How open source can help achieving sustainability of e-learning content: The GITTA experience

Authors

– **Robert Weibel,** University of Zurich, Department of Geography, *Switzerland*

– **Susanne Bleisch,** University of Applied Sciences Northwestern Switzerland (FHNW), Department of Infrastructure Engineering, University of Melbourne, *Australia*

– **Joël Fisler,** University of Zurich, Computing Services, *Switzerland*

Introduction

In the early 2000s, government initiatives were implemented in various countries that funded the development of e-learning content for academic programs. Common to these funding programs was the objective to promote the use of new media and information technology in teaching and learning in higher education, and the creation of synergies (and thus reduced costs) through reuse of teaching materials. Thus, typically, projects funded under these programs were required to consist of several networked partner groups. After funding had run out in the mid-2000s, however, many of the above projects quietly disappeared, or are no longer maintained, and exorbitant expectations raised in the hype over e learning in the early years had to be corrected . It is interesting to note that at the same time, there are several programs that have been existing for many years and continue to be successful. These are, however, degree-granting programs subject to tuition and not freely available.

Our hypothesis is that the failure of the government-funded projects is mainly due to two factors. First, there was typically a lack of integration into a curricular context (while the tuition-based projects are all firmly embedded

in Masters degree programs). And second, many government-funded projects were developed with the limited timeframe of the funding period in mind, and thus not built for sustainability and easy maintainability.

In this paper, we focus on the second issue, and particularly on how open source and content strategies may help in improving the longevity of e-learning projects. We will use the example of GITTA (Geographic Information Technology Training Alliance), a large, multilingual e-learning project. Among others, GITTA has spawned off eLML (eLesson Markup Language), an XML framework initially developed within GITTA, redesigned through the use in further e-learning projects and released as open source.

An overview of GITTA

GITTA is a multi-lingual project originally developed by a consortium of ten groups in several GIScience related disciplines at seven partner universities in Switzerland, and maintained by the GITTA Association since 2006. In the early years since its start in 2001, the project was funded through the Swiss Virtual Campus , a program of the Swiss federal government. The project's mission is to develop and deliver e-learning content for integration into higher education curricula in GIScience, preferably in blended learning mode [5]. In 2008, the project won the MedidaPrix, the largest award for new educational media in Europe.
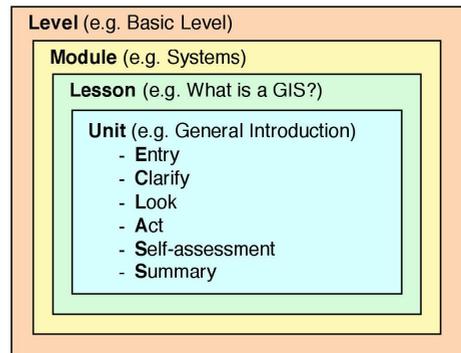
Content: GITTA covers a large scope of topics in GI science and technology. Over 40 lessons exist today, grouped into six broad thematic modules: GI Systems, Data Capture, Data Management, Spatial Modeling, Spatial Analysis, and Data Presentation. Lessons focus on conveying theoretical and technical concepts and are organized into a basic and an intermediate level, depending on the level of complexity of concepts presented. Every lesson accounts for 2-3 hours of learning time for the student.

Besides the theory lessons, 6 case studies have been created in which students are confronted with realistic sample cases. In these case studies, the practical problem solving skills of the students are trained [4]. In each case study, a description of the assignment and original data material is provided. The student is then expected to develop solutions for solving the assignment using GIS tools.

Finally, the GITTA website also provides access to 15 lessons from the CartouCHe project (an e-learning project developed by a subgroup of the GITTA project partners), specializing on multimedia cartography and location-based services .

Pedagogical approach: The pedagogical design of GITTA is modular, but ensures at the same that a common structure is used for lessons and case studies, respectively [7]. Lessons and case studies are provided as a pool of learning resources rather than a closed, static course that follows a fixed order. These resources are provided as IMS or SCORM content packages, such that they can be imported to learning management systems (LMS).

The common pedagogical structure for theory-related content is shown in Figure 1. Levels (basic, intermediate) and thematic modules, as described above, provide the coarse grained structure that embeds lessons and helps structure their use in courses. Each lesson then consists of different units, which contain learning elements that follow the ECLASS model (Entry, Clarify, Look, Act, Self-assess, Summary), an extended version of the model originally developed by [2].

Level (e.g. Basic Level)
  Module (e.g. Systems)
    Lesson (e.g. What is a GIS?)
      Unit (e.g. General Introduction)
        - **E**ntry
        - **C**larify
        - **L**ook
        - **A**ct
        - **S**elf-assessment
        - **S**ummary

FIGURE 1

Organisation of GITTA content and pedagogical structure (ECLASS model)

Languages: Owing to the multilingual background of the original GITTA Consortium, content is available in different languages. On the basic level, lessons and case studies are available in German or French and partly in English. Lessons on the intermediate level are offered in English only. Translation of all non-English lessons to English is currently under way. Further languages (particularly French and Spanish) may follow, depending on funding. The technical infrastructure of GITTA has been designed such that it can support

different language versions, and to facilitate translation to additional languages (cf. next section).

Technical framework

eLML – the eLesson Markup Language: One of GITTA's requirements was that the pedagogical model outlined above could be directly mapped to the technical infrastructure used for content development. However, when the project started in 2001 there were no formats, content standards or LMS available that could meet our needs for open standards, easy portability, and coherent structuring and presentation of content. It was then decided to base the content development on XML and subsequently, eLML was developed as a framework based on XML Schema. eLML was documented for general use and published as an open source project under the Apache License on Sourceforge.net since 2004. Since then a constantly growing number of projects and authors in Switzerland and other European countries started using eLML (e.g. a tutorial for InfoVis). Since 2006 eLML is maintained by the Computing Services of the University of Zurich and became an independent and successful open source project in the field of content creation, winning several awards. An in-depth description of eLML is given in [1]. Furthermore, the eLML website provides the complete technical documentation, downloads, and links to other projects using eLML. It also provides information about Firedocs, a WYSIWYG eLML editor implemented as Mozilla Firefox AddOn, to help content authors who are not versed in writing content in a markup language, as well as other productivity tools.

eLML and the ECLASS model [2] are intimately related. eLML implements ECLASS in XML by offering XML tags that follow the content and structure of ECLASS. Besides the known elements of the ECLASS model, eLML contains additional semantic elements such as glossary, bibliography, and metadata [1]. Hence, eLML offers all the necessary elements to develop e learning lessons such that 1) content follows a consistent form across the entire course, and 2) authors are provided with a guideline how lessons or case studies should be structured. Both conditions are absolutely crucial for content development and maintainability in large, distributed, multi-author projects such as GITTA.
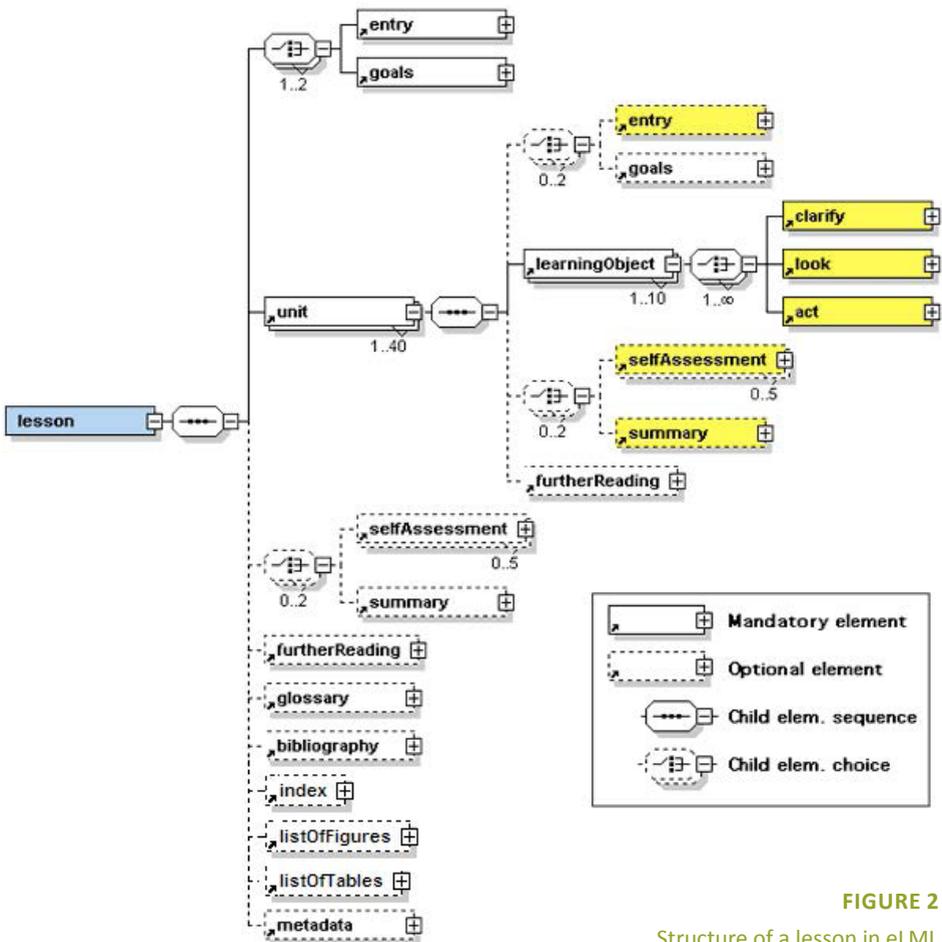
FIGURE 2
Structure of a lesson in eLML

Figure 2 shows the structure of an eLML lesson. The elements of the ECLASS model compose the structure of the eLML lesson and its units. The first structural layer of a lesson consists of an introduction (entry), the learning objectives of the lesson (goals), and the units contained in a lesson. Additionally, a lesson may contain a self-assessment section, a summary, a further reading section, glossary, bibliography, and metadata (providing descriptive information such as author, technical requirements, estimated time needed for completion, etc.).

The units of a lesson may contain an entry section, the goals, a self-assessment and a further reading section. They must contain at least one learning object (LO), composed of at least one clarify, look or act section. Additional content elements are available for micro structuring of content for presentation, such as markups for tables, lists, boxes or interactions like multimedia content or popups [1].

Lessons written in eLML (i.e. XML) must be transformed into a file format that makes it possible to display the content in commonly used web browsers or LMS. In this regard many options exist . It is also possible to create archiving formats such as IMS or SCORM content packages, for import into LMS such as Moodle, Blackboard, or OLAT. For mobile learning, mobile views of eLML lessons can be generated based on the jQuery Mobile framework . Hence, platform independence is truly achieved.

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Content management: As mentioned above, content in GITTA is not directly embedded into an LMS. Instead, it is held as a pool of lessons and case studies, each of which are offered in XML as well as derived formats. Hence, content is maintained on a content server that is running the open source Concurrent Versions System (CVS; [8]). The regular GITTA website offers a web front-end to the CVS content server, making it possible to access the latest version of individual lessons or case studies, either as XHTML or as content packages (IMS, SCORM) for integration in an LMS of choice.

Open content strategy

Originally, the GITTA consortium was planned as a closed organization, with the intention of sharing content only among the seven participating Swiss universities. Later on, the consortium agreed on adopting an open content strategy, releasing GITTA content under the 'by-nc-sa' Creative Commons license as of early 2006.

Two main reasons led to the adoption of this strategy. First, releasing materials as open educational resources (OER) made life a lot easier by simplifying legal matters between the consortium members as well as in communication with external users. Second, open content provided a major element of the strategy to achieve a long life for the materials created during the project phase. By publishing content as OER it was hoped to create a 'GITTA Community' that would use and maintain the released lessons, just like in other open source/content projects. A survey conducted among the GITTA subscribers in 2010 not only documented the worldwide usage of GITTA content but also provided valuable feedback. Among others, requests for translations to other languages were made, and new lessons or modifications of existing lessons proposed. More than forty respondents indicated that they would be willing to help with the further development of GITTA content, as translators, reviewers of existing lessons, authors of new or extended lessons, or developers of animations. This pool of potential volunteers represents a valuable resource, but managing these potential authors represents a major challenge, given the limited staff resources available in the member groups of the GITTA Association.

Conclusion

We have presented a summary of the open source and open content strategy of the e-learning project GITTA and its associated XML framework eLML. We are convinced that this approach has helped improving GITTA's sustainability, as it is one of the few non-commercial e-learning projects in GIScience that has continued to exist for many years. Besides perhaps ELOGeo , which however appears to be a relatively loose repository of resources with an educational bearing rather than a full-fledged e-learning project. The content of GITTA is routinely used and has received positive ratings from external sources (e.g. Medida Prix 2008 or [3]). The technical framework, in particular working with a platform and LMS independent approach based on eLML has facilitated the open content strategy and ensured sustainability. Otherwise, lessons developed in an LMS of 2001 would almost certainly no longer be accessible today. As a consequence of this good example, eLML has found use in various projects beyond GITTA. In an academic environment, OER and content sharing is certainly the way to go, even irrespective of sustainability considerations. The

GITTA content, information about the GITTA Association, and publications about the project can be found on the project website www.gitta.info. For more detailed information on the sustainability strategy the reader is referred to [6]. The educational use and curriculum integration of GITTA content is discussed in [7]. More information on eLML can be found in [1] and on the project website www.elml.org.

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