

# Full Paper

## Background

Portfolios generally and eportfolios specifically have played a role in student learning and assessment in universities for some time. The literature supports the use of portfolios in developing student ability to critically reflect and to articulate university and workplace achievements that in turn aids their employability (Trevitt, Stocks & Quinlan, 2012; Shen & Ooi, 2013; Bramhall, Short & Lad, 2013).

Eportfolios have been used in various disciplines such as IT (Chang & Liao, 2014), the humanities (Mossa, 2014), dentistry (Gadbury-Amyot, McCracken, Woldt & Brennan, 2014), medicine (Webb, et al, 2014), nursing (Anderson, Gardner, Ramsbotham & Tones, 2009) and teaching (Boulton, 2013). There has been some use of portfolios in the area of engineering (Williams, 2002; Eliot & Turns, 2011; Fielke & Quinn, 2011) and these have pointed to the place of eportfolios in enhancing engineering students' communication skills and the development and articulation of workplace learning.

Despite the longstanding recognition of the value of eportfolios and links to lifelong, self-directed learning and employability, and a call for collaboration in the higher education sector (Hallam, et al, 2008), universities have largely adopted piecemeal and isolated approaches to eportfolio development and use. Von Kinsky and Oliver (2012) reported that across the higher education sector, much of the eportfolio use is limited to a single topic, unit or subject use, with student uptake of eportfolios largely driven by assessment requirements.

An additional weakness in eportfolio use to date has been a failure to provide value to students by aligning eportfolios with recruitment practices, by working with employers and professional societies. The potential benefits of employers' involvement in student learning have not been fully realised (Hallam et al., 2010, Ferns and Comfort, 2014). An additional untapped potential benefit lies in involving professional bodies in aligning eportfolios used during higher education with program accreditation and chartered status processes. Such collaboration could streamline lifelong learning and its recognition.

Compared with higher education generally, engineering and ICT have particular needs. Student exposure to engineering practice is both important and difficult as most engineering academics lack recent industry experience and students need awareness of roles of engineers and the value of their learning in order to become self-directed learners (Cameron, Reidsema & Hadgraft, 2011; Male & Bennett, 2015). Work integrated learning, including both placements and exposure to practice, is enhanced by critical reflection and students need tools and resources to support this Work Integrated Learning (WIL), which can be an especially transformative experience and opportunity to develop employability skills.

However, the diversity of workplace learning experiences, coupled with the tacit nature of the learning these offer, can limit students' recognition of the learning occurring in the workplace (Raelin, 2007). Processes, resources, and tools to support critical reflection on the development of employability skills through WIL and authentic learning experiences are therefore essential (Orrell, 2011; Kelly & Dansie, 2012; Billett, 2011).

The Australian Council of Engineering Deans led a national project to enhance engineering students' exposure to practice (Male & King, 2014a). Despite the importance of reflection and awareness of employability skills, in a student survey undertaken during the project, among 215 responses from final-year bachelor or master of engineering students in Australia, 74% of the students responding did not indicate agreement with the statement that they had tracked their development towards engineering capabilities (Male & King, 2014b). The guidelines on enhancing industry engagement in engineering degrees that were developed during the project recommended a standardised eportfolio (Male & King, 2014a).

Standardisation was based on employers indicating that they would use students' eportfolios

in selection processes only if the eportfolios were standardised for convenient comparison. An additional benefit of standardisation of eportfolios aligned with employability skills will be to inform students from early in their degrees of the employability skills recognised in their industries.

Acknowledging the sector readiness and, in particular, the readiness in engineering and ICT for a national approach, the Australian Council of Engineering Deans initiated a pilot study in which a team of academics from a range of universities investigated eportfolio use in engineering and ICT. This led to the establishment of a large collaboration designed to bring together the learning and employability imperatives for students in ICT and engineering programs through the development of the first national portal for reflective practice that is nationally uniform and endorsed by a professional body.

This paper reports on the findings of the pilot study and the aspirations of the larger collaboration.

## Methodology

The initial study sought to map the institutional portfolio use in engineering and to identify points of agreement and need. The interest this project generated led to the formation of a collaboration comprising 16 universities and two professional bodies. The aim then became the development of a national eportfolio portal focused on student employability and lifelong learning. The larger collaboration work is still underway and is waiting for funding approval for 2016 and beyond.

The small scale study, informed by literature into best eportfolio practice, surveyed universities on their use of eportfolios in engineering and ICT. Questions focused on platforms, whole of program versus single unit use and the standards or outcomes against which the portfolios were framed (See Table 1). Participants were recruited by email invitation through the Australian Council of Engineering Deans (ACED) and the Australian Council of Deans of ICT (ACDICT). Ten universities responded. Responses were analysed for themes in NVivo and were clustered into thematic categories.

The outcomes of this project supported the need for a wider project. The questions posed were:

1. Do you currently use portfolios in any of your engineering/ICT schools?
2. What system/platform do you use?
3. What resources (learning/teaching) are used to help students build the portfolio
4. Are they mapped against Engineers Australia's Stage 1 Competencies, the Australian Computer Society's ICT Profession Core Body of Knowledge or the Skills Framework for the Information Age (SFIA), Graduate Attributes etc.?
5. Are the portfolios used for whole of program or individual units?
6. What is done poorly/well?

The larger project – at the time of writing being assessed by the Office for Learning and Teaching – proposes a staged approach reflecting action research principles. It proposes a focus on activities at participating universities to trial and hone eportfolio use and to determine portability standards. Note that the focus is on portability of portfolios. The project does not aim to stipulate that universities adopt a uniform portfolio platform, but rather enhance existing practices (e.g. student critical self-reflection) and link to the need for improved employability through the establishment of a portal. Simultaneous to the trials, the project team will collect and review best practice resources and have these evaluated at local forums that include industry representatives and students. In response to formative evaluation, data collection, trials and forums will be iterative and outcomes from these will inform the dissemination workshops as the final planned stage of the project.

This wider collaboration has three significant and original features. First, it is the first attempt at addressing the previously identified need for national collaboration and action on eportfolio use. Second, its research stages involve all stakeholder groups not as sources of data but as evaluators of data. Students are proposed as evaluators of resources and practices as are representatives from industry. Third, the professional bodies Engineers Australia and the Australian Computer Society are key partners in the research activity.

## Findings and Discussion

Responses to each of the questions asked in the small scale study are presented below.

### **1. Do you currently use portfolios in any of your engineering/ICT schools?**

Of the ten respondents, only four indicated that portfolios were used and one of these said they were used in very limited ways. Five said there were plans, pilots or interest to introduce them. One university offered a portfolio platform for all students within the university to access throughout their enrolment but that uptake was optional.

### **2. What system/platform do you use?**

Nine universities had looked into or trialled different platforms. Some had Mahara or iPortfolio embedded into their Learning Management Systems. Two universities had site licenses for PebblePad but another indicated this platform was not suited to a tertiary environment. One university had its own student portfolio platform used across the institution.

### **3. What resources (learning/teaching) are used to help students build the portfolio?**

Of the universities who had active portfolio use, two listed the system or platform supports available to students to access of their own accord. Two others indicated more pedagogical approaches where students are scaffolded in class via learning and teaching activities to gather and reflect on evidence of achievement of outcomes. At a university where portfolios were due to be introduced, there was significant preparation work on students' development of reflection skills. There was significant preparation in this instance to introduce portfolios across the whole engineering program using a framework for implementation. The faculty was in the process of redesigning some of its courses to focus on the collection of evidence of competencies.

### **4. Are they mapped against Engineers Australia's Stage 1 Competencies, the Australian Computer Society's ICT Profession Core Body of Knowledge or the Skills Framework for the Information Age (SFIA), Graduate Attributes etc.?**

For the university where portfolio development was left to students to develop independently, evidence was mapped against that institution's graduate attributes. Where portfolios were used as part of whole programs or individual units, evidence was mapped against unit or program outcomes, although it was pointed out in all cases that these outcomes 'incorporate' or are 'mapped to' or 'mapped against' Stage 1 Competencies.

### **5. Are the portfolios used for whole of program or individual units?**

In only one case eportfolio use was left to individual students and was not linked to any program or units. Similarly, only one university has a whole of program approach to portfolios though several were planning a whole approach. Single unit or subject use was the most common approach.

## 6. What is done poorly/well?

Where portfolios were used identified strengths included assisting students in understanding course learning outcomes. In addition, they provide a measure of student achievement at the completion of the term. Where the curriculum is designed with portfolios in mind there is coherence in approach across a whole program. The challenges were clustered in areas where portfolios were only used in individual units and these included the high dependence on individual academics, and where the portfolio was used late in the program, convincing students of their worth and teaching them how to build them.

In summary then, the initial study determined that eportfolio use ranged from non-existent to planned, and from student initiated, individual unit use to whole of program embedded use with some eportfolios having a specific work integrated learning (WIL) focus. The most developed process and support seemed to be at one university which had developed a whole of program/course approach where the intention was to develop and maintain the eportfolio across all units/subjects and explicitly teach students the skills of critical reflection throughout. This is also likely to be the most sustainable. (Our wider project collaboration reveals that there is at least one other university with this approach.)

Where eportfolio use was restricted to a single unit, there was a heavy reliance on individual academics for its implementation and success. Platforms, resources used to support portfolio development including critical reflection, the domains or outcomes against which student artefacts were mapped, and the ways in which portfolios were assessed all varied across institutions. Mapping occurred across a variety of domains and whilst many respondents mentioned Stage 1 Competencies in Engineering, they were only indirect inasmuch as subject or course outcomes were linked to Competencies. Similarly, there was no consistency in terms of assessment with no clear sense of how best or when to do this.

This variation represented an imperative for further work in this area and led to the formation of the national collaboration with the dual focus of initiating a national portal and developing pedagogical practices to support student critical reflection and employability.

There was a strong rationale and sector readiness for such a project as seen in:

1. Literature that highlights the links between higher order student learning and eportfolios;
2. Projects pointing to the need for a systematic nationwide approach to eportfolio use;
3. Employer groups looking for greater employability skills in graduates;
4. The recognised value of WIL but limited articulation of experiences into demonstrable skills for employment;
5. Commitment of ACED, the Australian Council of Deans of ICT (ACDICT) and professional bodies such as ACS and EA to a unified approach; and
6. Widespread interest in and commitment to the concept of the portal as seen in Australia-wide university representation in the project proposal.

## Conclusions

This project has mapped and explored local eportfolio use in engineering at several Australian universities. It gathered literature and online resources that point to the purpose and value of eportfolios in supporting and enabling student learning and improving pedagogy. It has established how ten Australian universities currently use eportfolios and has shown the value of a whole of program approach with a focus on career or professional competencies. The project highlighted groundswell support for a national approach to eportfolio use, not necessarily a uniformity in platforms within institutions, but support for the development of a portal where students can readily transition from university to the workplace. A current collaboration between 16 Australian universities and two professional bodies aims to achieve this goal.

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