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Personal Information Management in Educational Context: the importance of unification to information access

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Abstract: This paper is focused on personal information management system (PIMS) that are aimed at helping students to manage all kind of data they might need during their academic life. Whilst the research on PIMS is not specific to a particular domain, we claim that it is necessary to understand users' tasks and which data they manipulate in order to design successful tools. As far students are a concern, few works have investigated the challenges that they face for managing personal data in their academic life. In this paper we describe those challenges and we propose centralized approach for managing students build upon the metaphor of a student's portfolio. The approach relies on standardization of data forms for allowing the communication and data sharing between the portfolio and third-party application. The approach is illustrated by a set of scenarios that demonstrate its feasibility and describe how dedicated PIMS might help students to sort out their duties related to their education.

Introduction

Nowadays, digital environments and resources that support e-learning and teaching activities play a dual role in education: on the one hand, they support pedagogical activities, on the other hand they can also be used to support the creation of curriculum including records of practical and theoretical experiences that they might need to achieve the job market (Brown, Dehoney and Millichap, 2015). Nonetheless, the information that students have to handle are often distributed among several web portals with aim at provide an administrative view of information, and teaching and learning environments (e.g. Moodle, TelEduc, Sigaa, Eleven, and so on). As consequence of search distributed of information, the students might lose control of their personal data, and thus lacking an overview of records that can help them to better understand their progress and actual skills. This problem is closely related to the research on Personal Information Management System (PIM system, or PIM tool, or PIMS) (Scapin et al., 2011, Jones and Teevan, 2007).

The Personal Information Management (PIM) is related to maintenance, use and storage of personal information (Jones and Teevan, 2007). It includes organized control of personal data, in order to provide easy retrieval and direct information whenever necessary. The PIM researches are realized in several fields, as e-commerce, personal networks, cognitive psychology, and so on (Jones, 2008). However, each field has particular characteristics, including target audience and scope of information. PIM research is mainly concerned by problems search as fragmentation of information, organization of information and user behavior. Only recently some authors started to investigate the role of PIMS in student's context. Catherall (2008) studied the access and organization of information, but did not address the issue of user behavior. Oprah and Dadzie (2013) discussed aspect of student

behavior utilizing digital material and non-digital material (e.g. text material), but also, they didn't investigate fragmentation of information. The research presented by Stewart, Basic and Erdelez (2012) also dealt with relevant issues in behavior of students when seeking data, but did not deal with the fragmentation of information. We assume that PIMS might help many students of different ways, by providing: (i) An unique or centralized entering point to information; (ii) A standard way to display information; (iii) Support continuous interaction with information gathering from sources; (iv) Adapt mechanisms for information control.

Thus, this paper investigates the use of PIMS to create a kind of portfolio in which the students have centralized access to all information they need about their academic life. We present a proposal of a portfolio that integrates capabilities to inclusion of information from many third-party learning environments such as Moodle, Pegadas, Sigaa, and so on. We illustrate our framework and its applicability cases studies, in which are shown the interoperability features of information between portfolio (PIM system) and other environments. Moreover, the scenarios describe how dedicated PIMS might help students to sort out their duties related to their education. Next, the document presents the importance and challenges of the information in the student's context. The third and fourth section shows our system proposal and the actual instances of its application. The fifth section, in turn, discusses the advantages of using PIMS and, finally, the sixth section presents the conclusions.

Personal information in the student's context

PIMS are subject of interest here because the advancement and technological development drive and transform the way of teaching and learning, requiring students to manager a lot of information electronically. Hardré (2001) states that the educational demand is not only restricted to the age group of people who attend schools or universities, but it also concerns the general public that need to be continually updated/upgraded to follow a competitive job market. This encompasses long periods when people may be considered student.

According to Graetz (2006), students choose the information by means of automatic and controlled processes. They try to understand what they are feeling gathering the pieces of information. Thus, what may be deemed useful for a particular person, can also have the same meaning for the other. This is part of the process to measuring the value of information, according Weitzen (1991), satisfies some logical steps and stages, such as: (i) Meeting a lot of information; (ii) Learn about the information; (iii) Collect and store relevant information; (iv) Select, analyze and filter the most valuable information; (v) Organize information in a logical way; (vi) Enhance the information; (vii) Provide and use the information.

When associated to teaching and learning environments, PIMS can indeed help students to deal with the tasks administrative and pedagogical. Nonetheless, the use of a PIMS for students has to provide solution to the some challenges. Among them, the information fragmentation, that is present in various stages of personal information management (PIM). It is common that fragmentation occurs by the very tools that are designed to help us (Jones et al., 2005). For student, some information may be in an environment for online course, other information may be in an old virtual learning environment (VLE), and others may still be accessible through the student virtual space of their university.

Information fragmentation represents a huge challenge for the interoperability among the environments. Students complain, rightly, that it is difficult to manage data scattered in diverse tools (Stewart, Basic and Erdelez, 2012). Another challenge is related to information control (Jones, 2008). Thereby, the student might need different views, or data collections, of information that reflects different periods of their life (Otopah and Dadzie, 2013). Those data collections may vary from the number of items, shapes and consistency of their contents. Thus, they form islands in personal information space, which demand efforts for control of data entered (Jones and Teevan, 2007). The information management in the student's context also handles with the challenge of the transience of access. At times, learning support environments enable access to information only in the period which the student has active participation in the environment. So, when the student conclude the activities, can lose the link with the environment and information.

Towards an integrated view based on students data

The idea behind a student portfolio is to have a PIM tool that gathers data set which have added value for students, can be used in economy, arts, education and others. Example of similar portfolios can be found in employment record books that record employment status of its owner over time, and business portfolio that shows the collection of products and services provided by a company. In education, a student portfolio is aimed at recording the students' learning journey in detail and in context. Thus, inspired for portfolios, the work presents a PIM system that integrates information of academic's life in the digital context.

In this section, we present a conceptual framework to a PIM system in the student's context (Figure 1). In order to support the integration of diverse information sources, the proposed PIM tool employ standardized data using microformats. The tool we proposed is an extension of a management tool called PIMI. PIMI (Personal Information Management through Internet) defines an environment of personal data access and services, allowing people to reuse such data whilst they are also navigating third-party applications (reference omitted for blind review). Herein we customize the PIMI tool to fits the context of students.

Figure 1 shows the system's modules responsible for three important tasks for users: access, seeking and maintenance. The presentation module is responsible for access to information, with parsing the formats for exhibition at the interface. The search module is related to the seek task that can be performed based on categories of information to the student's context. The integration module, in turn, is related to the maintenance task and it is responsible for register and interoperability of the information. This module recognizes the information format to be integrated into the system and sends the data manager. All these modules are connected to the data format manager, which is responsible for control of formats (new or existent) and data base. In this paper, we focus on some issues: (i) Categories in the student's context: associated with the data value for the student; (ii) Adoption of standards: associated with the need to facilitate the correspondence and integration of information.

The figure below provides a view at glance of the tool we propose. Despite this simplified view we assume that it is enough for supporting the description of the scenarios we present in the next section.

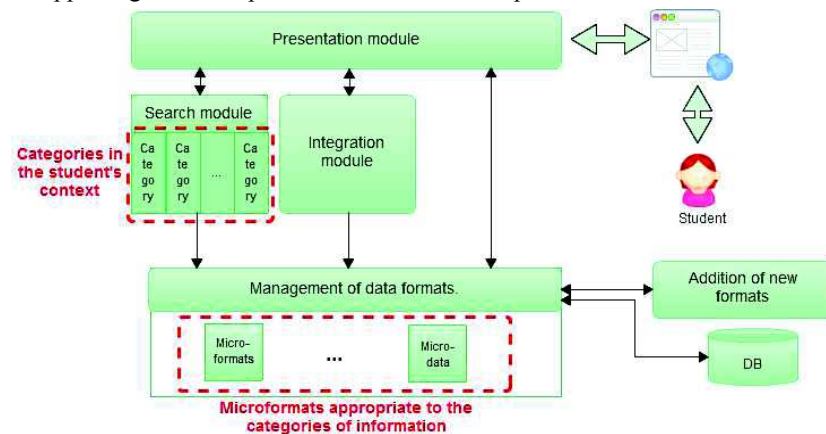


Figure 1: Conceptual framework of PIMS for student's context.

Scenarios of use for a portfolio featuring a PIM of students

The scenarios presented in this section show realistic cases using three environments: Pegadas (learning support environment), Sigaa (name omitted for blind review, it is a virtual environment for student information at the university) and PIMI for Student (PIMIS, our PIM system customized for student's context).

Scenario 1 – Challenge: Information centralization

This scenario emphasizes the usefulness of a PIMIS to centralize the information storage that might be required for academic purposes. Although originally the data of student were scattered in different environments, the PIMIS helped in data gathered and searched for the necessary materials.

Natalia is studying for a certification exam in the graphic area and she has participated in several online courses. In order to gather the information she needs to start a review of studies, including programs courses, contacts of teachers and others materials, she decides to use PIMIS as illustrated in Figure 2.

Scenario 2 – Challenge: Manipulating data in standard formats

The scenario shows that, although different origins, the information can follow a standard format regardless of aspects such as graphic presentation report by third parties learning environments. For example, a course curriculum can be described by a microformat, as the h-resume. In this microformat, the curriculum, along with their properties (name of the course, description, education, skills) would be available in a format understood by both the online course environments such as the PIMIS in which the student wishes to keep information. That is, a list of 'course curriculum' could be more easily formed, indexed, maintained, updated, searched, reused, finally managed in a system without hassle of information clippings or propensity of types. The same applies to information about the teacher described by h-card. In this microformat the properties, name, description, job-title, photo, affiliated organization and address are displayed.

The information in PIMI for Student came from Pegadas and Sigaa. All environments used microformats. The Pegadas had information about a program course that Natalia participated in the environment. The Sigaa, in turn, had information about a teacher of computer graphics that could help Natalia (Figure 3).

Many tools can actually parse web pages and extract data in microformat standard. The presentation of these tools is out of the scope of this paper, but it is interesting and can be more detailed at web site microformats.org.

Scenario 3 – Challenge: Interoperability between system and environments.

Scenario 3 introduces an example of information reuse in applications third parties and of integrating new information on PIMIS. When environments use the same information standard, the student concentrates more in "what I want" than "how I keep". Thus, when the student needs to send information for other environments, saves time and effort because the data are sent in accordance with standard. Furthermore, the use of the same information standard allows the user be spared from filling out forms and prevents errors from manual cataloging. The PIMIS also provides means for the integration of data out of standard, but the fact of using a standard data facilitates the communication and information insertion. We should notice that the integration of data into PIMIS does not exclude the possibilities of accessing the same information at the original source.

Natalia wants send information about her academic life to a postgraduate virtual university. As all the data about her experience in the several environments and courses are gathered into PIMIS, Natalia saves time and effort to select and send the information because both environments follow the same standard (Figure 4- A). Moreover, before sending the information, Natalia would like to add the course program of the new activity that she finished in the Pegadas and her institutional data of Sigaa. Because this information is the only one missing in the PIMIS, she needs to add it in the system. In this regard, Natalia needs to concentrate only in choosing what she wants to keep, because the PIMI for Student interprets correctly the data format on both environments (Figure 4 - B).

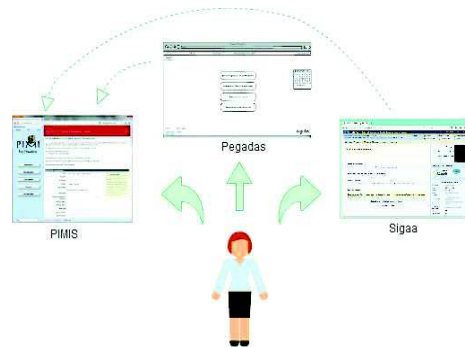


Figure 2: PIMIS centralizes the information from several student environments.

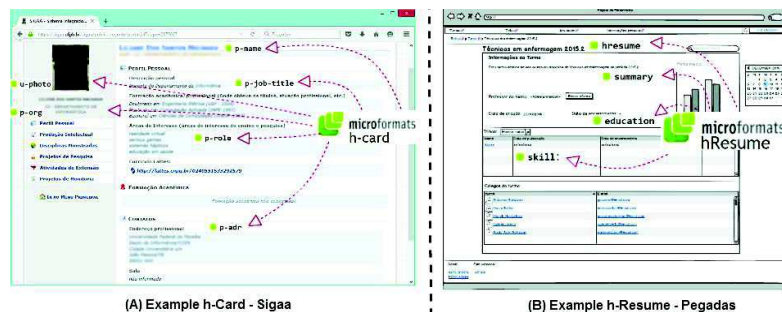


Figure 3: Microformats into environments: (A) Teacher contact with h-Card; (B) Program course with h-Resume.

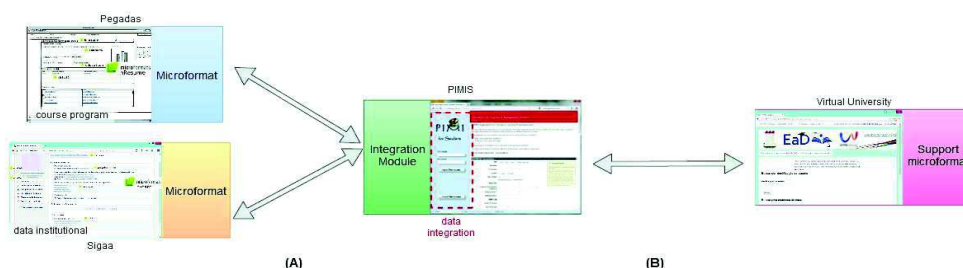


Figure 4: Interoperability of information: (A) Integration of new data in the PIMIS; (B) Data export.

Discussion and Related work

Jones et al. (2005) argue that the obvious antidote to information fragmentation is the integration (or unification). Those authors consider some approaches for the integration and illustrate some of them (Jones et al., 2005). We believe that PIM system is a viable way to assist this integration of information.

Even today the use of PIM systems for data integration is not well explored in the student's context. We observe a scope where the students need managing their personal collections of information in order to support their academic activities and other purposes (Otopah and Dadzie, 2013); and, additionally, management systems which can be adapted to this process (Scapin et al., 2011). While the PIM system area generally covers many contexts and activities, we presented in this article a PIM system in a more specific way: as a tool for support the student in the challenges faced to keep a portfolio of academic's life (denominated PIMI for Student or PIMIS).

Therefore, the PIMI for Student supplies a space in which people can register academic experiences, content from other data useful to their context, allowing the grouping, search and interoperability of information. In this sense, the PIMIS is a structured set of personal data concerning the academic life of the person and should be integrated into the student's personal space, usually hosted on a Web application.

In order to facilitate the integration of activity and transfer of personal data, a system should match the data and environments. The means to establish this correspondence is based, in part, on the constitution and the structure of the content involved. Thus, personal information in the student's context is critical to PIMI for Students proposal. Considering the scenarios of the previous section, the information can be sorted as means of assisting the organization and management.

In the context of discussion, why standardize? We show that, with the standards, the students can focus more in the value of information than in how to keep it, saving time and effort. We believe that the search for standardization of information involved in PIM scenarios for students is a way to help matching the data in a system layer related to semantic information. Thus, when the learning support environments and PIMIS use the same information standard, the latter is understood by both systems and this promotes interoperability. This fact also is attractive to people who develop others PIMS and other environments because when there is a standard adopted by most tools, interoperability is strengthened.

Among the existing standards for semantic interoperability, we consider the proposal of microformats. Generally, this standard consists in a set of class names for the information that the user wants to describe and, sometimes, accompanied tags that should be used. According to the official website, microformats are: *"simple conventions for embedding semantic markup for a specific problem domain in human-readable (X)HTML/XML documents, Atom/RSS feeds, and "plain" XML that normalize existing content usage patterns using brief, descriptive class names often based on existing interoperable standards to enable decentralized development of resources, tools, and services"* (Prabhakar, 2005). Thus, by using existing standard the data are encoded within web content. In analysis, the microformats can help transform unstructured information available to students in structured data understandable for machines. A significant advantage of microformats, compared to other semantic web technologies is its simplicity and ease of adoption (Stolley, 2009). In the literature we observed initiatives of integration for microformats standards into learning support environment (Ermalai et al., 2013, Tomberg and Laanpere, 2009). Once deployed, this standard allows the collection and aggregation of content encoded from different locations. Thus, the information would receive a well-defined meaning, a structure that would allow for better communication, therefore, an improvement of interoperability.

Conclusions and Future work

In this paper, we have presented preliminary results of the development of a framework of PIMI tool for Student. One of the contributions of the system is to allow the management of academic life portfolio, which keeps a personal historic and facilitates the seeking and reuse of information. From of challenges discussed in the personal

information management for student's context, the PIMIS shows itself as a centralization tool that helps in the control, continuous interaction with information and data interoperability. Through scenarios reported, we have illustrated use cases of PIMIS which describe examples of problems that students face and as the system helps to solve them. The work presents the standardization as a way of support the student in ordinary tasks, for example in records and change of data with of third party applications.

The discussion provides targeting to PIMS applied as support tool to students. Nonetheless, much still remains to be done. Therefore, in future work we will focus on the validation the categories of information in the student's context, in order to determine the set of essential information and their data standards. The availability of such as PIMIS tool allows its use to explore aspects of usability and user experience with tools that are focused on tasks of management of personal data. We plan to expand the investigation of tools that could cover students data in a long life span, for example by including the management of personal data of young students; in that context new actors such as parents and educations might come to play with a personal information management systems that would be much more personal in an adult life. Whilst our results are still preliminary, they raise very interesting questions of theoretical and practical importance for the research in this area that are worthy to be discussed in the community.

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