Professional Reflection and Portfolios to Aid Success and Employability

Prof Michael Bramhall [a], Dr. Chris Short [a], Raju Lad [b]
Sheffield Hallam University, UK [a], Alcoa, Australia [b]
Email: m.d.bramhall@shu.ac.uk

BACKGROUND
UK professional institutions (UK Spec, 2010) and employers demand that graduates possess a range of professional and personal skills (Baker, 2009). In the 1990s, Sheffield Hallam University pioneered a BEng (Hons) degree in Integrated Engineering with an emphasis on assessing students' technical, personal and professional skills using paper based "portfolios" for recording and reflection. Ultimately it ceased in its original form because it was subsumed into a bigger programme and whilst some of the good elements were kept, some were lost because of its resource intensive nature. Other courses have now replaced the Integrated Engineering course but there has been a reduction in the numbers of students/ graduates maintaining a portfolio of evidence to demonstrate these skills, even though the UK Quality Assurance Agency (QAA Framework, 2008) specifically requires that university courses provide students with the opportunity to do this.

PURPOSE
This paper explores what motivates meaningful self-reflection in student portfolios, and what are the pros and cons in continuing the portfolio into their professional career.

DESIGN/ METHOD
A UK Interdisciplinary funded project (Bramhall, 2012) formed the basis for seeding two mini projects at first year undergraduate level. Project 1 was specifically around providing opportunities for undertaking interdisciplinary/ multidisciplinary problem based design work, which integrates other aspects of the curriculum and provides an excellent source of material for undergraduate students' to record progress and achievement in a portfolio. The second project, and the main emphasis of this paper, provided an opportunity to investigate students' involved in project1 and their perceptions around the development of e-portfolios for reflecting on and recording such integrative/ interdisciplinary work.

In parallel, a case study is presented of the career development of a graduate from the Integrated Engineering course who graduated in 1994 and who is currently resident and working in Western Australia. His approach to the continued use of a CPD portfolio/ Professional Development Plan and the benefits he gained in relation to his career development has been reviewed, and together with results of the undergraduate student perceptions, suggestions have been built into the design of an e-portfolio template for use in engineering design technology courses.

RESULTS
Undergraduate student motivations to compile a portfolio were low and dependent upon achieving success at some future point in time. Their views and perceptions in relation to an e-portfolio structure and template were elicited, and together with the extraction of generic assessment outputs for their course, supported by a graduate's perceptions, a flexible template was designed and developed for undergraduates to encourage and motivate students to develop their own individual e-portfolios.

CONCLUSIONS
The results of the interdisciplinary work emphasise the value of an on-line mentoring blog in aiding student performance and supports the concept that an e-portfolio template needs to build in a "Shadow Mentoring System", which automatically guides students in its compilation and reduces external resources requirements. Motivations to compile and maintain an e-portfolio are enhanced through physical examples, which demonstrate that doing so "gives students an edge".

KEYWORDS
Professional Portfolios, Reflection, Careers Development

Introduction

Over the last twenty years there has been much written and developed around the use of portfolios for recording student performance and achievement. Sheffield Hallam University were one of the pioneers of this in developing an Integrated Engineering Degree Programme (IEDP) (Robinson et al, 1991). This was in response to government and professional body initiatives for the development of professional skills in the engineering undergraduate curriculum (SARTOR, 1990). Since then the Engineering Council published UK-Spec (Engineering Council, 2010) and professional and personal skills development and reflection remain an important aspect of becoming a chartered engineer.

At the time, the IEDP course was innovative in that it had a broad-based structure comprising: mechanical engineering, manufacturing, electrical and electronic engineering, materials, business studies, mathematics and 'integrating studies' in the form of a Ghost Company (Bramhall et al, 1994). The Ghost Company was a simulated company that ran throughout the course as a spine within the degree. The other innovative feature was that 25% of the final year of the course was assessed by a Portfolio (Payne et al, 1993). This professional portfolio allowed students to demonstrate professional, personal and technical achievement throughout the course. The course eventually evolved into a broad based automotive course and after some 12 years of operation, the portfolio was removed from the course, due to the modular nature of the degree programme.

Since then the UK QAA requires all courses in the UK to provide a PDP/ Progress File system that students can choose to undertake and develop whilst at university, either paper based or electronic. Evidence from the literature shows the advantages of compiling an e-portfolio are now well defined (Prpic & Moore, 2012) and the guidelines clearly support and encourage the maintenance of such documents to record graduate attributes (Palmer et al, 2011), but there is no one approach to building their use into the curriculum (Madden, 2007). Some institutions (as in the example above) integrate portfolios with elements of assessment as reward for students to keep these records whereas others take a more relaxed approach. On entering Graduate employment graduates are however on the first rung of the ladder towards becoming professional engineers. This therefore means that they may be taking further postgraduate qualifications towards chartered status. To support this they will also have the need to autonomously compile a portfolio of their CPD activities; something that for many they may not be used to doing or have only done previously for reward. Once in employment, graduates will also no longer be involved in single discipline work as in the academic environment, but will be working in multi-disciplinary teams and crossing subject boundaries associated with interdisciplinary projects, hence recording such work in a portfolio can be a powerful way to keep evidence and demonstrate achievements. But a number of problems exist, especially with first year undergraduate students:

- What prevents students from maintaining a portfolio? Through their course and beyond?
- How can students be encouraged to keep their own portfolio without summative reward?
- What supports students in this endeavour?
- What are student's perceptions of the material and content that they should record in a portfolio, especially with respect to interdisciplinary work?
- How can students experience interdisciplinary project work and how can they record this in a portfolio?

Sheffield Hallam University (SHU) has been using interdisciplinary taught academic assignment and project work in a large number of courses for several years to enhance the

student learning. Recent SHU in-house interdisciplinary projects aimed at evaluating the use of interdisciplinary work have confirmed its benefits and led on to a recently completed STEM funded large scale curriculum innovation and enhancement project (Bramhall, 2012) which allowed the spawning of two mini projects on the development of interdisciplinary coursework across the Engineering Design Technology undergraduate programme. The two interdisciplinary mini projects involved (1) the incorporation of the Engineering Without Borders (EWB) challenge into a common first year module; (2) development of an e-portfolio structure which provides a means of recording integrative work and performance from the other project (plus other projects in the future). This paper will concentrate on the approach to e-portfolios resulting from this national STEM project work.

The E-Portfolio Mini Project

A substantial literature review was carried out which confirmed what we all know, that there has been significant work done on paper based and e-portfolios. But whilst there is some material, in comparison there is very little evidence on the recording of interdisciplinary linkages.

The work done for the interdisciplinary e-Portfolio mini project initially involved focus group interviews with two separate cohorts of first year students (20 students in each class) undertaking a non-credit bearing module on Academic Learning Skills (ALS) running during their first semester of studies. This activity allowed staff to run an interactive class/ open discussion of PDP and e-PDP and to present and review physical electronic examples of e-PDP files from students in other areas and disciplines in the Faculty eg art/ design, and those studying to teach craft, design and technology etc. It also allowed discussion about the advantages of using portfolios and allowed staff to gather student views on portfolios; several two minute video clips were compiled to record this. Both good and bad examples of e-portfolios were showcased to these students to provide a "Feel Factor" on what a portfolio is. A few benefits were suggested to students and their thoughts on what would motivate them to keep a portfolio were recorded. Students were also asked to discuss their thoughts on what they would expect or like to see in a portfolio and what a portfolio should look like. Discussions also took place around what would help or hinder students in compiling portfolios.

Following the initial focus group interviews, a questionnaire was compiled in order to widen the study of student perceptions and to compare, contrast and confirm the previous results. A presentation was made to 143 first year engineering design technology students during a one hour common lecture/ tutorial for the EWB Interdisciplinary project. These students were enrolled on a range of seven BSc courses with specialist flavours including Aerospace, Automotive, CAD, Product Design and Sports Technology. The 143 questionnaires were distributed and completed within the lecture and student questions and comments were recorded.

Results

Results from both the focus group study and the questionnaire presentation explained why many students don't compile and maintain a portfolio. It was evident to students that although there was no credit involved, it is the 'success' part at the end of their course, including 'graduation', and help with 'employability' that matters. However, students' perceptions were "this is a long way off" and "they don't need to compile a portfolio until they start to be successful"; which is an interesting aspect as many pre-university students use Records of Achievement within schools prior to progressing to university. From a single discipline subject aspect, students had little understanding of what to include in a portfolio and were even more confused about recording "Interdisciplinary" work, in spite of being involved with the EWB work

Their comments detailing their initial perceptions of portfolios are shown in Figure 1 and show a negative view. However when they were showcased a range of variable quality sample portfolios, students clearly knew what they liked and disliked about the e-portfolios and what would be good or not so good (Table 1).
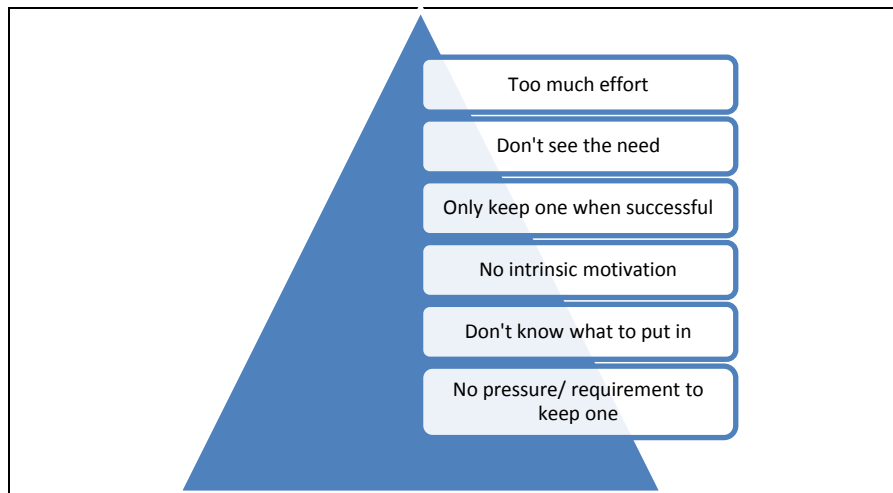

Too much effort

Don't see the need

Only keep one when successful

No intrinsic motivation

Don't know what to put in

No pressure/ requirement to keep one

Figure 1 Initial Perceptions of students regarding portfolios

Table 1 Student comments about existing showcased Portfolios

Likes	Dislikes
• Professional Look • Good Layout • Images/ sketches • Logos • Organised structures • Variety of media • Evidence of students working on activities • Lots of examples and range of skills shown • Use of colour and sound • Eye catching	• Unclear messages • Unprofessional look • No one clear skill set • Too many pictures and no explanation • Too much text • No clear headings/ structure • Looks too like a Power-point presentation • Large demand on time to complete which could be spent on assignments

In terms of motivation to keep a portfolio student comments fell into the categories shown in figure 2.
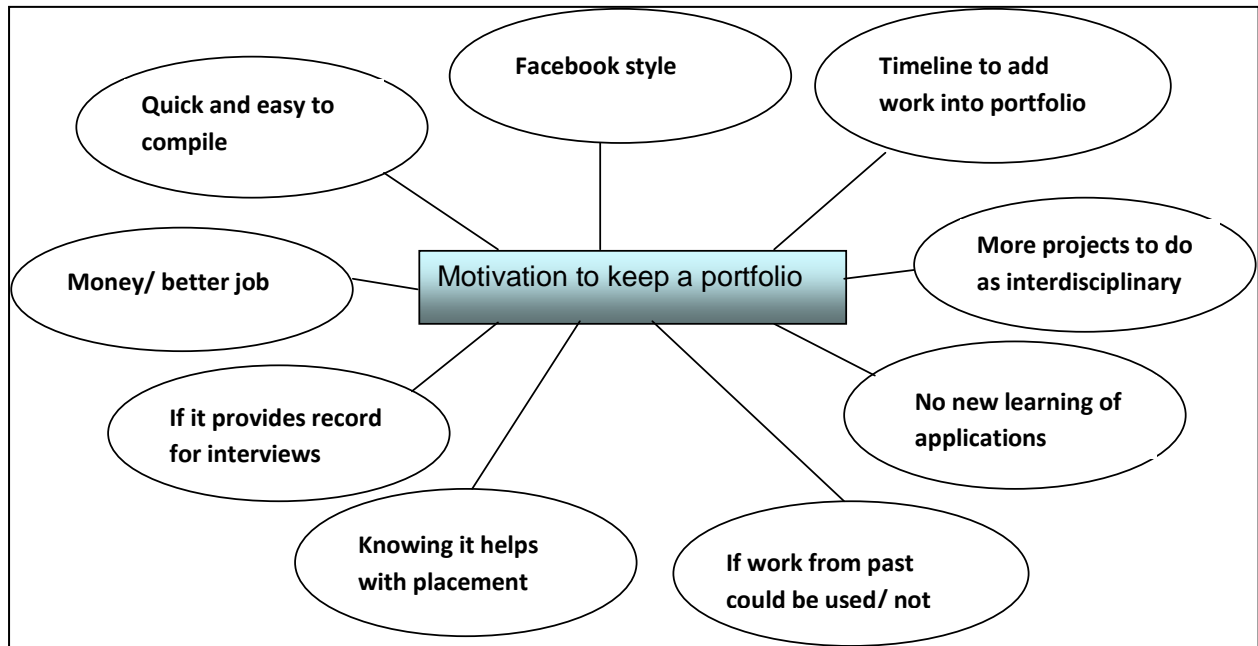
Figure 2 Student comments regarding what would motivate them to produce a portfolio

So overall, students generally had an appreciation of some of the benefits of keeping a portfolio. They basically had a clear idea of what they thought would make a well-presented portfolio, but complained that they did not know what to include in one. They indicated a lack of motivation to start one because they considered them an impingement on their time and effort. Students cite their desire for something quick and easy to use, which requires no extra work, yet interestingly, having been involved in an interdisciplinary project, they recognise the opportunities from that work for recording activities and achievements.

Approach to E-Portfolio Design

It seems therefore that some sort of template was required for providing guidance to students on what to include, whilst providing flexibility of design that could be used in any e-portfolio software.

Within an art and design environment the keeping of a portfolio is an obligatory part of showcasing someone's capabilities and is mostly part of the assessment; primarily because the assessed aspect is usually concentrated on a final product.

Within engineering courses, work is not always related to a final product, but may be based around demonstrating other activities or processes (such as project management) and may not be linked directly to the assessment. This therefore poses problems for how to structure the portfolio and what to include in it.

The way forward with this STEM based e-portfolio project has been to match the portfolio design to course aims and objectives/ Learning outcomes and assessed and non-assessed work via a 'course specific' template which incorporates Knowledge and Understanding, Intellectual, Subject, Professional and Key skills.

This approach (shown in Figure 3) has been used at Sheffield Hallam University for the engineering design technology courses to match the type of work done by students to learning outcomes and to provide a type of hidden guidance (shadow mentoring) to students on what might be included in a portfolio, but without being prescriptive about content or structure, allowing them the opportunity for individualism.
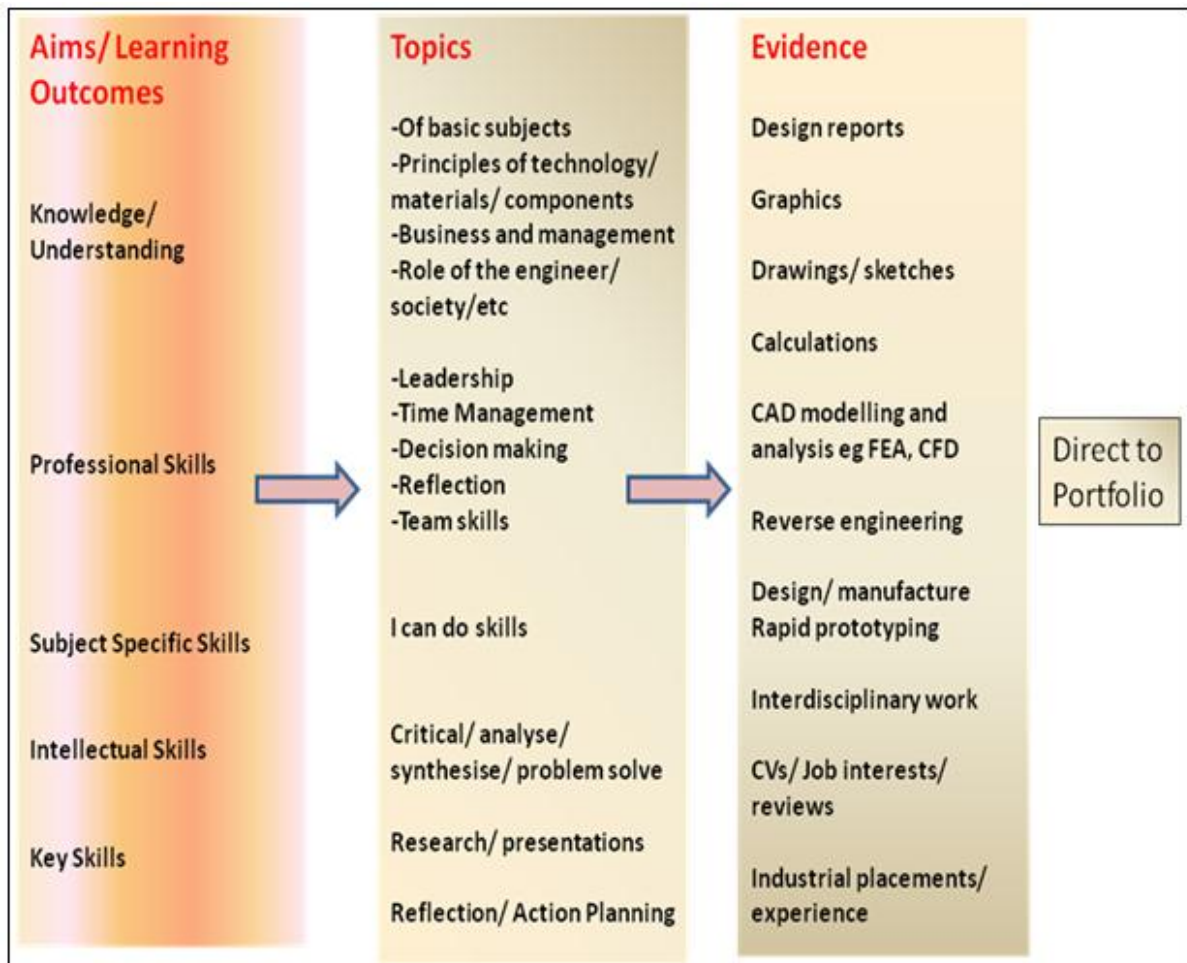
Figure 3: Matching of aims/ learning outcomes to evidence / portfolio Template

To maintain the opportunity for individualism, there is no prescriptive software platform being proposed for e-portfolios that students should use. Instead a template has been developed in PowerPoint, which provides an example of sections/ materials that might be employed and guides students through compiling a portfolio. Each page takes learning outcomes and provides examples of assessment and work that may provide suitable evidence and links via hyperlinks to other example portfolios and sources of information.

Within this project the form of a portfolio is about guiding students through its compilation and encouraging practice. However, the form and nature of a portfolio will change to match the requirements of the owner and the environment it will be used in. After graduation and within the industrial environment the form and style may or may not match the academic practice. In the literature, Palmer et al, (2011) uses on-line student portfolios for the development of graduate attributes. Students rated their system as 'easy to use', thus this ease of use is a pre-requisite for students at Hallam.

Case Study: Career use of a Portfolio by a Graduate from the Integrated Engineering course at Sheffield Hallam University

This section profiles one of the original Integrated Engineering degree students, who graduated in 1994, being one of the first to utilise a professional portfolio as part of his assessed studies. Face to face discussions and an in-depth, "Open" style of electronic

questionnaire provided the means to illicit relevant information concerning how this graduate's professional development was influenced by his earlier formative studies and involvement in using portfolios.

Reflection on the use of Professional Portfolios within the course

The graduate's memory of the use of portfolio's on the course itself is that of compiling a 'best of compilation', - its ultimate aim was to help 'sell' the potential of the student to industry – but it's benefit through the years of the course for him was that it was a good aid in the preparation for exams, in that it provided a 'pre-organised' body of work which could be referred to as part of preparation.

It was also an important 'confidence' building tool – "*it evidenced to yourself that you could do it!"*

Reflection on how the course and the use of portfolios has helped the graduate reflect on his career

The graduate reported that the structure of the course, content, and in particular the use of portfolios, was invaluable to him through his career to date, much for the same reason it was invaluable during the course itself. Having a compiled portfolio of evidence demonstrating existing or new skills and/or attributes, even if the compilation was in one's mind, was a great confidence booster, particularly when taking on new challenges or roles. It has been particularly useful in demonstrating key strengths and attributes. For example, having begun his professional career as a Manufacturing Engineer, a review of the type of 'evidence' he was committing to his portfolio, underlined a gut feel that he preferred 'project' based work (introduction of new processes, equipment and products) and in particular, 'leading' projects. This led to the pursuit and attainment of project lead/management roles in initially the electronics industry, then chemicals. This 'review' of his portfolio evidence has ultimately led to a project management career within the booming resources sector in Western Australia. Although he had not worked within the resources sector, or heavy engineering or process industries previously, he strongly believes the 'possession' of a portfolio assisted in the demonstration and communication of transferable skills and experience. In particular, during his preparation for the interview and assessment process with Alcoa (which was considerable), he was able to refer back to his portfolio to enable him to 'build' the responses to standard and potential questions, which focused on 'transferable' skills/attributes and examples of achievement, and how he has previously added value to organisations and where he could add value for Alcoa.

Graduate use of Portfolios throughout his career.

On starting his professional career, with Ericsson, the graduate also commenced along the road of becoming a professional engineer via the UK IMechE's Monitored Professional Development Scheme (MPDS). The requirement, through the 4 years of this process, was to maintain a record and evidence of training and experience – essentially maintaining a formal training record and evidence portfolio.

 Further to this and beyond the 4 year MPDS the graduate states*, "I have maintained my own mental portfolio and kept physical copies of evidence. I think in pictures, and once I recognise a piece of work demonstrates something worthy of inclusion in my portfolio, I'm able to register that in my mind, as an image, and include it in my 'mental portfolio'.   I have maintained my portfolio throughout my career, (much to the dismay of my partner at my growing pile of evidence) and continue to do so."*

However*,* the other main area he sees the potential for use, is within the appraisal/performance review system. *"Portfolios can be used here to evidence personal performance and progress against role objectives".*

Other than as mentioned above, the graduate does not report any 'formalised' experience or use of portfolios within industry in Australia or the UK and says,

"CPD has been (in AU and the UK) very much a self-motivated and self governing activity. I myself have not kept a formal CPD record, although have collated the 'evidence' from CPD activities (seminar notes, training notes, articles etc). I don't feel any pressure to maintain a portfolio for CPD activities, but am cognisant of the requirement to evidence my continuing professional development as part of maintaining my standing with the IMechE – this I'm confident I comply with given the evidence I have and maintain."

Conclusions

The results of the interdisciplinary work support the concept that an e-portfolio template needs to build in a 'Shadow Mentoring System', which automatically guides students in its compilation. It is clear that the use of teamwork within courses and the development of interdisciplinary skills is important for students and is essential for the graduate engineer. The development of an electronic portfolio is therefore highly important for an undergraduate student, and as can be seen from the personal reflection of one of the graduates from a course that utilised Portfolios for assessment, it is clear that this has influenced and helped his career both within the UK and in Australia. He is now at a point where he does not need a particularly formal structured portfolio, but can adapt and modify as necessary from the evidence he collects. However, he would not be able to do this without his undergraduate portfolio experience, and so the experience is vital. Thus to ensure experience, take up and use of portfolios by undergraduates, two programme areas encompassing 200 students at first year are thus currently piloting a common approach. ALS lectures running for 1 hour per week for 12 weeks are being used to introduce students to portfolios and encourage take up. This portfolio activity is being incorporated into an "Academic Tutor" process taking place between tutor and student in each semester and forms the basis for discussion of student performance and development. To further overcome the lack of motivation and engagement by students, an end of semester Faculty "Portfolio Conference" is to be run whereby each student will take part and present their portfolio. The use of portfolios to gain professional institution Engineering Technician registration by end of year three (placement year) is being developed to ensure continuation through year 2 and the final year emphasis is based on individual final year projects and graduate employment.

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