

THE JISC-funded TOIA project

Summative external evaluation:
final report

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Contents

Exec summary	3
Introduction	4
Background	4
Overview of the study and scope	6
Methodology	6
Findings and discussion	7
Project aspirations	8
Links with related projects	8
Key success factors and outcomes	10
Dissemination mechanisms	14
Reasons for using TOIA	15
Usage	17
Comparison with other e-assessment tools	20
TOIA support	22
The TOIA hosted service	23
Views on continuation	26
Recommendations	27
Conclusion	28
Acknowledgements	28
References	28
Appendix A: TOIA Survey Analysis	29
Features of TOIA	30
A TOIA hosted service	38

Exec summary

This document summarises the findings of the external evaluation of the JISC-funded TOIA project. The key focus was evaluation of the project outcomes against stated objectives. Data was collected through document analysis, interviews with thirteen stakeholders (including members of the steering group, representative users of the e-assessment community and relevant JISC personnel) and through an online survey.

The evaluation looked at: project aspirations and the origins of TOIA, links with related projects, key success factors and outcomes, barriers and enablers to the uptake of the products produced, and assessment of the viability of a hosted e-assessment service.

The findings of the evaluation highlight that the project was timely; occurring at the start of an upsurge in interest in development and use of e-assessment across FE and HE. It formed part of a cluster of related projects and can be linked to other projects which were funded after TOIA. The project steering group worked well bringing together a range of expertise in e-assessment across FE and HE. The project explored an interest model of technical development through partnership with a commercial company and outsourcing of the product development. This enabled the project to produce a high specification high functionality e-assessment system within 18 months of the project inception. The project was deemed to act as a valuable catalyst to raising the profile of e-assessment across the sector and enabled individuals to trial a high-end e-assessment system, as well as enabling them to explore its potential use for teaching and learning. The project used a range of appropriate mechanisms to disseminate the product including collaboration with Netskills to provide a suite of e-assessment workshops. The project also acted as a testbed for demonstrating proof of concept in interoperability by implementing and demonstrating the potential of the QTI e-assessment standard.

Views on the value of a hosted service were mixed but on balance it seems unlikely that such a service would be financially viable at this time. In addition such a service would require cross scrutiny in terms of addressing associated issues with respect to IPR and expected service level agreement between the host institution and institutions using the system.

External evaluation of the TOIA project

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Introduction

This report represents the summative evaluation of the JISC-funded TOIA project (<http://www.toia.ac.uk>). The evaluation was commissioned by the University of Strathclyde (the lead site for the TOIA project) on behalf of the funding body, JISC. The evaluation was carried out between March – May 2007. The primary purpose of the evaluation was to provide a summative evaluation of the TOIA project against its key aims and objectives and to provide feedback to JISC on lessons learnt and highlighting issues of relevance for future JISC and related e-assessment work across the FE and HE sectors.

Background

The Technologies for Online Interoperable Assessment (TOIA) project was funded by JISC under Strand B of the Exchange for Learning (X4L) programme.¹ Funding was administered by JISC's Committee for the Information Environment (JCIE) and Committee for Learning and Teaching (JCLT).

Strand A of the X4L programme focused on the development and repurposing of materials, whereas Strand B projects were intended to provide enabling tools to support the outcomes of the Strand A projects (however as the two strands were funded in parallel, in reality the Strand B tools were not used extensively by the Strand A projects during the lifespan of the programme). Two other projects were funded under strand B: JORUM (a digital repository) and RELOAD (a content packaging and metadata tool). The TOIA project focused on the development of a set of e-assessment tools and was partially funded to demonstrate interoperability, so in a sense was more ideological than the other two projects.

So we saw it very much as a prototype system to be as standards compliant as possible and enable those who couldn't buy the commercial offering to see a high level good [e-assessment] system.[X4L programme manager]

The project focused on the development of a free e-assessment tool for use across FE and HE. The intention was that the project would demonstrate best practice in achievement of interoperability and implementation of the e-assessment standards at the time. The tools were developed in collaboration with Freedom2Learn, based around the IMS Question and Test Interoperability (QTI) Specification. Freedom2Learn is a Joint Venture between Excelsoft Technologies, Mysore, India (www.excelindia.com) and Dynamic Distance Learning, Newcastle, UK (www.ddluk.com). The project was initially funded to the tune of £230, 300 for three years from October 2002 to September 2005. A

¹ http://www.jisc.ac.uk/whatwedo/programmes/programme_x4l.aspx

further phase of funding to explore the potential of offering a hosted e-assessment system for the sector was funded from October 2005 – March 2007, funding for this extension was £52, 000.

The original project deliverables, as outlined in the project consortium agreement were:

- a) Development of a QTI-based Question and Test database
- b) Question and test creation tool (for on and offline use) incorporating all IMS supported question types
- c) Test delivery system and piloting of tools in FE and HE partners
- d) Construction of a QTI Results Reporting Specification database
- e) Development of a web-based tool to interact with the Results database
- f) Interoperability testing of TOIA tools with commercial assessment products.

Underpinning these was a key principle “to develop tools for the creation, storage, online exchange and delivery of assessment content”. The consortium documentation states that:

This purpose is in line with the tools-only bid submitted to the JISC. The Project Members recognise the need for Project outcomes and deliverables to have a broad appeal and application within the Further and Higher Education communities and that an active program of collective dissemination underpins individual activity. The Project aims to ensure that the outcomes are both technically and pedagogically sound by drawing upon the varied expertise and experiences of Project Members and external agencies where appropriate.

The project was led by the University of Strathclyde, but was a consortium of institutions across FE and HE in conjunction with a commercial company Freedom2Learning – key roles in the project are outlined in table one.

Table One – The TOIA team and steering group		
Name	Role	Institution
Niall Sclater	Director (2002-2005)	University of Strathclyde
Ian Hesketh	Project Manager (2002-2004)	University of Strathclyde
Jalshan Sabir	Project Manager (2004-2007)	University of Strathclyde
Niall Barr	Technical advisor (2002-2004)	University of Strathclyde
Hugh Davis	Steering group	University of Southampton
Su White	Steering group	University of Southampton
Gráinne Conole	Formative evaluation	University of Southampton
Gui Power	Technical developer	University of Southampton
Dick Bacon	Interoperability consultant	University of Surrey
Steve Jeyes	Steering group	Edexcel
Clive Church	Steering group	Excel/Newark and Sherwood College
Graeme Clark	Steering group	Glenrothes College
George Herd	Steering group	Glenrothes College
Myles Danson	Steering group	University of Loughborough
Bryan Dawson	Steering group	University of Loughborough
Alison Hudson	Steering group	Sheffield Hallam University
Grant Naylor/Paul Helm	Technical advisor	Sheffield Hallam University
Freedom2Learn developers	TOIA tool development	Excelsoft Technologies, Mysore, India (www.excelindia.com) and Dynamic Distance Learning, Newcastle, UK

At the time when TOIA was funded, many free assessment tools lacked flexibility and functionality, offering only a limited set of question types. Assessment tools in emergent Virtual Learning Environments (VLEs) at the time were also lacking in sophistication. The main commercial offering, QuestionMark Perception, was more sophisticated and offered a greater range of possibilities and had a reasonably good track record of delivery, however, as an initial outlay for institutions, it was expensive and therefore representative a significant investment. Institutions were faced with a dilemma; without practitioners having the ability to trial and test e-assessment tools it was unclear what the uptake would be and hence it was difficult to assess longer term demand. In parallel work was progressing in terms of interoperability and the release of the IMS Question and Test Interoperability (QTI) specification enabled developers to explore the potential for transporting items between systems. TOIA as a project was therefore timely in that it both provided a robust, functionally rich, e-assessment tool which could be trialed for free across FE and HE and a system which aimed to implement and push the boundaries of the then current QTI specification.

Overview of the study and scope

This evaluation represents a summative evaluation of the TOIA project. In consultation with JISC and the University of Strathclyde during February 2007 it was agreed that the evaluation should focus on the following aspects. The objectives of the evaluation were to

1. undertake a summative evaluation of the TOIA project,
2. carry out an examination of the project activities and evaluate the success of the project against stated aims and objectives,
3. explore the extent to which TOIA products were used within the FE and HE communities,
4. determine the perceived value of a hosted service and the potential associated market and logistics of such a service,
5. explore strategies for sustainability and make recommendations for future actions in relation to the outputs of the project and the findings of the evaluation study,
6. produce a final report with recommendations (for best practice and possible further work).

Methodology

Data collection consisted of three main sources: contextual project information (through consultation with the TOIA team, documentary evidence and web site information), interviews with key stakeholders and those involved in the development of the product and use of the system and service, and a wider survey of users across a broader base of the community.

The evaluation aimed to elicit the views of a range of stakeholders across FE and HE. These included members of the core TOIA team and the wider steering group, users of the TOIA tools and hosted service, the wider e-assessment community and those with a strategic and policy perspective on e-assessment. A range of users were canvassed and thirteen interviews were conducted between April-May 2007 (table two). All except two of the interviews were conducted by phone; the remaining two were face to face. All were digitally recorded for accuracy and notes taken during the interview process. Interviewees included practicing academics involved in the development and delivery of course materials and assessment to undergraduates, learning technologists and more specialised e-assessment officers responsible for the development and roll out of e-assessment

across their institutions, those with an interested in evaluating and comparing e-learning tools, those with institutional or national remits in terms of the development and deployment of e-learning across FE and HE and more specialised e-learning and e-assessment researchers and developers (table two).

Table two		
Name	Institution	Date
Keith Attenborough	University of Hull	30 th April
Julian Cook	University of Bristol	30 th April
Myles Danson	University of Loughborough/JISC	3 rd May
Clive Church	Newark and Sherwood College	18 th May
Hugh Davis	University of Southampton	22 nd May
Dick Bacon	University of Surrey/HE Academy	22 nd May
John Norman	University of Cambridge	23 rd May
Steve Jeyes	Edexcel	30 th May
Niall Sclater	University of Strathclyde/The Open University	24 th May
Lou McGill	JISC	25 th May
Steve Boneham	Netskills	25 th May
Nick Crabb	Bristol Vets school	25 th May
Susan Eales	JISC/The Open University	30 th May

Document analysis provided contextual data about the project and its key activities and milestones. Interviews were semi-structured using a set of questions derived from the evaluation brief, document analysis and discussion with the Head of Learning Services at Strathclyde. All interviews were audio recorded and transferred to a computer. Interviews were transcribed, focusing in particular on key segments which related to the principle evaluation questions. Field notes were also kept during the interviews and these were checked for accuracy by the interviewees immediately after the interviews. Interviews were coded using an emergent theme approach which iteratively identified the key categories of interest. All quotes included in this report have been coded, for example [IntN] signifies data from Interviewee N.

The survey was administered on the TOIA system and information about the survey was emailed out to the project database of those who had been in touch with the TOIA team and shown an interest in the product (including those who had downloaded the software or used the hosted service) and also to the wider CAA community (via the mailing list held for the International CAA conference. A total of 800 emails were sent out. Of those: 24 contacts were on leave, 6 emails were lost due to technical problems and 70 were undeliverable because the email address was no longer in existence. This left 700 potential respondents and a response rate of 5.5%, which is within the normal expected response rates for online surveys (Jones, 1998). Appendix A provides a summary of the findings from the survey results.

Findings and discussion

The findings of the evaluation cover the following broad themes:

- Project aspirations
- Links with related projects
- Key success factors and outcomes
- Dissemination mechanisms
- Reasons for using TOIA

- Usage
- Comparison with other e-assessment tools
- TOIA support
- The TOIA hosted service
- Views on continuation

Project aspirations

The key aspirations underpinning TOIA are encapsulated in the following quote from the project director:

To provide a free online assessment system which would help to bring people into the area of CAA and push that whole agenda in HE and FE and investigate the interoperability of assessment by implementing the QTI specification and trying to push that as the main way of developing interoperable assessment. [TOIA Project Director]

The overarching aspirations were echoed in the responses from the thirteen stakeholders interviewed, giving a sense of a shared ownership and vision; although not surprisingly they varied in the emphasis of which aspects they felt was most important.

A key aspiration was to create an IMS QTI-compliant web-based e-assessment system which covered the full range of e-assessment functionality (authoring, delivery, marking, administration) and that this should be produced free for use across the HE and FE sectors.

A secondary aspiration was to act as a catalyst; to demonstrate what was possible and offer a free set of tools which enabled the FE and HE communities to experiment with carrying out e-assessment activities, with a longer term goal of increasing the uptake in the use of e-assessment across the sectors beyond initial enthusiasts.

I saw it [TOIA] as a catalyst exercise to offer a wide set of institutions access to an assessment management system but with the underlying principle of it being standards compliant with all the inspirational benefits of that and free of charge. [Int 3]

We really wanted to give people a chance to do e-assessment at low cost and low risk whoever they were. Encourage them to see the value. That was what I thought was the most important thing. It was having a tool that would work that schools and departments could use.[Int 8]

Exploration of the extent to which the system was standards compliant was built into the project plan and was considered an important outcome of the project for steering group members. One interviewee felt that standards compliance was important because it represented the 'holy grail' of content exchange and was important because it offered a mechanism for separating content from delivery systems as well as avoidance of vendor lock in – a particularly pertinent issue for e-assessment in the UK. There was a vision too that compliance would facilitate greater exchange of content across institutions. However despite this being a key aspiration, in reality of the extent to which institutions do share e-assessment content is low. This resonates with the wider literature on repurposing (Littlejohn, 2003) and recent work on Open Educational Resources (Downes, 2007).

Links with related projects

E-assessment has been an important and growing subset of the use of technology for learning running alongside broader and more general trends in e-learning. The International Computer Assisted Assessment conference for example is now entering its eleventh year. Whilst the purpose of this report is not to provide a comprehensive overview of current e-assessment activities, it is important to contextualise the TOIA work

with related research and development activities in the area. See Conole and Warburton (2005) for a review of e-assessment research literature and Sclater et al (2007) for an overview of e-assessment research and development activities and key drivers, and Warburton (2006) for an in-depth analysis of the barriers and enablers to the uptake of CAA in institutions.

Specific funding for e-assessment activities have occurred across the funding councils; such as early use of CAA within the Teaching and Learning Technology Programme (TLTP) funded by HEFCE in the eighties and early nineties, strands across the subject-based Funds for the Development of Teaching and Learning (FDTL) and the National Learning Network (NLN). Some of the HE Academy subject centres also have specialised interests in the use of e-assessment in relation to their discipline base. The Scottish Executive funded a major initiative in exploration of e-assessment across schools and colleges, Pass-IT (see <http://www.pass-it.org.uk/> for further details and project documentation), which undertook a detailed and empirically based study of the comparison of the use of paper-based and electronic assessments. The more recent HEFCE-funded Centres for Teaching and Learning (CETL) Initiative (<http://www.hefce.ac.uk/learning/tinits/cetl/final/>) has established approximately 70 centres of excellence to promote teaching and learning across HE; some of these are explicitly focusing on assessment – for example the Centre for Excellence in Teaching and Learning in Assessment for Learning (http://northumbria.ac.uk/cetl_afll/) and the Centre for Open Learning of Mathematics, Science, Computing and Technology (<http://www.open.ac.uk/colmsct/>). A parallel e-assessment initiative at the University of Strathclyde is the SHEFC-funded REAP (Re-Engineering Assessment Practices in Scottish Higher Education – see project website for more details, <http://www.reap.ac.uk>).

JISC has funded a number of e-assessment activities, a few of particular relevance to TOIA are highlighted here. JISC funds CETIS (the centre for educational technology interoperability standards), which represents the FE and HE communities on international educational standards initiatives (<http://zope.cetis.ac.uk/>) and it is worth noting that TOIA emerged from members of the SIG. CETIS is primarily organised into a series of special interest groups, including one focusing on e-assessment (<http://assessment.cetis.ac.uk/>). The Assessment Special Interest Group has provided a vibrant mechanism for the development of debate and discussion around e-assessment related standards developments (particularly the development of QTI) however it has also enabled the fostering of a community with an interest in the implementation and use of e-assessment more broadly.

The JISC Organisational Support Committee funded three related projects in recent years:

- A 'Roadmap for e-Assessment' - which provides an overview of the current drivers and barriers to e-assessment in post-16 education, using a broad definition of the term e-assessment to cover summative (or high stakes) assessment, formative (or low stakes) assessment and diagnostic testing/assessment (http://www.jisc.ac.uk/uploaded_documents/RM%20Final%20report%20Vf.doc).
- A set of case studies of innovative and effective e-assessment practice (Whitelock et al, 2006).²
- A glossary of assessment terminology for schools, post-16 and HE institutions.

The outcomes of these have been summarised into an “Effective Practice for E-Assessment guide” which is available in print form or downloadable (see http://www.jisc.ac.uk/media/documents/themes/elearning/effprac_eassess.pdf). This forms part of a broader suite of effective practice guides synthesising key findings from across a range of JISC-funded projects.

² http://www.jisc.ac.uk/uploaded_documents/E-assessmt%20case%20studies%20update.doc

As part of the broader e-Framework programme, JISC funded a reference model project in the area of e-assessment, FREMA (<http://www.frema.ecs.soton.ac.uk/>), which helped to capture of the status of e-assessment, areas of activities, key projects and people and the relationships between these. This partnership emerged as a logical follow on from TOIA and involved member of the same individuals. It provided a useful continuation of the network of e-assessment expertise brought together in the TOIA project. More closely aligned to the TOIA project and overlapping with it was the Item Banks Infrastructure Study (IBIS), which provided an overview of the current status of item banks (Sclater, 2004). IBIS aimed to 'study the processes involved in developing large scale item banks and managing an item bank service' (ibid), it provided an important foundation on which related projects were able to build. An overview of broader JISC-funded e-assessment work which shows the relationship between the projects discussed here and others was produced last year (JISC, 2006) and gives an indication of the extent and richness of e-assessment activities now occurring.

Key success factors and outcomes

The overarching key success factor of the project was that it enabled the development and deployment of a high-end, robust and extensive e-assessment tool across FE and HE.

I think the system was quickly built and efficiently built for the funding investment. To create a software tool of that complexity the model enabled a quick and efficient way to create a stable system.[Int 3]

Feel very positive about it as a JISC project. It seems to me that this is a project that has delivered and is being used.[Int 6]

The speed of development, achievable because the project worked in partnership with a commercial company (ExcelSoft), meant that a functional set of tools was available within about 18 months of the project's inception and unlike many development projects, this meant it was possible to concentrate on the use and uptake of the system and to make an informed judgment on the longer term viability of such a project by the community. It is unlikely that such a high quality product could have been produced this quickly, if the project has used a UK university-based programmer.

The systems development was informed by rapid feedback from a range of sources. Around 300 beta-testers looked at the system between April 2004 and July 2004. Their feedback (which constituted ca. 50 or so changes to the system) was fed back to and implemented by the developers.

However the development of a working relationship with an outsourced development outfit abroad was not without its teething problems and the development of a clear and effective communication mechanism proved critical to the success of the project.

Had some initial communication difficulties but worked those through – face to face contact proved important in this respect.[Int 13]

I thought that working with the Indians worked really rather well. We had some problems with some of the explaining to them and required two or three times but so what in a sense. So I think that worked quite well Int 5]

[I] was impressed with the Indian programmers and how they dealt with our requests.[Int 6]

A number of those interviewed also saw that the model of a JISC-funded project working in partnership with a commercial outfit was valuable and of potential interest to other

aspects of JISC activities. Such partnerships could be beneficial to all those involved. For the commercial company it provides them with access to cutting-edge research and ideas from the FE and HE sectors, as well as a vehicle for linking into the e-assessment community across post-compulsory education. Conversely, commercial software development companies have in place appropriate processes and procedures to ensure that products are developed, tested and deployed on time and would have a wider range of specialised skills needed than might be possible within a small JISC-funded project team.

The idea of JISC working with a commercial partner is extremely valuable; gives potential for sustainability.[Int 8]

The model of the development in India was an interesting model. It meant that unlike RELOAD TOIA didn't worry about how they got there they just wanted to get there in the quickest and most cost effective way.[Int 11]

Outsourcing was also seen as beneficial because overall it was a cheaper option.

It was cheaper much cheaper and it was done by pretty good software engineers.[Int 5]

Such outsourcing of technical developments to India is an interesting model and something that JISC may well want to explore further. A more detailed analysis is needed to understand the pros and cons of such an approach, as well as the longer term implications.

The project steering group worked well in the first phase of the project. Involvement of key e-assessment experts and contributions from across FE and HE were important factors as was the shared vision and enthusiasm for the project amongst the steering group members (see section 'project aspirations').

We had a good project team and developed an excellent specification for the product. And then developed good working relationships with excel soft and so they could implement our requirements. It is a good product and it does implement QTI extremely well. Team worked well and product was good. There was also a high level of dissemination.[Int 13]

What did work was how it fitted in the whole programme – the enthusiasm of the team and the willingness to be involved in the programme.[Int 11]

Therefore the project was underpinned by a strong and supportive steering group, made up of key experts in e-assessment drawn from across FE and HE. The steering group provided a broad range of expertise on different aspects of e-assessment (technical and pedagogical, as well as development and deployment) as well as representation from across both FE and HE. The steering group members helped shape the vision and offered specialized advice as appropriate. However one member of the steering group commented that some of the partners in the consortium could have been used to better effect.

Part of the project's aspirations was to demonstrate interoperability and in this respect the project can be deemed to have been successful in that it complied with QTI 1. Many of the vendors at the time were claiming that they were standards compliant but in reality weren't. As is often the way the timing was unfortunate in that QTI 2 was in development, although there is no widespread adoption of this at the current time.

The project did however also provide an important demonstration of transfer of item banks between assessment tools; an important proof of concept which fed into the review of item banks (Sclater, 2004) and the other more recent e-assessment projects described earlier. This work was done in conjunction with an FDTL-funded project, HELM, which consisted

of mathematics questions for use with first-level HE engineering students and also the COLA project which was a cross-Scottish initiative. So this provides a good example of a cross-fertilisation of a JISC and FDTL project. Overall the project raised the profile of interoperability and of QTI specifically. This was deemed valuable as interoperability was seen by the steering group members as a means of generating a market for exchange of question items. It also implemented other specifications, most notably LOM, Content Packaging and LIP (which enabled the uploading of a batch of students simultaneously), so it was an exemplary system in terms of demonstrating and implementing key learning technology specifications.

The project was also about capacity building and raising the profile of e-assessment across the FE and HE sectors:

I think the key one [aspiration] for me was to be able to have a tool that people could provide online assessment and more importantly to facilitate the sharing of online assessments.[Int 4]

Dissemination, particularly in the early stages of the project, was deemed good on the whole; see section 'Dissemination mechanisms'. This meant that there was high awareness across the FE and HE communities of the product and its potential use. This resulted in significant interest in the project – via traffic on the TOIA web site and enquiries to the project manager (see section 'Usage' for further details).

It [TOIA] did create a free QTI compliant system for the duration of project and there were significant downloads and interest in the system. I saw it as a catalyst for those who couldn't host something to trial it for free and it did offer that but I don't know how well it achieved this. [Int 3]

I think probably the project had quite a high profile and [we] presented in a number of forums... subject centres were interested, etc and therefore did raise the profile of e-assessment and the possibilities. Lots of people tried it out and got ideas for CAA in their institution. [Int 13]

[TOIA] Was really successful, the number of downloads were symptomatic of fact that people wanted to play initially and the profile across the sectors was strong.[Int 8]

In the later stages of the project there were a number of staff changes, most crucially the director leaving to take up another post elsewhere and inevitably this had an impact on the project. Also some felt that the overall aims of the project were over ambitious, with unrealistic expectations being set against the project and what it could reasonably achieve. Critically the project did not really have an adequate exit strategy; there was a tension between continued involvement of the commercial partner (who would ultimately want to see a return on investment) and managing community expectation (who would expect the product to continue to be made available and supported for free). This is a crucial issue for JISC; with hindsight it might have been better to agree the scope and remit of the project more tightly. With projects, like TOIA, where there might be the potential to develop them into JISC services there needs to be a much clearer management of the process and adherence to JISC wider policy and approaches to their service portfolio. The current review of some of the services and their governance should shed some light on this and a potential way forward. Expecting the TOIA project to develop an exit strategy in isolation was perhaps unrealistic with hindsight.

The decision to outsource the technical development to a commercial partner clearly enabled the product to be developed much more quickly than would have been possible with in-house university developers. However involvement of a commercial partner did raise a number of issues. One has been mentioned above; namely that ultimately the commercial partner was looking for a return on investment. But a second issue was that

there was some wider disquiet in the e-assessment community about use of public funding to sponsor a commercial development, albeit under a JISC project. This is important because clearly it is critical that the sector engage with and develop a trusted relationship with relevant vendors in the area.

The fact that we worked with a commercial partner was one of the successes of the project. We had to work with them. Perhaps JISC should do more of this kind of model but it's an uneasy model - balance of Academia/Commercial.[Int 13]

A number of suggestions for improvement of the product emerged during the interviews which mirror those reported in the survey discussed earlier in this report. The project didn't manage to achieve cross browser and systems support; which may have been a factor in the decision to not use TOIA for some. Similarly there were a number of suggestions for how the user interface could be improved.

A crucial issue for TOIA was that of credibility in comparison with other tools available, some of which have been around for many years and hence have a track record in terms of uptake and support. One interviewee felt this credibility was a key issue in terms of the decision for an institution to adopt the tool:

It needed some examples of high level usage to give it credibility and the ongoing support after the project... Would an institution really launch TOIA as a core service knowing so little about its track record, lack of reference sites and knowing that technical support was limited to the project manager? [Int 3]

Whilst another interviewee felt that the lack of wider uptake of the product was closely tied into the perceived longer term viability of the product, highlighting that the factors involved in a decision to adopt a product are complex.

Ultimately what is less successful has been the take up of the product – we could have achieved more perhaps. What's become clear is that the product has an uncertainty in terms of longer term viability. ... If open source it might have helped. But we could not have built such a good product in the time scale and to that budget whereas we built on an existing product and good expertise in India. Adoption may be down to a number of issues. Also a lot of institutions were introducing VLEs which had some basic CAA tools and many therefore don't have complex CAA requirements so VLE tools may be good enough. Many ... Also commercial competitors QM for example – some institutions went for that as had higher profile and had been there for longer. [Int 13]

Others felt that there wasn't enough of an opportunity with the project to explore how this could be embedded in FE and HE, although this was not an explicit intention of the project:

[The TOIA] tool was developed which was professional and accessible but we weren't very good at enabling a community to grow round it in FE to share and use but don't think that was one of the original objectives of TOIA. We should have had associated projects like the COLEG team to enable people to have time to develop items and get the ball rolling. Unless FE staff have the time bought out they can't get involved.[Int 4]

The interviewee went on to suggest ways in which this might have been achieved by building in item bank contributions and building a community of use around these:

[It was a] Lost opportunity not to seek support for contributors of items – would have made a big difference to the use of it. From the FE perspective to promote the thing more to FE colleges could have been better.[Int 4]

However it was also noted that such an institution-wide adoption of TOIA was unrealistic and overambitious and beyond the scope of the call and that what needs to be

emphasized more was the fact that TOIA acted as a catalyst in the sector, enabling institutions to trial and explore the potential of a high-level, functionally rich assessment tool.

Overall the perception was that TOIA contributed to the interest in e-assessment across the FE and HE communities and was part of a suite of e-assessment projects (then and after) which helped to reinforce and strengthen the e-assessment community. Evidence of this is visible in the range of e-assessment projects (see the 'Links with related projects' section) which have arisen since TOIA.

Dissemination mechanisms

The purpose of dissemination was fourfold, to:

- i) raise awareness across the e-assessment community and more broadly across FE and HE of the potential of e-assessment by providing a suite of free high-level, robust e-assessment tools,
- ii) help develop the e-assessment community and capacity build,
- iii) to raise awareness of e-assessment issues,
- iv) provide a proof of concept in terms of interoperability in e-assessment through implementation of the latest in e-assessment standards through Question and Test Interoperability (QTI).

On the whole dissemination of the project was deemed to increase the awareness in the sector of both TOIA and more broadly e-assessment.

It did widen the community of people involved in online assessment. Demonstrated that such a tool could work.[Int 4]

Project team members and the broader steering group provided information about the project and its activities at a range of relevant events during the lifespan of the project, whilst also evangelizing about the broader underpinning aspirations of the project.

The project team used a variety of standard routes to disseminate the findings of the project to the wider research community – both nationally and internationally. Conferences and word of mouth not surprisingly were deemed the most valuable communication channels, but also of note were journal articles and conference posters. Targeted sectors of the community were reached through involvement in a range of JISC-specific events and through presentation at e-assessment-related conferences such as the CAA conference held annually at Loughborough. The project also took part in a range of institutionally specific events and parallel initiatives funded by HEFCE and SHEFC. More broadly specific training on the use of e-assessment tools was undertaken in conjunction with the JISC-funded Netskills (see also the section on 'Support'). Overall those interviewed felt that there was a good range of dissemination activities associated with the project and that TOIA had a reasonably high profile across the FE and HE sectors. However one person felt that the publicity and conference coverage was not as extensive as it might have been, highlighting in particular that there were a few technical hitches in some of the demonstrations.

In addition all the JISC RSC staff were given accounts. The RSC Northern made heaviest use of the accounts by running TOIA workshops. RSC London were the first to run a workshop and there were about 16 workshops in total delivered by the TOIA project manager.

Reasons for using TOIA

For many a primary advantage of TOIA, not surprisingly, was that it was free.

I used TOIA because it gave me access to questions without having to get the institution to buy the QuestionMark Perception software.[Int 1]

Interestingly this was not so much that there was a resistance against QuestionMark Perception per se, but more that access to a free set of tools enabled users to play with and trial the use of e-assessment and to explore in more depth how such a system might be used more extensively to support teaching, learning and assessment activities within their institution. Although not explicitly explored in the evaluation, it would be interesting to do a follow up in one or two years to see what assessment tools institutions are using and to what extent, if any, exploration with the TOIA tools has informed or influenced that uptake.

One interviewee also highlighted the fact that TOIA was particularly good for assessment purposes because it had a simple interface, pointing out that students are nervous when taking tests and anything that makes the process simpler for them is important.

One of the fundamentals was its simplicity of delivery to the students. I am interested in students' stresses in exams. Blackboard takes six clicks to get into [the assessment test]. TOIA they log in, [and it's a] one click operation. Very clean and easy to navigate – that's a very strong feature for it. [Int 10]

For those with an interest in item banks it provided a mechanism for getting access to question banks hosted on the system. The collaboration with the HELM project and its associated question bank, was particularly important and provided an important proof of concept as a basis for the related work being carried out in the IBIS project and the follow on JISC-funded item-bank work. This access to a peer-reviewed subject-based item banks was also cited as a reason for use.

Therefore a way of using tried and tested questions that I didn't have to develop myself. [Int 1]

Some users appear to use a number of assessment tools in parallel; not necessarily creating, storing and delivering items all through the same system. The numbers interviewed and surveyed were too small to explore this issue further but it seems that this pattern of behaviour is in line with the vision behind the development of an e-framework, adopting more of a pick and mix approach to development and use of tools.

Many liked the functionality of TOIA and saw this as a distinct advantage of the system. For example one interviewee commented on the timing facility available within the system and the fact that it was possible to set an exact number of questions on a page – providing a better layout of questions than was then available in the commercial rival QuestionMark Perception. This also meant that the student view of the test was clean and simple, enabling students to easily navigate through – a crucial and beneficial feature, as outlined above, given that students are generally nervous when taking tests and anything that makes the process simpler and easier is beneficial. TOIA was from the start developed as a web-native product which was a distinct advantage in comparison to some of the other products available at the time. TOIA offered a much more sophisticated set of functionality (more question types, better design interface, more robust system and good reporting mechanisms) in comparison with the e-assessment tools available in VLEs. In comparison with the main commercial vendor product, TOIA had some better features, QuestionMark Perception others.

Views were mixed on the user interface – some felt it offered a clear and intuitive screen, others thought that the user interface was a little complex and that it didn't follow the standard screen conventions of the time, although some of these earlier concerns were addressed in the revisions to the system and feedback to the development team. One interviewee felt that having someone on the project with more of an HCI specialism would have been advantageous, whilst recognizing that this was beyond the scope and resources of the project.

In addition a key feature of an assessment tool is the question of how it might scale up to large-scale use. Load testing is crucial in this respect and the interviews with the steering group suggested that the project did not engage in any large-scale load testing to assess the system capacity in this respect (although it should be noted that this was not one of the original deliverables of the project). These points do raise a wider issue; software development is complex and multifaceted requiring a range of specialized skills, beyond technical programming and it is questionable whether a small, short term, JISC-funded project will be able to ensure these skills are adequately met.

Interoperability also emerged as an important factor and indeed was one of the key aspirations behind the development of the system. Some users tested the exporting and importing of tests between systems and commented favourably on the QTI compliance of the system.

The project really was aiming to get a system working that got people using an assessment system. Has done that and I believe that a number of universities have used it where they wouldn't have done before. ...If the service had not been QTI compliant then their [users of the TOIA system] work would have been in vain but it's not a waste – therefore JISC need to be aware of this and the success in terms of QTI. [Int 6]

Some felt that the system was perhaps too sophisticated for the specific use their institution were likely to make of such a tool and that in fact the rudimentary assessment functionality available within most VLE tools was good enough for most purposes.

The college did attempt to use it but a major problem was time. There was a steep learning curve to get into it and in many respects there were quick and easier tools available that people could use. Maybe it was too sophisticated. There were other simple tools around at the time such as Hotpotato for example. [Int 4]

Perhaps it was too complex for a starter FE market.[Int 4]

With respect to this some of those interviewed felt that TOIA offered the potential for the community to try out an e-assessment tool without having to get institutional buy in or support. Part of this was access to a product which was simple to use and could be used for putting together fairly light-weight, quick tests.

So my drive for TOIA and what it should do – I was saying people need a light way of doing these things – they just need an easy way of trying things out, don't need everything recorded etc.[Int 5]

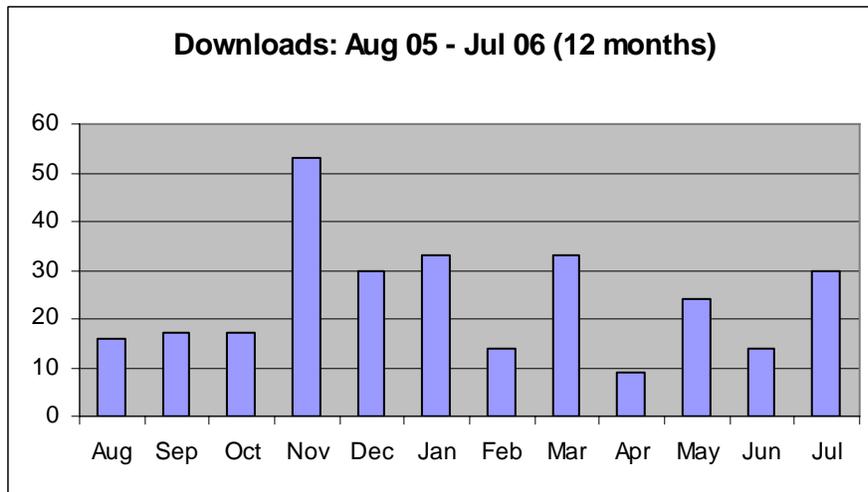
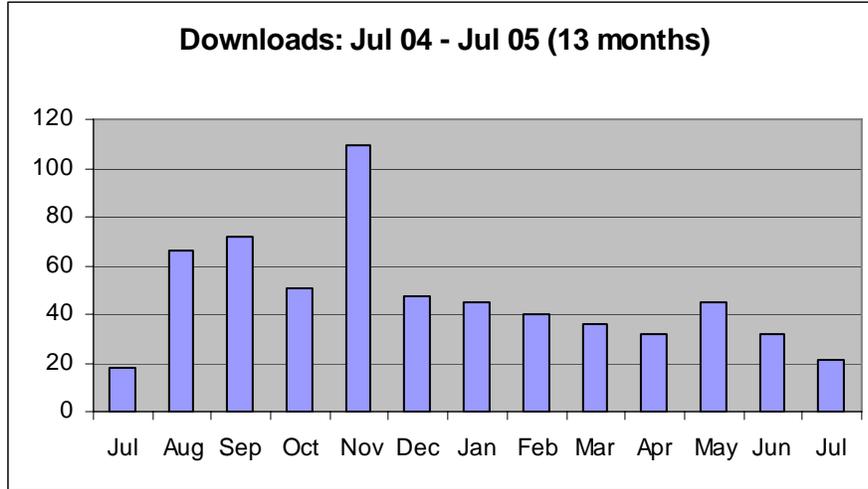
I was always keen that we should have an option in the system that was not over administered so that someone could use it easily without too much of a learner curve.[Int 5]

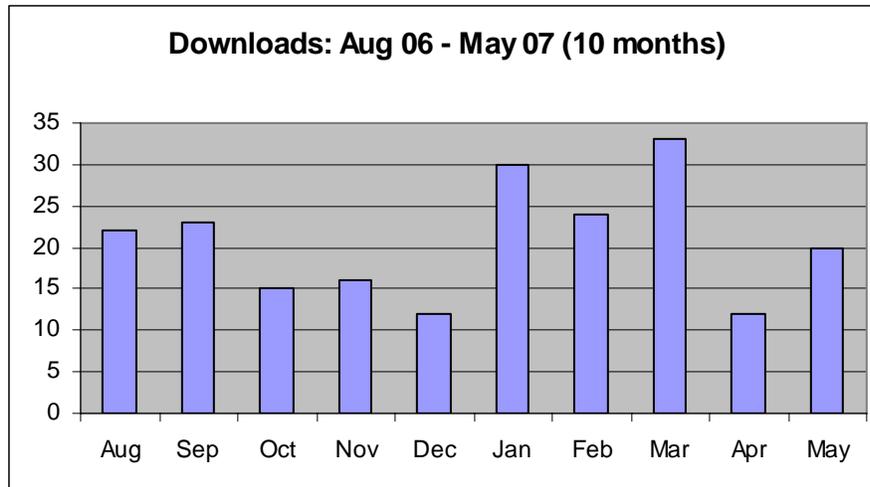
A number of those interviewed felt that (but did not have any supporting robust evidence) TOIA was potentially more scalable than other e-assessment tools and furthermore that it was less resource hungry.

Can log 1000 students in [to TOIA] without problems. We had 50 students logging in at one time and it was fine. Wouldn't even attempt to do that with Blackboard!![Int 10]

Usage

The figures below provide a snapshot of overall usage, illustrating the number of downloads of TOIA from July 04 - May07.





A number of case studies of use are worth expanding as they provide valuable insights into how TOIA was used across the community. Usage and uptake of the TOIA tools appeared to be relatively good across the sector, given the nature, timing and focus of the work. Dissemination activities across a broad range of channels and supportive local help seem to have helped to facilitate and mediate this uptake. In a detailed plan in September 2005 it was reported that:

The software has now been available for a year and has been downloaded 550 times in total – and is currently being downloaded, on average, once every two days. The amount of interest received from the HE and FE sector has been significant in demonstrating that our dissemination work has helped promote the use of online assessment and *interoperability* of assessment items - another key objective of the original TOIA Project.[toia_detailed_plan_v1 7(2).doc, University of Strathclyde Internal Document]

This indicated that there was significant initial interest in the tools developed by the FE and HE communities. Furthermore, feedback from the community also suggested that there was a potential demand from the community for a hosted service. In the February 2006 the TOIA biannual report to JISC, it was reported that [the TOIA system]

Was benefiting our community a great deal by allowing institutions to administer and run standards compliant online assessments to students without installing TOIA locally. We now have over 400 user accounts for the hosted service and this had led to collaborations between other projects who find it very convenient to share questions and assessments in the hosted environments compared with using their local versions

TOIA appears to have been used for a range of both formative and summative assessment activities, and also as a mechanism for storing and sharing discipline-specific item banks. Bristol University used it in a pilot with vet nurses. The students were distributed between their work place and the campus. Every fortnight the students would come back to the campus to consolidate their knowledge through a small-scale summative test. A cohort of ca. 24 students in each instance did a thirty-minute basic text-based test.

We used it aggressively for one year with the vet nurses – bi-weekly formative and summative assessment. Two weeks in practice and one day on site (lecture plus summative exam on prior lecture) and ran their final summative exam with TOIA that year.[Int 10]

In addition at Bristol, the Vet school have used the TOIA system as a backup engine (via the hosted service) to their primary assessment tool for the last three years and indeed have had to resort to using TOIA on two occasions in this capacity.

But use TOIA as a backup when blackboard was down which did happen twice. I liked TOIA, if I was clear of its future we would be using it in anger.[Int 10]

The University of Hull provides an interesting case study for three reasons. Firstly, they used TOIA for summative assessment purposes. Secondly they used the system to access a set of question banks for their subject area, developed in a parallel initiative funded under FDTL, the HELM (Helping Engineers Learn Mathematics) project (see <http://helm.lboro.ac.uk/>). Thirdly they choose to use the hosted service rather than download the tools locally to their own service. Hull used TOIA with 50 students in Engineering. Two electronic assessments were scheduled per year, during one of timetabled PC lab sessions so that students undertook the e-assessment tests under monitored conditions. TOIA was used to post an assessment with an allocated time limit for completion of the test imposed. Feedback from Hull was very positive on the use of the system, there were some minor logistical problems (students forgetting their TOIA passwords or machines being problematic in terms of loading TOIA) but overall little was reported in terms of problems. The tutor did however ensure that hard copy back ups were available as well. At Surrey University TOIA is being used in a collaborative project to host ca. 200 questions. Questionbank reviewers use TOIA to access and review the questions.

At other universities where the tradition was to focus on small-group tutorials as the predominant mode of teaching, there was an interest in using e-assessment tools for more specialized applications, such as assessment of higher-order skills or use of more open-ended responses. At the other end of the scale were institutions who were interested in the use of TOIA for large-scale summative assessments – particularly at level one or for assessment of more skills rather than cognitive concepts. The finished product has been customised by Liverpool Community College for use in the City & Guilds exams. A case study has been written up describing the experience and highlighting the perceived benefits of the use of TOIA.³

TOIA was also used by some to test out interoperability both as part of the JISC community and also to demonstrate the concept of interoperability to the HE Academy and its subject-based sector wide community in HE.

Conole and Warburton (2006) highlighted a range of factors which influenced the use and uptake of e-assessment and many of these were evident in the reasons cited for using TOIA as an assessment tool, such as the perceived benefit in terms of time saving through automatic marking of results.

Interestingly one interviewee felt that the relationship with the commercial partner may have put some people off using the system:

The “commerciality” of the system means that some sites were prepared to use it that might not have done otherwise.[Int 6]

However they also noted that some IT services were unlikely to favour the uptake and implementation of a system which was deemed to be developed by the community rather than through a professional development solution. These conflicting views illustrate that the decision to adopt a particular technical solution is far from simple.

Cambridge University has a very specialized need in terms of e-assessment and was interested in a product which could enable them to present complex assessments rather

³ TOIA: An effective way to assess and evaluation, City and Guilds Case Study, via personal communication with the TOIA project manager

than simple MCQ-type tests. In addition Cambridge runs a major diagnostic entry test for students, ca. 1000 students per year. Cambridge did not find a commercial offering which met their needs for this purpose so ended up developing their own bespoke system used solely to run these diagnostic tests.

Comparison with other e-assessment tools

A number of other key e-assessment tools were mentioned. Not surprisingly there was significant use of QuestionMark Perception, the main commercial e-assessment product available in the UK, as well as the e-assessment tools available within institutional VLEs such as Blackboard or WebCT. Free products such as Hotpotatoes were also mentioned. Others mentioned institution specific tools such as Merlin, for more general assessment purposes. Merlin is a product similar to Firstclass which has been used for posting assignments and enabling students to access assessment, these are then manually marked and returned electronically to the student. STOMP a product from the TLTP-funded programme was also mentioned. Other e-assessment tools mentioned included TRIADS, Respondus, Pearson tools, Promisor, QUIA and in-house developed products.

Many of those interviewed and surveyed using the e-assessment functionality available from their institutional VLE. WebCT and Blackboard both featured significantly in the responses and uptake of VLE tools (and more specifically the e-assessment functionality) was in general patchy across institutions, mainly driven by bottom-up enthusiasts and local interests rather than strategic drivers. Interest was often driven by a particular academic need or discipline problem such as assessing first-year students, diagnostic needs or drill and practice for professional requirements. Several of those who responded undertook a comparison of TOIA against other assessment tools; some looked at TOIA because they had run into problems with their existing tool, or wanted more extensive functionality than that offered by the basis toolset in their VLE:

First tools used here was webct used by vets and they liked it and then larger scale decision was made to use blackboard for other reasons not popular with vets because e-assessment tools not good but electronic engineers still used webct. About three years ago people were doing quite large scale assessments with blackboard but ran into problems and once ran to a halt with 40 students. So we were looking for alternatives and were aware of limitations of blackboard. [Int 2]

Evaluations tended to cover a different set of e-assessment tools depending on the local criteria and primary purpose of the evaluation. Tools evaluated included: QuestionMark Perception, TOIA, Blackboard, WebCT, TAL, QP, MAPLE TA, STOMP, TRIADS, and Hotpotatoes. In most cases the evaluations were inconclusive – no one tool appeared to be significantly better than the others and TOIA certainly appeared to have a lot of very good features.

Conclusion was that none of them were quite enough for various reasons.[Int 2]

Liked the [TOIA] system and the features very much. ... we were extremely impressed by the features, it seemed to be a very good product.[Int 7]

Both the interviews and survey results highlighted positive and negative aspects of the functionality available within TOIA and inevitably the responses elicited a long wish list of improvements depending on particular needs and interests. At the time in a number of respects TOIA appeared to have a number of distinct advantages over the main commercial offering or the e-assessment toolset available in most VLEs. For example it had better features than Blackboard for summative evaluation and provided a cleaner interface. The following quote illustrates some of the very specific issues raised:

Downside there seemed to be only one images folder and so images with same name overwrite each other and didn't tell you... quite off putting. [Int 2]

For some there was steep learning curve in terms of getting to grips with the tool and its associated functionality.

During the first year got a lot of help in getting used to the system.... TOIA was good once I worked out how to use it. [Int 1]

Admin point of view not bad but a bit of a learning curve but once you understand is ok. [Int 2]

However it was also commented on by several of those interviewed that the system provided a clean and simple interface for students.

Students took to it readily though and appeared to like doing tests at the computer [Int 1]

Criteria used in the comparative evaluations of different e-assessment tools varied but included: functionality, support, robustness, security, cost and reliability. However given the special nature of the product (namely as the output from a JISC-funded project), an additional key criterion was around the issue of sustainability of the product once funding has stopped. Indeed this seems to have been one of the crucial decisions by a number of institutions **not** to choose TOIA as their assessment tool.

Didn't want to pilot TOIA [because] we were unsure about its future because our experience of it was we quite liked it whereas QP is well supported and a safer bet. [Int 2]

Looked at TOIA very seriously – really liked the product and the features but decided against going with it because there were issues in terms of its longer term viability and whether or not it was sustainable post the project completion. Asked whether there were any plans to make the code available to the HE community – would have liked to have seen it as an open source product... Were concerned therefore also about the long term viability of the system and hence this heavily influenced the decision not to use it. [Int 7]

Some more specialised issues were raised, such as the use of generic e-assessment tools for different discipline specific needs. One interviewee for example raised a concern about the appropriateness of TOIA for language-based assessment and suggested that there was a perception that the functionality available in TOIA was too limited for these purposes.

Scalability and robustness clearly are critical when evaluating potential e-assessment tools, particularly if the plan is to use them for summative, high-stakes assessments. Views varied on the robustness of the system – some of those interviewed echoed the comments made in the survey about TOIA occasionally being 'flaky', however it is unclear to what extent these are just perceptions and it is unlikely that many (if any) of those interviewed and surveyed did an extensive technical testing and comparison. In TOIA's favour there was a view expressed by some that it may well have been more capable of supporting large-scale simultaneous assessments. One interviewee voiced a concern that at the time they were having problems with the main commercial offering in terms of scale up and that in his view TOIA appeared to be able to run more students with fewer hardware requirements – although it is important to stress that this cannot be validated and is only an opinion.

The partnership with a commercial company rather than adoption of an Open Source solution influenced some in their decision not to use TOIA.

When we assessed it looked at what it could do, can we see it, touch it, play with it and what life would be like if we started to use it. It was there that we ran into problems, although it was free it wasn't clear what would happen if further developments were required and how that would be

handled and what would be the cost implications associated with that. It seemed to be part of a broader proposition [i.e. the development] of a commercial VLE. We were already exploring the open source option at that time and it wasn't clear how TOIA would fit in with those. And so it seemed like a large of trouble for not a very clear future and the lack of clarity about the future was probably the critical issue for us.[Int 7]

For those who were engaged in fairly large-scale e-assessment activities in reality TOIA was probably never really a viable option, because these institutions had already made a significant commitment (and investment) to an existing commercial system.

Didn't intend to put [TOIA] into production because already had a resilient QMP system in place, to replace that would have costed a lot of in house resources.[Int 3]

A number of those interviewed expressed disappointment that there was no clear exit strategy for the project (an issue as much for JISC as for the project itself) and that this was a missed opportunity as essentially it was a good product. Other concerns raised concerned the perceived lack of clarity of the role of the commercial partner and hence the impact on the product in the longer term and the lack of cross-platform compatibility. For many therefore it was safer to go with the well established commercial offering, QuestionMark Perception.

TOIA support

The TOIA team provided support on the use and implementation of the tools through three main vehicles; via direct support from the central team at Strathclyde (mainly through telephone and email support), through tool documentation (available from the TOIA web site (available at <http://www.toia.ac.uk/docs.html>) and through a set of JISC-sponsored Netskills workshops on e-assessment.

Those interviewed were very positive about the general level of support provided by Strathclyde University on using the TOIA products. They said that they were provided with general advice and guidance on using TOIA as well as more specific back up support when large-scale assessments were run with students. Clearly this directed and individual support was deemed extremely valuable and contributed to the perception of those using the system but it does raise questions about the longer term viability of such a level of support and how it might be funded.

We ran it [the TOIA tool] at Strathclyde and communicated a lot with Jalshan and let her know when we were running tests and most of the time they were able to provide support and be there – great for pilot but sustainability issues longer term. [Int 2]

[Contact with TOIA team was] Mainly phone and email – mainly through Jalshan – she has been great. She has gone the extra mile to help out when we had panics. Support aspect is very important. Particularly when we don't have full access to everything. Any system like this needs good support... Support was excellent – spot on, couldn't complain.[Int 10]

The transition from developmental projects to national-level support services is a well known and long standing issue for JISC and a number of models have been tried over the years; this ties in with the current review of some of the JISC's portfolio of services, which includes a review of their associated governance.

In an attempt to provide a more strategic approach to training and support for TOIA, JISC appointed Netskills to develop and run a series of e-assessment workshops, which ran for over two years. Netskills is one of JISC's advisory services and offers a range of training and support functions including a suite of workshops to illustrate the pedagogical and technical aspects of a range of technologies. The Netskills team liaised with JISC and the TOIA team through a series of initial meetings to establish requirements for the

workshops, the project manager for TOIA and the JISC programme manager also attended some of the workshops. However there was some concern raised that these wasn't as productive or targeted as it could have been and some in the project team voiced a concern that the workshops were too generic in nature. The aim was to help raise the profile of TOIA but also more broadly to capacity build across the sector in terms of the use of e-assessment. Therefore the workshops were designed to provide a solid introduction to e-assessment, using TOIA as a hands-on practical demonstration. Part of the aim was to demonstrate interoperability, which the TOIA product was particularly strong on. A range of both regional and targeted workshops were offered. Netskills ran 33 events (23 public, 10 onsite for individual organizations. Feedback was received from 254 delegates. The overall 'satisfaction rating' for the events was 4.3 (out of 5), although it is important to stress that this was for the overall workshop which was generic in nature (in terms of e-assessment), rather than being specifically about TOIA. The workshops mirrored the advantages and disadvantages of the system summarized from the survey results. Perhaps most importantly attendees at the workshops did not necessarily see the overarching benefit of TOIA in comparison with other e-assessment tools.

One of main conclusions people came to was they were not sure why they needed [it]. Most people wanted to do fairly simple things in terms of e-assessment. Although TOIA is interoperable, VLEs are not necessarily... I think it was generally well received but people left feeling do I really need this system?[Int 9]

The TOIA hosted service

The TOIA project received additional funding from August 2006 to further develop the TOIA system and to continue to host the TOIA service. A primary function of this extension was to explore the introduction of the *hosted TOIA service* – based at the University of Strathclyde. It was perceived that such a hosted service would be beneficial to the CAA community by allowing institutions to administer and run standards compliant online assessments to students without installing TOIA locally.

One of the unforeseen consequences of releasing the TOIA system was that it created a demand for a (potential) **hosted assessment service**. Initially the project team envisaged that most institutions would wish to install the software locally but during the early stages of the project it became clear that many institutions appeared to prefer to outsource their online assessment service. The team began to receive a number of queries about the possibility of a hosted service and although this was never envisaged as part of the original project plan, the project team began to see that this was something worth exploring.

We wondered in phase one whether there would be a demand for a hosted service ... Some feedback suggested users wanted to use it but having the hosting and maintenance done by someone else, so saw a potential [for a hosted service]. [Int 13]

The concept of a hosted service was also of interest because there were a number of examples of commercial vendors offering hosted services for various products and hence it was of interest to see what issues might arise from setting up a hosted assessment service and whether it would be financial viable and of enough interest to the sector. Therefore, as the following quote illustrates from a member of the steering group there seemed to be enough interest and potential in the idea of a hosted service to explore further:

I think there are hosted services out there – QMP for example do that from a server farm in the US. So there is probably a market for it. One could imagine that schools and FE sector through their limited resources and structure might see that as a better solution for them in terms of budget limitations and planning and perhaps joining a peer club. Falls in line with QCA vision statement and work coming out of Becta. I imagine awarding bodies would be interested and

Research Machines (RM) probably interested. In university sector I had demand in early stages of TOIA and we still see universities spending a lot on commercial license etc to run their own e-assessment. [Int 3]

The hosted service was free for the duration of the project and was used primarily in four main ways;

- a) to run formative and summative assessments for external institutions,
- b) as a medium for training colleagues on e-assessment, TOIA and interoperability,
- c) for evaluation purposes – by colleagues who are looking at different CAA systems,
- d) by teachers who wish to work with QTI items – e.g. to create item banks.

Those who used the hosted service were very positive about it and on the whole supportive of its continuation. It was viewed as a good solution to enabling a good system which had been developed by one institution being made available for use by others across the sector.

Very good starting point especially for colleges to evaluate a tool and decide whether they should be used in anger.[Int 4]

I think its an excellent idea because anyone can go and use it – don't have to get it set up or argue with computer service etc and fits with the web 2.0 idea – i.e. good software is distributed and students are increasingly familiar with the idea of being pointed to services elsewhere. [Int 5]

Think it's an excellent idea if there is a demand. Personally thought there was a demand from people on the workshops. They often asked what happens after the project is funded.[Int 9]

I think it's been a good thing. There is a lot of mileage in it still. Lots of universities are investing in one VLE – but this [TOIA] lets us have a back up service, also having something that is robust and reliable... I think if it was properly supported and funded the viability would be very good... Blackboard is quite limited in terms of e-assessment, QuestionMark is expensive, we run 19 summative exams now here and the rest of the university is only running 3. People are scared of running high stakes e-assessment and don't have the support they need... Again could be a potential benefit of a hosted service.[Int 10]

However when asked whether their institution would be willing to pay for such a hosted service, the responses were less favourable.

No I don't think they would be prepared to pay – they would say "what's wrong with QM and Blackboard?" The answer is all to do with item banking and sharing of questions etc but they will say no one is trying to do that – chicken and egg situation. A hosted service could be a back door route to a subject-based item bank for languages, computer science whatever, It's a route for been able to do these things and I am still convinced item banking is the crucial issue, i.e. sharing of questions.[Int 5]

Overall most felt that their institution would either be unwilling to pay for a specific e-assessment hosted service (arguing either that basis tools providing through the institutional VLE would suffice most needs or that there was not enough demand across the institution for large-scale uptake and use of e-assessment). And as the following quote illustrates there are a number of complex and inter-related issues:

[Idea of a hosted service] Difficult opens up old chestnut of cost and value for money for e-learning offerings do institutions understand real costs and is there any real cost benefit? ... Institutions now do see e-assessment as something necessary. In my experience following set up it costs ca. 6K for software license and in house staffing, hardware 35-40K lifetime 3 year therefore 17-18 K per year without human cost. What would a hosted service remove from this? Clearly hardware costs and license as well as in house server and database management. So probably a great deal. The business case could be put together and if done well I can imagine a

hosted service being utilized across the JISC Sectors. The e-Framework should be considered and the reference model for assessment (FREMA) should be expanded to consider these issues. The schools and FE Sector should be monitored / engaged with and this might be something that the National e-Assessment Advisory Group would have a view on.[Int 3]

Others felt that their institutions might be willing to pay but that the cost would need to be minimal - in the order of hundreds rather than thousands of pounds. They were unconvinced of the additional benefits a hosted service might provide (back up security, general advice and support, training). In this respect as the following quote illustrates in comparison to providing an in-house solution there are clear advantages to a hosted service.

If you look at the overall costs the idea of hosting is beneficial. Offers advantage that responsibility elsewhere, don't need to maintain or update, have fixed fee can budget for and takes burden away.[Int 13]

However the same interviewee also recognized that if e-assessment was enough of a strategic priority then they were more likely to want to run their own service and that a hosted service might not be totally trusted. This issue of trust is key and indeed it may be difficult for an individual educational institution (as opposed to a commercial outfit) to build the respect and reputation in terms of being a reliable hosted service. A number argued strongly that JISC should continue to support TOIA as a free service as part of its portfolio of offerings to the community. One suggestion was that the Regional Support Centres could host it.

In addition, given the specialized nature of e-assessment it is questionable whether there would be enough of a market to justify a hosted service.

In retrospect whether CAA is big enough market is another matter. CAA is huge in some small fields – eg exam boards, but not a main stream activity in HE and FE. Did we have limited take up because of lack of demand or lack of good marketing and promotion? Don't know – maybe both. [Int 13]

However it may also be that e-assessment has not yet penetrated across the sector and that once there is wider scale adoption there may be more of a need for a hosted service.

But I think the market will grow, don't think e-assessment has come of age yet. Automated marking benefits will become clearer – particularly for schools, FE and basic HE. [Int 13]

This raises questions about the positioning of short-term funded projects in two respects: if successful how is the product then maintained and updated after project completion and who should be responsible for funding this and for how long?

IPR emerged as an issue in relation to the host service. By its nature the hosted service means that student data from one institution is residing on the software controlled and owned by another institution. This raises a host of issues around IPR and service level agreements. Institutions who trialed the hosted service appeared aware of these issues to some extent and appeared to have found short term “work arounds”, such as getting the students to sign disclaimers saying that they were happy for their data and material to be hosted on a machine external to the institution in which they were studying. However, clearly if the intention was to scale the hosted service up this issue would need very careful and close scrutiny. Although this issue is not new and is arguably particularly prevalent now with the massive uptake and use of distributed social software in FE and HE, it is particularly pertinent as an issue in relation to assessment given assessments critical role and function in the teaching and learning lifecycle.

I think there were a great deal of issues in terms of legal issues, data protection, service level agreements, use of Janet, bandwidth issues, hosted service capacity issues and hardware configurations to support load, etc. [Int 3]

The conclusion which can be drawn from the evaluation is that if a hosted service is to be continued a significant body of work needs to be carried out to develop a more robust IPR framework and service level agreement between the host institution and those using the system.

Views on continuation

Of the individuals surveyed and interviewed those using the TOIA system were very pleased with it overall and were keen to see it continue in some form or another:

Used it for two years and was delighted when they had extension for another year. Would have caused a problem if they pulled the plug [Int 1]

However an overarching theme to emerge from the interviews and the survey was the issue of credibility. Many choose not to use TOIA because they were unsure about its status and long term sustainability. As discussed in the section on the survey results views were ambivalent about the value and potential uptake of a hosted service, and the factors which would influence an institution's decision with respect to this are complex and not simply related to direct costs. Nonetheless the interviews point to suggestions that there may be a demand for a hosted service, however this is far from conclusive and if such a hosted service were to be considered a much more detailed and robust market analysis and business plan would be needed.

[There is an] Issue re: credibility – if there was a credible assessment tool and JISC said that they would continue to support it and continue to develop it (doesn't have to be cheap) I reckon there would be a demand for it.[Int 2]

The interviews highlighted the fact that the cost of the main commercial product was not cheap – in the order of an initial investment of ca. £25K and annual maintenance costs of ca. £4-5K. Therefore on the surface a hosted service of under £3K might appear very attractive for individual institutions, however as discussed elsewhere, pure monetary considerations are not the only issue and it is a balance of an institution's investment in a hosted system versus what is already available within their VLE toolset.

This does raise an issue for JISC in terms of continuation. It is evident from the evaluation that the TOIA project has raised the profile of e-assessment across FE and HE. However in doing so it has also raised expectations, in terms of the provision by JISC of a free e-assessment tool and although the numbers of people using TOIA in earnest are not high, JISC needs to manage the process of completion of the project carefully. The dual focus on promotion of TOIA whilst demonstration of interoperability was adopted precisely to ensure that an over dependence on one product did not occur. However, despite the success in terms of implementation of TOIA with QTI the remainder of the e-assessment developers and vendors has been slower to implement full QTI compliance with anger. There are also issues in terms of current users of the system as the current quote illustrates and a suggestion that it could be incorporated into the JISC portfolio of service.

There are a number of people using it at the moment and until they stop using it, it should be maintained. Impossible to predict what people will do because don't know what new systems will come out, particularly because it is not that expensive to maintain. [Int 6]

Another recurrent issue which emerged was the fact that TOIA was not produced as an open source product and many expressed the view that if it had been then it might have had more chance of being taken up and sustained by the community.

TOIA is now not open source and it might have had another life if it had been.[Int 5]

However, as one of the interviewees noted, this criticism is a little unfair in that the Open Source movement in the UK was only really beginning to take off during the lifespan of the project.

Also unfortunate that when TOIA was funded the open source movement hadn't quite taken off and neither had the e-Learning Framework (now the e-Framework) or related underlying technological approaches of SOA.⁴ Shame that TOIA was not open source and that was its major failing. The community would level that as a criticism of the project and I think that is unfair and was a consequence of the timing of the project. The trend is now towards Open Source of learning technologies as evidenced by the changing trends in the VLE Market.[Int 3]

It [the TOIA project] was just at the tipping point for this [development of Open Source software] with respect to JISC. We would have preferred to do open source as product would have had a longer lifespan. [Int 13]

However one interview also felt that although the product wasn't Open Source it did raise the profile of Open Source:

Technically the tool work and satisfied objectives and raised the profile of online assessment. Although not open source it did raise the profile of Open Source as it made people recognise that just giving licences to commercial companies wasn't the only option, there were alternatives – it demonstrated a free tool that anyone could use via the JISC community. [Int 4]

The reasons cited for adopting an Open Source approach mirror the wider community perspective on the benefits of adopting an Open Source approach (Raymond, 2000) and included: community ownership, and the ability to take, adapt and develop.

An interesting issue to emerge from the interviews is the question the TOIA project raises re: the balance of JISC-funded developmental projects versus services for the community. Partly because of working with a commercial vendor, the TOIA project achieved its primary objective of creating a comprehensive e-assessment tool very quickly; however this raised expectations within the community in terms of the product. Some interviewed felt that JISC didn't capitalize enough on the initial success of the project and didn't think through enough how the work might have been aligned with other e-assessment activities occurring across JISC and beyond.

My general feeling is that JISC didn't follow through with a project that was in a good shape at that point.[Int 5]

Recommendations

A number of key recommendations are evident and of relevance to a number of different stakeholders – in particular the JISC.

1. The issues TOIA raises about the benefits and issues associated with Open Source developments – JISC should continue to explore different and appropriate technical development models with a focus on ensuring sustainability.

⁴ SOA Service Orientated Architecture

2. The TOIA project represented an interesting model in terms of exploring the potential of projects working with commercial partners and outsourcing technical developments – JISC should give some considerations to this as an area worthy of further exploration.
3. The project raised key issues about the sustainability of projects which involved technical development. The project can be deemed to have been a success – having produced a high quality product within a short time, but the overall conclusion from the evaluation is that one of the main barriers to uptake and use was a lack of clarity in terms of longer term viability and support for the project. JISC needs to think carefully in terms of future technical developments and clarify the intended purposes of such projects within the broader framework of JISC activities.
4. A point related to 3 is that TOIA raised an expectation in the community in terms of production of a free product without any clarity of the longer term availability of the service – future projects should address this issue of management of community expectations at an early stage.
5. A key lesson for JISC is the value of projects like TOIA in terms of proof of concept and capacity building within the area of e-assessment.
6. Another key outcome was the way in which TOIA inter-related with other assessment projects at the time and acted as a spring board for future activities in the area, which provides a useful model which is worth exploring for future programmes to ensure there is maximum benefit and connections between different aspects of JISC work.

Conclusion

The TOIA project is an interesting case study for a number of reasons. On the surface it was a project which was successful when judged against the original project objectives. However as is often the case with good innovative development projects, it raised as many issues as it resolved: what is the appropriate balance of in-house, commercial and open source developments, how should uptake of use be encouraged across the sector and to what extent is this the responsibility of the project, the funder or the sector more widely, how should funders manage the process of individual projects within programmes and a wider national strategy given the known volatility of such projects and the dependence and importance of local visionaries and champions?

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Appendix A: TOIA Survey Analysis

The analysis below was drawn from the 39 responses received from individuals who responded to the TOIA On-Line Survey (table three categorises the respondents by job title).

The respondents

Table three	
Job Category	Number
Learning Technologist /Educational Technologist/ E-Learning Development Officer / CAA Specialist	9
Lecturer	6
Senior or Principal Lecturer	4
Learning and Teaching Officer or Senior Officer or Fellow / Curriculum Developer	3
IT Manager or Director	3
Learning Resources or Media Manager	3
IT Officer/Programmer	2
Evaluation Coordinator / Qualifications Manager /	2
Manager from Support body (e.g. TechDis, SQA)	2
Senior Manager	1
Other / Unknown	4

Table four gives an indication of the success of the communication and dissemination of the project and highlights the different ways in which individuals became aware of TOIA. By far the most common means of hearing about TOIA was via JISC – either through meetings or the website. However conference presentations also appear to have been valuable. Not surprisingly a significant number heard about it through a colleague.

Table four

Category	Number
JISC (JISC Meeting / JISC Event / JISC Website / Through involvement in other JISC Projects)	13
CETIS Network	2
JISC's Regional Support Centres	1
At a Conference (e.g. CAA, ALT-C)	5
Through researching CAA (on the web or otherwise)	3
Heard for the first time through this survey	5
From a colleague or other unit with own institution	7
Don't know / can't remember	3

The level of e-assessment expertise (in terms of either creation of questions or development/deployment of e-assessment systems) varied but approximately two-thirds rated themselves as 'experienced' (24, 62%), with most of the remainder describing themselves as 'reasonably competent' (13, 33%), only 2 (2%) considered themselves to be novice. This bias towards more experience users is not surprisingly given the sample that the survey was sent to. However clearly it is important to bear this in mind in terms of interpreting the results. Given this population it is perhaps surprising that 22 (59%) reported that they never used an e-assessment system, with a further 14 (38%) stating that they only used e-assessment occasionally and only 1 person (3%) indicating that they used e-assessment regularly. Sixteen of the respondents (41%) said that they had never used the TOIA assessment system, but just over half (20, 51%) had used it occasionally and 3 people (8%) used it frequently.

Features of TOIA

There are two key uses of TOIA: to author questions and to deliver assessments. As indicated above only 23 of the respondents had actually used the TOIA system. Of these 20 (87%) out of 23 experimented with the system to create questions and 8 (35%) out of 23 used the system to deliver assessment to students. Other features of TOIA that respondents said they used included:

- Creating accounts, reports,
- Non Authenticated Schedules Generating word versions from assessment previews,
- Evaluation of TOIA as a potential system in comparison with commercial products such as QuestionMark Perception,
- Ability to introduce custom Java question types,
- Item-banking features and their structure,
- Meta-tagging, item-banking.

Table five gives an indication of the spread of usage of the different types of questions available in TOIA. At least one respondent noted that they were answering this question in relation to any type of assessment tool, not just TOIA, so these results need to be interpreted with some caution. Given that (for example) 29 respondents noted that they used the multiple choice questions either frequently or occasionally and only 23 claimed to have used the TOIA system, we might conclude that a number were answering in a general context rather than in relation to TOIA.

Table five				
	Never	Occasionally	Frequently	Total Number
Multiple Choice	6 (17.1%)	14 (40.0%)	15 (42.9%)	35
Multiple Response	9 (27.3%)	7 (21.2%)	17 (51.5%)	33
Pull Down Lists	8 (25.0%)	18 (56.3%)	6 (18.8%)	32

Fill-in Blanks	9 (27.3%)	19 (57.6%)	5 (15.2%)	33
Matrix	14 (45.2%)	11 (35.5%)	6 (19.4%)	31
Essay	20 (62.5%)	6 (18.8%)	6 (18.8%)	32

Table six outlines the spread across the three main usages of TOIA: for computer-marked assessment, for tutor-marked assessment or for creation and delivery of surveys.

Table six					
Type of use:	Number of responses			Percentages	
	Yes	No	Total	Yes	No
Assessment Purposes (where the system marks the answer)	16	20	36	44.4%	55.6%
Assessment purposes (where the teacher marks the answer)	2	31	33	6.1%	93.9%
To create and deliver surveys	4	29	33	12.1%	87.9%

Only a very small percentage of those surveyed were using TOIA as their main computer-based assessment tool (3, 8%). These were: Hartpury College in Gloucestershire, New College at Oxford University and Liverpool Community College.

There was quite a spread in terms of which assessment tools were being used across the community; the main commercial product, QuestionMark Perception, not surprisingly, featured prominently (12 out of the 39 respondents). A number were using the assessment tools within their institutional VLE (Blackboard – 3, Moodle – 2, WebCT – 2). Two were engaged in in-house developments, 4 were still evaluating different systems before making a decision and for 5 of the answers it was unclear what they were using. Table seven provides more detail.

Table seven	
Response	Categorisation
At this moment there is no assessment platform in place (yet), currently we create questions in Articulate quizmaker.	ARTICULATE QUIZMASTER
Blackboard	BLACKBOARD
Blackboard assessment tools (Enterprise version 7)	BLACKBOARD
VLE assessment engine (Blackboard)	BLACKBOARD
My own program, developed at Bolton, helped by an LTSN (HEA) miniproject grant	IN-HOUSE
STACK, http://www.stack.bham.ac.uk/ and AiM http://mat111.bham.ac.uk	IN-HOUSE
None at present looking at possibilities moodle and hot potato	INVESTIGATING
Still looking at them all	INVESTIGATING
Trialling as many as possible	INVESTIGATING
We are starting a VLE project and are aiming to use the Moodle assessment functionality, with the hope that TOIA will be integrated	INVESTIGATING
Moodle 'Quiz' activity	MOODLE
principally moodle assignments	MOODLE
MS Access	MS ACCESS
QuestionMark Perception	QM PERCEPTION
QuestionMark Perception	QM PERCEPTION

QuestionMark Perception, Speedwell/OCTAVE database- near completion	QM PERCEPTION
Question Mark Perception VLE (Bodington)	QM PERCEPTION
QuestionMark Perception and CP3 and Moodle.	QM PERCEPTION
QuestionMark Perception	QM PERCEPTION
QuestionMark Perception	QM PERCEPTION
QuestionMark Perception and Moodle quiz tool.	QM PERCEPTION
QuestionMark perception, Bb quiz engine	QM PERCEPTION
Questionmark Perception, MapleTA and WebCTVista (University is about to make a decision whether to support all three or just WebCT	QM PERCEPTION
QuestionMark perception, VLE assessment function	QM PERCEPTION
Questionmark Perception, WebCT quizzes, In-house custom web pages some with SQL Server connection.	QM PERCEPTION
Survey monkey its quick and easy and only \$20/month. QuestionMark Perception looked too 'fussy'. Haven't had time to explore TOIA, its on the list also require MAC compatibility VLE (studynet assignment system for essays) it integrates with student records - also permits anonymous marking WISH LIST simple item banking easy compatibility with mathML	SURVEY MONKEY
TRIADS	TRIADS
Embedding multimedia tasks in VLE using VLE self marking quiz	UNKNOWN
A wide range incl. BTL, QuestionMark Perception, Pass-IT and R2Q2	VARIOUS
PASS-IT, VLE Assessment functionality, email, wikis.	VARIOUS
QuestionMark Perception and home grown	VARIOUS
Respondus and / or WebCT vista	VARIOUS
SToMP for use with students, SToMP and TOIA together for reviewing	VARIOUS
VLE both WebCT and recently Moodle (experimental)	VARIOUS
Weblearn/Bodington	VARIOUS
WebCT	WEB CT
WebCT Vista VLE assessment engine	WEB CT

A number of key advantages were cited for TOIA. Firstly that it was simple to use. In general the perception was that the system was simple and easy to use with an intuitive interface. Secondly the fact that it was free was a major advantage for many; however one respondent at least was under the impression that the software was both free and open source. Coupled with this the fact that it was web-based and hence available regardless of location was deemed beneficial. Thirdly, standards compliance was cited as a benefit, as it was perceived to offer greater flexibility and enable interoperability. Fourthly, because it was free and easily available it enabled institutions to trial the use of an e-assessment before having to commit to buying a particular system. Fifthly, the system was deemed to have a good level of functionality without being overly complicated and compared favourable, against other e-assessment tools. Table eight gives a selection of quotes. Two of the respondents felt there were no particular key advantages to the system.

Table eight

- Currently free hosted service for HE colleges
- Lack of cost
- Free, reliable, available regardless of location, QTI compliance
- Price
- Extensible, cheap, does what it says on the tin
- Extreme flexibility, money and labour saving
- Completely online, nice lay-out, item banking options, QTI compatible
- QTI specification (not tied to production format), web-based (no client install), quit some management capabilities
- Open, Standards compliant
- 'Flexible in terms of building in accessibility features
- Ability to shape the development of the system
- It's free. It provides assessment management for those not using VLE's or who have limited VLEs Its relatively easy to install and maintain. Gives a good range of different question types and assessment control I like the publishing options (authenticated/non authenticated)
- It offers the possibility of e-assessment to institutions which do not have a VLE with the associated assessment function
- Good degree of functionality in return for not too high level of complexity
- More flexible that the Boddington offer. (and looks a bit nicer, with control over the styling etc)
- 1. ease of use 2. robust 3. ability to easily add marks from paper assessment to yield a complete spreadsheet of a Unit coursework results 4 timed receipt to student and lecturer 5 link to Turn it In anti plagiarism for essay type assessment 6. Free or low cost institutional licence funded by JISC
- Important features for Lboro Scaleability Robustness Author and Participant friendly Ease of use
- Free - our uni pays for a VLE -wouldn't buy in anything else
- A promising platform !
- Easy to learn. Exports questions with proper attribution. Imports questions from published sources. Supports community around it. reliable, dependable, lockable (no other windows), randomises
- Good range of question types that are useful to lecturers. Rich reporting systems. System which is developing according to lecturer's needs (we are still discovering useful features!).
- Great system and service that has been very useful. In the sciences we need some of the features of QTI v2 - e.g. randomised numerics.
- A good way to introduce institutions to the joys of CAA without breaking the bank.
- A most useful service
- I wish I had known of it earlier: will try it.
- Pity did not hear about it earlier!
- See above Jalshan has been incredibly supportive and helpful well beyond the call of duty Some questions were left blank because there was not an appropriate choice - I have been forced to fill them in so accuracy of survey compromised.
- To bad, the project stopped.

Despite the positive advantages cited above, a number of critical disadvantages were noted. However it is worth noting a word of caution when reading these. It is unclear from the data returned from the survey to what extent this views represent individuals who thoroughly user tested and evaluated the system or not. Hence the views may be based on a fairly cursory look at the system and potential.

These can be grouped into five main themes: robustness of the system and compatibility, functionality/look and feel, complexity vs. ease of use, interoperability and lack of sustainability. Some of these are very specific and related to the user interface however others are more substantial in nature.

Table nine
<p>Robustness of system and compatibility with browsers</p> <ul style="list-style-type: none"> • As it only works in Internet Explorer it does not present a satisfactory alternative to commercial systems. Code flaky in places Need to pay for interesting question types • Browser incompatibility (it can only deliver assessments/surveys on Internet Explorer 6 or later). This issue has completely stalled its potential use, particularly for surveys. Other disadvantages include unresolved technical issues (SQL installation, autoupdater), lack of VLE integration, lack of compliance with other standards (SCORM) and usability issues (user-friendliness, flexibility, system error workflow) • Extreme unreliability. Poor documentation. Difficulty in setting up. Serious bugs • The advantages listed in earlier question - QTI specification (not tied to production format), web-based (no client install), quit some management capabilities... do not work properly in all cases this works properly (broken connections), offline assessment still is required • The interface is actually nicer and easier for academic staff than QM but the system is not particularly robust or secure • In my opinion the TOIA project missed an opportunity to deliver an useful tool. Unresolved technical issues, lack of browser compatibility, lack of VLE integration and lack of adoption of more widely used standards have resulted in making the system marginally usable. <p>Functionality / Look and Feel</p> <ul style="list-style-type: none"> • No formative feedback • Shallow MCQ and similar questions predominate • Not many question types included • Duplicates quite a lot of functionality we already have. Looks as though incorporating user credentials from another system may not be straightforward • Unable to scroll down once viewing question if image large. forward buttons at bottom of page • The question bank aspect is OK for single users, but probably not for many users to share questions. <p>Complexity / Ease of Use</p> <ul style="list-style-type: none"> • I have used question mark and webct assessment engines over the last years at different institutions. I trialled TOIA to see how easy it was to use. I found it more complex than both of the above - there seemed to be 5 stages instead of the normal 3, excluding adding the students 1. create questions in database 2. move questions to test 3. schedule test with TOIA besides scheduling there was an additional publish stage also one had to add students - but that was acceptable • Far too inflexible • Internal structure takes time to understand. Creating accounts - need better batch system <p>Interoperability</p> <ul style="list-style-type: none"> • Having to add participants manually - it would be a lot better if TOIA could use active directory. Its not very interoperable in the sense that it would be good if TOIA was SCORM compliant - I'd like to be able to export an assessment and import it into SCORM compliant VLE

- Lack of integration with Moodle
- My understanding is that TOIA does not as yet integrate with in particular Moodle and therefore the additional question types available in TOIA are not available 'through Moodle'. Most institutions are trying to move away from a multiplicity of software that deliver different functions to reduce the training overhead for staff and to make the accessing of content, assessment, social networking tools etc as seamless as possible for students - at the end of the day we trying to encourage as many of our staff and students to buy in to e-learning
- Not AD integrated. Groups already exist in AD, why create more here which would need updating at the end of each year?
- Not integrated with VLE, unclear future, limited options for scoring and case-based questions, drag-and drop

Worries over sustainability and on-going development

- Unknown support
- Lacks marketing or key reference sites. Can it be a plug-in to a range of VLEs? My experience of it is very basic - just enough to be able to say 'this is worth a look if you are considering online assessment.
- Not enough development work going on due to short term funding
- The IPR arrangements
- It is not clear whether this system is still underdevelopment and supported as it appears rather unfinished at present
- TOIA is a potentially excellent system which has been let down by extremely poor support from the original developers together with remarkable oversights in terms of poor control over data, inadequate documentation and frequent bugs. It will also suffer from being incompatible with Apple Macs and IE 7.

The reasons cited by those who weren't using the system naturally mirror many of the disadvantages listed above (Table ten)

Table ten

Lack of Functionality or Flexibility

- Shallow MCQ and similar questions predominate. In mathematics we have been doing much richer CAA for many years.
- Far too inflexible
- I found the system too time consuming to use and I felt it would be too complex for staff who are not experienced in this field
- Originally looked at it in the hope it would provide questions with numerical answers. This turned out not to be the case so I lost interest, sorry

Technical Issues

- Installation of server etc
- As it only works in Internet Explorer it does not present a satisfactory alternative to commercial systems. Code flakey in places Need to pay for interesting question types. No clear support (Jalshan has been fantastic throughout the project) Website suggests project no longer under development No clarity over security of database. It is unlikely we would wish to use a hosted solution for summative formal examinations.
- End of hosted service unable to down load the system onto our server; although we tried
- Not AD integrated

Support Issues

- Difficulties with IPR

- Unclear future, the use of QM at my institution

University/Department uses alternative system

- Because the university has a licence for QuestionMark Perception.
- We have invested heavily in the QM Perception here. It is made available as a scalable & secure alternative to Bb.
- Lack of time to get round to exploring it, and have a suitable e-assessment system in place at present which meets my needs
- No reason. We started to use other systems first.
- SurveyMonkey meets most needs time to explore thoroughly
- We are using the Moodle Quiz activity
- Have own systems that are more than sufficient, and so not used TOIA enough to comment - only explored capabilities.
- QuestionMark Perception site
- QuestionMark Perception established here on campus already.
- I have yet to present my results on using TOIA to my colleagues, however I feel it at the present stage of development in eLearning it is doubtful my university would want to pursue the use of TOIA

Lack of Knowledge / Lack of Marketing

- Why should I? What are its advantages?
- Don't know anything about it
- Never hear of it until your email
- Have not heard about it before now
- Don't know about it

Not had time or resources to implement / evaluate

- It is not a top priority yet, other infrastructure has to come first (LCMS)
- Have not had the time to fully investigate feasibility of TOIA.
- Not enough time to engage in another system
- There was no time to gain experience of it in test mode owing to the workload of those responsible at the time.
- Not implemented, insufficient IT facilities

One issue seemed to be the balance of detailed functionality versus ease of use: as one respondent stressed: 'needs to be intuitive for non-technical lecturers, idiot proof for both staff and students'.

There is a long standing argument that e-assessment (and in particular simple MCQ- type assessment) is more suitable where the emphasis is on testing of lower level cognitive skills. This was reflected in some of the responses with the view that where the emphasis is on personal contact with students, small groups or dialogic learning then e-assessment has limited value, whilst also recognising that it can have a value for testing drill and practice type learning or specific skills.

In an environment where we have a great deal of personal contact with the students (as at Oxford University) this sort of thing will be of limited value. An area where I saw possibilities is in a 'training' type context (eg statistical methods) where we may not want to assess individuals work on the tutorial model but setting and marking problems for a class is a huge logistic task for a limited number of people.

Not surprisingly, security and robustness featured in a lot of the answers, although it was difficult to gauge from the survey to what extent the respondents were using e-assessment

for large-scale summative assessment where these would clearly be of critical importance. For some these were critical factors in the decision as to whether or not to use TOIA:

It's been a useful tool but its limitations particularly with regards to participant authentication will mean that it will never be widely used at our college.

For others security and robustness were important factors but in conjunction with a host of other features and criteria:

Security, reusability of questions in different units/departments/faculties, ease of use, ease of access, ease of modification of questions, ease of use of graphics in the stem, choice and feedback, ease of handling complex mathematical formulae

Some believe that the full potential of e-assessment within institutions would not be realised until there was a clear fully integrated learning environment, whilst this may have some truth it is important to note that it takes no account of the pedagogical and organisational barriers and enablers to the uptake of e-assessment, which Warburton (2006) has shown to be key.

Staff will not assign participants to the assessments and assignments. You need a fully AD and MIS integrated system to make a truly successful system.

We are at the very beginning with Moodle, but see the full integration of any online assessment system within the Moodle grade book as a priority. We don't want a system that sits outside of the VLE

Please use TOIA experience to aid QM and other VLE systems to improve.

As might be expected there was a wish list of additional functionality:

What we need is graphics questions with a drag-and-drop labelling facility or similar. Ability to select a range of questions from a bank, matching for degrees of difficulty is also important.

Useful features would be to allow all participants, groups, and scheduling of assessments to be done by a web service such as QuestionMark Perception's QMwise - BUT BETTER.

The fact that TOIA was not Open Source was an issue for some respondents who felt that this was a missed opportunity and that take up and sustainability of the product might have been better if it had been Open Source.

I am only interested in open source, free software for the academic community.

One respondent indicated that they would like to know more about how TOIA was being used in specific disciplines:

I would like to hear of Bioscience users who have used it successfully and any user who has migrated content between QMP and TOIA and anything else.

And another respondent pointed to the needs of particular disciplines in terms of specialised functionality needed.

Unless it is fully customisable to cope with assessment in languages other than English, it will be of no use to us.

Another respondent echoed the findings of others (Sclater et al, 2007, Warburton, 2006) that two of the critical barriers to uptake are lack of time and support.

My contribution is probably not very useful, but our reasons for not using TOIA are valid within education – lack of time and the lack of academic support posts.

A TOIA hosted service

Of the 39 responses, only 11 (28%) had a TOIA hosted service. As with information about TOIA itself respondents indicated that they found out about the hosted service through a variety of mechanisms (their computing service, through the Regional Support Centres or the JISC-CETIS assessment special interest group, the TOIA website, through individual contact with the TOIA team, or through attendance at a QTI workshop). Disappointedly only one of the respondents used the hosted service frequently, with 10 (28%) using it occasionally and 25 (69%) never.

A variety of reasons were given for using the hosted service: to deliver a CAA questionnaire, as part of an initial evaluation of e-assessment systems, to run an assessment test (pilot), to demonstrate TOIA in staff development workshops, to learn about QTI or to run a study as part of a masters programme to test the concept of online assessment. Table eleven gives the views of those who did use the hosted service. Responses are very positive in terms of availability and the fact that it was a free service. Responses were slightly more variable in terms of the registration process, the reliability of the service and the level of support provide; which mirrors many of the comments made in the open-ended responses received. A relative high percentage (44%, 17) indicated that they 'might' be interested in paying for a hosted service, although 56 % (22) indicated categorically that they would not be prepared to pay. When asked specifically how much might be reasonable, 4 said between £1.5-2K, 15 said between £2-2.5K, but 20 respondents didn't give a clear indication quantitatively, although the qualitative responses reaffirm the argument being made here, namely that it is unlikely that there would be large-scale uptake of a hosted service. Five respondents said that whether or not they would be interested in a paid-hosted service would depend on what functionality was offered, 3 said that they did not hold a budget or have the appropriate level of authority to make such a decision, 6 stated that they were only interested in a free service and 1 respondent said they were not interested in the service at all. Even the interest in JISC providing a hosted assessment system was mixed (22 (49%) said yes, 16 (41%) said no). Although it is worth noting that 49% is arguably a high enough level of interest to make exploration of this option worth while.

This raises real issues as to whether or not institutions would be willing to pay for a hosted service and mirrors the responses received in the interviews (see the next section of the report). It suggests that institutions would need a compelling argument about the benefits of paying for a hosted service. Two issues seem to be at the heart of this: firstly that most institutions now have a VLE which has some e-assessment functionality and the perception is that this is 'good enough' for most purposes, secondly e-assessment is quite a specialised aspect of the use of technologies within a broader spectrum of e-learning and that only a limited percentage of staff are likely to want extensive, high-end use of e-assessment which would justify the use of a hosted service of a system with sophisticated functionality. In addition many institutions are likely to want to have control of the system in-house, particularly because use of the system involved student data and had the potential to be used for high risk summative assessments.

I would imagine that in an institution like ours we would host our own service or not use it all

Table eleven					
	Excellent	Good	Ok	Bad	Total

Availability	9 (50.0%)	2 (11.1%)	6 (33.3%)	1 (5.6%)	18
Free service	14 (70.0%)	2 (10.0%)	4 (20.0%)	0 (0%)	20
Registration process	3 (18.8%)	4 (25.0%)	8 (50.0%)	1 (6.2%)	16
Reliability of Service	4 (26.7%)	3 (20.0%)	7 (46.7%)	1 (6.7%)	15
Level of Support	3 (25.0%)	2 (16.7%)	6 (50.0%)	1 (8.3%)	12

However despite the ambivalent responses in terms of a hosted service there were numerous comments indicating the recognition of the *potential* benefits of such a service, suggesting that there are a complex set of factors which would influence an institution's decision.

Table twelve
<p>General</p> <ul style="list-style-type: none"> • Ease of use and reliability to the community - sharing of resources and practice. • It would be difficult to persuade senior managers that a hosted service was secure. The advantages should be security, multiple banking, work flow. Lack of control for formal examinations. Needs secure browser for examinations We would only use for formative or diagnostic assessments so would have to maintain our own assessment system at which point we might as well run all assessments on that. A system that only works on IE is not acceptable to the HE community in general • same benefits I take advantage of with TOIA - but should be QTI V2 compliant as well. <p>Item Bank and Shared Content</p> <ul style="list-style-type: none"> • A central repository of assessment materials, made available to JISC members. • Eventually, inter-institution sharing of questions and assessment methods • To support 'subject based' communities around topic and perhaps share some content. I have no evidence this is viable though. <p>Cost</p> <ul style="list-style-type: none"> • Not for profit charging, responsive to users' needs. • Not sure - would have to evaluate - may reduce overall costs of service • Reducing overhead costs at my own institution. Just pay the fee and start going. • Reliability. Low cost. <p>Responsiveness, Reliability and Sustainability</p> <ul style="list-style-type: none"> • frequent upgrades, high level of support • Reliable support. • Stability (technical) Community Development Availability • Sustainability