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# The status of interoperability in e-portfolios: Case Mahara

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***Abstract:*** *One of the constant issues brought up along portfolios is life-long learning. As the e-portfolio tools are still evolving rapidly and becoming from data depositories towards tools that support the construction process, the interfaces to support interoperability are still in their infancy. The needs for well-designed specifications and their implementations are obvious. Firstly, users will be transferring their portfolios from a platform to another. Secondly, e-portfolio applications operate mainly as platforms combining information provided by numerous external applications. Importing this information automatically between applications requires extensive implementations.*

***Key words:*** *Leap2A, IMS LIP, IMS e-portfolio, Mahara*

## INTRODUCTION

Portfolios are traditionally being used to organize, document and represent personal skills, experiences and education. The results of projects and work that have been completed during studies can be collected into portfolios as evidence of achievements. The purpose of e-portfolios is the same: to support learning and act as a collection of digitalized artefacts [7] based on personal preferences. As the user centric services have lately more gained ground and more responsibility of managing personal information is given to students, e-portfolio tools have also conquered more attention. Compared to e.g. the certificates of completed studies as a proof of the personal qualities, portfolios are more focused on the tasks that have been completed and the skills that have been achieved. Highlighting the most valuable results and reflecting these outcomes will give a more detailed picture of personal development and capabilities.

The use of electronic systems, such as personal learning environments, makes it easier to produce digital information to e-portfolios. Modern information technology permits a huge amount of information to be stored electronically. This has also brought some weaknesses for the design of earlier e-portfolio systems and their use. Miles Kimball [5] has earlier researched the trends that have had an effect to e-portfolio systems using electronic databases. He concluded that the relationship between these systems and the actual portfolio pedagogy is weak. E-portfolio solutions should not only act as data depositories, but to support a learner centered and organized collection of artefacts [7, 3, 12, 6]. Since various advanced features and operations can be used to handle portfolios, they should be utilized to support the construction process.

Life-long learning is constantly brought up alongside e-portfolios. Although the importance of its construction and reflecting personal achievements from learning aspects is emphasized on the stage of completing academic degree, the value of the created portfolio in representational means often comes up in the end of the studies or after graduation. Constructed portfolio and collected artefacts can be used to prove the skills and achievements when applying for a specific job. Collecting new artefacts and reflecting can be carried on to cover the skills and abilities that are trained and learnt later at work. This raises the important question concerning transferability of portfolios and interoperability between different systems.

If personal portfolio is constructed using e.g. a non-public system provided by university, is the access to the system going to be removed after graduation? If a company provides portfolio system for their employees, what is their interest to provide the service for the ones who change the employer? If e-portfolios are going to be used for a lifetime as promoted, there need to be means to transfer them from a system to another.

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Transferring only the artefacts is not satisfactory but also the relations between them and descriptive metadata has to be included not to lose the valuable work done for sorting. Presumably there is not going to be a *de facto* tool for the construction of portfolios and the amount of tools is going to be large, interoperability standards and specifications are playing an important role when implementing APIs to export and import information from system to another.

In this paper we take a look at three existing specifications and evaluate the implementation of *Leap2A* to one of the most popular open-source e-portfolio platforms, *Mahara*. Our motivation to examine the functionality of interoperability rises from the standalone tools we have implemented to support the process of e-portfolio construction. In addition to their primary purpose, the created artefacts can be imported into portfolios and used to represent personal learning outcomes or skills. Our concern is how these artefacts will be exported to these systems without losing valuable metadata, what will happen to them when portfolios are transferred from a system to another and what do we have to take into consideration when describing and exporting these artefacts.

This paper is organized as follows. Section 2 discusses about the applications that can be used to construct a personal e-portfolio and the specifications that support interoperability. Section 3 represents our experiences using the combination of *Mahara* as an e-portfolio platform and its *Leap2A*-based implementation for exporting the existing portfolios from the system. The last section concludes this paper.

## TECHNOLOGY FOR THE NEEDS OF E-PORTFOLIOS

Development of e-portfolio tools is going through an era where applications are being developed and their structure and functions are evolving. As different tools have already been used for construction for some time, the need for transferability of created portfolios has slightly become more evident. Until lately there has not been a clear front runner as an interoperability standard that would have been widely used. Equally, well-defined interfaces to external systems have more or less been missing from the implemented e-learning applications. In addition, since the tasks being supported by e-portfolio tools vary a lot, importing and exporting entire portfolios from a system to another is problematic indeed. The applications do not necessarily support the same functions or do not share the same approach which makes sorting and representation of unrecognized information challenging.

Diverse tools for this task have been proposed and tested for the construction of e-portfolios in academic world. *Google Apps* provides a wide scale of tools that can be used for the construction of the content and also for the representation of the produced information. *Wikis* can provide a light and easy-to-use-and-share platform, and the same functionalities with some extensions can be provided by other web based content managements systems (CMS), such as *Wordpress*, *Joomla* and *Drupal*. Montgomery [9] has even proposed using *Microsoft Office PowerPoint* for creating e-portfolios. The advantage of popular tools is that they are often really familiar for the users and learning to use these tools does not require too much effort. However, these tools do not provide support and guidance for the construction process, but work mostly for collective and representative purposes.

In addition to these tools there are solutions that have been tailored especially to be used for the construction of portfolios. They can be add-ons for the existing systems as *Moofolio*, which is an additional module for the popular *Moodle* learning management system (LMS). The content being produced as a part of learning in Moodle can directly be embedded as a part of personal e-portfolio to serve the needs of the students.

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Furthermore there are applications and platforms that have been developed particularly for the construction and needs of e-portfolios. The objective of these tools is often the representational portfolio, and collecting and arranging the information. The steps of the construction process, such as reflection, are not necessarily taken into an account clearly, but the expandability of some of the open-source tools gives an opportunity for the implementation.

*Mahara*[1] is a one of the learner centric open-source e-portfolio platforms. It is clearly separated from the operations that are provided by learning management systems, but it can also be integrated as a part of a LMS. Though Mahara is fully operable standalone system the developers have also considered its role as an additional tool for Moodle, whose development is closely related to the Mahara. Mahara is being developed to more modular architecture which has opened up a potential for external plug-ins. System administrator has rights to manage users, groups, views and system properties including language packages, security, authentication methods and plug-in installations. Being fully learner centered, teachers or study advisors do not have extensive access or control for students' portfolios and the information they hold.

Learners' actions in Mahara are divided in three parts that can be seen inherited from portfolio pedagogy and learning process. "Create and Collect" is used construct the developmental portfolio: to manage personal information and characteristics, setting goals and achievements, upload or produce artefacts, etc. "Organising" is based on creating different views of the information thus creating a representational portfolio. Organizing the information is eased by the use of keywords as meta-information to describe the artefacts. Since the representational portfolio is often created for a particular need, the number of active views is unlimited and the access to the views can be controlled and provided by the user. The views can also be united as larger collections giving a change to better manageability and modularity of personal portfolio. The third activity is "Share and Network". User can join in and create groups that can share information and other users can be requested or accepted as friends.

To support transferability of information, different interoperability specifications have been created. Cambridge [2] has divided the needs for interoperability in four categories: aggregation, syndication, distribution and migration. As we are looking for means to transfer the e-portfolios either from an e-portfolio system or from an e-portfolio-related-service, as defined in [4], migration is the approach we are using as a basis when evaluating the interoperability of the selected combination.

*IMS Learner Information Package* (IMS LIP)[2] is a specification to manage students' personal information [3]. While IMS LIP enables the specification of the personal information it can be used to transfer student specific information between distinct systems. Classifying the information is based on XML-standard (eXtended Markup Language). Learner information is divided in 11 classes, including identification, QCL (qualifications, certifications and licenses) and competences. Information under these classes is outlined hierarchically. Competences for example are constructed of recorded data in selected file format, its modification date and description.

IMS Global Learning Consortium has also developed another standard for e-portfolios called IMS *ePortfolio*[3]. It provides means to define also the content of the portfolio, not only personal information thus giving a possibility to transfer information

[1] http://mahara.org/
[2] http://www.imsglobal.org/profiles/
[3] http://www.imsglobal.org/ep/

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between different systems that use different solutions to store and present information. The artefacts are stored as IMS Content Packages containing contextual meta-information and mutual relations in addition to the artefact itself. Like IMS LIP it is based on XML and the modelling of information is managed in layers (hierarchically).

The Atom-based *Leap2A* specification[4] is designed to exchange the content of e-portfolios. It has emerged as a result of InterOperability-project in association with the development of LEAP 2.0 of JISC CETIS. The development work is currently driven by the Leap2A community and anyone has a possibility to take part in the development. Three different types of information can be used: 1) stored artefacts, 2) short writings and descriptions, such as blog entries, and 3) personal information about users. All the types also carry metadata to describe the contents. From the richness of content Leap2A reminds IMS ePortfolio but the goal compared to other more complex specifications has been to keep it simple. The three specifications are compared in Table 1.

**Table 1: Comparison of e-portfolio specifications.**

| | User-related information | Digital content | Other |
|---|---|---|---|
| IMS LIP | - Personal data<br>- Goals<br>- Objects of interests<br>- Skills and knowledge | | |
| IMS ePortfolio | - Skills and knowledge<br>- Goals and plans<br>- Ownership information | - Artefacts<br>- Evaluations of the works and testing results | |
| Leap2A | - Skills and knowledge<br>- Objects of interests<br>- Working history | - Audio, video, multimedia, text<br>- Metadata about the information | - Blog entries<br>- Descriptions about the completed tasks |

When comparing the interoperability specifications and their role, Leap2A is about to turn out to be the one that is getting popularity on the basis of its implementation in different applications. As it is also the only specification that is supported by Mahara, which we have decided to use based on our earlier evaluations, we have had an interest to follow its recent development. Because the development is still going on, we have the courage to assume that during the following years it will be the solution to lean on when carrying out our own implementations.

## EXPERIENCES WITH LEAP2A INTERFACE WITH MAHARA

Leap2A has been tested in association with Mahara and full import and export support is reported to be included in Mahara 1.2 [8]. Based on this assumptions have been made that students' e-portfolios can be exported from a system after students have finished their education and no need to consider the integration regarding Mahara with LMSs from the e-portfolio application [1]. Also Oliveira and Moreira [10] have been planning to use Leap2A to enable the exportation of portfolios to other platforms.

From another aspect Queirós et al. [11] have examined the integration of e-portfolios in learning management systems. They compare three different strategies to integrate e-portfolio systems into LMS: data-, API-, and tool integration. The tests were specified to the integration of the two most representative systems, Moodle and Mahara. As sharing the information between different systems is in our interests, the approach we have

[4] http://wiki.cetis.ac.uk/LEAP2A_specification

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considered in our study is based on sharing information using API-integration where the data is transferred as described information, not as a HTML-code.

By default, Mahara offers a possibility to export the portfolio from the systems using Leap2A specification. The structure of portfolio and links to the uploaded artefacts are described in an XML-file, and all the files are included in exported zip-archive. Another possibility is to export the content in a standalone-HTML-format which makes the portfolio browsable but on the other hand loses the additional information. The exported portfolio can later be imported to another installation. With the current implementation the portfolios are handled as wholes, so importing a part of information to personal portfolio with the interface is currently impossible.

In the first stage of our tests we concentrated only on the representation of the e-portfolio after the transfer and did not examine the stored artefacts and how they were described with metadata. We exported an e-portfolio from ePET and imported it to Mahara. In this order we did not find errors or difficulties in the process. When completing the operation vice versa the case was not exactly the same. All the files uploaded to Mahara were defined as blog posts when imported to ePET and the actual files were completely lost. This seems to be mostly due to the limitations in implementation of ePET.

Being able to transfer files between the systems is not going to be a problem or a challenge in the future. A greater concern rises when the artefacts and information are being produced by modules, plug-ins or external standalone applications and are imported to the e-portfolio platform. The information may describe the abilities of the portfolio holder in many different forms. As an example we were using the *Learning Styles* plug-in that is distributed in association with Mahara. We exported a portfolio containing the results of this test and examined how the information is described in the file. The findings did not prove to be positive. The plug-in describes the personal learning style based on VAK-model using three preferences: visual, auditory and kinaesthetic. These preferences can be perceived as personal abilities that could be described using Leap2A specification. However, the only way the information was exported, was through a user-created view of the results having two major drawbacks. First of all, the information was exported only as XHTML, not using and describing the information and its type using the possibilities of Leap2A. Secondly, in addition the exported part of view has also hard links to the e-portfolio platform where it was exported from and its tools. In the case when the access is denied from the user to the e-portfolio platform (such as after changing organization) or the service is run down, the results will not be available. The view of results and part of the exported XML-files is presented in Figure 1. The given example points out the challenges that will exist when more plug-ins will be implemented. The implementations of interfaces have to be improved to take the type of information and metadata into an account but these aspects need to be considered carefully when implementing and certifying plug-ins.

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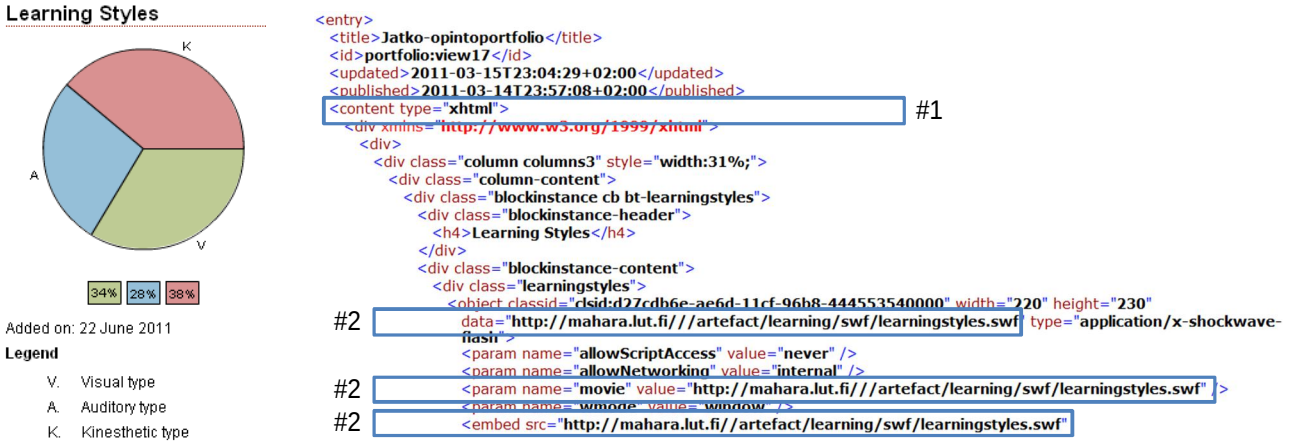


**Figure 1: Exporting information produced by a plug-in through a view using HTML.**

## CONCLUSIONS

In this paper we introduced three interoperability specifications of e-portfolios. Interoperability is one of the key issues when reaching towards life-long learning and portfolios for the lifetime. As it can be imagined, the differences between available functions in e-portfolio platforms are varying, creating challenges even with specifications of good quality. When considering the current export functionality of Mahara-platform and its operation with future plug-ins, there is still a lot to do when supporting the process of portfolio construction widely: not only the views and representation of the information is supposed to be transferable but what is important is that the described information is transferred making it usable in the same state as it is in the original collection.

The same challenge raises even when transferring portfolios between exactly identical installations of platform. As the data and information is not transferred exactly as it is but it might get oversimplified causing reduction in the value and exploitability of the information. This challenge is even more emphasized when considering the information that is produced to the portfolios using the plug-ins or modules being used or standalone applications that are able to produce well-defined information with metadata and connected to the platforms through a specified interface in the future. These aspects have to kept in mind when implementing these tools and also when evaluating the quality and functionality of the import and export functions.

Although some instances have promised to provide platforms for their users for a lifetime, we see that there is still a lot development to go through before a real transferability, interoperability and thus support for life-long learning activities are achieved in technical solutions for e-portfolios. The current development going on with Leap2A specification is valuable work when reaching for this objective. Taking advantage of the potential of the current specification already will require consideration not only from the interface constructors but all of them who are implementing tools that provide information to be used in personal, transformable, life-long e-portfolios.

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