REPORT

Online and on-screen assessment in high stakes, sessional qualifications.

A review of the barriers to greater adoption and how these might be overcome.

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Executive summary

Context

The arrival of on-screen and online high stakes, sessional assessment has been predicted for many years. There is a broad body of research examining the potential benefits and challenges of implementing online and on-screen assessment in different contexts. Motivations for making a transition include the desire to implement an approach to assessment more in line with our digital society, opportunities to enhance the validity of assessments, and the potential for improvements to teaching and learning. Despite the potential benefits to be realised, little progress has yet been made in England for high stakes, sessional qualifications.

The objective of this review is to fill a gap in the published research literature by considering the barriers to greater adoption of online and on-screen assessment in high stakes, sessional qualifications taken at volume in English schools and colleges. We explore how such barriers could be broken down.

We consider the delivery of assessments online here, but not the purpose, content or construct that may be assessed or any other processes such as marking or awarding. Questions about the desirability of moving online or on-screen go much wider than questions about the validity of assessments that are properly Ofqual's remit. Cultural and societal preferences and knock-on effects on student behaviour, on teaching and learning and on society more broadly are relevant considerations.

In looking at the barriers and solutions to adoption of new approaches, Ofqual is not seeking to advocate for such a change. Instead, given that these approaches could improve the validity and security of assessments, we are interested in what is driving or preventing adoption, and we wish to stimulate thinking.

We started this work before the pandemic, but the topic seems especially pertinent given the impact of the coronavirus (COVID-19) pandemic. The closure of schools and colleges and other public health restrictions have led to a rapid increase in the use of technology in teaching and learning. Schools and colleges are now expected to offer some form of online provision as part of their statutory obligation to offer remote education, and attention has turned to how technology could be used to support qualification and examination delivery in these challenging times.

The findings are derived from a review of the relevant published literature, and engagement with relevant stakeholders in England and in other countries where high stakes, sessional assessments are already delivered online and/or on-screen. We are grateful to all those who contributed to its production, and particularly to those across the sector who supported our discussion groups and interviews.

Barriers

The most significant barriers to greater adoption of online and on-screen assessment identified through this review can be grouped into 3 categories: those associated with information technology provision in schools and colleges, implementation challenges, and challenges of maintaining equity and fairness for all students during

and after implementation. While the barriers will exist in both schools and colleges, the extent and detail of each barrier is likely to be different in each.

IT provision in schools and colleges

There is little consistency in the IT provision available in each individual school and between schools and colleges in England. This also appears to be a challenge in other jurisdictions. Variations between schools creates barriers to introducing consistent national solutions at scale. The review highlighted challenges in schools and colleges including:

- a lack of enough devices of a consistent specification for whole cohorts to sit assessments at the same time
- insufficient or unreliable internet and local network capabilities
- insufficient staff with the expertise or capacity to support the adoption and ongoing use of new online or on-screen assessments
- a lack of physical spaces with the electrical and network facilities suitable for large cohorts to take assessments on devices concurrently
- insufficient ability of the variable infrastructure to manage security risks

It was noted that there are potential solutions to all of the above barriers - though these would require initial financial investment and support for ongoing maintenance.

Implementation challenges

In jurisdictions where online or on-screen assessment has been introduced successfully, the speed and method of introduction varied from compulsory introduction at scale to a gradual voluntary approach. Each approach influenced the type and relative importance of barriers experienced. For example, gradual adoption, typically involving dual running of paper and on-screen assessments, risks unfair advantage or disadvantage to groups of students.

In contrast, a national approach introduces increased challenges with the physical estate and IT constraints within schools and colleges, and heightens the risks associated with large scale IT change.

Other barriers identified include:

- concern in stakeholder groups essential to the success of any deployment, and in broader public opinion
- lack of appetite or demand from schools and colleges to transition to online and on-screen assessment
- a consequent absence of commercial or strategic benefit for awarding organisations to being first to implement

Ensuring fair treatment of all students and cohorts of students

The established arrangements for high stakes examinations in England across schools, colleges, awarding organisations and the regulatory regime create a system of controls which aim to secure fairness for students with particular protected and other characteristics. Many of these controls, from the ability of teachers to prepare students for the assessment experience to formal arrangements for reasonable adjustment, need to be revisited for online and on-screen assessment. Amongst the barriers identified are lack of established methods to:

- prevent unequal opportunities for students to practise on the relevant software or devices creating unfairness
- prevent unequal performance of different devices in assessment conditions creating unfairness for students without access to the most up to date technology
- develop appropriate adjustments for students with special educational needs and disabilities (SEND) - although it is noted that a number of current arrangements use on-screen assessment as an adjustment and that appropriate adjustments are in place in many qualifications outside the scope of this review
- manage the impact of any mode effect during transition, in the event of 'dual running'[1]

Overcoming barriers

Online and/or on-screen assessment has been successfully implemented in a number of international jurisdictions. Evidence from practitioners involved in these successful projects, and from well informed stakeholders in England and published literature, highlights that jurisdictions where barriers have been overcome or are being managed include most, or all, of the following measures:

- jurisdiction wide initiatives led by a sponsoring national or regional government or awarding organisation, often in collaboration – which feature: investment in school/college infrastructure and online or on-screen systems, well considered risk appetite including an acceptance that things may go wrong, and system leadership
- a vision that assessing on-screen or online matches wider societal changes and needs, including those of students and employers and that the anticipated benefits justify the investment and required appetite for risk
- redesign or reconsideration of what should be assessed to forms which support on-screen or online assessment methods
- significant engagement and communication activities with key stakeholders, often inviting early adopters to play an influential part in the roll out of programmes or pilots

[1] The mode effect refers to the extent to which the student performs differently on different means of assessment (on-screen or paper assessment).

- thorough testing and piloting of new software and systems used
- practice platforms for students to become familiar and confident in the use of new software and devices
- a high degree of student input during transition
- clear understanding of roles and responsibilities between all those with a role in successful delivery including schools, colleges, awarding organisations, government, regulators, and teachers
- clear advice and support for teachers, IT support staff, exams officers and invigilators on expectations of them prior to and on the day of the assessment
- robust disaster recovery and risk management plans and mitigations, which stakeholders have confidence in, if things go wrong

This review provides a view of the delivery challenges to be overcome, a summary of success factors from jurisdictions that are already using online and onscreen assessment in high stakes, sessional assessment and provides a specific contribution to the debate in England. We welcome views on it, and the barriers identified so that dialogue can continue. To comment on this report, contact innovation@ofqual.gov.uk.

Introduction and context

The arrival of on-screen and online high stakes, sessional assessment has been predicted for many years with limited progress made in practise. In 2004, Ken Boston, the then head of the Qualifications and Curriculum Authority, said that “e-assessment would touch the lives of everyone” and yet there is still no significant use of online or on-screen assessments in this context in England.

In contrast, online or on-screen assessments are routinely used in professional qualifications and increasingly in vocational qualifications. The objective of this review is to establish a current view of the barriers to greater adoption of online and on-screen assessment in high stakes, sessional qualifications taken at volume in English schools and colleges and explore examples of how such barriers might be managed.

The review considers online and on-screen assessment as an end in its own right, including the mechanics of how a student receives exam questions, generates and submits a response and collection of that response by the awarding organisation. The review considers all cases where these mechanics of assessment can be conducted online (connected to the internet at the time of assessment) and on-screen (offline at the time of assessment).

Given this emphasis, evidence which focussed on the following was largely excluded:

- the purpose of the assessment and construct being assessed (e.g. curriculum),
- the nature of the assessment (e.g. innovation in item design and adaptive testing)
- other process mechanics (marking, awarding and certification etc)
- the validity effects of moving assessments online or on-screen

Similarly, the review considers barriers in the context of qualifications which are high volume, sessional delivery, and taken in schools and colleges. Evidence relating to, but not limited to, general qualifications was considered. Evidence in relation to any high stakes school or college qualifications taken at volume internationally was considered. Evidence which focussed on curriculum change to support online or on-screen assessments or assessments that are not sessional (for example on demand assessments) was not included in the review.

Whilst this focus is narrow, it is intentionally so. There is a broad body of literature in respect to the validity of onscreen assessment, including research specifically in an English context. By contrast, there is little research which directly considers the barriers to delivery of this online and onscreen assessment. The approach to this review was therefore to intentionally address this gap and add to the body of knowledge in a way that is useful and relevant to the current context in England.

In practice, it is impossible to completely decouple the delivery aspects which are the focus of this report from other aspects of the assessment such as those noted above. This is reflected in some of the discussions on barriers and their management below whilst retaining this focus on delivery.

Methods used to gather evidence

The evidence gathered for this review came from 3 sources: a review of research literature, a workshop with informed stakeholders, and interviews with a sample of leaders who have introduced on-screen or online assessments to some jurisdictions globally, or those with particular subject matter expertise. Given the very specific context, there were limited literature sources which were entirely relevant, though many which contributed in part. A schedule of sources which informed this review is included at Appendix A.

A workshop was held at Ofqual's offices in January 2020. A cross section of well-informed stakeholders participated representing: teachers and school/college leaders, technology providers, awarding organisations, industry bodies, government and Ofqual. In advance of the workshop each participant was asked to submit their 3 most significant barriers to adoption of on-screen or online assessments in this specific context. These were then classified and combined with the themes from the review of research literature to create a summary of the most often referenced barriers. At the workshop participants were asked to review each barrier in detail and consider:

- why is this a barrier to greater adoption?
- is the barrier real or perceived?
- what measures could be taken to overcome this barrier?
- whether there are examples of where this type of barrier has been overcome?

In addition to the review of research literature and workshop, interviews were conducted with leaders responsible for the introduction of on-screen or online assessments in New Zealand, Israel and Finland, and with the UK National Cyber Security Centre. These jurisdictions were identified as having successful adoption of online and on-screen school leaving assessments, and good sources of evidence as to barriers faced and overcome. It is acknowledged that the evidence from this sample of interviewees is illustrative and not exhaustive, though directly relevant to the question examined.

This review is a summary of all these sources of evidence, discussing the highlights and key issues identified.

The main barriers to greater adoption

The barriers identified in the review can be broadly categorised into those which were concerned with IT provision in schools and colleges, implementation challenges and the risk to delivering fair assessments for all students.

IT provision in schools

Qualifications, within the scope of this review, are taken by students in a wide range of types of school or college, as well as in other centres approved by awarding organisations. They include further education colleges, independent schools, free

schools, schools in multi-academy trusts, those in local authority control, independent training providers and others.

The IT environment is unique to each individual setting, creating a complex landscape to deliver a consistent national approach to introducing online or on-screen assessments. By way of example, the 2019 national voluntary pilot of the Multiplication Tables Check by the Standards and Testing Agency, in which approximately two thirds of English primary schools participated, found 424 combinations of browser and operating systems, and it is reasonable to assume that secondary and tertiary schools and colleges are likely to have at least similar complexity.[2]

Similarly, arrangements for IT provision vary. Some schools and colleges have independent in-house expertise; others have contracted-out arrangements with third party providers of hardware, software and associated support; some operate arrangements in individual schools and colleges; others share infrastructure across a group.

This heterogeneity of the institutions, their infrastructure, and the means under which it is provided and managed, creates barriers for adoption of national solutions, many of which are very practical in nature.

In most cases, the way and extent to which the barriers below are experienced depends on critical choices in the implementation approach including whether arrangements are online or on-screen, which elements of delivery are online or on-screen (question delivery or response collation or both), and which devices are used. However, it is impossible to escape some reliance on a school or college's IT infrastructure in delivering a secure, scalable solution in the specific context considered.

Devices in schools and colleges

The most frequently referenced barrier from all sources was the lack of sufficient numbers of devices with sufficient and consistent specification for whole cohorts to sit assessments at the same time. This is particularly challenging due to the sessional set up of these high stakes assessments and is especially true for subjects with large national entries[3].

In jurisdictions that have successfully implemented online or on-screen assessments in this context, tested solutions to this barrier have included state funded procurement of "exam ready" devices and bring your own device (BYOD) solutions. These solutions are not without their own challenges.

The wholescale procurement of exam ready devices requires significant capital outlay as well as the need for ongoing maintenance and replacement to prevent obsolescence and ensure good operating performance of the equipment when needed for assessment. There are also implications for how best use is made of the investment for the rest of the academic year.

[2] Data shared by the Standards and Testing Agency from their pilot of Multiplication Tables Check.
[3] In 2019 there were 742,245 entries to mathematics GCSE and 729,315 entries to English language GCSE.

It was noted in our workshop that laptop or desktop devices are most suited to completion of the types of assessment common to the qualification suite in question – particularly where an extended response, and therefore extended typing, is required. By contrast, teaching and learning can use a range of device types and is often supported by tablet devices. These additional costs may be balanced to some extent by potential savings in assessment printing and distribution.

Where delivery of only the assessment question(s) through online or on-screen means is sought, with student responding through pen and paper, a greater range of devices and devices types might be suitable and available.

Operating a BYOD solution offers solutions to some of these barriers but presents different barriers in turn. Technical challenges include: the compatibility of all devices, browsers and operating systems with the chosen assessment platform, the consistency of specifications such as screen size, scrolling capabilities, compatibility with keyboards, and the ability to integrate an assessment system with a diverse range of existing IT tools (calculators, spreadsheets, word-processing etc) used across those device types.

The software used for online or on-screen assessment can require an 'executable file' to be installed on the host device, to mitigate against security and malpractice risks. This was noted as a particular risk in BYOD models, with a need to understand responsibility for any subsequent unintentional disruption to that device's operation, including from a potential compromise of cyber security.

There is significant potential impact on the fairness and equity of a BYOD approach. Concerns cited in our workshop included those relating to differential performance between devices of different cost and quality, or perceptions of them, and the risk that this creates perceived and real inequalities between different students, student groups, or between individual schools or colleges.

There would also remain a need to provide devices to students that do not own one and with sufficient time to enable them to become familiar with both the device and the software to be used. Due to the risk of disadvantage to students without a personal device, workshop participants felt that a BYOD solution could not be the complete solution for roll-out at scale in England and would need to be bolstered by some state provision.

Ineffective and/or unreliable broadband, wifi and network capabilities at schools and colleges

Barriers associated with broadband, wifi and network capabilities were the second most frequently cited in the literature, they were also discussed by participants in the Ofqual workshop and each of the international jurisdictions we contacted described how they had managed these barriers.

There were concerns about unequal broadband speeds available to schools and colleges, especially in rural areas. This has a particular impact on online assessments, but can also be important in on-screen assessment in the resilience of processes to distribute papers to student devices, and securely collect responses, depending on the technical implementation approach taken.

Relevant literature which has studied on-screen or online provision in Wales, Northern Ireland and Scotland mention this potential barrier[4].
It was also experienced in rural Finland, where they have frequent power cuts. There, encrypted assessments are downloaded ahead of time and are then distributed through a local network to maintain robust delivery without a reliance on broadband.

The internet speed experienced is also affected by the technology and wifi arrangements in place within institutions. The review highlighted concerns that the differences in network capabilities across schools and colleges would create an unequal playing field, risking some students using unreliable systems or experiencing worse device performance than other students at schools and colleges with newer, higher quality, better maintained, higher performance equipment, or those better served by the national broadband infrastructure.

There were concerns that this may impact the student experience in the exam, for example by impacting the speed of delivery of each question, or the speed at which responses are saved or backed up. Where it is possible to design a system that would ensure fair delivery for all, workshop participants felt there remains a risk that there is a perception of difference that impacts public confidence in these high stakes assessments, though the limited evidence in the reviewed literature suggests this was less of a concern for students.

Teachers and school or college staff have insufficient time and support for the adoption of new online or on-screen assessments

This barrier appeared in the review of research literature and participants at the workshop were concerned this would be overlooked or under resourced with any roll out of an on-screen and/or online programme. There were concerns over a perceived wide variability in the existing digital capabilities of teachers, the ability to deliver comprehensive training, the variability in IT support arrangements in schools and colleges and the new skills needed for invigilation and exams officers.

In response to the coronavirus (COVID-19) pandemic, many teachers will be more familiar with delivering teaching and learning online. However, it remains that teachers have a wide range of existing digital capabilities and awarding organisations report differing appetites to adopt on-screen or online assessment in circumstances where it has been made available. Students could receive unequal support leading to some students being better prepared than others.

Workshop participants focussed particularly on the time and training teachers may need to feel comfortable about how to prepare students appropriately for the exam, which could in turn take away from contact time, and teaching and learning. To address this concern, New Zealand recommends that only schools that use digital systems in classroom teaching, and therefore teachers are comfortable with the software, opt in to on-screen assessment systems.

IT support capabilities in schools and colleges are typically a mixture of in-house and third-party contracts, with uneven levels of cover and response times. In house ‘on

[4] (CCEA et al., 2014)

the ground' knowledge of how to act, and capacity to act when things go wrong is variable. There were concerns that this risks putting some schools or colleges at a disadvantage. High stakes assessment relying on IT infrastructure may increase the need for quality technical expertise and support, requiring schools and colleges to invest in this additional expertise.

Participants in our workshop noted that invigilation and exams officer requirements change in an on-screen or online context, requiring a different skill set and creating new training and resourcing needs. It was noted that it may also be possible to use technology to fulfil some of the additional invigilation requirements.

It was recognised by workshop participants, and a feature of discussions with those delivering in other jurisdictions, that clearly defined roles and responsibilities, demarcation of those responsibilities between schools or colleges, awarding organisations and any technology providers and clear understanding of how to act in scenarios which may arise was critical. Making sure as little as possible goes wrong on the day of the exam and that all actors in the system know what to do if an issue occurs were key concerns from workshop participants.

Physical spaces in schools and colleges are not suitable for large cohorts to take assessments on devices concurrently

High volume and sessional qualifications, by definition, require a large number of students to take assessments concurrently in controlled or 'exam conditions'. Barriers noted included that the spaces currently used for assessments, such as sports halls, may not easily adapt to the needs of assessment on devices. In particular, whether they are able to support the power needs of devices for the duration of assessments, and whether solutions to this problem may introduce new health and safety risks through, for example, trailing cables and power packs. Attendees at our workshop felt that in most schools and colleges additional rooms would need to be set up for on-screen and online assessments to meet the power and layout requirements. Any increase in the number of rooms has an impact on the number of invigilators required, and it may be difficult to find alternative space on site given the extent to which their estate is occupied by teaching activities.

The review identified evidence that for some assessments in some jurisdictions, schools and colleges hire additional space, which they do not control and therefore cannot modify as they could their own. This may create challenges in them finding suitable spaces or increasing the cost of doing so.

Solutions that are often used where online and on-screen testing is used in other contexts, such as test centres and distance assessment with remote invigilation, bring logistical and security challenges if they are to be used in these high stakes sessional assessments. The context of the coronavirus (COVID 19) pandemic in particular has prompted consideration of the potential for assessments to be taken in other settings.

Security

The introduction of online or on-screen assessments presents both potential improvements and new risks to security. Rigorous security procedures are built in to every part of the current, paper based, process with established roles and practice across schools, colleges and awarding organisations. Introducing an electronic system removes some of the risks associated with storage and transport of question papers and student responses, however, new risks would be introduced to the system, for which equally or more robust security procedures would be required.

The review identified potential security weaknesses. These included the potential for security to be compromised through cyber security attack. This introduces a real and perceived risk to personal data security, creates new methods for students to gain unauthorised access to assessments early and raises concerns that student responses may be lost or corrupted, or the student's experience of the assessment could be compromised.

At an extreme, it creates risks to the ability of a cohort of students in a particular school or college, geographic region or across the whole nation to take assessments when scheduled. There is a significant increase in the scale of possible disruption compared to a paper system.

There will also be a need to manage the risks from new approaches to malpractice, fraud or other cheating which may emerge in the use of new technology. Malpractice causes unfairness, so a continued effort would be required to ensure that new opportunities created, such as access to the internet, are only used where intended. These new risks may drive the need for changes to the role of invigilators or an increased use of technology to monitor students' activity during assessments.

In common with other barriers, the nature of cyber security and malpractice risks varies with the approach to implementation, in particular whether assessment is on-screen or online, and to the provision of devices. The introduction of a national assessment and testing system creates a new target for cyber criminals to exploit, and the heterogeneity of infrastructure creates barriers to effective controls of these threats.

Implementation Challenges

Wholesale change of any complex system creates significant implementation challenges. The high stakes examination system in England is large, requires coordinated and controlled activity from hundreds of individual schools, colleges and training providers, impacts on millions of young people and other students, and its delivery is compressed into a relatively short period. Implementing operational change inevitably brings risks.

The review highlighted a number of choices in any path to implementation, including choices about the speed and methods of introducing online and on-screen assessments. These choices influence which of these barriers are most prominent.

Of the jurisdictions that we spoke to in the review, each took a different approach. For example, New Zealand took a gradual voluntary approach. This resulted in a longer timeline for introduction but enabled public perception to change as the adoption grew to ensure positive user perception prior to use. However, the gradual adoption introduced challenges of running a dual paper and on-screen system. New

Zealand Qualification Authority are now beginning to consider how they may switch from an ‘opt in’ to an ‘opt out’ approach to further increase uptake.

Qualifications rely on public confidence for their currency and public perceptions, including the attitudes of influential stakeholders, were documented as having potential to create barriers in turn.

Risks associated with the dual running of a paper and online or on-screen version of assessments

This barrier is concerned with the risks created where some students take the ‘same’ assessments on paper and others on-screen or online. The provision of a paper exam has been used by some jurisdictions as a contingency plan to manage situations where technology or networks fail. Within the constraints set out by this review high stakes, sessional and high-volume assessments, a gradual adoption of on-screen or online, while providing a paper version as an option, was usually considered the most likely way to progress for England.

Having a dual paper and on-screen or online provision prevents the use of new assessment construct capabilities enabled on-screen such as interactivity in the exam. This makes adoption in the English context less attractive to awarding organisations because assessment benefits, for example improving assessment validity through innovation, are not achievable in the short term. Israel deal with this difficulty by treating the online and paper versions as separate assessments - although they contain common questions, they are not identical.

Should a dual paper and on-screen roll out take place in England this may require different grade boundaries, even if identical papers were used. This is because of the potential for each cohort of candidates to find one mode of presentation easier or harder than the other. But having different grade boundaries for 2 sets of students who answered the same questions is difficult to explain, and may undermine confidence in assessment outcomes.

Potential barriers from the literature and workshop included that students taking either a paper or on-screen or online version of the same exam must not be advantaged or disadvantaged due to presentation format of assessments. Student experience of reading on screen is different from reading on paper and could create unfairness. It was felt that the high stakes context of the English system would place an even higher priority on this matter than was the case internationally. This means appropriate research and testing would be needed prior to and in the initial roll-out stages to provide evidence of this comparability.

Capability of the technology to assess all subjects

The review identified constraints with capability of the technology to assess all subjects validly which further reduces the desirability to introduce an online or on-screen solution. Some subjects may be difficult to convert to on-screen, for example, due to specific use of mathematical or scientific notation or formulae.

There may also be elements of assessment that take more or less time to type or click than write. For example, software might require students to select special fonts

or notation from a drop-down menu which takes more time to select than to write by hand. Similarly, on-screen capability to plot graphs, draw diagrams or write in a foreign language through a non-roman alphabet is potentially difficult or different compared to using a pen.

Whilst familiarity with the method required for input during an assessment was noted as a means to overcome this barrier, this depends on full integration of teaching and learning methods (which may vary depending on device type, availability and other factors) into an assessment system, or replicating the assessment system into a variety of operating systems. In Finland, it was reported that all the systems used in assessment have been integrated in to teaching and learning to ensure familiarity.

It was considered that some 'unusual' entry, such as to typing scientific formula, by students might remain necessary contributing to this barrier. In England, the coronavirus (COVID-19) pandemic has increased the use of technology to deliver teaching and learning. As a result, many students will have increased familiarity with learning online and/or on-screen.

Lack of market or financial incentive for the change

There was little or no evidence from the review of research literature focussed on the role of awarding organisations, or regulators as a barrier to adoption. At the Ofqual workshop most participants thought there was a lack of incentive for awarding organisations to invest to change the system, although most barriers were considered perceived rather than real. Subsequent to that workshop, the coronavirus pandemic may have changed awarding organisations' longer term considerations regarding investment in online systems.

Market participants noted that there had not been significant uptake of online and on-screen where offered to schools and colleges in GCSE and A level subjects in the past. It was beyond the scope of this review to examine why, but participants noted many of the barriers documented elsewhere in this report as contributory factors.

Participants highlighted that the structure of the market presented a barrier. Schools and colleges usually deliver GCSEs and A levels selected from several different awarding organisations. If each awarding organisation develops their own systems and software, this presents different implementation requirements for schools and colleges.

Any lack of consistent technology standards and requirements would make wide scale adoption difficult, for example leading to students having to become familiar with the assessment platform and means of entry from different providers, potentially in closely related subjects (e.g. mathematics and physics using different means to capture mathematical notation). Confusion over the support and recovery plans for technical issues experienced during assessments if these vary across providers was noted as a challenge.

Participants believed the absence of a clear co-ordinated sponsorship or requirement to change probably limited the clear business case for change. The concern is also amplified if a dual paper and on-screen or online system needs to be adopted to provide appropriate contingency arrangements, or to allow for optionality by schools, colleges and students. This is likely to require the operational costs of 2 systems, significantly dampening any financial benefit which might be expected. The

investment costs were considered significant, and unlikely to be justified without a certainty of demand.

It was suggested in discussion that a move to online or on-screen delivery could enable or require changes to responsibilities for monitoring and invigilating exams between exam boards and schools and colleges. Whilst the introduction of online or on-screen technology may allow new capabilities such as real time monitoring of candidate responses during exams, any changes to existing processes would need careful trialling, communication and training of those responsible.

Public opinion and influential stakeholders are sceptical and concerned with risks of security, unfairness and/or malpractice

There is evidence from jurisdictions that have introduced online and on-screen assessment that the public, politicians, media, parents, teachers, unions and students can all have reservations about a move to on-screen or online provision which creates a barrier. The coronavirus (COVID-19) pandemic will have undoubtedly had an impact on this public perception.

Following our consultation on the proposed changes to the assessment of GCSEs, AS and A levels in 2021, we received responses both highlighting concerns around the inequality of online solutions as well as those suggesting online assessment as a solution to current and future disruptions. The review found evidence that students appear to have a more positive perception of a move to on-screen or online than other groups. This was also the finding of our 2020 survey of perceptions of general qualifications[5] which suggested that young people were the most likely to agree that on-screen assessments would be fairer and more manageable than pen and paper versions.

Some of the evidence of sceptical public opinion relates to concern over how some of the other barriers identified by this review are managed, such as:

- perceptions of unfairness in moving to dual on-screen or online and paper modes of exam delivery
- some students and parents will believe that the choice of mode of assessment decided by their school or college causes disadvantage because that mode is less suitable for them
- the risk of system wide or local IT failure or power outage impacting students and creating new forms of exam stress for students

A notable feature of deployment in all jurisdictions has been extensive engagement across all involved in the system as a core part of planning and implementation of new solutions.

[5] (You Gov, 2020)

Risks to delivering fair assessments for all

The review identified challenges to ensure any implemented system is one that is fair for all students. A frequently mentioned barrier in the review of research literature, and the workshop related to fairness for SEND students and the impact of differential access to software and devices.

SEND students' requirements need careful consideration

The switch from paper to on-screen or online assessment presents both challenges and opportunities for SEND students.

Students who use devices to generate their responses under current reasonable adjustments should see their experience become more directly equivalent to that of all others, and a system wide on-screen approach may lead to this experience being more inclusive and higher quality with more investment in the user experience.

Students who use assistive technologies such as e-readers in assessment may see these more readily integrated with the examination experience, and options such as differential print sizes can be directly embedded into assessment systems.

For other SEND students, technology may create new barriers not experienced in current pen and paper arrangements, and for which reasonable adjustments may in turn need to be developed and made available. For example, some SEND students find using a mouse difficult or impossible.

It is notable that this barrier applies to all assessments moving from pen and paper to online or on-screen provision and that it has been successfully overcome in contexts outside the scope of this report. Online and on-screen assessment is already used successfully in many vocational and technical qualifications in England. Awarding organisations put in place appropriate adjustments to enable SEND students to access the assessments and demonstrate their attainment.

For general qualifications, a common and coordinated system of reasonable adjustments applies across all GCSE, AS and A levels. This system would need to be reviewed to ensure that no student is advantaged or disadvantaged with the introduction of any online or on-screen assessments including if provision is available either on-screen or on paper.

Overall, the evidence highlighted that research and development would be needed so that the transition from paper for this suite of qualifications does not have unintended consequences or create additional problems for SEND students to complete assessments on an equal footing.

Students do not have equal access to practice on the relevant software or devices used in assessments creating unfairness

Equal access to any new software and access to devices of equivalent capability, was a barrier often cited when considering fairness to all students.

A theme in discussions at the workshop was that students from different backgrounds might have unequal access to the exam software and devices to practice ahead of the assessments taking place or must use inferior devices.

The extent to which a student has routinely used devices prior to practicing for assessment may also influence the amount of time they need to become familiar and skilled at using assessment devices and software. Any system would need to ensure a student has equal opportunity to demonstrate their knowledge and skill of the subjects being assessed despite their access to technology.

Concerns about access to relevant devices were raised in the media by some students preparing for on-screen assessments in New Zealand. Also, it was noted that different students need varying lengths of time to prepare and feel comfortable to use new software. To manage this concern, the New Zealand Qualifications Authority strongly advises schools and students that they should only use digital assessment if they are learning digitally and are familiar with their device.

Schools and students are also strongly encouraged to practise using the features and functions of the software and use the many familiarisation activities before the assessment.

Evidence from participants in our workshop suggested that some students choose to undertake repeated practice assessments to familiarise themselves with an assessment technology, even where this is used for simple input methods like multiple-choice questions.

How to overcome or manage potential barriers

This section provides an explanation of measures that have been, or might be, taken to overcome the main barriers in section 4.

There is not one clear solution for implementation, but rather a suite of options that can be used to meet the needs of a jurisdiction. Remedies have been identified from the review of research literature and where jurisdictions are implementing successfully. Suggestions from stakeholders participating in the workshop for how best to overcome barriers in England in this context are also included in some cases.

Overall, these themes relate to the culture, context and extent of public and political support for a transition to online and on-screen assessment, and practical aspects of implementation.

Culture and context

Jurisdiction wide initiatives

Successful implementation often included jurisdiction wide initiatives led by a sponsoring national or regional government or exam board, often working in collaboration, which feature: investment in school/college infrastructure and online or

on-screen systems, well considered risk appetite including an acceptance that things may go wrong, and system leadership.

The overwhelming evidence from all sources cited these interconnected measures as the most important to succeed in overcoming barriers to adoption in this specific context. Whilst the structure of examination and assessment systems varies widely, for example most international jurisdictions do not have a system of several competing awarding organisations, these jurisdiction-wide initiatives are widely noted as a critical factor.

In all cases those leading their implementation had a clear understanding of the potential barriers in their local context and detailed risk management mitigations and countermeasures. There was also a clear risk appetite and an understanding there would be some learning by doing so not everything would be perfect first time.

The latter point was particularly evident in New Zealand and Finland where there was an expectation and an acceptance by sponsors that things would go wrong but there were robust plans to deal with these issues arising, and an understanding that there are also failures in existing arrangements.

Most participants in the workshop considered that the scale of the English system as a single assessment geography, correspondingly large cohort and its heterogeneity at a centre level, act in favour of top-down sponsorship being a critical component of any change.

In addition to the need for funding of infrastructure towards broadband, device, network and wifi barriers, the need to create minimum standards and ensure a level playing field for all students and across all schools and colleges was thought to point to the need for a national approach, which takes account of how qualifications are used in those contexts. Features could include minimum broadband speed to the school/college gate, which is guaranteed by government in New Zealand, and a minimum number and specification of devices, and minimum capabilities of IT support functions in schools.

Where implementation is happening internationally, leading authorities specified minimum network security and reliability capabilities and minimum specifications for devices to be used by students.

Workshop participants often mentioned the need in England for government led change and/or investment. Faced with a seemingly large capital investment need, some felt the money needed to overcome these barriers might be better invested elsewhere in the education system, particularly unless devices were also used throughout the year for other purposes.

Some thought this more holistic view of device use would make the business case for investment in devices more favourable. In the context of the coronavirus (COVID-19) pandemic, government has provided access to devices and connectivity for disadvantaged and vulnerable children and enabled all schools to get paid-for support to access cloud-based remote education platforms. However, workshop participants noted that a specific strategy to meet the need for online and on-screen assessment would be needed.

In Israel, other sites, such as public libraries or community centres nearby, are used by schools if they do not have enough devices. There was not thought to be a supply of sufficient alternative site to be a practicable measure for England.

In Finland the barrier of sufficient devices has been solved by students using BYODs (laptops). Each student can use their own device provided it passes a compatibility test. Student and parent led concerns were raised in the media about a lack of access to appropriate devices for those that could not afford a suitable device, and in such situations the schools provide one.

In New Zealand the barrier is managed by operating a BYOD systems only in schools that "opt in" and are therefore confident that they have sufficient devices to appropriately support an online or on-screen system of assessment.

In Finland the awarding organisation delivers a USB stick to every student, which converts each device to have the same functionality. This method or provision reduces the barrier of schools and colleges needing IT experts during the software set up and installation phase. However, the process of creating, despatching and collecting the USB sticks creates its own logistical and security challenges.

What is clear is that a specific solution for the English context would be needed, with the appropriate leadership and sponsorship in place. Individual initiatives from each awarding organisation in England are unlikely to lead to wide scale on-screen or online adoption because awarding organisations do not seem to have sufficient breadth of control of the relevant parts of the education system to ensure success and incentives for schools and colleges to adopt on-screen assessments.

A vision that assessing on-screen or online matches wider societal changes and needs, including students and employers

Evidence from Wales, New Zealand, Israel and Finland shows initial steps in to an on-screen or online assessment approach were each triggered by a clear vision to deliver to wider expectations in society, given how pervasive technology is in modern life. International jurisdictions recognised on-screen enabled new types of assessment which were, for certain subjects and contexts, considered more relevant to the needs of students about to leave school or college and were in line with expectations of employers.

In Finland their vision to provide on-screen assessments was guided by being able to assess new constructs and have sufficient security.

The review of research literature highlighted motivations for making a transition to on-screen included the desire to follow an approach to assessment more in line with our digital society, more authentic or enhanced assessments, mitigation of effects of poor handwriting skills and quicker and higher quality feedback. It also highlighted motivations linked to teaching and learning including, improved student preparation and learning and benefits to teachers and schools and lower exam related costs.

In summary, this review identified that to deliver strategic change on this scale, in any context, requires a clear and compelling vision for change, committed leadership and sponsorship and funding to overcome or mitigate barriers to adoption.

Redesign or reconsideration of what should be assessed

Although redesign of what is being assessed was outside the scope of this review, the evidence provided internationally suggests being able to unlock the full benefits of new types of assessment enabled by on-screen or online assessment is difficult to ignore as being a key step to removing barriers to adoption. This view was also expressed at the Ofqual workshop.

Unlocking new assessment capabilities, only enabled by on-screen presentation is likely to be a key ingredient of a successful adoption strategy. Subtle changes to what is sought to be assessed can unlock new opportunities for new types of assessment online or on-screen. For example, the requirement for student interactivity in an on-screen presentation can make assessment more valid without requiring curriculum change.

Such change would allow the potential for individual subjects and qualifications to transition across over time, possibly starting with smaller entry subjects, without having to have dual paper and on-screen or online provision.

In Finland a political decision was taken to change teaching and learning so that assessments supported realistic ways of using computers in a digital world, better preparing students for work and the real world. This initial decision has rippled through what is taught, how it is taught and how it is then assessed. The new structure required a solely on-screen approach to assessment because this was the only method that allowed certain curriculum requirements to be tested. In Finland once a subject is converted there is no paper option.

Practical aspects of implementation

Significant engagement and communication activities with key stakeholders

In Finland and New Zealand, it was striking to hear the amount of effort, and level of importance, given to having a comprehensive communications and engagement plan. Each jurisdiction shared some common features around engaging teachers and getting early adopters involved in shaping the roll out programme. All were carefully planned and phased.

In New Zealand a school specific approach was taken, winning over the trust and upskilling one school at a time to convert to on-screen. Over time this enabled demand to build up from other schools as they heard of positive experiences. This was backed up with school and student satisfaction surveys.

Also, during the introductory phases, the media were invited to observe some sessions where teachers and students became familiar with the new software, resulting in positive media coverage. Web based support is also available for schools and colleges considering adoption, for example with videos of students' experiences of using the new software and instructions about how to get involved.

In Finland social media was used to create communities of teachers and technicians who were involved in the roll out programme, creating an open communication channel for concerns and issues to be shared and discussed. This openness, which included the sharing of positive and negative feedback, was in conscious contrast to

the assessment organisation's previous approach to communication for traditional paper assessments.

The Finnish authority worked closely with teacher and student unions during their roll out but reflected that earlier and greater communication to parents and students directly would have helped reduce public perception barriers.

Despite the examples above, there have been problems with implementation in each of the jurisdictions, and this led to critical media coverage at times. However, by having strategies to manage the risk and disaster recovery plans, these jurisdictions, supported by well-informed leaders and sponsors, have not seen interruptions to their roll out plans.

All jurisdictions contacted have adopted a staggered roll-out, usually taking the needs of one subject or a group of subjects at a time, before moving on to the next batch a year later.

Thorough testing and piloting of new software and systems used

The evidence in the literature and that from colleagues globally reinforced the need for comprehensive testing and piloting of new software and systems. In all cases this happened in a non-live context first and then saw the gradual build-up of volume.

During the proof of concept stages software was often developed with involvement of some teachers and students and their feedback was instrumental in removing glitches and making improvements. A key factor for success was to make the software as intuitive to use as possible, with the design focus on the student. Careful consideration of the requirements of SEND students needs to be a fundamental part of the software design process.

In Israel, for example, the issue of students using scientific notation (special equations and formulae) is receiving special attention, during the software testing phase, to deal with concern that responding by hand is quicker than on screen.

In Finland they have created a practice platform that has recorded over 5,000,000 responses in a country that only have 200,000 assessments taken annually. Such is the level of use of the practice platform that it is also used to test the multiple improvements and additions developed before the system is used in a live context, providing a live test environment with real students in a low stakes setting.

During the testing phase robust security countermeasures and mitigations for all security risks are needed. All international jurisdictions had measures to manage these risks and were able to demonstrate technological countermeasures to avoid the loss of student exam responses, even if connections were lost.

In Israel every school must pass a check of their system capability before the day of the assessments to prevent problems on the day. Other jurisdictions have similar pre-exam readiness tests.

Workshop participants felt it was important that if different awarding organisations in England were to create and use different on-screen exam software that it should have common design principles, standards or features. In the absence of a universal system to be used across England it was important that students would be

comfortable in using any awarding organisation software. It was felt a universal minimum specification for compatibility of school and college devices and systems should be agreed across all exam boards to make adoption across schools and colleges manageable.

Practice platforms and seeking student input during transition

Workshop participants felt that all students must have equal access to practice platforms to become familiar with new software and devices to be used in assessment. All international jurisdictions we contacted offer such a service. It was noted in providing this practice site that some students would spend a lot more time than others in this familiarisation process.

It was considered important to allow the student to feel in control of this process and therefore determine their own comfort levels around familiarity. It is important the adaptations and adjustments provided to support SEND students are also available on practice platforms with at least equivalent access.

In New Zealand significant work went in to conducting student trials and pilots that offered valuable feedback for how to improve the software. Overall, the evidence they collected through these trials demonstrated significant satisfaction levels with the move away from paper.

In the published literature there is little evidence of significant concerns being raised by students as transitions have taken place, although there are occasional references to concerns about fatigue in terms of screen time and lengthy typing requirements. In New Zealand schools supported the transition by offering students preparatory support in improving their typing skills.

Participants to our workshop were more concerned that guidance for the use of display screen equipment typically discourages prolonged intensive use for the time periods expected in current assessments.

Clear advice and support for teachers, IT support staff, exams officer and invigilators

The engagement activities described in section 5.4 offer measures for how teachers can gain confidence in what is expected of them and of their students. Given the variety of types and quality of IT support in schools and colleges and the large combination of different servers and browsers used, very careful planning would be needed in the English context.

Adopting minimum IT equipment and network standards is a start but staff expect to be provided with detailed support to install, set up and maintain systems and software. A threshold test for each school/college to check they have the capabilities to offer on-screen assessments, at volume and concurrently, has been an important measure to overcome this technology barrier in other jurisdictions.

Online exam provision provides additional opportunities for some of the burden of invigilation to be taken over by the awarding organisation through some of the tools commonly used within remote invigilation arrangements.

The needs of SEND students and the appropriate adjustments which can be made in an on-screen exam setting require careful planning. Once again relevant staff in awarding organisations and schools and colleges will need to be aware of how to apply for, or make, these adjustments prior to and on the day of the exam.

It is important that moving to on-screen does not create additional access barriers for SEND students and the testing of suitable adjustments and gaining support and advice of relevant authorities will be important in the planning phases. Some workshop participants were very optimistic about the new capabilities that an on-screen provision could unlock for SEND students for example video signing of questions in assessments.

In Israel students can elect to hear the questions and some can answer by voice recording their answers. The opportunities that use of technology opens up for SEND students appear significant, provided implementation is properly researched.

Robust disaster recovery and risk management plans and mitigations

Those leading the on-screen or online rollouts in Israel, New Zealand and Finland were clear that things will, and do, go wrong. Power outages happen; broadband or networks fail, devices malfunction etc. To run high volume, high stakes and sessional qualifications will create pressure points when sending the exam to the school/college, distributing it to the student devices, taking the exam and capturing and submitting the student responses.

The right arrangements depend on the design of the way technology will be deployed. A key decision is whether to offer online assessments or download assessments and run them on the local network at school/college. There are advantages and challenges in each approach.

Finland and Israel have opted for assessment distribution to local networks, Finland is also using USB sticks to distribute the operating system required for internal distribution. New Zealand has opted for online, this partly reflects the commitment from the New Zealand government to guarantee a minimum of 1GB broadband to every school gate.

Most examples previously attempted in England, Wales and Scotland have also gone for a downloaded exam to be used locally under secure conditions partly due to concerns about broadband speeds and reliability.

In Israel assessments are downloaded to a local server one hour before the exam, an encrypted version of each exam is sent to every school 2 days earlier and if the internet fails on the day of the exam an encryption code can be sent by mobile phone to unlock on the local network. No internet is used during the exam to manage security risks.

In Finland the Principal for each school is given the encryption code to unlock the predownloaded assessment at the appropriate time. No internet is used during the

exam but students can use tools such as calculators and drawing tools that they are familiar with in their school environment. The tools available are the same for all students and included with the operating systems in the USB sticks.

New tools can be added in the future if they are used in schools. This is because questions are open-ended and no advantage is conferred by the use of awarding organisation approved school specific tools. A paper-based version of the exam is not an option because the assessments are not replicable on paper. Finland also has a well-planned crisis management policy and plan to deal with 'inevitable' things that go wrong on the day of the exam.

In any scenario a full disaster recovery plan, with communication and training about how to execute the plan is needed. This needs to be executed consistently by all awarding organisations and all schools and colleges so that there is no perceived unfairness. For example, in New Zealand a student can elect to revert to a paper version of the exam at any point, even during the exam itself.

All actors in the system need a consistent understanding of their authority to act, and actions to take, in order to maintain public confidence and demonstrate fairness. This needs substantial communication and training.

The international experiences tell us that a very careful risk assessment and issue resolution process is needed, adapted to risk scenarios for the local on-screen solution(s) adopted.

The regulatory framework

There was no evidence in the literature of regulation as a barrier to greater adoption of online and on-screen assessment in its own right. Similarly, it was not raised by workshop participants. An initial review of our regulatory framework has also not highlighted any specific barriers, but there are some areas, particularly around the management of risk and the deliverability of assessments, which we judge might be likely to be interpreted as disincentives to innovation in this area.

We also recognise that those active in considering or delivering online or on-screen assessments may have identified further barriers, or areas of uncertainty, in our current framework.

We intend to continue working to identify areas where our regulation has potential to interact with decisions on whether and how to move to online or on-screen assessment, including considering what approaches are currently used in vocational and technical qualifications.

We welcome feedback on areas of our regulation that act as a barrier, have potential to be perceived to act as a barrier, or where further clarity might be helpful to support greater adoption of online and on-screen assessment in high stakes, sessional qualifications taken at volume in English schools and colleges. Feedback can be provided through innovation@ofqual.gov.uk.

Conclusion

It is clear, from the examples of New Zealand, Finland and Israel, that online and/or on-screen assessment can be successfully implemented in high stakes, sessional exams taken at volume in schools and colleges. This review aimed to establish a current view of the barriers to greater adoption of online and on-screen assessment in this context in England and to explore examples of how such barriers might be broken down and overcome.

The review identified challenges to be overcome in schools and colleges including the lack of availability of sufficient devices, broadband and network capabilities in some cases, the variability in appropriate skills in teaching and support staff, challenges to overcome through implementation and the need to maintain fairness in delivering assessments digitally.

The barriers identified were seen as real challenges to overcome by leading practitioners in the field, and representative groups of those integral to delivery of assessments in this context – teachers, headteachers, and others.

Whilst the barriers identified are real, many are not unique to the circumstances in England. Each jurisdiction we looked at has taken a different path to implementation, making different choices as to how to manage the barriers in their specific circumstances to meet the needs of their students, qualifications users and broader education systems and to deliver the purpose and benefits the changes aimed for.

This review provides a view of the delivery challenges to be overcome and provides a specific contribution to the debate in England. We welcome views on it, and the barriers identified so that dialogue can continue. To comment on this report, contact innovation@ofqual.gov.uk.

References

Ashton, H.S., Beevers, C. and Thomas, R., (2008, July 8). Can e-assessment become mainstream [Paper presentation] 12th CAA International Computer Assisted Assessment Conference, Loughborough. https://www.semanticscholar.org/paper/Can-e-assessment-become-mainstream-Ashton-Beevers/94178ac3f35c70f9541cb0b5158752d26559b87a?p2df

Burns, J. (2013, September 20). '*Online tests to replace paper exams within decade*'. BBC News. https://www.bbc.co.uk/news/education-24174535

Boyle, A. (2010, February). Regulatory research into on-demand testing. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/605765/0210_AndrewBoyle-Regulatory-research-into-on-demand_testing.pdf

CCEA, SQA, & The Welsh Government. (2014, December). Centre readiness to use e-assessment. https://www.sqa.org.uk/files_ccc/Centre_readiness_to_use_E-Assessment-17-12-14.pdf

Chairman's Report from Surpass Conference 2019. (2019, November 20). The E-assessment Association. https://www.e-assessment.com/news/chairmans-report-from-surpass-conference-2019/

Collins, S. (2018, August 20). *Botany Downs College students rebel against digital NCEA exam*. NZ Herald. https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12110032 Cortez, M.B. (2016, August 8). *Test takers continue to face challenges when using some technology.* Ed Tech Magazine. https://edtechmagazine.com/k12/article/2016/08/test-takers-continue-face-challenges-when-using-some-technology

Craven, P., (2010). History and challenges of e-assessment. https://www.cambridgeassessment.org.uk/Images/138440-history-and-challenges-of-e-assessment-the-cambridge-approach-perspective-e-assessment-research-and-development-1989-to-2009-by-patrick-craven.pdf

Craven, P. (2017, May 4). *Assessing pedagogy's use of digital exams.* https://www.e-assessment.com/news/assessing-pedagogys-use-digital-exams/

Digital matriculation examination. (n.d.). https://www.ylioppilastutkinto.fi/en/matriculation-examination/digital-matriculation-examination

Hill, P. Barber, M. (2014, December). *Preparing for a Renaissance in Assessment.* https://www.pearson.com/content/dam/one-dot-com/one-dot-com/global/Files/about-pearson/innovation/open-ideas/PreparingforaRenaissanceinAssessment.pdf

Jacovidis, J.N., Chadwick ,K.L., Fukuda, E., Todd, J & Their ,M. (2018, February) Study of International Baccalaureate Diploma Programme and Career-Related Programme School Readiness for and Perceptions of On-screen Examinations. https://www.ibo.org/globalassets/publications/ib-research/dp/dp-cp-onscreen-assessment-final-report-2018-en.pdf

Jones, N. (2018, March 3). *Online exam pilot a 'disaster': 'we were run off our feet solving problems'*.NZ Herald. https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12005186

NZQA. (n.d.). *2018 trials and pilots evaluation reports*. https://www.nzqa.govt.nz/about-us/future-state/previous-digital-trials-and-pilots/2018-evaluation-reports/#heading2-2

Oldfield, A., Broadfoot, P., Sutherland, R., & Timmins,S. (2012). Assessment in a Digital Age: A research review. https://www.bristol.ac.uk/media-library/sites/education/documents/researchreview.pdf

Oprandi, P. (2018, September 22). *Are electronic examinations the future?* Technology Enhanced Learning. https://blogs.sussex.ac.uk/tel/2018/09/22/are-electronic-examinations-the-future/

Overcoming barriers to e-assessment. (2015, June 29). Maxinity. https://www.maxinity.co.uk/blog/2015/6/29/overcoming-barriers-e-assessment

Roads, M. (2016, May). e-Assessment survey final report. https://www.e-assessment.com/wp-content/uploads/2016/05/e-Assessment_survey_report_May_2016_FINAL.pdf

SCA Accreditation, &CCEA. (2018, March). A Study of Learner and Centre views on the use of Electronic Assessment in Vocational, Professional and Technical Qualifications. https://ccea.org.uk/downloads/docs/regulation-asset/Guidance/A%20Study%20of%20Learner%20and%20Centre%20views%20on%20the%20use%20of%20Electronic%20Assessment%20in%20Vocational%2C%20Professional%20and%20Technical%20Qualifications.pdf

Scheuermann, F., Björnsson, J. (2009). The Transition to Computer-Based assessment. https://publications.jrc.ec.europa.eu/repository/bitstream/111111111/8713/1/reqno_jrc49408_final_report_new(1)[1].pdf

Transforming assessment. (2018, December 5). *A national roll out of e-exams for high stakes Matriculation: e-Exam Symposium 2018 (session 4)*.[video] YouTube https://www.youtube.com/watch?v=QLvGIdDeSmE&feature=emb_logo+https%3A%2F%2Fwww.nfer.ac.uk%2Fpublications%2Ffutl64%2Ffutl64.pdf

Who's afraid of e-assessment; is the UK reluctant to abandon pen-and-paper tests? (n.d.). Retrieved 19 January 2020, from https://www.cambridgeassessment.org.uk/insights/is-the-uk-reluctant-to-abandon-pen-and-paper-tests/

YouGov (2020, July). Perceptions of AS/A levels, GCSEs and Applied General qualifications in England – Wave 18. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/896440/Perceptions_Survey_Wave_18_-_Report.pdf

Other unpublished papers were made available to the author, some in confidence, and relevant themes have been included in this report.

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The following organisations participated in the Ofqual workshop.

Alpha Plus Consultancy
AQA
Association of Schools and College Leaders
BTL Group Ltd
E-assessment Association
Federation of Awarding Bodies
Girls School Association
Joint Council of Qualifications
NASUWT
National Association of Headteachers
National Education Union
Pearson Education Ltd
RM Results (RM plc)
Standards and Testing Agency
Tata Consulting Services
TestReach Ltd
WJEC-CBAC Ltd

The following organisations were contacted to share their experiences of overcoming barriers to adoption in their jurisdiction.

Ylioppilastutkintolautakunta (The Matriculation Examination Board of Finland)
New Zealand Qualifications Authority
The Center for Educational Technology, Israel

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