

A Dutch Repository for Open Educational Resources in Software Engineering: Does Downes' Description Fit?

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Abstract: *In 2007, Stephen Downes described three models for Open Educational Resources in his article entitled "Models for Sustainable Open Educational Resources". The models describe the issues that are relevant to institutions which want to develop a repository with Open Educational Resources (OER). Two years later, the new Dutch organisation "Network for Open Education in Software Engineering" (NOH-I) decided to start a programme to develop a repository in which all the newly developed learning materials could be made freely available. In this article I will describe this programme and compare it to Downes' models. The questions I have tried to answer are:*

1. *Is Downes' article a valid description of the relevant issues compared to a practical casus?*
2. *What decisions did the NOH-I make on the relevant issues?*

It can be concluded that Downes' models are really important to the development and existence of the repository. An important issue for the NOH-I repository that was not described by Downes is that of the metadata model. NOH-I put a lot of effort into creating a model that complies with international standards and fits the characteristics of their learning objects.

Keywords: *Open educational resources, repository, metadata, OER*

Introduction

In 2007, Stephen Downes (2007) described three models for Open Educational Resources in his article entitled "Models for Sustainable Open Educational Resources". The models describe the issues that are relevant to institutions who want to develop a repository with Open Educational Resources (OER). Two years later, the new Dutch organisation "Network for Open Education in Software Engineering" (NOH-I) decided to start a programme to develop a repository in which all the newly developed learning materials could be made freely available for all Dutch institutions with higher education in software engineering. In this article I will describe this programme and compare it to Downes' models. The questions I will try to answer are:

1. Is Downes' article a valid description of the relevant issues compared to a practical casus?
2. What decisions did the NOH-I make on the relevant issues?

I will start with a description of what OER really is. The William and Flora Hewlett Foundation describes them as: "teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others" (Atkins, Brown, & Hammond, 2007, p. 4). Johnstone (2005, p. 1) states that the resources include:

- Learning resources – courseware, content modules, learning objects, learner support and assessment tools, online learning communities.
- Resources to support teachers – tools for teachers and support materials to enable them to create, adapt and use OER, as well as training materials for teachers and other teaching tools.

One of the first and best known repositories with OER is the OpenCourseWare repository of the Massachusetts Institute of Technology (MIT) in Boston. It was announced in 2001 and launched in 2006. Caswell et al. (2008) state that OpenCourseWare supports advanced teaching models such as distance learning and blended learning. OpenCourseWare is an expression of OER, but not quite the same. According to the OpenCourseWare Consortium (OCW, 2011), OCW only includes high quality college and university-level educational materials. The standards for OCW are high, those for OER are not. Materials for lower education or with moderate quality can be presented as OER. An example of a repository with OER that is not OCW is Youtube.com/edu. However, the MIT repository is often mentioned as the standard for repositories with OER.

The distinction between OCW and OER is illustrated by the first question Downes raises in his article: What resources? In correspondence with the statement by Johnstone (2005), NOH-I decided that learning resources as well as the resources to support teachers should be placed in the repository. These include textbooks, presentations, tasks,

images, software tools, etc. Every learning object that is developed for NOH-I courses will be uploaded to the repository. This guarantees a certain quality: only that which is good enough for use in NOH-I will be uploaded. Because these materials are used on a regular basis in NOH-I courses, they will be constantly updated and improved according to the experiences of the teachers.

In addition to objects that are developed by the teachers, high quality student products can also be labeled as OER, when they are a good illustration of how a certain assignment should be done. This is to be decided by the teachers.

A second group of contributors is the wide community of Dutch teachers in software engineering. They are invited to contribute to the repository by sharing their own material. For the materials that are uploaded by these users, an alternative way of quality control has to be organised which I will discuss later in this paper.

In his article, Downes' second question is: 'What is 'Open'? On this issue, Downes cites Daniel (2006, p.20), who states: "the four A's: accessible, appropriate, accredited and affordable". The NOH-I repository is freely available by means of a website and it is free of charge to use material and to contribute by uploading material.

A crucial, and often difficult, issue in this matter is that of the copyrights. 'Open' is not the same as 'Without limitations'. Most institutions want to prevent publishers from using OER for commercial purposes. The Creative Commons license model provides several possibilities to prevent abuse of materials that are freely available. The NOH-I studied the model and its possibilities and decided to apply the CC-BY-SA model, in which BY stands for the obligation to the user to mention the creator of the learning object. SA stands for 'Share alike', which means that others are free to use the objects to create derivative works, even by a commercial party, as long as they share the materials under the same conditions (Creative Commons, 2011).

This model is in line with the terms formulated by Foote (2005):

- Freedom to copy,
- Freedom to modify,
- Freedom to redistribute,
- Freedom to redistribute modified versions.

Sustainability and Funding Models

The development of an OER-repository is often organised as a project and financed on a temporary basis. Downes states that when the repository has been developed, there should be a funding model that guarantees a long existence of the repository. Our activities to develop the NOH-I repository are also being temporarily financed by a special fund. The Dutch investment programme "Nation Action Plan E-learning" (NAP) is financing all the activities until the summer of 2012.

In the long term, all the costs for the hosting, management and quality control of the repository will be paid for by the NOH-I itself. As the NOH-I is a new initiative of which success is not guaranteed, the developers are searching for solutions in case NOH-I should end its activities due to an insufficient number of students.

Technical Models

Downes states that technical matters are important aspects in sustainability. This is of course true; however, when the development team of the NOH-I repository started its activities, it had to take more matters into consideration than just sustainability.

The most important matters were:

- a) Selection of the database software. Criteria for the selection were: usability, sustainability, search functions, version control and the opportunity to add comments to the learning objects in the repository as part of the quality management. Besides this, the software had to be able to implement the chosen model for metadata.
- b) Model for metadata.

Selection of the database software: After formulating the requirements, the development team did not start the selection procedure immediately.. First a pilot was started to test if the requirements were valid. For this pilot a database was created in a semantic Wiki, using the Mediawiki Software. Some members of the development team uploaded learning objects to experience important facets such as the usability and the chosen model for metadata.

In the meantime, there were some interesting developments in relation to OER-repositories in the Netherlands. The Minister of Education launched a national portal to OER-repositories in December 2008. This portal, called Wikiwijs.nl (Wikiwise), was primarily developed to provide access to existing repositories with OER for primary and

secondary education, but in the long term it can also provide access to OER repositories in Higher Education. For this reason, the NOH-I development team came into contact with the founders of Wikiwijs. It soon appeared that Wikiwijs.nl was not only a portal to external repositories but also a repository itself, prepared to host any initiative with OER.

The development team of the NOH-I repository tested the software of the Wikiwijs-repository and decided that it met all their requirements. Besides this, Wikiwijs offered to provide hosting and services free of charge until the end of 2013, thanks to the funding by the Dutch Ministry of Education. For this reason, the NOH-I development team decided not to create their own repository but to use the software and hosting that are offered by Wikiwijs. However, the business model of Wikiwijs after 2013 is uncertain. It might be possible that NOH-I will have to pay for the services by Wikiwijs in the future.

Of course this only applies to the Dutch situation but it also illustrates that it might be interesting to investigate opportunities to join an existing repository instead of spending energy and money on creating a new one.

The decision to create an environment with learning objects for higher education in Wikiwijs made technical matters a lot easier, but it did not help with the decision about the model for metadata that should be used:

Model for metadata: There are several reasons why OER need to be enriched by adding metadata. First of all, metadata is needed for appropriate management of the learning objects. Material type, creator and copyright issues are only some of the relevant metadata fields in this matter. Secondly, harvesters of OER portals need to recognise the learning objects when indexing. For this reason, it is important to apply standards for the metadata that meet the OAI-PMH, a protocol harvesters use to index open access resources (OAI-PMH, 2011).

But the most important reason for using metadata is to make the collection searchable in a way that fits the needs of the users. When searching for OER, users of a repository have the need for searching using facets; subject, level, target group, type of the object, etc. are criteria to select the objects that fit the need of the user.

Wikiwijs offers an interface with these metadata fields as selection criteria. For this it applies the national standard for metadata: NL-LOM. NL-LOM is a description of relevant metadata-fields, based on the international standard IEEE 1484, which is managed by the global learning consortium IMS (IMS, 2012).

NL-LOM (2012) contains descriptions of nine main elements, each with several sub-elements. Some of these elements are compulsory, others are optional. For some elements, such as date and language, the notation format is given. For others, the developers of a repository can choose their own format or vocabulary.

This applies in particular to the element ‘Classification’ (field no. 9 in NL-LOM). Where other elements mainly describe the formal aspects of the learning object, this element is meant to describe the topic of the object (what it is about) and the educational level.

Developers of a repository should find out if there is a standard vocabulary or classification that can be applied to this field in order to create authority lists from which users select the correct values. The development team of NOH-I encountered the fact that there was no accepted vocabulary that met their needs, so they had to develop a new vocabulary for their repository. For this, they researched the description of competences for the Bachelor of ICT in the Netherlands. This domain description has been developed by HBO-I, a cooperation of ICT programmes within Higher Professional Education in the Netherlands (HBO-I, 2009). In 2009 the description was published to help institutions to develop their curricula. Although adoption of the description is not compulsory, most institutions use this description. This stimulates uniformity of the curricula throughout the country and makes it easier to compare the educational programmes among institutions (HBO-I, 2009). The education for Library and Information Sciences is also based on this description.

The NOH-I development team decided that the description could be used as a basis to create a vocabulary for the learning objects. The description consists of three layers:

Life cycle phases. In the past, many courses on ICT were based on the life cycle phases. Different models such as the European e-Competence Framework or the framework from the ISO/IEC standard 12207 are also based on the life cycle. The phases are: Analyse, Advise, Design, Implement and Manage.

ICT architectural layers. Based on several frameworks and standards, the model describes the layers: User interaction, Business processes, Software, Infrastructure and Hardware interfacing.

Skill level and professional duties. According to the HBO-I description: The European Competence Framework states five levels of competence at the workplace and always integrates three facets in these competence levels:

- a) Autonomy: has a range from “carrying out instructions” to “making personal choices”.
- b) Behaviour: represents what is seen as the consequences of an attitude and has a range from “the capacity to apply” to “the capacity to penetrate”.

- c) Context: has a range from “structured - predictable” situations to “unpredictable – unstructured” situations.(HBO-I, 2009).

The Dutch bachelor degree at universities of applied sciences educates students to skill level 3 to 4.

The three layers of the HBO-I competence model can be visualised in a cube:

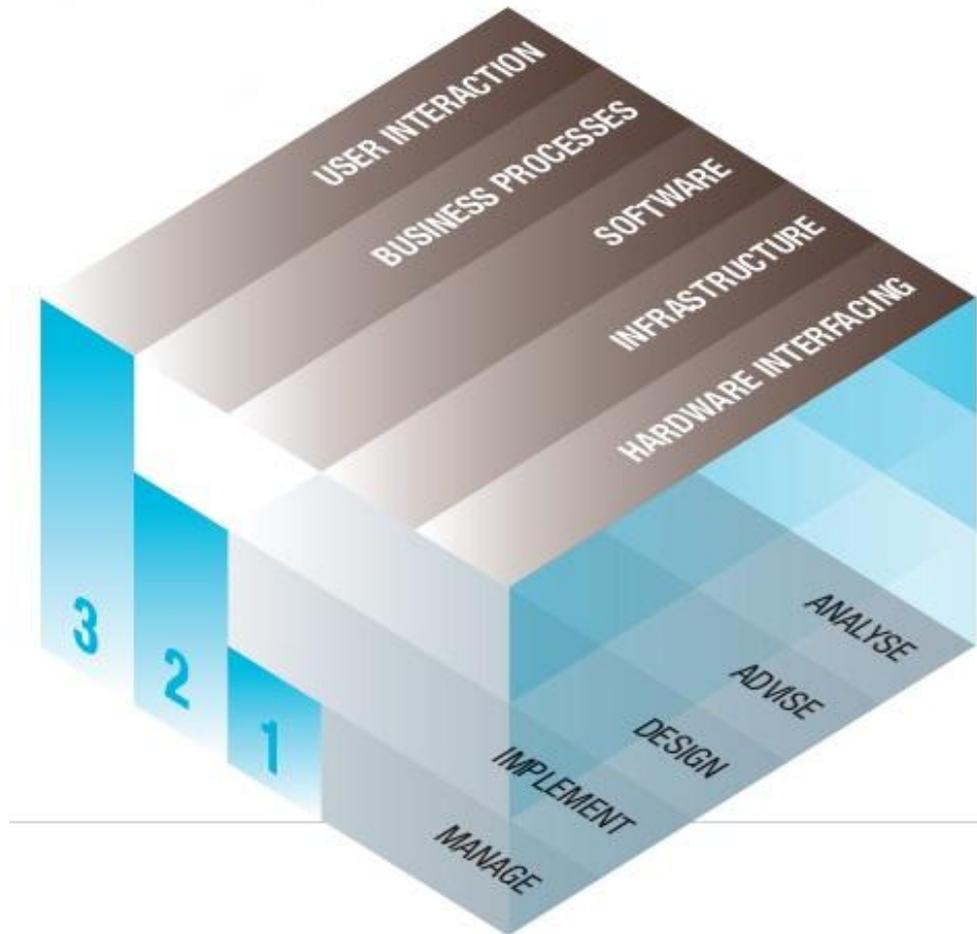


Figure 1. HBO-I competence model

Every learning object that is uploaded to the repository can have a positioning in this cube by attributing values from the three dimensions. The interface of the NOH-I repository provides three compulsory fields for the three dimensions.

The skill level (1-3) can be subject to personal view and subjectivity. In order to facilitate users' making a good estimation of the skill level of the object, the NOH-I adopted the matrix which has been developed by the ICT department of the Hague University of Applied Sciences:

Table 1. Matrix of levels

		Role		
		guided	independent	guiding
Context	easy	1	2	3
	difficult	2	3	4
	complex	3	4	5

This matrix helps teachers and students to estimate the skill level of a certain task and can also be used to attribute the level to learning objects.

In cooperation with the developers of HBO-I, the description will be accepted as a formal standard for learning objects in Dutch repositories.

Content Models

The NOH-I repository is primarily filled with learning objects created for the NOH-I courses which take place at several universities throughout the year. However, developers and teachers from other institutions in the Netherlands are invited to contribute to the repository. Downes states that all the materials should be sustainable, in the context of tantamount to reusable, which means that the materials can be adapted to local needs and conditions (or ‘glocal’) (Walker, 2005). The development team of the NOH-I repository took no action to guarantee this kind of sustainability. However, as the learning objects of NOH-I are based on the description of the HBO-I (as explained above), which is used by many institutions for their curricula, it is expected that the objects in the repository will fit into their programme of software engineering.

Another matter, not mentioned by Downes, is that of quality control. Any object that is uploaded to the NOH-I repository that has not been developed by NOH-I itself is subject to a quality check by a board of the NOH-I before it is made public. The board considers several criteria, of which the most important are:

- Reusability of the object,
- The object contains correct information,
- The object has no copyright restrictions,
- The object can be used independently.

Downes describes the different issues that matter in copyright restrictions. NOH-I maintains the rule that those who contribute to the repository must declare that all parts of the objects are free of restrictions and the objects will be presented according to the license model CC-BY-SA as described above.

Staffing Models

Sustainability is one of the main issues in Downes’ models. He justly states that good organisation of the staff managing the repository is vital to guarantee a long existence. The technical management of the NOH-I repository is in the hands of its host Wikiwijs. The content, however, including the quality check, is managed by staff members of NOH-I. These staff members are paid by NOH-I, which makes the organisation stable. Downes describes organisational and voluntary models for the growth of the content. The NOH-I repository is a combination of both. All teachers and developers of NOH-I are obliged to upload their learning objects to the repository. Users from other institutions may contribute on a voluntary basis. To stimulate these contributions, a community has been created on LinkedIn. In this community all kinds of issues concerning OER are discussed and members are stimulated to contribute to the repository.

The Way Forward

Under this heading, Downes repeats the main issues in his paper with an eye to the future. Here, sustainability plays an important role as well. In this context, he cites Wiley (2005) who asks: “What is the future of open education, where is it going?” Downes’ answer is: localization. The NOH-I repository is intended as a national repository with learning objects in Dutch. This seems to be in line with Downes’ vision. Whether this guarantees a successful repository is not certain, but the initial prospects are hopeful.

Conclusions

In this article Downes’ models are related to a practical case: the repository that has been developed by NOH-I. It can be concluded that Downes’ models are really important to the development and existence of the repository. An important issue for the NOH-I repository that has not been described by Downes is that of the metadata model. The findability and exchange options of learning objects are important factors for the success of a repository. The development team of NOH-I spent a lot of time creating an appropriate vocabulary to enable this. Most of Downes’ models are important for the sustainability of a repository. The NOH-I development team formulated answers to these topics. The future will tell us if those answers will help to make the repository a success.

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