Navigational SCOs – navigating a complex learning activity

1. Abstract

We propose a new type of SCO, the Navigational SCO, which provides the content author with the ability to control navigation through a learning activity in a flexible and robust manner providing just in time tailored learning specifically suited to the needs of an organisation and the individual student without compromising the learning ideas of the SCO or placing burden upon the content administrator, content tester or LMS vendor.

2. Problem definition

We have frequently encountered situations in corporate, public sector and defence e-learning production, where individuals and organisations procuring and developing e-learning content want to be able to create content with multiple SCOs, without relying on the LMS to navigate between them. There are a number of reasons for this:

- SCORM 2004 simple sequencing is not simple to use or test. Therefore it is expensive and time-consuming for content authors to develop and test content using simple sequencing, particularly if it needs to run on different Learning Management Systems (LMS)

- Branding is very important (at least outside the context of the education system) and many of those procuring content want branding in the navigation of a course as well as the content. Furthermore, when content is being reused, not created specifically for a programme or initiative, the navigation may be the only area available to be branded.

- The SCORM 2004 simple sequencing standard, while complex, cannot match the flexibility of business logic coded into a SCO – we have observed cases where we could not apply the business rules we wanted even taking full use of simple sequencing.

3. Use cases

The following use cases are considered:

- A content author or content procurement team has identified that a learning activity composed of many SCOs is necessary (for example, to record multiple scores) but each user is expected to complete a subset of it. The criteria for determining the subset is based on a user evaluation and knowledge stored within an integrated HR system on the users job role and skills.

- A user of a learning activity has recently completed a similar activity; he is only required to complete a subset of the learning activity.

- Part of the learning activity is not essential and should be made available to the user as optional content or resources for future reference only; it is not clear however which content is reference material until the user has completed an evaluation.

- A users certificate is about to expire, if the user refreshes their knowledge using the learning activity recommended to them they may be able to complete a subset of the learning activity.

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The criteria for which SCOs are required is determined by the users role and the result of an evaluation within the learning activity.

4. Proposed solution

We propose that these problems be solved by extending the SCORM standard to include two optional object types:
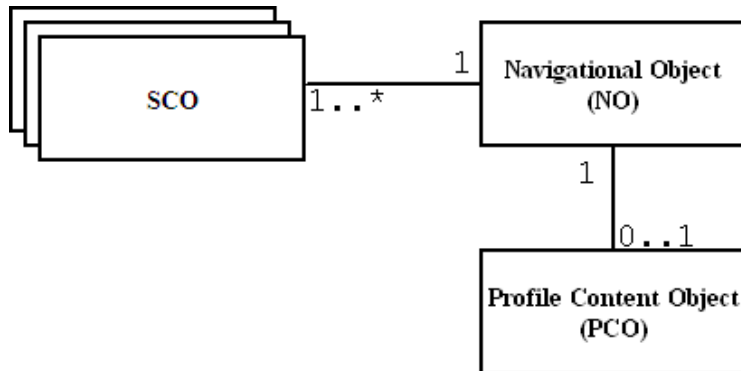
The navigational object. The LMS would be aware of both SCOs and a Navigation Object which compose a learning activity. It navigates SCOs based on complex rules to meet the users training needs.

The profile content object (PCO). Its purpose is to ensure a decoupled evaluation can be created separate of the business rules stored within the navigational object. It is not mandatory.

4.1. Navigational Objects:

We propose that a navigational object is the orchestrator of a learning activity. The navigational object controls access to one or more SCOs required for the learning activity. It is the learner's single point of entry into the course. It has the capability to evaluate a user's learning requirements and business rules to determine the SCOs necessary for each individual learner. A business rule could be alter which SCOs are required learning based on the date at which the student last completed the learning activity. The navigation object can implement as many rules as the author requires. It may communicate with the LMS only.

A learning activity would be composed of the following objects. This diagram shows a typical structure and relationship to each other.

There are zero or one Navigational SCOs in any content aggregation, and if there is a navigational SCO, there can be zero or one Profile Content SCOs. There is no limit to the number of normal SCOs, but there must be at least one.

The following is an example of a typical situation where this proposed structure can enable the content author to structure the content into separate SCOs which are targeted at a particular purpose whilst assembling them into a learning activity which is orchestrated by the navigational object to the needs of the user:

A user Tom has been assigned a course on compliance which he last completed less than 12 months ago. The business permits Tom to do a mandatory subset of the course when he is within the statutory period if he can achieve a 70% passmark in a refresh assessment. As a part of the course he must complete section 2 on fire procedures and if he is a first aider (which Tom is) he must also complete section 6 on emergency evacuation procedures.

The course begins by welcoming Tom back to the course and providing the option to

- enter the full course (anticipated learning time: 2hrs), or
- enter the refresher course (anticipated learning time: 20-30mins).

Tom selects the refresher course, which begins with an evaluation exercise (a 30 question assessment). It has been configured to show feedback at the end of the assessment only and Tom must reach the passing score or do the full course. If Tom does not pass, the navigational object will then notify the user and enter the full course. However if the navigational object receives a passing score from the assessment the refresher course (consisting of 4 SCOs) is presented instead of the full course (9 SCOs).

For our example, assume that Tom did reach the pass mark, but the assessment identified a below-average score in 2 areas. This means that the navigational object can also suggest that he study refresher SCOs (or review off-line materials) to improve these areas.

Once Tom has completed the refresher course a further assessment within a SCO enables the user to be certified as meeting the companies' standard. In addition the 4 compulsory SCOs have each recorded their scores within the LMS.

In addition the LMS has been updated to support the new navigation object and has recorded the sequence of SCOs the user completed, each SCO's score and the total_course_time variable as 28:00 minutes. This total course time allows the organisation to assess time savings through the navigation approach, and helps to make future investment decisions.

The evaluation within the navigational object is capable of assessing an individual learner and providing detailed feedback to the learner and the LMS. In addition it provides a mechanism for identifying the specific SCOs required to meet that individuals needs. To communicate this complex format and record this within the LMS we recommend the use of json.

This mechanism provides a content author with the capability to compose a learning activity best suited to the needs of the individual which can be scaled as necessary. By placing the functionality within the navigational object the development and testing process are minimised, and the burden upon the LMS is minimal providing the greatest opportunity for reuse across LMS vendors without additional work.

4.2. Profile Content Object

A navigational object has one responsibility; to orchestrate the learning activity based on a number of rules. However the discussion to this point has also included the task of collecting the user data to evaluate the rules. This coupling of separate concerns could be problematic, in that it does not allow for reuse of assessment separate from navigation, and we therefore propose the profile content object (PCO).

The profile content object allows evaluation or other data capture to be separated from the navigational object (business rules). However this will not always be necessary so the content author may choose to not include a PCO.

Where there is a navigational object in a content aggregation there can be 0 or 1 profile content objects. It is left to the needs of the learning activity author to determine the interface and method of evaluation presented by the PCO. Examples are a pre-assessment, or the user selecting their job role.

The outcome of the exercise can be communicated to the navigational object with the score and outcomes of each aspect as the content author requires. This would might include details like the following:

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section1:not required
section2:not required
section3:not required
section4:required
section5:optional
section6:optional
section7:not required
section8:required
section9:optional
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This format could be transferred to the navigational object using (for example) the json[1] format and permits the content author to separate the evaluation from the learning activity sequencing rules, whilst permitting the exchange of a complex data structure.

4.3. Definition of a navigation object

We propose that the imsmanifest file is extended to provide the capability of supporting the navigational object. It would include the following additional elements:

Element	Explanation
Navigational element	A container element for all aspects of the navigational object specification
Profile content elements	A container element for all aspects of the profile content object

The navigational element container is expected to define the navigational object as the entry point to the learning activity. It will also define all the SCOs which define the learning activity. We propose that the existing aspects of the content aggregation model remain unaffected.

The profile content element is expected to define the profile content object as an evaluation exercise.

We anticipate that there is a range of useful fields which could be included within these containers and leave this for further discussion to define.

5. Summary

This paper has introduced an approach to provide content producers the capability to create compelling learning activities without undue overhead on the content author or the LMS vendor. It has provided real world experience and consideration of the ways in which clients wish to use and consume elearning today. With this in mind the solution is intended to extend the current capabilities with additional flexibility and improve the ability to tailor the learning to the needs of the learner.

6. LINE Communications

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[1] See http://json.org/