

E-Learning Proposal Cover Sheet

Cover Sheet for Proposals (All sections must be completed)	<i>JISC Capital Programme</i>
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Name of Capital Programme: e-Learning

Bid for Call:
(Please tick ONE BOX ONLY, as appropriate)

Supporting lifelong learning

<input type="checkbox"/>	Call I – HE in FE				
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Technical developments to support learning and teaching

	Call II – Assessment <input checked="" type="checkbox"/> a) Item Authoring Tool <input type="checkbox"/> b) Item Bank Software <input type="checkbox"/> c) Assessment Delivery Tool		Call IV – Admissions demonstrators <input type="checkbox"/> a) structured personal profiles, course entry profiles and pre-assessment; <input type="checkbox"/> b) improving applicant feedback; <input type="checkbox"/> c) accreditation of prior experiential learning; <input type="checkbox"/> d) e-portfolio based admissions.	<input type="checkbox"/>	Call VI – Course validation
<input type="checkbox"/>	Call III – Technology supported learning environments	<input type="checkbox"/>	Call V – Course description and discovery	<input type="checkbox"/>	Call VII – Domain maps

Name of Lead Institution: Kingston University

Name of Proposed Project: AQuRate: A QTI Authoring Tool

Name(s) of Project Partner(s):
Centre for Applied Research in Educational Technologies (CARET), University of Cambridge

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Length of Project:	1 Year		
Project Start Date:	1 st March 2007	Project End Date:	31 st March 2008
Total Funding Requested from JISC:			
Funding Broken Down over Financial Years (April – March): £ 99,743			
Apr06 – Mar07	Apr07 – Mar08	Apr08 – Mar09	
£ 9,827	£ 89,916	n/a	
Total Institutional Contributions: £ 91,392			
Percentage Contributions over the Life of the Project:	JISC 52	PARTNERS 48	
Outline Project Description			
<p>The AQuRate project will develop an open source, standards compliant and platform-independent tool to enable the authoring of question items conforming to the current IMS QTI 2 Specification. The core tool would be desktop-based system that enables the production of as wide a range of QTI 2.1 question types as is allowed in the project timescale. Question Items will be packaged as SCORM 2004 compliant IMS Content Packages. The Project aims to integrate the AQuRate Authoring Tool with the two other eAssessment components: namely Item Banking and Assessment Delivery. The aim is to create a full eAssessment lifecycle to promote the use of QTiv2 and provide an alternative to monolithic commercial systems.</p> <p>In addition to a Desktop-client the system architecture will be designed in order to allow the core functionality of the software to be extensible – to other user environments and interfaces (such as plug-ins or web-based clients) or to developers who wish extend the system capabilities.</p> <p>The project will incorporate an educational study of both existing tools and project outputs. These user trials will feed into the requirements analysis and testing & evaluation, in order to control the quality and usability of the final deliverable software.</p>			
I have looked at the example FOI form at Appendix A and included an FOI form in the attached bid (Tick Box)	YES ✓	NO	
I have read the Circular and associated Terms and Conditions of Grant at Appendix B (Tick Box)	YES ✓	NO	

FOI Withheld Information Form

We would like JISC to consider withholding the following sections or paragraphs from disclosure should the contents of this proposal be requested under the Freedom of Information Act.

We acknowledge that the FOI Withheld Information Form is of indicative value only and that JISC may nevertheless be obliged to disclose this information in accordance with the requirements of the Act. We acknowledge that the final decision on disclosure rests with JISC.

Section / Paragraph No.	Relevant exemption from disclosure under FOI	Justification
n/a	n/a	n/a

1 Introduction

1.1 Background

The AQuRate project will develop an open source, standards compliant and platform-independent tool to enable the authoring of question items conforming to the current IMS QTI 2 Specification. This would help to accelerate the adoption of the QTI 2 standard across disciplines within UK Higher Education. In recent years JISC/CETIS has sponsored the development of the IMS QTI standards and funded initiatives for developing proof of concept demonstrators and infrastructure to advance the use of QTI in the e-Assessment domain. One of these demonstrator projects, JELFAD at Kingston University, that produced a sequenced set of learning materials incorporating QTI 2.1 question types, identified the need for the kind of user friendly authoring tool outlined in this proposal.

The FREMA project at Southampton reflected upon these, and other, initiatives in order to create a reference model for the e-Assessment domain within the overall JISC eFramework. One of the approaches of FREMA was to identify the processes used by eAssessment and these can be broadly mapped on to the three components corresponding to the ITT in Circular 4/06: Authoring; Item Banking; and Delivery. This proposal is based upon the these components.

1.2 Project Brief

The project will start on 1st March 2007 and finish at the end of March 2008 and produce a desktop-based user friendly QTI authoring environment as an alternative to commercial eAssessment software (including that which does not support QTI v2 e.g. Respondus and Course Genie) which is generally designed to work within proprietary frameworks used to cover all of the eAssessment phases. The project will aspire to support of all QTI 2.1 question types but the focus will be upon the production of a distributable application that provides users with an easy way of creating and editing a core set of the more commonly used question types. Since there is little familiarity with the QTIV2 system among potential users the project will provide authors with guidance as to the potential use of the QTIV2 interaction types by linking the tools provided with the QTITools project which is itself an outcome of previous JISC-supported projects.¹

This proposal will need to work with the other funded initiatives in this call, covering the complementary phases of the eAssessment lifecycle. The authors identified two other proposals covering the Item Banking and Delivery of eAssessment items, Minibix (Cambridge University) and AsDel (Southampton University) respectively, and have adopted a common strategy for inter-project collaboration – this proposal is not however dependent upon the other projects. The AQuRate tool needs to work with the tools produced by the parallel projects and requires some advanced planning in this regard.

If the three assessment projects being sought under this call for proposals are looked at as a whole then a shared project steering group would have clear benefits, increasing the value of involvement by steering group members and reducing any facilitation costs. We envisage that steering group meetings would be co-located with community events, such as Assessment SIG meetings.

The first Phase of development and testing can be informed by the Steering Group, pre-existing QTI standards and systems and the user requirements of an internal client (as a question author and assessment practitioner). The second Phase will then integrate with the outputs of the other projects and can be tested for interoperability with the community of JISC tools and systems that contribute to the e-Assessment domain. The details of the two project Phases are outlined in the following two sections.

2 Project Description

2.1 Aims

The aim of the project is to produce a desktop-based system that enables the production of QTI Items that represent as wide a range of QTI 2.1 question types as possible within the project timescale. The system will follow an open source development model and be designed to work on a wide a range of software platforms. In addition the system architecture will allow the core functionality of the software to be extensible – to, either, other user environments and interfaces or to developers who wish extend the system capabilities.

The core functionality of the system will be to:

- Create new QTI 2.1 items
- Edit existing QTI 2.1 items

¹ The JISC-supported PyAssess project has been extended by the Jassess QTIV2 demonstration and XML testing systems. These three aspects have been combined by Steve Lay and Graham Smith into the QTITools project. All the code of these projects is open-source.

- Import and Export QTI 2.1 items (from / to other pre-existing systems)
- Package QTI 2.1 Items as IMS Content Packages that are SCORM 2004 compliant
- Use external web services for testing the rendering and response of questions using one or more of Assessment Delivery, Assessment Rendering and QTI validation systems
- Use external web services for depositing and retrieving questions from Item Banks
- Dual layer architecture separating the presentation and core logic components of the system (for extensibility)

The system will be designed with the following aims in mind:

- Offline creation of assessments
- Offline rendering of assessments
- Production of new system interfaces e.g. plug-ins, web services, server pages
- Extension and Development of new System Capabilities e.g. extra question types, use of items with sequenced content (such as in JELFAD demonstrator), support for custom interactions (such as the ASAP automated program marker)

In both the software requirements and specifications phase, and the initial phase of development and testing, consideration will be given to the evaluation of the system against recent JISC Projects in the eAssessment Domain:

- R2Q2, QTITools (distribution point for JAssess, PyAssess and Migration tool) APIS rendering services for viewing and testing QTI questions
- Utilising the PyAssess and QTITools toolkit for QTI Specification testing
- Utilising SPAID for item banking and packaging
- Utilising TOIA / E3AN for pre-existing QTI content and item banking
- Utilising TOIA for assessment delivery and item exchange
- Supporting the RQP protocol for communicating with other QTI assessment services

The QTI Author would be a stand-alone tool for production of Assessment Items in a SCORM 2004 compliant form and has the potential as a conduit to and from SCORM-compliant virtual learning environments. Additionally the project would link with other Kingston University-based projects namely, the sequencing of QTI items along with other learning content (JELFAD) and the use of additional external assessment services (ASAP / PAINTS) for the automated assessment of programming. Whilst these are not requirements of this project proposal they are further motivations for the work and build upon and contribute to previous JISC projects.

2.2 Technical Approach

QTI 2.1 is an extensive and sophisticated specification that allows the creation of diverse and complex question items. The development plan for a QTI authoring tool will need to analyse and prioritise the components of the specification in order to provide maximum benefit for the community, and provide the complementary projects with the tangible results at a sufficiently early stage to allow successful integration and joint demonstrations. Below, three main aspects are identified for prioritised development, along with some further considerations, which follow.

2.2.1 Application Environment

The terms of reference state that a desktop application is required. This will be able to be deployed on a range of platforms (of hardware and operating systems). The application could be stand-alone and create/save as content package without reference to an outside service, but since it will need to interact with remote item banks; and possibly also a rendering and processing facility a non-stand-alone option will additionally be considered. This interaction will use standard protocols such as Web Services, and the standard will use the API developed and published by the Item Banking project for adding new items (and editing and updating existing items).

Nevertheless, in Phase 1, a stand-alone application will be developed, interfacing with local repository of content-packaged items. This interface will be designed with consideration to the development (in Phase 2) of a web-service interface for remote item banks.

The terms of reference also state that the design of the Desktop Application should support extensibility, to e.g. allow an authoring component to be 'plugged in' to the 'Eclipse' integrated

development environment. The requirement for extensibility suggests that an 'authoring API' should be identified and abstracted from the Desktop Application, to be used in (as yet undetermined) extended environments such as an Eclipse plug-in, an authoring web-service or possibly Server Pages to allow a Web-Based Authoring tool. This architecture is illustrated in Figure 1.

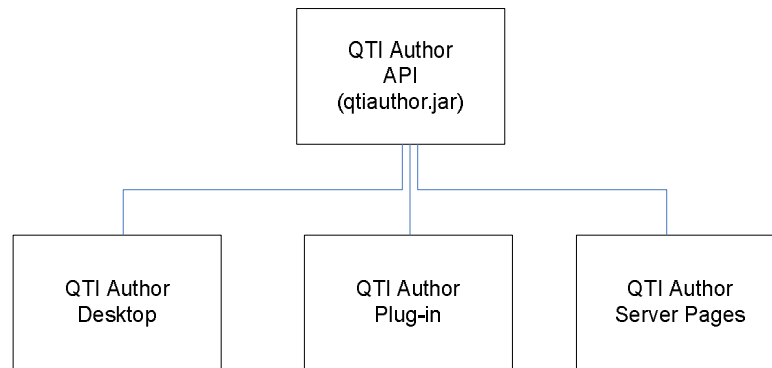


Figure 1: An Authoring API would allow extensibility in addition to a standard Desktop Application.

2.2.2 Question Types

There are a total of 21 Question Types in the QTI 2.1 standard. It is proposed to divide this set into first and second priority, for implementation in the authoring tool. The first ('core') subset will be implemented in the first phase of development. This will allow a reasonable diversity of question types to be supported by the authoring tool by the start of Phase 2, but also allow Phase 1 development time to be spent on other aspects of the specification such as Shared Material and Composite Items. The proposed division into first and second priority types is shown in Table I, although this may be subject to change after consultation with the relevant stakeholders.

Phase 1 (core set)	Phase 2 (extended set)	
Choice	Match	Graphic Gap Match
Order	Simple Associable Choice	Position Object
Associate	Gap Match	Media
Inline Choice	Extended Text	Drawing
Text Entry	Hot Text	Upload
Hotspot	Select Point	Custom00
Graphic Order	Graphic Associate	
Slider		

Table I: Diagram showing proposed prioritised development of the QTI 2.1 Question Types.

The conjunction of the three aspects of development discussed above (application environment, item bank location and types of question) is illustrated in Figure 2. Further aspects, not shown in the diagram, include: capacity for shared material and composite items (a Phase 1 activity); and MathML, templates and adaptive items (a Phase 2 activity). Phase 1 will provide a Desktop application with a local item bank supporting core question types. Phase 2 will extend the application environment, location of item bank and range of question types, through collaboration with the Item Banking and Assessment Delivery projects. There are several further issues about the specification of the authoring tool, which are discussed below.

2.2.3 Further Technical Considerations

The QTI 2.1 specification makes reference to several further features. A fully compliant Authoring tool would need to support them all. Some remarks on a provisional prioritisation are bulleted below:

- Shared Material and Composite Items.** These features allow multiple items to refer to the same material (such as a figure or text fragment); and for an item to have multiple components of interaction. These are considered to be popular and important features, and at least one will be included in the Phase 1 development. Another reason for early adoption of this feature is that the inclusion of shared material informs the requirements for the data model architecture, which can then be designed accordingly.

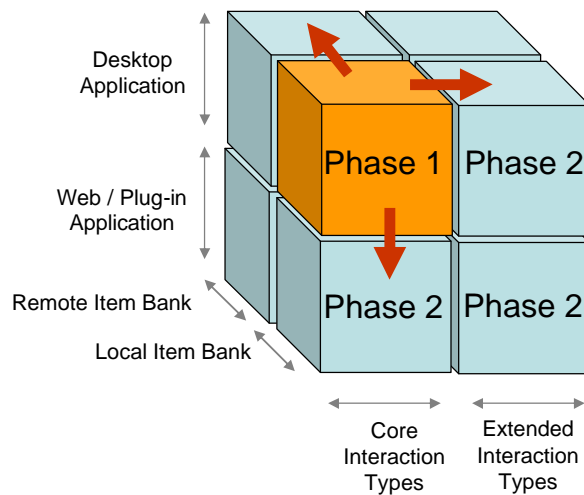


Figure 2: Diagram showing three aspects of the prioritised development. Phase 1 will address core components of all required aspects; Phase 2 will extend development in each dimension.

- **Item Templates; Adaptive Items.** These features are considered to be more easily incorporated at the Phase 2 development stage.
- **Usage and other Meta-Data.** The IEEE Learning Object Metadata can be used to describe the item: with General, Lifecycle, Metadata, Technical, Educational, Rights, Annotation and Classification categories. The authoring tool will provide the means to set these fields on a global and per-item basis. However, the Usage Data is considered to be outside the scope of the item authoring application, since they are generated by another means and are scenario-specific.

The application development will be in Java, thus providing a convenient software development platform for interface with existing work (such as R2Q2) and the deployment of multi-platform applications.

2.3 Project Management

An iterative approach will be taken using the Dynamic Systems Development Method (www.DSDM.org) to ensure management, user and stakeholder involvement and the delivery of work on time. *MoSCoW* rules will provide the basis on which decisions are made over the entire project, and during any *Timebox*. This complements the *Action Research* approach being used in workpackage 4.

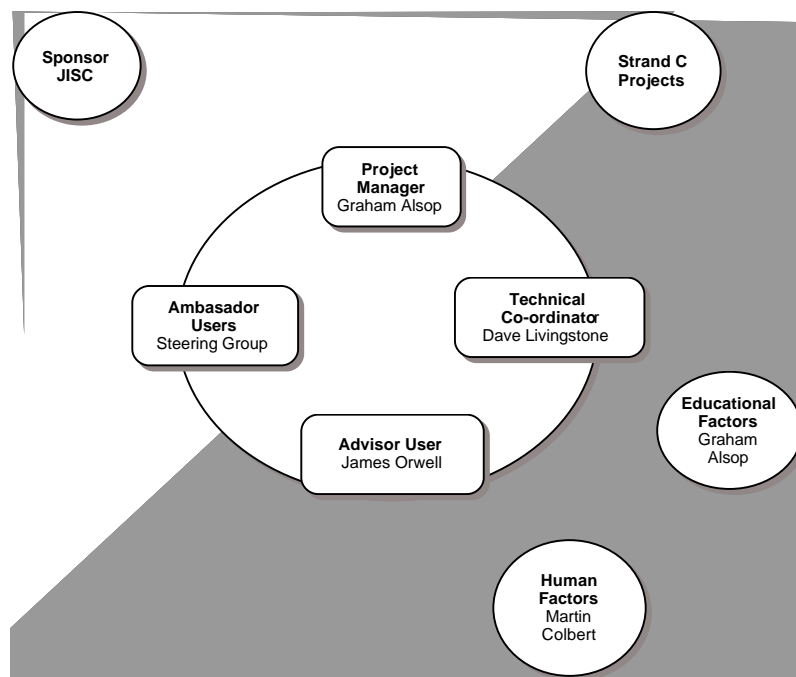


Figure 3: Depiction of Management stakeholders.

The principle researchers will be taking on the *Project Management* and *Technical* co-ordination roles. Meetings in workpackage (WP) 6 will enable *Sponsor, Ambassador Users* and *Stakeholders* in related projects to input. WP 2 and 4 allow for *Advisor* and *Specialist* input. *Timeboxes* will encompass deliverables that overlap packages, but packages will form the basis of progress reports. WP 6, Phase 1 events will effectively be high level facilitated workshops to ensure Phase 2 compatibility is maintained.

3 Project Plan

3.1 Phases

The project is divided into two phases that are approximately each six months in duration. Phase 1 (Development Phase) is the development of the core desktop author. Phase 2 (Testing and Integration Phase) is the system testing with the outputs of the Item Banking and Assessment Delivery projects.

The key milestones in Phase 1 are: the setting up of the internal AQuRate project team including system developers; the setting up of the Projects Steering Group in conjunction with the other successful projects in this call; the production of the first version of AQuRate for presentation at a, targetted 'Show and Tell Event' (such as an Assessment SIG) with the other project teams. Phase 1 is primarily about technical development, although the development methodology dictates that user testing will go on throughout this phase. The details of the technical component of Phase 2 that relates to the development of the QTI Authoring tool is outlined in section 2.2.

A strategy for Phase 2 Integration was discussed with the AsDel and Minibix Projects. This was based upon the Use Case from the QTIv2 specification and would it could therefore be applicable irrespective upon which bids are actually successful.

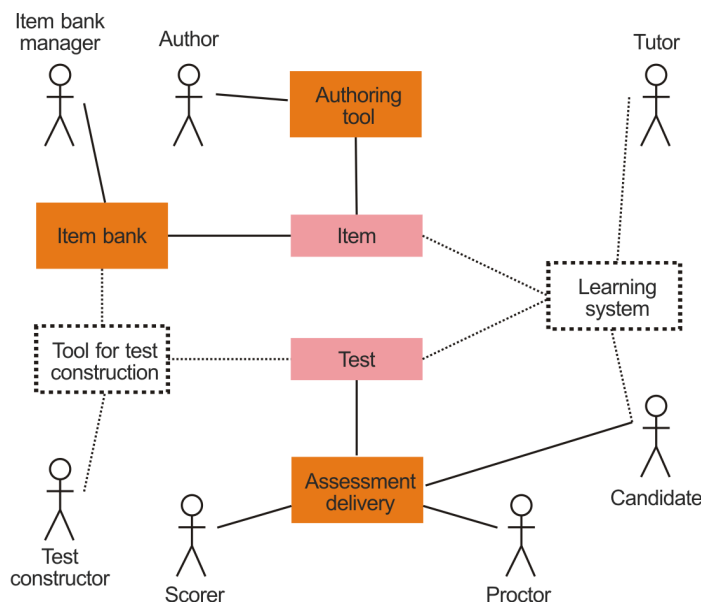


Figure 4: Phase Two -- Integration of the successful bids from the assignment domain

Figure 4 shows a modified diagram of the Use Case, demonstrating how the different tools and system in this ITT related together. It clearly shows where the dominant boundaries between the delivery system, authoring tool, and item banking lay. A general scenario would be:

1. A lecturer/Tutor will write questions (items). The authoring tool will provide a user interface appropriate to the end user, but formats and stores the items in an interoperable standard such as QTIv2. By using QTIv2, allows these items to be stored and exchanged with other compliant systems, not developed by the same vender.
2. Users can select items from the questing bank and place the items in a pool ready for constructing into a test. The test construction system, like the item authoring tool, will use an appropriate user interface and behind the scenes out put the test in a QTIv2 compliant format.
3. By having the Test and Item in the way specified by the QTIv2 specifications the deployment of items, item banks, and tests from diverse sources can be delivered through the test delivery system to candidates via a leaning environment to direct to their internet browser.
4. The candidate can now take the test, and the results will be reported in a consistent manner.

There are 6 basic workpackages that cut across these two project phases and these are discussed in more detail in the next section, comprising Table III – a breakdown of workpackage deliverables.

3.2 Workpackages (Table III)

	WorkPackage	Deliverables, Milestones and Description
WP1	<p>Project Management and Reporting.</p> <p>1.1 Project Initiation: Resource and Internal Staff Allocation 1.2 Collaboration with JISC and Associated Projects 1.3 Project Plan and Documentation 1.4 Project Progress Report 1.5 Project Final Report</p>	<p>JISC Project Plan, Project Website, Project Resources and Infrastructure Complete, JISC Progress Report, JISC Final Report, AQuRate Project Complete</p> <p>This will encompass essential tasks including: the purchase of equipment, allocation of staffing, management of staff, liaison with related projects (and JISC, CETIS etc.), budget administration, organisation of meetings, production of project reports and maintenance of the project plan. The project size does not merit the management of a steering group, but as mentioned it is envisaged that a shared steering group across the three assessment projects would be sustainable and be able to provide advice and guidance throughout the life of the project.</p>
WP2	<p>Software Requirements and Specification.</p> <p>2.1 Interaction Design 2.2 Interoperability Specification: Assessment Components Interface Requirements 2.3 Use Case Scenarios 2.4 Application Design and Specification 2.5 Software Integration Requirements and Re-factor</p>	<p>System Requirements and Design: Use Case Scenarios, Interfaces and System Diagrams</p> <p>Interaction design will carry forward the best of existing solutions by subjecting existing applications to artefact analysis and usability inspection. Models of the question authoring task will be developed through observation and represented as Hierarchical Task Analyses. General purpose styleguides for PC applications will ensure consistency and match user expectations. The User-Centred Requirements Specification will state the qualities of tutor interaction with AQuRate (notably efficiency, and satisfaction) in measurable terms, and with respect to the authoring of different types of question. The User Interface Specification will be in the form of paper prototype, that will show all primary and secondary windows, the graphical components of each window and the consequences of each user input action.</p>
WP3	<p>Software Development.</p> <p>3.1 Desktop Author for Core QTI Question Types 3.2 Extensible Author for Core QTI Question Types 3.3 Incorporation of additional question types</p>	<p>Desktop QTI Author Software, Phase 1 Development Phase Complete, Extended QTI Author Software, System Source Code and Documentation</p> <p>Throughout the duration of the project QTI 2.x content will be developed to cover all types of QTI 2.x items that are supported by the QTI Author question and all supported marking services. QTI 2.x items will be derived from the QTI 1.x Migration tool and tested for compatibility with the QTI Author. The content will be tested for use in SCORM-2004 compliant IMS Content Packages. This will involve the creation of QTI 2.x authoring system that allows the creation and editing of key QTI 2.0 question types either from scratch or by conversion from QTI1.x using the PyAssess QTI migration tool.</p>
WP4	<p>Testing</p> <p>4.1 Usability Lab. Test of Author Tool 4.2 Field Demonstration of Author</p>	<p>Usability Test Report and Redesign Recommendations, Field Demonstration Report and Recommendations, Test Report and Recommendations</p> <p>This workpackage will follow the Common Industry Format (CIF) Standard for conducting and reporting</p>

	<p>Tool: Target User Event 4.3 Round-trip Field Trial: Testing of Integrated System</p>	<p>usability tests. The tests will occur in Kingston's Usability Laboratory, so that a complete audio and video record of interaction's with the tool can be made. To ensure consistency, conversations between the usability engineer and participant will be scripted. A time-stamped log of informative sequences of behaviour will be maintained and later analysed. To prioritise redesign, a representative sample of 9 users will participate. Test tasks will be devised using data gathered during WP 2.</p> <p>During Phase 1, to complement the usability tests, an educational study will be undertaken of the existing solutions by taking an Action Research (AR) approach that will be complemented by a Phenomenographic (PG) study. The AR study will allow for the users to be co-researchers in the process. The PG work will allow for an analysis of the differences between their learning experiences to be identified. In the first phase this will be by using existing packages with staff and students in the module team delivering and studying a level 1 2nd semester java programming module respectively. One outcome will be a set of questions that can be used in the pre-requisite for this module. The AR approach will then continue into Phase 2 where the use of the new tool will be studied. After this analysis of the authoring tool, an examination of the delivery and use by students using the questions written in Phase 1 in the pre-requisite module will take place.</p>
WP5	<p>Software Integration. 5.1 Deposition of Authored Items into Item Bank 5.2 Rendering and Testing of Authored Items using R2Q2 5.3 Web-based Authoring Interface</p>	<p>Integrated QTI Author Software, Authored QTI Items, Integration Test Report, <i>Phase 2 Development Phase Complete</i></p> <p>Phase Two: will integrate with the other projects in this ITT on Item Banking and Assessment Delivery. and this process will be guided by the Projects Steering Group and a 'Show and Tell' Event that will occur at the end of Phase 1. Planning for this work will occur in workpackage 6. Some of the issues that will need to be discussed are the possible need for: An elementary Test Construction Tool; using a common code repository, common tools (e.g. xml parsing), and common test scenarios among the three projects.; and the evaluation of the Phase 2 integrated prototype/demonstrator.</p>
WP6	<p>JISC Programme Activities. 6.1 Phase 1 SIG 'Show and Tell Event' – including Project Steering Group and Assessment Projects 6.2 Phase 2 Open Access 'Show and Tell Event' 6.3 Publication of Project Outputs</p>	<p>JISC 'Show and Tell Event' Phase 1, <i>Phase 1 Development Phase Complete</i> , JISC 'Show and Tell Event' Phase 2</p> <p>Phase 1 will begin with a start up 'event between the successful projects funded under this strand. This will take place at a central location and allow for the planning of a second meeting towards the end of the phase. This second meeting will comprise of a private strand meeting after a public showing of the outcomes to date. This will allow for input from the wider community to be taken into account in the work for Phase 2. There will then be one further strand meeting before project closure to enable loose ends to be tied off with a final show and tell event for the wider community. All of theses meetings will allow input from the steering group. Written outputs will include a final report, and there is a commitment to two research papers at this stage. A website of project documents will also be maintained.</p>

WORKPACKAGES	Month	1	2	3	4	5	6	7	8	9	10	11	12
	Phase	1	1	1	1	1	1	2	2	2	2	2	2
1: Project Management and Reporting	All												
2: Software Requirements and Specification	1 + 2												
3: Software Development	1												
4: Usability and Testing	1 + 2												
5: Software Integration	2												
6: JISC Programme Activities	1 + 2												

Table IV: Project Timeline for Workpackages
On Pages 6 and 7: Table III: Project Workpackages

3.3 Risks

Risk	Prob'y (1-5)	Sev'ty (1-5)	Score (P x S)	Action to Prevent / Manage Risk
Staffing (Staff leaving because of short-term research contracts).	2	4	8	Where possible allocate existing university research staff and extend employment time beyond the due date of key project deliverables.
Organisational (Keeping to timescale and meeting milestones)	2	3	6	Project advisory group to meet with the project team once a month.
Technical (technical problems with the institutional infrastructure which inhibits development)	1	5	5	Involve a representative from central computing on the project advisory group. Agree modus operandi before commencement of the project.
Incompatible / untimely outputs from toolkit developers	2	4	8	Split workpackages into components that are not critically dependent on external outputs. Acquire source code so that resources can be re-allocated and modifications can be made in-house if required
Legal complications	1	3		University Solicitor to draw up contracts with any sub-contractors or suppliers.

Table V: Project Risks

4 Budget

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Non-Staff	"March 07"	"April 07-March 08"	Total	
Travel and Expenses	600	600	1200	
Hardware/Software	2000	0	2000	
Dissemination	0	600	600	
Evaluation	0	1500	1500	
Total Directly Incurred Non-Staff (B)	2600	2700	5300	
Directly Incurred Total (A+B=C)	7277	59509	66786	
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
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[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Indirect Costs	"March 07"	"April 07-March 08"	Total	
Indirect Costs (University)	6024	66268	72293	
Indexation	0	2355	2355	
Total Indirect Costs (E)	6024	68623	74647	
Total Project Cost (C+D+E)	17443	173692	191135	
Amount Requested From JISC	9827	89916	99743	
Institutional Contributions	7616	83776	91392	
Percentage Contributions Over Life of Project	JISC	Partners	Total	
	52	48	100	

Table VI: Proposed Budget

5 Key Personnel

Graham Alsop (Kingston University) will act as the Project Manager and lead researcher on the educational evaluation of the project. He is a Principal Lecturer in Computing and Information Systems and has been researching the use of learning technologies for some years. He was Faculty Educational Technology Leader 2000-2006 (aiding the implementation and use of Blackboard and other learning technologies into teaching) and Associate Director (Learning and Teaching) for the New Technology Institute 2002-2004. He has now returned to the Faculty full-time. He has published recently with Chris Tompsett on social science research methodologies and their use in study learning technology in ALT-J and JETS.

David Livingstone (Kingston University) will be the Technical Co-ordinator. He is a Senior Lecturer in the Faculty of Computing, Information Systems and Mathematics, and course director of the MSc Mobile Location-based Services. David's research interests include Environmental Modelling, GIS, Location-based Services and Educational Technologies. He was the joint recipient in 2001 of the Journal of Geography in Higher Education Biennial Award for Promoting Excellence in Teaching and Learning, and in 2003 was the guest editor for a special edition of Geography, on Mobile Geographies. He has successfully delivered previous JISC development and demonstration projects, including ASAP and JELFAD.

Dr. James Orwell (Kingston University) will be the Advisor User. He is a Reader in the Faculty of Computing, Information Systems and Mathematics, teaching programming and Digital Imaging. He has worked on numerous projects relating to image processing and computer vision. He has also been responsible for several initiatives regarding the teaching and learning of programming at Kingston University. In the Faculty, he pioneered the 'objects first' methodology; developed software to enable randomised multiple choice questions for use in the lecture hall, and then software to automatically test student source code submissions, to check conformity to its specification. He has worked with David Livingstone on previous JISC development and demonstration projects, including ASAP and JELFAD.

Dr Martin Colbert (Kingston University) will act as the project's Human Factors expert. His research focus is now user behaviour, position-aware devices and user interface design, and teach Human Computer Interaction, and Java. He publishes in, and reviews for, established journals and conferences, and conducts contract/commercial work. He was a Research Associate at the Ergonomics Unit, University College London (UCL). There he encountered a wide range of technologies, application domains, and usability issues – from turn-taking in interactive TV for training, and navigation in digital libraries, to the assessment of 'best HF practice' (styleguides, structured methods and guidelines). In 1998, he became Senior Lecturer at the School of Computing and Information Systems, Kingston University and is now a Principal Lecturer in the Faculty of Computing, Information Systems and Mathematics.

Steve Lay will be available for consultation. He is Senior Research Associate at the Centre for Applied Research in Educational Technologies (CARET) at the University of Cambridge (Cambridge Assessment) will be available for consultation on several important technical aspects of the work.. He was Project Manager of the JISC 'PyAssess' Project, and is the Co-Chair of the Working Group for the IMS QTI Specification.

Dr. Graham Smith (formally of Leeds University) will be available for consultation on the rendering and processing components of the 'PyAssess' (now QTITools) toolkit. Dr. Smith has been closely involved with the development of the QTI standard since the first implementations he produced in 1999. His experience includes his role as a user of assessment materials, in his position as Senior Lecturer in Department of Animal Physiology and Nutrition, University of Leeds, and also through his role as a developer, first through his association with the University Computing Service, manager of the Institutional TLTP project, and thereafter as a consultant. He has provided implementations of several QTI versions, in a couple of different languages, and as such is uniquely qualified to provide assistance on the proposed project.