E-Portfolios and Blogs: Online Tools for Giving Young Engineers a Voice

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***Abstract*— Weblogs or blogs, as they are referred to by the Internet savvy, are gaining popularity as a medium for publishing content on the Web. They allow the author to voice their own opinion or ideas, and have the potential to reach a massive audience via the Web. On the other hand, e-portfolios are gaining recognition as a personal learning and development tool, where users can learn through reflection, and are able to showcase their work to demonstrate skills, competencies and capabilities. This paper presents an e-learning system that couples a blog with a learning e-portfolio. The system is called *dotFOLIO* and is currently being trialled in a first year engineering course taught at the University of Sydney. An evaluation of the system was conducted through a survey to gather the students' initial perceptions of reflective learning and of using dotFOLIO for a learning activity that was previously paper-based. Preliminary results of this survey are presented.**

1. Introduction

The Faculty of Engineering at the University of Sydney are currently trialling an e-portfolio system called *dotFOLIO* in a first year engineering unit of study called *ENGG1803 Professional Engineering*. The Faculty required an e-portfolio system to implement part of their Generic Graduate Attributes (GGAs) strategy. The GGAs are core skills and competencies that a student should obtain upon successfully completing a degree [18]. The attributes differ between degrees, however the attributes that best characterise an engineer are: communication capabilities; ethical, social and professional understanding; personal and intellectual autonomy; information literacy; research and inquiry. Developing a tool that can be used to support and nurture these attributes is a challenge. Therefore, the purpose of trialling dotFOLIO is to determine whether it can be used by students to manage and develop their GGAs, as well as to showcase evidence of obtaining the GGAs.

This paper reports our experiences with developing and using dotFOLIO in a first year engineering unit of study. More specifically, we focus on the blogging application that dotFOLIO provides, and how it was used to facilitate an assessable online reflective logbook. Details of the reflective logbook task and how it contributes to the communication capabilities and information literacy GGAs are provided in Section 2. Sections 3 and 4 cover the e-portfolio system and blogging application, respectively. We also show how these tools support the GGAs that the unit of study contributes to. Finally, the results of the evaluation of students perceptions of using dotFOLIO's blogging application for the logbook task is presented in Section 5, and Section 6 concludes.

2. Reflective Logbooks

Practising engineers must stay abreast of the rapidly changing environment, in which they work, to remain effective and to provide essential services that are both functional and efficient. To do this, they must be proficient in communication and information literacy skills. Both of these skills have been identified as characteristics of the engineering profession and form a part of the University of Sydney's core set of Generic Graduate Attributes for their engineering degrees.

For the engineer, information literacy means being aware of matters of concern to the engineering profession that appear daily in various forms of media, such as professional journals, magazines, television and the Internet. It includes capabilities to access, locate, manage, integrate and evaluate critically relevant information resources as well as to use ethically and create own information [5]. In terms of communication capabilities, the engineer must be able to discuss these issues, and present their views in a logical and yet forthright manner with their clients, colleagues, and members of the community.

To promote this practise, students undertaking the ENGG1803 Professional Engineering unit of study were required to maintain a reflective logbook as a part of their assessment. The purpose of the reflective logbook was to encourage "active intellectual monitoring and evaluation of one's own formal learning and professional practice activities, to examine them for new understandings, and to add to the individual's accumulated knowledge and experience" [17].

The logbook task required students to search through information resources each week to find an article related to a specific topic in engineering, such as *project management* or *environmental sustainability*. This part of the task was designed to improve students' information literacy, so that they develop an appreciation of the various forms of information

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within the engineering discipline that include technical books and reports, research articles, and magazines. The process of searching for an article further developed their ability to identify, utilise and locate appropriate information resources for a specific objective.

Finally, they were asked to complete a written discussion of the significance of the article, and its importance to the engineering profession. A word limit was placed on the length of the written discussion, which forced the students to communicate their ideas more effectively, clearly and concisely. The aim of the written discussion was to promote learning through reflection and improve the students' communication skills.

In previous years the logbook task was conducted as a paper-based assignment. This limited the resources that students could use to text-based media (i.e. students had to include copies of selected articles into their logbooks) and their written discussion would only have been read by their tutor. This year, however, the logbook task was conducted online. This allowed for more possibilities in that students were no longer restricted to just text-based media, but were able to explore other web-based digital resources that included both audio and video files. Also, students had to change their mindset when completing their written discussion, as they were writing for a much larger audience. The electronic version of the logbook was placed in the public domain on the Web, so that not only could their tutor read and provide feedback on their logbook, but so could their peers. The tool used to facilitate the online version of the logbook is presented in the following sections.

3. THE DOTFOLIO PROJECT

Portfolios and their digital counterparts *e-portfolios* are viewed as "personal, life-long content-management systems for collecting, reflecting on, selecting, and presenting learning outcomes" [13]. Various kinds of portfolios are used in tertiary education and professional training, such as "teaching portfolios" [15], "writing portfolios" [3] and "standard-based portfolios" [7]. The notion of portfolio includes both product and process [15]. As a product, portfolio is a storage that contains evidences about achieved learning results: created artefacts, certificates and other evidences of learning outcomes. E-Portfolio systems allow learners to archive their learning outputs as *digital learning artefacts* in a repository [1] and to create "credential" or "showcase" portfolio [20]. These digital artefacts can then be used in the future for specific goals, such as to "demonstrate competencies and to receive credit for prior learning" [12], to organize learning results and to "demonstrate fulfilment of required standards" [7]) or "to present themselves to prospective employers" [20].

Portfolio is also a process of collection, selection, interaction, development and reflection [3], [7]. Portfolios are used with long-term educational goals, and are said to support life-long learning experiences. From the process perspective, portfolios are primarily pedagogical tools (learning environments) that are used throughout all learning process and support gradual knowledge building rather than (just) assessment. Portfolio is a medium that allows to organise purposeful learning, reflection and building of personal understanding. E-portfolio systems allow learners to create *conceptual artefacts* [4] as well as reflect on them and through this process to develop their authentic knowledge.

Traditional taxonomies traditionally categorize e-portfolio systems into two broad categories: 1) "showcase of achievement and accreditation" portfolios that mainly focus on the final product and assessment 2) "instruction and learning" portfolios that mainly support the process of learning [6]. The goal of the dotFOLIO project is to develop an open source e-portfolio application for supporting both: the process of learning and reflection as well as the presentation of learning outcomes for course assessment. DotFOLIO can be used to construct a thoughtful collection of learning resources and digital learning artefacts and experience that leads to a desired outcome or educational goal (i.e. creation of conceptual artefacts). DotFOLIO provides the functionality for this, as well as allow learners to preserve more knowledge over time and to forge richer connections between their academic and work endeavours.

DotFOLIO differs to other e-portfolio applications [10], in that each e-portfolio owner is issued a "subsite" to use as their own personal Web space, as shown in Figure 1. This translates to a flexible environment for the creation and presentation of e-portfolios. The advantage of a personal Web space is to give the e-portfolio owner the freedom to think differently, and to give them control over how they present themselves and their ideas to others. This essentially provides "consistency for the user's identity" on the Web [9].

A core feature of any e-portfolio system is a repository for archiving learning resources and learning artefacts. Learning resources can be any digital "raw" material that learners use to construct their authentic understanding. Learning artefacts can be various completed pieces of work (material evidences) that are the results of learning activities. An e-portfolio system must be able to archive the learning resources and artefacts for future reference. By default, dotFOLIO includes a file storage application, as shown in Figure 2, that provides the functionality for archiving and managing the learning resources and artefacts. For the purpose of the logbook task, the file storage application allowed students to either upload files, or link to a resource located on the Web that related to the topic of the week. Students were encouraged to search through the library's electronic resources, and link to a resource from their e-portfolio. The e-portfolio allowed the student to keep a record of the resources used for the learning activity. More importantly, it allowed for alternative digital resources such as streaming video to be used, a resource that could not have been used in a paper-based logbook. This increases the range of possible information resources that a student can choose

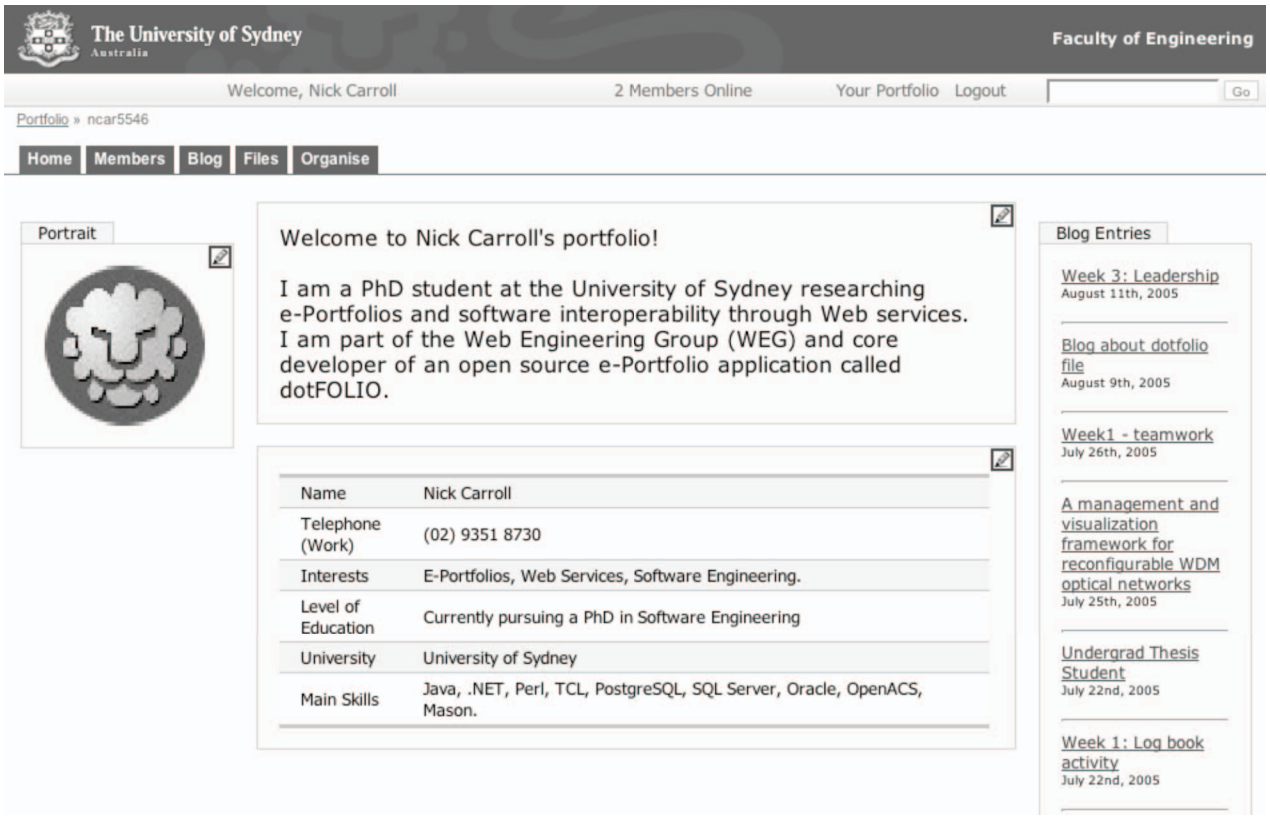

Fig. 1: *A student's e-portfolio site.*

from, which makes the process of identifying and utilising an information resource more challenging. By fulfilling this task, the student gains more in information literacy.

Once the information resource had been added to the repository, the student needed another web-based tool that provided the functionality to write a reflective passage on the resource, i.e. to create conceptual artefacts. DotFOLIO was designed with this in mind, in that an application can be "plugged in" to the system, and it would be integrated with other applications in such a way that the content of one application could be used in another. This meant that the resources stored in dotFOLIO's file storage application could be linked to another application that provided authoring capabilities. For such an application we decided to use a blog to support the writing task, for reasons that will be made obvious in the following section.

4. Blogs Give You a Voice on the Web

Blogs are exploding onto the Web at a phenomenal rate. They have even found their way into corporations such as General Motors, where their corporate leaders blog about GM's vehicles (see at http://fastlane.gmblogs.com). *Technorati* - a search engine for blogs - currently indexes about 15 million blogs, and discovers around 80 thousand new blogs a day [19]. These figures indicate the size and rate of growth of the blogosphere - the blogging landscape - respectively. This astonishing growth in the uptake of blogging has led many to ponder about the fascination of blogging [16], and whether it can be used effectively in education [8].

The nature of blogging is the act of reflecting and voicing one's own opinion or ideas on a particular subject via the Web. This has become a trivial task with blogging software, which are web-based tools for publishing content on a Web site, generally in reverse chronological order. Blog postings can be commented on by others, and these "conversations" can be archived for future reference. "Blogs contribute to Web content by linking and filtering evolving content in a structured way and by establishing interlinked communities - the blogosphere - connecting people through shared interests" [14]. Blogging is changing the way we use the Web with a fundamental shift from being passive consumers of information, to becoming active participants in the generation of information and knowledge sharing. The use of blogs for learning is increasingly becoming common practice in educational settings. Blogging is primarily "individualistic" rather than "collaborative" activity [11]. Blog technologies support reflective writing and personal knowledge building experience [2]. The main features of blogs give excellent possibility to create and organize conceptual artefacts.

For these reasons, the blog was selected as the ideal approach for the reflective component of the logbook activity. An alternative to the blog would have been a discussion forum [17], [21], however forums are less personal, and

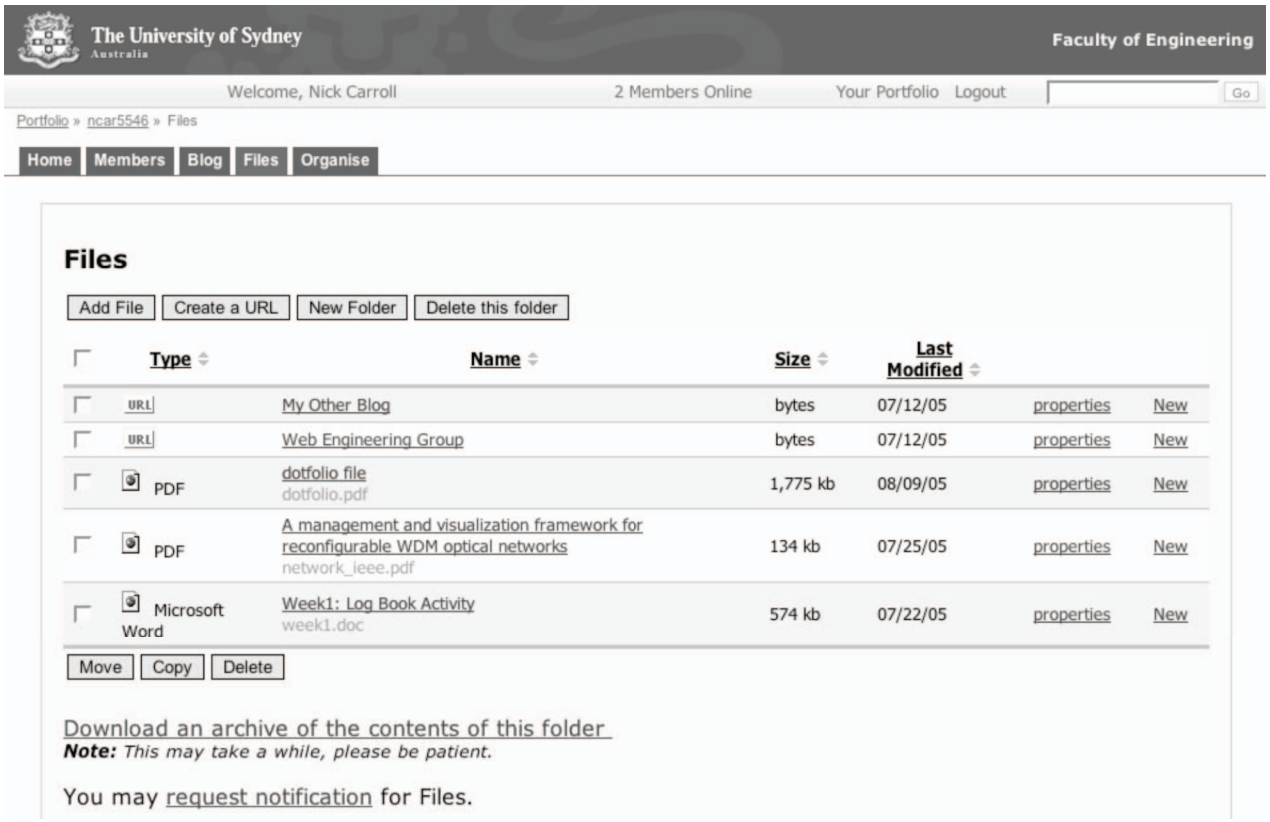

Fig. 2: *Repository for learning artefacts.*

individual perspectives would get buried within the forum threads. Forums are considered to be a tool that is best used in a learning management system, which by nature are course-centric with the purpose of managing a large group of students by a course co-ordinator. Also, course-centric tools tend to get wiped clean in preparation for when the course starts again. So the student would not be able to access their contributions in the forums beyond the duration of the course. A blogs on the other hand are learner-centric, in that it promotes personal learning and development. The student is in control of their own learning experiences, and can therefore demonstrate this within their own personal e-portfolio and the tools it provides. Integrating a blog into the e-portfolio means that students can use the blog to organize their learning resources and artefacts, reflect on them and create their personal knowledge, communicate their thoughts and ideas to a large audience, and have the capability to archive their work for future reference.

Applications in the dotFOLIO system are integrated in such a way that content items within an application can be linked to content items belonging to another application. This level of integration is depicted in Figure 3, which shows a blog entry in the main content area, and all related resources from the file storage application listed below. This functionality completes the requirements of the logbook task, by firstly providing an area to either upload or link to an information resources, and secondly a blog for publishing the reflective writing that can be linked to the relevant resources in the file storage application. Individual learning logbooks can be viewed by other course participants. They can read logbook entries or leave their comments. This common feature of blogs provided a convenient possibility for teachers to give a feedback to students and assess their work.

5. Evaluation

An evaluation of initial students perceptions about reflective learning and dotFOLIO as a tool for the logbook exercise was conducted after students had a week to interact with the system. The evaluation took the form of a paper-based questionnaire. A follow-up questionnaire was intended to be distributed towards the end of the course to determine a change in attitude towards dotFOLIO and the reflective logbook task. However, at the time of writing the course was only midway through the semester, and thus only the preliminary results of the first survey will be reported.

A. Method

The written questionnaire was distributed among students enrolled in ENGG1803 Professional Engineering during their tutorial time. In accordance with the University of Sydney Human Ethics Committee, participation in the survey was

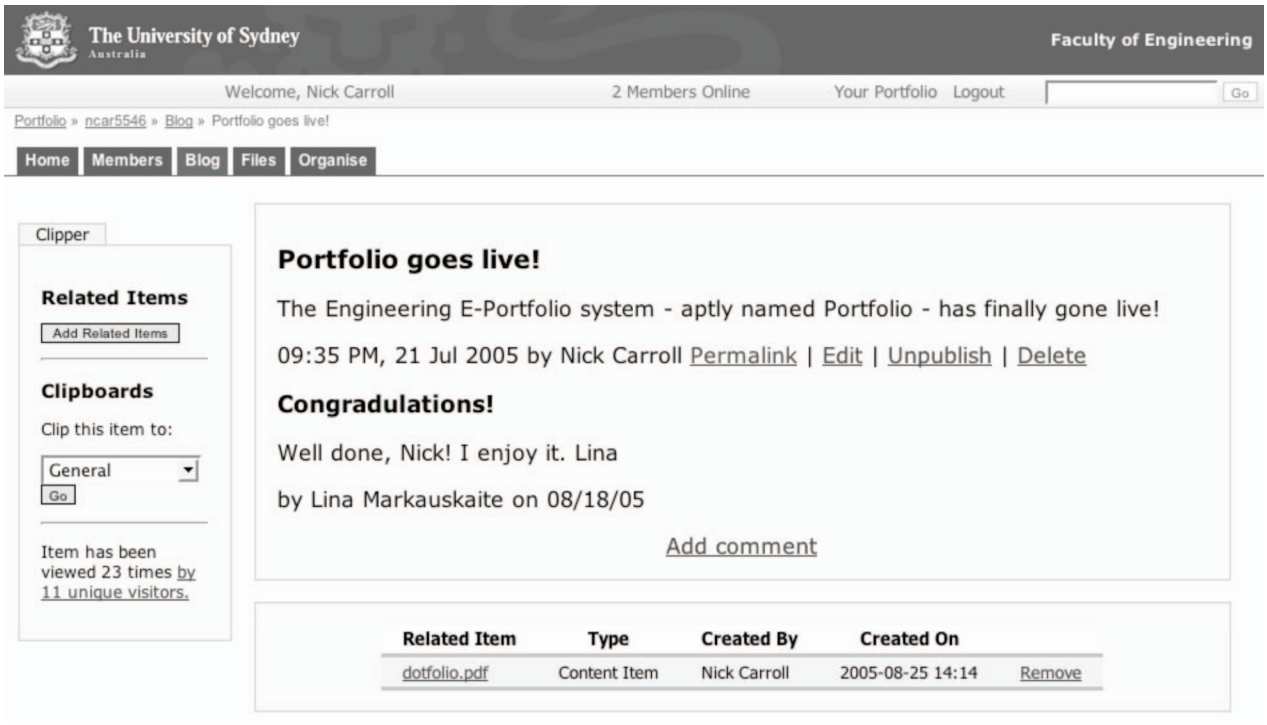

Fig. 3: *Blogging within dotFOLIO.*

voluntary. Students were kindly asked to complete the questionnaire, and were allowed to opt out if they did not wish to participate.

The questionnaire comprised of three sections: demographic information; general questions on the reflective logbook task; and epistemological beliefs. The section on demographic information queried for the age, gender, learning to use information technologies, previous experience with e-learning. The general questions section sought responses on student perceptions of the reflective learning, logbook task, and the tools used to facilitate the task online. The last section required students to answer questions on their epistemological beliefs, and would be used to profile the type of learner the student is. The latter section on epistemological beliefs was mainly administered for longitudinal research purposes and will be linked with the second follow-up questionnaire. Therefore only the demographic information and responses to the general questions will be discussed in the following section.

B. Results and Discussion

In a class of 267 students, there were 204 valid and complete questionnaire responses that were collected, giving a response rate of 76.4%. The following statistics about respondents' were obtained from the sample. The age ranged from 18 to 33 years with an average 19.4 years (standard deviation - 1.6) and median 19 years. Of the 204 respondents, 82.4% were male and 17.6% were female. The percentage of male and female students in the entire cohort were 83.9% and 16.1% respectively, which is not statistically significant from the sample (chi-square = 0.361, p = 548). Due to the relatively high response rate, and matching characteristics between the sample and the entire class, it is possible to infer valid conclusions about the entire class.

The following computer literacy statistics were also obtained from the questionnaire. The age range for first use of the Internet was from 3 to 23 years, with a mean age of 11.8 (SD = 2.5) years and median of 12 years. 50% of respondents had previously completed a course in which they were taught how to use a computer or the Internet. About 65% of students already had some e-learning experience, i.e. had previously taken one or more courses that had an online learning component. 80% of respondents indicated that they previously used an online learning management system, such as *WebCT* and *Blackboard*. Students on average used a computer for 5.5 (SD = 6.8) hours per week with median of 4 hours per week. 97% of students had easy access to a computer for their off-campus study. From these statistics, we can conclude that students enrolled in the course were fairly experienced with using computers and the Internet.

For the questions with regards to perceptions of the logbook task and reflective learning, five-point Likert scale was used, i.e. students were asked to respond to a question with either a: strongly disagree; disagree; neutral; agree; or strongly agree. A selection of responses pertaining to the students' initial perception of the logbook task is conveyed in Figure 4.

Figure 4(a) shows that a majority of students (54.2%) understood the objectives of the logbook task (i.e. agreed and strongly agreed with the statement that the objectives of the

logbook task were clear) compared to 19.6% that disagreed or strongly disagreed, and 27.9% that were neutral about this statement. This conveyed that a majority of respondents were satisfied with the specification of the logbook task. A majority of students believed that the logbook task would enhance their understanding of current professional engineering issues as shown in Figure 4(b), with 43.1% being positive (i.e. agreeing or strongly agreeing)and 25.5% being negative (i.e. disagreeing or strongly disagreeing). Likewise, Figure 4(c) conveys that most of students (57.8%) agreed or strongly agreed that reflective capabilities are important in the engineering profession compared to 9.8% disagreeing or strongly disagreeing. Conversely, when students were asked if they would like logbooks included in other units of engineering studies, a majority of respondents (57.9%) were negative and only 19.2% agreed or strongly agreed as depicted in Figure 4(d). These results imply that the students understood the purpose of the logbook task and its benefits, however most opposed the use of the logbook in other units of study. Students were asked to provide additional open-ended comments about the logbook task in the questionnaire, and some alluded to the reason why they opposed the use of logbooks in other units of study, by suggesting that "maintaining a logbook is a time-consuming task".

There were some positive feedback on the use of dotFOLIO and e-portfolios in general for the logbook task. Figure 4(e) conveys that students were in favour of the online environment being an appropriate tool for the logbook task, with 66.6% agreeing or strongly agreeing and 18.2% disagreeing or strongly disagreeing. It was also perceived that e-portfolios or similar reflective learning tools can help engineers keep up to date with current issues in their profession, with 58.8% agreeing or strongly agreeing with the statement and only 11.3% disagreeing or strongly disagreeing, as conveyed in Figure 4(f). These statistics show that e-portfolios, in particular dotFOLIO's integration with a blog, are perceived to be useful tools for aspiring engineers in their personal learning and development. The results also suggest that the online tools are not the cause for students being out of favour for logbooks to be maintained in other units of study. The fault may lie with the nature of the reflective learning and task, in that it is requires permanent engagement and perceived to be a weekly chore. Therefore efforts must be applied to determining more attractive incentives for students to use learning e-portfolios. Three possible areas to investigate would be building students' awareness of how to accomplish reflective learning tasks, adding more attractive features to the e-portfolio or adjusting the workload for the logbook task.

6. Conclusion

An e-portfolio system called dotFOLIO was presented as a viable online learning environment for a reflective logbook task. The integrated blogging application within dotFOLIO allowed students to assemble, reflect and publish content for their logbook task with ease. The openness of the blog meant that the logbook entries were made available to the public domain. This meant that students had to rethink how they would reflect on certain issues in engineering and communicate their ideas, knowing quite well that what they write would be read not only by their tutor, but also their peers. This differed to the paper-based logbook, in that the logbook would only have been read by the tutor. Another advantage over the paper-based logbook was that the students were exposed to a greater variety of information resources that were available to them over the Internet. The benefits pertaining to the learning outcomes of the reflective logbook task is that it contributes substantially to the development of many students' Generic Graduate Attributes, in particular communication capacities and information literacy.

The evaluation of dotFOLIO suggests that it is an appropriate online environment for the logbook task, and therefore implies that it can be used to support Generic Graduate Attributes. The only negative point drawn from the evaluation is that students are concerned that maintaining a logbook is perceived to be laborious, even though they agree that it enhances their understanding of current professional engineering issues. This is an issue that needs to be addressed for future work, and maybe rectified by either reducing the weekly workload of the task, or by improving the online environment to make the task more efficient. Nevertheless, the use of e-portfolios for reflective learning in engineering looks promising.

7. Acknowledgements

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References

[1] H. C. Barrett. ICT support for electronic portfolios and alternative assessment: The state of the art. In *Proceedings of World Conference on Computers in Education (WCCE2001)*, July 2001.

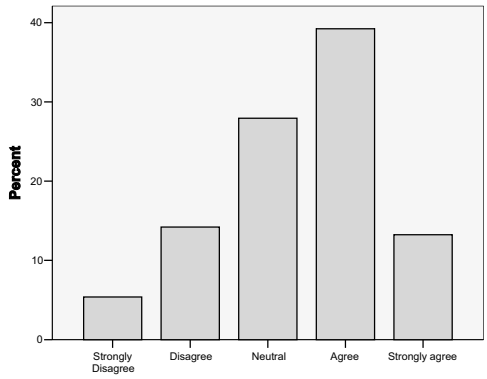
[2] A. Bartlett-Bragg. Blogging to learn. *The Knowledge Tree*, `http://knowledgetree.flexiblelearning.net.au/edition04/html/blogging_to_learn_intro.html`, 4 December 2003.

[3] E. Beagle. Bravely go where few have gone before with digital portfolios. *Tech-Learning*, `http://www.techlearning.com/content/new/new200409.html`, 1 September 2004.

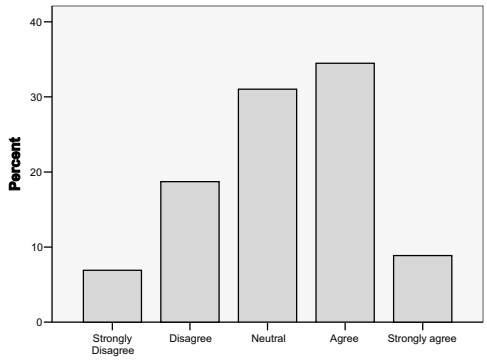
[4] C. Bereiter. *Education and Mind in the Knowledge Age*. Mahwah, NJ: LEA, 2002.

[5] A. Bundy (ed.). *Australian and New Zealand Information Literacy Framework: Principles, Standards and Practice* (2nd ed.) Adelaide: ANZIIL, 2004.

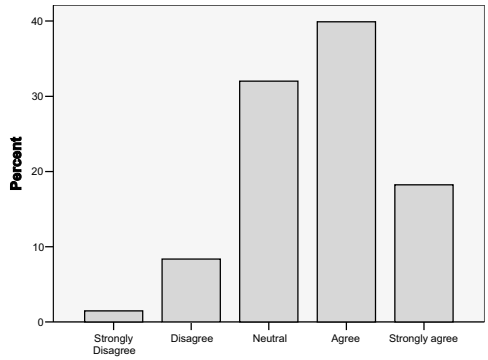
[6] K. K. Chan. Digital portfolio: More than an electronic file cabinet. In *Proceedings of International Conference on Computers in Education (ICCE2004)*, 30 November–3 December 2004.



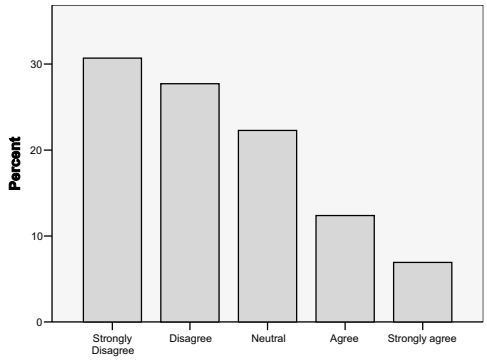
(a) The main objectives of the logbook task are clear for me.



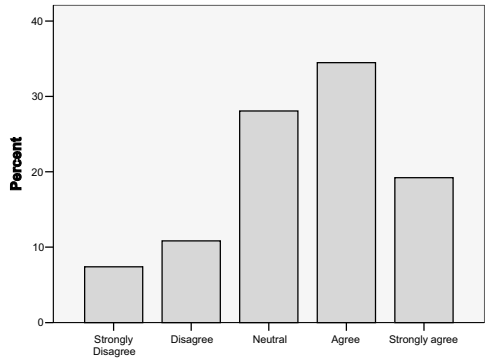
(b) The logbook will enhance my understanding of current professional engineering issues.



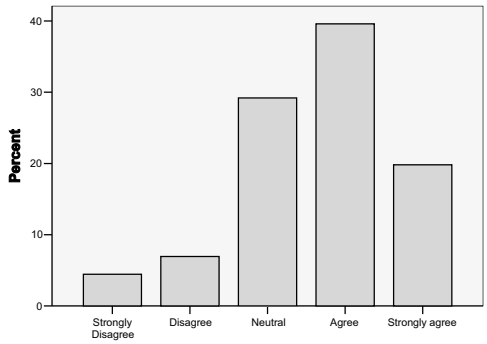
(c) Reflective capabilities are important in the engineering profession.



(d) I would like logbooks to be included in other units of engineering studies.



(e) The e-Portfolio (online environment) is an appropriate tool for the logbook task.



(f) e-Portfolio or similar reflective learning tools can help engineers to keep up to date with current issues in their profession.

Fig. 4: *Survey results of students' initial perceptions of using dotFOLIO (an e-Portfolio system) and its blog for reflection.*

[7] C. C. Chou. Technology integration with standards-based eFolio for K-12 in-service teachers. In *Proceedings of International Conference on Computers in Education (ICCE2004)*, 30 November–3 December 2004.

[8] S. Downes. Educational blogging. *Educause Review*, 39(5): 14–26, September 2004.

[9] C. Gates and J. Slonim. Owner-controlled information. In *Proceedings of the 2003 workshop on new security paradigms*, Ascona, Switzerland, 2003. Applied Computer Security Associates (ACSA), ACM Press, pp. 103–111.

[10] P. Gathercoal, D. Love and G. McKean. Profport webfolio system: Implementation, curriculum and assessment. In *The 2003 Educause Annual Conference: Balancing Opportunities, Expectations, and Resources*, Anaheim, California, USA, 2003.

[11] J. Farmer and A. Bartlett-Bragg. Blogs @ anywhere: High fidelity online communication. In *Proceedings of the 22nd Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE 2005)*, Brisbane, December 2005, pp. 197-203

[12] J. C. Ittelson. Building an e-dentity for each student. *EDUCAUSE Quarterly Articles*, 24(4): 43–45, 2001.

[13] A. Jafari. The "sticky" eportfolio system: Tackling challenges and identifying attributes. *EDUCAUSE Review*, 38–48, 2004.

[14] C. Lindahl and E. Blount. Weblogs: Simplifying web publishing. *IEEE Computer*, 36(11): 114–116, November 2003.

[15] J. Loughran and D. Corrigan. Teaching portfolios: A strategy

for developing learning and teaching in preservice education. *Teaching and Teacher Education*, 11(6): 565–577, 1995.

[16] B. A. Nardi, D. J. Schiano, M. Gumbrecht, and L. Swartz. Why we blog. *Communications of the ACM*, 47(12): 41–46, December 2004.

[17] S. Palmer. Evaluation of an on-line reflective journal in engineering education. *Computer Applications In Engineering Education*, 12(4): 209–214, 2004.

[18] S.C. Barrie, P. Jain, and A. Carew. Generic graduate attributes: A research based framework for a shared vision. *Journal of Staff and Educational Development International*, 23(3): 261–275, 2004.

[19] David Sifry. State of the blogosphere. `http://www.sifry.com/alerts/archives/000332.html`, August 2005.

[20] E. K. Wilson, V. H. Wright and J. Srallworth Secondary preservice teachers' development of electronic portfolios: An examination of perceptions. *International Journal of Technology and Teacher Education*, 31(4): 515–527, 2003.

[21] L. Wise. Blogs versus discussion forums in postgraduate online continuing medical education. in *Blogtalk downunder conference*, `http://incsub.org/blogtalk/?page_id=106`, 2005.