Semantic social scaffolding for communities of practice in dissertation writing

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Abstract. This paper presents a novel collaborative tool 'AWESOME Dissertation Environment (ADE)' which uses semantic wikis to implement a pedagogical approach 'social scaffolding'. It discusses how the semantics, in terms of categories and properties, are used for channelling and focusing the social exchanges between students and tutors during the dissertation writing process. Five communities of practice were trialled, each with their own instance as tailoring is important to embed the ADE into the community practice. A reflection on the outcome from this co-evolutionary process is provided.

Keywords: semantic social scaffolding, semantic wikis, community of practice, dissertation writing, co-evolutionary design process.

1 Introduction

This paper proposes a novel collaborative system based on semantic wikis to support a pedagogical approach of 'social scaffolding' for dissertation writing. The challenge of introducing an innovative system into an existing practice is well known. This paper describes and reflects on our approach in **AWESOME**[1] (Academic Writing Empowered by Social Online Mediated Environments) which uses semantics for the understanding and dissemination of communities of practice in dissertation writing. In addition, special attention has been given in the tailoring of the environment for specific community-of-practice. The co-evolution between system development and a community is particularly interesting to observe. Our findings illustrate that there are significant variation in the practice even in what could be perceived as similar 'learning communities'.

Dissertation writing is a major challenge faced by most students in the higher education [10, 11]. Research has shown that students could enrich their learning of writing by *sharing ideas and experiences*, and by *communicating their thoughts with others* on the various dissertation issues and problems encountered [9]. These social

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exchanges can deepen their understanding of the process and help them make better connections between the steps and the already available explicit knowledge. Putting a structure or 'scaffold' [3] for channelling and focusing these social dimensions [13] amongst students and tutors is defined in this project as 'social scaffolding'. The distinctive characteristic of this work is the use of semantics to channel and focus social exchanges during dissertation writing.

There has been an increasing level of interest in social computing for supporting collaborative activities, be these for work, leisure or learning [2, 7, 15]. Wikis as collaborative tools for learning have generated considerable enthusiasm and applications [12]. The ease for users to contribute content in a wiki removes barriers for knowledge aggregation from a wide range of sources, but runs the danger of overwhelming users with the sheer amount of information. The potential of semantic wikis is attractive as automatic context-sensitive extraction of relevant information can be made possible in knowledge rich environments [1, 4, 5, 14, 16].

This paper firstly clarifies AWESOME's view of 'community of practice'. It is followed by a description of how semantics are built into the architecture of the AWESOME Dissertation Environment (**ADE**) and into the pedagogy of 'social scaffolding'. The co-evolutionary process of embedding the ADE into a community of practice will be outlined and lessons learned from the tailoring of the generic AWESOME Dissertation Environment (**ADE**) for five different communities of practice will be discussed.

2 Communities of practice in dissertation writing

According to Wenger [17], the notion of community of practice encompasses 'memberships (or affiliation) of the community' and the 'social practices' that is in operation. It is of particular interest that Wenger's view on social practice "includes both the explicit and the tacit … it also includes all the implicit relations, tacit conventions, subtle cues, untold rules of thumb, recognizable intuitions, specific perceptions, well-tuned sensitivities, embodied understandings, underlying assumptions, and shared world views. Most of these may never be articulated…" [17, p.47]. Many of these characteristics resonate with the 'apprentice' model adopted in the dissertation writing process where a student gets his/her guidance from a tutor as the 'master' [6].

The current dissertation writing practice, at least in the UK, is to provide explicit knowledge through resources in specific intranets, classes, and/or text books, and supplemented with a tutor (or supervisor) who will pass on his/her tacit knowledge to the student in one-to-one or small group meetings. It was reported at the requirements gathering stage that tutors found it an attractive proposition to be able to reuse some of the advices given to different students; and the students welcomed more support outside the supervision sessions to make sense of the written information when they needed it.

It is also known that, sometimes, students will pass information to their friends that they heard from their tutors, their seniors and peers without checking their validity. Any misrepresentations in these social exchanges will be difficult to detect and be

corrected. Compounded with the Chinese whispers effect, any 'misinformed' tacit knowledge might have a negative impact on the practice. Hence, it is desirable that this kind of tacit knowledge passed around through social processes could be made more explicit, so that their influence on the practice could be more visable and further debate on their application could be conducted.

In AWESOME, a community of practice can be degree-specific (e.g. a group of tutors supervising a cohort of students in a specific degree programme who are undertaking the dissertations at the same time), or focussed on a generic topic (e.g. a group of students from any degree programmes but have joined a specific skills training programme, such as 'writing skills' run by skills specialists). Participation in the environment is not mandatory and it has always been designed to provide extra support rather than replacing current structure or learning activities. Participation is motivated by need/benefit, and not by obligation. Content (e.g. examples, questions and answers to clarify 'rules of thumb', and so on) is populated by members (tutors and students) who are treated equally by the environment. The rules of joining or leaving are defined by the community itself. However, it is worth noting that every community needs to have a moderator/co-ordinator role.

3 The role of semantics for scaffolding in the ADE

In the AWESOME Dissertation Environment (ADE), semantics are used in a number of ways: (i) to provide a framework to anchor the scaffolding, (ii) to provide a means to articulate tacit knowledge for sharing, (iii) to provide a structure to access dynamic content and (iv) to provide shared social awareness. It uses MediaWiki (http://www.mediawiki.org) and its extension Semantic MediaWiki [8] to create and query semantic content. As shown in Fig. 1, the ADE consists of three layers – the user interaction layer, the content and semantics management layer, and the data and semantics layer.

3.1 Provide basic scaffold at the user interaction layer

The **interaction** layer of the ADE implements the user interface. Through this layer, a user can
(i) contribute, browse and bookmark content in the 'community space' and
(ii) manage one's profile (including a message on one's mood) and access the bookmarked collection in the 'personal space'. The bookmarked collection will be organized according to a pre-defined ontological framework similar to the one used in the community space (i.e. using the basic scaffold in terms of the main stages of dissertation writing process).
As part of the embedding process, one or more tutors will contribute some seeding content initially for scaffolding activities (e.g. a few examples at each stage of the dissertation process and some questions to prompt further analysis or reflection). It is likely that students may initially browse the content before gaining enough confidence in raising questions or making their own contributions.

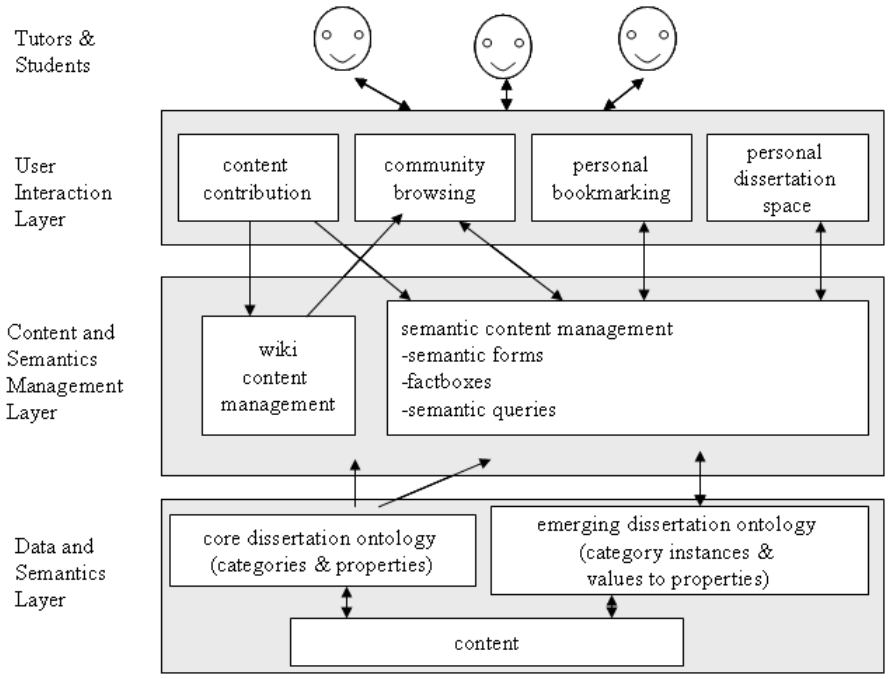

Fig. 1. The ADE Architecture.

3.2 Use of semantic forms for tacit knowledge capture and queries for dynamic content generation

The **content and semantics management** layer provides the key functionalities in the ADE. While the basic organization of the content is by wiki pages, extensive use of semantic features enables more guidance for contribution and better organization of related content. Firstly, *semantic forms* are provided for users to add data (instances) which will be semantically tagged automatically according to a pre-defined core ontology. The user can also insert inline semantic markup if they so wish to create new properties (hence capturing tacit knowledge). Secondly, *factboxes* are used to provide a summary of the relevant semantic markups and their links. Thirdly, *semantic queries* are used to mine the semantic markups to enable the 'mashing' of content into a wiki page (see Fig. 2).

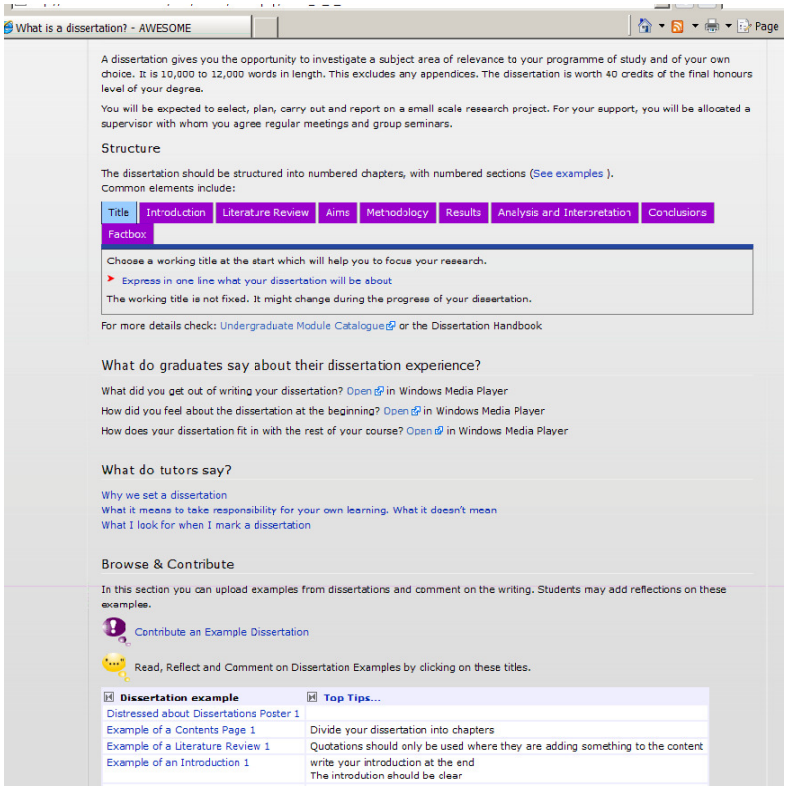

Fig. 2. An example of a Wiki page which shows scaffolding (under 'What do tutors say?') and tables with content populated by semantic queries.

3.3 Facilitate social awareness and capture evolving community of practice

The **data and semantics** layer of the ADE maintains the *content* and its links to *a core ontology* and *an emerging dissertation ontology*. The core ontology includes pre-defined categories and properties, while the emerging ontology is being built during content creation (i.e.at use time).

Categories capture the main aspects of the dissertation process which will be used as the main anchor for scaffolding, such as getting an overview of dissertation `[[category::dissertation]]`, choosing a topic `[[category::topic]]`, adopting an appropriate research methodology `[[category::methodology]]`, building the body of literature `[[catetory::literature]]`, dissertation writing `[[category::writeup]]`, and management of the dissertation project `[[category::project management]]`. In addition, each category can have subcategories, e.g. `[[category::disserationFAQ]]` is a sub-category of `[[category::FAQ]]`.

Properties are the basic way of augmenting a page with semantic data. They express binary relationships between one semantic entity (a wiki page or a category) and another data entity or data value. In ADE, properties are mostly predefined as part of the core ontology. ADE exploits properties to enable semantic social scaffolding. There are three types of properties: (1) characteristics of the main dissertation categories, e.g. `has research question` and `is inappropriate` are properties associated with the category `topic`; (2) general social scaffolding categories, e.g. `is top tip`, `is good writing`, `has feeling`; and (3) additional information about the contributions made, e.g. `has user`, `has question`, `has answer`.

The core dissertation ontology includes the predefined properties. Using semantic forms or direct semantic annotation, users can add semantic markup in the form of: `[[property::value]]` which adds a triple `<content, property, value>` to the emerging ontology (`content` is the wiki page and `value` usually corresponds to some important part or characteristics related to the content in that page). This provides a means for users to articulate their thoughts about a particular piece of content and tag it for sharing. See Fig. 3 for an example of using a semantic form for feedback on a contribution.

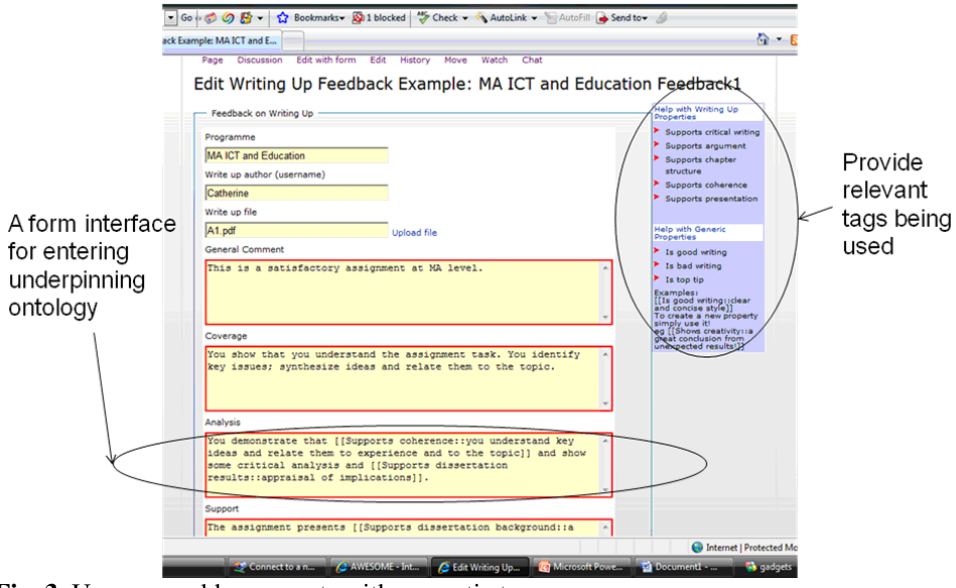

Fig. 3. Users can add comments with semantic tags.

4 The embedding of ADE into communities of practice

To embed an ADE into a community of practice, the environment must be tailored to the vocabulary/processes of that community. This will be an ongoing and evolving process involving users and developers.

As the first step for the engagement process, a generic prototype was needed to demonstrate the potential to the champions from each community to gather support.

In the domain of dissertation writing, text books were available on this topic. While accepting the general flaws of self help books [6], they nevertheless provide familiar vocabulary for the construction of the generic ADE. Hence, the initial design for the core ontology of the generic platform (the public instance of ADE), was based on the linear dissertation process commonly adopted by text books. The other main ADE categories and properties were derived via focus groups with academic writing experts available to the AWESOME team. The core ontology in the public instance of ADE includes 26 categories and 64 properties which provide the initial scaffold for disseminating a community's dissertation writing practice and advice.

At the stakeholders meeting, the champions were made aware that further tailoring may be needed and would involve further input from a few more early adopters in each community. After the meeting, further consultations were established to clarify usage scenarios, collect samples for further seeding of content, and fine-tune the vocabulary to be used for each community. Dates for user trials were set as targets.

A total of five communities of practice participated in the project. In our trials, a separate instance of the ADE was installed for each of the five communities of practice. For each instance, a member of the project team acted as a 'mediator' in the ADE whose role was to bridge the gap between the current practice and the envisioned practice. The mediator tailored the generic ADE according to the findings from the consultations. Close working relationship amongst the early adoptors, mediator and developer was cruical for the embedding process. Table 1 presents the five instances we had installed for the trials.

5 Discussion

Feedback from the trials was collected from focus groups, interviews and questionnaires over a period of nine months. Below is a summary of the outcome relating to tailoring and embedding of the ADE into the practice:

- The general concept of AWESOME was enthusiastically received which indicates that it fills a gap in the current practice. Several other communities have come forward for future deployment seeing the flexibility in its adaptation for their own use.
- The main stages of the process (i.e. part of the core ontology) were accepted by all but one. Variations to the vocabulary were found. For example, even for the fundamental term 'dissertation', one instance used 'critical study' and another used 'extended essay'. As it was seen as important to provide familiar terms that help users to identify themselves as members of the community, we had adapted the vocabulary for the community as and when it was essential. This flexibility was well received.
- A conscious decision is needed on the issue of access (i.e. degree of openness) as the democratic paradigm of social software may not necessarily fit with the culture of the community (or even the institution). The participants in the trials were supporters of openness in information sharing.

Table 1. Summary of the ongoing user trials with ADE.

Institution	Context	Tutors	Students	Usage	Duration
School of Education, Leeds University	Master distance learning course in ICT in education	[1 tutor] Course coordinator, dissertation supervisor	[5 students] Mature, part-time, both home and international	Pilot study End of the dissertation period (writing up), intensive use, active tutor involvement	1 week in July 2008
School of Fashion Design, Leeds University	Undergraduate course with a very practical focus and little formal writing	[3 tutors] Course coordinators, dissertation supervisors	[10 students] Young undergraduates	Students had just returned from a year on work experience. Preparation for dissertation, additional support during the dissertation process	July 2008 – April 2009 Ongoing
		[1 tutor] Academic skills tutor	[19 students] Young undergraduates	Students in their second year preparing for their dissertation to follow in their final year	1 day session, October 2008
Centre for Academic Writing at Coventry University	Volunteers from the students who visit the Centre	[2 tutors] Academic writing tutors	[2X10 students] Diverse years, courses, and background	An online session facilitated by CAW tutors; feedback gathered immediately	2x 1 day sessions, Nov 2008 and January 2009
College of Education and Lifelong Learning	Mature part time students and postgraduate students on PG certificate teaching course	[2 tutors]	[12 students] Mature adult learners, limited IT experience	Supplementary support environment for face to face teaching, new dissertation regulations	Dec 2008 Ongoing
UK Higher Education Centre in Philosophy and Religious Studies	Tutors from three large UK universities – Manchester Metropolitan, Sheffield, York	[6 tutors]	[up to a possible 200 students]	Developing a community repository for sharing dissertation practices	Nov 2008 – April 2009 Ongoing

- To fully realize the benefits, there needs to be a co-evolution of the pedagogical practice in the community with the extension of technical features. For example, it may not be self-explanatory to a tutor (or indeed a student) how to use the semantic markups effectively. Hence in the trials there was a need to provide simple pre-defined markups at the beginning for automatic extraction of information onto the home page. More advanced user-defined semantic markups should come when the tutors / students have mastered the concepts of markups with scaffolding.
- Reservation was expressed about the effort required for sustainability of the ADE. Need to demonstrate the benefits from the outset to persuade users to participate and continuing the momentum.

6 Conclusion

In conclusion, the AWESOME project has produced a dissertation environment 'ADE', based on semantic wikis, which implements the practice of 'social scaffolding' for supporting dissertation writing.

By involving writing and domain specialists, semantics were used to capture the core ontology for each of the community of practice. This process of articulation has increased our understanding on the main generic concepts and disciplinary-specific concepts and disseminated through the ADE in five different instances.

The immediate benefits of semantics over traditional approaches (such as forums) are: (i) Semantic markups empower members to articulate and highlight the nuggets in the comments or longer pieces of writing being shared; and (ii) Semantic queries dynamically populate tables of indices according to the scaffolding framework which in turn guide the members to the appropriate content at the right time.

The limited experience through these short trials has shown the potential of using semantics in the mining of usage patterns. Longer trials will (i) provide accumulative data in the emerging ontologies for a more in depth analysis on how different communities of practice may evolve; and (ii) collect individual member's profiles for identification of interesting patterns in learning and problem solving activities so that timely intervention could be introduced.

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References

1. Baumeister, J., Reutelshoefer, J., Haupt, F., Nadrowski, K.: Capture and Refactoring in Knowledge Wikis – Coping with the Knowledge Soup. In: Proc. 2nd Workshop on Scientific Communities of Practice, Bremen, Germany, June 2008 (2008)
2. Chatti, M.A., Jarke, M., Frosch-Wilke, D.: The future of e-learning: a shift to knowledge networking and social software. International Journal of Knowledge and Learning. Vol. 3, No 4-5. pp. 404 - 420 (2007)
3. Clark, A: Being There : Putting Brain, Body, and World Together Again, MIT Press (1997)
4. Decker, B., Ras, E., Rech, J., Klein, B., Hoecht, C.: Self-organized Reuse of Software Engineering Knowledge Supported by Semantic Wikis. In: Proc. Workshop on Semantic Web Enabled Software Engineering (SWESE), at the 4th International Semantic Web Conference (ISWC 2005), Galway, Ireland (2005)
5. Ghidini, C., Rospocher, M., Serafini, L., Kump, B., Pammer, V., Faatz, A., Zinnen, A., Guss, J., Lindstaedt. S.: Collaborative Knowledge Engineering via Semantic MediaWiki. In: International Conference on Semantic Systems (I-SEMANTICS '08), Graz, Austria, September 2008, pp. 134—141 (2008)
6. Kamler, B., Thomson, P.: The Failure of Dissertation Advice Books: Toward Alternative Pedagogies for Doctoral Writing, Educational Researcher, Vol. 37, No. 8, pp. 507-514 (2008)

7. Koch, M.: CSCW and Enterprise 2.0 - towards an integrated perspective. In: Proc. Bled eConference, June 2008 (2008)
8. Krötzsch, M., Vrandečić, D., Völkel, M., Haller, H, Studer, R.: Semantic Wikipedia. Journal of Web Semantics, Vol. 5, Elsevier, pp. 251-261 (2007)
9. Lea, M., Street, B.: Student writing in higher education: an academic literacies approach. Studies in Higher Education, Vol. 11 No.3, pp. 182-199 (1998)
10. Lillis, T., Turner, J.: Student Writing in Higher Education: Contemporary Confusion, Traditional Concerns. Teaching in Higher Education, Vol 6, Issue 1, pp.57-68 (2001)
11. Paltridge, B.: Academic writing. Language Teaching, Vol. 37, Issue 2, pp 87-105 (2004)
12. Parker, K.R., Chao, J.T.: Wiki as a teaching tool. Interdisciplinary Journal of Knowledge and Learning Objects, Vol. 3, 2007, pp.57- 72 (2007)
13. Pea, R.D.: The Social and Technological Dimensions of Scaffolding and Related Theoretical Concepts for Learning, Education, and Human Activity. The Journal of the Learning Sciences, Vol.13, No.3, pp.423-451 (2004)
14. Schaffert, S., Bischof, D., Bürger, T., Gruber, A., Hilzensauer, W., Schaffert, S.: Learning with Semantic Wikis. In: Proc. Workshop on Semantic Wikis – From Wiki to Semantics SemWiki2006, held at ESWC2006 (2006)
15. Sen, S., Lam, S.K., Rashid, A.M., Cosley, D., Frankowski, D., Osterhouse, J., Harper, F.M., Riedl, D.: Tagging, communities, vocabulary, evolution. In: Proc. 20th anniversary conference on Computer Supported Cooperative Work, Banff, Alberta, Canada, 2006, pp. 181 - 190 (2006)
16. Völkel, M., Krötzsch, M., Vrandecic, D., Haller, H., Studer, R.: Semantic Wikipedia. In: Proc. 15th international conference on World Wide Web, ACM Press, pp. 585-594 (2006)
17. Wenger, E.: Communities of practice: learning, meaning, and identity. Cambridge University Press (1998)