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xAPI What it is and the benefits it brings to the learning environment

An introduction to xAPI, how it relates to SCORM, CMI5 and the wider L&D landscape

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In this white paper we will look at the differences between SCORM and xAPI, how they are used, and the benefits that xAPI can bring to the L&D environment. To support this we will look at where both SCORM and xAPI have come from, what the issues have been in the past and how cmi5 now fits into the landscape enabling further functionality.

Brief History

For most people within the Learning and Development world the acronym SCORM is well known. Created in 1999 by a division of the US Department of Defense, the Shareable Content Object Reference Model was a robust and reusable package for the delivery of information that, later, easily integrated into an LMS. It also provided a technical standard that all could use to ensure compatibility and interoperability.

At present it is highly likely that the majority, if not all, of your learning content is in some way wrapped using SCORM to help deliver it to your users. Through this you will be able to report on which users have completed training, passed tests or taken assessments. But what if you wanted to know more than the general results? This is where xAPI has been developed to help provide a wider view.

xAPI was created by Rustici at the request of the ADL (Advanced Distribution Learning), who are the owners of SCORM, and in 2010 they wanted to push the product by creating the next generation without it being a simple update. Rustici won the application and so the Tin Can project was born later to be developed into, and named, xAPI (as well as also being known as Experience API). The result was that from more than a decade of using SCORM and the combined experience, ideas and problems solved, xAPI is able to deliver information across a wider range of device types, both on and offline, as well as a deeper level of information to report on. xAPI was released for use in 2013 and has been used since for the creation and delivery of content.

What makes xAPI different to SCORM?

On many levels there are similarities between SCORM and xAPI. For one they both facilitate learning and the supply of learning outcomes for reporting. On this basis there is very little difference until you look at what data is provided by each of them. In very general terms SCORM will be able to tell you that a user has passed a test, xAPI will also tell you how they passed and what they did.

To give a basic example of this:

James (the user) has started a course as part of his Health and Safety Training at his company. The training has a short piece of content, followed by a video to watch and finishing with a test comprising of 10 questions

SCORM

James has launched the Health and Safety Course
James has completed the Health and Safety test.
He completed it at 13:00 on 21/06/17
He passed with a pass mark of 80%

xAPI

James initialised the Health and Safety Course
James launched the Health and Safety Course

James launched the content section
James completed the content section

James launched the Video
James abandoned the Video
James launched the Health and Safety test
James launched question x (each question can record a pass/fail reference)
James completed the Health and Safety test.
He completed it at 13:00 on 21/06/17
He passed with a pass mark of 80%
James has terminated the Health and Safety course

(Please note there are other steps involved but for demonstration purposes this has been abbreviated)

In the instance where a SCORM package is used an administrator can see that James has completed and passed the course. Using xAPI, anyone reviewing the course and James' performance will be able to see how well he has done, what actions he has taken and, when compared to the other learners, if there are any trends in any particular questions or sections passed this will become more evident. This may not seem an important example but being able to examine the effectiveness of a course or piece of learning down to the individual question level can provide valuable insight to learning and its delivery. If all of your candidates are failing the same question is it worded poorly? Or is the learning not specific enough to present the required information well enough? What if you had a large proportion of your user base passing a course with 80% (after a mandatory pass rate of 75% had been set) but the missing 20% was the most critical and they were deficient in this key area as a result? How could that impact your business?

This in turn can be used to demonstrate the effectiveness of the course or training and be able to support the team when asked to show ROI on L&D investment.

SCORM sends back a short succinct message to the LMS that it is contained within to provide the ability for an administrator to report on. xAPI will also send back this information but with a lot of supplementary information as well and uses a defined format known as a statement. For all information delivered by xAPI a statement in the form of "Noun – Verb – Object" is created. In the simplest form "I Did This". In the above example this can be seen in all lines James (Noun) launched (Verb) the Video (Object).

The standard statement format that xAPI uses it means that it has the ability to record any learning activity and make it part of the users learning record. This open statement structure then also allows input from all different types of learning so it is not restricted by location, internet accessibility, device or learning type, while SCORM is restricted to an online connected platform.

Another similarity between SCORM and xAPI is the use of a Learning Record Store (LRS) when transmitting information back from a learning object. Both of them use an LRS as a repository of data which can be interrogated for reporting functionality. However, the nature in how and what they both communicate differentiates them.

With SCORM's single statement reporting is simple and easy. It is also limited in the amount of information it can deliver. xAPI also delivers information but the statement structure it uses provides some extra benefits. The volume of statements sent to the LRS allow for a greater range of reporting to be made. The reports can also look deeper into the learning activity as a result. Statements delivered by xAPI can come from any learning experience whereas SCORM is reliant upon the use of

the LMS it is imbedded within. Finally, the statements that xAPI use are uniform in their design when sent to the LRS. The benefit of this is that it means data sent via the xAPI to an LRS can (in theory) be set to ANY LRS. The data can also be shared to any other LRS. This is a massive advantage between the two systems as it means that using xAPI individual users' learning records can now be shared and move with the user as well. It will also be the culmination of all of the users' learning experiences not just the LMS controlled aspects.

Does xAPI solve everything then?

There is an inherent weakness in the flexibility the xAPI creates. Firstly, due to the wide scope of sources that learning experiences can come from via xAPI there is a requirement for users to be strict in their sending of data. It is very easy to leave out a result or learning experience which does not have a favourable or perceived high enough score thus skewing a training records overall profile. The other possible flaw is within the statement that xAPI sends. Within the NOUN – VERB – OBJECT structure the noun will always be the actor or user doing a specified thing (object). In the case of the verb the open nature of xAPI can work against itself. The language used for the verb in a statement can be as diverse as the task itself and this diversity creates the weakness within the system. For example James finishes a course and the xAPI records the result. Depending on who has designed and created the course the statement that is sent to the LRS for a completion could be:

James has **completed** the course

James has **finished** the course

James has **fulfilled** the course

James has **ended** the course

James has **concluded** the course

In all of the five examples the NOUN – VERB – OBJECT structure is satisfied but the verb varies greatly. This means that when the LRS is asked to report on the course results it will miss all of the results which do not conform to what it is specifically looking for. If the report is designed to give information on completed courses then 80% of the above statements would be ignored even though all of them are also correct. With SCORM's straight forward approach the reporting does not suffer from this ambiguity.

The solution for this weakness is a uniform and defined reporting language, which is where the term cmi5 may have been heard. As a user it is unlikely that cmi5 will mean much and to many administrators it may also have little impact but it is a buzzword that has been heard a lot when talking about xAPI as well so worth looking at for information.

The introduction of cmi5

Discussing it at a general user facing level, cmi5 (computer managed instruction) is a protocol or framework that sits over xAPI without any restriction or active prohibitions placed on it. It is probably easiest to think of it as a set of rules to standardise the communication that xAPI uses when working. The rules set out what verbs to use in the standard statement format. A bit like Esperanto for businesses except it works, is useful and is being adopted and actually used!

Without being overly complicated cmi5 uses the following nine verbs:

Launched – An LMS has started a learning object (used in conjunction with **Initialised**).

Initialized – A learning object has been fully started and is ready to go.

Completed – A learning object has been finished with all relevant sections viewed/used.

Passed – A learning object has been attempted and the pass criteria has been met.

Failed – A learning object has been attempted and the fail criteria has been met.

Satisfied – The criteria required for progression to the next section has been met.

Waived – The learning object or section may be skipped by the user (this is also reliant upon the design of the course structure built with cmi5).

Terminated – This is the last recorded statement for a learning object denoting its closure.

Abandoned – If a learning object is not closed with a **Terminated** statement then the system monitors for any other statements. If it sees other statements from different learning objects then the conclusion that this learning object has been **Abandoned** and is recorded as such. (This can also cover any learning object that has an abnormal termination as well)

The nine verbs that cmi5 utilises creates a consistency that xAPI can use and allows for the use of either to continue in the future without L&D teams having to rush out and get new xAPI content to future proof their systems against redundancy. By creating a universal tongue both SCORM and xAPI can continue to be incorporated into learning material providing a solution that is fitting for the requirements of the businesses purchasing or creating them. This does not preclude the eventual phasing out of SCORM or another new package being created in the future either.

cmi5 is also the magic ingredient that allows for the offline learning and content sharing discussed earlier. SCORM was originally designed to have a level of portability built in but due to having too much scope (to be misunderstood) it has become notoriously hard to make use of this function. cmi5's simple approach addresses this and solves the issue.

It has further expanded usage such as the recording of audio, images, pdf's or video files (for example) which positions it well with the developing growth of more experiential learning of VR and AR training or gamified learning. All of this supports the next generation of API and the deliverables they can provide.

The additional bonus of *how* cmi5 handles courses and content adds even more potential. Whereas with SCORM, content is hosted within an LMS alongside the course structure but cmi5 makes a separation. Only the course structure is imported for a user and the course content is then accessed on an individual basis. By removing this element from the host LMS, content can then be stored and accessed in different and even multiple locations on several servers giving a smoother, quicker user experience as opposed to longer load times that could be incurred accessing one central location. A secondary feature of this course and content handling is the removal of the dreaded pop-up window. SCORM will always look to open a new window for the user which creates all sorts of problems with pop-up blockers and mobile functionality. By addressing this early on in the development of cmi5 this issue has been solved and courses launch in the active window neatly sidestepping the old issue. I am sure that L&D teams will be happy to see that has now changed!

What does this mean from a user or L&D Manager perspective?

For the user it all means very little, with the exception of the amount of material available to them for use. If the learning pathway they are on exclusively uses material combined with SCORM then they will still be using an LMS. If the learning material utilises xAPI (and cmi5 as a partner) then the accessibility of material opens up a lot more giving a greater number of options for different learning methods. A user may not notice or be aware of this difference but from an L&D Manager's point of view it does mean that the ability to supply training and learning across a broader scope gives them the diversity that their user base needs. The increased level of information being delivered to the LRS also allows for deeper reporting on a larger number of aspects as well. This means that the effectiveness and efficiency of training can be made more tangible to the business enabling a more substantial answer when asked about the return on investment it provides. With a greater amount of information at their disposal, and a simple language it is all delivered in, L&D professionals are now in a more favourable position. Gone are the days when a report will simply develop an image of the user base and their pass/fail rate. Now you can see which users have spent the most or least time watching, reading or interacting with each piece of learning material. The impact of each item can be analysed and the model of perfect learner can be created. From a cost perspective, if you know that your user base spends more time watching videos to completion, or a higher percentage of completion, as opposed to reading an article your L&D team can shape the spending and material development into an ideal offering to captivate learners and decrease wasted funds on material that is infrequently watched or rarely completed. Other trends such as best studying times can be mapped for enhanced work/study balance in the office as another example which can aid productivity or at least restrict any drop in it further enhancing the implicit value of education.

What it doesn't mean though is that L&D teams have to immediately start changing the material they use or have new material made for them. As we are in a period of time where SCORM is still widely used and xAPI is on the increase, businesses have the option to choose which package is the more appropriate to their usage, requirement and budget or could mix and match to fulfil needs. Eventually it is likely that SCORM will decline and then be phased out but there is still time before this happens.

Additionally, it doesn't mean that you have to go and alter the LMS you are using. Software solution providers, like Enterprise Study*, should have within their platform an LRS in place and the capability to host and receive information from xAPI to support their customers' needs. Free format reporting will also enhance this experience further and the continuing development in systems and apps continues to add more.

Conclusion

The prevailing use of SCORM as a method to run learning material on an LMS is still a good option for a business to use, but it does have limitations which are now being addressed by xAPI. Both are good alternatives for each other at present but this decision is driven by the requirements and budgets of the business that is looking to use them as part of their learning experience for their users. For companies wanting to invest more and take advantage of new learning methods and options the accessibility that xAPI provides will support this now and well into the future.

The introduction of xAPI (combined with the use of cmi5) allows for a greater flexibility in the learning landscape but also needs the investment on the development side of things for greater inclusion. You must also consider that authoring tools are still playing catch up with cmi5 so there

are few places that currently support development in this way but in time the number will also grow. The secondary effect of this is that there is bound to be some teething problems for those taking on the task.

SCORM isn't going away just yet and will fill a need but in the future xAPI will be taking off. The next steps are now going to be influenced by businesses and their own development plans.

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