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Paper Title: The challenges of introducing new technologies globally

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Abstract

National assessment bodies worldwide are making use of electronic marking of candidates' examination scripts to create a positive shift in the reliability of marking outcomes. Significant improvement in the accuracy of marking has been achieved with many of the traditional constraints of paper-based marking being removed.

In the UK, all Unitary Awarding Bodies in England, Wales and Northern Ireland have been using electronic marking, with Scotland taking up the approach in the near future. In 2011, upwards of 9m scripts will be processed in this manner.

The paper will discuss the technologies used to improve both operational and marking outcomes and the challenges associated with its implementation internationally.

Key Words

Electronic marking; efficiency; marking reliability, high-stakes, risk management, cultural, processing, change, assessment, technology, international

Background

DRS has successfully implemented electronic marking with a number of awarding body clients in the UK, the largest of which is AQA. The general benefits of using electronic marking are becoming more widely recognised both within the UK and internationally.

Key to the approach adopted by DRS and its clients is the focus on improving the quality of marking through the use of technology. Marking judgements made by senior examining personnel, combined with sophisticated algorithms, enable those marking standards to be built into a marking process that continuously checks anonymously marking standards with a regularity that could not feasibly be achieved in a paper-based system.

In addition, those awarding bodies that have embarked upon exploring electronic marking have found that the change programmes initiated have led to a wider review of operational processes, resulting in further streamlining and improvement that may not have been envisaged when first considering electronic marking.

This paper reviews some elements of the changes that awarding bodies have had to consider and the challenges presented to both them and suppliers as a result. Ways in which those changes can be effected successfully are discussed drawing upon practical experience.

Basis of experience

The changes discussed in this paper are based upon the experience of DRS staff in many interactions with awarding bodies in six continents over the last seven years. Whilst no references to research or technical papers can be provided for much of this experience, it is hoped that practical and detailed interaction with many examination professionals, many of whom are at this conference, will suffice as evidence.

DRS started piloting electronic marking over ten years ago and was the first organisation to provide a system to a UK awarding body. It was the first organisation to facilitate the marking of scanned scripts in the UK, establish a UK-based system containing automated quality control mechanisms and the first to provide percentage double marking of segmented items. It was also the first to design and build its own, dedicated delivery infrastructure for such a system.

The current scope of work for DRS involves capturing marks for over 8 million candidates per year (just under half directly from paper scripts with the remainder from scanned scripts) covering a range of awarding bodies in the UK.

Why make use of technology?

All organisations that wish to grow and develop will look to make use of new techniques and processes. There are only a limited number of reasons why organisations will want to make use of new technologies and their adoption will depend not only upon the business objectives to be achieved but, as importantly upon the culture of the organisation.

Generic reasons for adoption include making delivery of product and services faster, more efficiently with improved productivity. Of particular relevance to assessment bodies will be the reduction of errors, reproducibility of outcomes, more consistent quality control and the

ability to check and reconcile information more readily. More challenging, perhaps, in the assessment arena, would be the ability to widen business activities that would not be undertaken before and to grow business as a result – largely because of the sectors in which each organisation will operate, regulatory requirements which constrain approaches and concerns about failure in a highly visible and high-stakes environment.

Examples of how these challenges can be met are given in this paper. Specifically, there has to be a recognition that not all working environments may be supported by the same type of infrastructure and services and that the design of the system and processes has to take that into account. The simplest systems, which can be modularised, tend to make the best fit in these circumstances.

Key benefits of electronic marking

Electronic marking makes use of scanned images of candidates' examination and test scripts to support the marking process. Images of candidates' scripts are held securely and anonymously distributed as questions, or parts of questions, to markers for marking across the Internet. Marks are captured at the time of marking and checking of marking standards takes place in real time.

Use of the images of candidates' answers provides many more degrees of freedom to support more rapid processing of marks and a variety of quality control measures. Paper-based systems are constrained by the physical limitations of the scripts – which can only be in one place at a time unless complex and costly logistical management approaches are adopted.

By dividing the candidates' scripts into segments, electronic marking provides significant improvements over conventional marking by:

- removing marking bias, related to the leniency or severity of a marker's judgement for an individual candidate and for groups of candidates;
- enabling markers to focus on topics related to their expert knowledge;
- allowing markers to focus only on marking and not be diverted by administrative or procedural matters;
- marking that does not meet the appropriate quality tolerances can be identified in real time and markers stopped from marking that item and provided with further training;
- removing clerical errors (such as addition errors by markers and transposition errors to marksheets) inherent in a paper-based system.

The challenges facing assessment bodies internationally

What sort of challenges are assessment bodies going to face in order to make the change to new ways of working and improve the outcomes for their candidates? What plans should be made to make deliver a successful implementation? DRS has identified seven areas to address with strategies to manage them. These are:

- being clear about why the changes are being made;
- the implications of the technological change;
- recognising the extent of the organisational and process change;
- the change management of stakeholders;

- provision of comprehensive support;
- establishing the appropriate division of control;
- the local implementation of technology internationally.

Discussion of how to address these areas is provided in the following pages.

1. Being clear about why changes are being made

Successful management of change has to be planned and executed as a project in its own right. The implications of such an approach include identifying the person in the organisation who will champion the change and setting aside an appropriate budget to support the project. The champion must have clear authority from the leadership team to make the changes and that the whole organisation understand this approval.

In order for the changes to be understood by all the stakeholders, the majority of whom will be the examining and marking teams, the rationale for the changes must be made clear. For example, is the approach to reduce costs to enable examination fees to be stabilised over the medium-term? Or, is the key concern related to the quality of marking? It could be that the environment in which the assessment body operates has begun to move to the wider use of technology and comparability of service has to be maintained. Whatever the reason, or reasons, the benefits that will be realised as a result have to be explained not only for the awarding body candidates but the wider stakeholder community as well.

As discussed, time has to be spent ensuring that a common message is produced and maintained. DRS has seen a number of instances where an unsupportive attitude of a single stakeholder has undermined the confidence of all others involved solely because the rationale for change has not been communicated and understood fully.

2. Implications of technological change

The introduction of new technologies will inevitably require change to the current operational processes being undertaken by the assessment body. In many cases, there is natural concern at the level of risk involved and whether or not there will be a significant failure. There are straightforward actions that an assessment body can undertake to minimise any such risk.

At a fundamental level, any system chosen must be proven and, ideally, be simple to use, produce a reliable service and have comprehensive support. This can be assessed by asking for references from other customers, undertaking site visits to all operational sites and assessing the fit of the assessment body requirements with those of other customers currently using the technology.

Clearly, any organisation considering such change needs to make a business case referencing the benefits that are anticipated. The level of experience of the supplier in the assessment environment will be vital here to ensure that all appropriate processes have been covered and the impact of the change identified. Both tangible and intangible benefits needs to be understood and how this can be best presented to internal decision-makers.

Once a decision to proceed has been taken, adequate business and technical resource has to be set aside on the part of the assessment body to work with the supplier to establish the scope of the service, what logistical and data interfaces might be required and how the integration is to be managed.

Staff involved must be dedicated to the tasks. DRS's experience is such that those organisations that attempt to assign responsibilities for change to staff undertaking other operational and business activities will be less successful, take longer to effect and almost certainly incur more expenditure overall.

The project teams of both organisations must work closely together to such an extent that for all intents and purposes they are one team. Where there is a geographical separation, then support processes must be in place to exchange plans, progress reports and manage issues effectively and rapidly. Much can be done in this respect with web-based tools. A rapid development of mutual trust has to be achieved.

3. Recognising the extent of the organisational and process change

This area can be a source of frustration for all stakeholders and can lead to fewer benefits of the technological changes being realised.

At one level, the introduction of new processes means that other processes have to change to accommodate them. Unless appropriately scoped and planned, this in itself can lead to misunderstanding, miscommunication and unexpected issues arising once operational work starts. Mitigation of this comes from involving all stakeholders in a complete review of all processes likely to be involved, the implications being fully assessed and joint planning being undertaken to ensure secure delivery takes place.

At another level, the full benefits of the technology may not be realised because its potential for process improvement has not been fully assessed. The potential impact is more than just swapping paper for a digital image.

For example, the approach to item-based marking could lead to significant changes being considered, such as:

- how items are generated by the chief examiner – individually or as part of a complete paper;
- how subject administrative staff brief the examining team on the implications of electronic marking and adapt approaches to take account of how items are structured for marking by image and by difficulty;
- whether or not a rigid team structure is needed, if traditional sampling of marking quality is no longer undertaken;
- whether post-hoc checking of scripts and borderline reviews are required any longer;
- how the reporting of marking accuracy back to markers is carried out.

To address this requires a commitment to realising the full benefits by changing the assessment body processes that interface with those of the electronic marking system. Again, the experience of the supplier in the assessment environment will determine the extent to which this process is successful.

4. Change management with stakeholders

The implementation of electronic marking has led to a number of very interesting encounters with stakeholders and a great deal of satisfaction, as the benefits of the changed processes become apparent. As well as managing change with the staff within the assessment body, the key to success is creating champions from within the examining team.

There are natural concerns and uncertainties that all involved in change have, but a number of straightforward ways of alleviating them. These include:

- providing briefing sessions with examiners with access to a ‘training system’ that replicates the ‘live system’. Examiners can ‘have a try’ on the system without having to worry about making mistakes on a live system. In some cases, examiners have brought along younger family members to such sessions to help them with using a computer!
- ensuring that the senior examining personnel and team leaders are clear about the rationale for the changes and can see the benefits;
- produce good quality, simple and clear guidance material preferably backed up by interactive, on-line training materials that walk markers through the use of the system in a simple manner. This not only helps to minimise uncertainty, but demonstrates the assessment body’s commitment to realising the benefits of the technology;
- identify ‘champions’ from early pilot activity and involve them in the ‘roll-out’ of the implementation for other parties.

In addition, the change can be introduced in phases – such that not all examination papers are included at the outset. One tactic used by an assessment body, where tiered papers of specific difficulty are used, was to introduce the new process to one tier of difficulty one year and to both the next. This provided some examiners with the option to stay with the current system for longer, follow its introduction with colleagues and understand more fully the benefits of the approach before embarking upon the change themselves.

5. Provision of comprehensive support

A vital element on the introduction of change is to have comprehensive support from the supplier which inspires confidence not only in the staff of the assessment body but in the examiner community also.

It would be naive to assume that issues will not arise. What is important, in such relationships, is to ensure that all parties keep each other informed and work together to resolve them.

6. Appropriate division of control

An almost inevitable consequence of introducing new technologies is a re-distribution of responsibilities for work to be undertaken. This occurs as parts of the existing process are reformulated and responsibilities move from one organisation to another.

Success in managing this change is focused on two areas. First, that the division of responsibilities is appropriate and suits the specific needs of the assessment body. The applications and services supplied must have sufficient flexibility to achieve this. Second, confidence in the supplier that delegated areas of responsibility will be conducted to the agreed specification and service level agreement.

Assessment bodies who wish to take this aspect into account will be able to gauge from discussions with potential suppliers how the service is currently delivered with existing customers and seek references to that effect. The examination of service documentation and training materials relating to the administration of the processes will also give a good indication of how responsibilities can be attributed.

In addition, site visits to the supplier during an operational phase will provide direct evidence of the approaches taken. One aspect to consider is the degree of control that the supplier has over all parts of the process. For example, what are the existing commercial relationships with couriers for receipt and despatch of materials? How close is the supplier to regional centres and hubs for this purpose? How much of the operations are out-sourced to other suppliers, such as scanning, script and document management? How close to each aspect of the process can the assessment body get to provide their own level of assurance through inspection and auditing? What quality assurance processes are utilised by the supplier organisation during script processing?

This will vary, of course, depending upon local conditions, the state of national infrastructures and the standards normally expected by the assessment body.

7. Local implementation of technology internationally

For the local implementation of technology internationally an essential factor of success is the use of competent and knowledgeable local organisations. This is because:

- local organisations understand local requirements and the environment well;
- good communication is facilitated;
- delivery of the change and its on-going management can be managed more closely, with focused support for the assessment body;
- pricing of the service can take advantage of local conditions and service costs.

The successful supplier will have appointed appropriate local partners, trained and supported them to ensure that the service to the customers is tailored to their needs.

An example of implementation in practice

In some cases, the assessment bodies that DRS have worked with have been established for many years and, in some cases, date back to the 19th century. Whilst the traditional ethos of such organisations is often retained – and makes their offerings sought after and valued – they have not retained their original processing systems through to today. Technology of various kinds has been used to improve processing efficiency, accuracy and timings. However, much of the change has been ‘back office’ and has not significantly changed the way that examiners mark papers.

The introduction of electronic marking is a change of a different magnitude, in that examiners will be affected more than with previous changes. 'Back office' changes are also likely to be more significant, as processes are likely to be changed or removed completely – rather than improved and streamlined, as would be the case with previous initiatives.

So, extended discussion about approach, benefits and assistance with a key stakeholder led to a small scale introduction to electronic marking with key examiners, a small number of scripts that had been marked previously and marking in one venue for two days. This was evaluated systematically, by both the parties and agreement reached to progress to a small-scale pilot with scripts that had not been marked before.

Some technical issues had to be addressed with the formatting of the question papers, which were of a specialist nature and size. This had to be completed before the candidates sat the paper in the forthcoming examination session. In addition, the lessons learned from marking many different formats of question papers were passed on to the assessment body concerning the way in which small changes to format would enable access to the different methods of marking electronically. This was championed by one of the assessment leaders in the organisation. Whilst this took some time to execute, the down-stream benefits were worth the effort and delay in execution.

Once the small-scale pilot had been carried out and the outcomes evaluated, the benefits were discussed with all key stakeholders. The assessment body concerned has specific procedures for making awards to candidates. The use of electronic marking could have led to those processes changing significantly, but this was not considered appropriate by the assessment body and was viewed as a potential barrier to change for some of the examining team. Instead, changes to provide special reporting features to support this process were developed so that electronic marking could support their continued use and add value as a result.

As discussed earlier, organisations can feel that control for some processes is being taken away as a result of the change. This was true in this case also. To address this, additional reporting was provided for identified stages in the processing of scripts and arrangements for staff to be present during their processing at the scanning facility were made, with a complete walk-through by the facility manager. The consistent demonstration of complete, secure and transparent processing of scripts served to provide the right degree of confidence in the approaches taken.

One further area where some questions were raised was in the management of marking quality. Documentation of past experience and evidence proved helpful, but some underlying unease remained. To help further, a meeting of all senior examiner staff was arranged where the quality approaches used were explained again, together with alternatives that were available, but not used. As part of that presentation, an independent researcher in national assessments was invited to discuss the technical aspects of the quality control mechanisms and why they were seen to add specific value. As a result, the senior examining team were better informed and could talk to their own examiners with greater confidence about the basis for the approaches used and why they are valid. In addition, agreement was reached to make use of the complementary quality control approaches for some items in future examination series.

The outcome has been greater confidence within the organisation that the changes made are of real benefit and who are now able to articulate them more clearly with their own stakeholders.

Summary

Whilst some of the challenges in implementing technology globally relate to the technology itself, its implementation, local conditions and infrastructure, by far the greater challenges lie with the organisational and personal changes that have to be managed.

To succeed, assessment bodies need to:

- be clear about why the change is wanted, get buy-in from key influencers and ensure that this is communicated well to all stakeholders;
- decide the extent of the change to be implemented and the pace – to realise the full benefits of the technology;
- plan for the change and set aside expertise and resources to support it;
- understand and formalise how the new processes will impact upon existing structure and the extent to which they will be outsourced;
- review progress regularly and make known the benefits as they are being realised.

Making the right choice of technology partner is also fundamental together with establishing a partnering relationship that will pool expertise and experience that will reduce significantly the risk of failure.

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