

Necessary Conditions for the Flexible Reuse of Educational Content

Peter B. Sloep

Open University of the Netherlands, Netherlands
peter.sloep@ou.nl

Abstract

This paper discusses two conditions for a reusable learning object economy to become established. The first condition is a familiar one, it uses information objects that are described through metadata. The second condition is new, it builds on the information objects, but in addition to this calls for the use of an educational modelling language to generate true learning objects. The paper claims that, contrary to what seems to be the consensus, both conditions and not just the first are necessary to realise flexible reuse of learning objects.

Keywords: flexible reuse of content, EML, metadata.

1 Sharing educational materials

The demand for higher education has become ever more divers over the last few decades. For several hundreds of years there has been a demand for initial higher education for adolescents. Since roughly the sixties of the previous century, we've grown accustomed to the fact that there is a demand by adults for degree track higher education. The advent of the knowledge economy has brought us a new phenomenon, which goes by such names as further education, continuous education, life long learning, etc. [5] In virtue of the initial education's orientation on academic curricula with fixed degree programmes, its programmes are rather homogeneous and teacher led. This contrasts strongly with the needs that further education has. It wants personalised arrangements that are offered in a setting of the student's own choice. In some cases this may be face to face teaching, in others distance teaching; some students may prefer to be treated individually only, others might rather work in groups; and some students may want to indulge in problem based, case based, or simulation based forms of learning, yet others may simply want to be told what there is to know. And obviously all these preferences mix happily. So the question is how we may best meet the modern, further education seeking student's needs while still keeping it affordable. For customised learning may strike us as the best solution, it comes at a price. E-learning - that is the use of networked computers in support of education - has often been greeted as the solution to this problem. Particularly the flexible reuse of educational materials ('content') is a cornerstone to this argument. Supposedly e-learning lowers the cost to such an extent that the modern, further education seeking student's needs and wishes may be met. One may question this line of reasoning. However, since here I have an other axe to grind, for the sake of argument I will assume its validity. More specifically, I will assume that the flexible reuse of content does actually help increase the quality of educational materials while at the same time

lowering or at least not increasing their development costs [4]. If flexible reuse of educational content is a viable option, that is. This is the question I will address in this short paper.

I shall discuss two different conditions for flexible reuse. The first corresponds to an information technological tack. It holds that flexible reuse can only come off the ground if an adequate technical infrastructure, in terms of hardware, software and standards, is in place. The second refers to an educational technological angle, which in my view thus far has been wanting in most discussions on the flexible reuse of educational content. This paper may be seen as an attempt to redress the balance.

2 The information technological angle

Central to this perspective is the view that educational content consists of various kinds of computer files that an instructional designer deploys as he or she seems fit: text files, graphics files, video and audio files, etc. These files typically are accessed by a managed learning environment¹ (MLE) and served by it to students in order to create actual educational experiences. If everybody were to store its files in a simple, local file structure these files can hardly be reused by other systems or adapted by other designers. Local storage prevents access by non-local systems, the simple file structure prevents the files from being found for anything but the smallest content collections. And of course, the benefits from flexible reuse become the more apparent, the larger the collection. For this reason currently so called digital repositories² are being established. They may be best described as databases for educational materials. To add to their discoverability the files in the database are described with the aid of metadata. To this aim, over the last five years a collaborative project of a number of international parties has put together the learning object metadata specification, LOM for short, which at the time of this writing is about to become an international standard. The LOM allows one to describe such items as the title, language, copyrights and author, but also educational variables like difficulty, typical learning time and typical age range. Software is also being developed to ease the filling out of the various LOM fields and to upload the files to the digital repository. Preferably, files aren't uploaded as plain files but in the form of so called content packages. A content package contains not only the files' metadata descriptions, but also a description of the way the files in the package cohere ('organization'). The IMS consortium³ has put together a specification that details what content packages should look like.

Since computer files that contain educational materials only differ in their content from computer files *per se* - i.e. on the

inside, not on the outside - from a purely information technological point of view e-learning doesn't pose any unfamiliar challenges. Sure, the details have to be worked out. Adequate software tools (repositories, metadata descriptors, content packagers, managed learning environment) that suit the demands of the educational establishment have to be created; and the standards that these tools employ (such as content packaging and learning object metadata) have to be worked out and agreed upon. But this is a matter of time, not of technological innovation. To give one example, since the information technological approach pivots on swapping files, it does not make highly specific demands on the MLEs that have to serve up these files. Present generation MLEs almost without exception use browser technologies on the client side and employ the help of standard plug ins to render non-html file formats (rtf, ppt, flash, etc.). Nothing of a specific educational nature then. From an educational point of view the information technological approach to the reuse of educational materials is one of changing a book or paper based economy into a computer and internet based economy. The changes may be big and sometimes even hard to swallow for the educational establishment, they certainly aren't revolutionary⁴.

So the principles of file based flexible reuse of content seem to be firmly in place. *Interoperability* of software systems – the term that is used to describe the ability of software systems to exchange content – which for obvious reasons is needed for the flexible reuse of content to come true, seems to be at arm's length. Or is it? The interoperability of software systems may be a necessary condition for the reuse of content, but is it also a sufficient one?

3 An education technological approach

The world is currently in the middle of the implementation of what I've just dubbed the information technological approach to the flexible reuse of content. So any judgement on its merits can only be provisional. The signs aren't good, though. Admittedly, the empirical evidence I have is far from solid. In part, it is based on an inspection of available repositories. For another part it derives from similar impressions communicated to me by others. Responsible for this sorry is the fact that to my knowledge little to no systematic research into actual reuse has been conducted. And how could it, in light of the fact that the entire approach is new and implementation projects have just been started⁵. And yet I do believe that the present approach to reuse is too meagre, that is, focuses too much on the information technological and too little on the educational aspects. To my mind, the crucial fallacy is that content items are being taken as the start and end point, and that one believes their metadata descriptions to be sufficient for or at least highly conducive to the creation of full-fledged educational experiences.

Content viewed this way consists of mere chunks of information used in an educationally informed setting. There is nothing that characterises them as educational objects *per se*. In line with others, I will call such chunks of content *information objects*⁶. From an educational point of view such

objects are neutral, they could have been used for any purpose beside education. They only acquire educational significance once they are hooked up in an educational context. This context is absent in digital repositories but for the metadata description, which provides suggestions for how they might be used. An educational approach would examine full-fledged educational experiences and investigate what are its ingredients. One then does find resources, such as books, collections of hyperlinks, videos and audio; that is, the information objects just mentioned. But in addition to this, educationally relevant categories will be discerned, such as various *learning activities* that are carried out by the students; *support activities* that teachers and tutors may engage in; *roles*, if students turn out to learn collaboratively, as a group rather than on their own. Most importantly, analysis will reveal the existence of a *didactic scenario* that details in what order and with what leeway the various activities are carried out by the people (staff and students) in their various roles. These then are the ingredients of what may be called genuine *learning objects*.

Metadata descriptions in conjunction with information objects thus aren't rich enough to describe full-fledged educational experiences, if only because they cannot capture their dynamics adequately. This can only be achieved in learning objects. How does one describe these adequately? Through the use of a sufficiently rich educational modelling language. Such a language not only should allow one to label the precise educational function that chunks of content have, it also should contain the tools to generate activities and roles and detail didactic scenarios[2]. Such languages have been around for a short while, they are currently the object of research of the IMS workgroup⁷ and the Workshop Learning Technologies⁸ in CEN/ISSS. The consensus seems to be in either forum that there is really only one modelling language that is sufficiently rich: EML⁹. Its vocabulary allows one to connect activities with the resources needed to carry out the activities; to describe specific roles of both students and staff; to keep tabs of their status while engaging in learning experiences. But most importantly, one may detail elaborate (or simple, as the case may be) didactic scenarios in which activities, environments and roles are coherently described with ample opportunities for run-time variations in the scenarios.

So with EML one may separate resources – the files in the information technological approach – from their didactic matrix. Crucially, one may edit the didactic matrix in isolation of the resource files. This means that not only resources are reusable, so are the didactics. Also, not only the resource files can be edited relatively easily, so can the didactic scenario. Obviously there are limits to the extent to which one may repurpose a particular didactic scenario. Or rather, a radically different implementation - say switching from a class based, cohort based course to a distance taught course that employs collaborative learning - requires more work than a marginal adjustment –say from a synchronously, teacher led face to face course to an asynchronously, teacher led distance mode course. But in this respect the repurposing of resource materials fares little differently.

The upshot is that now, for the first time, reusability has been extended to cover not only resource materials but also didactic scenarios. This is a big step forward. Another benefit is that stored resources now not only can be retrieved through their metadata descriptions but also through the actual educational experiences that they are a part of. This way, repositories do not become odd collections of chunks of content that, at best, someone has quite successfully used in some irreproducible way, at worst, the author wasn't determinate enough to throw away. Repositories now only contain resources that have actually been used *with their context of use*. So one may in fact inspect how they have been used. Obviously, this does not imply a commitment to reuse them in the same way. Rather, much like textbooks, one may become inspired by them and employ them however one sees fit¹⁰. There is one big difference though. A textbook contains an explicit pedagogy that cannot be changed easily. One may skip paragraphs or even chapters, the pedagogy stays in place. Through the use of EMLs, for the first time one may alter the pedagogy without necessarily altering the content. This is a genuine educational innovation and a substantial contribution to the flexible reuse of learning materials.

4 Conclusion

So the information technological and the education technological approaches both have something valuable to offer to the flexible reuse of learning materials. It should be clear by now that I believe, in contrast with the current consensus that both ingredients are necessary for actual reuse to happen. Obviously, this means that we have an even longer way to go to the wide-scale implementation of a reusable object economy. Current MLEs cannot make use of EML objects. They may have no trouble reading the resource files, but they cannot render the scenario instructions as they have no way of interpreting the instructions. Rather than look upon this as a drawback, I suggest to view as a benefit. As argued, the information technological approach has little to offer in the way of innovative educational practices, if it is able to pull off actual reuse of educational materials at all. But if we manage to embed reusable resources in reusable scenarios, then we probably stand a good chance of creating a flourishing learning object economy. Actually, I'm not even sure that the combined information technological and education technological approach suffice, as I have entirely left out the organisational aspects of such an economy. If developers are already reluctant to provide metadata descriptions, how will persuade them to share entire learning objects? But that is a matter to be left for another occasion.

References

- [1] D. Kohn. "Steal This Essay" *Tidbits* **602, 603, 605, 610**, (2001). Online publication <<http://db.tidbits.com/getbits.acgi?bart=06669>>.
- [2] R. Koper. *From Change to Renewal: Educational Technology Foundations of Electronic Learning Environments*. Open Universiteit Nederland, (2000).
- [3] P. Scholtz. "Transaction Costs and the Social Cost of Online Privacy", *First Monday* May 2001, (2001). Online publication: <http://firstmonday.org/issues/issue6_5/sholtz/>.

- [4] P.B. Sloep, K.Schlusmans. "Op weg naar een Digitale Universiteit: Nieuwe uitdagingen voor het onderwijs, nieuwe vormen van onderwijs". ["Towards a Digital University: New Challenges for Education, New Forms of Education"] *Th&ma, tijdschrift voor Hoger onderwijs & Management* **4**, pp. 15 – 21, (2001).
- [5] W.Westera, P.B. Sloep. "The Future of Education in Cyberspace". In: Larry R. Vandervert & Larisa V. Shavinina (eds) *Provocative and Do-Able Futures for CyberEducation: Leadership for the Cutting Edge*. Mary Ann Liebert Publishers, (2001).
- [6] W. Wieseler. "RIO: A Standards-based Approach for Reusable Information Objects". *Cisco Systems White Paper*, San Jose, (1999). Online publication <<http://www.cisco.com/warp/public/779/ibs/solutions/publishing/whitepapers/>>.
- [7] D.A.Wiley. "Connecting Learning Objects to Instructional Design Theory: A Definition, a Metaphor, and a Taxonomy". In: D.A.Wiley (ed.) *The Instructional Use of Learning Objects*, pp. 1-28. Agency for Instructional Technology, Bloomington, (2002).

¹ Terminology varies widely. I follow here the term that the British Centre for Educational Technology Interoperability Standardisation <<http://www.cetis.ac.uk>> seems to favour. An often used alternative is 'learning management system'. Whatever the term may be, MLEs minimally provide students with learning experiences, although they often also contain all sorts of information portal-like information..

² Examples of three better known open repositories are Merlot <<http://www.merlot.org>>, the Scottish electronic, Staff Development Library SeSDL <<http://www.sesdl.scotcit.ac.uk>> and the Universal Brokerage Platform for Learning Resources <<http://www.ist-universal.org/>>.

³ The IMS consortium <<http://www.imsproject.org>> was founded by Educause and draws its membership from universities, vendors of learning software, publishers, etc.

⁴ There may be one important exception to this: copyrights and licensing. The music and film industries have experienced how difficult it is to stick to the old licensing scheme's for digital media. No doubt, the book publishing model does not fit an economy that is to thrive on the flexible reuse of learning content either. This issue, however, seems to stem from the use of electronic media *tout court* and is not specific to the educational context. See for an interesting angle on this problem [1, 3].

⁵ Examples are the Dutch Digital University <<http://www.digiuni.nl>>, the Finnish Virtual University. <<http://www.virtuaaliyliopisto.fi/index.php?language=eng>>.

⁶ The term is for instance also used in a Cisco white paper, in which Cisco describes its strategy with respect to the reuse of learning materials. See [6] but also [7].

⁷ The IMS consortium is not particularly forthcoming about works in progress. According to the IMS site at <<http://www.imsproject.org>>, the Learning Design Team has produced a scope document, detailing the work to be done. This document has been approved by the Technical Board over the summer of 2001, and the team now works on a base document, that should contain a first specification. According to the IMS's standing procedures, this document is to be expected some 6 month after the approval of the scope document.

⁸ In contrast to IMS, the CEN/ISSS workshop Learning Technology is much more open about its proceedings. The progress of the EMLs' group can be found at their website at <<http://www.cenorm.be/iss/workshop/lt/>>.

⁹ EML – Educational Modelling Language - has been developed by the Open University of the Netherlands. The DTD plus reference manual and several documents describing its philosophy and rationale may be accessed at <<http://eml.ou.nl/>>.

¹⁰ Provided copyright and licensing issues have been solved satisfactorily; see also note 4.