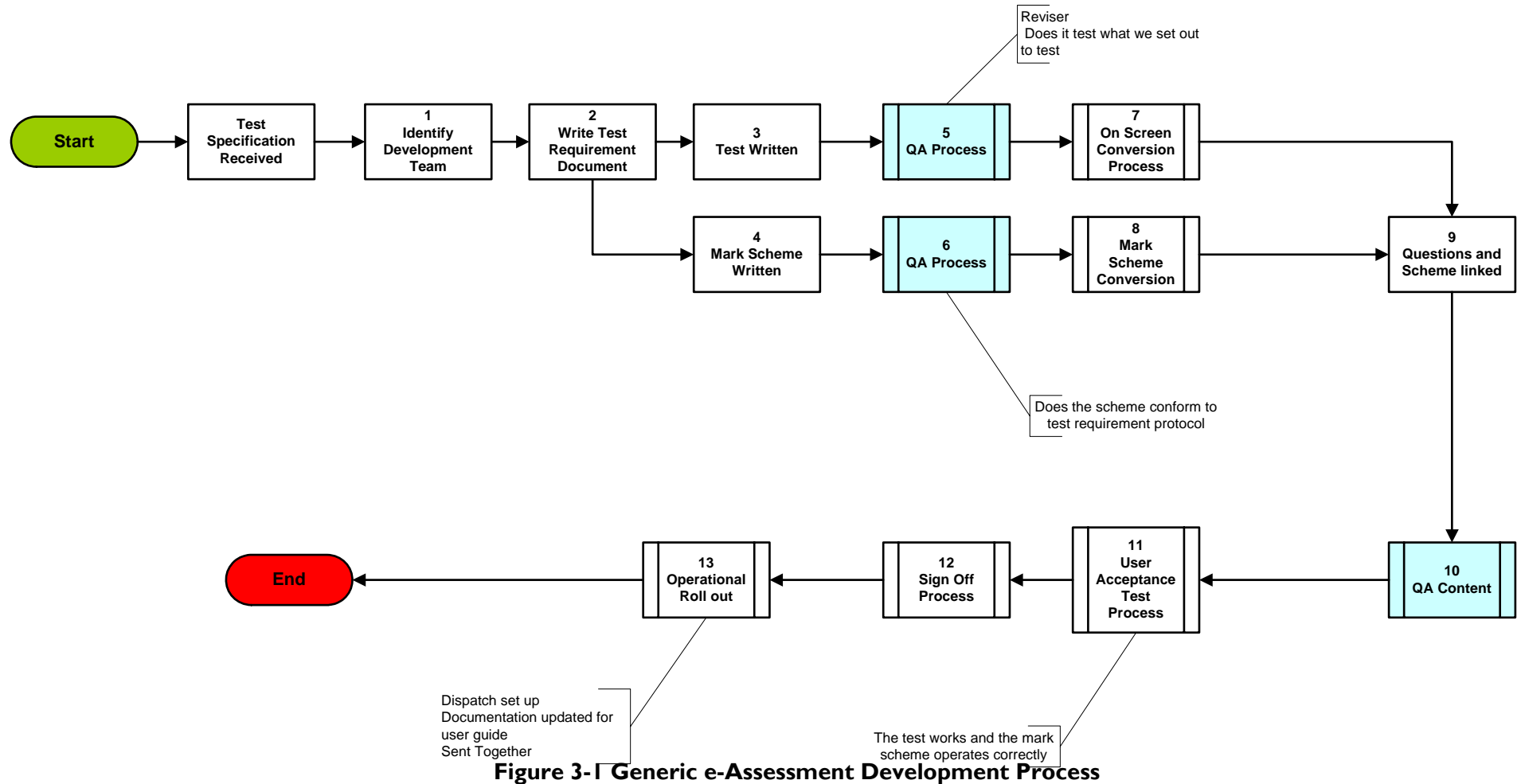
In relation to qualifications the DDA makes a key distinction between an awarding body’s duty to make reasonable adjustments to the assessment process and its right not to adjust the competence standards inherent in a qualification. The specification must (among other things) therefore address two key 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 e-assessment. 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! Some further discussion on standards is given in section 4.

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.

The guidelines in Appendix 2 may be useful for authors and content producers in how to address particular item types.

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 an 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. The guidelines in Appendix 2 provide some guidance on specific measures for accessibility and usability on specific item types.

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.

Questions and scheme linked (Draft assessment released)

Any linking of the questions and mark scheme through a marking algorithm does not carry special considerations for accessibility.

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 check that accessibility features are included and operating as specified, and that the validity and difficulty 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. This is considered further below, but 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.

3.4 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.

4 Findings of the consultation

During the development of this document, the authors have consulted with a number of organisations including government agencies, awarding bodies and technology providers. Details of the consultation are given in Appendix 1. Where points raised address issues relevant to particular stages of the e-assessment process given in section 3, the points have been included in the body of the text. Further 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 on-screen 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 ad-hoc 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. This could potentially be an extension of the excellent work already undertaken by TechDis and could lead to 'approval marking' of known interoperable products.
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. The measures discussed in section 3 are all concerned with access rather than inclusion. There are two wider 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 standards³ 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 Becta⁴ highlighted that where an e-portfolio platform is mandated, many are poor on issues of accessibility, usability and inclusion!

³ Example Standards

Technical Standard	Purpose	Issues for Accessibility
IMS QTI (Question and Test Interoperability)	A specification describing a data model for the representation of question and test data and their corresponding results reports. Therefore, the specification enables the exchange of this item, test and results data between authoring tools, item banks, test constructional tools, learning systems and assessment delivery systems.	The specification is at a high level of abstraction so does not allow the author to specify the on-screen appearance of items. This can result in a very low level of usability for items transferred between QTI compliant systems. QTI is part of a family of standards for which accessibility is handled elsewhere in the family (see ACCLIP below)
IMS LIP (Learner Information Package)	This standard is designed to make e-learning interoperability possible and deals with details relating to the learner's identity. In addition to the obvious administrative information, it provides categories and classifications for a wide range of item types such as goals, interests, qualifications, activities, products, competencies, assertions, reflections and rubrics.	Attempts to use IMS LIP have found it both too complex and insufficiently well defined in terms of a common language of terminology to be useful. There is a specific subset of data relating to accessibility issues (ACCLIP), but lack of support for LIP may impact support for ACCLIP.
IMS ACCLIP (Accessibility for Learner Information Package)	The IMS ACCLIP Specification provides a means of describing preferences so that learners can interact with an e-learning system regardless of disability, hardware or environment. These preferences are based on those parts of a computer system (hardware and software) that can be adjusted to improve accessibility, rather than on type of disability. It concentrates on the display, control and selection of learning content, so that learners with alternative content or interface requirements can be supported.	Experience in trialling it in the UK has suggested that it is viable, however it is relatively complex (it covers a very wide range of adaptations to systems and services, most of which are not practical to implement in common systems) and therefore costly and time-consuming to implement. There are simpler alternatives which take a more pragmatic approach (although not ultimately providing the same extensibility).
UK LEAP (UK Lifelong Learner Information Profile)	This work was undertaken as a specialisation of IMS LIP, and is designed to enable skills and learning organisations to exchange information about learners in practical settings in the UK.	This work was of limited effectiveness due to the 'semantic gap' (lack of common language) between institutions when describing data and was not concerned directly with accessibility issues.

⁴ Report for BECTA Scoping and Evaluating E-Portfolios, 3Square Solutions, 7th April 2006

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.

4.1 Variations across the Nations

This report does not take particular account of the variations of practice or advice across the UK nations. The significant legislation is applicable across the UK, and variations in advice from the national regulators are not material.

5 Glossary

This glossary of terms is drawn from the e-assessment glossary of terms developed by 3Square Solutions on behalf of JISC, BECTA and the QCA, which is currently available in Beta form at; www.vyvhopescott.co.uk/jgloss

The glossary includes terms which are not used within this document, but will be encountered by the reader if undertaking wider research on the topic.

Term	Definition
<u>Access Technology</u>	ICT used by those with disabilities or special educational needs to access computer-based materials.
<u>Access Tool</u>	Computer-based materials and software designed to provide or improve accessibility of computer based testing. Note: tools include aids to authors for evaluating accessibility or for adding in accessibility features to content, devices and programmes provided for the candidate to provide an alternative or augmented means of accessing on-screen assessments.
<u>Accessibility</u>	The extent to which a service can be used by people with disabilities or special access requirements. With reference to e-assessment, the accessibility of an e-assessment is the extent to which the e-assessment system (including the physical environment, test software itself, and the administration system) can be accessed, including by the student using special software access tools (such as Screen Readers, Screen Magnifiers, Braille readers and speech recognition software).
<u>Accommodation</u>	A special arrangement made to an assessment instrument or its application to enable the candidate to demonstrate skills, knowledge and ability in their given subject areas in ways which are appropriate to their learning styles and study methods. For example, an accommodation for a student with poor vision might be an extra 10 minutes to complete the assessment, or access to a large print version of the assessment. Note: the term is falling out of use, and now tends to be replaced by reasonable adjustment.
<u>Adjustments</u>	Variations to examination administrative arrangements agreed in advance of an assessment to allow attainment to be demonstrated by candidates with either a permanent or temporary disability. Note: this term is falling out of use and now tends to be replaced by reasonable adjustment.
<u>Alt Tag</u>	The alternative text that a browser displays when a learner does not want to, or cannot see the pictures present in a web page or other on-screen content. Note: alt tags are essential in making e-assessment content accessible for candidates with disabilities, but must be carefully considered to ensure that they do not unduly aid or hinder the user in answering the question. The text of an alt tag attached to an image usually appears when the mouse is hovered over the image.

Term	Definition
<u>Alt Text</u>	<p>The alternative text held within an alt tag, displayed when a user is unable or unwilling to view graphics in a web page or other on-screen content.</p> <p>Note: the text must be carefully considered to ensure that it gives equivalent information to the image it is describing, but does not unduly aid or hinder the user in answering the question.</p>
<u>Assistive Technology</u>	See <i>Access Technology</i>
<u>BECTA</u>	See <i>British Educational Technologies Agency</i>
<u>Braille Display</u>	<p>A tactile device which enables the learner to read the contents of a computer screen, by touch in Braille. They are also known as Paperless, Soft or Refreshable Braille displays and vary in size from 20 to 80 Braille cells. Each cell has 6 or 8 pins made of metal or nylon, which are electronically controlled to move up and down, to display a Braille version of characters that appear on the computer screen. When used in conjunction with a screen reader a Braille display also gives the user access to alt text.</p>
<u>Braille Reader</u>	<p>A combination of software and a Braille display that enables a learner to view information from a computer and alt text using Braille.</p>
<u>British Educational Communications and Technology Agency</u>	<p>A UK government agency which supports all four UK nation's education departments in their strategic ICT developments. Http://www.becta.org.uk</p>
<u>British Standards Institution</u>	<p>The UK organisation for national and international standards. The organisation which produced BS7988: Code of practice for the use of information technology (IT) in the delivery of assessments (2002). This code (being revised in 2005) has a particular focus on the practical aspect of delivering high-stakes summative assessment and advises on issues such as the layout of computers and security procedures. http://www.bsi.org.uk.</p>
<u>BS7988</u>	<p>The British Standard for the use of information technology in computer-aided examinations. The first draft was published in 2002. It is aimed at a wide audience of both exam providers and exam centres and includes performance criteria and codes of practice.</p>
<u>BSI</u>	See <i>British Standards Institution</i>
<u>Centre For Educational Technology Interoperability Standards</u>	<p>The UK observatory for technical interoperability standards for e-learning which includes e-assessment, most commonly referred to as CETIS..</p> <p>Note: CETIS provides a number of services to UK HE and FE including managing the e-assessment SIG. http://www.cetis.ac.uk.</p>
<u>CETIS</u>	See <i>Centre For Educational Technology Interoperability Standards</i>
<u>Code Of Practice</u>	<p>Principles and practices which define a required standard of activity.</p> <p>Note: in the non-HE sectors of education, these are specified by the regulatory authorities against which, for example, awarding body processes and procedures for the assessing and awarding of particular qualification types are designed and evaluated.</p>

Term	Definition
<u>DDA</u>	<i>See Disability Discrimination Act</i>
<u>Department for Education and Skills.</u>	<i>The Government Department responsible for Education and Training in England. http://www.dfes.gov.uk</i>
<u>DFES</u>	<i>See Department for Education and Skills</i>
<u>Disability Discrimination Act</u>	<p>The Disability Discrimination Act 1995 is an act of the UK Parliament which aims to end the discrimination which many disabled people face. It gives disabled people rights in the areas of employment, access to goods, facilities and services and buying or renting land or property.</p> <p>Note, this act applies to providers of education services.</p>
<u>Disapply</u>	<p>Within schools, used to define the small number of students who are working at the levels covered by the National Curriculum, but who are unable to take part in some or all of the assessment arrangements, even allowing for the full range of special arrangements/reasonable modifications that can be made.</p>
<u>E-Assessment SIG</u>	<p>A UK SIG (Special Interest Group) dealing with e-assessment technology issues. http://assessment.cetis.ac.uk/.</p>
<u>e-Government Interoperability Framework</u>	<p>The e-Government Interoperability Framework, which defines the technical policies and specifications governing electronic information flows across government and the public sector. They cover interconnectivity, data integration, e-services access and content management.</p> <p>Note: e-GIF defines and adopts technical standards (which may have developed internationally or in the UK) with which UK Government ICT projects are expected to comply. http://www.govtalk.gov.uk/schemasstandards/egif.asp.</p>
<u>Human-Computer Interface</u>	<p>The group of computer input devices (mouse and keyboard, usually) and output devices (screen and speakers, usually), in addition to the parts of the operating system and application software which control how the human-computer interactions are carried out.</p> <p>Note: in the context of e-assessment, there is often a requirement for the HCI to be user-friendly for the candidate.</p>
<u>JISC</u>	<i>See Joint Information Systems Committee.</i>
<u>Joint Information Systems Committee</u>	<p>An independent advisory body that works with further and higher education by providing strategic guidance, advice and opportunities use to use ICT to support learning, teaching, research and administration. JISC is funded by the UK Further and Higher Education Councils and is responsible for the development of this E-Assessment Glossary.</p>
<u>Modification</u>	<p>Adaptation(s) of a test to make it accessible to pupils with special educational needs .</p>
<u>National Information and Learning Technologies Association</u>	<p>A UK association for organisations and individuals in post 16 education. NILTA aim to facilitate the active participation of all staff throughout the lifelong learning sector in the development, use and exploitation of ILT through the exchange of ideas and expertise, sharing of best practice, facilitation of partnership and access to information, advice and support.</p>

Term	Definition
<u>Personalisation</u>	The configuring of a system by students to suit their personal requirements (e.g. selecting preferred font sizes and colours, volume levels for audio, et al). Also refers to more complex customisations of the user experience to meet personal learning needs.
<u>Practicability</u>	The feasibility of an assessment. A valid and/or reliable assessment may not be practical due to the cost or time required to carry it out. High quality assessments are valid, reliable and practicable.
<u>QTI Lite</u>	A simpler-to-implement technical specification for tests and items which allows tests developed in one system to be delivered to candidates on other systems (currently at version 1.2). See http://www.imsglobal.org/question/index.cfm#version1.2lite
<u>QTI V2</u>	A technical specification for tests and items which allows tests and test items to be authored and delivered on multiple systems interchangeably. It specifically relates to content providers (that is, question and test authors and publishers), developers of authoring and content management tools, assessment delivery systems and learning systems. It is designed to facilitate interoperability between systems.
<u>Reasonable Adjustment</u>	An accommodation arrangement which is approved in advance of an examination or assessment to allow attainment to be demonstrated by candidates with either a permanent or temporary disability or learning difficulty, or a temporary disability, illness or indisposition.
<u>Regulator, The</u>	<p>A Government body (usually a NDPB) set up to oversee the activities of suppliers of services within an industry sector. Within UK education there are a number of regulators: QCA regulates the curriculum and qualifications in England, excluding higher education. (www.qca.org.uk). ACCAC undertakes the same role in Wales (www.accac.org.uk). SQA undertakes a similar role in Scotland (www.sqa.org.uk) and CCEA undertakes a similar role in Northern Ireland (www.ccea.org.uk). QAA regulates Higher Education (www.qaa.org.uk) in the UK.</p> <p>The UK regulatory authorities (excluding QAA) can accredit qualifications which: are: a) external public awards, i.e. they are not internal certificates made by an employer to its staff or trainees, or by a college to its students; b) are permanent once achieved, they are retained by the candidate; c) are not degrees or other higher education awards made by degree awarding institutions acting in their own right.</p>
<u>Regulatory Authority</u>	(For Qualifications) Government-designated statutory organisations required to establish national standards for qualifications and secure consistent compliance with them. The regulatory authorities for qualifications in England, Wales and Northern Ireland are respectively QCA, ACCAC and CCEA

Term	Definition
<u>Screen Magnifier</u>	<p>A software package to enhance accessibility for partially sighted learners. It works together with the operating system and on-screen assessment browser to enlarge the contents of the screen. Generally this magnification is very large, and far exceeds the largest settings that a standard operating system has in its settings. It is the software of choice amongst people with low vision.</p> <p>Note: assessment designers need to take care that some images (particularly of text) become unreadable at high levels of magnification due to pixelation.</p>
<u>Screen Reader</u>	<p>A software tool which reads out the text content of screens, allowing blind and partially sighted people to interact with computers. Distinct from a Text-to-Speech tool which also reads out text, but is designed for dyslexic users.</p>
<u>Screen Resolution</u>	<p>The number of distinct dots (pixels) that a screen can display (not the same as screen size). Higher screen resolutions allow presentation of more detail and information on a screen page.</p>
<u>SEN</u>	<p>See <i>Special Educational Needs</i></p>
<u>SENDA</u>	<p>See <i>Special Educational Needs And Disability Act 2001</i></p>
<u>Special Arrangements</u>	<p>An accommodation that is approved in advance of an examination or assessment to allow attainment to be demonstrated by candidates with either a permanent or long- term disability or learning difficulty, or a temporary disability, illness or indisposition Special arrangements are now referred to as reasonable adjustments to bring usage into line with the wording of legislation on equal opportunities. See reasonable adjustment.</p>
<u>Special Considerations</u>	<p>Procedures implemented at the time of an examination to allow attainment to be demonstrated by candidates who have suffered temporary illness, injury or indisposition at the time of the examination. Special arrangements are now referred to as reasonable adjustments to bring usage into line with the wording of legislation on equal opportunities.</p>
<u>Special Educational Needs</u>	<p>Denoting a learning difficulty (physical and/or mental) which requires the provision of special arrangements for teaching and learning.</p>
<u>Special Educational Needs And Disability Act 2001</u>	<p>An act of UK Parliament that extended the Disability Discrimination Act 1995 to cover all aspects of pre and post-16 education. This act has the effect of ensuring that products and services used across the UK (particularly in education) do not discriminate on the grounds of disability.</p> <p>For the act see http://www.opsi.gov.uk/acts/acts2001/20010010.htm</p>
<u>TechDis</u>	<p>An educational advisory service providing advice and guidance on technology and disability to promote an accessible and inclusive experience for students and staff in higher education, further education, adult and community learning and specialist colleges across the UK. TechDis is a JISC-funded service. See http://www.techdis.ac.uk</p>

Term	Definition
<u>W3C</u>	The World Wide Web Consortium - an organisation developing technical standards and best practice for the Web. Their stated mission is 'To lead the World Wide Web to its full potential by developing protocols and guidelines that ensure long-term growth for the Web'. See http://www.w3.org/Consortium/
<u>WAI</u>	<i>See Web Accessibility Initiative</i>
<u>WCAG</u>	<i>See Web Content Accessibility Guidelines</i>
<u>Web Accessibility Initiative</u>	A section of the W3C that works in coordination with organizations around the world to pursue accessibility of the Web through five primary areas of work: technology, guidelines, tools, education and outreach, and research and development. Abbreviated to WAI. See http://www.w3.org/WAI/about.html
<u>Web Content Accessibility Guidelines</u>	Guidelines explaining how to make Web content accessible to people with disabilities.

6 Sources of Further Information

The following links provide further information and advice on the applicable legislation, technology and accessibility design tips. This is not an exhaustive list, and given ongoing developments in this field, is likely to become rapidly dated but provides a good starting point for further research. There is further information published by the regulators in each of the UK nations relating to accessibility and discrimination in assessments. These are currently principally aimed at paper assessments, but the generic guidelines are equally applicable to e-assessment.

Reference	Summary
http://www.opsi.gov.uk/acts/acts1995/1995050.htm	The Disability Discrimination Act 1995
http://www.opsi.gov.uk/ACTS/acts2005/20050013.htm	The Disability Discrimination Act 2005
http://www.opsi.gov.uk/acts/acts2001/20010010.htm	The Special Educational Needs and Disability Act 2001
http://www.opsi.gov.uk/acts/acts1999/19990017.htm	The Disability Rights Commission Act 1999
http://www.drc-gb.org/default.aspx	The Disability Rights Commission website. Provides links to the Welsh and Scottish DRC sites. Provides links to the Acts of Parliament, regulations and guidance, as well as recent case law.
http://www.w3.org/WAI/	Homepage for the Web Accessibility Initiative of W3C (The World Wide Web Consortium), which provides information on how to provide and assess accessibility on the internet.
http://www.techdis.ac.uk/	The TechDis homepage which provides advice and support on issues of technology and disability in UK education.
http://rnib.org.uk/	The Royal National Institute of the Blind homepage, which provides information on good design for accessibility
http://rnid.org.uk/	Royal National Institute of the Blind website which has an extensive 'information and resources' section
http://www.bda-dyslexia.org.uk/	The British Dyslexia Association website which contains extensive information on dyslexia friendly design and education.

Appendix 1 Consultation

The following questions were asked at the consultation and responses taken as written answers or telephone consultations. Please note that individual responses are not given in this document.

1 Legislation

- 1.1 Do you believe that you and your colleagues have a good understanding of your legal responsibilities to provide accessible assessment under current UK legislation?
- 1.2 Do you believe that current UK legislation or guidance should be amended or extended in any way?
- 1.3 Is regulation in UK assessment coherent with accessibility legislation, or are changes in regulation desirable? If so what areas of regulation should change?

2 Current Best Practice

- 2.1 Does your organisation have an accessibility assurance process in place? If so, at what stage in the authoring and assessment design process do checks and measures occur?
- 2.2 Do content authors and on-screen authors reside together, and are processes in place to ensure effective communications regarding accessibility issues between the two groups?
- 2.3 Are content authors trained in the capabilities of the electronic authoring and test systems to ensure they are aware of the capabilities, opportunities and constraints with regards to designing an accessible assessment?
- 2.4 What do you believe is the current biggest obstacle to your organisation providing fully accessible e-assessments?
- 2.5 Does your organisation collect demographic data regarding accessibility and if so, what information is captured?

3 Adjustments

- 3.1 How well are adjustments covered (in terms of support for, usage of, and regulation of) in each of the following areas;
- 3.2 **Content** i.e. providing comparable but alternative content to assess skills and knowledge under certain accessibility constraints
- 3.3 **Delivery Systems / Software**; i.e. timing alterations / allowances on a per assessment and per question basis, Display customisation on a per user basis, Navigation options
- 3.4 **Hardware Support** i.e. knowledge of, compatibility testing with and technical support for assistive aids used in conjunction with e-assessment delivery systems.

4 Interoperability

- 4.1 Is formal or informal interoperability testing (of assistive software and hardware with an e-assessment delivery system) conducted by your organisation?
- 4.2 If interoperability testing is conducted, is a register of results maintained and disseminated to centres etc?
- 4.3 Is information on interoperability requested by centres and is information fed back to manufacturers of assistive hardware and software?

5 Miscellaneous

- 5.1 Has a potential e-assessment development been rejected due to accessibility issues?
- 5.2 Are there other key topics or issues not raised above that should be considered?

Appendix 2 Question Guidelines

The following guidelines have been developed by the TechDis e-Assessment SIG.

Principles

- If assessment is to be timed, software needs to be modifiable per individual candidate, up to 25% extra time by appropriate centre staff, and by greater amounts under authority from the Awarding Body.
- Be aware of assessment items where a simple text-to-speech conversion will not be straightforward. The alternative version may need to be tagged in a particular way with text to explain an image, and source material may need presenting in an alternative form. Certain items may need to be marked such that when reading assistants are used, they do not inadvertently read out to candidates material which would reduce the effectiveness of the assessment item.
- Readers, signers, scribes etc – needs to mirror what is already stated in existing documents (subject to these being available to the group) – future developments may include voice input software
- Bilingual dictionaries should be selectable by all candidates at the beginning of an assessment. It is hoped that future work will lead to keywords in each assessment being available in a range of languages that show in a candidate's preferred language by use of mouseover or tabbing.
- Choice of text should be undertaken with care. Avoid visual-specific references (such as 'see picture opposite' or 'below the diagram') as users of assistive software may experience a different layout to the one originally intended.
- Centres and candidates should have some facility to select text and background colours, and font sizes. This needs to be borne in mind when designing assessment items, so that items are not set by the designer to display in a specific colour, which could then lead to the candidate choosing to display a background of the same colour. If an item needs to display in a specific colour for a reason, this needs to be flagged to centres, in order to avoid this scenario.
- Colour should not be used alone to convey meaning (e.g. which of the words in red in the following passage means the same as.....) as users of assistive technologies may see different or no colours associated with that question. If colour must be used to convey meaning, an alternative should be sought in addition to the original assessment item.
- All assessment software should be capable of pausing to allow rest breaks, and being locked securely mid-assessment (such as in the event of a fire alarm etc).
- Language used should be as clear and unambiguous as possible. If a version that is clearer needs to be considered for some candidates, it should be available to all candidates. Technical terms aside, candidates should be in no doubt as to what is being asked of them in each assessment item. To provide emphasis use heading tags (such that screen readers can detect the emphasis) or, failing that, bold text. Avoid use of italics and underlining.
- It is hoped that in future assessment software will enable device-independent support for Cascading Style Sheets. This will enable candidates to select their preferred settings, and would also enable designers to insert device-specific tags into assessment items (for example, a text description of an image may be set to only output to a Braille display, such that it does not assist candidates who can see the image visually, although in this example blind candidates who do not have a Braille display would then be disadvantaged).
- Software should display input boxes (such as check boxes, text entry boxes etc) such that they will be appropriate to all candidates, including those using screen-reading software. Hence, check boxes should be placed after each choice rather than before (so that the process flow runs: hear question, hear correct answer, hear and fill check box, move on, rather than running: hear question, hear check box, hear correct answer, backtrack twice, hear check box again, fill check box, move on)
- Be aware of pixelation when assessment items are magnified. Are images and diagrams sensible at increased magnification? Can the full magnitude of the image be comprehended when only a small portion can be viewed at any one time (for example, if one can only see part of a flow-chart, comprehending the whole is much more difficult than if one can see the whole chart in one field of vision)? Avoid the use of text in images where possible, as this is most susceptible to pixelation.

- Lay out tables in a way that will make the most sense to candidates using a screen reader that reads linearly row by row. For example, in a question where the candidate has to calculate the mean test score of students over the age of 25, a table laid out horizontally will be read out thus: Student Name, Ash, Bill, Cyril..., Age, 28, 19, 31..., Score, 89%, 88%, 60%.... In this circumstance it would be extremely difficult to relate each score and age to each student and construct the correct response. However, if the table were laid out vertically, the candidate would hear: Student Name, Age, Score, Ash, 28, 89%, Bill, 19, 88%..., which makes the difficulty level much closer to that of a candidate able to see the table visually.
- Consideration should be given to error-tolerance within gap-fill responses. Dyslexic students may enter responses that are intended to be correct but are much removed from the correct spelling. In a question regarding the author of 'Twelfth Night', should a response of 'Shakspera' automatically attain a zero score? These issues need to be considered prior to automated marking taking place.