

BRIDGING PERSONAL LEARNING ENVIRONMENTS

Interfacing personal environments and Learning Management Systems: The example of a bookmarking tool

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ABSTRACT

This conceptual study investigates the ability to connect learners Personal Learning Environments (PLE) by a central, permeable and social Learning Management System (LMS). Within the exemplary scope of bookmarking tools as an element of learners PLE in Higher Education (HE), the relevance of this conceptual idea is shown with reference to the social bookmarking tool “Edutags” as well as by a survey about the heterogeneity and use cases of bookmarking tools in distance learners PLE. As the analysis shows the issue of connecting PLEs – a metaphor with can be adopted from “bridges” in graph theory and social network analyses – refers to a non dominant and inconsistent design of a LMS. Theoretical questions concerning the relation between personal and social, institutional and private, consistency and heterogeneity are addressed. As a framework for implementing the interface, the Content Management System “Drupal” is considered as well as the social Learning Management System “OnlineCampus Next Generation”.

KEYWORDS

bookmarking tools, social media, learning management system (LMS), graph theory, higher education (HE), bridge, conceptual study, Drupal

1. PERSONAL LEARNING ENVIRONMENTS IN INSTITUTIONS OF HIGHER EDUCATION

Offering formal online learning opportunities at universities often depends on institutional learning environments, frequently referred as Learning Management System (LMS). In recent years, an increased interest has emerged in the personalization of online leaning processes. Most Higher Education (HE) institutions offer online learning opportunities through LMS. However, these systems do not seem to facilitate the level of personalisation and individualisation of learning required. In this context, the main question addressed in this article is how formal learning scenarios can be designed while fostering the concept of a Personal Learning Environment (PLE).

Regarding the scientific discussion about Personal Learning Environments it appears necessary to define PLE in more definite terms, since the spectrum of possible understandings ranges from technological platforms to pedagogical ideas, from learning opportunities offered by institutions to informal opportunities opposing the integration in educational institution. Our central thesis is that PLE denotes as least a theoretical concept fostering the learning environment as belonging to an individual. The relation between the individual and the environment can be characterised in terms of ownership and control (Buchem et al, 2011). In doing so the person can own the environment in different manners. She or he can own and control the data and

functions of the environment in a technological sense by deleting or expanding them. The data can also be owned by someone else while the learner is the legal owner of the functions and the data of the environment. At least the individual can feel the ownership and the control as a psychological aspect. Even though granting ownership and control to the learner may be realised by a central environment from a HE institution (Taraghi et al., 2009), the scientific discussion of PLE focuses on heterogeneous and decentralised systems, claiming the benefit from the wide range of generic tools on the web as quality, flexibility and pedagogical suitability (e.g. Weller, 2010). The focus on personalisation and the learner as a pedagogical approach leads to a technological implementation of learning environments as a framework of less dominant, open and permeable systems with an inconsistent set of tools (Wilson 2009). The inconsistency of tools means, the system is not restricted to a single tool per task, instead it is open to include multiple tools for the same purpose. This diversity of tools is considered to meet the demands of human individuality.

The personalisation of learning environments has to accompany learning as a social process. The learner is integrated in a social context that is essential for the learning process. So if one considers the heterogeneity of tools on the web as basis of a PLE, these tools usually include social aspects. A PLE is not an isolated environment. A PLE is social at least in its different components: messaging and communication tools, collaborative editing tools, weblogs and sharing tools (Attwell, 2007). As the social and the personal aspects may represent two opposing poles of single dimension delimiting the concretion of PLE systems, the institutional inclusion of a platform is a second dimension that specifies different kinds of PLE designs: a PLE can be a platform of an educational institution (e.g. Aresta 2012; Taraghi 2009) and it can be a non-institutional personal arrangement of independent tools (e.g. Wilson, 2009).

From the perspective of a higher education institution these two dimensions are essential for designing a system for technology-enhanced learning environment. A PLE as a personal arrangement of generic social media tools depends on the capacity of these tools to manage and determine the relationships between users. For example, Google+ and the collaborative text editing tools Google Docs own a dedicated user management as well as the note taking app Evernote, the social media platform Facebook and the synchronous communication tool Skype. The learners have to connect each other on every chosen tool. Building a group and especially building a formal learning context is a challenge and depends on further arrangements of frameworks. One approach of enabling social relations in PLE is to avoid generic social media tools. Mash-up, gadget or widgets are developed as components of PLE sharing the same background structure and can be arranged in special portal sites. According to this approach these arrangement portals are considered as a PLE. A widget based PLE serves the need of personalisation by offering functional learning objects that can be reused, individually arranged, shared and created. An example for this approach is the ROLE widget store combined with GRAASP as portal (Dahrendorf 2012)¹. The portal can be hosted by an educational institution, serve as a central platform and build a unified formal learning context. While the widget based approach dissolves problems caused by the heterogeneity of tools, widgets are simple applications like todo-lists that hardly satisfy the needs of higher educational institutions.

Another approach is to combine generic tools through interfaces and APIs (Wilson 2009). While this approach normally lacks a unified platform or portal, it benefits from the quality and richness of generic social media tools. Some standards for interoperation between generic tools already exist: rss-feeds and atom-feeds. Others need to be developed. An example for this kind of PLE is gRSShopper (Downes 2010).

Technology enhanced learning in the context of higher educational institutions somehow depends on central platforms, especially for the needs of online study programs (Hölterhof et al., 2012). Instead of building a Learning Management System as a dominant system and consistent set of tools (Wilson, 2009), the discussion about PLE and LMS should consider the design of open and permeable systems including a wide (and maybe inconsistent) range of generic tools. A strategy for integrating the demands of formal and institutional study programs in learners' own Personal Learning Environment is through the implementation of "social hubs": a social hub connects the PLEs of different learners, including heterogeneous collaboration and learning tools as well as different devices, with the members of formal groups representing modules and

¹ Another approach is the PLE design language LISL, that offers the possibility to use generic social media tools as well but doesn't face the mentioned problem with dedicated user management (Wild et al., 2008)

courses of study programs (Hölterhof, Nattland & Kerres, 2012). The strategy is based on the Social Learning Management System (SLMS) instead of a common Learning Management System (Kerres, Hölterhof & Nattland, 2011).

The “Online Campus Next Generation” is a Social Learning Management System used for technology enhanced learning in the online master programmes “Educational Media” and “Educational Leadership”. The system realizes an approach of connecting generic web 2.0 tools instead of a widget based technology. Taking this system as an example as well as the masters programme, the following investigation develops a concept on how to connect different generic tools used in learners PLE. The mentioned aspects of heterogeneity are the first assumption for designing the concept. Accordingly, learners PLEs can contain an inconsistent set of tools, including redundancy. The second assumption concerns the understanding of PLE itself. Thus a Learning Management System for formal learning opportunities in higher education should focus on connecting the personal environments of the learners instead of offering a dominant and central TEL system. With these assumptions the interaction between PLE and LMS can complement each other. The belief, sometimes suggested in the scientific discussion, that PLEs displaces LMSs, is unsustainable from the perspective of a formal master programme in higher education, because an LMS fulfils at least the function network and links the participants in a central und unified place.

2. BOOKMARKING TOOLS IN PLE

Bookmarking tools are created to help users to collect and structure web resources. Many of these tools use social tagging as a way to structure resources and contents. The idea of social tagging has become popular in many different web tools and is a standard tool in many social software applications (Marlow et al., 2006).

Tagging means that users annotate digital objects with free chosen keywords (Golder & Huberman, 2006). Together with other tools, tags are used to describe single objects in the platform. For example in flickr tags are used to describe photos that are uploaded to the platforms. In social bookmarking platform the objects are links that refer to other websites or documents. A single learner describes an object by free chosen tags. In contrast to a hierarchically taxonomy, learners do not have to classify the object in a given set of terms. They are free to create their own system of classification. Describing an object by using tags can be seen as part of a learning process: Learners have to think about the tags that are most appropriate to describe an object. Therefore tagging is an active part of learning. The result of this learning activity is “tag cloud”. In this cloud all tags are assembled and tags that are use more frequently are represented in a bigger scale. A tag cloud, therefore, can be regarded as a representation of a learner’s concept of the subject.

So far we have described a personal tagging tool. The social aspect occurs when different learners start to share their tags and objects – in case of a bookmarking tool their bookmarks. In common social bookmarking tools the community of people share their tags and links and, therefore, their knowledge as an informal open community. In these communities, people can also build open or closed groups and networks by building friendships or following each other. But it is important to keep in mind, that in this place learning happens in an informal setting and manner. When using a social bookmarking tool, at the beginning learners can browse through the collection of resources by using the tags created by other users. While exploring the tag clouds they may pick up new tags they consider helpful for their own resources. Again the idea of the tag cloud and relevance of the tag indicated by the relative size of a word in the cloud become important support of the learning activities taking place in this bookmarking communities. For example, a learner can use tag cloud to explore the resources of a given area and may reflect and expand his or her own concept of this area and adopt certain tags to use with their own objects. A social bookmarking tool therefore is not only a tool that gives learners access to even more information, documents and resources. It also can help to build and extend knowledge by using tags. As we can see tags can be used by learners in two ways: learners can describe objects to elaborate their concept of the topic or they use tags of others to broaden their knowledge (Cress, Held & Kimmerle, 2012).

From the perspective of higher education learning communities in formal learning settings often share knowledge that is represented in texts which can be found on websites. They can use different tools of a LMS to do so. They can collect links in a forum or wiki - in both cases losing the benefit of tags and tag clouds. Therefore, a social bookmarking tools can be useful for learning in a formal setting using an LMS. Learners can collect resources from the web together and tag them to create a common knowledge base structured by a folksonomy build from the tags they used. However, here a problem occurs: What is the appropriate tool or web service to use? Is it part of the LMS offered by the institution or do they use a generic tool specialized on the task of bookmarking? And if the decision is to use a generic tool, how can they decide what tool they are going to use? If the tool is part of the LMS, the knowledge created remains in the LMS even when the students finish the course. Even if there is an export feature: during the course students would have to decide whether to use the usual tool or the course tool. Using generic tools is even worse. Students using different tools would hardly be able to know about the findings of their fellows.

Learners learn during their entire lifetime, that means learning is a life long learning process that now can be supported by social software of different types (Klamma, 2007). Therefore, learners who use the internet as a learning resource will most likely make a decision for one tool the like best regardless of the context. Learning in formal settings takes place only for a period of time. Learners come together to take a course or a seminar and then spread out again. It is not necessary that they build a community that lasts longer than the duration of the learning activity they share. For this purpose it seems to be useful to describe possibilities to bridge PLEs and LMS. In this way learners can use their usual bookmarking tools and amount of links, knowledge and groups they collected and formed within the tool when following a formal learning course. The idea of bridging PLE and LMS considers the use of different external bookmarking tools and the linking of them together in a formal learning scenario. As a result, learners may use their PLE to organize their own learning process, to create a knowledge base and to share resources.

In a formal learning scenario learners may use their knowledge and structures to obtain new information. New items shouldn't be stored in a new and course related bookmarking system or a bookmarking system of an isolated LMS. Learners might also want to transfer new items into their own PLE. So the Bridge has to serve two purposes: It has to offer an easy to use way to aggregate knowledge from a variety of bookmarking tools used in the learners PLEs (direction PLE to LMS) and a smart option for the user to integrate selected items into a PLE (direction LMS to PLE). As explained later the PLE in this case can be regarded as a bridge. Also to understand how different tools can be bridged by the use of tags we have to take a closer look on tagging as the way individual and shared knowledge is represented. When it comes to social tagging another advantage is important. Social tagging means different learners objects can be described in different dimensions. The challenge is to correctly assign the resources of different origins to the corresponding courses and formal learning groups.

2.1 Edutags: exemplify a social bookmarking tool

As a result of a joined project between the University of Duisburg-Essen and the DIPF, the German Institute for International Educational Research as a member of the Leibniz Association, the social bookmarking system "Edutags" has been developed (see figure 1). Beside others the DIPF offers and operates the German "Eduserver", a server dedicated to educational resources. Edutags extends this server by a community oriented bookmarking system. With the focus on primary and secondary education, Edutags is a bookmarking tool for educators, teachers, pupil and also students to collect and classify a knowledge base of educational resources on the web. The system offers both a personal bookmarking tool combined with community and collaboration functions. The concept of Edutags is to offer teachers an easy to use system to collect, tag and share resources for daily teaching (Heinen, 2011). The service features

- an integration into all common web browsers allowing to mark and classify any web resource within the web browser
- suggestion of classification while bookmarking a resource, based on the community
- functions to explore and search web resources

- management of groups and friendships, among the ability to share bookmarks
- interoperability with mobile devices and LMS

The social bookmarking tool was established in 2011. Until now the tool counts 1.800 active users. The database contains more than 18.000 resources collected by users and shared in around 250 groups. With this spreading this tool is used in the PLEs of several students, learners and teachers for managing and collecting their private bookmarks as well as in learning groups, distance learning courses and LMS of schools and HE institutes.

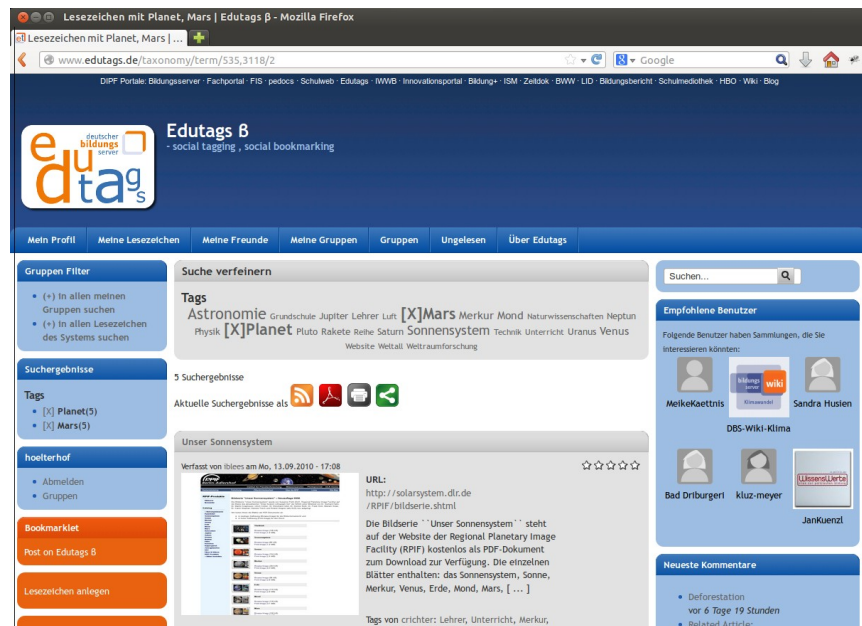


Figure 1: The social bookmarking tool “Edutags”

2.2 Investigating the use of bookmarking tools in distance learners PLE

For the scope of bookmarking tools as a central element of a PLE, the authors conducted a study to have a closer look at the heterogeneous use of bookmarking tools of participants of distance learning courses. The survey has been distributed in the Social Learning Management System of the master programmes “Educational Leadership” and “Educational Media” of the University of Duisburg-Essen as well as to the participants of a dedicated online course concerning Open Educational Resources “COER 13”. In the online master programmes nearly 100 participants of the two programmes are familiar with Technology Enhanced Learning and distance learning scenarios. Also the participants of COER 13 are familiar with distance learning. The amount of return of the survey (n=32) can hence serve as an exemplary basis to illustrate the concept and not to draw further conclusions. This survey focuses on the plausibility of conceptual ideas and does not predicate the use of the final implementation.

Table 1: Frequency mentioned bookmarking tools in distance learners PLE (n=32)

Edutags	14	Webbrowser	14	Diigo	11	delicious	9	Google Bookmarks	7
Mr Wong	4	Pocket	3	Zotero	2	Instapaper	1	Readability	1
Xmarks	1	Pinboard	1	Evernote	1	ScoopIT	1	Kippt	1

The questionnaire first suggested several bookmarking tools (eg. Delicious, Edutags, Google Bookmarks etc. as well as the bookmarking tool of the web browser) including the possibility to freely add other tools and asked the user to choose the tools they usually employ. The question offered the possibility to choose multiple tools and 59% of the respondents chose two or more tools. The most chosen tools in the sample are Edutags (marked 14 times), the bookmarking tool of the web browser (also marked 14 times), Diigo (marked 11 times) and Delicious (marked 9 times). The second question explored the use of bookmarking tools. They may either be used in a private way to bookmark content for oneself but also in a social way. The social way includes searching in the collections of the community, assign search results to the private collection and collect bookmarks collaboratively in groups. Clearly the private usage is the most common use case as 75% of the respondent marked that item as “often” and 94% as at least “sometimes”. The two use cases searching and assigning results to the private collection are very similar: around 40% never used a tool that way, around 60% at least sometimes whereas searching is a little bit more common (20% “often”) compared to assigning search results to the private collection (15% “often”). Finally the collaborative usage is somewhat more popular than the other two social usages. Concluding the private usage can be considered as the default usage for bookmarking tools, although the social usages showed also some relevance.

Table 2: Usage of bookmarking tools in distance learners PLE (n=32)²

Use Case → ↓ Frequency	Private Usage		Social Usage					
	bookmark for oneself		search bookmarks		assign results to private collection		collect bookmarks in groups	
never	2	6%	11	37%	11	41%	11	35%
sometimes	1	19%	13	43%	15	56%	15	48%
often	24	75%	6	20%	4	15%	5	16%

As the survey showed bookmarking tools are used as an element of learners PLE. Also social bookmarking is established and used. Therefore a concept of linking different bookmarking tools used by the participants of a formal learning scenario like courses of a master programme seems to be plausible and useful. One not even has to consider that distance learners already use multiple bookmarking tools and thus own expertises in using this tools as well as an amount of bookmarks stored in different systems. But also learners are at least familiar with the social usage of bookmarking tools.

3. CONCEPTUAL REFLECTIONS AND INTERFACE DESIGN

This article describes the design of an interface between bookmarking tools as an element of the learners PLE and the institutions SLMS realised as a “social hub”. The design focuses on an interface is to be used in higher education courses, in particular a formal online master programme. This approach is geared to the structure of a bridge in graph theory and social media analysis insofar as it takes this structure as a design model. To focus the concept the above mentioned tools and systems are used as example: “Edutags” as a social bookmarking tool as well as “Online Campus Next Generation” as Social Learning Management System. Although this study focuses on a connection of specific tools, the interface needs to be designed as an open and universal connector suitable for many bookmarking tools.

Typically a PLE is illustrated as a network graph but as a special form of network. Scott Leslie collected 78 diagrams of PLEs on his wikispace “edtechpost”. The diagrams have been created by educators, advanced learners and specialists. They have been collected from Leslie’s own personal network and illustrate a personal view to the subject of PLE. After four years of collecting them he posted some of his observations concerning the diagrams (Leslie, 2012). He remarked that the main metaphor used to illustrate a PLE is a network diagram, especially a hub-and-spoke network characterized by a centred hub at which all lines

² The survey offered the possibility to skip answers. The percentage value is calculated against the amount of answers within the use case.

3.1 Assigning items on behalf of tags

A challenge in bridging PLEs with regard to bookmarking tools is to identify the context of a bookmark resource. One has to consider that in higher education learners follow multiple courses. Thus a Social Learning Management System must be able to aggregate the bookmarks of participants of different courses. Lastly, because bookmarking tools are also used privately a learner must be able to decide if a resource is to be assigned to a formal learning context. An obvious way to solve that challenge is to use the tagging feature of bookmarking tools. As explained above, social bookmarking uses tags to identify resources. Because tags can be freely assigned by the learner, they can be used for different purposes. A requirement to automatically identify the formal learning context of a bookmark resource by its tags is a unique set of fixes tags used by all participants of a course to identify the context of the corresponding course. In other words, courses in social learning management systems need short acronyms (see figure 3). If the acronym of a course is used by a participant as tag for a bookmark resource the bookmark can be assigned to the course.

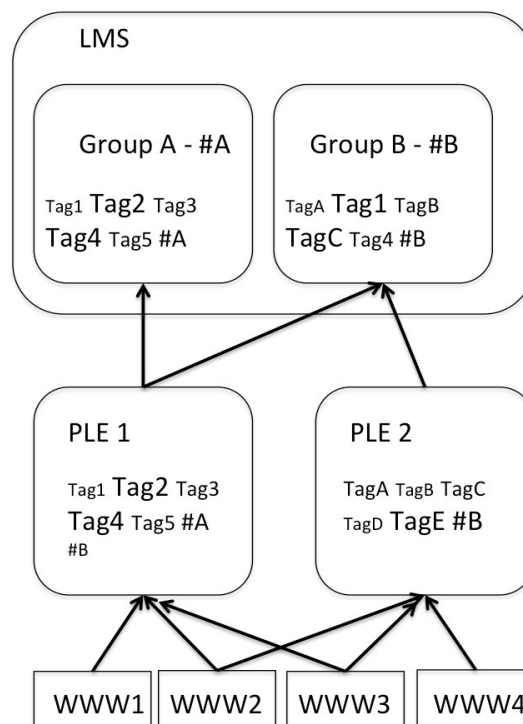


Figure 3: Concept of bridging PLEs: courses within the Learning Management Systems are marked with acronyms (here: “#a” and “#b”) that matches tags used in learners PLE bookmarking tool.

A closer look on adequate interfaces to export content from bookmarking tools shows that RSS feeds are widely-used for that purpose. Edutags as well as Diigo and Delicious, the three most frequently mentioned online bookmarking tools in the survey, support RSS feeds to export bookmarks of a user. Reading and handling RSS feeds is well established in most web developing environments. But with respect to the need to include users tags in the RSS feed, the situation looks different. It is not sufficient to somehow include the tags in the RSS feed, the tags need to be marked up so they can be identified automatically. The specifications of RSS 2.0 provide an element that can be used to mark tags: the “category” element³. Edutags supports marking tags in that way. Diigo like Delicious do not support the category element, maybe because the feeds do not support RSS specification version 2.0. Instead the tags are included in the description element as links. Of course this way of marking tags can also be processed automatically, but the markup style misses an official standard. At least the fact that both tools, Diigo and Delicious, include the users tags

3 According to RSS 2.0 Specifications: <http://www.rssboard.org/rss-specification>

in the description elements shows that a PLE bridge can use bookmark tags to assign bookmark resources to courses. The required data is exported by the RSS feed.

To transfer the knowledge of a single learners PLE to the group within the Social Learning Management System RSS feeds are reasonable. The learner can register the feeds of the own PLEs bookmarking tools to the LMS and as soon as the new bookmarks appears in the feed it is imported into the LMS as well and assigned to the course group according to the tag acronym. To save the benefit of the social tagging the LMS has to preserve the tags of the bookmarks and take care that the imported bookmarks within the LMS are marked with the same tags then in the generic bookmarking tool. The LMS can than build a new tag-cloud representing the knowledge of the group. This import procedure may produce duplicate bookmarks within the LMS because learners can tag the same web resource on different bookmarking tools all imported to the same group in the LMS. This might be regarded as a problem, but the doublet bookmarks referring to the same web resource keep meaningful information within the LMS. They also retain the relation to the learners bookmarking system expressing that a specific resource has been bookmarked and tagged by several learners. By accepting doublets, the bridge offers the opportunities to explore more of the learners collected knowledge.

In case a learner will add a resources from the LMS to his or he own PLEs bookmarking tool, this can be done in the same way other resources are added to the specific bookmarking tool: the user can use a generic javascript “bookmarklet”, an adapted toolbar for the web browser as well as other ways offered by the bookmarking system. Via RSS this adopted bookmark will be integrated in the tag cloud of the learners group if the learner specified the group acronym as a tag while assigning the resource to the own bookmark collection. In this case the interface collects the resource in the next iteration, identifies the acronym and assigns the bookmark to the corresponding learning group in the LMS. Possible new tags broaden the knowledge base of the learning community.

3.2 Implementation using the Content Management System “Drupal”

The implementation of the specified interface is planed to use the Content Management System “Drupal” as framework instead of generic Learning Management Systems like Moodle. The decision to choose Drupal rests upon the Social Learning Management System that is currently used in the online masters programmes at the University of Duisburg-Essen. The “Online Campus Next Generation” is developed with Drupal to take advantages of the numerously social media modules developed and maintained by the Drupal community. The organic groups module builds social relations between website users by forming groups. This module can be used to form courses as well as learning groups. Arranging learning content can be done by the books module featuring a hierarchical structure of pages. Content can consist of videos, audios, pictures, texts, pdf files as well as SCORM elements. Learning assignments, student submissions and teacher feedback can be realised by the workflow module in combination with several workflow extension modules. The workflow modules allows to specify a succession of submission states like creation, editing, submitted, reviewed, finalised with corresponding fields to be activated and locked for feedback text, attachments etc. A more detailed description on how the “Online Campus Next Generation” is created on basis of the Content Management System Drupal is given in Hölterhof & Kerres (2011).

The interface to bridge bookmarking tools used in learners PLEs to a SLMS like the “Online Campus Next Generation” can use the Drupal feed module and its extension modules. This modules allows to parse RSS 2.0 feeds and import the feed items as website content by mapping item fields to internal web content. In this way the interface can be configured almost without the need of programming. However a little customisation is necessary first to extract the bookmark tags from RSS feeds that do not use the category element. In this case a parser needs to be written that matches the tags within the description section of the feed. Second assigning the imported bookmarks to the corresponding courses on behalf of the acronym is a customisation task of Drupals feed modules as well. Lastly, the issue of creating tag clouds is a standard feature and can be realised by corresponding modules without the need of programming. So the Drupal community offers valuable modules and plugins to implement the interface, but still there is a need of customisation by programming.

4. CONCLUSION

The concept to bridge learners PLE is based upon the metaphoric idea of bridges in social network analyses. According to this metaphor, a bridge connects components of a graph that elsewhere stays isolated. An analyse of PLE diagrams by Leslie (2012) indicates the structure of PLEs to be an ego-centred hub and stroke structure. It has been argued that the need to connect PLEs can be derived from this structure because it stays in contrary to the connected structure of the internet. Regarding the example of bookmarking tools used in learners PLE this need can be concretised. As an exemplary survey showed, distance learning participants uses multiple bookmarking tools in private and social use cases within their PLE. To make available the knowledge and resources learners collected in their bookmarking tools to formal learning scenarios as learning courses in higher education, the bookmarking tools needs to be connected to the institutions Learning Management System.

As an exemplary environment to discuss an interface for connecting bookmarking tools as PLE components the Social Learning Management System “Online Campus Next Generation” is used as well as the social bookmarking tool “Edutags”. The mentioned LMS and bookmarking tool uses Drupal as framework. A challenge in realising this interface is to assign the learners bookmarks to the corresponding course within the LMS. To solve this need the courses are marked with acronyms. Bookmarks are imported by the LMS with the corresponding tags from the generic learners bookmarking tools and assigned to the courses by matching the tags to course acronyms. With this procedure, tag clouds can be formed out of the bookmarked web resources of the course learners.

This article shows the need of rich metadata in feeds as the RSS 2.0 standard offers. Feeds are an easy way to connect web tools used in PLEs but to preserve meaningful informations collected in the bookmarking tools, tags and marks assigned to a resource by the learner needs to be considered as well. As a way to face dominant design and to include personalisation, Learning Management Systems needs to be designed as permeable systems.

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