USING SOCIAL SOFTWARE FOR PERSONAL KNOWLEDGE MANAGEMENT IN FORMAL ONLINE LEARNING

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ABSTRACT

In this paper we focus our attention on the use of social software as educational enablers for use in formal online education contexts. To this end we study the hypothesis that users have to acquire a set of important Personal Knowledge Management (PKM) skills. Such PKM skills are presented in the paper. They are also examined in relation to current 2.0 technologies that can sustain PKM skills acquisition and development. However, the acquisition of PKM skills is not in itself sufficient to guarantee the online learner who uses social software the chance to be part of the relevant and effective online learning experience unless it is coupled with a proper Instructional Design (ID) Model. We therefore present a possible Instructional Design Model for the Connectivist environment. Finally, we illustrate a sample scenario in which the use of social software is implemented on the basis of the ID model presented so as to support PKM skills acquisition.

Keywords: **Learning 2.0; personal knowledge management; personal learning environment; connectivism; instructional design**

INTRODUCTION

The continuing technological change as well as the way people and things relate and interact through the network is not only affecting what we know but – more importantly – it changes the way we come to know and learn.

Given the relational and recursive nature of the learning process, in this paper we focus on the recognised and growing importance of social software as an "educational middleware" in formal learning. By "educational middleware" we mean a network-based environment which allows the setting up and distribution of learning and knowledge management activities to promote flexible individual and collective knowledge-construction, through reflection and meta-cognition. The spontaneous use of social software in informal contexts, favours the creation of an *open and socially shared information space* which nurtures the relational negotiation of co-constructed and re-defined meaning (Morin, 1996).

Users (learners) become the main protagonists of their potential lifelong knowledge acquisition experience. How can we transpose the advantageous aspects of such use into formal educational praxis?

This paper highlights how the use of social software can support the management of one's personal knowledge through the process of *making meaning of socially shared and co-created content*. We explore a "2.0 learning and knowledge landscape" (FOE,

2007) (Downes, 2005) which merges formal and informal learning practices as a fertile "Connectivist" grounding for the knowledge growth of the subject (Siemens, 2006).

This work starts with the analysis of the theoretical implication of learning and knowledge co-construction processes with some preliminary explorative investigations into the advantages of the use of social software in formal e-Learning experiences. The paper then focuses on the presentation of three models:

- **The first illustrates the skills that the online learner in the Knowledge Society should develop in order to be able to fully experience meaningful learning. We refer to these skills as Personal Knowledge Management (PKM) skills.**
- **The second model highlights how social software and, more generally, 2.0 technologies can be represented with respect to the PKM skills they foster.**
- **The third model hypothesises a possible Instructional Design (ID) Model to support the acquisition of the PKM skills. Finally, we present a sample scenario in which the ID model is applied through the use of social-software which also leads to the development of the PKM skills.**

Our hypothesis is that in order to benefit from informal learning activities in formal settings, learners need to acquire specific PKM skills if they are to be lifelong constructors of new knowledge.

LIFELONG KNOWLEDGE CONSTRUCTION IN THE KNOWLEDGE SOCIETY

In informal learning practices, social behaviour and technologies-support systems converge towards the "network"; a network made up of people and resources, that is a social network, linked through personal needs and/or common goals, interaction policies, protocols and rules together with telematic systems which favour the growth of a sense of belonging to the "net" community.

The lifelong-learning culture is one of the challenges of the Information and Knowledge Societies. These Societies require individuals to continuously update their knowledge also availing of the Network (Sorrentino, 2006). This cannot happen only as a progressive "information accumulation" process.

Instead, it occurs through the preservation of one's connections i.e. social relations and links to networked resources (Siemens, 2006). The true core competence necessary for a lifelong learner in the Knowledge Society is the capability to "stay connected" and "belong" to digital communities in which interests are, and can be, continuously shared.

In 2004, Siemens launched the theory of Connectivism based on a critique of previous main-stream learning theories synthetically labelled as Behaviourism, Cognitivism and Constructivism (Siemens, 2004).

According to Siemens, even the latter theory, which appeared to be the possible theoretical framework for e-learning practices (more specifically in its variant named "Social Constructivism")–fails to provide an adequate theoretical support for the instances brought about by the new learning contexts. Siemens maintains instead that:

> ***Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core***

> ***elements–not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing. (Siemens, 2004)***

If, on the one hand, we value Connectivism as a context in which learning can more favourably occur, thanks to available technological solutions (Fallows, 2006), on the other hand we acknowledge that Connectivism becomes possible and is enabled by an ever stronger user participation in the creation, sharing, use and management of resources (contents, relations, applications, etc.) through the use of social software (OCC, 2007).

In a Connectivist context, knowledge is the result of a fluid combination of experience values, contextual information and specialist competencies; taken together they provide a reference framework for the evaluation and assimilation of new experience and knowledge (Pettenati, 2006b).

Sharing Norris' perspective on the social connotation of learning (Norris, 2003) we interpret e-learning as a type of learning which is supported by technologies, but it is not necessarily conducted at a distance; it allows interaction between people and contents, and among people; most importantly, it is a type of learning which values the social dimension of the underlying knowledge processes (based on definitions (Calvani, 2005) freely translated and adapted by the authors).

Lifelong e-learning methods and tools can provide Knowledge Society citizens with the possibility of conducting individual and personalised lifelong learning experiences which will bridge formal, non formal and informal learning stages varying levels of uses of technology (Sie-L, 2007). In this domain, theoretical reflection and applied research is still in the initial stages.

PERSONAL KNOWLEDGE MANAGEMENT SKILLS IN THE DIGITAL LANDSCAPE

The origin of the term Personal Knowledge Management (PKM) is to be found in a university environment in two U.S. institutions, first at UCLA, Los Angeles, CA. (Frand & Hixon, 1999), and then at Millikin University in Decatur, IL. (Millikin, 2003).

Initially PKM was an isolated area of interest for universities, but, subsequently, it was re-interpreted as valuable in any environment, including enterprises. According to Professor Paul A. Dorsey of Millikin, University:

> ***Personal Knowledge Management is best viewed as based on a set of problem solving skills that have both a logical or conceptual as well as physical or hands-on component. (Avery et al., 2000).***

PKM is a deep and complex concept, but its roots are clear and simple:

- **if knowledge is power, a precious asset to attain leadership and self-realization, why should it not be at the centre of an individual's personal aspirations and efforts?**
- **Why should it not be the object of specific skills development?**

With a view to establishing the relation between PKM skills and learning design, we group PKM skills under three intertwined macro-competence categories, CREATE, ORGANIZE and SHARE, as shown in the following table (Pettenati et al., 2007):

Table: 1
PKM skills

CREATE	ORGANIZE	SHARE
Editing: exploit technological features for digital information creation in multimedia formats. Integrating: post-processing of recordings, digital annotations, automatic abstracting, etc. Correlating: making connections, drawing diagrams and mind maps, etc. Manage security: protect privacy, intellectual property rights, and digital management rights.	Searching and finding: use search engines and social filters, refine results, etc. Selective retrieving: managing information abundance, managing cognitive overload. Storing: archiving media, considering resource availability and accessibility. Categorizing/classifying: defining relations among pieces, using folksonomy descriptors. Evaluating: extracting meaning, deciding quality, attributing relevance, affecting trust levels.	Relating with others: establishing connections, communicating effectively using new media; understanding peers, using different languages. Managing contacts: keeping profiles, keeping contact contexts (social network representation). Collaborating: sharing tasks, working to a common goal. Mastering knowledge exchanges: being concise, taking turns, focusing on topic, etc. Publishing; presenting relevant information, using appropriate publication channels (web sites, digital archives, blogs, ...).

"2.0" TECHNOLOGIES

The technological and behavioural revolution referred to as Web 2.0 (Hinchcliffe, 2006; O'Reilly, 2004; Fallows, 2006) is the basis of our current research. Indeed, innovation in technology has brought about new or revisited processes and practices in learning which are expressed through new or revisited criteria and terms of application (Bonaiunti, 2006). Recently, the educational e-learning universe as a whole (i.e. formal, informal, non formal (Conner, 2004), lifelong (Cross, 2006)) brought together within Connectivism have been named "e-learning 2.0" or "learning 2.0" (Downes, 2005), similarly to what occurred with the Web 2.0 phenomena (O'Reilly, 2004; Mc Fedries, 2006).

Folksonomies, co-browsering, social tagging, social networking and blogging are the most well known "2.0" practices.

The common thread they share is that they all provide means of expressions for shared, distributed information and knowledge using social sharing tools such as social bookmarking tools, image sharing tools, blog search engines, etc.

Many of the innovative "social software" technologies mentioned above, play a crucial role in supporting learning and knowledge processes because they provide the opportunity to develop shared knowledge construction, meta-cognitive reflection and knowledge production (Guerin, 1998, 2002, 2005).

Through social tagging, members of a community define links between resources (sites, images, videos, audios, etc.) together with the terms used to describe them (tags) (Bonaiuti, 2006).

This is a bottom-up process, which starts with a single user adding a link to a site and tagging it at the user's complete discretion, using keywords which are meaningful to the user. Social sharing tools can display these tags using a visual approach thus realising Tag Clouds which immediately provide users with a perception of the popularity of the tags i.e. font sizes of most popular tags are bigger.

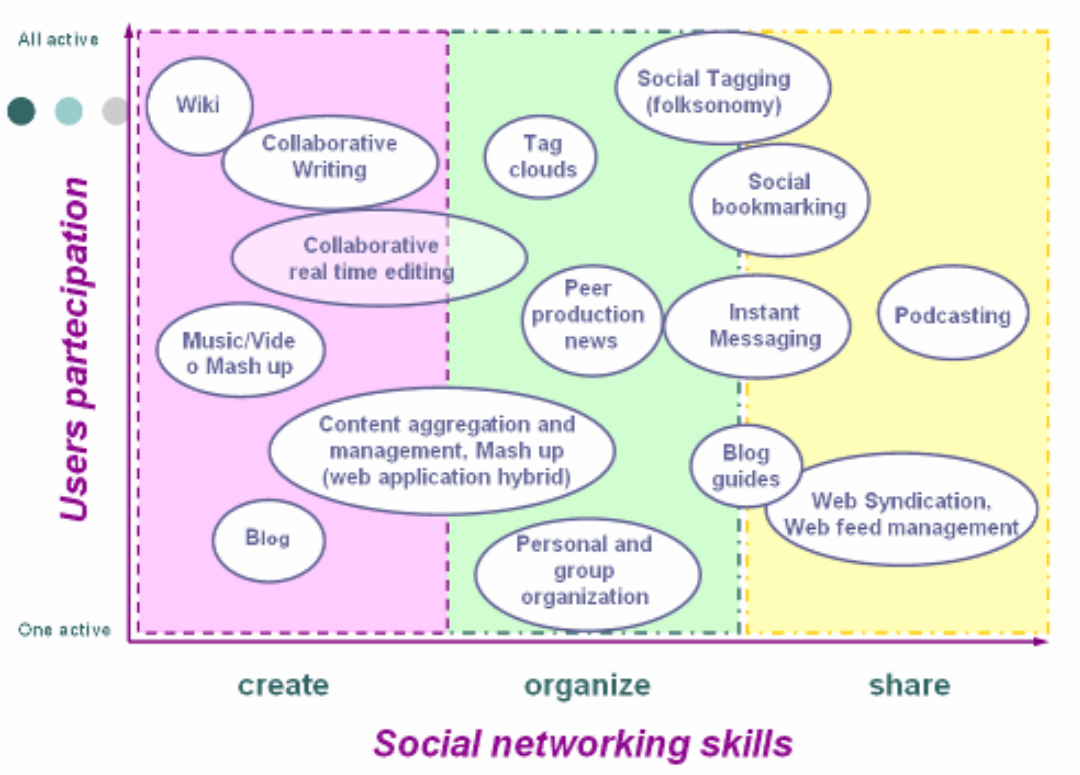

Figure: 1
Social networking technologies and PKM skills
(adapted from (Heddergott, 2006; Sancassani, 2006; METID, 2007).

This "folksonomic" classification method, which relies on the spontaneous users' contributions (be s/he an author or a sporadic resource user) leads to results which represent the information according to the conceptual model of the community that creates it (Warburton, 2006). Representing information in classificatory structure constitutes information in itself. Classification incorporates information and provides the interpretation context which, in its totality, appears transparent, objective and neutral (Surowiecki, 2005). Figure: 1 summarises the social networking technologies grouped on the basis of the above described PKM skills in relation to user participation in a social learning context.

This representation is elaborated based on two different sources. The first one gathers web 2.0 technologies on a Cartesian axis; it relates degrees of user participation and technology socialization with the different "areas" of application i.e. announcement of information; collection and systematisation of information; learning and education; social exchange; entertainment (Heddergott et al., 2006).

On the x-axis we substitute Heddergott's "areas", with part of the methodological proposal from the second model developed by Sancassani et al. (2006) and applied by

METID (2007), in which we group "2.0" technologies in a 3-dimensional model. In this model we represent 2.0 technologies with respect to PKM skills:

- **Create,**
- **Organize and**
- **Share.**

For an in-depth analysis of technologies and their educational adaptations, refer to Fini (2006), Bonaiuti (2006) and Pettenati (2006a).

INSTRUCTIONAL DESIGN (ID) FOR PKM SKILLS ACQUISITION

Our experience within the post-graduate blended course for "e-learning design and management" run by the University of Florence, led us to propose a possible ID model (Calvani 2005) to be applied for PKM skills acquisition. Such a model is grounded in the recognised principles of Instructional Design (Merrill, 2002; Ranieri, 2005; Akbulut, 2007) and accounts for social software educational features.

The proposed model is illustrated in Table: 2. The first column represents the phases in the Instructional Design process:

- **1-Access, Motivation and Socialisation;**
- **2- Information Exchange and Recognition of the Objectives;**
- **3-Collaborative Construction of Knowledge;**
- **4-Development and Self-Generation in Communities.**

The above Instructional Design Principles can be referred to the macro teaching phases (Merrill, 2002) as illustrated in the second column: 1-Activation; 2-Demonstration; 3–Application; 4-Integration.

In column three, the types of knowledge developed are highlighted on the basis of the different existing taxonomies (Ranieri 2005): 1- Pre-Knowledge; 2 – Conceptual (or declarative) Knowledge; 3- Factual (or procedural) Knowledge; 4 - Metacognitive Knowledge. The framework thus described can support the definition of the necessary steps for effective learning to take place in a given context (Duffy, Jamie, 2004). Such steps serve as a basis for the adoption of web 2.0 technologies in the four different phases presented in Table: 2.

The previously-described PKM skills (create, organize, share) are intrinsic in all phases of the proposed model, as is illustrated in the following paragraph through the sample scenario.

Table: 2
ID model and related knowledge outcomes

Instructional Design phases	Principles	Types of Knowledge developed
Phase 1: Access to resources and to socialization spaces	Activation (pre-knowledge)	*Pre-knowledge*
Phase 2: Recognition of knowledge objectives and initiation of information exchange	Demostration	*Conceptual knowledge* - Learning as knowledge acquisition
Phase 3: Knowledge Costruction and	Application	*Factual Knowledge* Learning as acquisition

Collaboration Activities		**and demonstration of abilities (eventually addressing/individual or collective active participation)**
Phase 4: Group Self-generation in Communities of Interest	**Integration**	***Meta-cognitive knowledge*. Learning as acquisition of competences and organizational structures.**

EXAMPLE OF A SOCIAL SOFTWARE-BASED SCENARIO

What has been presented so far requires a practical realization to pave the way for the demonstration of the effectiveness of the suggested approaches. For the purpose of this paper, we will hereafter present a macro-instructional design which is both the expression of the networked learning concept as well as the trigger for the development of the PKM skills which support life long e-learning.

The scenario is set in the context of the post-graduate online learning Master degree program for e-learning Design and Management held at the University of Florence, in Italy (Netform, 2007).

In this context the authors, acting as teachers and tutors in different modules of the curricula, have worked to harmonize their didactic activities in order support both the development and the use of PKM skills in the construction of knowledge through social software-based learning environments (Pettenati, Cigognini, 2007).In order to support interdisciplinarity and know-how interconnections in the online activities– also referred to as *e-tivities* (Salmon, 2002) -the same e-tivity scenario envisaged in a given module is to be analysed from the perspective of different profiles:

- **the learning designer, the e-tutor, the info-broker,**
- **the content manager, the learning environment and**
- **the change manager.**

Being inspired by such experience, the authors' intent is now to transform this instructional design praxis into a methodological approach supported by social software technologies.
In the following scenario we illustrate how an online educational experience can be designed in order to support PKM skills acquisition through the use of social software. To this end, we quote two messages written by two module tutors to highlight the learning design interconnection and the social nature of the design setting. The two modules taken examined are the *info-broker* and the *content manager* modules. The same reasoning can be extended also to the other modules in the curricula.

The "info-broker" e-tivity module is based on the scenario of developing a multimedia virtual Art tour. Quoting the tutor's message:

> ***"Starting with the wiki of the macro-instructional design module, you are asked to tag all fundamental concepts…***

The first phase is aimed at activating pre-knowledge. Group members are supposed to have already socialised through previous activities, so there is no need to facilitate purely socializing activities. The request related to "socially tagging fundamental concepts" in the shared wiki is a "phase 2- recognition of knowledge objectives and initiation of information exchange" activity. This first sentence of the tutor's message involves "sharing" and "organizing" PKM skill.

and start building a collaborative glossary using the tools you prefer among those presented during the class meeting (e.g. del.icio.us, connotea, diigo, etc.);

Phase 2 merges with phase 3 where knowledge construction is targeted through a collaborative activity (building glossary). This task requires all PKM skills: "organization" (for the tools evaluation and selection), "creation" and "share" (for the collaborative tool use in knowledge construction).

then keep on creating your shared image gallery (on Flickr) and setting up the virtual tour, after having looked for related resources (virtual museum tours for instance on YouTube, etc.).

These activities also pertain to phases 2 and 3 and involve all PKM skills for resource selection and management and for the use of the photo sharing tool:

I suggest that you use the module forum and a VoIP tool (e.g. Skype) for coordinating the collaborative activities (don't forget to elect a moderator for the synchronous sessions and to remind him/her to update the log of your sessions on the wiki page). As for the collaborative editing of the event's content (two brochures and a poster were required) you can use the course wiki.

The tutor here is providing hints on "organizational" issues related to managing communication, coordinating the work and collaborating for the production of the scheduled assignments.

For the final group reflection about critical issues which have emerged, possible improvements etc. I ask you to install and use the mind maps sharing tool (Cmap) and export the co-created map into an image format. I'll be hanging around until you have your first meetings in Skype done. Then you'll read from me again. ☺!"

The tutor is opening towards the final fourth phase activities related to reflection and meta-cognition. All PKM skills are required and applied in this stage of the group work. After the completion of the info-broker module, the content manager module starts. The tutor's message first summarises to the students that this module's e-tivities are related to developing the design and creation of educational content for the Web. The scenario has the same focus, as above, i.e. the creation of a virtual Art tour. The following part of the tutor's message reads as follows:

[…] from the collaborative wiki's content, the blog, the image gallery, the glossary and the videos you've collected, you are now asked to make the storyboard and realise the multimedia product.

Learners are asked to enter phase 1 (access to resources) and become aware of the available material. The PKM skills required here pertain mainly to "Organizational" skills.

The tutor then leads the learners into Phase 2 where they *Use Del.icio.us with a shared tag to collect the different contents (each group negotiates and chooses its tag).*

are required to recognize knowledge objectives and initiate information exchange for the choice of shared tags. "Organization" and "Sharing" PKM skills are required here.

Wiki's content is to be reformulated into learning pills following the sequence of the tour in two or three vertical paths (one for specific artwork). To this end I ask the new coordinator to organise a round-table in the proper forum's thread to post the wiki choices in the wiki-log. Please, use Cmap to build the virtual tour path which will lead the user through the art-related materials.

Knowledge construction and collaboration activities required at this stage correspond to Phase 3 where all PKM skills are required.

Once you have completed your assignments I suggest that you publish a message in the MySpace social network work-description to give visibility to your collective work for all those who could be interested in "art virtual tours", "instructional design" "multimedia production" etc. etc.

The tutor here opens to Phase 4 where group self-generation in communities of interest is supported through the use of a very wide social network which can provide the learners with the opportunity to reflect on their competencies and works under different perspectives. All PKM skills are required for the learners to effectively have such an experience.

CONCLUSION

Until recently, traditional educational contexts have considered to varying degrees the problem of availing of telematic technologies to provide enhanced learning. Nonetheless, the issues of preparing students to properly master these technologies so as to derive the maximum advantages has not yet become part of the formal educational activities.In this paper we provided our interpretation of the current socio-technical educational system shaped by the technologies and practices of the "Knowledge Society" in a lifelong perspective. We believe that users' attitudes and available technologies are both mature for users to engage in a personal social network-based lifelong learning experience.
To this end we have identified the necessary PKM skills. These PKM skills must be framed within appropriated appropriate Instructional Design methodologies and sustained by appropriately designed and developed personal learning contexts.

Our hypothesis is that the Knowledge Society requires everybody to acquire a set of PKM skills to become users interpreted as citizens, workers, lifelong learners, tourists, etc., who are aware of the network affordances. Social networking tools and methods provide a tremendous opportunity and context to lead the learner into a learning and knowledge landscape in which PKM skills and competences are both the enabling condition and final outcome of the social network-based learning experience. However, developing a new "social-software-based e-learning pedagogy" requires an integrated approach to the learning processes; how can we build innovative and effective Instructional Design (ID) models which meet the needs of knowledge-construction, reflection and meta-cognition in the learning context? We tried to answer this question by providing a possible ID model for the social-networked context rooted in state-of-the-art models. We then presented a sample educational scenario to illustrate an example of the ways in which formal and informal learning may lead to holistic and complete development of PKM skills for the connected learner. The application of such a model in different educational contexts (e.g., under-graduate students in Psychology and Engineering) in order to evaluate and asses its validity is underway. Apart from the multiple views about the concept of e-learning, we believe that the approach we adopted is on track for the actualization of a lifelong learning practice for all Knowledge Society members.

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