CNS 國家標準草案：問題與測驗互運性

(IMS Question and Test Interoperability, Version 2.1 Public Draft（revision 2）Specification)

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研譯

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規劃與建置數位內容與數位生活應用之技術標準環境

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Question and Test Interoperability

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1.適用範圍

IMS QTI 標準旨為試題(assessmentItem)與測驗(assessmentTest)資料之表述及對應的結果報告描述一資料模型，因此，此標準促使試題、測驗、結果資料在編輯工具、試題庫、測驗建構工具、學習系統，及評量傳遞系統間的交換。資料模型採用 UML 語言被抽象的描述，以便使其可繫結到廣範圍的資料模型工具及程式語言中。然而，為了能在系統間交換，此繫結規定使用業界標準 XML，且高度建議採用。透過定義好的擴展點之規定，IMS QTI 標準被設計來支援互運性及創新性，此擴展點可以包裹特定的或專屬的資料，包裹方式乃使其在可直接呈現的試題旁被使用。

The IMS Question & Test Interoperability (QTI) specification describes a data model for the representation of question (assessmentItem) and test (assessmentTest) data and their corresponding results reports. Therefore, the specification enables the exchange of this item, test, and results data between authoring tools, item banks, test constructional tools, learning systems, and assessment delivery systems. The data model is described abstractly, using [UML] to facilitate binding to a wide range of data-modeling tools and programming languages, however, for interchange between systems a binding is provided to the industry standard eXtensible Markup Language [XML] and use of this binding is strongly recommended. The IMS QTI specification has been designed to support both interoperability and innovation through the provision of well-defined extension points. These extension points can be used to wrap specialized or proprietary data in ways that allows it to be used alongside items that can be represented directly.

IMS QTI 的工作特別與內容提供者(即試題與測驗的作者與出版者)、編輯與內

容管理工具、評量傳遞系統及學習系統之發展者有關。為表述試題為主的內容之資料模型，適合於跨所有年齡層及國別情境之學習、教育訓練之目標使用者。

The IMS QTI work specifically relates to content providers (that is, question and test authors and publishers), developers of authoring and content management tools, assessment delivery systems, and learning systems. The data model for representing question-based content is suitable for targeting users in learning, education, and training across all age ranges and national contexts.

2.標準使用案例

QTI 乃被設計來促使一些系統互通，在此描述使用這些系統的相關角色。QTI 特別設計用以：

提供一合於文獻的內容格式以儲存及交換試題(item)，使其不受編輯工具支配

支援試題庫在廣域的學習及評量傳遞系統間的調度；

提供一合於文獻的內容格式以儲存及交換測驗(test)，使其不受測驗建構工具之支配；

支援在單一學習或評量傳遞系統中，來自不同來源之試題、試題庫、及測驗的調度；

提供系統以一致性方式，報告評量結果的能力。

QTI is designed to facilitate interoperability between a number of systems that are described here in relation to the actors that use them. Specifically, QTI is designed to:

Provide a well documented content format for storing and exchanging items independent of the authoring tool used to create them.

Support the deployment of item banks across a wide range of learning and assessment delivery systems.

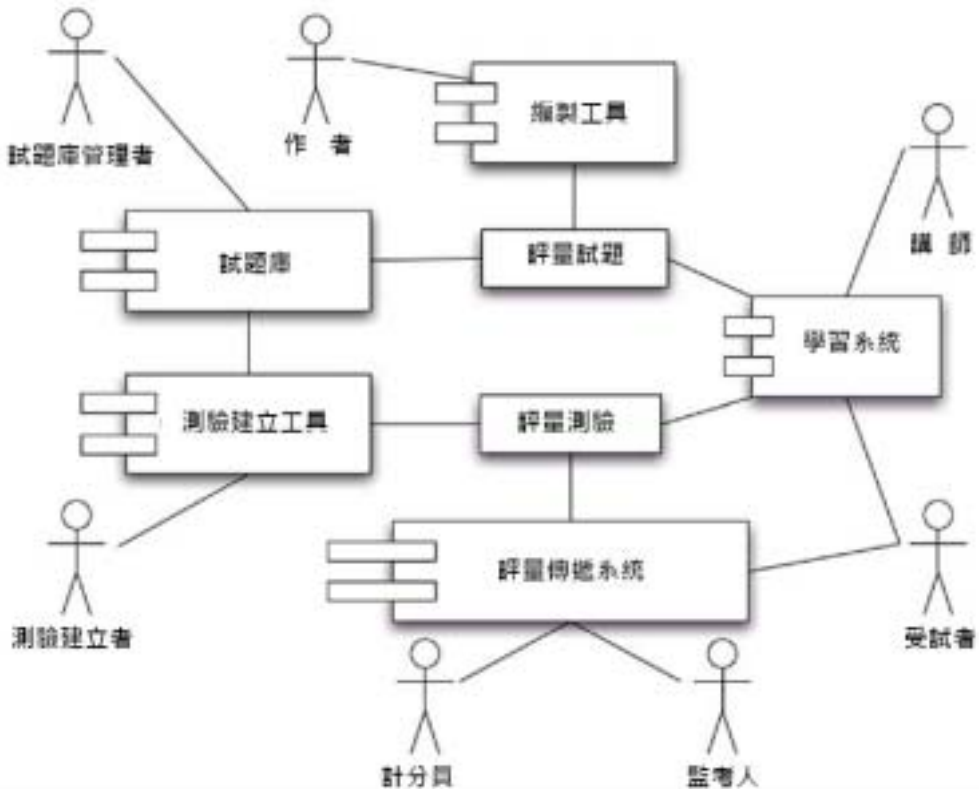
Provide a well documented content format for storing and exchanging tests independent of the test construction tool used to create them.

Support the deployment of items, item banks, and tests from diverse sources in a single learning or assessment delivery system.

Provide systems with the ability to report test results in a consistent manner.

圖 2.1 評量測驗及評量試題的角色

Figure 2.1 The Role of Assessment Tests and Assessment Items.



3.用語釋義

3.1 編輯工具(authoringTool)：作者用來建立或修改評量資料之系統。

A system used by an author for creating or modifying an assessment item.

3.2 試題庫(itemBank)：用來收集及管理評量試題之系統。

A system for collecting and managing collections of assessment items.

3.3 測驗建構工具(testConstructionTool)：用來組合來自個別試題之測驗的系統。

A system for assembling tests from individual items.

3.4 評量傳遞系統(assessmentDeliverySystem)

用來管理將評量傳遞給受試者之系統, 此系統包括一個傳遞引擎用來傳遞試題給受試者，並記錄自動回應的分數，或將他們傳佈給記分員。

A system for managing the delivery of assessments to candidates. The system contains a delivery engine for delivering the items to the candidates and scores the responses automatically (where applicable) or by distributing them to scorers.

3.5 學習系統(learningSystem)

在學習活動中，啟動或指引學習者的系統，可能會需與講師協調合作。於本標準中，學習系統之目的則為，學習者之學習活動有某部份是透過學習系統來面對評量（例如：透過形成性評量），上述情形不特別區隔形成性評量或總結性評量之受試者。儘管行政與安全機制可能和評量傳遞系統有很大的差異，然學習系統亦需包含傳遞引擎。

A system that enables or directs learners in learning activities, possibly coordinated with a tutor. For the purposes of this specification a learner

exposed to an assessment item as part of an interaction with a learning system (i.e., through formative assessment) is still described as a candidate as no formal distinction between formative and summative assessment is made. A learning system is also considered to contain a delivery engine though the administration and security model is likely to be very different from that employed by an assessmentDeliverySystem.

3.6 作者(Author)

指評量試題的作者。簡單的情況下，評量試題可能只有一個作者，複雜的情況下，評量試題從建立到品質控制過程中，可能有多人投入。在此標準中，這些人都定義為作者之角色。作者關心的是試題的內容，它與 itemBankManager 中的角色有所區別。作者乃透過 authoringTool 與試題互動。

The author of an assessment item. In simple situations an item may have a single author, in more complex situations an item may go through a creation and quality control process involving many people. In this specification we identify all of these people with the role of author. An author is concerned with the content of an item, which distinguishes them from the role of an itemBankManager. An author interacts with an item through an authoringTool.

3.7 試題庫管理者(itemBankManager)

乃指負責以試題庫管理評量試題集者。

An actor with responsibility for managing a collection of assessment items with an itemBank.

3.8 測驗建構者(testConstructor)

測驗建構者的角色主要在從個別試題建立測驗(測驗表)者。試題通常都是從試題庫找出來的。

The role of test constructor is to create tests (test forms) from individual items. The items are typically drawn from an item bank.

3.9 監考人(Proctor)

負責監督評量進行的人，通常指監考者。於本標準中，監考人為與傳遞過程有關（非受試者），但不牽涉評量受試者之回應的角色。

A person charged with overseeing the delivery of an assessment. Often referred to as an invigilator. For the purposes of this specification a proctor is anyone (other than the candidate) who is involved in the delivery process but who does not have a role in assessing the candidate's responses.

3.10 記分員(Scorer)

乃指在評量傳遞過程中，負責評量受試者的反應之人員或外部系統。記分員可有可無，例如，很多評量試題可以利用已定義在評量試題中的回應處理規則自動記分。

A person or external system responsible for assessing the candidate's responses during assessment delivery. Scorers are optional, for example, many assessment items can be scored automatically using response processing rules defined in the item itself.

3.11 講師(Tutor)

乃指在學習處理中管理、指導、支援學習者的人，此人不受評量管制。

Someone involved in managing, directing, or supporting the learning process for a learner but who is not subject to (the same) assessment.

3.12 受試者(Candidate)

乃指被評量測驗及評量試題評量者。

The person being assessed by an assessment test or assessment item.

4.引用標準

APIS	Assessment Provision through Interoperable Segments Barr, Sclater and Young
ASI_BIND	IMS Question & Test Interoperability: ASI XML Binding Specification, Version 1.2 Published: 2002-02
CMI	IEEE 1484.11.1, Standard for Learning Technology - Data Model for Content Object Communication
IMS_AP	IMS Application Profile Guidelines Whitepaper, Version 1.0
IMS_CP	IMS Content Packaging Specification, Version 1.1.3
IMS_LD	IMS Learning Design Specification, Version 1.0 Published: 2003-01
IMS_LIP	IMS Learner Information Package Specification, Version 1.0 http://www.imsglobal.org/profiles/index.html
IMS_MD_Binding	IMS Learning Resource Meta-Data XML Binding, Version 1.2.1
IMS_SS	IMS Simple Sequencing Specification, Version 1.0 Published: 2003-03
ISO_9899	ISO/IEC 9899:1999 Programming Languages - C
ISO11404	ISO11404:1996 Information technology — Programming languages, their environments andsystem software interfaces — Language-independent datatypes Published: 1996
ISO8601	ISO8601:2000 Data elements and interchange formats – Information interchange – Representation of dates and times Published: 2000
LOM	IEEE 1484.12.1-2002 Standard for Learning Object Meta-data (LOM)
MathML	Mathematical Markup Language (MathML), Version 2.0 (Second Edition) http://www.w3.org/TR/2003/REC-MathML2-20031021/ Published: 2003-10-21
RDN	RDN/LTSN resource type vocabulary http://www.rdn.ac.uk/publications/rdn-ltsn/types/

RFC1766	RFC 1766 Tags for the Identification of Languages H. Alvestrand http://www.ietf.org/rfc/rfc1766.txt Published: 1995-03
RFC2045	RFC 2045-2048 Multipurpose Internet Mail Extensions (MIME)
RFC3066	RFC 3066 Tags for the Identification of Languages H. Alvestrand http://www.ietf.org/rfc/rfc3066.txt Published: 2001-01
SMITH	Development of an implementation of QTI Version 2.0 Dr. Graham Smith, with support from CETIS and UCLES
UML	OMG Unified Modeling Language Specification, Version 1.4 Published: 2001-09
URI	RFC 2396 Uniform Resource Identifiers (URI): Generic Syntax Published: 1998-08
VDEX	IMS Vocabulary Definition Exchange, Version 1.0 http://www.imsglobal.org/vdex/index.html Published: 2004-02-24
XHTML	XHTML 1.1: The Extensible HyperText Markup Language
XHTML_MOD	XHTML Modularation http://www.w3.org/MarkUp/modularization
XINCLUDE	XML Inclusions (XInclude) Version 1.0 http://www.w3.org/TR/xinclude/
XML	Extensible Markup Language (XML), Version 1.0 (second edition) Published: 2000-10
XML_ERRATA	XML 1.0 Specification Errata http://www.w3.org/XML/xml-19980210-errata
XML_SCHEMA2	XML Schema Part 2: Datatypes http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/

5.實作指引

以例子引領你了解資料模型的文件，對 QTI 初學者及想要知道 QTI 能做什麼的人，是一份最佳入門文件。

A document that takes you through the data models by example. The best starting point for readers who are new to QTI and want to get an idea of what it can do.

有些範例利用螢幕畫面說明。本標準之公開草稿修訂審閱期間，所有螢幕畫面均由單一教材傳遞引擎[SMITH]取得。所有畫面被設計用來說明如何利用系統實作標準，而非規定。其他描述型式也同樣有效。

Some of the examples are illustrated by screen shots. All screen shots are taken from a single delivery engine [SMITH] developed during the public draft review period of this specification. They are designed to illustrate how a system might

implement the specification and are not designed to be prescriptive. Other types of rendering are equally valid.

5.1 試題(Items)

QTI 標準的主要目的是為了定義資料模型及相關繫結，用以呈現及交換試題。QTI 的目的是利用一組互動方式（可能為空）的一個試題，收集集中所有支援教材及一系列選擇性規則，將受試者的答覆轉換成試題結果。

The main purpose of the QTI specification is to define an information model and associated binding that can be used to represent and exchange assessment items. For the purposes of QTI, an item is a set of interactions (possibly empty) collected together with any supporting material and an optional set of rules for converting the candidate's response(s) into assessment outcomes.

5.1.1 試題之大小?(How Big is an Item?)

上述定義包含很多可能性。試題是可以明確的在一極簡單的單行問題中，將答案輸入相對應的回應欄。另外，一個完整試題包括操作說明、教材及大量的相關問題也同樣能滿足定義。在第一個定義中，QTI 是一個適當的標準用來描述資訊，第二個定義則不行。

The above definition covers a wide array of possibilities. At one extreme a simple one line question with a response box for entering an answer is clearly an item but at the other, an entire test comprising instructions, stimulus material and a large number of associated questions also satisfies the definition. In the first case, QTI is an appropriate specification to use for representing the information, in the second case it isn't.

為了幫助決定一個多重互動組成的試題是否可由 assessmentItem 單一試題表示，應檢查互動之間的關聯程度。如果試題可以獨立運作，則適合被

當成單獨試題來運用，包括可能在物件中分享了一件教材（如一張影像或段落文字）的試題。如果數個互動緊密的相關，則應歸類為複合試題，當包含的教材與互動相關時，能多容易的讓受試者對試題狀況做紀錄，被視為一個問題，如果問題需要使用者在他們電腦螢幕上滾動視窗，只需理解所有的互動，然後試題就能改善重寫成數個較小的相關試題。考量到使用者透過螢幕閱讀器與試題互動所面臨的困難，則有許多可能互動點的試題在此介面下會顯得過度繁雜。

To help determine whether or not a piece of assessment content that comprises multiple interactions should be represented as a single assessmentItem (known as a composite item in QTI) the strength of the relationship between the interactions should be examined. If they can stand alone then they may best be implemented as separate items, perhaps sharing a piece of stimulus material like a picture or a passage of text included as an object. If several interactions are closely related then they may belong in a composite item, but always consider the question of how easy it is for the candidate to keep track of the state of the item when it contains multiple related interactions. If the question requires the user to scroll a window on their computer screen just to see all the interactions then the item may be better re-written as several smaller related items. Consider also the difficulty faced by a user interacting with the item through a screen-reader, an item with many possible of points of interaction may be overwhelming in such an interface.

5.1.2 簡單題(Simple Items)

簡單題是試題只包含一互動點，舉例來說，單選或多重問答覆題。本節以一組範例說明簡單題，本標準支援的每一種互動型式均有範例說明。

Simple items are items that contain just one point of interaction, for example a simple multi-choice or multi-response question. This section describes a set of examples illustrating simple items, one for each of the interaction types supported by the specification.

沒人照顧的行李(Unattended Luggage)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice.xml

圖 5.1 沒人照顧的行李(圖例)

Figure 5.1 Unattended Luggage (Illustration).

此範例說明可以利用 choiceInteraction, 從受試者獲得單一答覆。

This example illustrates the choiceInteraction being used to obtain a single response from the candidate.

注意受試者的答覆是公開的, 在試題上面有單一的 identifier 及 values, 此 identifier 可由擁有一致性的 identifier 屬性的個別 simpleChoices 之

values 獲得。正確答案包含在答覆的宣告。從這簡單的例子可知，只有一個答覆變數和一個互動，但注意此互動一定要使用 choiceInteraction 的 responseIdentifier 屬性來答覆宣告。

Notice that the candidate's response is declared at the top of the item to be a single identifier and that the values this identifier can take are the values of the corresponding identifier attributes on the individual simpleChoices. The correct answer is included in the declaration of the response. In simple examples like this one there is just one response variable and one interaction but notice that the interaction must still be bound to the response declaration using the responseIdentifier attribute of choiceInteraction.

此試題的計分使用標準答覆處理模版，Match Correct。

The item is scored using one of the standard response processing templates, Match Correct.

沒人照顧的行李(固定選項)[Unattended Luggage (with fixed choice)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_fixed.xml

此範例為先前範例之變化，說明固定屬性的使用，可用來固定試題中某個選項的位置。

This example is a variation on the previous example and illustrates the use of the fixed attribute to fix the location of one of the options in the item.

沒人照顧的行李(DTD)[Unattended Luggage (DTD)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_doct

ype.xml

這個例子和「沒人照顧的行李」完全相同-----除了它使用 DTD 繫結取代 XSD 之外。XSD 格式較好且可做為使用 DTD 繫結方法的替代選擇方法。此例只提供使用 DTD 繫結方法的說明。

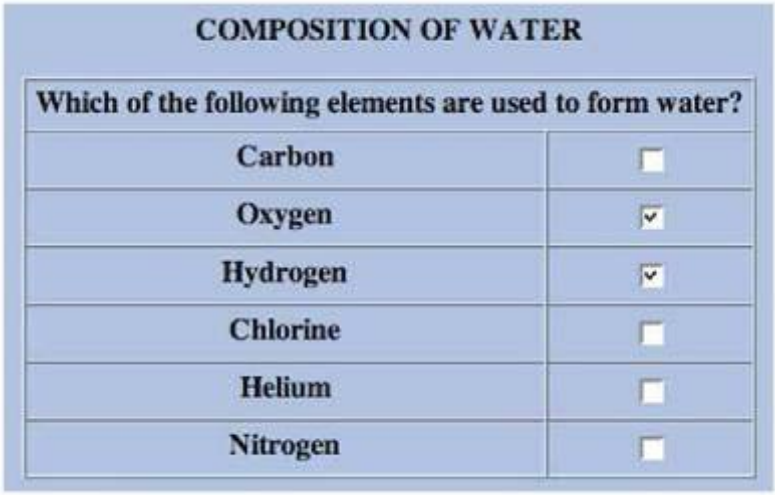
This example is identical to Unattended Luggage except that it illustrates the use of the DTD binding instead of the XSD. The XSD form is preferred and the alternative binding method using the DTD is illustrated for this example only.

水的成分(Composition of Water)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_multiple.xml

圖 5.2 水的成分(圖例)

Figure 5.2 Composition of Water (Illustration).



這個範例說明 choiceInteraction 被用來從受試者身上得到多重答覆。

This example illustrates the choiceInteraction being used to obtain multiple responses from the candidate.

請注意，受試者的答覆被宣告有多重基數，且正確的 value 由一個以上的 value 組成。這個例子與前面的例子用同樣的記分方式，可正確辨別只給予一個標記的兩個以上之元件（或只有兩個元件）及沒有給予標記的其他元件；部份給分的記分方法使用標準答覆處理的 Map Response。此模版利用 RESPONSE 的對應來總計個別選項中 values 的分配。結果，判斷正確的兩個選項(答案只有兩個)獲得兩分。若選擇了第三個(不正確的選項)選項後，選項上沒有對應到答案則對應到 defaultValue，分數則從 2 分(氯(Chlorine)選項除外)降低為 0 分。為了防止總分為負分，標準亦有計算限制說明。不當選擇氯(Chlorine)較少，或許表現出氯是常用水添加液的功用。

Notice that the candidate's response is declared to have multiple cardinality and the correct value is therefore composed of more than one value. This example could have been scored in the same way as the previous one, with 1 mark being given for correctly identifying the two correct elements (and only the two correct elements) and 0 marks given otherwise; however, a method that gives partial credit has been adopted instead through the use of the standard response processing template Map Response. This template uses the RESPONSE's mapping to sum the values assigned to the individual choices. As a result, identifying the correct two choices (only) scores 2 points. Notice that selecting a third (incorrect) choice reduces the score by 2 (with the exception of Chlorine) resulting in 0 as unmapped keys are mapped to the defaultValue. To prevent an overall negative score bounds are specified too. The penalty for selecting Chlorine is less, perhaps to reflect its role as a common water additive.

因為 map_response 模版的使用會回歸到一個 float(浮動), 所以注意 Score 需要設置 float(浮動)。

Also note that SCORE needs to be set to float because of the use of the map_response template which returns a float.

巧克力牛奶(Chocolate Milk)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_multiple_chocolade.xml

這個例子說明 choiceInteraction 可獲得多重答覆, 從受試者的回覆獲取兩組正確的答案。

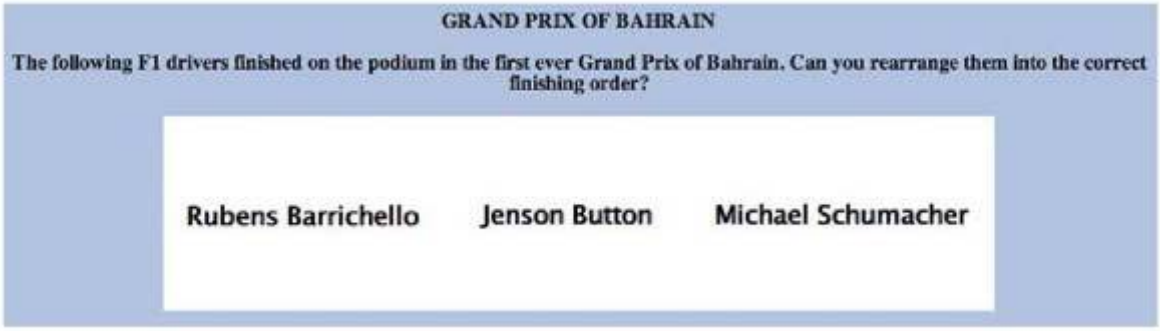
This example illustrates the choiceInteraction being used to obtain multiple responses from the candidate with two correct sets of responses.

巴林大賽(Grand Prix of Bahrain)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/order.xml

圖 5.3 巴林大賽(圖例)

Figure 5.3 Grand Prix of Bahrain (Illustration).



此例說明 orderInteraction。受試者的答覆被宣告為有序的，此正確的值係由值的有序表列組成。Shuffle 屬性告訴傳遞引擎在展示給受試者之前，先混和選項的次序。注意固定屬性被用來確保最初提交的次序不會是正確答案。這個問題使用標準答覆處理模版 Match Correct 來計分，完全正確的為 1 分，其他均為零分。

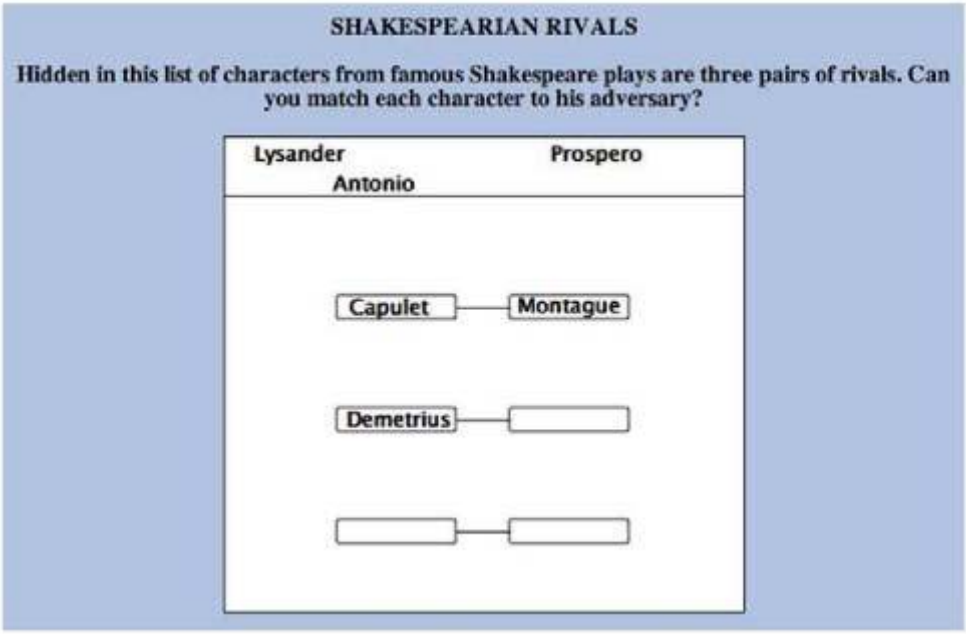
This example illustrates the orderInteraction. The candidate's response is declared to have ordered and the correct value is therefore composed of an ordered list of value. The shuffle attribute tells the delivery engine to shuffle the order of the choices before displaying them to the candidate. Note that the fixed attribute is used to ensure that the initially presented order is never the correct answer. The question uses the standard response processing template Match Correct to score 1 for a completely correct answer and 0 otherwise.

莎士比亞戲劇中的競爭對手(Shakespearian Rivals)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/associate.xml

圖 5.4 莎士比亞戲劇中的競爭對手(圖例)

Figure 5.4 Shakespearian Rivals (Illustration).



這個範例說明 associateInteraction。受試者的答覆被宣告為成對，因為作業包含配對選項。associateInteraction 中的 maxAssociations 屬性控制受試者配對的最大值，允許受試者決定整體。特別的是，每個選項都有一個 matchMax 屬性去控制這些配對為其中一部份。由兩種方法組成的 associateInteraction 可製造這些結合的數量—此情況下，他們有相同的整體作用，但不需要變成這種狀況。

This example illustrates the associateInteraction. The candidate's response is declared to have pair because the task involves pairing up the choices. The maxAssociations attribute on associateInteraction controls the maximum number of pairings the candidate is allowed to make overall. Individually, each choice has a matchMax attribute that controls how many pairings it can be part of. The number of associations that can be made in an associateInteraction is therefore constrained by two methods—in this case they have the same overall effect but this needn't be the case.

不需指導受試者即可創造這些結合，基底-型式對是一個無向(undirected)對，所以當組成的答覆為"A P"可以將之相對的看成"P A"---對互動而言這兩個區別沒有意義，即使受試者需要實體流程的使用指導，例如在選項之間畫出一條線。

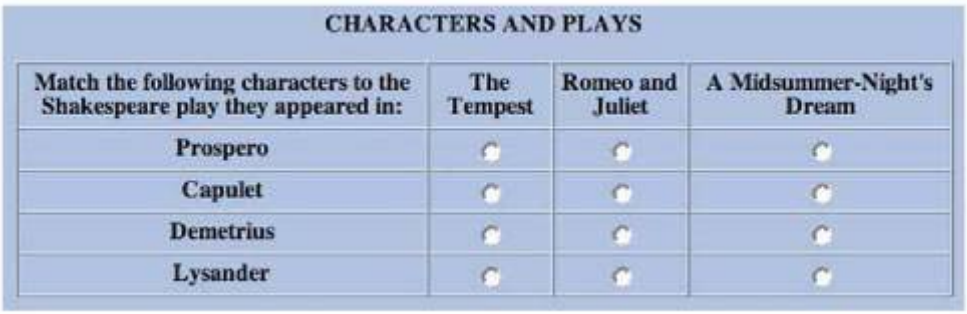
The associations created by the candidate are not directed, the pair base-type is an undirected pair so when comparing responses "A P" would be treated as a match for "P A"—the distinction has no meaning to the interaction even though the physical process used by the candidate might be directional, for example, drawing a line between the choices.

角色與表演者(Characters and Plays)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/match.xml

圖 5.5 角色與表演者(圖例)

Figure 5.5 Characters and Plays (Illustration).



此例說明 matchInteraction。這次受試者的答覆被宣告為 directedPair，因為這個作業涉及到從來源集到標的集的成對選項。這個案例詢問受試者在戲劇中所表演的角色姓名。可以注意到 matchMax 在角色上只有一個，因為每個角色只能由一個受試者表演（事實上，莎士比亞通常重複使用角色

姓名，但此處已離題），但是角色有四個，因為每個表演者可以包含所有的角色。舉例來說，Demetrius 及 Lysander 均為仲夏夜之夢的角色，所以正確的答覆有兩個聯結。在這個對應中，利用答覆處理判斷這兩個聯結之中只能一個有標記。

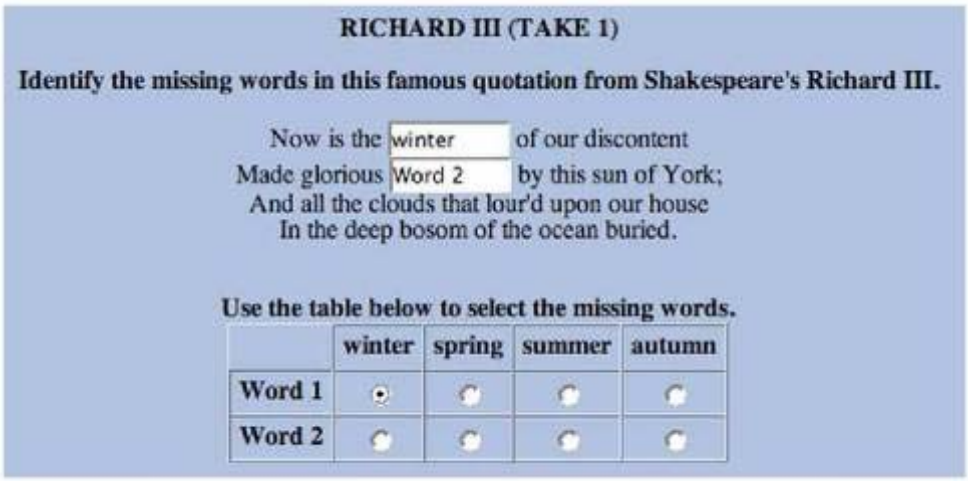
This example illustrates the matchInteraction. This time the candidate's response is declared to have directedPair because the task involves pairing up choices from a source set into a target set. In this case characters from plays with the names of the plays from which they are drawn. Notice that matchMax on the characters is one because each character can be in only one play (in fact, Shakespeare often reused character names but we digress) but it is four on the plays because each play could contain all the characters. For example, Demetrius and Lysander were both in A Midsummer-Night's Dream, so in the correct response that play has two associations. In the mapping used for response processing these two associations have been awarded only a half a mark each.

李察三世(幕 1)[Richard III (Take 1)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/gap_match.xml

圖 5.6 李察三世(圖例 1)

Figure 5.6 Richard III (Illustration 1).



這例子說明 gapMatchInteraction。此互動與 matchInteraction 相似----除了在特定段落文字上的第二個集合選項為 Gaps 之外，特定的段落文字及作業包含選擇性選項，選擇性選項來自第一個集合，並且可用來填充 gaps。相同的屬性可以控制一組及更多成對，雖然 gaps 沒有 matchMax，但因擁有一個關聯選項, 所以允許成對存在。而記分方式仍利用對應的方式進行。

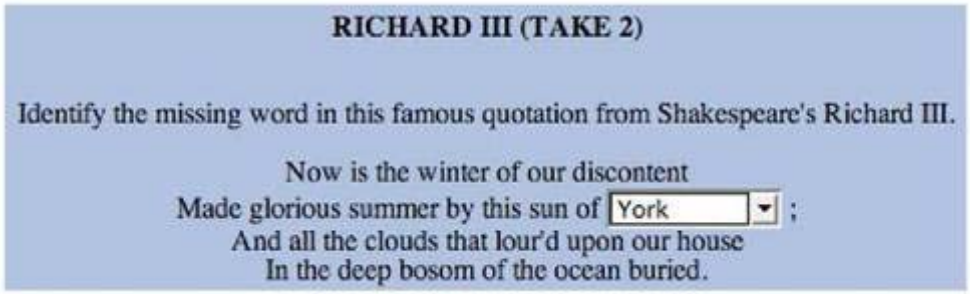
This example illustrates the gapMatchInteraction. This interaction is similar to matchInteraction except that the choices in the second set are gaps in a given passage of text and the task involves selecting choices from the first set and using them to fill the gaps. The same attributes are involved in controlling which, and how many, pairings are allowed though there is no matchMax for the gaps because they can only ever have one associated choice. The scoring is again done with a mapping.

李察三世(幕 2)[Richard III (Take 2)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/inline_choice.xml

圖 5.7 李察三世(圖例 2)

Figure 5.7 Richard III (Illustration 2).



見上述李察三世(幕 1)的例子, 其使用一個共享 stock 的選項來填充 gaps。不論只有一個 gap 或有多個 gaps, 都需要各自從每個選項列表進行填充, 然後即可利用 inlineChoice 互動。

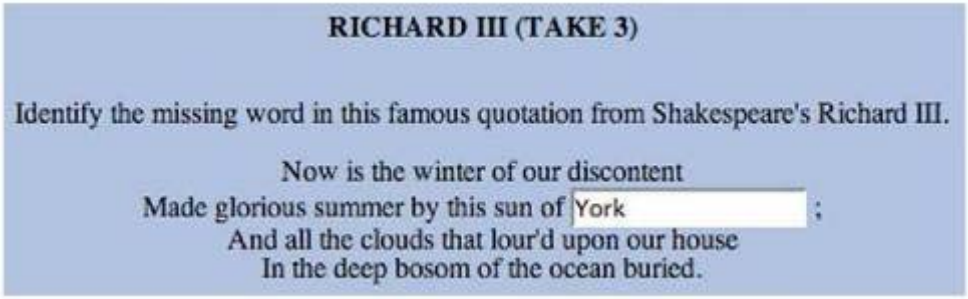
The Richard III (Take 1) example above demonstrated the use of filling gaps from a shared stock of choices. In cases where you only have one gap, or where you have multiple gaps that are to be filled independently, each from its own list of choices, then you use an inlineChoice interaction.

李察三世(幕 3)[Richard III (Take 3)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/text_entry.xml

圖 5.8 李察三世(圖例 3)

Figure 5.8 Richard III (Illustration 3).



圖例 3 所運用的 textEntryInteraction，是最後一個利用來填充 gaps 的方法，此方法需要受試者構想他自己的答覆，最基本的是將字輸入在裡面。需注意的是，雖然受試者應該被允許輸入所有他想輸入的答覆，但如果真的需要輸入大量的文本時，記得利用 expectedLength 屬性。

The third, and final method of filling gaps is to use an textEntryInteraction which requires the candidate to construct their own response, typically by typing it in. Notice that a guide to the amount of text to be entered is given in the expectedLength attribute—though candidates should be allowed to enter more if desired.

這個選項的記分方式需要配合正確答覆, 但事實上對照利用部分給分的方式進行, 只能給予 york 這個答案部分分數(因為 y 沒有大寫)。當對照 strings 對照時，經常發生這樣的狀況。這個例子也說明，對照在答覆只有單一基數時的情況。

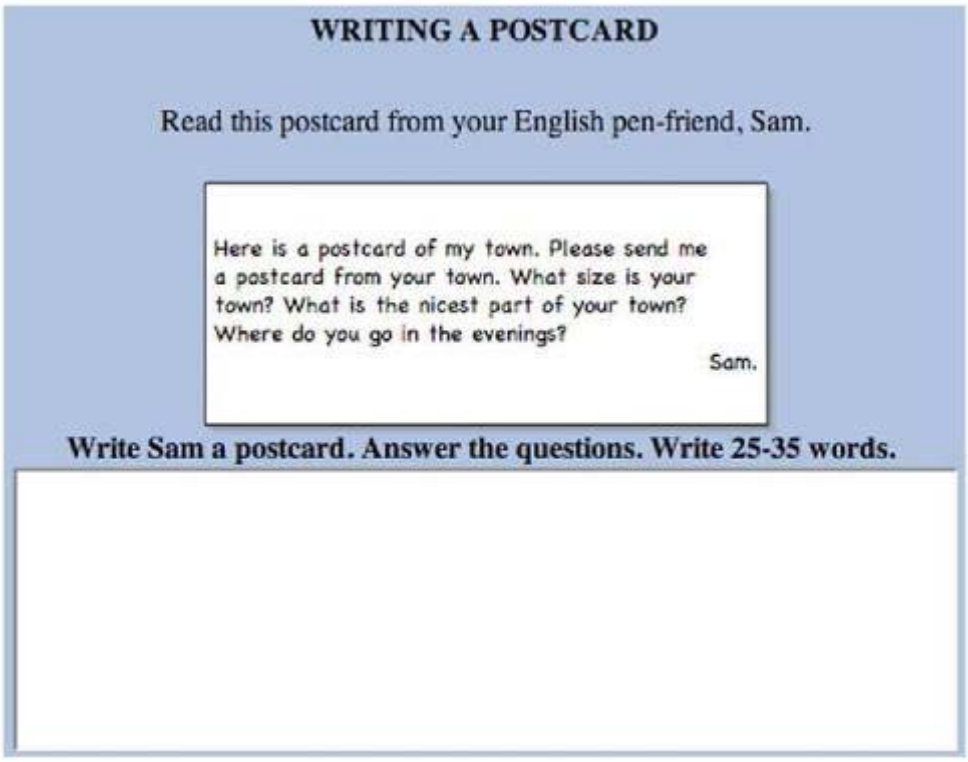
The scoring for this item could have just matched the correct response but actually uses a mapping to enable partial credit for york (spelled without a capital letter). When mapping strings the mapping always takes place case sensitively. This example also illustrates the use of the mapping when the response only has single cardinality.

寫張明信片(Writing a Postcard)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/extended_text.xml

圖 5.9 寫張明信片(圖例)

Figure 5.9 Writing a Postcard (Illustration).



如果需要從受試者那得到延伸答覆，適合用 extendedTextInteraction。請注意這個例子不包含 responseProcessing 題組，因為延伸文本答覆的記分方式超過本標準之範圍。

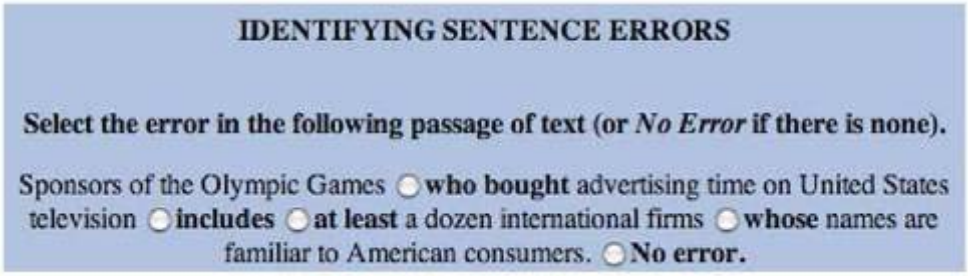
If an extended response is required from the candidate then the extendedTextInteraction is appropriate. Notice that this example does not contain a responseProcessing section because the scoring of extended text responses is beyond the scope of this specification.

奧林匹克運動會(Olympic Games)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/hottext.xml

圖 5.10 奧林匹克運動會(圖例)

Figure 5.10 Olympic Games (Illustration).



這個例子說明 hottextInteraction。此互動藉由突顯段落文字內的熱詞/片語(hot words/phrases)給受試者選擇。與 choiceInteraction 的不同之處在於其選項必須呈現在附近文字的上下文中。

This example illustrates the hottextInteraction. This interaction presents a passage of text with some hot words/phrases highlighted and selectable by the candidate. It differs from the choiceInteraction in that the choices have to be presented in the context of the surrounding text.

英國機場(UK Airports)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/hotspot.xml

圖 5.11 作答前的英國機場(圖例)

Figure 5.11 UK Airports in Unanswered State (Illustration).

圖 5.12 作答後的英國機場(圖例)

Figure 5.12 UK Airports in Answered State (Illustration).

此範例說明 hotspotInteraction。hotspotInteraction 與 hottextInteraction 兩

者是非常類似，除了受試者選擇的是影像上的熱點，而不是選擇段落文字的熱門區域。

This example illustrates the hotspotInteraction. This is very similar to the hottextInteraction except that instead of having to select hot areas embedded in a passage of text the candidate has to select hotspots of a graphical image.

注意 type identifier 的答覆及每個個別的 hotspotChoice，使 identifier 與影像區域有所聯繫。

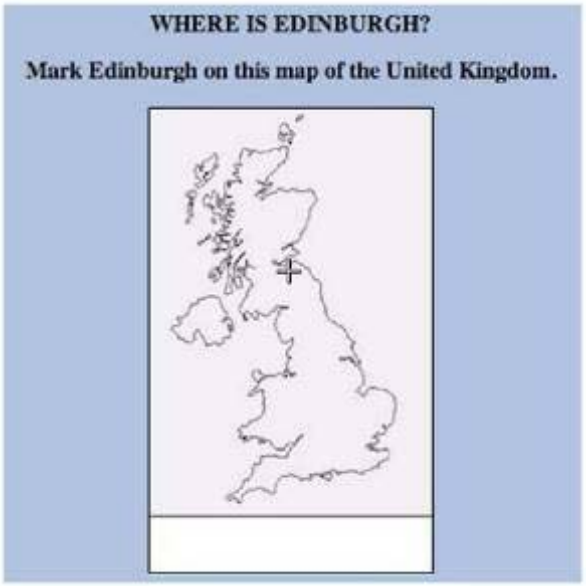
Note that the response is of type identifier and that each individual hotspotChoice associates an identifier with an area of the image.

愛丁堡的位置?(Where is Edinburgh?)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/select_point.xml

圖 5.13 愛丁堡的位置?(圖例)

Figure 5.13 Where is Edinburgh? (Illustration).



本例說明 selectPointInteraction。RESPONSE 被宣告為一個單一的點，此單一的點被歸類為用來記錄受試者在地圖上所標示的點。correctResponse 給的答覆雖然也相同，然而，對這型式問題而言，預期受試者可以在地圖上點到正確位置相當不合理，且需要建立太多 values 作為可用的對照。考慮到這點，可在此例使用 areaMapping 作為取代，areaMapping 允許一個以上的座標空間來對照 numeric value(作為計分)。在這個例子中，只定義一個空間：即正確答覆(最理想)為半徑 8 像素的圓形之圓心。並可利用標準答覆處理模版 Map Response Point 的 areaMapping 設定分數。

This example illustrates the selectPointInteraction. The RESPONSE is declared to be a single point that records the coordinates of the point on the map marked by the candidate. The correctResponse is given in the declaration too, however, for this type of question it is clearly unreasonable to expect the candidate to click exactly on the correct point and there would be too many values to build a workable mapping. To get around this problem an areaMapping is used instead, this allows one or more areas of the

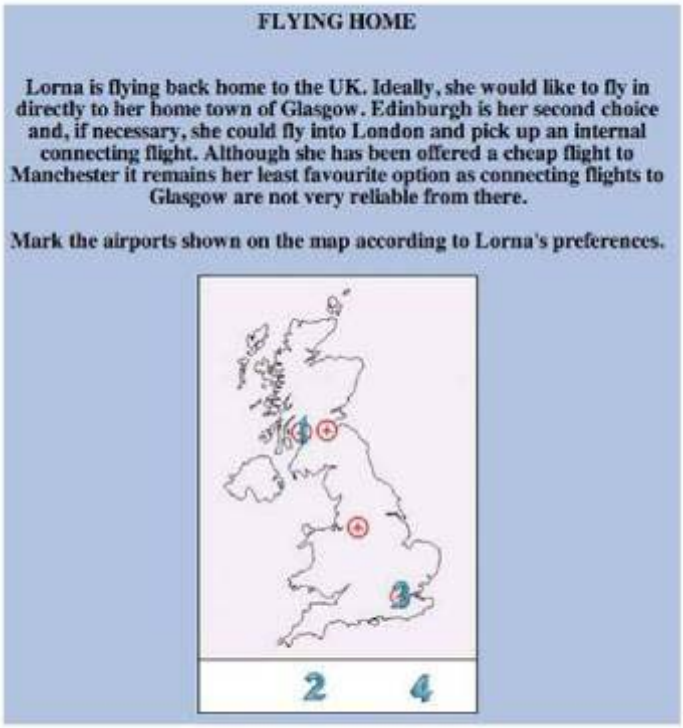
coordinate space to be mapped to a numeric value (for scoring). In this example, just one area is defined: a circle with radius 8 pixels centered on the correct (optimal) response. The standard response processing template Map Response Point is used to set the score using the areaMapping.

飛回家(Flying Home)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/graphic_order.xml

圖 5.14 飛回家(圖例)

Figure 5.14 Flying Home (Illustration).



此例說明 graphicOrderInteraction。此作業與巴林大賽相似，除了選項用影像上的熱點呈現。

This example illustrates the graphicOrderInteraction. The task is similar to

Grand Prix of Bahrain except that the choices are presented as hotspots on a graphic image.

廉價飛行(Low-cost Flying)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/graphic_associate.xml

圖 5.15 未知的廉價飛行(圖例)

Figure 5.15 Low-cost Flying Unanswered State (Illustration).

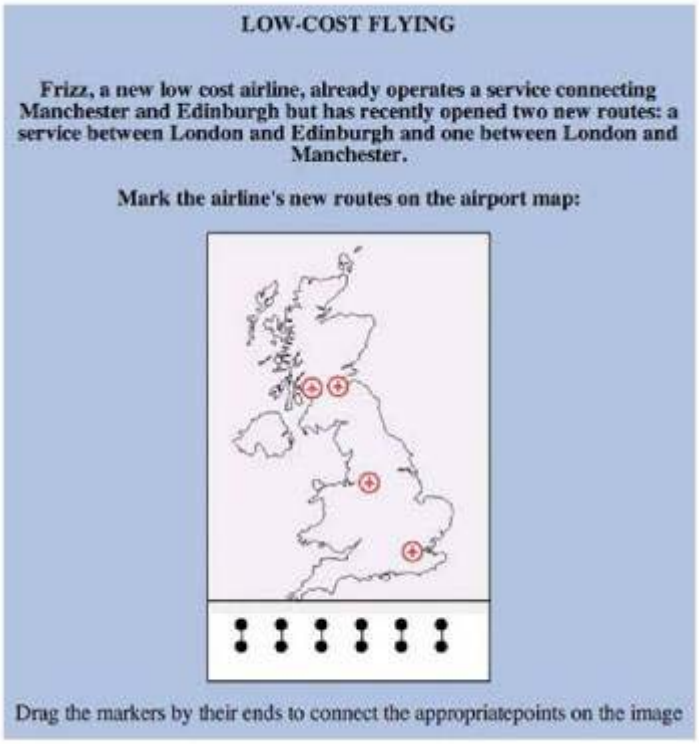
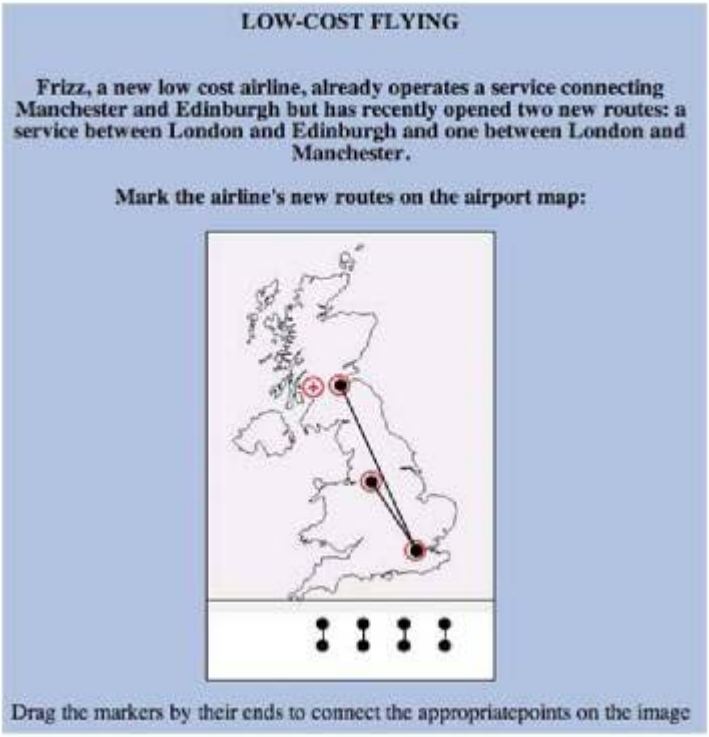


圖 5.16 已知的廉價飛行(圖例)

Figure 5.16 Low-cost Flying Answered State (Illustration).



此例說明 graphicAssociateInteraction。此作業與「莎士比亞戲劇中的競爭對手」相似----除了以位在影像上的熱點呈現選項以外。需注意每個熱點均設置三個 matchMax，讓受試者每個熱點可以聯繫三次(換句話說，其他熱點也可依需求設置)。

This example illustrates the graphicAssociateInteraction. The task is similar to Shakespearian Rivals except that the choices are presented as hotspots on a graphic image. Notice that matchMax is set to three for each of the hotspots allowing the candidate to associate each hotspot up to three times (in other words, with all the other hotspots if desired).

機場標籤(Airport Tags)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/graphic_gap_match.xml

圖 5.17 機場標籤(圖例)

Figure 5.17 Airport Tags (Illustration).

這個例子說明 graphicGapMatchInteraction。此作業類似「李察三世(幕 1)」，除了第一個選項的設置為影像，第二個設置則包含了較大背景圖的 gaps。影像化系統可執行 drag and drop 來支援拖曳功能。

This example illustrates the graphicGapMatchInteraction. The task is similar to Richard III (Take 1) except that the first set of choices are images and the second set are gaps within a larger background image. In graphical system that supports dragging this would typically be implemented using drag and drop.

機場位置(Airport Locations)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/position_object.xml

圖 5.18 機場位置(圖例)

Figure 5.18 Airport Locations (Illustration).

此例說明的 positionObjectInteraction, 絕大部分與「愛丁堡的位置」這題相同, 除了該”點”係藉由定位在影像(影層)上的給定物件 所選擇。注意該影層不被列為互動之中, 此允許在多重位置物件互動中共用一個單一影層。

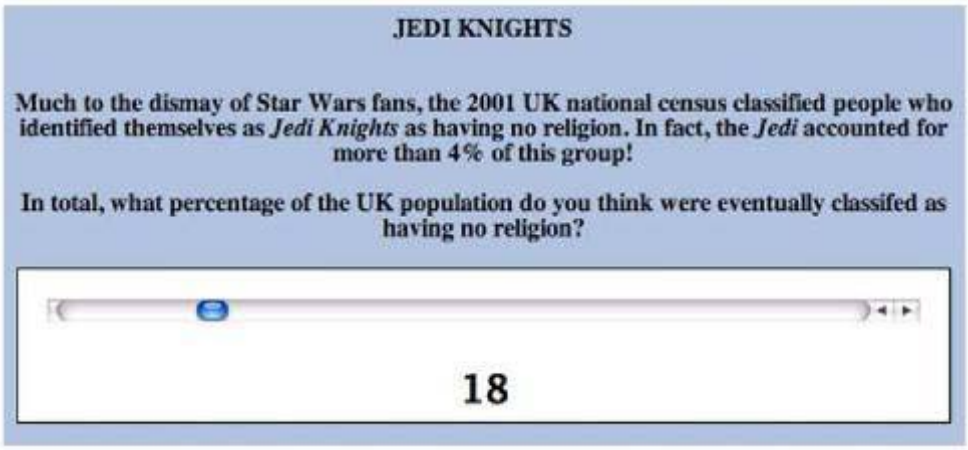
This example illustrates the positionObjectInteraction. It has a lot in common with Where is Edinburgh? except that the 'point' is selected by positioning a given object on the image (the stage). Notice that the stage is specified outside of the interaction. This allows a single stage to be shared amongst multiple position object interactions.

絕地武士(Jedi Knights)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/slider.xml

圖 5.19 絕地武士(圖例)

Figure 5.19 Jedi Knights (Illustration).



此例說明利用 sliderInteraction 獲得百分比評量。這個互動必須先有一個完整的答覆，然後才可利用標準 Map Response response processor 計分。

This example illustrates the sliderInteraction. It is used in this example to obtain a percentage estimate. The interaction is bound to an integer response which can then be scored using the standard Map Response response processor.

白爾謝的故鄉(La casa di Giovanni)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/drawing.xml

這個範例說明 drawingInteraction。注意此 RESPONSE 被宣告其型式係為檔案。此繪圖發生在一個必備的預設畫布上，預設畫布以現存影像的形式存在，並可針對受試者的答覆決定適合的影像大小、解析度及影像型式。

This example illustrates the drawingInteraction. Notice that the RESPONSE

is declared to be of type file. The drawing takes place on a required pre-supplied canvas, in the form of an existing image, which is also used to determine the appropriate size, resolution and image type for the candidate's response.

巧克力工廠(幕 1)[The Chocolate Factory (Take 1)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/upload.xml

這個範例說明 uploadInteraction。RESPONSE 再次被宣告為 type file。是一個提供受試者將答覆中的試算表上載到作業的機制，而處理 file-based 問題的答覆處理，已超出本標準之範圍。

This example illustrates the uploadInteraction. The RESPONSE is again declared to be of type file. The candidate is provided with a mechanism to upload their own spreadsheet in response to the task, response processing for file-based questions is out of scope of this specification.

5.1.3 複合試題(Composite Items)

複合試題指的是，在一個互動中包含超過一點的試題。複合試題包含多個相同形式的互動，或一個混合型式的互動。

Composite items are items that contain more than one point of interaction. Composite items may contain multiple instances of the same type of interaction or have a mixture of interaction types.

巧克力工廠(幕 2)[The Chocolate Factory (Take 2)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/upload_composite.xml

此例延伸自「巧克力工廠(幕 1)」，但附加上可讓記分客觀的文本答覆區。

This example extends The Chocolate Factory (Take 1) with an additional text response field that can be marked objectively.

5.1.4 答覆處理(Response Processing)

截至目前，所有範例的記分都使用標準答覆處理模版，否則就是沒有合適的客觀記分方式。對簡單的問題情境而言，使用答覆處理只需配合幾個固定的記分方法，並且能促進及改善系統之間的互通性。

So far, all the examples have been scored using one of the standard response processing templates, or have not been suitable for objective scoring. For simple scenarios, use of the response processing templates is encourage as they improve interoperability between systems that only cater for a limited number of fixed scoring methods.

有許多選項---特別是使用到更多一般性答覆處理模型並且具回饋的選項，需藉由本範例定義。標準模版則自行利用更多的一般性答覆處理語言定義。

Many items, particularly those involving feedback, will require the use of the more general response processing model defined by this specification. The standard templates are themselves defined using this more general response processing language.

巴林大賽(部份給分)[Grand Prix of Bahrain (Partial Scoring)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/order_partial_scoring.xml

此範例為增加部份給分的記分方式的「巴林大賽」。平台上有三個賽車手, 受試者的答覆有六種可能性, 但只有一個是正確答覆。過去的記分方式給予正確答案一分, 其他選項零分。現在的記分方式則給予正確答案兩分。如果其他兩位賽車手放錯, 但正確的將 Michael Schumacher 放置第一個位置時可得一分。如果將 Barichello 或 Button 放到第一個位置則零分(即其他所有組合)。

This example extends Grand Prix of Bahrain to include partial scoring. With three drivers to place on the podium there are 6 possible responses that the candidate can make, only one of which is correct. Previously, the correct answer scored 1 and all other responses scored 0. Now, the correct answer scores 2. Correctly placing Michael Schumacher first scores 1 if the other two drivers have been muddled up. Placing Barichello or Button first scores 0 (all other combinations).

答覆處理是由一連串的規則構成, 並由 response processor 適當地去實現完成。responseCondition 是一特別的規則, 它可包含 sub-sequences 的規則, 劃分出 responseIf、responseElseIf 及 responseElse 題組。response processor 評量 responseIf 及 responseElseIf 元件, 並決定表示式中要執行哪一個。在這個例子中, 只要變數與 identifier RESPONSE 符合被宣告之正確答覆時, 表示式就會執行 responseIf 題組, 而當 RESPONSE 明確地的給予符合之答覆時, 表示式執行 responseElseIf 題組(即正確的放置第一個賽車手, 但其他兩者亂放)。若先前兩種情況均不符合, 則執行

responseElse 題組。responseElse 題組沒有一致的表達方式。setOutcomeValue 元件只是一個 responseRule，其告知處理器設定特定 outcomevariable 的值為其包含表示式的值。

Response processing consists of a sequence of rules that are carried out, in order, by the response processor. A responseCondition rule is a special type of rule which contains sub-sequences of rules divided into responseIf, responseElseIf and responseElse sections. The response processor evaluates the expressions in the responseIf and responseElseIf elements to determine which sub-sequence to follow. In this example, the responseIf section is followed only if the variable with identifier RESPONSE matches the correct response declared for it. The responseElseIf section is followed if RESPONSE matches the response explicitly given (which places the correct driver 1st but confuses the other two). Finally, the responseElse section is followed if neither of the previous two apply. The responseElse section has no corresponding expression of course. The setOutcomeValue element is just a responseRule that tells the processor to set the value of the specified outcomevariable to the value of the expression it contains.

corrent 變數及 baseValue 元件為簡易表示式的範例；換句話說，是無法再分解的表示式。相對來說，match 及 ordered 元件為運算符的範例。運算符是結合其他表示式形成的新值之表示式。舉例來說，match 被用於視兩個表示式是否有匹配值以形成布林式。

The variable, correct, and baseValue elements are examples of simple expressions. In other words, expression that are indivisible. In contrast, the

match and ordered elements are examples of operators. Operators are expressions that combine other expressions to form new values. For example, match is used to form a boolean depending on whether or not two expressions have matching values.

5.1.5 回饋(Feedback)

回饋根據 responseProcessing 的結果，條件性的將教材呈現給受試者。換句話說，結果變數可以控制回饋。回饋教材有兩種形式，模態(modal)及整合(integrated)。模態回饋發生在結束答覆處理機制後，且在任何後續試題嘗試或檢視之前。整合回饋嵌入 itemBody，且僅呈現於後續試題嘗試或檢視期間。

Feedback consists of material presented to the candidate conditionally based on the result of responseProcessing. In other words, feedback is controlled by the values of outcome variables. There are two types of feedback material, modal and integrated. Modal feedback is shown to the candidate after response processing has taken place and before any subsequent attempt or review of the item. Integrated feedback is embedded into the itemBody and is only shown during subsequent attempts or review.

墨西哥總統(Mexican President)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/feedback.xml

在這個範例中，一個簡單的多選題宣告一附加結果變數，FEEDBACK，它被用來控制 integrated 回饋(feedbackInline 元件)及 modalFeedback 的 visibility。在這個例子中，回饋接著受試者給予答覆後立即出現，因此

FEEDBACK 可以直接簡易設定至 RESPONSE 值。

In this example, a straightforward multi-choice question declares an additional outcome variable called FEEDBACK which is used to control the visibility of both integrated feedback (the feedbackInline elements) and modalFeedback. The feedback shown depends directly on the response given by the candidate in this case so FEEDBACK is simply set to the value of RESPONSE directly.

圖 5.20 提交答覆之前的墨西哥總統(圖例)

Figure 5.20 Mexican President Before Submission (Illustration).

圖 5.21 提交答覆之後的墨西哥總統(圖例)

Figure 5.21 Mexican President After Submission (Illustration).

5.1.6 適性題(Adaptive Items)

適性題是 2.0 版的新功能之一，為試題在連續動作中提供適當的記分方式。允許受試者得到回饋後修改答案或根據目前的答案提出額外問題。答覆處理的運作會因適性題而有所不同。通常(就非適性題而言)每個動作具獨立性, 且結果變數在每次 responseProcessing 完成後, 設置他們的 default values。對適性題而言，結果變數在多重動作或答覆處理更新之後，保留他們的 values。差別在於，assessmentItem 具有適性屬性的 value，適性題則由 assessmentItem 指示。為了讓受試者修正他們的答覆，適性題必須在過程中提供回饋。

Adaptive items are a new feature of version 2 that allows an item to be scored adaptively over a sequence of attempts. This allows the candidate to alter their answer following feedback or to be posed additional questions based on their current answer. Response processing works differently for adaptive items. Normally (for non-adaptive items) each attempt is independent and the outcome variables are set to their default values each time responseProcessing is carried out. For adaptive items, the outcome variables retain their values across multiple attempts and are only updated by subsequent response processing. This difference is indicated by the value of the adaptive attribute of the assessmentItem. Adaptive items must of course provide feedback to the candidate in order to allow them to adjust their response(s).

具適性回饋的墨西哥總統試題(Mexican President with adaptive feedback)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/feedback_adaptive.xml

在這適性範例中，受試者在每個不同的動作後，可以獲得不同的「墨西哥總統」。在提供正確答案之前，選項允許四個不正確的動作被執行。

In this adaptive example, the candidate receives different Mexican President for each attempt. The item allows for four incorrect attempts before the correct answer is provided.

蒙提霍爾(幕 1)[Monty Hall (Take 1)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/adaptive.xml

這個例子提出有名的數學問題，並以遊戲方式向使用者呈現。feedbackBlock 元件接合一些控制大量故事的結果變數，從開局策略到是否贏取獎品。當故事結束後，可以詢問之前所採用過的策略。注意問題的記分方式根據所採用的實際策略(一個標記)以及最後對問題的答案(兩個標記)。假使一開始就選擇到不好的策略，遊戲就會失敗。如果受試者覺得太假，蒙提霍爾(幕 2)結合了適性及具強大功能的試題模版，可以看到更多相同問題的實際描述。

This example takes a famous mathematical problem and presents it to the user as a game. The feedbackBlock element, in association with a number of outcome variables is used to control the flow of the story, from the opening gambit through to whether or not you have won a prize. When the story concludes you are asked about the strategy you adopted. Notice that the scoring for the question is based on the actual strategy you took (one mark)

and your answer to the final question (two marks). If you choose a bad strategy initially you are always punished by losing the game. If you feel that this is cheating take a look at a more realistic version of the same question which combines adaptivity with the powerful feature of item templates: Monty Hall (Take 2).

圖 5.22 蒙提霍爾的第一步驟(圖例)

Figure 5.22 Monty Hall First Attempt (Illustration).

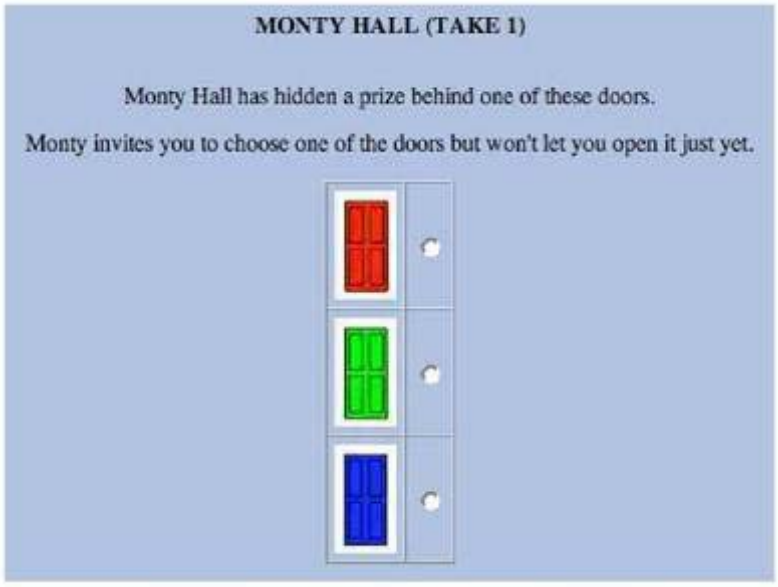


圖 5.23 蒙提霍爾的第二步驟(圖例)

Figure 5.23 Monty Hall Second Attempt (Illustration).

圖 5.24 蒙提霍爾的第三步驟(圖例)

Figure 5.24 Monty Hall Third Attempt (Illustration).

圖 5.25 蒙提霍爾的回饋(圖例)

Figure 5.25 Monty Hall Final Feedback (Illustration).

在先前的例子中，終止嘗試的預設方法用於整個試題的進展過程中，然而，有時也想要能提供受試者終止嘗試的替代方法。最常用的需求是，選擇獲得提示而不是要提交最後答案。QTI 透過 endAttemptInteraction 的特殊功能，提供彈性的方式來整合這些替代路徑。

In the previous example, the default method of ending an attempt was used to progress through the item, however, sometimes it is desirable to provide alternative ways for the candidate to end an attempt. The most common requirement is the option of requesting a hint instead of submitting a final answer. QTI provides a flexible way to accommodate these alternative paths through the special purpose endAttemptInteraction.

具提示的墨西哥總統試題(Mexican President with hints)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/hint.xml

在這個例子中，「墨西哥總統」增加回饋及需要提示的選擇。endAttemptInteraction控制答覆變數的value--- HINTREQUEST---true為需要一個提示來結束動作，其餘為 false。

In this example, Mexican President is extended to provide both feedback and the option of requesting a hint. The endAttemptInteraction controls the value of the response variable HINTREQUEST - which is true if the attempt ended with a request for a hint and false otherwise.

5.1.7 試題模版(Item Templates)

試題模版也是修訂 2 版的新功能，其定義許多相似試題使用相同的assessmentItem。

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tem templates are a new feature of version 2 that allows many similar items to be defined using the same assessmentItem.

挖洞(Digging a Hole)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/template.xml

這個例子包含了簡易的textEntryInteraction，但每個試題session的問題(及正確答案)均不相同。除此之外，通常會宣告一些模版變數---RESPONSE變數及 SCORE 變數。它們的 value 被一系列的 templateProcessing 規則所設置。模版處理機制與答覆處理十分相像。使用相同的條件性模式及表示

式語言。不同的是，templateRules 設置模版 correctResponse 的 value，因為答案的變化根據選擇 A 及 B 的 value 而定。並使用特別規則，使用模版處理機制題組中的 setCorrectResponse。

This example contains a simple textEntryInteraction but the question (and the correct answer) varies for each item session. In addition to the usual RESPONSE and SCORE variables a number of template variables are declared. Their values are set by a set of templateProcessing rules. Template processing is very similar to response processing. The same condition model and expression language are used. The difference is that templateRules set the values of template variables and not outcome variables. Notice that the declaration of RESPONSE does not declare a value for the correctResponse because the answer varies depending on which values are chosen for A and B. Instead, a special rule is used, setCorrectResponse in the template processing section.

randomInteger 元件描述，從標準範圍中選取一個隨機整數的簡易表示式。隨機元件則描述，從容器中選取一隨機 value 的運算符。

The randomInteger element represents a simple expression that selects a random integer from a specified range. The random element represents an operator that selects a random value from a container.

itemBody 顯示使用 printedVariable 元件的模版變數的 value。

The itemBody displays the values of the template variables using the printedVariable element.

米克的旅行(Mick's Travels)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/template_image.xml

讓一個試題在方向上有些變化，可以吸引受試者的注意。作法是不能直接描述模版變數的 value。舉例來說，「米克的旅行」這個試題，itemBody 控制一個影像，這張影像需要根據不同的 value 去選擇模版變數。要完成三個 templateInline 元件，每個 templateInline 元件都要封入不同的 img 元件。當結果變數被用來控制回饋的 visibility 時，此元件（與相似的 templateBlock 一起）和模版變數一樣，利用相同方式控制其 visibility 屬性。

Sometimes it is desirable to vary some aspect of an item that cannot be represented directly by the value of a template variable. For example, in "Mick's Travels", the itemBody contains an illustration that needs to be varied according to the value chosen for a template variable. To achieve this three templateInline elements are used, each one enclosing a different img element. This element (along with the similar templateBlock) has attributes for controlling its visibility with template variables in the same way as outcome variables are used to control the visibility of feedback.

試題模版也可以與適性試題相結合。

Item templates can be combined with adaptive items too.

蒙提霍爾(圖 2)(Monty Hall (Take 2))

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/adaptive_te

mplate.xml

蒙提霍爾(幕 1)中固定的遊戲會令人厭倦，故受試者總是使用錯誤的策略而得不到獎品(及第一個標記)。在蒙提霍爾(幕 2)這個試題中，使用試題模版來呈現更多遊戲的寫實描述。相同的結果變數被定義來控制故事及回饋給予，templateDeclaration 則被用來宣告 PRIZEDOOR 變數。templateProcessing 規則還被用來隨機預選勝利之門，讓遊戲更加真實。responseProcessing 規則的結構變得較複雜，因為 PRIZEDOOR 必須檢查以：(a)保證蒙提不會在受試者的第一個選擇後打開獲獎之門；(b)視受試者實際上是否贏得"夢幻獎"。

In Monty Hall (Take 1) we cheated by fixing the game so that the wrong strategy always lost the candidate the prize (and the first mark). In this version we present a more realistic version of the game using an item template. The same outcome variables are defined to control the story and the feedback given but this time a templateDeclaration is used to declare the variable PRIZEDOOR. The templateProcessing rules are then used to preselect the winning door at random making the game more realistic. The responseProcessing rules are a little more complicated as the value of PRIZEDOOR must be checked (a) to ensure that Monty doesn't open the prize winning door after the candidate's first choice and (b) to see if the candidate has actually won the "fantastic prize".

在此例中，受試者雖然運用正確的策略，但仍有 1/3 次機率輸掉獎品(即使他們總是獲得標記)。

In this example, using the correct strategy will still lose the candidate the prize 1/3 of the time (though they always get the mark).

5.1.8 各式各樣的技術(Miscellaneous Techniques)

(1)分享教材物件(Shared Material Objects)

當詢問的問題全部都能連結到相關的常用教材, 如影像或段落文字時, 是相當不錯的。影像檔總是被分開的儲存且利用標示來使用內部的img或物件元件, 相當容易從多選試題中被使用, 使用段落文字也可利用相同方法。物件元件認可外部定義文字(純文字檔或超文本標示)被包含在itemBody。

It is often desirable to ask a number of questions all related to some common stimulus material such as a graphic or a passage of text. Graphic files are always stored separately and referenced within the markup using img or object elements making them easy to reference from multiple items but passages of text can also be treated this way. The object element allows externally defined passages (either as plain text files or HTML markup) to be included in the itemBody.

接下來的兩個例子示範使用分享教材物件。

The following two example demonstrate this use of a shared material object.

奧克尼群島 問題1 Orkney Islands Q1

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/orkney1.xml

奧克尼群島 問題2 Orkney Islands Q2

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/orkney2.xml

(2)樣式表(Stylesheets)

結合樣式表與試題只需要在assessmentItem中使用樣式表元件。「奧克尼群島」的例子使用CSS2語言撰寫，使用assessmentItem元件來結合樣式表。請注意，類別屬性將試題主體分割為兩塊區域，即分開的樣式表，分享的教材顯示在右手邊的視窗，說明及問題則顯示在左手邊的視窗。

Associating a stylesheet with an item simply involves using the stylesheet element within an assessmentItem. The Orkney Islands examples above use this element to associate a stylesheet written using the CSS2 language. Notice that the class attribute is used to divide the item's body into two divisions that are styled separately, the shared material appearing in a right-hand pane and the instructions and question appearing in a left-hand pane.

奧克尼群島樣式表(Orkney Islands Stylesheet)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/shared/orkney.css

在QTI 2.0版中，樣式表是說明提供絕對定位的合適方法---部分已不再被試題資料模型直接支援。修訂1版中，教材元件擁有自己的類別集(可從升級指引觀看更多有關功能使用升級內容的資訊)。

This stylesheet also demonstrates a possible approach to providing absolute positioning in QTI version 2 - something which is no longer supported directly by the item information model. In version 1, material elements could have their coordinates set explicitly (see the Migration Guide for more information about migrating content that used this feature).

(3)替換媒體(Alternative Media)

XHTML物件元件被設計用來支援媒體物件故障之損耗支援程度。HTML4.01標準(依據

[XHTML]提出”不論任何原因只要用戶代理無法提供物件(無法更改設定、缺少資源、錯誤的架構等)，就要試著提出內容”)。

The XHTML object element is designed to support the graceful degradation of media objects. The HTML 4.01 specification (the basis for [XHTML]) says "If the user agent is not able to render the object for whatever reason (configured not to, lack of resources, wrong architecture, etc.), it must try to render its contents."

寫張明信片(幕2)[Writing a Postcard (Take 2)]

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/nested_object.xml

這個例子與「寫張明信片」相同，除了為明信片的影像提供兩種不同的格式。第一個格式為encapsulated PostScript file (EPS)，另一種格式是PNG bitmapped image。最後，要是教材傳遞引擎無法處理所提供的影像型式，明信片的文字就會直接顯示。對於許多不同種類輸出媒體，如試卷、高解析度顯示器、低解析度顯示器等，試題作者可以考慮使用這個技術，適當的維護影像。

This example is the same as Writing a Postcard except that the picture of the postcard is provided in two different formats. Firstly as an encapsulated PostScript file (EPS) and then, alternatively, as a PNG bitmapped image. Finally, if the delivery engine is unable to handle both offered image types the text of the postcard can be displayed directly. Item authors should consider using this technique for maintaining images suitable for a variety of different output media, e.g., paper, high-resolution display, low-resolution display, etc.

(4)互動的替換方式(Alternative Renderings for Interactions)

奧克尼群島樣式表說明，樣式應用XHTML元件來定義試題主體結構的方式。類別屬性

可以執行仍然可應用的互動及許多常用格式化概念(字體大小、顏色等)。教材傳遞引擎也可以使用這個屬性，選擇要呈現給受試者的多樣的互動----然而互動中類別屬性的字彙目前仍超出標準範圍。

The Orkney Islands Stylesheet illustrates the way styles can be applied to the XHTML elements that defined the structure of the item's body. The class attribute can also be applied to interactions and many of the common formatting concepts will still be applicable (font size, color, etc.). Delivery engines may also use this attribute to choose between multiple ways of presenting the interaction to the candidate—though the vocabulary for class attributes on interactions is currently beyond this specification.

QTI問卷(The QTI Questionnaire)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/likert.xml

這個例子說明一般用來呈現一組選擇的試題，又稱李克特量表，此量表用來獲得以態度為基礎的答覆。問題藉由標準的choiceInteraction來呈現，但itemBody的類別屬性被設定為likert，用來指出教材傳遞引擎，為問題做適當的設計，例如：問答提示符使用單行，且每個選項皆有一個固定的定位停駐點。整個試題主體均使用樣式類別，教材傳遞引擎結合多種李克特試題，讓選項更加簡潔精練。請注意在例子中沒有responseProcessing，因為問卷試題沒有所謂的正確答案！

This example illustrates an item that is used to present a set of choices commonly known as the likert scale used to obtain responses to attitude-based questions. The question is represented by a normal choiceInteraction but the class attribute of the itemBody is set to likert to indicate to the delivery engine that it should use an appropriate layout for the question, e.g., using a single line for the prompt and the choices with each choice at a fixed

tab stop. By applying the style class to the whole of the item body, a delivery engine that renders multiple likert items together might be able choose a more compact rendering. Note that in this example the responseProcessing is absent, there is no right answer!

(5)使用數學標籤語言(Using MathML)

Relativity 相對性

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/math.xml

這個簡單的範例說明使用數學標籤語言(MathML)於試題中標示數學表示式。

This simple example illustrates the inclusion of a mathematical expression marked up with MathML into an item.

(6)格式化數字(Number Formatting)

藉由C標準的描述，printedVariable的格式屬性呈現格式化規則。下列的表格說明主要功能。空白字元以'_'表示(底線)，增加易讀性。

The format attribute of printedVariable profiles the formatting rules described by the C standard. The following table illustrates the main features. Spaces are show as the '_' (underscore) character to improve readability.

格式標準 Format specification	輸入 Input	格式化輸出 Formatted output	備註 Notes
%i	-987	-987	簡易單一十進位格式 Simple signed decimal format.
%.4i	-987	-0987	精確的在i、o、x及X格式指定最小值並default最小值 Precision specifies the minimum number of digits ini, o, x 和 X formats and defaults to no minimum.
%.0i	0		格式化0及0的精確度沒有數字輸出(只有格式i, o, x 和 X)

			When formatting zero with a precision of 0 no digits are output (i, o, x and X formats only).
%8i	987	_____987	欄位寬度手動設定為8，結果有5個前置空格 Field-width set manually to 8 results in five leading spaces.
%2i	987	987	欄位寬度手動設定為2不適合，結果被忽略 Field-width set manually to 2 is insufficient so ignored.
%-8f	987	987_____	連字號往左測推移，結果為5個後綴空格 Hyphen flag forces left field alignment resulting in five trailing spaces.
%08i	987	00000987	0 號推移補零，結果為5個前置0 Zero flag forces zero-padding resulting in five leading zeros.
%+i	987	+987	加號符號，以” + ”前置於正數(除了格式o, x及X) Plus flag leads positive numbers with plus sign (excluding o, x and X formats).
%_i	987	_987	空白符號，以” ”前置於正數(除了格式o, x及X) Space flag leads positive numbers with space (excluding o, x and X formats).
%o	987	1733	八進格式，數字必為正 Octal format, number must be positive.
%#o	987	01733	#號保證格式o至少會有一個前置0 # flag ensures at least one leading 0 for o format.
%x	987	3db	十六進格式(小寫)，數字必為正 Hex format (lower case), number must be positive.
%#x	987	0x3db	# 號為格式x顯示前置0x # flag always displays leading 0x for x format.
%X	987	3DB	十六進格式(大寫)，數字必為正 Hex format (upper case), number must be positive
%#X	987	0X3DB	# 號為格式X顯示前置0X # flag always displays leading 0X for X format.
%f	987.654	987.654000	小數位數的精確度為f格式顯示並預設到小數後6位 The precision specifies number of decimal places to display for f format and defaults to 6.
%.2f	987.654	987.65	手動設定精確度為2 Precision set manually to 2.
%#.0f	987	987.	# 號推移後綴點到格式f, e, E, g, G, r 及R # flag forces trailing point for f, e, E, g, G, r and R

			formats.
%e	987.654	9.876540e+02	推移使用科學記號。精確度為格式e、E計算出點右邊的位數，預設為六位 Forces use of scientific notation. The precision specifies number of figures to the right of the point for e and E formats and defaults to 6.
%.2e	987.654	9.88e+02	手動設定精確度為2 Precision set manually to 2.
%E	987.654	9.876540E+02	推移使用科學記號(大寫形式) Forces use of scientific notation (upper case form).
%g	987654.321	987654	四捨五入精確度為有意義的數字(預設為六位)，當精確度大於或等於數字左邊的點時，以一般形式顯示。 Rounded to precision significant figures (default 6) and displayed in normal form when precision is greater than or equal to the number of digits to the left of the point.
%g	987	987	移動後綴0到點的右邊 Trailing zeros to the right of the point are removed.
%g	987654321	9.87654e+08	當需要時使用標準形式 Scientific form used when required.
%g	0.0000987654321	9.87654e-05	當4或更多前置0被右邊的點需要時使用標準形式 Scientific form also used when 4 or more leading zeros are required to the right of the point.
%#g	987	987.000	# 號在格式g及G中推移顯示的後綴零(直到精確度為有意義的數字) # flag also forces display of trailing zeros (up to precision significant figures) in g and G formats.
%G	0.0000987654321	9.87654E-05	同g，但使用大寫形式 As for g but uses upper case form.
%r	0.0000987654321	0.000098765454	同g，除了沒有限制前置零到點的右邊 The same as g except that leading zeros to the right of the point are not limited.
%R	0.0000987654321	0.000098765454	同G，除了沒有限制前置零到點的右邊 The same as G except that leading zeros to the right of the point are not limited.

5.4 測驗(評量)[Tests (Assessments)]

試題集與主要教材(Sets of Items With Leading Material)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest01.xml

這個例子說明, 由一組共同分享的三個試題所組成的測驗(rtest01-set01.xml, rtest01-set02.xml, rtest01-set02.xml), 並分享主要教材的單一片斷(rtest01-fragment.xml)。片斷包含在集合中每個使用 XInclude 結構的 assessmentItems。

This example illustrates a test consisting of a set of three items (rtest01-set01.xml, rtest01-set02.xml, rtest01-set02.xml) sharing a single fragment of leading material (rtest01-fragment.xml). The fragment is included in each of the assessmentItems in the set by using the XInclude mechanism.

提交 mode 設定一組個別 mode, 需要受試者一個試題接一個試題地去提交答覆。

The submission mode is set to individual mode requiring the candidate to submit their responses on an item-by-item basis.

導覽 mode 設定的線性 mode, 限制受試者依序在每個試題所執行的動作。一旦受試者進行下一試題, 就被限制無法在返回上一題。

The navigation mode is set to linear mode restricting the candidate to attempt each item in turn. Once the candidate moves on they are not permitted to return.

試題結果的任意收集(Arbitrary Collections of Item Outcomes)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest02.xml

此範例說明使用兩個 assessmentSections(sectionA 和 sectionB)及一個小單位元(sectionB1)。sectionA 及 sectionB 均為 visible 屬性, 可以讓受試者進行辨別。

This example illustrates the use of two assessmentSections (sectionA and sectionB) and one subsection (sectionB1). Both sectionA and sectionB are visible, meaning that they are identifiable by the candidate. Conversely, sectionB1 is not identifiable as a section.

提交 mode 設定為同步。在例子最後的 testPart 部分, 受試者的答覆一起提交(此例實際上最後為 assessmentTest)。

The submission mode is set to simultaneous. The candidate's responses are all submitted together at the end of the testPart (in this case effectively meaning at the end of the assessmentTest).

導覽 mode 設定的非線性 mode 可讓受試者在測驗中的任何時候往返於各試題間。

The navigation mode is set to nonlinear mode allowing the candidate to navigate to any item in the test at any time.

這個測驗使用 weights, 由所有個別試題所提供的分數決定測驗總分。在此例中, item160 的 weight 為 0, 表示當計算測驗總分時, 此題分數無法列入考慮。Item034 的 weight 為 2, 則表示計算到測驗總分的分數加倍。

The test uses weights to determine the contribution of the individual item score to the overall test score. In this example the weight of 0 for item160 means that its score isn't taken into account when calculating the overall test score. The weight of 2 for item034 means that the score for item034 is multiplied by 2 when calculating the overall test score.

沒有給予 assessmentItems weight, 則假設其 weight 為 1.0。

For the assessmentItems where no weight is given, a weight of 1.0 is assumed.

試題分類(Categories of Item)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest03.xml

這個例子使用在 assessmentTest 中的 assessmentItems 來分類。

This example illustrates the use of categories of assessmentItems in the assessmentTest.

提交 mode 設定為同步。在例子最後的 testPart 部分, 受試者的答覆一起提交(此例實際上最後為 assessmentTest)。

The submission mode is set to simultaneous. The candidate's responses are all submitted together at the end of the testPart (in this case effectively meaning at the end of the assessmentTest).

導覽 mode 設定的非線性 mode 可讓受試者在測驗中的任何時候往返於各試

題間。

The navigation mode is set to nonlinear mode allowing the candidate to navigate to any item in the test at any time.

測驗運用分類將試題指派一個或更多的分類。此例的其中一部份---Outcomeprocessing，顯示分類如何被用於計算選擇問題的總分。

The test uses the category assign the items to one or more categories. The outcomeprocessing part of the example shows how the category is being used to sum the score of a selection of the questions.

試題結果的任意權重(Arbitrary Weighting of Item Outcomes)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest04.xml

詳細說明允許之動作(Specifying the Number of Allowed Attempts)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest06.xml

這個範例說明利用 itemSessionControl 去設定一些允許的動作。

This example illustrates the use of itemSessionControl to set the number of allowed attempts.

此範例包含兩個 testParts，第一個 testPart 是被允許動作的最大值，被設定為沒有限制(maxAttempts = 0)，第二個 testPart，其被允許動作的最大值為 1。

The example contains two testParts, the maximum number of allowed attempts for the first testPart is set to unlimited (maxAttempts = 0) and the maximum

number of allowed attempts for the second testPart is 1.

提交 mode 中的兩個 testParts 被設定為個別 mode，需要受試者一個試題接一個試題地去提交答覆。

The submission mode for both testParts is set to individual mode requiring the candidate to submit their responses on an item-by-item basis.

導覽 mode 為兩個 testParts 設定線性 mode，限制受試者依序在每個試題所執行的動作。一旦受試者進行下一試題，就被限制無法在返回上一題。

The navigation mode for both testParts is set to linear mode restricting the candidate to attempt each item in turn. Once the candidate moves on they are not permitted to return.

控制與測驗相關的試題回饋(Controlling Item Feedback in Relation to the Test)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest08.xml

此例利用 itemSessionControl，設置與測驗相關的試題回饋。

This example illustrates the use of itemSessionControl to set the item feedback in relation to the test.

提交 mode 的第二個 testPart 被設定為同步發生。在例子最後的 testPart 部分，受試者的答覆一起提交。

The submission mode for the second testPart is set to simultaneous. The candidate's responses are all submitted together at the end of the testPart.

第二個 testPart 的導覽 mode 被設定為非線性 mode, 可讓受試者在第二個 testPart 中的任何時候往返於各試題間。

The navigation mode of the second testPart is set to nonlinear mode allowing the candidate to navigate to any item in the testPart at any time.

在 itemSessionControl 中的 showFeedback 屬性被設定為 true, 它在最後一部分的最後動作後, 影響回饋的 visibility。

The showFeedback attribute of itemSessionControl is set to true, affecting the visibility of feedback after the end of the last attempt.

允許檢視及回饋使用同步 mode 表示, 在提交答覆之後可以進行測驗的導覽(本例為非線性樣式)。

Allowing review and feedback in simultaneous mode means that the test is navigable after submission (in this case, in a nonlinear style)

itemSessionControl 的 showSolution 屬性被設定為 false, 表示系統無法提供讓受試者進入解答狀態的方式。

The showSolution attribute of itemSessionControl is set to false, meaning the system may not provide the candidate with a way of entering the solution state.

記住在測驗等級中 showFeedback 屬性控制 assessmentItem 回饋。它被設定在試題裡, 無法改變回饋的顯示。

Remember that the showFeedback attribute controls the assessmentItem

feedback on test level. It doesn't overrule the display of feedback as set inside the item.

史帝芬的測驗(Steve's Test)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest09.xml

這個範例說明在特定測驗中，試題動作的持續時間(最大值與最小值)。

This example illustrates controlling the duration of an item attempt (both maximum and minimum) in the context of a specific test.

此測驗表示利用 timeLimits 元件，為全部測驗設定 maxTime，控制單一的 assessmentSection 及單一的 assessmentItem。

The test shows the use of the timeLimits element to set the maxTime constraint for the complete test, a single assessmentSection and a single assessmentItem.

這個例子包括一個 assessmentItemRef (item034)，其 minTime 為 3 分鐘，maxTime 為 10 分鐘。這表示在測驗中受試者無法進行下一個試題(item160)，直到他們與 item034 互動超過 3 分鐘以上。測驗中，每個試題給予一個最大值，限制受試者的動作，可以預防受試者還沒超過三分鐘以上就提交他們的答覆。不過，他們必須在超過 10 分鐘前提交答覆。因為到達限制時間時，即自動提交當下的答覆。

The example contains one assessmentItemRef (item034) which has a minTime of 3 minutes and a maxTime of 10 minutes. This means that candidates cannot progress to the next item in the test (item160) until they have spent 3 minutes interacting with it. Given that the candidate is limited to a maximum of 1

attempt at each item in the test, this effectively means that the candidate is prevented from submitting their responses until 3 minutes have passed. However, they must submit their responses before 10 minutes have passed. When the time limit is up the current responses would typically be submitted automatically.

試題建構者可以決定在試題中所有 maxTime 元件的總和，等於 assessmentTest 的 maxTime 或比其小，也能決定試題中所有 minTime 元件的總和，等於 assessmentTest 的 minTime 或比其小。

It is up to the assessment constructor to make sure that the sum of all maxTime elements in the assessment is smaller or equal to the maxTime of the assessmentTest and that the sum of all minTime elements in the assessment is smaller or equal to the maxTime of the assessmentTest.

史帝芬的測驗(Steve’s Test)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest10.xml

這個範例說明如何根據累積的試題結果，為較早結束的測驗提供支援。

This example shows how to provide support for early termination of test based on accumulated item outcomes.

每個動作及檢核以後，如果 SCORE 大於 3，則呼叫測驗的 outcomeProcessing。

The outcomeProcessing for the test is invoked after each attempt and checks to see if the SCORE is greater than 3. If that is the case the exitTest terminates the test.

黃金(必要的)試題與題組(Golden (required) Items and Sections)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest12.xml

這個範例說明如何根據累積的試題結果，為較早結束的測驗提供支援。

This example shows how to provide support for early termination of test based on accumulated item outcomes.

在 assessmentSection B，使用選擇元件挑選兩個子題，但 assessmentSection B1 為必備(因為需要為 true 屬性)，所以選擇 B1 和其他三題試題中的其中一題。當混和的結果為 assessmentSection 時包含了四個試題，B1 係隱形題組，包含混合其他選擇試題的三個試題。

In assessmentSection B, we select 2 children using the selection element, but assessmentSection B1 is required (because of the required="true" attribute) so we effectively select B1 and one of the other three items. B1 is an invisible section and the three items it contains will be mixed in with the other selected item when shuffling resulting in a an assessmentSection containing four items.

史帝芬的測驗(Steve ’ s Test)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest13.xml

這個例子說明根據答覆 assessmentItem 來支援轉移。

This example shows the support for branching based on the response to an assessmentItem.

preCondition 元件設定顯示需要 assessmentItem 及 assessmentSection 碰上的狀況。非線性 mode 則不理會 pre-conditions。

The preCondition element set the conditions that needs to be met for an assessmentItem or assessmentSection to be displayed. In nonlinear mode, pre-conditions are ignored.

branchRule 元件包含規則，評量整個測驗過程。設定在下個試題或選擇的替換目標。有了先決條件，非線性 mode 不理會轉移規則。第二個 branchRule 元件包含一個特別的 targetItem” exitSection ”，用來選擇退出測驗。

The branchRule element contains a rule, evaluated during the test, for setting an alternative target as the next item or section. As with preconditions, branch rules are ignored in nonlinear mode. The second branchRule element contains a special targetItem "exitSection" which means exit this section of the test

Items Arranged into Sections within Tests 在測驗中試題被安排於題組

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest22.xml

這個例子顯示利用選擇來分組個別試題。

This example shows the use of sections to group individual items.

隨機排序試題與題組(Randomizing the Order of Items and Sections)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest24.xml

此例子顯示利用 ordering 元件來隨機排序試題與題組。

This example shows the use of the ordering element to randomize the order of

items and sections.

基本統計結果(Basic Statistics as Outcomes)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest25.xml

此例則顯示如何分配測驗的基本統計結果。

This example shows how basic statistics of a test are assigned to outcomes.

由統計所建構的數字(numberCorrect, numberIncorrect, numberPresented, numberSelected, numberResponded)均被結果變數分類。

A number of build in statistics (numberCorrect, numberIncorrect, numberPresented, numberSelected, numberResponded) are assigned to Outcome Variables.

除外, 根據其中兩個基本統計, 亦能預測結果變數"PERCENT_CORRECT"。

In addition to that the Outcome Variable "PERCENT_CORRECT" is calculated based on two of those basic statistics.

史帝芬的測驗(Steve ’ s Test)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest26.xml

這個例子說明試題結果如何在聚集前對應照

This example shows how item outcomes are mapped prior to aggregation.

variableMapping 元件對照 item034。NOTA 對照變數 SCORE。

The variableMapping element maps the item034.NOTA to the variable SCORE.

5.5 使用資料(試題統計)[Usage Data (Item Statistics)]

範例試題統計(Example Item Statistics)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/usagedata/example.xml

這個例子說明使用資料檔的結構。當要分類在一個內容封包內的使用資料時，使用資料會被儲存在封包內一分開的檔案中，藉由適合的 cp:resource 元件與內容清單產生關聯。注意試題試題和其他在使用資料自身中的物件產生關聯，不會被考慮成為依存資源。使用資料檔的資源形式為 imsqti_usagedata_xmlv2p1。

This example demonstrates the construction of a usage-data file. When distributing usage data within a content package the usage-data should be stored in a separate file within the package and referred to in the manifest file by an appropriate cp:resource element. Note that references to the assessment items and other objects within the usage-data file itself are not considered to be dependencies of the resource. The resource type for usage-data files is imsqti_usagedata_xmlv2p1.

5.6 包裝試題、測驗及詮釋資料(Packaged Items, Tests and Meta-data)

簡易包裝範例(Simple Packaging Example)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package/imsmanifest.xml

這例子說明如何運用集成指引所描述的技術，包裝單一試題。內容清單說明資源元件的使用結合了詮釋資料(LOM 及 QTI)與試題，及檔案元件參照

assessmentItem XML 檔及結合的映像檔。

This example demonstrates how a single item is packaged using the techniques described in the Integration Guide. The manifest file demonstrates the use of a resource element to associate meta-data (both LOM and QTI) with an item and the file element to reference the assessmentItem XML file and the associated image file.

分享影像範例(Shared Image Example)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package_shared/imsmanifest.xml

這個例子說明如何包裝多個試題。注意有兩個試題共同分享一媒體物件(如一張影像), 依存關係可以藉由在內容清單中自身的資源元件呈現物件。

This example demonstrates how multiple items are packaged. Note that where two items share a media object (such as an image) a dependency can be used to enable the object to be represented by its own resource element within the manifest.

Package with Response Processing Templates 包裝答覆處理模版

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package_maxfiles/imsmanifest.xml

QTI 的答覆處理模版功能, 將答覆處理規則的常用子集, 利用分開的 XML 文件及試題的簡易參考加以文件化, 並能利用。模版的結構利用在

responseProcessing 元件的模版屬性識別。雖然是 URI 屬性，但不需要成為 URL，直接決定採用適合的 XML 文件。為了協助這些系統，支援一般答覆處理發現規則定義，需要支援新模版，故提供了 templateLocation 屬性，它可提供 URL 採用模版的 XML 文件。如果 URL 與試題位置有關，模版應包含於相同內容之套裝，並在每個與之有關的試題列出為相依性。

The response processing templates feature of QTI allows common sets of response processing rules to be documented in separate XML documents and simply referred to by the items that make use of them. The mechanism for identifying the template to use is the template attribute on the responseProcessing element. This attribute is a URI, but it is not required to be a URL that resolves directly to the appropriate XML document. To help systems that support general response processing find the rule definitions required to support new templates an additional templateLocation attribute is provided which may be used to provide a URL that resolves to the template's XML document. If this URL is given relative to the location of the item then the template should be included in the same content package and listed as a dependency for each of the items that refer to it.

此範例套裝說明相對 URL 與答覆處理有關，列出上文描述在封包中分開的資源。注意此使用之技術類似從參考其名稱空間之 URIs 定位 XML 架構技術，然而，XML 架構包含於內容套裝，用於協助在內容清單中，是否能被描述為分開資源的確認(或檔案依存性)

This example package demonstrates the use of a relative URL to refer to response processing templates listed as separate resources within the package

as described above. Note that the technique used is similar to that for locating XML schemas from the URIs used to refer to their namespaces, however, XML schemas included in content packages to assist with validation should not be described as separate resources (or file dependencies) in the manifest file.

套裝與外部定義的答覆處理模版(Package with Externally Defined Response Processing Templates)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package_minfiles/imsmanifest.xml

除了沒有答覆處理模版外，這個例子與上文其中一個例子相同(套裝與答覆處理模版)。templateLocation 屬性被使用於模版的絕對 URL。

This examples is the same as the one above (Package with Response Processing Templates) except that response processing templates are not included. The templateLocation attribute is used with absolute URLs of the templates.

套裝與測驗、試題(Package with Test and Items)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/test_package_minfiles/imsmanifest.xml

此例說明如何在相關的測驗中將 assessmentTest 與 assessmentItems 包裝在一起。assessmentTest 與 assessmentItems 在內容清單藉由資源元件進行描述。相依關係被用於呈現 assessmentTest 和個別 assessmentItems 之間的關係。

This examples demonstrates how to package an assessmentTest together with

the assessmentItems referenced by the test. Both the assesmentTest and assessmentItems are represented by resource elements within the manifest. A dependency is used to represent the relationship between the assessmentTest and the individual assessmentItems.

5.7 確認(Validation)

QTI 架構檔含有兩個被定義的外部輔助架構，嵌入 XML 名稱空間及數學標籤語言。架構含有在網路上發佈所在位置的絕對 URL。結果導致 XML 確認工具無法在離線時確認 QTI 文件。

The QTI schema file imports two externally defined auxiliary schemas, the built-in XML namespace and MathML. The schema imports these from their published locations on the web using absolute URLs. As a result, some XML validation tools may not be able to validate QTI documents when working offline.

還有些問題是，不管 XML 架構怎樣參考嵌入 XML 名稱空間的結構(如 QTI 使用 xml:lang 屬性)都應(或應該)提供有關聯的名稱空間 prefix 宣告。這點在 XML 標準第一版中說明不清楚，直到發行勘誤表[XML_ERRATA]才加以解釋。勘誤表目前已由[XML] 2.0 版所取代，[XML] 2.0 版說明----假如欲保留 prefix xml，應該包含宣告，但是它並不需要。與最新的 IMS 內容包裝標準一致，QTI 架構在架構的根目錄包含宣告。清楚的是，一些工具仍無法確認文件與包含 QTI 架構的 prefix 及 local copy 的架構，需要代替使用從架構元件調動的屬性。

There is also some confusion as to whether or not XML schemas that refer to components of the built-in XML namespace (such as the xml:lang attribute

used by QTI) should (or even may) provide an associated namespace prefix declaration. This point was unclear in the first edition of the XML specification and not cleared up until the errata to that addition [XML_ERRATA] was published. The errata has itself now been superseded by the second edition [XML] which makes it clear that the declaration may be included provided it is bound to the reserved prefix xml but that it is not required. In keeping with the latest IMS Content Packaging specification the QTI schema includes the declaration in the root of the schema. It is clear that some tools will still not validate documents against schemas that contain this prefix and a local copy of the QTI schema with the following attribute removed from the schema element may need to be used instead:

xmlns:xml="http://www.w3.org/XML/1998/namespace"

這個標準的 QTI 架構的名稱空間識別符為 2.1 版修訂, http://www.imsglobal.org/xsd/imsqti_v2p1。在此版本中使用任何被定義的新元件, 均要使用名稱空間。文件的名稱空間仍可使用 http://www.imsglobal.org/xsd/imsqti_v2p0。為了相容性, 系統當產生符合定義本標準 2.0 版較為狹義模型之內容時, 期待能使用 2p0 名稱空間識別符。

The namespace identifier of the QTI schema has changed for version 2.1 of this specification to `http://www.imsglobal.org/xsd/imsqti_v2p1`. Use of this namespace is required when using any of the new elements defined by this version. Documents with a namespace of `http://www.imsglobal.org/xsd/imsqti_v2p0` must still be supported. For compatibility systems may wish to use the 2p0 namespace

identifier when generating content that conforms to the narrower model defined by version 2.0 of this specification.

6.評量測驗、節、及試題資料模型

有關評量測驗及試題之主要資料模型的參考指引。此文件提供傳遞引擎、編製系統之模型及指定需求的詳細資訊。

The reference guide to the main data model for assessment tests and items. The document provides detailed information about the model and specifies the requirements of delivery engines and authoring systems.

7.詮釋資料及使用資料

此為描述 IEEE LOM 資料模型之應用標準規範，用於與評量測驗和試題，及用於表達使用資料（例如：試題統計）的個別資料模型。本標準特別會讓試題庫及其他內容儲存的開發者、管理者, 以及從試題庫來建構評量試題者感興趣。
A document that describes a profile of the IEEE Standard for Learning Object Metadata [LOM] data model suitable for use with assessment tests and items and a separate data model for representing usage data (i.e., item statistics). This document will be of particular interest to developers and managers of item banks and other content repositories, and to those who construct assessments from item banks.

在 QTI 2.0 版當中，QTI 特有的詮釋資料是與 IEEE LOM 一致，與 IMS Meta-Data Best Practice 以及 Implementation Guide（LOM 的）。IEEE LOM 標準定義一組可用於描述學習資源之詮釋資料元件, 但是不足夠描述評量資源的細節部份。在本標準提供之應用規範因而延伸 IEEE LOM ，以滿足 QTI 希望將詮釋資料與試題合併之開發者的特定需求（如由隨附的試題資料模型定義）。QTI2.1 版進一步延伸使能描述測驗、題庫與物件庫。

In QTI version 2.0, QTI-specific meta-data was brought into line with the IEEE LOM in accordance with the IMS Meta-data Best Practice and Implementation Guide for [LOM]. The IEEE LOM standard defines a set of meta-data elements that can be used to describe learning resources, but does not describe assessment resources in sufficient detail. The application profile provided in this

document therefore extends the IEEE LOM to meet the specific needs of QTI developers wishing to associate meta-data with items (as defined by the accompanying Item Information Model). QTI version 2.1 further extends this to enable the description of tests, pools, and object banks.

7.1IMS QTI 2.0 版的新詮釋資料元件(New Meta-data Elements in IMS QTI v2.0)

IEEE LOM 允許延伸格式成為概念性的資料模式，以提供對於現有辭彙新增新試題、對於現有存在元件的新辭彙，或是新的可被加入schema 之元件，這些不會毀損現有了參照連結或是引入為現存領域的資料類型。

The IEEE LOM permits extensions to be made to the conceptual data schema, in the form of new terms for existing vocabularies, new vocabularies for existing elements, or new elements, which may be inserted into the schema provided they do not subvert the existing chain of references or introduce new data types for existing fields.

應當注意延伸格式是特定社群以及會顯著影響包含其之詮釋資料的互用性。

It should be noted that extensions are community specific and will impact significantly on the interoperability of the meta-data which contains them.

次級詮釋資料，一般也稱作「使用資料（試題統計）」，是單獨在其資料模型當中被定義的。見本文件 Usage Data。

Secondary meta-data, sometimes known as 'usage data' (item statistics), is defined separately in its own data model. See Usage Data later in this document.

以下類別說明了一個為了QTI 特定資訊記錄所產生的新的詮釋資料分類。它被設計來當作額外的上階層的類別，以增加LOM 簡介，下一節會再說明。

The following class describes a new category of meta-data for the recording of QTI specific information. It is designed to be treated as an additional top-level category to augment the LOM profile described in the next section.

Class : qtiMetadata

Contains : itemTemplate boolean [0..1]

當此試題事實上是一個試題範例時為真。換句話說，這個試題根據一些隨機或是外部因素而改變其外觀。一個assessmentItem 內涵一個templateProcessing 區段。

Contains : itemTemplate boolean [0..1]

True if the item is actually an item template, in other words, the item changes its appearance based on some random or external factor. An assessmentItem that contains a templateProcessing section.

Contains : timeDependent boolean [0..1]

此試題是否時間相依。時間相依題所費之時長作為計分的考量。

Whether or not the item is time dependent. A time dependent item takes the length of time taken for an attempt into consideration when scoring.

Contains : composite boolean [0..1]

如果該試題包含一個以上的互動時為真。舉例來說，包含一個以上的互動之assessmentItem。

Contains : composite boolean [0..1]

True if the item comprises more than one interaction, for example, an assessmentItem that contains more than one interaction.

Contains : interactionType [*]

試題的互動類型，字彙是由資料模型定義之名字與由互動轉變而成的次分類所組成。

Contains : interactionType [*]

The interaction type(s) of the item. The vocabulary is comprised of the names, as defined in the information model, of the leaf classes derived from interaction.

Contains : feedbackType [0..1]

說明回饋之類型。若有將存在於試題當中。若是具有回饋，那就說明合適與否必須視試題本身合適與否。一個非合適的試題會產生的回應是基於由部份攻擊提出之回應。一個合適性的試題會產生的回應是由試題路徑所產生的。換言之，基於所有攻擊堆積的回應，而非只是最後一個。

Contains : feedbackType [0..1]

Describes the type of feedback, if any, available in the item. If feedback is available then it is described as being non-adaptive or adaptive depending on whether the item is itself adaptive. A non-adaptive item generates feedback based on the responses submitted as part of (the last) attempt only. An adaptive item generates feedback that takes into consideration the path taken through the item, in other words, feedback based on the accumulation of all attempts and not just the last.

Contains : solutionAvailable boolean [0..1]

若是一個模型方案存在於試題當中，為真。舉例來說，為所有公開的多樣回應，所有提供正確回應的assessmentItem 。

Contains : solutionAvailable boolean [0..1]

Set to true if a model solution is available for the item. For example, an assessmentItem that provides correct responses for all declared response variables.

Contains : toolName string256 [0..1]

用於評量對象的工具名稱。

Contains : toolName string256 [0..1]

The name of the tool used to author the evaluation object.

Contains : toolVersion string256 [0..1]

用於評量對象的工具版本。

Contains : toolVersion string256 [0..1]

The version of the tool used to author the evaluation object.

Contains : toolVendor string256 [0..1]

用於評量對象的工具生產公司。

Contains : toolVendor string256 [0..1]

The company which produced the tool used to author the evaluation object.

Enumeration: feedbackType

none

沒有回應。

none

No feedback is available.

nonadaptive

有回應，但是非合適性。換言之，試題為非合適的試題。

nonadaptive

Feedback is available but it is non-adaptive. In other words, the item is a non-adaptive item.

adaptive

有回應，且為合適性。換言之，試題為合適的試題。

adaptive

Feedback is available and is adaptive. In other words, the item is an adaptive item.

Enumeration: interactionType

associateInteraction

choiceInteraction

customInteraction

drawingInteraction

endAttemptInteraction

extendedTextInteraction

gapMatchInteraction

graphicAssociateInteraction

graphicGapMatchInteraction

graphicOrderInteraction

hotspotInteraction

hottextInteraction

inlineChoiceInteraction

matchInteraction

orderInteraction

positionObjectInteraction

selectPointInteraction

sliderInteraction

textEntryInteraction

uploadInteraction

7.2IEEE LOM 簡介(IEEE LOM Profile)

當為QTI 試題創作詮釋資料時，QTI 2.0版反對使用關聯分類，並預留以供未來使用。創作2.1版時的一些突發的情境之使用情況，透過此類將會是最好的說明。

QTI v2.0 deprecated use of the relation category when creating meta-data instances for QTI items, reserving it for future use. A number of use cases which informed the work on v2.1 raised scenarios which could be best addressed through the use of this category.

7.2.1 一般(General)

注意 Lom 定義結構與 AggregationLevel 領域再本簡介當中並不推薦。

Note that the LOM-defined Structure and AggregationLevel fields are not recommended by this profile.

(1)識別符(identifier)

其中一個屬性被標示必須有符合共同試題、測驗或是物件庫的辨識。

One of the values given for the identifier must have an entry that matches the identifier of the associated item, test, or object bank.

(2)標題(title)

標題必須是一個符合共同試題、測驗或是物件庫之標題屬性的值。必須使用從共同的試題、測驗或是物件庫之 lang 屬性的語言。

The title must have a value that matches the value of the title attribute of the

associated item, test or object bank. The language used to interpret the title is taken from the lang attribute of the associated item, test, or object bank.

(3)語言(language)

必須有一個為了每個參照語言屬性的語法的值, 這個語法屬性是來自共通的評量試題、測驗、或是物件庫以及本身的 bodyElements。

There must be one value for each of the languages referred to by the language attributes on the associated assessmentItem, test, or object bank and its bodyElements.

(4)描述(description)

當轉換試題詮釋資料記錄若是系統內沒有描述。那就需要該領域的試題、測驗、或物件庫之值，來設定描述的值。

When transforming item meta-data records with no description into systems that require a value for this field, the title of the item, test, or object bank should be used to set the value of the description.

(5)關鍵字(keyword)

當轉換試題詮釋資料記錄若是系統內沒有關鍵字。那就需要該領域的試題、測驗、或物件庫之值，來追朔一組關鍵字。值得注意的是，LOM 特別指出為了主題區域與詳細說明 generalkeyword 之分類的使用，必須不能被其他資料元件描述之字元使用。

When transforming item meta-data records with no keywords into systems that require a value for this field, the title of the item, test, or object bank should be used to derive a set of keywords. It should be noted that LOM specifically indicates the use of classification for the description of subject area, and specifies that general.keyword 'should not be used for

characteristics that can be described by other data elements'.

(6)涵蓋範圍(coverage)

由 LOM 定義使用標準。

Usage as defined by [LOM].

7.2.2 生命週期(Lifecycle)

(1)版本(version)

見下小節重要資訊。

See comment in status below for important information about the use of this field.

(2)狀態(status)

可預期的，處理評量資源系統寧可收取從比 LOM 定義之更廣的字彙集。然而，為了促進詮釋資料實例的轉換，至需要使用此領域當中曾經此版本為了達到試題、測驗與物件庫之追蹤的建議 LOM 字彙系統，這些都是透過更複雜的處理程序。分類類別或許曾經傳達狀態與評量資源的效力。

It is anticipated that systems for handling assessment resources would prefer to draw from wider vocabularies than the one defined by [LOM]. However, in order to facilitate the transformation of meta-data instances to systems that require the use of the LOM vocabulary for this field it is recommended that the version is used to achieve the tracking of items, tests, and object banks through more complex production processes. The classification category may also be used to express the status and availability of assessment resources.

(3)貢獻(contribute)

由 LOM 定義使用標準。

Usage as defined by [LOM].

7.2.3 後設詮釋資料(meta_metadata)

(1)識別碼(identifier)

識別該詮釋資料記錄的全球唯一標籤。

A globally unique label that identifies this meta-data record.

(2)貢獻(contribute)

由 LOM 定義使用標準。

Usage as defined by [LOM].

(3)詮釋資料架構(metadata_schema)

固守本簡介的詮釋資料記錄與 LOM 實例一致化，因此參考標準與 LOM 都是能應用的。適合的參考文件為 IMSQTI 2.1 版與 LOM 1.0 版。參考其他詮釋資料實例架構一致也是被允許的。

Meta-data records that adhere to this profile are conforming LOM instances, therefore references to both this specification and LOM are applicable. The appropriate references are IMSQTIv2.1 and LOMv1.0. References to other schemas to which the meta-data instance conforms are also permitted.

(4)語言(language)

在以 LOM 為基礎的詮釋資料記錄當中，有兩個提供多語資訊的方法，或是單獨的，或是組合的。第一種，將詮釋資料以逐一區域原則的方式翻譯，

而每個區域值是為一個字串, 每個字串皆有獨立的語言標籤。另一種方法為形成多重相當的詮釋資料記錄與使用該語言領域（在後設詮釋資料類中）來為全部記錄設定預設語言。本簡介偏好使用後者, 詮釋資料記錄符合本簡介不該提供多語值至區域內的個別區域。

There are two approaches to providing multilingual information in LOM-based meta-data records which can be used separately or in combination. The first is to translate the meta-data on a field-by-field basis providing each field value as a set of strings, each individually language tagged. The alternative is to generate multiple equivalent meta-data records and use this language field (on the meta-meta-data category) to set the default language for the whole record. This profile prefers the latter approach, meta-data records conforming to this profile should not provide multilingual values to individual fields within the record.

7.2.4 特殊性(Technical)

註明 LOM 定義的需求、安裝備註與安裝期限這些區域是不被建議的。

Note that the LOM-defined Requirement, Installation Remarks and Duration fields are not recommended by this profile.

(1)格式(format)

至少應該有一個具有 text/x-imsqti-item-xml, text/x-imsqti-test-xml or application/xml 值之格式實例。

There should be at least one instance of format with the value text/x-imsqti-item-xml, text/x-imsqti-test-xml or application/xml .

(2)大小(size)

由 LOM 定義使用標準。

Usage as defined by [LOM].

(3)位置(location)

由 LOM 定義使用標準。

Usage as defined by [LOM].

(4)其他平台需求(Other Platform Requirements)

由 LOM 定義使用標準。

Usage as defined by [LOM].

7.2.5 教育(Educational)

注意以 LOM 定義之 Interactivity Type, Interactivity Level, Semantic Density, Intended End User Role, Typical Age Range and Difficulty 之區段，在此簡介中不建議使用。

Note that the LOM-defined Interactivity Type, Interactivity Level, Semantic Density, Intended End User Role, Typical Age Range and Difficulty fields are not recommended by this profile.

(1)學習資源型式(learning_resource_type)

QTI 物件被設計為一個可重複使用於各種評量情境。因此，LOM 定義的 self assessment 與 exam 值被禁止使用。如果標準的 LOM 字彙已經被使用，則只有 exercise 或是 questionnaire 值應當被用來描述一個試題。為此區段設計的選擇性辭彙已經被定義在[RDN]，當使用該辭彙 AssessmentItem, AssessmentTest 以及 AssessmentPool 值是建議的。

QTI objects are designed to be reusable in a variety of assessment scenarios. Therefore, the LOM-defined values self assessment and exam are forbidden. If the standard LOM vocabulary is used then only the values exercise or questionnaire should be used to describe an item. An alternative vocabulary for this field has been defined in [RDN], when using that vocabulary the value AssessmentItem, AssessmentTest, and AssessmentPool are recommended.

(2)情境(Context)

此係用以提供基本學習時數中值之以教育情境。

This is used to provide an educational context for the value given in typical learning time.

(3)基本學習時數(typical_learning_time)

在 QTI 物件的背景中，基本學習時數是為時間長度，受試者一般應當被分派以完成該物件。這並非時間限制，然而，當試題庫建立時間限制測驗時，選擇性試題的基本學習時數可能就會被加入以評定預期測驗的時間，以及如果需要的話以時間限制來進行測驗。

In the context of a QTI object, the typical learning time is interpreted as the length of time the candidate would normally be allocated to complete the object. It is not a time limit, however, when building a time-limited test from an item bank the typical learning times of the selected items may be added together to estimate the expected duration of the test and used to calculate a time limit for the test if required.

(4)描述(description)

若必要的話試題、測驗或題庫之目的應該被包括在此區域。

Item, test, or pool objectives should be included in this field if required.

(5)語言(language)

由 LOM 定義使用標準。

Usage as defined by [LOM].

7.2.6 權利(Rights)

注意 LOM 定義 cost 與 copyright_and_restrictions 區段是有有高度問題的，以及提及更多權利描述語言的細節是必須適當地表達一般複雜權利議題環境資源的創造與再用。然而，為數廣大的應用簡介要求權利的分類，與在此簡介中的使用建議。

Note that the LOM-defined cost and copyright_and_other_restrictions fields are highly problematic, and that a more detailed rights description language is necessary to adequately express the often complex rights issues surrounding resource creation and reuse. However, the vast majority of application profiles mandate the rights category, and it is therefore recommended for use within this application profile.

當一個以其詮釋資料取決於媒體檔案試題時, 必須確認媒體檔案使用限制是取決於自試題本身的全部權利描述。

Care should be taken when an item depends on a (shared) media file with its own meta-data to ensure that restrictions on the use of the media file are reflected in the overall rights description of the item itself.

(1)價格(cost)

由 LOM 定義使用標準。

Usage as defined by [LOM].

(2)著作權及其他的限制(copyright_and_other_restrictions)

由 LOM 定義使用標準。

Usage as defined by [LOM].

(3)描述(description)

由 LOM 定義使用標準。

Usage as defined by [LOM].

7.2.7 關聯性(Relation)

LOM 關聯類別是用以描述學習物件之間的關係，並且欲留在 QTI 2.0 版未來使用。在 2.1 版當中，此分類是用來表達試題與試驗、片段之間的關係，以及包含其物件試題之間之個別關係。

The LOM relation category is used to describe the relationship between learning objects, and was reserved in QTI v2.0 for future use. In v2.1, this category is used to express the relationship between items and tests, fragments and the objects that include them and individual relationships between items.

(1)種類(kind)

一些介於試題之間的關係可能以不包含延展 LOM 字彙的方式描述。然而，一個新的字彙元件已經被引介來允許更複雜的內部試題關係共同傳達在試題庫當中。另外，一些 LOM 字彙元件的說明也已經提供。它必須註

明每個目標必須有一個新的關係實例。

A number of relationships between items may be described without extending the LOM vocabulary. However, a new vocabulary element has been introduced to allow one of the more complex inter-item relationships commonly expressed in item banks. In addition, interpretations of some LOM vocabulary elements are provided. It should be noted that each target should have a new relationship instance.

元件名稱 **Element name**	出現在LOM與否？ **Present in LOM?**	解釋 **Explanation**
ispartof	Y	指稱包括使用此術語的對象之部份。relation.resource.identifier 包含該對象之識別符。 A fragment may refer to the objects which include it using this term. The relation.resource.identifier containing the identifier(s) of the including objects.
haspart	Y	指稱包括使用這個術語之部份的對象。 relation.resource.identifier 包含片段的識別符。 An object may refer to the fragments which it includes using this term. The relation.resource.identifier containing the fragment's identifier(s).
isversionof	Y	同LOM所定義之使用方式。 Usage as defined by [LOM].
hasversion	Y	同LOM所定義之使用方式。 Usage as defined by [LOM].
isformatof	Y	同LOM所定義之使用方式。 Usage as defined by [LOM].
hasformat	Y	同LOM所定義之使用方式。 Usage as defined by [LOM].
references	Y	同LOM所定義之使用方式。 Usage as defined by [LOM].
isreferencedby	Y	同LOM所定義之使用方式。 Usage as defined by [LOM].
isbasedon	Y	同LOM所定義之使用方式。

		Usage as defined by [LOM].
isbasisfor	Y	同LOM所定義之使用方式。 Usage as defined by [LOM].
requires	Y	同LOM所定義之使用方式。請注意此適用於呈現測驗或測驗片段與所指稱之試題之間的關係。 Usage as defined by [LOM]. Note that this is the appropriate way to represent the relationship between a test or test fragment and the items that it refers to.
isrequiredby	Y	同LOM所定義之使用方式。請注意此適用於呈現試題與測驗或所指稱之測驗片段間的關係。 Usage as defined by [LOM]. Note that this is the appropriate way to represent the relationship between an item and the tests or test fragments that refer to it.
precludes	N	此詞彙可用於指稱不能合併於同一測驗之試題。此關係為對稱的。 This term can be used to indicate items which must not be incorporated into the same test as each other (sometimes referred to as enemy items). This relationship is symmetric.

(2)資源(resource)

由 LOM 定義使用標準

Usage as defined by [LOM].

7.2.8 註解(Annotation)

由 LOM 定義使用標準

Usage as defined by [LOM].

7.2.9 分類(Classification)

LOM 分類方法的標準下，LOM 價值分類法中"標準"的使用，是比較推薦用於描述一個物件的主題部分，使用任何正式或非正式認可的分類方法，像是 LCC，DDC，還有在 paxonPATH 下，有關組織的，區域性的，或者是國際性的期刊分類方法有都包含在此分類法下。若想對於主題做更細部

的分類，需對於主題"想法"多做說明，並配合更高級的 LCC 或 DDC 分類方法。而分類的種類，在有限字彙的提供下，也常常被用於描述一個物件的可透性和可行性。傳統方法分類法的使用，可以使館務的管理者在使用最合適的字彙時，找尋到所有他所需要的資料。仍然還有許多分類法，可以針對主題給予更細部的標準，同時也提供其他相關的主題作為參考。

Usage as defined by [LOM]. The preferred solution for the description of an item_s subject area is to used the LOM classification category with the value classification.purpose = "discipline". This allows the use of any recognized or bespoke subject classification scheme such as the top level(s) of the Library of Congress Classification (LCC) and Dewey Decimal Classification (DDC), or institutional, regional or national curriculum classifications, as specified under classification.taxonPath.source. For more detailed description of topics within subject areas, the value classification.purpose = "idea" may be used with further levels of LCC, DDC or subject-specific classification schemes. The classification category may also be used to describe the visibility and availability of items beyond the limited vocabulary provided by LOM lifecycle.status. The use of custom schemes for classification enables repository administrators to capture all the information they need to capture, using the terms most appropriate for that institution. There may be multiple instances of the classification category, enabling detailed classification of assessments by subject area and association of an assessment with a number of different subject areas or topics.

7.3 使用資料(Usage Data)

Class : usageData

使用資料，最常見的試題統計，並不直接構成asssessmentItem 之一部份，因為他們總是與一些背景或是領域有關。因此，本標準定義一個分別的類別以描述這些統計數字。

每個統計資料意即它的背景以及相關之 assessmentItem，因此此類實例單獨地被約束與包裝以達到互通性。

Class : usageData

Usage data, most commonly item statistics, do not form part of an assessmentItem directly because they always relate to some context or domain in which the statistics are valid. Therefore, this specification defines a separate class for describing these statistics.

Each statistic refers to both its context and to the assessmentItem(s) it relates to. Therefore, instances of this class are bound and packaged separately for interoperability.

Attribute : glossary [0..1]: uri

選擇性的URI 定義了預設辭彙解釋在itemStatistics 的名稱當中。

Attribute : glossary [0..1]: uri

An optional URI that identifies the default glossary in which the names of the itemStatistics are defined.

Contains : itemStatistic [*]

Abstract class : itemStatistic

Derived classes:

categorizedStatistic, ordinaryStatistic

Associated classes:

usageData

一個或是一組值在特定情境中描述試題的表現。常見的測量方式包含試題的難易度、以及辨別不同受試者程度之能力。

A value or set of values that describe the performance of the item within a specific context. Common measures include the item's difficulty and how well it discriminates between various candidate ability levels

Attribute : name [1]: identifier

唯一試題統計的標示，由此標準定義的辭彙識別之常用試題，以及錯誤選擇統計是被定義與應該採用可行的。請詳見統計試題交換辭彙表。

Attribute : name [1]: identifier

The unique identifier of the item statistic. Glossaries of identifiers defined by this specification for commonly used item and distractor statistics are defined and should be used where possible. See Vocabulary for the Exchange of Item Statistics for more details.

Attribute : glossary [0..1]: uri

選擇性的URI 定義了預設辭彙解釋在其定義之名稱中。該值拒絕任何一個由使用資料之解釋辭彙屬性所提供的預設辭彙解釋。

Attribute : glossary [0..1]: uri

An optional URI that identifies the glossary in which the name is defined. This value overrides any default glossary provided by the glossary attribute of the parent usage Data.

Attribute : context [1]: uri

建立一致性的資源標識關於包含統計試題之情境的資訊。舉例來說，URI 可能指出試題評

分與統計試題建立之具體計算的範例。URI 或許為URL、一個資料庫索引，或是其他有效的標識。

A Uniform Resource Identifier that points to information about the context within which the item statistic was created. For example, the URI may point to the sample of item scores and the specifics of computations that created item statistics. The URI may be a URL, a database index, or other valid identifier

Attribute : caseCount [0..1]: integer

數個在範例當中的案件用以建立統計試題。

Attribute : caseCount [0..1]: integer

The number of cases in the sample used to create the item statistic.

Attribute : stdError [0..1]: float

統計試題之標準錯誤，一般也被認為是變異。

Attribute : stdError [0..1]: float

The standard error of the item statistic, also known as the variance.

Attribute : stdDeviation [0..1]: float

統計試題的標準偏差（意即標準錯誤的平方根）。

Attribute : stdDeviation [0..1]: float

The standard deviation of the item statistic (i.e. the square root of the standard error).

Attribute : lastUpdated [0..1]: date

統計試題的最後更新時間。

Attribute : lastUpdated [0..1]: date

Date of the last update to the item statistic value.

Contains : targetObject [1..*]

Class : targetObject

Associated classes:

itemStatistic

TargetObject最常被認為一種評量的工具，但除了可以有分類的功能外，也可以代表其他不屬這個範圍領域內的主題，像是一整場考試。在一些例子當中，TargetObject配合optional partIdentifier 的使用，除了當作評量的物件外，也可以視作是那物件的一部分。

The targetObject is used to refer to an assessment object. This object may be an assessmentItem or some other type of object defined outside the scope of this specification, for example, an entire test. In some cases it is desirable to refer not just to the assessment object but to a specific part of that object, in which case the optional partIdentifier can be used.

Attribute : identifier [1]: string

AssessmentItem或是其他目標物件的標識。

Attribute : identifier [1]: string

The identifier of the assessmentItem or other target object.

Attribute : partIdentifier [0..1]: identifier

選擇性標識某一特定定義於assessment物件的部份（如一個itemVariable），在assessmentItem

的案例當中，partIdentifier 一般來說參照一個多樣的演變，但仍可以參照其他定易於相同名稱空間的物件，如一個包含一個互動之特定選擇。如果沒有給予partIdentifier，統計資料也被認為是參照目標物件整體。

Attribute : partIdentifier [0..1]: identifier

An optional identifier to a specific part (e.g. an itemVariable) defined within the assessment object. In the case of an assessmentItem the partIdentifier typically refers to an outcome variable but can refer to other objects identified in the same namespace, such as a specific choice within an interaction. If no partIdentifier is given the statistic is considered to refer to the target object as a whole.

Class : ordinaryStatistic (itemStatistic)

單一數值組成的統計試題。

Class : ordinaryStatistic (itemStatistic)

An item statistic that consists of a single numeric value.

Contains : value [1]

Class : categorizedStatistic (itemStatistic)

一包含多個值的試題統計，例如IRT 分散參數。

Contains : mapping [1]

Contains : value [1]

Class : categorizedStatistic (itemStatistic)

An item statistic that consists of multiple values, e.g., IRT Dispersion Parameters.

Contains : mapping [1]

7.3.1 辭彙與套裝統計交換(Vocabulary for the Exchange of Item Statistics)

此標準定義了一個以交換常用統計數字的辭彙, 此辭彙是分成兩個辭彙解釋的。

This specification defines a vocabulary to aid the exchange of commonly used statistics. The vocabulary is split into two glossaries.

Item Statistics

http://www.imsglobal.org/question/qtiv2p1pd2/glossaries/item_statistics.xml

主要的試題統計術語定義統計是參照一特定之試題結果。(一般為 SCORE 變數之結果)

The main item statistics glossary defines statistics that refer to a specific outcome of an item (typically the outcome variable SCORE).

Distractor Statistics

http://www.imsglobal.org/question/qtiv2p1pd2/glossaries/distractor_statistics.xml

錯誤選擇的統計辭彙解釋定義統計數字參照包含一個試題之特定回應(一般為 simpleChoice)。

The distractor statistics glossary defines statistics that refer to a specific response (typically a simpleChoice) within an item.

這些辭彙確定使用[VDEX]。一般認為此辭彙可能與跨應用區域大相逕庭。建議此標準使用者以共通格式記錄及分享自己的辭彙。

These vocabularies have been defined using [VDEX]. It is recognized that vocabularies may differ widely across application areas. Users of this specification are encouraged to document and share their own vocabularies using this common format.

7.4 XML 繫結(XML Binding)

XML和IMS MD 提供 qtiMetadata 物件的裝訂。qtiMetadata class 是一種新的類別，可以伴隨著 LOM分類法中的General，Lifecycle 一起出現。IMS 裝訂其實就是直接會以LOM物件的一部分來出現，但IMS在這裡又不是XML裝訂的延伸，所以qtiMetadata是個別分屬於IMS和XML，在使用上並須平行於LOM，且被視為一個獨立的meta-data 物件。

The accompanying XML binding provides a binding for the qtiMetadata object that is consistent with the binding given in [IMS_MD_Binding]. The qtiMetadata class defines a new category that could appear alongside LOM categories such as General, Lifecycle, etc. In the context of the IMS binding, that means it would naturally appear as a direct descendant of the <lom> object itself. The IMS binding does not support extension at this point in the XML binding however, so qtiMetadata is bound separately and must be used in parallel to the LOM object as an additional meta-data object.

8.結果報告

資料模型之結果報告的參考指引，此文件提供有關模式的詳細資訊，並指出傳遞引
擎的相關需求。

A reference guide to the data model for result reporting. The document provides detailed information about the model and specifies the associated requirements on delivery engines.

8.1 評量結果(Assessment Result)

類別(Class)：assessmentResult

Class：assessmentResult

評量結果用於回報受試者與測驗、及/或1或多試題互動的結果。關於測驗的資訊為選項，在某些系統中，測驗資訊可能可以與那些之完全沒有整理到測驗中的試題互動。例如：以學習資源組織，且依形成之情境個別呈現的試題。

An Assessment Result is used to report the results of a candidate's interaction with a test and/or one or more items attempted. Information about the test is optional, in some systems it may be possible to interact with items that are not organized into a test at all. For example, items that are organized with learning resources and presented individually in a formative context.

容器(Contains) : context [1]

Contains : context [1]

容器(Contains) : testResult [0..1]

當給予測驗結果時，下列試題結果必須與選出且呈現為相對測驗階段部分之試題有關。此外，所有選出欲呈現之試題應有相對itemResult的報告。

When a test result is given the following item results must relate only to items that were selected for presentation as part of the corresponding test session. Furthermore, all items selected for presentation should be reported with a corresponding itemResult.

容器(Contains) : itemResult [*]

測驗之摘要報告，該報告應呈現包含testResult但不含itemResults之評量結果。

A summary report for a test is represented by an assessment result containing a testResult but no

itemResults.

類別(Class) : context

相關類別(Associated classes):

assessmentResult

容器(Contains) : sessionIdentifier [*]

產生結果之系統（例如：測驗傳遞系統）應指定一階段識別符，其用以辨別階段。其後處理此結果之系統應指定其各階段其自身之識別符，如果結果被修正且為了再次傳送而輸出，則情境中應加入該階段。

The system that creates the result (for example, the test delivery system) should assign a session identifier that it can use to identify the session. Subsequent systems that process the result might assign their own identifier to the session which should be added to the context if the result is modified and exported for transport again.

容器(Contains) : identification [0..1]

類別(Class) : sessionIdentifier

相關類別(Associated classes):

context

屬性(Attribute) : sourceID [1]: uri

特殊的identifier，系統將此identifier加入結果中。

A unique identifier of the system which added this identifier to the result.

屬性(Attribute) : identifier [1]: string

建立報告之系統應加入一階段識別符。其後處理此結果之系統應指定各階段其自身之識別符，如果結果被修正且為了進一步傳送而再次輸出，則情境中亦應加入該階段。

The system that creates the report should add a session identifier. Subsequent systems that process the results might use their own identifier for the session and should add this too if the result is exported again for further transport.

類別(Class) : identification

相關類別(Associated classes):

context

說明[IMS_LIP]所定義之受試者的資訊格式。

The format of the information used to identify the candidate is defined by the [IMS_LIP].

類別(Class) : testResult

相關類別(Associated classes):

assessmentResult

屬性(Attribute) : identifier [1]: string

表示此為評量結果之identifier。

The identifier of the test for which this is a result.

屬性(Attribute) : datestamp [1]: datetime
結果紀錄時間之日戳。

The date stamp of when this result was recorded.

容器(Contains) : itemVariable [*]

測驗結果與在測驗之中被追蹤的期間之值。請注意期間是以名稱為duration之內建測驗等級回應變數來回報。以加上前綴之識別符來作為區別的個別測驗部分或段落期間，該識別符描述於「評量測驗、題組與試題資訊模型」中。

The values of the test outcomes and any durations that were tracked during the test. Note that durations are reported as built-in test-level response variables with name duration. The duration of individual test parts or sections being distinguished by prefixing them with the associated identifier as described in Assessment Test, Section and Item Information Model.

類別(Class) : itemResult

相關類別(Associated classes):

assessmentResult

試題段落的結果會以itemResult回報。該報告會包含呈現多個嘗試試題之同一物件的多個結果，以適性題、或者更詳細的追蹤來進行。上述例子中，每個試題結果需有不同的日戳。

The result of an item session is reported with an itemResult. A report may contain multiple results for the same instance of an item representing multiple attempts, progression through an adaptive item, or even more detailed tracking. In these cases, each item result must have a different datestamp.

屬性(Attribute) : identifier [1]: string

試題之識別符在此為一個結果。對回報為某一部份測驗結果之試題結果而言，其識別符用以指稱該測驗之試題（請見 assessmentItemRef）。對回報為屬於其自身之試題結果而言，其可用來指稱試題之任意合適之識別符。此情況下，其值應符合相關 assessmentItem 之識別符屬性。

The identifier of the item for which this is a result. For item results that are reported as part of a test result this is the identifier used to refer to the item in the test (see assessmentItemRef). For item results that are reported on their own, this can be any suitable identifier for the item. Where possible, the value should match the identifier attribute on the associated assessmentItem.

屬性(Attribute) : sequenceIndex [0..1]: integer

試題結果回報為測驗之一部分，其值必用於代表試題在測驗中特定情況的位置。測驗第一

部份的第一題設定其次序為index 1。

For item results that are reported as part of a test, this attribute must be used to indicate the position of the item within the specific instance of the test. The first item of the first part of the test is defined to have sequence index 1.

屬性(Attribute) : datestamp [1]: datetime

結果紀錄時間之日戳。

The date stamp of when this result was recorded.

屬性(Attribute) : sessionStatus [1]: sessionStatus

用來解譯試題變項值之session狀態。請見sessionStatus。

The session status is used to interpret the values of the item variables. See sessionStatus below.

容器名稱(Contains) : itemVariable [*]

在試題期間, 傳遞引擎追蹤給定所有itemVariable之最新值, 包含內嵌numAttempts、duration與completionStatus變數值之值。每一值以itemVariable物件回報。

During the item session the delivery engine keeps track of the current values assigned to all itemVariables. The values of including the values of the built-in variables *numAttempts*, *duration*, and *completionStatus*. Each value is represented in the report by an instance of itemVariable.

容器(Contains) : candidateComment [0..1]

由受試者提供的選擇性評語（請見allComment）。

An optional comment supplied by the candidate (see allowComment).

列舉(Enumeration): sessionStatus

session狀態用以追蹤試題變項在一試題session之狀態。

The session status is used to keep track of the status of the item variables in an item session.

抽象類別(Abstract class) : itemVariable

衍生類別(Derived classes):

outcomeVariable, responseVariable, templateVariable

相關類別(Associated classes):

itemResult, testResult

屬性(Attribute) : identifier [1]: identifier

itemVariable以特定identifier來回覆試題變項之值。

The purpose of an itemVariable is to report the value of the item variable with the given identifier.

屬性(Attribute) : cardinality [1]: cardinality

變項之基數，來自定義之宣告。

The cardinality of the variable, taken from the corresponding declaration or definition.

屬性(Attribute) : baseType [0..1]: baseType

變項之基本型式，來自定義之相對應的宣告。變項中有記錄基數時，其值省略。

The base type of the variable, taken from the corresponding declaration of definition. This value is omitted only for variables with record cardinality.

類別(Class) : responseVariable (itemVariable)

屬性(Attribute) : choiceSequence [*]: identifier

當回答必定是會變換的互動式選項時，受試者遇到之選項次序會依測驗情況而改變。當選

項有所改變，選擇之次序便以其屬性回報為選項identifier之次序。

When a response variable is bound to an interaction that supports the shuffling of choices, the sequence of choices experienced by the candidate will vary between test instances. When shuffling is in effect, the sequence of choices should be reported as a sequence of choice identifiers using this attribute.

容器(Contains) : correctResponse [0..1]

若有需要，正確回應會出現於報告的其中一部份。

The correct response may be output as part of the report if desired.

容器(Contains) : candidateResponse [1]

由受試者給予之回應。

The response given by the candidate.

類別(Class) : candidateResponse

相關類別(Associated classes):

responseVariable

容器(Contains) : value [*]

回應變項之值。因無回應所產生之NULL值，由任意值之空缺指定。

The value(s) of the response variable. A NULL value, resulting from no response, is indicated by the absence of any value.

類別(Class) : outcomeVariable (itemVariable)

屬性(Attribute) : view [*]: view

為了結果而宣告之觀點(view)（若有的話）需複製到報告中，以讓提交報告之系統在特殊情況下隱藏不相關之資訊。若無給定之值，結果值應視為在所有觀點中都有關連。

The views (if any) declared for the outcome must be copied to the report to enable systems that render the report to hide information not relevant in a specific situation. If no values are given, the outcome's value should be considered relevant in all views.

屬性(Attribute) : interpretation [0..1]: string

請見interpretation。

See interpretation.

屬性(Attribute) : longInterpretation [0..1]: uri

請見See longInterpretation。

See longInterpretation.

屬性(Attribute) : normalMaximum [0..1]: float

來自於outcomeDeclaration。

Taken from the corresponding outcomeDeclaration.

屬性(Attribute) : normalMinimum [0..1]: float

來自outcomeDeclaration。

Taken from the corresponding outcomeDeclaration.

屬性(Attribute) : masteryValue [0..1]: float

mastery value代表對應之outcomeDeclaration，其可能伴著outcomVariable之值回報。在某些情況中，mastery value可能該試題本身之非屬性，但由該試題傳遞之情境來決定，例如：檢

驗一群特定群體之受試者。即使宣告中無相應之值, mastery value仍可用outcome value來回報。

If a mastery value is specified in the corresponding outcomeDeclaration it may be reported alongside the value of the outcomeVariable. In some cases, the mastery value may not be an attribute of the item itself, but be determined by the context in which the item is delivered, for example, by examining the candidates in a specific cohort. The mastery value may be reported with the outcome value even when there is no corresponding value in the declaration.

容器(Contains) : value [*]

結果變項之值。

The value(s) of the outcome variable.

類別(Class) : templateVariable (itemVariable)

容器(Contains) : value [*]

樣版變項之值。

The value(s) of the template variable.

類別((Class) : candidateComment

相關類別(Associated classes):

itemResult

本類別用於來自受試者之評語。以純文字表示。

The class used for comments from the candidate. A simple run of text.

9.整合指引

描述此標準及其他相關標準之關係的文件, 相關標準如 IMS 內容包裝

([IMS_CP])、IMS 簡易順序安排 [IMS_SS]及 IMS 學習設計[IMS_LD]等。

A document that describes the relationship between this specification and other related specifications such as IMS Content Packaging [IMS_CP], IMS Simple Sequencing [IMS_SS], and IMS Learning Design [IMS_LD].

9.1 內容包裝(Content Packaging)

系統間轉換試題（assessmentItems）、評量測驗（assessmentTests）、處理模塊（processing templates）時，會應用到IMS內容包裝標準，為了避免與內容包裝標準中同樣名稱空間為節點（item）者混淆，以及讓存在於整合指引（Integration Guide）且指引到內容包裝模型元件的用語更為清楚，所有這類元件的參照都需加上字首’cp’，以茲限定；而這純然只是為了排版上的便利，不具有應用XML名稱空間語法的意義。

IMS Content Packaging [IMS_CP] should be used when transferring assessmentItems, assessmentTests, or processing templates between systems. To avoid confusion between the identically named item in the Content Packaging specification and, more generally, to make it clear when terms in this Integration Guide are referring to elements in the content packaging model, all references to these elements will be qualified with the prefix "cp:". This is purely a typographical convention and does not indicate the use of XML namespacing syntax.

為了完成QTI此項標準，IMS花費許多心力在確認，沒有任何修改或延伸至現有內容包裝資料模型者定義於內，QTI仍保有原先預期的標準特色。IMS的目標是讓含有評量物件在內的內容包裝，能在現有工具的基礎上運用，能在不修改的情況下支援IMS內容包裝。

In preparing this specification, every effort has been taken to ensure that no modifications or extensions to the existing Content Packaging data model are defined and, furthermore, features of that specification are used in the way originally intended. The goal is to enable the use of content packages containing assessment objects with the existing base of tools that support IMS Content Packaging without modification.

QTI此版標準發展之際，IMS已著手發展1.2版IMS內容包裝，雖然該版本尚未到達最終階段，但QTI標準已調整成IMS內容包裝標準預期會有的改變。最明顯的轉變是在IMS QTI節點cp:schema的使用建議，以及QTI 2.0中cp:schemaversion用於所有資源。目前已反對再依照1.2版IMS內容包裝的預期改變做改變。

During the development of this version of the QTI specification, IMS has started the development of version 1.2 of IMS Content Packaging [IMS_CP]. Though that version hasn't reached its final status yet, the QTI specification has been aligned to the expected changes in the IMS Content Packaging [IMS_CP] specification. Most notably is the change in the recommendation of the use of cp:schema of "IMS QTI Item" and cp:schemaversion of "2.0" for resources. This has now been deprecated following the expected change in IMS Content Packaging [IMS_CP] version 1.2.

QTI標準第一版定義題庫（objectbank）是試題（items）與題組（sections）的集合，而在此版本中，題庫的概念已延伸至包括評量測驗；因此，內容包裝裡的評量物件集合被認為是題庫，而與包裝相關的詮釋資料則視為是，用於解釋描述於題庫之詮釋資料的全部。換句話說，題庫專門用於內容包裝的交換。值得注意的是，題庫（item pool）僅被視為objectbank的特殊個案。經套裝的試題仍可個別指引到相關學習設計，或是一系列編序規則。本文稍後會討論整合的型式（type of integration）。

Version 1 of this specification defined an objectbank as a collection of items and sections. In this version of the specification, this concept has been extended to include assessment tests. A collection of assessment objects in a content package is therefore considered to be an objectbank and the meta-data associated with the package as a whole is interpreted as the meta-data describing the objectbank. In other words, objectbanks are bound to content packages for interchange. Note that an item pool is simply treated as a special case of an objectbank. Packaged items may still be referred to individually in an associated learning design or set of sequencing rules. This type of integration is discussed later in this document.

已知使用者希望應用第一版QTI標準的補充指引，套裝已定義完成的評量內容，並且了解如何套裝questestinterop物件。在第一版QTI標準的標準下，questestinterop物件得以依任何方式定義試題、題組、評量模塊、題庫。

Given that users may wish to package assessment content defined using version 1 of the QTI specification additional guidance is given on how to package questestinterop objects. These objects may define items, sections, assessments, or objectbanks in any way allowed by that version of this specification.

9.1.1 包裝試題(Packaging Items)

IMS 內容包裝是由內容檔案（content files），以及一個描述這些內容檔案的所組成的邏輯目錄（logical directory）。評量試題（assessmentItem）在內容包裝中是以 XML 檔案格式呈現，此 XML 檔案格式描述於 QTI 標準中，符合 XML 繫結的標準。

An IMS content package is a logical directory containing the content files and a special manifest file which describes them. An assessmentItem is represented in a content package by an XML file that satisfies the XML binding described by this specification.

舉例來說，單筆內容包裝試題包含下列三項內容：

(1)內容清單（在 XML 檔案中，稱作 imsmanifest.xml）。

(2)試題（一筆 QTI XML 檔案）。

(3)試題所必備的所有附屬檔案（一般都是影像檔或媒體檔）。

For example, in the case of a single item the content package will contain:

(1)the manifest (an XML file called imsmanifest.xml)

(2)the item (a QTI XML file)

(3)any auxiliary files (typically images or media files) required by the item

內容清單必須包含個別描述於每項試題的 cp:resource。cp:resource 的 cp:type 必然是 imsqti_item_xmlv2p1。緊接在後的 cp:resource 須包含一筆描述試題 XML 檔的 cp:file。此外，cp:resource 也應針對所有試題的附屬檔案包含一筆 cp:file；然而，假使某項附屬檔案同時存在於多個試題中，（無論這些其餘的試題是否包含在同一個內容包裝裡），該附屬檔案會以不同的 cp:resource 呈現，在此情況下，試題的 cp:resource 必須包含 cp:dependency，以表現附屬檔案。

The manifest file must contain a **separate** cp:resource describing each item. The cp:type of the cp:resource must be imsqti_item_xmlv2p1. The cp:resource in turn must contain a cp:file representing the item's XML file. The cp:resource should also contain a cp:file for each of the item's auxiliary files, however, if an auxiliary file is shared amongst several items (whether or not these other items are contained in the same content package) the auxiliary file may be represented by a separate cp:resource. In this case, the item's cp:resource must contain a cp:dependency to the cp:resource representing the auxiliary file.

詮釋資料藉由將試題包含在 cp:resource 之內，與試題產生關連。在內容包裝僅包含單一試題的情況下，詮釋資料假使已知，則必須被包含在 cp:resource 之內，且不包含 cp:manifest。假若詮釋資料與 cp:manifest 本身產生關連，則必然是用於描述包裝（題庫），而不是包裝的內容。

Meta-data may be associated with an item by including it in the cp:resource. In the case of a content package that contains only one item the meta-data, if given, **must** be included in the cp:resource and not the enclosing cp:manifest.

Meta-data associated with the cp:manifest itself is reserved for describing the package (objectbank), not the package's contents.

與試題相關的詮釋資料，應與模型和 XML 繫結中，用於描述本標準其他用途之試題詮釋資料相一致。與模型相符的詮釋資料必須特定說明 QTI 2.1 版的 metadatascheme。IMS QTI 試題（IMS QTI Item）和 QTI 2.0 版 cp:schemaversion 應用 cp:schema 的方式，被反對遵循 IMS 內容包裝[IMS_CP]標準的改變。

The meta-data associated with an item should conform to the model and XML binding for item meta-data described elsewhere in this specification. Meta-data that conforms to that model must specify a metadatascheme of "QTIv2.1". The use of cp:schema of "IMS QTI Item" and cp:schemaversion of "2.0" is deprecated following the changes to the IMS Content Packaging [IMS_CP] specification.

cp:resource 的 cp:type 必然是 imsqti_item_xmlv2p0 或 imsqti_item_xmlv2p1，必須視試題所遵循的標準版本來決定。

The cp:type of the cp:resource must be imsqti_item_xmlv2p0 or imsqti_item_xmlv2p1 depending on what version of the specification the item conforms to.

除非當 cp:organization 是一系列依簡易編序標準（Simple Sequencing specification [IMS_SS]）描述之規則的基礎，則應用 cp:organization 組織包含在內容包裝裡的 QTI 試題，是不會用到的，是預留的功能。系統只有在處理與 QTI 標準相符之評量物件交換時，應忽略組織何時輸入內容

包裝。

The use of a cp:organization to organize QTI items contained in a content package is reserved, except where the cp:organization is the basis for a set of rules described with the Simple Sequencing specification [IMS_SS]. Systems dealing only with the interchange of assessment objects conforming to this specification should ignore organizations when importing content packages.

凡指引到影像或物件中，應用相關 URLs 的附屬檔案，必包含在內容包裝裡。這些檔案可能存放在第一層的目錄，或是內容包裝所選擇的（if preferred）子目錄。

Auxiliary files that are referred to using relative URIs in an img or object must be included in the content package. These files may be placed in the top level directory or in a sub-directory of the content package if preferred.

9.1.2 包裝測驗(Packaging Tests)

當包裝（package）同時包含試題與測驗時，內容清單必須包含描述評量測驗（assessmentTest）的 cp:resource。cp:resource 針對測驗所使用的 cp:type 必須是 imsqti_test_xmlv2p1。緊接在後的 cp:resource 須包含一筆描述測驗 XML 檔的 cp:file。此外，cp:resource 也應針對所有測驗的附屬檔案包含一筆 cp:file。一個包裝可以包含多種測驗，每一個測驗透過其 cp:resource 予以呈現。

When a package not only contains items, but also a Test, the manifest file must contain a cp:resource describing the assessmentTest. The cp:type of the cp:resource for the test must be imsqti_test_xmlv2p1. The cp:resource in turn must contain a cp:file representing the test's XML file. The cp:resource

should also contain a cp:file for each of the test's auxiliary files. A package can contain multiple tests, each represented by its own cp:resource.

當包裝僅包含試題時，試題應透過個別的 cp:resource 呈現。針對存在於測驗 cp:resource 的每一個別的試題，應透過 cp:dependency 呈現試題與測驗間的關連。

As with packages containing only items, the Items should be represented by a separate cp:resource. The relationship between items and test should be represented by a cp:dependency for each individual item in the cp:resource of the test.

單一一個評量測驗（assessmentTest）可以同時參照到符合 2.0 版 QTI 標準的試題，以及符合 2.1 版 QTI 標準的試題。

A single assessmentTest can reference both items conforming to version 2.0 and items conforming to version 2.1 of this specification.

假使附屬檔案分散在其他測驗，或甚至其他測驗試題裡（無論它們是否包含在相同的內容包裝），附屬檔案會透過個別的 cp:resource 呈現。在此情況下，代表測驗意義的 cp:resource，必須包含 cp:dependency，以呈現附屬檔案。

If an auxiliary file is shared with other tests or even other testitems (whether or not these are contained in the same content package) the auxiliary file may be represented by a separate cp:resource. In this case, the tests's cp:resource must contain a cp:dependency to the cp:resource representing the auxiliary file.

符合特定測驗的詮釋資料，透過將其包含在 cp:resource，與測驗產生關連。假使詮釋資料已知，則此詮釋資料必須包含在 cp:resource 之內，而不是 cp:manifest 之內。與 cp:manifest 本身相關的詮釋資料用於描述包裝，而不是包裝的內容。

Meta-data specific to the test may be associated with a test by including it in the cp:resource. If given, this meta-data **must** be included in the cp:resource and not the enclosing cp:manifest. Meta-data associated with the cp:manifest itself is reserved for describing the package, not the package's contents.

除了當 cp:organization 是一系列依簡易編序標準（Simple Sequencing specification [IMS_SS]）描述之規則的基礎，則應用 cp:organization 組織包含在內容包裝裡的 QTI 試題，是不會用到的，而是預留的功能。

The use of a cp:organization to organize QTI Tests contained in a content package is reserved for future use, except where the cp:organization is the basis for a set of rules described with the Simple Sequencing specification [IMS_SS].

凡指引到影像或物件中，應用相關 URLs 的附屬檔案，必包含在內容包裝裡。這些檔案可能存放在第一層的目錄，或是內容包裝所選擇的（if preferred）子目錄。

Auxiliary files that are referred to using relative URIs in an img or object must be included in the content package. These files may be placed in the top level directory or in a sub-directory of the content package if preferred.

9.1.3 包裝試題與測驗片段(Packaging Item and Test Fragments)

試題片段是試題的一部分，受倚靠它的試題們獨立管理。相似的是，測驗

片段是測驗的一部分，受倚靠它的測驗們獨立管理。針對測驗的 cp:resource，其 cp:type 必須是 imsqti_fragment_xmlv2p1。緊接在後的 cp:resource 須包含一筆描述 XML 檔案片段的 cp:file。一個包裝可以包含多種片段，每一個片段透過所擁有的 cp:resource 予以呈現。

An item fragment is part of an item that is managed independently of the items that depend on it. Similarly, a test fragment is part of a test that is managed independently of the tests that depend on it. The cp:type of the cp:resource for the test must be imsqti_fragment_xmlv2p1. The cp:resource in turn must contain a cp:file representing the fragments XML file. A package can contain multiple fragments, each represented by its own cp:resource.

試題與片段間的關連，應透過運用模塊（template）且存放於試題 cp:resource 片段的 cp:dependency 予以呈現。

The relationship between items and fragments should be represented by a cp:dependency for the fragment(s) in the cp:resource of the item that uses the template.

9.1.4 套裝答覆處理模塊(Packaging Response Processing Templates)

通常沒有真的需要在內容包裝裡包含標準模塊, 但他們能夠被納入包含試題的包裝內。包裝也可以包含自定答覆處理模塊（custom response processing templates），透過在包裝內的試題達到共享的結果。cp:resource 針對測驗所使用的 cp:type 必須是 imsqti_rptemplate_xmlv2p1。緊接在後的 cp:resource 須包含一筆描述模塊 XML 檔的 cp:file。一個包裝可以包含

多種模塊，每一個模塊透過所擁有的 cp:resource 予以呈現。

There usually is no real need to include the standard templates in a content package, but they can be included in the package containing items. The package can also contain custom response processing templates shared by the items in the package. The cp:type of the cp:resource for the test must be imsqti_rptemplate_xmlv2p1. The cp:resource in turn must contain a cp:file representing the template's XML file. A package can contain multiple templates, each represented by its own cp:resource.

針對存在於試題 cp:resource 的模塊，對於使用該模塊的試題而言，試題與模塊間的關連應透過 cp:dependency 予以呈現。

The relationship between items and templates should be represented by a cp:dependency for the template in the cp:resource of the item that uses the template.

9.1.5 內容包裝中，與試題相關的詮釋資料(Associating Meta-data to items in a Content Package)

先前 IMS QTI 標準的版本有特定的詮釋資料集，包含在資料結構的本身，如 ASI。詮釋資料字彙有其自身擁有的名稱，皆以 qmd 字元起首。整合指引文件敘說如何轉換這些元件，以符合 QTI 2.1 版的使用。

Previous versions of the IMS QTI specification had a specific meta-data set contained within the data structures themselves, i.e. the ASI. That meta-data vocabulary had its own set of names, all of which started with the characters 'qmd_'. The Migration Guide document describes how to convert these

elements for use in QTI version 2.1.

根據 IMS 在 LOM 最佳實務與實作指引（Best Practice and Implementation Guide）規劃的詮釋資料，QTI 2.0 版本中，特定的 QTI 詮釋資料已符合（brought into line with）IEEE LOM。IEEE LOM 標準定義一系列可用於描述學習資源，但不具有足夠細節描述評量資源（assessment resources）的詮釋資料元件。因此，在此份文件中，應用剖繪（application profile）提供延伸至 IEEE LOM 的標準，以符合 QTI 發展者希望與試題詮釋資料有所關連的明確需求。（試題是與試題資料模型定義在一起）

In QTI version 2.0, QTI-specific meta-data has been brought into line with the IEEE LOM in accordance with the IMS Meta-data Best Practice and Implementation Guide for [LOM]. The IEEE LOM standard defines a set of meta-data elements that can be used to describe learning resources, but does not describe assessment resources in sufficient detail. The application profile provided in this document therefore extends the IEEE LOM to meet the specific needs of QTI developers wishing to associate meta-data with items (as defined by the accompanying Item Information Model).

詮釋資料與使用資料文件所描述的 LOM 剖繪（profile of [LOM]）適合與評量試題，及為呈現有用資料（如試題統計）的個別資料模型一起使用。試題庫和其他內容資料庫的發展者、管理者，以及從試題中建立評量方式者，對於此文會特別感興趣。

The Meta-data and Usage Data document describes a profile of [LOM] suitable for use with assessment items and a separate data model for

representing usage data (i.e., item statistics). This document will be of particular interest to developers and managers of item banks and other content repositories, and to those who construct assessments from item banks

詮釋資料或許會與存在於 cp:resource 的試題發生關連，假使已知，內容包裝中僅包含一種試題，則詮釋資料必包含在 cp:resource 之內，而不包含在 cp:manifest 之內。假若詮釋資料與 cp:manifest 本身產生關連，則必然是用於描述包裝，而不是包裝的內容。

Meta-data may be associated with an item by including it in the cp:resource. In the case of a content package that contains only one item the meta-data, if given, **must** be included in the cp:resource and not the enclosing cp:manifest. Meta-data associated with the cp:manifest itself is reserved for describing the package, not the package's contents.

QTI 標準發展時，其中一個目標是盡量能夠被已存的工具支援。此外，同樣重要的是, 提供 QTI 特定詮釋資料與現行廣泛應用之[IMS_MD_Binding]和未來的 IEEE [LOM] binding，三者結合應用的支援。上述這兩個目標皆已在發展整合方法（integration method）時列入考慮。

One of the goals during the development of this specification was to allow support by as large a number of existing tools as possible. It was also considered important to provide support for use of both the QTI specific meta-data in combination with the currently widely used [IMS_MD_Binding]

and the future IEEE [LOM] binding. Both of these have been taken into account while developing the integration method.

完整的範例檔包含下列所討論的程式碼：

The complete example file contains all the code discussed below:

內容包裝裡詮釋資料範例

Meta-data in Content Package example

http://www.imsglobal.org/question/qtiv2p1pd2/examples/mdexample/imsmanifest.xml

IMS QTI 2.1 版詮釋資料的 schema 檔案需要應用建議使用的 **imsqti** 字首, 參照至清單元件內。

The schema file for the IMS QTI Version 2.1 meta-data needs to be referenced in the manifest element using a suggested prefix of **imsqti**.

```
<manifest xmlns="http://www.imsglobal.org/xsd/imscp_v1p1"
 xmlns:imsmd="http://www.imsglobal.org/xsd/imsmd_v1p2"
 xmlns:imsqti="http://www.imsglobal.org/xsd/imsqti_v2p1"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 identifier="MANIFEST-QTI-1"
 xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
imscp_v1p1.xsd
 http://www.imsglobal.org/xsd/imsmd_v1p2 imsmd_v1p2p2.xsd
 http://www.imsglobal.org/xsd/imsqti_v2p1 imsqti_v2p1.xsd">
```

在此情況下, XSD 檔案應被包含在內容包裝之內, 或是針對 IMS 網站上

的 schema 檔案, 能夠以參照而非包含在內的方式, 與內容包裝建立關連。

In this case the XSD-files **should** be included in the content package. Alternatively the schema files on the IMS website can be referenced instead of including them in the package.

```
<manifest xmlns="http://www.imsglobal.org/xsd/imscp_v1p1"
 xmlns:imsmd="http://www.imsglobal.org/xsd/imsmd_v1p2"
 xmlns:imsqti="http://www.imsglobal.org/xsd/imsqti_v2p1"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 identifier="MANIFEST-QTI-1"
 xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
http://www.imsglobal.org/xsd/imscp_v1p1.xsd
 http://www.imsglobal.org/xsd/imsmd_v1p2
http://www.imsglobal.org/xsd/imsmd_v1p2p2.xsd
 http://www.imsglobal.org/xsd/imsqti_v2p1
http://www.imsglobal.org/xsd/imsqti_v2p1.xsd">
```

個別試題的詮釋資料加入在詮釋資料元件內, 使資源元件包含 QTI 試題。除了使用 IMS MD 架構或 IEEE LOM 架構, 一般首次出現在 cp:metadata 元件的詮釋資料, 遵循 IMS QTI2.0 版試題詮釋資料。

The meta-data for the individual items is added inside the meta-data element for the resource element containing the QTI item. The generic meta-data, either using the IMS MD structures or the IEEE LOM structures goes first in the cp:metadata element, followed by the IMS QTIv2 Item meta-data.

```
<resource identifier="RES-1" type="imsqti_item_xmlv2p1"
href="qti_v2_item_01.xml">
  <metadata>
```

```
    <imsmd:lom>
      <imsmd:general>
        <imsmd:identifier>qti_v2_item_01</imsmd:identifier>
        <imsmd:title>
          <imsmd:langstring xml:lang="en">Meta-data Example Item
#1</imsmd:langstring>
        </imsmd:title>
        <imsmd:description>
          <imsmd:langstring xml:lang="en">This is a dummy
item</imsmd:langstring>
        </imsmd:description>
      </imsmd:general>
      <imsmd:lifecycle>
        <imsmd:version>
          <imsmd:langstring
xml:lang="en">1.0.1</imsmd:langstring>
        </imsmd:version>
        <imsmd:status>
          <imsmd:source>
            <imsmd:langstring
xml:lang="x-none">LOMv1.0</imsmd:langstring>
          </imsmd:source>
          <imsmd:value>
            <imsmd:langstring
xml:lang="x-none">Draft</imsmd:langstring>
          </imsmd:value>
        </imsmd:status>
      </imsmd:lifecycle>
      <imsmd:metametadata>
        <imsmd:metadatascheme>LOMv1.0</imsmd:metadatascheme>
        <imsmd:metadatascheme>QTIv2.1</imsmd:metadatascheme>
        <imsmd:language>en</imsmd:language>
      </imsmd:metametadata>
      <imsmd:technical>
        <imsmd:format>text/x-imsqti-item-xml</imsmd:format>
        <imsmd:format>image/png</imsmd:format>
      </imsmd:technical>
    </imsmd:lom>
```

```
    <imsqti:qtiMetadata>
      <imsqti:timeDependent>false</imsqti:timeDependent>

<imsqti:interactionType>choiceInteraction</imsqti:interactionTy
pe>
      <imsqti:feedbackType>nonadaptive</imsqti:feedbackType>
      <imsqti:solutionAvailable>true</imsqti:solutionAvailable>
      <imsqti:toolName>XMLSPY</imsqti:toolName>
      <imsqti:toolVersion>5.4</imsqti:toolVersion>
      <imsqti:toolVendor>ALTOVA</imsqti:toolVendor>
    </imsqti:qtiMetadata>
  </metadata>
  <file href="choice.xml"/>
  <file href="images/sign.png"/>
</resource>
```

上述程式碼顯示簡易的範例，包含從 IMS 詮釋資料標準得到的兩種詮釋資料，描述題名、敘述、試題狀態。第二部份是 IMS QTI 特定的詮釋資料。不必然需要同時使用兩個部份的詮釋資料，一般的和特定的都可單獨使用。

The above code shows a simple example containing both meta-data from the IMS meta-data specification, describing the title, description, version and status of the item. The second part of the meta-data is IMS QTI specific. It is not mandatory to use both meta-data parts, either the generic IMS meta-data part or the QTI specific part of the meta-data may be used alone.

9.1.6 包裝 QTI1.0 版物件(Packaging QTI Version 1 Objects)

在 QTI1.0 版中，questestinterop 元件用於包含各別的試題（items）、題組（sections）、評量（assessments）、題庫（object banks）。在 QTI1.0 版中，questestinterop 元件用於包含各別的試題（items）、題組（sections）、

評量(assessments)、題庫(object banks)。所有物件包含集合(collections)在內，能讓標準的版本與 XML 文件產生相同繫結，意即第一層是<questestinterop>元件的文件。

In QTI version 1, the questestinterop element was used to contain individual items, sections, assessments, or object banks. All of these objects, including any collections allowed by that version of the specification are bound to XML documents of the same type, documents with a top level <questestinterop> element.

當套裝 questestinterop 實例時，內容包裝會包含：

(1)內容清單；

(2)questestinterop 檔案（這是一個 QTI XML 檔案，此檔案符合描述於[ASI_BIND]繫結。）

(3)所有 questestinterop 物件所需要的附屬檔案（一般都是影像檔或媒體檔）。

When packaging questestinterop instances, the content package will contain:

(1)the manifest

(2)the questestinterop file (a QTI XML file satisfying the binding described in [ASI_BIND])

(3)any auxiliary files (typically images or media files) required by the questestinterop object

內容清單必須包含個別描述於每個 questestinterop 物件的 cp:resource。cp:resource 的 cp:type 必須是 imsqti_item_xmlv2p1。緊接在後的

cp:resource 須包含一筆描述 questestinterop XML 檔的 cp:file。此外，cp:resource 也應針對所有附屬檔案或替代檔案包含一筆 cp:file；cp:dependency 對個別 cp:resource 來說表示附屬檔案之意。兩種方法得以混合在同一個內容包裝，但必須個別處理。

The manifest file must contain a **separate** cp:resource describing each questestinterop object. The cp:type of the cp:resource must be imsqti_questestinterop_xmlv1p2. The cp:resource in turn must contain a cp:file representing the questestinterop's XML file. The cp:resource should also contain a cp:file for each of the auxiliary files or, alternatively, a cp:dependency to a separate cp:resource representing the auxiliary file. The two approaches may be mixed in the same content package and must be treated identically.

詮釋資料透過加入相關的 cp:resource，得以與 cp:manifest 裡的 questestinterop 物件產生關連。符合試題詮釋資料模型和 XML 繫結，描述於本標準其他地方的詮釋資料，僅能用於當 questestinterop 物件包含單一試題且無題組（section）、評量（assessment）或題庫物件的時候。此外，該種試題必不能包含 qtimetadata 或 itemmedata 元件。

Meta-data may be associated with a questestinterop object in the cp:manifest by adding it to the associated cp:resource. Meta-data conforming to the model and XML binding for item meta-data described elsewhere in this specification must only be used when the questestinterop object contains a single item and no section, assessment or objectbank objects. Furthermore, this item must not contain either qtimetadata or itemmedata elements.

在包含於內容包裝的 QTI questestinterop 物件，應用 cp:organization 再加上階層順序，是不被允許的。

The use of a cp:organization to impose a hierarchical ordering on QTI questestinterop objects contained in a content package is forbidden.

9.2 學習設計(Learning Design)

IMS學習設計[IMS_LD]和IMS QTI在學習歷程上是天生的夥伴，IMSLD標準的核心目標是模型化學習單元，界定教育和訓練的部份，如科目（courses）、模型（modules）、課程（lessons）等。一個學習單元描述了教學過程，以及包含許多活動、評量、服務，和由教師、訓練員、其他職員所提供的支援性設備。

IMS Learning Design [IMS_LD] and IMS QTI are natural partners in the learning process. The central objective of the IMSLD specification is to model Units of Learning, delimited pieces of education or training, such as courses, modules, lessons, etc. A unit of learning describes the teaching-learning process and includes a variety of activities, assessments, services and support facilities provided by teachers, trainers, and other staff members.

整合IMS學習設計（IMSLD）和QTI的主要動機源自於，涉及利用測驗或評量影響學習過程之結果的使用個案，通常引用作為形成性評價（formative assessment）。然而，其他涉及總結性評量（summative assessment）的使用個案，也就是針對使用者理解程度的最終和全面的測驗，也會形成部分的整合理由（rationale for integration）。

The primary motivation for integrating IMS Learning Design (IMSLD) and QTI stems from use cases which involve exploiting the results of a test or assessment to influence the learning process, often referred to as formative assessment. However, other use cases involving summative assessment, a final and comprehensive test of the learner's level of understanding, also form part

of the rationale for integration.

基本學習情境涉及包含了測驗或評量的學習單元，視學習者可能參與學習活動的連續性，再施予簡短的評量。以該項評量的結果為基礎，對於素材感到困難的學習者，將直接增加設計用來加強學習者理解的學習活動。另外，對於成績特別好的學習者將直接跳過某些學習活動。

A typical learning situation involving a Unit of Learning containing a test or assessment might see learners engaging in a series of learning activities, then undergoing a short assessment. On the basis of the results of this assessment, learners experiencing difficulties with material are directed to additional learning activities designed to strengthen their understanding. In addition, those learners scoring particularly well might be directed to skip certain learning activities.

其他整合情形存在著，透過學習單元的低門檻問題維持某種程度的學習者互動，並且在以團體為主的學習中，針對團體的組成進行評量。（例如：將具有相近能力程度的學習者歸入團體中）。

Other cases of integration exist, such as the incorporation of straightforward, low-threshold questions throughout a unit of learning to maintain a certain degree of learner interaction, and the use of assessments for group formation in group-based learning (e.g., when dividing learners into groups of similar levels of ability).

一般而言，整合嘗試將評量放置於較廣泛的教育情境中，以及將圍繞著用於基於IMSLD過程之基於QTI過程的結果。然而，溝通並不限於單向，資訊得以被帶入以影響評量過程，包括學習者喜好、先前測驗的結果，或是達到評量的時間。

In general, the integration seeks to position assessment in its wider educational context, and revolves around the results of QTI-based processes being used in IMSLD-based processes. However, communication is not restricted to one direction; information can be brought in to influence the assessment process, including learner preferences, the results of previous tests, or the time taken to reach the assessment.

的確, 將應用IMSLD描述和應用QTI描述之資訊調整成一致, 使得執行系統有效交互運作, 是全面內部標準互動時的特殊情況。此整合指引不試圖解決全面性的問題, 而將目標放在促進更緊密的IMSLD和QTI整合, 以幫助擴大兩者的應用領域與增進兩者結合應用的效益。

Indeed, reconciling information described using IMSLD with that described using QTI so that run-time systems interoperate appropriately is a particular case of more general inter-specification interoperability. This Integration Guide does not seek to solve the more general issue, but aims to foster a tighter integration of IMSLD and QTI to help extend their application areas and improve the benefit of their combined use.

9.2.1 透過 IMS LD 性質和 QTI 變數之整合

Integration through IMS LD Properties and QTI Variables

IMS LD 在精細的學習過程中的彈性, 很大一部分來自性質（properties）和條件（conditions）的應用。性質用來記錄各種不同的資訊型式, 且稍後可被檢視和用來影響學習過程時的觀點, 包含學習活動和學習物件的順序和可視性。IMS LD 支援性質在範圍和耐力（persistence）方面, 不同型式的定義（見 IMS 學習設計標準的細部說明）。值得注意的是, 性質的應用暗示著學習單元是在 IMS LD 層級 B 或層級 C 的程度。

A large part of IMS LD's flexibility in orchestrating learning flows comes

from the use of properties and conditions. Properties are used to record various types of information, which can subsequently be examined and used to influence aspects of the learning process, including the ordering and visibility of learning activities and learning objects. IMS LD supports the definition of different types of property in terms of scope and persistence (see the IMS Learning Design Specification for details). Note that the use of properties implies units of learning at IMS LD level B or C.

在下列基本範例中，學習設計者會創建一個名為 P-intake-test-result 的性質。

In a typical example, learning designers might create a property called P-intake-test-result:

```
<imsld:properties>
<imsld:locpers-property identifier="P-intake-test-result">
<imsld:title>The result for the test carried out as the first step in a learning flow</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
</imsld:properties>
```

此處 IMSLD（local, personal）性質宣告帶有型式整數（type integer）和初始化零的數值。此性質會根據評量結果，應用在選擇可替換學習活動間的條件下。

Here we see that an IMSLD (local, personal) property is declared, with type integer and with an initial value of zero. This property might be used in a condition to select between alternative learning activities, based on the

results of the test:

```
<imsld:conditions>
<imsld:if>
<imsld:less-than>
<imsld:property-ref ref="P-intake-test-result"/>
<imsld:property-value>3</imsld:property-value>
</imsld:less-than>
</imsld:if>
<imsld:then>
<imsld:show>
<imsld:learning-activity-ref
ref="LA-Review-Additional-Material"/>
</imsld:show>
</imsld:then>
</imsld:conditions>
```

此處之 IMSLD 條件式假使 P-intake-test-result 值小於三, 則學習活動應被顯示出來（舉例來說：在一個主題上, 加上額外的指引）。

Here we see an IMSLD condition which states that if the value of P-intake-test-result is less than 3, a learning activity should be shown (giving, for example, additional guidance on a topic).

IMS QTI 標準包含了相似的變數概念（notion of variables）, 用於紀錄評量結果。

The IMS QTI specification includes the similar notion of variables, used to record the outcomes of assessment:

```
<imsqti:outcomes_processing>
<imsqti:outcomes>
<imsqti:decvar varname="SCORE" vartype="Integer"
defaultval="0"/>
</imsqti:outcomes>
```

```
</imsqti:outcomes_processing>
```

上述 XML 片段顯示分數變數（variable SCORE）、型式整數（type integer）、初始化零數值（initial value of zero）的宣告。

The above XML fragment shows the declaration of a variable SCORE, of type integer and with an initial value of zero.

IMS LD 和 IMS QTI 的整合圍繞在相互連結的性質和變數名稱。實質上，當性質識別碼（property identifiers）和變數名稱（variable names），在設計的時候宣告成詞彙同一（lexically identical）（舉例：在以 IMS LD 為主和以 IMS QTI 為主的 XML），則兩者在涉及 IMS LD 和 QTI 為處理基礎的執行軟體環境下，會被視為共享變數（shared variable）。為達到上述 QTI 範例的效果，變數名稱需要修改，以成為 IMSLD XML 裡所使用的性質名稱。相對地，IMSLD XML 將修改成與 QTI 變數名稱相對齊（align with）（包含在所有 IMSLD 條件下，應用此性質的參照）

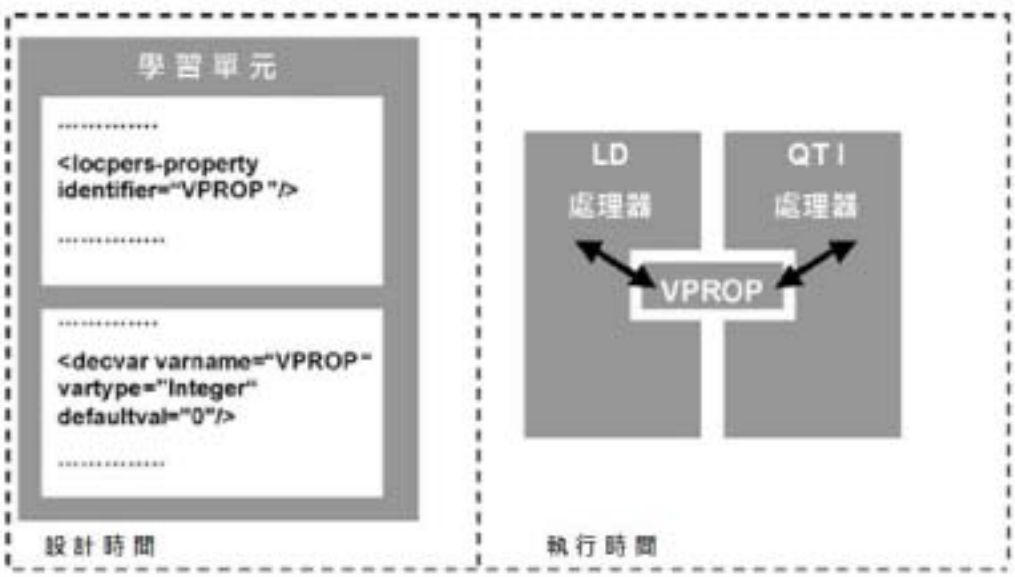
The integration of IMS LD and IMS QTI revolves around aligning property and variable names. Essentially, when property identifiers and variable names are declared to be lexically identical at design time (i.e. in IMS LD-based and IMS QTI-based XML), they are considered to be a shared variable in run-time software environments which involve IMS LD and IMS QTI-based processes. To achieve this effect in the above QTI example, the variable name would need to be modified to become the property name used in IMSLD XML. Alternatively, the IMSLD XML could be modified to align it with the QTI variable name (including references in any IMSLD conditions using the property).

圖 9.1 顯示包含 QTI 片段和 IMS LD 片段，以上述之方式指引到 VPRQP 的學習單元。這些片段可以透過不同工具產生，或是應用支援作者可產生兩種內容型式的編輯環境產生。儘管可製作出解釋兩種標準之軟體以有效地迴避(side-stepping)，但是 LD 處理器和 QTI 處理器仍各自存有市場。因此，執行時也會涉及不同讀取和寫入 VPROP 的處理器。

Figure 9.1 shows a Unit of Learning which includes both a fragment of QTI and a fragment of IMS LD which refer to VPROP in the manner describe above. These fragments may have been created with different tools or using an editing environment which supports authors in creating both types of content. Although software may be written to interpret both specifications, effectively side-stepping the integration issue, separate markets of LD processors and QTI processors already exist. As a result, the run-time situation may well involve different processors reading and writing VPROP.

圖 9.1 LD 和 QTI 整合圖示

Figure 9.1 Illustration of LD and QTI integration.



從 IMSLD 的觀點來說，這是一個在其內鬆散的整合層，應用在 QTI 內容的內部答覆處理演算法（internal response processing algorithms）是被隱藏起來的，僅有最終結果是重要的。相似地情形，以 QTI 為基礎的處理，在所有以 IMS LD 為主的結果應用中，也是無法得知的。某些執行機制必須妥善的放入，使得以 IMS LD 和 IMS QTI 兩種為基礎的處理器皆能寫入（write to）和讀取（read from），而根據新興 IMS 共享式狀態持續資料模型（IMS Shareable State Persistence Information Model）為基礎的服務，將會出現成為適當的候選服務。

This is a loose level of integration in that, from the perspective of IMS LD, the internal response processing algorithms used in the QTI content are hidden, with only the resulting outcome being of importance. Similarly, QTI-based processes are unaware of any IMS LD-based use of outcomes. Some run-time mechanism must be in place to enable both IMS LD and IMS QTI-based processes to write to and read from, and services based on the

emerging IMS Shareable State Persistence Information Model would appear a suitable candidate.

此方法複雜的因素在於，多樣 QTI 試題會不只一次地應用於相同 QTI 變數名稱。QTI 標準指出預設的變數名稱是「範圍」（SCORE），而此變數名稱用於 QTI 試題的情形並不常見。為了避免名稱空間牴觸，且增加整合 IMSLD 和 IMS-QTI 之學習單元的透通性（transparency），推薦最佳實務（the recommended best practice）去連結識別碼。此方法的目的在創建複合識別碼（compound identifiers），以作為 IMS LD 性質名稱藉資源識別碼與相關內容包裝資源相連結之用, 此內容包裝資源包含了用於變數名稱字首的 IMS QTI 試題，應用期間作區分。此方法圖示如下。

A complicating factor with this approach lies in the use of multiple QTI items in which the same QTI variable name may be used more than once. The QTI specification indicates the default variable name to be "SCORE", and it is not uncommon to see this variable name used with QTI items. In order to avoid naming clashes and increase the transparency of Units of Learning which integrate IMSLD and IMS-QTI, the recommended best practice is to combine identifiers. The approach is to create compound identifiers for use as IMS LD property names by combining the resource identifier associated with the content package resource containing the IMS QTI item as a prefix to the variable name, using a period as separator. This approach is illustrated below.

(1)名稱空間與型式化(Naming and Typing)

LD 的性質是 XML 識別碼型式（參見

http://www.imsglobal.org/learningdesign/ldv1p0/imsld_infov1p0.html#1515

694），在 XML 1.0 標準控制下訂定建置規則。

LD's properties are of type XML Identifiers (see http://www.imsglobal.org/learningdesign/ldv1p0/imsld_infov1p0.html#1515694), with the rules for their construction being governed by the XML 1.0 specification:

定義：以字母或是其中一個標點符號為起首的名稱, 且接續著字母、數字、連字符號、底線、冒號、句號, 將所有聚集在一起構成名稱字元。（源自於可延伸標誌語言（XML）1.0（第三版）W3C 於 2004 年 2 月 4 日提出建議 http://www.w3.org/TR/2004/REC-xml-20040204/#NT-Nmtokens）。

Definition: A Name is a token beginning with a letter or one of a few punctuation characters, and continuing with letters, digits, hyphens, underscores, colons, or full stops, together known as name characters.] (from Extensible Markup Language (XML) 1.0 (Third Edition), W3C Recommendation 04 February 2004 http://www.w3.org/TR/2004/REC-xml-20040204/#NT-Nmtokens)

QTI 2.0 版試題變數也是 XML 識別碼, 且相關規則控制著 IMSLD 性質的詞彙成分（lexical composition），以及 IMSQTI 變數的同一性。

QTIv2 item variables are also XML Identifiers and so the rules governing the lexical composition of IMSLD properties and IMSQTI variable are identical.

然而，型式系統（type systems）在 IMS LD 和 IMS QTI 應用的方式不同：

However, the type systems used in IMS LD and IMS QTI differ:

學習設計	**QTI**
Learning Design	
無等值物	識別碼
no equivalent	identifier
布林邏輯	布林邏輯
Boolean	boolean
整數	整數
Integer	integer
實數	浮點數
Real	float
字串	字串
String	string
文字	字串
Text	string
無等值物	小數點
no equivalent	point
無等值物	一對
no equivalent	pair
無等值物	有向對
no equivalent	directedPair
期間	期間
Duration	duration
檔案	檔案
File	file
一致性資源識別符	一致性資源識別符
URI	uri
日期時間	無等值物
Datetime	no equivalent

最終複雜的因素在於，在 QTI 中存在著多元數值變數（multi-valued variables），然而在 IMS LD 中卻沒有對應的等值。

A final complicating factor is the presence of multi-valued variables in QTI which have no equivalent in IMS LD.

當共享 Qname 局部部分之 QTI 結果變數（outcome variables）和 IMS LD 性質的型式或多元數值本質（multi-valued nature）看起來不同時，此議題指出需要有一系統混合 IMS LD 處理 QTI 試題以履行查核和議題警示。

These issues point to the need for systems which process QTI items in combination with IMS LD to perform checks and issue warnings when differences are seen either in the type or multi-valued nature of QTI outcome variables and IMS LD properties which share a local part of their Qname.

9.2.2 QTI 內容如何與何處參照到學習單元的學習設計(How and Where QTI Content is Referenced in the Learning Design of a Unit of Learning)

從 IMS 學習設計的觀點來看，概念上，測驗是連結至可呈現在現行環境中，提供教學完成測驗的學習活動。基於此種方式，QTI 試題的參照很可能是整個學習設計環境中，與學習活動相關的學習物件。下圖顯示包含這些關連的部份 IMS 內容清單。

Conceptually, from an IMS Learning Design perspective, tests are linked to learning-activities which provide the instruction to complete the test that is present in the environment. In this way, reference to QTI items is likely to be as learning-objects in environments associated with learning-activities. The following figure shows part of an IMS manifest file containing these relationships:

螢幕快照圖示學習設計參照到 QTI 試題

Screenshot illustrating a Learning Design referring to a QTI Item

http://www.imsglobal.org/question/qtiv2p1pd2/images/ldManifest.png

學習活動可以參照到一個以上的環境，且環境的巢狀結構是被允許的。接續地，每一個環境依序包含數個學習物件，每一個學習物件參照到個別的 QTI 試題。學習活動可以參照到一個以上的環境，且環境的巢狀結構是被允許的。接續地，每一個環境依序包含數個學習物件，每一個學習物件參照到個別的 QTI 試題。應用 IMS 學習設計條件機制，環境得以是可見的或隱藏的，且給予學習單元設計者在學習處理科目中，模型化測驗試題的順序和選項（selection）極大的彈性。值得注意的是，相同的方法可以應用在包含上述試題層級（題組和評量）的 QTI 內容中。

A learning activity can reference one or more environments, and nesting of environments is permitted. Each environment can, in turn, contain several learning-objects, each referencing a separate QTI item. Environments can be made visible or hidden using IMS Learning Design's condition mechanism, giving the designer of a unit of learning considerable flexibility in modeling the sequencing and selection of test items during the course of a learning process. Note that the same approach can be used for including QTI content above the item level (sections or assessments).

複合識別碼（compound identifiers）透過應用內容包裝資源的資源識別碼型塑而成，該項內容包裝資源參照至 QTI 試題，且結合 QTI 變數名稱和以期間區分。在上述範例中，假設存在於 choice_01.xml 檔案的 QTI 內容，包含了用於分數變數（variable SCORE）的結果變數宣告（outcome variable

declaration)，則需要應用變數值的 IMS-LD 內容，會使用性質（property）宣告成：<imsld:locpers-property identifier="Question1.SCORE">。

Compound identifiers are formed by using the resource identifier of the content package resource which references the QTI item, together with the QTI variable name, separated by a period. In the above example, assuming the QTI content in the file choice_01.xml contains an outcome variable declaration for the variable SCORE, IMS-LD content needing to use the value of SCORE would use a property declared as:

```
<imsld:locpers-property identifier="Question1.SCORE">
```

9.2.3 IMS LD、QTI、CP 三者整合的綱要範例（skeletal example of IMS LD, QTI, and CP integration）

這個章節將帶領讀者走過，內容包裝中整合 IMS 學習設計和 IMS QTI 學習單元的綱要範例；使用了三個問題來說明，其中兩個為了更進一步圖示複合識別碼的方法（approach），應用相同的變數名稱。

This section walks the reader through a skeletal example of a Unit of Learning which integrates IMS Learning Design and IMS QTI in a content package. Three questions are used, two of which use the same variable names in order to further illustrate the approach to compound identifiers.

接著將從具有三個個別檔案的 QTI 內容，開始建構範例。

We will build the example starting from the QTI content, held in three separate files:

choice_01.xml

http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/choice_01.xml

choice_02.xml

http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/choice_02.xml

choice_03.xml

http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/choice_03.xml

值得注意的是，首兩個試題皆使用分數變數（variable SCORE），第三個試題則使用符號分數變數（variable SIGNSCORE）。

Note that the first two items both use the variable SCORE, the third item uses the variable SIGNSCORE.

此三項 IMS QTI 試題將納入內容包裝，作為三項資源。（值得注意的是，其他兩個資源也會出現在資源區）

These three IMS QTI items would be included in the content package as three resources (note that two other resources are also shown in the resources section):

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<!-- edited with XMLSPY v5 rel. 4 U (http://www.xmlspy.com) by Colin
Tattersall (Open University of the Netherlands) -->
<imscp:manifest
xmlns:imscp="http://www.imsglobal.org/xsd/imscp_v1p1"
   xmlns:imsld="http://www.imsglobal.org/xsd/imsld_v1p0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
imscp_v1p1.xsd
    http://www.imsglobal.org/xsd/imsld_v1p0 IMS_LD_Level_B.xsd"
   identifier="Integration-Example">
<imscp:organizations>
<imsld:learning-design identifier="LD-Integration-Example"
uri="" level="B">
…
</imsld:learning-design>
</imscp:organizations>
<imscp:resources>
<imscp:resource identifier="R-Simple" type="webcontent">
<imscp:file href="simple.xml"/>
</imscp:resource>
<imscp:resource identifier="Question_1"
type="imsqti_item_xmlv2p1" href="choice_01.xml">
<imscp:file href="choice_01.xml"/>
          <imscp:file href="sign.png"/>
</imscp:resource>
<imscp:resource identifier="Question_2"
type="imsqti_item_xmlv2p1" href="choice_02.xml">
<imscp:file href="choice_02.xml"/>
          <imscp:file href="sign2.png"/>
</imscp:resource>
<imscp:resource identifier="Question_3"
type="imsqti_item_xmlv2p1" href="choice_03.xml">
<imscp:file href="choice_03.xml"/>
          <imscp:file href="sign3.png"/>
</imscp:resource>
<imscp:resource identifier="R-Feedback" type="webcontent">
<imscp:file href="feedback.xml"/>
</imscp:resource>
```

```
</imscp:resources>
</imscp:manifest>
```

在此範例中，此三項資源參照自與單一學習活動相關的單一環境。

In this example, the three resources are referenced from a single environment associated with a single learning activity:

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSPY v5 rel. 4 U (http://www.xmlspy.com) by Colin
Tattersall (Open University of the Netherlands) -->
<imscp:manifest
xmlns:imscp="http://www.imsglobal.org/xsd/imscp_v1p1"
   xmlns:imsld="http://www.imsglobal.org/xsd/imsld_v1p0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
imscp_v1p1.xsd
    http://www.imsglobal.org/xsd/imsld_v1p0 IMS_LD_Level_B.xsd"
   identifier="Integration-Example">
<imscp:organizations>
<imsld:learning-design identifier="LD-Integration-Example"
uri="" level="B">
…
<imsld:activities>
<imsld:learning-activity isvisible="true"
identifier="LA-Signpost">
<imsld:title>Complete the question show in the
environment</imsld:title>
<imsld:environment-ref ref="E-Simple-Environment"/>
<imsld:activity-description>
<imsld:title>Check your understanding of signposts</imsld:title>
<imsld:item identifier="I-Simple" identifierref="R-Simple"/>
</imsld:activity-description>
….
</imsld:learning-activity>
</imsld:activities>
<imsld:environments>
```

```
<imsld:environment identifier="E-Simple-Environment">
<imsld:title>Quick Test</imsld:title>
<imsld:learning-object identifier="LO-QTI-Item1">
<imsld:title>Assign a sign</imsld:title>
<imsld:item identifier="I-Question1"
identifierref="Question_1"/>
</imsld:learning-object>
<imsld:learning-object identifier="LO-QTI-Item2">
<imsld:title>Assign a second sign</imsld:title>
<imsld:item identifier="I-Question2"
identifierref="Question_2"/>
</imsld:learning-object>
<imsld:learning-object identifier="LO-QTI-Item3">
<imsld:title>And try to assign a third one</imsld:title>
<imsld:item identifier="I-Question3"
identifierref="Question_3"/>
</imsld:learning-object>
</imsld:environment>
</imsld:environments>
</imsld:components>
<imsld:method>
…
</imsld:method>
</imsld:learning-design>
</imscp:organizations>
<imscp:resources>
<imscp:resource identifier="R-Simple" type="webcontent">
<imscp:file href="simple.xml"/>
</imscp:resource>
<imscp:resource identifier="Question_1"
type="imsqti_item_xmlv2p0" href="choice_01.xml">
<imscp:file href="choice_01.xml"/>
          <imscp:file href="sign.png"/>
</imscp:resource>
<imscp:resource identifier="Question_2"
type="imsqti_item_xmlv2p0" href="choice_02.xml">
<imscp:file href="choice_02.xml"/>
          <imscp:file href="sign.png2"/>
```

```
</imscp:resource>
<imscp:resource identifier="Question_3"
type="imsqti_item_xmlv2p0" href="choice_03.xml">
<imscp:file href="choice_03.xml"/>
          <imscp:file href="sign3.png"/>
</imscp:resource>
<imscp:resource identifier="R-Feedback" type="webcontent">
<imscp:file href="feedback.xml"/>
</imscp:resource>
</imscp:resources>
</imscp:manifest>
```

IMS LD 性質針對下列方式，為用於每個資源檔的單一結果變數定義，並且與用來總合此三項資源的性質一起。

IMS LD properties are defined for each outcome variable used in each resource file in the following manner, together with a property which will be used to hold the sum of the three:

```
<imsld:properties>
<imsld:locpers-property identifier="Question_1.SCORE">
<imsld:title>The result for the first question</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
<imsld:locpers-property identifier="Question_2.SCORE">
<imsld:title>The result for the second question</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
<imsld:locpers-property identifier="Question_3.SIGNSCORE">
<imsld:title>The result for the third question</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
<imsld:locpers-property identifier="Total">
```

```
<imsld:title>The total</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
</imsld:properties>
```

假設是程式教學的教學方式, 則學習者很可能只會處理是否全部分數是三（舉例：假使全部三個問題皆被正確回答）。此項教學活動由 IMS LD 控制，藉由指出活動只有當設定好性質時，才得以完成。

Assuming a pedagogical approach of programmed instruction, the learner may only progress if the total score is three (i.e., if all three questions are answered correctly). This is handled in IMS LD by indicating that the activity can only be completed when a property is set (`when-property-value-is-set`):

```
<imsld:activities>
<imsld:learning-activity isvisible="true"
identifier="LA-Signpost">
<imsld:title>Complete the question show in the
environment</imsld:title>
<imsld:environment-ref ref="E-Simple-Environment"/>
<imsld:activity-description>
<imsld:title>Check your understanding of signposts</imsld:title>
<imsld:item identifier="I-Simple" identifierref="R-Simple"/>
</imsld:activity-description>
<imsld:complete-activity>
<imsld:when-property-value-is-set>
<imsld:property-ref ref="Total"/>
<imsld:property-value>3</imsld:property-value>
</imsld:when-property-value-is-set>
</imsld:complete-activity>
```

```
<imsld:on-completion>
<imsld:feedback-description>
<imsld:item identifier="I-Feedback" identifierref="R-Feedback"/>
</imsld:feedback-description>
</imsld:on-completion>
</imsld:learning-activity>
</imsld:activities>
```

最後一個步驟是納入 IMS LD 條件式，此條件式設定「全部」這項性質（property Total），使得當全部三個問題皆被正確回答後，會得到數值等於三。

The final step is to include an IMS LD condition which sets the property Total to have the value 3 when all three questions have been answered correctly:

```
<imsld:conditions>
<imsld:if>
<imsld:and>
<imsld:greater-than>
<imsld:property-ref ref="Question_1.SCORE"/>
<imsld:property-value>0</imsld:property-value>
</imsld:greater-than>
<imsld:greater-than>
<imsld:property-ref ref="Question_2.SCORE"/>
<imsld:property-value>0</imsld:property-value>
</imsld:greater-than>
<imsld:greater-than>
<imsld:property-ref ref="Question_3.SIGNSCORE"/>
<imsld:property-value>0</imsld:property-value>
</imsld:greater-than>
</imsld:and>
</imsld:if>
<imsld:then>
```

```
<imsld:change-property-value>
<imsld:property-ref ref="Total"/>
<imsld:property-value>3</imsld:property-value>
</imsld:change-property-value>
</imsld:then>
</imsld:conditions>
```

「全部」這項性質（property Total）同樣可以給予布林型式（type boolean），以及一旦達到總值時分派真值（value of true）。

The property Total could equally have been given the type boolean and assigned a value of true once the total had been reached.

完整內容清單(Full Manifest File)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/imsmanifest.xml

9.2.4 IMS LD 和 IMS QTI 試題整合(IMS LD and QTI assessmentTest integration)

前面的範例顯示，單個 QTI 試題（assessmentItems）如何從 IMS 學習設計中建立參照。以類似的方式，也可能從 IMS LD 中明確指出完整的試題。評量結果分數變數（variable SCORE）的值會應用性質宣告成如下型式：

```
<imsld:locpers-property identifier="Assessment1.SCORE">
```

The previous example shows how individual QTI assessmentItems are referenced from within IMS Learning Design. In a similar way it is possible to point to complete assessmentTests from within IMS LD. The value of the outcome variable SCORE of the test would use a property declared as:

```
<imsld:locpers-property identifier="Assessment1.SCORE">
```

Assessment1 在上述情況下，是包含 QTI 評量測驗（assessmentTest）的資源識別碼。

Assessment1 in that case is the identifier of the resource containing the QTI assessmentTest.

9.3 簡易編序(Simple Sequencing)

IMS簡易編序標準[IMS_SS]定義了一種方法，此方法是為了重現已編寫完成學習經驗所預期的編序行為（intended sequencing behavior）。換句話說，學習技術系統的方法可以是與學習活動相分離的順序，採各自獨立的方式。

The IMS Simple Sequencing specification [IMS_SS] defines a method for representing the intended sequencing behavior of an authored learning experience. In other words, the way learning technology systems can sequence discrete learning activities in a consistent way.

將單一試題和學習活動整合入由簡易編序規則所控制的單一活動樹（single activity tree），建議需要將試題所須的相關時間資訊（the information about the item session）對映至適當的簡易編序概念內。儘管在此社群中正在討論許多試驗性的方法，然而關於上述對映應如何導入的詳細討論，尚未在本文件述及。讀者或許會希望密切留意[APIS]計畫的結果，此計畫目前正準備針對對映提出更多詳細的建議。

Integrating individual assessment items with learning activities into a single activity tree controlled by simple sequencing rules suggests the need to map the information about the item session into the appropriate simple sequencing concepts. A detailed discussion of how this mapping might be implemented is beyond the scope of this document, though a number of

experimental approaches are currently being discussed within the community. Readers may wish to monitor the output of the [APIS] project which is currently preparing more detailed recommendations.

為促進更簡易將QTI試題整合入活動樹（activity trees），著者強烈鼓勵將具有分數名稱（name SCORE）的結果變數（outcome variable）定義成數字型式，且針對結果宣告（outcomeDeclaration）的常態最大值屬性（normalMaximum attribute）提供數值。特別值得注意的是，當設計試題產生具有能得到最小0以外數值的分數時，分數將被正規化在[-1.0,1.0]範圍之間，以符合編序規則的應用，這在應用時需要謹慎。

To help facilitate easier integration of QTI items into activity trees authors are strongly encouraged to define an outcome variable with the name SCORE to be of a numeric type and to provide a value for the normalMaximum attribute of the outcomeDeclaration. Note particularly that scores will be normalized to the range [-1.0,1.0] for use with sequencing rules so care will need to be taken when designing items that generate scores with minimum obtainable values other than 0.

簡易編序使得organization元件在內容包裝使用。為了將試題視為活動，organization元件需要納入適當的cp:item元件。如上所述，本標準建議當套裝QTI內容時，是唯一使用organization元件的時機。

Simple sequencing makes use of the organization element within the content package. In order to treat an assessment item as an activity a suitable cp:item element will need to be included in the organization. As stated above, this is the only use of the organization element that this specification recommends when packaging QTI content.

值得注意的是，試題具有資源型式imsqti_item_xmlv2p0但不具有網頁內容（webcontent）。這指出對於處理系統來說，資源並不適合直接控制網站瀏覽器的呈現。相反地，以網站為基礎的系統，支援試題在活動樹使用時，必須能夠將試題轉換成適合網站傳送的適當格式，並且處理答覆、收集與對映最後試題結果。2.0版針對itemBody簡介[XHTML]的資料模型，讓此項轉換動作變得非常容易。

Note that assessment items have resource type imsqti_item_xmlv2p0 and not webcontent. This indicates to the processing system that the resource is not suitable for handing directly to a web-browser for presentation. Instead, web-based systems that support the use of assessment items within activity trees must be capable of converting the assessment item into a suitable form for web delivery, processing the responses and collecting and mapping the resulting item outcomes. The version 2 data model for the itemBody profiles [XHTML] making this transformation considerably easier.

9.4CMI 資料模型(CMI)

CMI資料模型[CMI]設計用以提供對學習管理系統或其他執行服務於執行期間所建立資料（例如評量試題之結果）的交流機制。至於如何將試題所須時間內容（the contents of an item session）對映到CMI資料模型，相關細節的描述尚未在本標準提及。

The CMI datamodel [CMI] is designed to provide a mechanism for the communication of data created at runtime, such as the outcomes of an assessment item, to a learning management system or other runtime service. A detailed description of how to map the contents of an item session into this model is beyond the scope of this specification.

試題著者被鼓勵遵循描述於簡易編序中的最佳實務，以透過CMI介面有助於促進相互交流。completionStatus試題變數是特別預先定義的變數，定義用來簡化以CMI為基礎的系統整合。著者同時也被提醒，適當的試題必須保持在試題答覆處理規則（item's

responseProcessing rules）中，針對變數保有其值。

Item authors are encouraged to follow the best practice described in Simple Sequencing to help facilitate interoperability through the CMI interface. A special predefined item variable (completionStatus) is defined to ease integration with CMI-based systems. Authors are reminded that adaptive items must maintain a value for this variable in the item's responseProcessing rules.

10.XML 繫結

描述將資料模型以 XML 繫結之法的文件。

A document describing the way the data models have been bound to [XML].

11.符合性指引

描述符合性要求並提供建構 QTI 應用標準之資料模型的文件。此應用標準也包括用來取代 QTI LIte 標準之事先定義好的應用標準。這份文件目前沒有變動，但有一更新的版本將與最後發行的標準一起出版。

A document that describes conformance requirements and provides a data model for the construction of QTI profiles including a predefined profile that replaces the QTI Lite specification [QTI_LITE] released as part of version 1. This document is currently unchanged but an updated version will be published with the final release of the specification.

為了要建立一個有意義的戶用性聲明，必須要考慮 QTI-conformant 資料之議題與系統開發者為了確保其系統符合性而必須執行的關連議題。

In order to make meaningful statements about interoperability it is necessary to consider the issue of QTI-conformant data and the associated issue of what a system developer needs to do to ensure that their system conforms.

一個系統供應商或是資料出版商所做出的符合性聲明中可以讓社群使用以比

較自家產品與其他產品之能力。為了促進符合性聲明的建立, contentProfile 與 bankProfile 的類別必須定義為使一個確實的方法可以支援描述該項資訊的範圍與包裝模式；相同的類別當然可以用來描述一組需求。較小社群使用此種方式可以表達該標準之簡介。為了建立資訊與諮詢, 以及經營這一類的社群, 使用者常必須參照【IMS 應用概況指引白提書（IMS_AP）】。

A system vendor or data publisher makes a conformance statement that can be used by the community to compare the capabilities of their product with others. To facilitate creation of conformance statements contentProfile and bankProfile classes are defined that enable a rigorous approach to describing the extent to which the item information and packaging models are supported. The same classes can of course be used to describe a set of requirements. Used in this way they enable smaller communities to express profiles of this specification. For information and advice about setting up and running such communities, readers are referred to the IMS Application Profile Guidelines Whitepaper [IMS_AP].

這個標準當中定義了兩個可以作為決定互通需求的基礎簡介， 當沒有更具體的需求時 。這些簡介被稱作 QTI-Lite 2.0 版（僅適用於內容）以及 QTI-All 2.0 版, 並且可以備用以解釋聲明, 如「符合所有 QTI 2.0 版」。

This specification defines two profiles that can be used as the basis for determining interoperability needs in the absence of any more specific profiling requirement. These profiles are called QTI-Lite Version 2 (which applies only to content) and QTI-All Version 2 and can be used to interpret statements such as "conforms to all of QTI Version 2".

定義自己簡介的社群被強烈的鼓勵以確保所有的物件符合其簡介, 而這些也符合在本 QTI-All 2.0 版文件當中除了有關另外媒體形式之外的描述（參見 objectType 與 imageType）。允許（或是甚至要求） 對象不依照 QTI-All 2.0 版應該自我描述作為 QTI 的延伸名稱。

Communities that define their own profiles are strongly encouraged to ensure that all objects conforming to their profile also conform to the QTI-All Version 2 profile described in this document except with respect to additional media types (see objectType and imageType). Profiles that allow (or even require) objects that do not conform to QTI-All Version 2 should describe themselves as extensions of QTI.

11.1 符合性資料(Conforming Data)

本標準定義了幾種可被交換於系統之資料物件的類型, 因此需要定義互通性的程度。舉例來說, 一組試題統計可被描述為相容於QTI Version 2。本節將講述此符合性聲明之意涵。

This specification defines several types of data objects that may be exchanged between systems and hence require defined levels of interoperability. For example, a set of item statistics may be described as QTI Version 2 Conformant. This section explains what such conformance statements mean.

11.1.1 試題(Assessment Items)

試題(Assessment Items) 必須為符合 XML Schema 當中由標準定義之 assessmentItem 之 XML 文件, 並且對於額外的內容必須限制於資料模型所描述的。

Assessment Items must be XML documents that conform to the XML

schema for assessmentItem defined by this specification and to the additional content constraints described in the information model.

11.1.2 試題套裝(Item Packages)

試題套裝必須符合 IMS 內容包裝(IMS Content Packaging)標準, 並且包含套裝於整合說明（Integration Guide）之相同需求描述的試題。

Item packages must conform to the IMS Content Packaging specification and contain assessment items packaged in accordance with the requirements described in the Integration Guide.

11.1.3 試題統計 (Item Statistics)

試題統計 (Item statistics) 必須為符合 XML Schema 當中由標準定義之 usageData 之 XML 文件。

Item statistics must be XML documents that conform to the XML schema for usageData defined by this specification.

11.1.4 回饋處理器(Response Processors)

回饋處理器（Response Processors） 必須為符合 XML schema 當中由標準定義之 responseProcessing 之 XML 文件並且對於額外的內容也必須限制於資料模型所描述的。

Response Processors must be XML documents that conform to the XML schema for responseProcessing defined by this specification and to the additional content constraints described in the information model.

11.2 符合性系統(Conforming Systems)

除了界定於符合性標準為互通系統當中交換之資料物件之外, 此標準也說明了由其資料物件所呈現出系統資訊的需求。描述他們本身符合「QTI Version 2」的系統必須參照適當的描述；以下敘述在各類型系統當中的需求。

In addition to defining conformance criteria for the data objects that are exchanged between interoperable systems, this specification also describes requirements on the way those systems interpret the information described by those data objects. Systems that describe themselves as conforming to "QTI Version 2" must make reference to an appropriate profile. The requirements on each type of system are described below.

11.2.1 出版系統(Publishing System)

一個符合性出版系統是任何不必藉由cutomInteraction 與customOperator 的延伸元件, 就可以輸出評量試題(assessment items)裝載為試題套裝的系統。

A conformant publishing system is any system that can export conforming assessment items packaged as item packages without requiring the use of the extension elements customInteraction and customOperator.

出版系統也可以發佈各種形式的內容, 包括一些以QTI 為基礎延伸元件使用的格式, 但其必須能夠獨立的輸出或是運作狀態。舉例來說, 當發佈內容及與從被要求選定的資料集之中略過數題時, 出版系統應包含一個可停止使用QTI 延伸格式的標記。

A publishing system may also publish content in a variety of other formats, including some QTI-based formats that make use of the extension elements, but it must be possible to

separate this output or the modes of operation that generate it. For example, a publishing system may contain a flag to turn off the use of QTI extensions when publishing content and skip items from the selected data set that would have required them.

出版系統應該建立一個具有描述可被輸出內容範圍的contentProfile。該簡介主要的目的是為了描述一個系統輸入資料時所產生的需求，而此功能不需要出版系統利用他具有的全方位描述功能。舉例來說，一個出版系統只輸出單一回應多重選擇的問題時，例如QTI當中的assessment items可能仍會增加choiceInteraction 為interactionType 至其contentProfile，甚至因此這個描述多重回應，多重選擇的問題也是（這兩個問題在 contentProfile 當中，被視為為不可分割） 。

A publishing system should create a contentProfile that describes the range of content it can export. The main purpose of such a profile is to describe the requirements for a system that needs to import the data and does not imply that the publishing system exploits the full range of functionality it describes. For example, a publishing system that exports only single response multi-choice questions as conformant QTI assessment items would still add choiceInteraction as an interactionType to its contentProfile even though this describes multiple-response multi-choice questions too (these two question types being inseparable in the contentProfile).

11.2.2 編製系統(Authoring Systems)

一個符合性的一個編製系統允許試題作者可以建立新的試題，編輯由試題整合封包當中之輸入試題，並且匯出試題為新的或是更新的試題封包。

A conformant authoring system allows item authors to create new items, to edit existing items imported from conforming item packages, and to export items into new or updated item packages.

編製系統必須合適地設置或調整為toolName與toolVersion，當輸出試題時（除非沒有沒改變）。當出口試題時，所有的延伸格式的使用必須符合以下工具集合所提及的屬性，

這些延伸機制如下：

(1) bodyElement 中的標籤屬性。

(2) customInteraction 類別中的。

(3) customOpterator 類別中的。

編製系統應該忽略由延伸機制的資訊，當輸入一個由非相容的工具所建立的試題時。

Authoring systems must set or adjust the toolName and toolVersion appropriately when exporting items (unless no changes have been made). When exporting items, all use of extensions must be consistent with the conventions of the tool referred to by these attributes. The extension mechanisms are:

•The label attribute on bodyElement.

•The customInteraction class.

•The customOperator class.

Authoring systems should ignore information represented by the extension mechanisms when importing an item that was created by an incompatible tool.

編製系統還應該確保可以藉由本標準的資料模型所呈現的資料是可以以那樣的方式呈現的。換句話說，編製系統不應該利用延伸機制的使用來代表資訊本身。

Authoring systems should also ensure that data that can be represented by the information model defined by this specification is represented in that way. In other words, authoring systems should not make use of the extension mechanisms to represent information that could have been represented without them.

這項要求是為了確保編製系統在輸出評定試題時可以滿足作者合理的期

望。舉例來說，建立一個由背景影像上熱點代表之單一選擇問題的作者合理的期待該輸出資料包含 hotspotChoice，而非一個包含在傳遞引擎之限制集上實作相同功能性之專屬附屬程式的 customInteraction。

This requirement is made to ensure that authoring systems meet the reasonable expectations of authors when exporting assessment items. For example, an author who creates a question containing a simple choice represented by hotspots on a background image can reasonably expect the exported data to contain a hotspotChoice and not a customInteraction containing a proprietary applet that implements the same functionality on a limited set of delivery engines.

一系統使用延伸機制以代表可以直接在資料模型當中呈現的資料，不能宣稱資料模型之符合性。

A system that uses an extension mechanism to represent data that can be represented directly in the information model must not claim conformance for that part of the information model in its conformance profile.

請注意，工具可能結合編製系統與傳遞引擎的功能，以允許創作者嘗試其試題，但這並非必要。凡是包含順應編製系統的工具應該確保傳遞引擎也是一致的，以防止作者被誤導。

Note that a tool may combine the functions of authoring system and delivery engine, to allow authors to try out their items, but it is not required to do so. Where a tool contains a conformant authoring system and a delivery engine it should ensure that the delivery engine is also conformant to prevent authors being misled.

編製系統應該建立一contentProfile以描述QTI內容的支援範圍。

An authoring system should create a contentProfile to describe the range of QTI content that it supports.

11.2.3 題庫系統(Item Bank Systems)

題庫系統是為了管理收藏試題 其詮釋資料與任何關連使用數據的工具。

An item bank system is a tool for managing collections of items, their meta-data, and any associated usage data.

一個符合性的題庫系統允許試題庫經理人可以從試題套裝當中匯入與匯出試題的集合。題庫系統必須不會改變物件assessmentItem 的資料。儘管某個工具可能藉由一個編製系統結合一個題庫系統的特徵，要成為一個適應性題庫系統，它必須能夠不藉由修改相關assessmentItem 的資料而將試題集合匯入、管理與輸出。

A conformant item bank system allows item bank managers to import and export collections of items from item packages. Item bank systems must not alter the items' assessmentItem data. Though a given tool may combine the features of an item bank system with an authoring system, to be a conformant item bank system it must still be capable of importing, managing, and exporting collections of items without modification of the associated assessmentItem data.

題庫系統應該建立bankProfile以描述特徵之範圍與支援程度。第一版的標準描述了資料模型的bojectbanks, assessment 與 results, 這些都是尚未在此版本當中更新的，但可能在未來的版本當中會改進的。因此，題庫系統的符合性會關注於試題庫的互通性、評量與結果。以及關連 bankProfile 類別是否有變化。

An item bank system should create a bankProfile to describe the range of features that it supports. Version 1 of this specification described an information model for objectbanks, assessments, and results which have not been updated by this version but **may** be updated by future versions. Therefore, the conformance of item bank systems with respect to the interoperability of item banks, assessments, and results and the associated bankProfile class is subject to change.

11.2.4 傳遞引擎(Delivery Engines)

傳遞引擎是允許使用者或受試者與試題彼此互動的系統之組件，提供各種回饋價值並且對回應處理下達指令與提供合適的回應。傳遞引擎可能是評量系統的一部份，也可能僅為編製或編輯系統的組件。

A delivery engine is the component of a system that allows the user or candidate to interact with an item, to assign values to response variables and to invoke response processing and provide feedback as appropriate. A delivery engine may be part of a full-blown assessment system or it may simply be a component of an authoring or editing system.

一個符合性的傳遞引擎符合以關注其傳遞表現在資料模型當中描述的需求。舉例來說，它必須提供適當的控制操作，以每個支援互動與維持試題區段所描述的資料。

A conformant delivery engine conforms to the requirements described in the information model with respect to its behavior in delivering the items. For example, it must provide suitable controls that operate in accordance with the requirements of each supported interaction and maintain the data described by the item session.

11.3. 符合性簡介(Conformance Profiles)

11.3.1 編輯與傳遞系統(Authoring and Delivery Systems)

Class : contentProfile

此類別提供一描述編製系統、傳遞引擎能力或需求的框架。大部分規範元件用於指示某些特定功能為支援（true）或不支援（false）的布林邏輯。當用於表達情境的需求時，其值為必備或選項。此規範類別不支援功能之排除。

This class provides a framework for describing the capabilities or requirements of an authoring system or delivery engine. Most of the elements of the profile are booleans that indicate whether or not a specific feature is supported (true) or not supported (false). When being used in the context of expressing requirements the values correspond to required or optional respectively. This profile class does not support exclusion of features.

Contains : composite boolean [1]

系統是否支援複合題。

Whether or not the system supports composite items.

Contains : adaptive boolean [1]

系統是否支援適性題。

Whether or not the system supports adaptive items.

Contains : timeDependent boolean [1]

系統是否支援時間相依題。

Whether or not the system supports time dependent items.

Contains : templates boolean [1]

系統是否支援試題模版。

Whether or not the system supports item templates.

Contains : textElements boolean [1]

系統是否支援XHTML文字元件。支持任何其它XHTML元件組的檔案亦應該支持此系統。

Whether or not the system supports the XHTML text elements. A profile that supports any of the other XHTML element groups should support this one too.

Contains : listElements boolean [1]

系統是否支援XHTML列表元件。

Whether or not the system supports the XHTML list elements.

Contains : objectElements boolean [1]

系統是否支援XHTML對象元件。

Whether or not the system supports the XHTML object elements.

Contains : objectType mimeType [*]

對於支持對象元件的系統, 類型列表對象支持。例如: image/jpeg 、audio/aiff, 等。

For systems that support the object element, a list of the types of object supported. For example: image/jpeg, audio/aiff, etc.

Contains : presentationElements boolean [1]

系統是否支援XHTML介紹元件。

Whether or not the system supports the XHTML presentation elements.

Contains : tableElements boolean [1]

系統是否支援XHTML表元件。

Whether or not the system supports the XHTML table elements.

Contains : imageElement boolean [1]

系統是否支援XHTML影影像元件件。

Whether or not the system supports the XHTML image element.

Contains : imageType mimeType [*]

對於支援影像元件的系統, 類型列表圖像支持。例如: image/png 、image/jpeg, 等。

For systems that support the image element, a list of the types of images supported. For example: image/png, image/jpeg, etc.

Contains : hypertextElement boolean [1]

系統是否支援XHTML超文件元件。

Whether or not the system supports the XHTML hypertext element.

Contains : mathElement boolean [1]

系統是否支援MathML <math>元件。

Whether or not the system supports the MathML <math> element.

Contains : mathVariable boolean [1]

系統是否支援模版可變名字擴展在MathML 表示式。

Whether or not the system support the expansion of template variable names in MathML expressions.

Contains : feedbackIntegrated boolean [1]

系統是否支援整合回饋, 例如：feedbackBlock類別。

Whether or not the system supports integrated feedback, i.e., the feedbackBlock class.

Contains : feedbackModal boolean [1]

系統是否支援模態回饋, 即,modalFeedback類別。

Whether or not the system supports modal feedback, i.e., the modalFeedback class.

Contains : rubric boolean [1]

系統是否支援紅字題目塊, 即rubricBlock類別。

Whether or not the system supports rubric blocks, i.e., the rubricBlock class.

Contains : printedVariables boolean [1]

系統是否有核心支持對於printedVariable 元件。注意支持對於r 轉換類型指定成分是受控制分開地舍入。

Whether or not the system has core support for the printedVariable element. Note that

support for the r conversion type specifier is controlled separately rounding.

Contains : interactionType [*]

支援互動的類型，這個辭彙包括依照定義資料模型的名字、customInteraction的例外互動次階層。見下文交互特定的符合性附註。

The supported interaction type(s). The vocabulary is comprised of the names, as defined in the information model, of the leaf classes derived from interaction with the exception of customInteraction. See below for interaction-specific conformance notes.

Contains : responseRules boolean [1]

系統是否在支援回應處理中支援回應規則，設定為支援的系統假定能夠處理任意的模版，以致於不需個別列出。注意支援該equalrounded和patternmatch運算符是選項的，個別參照四捨五入(rounding)和正規表示式(regexp)。

Whether or not the system supports response rules in response processing. Systems that set this to true are assumed to be able to process arbitrary templates so need not list these individually. Note that support for the equalRounded and patternMatch operators is optional, see rounding and regexp respectively.

Contains : rpTemplate uri [*]

系統只支援應對處理範例，範例列表支援。

For systems that only support response processing templates, a list of the templates supported.

Contains : rounding boolean [1]

系統是否支援進階rounding；若支援printVariable，則亦能支援 r 溝通型式。

Whether or not the system supports advanced rounding: if printedVariables is supported then

the r conversion type specifier is also supported.

Contains : regexp boolean [1]

系統是否支援一般表達配對；若為textEntryInteraction或extendedTextInteractio，則亦支援patternMask屬性；若支援responseRule，則亦支援patternMatch運算符。

Whether or not the system supports regular expression matching: if the textEntryInteraction or extendedTextInteraction then the patternMask attribute is also supported; if responseRules is supported then the patternMatch operator is also supported.

Contains : metadataProfile [1]

參數有關的各種詮釋資料支援，是描述一個單獨的類別。

The parameters concerning the range of meta-data supported are described by a separate class.

Class : metadataProfile

相關類別(Associated classes)：

bankProfile, contentProfile

Contains : imsmd boolean [1]

根據這套詮釋資料標準，該系統支援詮釋資料描述和限制。

The system supports meta-data described by and bound according to the IMS meta-data specification [IMS_MD_Binding].

Contains : lomMetadata boolean [1]

系統支持詮釋資料描述【LOM】和約束，根據相關xml的繫結。

The system supports meta-data described by [LOM] and bound according to the associated XML binding.

Contains : imsqtimd boolean [1]

該系統支援詮釋資料描述和約束，根據該qtiMetadata類定義在相關詮釋資料和使用數據。

The system supports meta-data described by and bound according to the qtiMetadata class defined in the associated Meta-data and Usage Data.

11.3.1.1 互動符合性標示(Interaction-Specific Conformance Notes)

大部分的簡單互動可以單獨被支援。例如，它可能定義一個有意義的簡介，為了interactionType 藉由那個choiceInteraction 的簡單屬性，以及沒有其他的整合功能。

Most of the simple interactions can be supported in isolation. For example, it is possible to

define a meaningful profile with the a single value of choiceInteraction for interactionType and no other conforming features.

有些互動類型需要XHTML為基礎元件的使用，也就是那些在他們的簡介當中的自己為主題下的旗標。簡介必須包含一個支援其中一種類型的interactionType，也必須為任何必需的XHTML為基礎元件設定旗標，讓他們有效。這些需求列於下文。

Some interaction types require the use of XHTML-based elements that are subject to their own flag in the profile. A profile that contains an interactionType indicating support for one of these types must also set the flags for any required XHTML-based element to be valid. These requirements are listed below.

gapMatchInteraction	需要textElements，如果系統支援gapMatchInteraction以及objectElements，那它在簡介當中就應該支援具有任何圖像obectTypes 的gapImhg 使用。一個支援gapMatchInteraction 但不具有圖像ObjectType 的系統，則不支援GapImg 。 Requires textElements. If a system supports gapMatchInteraction and objectElements then it must support use of gapImg with any image objectTypes in the profile. A system that supports gapMatchInteraction but no image objectTypes does not support gapImg.
inlineChoiceInteraction, textEntryInteraction, hotTextInteraction, endAttemptInteraction	需要tectElemets Require textElements.
hotspotInteraction, selectPointInteraction, graphicOrderInteraction, graphicAssociateInteraction, graphicGapMatchInteraction, positionObjectInteraction, drawingInteraction	需要objectElemets 以及至少一個適當的objectType。 Require objectElements and at least one suitable objectType.

11.3.2 題庫系統(Item Bank Systems)

Class : bankProfile

此類別提供了一個為了描述題庫系統的功能與需求。它具有一個用以詳細說明類似兩用能力與需求的 contentProfile 類別。

This class provides a framework for describing the capabilities or requirements of an item bank system. It has a similar dual use for specifying capabilities and requirements as the contentProfile class.

請注意題庫系統必須能夠從內容包裝匯入與匯出試題，同時也必須能夠將辭彙或是架構從匯入資料與詮釋資料到以相同試題匯出的模式運作。

Note that item bank systems must be able to import and export items from content packages and must be able to operate in a mode whereby all imported usage data and meta-data from a vocabulary or scheme to which conformance is claimed can be exported again with the same set of items.

Contains : usageDataVocabulary uri [*]

開放的一個詞彙文件（或文件）描述詞彙支持使用數據。參考一詞彙表明支持系統使用的數據文件打包，根據描述的方法在整合指引。

The URI of a vocabulary file (or files) describing the vocabulary of supported usage data. Reference to a vocabulary indicates that a system supports usage-data files packaged according to the method described in Integration Guide.

Contains : metadataProfile [1]

描述支援之詮釋資料範圍的標誌與contentProfile所使用的相同。

The flags describing the range of meta-data supported are the same as those used in the contentProfile.

11.3.3 QTI 精簡版(QTI-Lite)

QTI-Lite是以所有階層到完整QTI 標準以及只有創作、修改與傳遞之相關內容的方式呈現。換句話說，也就是不包含題庫系統。QTI-Lite並不支援所有完整標準的功能，而只支援合適的簡介。也就是說一個與 QTI-Lite 簡介一致的試題，也同時符合下述之QTI-All 簡介定義的預設值。

QTI-Lite is presented as the entry-level profile to the full QTI specification and only concerns content, its creation, modification, and delivery. In other words, it does not concern item bank systems. QTI-Lite does not support all of the features of the full specification but it is a proper profile, in other words an assessment item that conforms to the QTI-Lite profile also conforms to the default "QTI-All" profile defined below.

QTI 精簡版簡介定義(QTI-Lite Profile Definition)

符合性(conformance)/ imsqti_lite_profile.xml

QTI-Lite與QTI-all在簡介上主要不同部份如下：

(1) 每個試題只有一個互動。

(2) QTI-Lite 支援的唯一互動類型是choiceInteraction，也適用於簡單複選問題的使用，如從多個選項選出一個選項（是或否，真或偽以及李克特量表），並且也具有多重回應問題，如從多個選項當中選出一個或多個選項（選擇所有適用）。

(3) 使用正確核對單一範例的簡單回應程序（或是一個為了多選回應之多重核對群組）。

(4) 不支援整合性回應。

(5) 對於圖像類型與結構化格式的限制。

(6) 不支援進階功能，例如自適應試題，範例或是以計分為主的時間。

The key differences between the QTI-Lite and the QTI-All profile are:

1. Only one interaction per item.
2. The only interaction type to be supported by QTI-Lite is the choiceInteraction, suitable for use with simple multi-choice questions like one choice from many (e.g., "Yes/No", "True/false" and "Likert scale") and also with multiple response questions like one or more choice from many (e.g., select all that apply).
3. Simple response processing using the Match Correct template enabling only a single right answer (or an exact matching group for multiple response).
4. No support for integrated feedback.
5. Limited image types and structural formatting.
6. No support for advanced features like adaptive items, templates or time based scoring.

請注意，多重回應問題的採用，顯示QTI-lite 從第一版的標準中範圍的延伸，然而這些在回應程序中的限制，尤其是對於Map Response 範例的支援缺乏，不應讓執行感受出顯著的負擔。

Note that the inclusion of multiple-response questions represents an expansion of the scope of QTI-Lite since version 1 of this specification but that the restrictions on response processing, in particular the lack of support for the Map Response template, should not present a significant burden to implementors.

11.3.4 QTI 完整版(QTI All)

一個描述順應QTI Version 2 標準的內容簡介，包含了一個完全的特徵列表與最小的媒體類型。

The content profile that describes conformance to the full QTI Version 2 specification includes a complete list of features and a minimal set of media types.

QTI 完整版內容簡介定義（QTI-All Content Profile Definition）

http://www.imsglobal.org/question/qtiv2p1pd2/conformance/imsqticontent_all_profile.xml

QTI 完整版資料庫簡介定義（QTI-All Bank Profile Definition）

http://www.imsglobal.org/question/qtiv2p1pd2/conformance/imsqtibank_all_profile.xml

英中名詞對照表

-A-

Absolute Positioning	絕對定位
Adaptive Item	適性題
Adaptive Test	適性測驗
Assessment	評量
Assessment Test	評量測驗
Assessment Variable	評量變數
Assessment Delivery System	評量傳遞系統
Attempt	嘗試
Authoring System	編製系統

-B-

Basic Item	基本題
Binding	繫結

-C-

Candidate	受試者
Candidate Session	受試階段
Cardinality	基數
Character set	字元集
Cloning Engine	複製引擎
Composite Item	複合題
Conformance	符合性
Conformance statement	符合性聲明
Container	容器
Content	內容
Content Packaging, CP	內容包裝

-D-

Declaration	宣告
Delivery Engine	傳遞引擎
Dependency	相依性

-E-

Element	元件
Expression	表示（式）
Evaluation	評鑑

-F-

Feedback	回饋
Fragment	片段

-G-

-H-

Hotspot	熱點

-I-

Integrated Feedback	整合回饋
Interaction	互動
Interoperability	互運性
Item	題、試題
Item Clone	試題複製
Item Fragment	試題片段
Item Session	試題階段
Item Set	試題集
Item Template	試題模版
Item Variable	試題變數

-J-

-K-

-L-

-M-

Mapping	對照
Mark	標記
Material	教材
Metadata	詮釋資料
Modal	模態
Multiple Response	多重答覆

-N-

Non-adaptive Item	非適性題

-O-

Object Bank	物件庫
Operator	運算符
Ordered Response	有序答覆
Outcome Processing	結果處理
Outcome Variable	結果變數

-P-

Package	套裝
Pool	題庫
Process	歷程、過程
Proprietary	專屬

-Q-

-R-

Response	答覆
Response declaration	答覆宣告
Response processing	答覆處理
Response Variable	答覆變數
Rule	規則

-S-

Schema	架構
Scoring	評分
Scoring Engine	評分引擎
Section	題組
Single Response	單一答覆
Source set	來源集
Stage	影層
Supporting material	支援教材

-T-

Target set	標的集
Test	測驗
Test Feedback	測驗回饋
Test Fragment	測驗片段
Test Report	測驗報告
Test Session	測驗階段
Template Processing	模版處理
Template Variable	模版變數
Time Dependent Item	時間相依題
Time Independent Item	時間獨立題

-U-

-V-

-W-

-X-

-Y-

-Z-

Question and Test Interoperability

Content

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1. Scope

The IMS Question & Test Interoperability (QTI) specification describes a data model for the representation of question (assessmentItem) and test (assessmentTest) data and their corresponding results reports. Therefore, the specification enables the exchange of this item, test, and results data between authoring tools, item banks, test constructional tools, learning systems, and assessment delivery systems. The data model is described abstractly, using [UML] to facilitate binding to a wide range of data-modeling tools and programming languages, however, for interchange between systems a binding is provided to the industry standard eXtensible Markup Language [XML] and use of this binding is strongly recommended. The IMS QTI specification has been designed to support both interoperability and innovation through the provision of well-defined extension points. These extension points can be used to wrap specialized or proprietary data in ways that allows it to be used alongside items that can be represented directly.

The IMS QTI work specifically relates to content providers (that is, question and test authors and publishers), developers of authoring and content management tools, assessment delivery systems, and learning systems. The data model for representing question-based content is suitable for targeting users in learning, education, and training across all age ranges and national contexts.

2. Specification Use Cases

QTI is designed to facilitate interoperability between a number of systems that are described here in relation to the actors that use them. Specifically, QTI is designed to:

Provide a well documented content format for storing and exchanging items independent of the authoring tool used to create them.

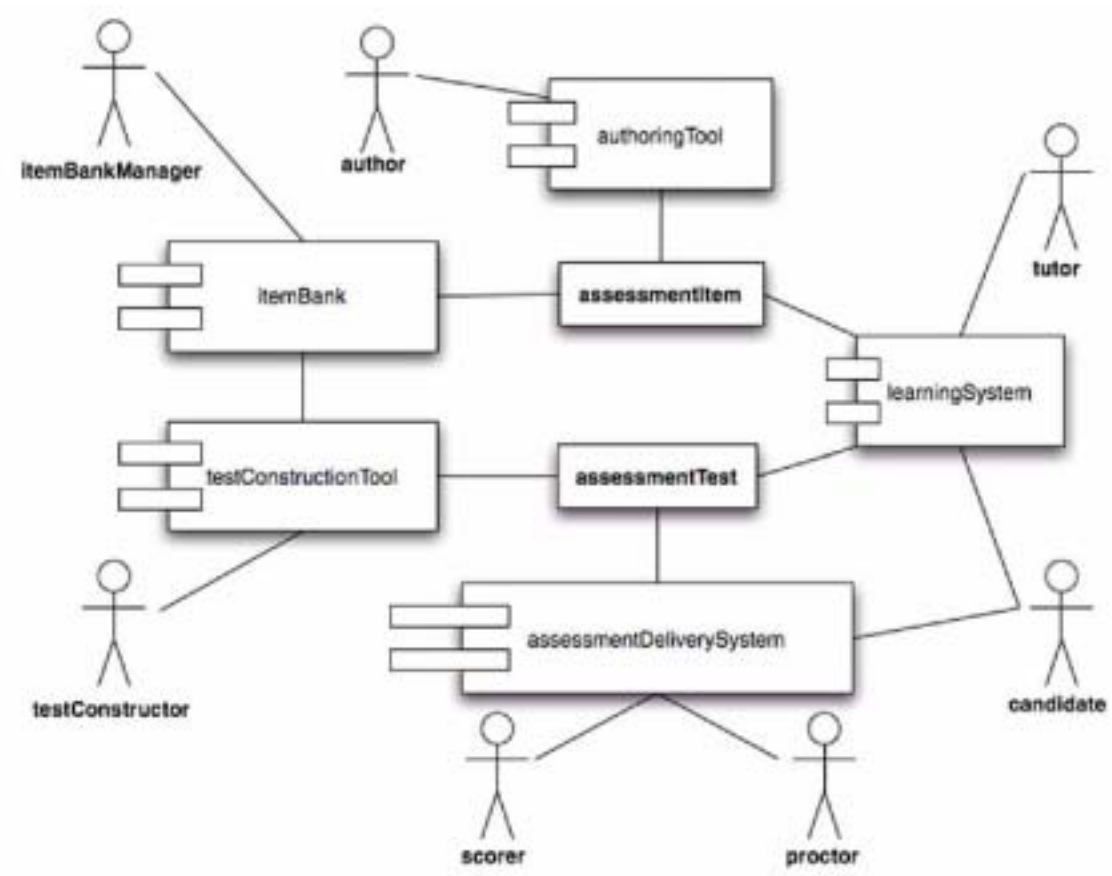
Support the deployment of item banks across a wide range of learning and assessment delivery systems.

Provide a well documented content format for storing and exchanging tests independent of the test construction tool used to create them.

Support the deployment of items, item banks, and tests from diverse sources in a single learning or assessment delivery system.

Provide systems with the ability to report test results in a consistent manner.

Figure 2.1 The Role of Assessment Tests and Assessment Items.



3. Terms and definitions

3.1 authoringTool：A system used by an author for creating or modifying an assessment item.

3.2 itemBank：A system for collecting and managing collections of assessment items.

3.3 testConstructionTool：A system for assembling tests from individual items.

3.4 assessmentDeliverySystem

A system for managing the delivery of assessments to candidates. The system contains a delivery engine for delivering the items to the candidates and scores the responses automatically (where applicable) or by distributing them to scorers.

3.5 learningSystem

A system that enables or directs learners in learning activities, possibly coordinated with a tutor. For the purposes of this specification a learner exposed to an assessment item as part of an interaction with a learning system (i.e., through formative assessment) is still described as a candidate as no formal distinction between formative and summative assessment is made. A learning system is also considered to contain a delivery engine though the administration and security model is likely to be very different from that employed by an assessmentDeliverySystem.

3.6 Author

The author of an assessment item. In simple situations an item may have a single author, in more complex situations an item may go through a creation and quality control process involving many people. In this specification we identify all of these people with the role of author. An author is concerned with

the content of an item, which distinguishes them from the role of an itemBankManager. An author interacts with an item through an authoringTool.

3.7 itemBankManager

An actor with responsibility for managing a collection of assessment items with an itemBank.

3.8 testConstructor

The role of test constructor is to create tests (test forms) from individual items. The items are typically drawn from an item bank.

3.9 Proctor

A person charged with overseeing the delivery of an assessment. Often referred to as an invigilator. For the purposes of this specification a proctor is anyone (other than the candidate) who is involved in the delivery process but who does not have a role in assessing the candidate's responses.

3.10 Scorer

A person or external system responsible for assessing the candidate's responses during assessment delivery. Scorers are optional, for example, many assessment items can be scored automatically using response processing rules defined in the item itself.

3.11 Tutor

Someone involved in managing, directing, or supporting the learning process for a learner but who is not subject to (the same) assessment.

3.12 Candidate：

The person being assessed by an assessment test or assessment item.

4. References

APIS	Assessment Provision through Interoperable Segments Barr, Sclater and Young
ASI_BIND	IMS Question & Test Interoperability: ASI XML Binding Specification, Version 1.2 Published: 2002-02
CMI	IEEE 1484.11.1, Standard for Learning Technology - Data Model for Content Object Communication
IMS_AP	IMS Application Profile Guidelines Whitepaper, Version 1.0
IMS_CP	IMS Content Packaging Specification, Version 1.1.3
IMS_LD	IMS Learning Design Specification, Version 1.0 Published: 2003-01
IMS_LIP	IMS Learner Information Package Specification, Version 1.0 http://www.imsglobal.org/profiles/index.html
IMS_MD_Binding	IMS Learning Resource Meta-Data XML Binding, Version 1.2.1
IMS_SS	IMS Simple Sequencing Specification, Version 1.0 Published: 2003-03
ISO_9899	ISO/IEC 9899:1999 Programming Languages - C
ISO11404	ISO11404:1996 Information technology — Programming languages, their environments andsystem software interfaces — Language-independent datatypes Published: 1996
ISO8601	ISO8601:2000 Data elements and interchange formats – Information interchange – Representation of dates and times Published: 2000
LOM	IEEE 1484.12.1-2002 Standard for Learning Object Meta-data (LOM)
MathML	Mathematical Markup Language (MathML), Version 2.0 (Second Edition) http://www.w3.org/TR/2003/REC-MathML2-20031021/ Published: 2003-10-21
RDN	RDN/LTSN resource type vocabulary http://www.rdn.ac.uk/publications/rdn-ltsn/types/
RFC1766	RFC 1766 Tags for the Identification of Languages H. Alvestrand http://www.ietf.org/rfc/rfc1766.txt Published: 1995-03
RFC2045	RFC 2045-2048 Multipurpose Internet Mail Extensions (MIME)
RFC3066	RFC 3066 Tags for the Identification of Languages H. Alvestrand http://www.ietf.org/rfc/rfc3066.txt Published: 2001-01
SMITH	Development of an implementation of QTI Version 2.0 Dr. Graham Smith, with support from CETIS and UCLES
UML	OMG Unified Modeling Language Specification, Version 1.4 Published: 2001-09

URI	RFC 2396 Uniform Resource Identifiers (URI): Generic Syntax Published: 1998-08
VDEX	IMS Vocabulary Definition Exchange, Version 1.0 http://www.imsglobal.org/vdex/index.html Published: 2004-02-24
XHTML	XHTML 1.1: The Extensible HyperText Markup Language
XHTML_MOD	XHTML Modularation http://www.w3.org/MarkUp/modularization
XINCLUDE	XML Inclusions (XInclude) Version 1.0 http://www.w3.org/TR/xinclude/
XML	Extensible Markup Language (XML), Version 1.0 (second edition) Published: 2000-10
XML_ERRATA	XML 1.0 Specification Errata http://www.w3.org/XML/xml-19980210-errata
XML_SCHEMA2	XML Schema Part 2: Datatypes http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/

5. Implementation Guide

A document that takes you through the data models by example. The best starting point for readers who are new to QTI and want to get an idea of what it can do.

Some of the examples are illustrated by screen shots. All screen shots are taken from a single delivery engine [SMITH] developed during the public draft review period of this specification. They are designed to illustrate how a system might implement the specification and are not designed to be prescriptive. Other types of rendering are equally valid.

5.1 Items

The main purpose of the QTI specification is to define an information model and associated binding that can be used to represent and exchange assessment items. For the purposes of QTI, an item is a set of interactions (possibly empty) collected together with any supporting material and an optional set of rules for converting the candidate's response(s) into assessment outcomes.

5.1.1 How Big is an Item?

The above definition covers a wide array of possibilities. At one extreme a simple one line question with a response box for entering an answer is clearly an item but at the other, an entire test comprising instructions, stimulus material and a large number of associated questions also satisfies the definition. In the first case, QTI is an appropriate specification to use for representing the information, in the second case it isn't.

To help determine whether or not a piece of assessment content that comprises multiple interactions should be represented as a single assessmentItem (known as a composite item in QTI) the strength of the relationship between the interactions should be examined. If they can stand alone then they may best be implemented as separate items, perhaps sharing a piece of stimulus material like a picture or a passage of text included as an object. If several interactions are closely related then they may belong in a composite item, but always consider the question of how easy it is for the candidate to keep track of the state of the item when it contains multiple related interactions. If the question requires the user to scroll a window on their computer screen just to see all the interactions then the item may be better re-written as several smaller related items. Consider also the difficulty faced by a user interacting with the item through a screen-reader, an item with many possible of points of interaction may be overwhelming in such an interface.

5.1.2 Simple Items

Simple items are items that contain just one point of interaction, for example a simple multi-choice or multi-response question. This section describes a

set of examples illustrating simple items, one for each of the interaction types supported by the specification.

Unattended Luggage

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice.xml

Figure 5.1 Unattended Luggage (Illustration).

This example illustrates the choiceInteraction being used to obtain a single response from the candidate.

Notice that the candidate's response is declared at the top of the item to be a single identifier and that the values this identifier can take are the values of the corresponding identifier attributes on the individual simpleChoices. The correct answer is included in the declaration of the response. In simple examples like this one there is just one response variable and one interaction but notice that the interaction must still be bound to the response declaration using the responseIdentifier attribute of choiceInteraction.

The item is scored using one of the standard response processing templates, Match Correct.

Unattended Luggage (with fixed choice)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_fixed.xml

This example is a variation on the previous example and illustrates the use of the fixed attribute to fix the location of one of the options in the item.

Unattended Luggage (DTD)

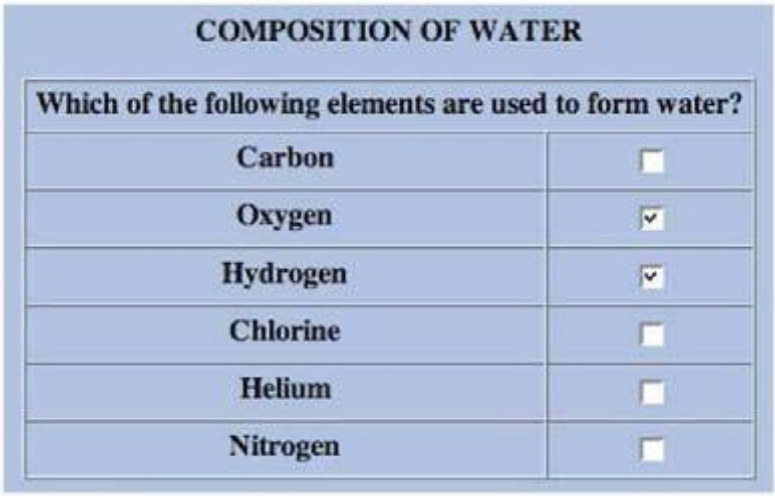
http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_doctype.xml

This example is identical to Unattended Luggage except that it illustrates the use of the DTD binding instead of the XSD. The XSD form is preferred and the alternative binding method using the DTD is illustrated for this example only.

Composition of Water

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_multiple.xml

Figure 5.2 Composition of Water (Illustration).



This example illustrates the choiceInteraction being used to obtain multiple responses from the candidate.

Notice that the candidate's response is declared to have multiple cardinality and the correct value is therefore composed of more than one value. This example could have been scored in the same way as the previous one, with 1 mark being given for correctly identifying the two correct elements (and only the two correct elements) and 0 marks given otherwise; however, a method that gives partial credit has been adopted instead through the use of the standard response processing template Map Response. This template uses the RESPONSE's mapping to sum the values assigned to the individual choices. As a result, identifying the correct two choices (only) scores 2 points. Notice that selecting a third (incorrect) choice reduces the score by 2 (with the exception of Chlorine) resulting in 0 as unmapped keys are mapped to the defaultValue. To prevent an overall negative score bounds are specified too. The penalty for selecting Chlorine is less, perhaps to reflect its role as a common water additive.

Also note that SCORE needs to be set to float because of the use of the map_response template which returns a float.

Chocolate Milk

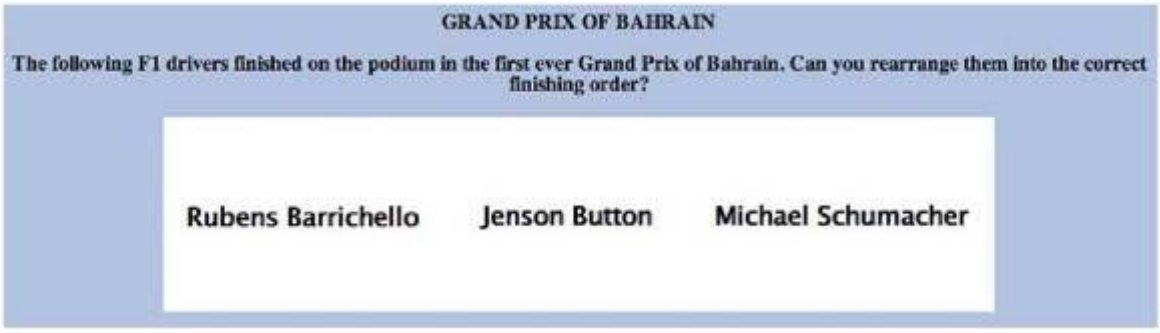
http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/choice_multiple_chocolade.xml

This example illustrates the choiceInteraction being used to obtain multiple responses from the candidate with two correct sets of responses.

Grand Prix of Bahrain

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/order.xml

Figure 5.3 Grand Prix of Bahrain (Illustration).



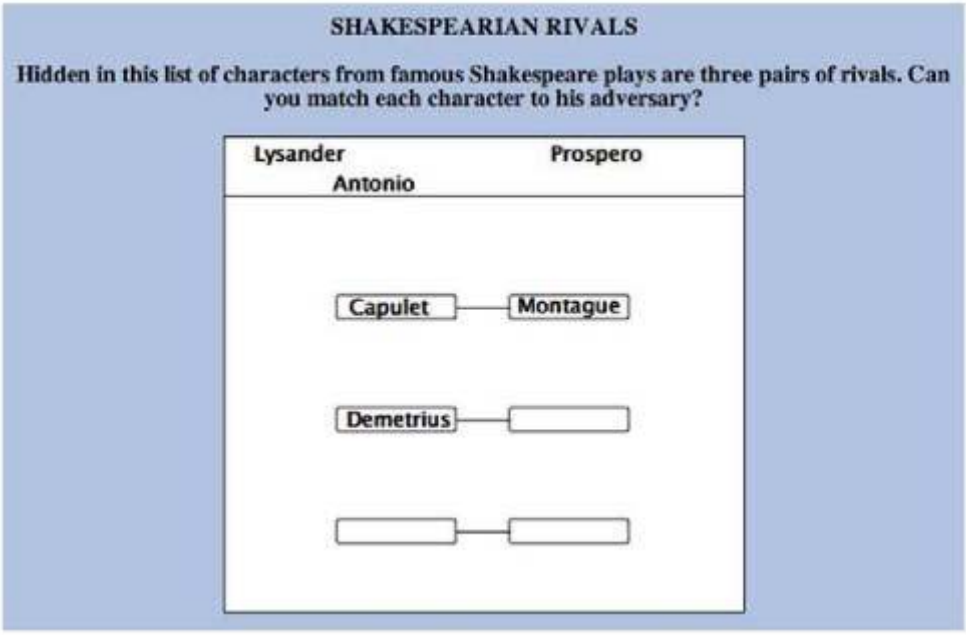
This example illustrates the orderInteraction. The candidate's response is declared to have ordered and the correct value is therefore composed of an ordered list of value. The shuffle attribute tells the delivery engine to shuffle the order of the choices before displaying them to the candidate. Note that the fixed attribute is used to ensure that the initially presented

order is never the correct answer. The question uses the standard response processing template Match Correct to score 1 for a completely correct answer and 0 otherwise.

Shakespearian Rivals

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/associate.xml

Figure 5.4 Shakespearian Rivals (Illustration).



This example illustrates the associateInteraction. The candidate's response is declared to have pair because the task involves pairing up the choices. The maxAssociations attribute on associateInteraction controls the maximum number of pairings the candidate is allowed to make overall. Individually, each choice has a matchMax attribute that controls how many pairings it can be part of. The number of associations that can be made in an

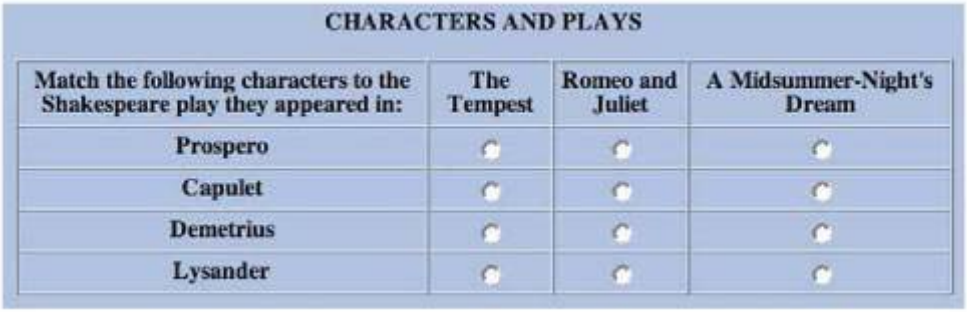
associateInteraction is therefore constrained by two methods—in this case they have the same overall effect but this needn't be the case.

The associations created by the candidate are not directed, the pair base-type is an undirected pair so when comparing responses "A P" would be treated as a match for "P A"—the distinction has no meaning to the interaction even though the physical process used by the candidate might be directional, for example, drawing a line between the choices.

Characters and Plays

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/match.xml

Figure 5.5 Characters and Plays (Illustration).



CHARACTERS AND PLAYS

Match the following characters to the Shakespeare play they appeared in:	The Tempest	Romeo and Juliet	A Midsummer-Night's Dream
Prospero			
Capulet			
Demetrius			
Lysander			

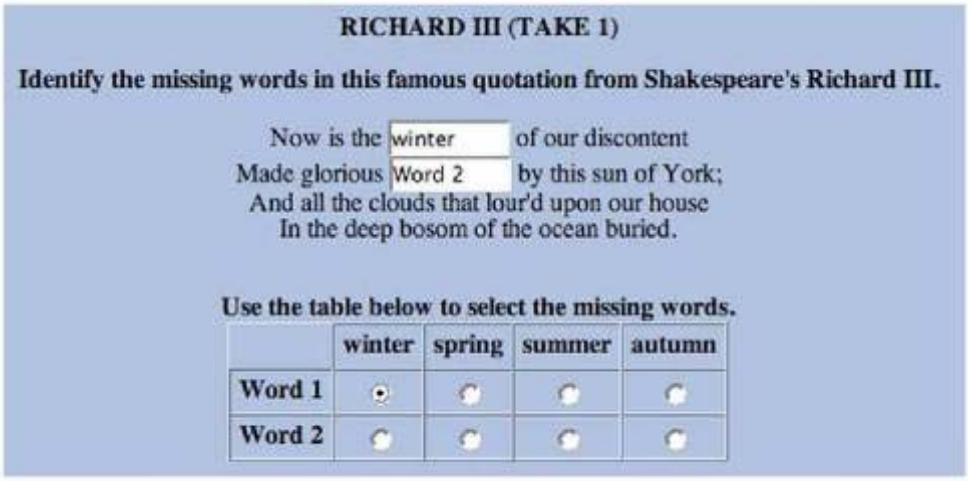
This example illustrates the matchInteraction. This time the candidate's response is declared to have directedPair because the task involves pairing up choices from a source set into a target set. In this case characters from plays with the names of the plays from which they are drawn. Notice that matchMax on the characters is one because each character can be in only one play (in fact, Shakespeare often reused character names but we digress) but it is four on the plays because each play could contain all the characters. For

example, Demetrius and Lysander were both in A Midsummer-Night's Dream, so in the correct response that play has two associations. In the mapping used for response processing these two associations have been awarded only a half a mark each.

Richard III (Take 1)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/gap_match.xml

Figure 5.6 Richard III (Illustration 1).

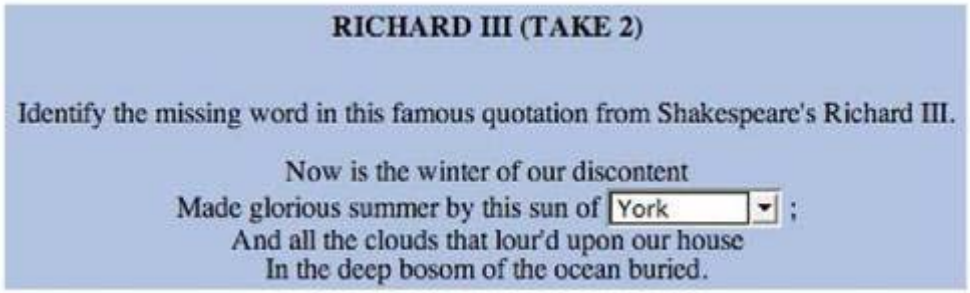


This example illustrates the gapMatchInteraction. This interaction is similar to matchInteraction except that the choices in the second set are gaps in a given passage of text and the task involves selecting choices from the first set and using them to fill the gaps. The same attributes are involved in controlling which, and how many, pairings are allowed though there is no matchMax for the gaps because they can only ever have one associated choice. The scoring is again done with a mapping.

Richard III (Take 2)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/inline_choice.xml

Figure 5.7 Richard III (Illustration 2).

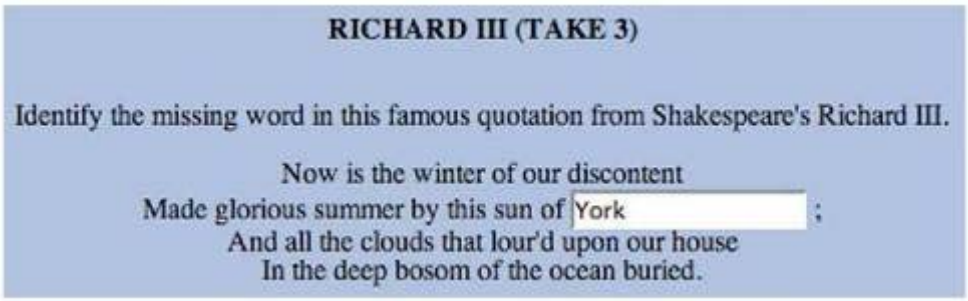


The Richard III (Take 1) example above demonstrated the use of filling gaps from a shared stock of choices. In cases where you only have one gap, or where you have multiple gaps that are to be filled independently, each from its own list of choices, then you use an inlineChoice interaction.

Richard III (Take 3)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/text_entry.xml

Figure 5.8 Richard III (Illustration 3).



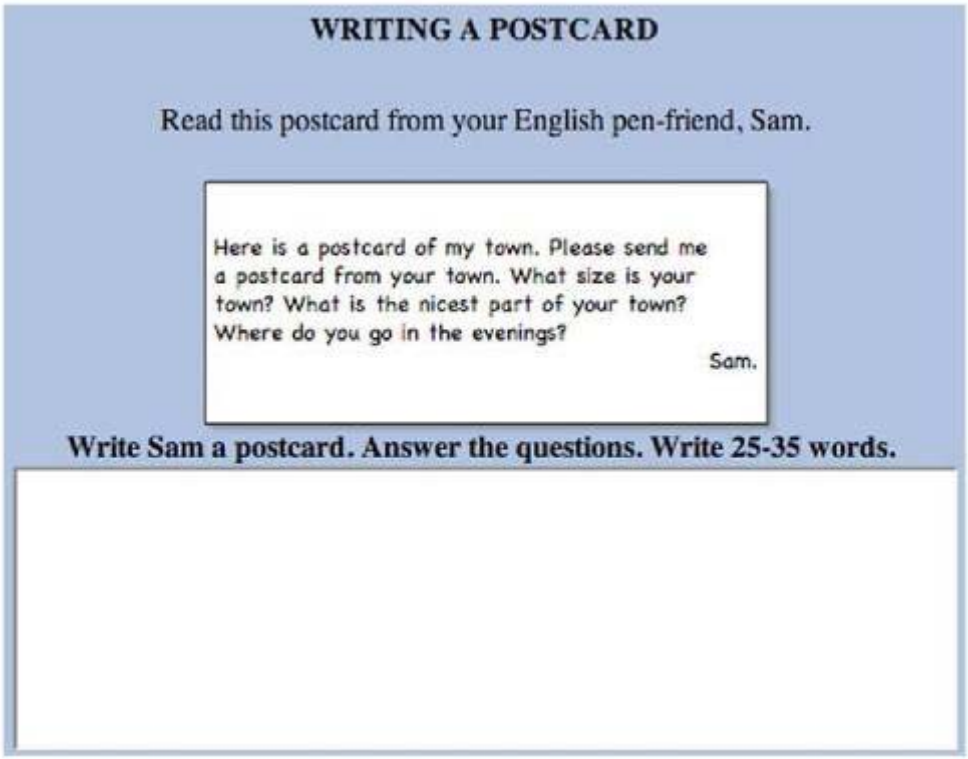
The third, and final method of filling gaps is to use an textEntryInteraction which requires the candidate to construct their own response, typically by typing it in. Notice that a guide to the amount of text to be entered is given in the expectedLength attribute—though candidates should be allowed to enter more if desired.

The scoring for this item could have just matched the correct response but actually uses a mapping to enable partial credit for york (spelled without a capital letter). When mapping strings the mapping always takes place case sensitively. This example also illustrates the use of the mapping when the response only has single cardinality.

Writing a Postcard

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/extended_text.xml

Figure 5.9 Writing a Postcard (Illustration).

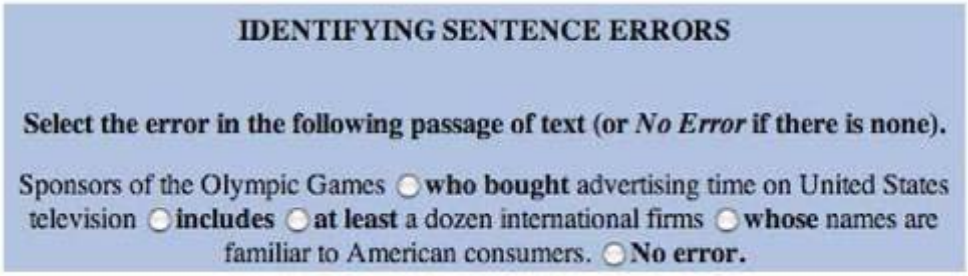


If an extended response is required from the candidate then the extendedTextInteraction is appropriate. Notice that this example does not contain a responseProcessing section because the scoring of extended text responses is beyond the scope of this specification.

Olympic Games

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/hottext.xml

Figure 5.10 Olympic Games (Illustration).



This example illustrates the hottextInteraction. This interaction presents a passage of text with some hot words/phrases highlighted and selectable by the candidate. It differs from the choiceInteraction in that the choices have to be presented in the context of the surrounding text.

UK Airports

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/hotspot.xml

Figure 5.11 UK Airports in Unanswered State (Illustration).

Figure 5.12 UK Airports in Answered State (Illustration).

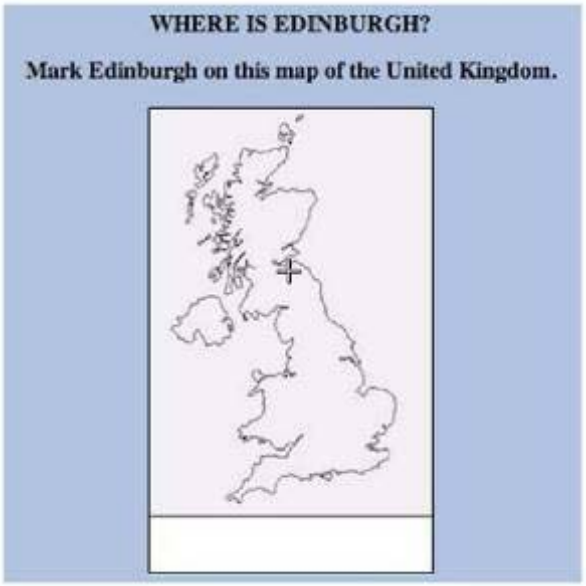
This example illustrates the hotspotInteraction. This is very similar to the hottextInteraction except that instead of having to select hot areas embedded in a passage of text the candidate has to select hotspots of a graphical image.

Note that the response is of type identifier and that each individual hotspotChoice associates an identifier with an area of the image.

Where is Edinburgh?

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/select_point.xml

Figure 5.13 Where is Edinburgh? (Illustration).

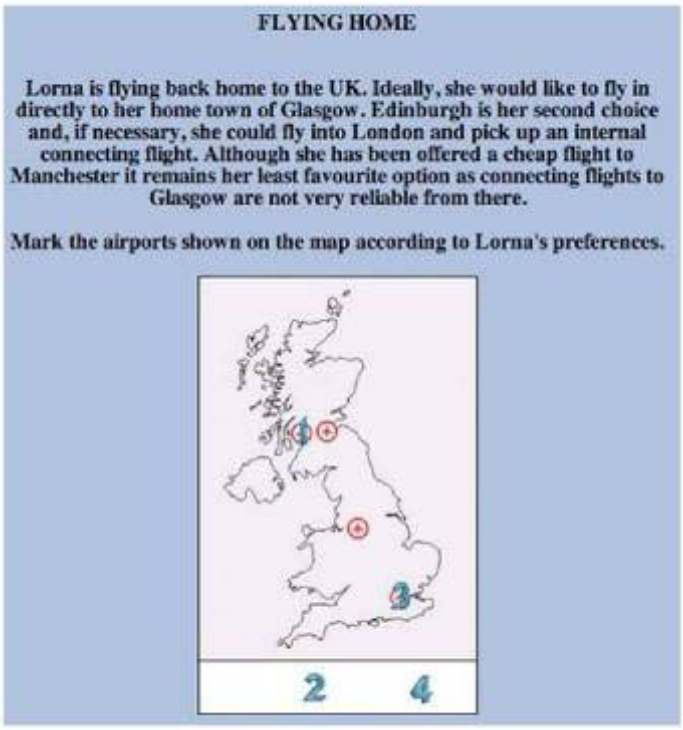


This example illustrates the selectPointInteraction. The RESPONSE is declared to be a single point that records the coordinates of the point on the map marked by the candidate. The correctResponse is given in the declaration too, however, for this type of question it is clearly unreasonable to expect the candidate to click exactly on the correct point and there would be too many values to build a workable mapping. To get around this problem an areaMapping is used instead, this allows one or more areas of the coordinate space to be mapped to a numeric value (for scoring). In this example, just one area is defined: a circle with radius 8 pixels centered on the correct (optimal) response. The standard response processing template Map Response Point is used to set the score using the areaMapping.

Flying Home

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/graphic_order.xml

Figure 5.14 Flying Home (Illustration).



This example illustrates the graphicOrderInteraction. The task is similar to Grand Prix of Bahrain except that the choices are presented as hotspots on a graphic image.

Low-cost Flying

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/graphic_associate.xml

Figure 5.15 Low-cost Flying Unanswered State (Illustration).

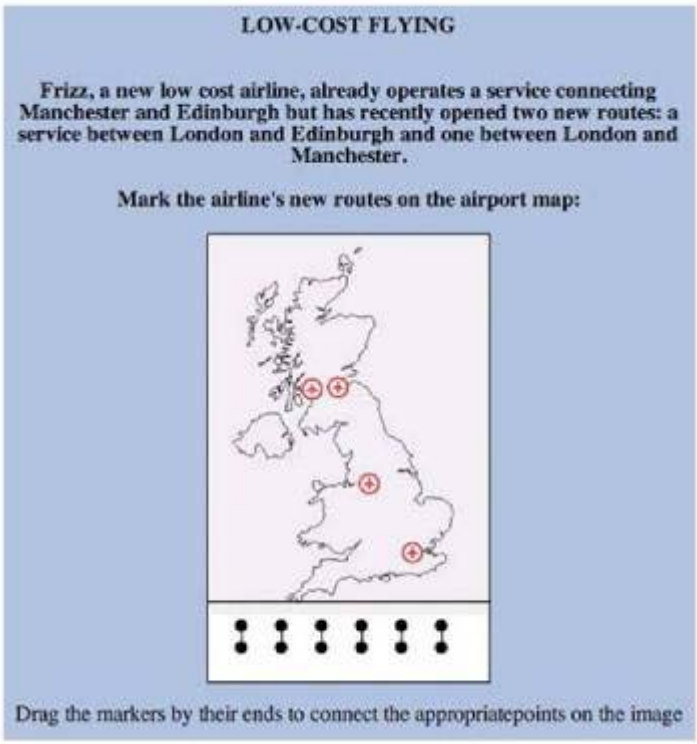
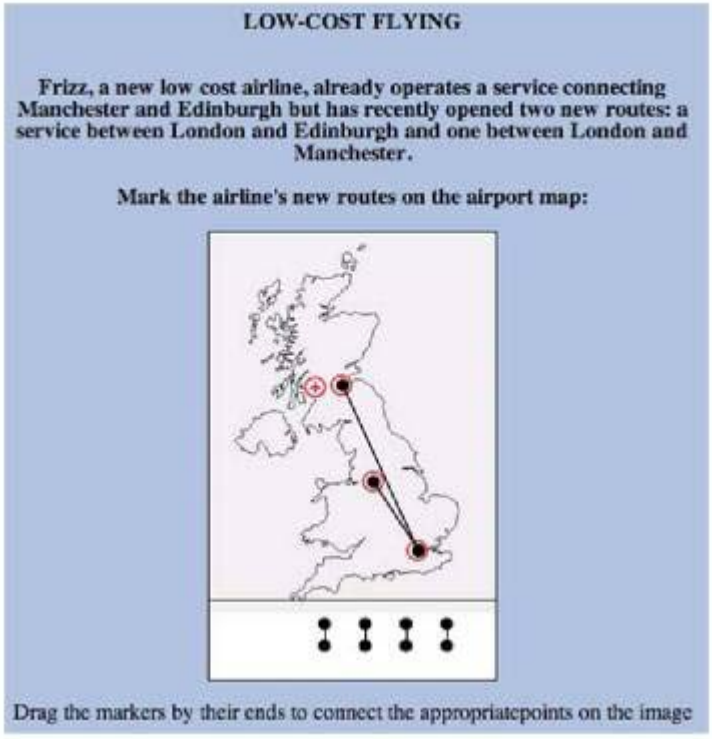


Figure 5.16 Low-cost Flying Answered State (Illustration).



This example illustrates the graphicAssociateInteraction. The task is similar

to Shakespearian Rivals except that the choices are presented as hotspots on a graphic image. Notice that matchMax is set to three for each of the hotspots allowing the candidate to associate each hotspot up to three times (in other words, with all the other hotspots if desired).

Airport Tags

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/graphic_gap_match.xml

Figure 5.17 Airport Tags (Illustration).

This example illustrates the graphicGapMatchInteraction. The task is similar to Richard III (Take 1) except that the first set of choices are images and the second set are gaps within a larger background image. In graphical system that supports dragging this would typically be implemented using drag and

drop.

Airport Locations

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/position_object.xml

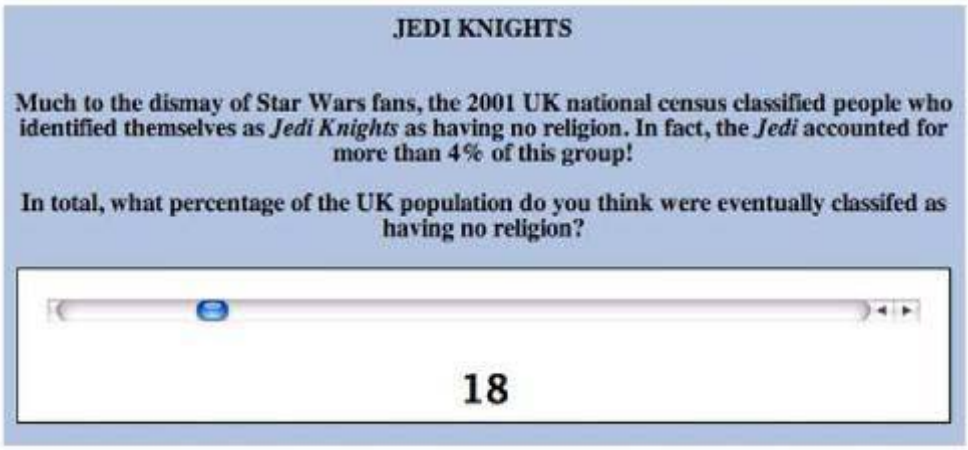
Figure 5.18 Airport Locations (Illustration).

This example illustrates the positionObjectInteraction. It has a lot in common with Where is Edinburgh? except that the 'point' is selected by positioning a given object on the image (the stage). Notice that the stage is specified outside of the interaction. This allows a single stage to be shared amongst multiple position object interactions.

Jedi Knights

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/slider.xml

Figure 5.19 Jedi Knights (Illustration).



This example illustrates the sliderInteraction. It is used in this example to obtain a percentage estimate. The interaction is bound to an integer response which can then be scored using the standard Map Response response processor.

La casa di Giovanni

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/drawing.xml

This example illustrates the drawingInteraction. Notice that the RESPONSE is declared to be of type file. The drawing takes place on a required pre-supplied canvas, in the form of an existing image, which is also used to determine the appropriate size, resolution and image type for the candidate's response.

The Chocolate Factory (Take 1)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/upload.xml

This example illustrates the uploadInteraction. The RESPONSE is again declared to be of type file. The candidate is provided with a mechanism to upload their own spreadsheet in response to the task, response processing for file-based questions is out of scope of this specification.

5.1.3 Composite Items

Composite items are items that contain more than one point of interaction. Composite items may contain multiple instances of the same type of interaction or have a mixture of interaction types.

The Chocolate Factory (Take 2)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/upload_composite.xml

This example extends The Chocolate Factory (Take 1) with an additional text response field that can be marked objectively.

5.1.4 Response Processing

So far, all the examples have been scored using one of the standard response processing templates, or have not been suitable for objective scoring. For simple scenarios, use of the response processing templates is encourage as they improve interoperability between systems that only cater for a limited number of fixed scoring methods.

Many items, particularly those involving feedback, will require the use of

the more general response processing model defined by this specification. The standard templates are themselves defined using this more general response processing language.

Grand Prix of Bahrain (Partial Scoring)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/order_partial_scoring.xml

This example extends Grand Prix of Bahrain to include partial scoring. With three drivers to place on the podium there are 6 possible responses that the candidate can make, only one of which is correct. Previously, the correct answer scored 1 and all other responses scored 0. Now, the correct answer scores 2. Correctly placing Michael Schumacher first scores 1 if the other two drivers have been muddled up. Placing Barichello or Button first scores 0 (all other combinations).

Response processing consists of a sequence of rules that are carried out, in order, by the response processor. A responseCondition rule is a special type of rule which contains sub-sequences of rules divided into responseIf, responseElseIf and responseElse sections. The response processor evaluates the expressions in the responseIf and responseElseIf elements to determine which sub-sequence to follow. In this example, the responseIf section is followed only if the variable with identifier RESPONSE matches the correct response declared for it. The responseElseIf section is followed if RESPONSE matches the response explicitly given (which places the correct driver 1st but confuses the other two). Finally, the responseElse section is followed if neither of the previous two apply. The responseElse section has

no corresponding expression of course. The setOutcomeValue element is just a responseRule that tells the processor to set the value of the specified outcomevariable to the value of the expression it contains.

The variable, correct, and baseValue elements are examples of simple expressions. In other words, expression that are indivisible. In contrast, the match and ordered elements are examples of operators. Operators are expressions that combine other expressions to form new values. For example, match is used to form a boolean depending on whether or not two expressions have matching values.

5.1.5 Feedback

Feedback consists of material presented to the candidate conditionally based on the result of responseProcessing. In other words, feedback is controlled by the values of outcome variables. There are two types of feedback material, modal and integrated. Modal feedback is shown to the candidate after response processing has taken place and before any subsequent attempt or review of the item. Integrated feedback is embedded into the itemBody and is only shown during subsequent attempts or review.

Mexican President

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/feedback.xml

In this example, a straightforward multi-choice question declares an additional outcome variable called FEEDBACK which is used to control the

visibility of both integrated feedback (the feedbackInline elements) and modalFeedback. The feedback shown depends directly on the response given by the candidate in this case so FEEDBACK is simply set to the value of RESPONSE directly.

Figure 5.20 Mexican President Before Submission (Illustration).

Figure 5.21 Mexican President After Submission (Illustration).

5.1.6 Adaptive Items

Adaptive items are a new feature of version 2 that allows an item to be scored adaptively over a sequence of attempts. This allows the candidate to alter their answer following feedback or to be posed additional questions based on their current answer. Response processing works differently for adaptive items. Normally (for non-adaptive items) each attempt is

independent and the outcome variables are set to their default values each time responseProcessing is carried out. For adaptive items, the outcome variables retain their values across multiple attempts and are only updated by subsequent response processing. This difference is indicated by the value of the adaptive attribute of the assessmentItem. Adaptive items must of course provide feedback to the candidate in order to allow them to adjust their response(s).

Mexican President with adaptive feedback

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/feedback_adaptive.xml

In this adaptive example, the candidate receives different Mexican President for each attempt. The item allows for four incorrect attempts before the correct answer is provided.

Monty Hall (Take 1)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/adaptive.xml

This example takes a famous mathematical problem and presents it to the user as a game. The feedbackBlock element, in association with a number of outcome variables is used to control the flow of the story, from the opening gambit through to whether or not you have won a prize. When the story concludes you are asked about the strategy you adopted. Notice that the scoring for the question is based on the actual strategy you took (one mark)

and your answer to the final question (two marks). If you choose a bad strategy initially you are always punished by losing the game. If you feel that this is cheating take a look at a more realistic version of the same question which combines adaptivity with the powerful feature of item templates: Monty Hall (Take 2).

Figure 5.22 Monty Hall First Attempt (Illustration).

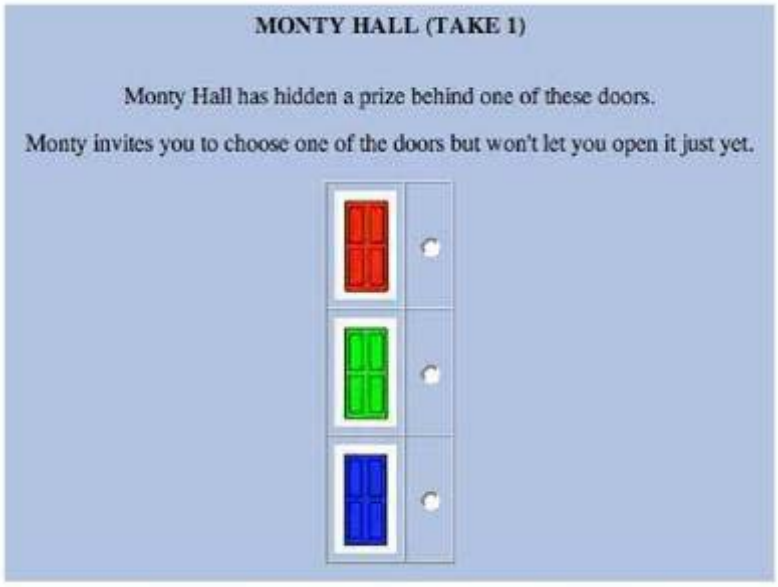


Figure 5.23 Monty Hall Second Attempt (Illustration).

Figure 5.24 Monty Hall Third Attempt (Illustration).

Figure 5.25 Monty Hall Final Feedback (Illustration).

In the previous example, the default method of ending an attempt was used to progress through the item, however, sometimes it is desirable to provide alternative ways for the candidate to end an attempt. The most common requirement is the option of requesting a hint instead of submitting a final answer. QTI provides a flexible way to accommodate these alternative paths through the special purpose endAttemptInteraction.

Mexican President with hints

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/hint.xml

In this example, Mexican President is extended to provide both feedback and the option of requesting a hint. The endAttemptInteraction controls the value of the response variable HINTREQUEST - which is true if the attempt

ended with a request for a hint and false otherwise.

5.1.7 Item Templates

Item templates are a new feature of version 2 that allows many similar items to be defined using the same assessmentItem.

Digging a Hole

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/template.xml

This example contains a simple textEntryInteraction but the question (and the correct answer) varies for each item session. In addition to the usual RESPONSE and SCORE variables a number of template variables are declared. Their values are set by a set of templateProcessing rules. Template processing is very similar to response processing. The same condition model and expression language are used. The difference is that templateRules set the values of template variables and not outcome variables. Notice that the declaration of RESPONSE does not declare a value for the correctResponse because the answer varies depending on which values are chosen for A and B. Instead, a special rule is used, setCorrectResponse in the template processing section.

The randomInteger element represents a simple expression that selects a random integer from a specified range. The random element represents an operator that selects a random value from a container.

The itemBody displays the values of the template variables using the printedVariable element.

Mick's Travels

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/template_image.xml

Sometimes it is desirable to vary some aspect of an item that cannot be represented directly by the value of a template variable. For example, in "Mick's Travels", the itemBody contains an illustration that needs to be varied according to the value chosen for a template variable. To achieve this three templateInline elements are used, each one enclosing a different img element. This element (along with the similar templateBlock) has attributes for controlling its visibility with template variables in the same way as outcome variables are used to control the visibility of feedback.

Item templates can be combined with adaptive items too.

Monty Hall (Take 2)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/adaptive_template.xml

In Monty Hall (Take 1) we cheated by fixing the game so that the wrong strategy always lost the candidate the prize (and the first mark). In this version we present a more realistic version of the game using an item template. The same outcome variables are defined to control the story and

the feedback given but this time a templateDeclaration is used to declare the variable PRIZEDOOR. The templateProcessing rules are then used to preselect the winning door at random making the game more realistic. The responseProcessing rules are a little more complicated as the value of PRIZEDOOR must be checked (a) to ensure that Monty doesn't open the prize winning door after the candidate's first choice and (b) to see if the candidate has actually won the "fantastic prize".

In this example, using the correct strategy will still lose the candidate the prize 1/3 of the time (though they always get the mark).

5.1.8 Miscellaneous Techniques

(1)Shared Material Objects

It is often desirable to ask a number of questions all related to some common stimulus material such as a graphic or a passage of text. Graphic files are always stored separately and referenced within the markup using img or object elements making them easy to reference from multiple items but passages of text can also be treated this way. The object element allows externally defined passages (either as plain text files or HTML markup) to be included in the itemBody.

The following two example demonstrate this use of a shared material object.

Orkney Islands Q1

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/orkney1.xml

Orkney Islands Q2

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/orkney2.xml

(2)Stylesheets

Associating a stylesheet with an item simply involves using the stylesheet element within an assessmentItem. The Orkney Islands examples above use this element to associate a stylesheet written using the CSS2 language. Notice that the class attribute is used to divide the item's body into two divisions that are styled separately, the shared material appearing in a right-hand pane and the instructions and question appearing in a left-hand pane.

Orkney Islands Stylesheet

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/shared/orkney.css

This stylesheet also demonstrates a possible approach to providing absolute positioning in QTI version 2 - something which is no longer supported directly by the item information model. In version 1, material elements could have their coordinates set explicitly (see the Migration Guide for more information about migrating content that used this feature).

(3)Alternative Media

The XHTML object element is designed to support the graceful degradation of media objects. The HTML 4.01 specification (the basis for [XHTML]) says "If the user agent is not able to render the object for whatever reason (configured not to, lack of resources, wrong architecture, etc.), it must try to render its contents."

Writing a Postcard (Take 2)

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/nested_object.xml

This example is the same as Writing a Postcard except that the picture of the postcard is provided in two different formats. Firstly as an encapsulated PostScript file (EPS) and then, alternatively, as a PNG bitmapped image. Finally, if the delivery engine is unable to handle both offered image types the text of the postcard can be displayed directly. Item authors should consider using this technique for maintaining images suitable for a variety of different output media, e.g., paper, high-resolution display, low-resolution display, etc.

(4)Alternative Renderings for Interactions

The Orkney Islands Stylesheet illustrates the way styles can be applied to the XHTML elements that defined the structure of the item's body. The class attribute can also be applied to interactions and many of the common formatting concepts will still be applicable (font size, color, etc.). Delivery engines may also use this attribute to choose between multiple ways of presenting the interaction to the candidate—though the vocabulary for class attributes on interactions is currently beyond this specification.

The QTI Questionnaire

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/likert.xml

This example illustrates an item that is used to present a set of choices commonly known as the likert scale used to obtain responses to attitude-based questions. The question is represented by a normal choiceInteraction but the class attribute of the itemBody is set to likert to indicate to the delivery engine that it should use an appropriate layout for the question, e.g., using a single line for the prompt and the choices with each choice at a fixed tab stop. By applying the style class to the whole of the item body, a delivery engine that renders multiple likert items together might be able choose a more compact rendering. Note that in this example the responseProcessing is absent, there is no right answer!

(5)Using MathML

Relativity

http://www.imsglobal.org/question/qtiv2p1pd2/examples/items/math.xml

This simple example illustrates the inclusion of a mathematical expression marked up with MathML into an item.

(6)Number Formatting

The format attribute of printedVariable profiles the formatting rules described by the C standard. The following table illustrates the main features. Spaces are show as the '_' (underscore) character to improve readability.

Format specification	Input	Formatted output	Notes
%i	-987	-987	Simple signed decimal format.
%.4i	-987	-0987	Precision specifies the minimum number of digits ini, o, x and X formats and defaults to no minimum.
%.0i	0		When formatting zero with a precision of 0 no digits are output (i, o, x and X formats only).
%8i	987	_____987	Field-width set manually to 8 results in five leading spaces.
%2i	987	987	Field-width set manually to 2 is insufficient so ignored.
%-8f	987	987_____	Hyphen flag forces left field alignment resulting in five trailing spaces.
%08i	987	00000987	Zero flag forces zero-padding resulting in five leading zeros.
%+i	987	+987	Plus flag leads positive numbers with plus sign (excluding o, x and X formats).
%_i	987	_987	Space flag leads positive numbers with space (excluding o, x and X formats).
%o	987	1733	Octal format, number must be positive.

%#o	987	01733	# flag ensures at least one leading 0 for o format.
%x	987	3db	Hex format (lower case), number must be positive.
%#x	987	0x3db	# flag always displays leading 0x for x format.
%X	987	3DB	Hex format (upper case), number must be positive
%#X	987	0X3DB	# flag always displays leading 0X for X format.
%f	987.654	987.654000	The precision specifies number of decimal places to display for f format and defaults to 6.
%.2f	987.654	987.65	Precision set manually to 2.
%#.0f	987	987.	# flag forces trailing point for f, e, E, g, G, r and R formats.
%e	987.654	9.876540e+02	Forces use of scientific notation. The precision specifies number of figures to the right of the point for e and E formats and defaults to 6.
%.2e	987.654	9.88e+02	Precision set manually to 2.
%E	987.654	9.876540E+02	Forces use of scientific notation (upper case form).
%g	987654.321	987654	Rounded to precision significant figures (default 6) and displayed in normal form when precision is greater than or equal to the number of digits to the left of the point.
%g	987	987	Trailing zeros to the right of the point are removed.
%g	987654321	9.87654e+08	Scientific form used when required.
%g	0.0000987654321	9.87654e-05	Scientific form also used when 4 or more leading zeros are required to the right of the point.
%#g	987	987.000	# flag also forces display of trailing zeros (up to precision significant figures) in g and G formats.
%G	0.0000987654321	9.87654E-05	As for g but uses upper case form.
%r	0.0000987654321	0.000098765454	The same as g except that leading zeros to the right of the point are not limited.
%R	0.0000987654321	0.000098765454	The same as G except that leading zeros to the right of the point are not limited.

5.4Tests (Assessments)

Sets of Items With Leading Material

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest01.xml

This example illustrates a test consisting of a set of three items (rtest01-set01.xml, rtest01-set02.xml, rtest01-set02.xml) sharing a single fragment of leading material (rtest01-fragment.xml). The fragment is included in each of the assessmentItems in the set by using the XInclude mechanism.

The submission mode is set to individual mode requiring the candidate to submit their responses on an item-by-item basis.

The navigation mode is set to linear mode restricting the candidate to attempt each item in turn. Once the candidate moves on they are not permitted to return.

Arbitrary Collections of Item Outcomes

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest02.xml

This example illustrates the use of two assessmentSections (sectionA and sectionB) and one subsection (sectionB1). Both sectionA and sectionB are visible, meaning that they are identifiable by the candidate. Conversely, sectionB1 is not identifiable as a section.

The submission mode is set to simultaneous. The candidate's responses are all submitted together at the end of the testPart (in this case effectively meaning at the end of the assessmentTest).

The navigation mode is set to nonlinear mode allowing the candidate to navigate to any item in the test at any time.

The test uses weights to determine the contribution of the individual item score to the overall test score. In this example the weight of 0 for item160 means that its score isn't taken into account when calculating the overall test score. The weight of 2 for item034 means that the score for item034 is multiplied by 2 when calculating the overall test score.

For the assessmentItems where no weight is given, a weight of 1.0 is assumed.

Categories of Item

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest03.xml

This example illustrates the use of categories of assessmentItems in the assessmentTest.

The submission mode is set to simultaneous. The candidate's responses are all submitted together at the end of the testPart (in this case effectively meaning at the end of the assessmentTest).

The navigation mode is set to nonlinear mode allowing the candidate to navigate to any item in the test at any time.

The test uses the category assign the items to one or more categories. The outcomeprocessing part of the example shows how the category is being used

to sum the score of a selection of the questions.

Arbitrary Weighting of Item Outcomes

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest04.xml

Specifying the Number of Allowed Attempts

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest06.xml

This example illustrates the use of itemSessionControl to set the number of allowed attempts.

The example contains two testParts, the maximum number of allowed attempts for the first testPart is set to unlimited (maxAttempts = 0) and the maximum number of allowed attempts for the second testPart is 1.

The submission mode for both testParts is set to individual mode requiring the candidate to submit their responses on an item-by-item basis.

The navigation mode for both testParts is set to linear mode restricting the candidate to attempt each item in turn. Once the candidate moves on they are not permitted to return.

Controlling Item Feedback in Relation to the Test

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest08.xml

This example illustrates the use of itemSessionControl to set the item feedback

in relation to the test.

The submission mode for the second testPart is set to simultaneous. The candidate's responses are all submitted together at the end of the testPart.

The navigation mode of the second testPart is set to nonlinear mode allowing the candidate to navigate to any item in the testPart at any time.

The showFeedback attribute of itemSessionControl is set to true, affecting the visibility of feedback after the end of the last attempt.

Allowing review and feedback in simultaneous mode means that the test is navigable after submission (in this case, in a nonlinear style)

The showSolution attribute of itemSessionControl is set to false, meaning the system may not provide the candidate with a way of entering the solution state.

Remember that the showFeedback attribute controls the assessmentItem feedback on test level. It doesn't overrule the display of feedback as set inside the item.

Steve’s Test

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest09.xml

This example illustrates controlling the duration of an item attempt (both maximum and minimum) in the context of a specific test.

The test shows the use of the timeLimits element to set the maxTime constraint for the complete test, a single assessmentSection and a single assessmentItem.

The example contains one assessmentItemRef (item034) which has a minTime of 3 minutes and a maxTime of 10 minutes. This means that candidates cannot progress to the next item in the test (item160) until they have spent 3 minutes interacting with it. Given that the candidate is limited to a maximum of 1 attempt at each item in the test, this effectively means that the candidate is prevented from submitting their responses until 3 minutes have passed. However, they must submit their responses before 10 minutes have passed. When the time limit is up the current responses would typically be submitted automatically.

It is up to the assessment constructor to make sure that the sum of all maxTime elements in the assessment is smaller or equal to the maxTime of the assessmentTest and that the sum of all minTime elements in the assessment is smaller or equal to the maxTime of the assessmentTest.

Steve ' s Test

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest10.xml

This example shows how to provide support for early termination of test based on accumulated item outcomes.

The outcomeProcessing for the test is invoked after each attempt and checks to

see if the SCORE is greater than 3. If that is the case the exitTest terminates the test.

Golden (required) Items and Sections

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest12.xml

This example shows how to provide support for early termination of test based on accumulated item outcomes.

In assessmentSection B, we select 2 children using the selection element, but assessmentSection B1 is required (because of the required="true" attribute) so we effectively select B1 and one of the other three items. B1 is an invisible section and the three items it contains will be mixed in with the other selected item when shuffling resulting in a an assessmentSection containing four items.

Steve ' s Test

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest13.xml

This example shows the support for branching based on the response to an assessmentItem.

The preCondition element set the conditions that needs to be met for an assessmentItem or assessmentSection to be displayed. In nonlinear mode, pre-conditions are ignored.

The branchRule element contains a rule, evaluated during the test, for setting

an alternative target as the next item or section. As with preconditions, branch rules are ignored in nonlinear mode. The second branchRule element contains a special targetItem "exitSection" which means exit this section of the test

Items Arranged into Sections within Tests

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest22.xml

This example shows the use of sections to group individual items.

Randomizing the Order of Items and Sections

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest24.xml

This example shows the use of the ordering element to randomize the order of items and sections.

Basic Statistics as Outcomes

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest25.xml

This example shows how basic statistics of a test are assigned to outcomes.

A number of build in statistics (numberCorrect, numberIncorrect, numberPresented, numberSelected, numberResponded) are assigned to Outcome Variables.

In addition to that the Outcome Variable "PERCENT_CORRECT" is calculated based on two of those basic statistics.

Steve ' s Test

http://www.imsglobal.org/question/qtiv2p1pd2/examples/tests/rtest26.xml

This example shows how item outcomes are mapped prior to aggregation.

The variableMapping element maps the item034.NOTA to the variable SCORE.

5.5 Usage Data (Item Statistics)

Example Item Statistics

http://www.imsglobal.org/question/qtiv2p1pd2/examples/usagedata/example.xml

This example demonstrates the construction of a usage-data file. When distributing usage data within a content package the usage-data should be stored in a separate file within the package and referred to in the manifest file by an appropriate cp:resource element. Note that references to the assessment items and other objects within the usage-data file itself are not considered to be dependencies of the resource. The resource type for usage-data files is imsqti_usagedata_xmlv2p1.

5.6 Packaged Items, Tests and Meta-data

Simple Packaging Example

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package/imsmanifest.xml

This example demonstrates how a single item is packaged using the techniques

described in the Integration Guide. The manifest file demonstrates the use of a resource element to associate meta-data (both LOM and QTI) with an item and the file element to reference the assessmentItem XML file and the associated image file.

Shared Image Example

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package_shared/imsmanifest.xml

This example demonstrates how multiple items are packaged. Note that where two items share a media object (such as an image) a dependency can be used to enable the object to be represented by its own resource element within the manifest.

Package with Response Processing Templates

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package_maxfiles/imsmanifest.xml

The response processing templates feature of QTI allows common sets of response processing rules to be documented in separate XML documents and simply referred to by the items that make use of them. The mechanism for identifying the template to use is the template attribute on the responseProcessing element. This attribute is a URI, but it is not required to be a URL that resolves directly to the appropriate XML document. To help systems that support general response processing find the rule definitions required to support new templates an additional templateLocation attribute is

provided which may be used to provide a URL that resolves to the template's XML document. If this URL is given relative to the location of the item then the template should be included in the same content package and listed as a dependency for each of the items that refer to it.

This example package demonstrates the use of a relative URL to refer to response processing templates listed as separate resources within the package as described above. Note that the technique used is similar to that for locating XML schemas from the URIs used to refer to their namespaces, however, XML schemas included in content packages to assist with validation should not be described as separate resources (or file dependencies) in the manifest file.

Package with Externally Defined Response Processing Templates

http://www.imsglobal.org/question/qtiv2p1pd2/examples/package_minfiles/imsmanifest.xml

This examples is the same as the one above (Package with Response Processing Templates) except that response processing templates are not included. The templateLocation attribute is used with absolute URLs of the templates.

Package with Test and Items

http://www.imsglobal.org/question/qtiv2p1pd2/examples/test_package_minfiles/imsmanifest.xml

This examples demonstrates how to package an assessmentTest together with the assessmentItems referenced by the test. Both the assesmentTest and

assessmentItems are represented by resource elements within the manifest. A dependency is used to represent the relationship between the assessmentTest and the individual assessmentItems.

5.7 Validation

The QTI schema file imports two externally defined auxiliary schemas, the built-in XML namespace and MathML. The schema imports these from their published locations on the web using absolute URLs. As a result, some XML validation tools may not be able to validate QTI documents when working offline.

There is also some confusion as to whether or not XML schemas that refer to components of the built-in XML namespace (such as the xml:lang attribute used by QTI) should (or even may) provide an associated namespace prefix declaration. This point was unclear in the first edition of the XML specification and not cleared up until the errata to that addition [XML_ERRATA] was published. The errata has itself now been superseded by the second edition [XML] which makes it clear that the declaration may be included provided it is bound to the reserved prefix xml but that it is not required. In keeping with the latest IMS Content Packaging specification the QTI schema includes the declaration in the root of the schema. It is clear that some tools will still not validate documents against schemas that contain this prefix and a local copy of the QTI schema with the following attribute removed from the schema element may need to be used instead:

```
xmlns:xml="http://www.w3.org/XML/1998/namespace"
```

The namespace identifier of the QTI schema has changed for version 2.1 of this specification to `http://www.imsglobal.org/xsd/imsqti_v2p1`. Use of this namespace is required when using any of the new elements defined by this version. Documents with a namespace of `http://www.imsglobal.org/xsd/imsqti_v2p0` must still be supported. For compatibility systems may wish to use the 2p0 namespace identifier when generating content that conforms to the narrower model defined by version 2.0 of this specification.

6. Assessment Test, Section, and Item Information Model

The reference guide to the main data model for assessment tests and items. The document provides detailed information about the model and specifies the requirements of delivery engines and authoring systems.

7. Meta-data and Usage Data

A document that describes a profile of the IEEE Standard for Learning Object Metadata [LOM] data model suitable for use with assessment tests and items and a separate data model for representing usage data (i.e., item statistics). This document will be of particular interest to developers and managers of item banks and other content repositories, and to those who construct assessments from item banks.

In QTI version 2.0, QTI-specific meta-data was brought into line with the IEEE LOM in accordance with the IMS Meta-data Best Practice and Implementation Guide for [LOM]. The IEEE LOM standard defines a set of meta-data elements that can be used to describe learning resources, but does not describe assessment resources in sufficient detail. The application profile provided in this document therefore extends the IEEE LOM to meet the specific needs of QTI developers wishing to associate meta-data with items (as defined by the accompanying Item Information Model). QTI version 2.1 further extends this to enable the description of tests, pools, and object banks.

7.1New Meta-data Elements in IMS QTI v2.0

The IEEE LOM permits extensions to be made to the conceptual data schema, in the form of new terms for existing vocabularies, new vocabularies for existing elements, or new elements, which may be inserted into the schema provided they do not subvert the existing chain of references or introduce new data types for existing fields.

It should be noted that extensions are community specific and will impact significantly on the interoperability of the meta-data which contains them.

Secondary meta-data, sometimes known as 'usage data' (item statistics), is defined separately in its own data model. See Usage Data later in this document.

The following class describes a new category of meta-data for the recording of QTI specific information. It is designed to be treated as an additional top-level category to augment the LOM profile described in the next section.

Class : qtiMetadata

Contains : itemTemplate boolean [0..1]

True if the item is actually an item template, in other words, the item changes its appearance based on some random or external factor. An assessmentItem that contains a templateProcessing section.

Contains : timeDependent boolean [0..1]

Whether or not the item is time dependent. A time dependent item takes the length of time taken for an attempt into consideration when scoring.

Contains : composite boolean [0..1]

True if the item comprises more than one interaction, for example, an assessmentItem that contains more than one interaction.

Contains : interactionType [*]

The interaction type(s) of the item. The vocabulary is comprised of the names, as defined in the information model, of the leaf classes derived from interaction.

Contains : feedbackType [0..1]

Describes the type of feedback, if any, available in the item. If feedback is available then it is described as being non-adaptive or adaptive depending on whether the item is itself adaptive. A non-adaptive item generates feedback based on the responses submitted as part of (the last) attempt only. An adaptive item generates feedback that takes into consideration the path taken through the item, in other words, feedback based on the accumulation of all attempts and not just the last.

Contains : solutionAvailable boolean [0..1]

Set to true if a model solution is available for the item. For example, an assessmentItem that provides correct responses for all declared response variables.

Contains : toolName string256 [0..1]

The name of the tool used to author the evaluation object.

Contains : toolVersion string256 [0..1]

The version of the tool used to author the evaluation object.

Contains : toolVendor string256 [0..1]

The company which produced the tool used to author the evaluation object.

Enumeration: feedbackType

none

No feedback is available.

nonadaptive

Feedback is available but it is non-adaptive. In other words, the item is a non-adaptive item.

adaptive

Feedback is available and is adaptive. In other words, the item is an adaptive item.

Enumeration: interactionType

associateInteraction

choiceInteraction

customInteraction

drawingInteraction

endAttemptInteraction

extendedTextInteraction

gapMatchInteraction

graphicAssociateInteraction

graphicGapMatchInteraction

graphicOrderInteraction

hotspotInteraction

hottextInteraction

inlineChoiceInteraction

matchInteraction

orderInteraction

positionObjectInteraction

selectPointInteraction

sliderInteraction

textEntryInteraction

uploadInteraction

7.2 IEEE LOM Profile

QTI v2.0 deprecated use of the relation category when creating meta-data instances for QTI items, reserving it for future use. A number of use cases which informed the work on v2.1 raised scenarios which could be best addressed through the use of this category.

7.2.1 General

Note that the LOM-defined Structure and AggregationLevel fields are not recommended by this profile.

(1)identifier

One of the values given for the identifier must have an entry that matches the identifier of the associated item, test, or object bank.

(2)title

The title must have a value that matches the value of the title attribute of the associated item, test or object bank. The language used to interpret the title is taken from the lang attribute of the associated item, test, or object bank.

(3)language

There must be one value for each of the languages referred to by the language attributes on the associated assessmentItem, test, or object bank and its bodyElements.

(4)description

When transforming item meta-data records with no description into systems that require a value for this field, the title of the item, test, or object bank should be used to set the value of the description.

(5)keyword

When transforming item meta-data records with no keywords into systems that require a value for this field, the title of the item, test, or object bank should be used to derive a set of keywords. It should be noted that LOM specifically indicates the use of classification for the description of subject area, and specifies that general.keyword 'should not be used for characteristics that can be described by other data elements'.

(6)coverage

Usage as defined by [LOM].

7.2.2 Lifecycle

(1)version

See comment in status below for important information about the use of this field.

(2)status

It is anticipated that systems for handling assessment resources would prefer to draw from wider vocabularies than the one defined by [LOM]. However, in order to facilitate the transformation of meta-data instances to systems that require the use of the LOM vocabulary for this field it is recommended that the version is used to achieve the tracking of items, tests, and object banks through more complex production processes. The classification category may also be used to express the status and availability of assessment resources.

(3)contribute

Usage as defined by [LOM].

7.2.3meta_metadata

(1)identifier

A globally unique label that identifies this meta-data record.

(2)contribute

Usage as defined by [LOM].

(3)metadata_schema

Meta-data records that adhere to this profile are conforming LOM instances, therefore references to both this specification and LOM are applicable. The appropriate references are IMSQTIv2.1 and LOMv1.0. References to other schemas to which the meta-data instance conforms are also permitted.

(4)language

There are two approaches to providing multilingual information in

LOM-based meta-data records which can be used separately or in combination. The first is to translate the meta-data on a field-by-field basis providing each field value as a set of strings, each individually language tagged. The alternative is to generate multiple equivalent meta-data records and use this language field (on the meta-meta-data category) to set the default language for the whole record. This profile prefers the latter approach, meta-data records conforming to this profile should not provide multilingual values to individual fields within the record.

7.2.4Technical

Note that the LOM-defined Requirement, Installation Remarks and Duration fields are not recommended by this profile.

(1)format

There should be at least one instance of format with the value text/x-imsqti-item-xml, text/x-imsqti-test-xml or application/xml .

(2)size

Usage as defined by [LOM].

(3)location

Usage as defined by [LOM].

(4)Other Platform Requirements

Usage as defined by [LOM].

7.2.5Educational

Note that the LOM-defined Interactivity Type, Interactivity Level, Semantic Density, Intended End User Role, Typical Age Range and Difficulty fields are not recommended by this profile.

(1)learning_resource_type

QTI objects are designed to be reusable in a variety of assessment scenarios. Therefore, the LOM-defined values self assessment and exam are forbidden. If the standard LOM vocabulary is used then only the values exercise or questionnaire should be used to describe an item. An alternative vocabulary for this field has been defined in [RDN], when using that vocabulary the value AssessmentItem, AssessmentTest, and AssessmentPool are recommended.

(2)Context

This is used to provide an educational context for the value given in typical learning time.

(3)typical_learning_time

In the context of a QTI object, the typical learning time is interpreted as the length of time the candidate would normally be allocated to complete the object. It is not a time limit, however, when building a time-limited test from an item bank the typical learning times of the selected items may be added together to estimate the expected duration of the test and used to calculate a time limit for the test if required.

(4)description

Item, test, or pool objectives should be included in this field if required.

(5)language

Usage as defined by [LOM].

7.2.6Rights

Note that the LOM-defined cost and copyright_and_other_restrictions fields are highly problematic, and that a more detailed rights description language is necessary to adequately express the often complex rights issues surrounding resource creation and reuse. However, the vast majority of application profiles mandate the rights category, and it is therefore recommended for use within this application profile.

Care should be taken when an item depends on a (shared) media file with its own meta-data to ensure that restrictions on the use of the media file are reflected in the overall rights description of the item itself.

(1)cost

Usage as defined by [LOM].

(2)copyright_and_other_restrictions

Usage as defined by [LOM].

(3)description

Usage as defined by [LOM].

7.2.7Relation

The LOM relation category is used to describe the relationship between

learning objects, and was reserved in QTI v2.0 for future use. In v2.1, this category is used to express the relationship between items and tests, fragments and the objects that include them and individual relationships between items.

(1)kind

A number of relationships between items may be described without extending the LOM vocabulary. However, a new vocabulary element has been introduced to allow one of the more complex inter-item relationships commonly expressed in item banks. In addition, interpretations of some LOM vocabulary elements are provided. It should be noted that each target should have a new relationship instance.

Element name	**Present in LOM?**	**Explanation**
ispartof	Y	A fragment may refer to the objects which include it using this term. The relation.resource.identifier containing the identifier(s) of the including objects.
haspart	Y	An object may refer to the fragments which it includes using this term. The relation.resource.identifier containing the fragment's identifier(s).
isversionof	Y	Usage as defined by [LOM].
hasversion	Y	Usage as defined by [LOM].
isformatof	Y	Usage as defined by [LOM].
hasformat	Y	Usage as defined by [LOM].
references	Y	Usage as defined by [LOM].
isreferencedby	Y	Usage as defined by [LOM].
isbasedon	Y	Usage as defined by [LOM].
isbasisfor	Y	Usage as defined by [LOM].
requires	Y	Usage as defined by [LOM]. Note that this is the appropriate way to represent the relationship between a test or test fragment and the items that it refers to.

isrequiredby	Y	Usage as defined by [LOM]. Note that this is the appropriate way to represent the relationship between an item and the tests or test fragments that refer to it.
precludes	N	This term can be used to indicate items which must not be incorporated into the same test as each other (sometimes referred to as enemy items). This relationship is symmetric.

(2)resource

Usage as defined by [LOM].

7.2.8Annotation

Usage as defined by [LOM].

7.2.9Classification

Usage as defined by [LOM]. The preferred solution for the description of an item_s subject area is to used the LOM classification category with the value classification.purpose = "discipline". This allows the use of any recognized or bespoke subject classification scheme such as the top level(s) of the Library of Congress Classification (LCC) and Dewey Decimal Classification (DDC), or institutional, regional or national curriculum classifications, as specified under classification.taxonPath.source. For more detailed description of topics within subject areas, the value classification.purpose = "idea" may be used with further levels of LCC, DDC or subject-specific classification schemes. The classification category may also be used to describe the visibility and availability of items beyond the limited vocabulary provided by LOM lifecycle.status. The use of custom schemes for classification enables repository administrators to capture all the information they need to capture, using the terms most appropriate for that

institution. There may be multiple instances of the classification category, enabling detailed classification of assessments by subject area and association of an assessment with a number of different subject areas or topics.

7.3 Usage Data

Class : usageData

Usage data, most commonly item statistics, do not form part of an assessmentItem directly because they always relate to some context or domain in which the statistics are valid. Therefore, this specification defines a separate class for describing these statistics.

Each statistic refers to both its context and to the assessmentItem(s) it relates to. Therefore, instances of this class are bound and packaged separately for interoperability.

Attribute : glossary [0..1]: uri

An optional URI that identifies the default glossary in which the names of the itemStatistics are defined.

Contains : itemStatistic [*]

Abstract class : itemStatistic

Derived classes:

categorizedStatistic, ordinaryStatistic

Associated classes:

usageData

A value or set of values that describe the performance of the item within a specific context. Common measures include the item's difficulty and how well it discriminates between various

candidate ability levels

Attribute : name [1]: identifier

The unique identifier of the item statistic. Glossaries of identifiers defined by this specification for commonly used item and distractor statistics are defined and should be used where possible. See Vocabulary for the Exchange of Item Statistics for more details.

Attribute : glossary [0..1]: uri

An optional URI that identifies the glossary in which the name is defined. This value overrides any default glossary provided by the glossary attribute of the parent usage Data.

Attribute : context [1]: uri

A Uniform Resource Identifier that points to information about the context within which the item statistic was created. For example, the URI may point to the sample of item scores and the specifics of computations that created item statistics. The URI may be a URL, a database index, or other valid identifier

Attribute : caseCount [0..1]: integer

The number of cases in the sample used to create the item statistic.

Attribute : stdError [0..1]: float

The standard error of the item statistic, also known as the variance.

Attribute : stdDeviation [0..1]: float

The standard deviation of the item statistic (i.e. the square root of the standard error).

Attribute : lastUpdated [0..1]: date

Date of the last update to the item statistic value.

Contains : targetObject [1..*]

Class : targetObject

Associated classes:

itemStatistic

The targetObject is used to refer to an assessment object. This object may be an assessmentItem or some other type of object defined outside the scope of this specification, for example, an entire test. In some cases it is desirable to refer not just to the assessment object but to a specific part of that object, in which case the optional partIdentifier can be used.

Attribute : identifier [1]: string

The identifier of the assessmentItem or other target object.

Attribute : partIdentifier [0..1]: identifier

An optional identifier to a specific part (e.g. an itemVariable) defined within the assessment object. In the case of an assessmentItem the partIdentifier typically refers to an outcome variable but can refer to other objects identified in the same namespace, such as a specific choice within an interaction. If no partIdentifier is given the statistic is considered to refer to the target object as a whole.

Class : ordinaryStatistic (itemStatistic)

An item statistic that consists of a single numeric value.

Contains : value [1]

Class : categorizedStatistic (itemStatistic)

An item statistic that consists of multiple values, e.g., IRT Dispersion Parameters.

Contains : mapping [1]

7.3.1 Vocabulary for the Exchange of Item Statistics

This specification defines a vocabulary to aid the exchange of commonly used statistics. The vocabulary is split into two glossaries.

Item Statistics

http://www.imsglobal.org/question/qtiv2p1pd2/glossaries/item_statistics.xml

The main item statistics glossary defines statistics that refer to a specific outcome of an item (typically the outcome variable SCORE).

Distractor Statistics

http://www.imsglobal.org/question/qtiv2p1pd2/glossaries/distractor_statistics.xml

The distractor statistics glossary defines statistics that refer to a specific response (typically a simpleChoice) within an item.

These vocabularies have been defined using [VDEX]. It is recognized that vocabularies may differ widely across application areas. Users of this specification are encouraged to document and share their own vocabularies using this common format.

7.4 XML Binding

The accompanying XML binding provides a binding for the qtiMetadata object that is consistent with the binding given in [IMS_MD_Binding]. The qtiMetadata class defines a new category that could appear alongside LOM categories such as General, Lifecycle, etc. In the context of the IMS binding, that means it would naturally appear as a direct descendant of the <lom> object itself. The IMS binding does not support extension at this point in the XML binding however, so qtiMetadata is bound separately and must be used in parallel to the LOM object as an additional meta-data object.

8.Results Reporting

A reference guide to the data model for result reporting. The document provides detailed information about the model and specifies the associated requirements on delivery engines.

8.1Assessment Result

Class：assessmentResult

An Assessment Result is used to report the results of a candidate's interaction with a test and/or one or more items attempted. Information about the test is optional, in some systems it may be possible to interact with items that are not organized into a test at all. For example, items that are organized with learning resources and presented individually in a formative context.

Contains : context [1]

Contains : testResult [0..1]

When a test result is given the following item results must relate only to items that were selected for presentation as part of the corresponding test session. Furthermore, all items selected for

presentation should be reported with a corresponding itemResult.

Contains : itemResult [*]

A summary report for a test is represented by an assessment result containing a testResult but no itemResults.

Class : context

Associated classes:

assessmentResult

Contains : sessionIdentifier [*]

The system that creates the result (for example, the test delivery system) should assign a session identifier that it can use to identify the session. Subsequent systems that process the result might assign their own identifier to the session which should be added to the context if the result is modified and exported for transport again.

Contains : identification [0..1]

Class : sessionIdentifier

Associated classes:

context

Attribute : sourceID [1]: uri

A unique identifier of the system which added this identifier to the result.

Attribute : identifier [1]: string

The system that creates the report should add a session identifier. Subsequent systems that

process the results might use their own identifier for the session and should add this too if the result is exported again for further transport.

Class : identification

Associated classes:

context

The format of the information used to identify the candidate is defined by the [IMS_LIP].

Class : testResult

Associated classes:

assessmentResult

Attribute : identifier [1]: string

The identifier of the test for which this is a result.

Attribute : datestamp [1]: datetime

The date stamp of when this result was recorded.

Contains : itemVariable [*]

The values of the test outcomes and any durations that were tracked during the test. Note that durations are reported as built-in test-level response variables with name duration. The duration of individual test parts or sections being distinguished by prefixing them with the associated identifier as described in Assessment Test, Section and Item Information Model.

Class : itemResult

Associated classes:

assessmentResult

The result of an item session is reported with an itemResult. A report may contain multiple results for the same instance of an item representing multiple attempts, progression through an adaptive item, or even more detailed tracking. In these cases, each item result must have a different datestamp.

Attribute : identifier [1]: string

The identifier of the item for which this is a result. For item results that are reported as part of a test result this is the identifier used to refer to the item in the test (see assessmentItemRef). For item results that are reported on their own, this can be any suitable identifier for the item. Where possible, the value should match the identifier attribute on the associated assessmentItem.

Attribute : sequenceIndex [0..1]: integer

For item results that are reported as part of a test, this attribute must be used to indicate the position of the item within the specific instance of the test. The first item of the first part of the test is defined to have sequence index 1.

Attribute : datestamp [1]: datetime

The date stamp of when this result was recorded.

Attribute) : sessionStatus [1]: sessionStatus

The session status is used to interpret the values of the item variables. See sessionStatus below.

Contains : itemVariable [*]

During the item session the delivery engine keeps track of the current values assigned to all itemVariables. The values of including the values of the built-in variables *numAttempts*, *duration*, and *completionStatus*. Each value is represented in the report by an instance of itemVariable.

Contains : candidateComment [0..1]

An optional comment supplied by the candidate (see allowComment).

Enumeration: sessionStatus

The session status is used to keep track of the status of the item variables in an item session.

Abstract class : itemVariable

Derived classes:

outcomeVariable, responseVariable, templateVariable

Associated classes:

itemResult, testResult

Attribute : identifier [1]: identifier

The purpose of an itemVariable is to report the value of the item variable with the given identifier.

Attribute : cardinality [1]: cardinality

The cardinality of the variable, taken from the corresponding declaration or definition.

Attribute : baseType [0..1]: baseType

The base type of the variable, taken from the corresponding declaration of definition. This value is omitted only for variables with record cardinality.

Class : responseVariable (itemVariable)

Attribute : choiceSequence [*]: identifier

When a response variable is bound to an interaction that supports the shuffling of choices, the sequence of choices experienced by the candidate will vary between test instances. When shuffling is in effect, the sequence of choices should be reported as a sequence of choice identifiers using this attribute.

Contains : correctResponse [0..1]

The correct response may be output as part of the report if desired.

Contains : candidateResponse [1]

The response given by the candidate.

Class : candidateResponse

Associated classes:

responseVariable

Contains : value [*]

The value(s) of the response variable. A NULL value, resulting from no response, is indicated by the absence of any value.

Class : outcomeVariable (itemVariable)

Attribute : view [*]: view

The views (if any) declared for the outcome must be copied to the report to enable systems that render the report to hide information not relevant in a specific situation. If no values are given, the outcome's value should be considered relevant in all views.

Attribute : interpretation [0..1]: string

See interpretation.

Attribute : longInterpretation [0..1]: uri

See longInterpretation.

Attribute : normalMaximum [0..1]: float

Taken from the corresponding outcomeDeclaration.

Attribute) : normalMinimum [0..1]: float

Taken from the corresponding outcomeDeclaration.

Attribute : masteryValue [0..1]: float

If a mastery value is specified in the corresponding outcomeDeclaration it may be reported alongside the value of the outcomeVariable. In some cases, the mastery value may not be an attribute of the item itself, but be determined by the context in which the item is delivered, for example, by examining the candidates in a specific cohort. The mastery value may be reported with the outcome value even when there is no corresponding value in the declaration.

Contains : value [*]

The value(s) of the outcome variable.

Class : templateVariable (itemVariable)

Contains : value [*]

The value(s) of the template variable.

Class : candidateComment

Associated classes:

itemResult

The class used for comments from the candidate. A simple run of text.

9. Integration Guide

A document that describes the relationship between this specification and other related specifications such as IMS Content Packaging [IMS_CP], IMS Simple Sequencing [IMS_SS], and IMS Learning Design [IMS_LD].

9.1 Content Packaging

IMS Content Packaging [IMS_CP] should be used when transferring assessmentItems, assessmentTests, or processing templates between systems. To avoid confusion between the identically named item in the Content Packaging specification and, more generally, to make it clear when terms in this Integration Guide are referring to elements in the content packaging model, all references to these elements will be qualified with the prefix "cp:". This is purely a typographical convention and does not indicate the use of XML namespacing syntax.

In preparing this specification, every effort has been taken to ensure that no modifications or extensions to the existing Content Packaging data model are defined and, furthermore, features of that specification are used in the way originally intended. The goal is to enable the use of content packages containing assessment objects with the existing base of tools that support IMS Content Packaging without modification.

During the development of this version of the QTI specification, IMS has started the

development of version 1.2 of IMS Content Packaging [IMS_CP]. Though that version hasn't reached its final status yet, the QTI specification has been aligned to the expected changes in the IMS Content Packaging [IMS_CP] specification. Most notably is the change in the recommendation of the use of cp:schema of "IMS QTI Item" and cp:schemaversion of "2.0" for resources. This has now been deprecated following the expected change in IMS Content Packaging [IMS_CP] version 1.2.

Version 1 of this specification defined an objectbank as a collection of items and sections. In this version of the specification, this concept has been extended to include assessment tests. A collection of assessment objects in a content package is therefore considered to be an objectbank and the meta-data associated with the package as a whole is interpreted as the meta-data describing the objectbank. In other words, objectbanks are bound to content packages for interchange. Note that an item pool is simply treated as a special case of an objectbank. Packaged items may still be referred to individually in an associated learning design or set of sequencing rules. This type of integration is discussed later in this document.

Given that users may wish to package assessment content defined using version 1 of the QTI specification additional guidance is given on how to package questestinterop objects. These objects may define items, sections, assessments, or objectbanks in any way allowed by that version of this specification.

9.1.1 Packaging Items

An IMS content package is a logical directory containing the content files and a special manifest file which describes them. An assessmentItem is represented in a content package by an XML file that satisfies the XML binding described by this specification.

For example, in the case of a single item the content package will contain:

(1)the manifest (an XML file called imsmanifest.xml)

(2)the item (a QTI XML file)

(3)any auxiliary files (typically images or media files) required by the item

The manifest file must contain a **separate** cp:resource describing each item. The cp:type of the cp:resource must be imsqti_item_xmlv2p1. The cp:resource in turn must contain a cp:file representing the item's XML file. The cp:resource should also contain a cp:file for each of the item's auxiliary files, however, if an auxiliary file is shared amongst several items (whether or not these other items are contained in the same content package) the auxiliary file may be represented by a separate cp:resource. In this case, the item's cp:resource must contain a cp:dependency to the cp:resource representing the auxiliary file.

Meta-data may be associated with an item by including it in the cp:resource. In the case of a content package that contains only one item the meta-data, if given, **must** be included in the cp:resource and not the enclosing cp:manifest. Meta-data associated with the cp:manifest itself is reserved for describing the package (objectbank), not the package's contents.

The meta-data associated with an item should conform to the model and XML binding for item meta-data described elsewhere in this specification. Meta-data that conforms to that model must specify a metadatascheme of "QTIv2.1". The use of cp:schema of "IMS QTI Item" and cp:schemaversion

of "2.0" is deprecated following the changes to the IMS Content Packaging [IMS_CP] specification.

The cp:type of the cp:resource must be imsqti_item_xmlv2p0 or imsqti_item_xmlv2p1 depending on what version of the specification the item conforms to.

The use of a cp:organization to organize QTI items contained in a content package is reserved, except where the cp:organization is the basis for a set of rules described with the Simple Sequencing specification [IMS_SS]. Systems dealing only with the interchange of assessment objects conforming to this specification should ignore organizations when importing content packages.

Auxiliary files that are referred to using relative URIs in an img or object must be included in the content package. These files may be placed in the top level directory or in a sub-directory of the content package if preferred.

9.1.2 Packaging Tests

When a package not only contains items, but also a Test, the manifest file must contain a cp:resource describing the assessmentTest. The cp:type of the cp:resource for the test must be imsqti_test_xmlv2p1. The cp:resource in turn must contain a cp:file representing the test's XML file. The cp:resource should also contain a cp:file for each of the test's auxiliary files. A package can contain multiple tests, each represented by its own cp:resource.

As with packages containing only items, the Items should be represented by a separate cp:resource. The relationship between items and test should be represented by a cp:dependency for each individual item in the cp:resource of the test.

A single assessmentTest can reference both items conforming to version 2.0 and items conforming to version 2.1 of this specification.

If an auxiliary file is shared with other tests or even other testitems (whether or not these are contained in the same content package) the auxiliary file may be represented by a separate cp:resource. In this case, the tests's cp:resource must contain a cp:dependency to the cp:resource representing the auxiliary file.

Meta-data specific to the test may be associated with a test by including it in the cp:resource. If given, this meta-data **must** be included in the cp:resource and not the enclosing cp:manifest. Meta-data associated with the cp:manifest itself is reserved for describing the package, not the package's contents.

The use of a cp:organization to organize QTI Tests contained in a content package is reserved for future use, except where the cp:organization is the basis for a set of rules described with the Simple Sequencing specification [IMS_SS].

Auxiliary files that are referred to using relative URIs in an img or object must be included in the content package. These files may be placed in the

top level directory or in a sub-directory of the content package if preferred.

9.1.3 Packaging Item and Test Fragments

An item fragment is part of an item that is managed independently of the items that depend on it. Similarly, a test fragment is part of a test that is managed independently of the tests that depend on it. The cp:type of the cp:resource for the test must be imsqti_fragment_xmlv2p1. The cp:resource in turn must contain a cp:file representing the fragments XML file. A package can contain multiple fragments, each represented by its own cp:resource.

The relationship between items and fragments should be represented by a cp:dependency for the fragment(s) in the cp:resource of the item that uses the template.

9.1.4 Packaging Response Processing Templates

There usually is no real need to include the standard templates in a content package, but they can be included in the package containing items. The package can also contain custom response processing templates shared by the items in the package. The cp:type of the cp:resource for the test must be imsqti_rptemplate_xmlv2p1. The cp:resource in turn must contain a cp:file representing the template's XML file. A package can contain multiple templates, each represented by its own cp:resource.

The relationship between items and templates should be represented by a cp:dependency for the template in the cp:resource of the item that uses the

template.

9.1.5 Associating Meta-data to items in a Content Package

Previous versions of the IMS QTI specification had a specific meta-data set contained within the data structures themselves, i.e. the ASI. That meta-data vocabulary had its own set of names, all of which started with the characters 'qmd_'. The Migration Guide document describes how to convert these elements for use in QTI version 2.1.

In QTI version 2.0, QTI-specific meta-data has been brought into line with the IEEE LOM in accordance with the IMS Meta-data Best Practice and Implementation Guide for [LOM]. The IEEE LOM standard defines a set of meta-data elements that can be used to describe learning resources, but does not describe assessment resources in sufficient detail. The application profile provided in this document therefore extends the IEEE LOM to meet the specific needs of QTI developers wishing to associate meta-data with items (as defined by the accompanying Item Information Model).

The Meta-data and Usage Data document describes a profile of [LOM] suitable for use with assessment items and a separate data model for representing usage data (i.e., item statistics). This document will be of particular interest to developers and managers of item banks and other content repositories, and to those who construct assessments from item banks

Meta-data may be associated with an item by including it in the cp:resource.

In the case of a content package that contains only one item the meta-data, if given, **must** be included in the cp:resource and not the enclosing cp:manifest. Meta-data associated with the cp:manifest itself is reserved for describing the package, not the package's contents.

One of the goals during the development of this specification was to allow support by as large a number of existing tools as possible. It was also considered important to provide support for use of both the QTI specific meta-data in combination with the currently widely used [IMS_MD_Binding] and the future IEEE [LOM] binding. Both of these have been taken into account while developing the integration method.

The complete example file contains all the code discussed below:

Meta-data in Content Package example

http://www.imsglobal.org/question/qtiv2p1pd2/examples/mdexample/imsmanifest.xml

The schema file for the IMS QTI Version 2.1 meta-data needs to be referenced in the manifest element using a suggested prefix of **imsqti**.

```
<manifest xmlns="http://www.imsglobal.org/xsd/imscp_v1p1"
 xmlns:imsmd="http://www.imsglobal.org/xsd/imsmd_v1p2"
 xmlns:imsqti="http://www.imsglobal.org/xsd/imsqti_v2p1"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 identifier="MANIFEST-QTI-1"
 xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
imscp_v1p1.xsd
 http://www.imsglobal.org/xsd/imsmd_v1p2 imsmd_v1p2p2.xsd
```

```
 http://www.imsglobal.org/xsd/imsqti_v2p1 imsqti_v2p1.xsd">
```

In this case the XSD-files **should** be included in the content package. Alternatively the schema files on the IMS website can be referenced instead of including them in the package.

```
<manifest xmlns="http://www.imsglobal.org/xsd/imscp_v1p1"
 xmlns:imsmd="http://www.imsglobal.org/xsd/imsmd_v1p2"
 xmlns:imsqti="http://www.imsglobal.org/xsd/imsqti_v2p1"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 identifier="MANIFEST-QTI-1"
 xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
http://www.imsglobal.org/xsd/imscp_v1p1.xsd
 http://www.imsglobal.org/xsd/imsmd_v1p2
http://www.imsglobal.org/xsd/imsmd_v1p2p2.xsd
 http://www.imsglobal.org/xsd/imsqti_v2p1
http://www.imsglobal.org/xsd/imsqti_v2p1.xsd">
```

The meta-data for the individual items is added inside the meta-data element for the resource element containing the QTI item. The generic meta-data, either using the IMS MD structures or the IEEE LOM structures goes first in the cp:metadata element, followed by the IMS QTIv2 Item meta-data.

```
<resource identifier="RES-1" type="imsqti_item_xmlv2p1"
href="qti_v2_item_01.xml">
  <metadata>
    <imsmd:lom>
      <imsmd:general>
        <imsmd:identifier>qti_v2_item_01</imsmd:identifier>
        <imsmd:title>
          <imsmd:langstring xml:lang="en">Meta-data Example Item
#1</imsmd:langstring>
        </imsmd:title>
```

```
      <imsmd:description>
        <imsmd:langstring xml:lang="en">This is a dummy
item</imsmd:langstring>
      </imsmd:description>
    </imsmd:general>
    <imsmd:lifecycle>
      <imsmd:version>
        <imsmd:langstring
xml:lang="en">1.0.1</imsmd:langstring>
      </imsmd:version>
      <imsmd:status>
        <imsmd:source>
          <imsmd:langstring
xml:lang="x-none">LOMv1.0</imsmd:langstring>
        </imsmd:source>
        <imsmd:value>
          <imsmd:langstring
xml:lang="x-none">Draft</imsmd:langstring>
        </imsmd:value>
      </imsmd:status>
    </imsmd:lifecycle>
    <imsmd:metametadata>
      <imsmd:metadatascheme>LOMv1.0</imsmd:metadatascheme>
      <imsmd:metadatascheme>QTIv2.1</imsmd:metadatascheme>
      <imsmd:language>en</imsmd:language>
    </imsmd:metametadata>
    <imsmd:technical>
      <imsmd:format>text/x-imsqti-item-xml</imsmd:format>
      <imsmd:format>image/png</imsmd:format>
    </imsmd:technical>
  </imsmd:lom>
  <imsqti:qtiMetadata>
    <imsqti:timeDependent>false</imsqti:timeDependent>

<imsqti:interactionType>choiceInteraction</imsqti:interactionTy
pe>
    <imsqti:feedbackType>nonadaptive</imsqti:feedbackType>
    <imsqti:solutionAvailable>true</imsqti:solutionAvailable>
```

```
      <imsqti:toolName>XMLSPY</imsqti:toolName>
      <imsqti:toolVersion>5.4</imsqti:toolVersion>
      <imsqti:toolVendor>ALTOVA</imsqti:toolVendor>
    </imsqti:qtiMetadata>
  </metadata>
  <file href="choice.xml"/>
  <file href="images/sign.png"/>
</resource>
```

The above code shows a simple example containing both meta-data from the IMS meta-data specification, describing the title, description, version and status of the item. The second part of the meta-data is IMS QTI specific. It is not mandatory to use both meta-data parts, either the generic IMS meta-data part or the QTI specific part of the meta-data may be used alone.

9.1.6 Packaging QTI Version 1 Objects

In QTI version 1, the questestinterop element was used to contain individual items, sections, assessments, or object banks. All of these objects, including any collections allowed by that version of the specification are bound to XML documents of the same type, documents with a top level <questestinterop> element.

When packaging questestinterop instances, the content package will contain:

(1)the manifest

(2)the questestinterop file (a QTI XML file satisfying the binding described in [ASI_BIND])

(3)any auxiliary files (typically images or media files) required by the questestinterop object

The manifest file must contain a **separate** cp:resource describing each questestinterop object. The cp:type of the cp:resource must be imsqti_questestinterop_xmlv1p2. The cp:resource in turn must contain a cp:file representing the questestinterop's XML file. The cp:resource should also contain a cp:file for each of the auxiliary files or, alternatively, a cp:dependency to a separate cp:resource representing the auxiliary file. The two approaches may be mixed in the same content package and must be treated identically.

Meta-data may be associated with a questestinterop object in the cp:manifest by adding it to the associated cp:resource. Meta-data conforming to the model and XML binding for item meta-data described elsewhere in this specification must only be used when the questestinterop object contains a single item and no section, assessment or objectbank objects. Furthermore, this item must not contain either qtimetadata or itemmedata elements.

The use of a cp:organization to impose a hierarchical ordering on QTI questestinterop objects contained in a content package is forbidden.

9.2 Learning Design

IMS Learning Design [IMS_LD] and IMS QTI are natural partners in the learning process. The central objective of the IMSLD specification is to model Units of Learning, delimited pieces of education or training, such as courses, modules, lessons, etc. A unit of learning describes the teaching-learning process and includes a variety of activities, assessments, services and support facilities provided by teachers, trainers, and other staff members.

The primary motivation for integrating IMS Learning Design (IMSLD) and QTI stems from use cases which involve exploiting the results of a test or assessment to influence the learning process, often referred to as formative assessment. However, other use cases involving summative assessment, a final and comprehensive test of the learner's level of understanding, also form part of the rationale for integration.

A typical learning situation involving a Unit of Learning containing a test or assessment might see learners engaging in a series of learning activities, then undergoing a short assessment. On the basis of the results of this assessment, learners experiencing difficulties with material are directed to additional learning activities designed to strengthen their understanding. In addition, those learners scoring particularly well might be directed to skip certain learning activities.

Other cases of integration exist, such as the incorporation of straightforward, low-threshold questions throughout a unit of learning to maintain a certain degree of learner interaction, and the use of assessments for group formation in group-based learning (e.g., when dividing learners into groups of similar levels of ability).

In general, the integration seeks to position assessment in its wider educational context, and revolves around the results of QTI-based processes being used in IMSLD-based processes. However, communication is not restricted to one direction; information can be brought in to influence the assessment process, including learner preferences, the results of previous tests, or the time taken to reach the assessment.

Indeed, reconciling information described using IMSLD with that described using QTI so that run-time systems interoperate appropriately is a particular case of more general

inter-specification interoperability. This Integration Guide does not seek to solve the more general issue, but aims to foster a tighter integration of IMSLD and QTI to help extend their application areas and improve the benefit of their combined use.

9.2.1 Integration through IMS LD Properties and QTI Variables

A large part of IMS LD's flexibility in orchestrating learning flows comes from the use of properties and conditions. Properties are used to record various types of information, which can subsequently be examined and used to influence aspects of the learning process, including the ordering and visibility of learning activities and learning objects. IMS LD supports the definition of different types of property in terms of scope and persistence (see the IMS Learning Design Specification for details). Note that the use of properties implies units of learning at IMS LD level B or C.

In a typical example, learning designers might create a property called P-intake-test-result:

```
<imsld:properties>
<imsld:locpers-property identifier="P-intake-test-result">
<imsld:title>The result for the test carried out as the first step
in a learning flow</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
</imsld:properties>
```

Here we see that an IMSLD (local, personal) property is declared, with type integer and with an initial value of zero. This property might be used in a condition to select between alternative learning activities, based on the

results of the test:

```
<imsld:conditions>
<imsld:if>
<imsld:less-than>
<imsld:property-ref ref="P-intake-test-result"/>
<imsld:property-value>3</imsld:property-value>
</imsld:less-than>
</imsld:if>
<imsld:then>
<imsld:show>
<imsld:learning-activity-ref
ref="LA-Review-Additional-Material"/>
</imsld:show>
</imsld:then>
</imsld:conditions>
```

Here we see an IMSLD condition which states that if the value of P-intake-test-result is less than 3, a learning activity should be shown (giving, for example, additional guidance on a topic).

The IMS QTI specification includes the similar notion of variables, used to record the outcomes of assessment:

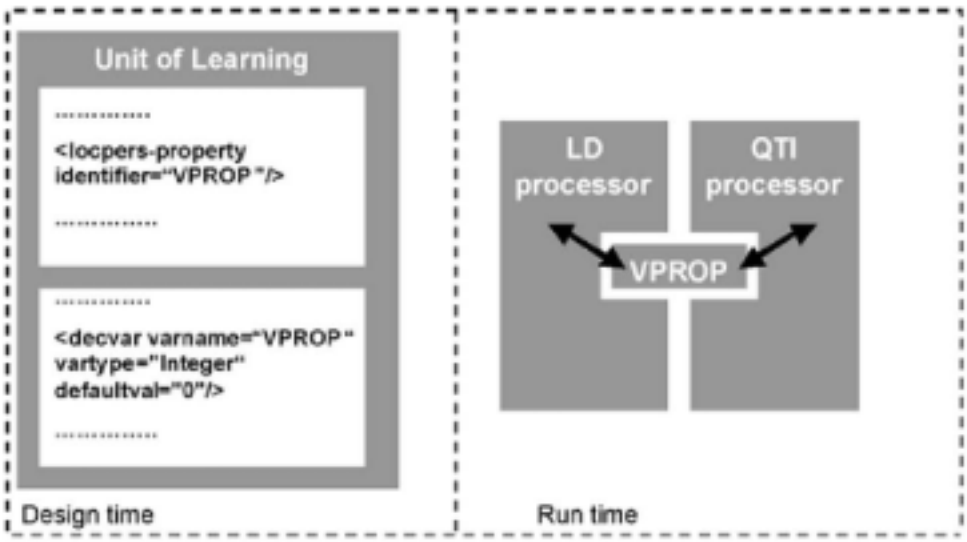
```
<imsqti:outcomes_processing>
<imsqti:outcomes>
<imsqti:decvar varname="SCORE" vartype="Integer"
defaultval="0"/>
</imsqti:outcomes>
</imsqti:outcomes_processing>
```

The above XML fragment shows the declaration of a variable SCORE, of type integer and with an initial value of zero.

The integration of IMS LD and IMS QTI revolves around aligning property and variable names. Essentially, when property identifiers and variable names are declared to be lexically identical at design time (i.e. in IMS LD-based and IMS QTI-based XML), they are considered to be a shared variable in run-time software environments which involve IMS LD and IMS QTI-based processes. To achieve this effect in the above QTI example, the variable name would need to be modified to become the property name used in IMSLD XML. Alternatively, the IMSLD XML could be modified to align it with the QTI variable name (including references in any IMSLD conditions using the property).

Figure 9.1 shows a Unit of Learning which includes both a fragment of QTI and a fragment of IMS LD which refer to VPROP in the manner describe above. These fragments may have been created with different tools or using an editing environment which supports authors in creating both types of content. Although software may be written to interpret both specifications, effectively side-stepping the integration issue, separate markets of LD processors and QTI processors already exist. As a result, the run-time situation may well involve different processors reading and writing VPROP.

Figure 9.1 Illustration of LD and QTI integration.



This is a loose level of integration in that, from the perspective of IMS LD, the internal response processing algorithms used in the QTI content are hidden, with only the resulting outcome being of importance. Similarly, QTI-based processes are unaware of any IMS LD-based use of outcomes. Some run-time mechanism must be in place to enable both IMS LD and IMS QTI-based processes to write to and read from, and services based on the emerging IMS Shareable State Persistence Information Model would appear a suitable candidate.

A complicating factor with this approach lies in the use of multiple QTI items in which the same QTI variable name may be used more than once. The QTI specification indicates the default variable name to be "SCORE", and it is not uncommon to see this variable name used with QTI items. In order to avoid naming clashes and increase the transparency of Units of Learning which integrate IMSLD and IMS-QTI, the recommended best practice is to combine identifiers. The approach is to create compound identifiers for use as IMS LD property names by combining the resource identifier associated

with the content package resource containing the IMS QTI item as a prefix to the variable name, using a period as separator. This approach is illustrated below.

(1)Naming and Typing

LD's properties are of type XML Identifiers (see http://www.imsglobal.org/learningdesign/ldv1p0/imsld_infov1p0.html#1515694), with the rules for their construction being governed by the XML 1.0 specification:

Definition: A Name is a token beginning with a letter or one of a few punctuation characters, and continuing with letters, digits, hyphens, underscores, colons, or full stops, together known as name characters.] (from Extensible Markup Language (XML) 1.0 (Third Edition), W3C Recommendation 04 February 2004 http://www.w3.org/TR/2004/REC-xml-20040204/#NT-Nmtokens)

QTIv2 item variables are also XML Identifiers and so the rules governing the lexical composition of IMSLD properties and IMSQTI variable are identical.

However, the type systems used in IMS LD and IMS QTI differ:

Learning Design	**QTI**
no equivalent	identifier
Boolean	boolean

Integer	integer
Real	float
String	string
Text	string
no equivalent	point
no equivalent	pair
no equivalent	directedPair
Duration	duration
File	file
URI	uri
Datetime	no equivalent

A final complicating factor is the presence of multi-valued variables in QTI which have no equivalent in IMS LD.

These issues point to the need for systems which process QTI items in combination with IMS LD to perform checks and issue warnings when differences are seen either in the type or multi-valued nature of QTI outcome variables and IMS LD properties which share a local part of their Qname.

9.2.2 How and Where QTI Content is Referenced in the Learning Design of a Unit of Learning

Conceptually, from an IMS Learning Design perspective, tests are linked to learning-activities which provide the instruction to complete the test that is present in the environment. In this way, reference to QTI items is likely to be as learning-objects in environments associated with learning-activities. The following figure shows part of an IMS manifest file containing these

relationships:

Screenshot illustrating a Learning Design referring to a QTI Item

http://www.imsglobal.org/question/qtiv2p1pd2/images/ldManifest.png

A learning activity can reference one or more environments, and nesting of environments is permitted. Each environment can, in turn, contain several learning-objects, each referencing a separate QTI item. Environments can be made visible or hidden using IMS Learning Design's condition mechanism, giving the designer of a unit of learning considerable flexibility in modeling the sequencing and selection of test items during the course of a learning process. Note that the same approach can be used for including QTI content above the item level (sections or assessments).

Compound identifiers are formed by using the resource identifier of the content package resource which references the QTI item, together with the QTI variable name, separated by a period. In the above example, assuming the QTI content in the file choice_01.xml contains an outcome variable declaration for the variable SCORE, IMS-LD content needing to use the value of SCORE would use a property declared as:

```
<imsld:locpers-property identifier="Question1.SCORE">
```

9.2.3 skeletal example of IMS LD, QTI, and CP integration

This section walks the reader through a skeletal example of a Unit of Learning which integrates IMS Learning Design and IMS QTI in a content

package. Three questions are used, two of which use the same variable names in order to further illustrate the approach to compound identifiers.

We will build the example starting from the QTI content, held in three separate files:

choice_01.xml
http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/choice_01.xml

choice_02.xml
http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/choice_02.xml

choice_03.xml
http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/choice_03.xml

Note that the first two items both use the variable SCORE, the third item uses the variable SIGNSCORE.

These three IMS QTI items would be included in the content package as three resources (note that two other resources are also shown in the resources section):

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<!-- edited with XMLSPY v5 rel. 4 U (http://www.xmlspy.com) by Colin
Tattersall (Open University of the Netherlands) -->
<imscp:manifest
xmlns:imscp="http://www.imsglobal.org/xsd/imscp_v1p1"
   xmlns:imsld="http://www.imsglobal.org/xsd/imsld_v1p0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
imscp_v1p1.xsd
    http://www.imsglobal.org/xsd/imsld_v1p0 IMS_LD_Level_B.xsd"
   identifier="Integration-Example">
<imscp:organizations>
<imsld:learning-design identifier="LD-Integration-Example"
uri="" level="B">
…
</imsld:learning-design>
</imscp:organizations>
<imscp:resources>
<imscp:resource identifier="R-Simple" type="webcontent">
<imscp:file href="simple.xml"/>
</imscp:resource>
<imscp:resource identifier="Question_1"
type="imsqti_item_xmlv2p1" href="choice_01.xml">
<imscp:file href="choice_01.xml"/>
          <imscp:file href="sign.png"/>
</imscp:resource>
<imscp:resource identifier="Question_2"
type="imsqti_item_xmlv2p1" href="choice_02.xml">
<imscp:file href="choice_02.xml"/>
          <imscp:file href="sign2.png"/>
</imscp:resource>
<imscp:resource identifier="Question_3"
type="imsqti_item_xmlv2p1" href="choice_03.xml">
<imscp:file href="choice_03.xml"/>
          <imscp:file href="sign3.png"/>
</imscp:resource>
<imscp:resource identifier="R-Feedback" type="webcontent">
<imscp:file href="feedback.xml"/>
</imscp:resource>
```

```
</imscp:resources>
</imscp:manifest>
```

In this example, the three resources are referenced from a single environment associated with a single learning activity:

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSPY v5 rel. 4 U (http://www.xmlspy.com) by Colin
Tattersall (Open University of the Netherlands) -->
<imscp:manifest
xmlns:imscp="http://www.imsglobal.org/xsd/imscp_v1p1"
    xmlns:imsld="http://www.imsglobal.org/xsd/imsld_v1p0"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1
imscp_v1p1.xsd
     http://www.imsglobal.org/xsd/imsld_v1p0 IMS_LD_Level_B.xsd"
    identifier="Integration-Example">
<imscp:organizations>
<imsld:learning-design identifier="LD-Integration-Example"
uri="" level="B">
…
<imsld:activities>
<imsld:learning-activity isvisible="true"
identifier="LA-Signpost">
<imsld:title>Complete the question show in the
environment</imsld:title>
<imsld:environment-ref ref="E-Simple-Environment"/>
<imsld:activity-description>
<imsld:title>Check your understanding of signposts</imsld:title>
<imsld:item identifier="I-Simple" identifierref="R-Simple"/>
</imsld:activity-description>
….
</imsld:learning-activity>
</imsld:activities>
<imsld:environments>
<imsld:environment identifier="E-Simple-Environment">
```

```
<imsld:title>Quick Test</imsld:title>
<imsld:learning-object identifier="LO-QTI-Item1">
<imsld:title>Assign a sign</imsld:title>
<imsld:item identifier="I-Question1"
identifierref="Question_1"/>
</imsld:learning-object>
<imsld:learning-object identifier="LO-QTI-Item2">
<imsld:title>Assign a second sign</imsld:title>
<imsld:item identifier="I-Question2"
identifierref="Question_2"/>
</imsld:learning-object>
<imsld:learning-object identifier="LO-QTI-Item3">
<imsld:title>And try to assign a third one</imsld:title>
<imsld:item identifier="I-Question3"
identifierref="Question_3"/>
</imsld:learning-object>
</imsld:environment>
</imsld:environments>
</imsld:components>
<imsld:method>
…
</imsld:method>
</imsld:learning-design>
</imscp:organizations>
<imscp:resources>
<imscp:resource identifier="R-Simple" type="webcontent">
<imscp:file href="simple.xml"/>
</imscp:resource>
<imscp:resource identifier="Question_1"
type="imsqti_item_xmlv2p0" href="choice_01.xml">
<imscp:file href="choice_01.xml"/>
          <imscp:file href="sign.png"/>
</imscp:resource>
<imscp:resource identifier="Question_2"
type="imsqti_item_xmlv2p0" href="choice_02.xml">
<imscp:file href="choice_02.xml"/>
          <imscp:file href="sign.png2"/>
</imscp:resource>
```

```
<imscp:resource identifier="Question_3"
type="imsqti_item_xmlv2p0" href="choice_03.xml">
<imscp:file href="choice_03.xml"/>
          <imscp:file href="sign3.png"/>
</imscp:resource>
<imscp:resource identifier="R-Feedback" type="webcontent">
<imscp:file href="feedback.xml"/>
</imscp:resource>
</imscp:resources>
</imscp:manifest>
```

IMS LD properties are defined for each outcome variable used in each resource file in the following manner, together with a property which will be used to hold the sum of the three:

```
<imsld:properties>
<imsld:locpers-property identifier="Question_1.SCORE">
<imsld:title>The result for the first question</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
<imsld:locpers-property identifier="Question_2.SCORE">
<imsld:title>The result for the second question</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
<imsld:locpers-property identifier="Question_3.SIGNSCORE">
<imsld:title>The result for the third question</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
<imsld:locpers-property identifier="Total">
<imsld:title>The total</imsld:title>
<imsld:datatype datatype="integer"/>
<imsld:initial-value>0</imsld:initial-value>
</imsld:locpers-property>
```

```
</imsld:properties>
```

Assuming a pedagogical approach of programmed instruction, the learner may only progress if the total score is three (i.e., if all three questions are answered correctly). This is handled in IMS LD by indicating that the activity can only be completed when a property is set (`when-property-value-is-set`):

```
<imsld:activities>
<imsld:learning-activity isvisible="true"
identifier="LA-Signpost">
<imsld:title>Complete the question show in the
environment</imsld:title>
<imsld:environment-ref ref="E-Simple-Environment"/>
<imsld:activity-description>
<imsld:title>Check your understanding of signposts</imsld:title>
<imsld:item identifier="I-Simple" identifierref="R-Simple"/>
</imsld:activity-description>
<imsld:complete-activity>
<imsld:when-property-value-is-set>
<imsld:property-ref ref="Total"/>
<imsld:property-value>3</imsld:property-value>
</imsld:when-property-value-is-set>
</imsld:complete-activity>
<imsld:on-completion>
<imsld:feedback-description>
<imsld:item identifier="I-Feedback" identifierref="R-Feedback"/>
</imsld:feedback-description>
</imsld:on-completion>
</imsld:learning-activity>
</imsld:activities>
```

The final step is to include an IMS LD condition which sets the property Total to have the value 3 when all three questions have been answered correctly:

```
<imsld:conditions>
<imsld:if>
<imsld:and>
<imsld:greater-than>
<imsld:property-ref ref="Question_1.SCORE"/>
<imsld:property-value>0</imsld:property-value>
</imsld:greater-than>
<imsld:greater-than>
<imsld:property-ref ref="Question_2.SCORE"/>
<imsld:property-value>0</imsld:property-value>
</imsld:greater-than>
<imsld:greater-than>
<imsld:property-ref ref="Question_3.SIGNSCORE"/>
<imsld:property-value>0</imsld:property-value>
</imsld:greater-than>
</imsld:and>
</imsld:if>
<imsld:then>
<imsld:change-property-value>
<imsld:property-ref ref="Total"/>
<imsld:property-value>3</imsld:property-value>
</imsld:change-property-value>
</imsld:then>
</imsld:conditions>
```

The property Total could equally have been given the type boolean and assigned a value of true once the total had been reached.

Full Manifest File

http://www.imsglobal.org/question/qtiv2p1pd2/examples/ldexample/imsman

ifest.xml

9.2.4 IMS LD and QTI assessmentTest integration

The previous example shows how individual QTI assessmentItems are referenced from within IMS Learning Design. In a similar way it is possible to point to complete assessmentTests from within IMS LD. The value of the outcome variable SCORE of the test would use a property declared as:

```
<imsld:locpers-property identifier="Assessment1.SCORE">
```

Assessment1 in that case is the identifier of the resource containing the QTI assessmentTest.

9.3 Simple Sequencing

The IMS Simple Sequencing specification [IMS_SS] defines a method for representing the intended sequencing behavior of an authored learning experience. In other words, the way learning technology systems can sequence discrete learning activities in a consistent way.

Integrating individual assessment items with learning activities into a single activity tree controlled by simple sequencing rules suggests the need to map the information about the item session into the appropriate simple sequencing concepts. A detailed discussion of how this mapping might be implemented is beyond the scope of this document, though a number of experimental approaches are currently being discussed within the community. Readers may wish to monitor the output of the [APIS] project which is currently preparing more detailed recommendations.

To help facilitate easier integration of QTI items into activity trees authors are strongly

encouraged to define an outcome variable with the name SCORE to be of a numeric type and to provide a value for the normalMaximum attribute of the outcomeDeclaration. Note particularly that scores will be normalized to the range [-1.0,1.0] for use with sequencing rules so care will need to be taken when designing items that generate scores with minimum obtainable values other than 0.

Simple sequencing makes use of the organization element within the content package. In order to treat an assessment item as an activity a suitable cp:item element will need to be included in the organization. As stated above, this is the only use of the organization element that this specification recommends when packaging QTI content.

Note that assessment items have resource type imsqti_item_xmlv2p0 and not webcontent. This indicates to the processing system that the resource is not suitable for handing directly to a web-browser for presentation. Instead, web-based systems that support the use of assessment items within activity trees must be capable of converting the assessment item into a suitable form for web delivery, processing the responses and collecting and mapping the resulting item outcomes. The version 2 data model for the itemBody profiles [XHTML] making this transformation considerably easier.

9.4 CMI

The CMI datamodel [CMI] is designed to provide a mechanism for the communication of data created at runtime, such as the outcomes of an assessment item, to a learning management system or other runtime service. A detailed description of how to map the contents of an item session into this model is beyond the scope of this specification.

Item authors are encouraged to follow the best practice described in Simple Sequencing to help

facilitate interoperability through the CMI interface. A special predefined item variable (completionStatus) is defined to ease integration with CMI-based systems. Authors are reminded that adaptive items must maintain a value for this variable in the item's responseProcessing rules.

10.XML Binding

A document describing the way the data models have been bound to [XML].

11.Conformance Guide

A document that describes conformance requirements and provides a data model for the construction of QTI profiles including a predefined profile that replaces the QTI Lite specification [QTI_LITE] released as part of version 1. This document is currently unchanged but an updated version will be published with the final release of the specification.

In order to make meaningful statements about interoperability it is necessary to consider the issue of QTI-conformant data and the associated issue of what a system developer needs to do to ensure that their system conforms.

A system vendor or data publisher makes a conformance statement that can be used by the community to compare the capabilities of their product with others. To facilitate creation of conformance statements contentProfile and bankProfile classes are defined that enable a rigorous approach to describing the extent to which the item information and packaging models are supported. The same classes can of course be used to describe a set of requirements. Used in this way they enable smaller communities to express profiles of this specification. For information and advice about setting up and running such communities, readers are referred to the IMS Application Profile Guidelines Whitepaper [IMS_AP].

This specification defines two profiles that can be used as the basis for determining interoperability needs in the absence of any more specific profiling requirement. These profiles are called QTI-Lite Version 2 (which applies only to content) and QTI-All Version 2 and can be used to interpret statements such as "conforms to all of QTI Version 2".

Communities that define their own profiles are strongly encouraged to ensure that all objects conforming to their profile also conform to the QTI-All Version 2 profile described in this document except with respect to additional media types (see objectType and imageType). Profiles that allow (or even require) objects that do not conform to QTI-All Version 2 should describe themselves as extensions of QTI.

11.1 Conforming Data

This specification defines several types of data objects that may be exchanged between systems and hence require defined levels of interoperability. For example, a set of item statistics may be described as QTI Version 2 Conformant. This section explains what such conformance statements mean.

11.1.1 Assessment Items

Assessment Items must be XML documents that conform to the XML schema for assessmentItem defined by this specification and to the additional content constraints described in the information model.

11.1.2 Item Packages

Item packages must conform to the IMS Content Packaging specification and contain assessment items packaged in accordance with the

requirements described in the Integration Guide.

11.1.3 Item Statistics

Item statistics must be XML documents that conform to the XML schema for usageData defined by this specification.

11.1.4 Response Processors

Response Processors must be XML documents that conform to the XML schema for responseProcessing defined by this specification and to the additional content constraints described in the information model.

11.2 Conforming Systems

In addition to defining conformance criteria for the data objects that are exchanged between interoperable systems, this specification also describes requirements on the way those systems interpret the information described by those data objects. Systems that describe themselves as conforming to "QTI Version 2" must make reference to an appropriate profile. The requirements on each type of system are described below.

11.2.1 Publishing System

A conformant publishing system is any system that can export conforming assessment items packaged as item packages without requiring the use of the extension elements customInteraction and customOperator.

A publishing system may also publish content in a variety of other formats, including some QTI-based formats that make use of the extension elements, but it must be possible to separate this output or the modes of operation that generate it. For example, a publishing

system may contain a flag to turn off the use of QTI extensions when publishing content and skip items from the selected data set that would have required them.

A publishing system should create a contentProfile that describes the range of content it can export. The main purpose of such a profile is to describe the requirements for a system that needs to import the data and does not imply that the publishing system exploits the full range of functionality it describes. For example, a publishing system that exports only single response multi-choice questions as conformant QTI assessment items would still add choiceInteraction as an interactionType to its contentProfile even though this describes multiple-response multi-choice questions too (these two question types being inseparable in the contentProfile).

11.2.2 Authoring Systems

A conformant authoring system allows item authors to create new items, to edit existing items imported from conforming item packages, and to export items into new or updated item packages.

Authoring systems must set or adjust the toolName and toolVersion appropriately when exporting items (unless no changes have been made). When exporting items, all use of extensions must be consistent with the conventions of the tool referred to by these attributes. The extension mechanisms are:

•The label attribute on bodyElement.

•The customInteraction class.

•The customOperator class.

Authoring systems should ignore information represented by the extension mechanisms when importing an item that was created by an incompatible tool.

Authoring systems should also ensure that data that can be represented by the information model defined by this specification is represented in that way. In other words, authoring systems should not make use of the extension mechanisms to represent information that could have been represented without them.

This requirement is made to ensure that authoring systems meet the reasonable expectations of authors when exporting assessment items. For example, an author who creates a question containing a simple choice represented by hotspots on a background image can reasonably expect the exported data to contain a hotspotChoice and not a customInteraction containing a proprietary applet that implements the same functionality on a limited set of delivery engines.

A system that uses an extension mechanism to represent data that can be represented directly in the information model must not claim conformance for that part of the information model in its conformance profile.

Note that a tool may combine the functions of authoring system and delivery engine, to allow authors to try out their items, but it is not required to do so. Where a tool contains a conformant authoring system and a delivery engine it should ensure that the delivery engine is also conformant to prevent authors being misled.

An authoring system should create a contentProfile to describe the range of QTI content that it supports.

11.2.3 Item Bank Systems

An item bank system is a tool for managing collections of items, their meta-data, and any associated usage data.

A conformant item bank system allows item bank managers to import and export collections of items from item packages. Item bank systems must not alter the items' assessmentItem data. Though a given tool may combine the features of an item bank system with an authoring system, to be a conformant item bank system it must still be capable of importing, managing, and exporting collections of items without modification of the associated assessmentItem data.

An item bank system should create a bankProfile to describe the range of features that it supports. Version 1 of this specification described an information model for objectbanks, assessments, and results which have not been updated by this version but **may** be updated by future versions. Therefore, the conformance of item bank systems with respect to the interoperability of item banks, assessments, and results and the associated bankProfile class is subject to change.

11.2.4 Delivery Engines

A delivery engine is the component of a system that allows the user or candidate to interact with an item, to assign values to response variables and to invoke response processing and provide feedback as appropriate. A delivery engine may be part of a full-blown assessment system or it may simply be a component of an authoring or editing system.

A conformant delivery engine conforms to the requirements described in the information model with respect to its behavior in delivering the items. For example, it must provide suitable controls that operate in accordance with the requirements of each supported interaction and maintain the data described by the item session.

11.3. Conformance Profiles

11.3.1 Authoring and Delivery Systems

Class : contentProfile

This class provides a framework for describing the capabilities or requirements of an authoring system or delivery engine. Most of the elements of the profile are booleans that indicate whether or not a specific feature is supported (true) or not supported (false). When being used in the context of expressing requirements the values correspond to required or optional respectively. This profile class does not support exclusion of features.

Contains : composite boolean [1]

Whether or not the system supports composite items.

Contains : adaptive boolean [1]

Whether or not the system supports adaptive items.

Contains : timeDependent boolean [1]

Whether or not the system supports time dependent items.

Contains : templates boolean [1]

Whether or not the system supports item templates.

Contains : textElements boolean [1]

Whether or not the system supports the XHTML text elements. A profile that supports any of the other XHTML element groups should support this one too.

Contains : listElements boolean [1]

Whether or not the system supports the XHTML list elements.

Contains : objectElements boolean [1]

Whether or not the system supports the XHTML object elements.

Contains : objectType mimeType [*]

For systems that support the object element, a list of the types of object supported. For example: image/jpeg, audio/aiff, etc.

Contains : presentationElements boolean [1]

Whether or not the system supports the XHTML presentation elements.

Contains : tableElements boolean [1]

Whether or not the system supports the XHTML table elements.

Contains : imageElement boolean [1]

Whether or not the system supports the XHTML image element.

Contains : imageType mimeType [*]

For systems that support the image element, a list of the types of images supported. For example: image/png, image/jpeg, etc.

Contains : hypertextElement boolean [1]

Whether or not the system supports the XHTML hypertext element.

Contains : mathElement boolean [1]

Whether or not the system supports the MathML <math> element.

Contains : mathVariable boolean [1]

Whether or not the system support the expansion of template variable names in MathML expressions.

Contains : feedbackIntegrated boolean [1]

Whether or not the system supports integrated feedback, i.e., the feedbackBlock class.

Contains : feedbackModal boolean [1]

Whether or not the system supports modal feedback, i.e., the modalFeedback class.

Contains : rubric boolean [1]

Whether or not the system supports rubric blocks, i.e., the rubricBlock class.

Contains : printedVariables boolean [1]

Whether or not the system has core support for the printedVariable element. Note that support for the r conversion type specifier is controlled separately rounding.

Contains : interactionType [*]

The supported interaction type(s). The vocabulary is comprised of the names, as defined in the information model, of the leaf classes derived from interaction with the exception of customInteraction. See below for interaction-specific conformance notes.

Contains : responseRules boolean [1]

Whether or not the system supports response rules in response processing. Systems that set this to true are assumed to be able to process arbitrary templates so need not list these

individually. Note that support for the equalRounded and patternMatch operators is optional, see rounding and regexp respectively.

Contains : rpTemplate uri [*]

For systems that only support response processing templates, a list of the templates supported.

Contains : rounding boolean [1]

Whether or not the system supports advanced rounding: if printedVariables is supported then the r conversion type specifier is also supported.

Contains : regexp boolean [1]

Whether or not the system supports regular expression matching: if the textEntryInteraction or extendedTextInteraction then the patternMask attribute is also supported; if responseRules is supported then the patternMatch operator is also supported.

Contains : metadataProfile [1]

The parameters concerning the range of meta-data supported are described by a separate class.

Class : metadataProfile

Associated classes：

bankProfile, contentProfile

Contains : imsmd boolean [1]

The system supports meta-data described by and bound according to the IMS meta-data specification [IMS_MD_Binding].

Contains : lomMetadata boolean [1]

The system supports meta-data described by [LOM] and bound according to the associated XML binding.

Contains : imsqtimd boolean [1]

The system supports meta-data described by and bound according to the qtiMetadata class defined in the associated Meta-data and Usage Data.

11.3.1.1 Interaction-Specific Conformance Notes

Most of the simple interactions can be supported in isolation. For example, it is possible to

define a meaningful profile with the a single value of choiceInteraction for interactionType and no other conforming features.

Some interaction types require the use of XHTML-based elements that are subject to their own flag in the profile. A profile that contains an interactionType indicating support for one of these types must also set the flags for any required XHTML-based element to be valid. These requirements are listed below.

gapMatchInteraction	Requires textElements. If a system supports gapMatchInteraction and objectElements then it must support use of gapImg with any image objectTypes in the profile. A system that supports gapMatchInteraction but no image objectTypes does not support gapImg.

inlineChoiceInteraction, textEntryInteraction, hotTextInteraction, endAttemptInteraction	Require textElements.
hotspotInteraction, selectPointInteraction, graphicOrderInteraction, graphicAssociateInteraction, graphicGapMatchInteraction, positionObjectInteraction, drawingInteraction	Require objectElements and at least one suitable objectType.

11.3.2 Item Bank Systems

Class : bankProfile

This class provides a framework for describing the capabilities or requirements of an item bank system. It has a similar dual use for specifying capabilities and requirements as the contentProfile class.

Note that item bank systems must be able to import and export items from content packages and must be able to operate in a mode whereby all imported usage data and meta-data from a vocabulary or scheme to which conformance is claimed can be exported again with the same set of items.

Contains : usageDataVocabulary uri [*]
The URI of a vocabulary file (or files) describing the vocabulary of supported usage data. Reference to a vocabulary indicates that a system supports usage-data files packaged according to the method described in Integration Guide.

Contains : metadataProfile [1]
The flags describing the range of meta-data supported are the same as those used in the contentProfile.

11.3.3 QTI-Lite

QTI-Lite is presented as the entry-level profile to the full QTI specification and only concerns content, its creation, modification, and delivery. In other words, it does not concern item bank systems. QTI-Lite does not support all of the features of the full specification but it is a proper profile, in other words an assessment item that conforms to the QTI-Lite profile also conforms to the default "QTI-All" profile defined below.

QTI-Lite Profile Definition

conformance/ imsqti_lite_profile.xml

The key differences between the QTI-Lite and the QTI-All profile are:

7. Only one interaction per item.
8. The only interaction type to be supported by QTI-Lite is the choiceInteraction, suitable for use with simple multi-choice questions like one choice from many (e.g., "Yes/No", "True/false" and "Likert scale") and also with multiple response questions like one or more choice from many (e.g., select all that apply).
9. Simple response processing using the Match Correct template enabling only a single right answer (or an exact matching group for multiple response).
10. No support for integrated feedback.
11. Limited image types and structural formatting.
12. No support for advanced features like adaptive items, templates or time based scoring.

Note that the inclusion of multiple-response questions represents an expansion of the scope of QTI-Lite since version 1 of this specification but that the restrictions on response processing, in particular the lack of support for the Map Response template, should not present a significant burden to implementors.

11.3.4 QTI All

The content profile that describes conformance to the full QTI Version 2 specification includes a complete list of features and a minimal set of media types.

QTI-All Content Profile Definition

http://www.imsglobal.org/question/qtiv2p1pd2/conformance/imsqticontent_all_profile.xml

QTI-All Bank Profile Definition

http://www.imsglobal.org/question/qtiv2p1pd2/conformance/imsqtibank_all_profile.xml

1. 参考資料

APIS	Assessment Provision through Interoperable Segments Barr, Sclater and Young
ASI_BIND	IMS Question & Test Interoperability: ASI XML Binding Specification, Version 1.2 Published: 2002-02
CMI	IEEE 1484.11.1, Standard for Learning Technology - Data Model for Content Object Communication
IMS_AP	IMS Application Profile Guidelines Whitepaper, Version 1.0
IMS_CP	IMS Content Packaging Specification, Version 1.1.3
IMS_LD	IMS Learning Design Specification, Version 1.0 Published: 2003-01
IMS_LIP	IMS Learner Information Package Specification, Version 1.0 http://www.imsglobal.org/profiles/index.html
IMS_MD_Binding	IMS Learning Resource Meta-Data XML Binding, Version 1.2.1
IMS_SS	IMS Simple Sequencing Specification, Version 1.0 Published: 2003-03
ISO_9899	ISO/IEC 9899:1999 Programming Languages - C
ISO11404	ISO11404:1996 Information technology — Programming languages, their environments andsystem software interfaces — Language-independent datatypes Published: 1996
ISO8601	ISO8601:2000 Data elements and interchange formats – Information interchange – Representation of dates and times Published: 2000
LOM	IEEE 1484.12.1-2002 Standard for Learning Object Meta-data (LOM)
MathML	Mathematical Markup Language (MathML), Version 2.0 (Second Edition) http://www.w3.org/TR/2003/REC-MathML2-20031021/ Published: 2003-10-21
RDN	RDN/LTSN resource type vocabulary http://www.rdn.ac.uk/publications/rdn-ltsn/types/
RFC1766	RFC 1766 Tags for the Identification of Languages H. Alvestrand http://www.ietf.org/rfc/rfc1766.txt Published: 1995-03
RFC2045	RFC 2045-2048 Multipurpose Internet Mail Extensions (MIME)
RFC3066	RFC 3066 Tags for the Identification of Languages H. Alvestrand http://www.ietf.org/rfc/rfc3066.txt Published: 2001-01
SMITH	Development of an implementation of QTI Version 2.0 Dr. Graham Smith, with support from CETIS and UCLES

UML	OMG Unified Modeling Language Specification, Version 1.4 Published: 2001-09
URI	RFC 2396 Uniform Resource Identifiers (URI): Generic Syntax Published: 1998-08
VDEX	IMS Vocabulary Definition Exchange, Version 1.0 http://www.imsglobal.org/vdex/index.html Published: 2004-02-24
XHTML	XHTML 1.1: The Extensible HyperText Markup Language
XHTML_MOD	XHTML Modularation http://www.w3.org/MarkUp/modularization
XINCLUDE	XML Inclusions (XInclude) Version 1.0 http://www.w3.org/TR/xinclude/
XML	Extensible Markup Language (XML), Version 1.0 (second edition) Published: 2000-10
XML_ERRATA	XML 1.0 Specification Errata http://www.w3.org/XML/xml-19980210-errata
XML_SCHEMA2	XML Schema Part 2: Datatypes http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/

2. 爭議事項

無

3.英中名詞對照表

-A-

Absolute Positioning	絕對定位
Adaptive Item	適性題
Adaptive Test	適性測驗
Assessment	評量
Assessment Test	評量測驗
Assessment Variable	評量變數
Assessment Delivery System	評量傳遞系統
Attempt	嘗試
Authoring System	編製系統

-B-

Basic Item	基本題

Binding	繫結
	-C-
Candidate	受試者
Candidate Session	受試階段
Cardinality	基數
Character set	字元集
Cloning Engine	複製引擎
Composite Item	複合題
Conformance	符合性
Conformance statement	符合性聲明
Container	容器
Content	內容
Content Packaging, CP	內容包裝
	-D-
Declaration	宣告
Delivery Engine	傳遞引擎
Dependency	相依性
	-E-
Element	元件
Expression	表示（式）
Evaluation	評鑑
	-F-
Feedback	回饋
Fragment	片段
	-G-
	-H-
Hotspot	熱點
	-I-
Integrated Feedback	整合回饋
Interaction	互動
Interoperability	互運性
Item	題、試題
Item Clone	試題複製
Item Fragment	試題片段
Item Session	試題階段
Item Set	試題集

Item Template	試題模版
Item Variable	試題變數

-J-

-K-

-L-

-M-

Mapping	對照
Mark	標記
Material	教材
Metadata	詮釋資料
Modal	模態
Multiple Response	多重答覆

-N-

Non-adaptive Item	非適性題

-O-

Object Bank	物件庫
Operator	運算符
Ordered Response	有序答覆
Outcome Processing	結果處理
Outcome Variable	結果變數

-P-

Package	套裝
Pool	題庫
Process	歷程、過程
Proprietary	專屬

-Q-

-R-

Response	答覆
Response declaration	答覆宣告
Response processing	答覆處理
Response Variable	答覆變數
Rule	規則

-S-

Schema	架構
Scoring	評分
Scoring Engine	評分引擎
Section	題組
Single Response	單一答覆
Source set	來源集
Stage	影層
Supporting material	支援教材

-T-

Target set	標的集
Test	測驗
Test Feedback	測驗回饋
Test Fragment	測驗片段
Test Report	測驗報告
Test Session	測驗階段
Template Processing	模版處理
Template Variable	模版變數
Time Dependent Item	時間相依題
Time Independent Item	時間獨立題

-U-

-V-

-W-

-X-

-Y-

-Z-

4.中英名詞對照表

互動	Interaction
互運性	Interoperability
元件	Element
內容	Content
內容包裝	Content Packaging, CP
支援教材	Supporting material
片段	Fragment

回饋	Feedback
多重答覆	Multiple Response
字元集	Character set
有序答覆	Ordered Response
來源集	Source set
受試者	Candidate
受試階段	Candidate Session
物件庫	Object Bank
表示（式）	Expression
非適性題	Non-adaptive Item
宣告	Declaration
架構	Schema
相依性	Dependency
套裝	Package
容器	Container
時間相依題	Time Dependent Item
時間獨立題	Time Independent Item
基本題	Basic Item
基數	Cardinality
專屬	Proprietary
教材	Material
符合性	Conformance
符合性聲明	Conformance statement
規則	Rule
單一答覆	Single Response
測驗	Test
測驗片段	Test Fragment
測驗回饋	Test Feedback
測驗報告	Test Report
測驗階段	Test Session
答覆	Response
答覆宣告	Response declaration
答覆處理	Response processing
答覆變數	Response Variable
結果處理	Outcome Processing
結果變數	Outcome Variable
絕對定位	Absolute Positioning

評分	Scoring
評分引擎	Scoring Engine
評量	Assessment
評量測驗	Assessment Test
評量傳遞系統	Assessment Delivery System
評量變數	Assessment Variable
評鑑	Evaluation
傳遞引擎	Delivery Engine
試題片段	Item Fragment
試題階段	Item Session
試題集	Item Set
試題模版	Item Template
試題複製	Item Clone
試題變數	Item Variable
詮釋資料	Metadata
運算符	Operator
嘗試	Attempt
對照	Mapping
影層	Stage
標的集	Target set
標記	Mark
模版處理	Template Processing
模版變數	Template Variable
模態	Modal
熱點	Hotspot
編製系統	Authoring System
複合題	Composite Item
複製引擎	Cloning Engine
適性測驗	Adaptive Test
適性題	Adaptive Item
整合回饋	Integrated Feedback
歷程、過程	Process
題、試題	Item
題庫	Pool
題組	Section
繫結	Binding