

What Is...

IMS Question and Test Interoperability?

by Niall Sclater and Rowin Young

In Brief

What is IMS Question and Test Interoperability?

Computers are increasingly being used to help assess learning and knowledge in many educational situations. IMS Question and Test Interoperability (QTI) is a specification for a standard way of sharing assessment data.

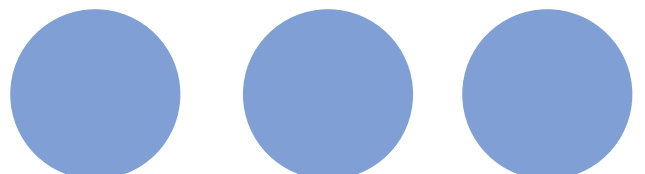
IMS QTI is designed to make it easier to transfer information such as questions, tests and results between different software applications. While IMS compatibility is not essential to the initial development of online tests, incorporating it at this stage will enable you to move your assessment data to a different system at a later date, and to share learner information and results with other learning management systems or your institution's central computing systems.

The QTI specification is now being implemented within a number of assessment systems and virtual learning environments. Many assessment systems will continue to store assessment data in their own formats but allow data to be imported from and exported to other systems in the IMS QTI format.

What is IMS Question and Test Interoperability for?

The main things that IMS Question and Test Interoperability allows you to do are:

- Develop e-assessment resources with a range of question types and flexibility in assessment structure;
- Share assessment information among different software packages, enabling you to edit and incorporate questions designed by other IMS QTI users into your own assessments;
- Facilitate the creation of question banks by subject experts;
- Transmit results and learner information to central computing systems or learning management systems.



Technical Details

How IMS Question and Test Interoperability v1.2 works

QTI uses XML – extensible markup language – to record information about learners. XML is a powerful and highly flexible markup language, and uses ‘tags’, rather like HTML, to define the function of each part of a record; for example, the stem of a true/false question might look like this:

```
<mattext>Glasgow is the capital of Scotland.</mattext>
```

Each tag has a meaning defined in the QTI specification.

Results in QTI are specific to a single participant. They can, however, contain multiple instances such as the results of several assessments. There are four elements within the results reporting data model:

- The **summary** contains data such as the maximum score and how many attempts have been made;
- The **assessment** contains one or more questions, and may contain one or more sections;
- A **section** allows assessment designers to group a series of questions within an assessment, enabling them to produce a different section for

each subtopic, and to calculate the score obtained for each section as well as over the assessment as a whole;

- A question and its associated data such as score, layout and feedback, together make up an **item**.

The IMS QTI data model can be understood as a hierarchy composed of elements whose contents and attributes are defined by XML tags.

IMS QTI tries to be pedagogy-neutral, and makes available a number of commonly used item types such as multiple choice/response, true and false, image hot spot, fill the blank, select text, slide, drag object/target, order objects, match items, connect points. New item types can be added if required.

The two core structures within IMS QTI are ASI (Assessment, Section and Item), which is concerned with the content of the test, and Results Reporting. There are therefore two separate specifications which can be implemented independently from each other, or in harmony.

Requirements

IMS QTI is based on XML. On a very basic level,

you could ‘hand-code’ the XML elements of a QTI assessment using a text editor or a special purpose XML Editor such as XMLSpy. Given the complexity of the specifications, this approach is only appropriate for QTI and XML developers and experts. Most people will prefer to use high-level authoring tools and systems which automatically generate assessments in QTI format, and which require no particular computing skills.

It should be stressed that things are at a relatively early stage and many of these tools are still under development. Some existing assessment systems claim to be QTI compliant but are yet to be independently evaluated. Various virtual learning environment (VLE) vendors have a commitment to IMS and are working to incorporate assessment in their systems.

Version 1.2 of the IMS QTI specification consists of nine separate documents within the current QTI specification, containing many examples of how to use the specifications in a practical context.

A cut-down version, QTI Lite, was developed in response to concerns that the specifications were becoming increasingly complex. It deals with items only, and the only item type to be implemented is multiple choice single response. The response process for this is specified but simplified.

Version 2.0 of the specification was released in February 2005, and has already been adopted by a number of developers. Unlike v1.2, it provides guidance on the development of items only; however, IMS are actively working on the development of v2.1, which will specify how QTI items should be combined to create deliverable assessments.

Related specifications

BS 7988 is a code of practice for the use of IT in the delivery of assessments both within and beyond Further and Higher Education. The standard details guidelines and minimum requirements for organisations using computers as part of the assessment process, and helps them to establish a good code of practice for their delivery. See: <http://edd.bsi.org.uk/link.php3/ist/43/-/1>

Implementations

JISC projects using Question and Test Interoperability

The main project to use the QTI specification is TOIA (Technologies for Online Interoperable Assessment), funded under JISC’s Exchange for Learning (X4L) and Learning and Teaching programmes. TOIA has developed question and test creation tools, an assessment delivery tool and a results analysis tool, together with the necessary database systems, all based on the QTI specification. The suite of TOIA products is freely available to all UK FE/HE institutions.

All projects funded under the X4L programme which incorporate online assessment are being encouraged to ensure that assessment content is in QTI format. Other JISC projects that use QTI include:

- APIS (Assessment Provision through Interoperable Segments);
- ASAP (Automated System for Assessment of Programming);
- ASSIS (Assessment and Simple Sequencing Integration Services, which is looking at the integration of QTI with the IMS Simple Sequencing specification);
- Serving Maths;
- SPAID (Storage and Packaging of Assessment Item Data).

Other examples

The e3an (Electronics and Electrical Engineering Assessment Network) project has developed QTI-based tools for collecting, storing and disseminating questions.

<http://www.e3an.ac.uk>

Various vendors of commercial assessment systems have now implemented IMS QTI (generally at the item level only) in their products. These include QuestionMark (<http://www.questionmark.com>) and Can Studios (<http://www.the-can.com>).

Example of QTI v1.2 in action

```
<questestinterop>
  <item id="IMS_example_X09678">
    <presentation label="example_X09678">
      <material>
        <mattext>Glasgow is the capital of Scotland.</mattext>
      </material>
      <response_lid id="TF01" rcardinality="Single" rtiming="No">
        <render_choice>
          <response_label id="T">
            <material><mattext> True </mattext></material>
          </response_label>
          <response_label id="F">
            <material><mattext> False </mattext></material>
          </response_label>
        </render_choice>
      </response_lid>
    </presentation>
  </item>
</questestinterop>
```



Resources

People, products and services

The CETIS Assessment Special Interest Group provides a good starting point for learning more about the QTI and other assessment-related specifications and standards, and finding other UK practitioners interested in them. It hosts an email discussion list and has regular meetings.

For more information contact Rowin Young (rowin.young@strath.ac.uk).

Information on the TOIA project can be obtained from Jalshan Sabir, TOIA Project Manager at jalshan.sabir@strath.ac.uk.

Resources on the Internet

The QTI specification, along with the other IMS specifications, is published on the IMS Global Learning Consortium website:

<http://www.imsglobal.org>

The CETIS Assessment Special Interest Group has a website at:

<http://assessment.cetis.ac.uk/>

The main CETIS website contains useful articles on all the IMS specifications including QTI.

The TOIA website can be accessed at

<http://www.toia.ac.uk>

Information on the JISC APIS, ASAP, ASSIS, Serving Maths and SPAID projects can be found through the JISC eLearning Framework programme pages:

http://www.jisc.ac.uk/index.cfm?name=elearning_framework.

About this guide

This guide was produced by CETIS, the Centre For Educational Technology Interoperability Standards. For more information on CETIS, visit <http://www.cetis.ac.uk>.

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About CETIS

CETIS is the JISC's Centre For Educational Technology Interoperability Standards. For more information visit the CETIS website at <http://www.cetis.ac.uk/>

