Full Paper

Abstract

This paper reports on the outcomes of a large federally funded project on graduate employability. The project explored the perspective of stakeholders from multiple disciplines: this paper focuses on outcomes for engineering stakeholders. Engineering work experience is generally considered the best way to develop employability for engineering undergraduates, however there are now insufficient placements to the increasing number of students. Employers continue to report gaps in graduate skills and attitudes, while academics resist teaching generic skills. This paper reports on the perceptions of employability of engineering stakeholders and maps similarities and differences through the lens of the CareerEDGE employability framework. This framework was chosen because it is systematic, comprehensive, and adaptable. A qualitative research methodology was used, with data collected through a series of small focus group discussions and interviews. The study found that students' breadth of knowledge of concepts relevant to employability was similar to both graduates, academics and employers: they were clearly aware that employers expect far more than just discipline knowledge. Students and graduates reported that extra-curricular, volunteer, life and work experience contributed most to the development of their employability. Stakeholder perceptions varied significantly in complexity. Students had much simpler perceptions than employers, even though they had undertaken a project-based learning program and many had work experience. Recommendations to enhance graduate employability include to design curriculum and assessments for employability, from the beginning to the end of programs. Team teaching and working closely with industry is also recommended.

Introduction

This paper reports on the outcomes of a large federally funded project on graduate employability (Jollands, Smith, et al. 2015). The project explored the perspective of stakeholders from five disciplines: engineering, information and computer technology (ICT), life sciences, media and communications, and psychology. Stakeholders included academics, students, graduates, and employers. The paper focuses on outcomes for engineering stakeholders. It reports on their perceptions of 'employability' and maps differences using an employability framework. The main findings are the similarity of stakeholder conceptions, which contrast with differences in complexity of their perceptions. Recommendations are made to improve curriculum for students' employability.

Background

Work experience with an engineering employer is generally considered the best way to develop employability for engineering graduates (Male & King 2013). However there are now insufficient work placements for engineering students, as employment outcomes fall across the sector (Graduate Careers Australia 2015a) and the divide between industry and academia grows (Baitch 2014). Hence there is a need to find alternative ways to develop graduate employability.

Employers continue to report gaps in graduate skills and attitudes (Spinks, Silburn &Birchall, 2006, Graduate Careers Australia 2015b, Jollands, Smith, et al., 2015). Employability is generally defined as encompassing the discipline knowledge, skills and personal attributes that gives an individual graduate the ability to gain and maintain work or employment (Hillage & Pollard 1998). It is sometimes used interchangeably with employment outcomes such as the percentage of graduates in employment at the time of a survey (Bridgstock 2009), but this may be because employment outcomes are easier to measure. Employability is also distinct from graduate attributes, which refer to a broader range of skills, including skills for life as well as for work (Barrie, Hughes & Smith, 2009).

Lack of consensus among academics about the meaning of graduate attributes has been reported (Barrie 2004) and some have 'doubts about the effectiveness of the classroom-based models' (Cranmer 2006). In addition little has been done to assess the views of students (Tymon 2013). Work integrated learning (WIL) has been put forward by some as the 'solution' to how to develop employability in students (Orrell 2011), with growing interest in non-placement WIL as the number of available placements dwindles. However, little research has been undertaken to assess whether learning outcomes of placements and non-placement WIL are equivalent. One study compared self-reported perceptions of employability skills of students who had undertaken placement and non-placement WIL. Student perceptions were similar after both types. Interestingly, when placements were divided into quartiles according to perceptions of quality, sub-median and low-quality, placements were found to be perceived as inferior in outcomes compared to average non-placement WIL (Smith, Ferns, Russell & Cretchley 2014).

In this context the Australian Federal Government Office for Learning and Teaching (OLT) commissioned a series of projects on graduate employability in 2013, focusing on disciplines with low employment outcomes. Engineering graduates have slightly higher employment outcomes (71.5%) than the national average (68%), and tend to be employed by large companies who require graduates to have specific formal qualifications (Graduate Careers Australia 2015a, Smith & Jollands, 2014). Engineering graduates were included in one of these projects as a comparison with disciplines with low employment outcomes. This paper describes the outcomes for engineering stakeholders.

Approach

This study was underpinned by a qualitative research methodology, with data collected through a series of small focus group discussions and interviews. Focus groups of about one hour duration were held with small groups of employers, students and academics. The students were recruited from penultimate or final year courses. Graduates were interviewed for about 20 minutes one-to-one over the phone. The graduates had one to three years of work experience. The academics who joined the focus group were experienced lecturers with an interest in scholarship of teaching. Numbers in each group are shown in Table 1.

Table 1: Participant numbers (n)

Employers	Students	Graduates	Academics	Total
10	20	4	3	37

Focus group and interview questions were semi-structured and presented informally to promote discussion. Perceptions of employability were explored through the following questions:

1. What knowledge, skills, and attitudes do you think employers want in graduates?
2. How are employability skills developed in the curriculum?
3. How are employability skills developed elsewhere?
4. How can undergraduates further enhance their employability skills throughout their time at university?

Focus groups and interviews were recorded and transcribed verbatim. Transcriptions were analysed thematically in NVivo using a qualitative approach based on themes drawn from a selected employability framework (Table 2). Comments were coded to one or more relevant sub-categories. They were coded thematically, so both positive and negative comments on a theme were coded to the same sub-category. Differences between stakeholder views were explored by comparing their knowledge of concepts, as well as the complexity of that knowledge.

Complexity was characterised using the approach of Wilson and coworkers (Wilson, Åkerlind, Walsh, Stevens, Turner & Shield, 2013). In general student learning outcomes are heterogeneous within any cohort, reflecting student orientation, teaching method and level of engagement (Biggs and Tang 2011). Wilson et al. (2013) studied students' understandings of professionalism and identified common elements ('signifiers') in students' comments, and whether students focused on acquisition of the signifiers, or could give a 'more nuanced and contextually dependent descriptions of appropriate practice and conduct'. Students' comments were then categorised as more or less sophisticated. The data in this study were coded to a single category (the common element) or multiple sub-categories (if nuanced and contextually dependant). Stakeholder comments were categorised as simple or sophisticated depending on whether they identified one or two common elements of employability, or whether they could give 'more nuanced and contextually dependent descriptions of appropriate practice and conduct', indicated by being coded to more than two categories.

The employability framework selected for use in this study was chosen from those commonly cited in the literature, considering criteria of breadth of detail, taxonomy, application for curriculum review, and adaptability. The most well-known is the USEM model of employability (Knight & Yorke 2003); however its usefulness is limited by its scholarly language (Dacre Pool & Sewell, 2007) and its categories are too global to facilitate development of learning objectives. Several lists of employability skills that are systematic and detailed were considered (Jackson, 2013), Oliver, 2011, Smith, Ferns, & Russell, 2014). These have multiple descriptors and detailed categories (up to 45 items). However Jackson's (2013) and Oliver's (2011) have gaps, generalities and vagueness (Smith et al. (2014) and Smith et al.'s (2014) was not developed as a framework.

The CareerEDGE framework of Dacre Pool and Sewell (2007) was selected for this study (Table 2). Like the other frameworks, it has a number of gaps, but it is readily adapted, by addition of new sub-categories. This is facilitated by its taxonomic categories. It is useful for mapping stakeholder differences because it is systematic, comprehensive, and adaptable.

Table 2: CareerEDGE framework (Dacre Pool & Sewell, 2007)

Category	**Sub-category**
Career development learning	career decisions, knowledge of job market, networking, passion and interests, recruitment processes and preparation, **business acumen, *professionalism*
Experience (*E*) – work and life	*none provided*
Degree subject knowledge, understanding and skills (*D*)	Grades
Generic skills (*G*)	adaptability, communication, critical thinking, entrepreneurship, imagination & creativity, lifelong learning, managing others, numeracy, planning, problem solving, teamwork, time management, using ICT, work ethic, working under pressure, **ethics*
Emotional intelligence (*E*)	self-awareness, self-management, awareness of others, managing others, motivation (Goleman 1998)

**sub-categories not present in the original framework*

Stakeholders in our study identified some themes not explicitly listed by Dacre Pool and Sewell (2007). Sub-categories that emerged but were not present in the CareerEDGE framework were initially coded as 'other', and were later analysed by the research team and

allocated to an appropriate category. The new sub-categories were named as: business acumen, professionalism, and ethics, and were allocated to categories as shown in italics in Table 2. Similar gaps were reported by Smith et al. (2014).

Limitations of the study include employers were predominantly from the state of Victoria; the small number of participants; engineering stakeholders were predominantly from the civil engineering sector.

Results and Discussion

There were many similarities in engineering stakeholders' conceptions of employability (Table 3). All stakeholder groups mentioned multiple aspects of employability, covering all categories of employability in detail. Students' breadth of knowledge of concepts relevant to employability was similar to those of academics, graduates and employers: they were clearly aware that employers expect far more than just discipline knowledge. In terms of conceptions, there was no discernible 'gap' between employers and students or graduates.

The CareerEDGE framework neatly demonstrates the high degree of similarity between stakeholders' conceptual knowledge of employability. Some concepts were not mentioned, which might be interpreted as gaps in stakeholders' employability knowledge. However the stakeholder group discussion were designed to explore their conceptions rather than create an exhaustive list. Focus groups were a finite length so with more time more ideas might have been raised. Hence these small gaps may not be significant.

Table 3: Stakeholder conceptions of employability (Jollands et al, 2015)

Employability category and sub-category		**Stakeholder#**
Career development learning	Career planning	X ☺ ■
	Knowledge of industry and job market	X ☺ ■ Ω
	Networking*****	X ☺ ■
	Passions and interests	X ☺ ■
	Professionalism*	☺ ■ Ω
	Recruitment processes preparation	X ☺ ■ Ω
Experience		X ☺ ■ Ω
Degree subject knowledge, understanding and skills		X ☺ ■ Ω
Generic skills	Adaptability	☺
	Communication	X ☺ ■ Ω
	Critical thinking	■ Ω
	Entrepreneurship	X ■ Ω
	Ethics*	X ■ Ω
	Innovation and creativity	■
	Managing others	X ☺ Ω

Employability category and sub-category		Stakeholder#
	Lifelong learning	X ☺ ■ Ω
	Numeracy	X
	Problem solving	X ☺ Ω
	Teamwork	X ☺ ■ Ω
	Time management	X ■ Ω
	Work ethic	X ■ Ω
	Working under pressure	☺ ■
Emotional intelligence	Self-awareness	X ☺ ■ Ω
	Self-management	X ☺ ■
	Awareness of others	X
	Managing others	X ☺ ■ Ω

***** New sub-category not in the original CareerEDGE framework

#KEY: Students X Graduates ☺ Employers ■ Academics Ω

In their focus group, engineering employers said they were looking for skills and attributes other than just good grades. Their comments on what they value show nuanced and complex links between skills and attitudes and context:

> *I don't personally look for the top marks, I actually look for the personality and I use the word smart so that they're… a thinker, that can actually yeah sort of react and think quickly is probably the sort of person that I'm looking for. And they may not necessarily be the top marks.*
>
> *Self-starter, well the sort of person you can give a fairly poorly defined task to and they don't need detail instructions on how to go about it but they'll pick it up and go away and do their own thinking about it. They might come back a little while later and go okay, this is what I'm thinking of doing. How does that compare. So they're not waiting for detailed instructions.*

Engineering academics in this study reported they spent very little class-time developing students' generic skills and career planning. There was reliance on out-of-class time: for example, generic skills of teamwork and communication are not formally taught in any part of the program, but students are expected to develop them in project work in their own time. The ineffectiveness of this approach can be seen in the following comments on group work by a range of stakeholders:

> *Well from time to time students will complain, some students will say "all my team member they are helpless, didn't do nothing, I'm the only person doing the job". So we tell the students you know we have assessment and you need to write down what's your contribution to your team work.[academic]*

and echoed by a final year student:

> *when you tell them to do work they just copy paste everything in fourth year, you still have to do it… and you go to the lecturers and they can't help you because they can't kick the other person out of the group. So you have to work around it and I think that can be useful in industry.[student]*

and a graduate:

> *I think every single subject at RMIT they'll tell you that engineering is all about team work … when you go through the generic interview process you always get questions have you worked*

in a team and give us an example, .., so there's always I guess you know a case study there that you can draw on in terms of the experiences of working as a teacher and a lifeguard [graduate]

Career planning is covered only in an *ad hoc* way when industry personnel give guest lectures. Students then have the opportunity to ask questions about engineering employment and job opportunities. Academics also dencourage students to develop their employability through extra-curricular activities, such as professional networking at Engineers Australia functions, or through leadership roles in the student community. Most generic skills and emotional intelligence are rarely if ever addressed. It seems unlikely that their programs are contributing much to the students' broad conceptions of employability.

…so I think RMIT is really about initiative, you've got to go find everything yourself [student]

… I was in the civil engineering representative for 3rd year and 4th year in my bachelor so that helped me to engage yes, like in [work] readiness skills and presenting ideas [graduate]

A distinguishing characteristic of student comments about employability was heterogeneity: the comments ranged widely on a continuum from simplistic to complex, as reported by Biggs and Tang (2011) and Wilson et al. (2013). In the current study heterogeneity may reflect that some students had work experience and others did not. In addition, some students mentioned undertaking extra-curricular activities, such as volunteering and being part of a mentoring scheme. Examples of simplistic comments are:

I think everybody is going to graduate with some sort of academic skill but I think employability should depend on developing other transferable stuff like your leadership qualities, stuff like that.[student]

She actually told me that having engineers without borders membership on your CV, employers love that.[student]

They tried by organising these fairs and expos and all but I don't think that helps a lot to be honest.[student]

I know that RMITs focus was sort of on a project base learning system which I think I enjoyed, probably everybody in the course enjoyed more than like a theoretical type learning system where you studied the book and then regurgitate what was in the book on an exam paper.[student]

Yeah we got some guest lectures every now and then but unfortunately I don't see any networking happens in that.[student]

It sounds a bit blunt but like you start a degree you should be able to interact with people, you should be able to know how to act professionally and if you can't then I don't know what you're doing there.[student]

These comments mention only one or two employability concepts, and links between concepts and descriptions of context, practice and conduct are largely absent. Some examples of more complex comments by students are:

One example I saw …a guy breakup a project brief, delegate it very quickly and I was wondering how did he do that so quickly. He went home, he read out to himself how to do it and stuff and then he came in the next day and gave it away easily to everybody who was working there so you learn a lot from the people you work with.[student]

You kind of learn how to work with different people. I mean you find that not everyone is as motivated to get it done, and get it done as well as you want. Now whether or not that's going to be the same in industry I don't know because you imagine that if you're all at the same company you're all motivated for the common goal.[student]

The comments of engineering graduates showed an increasing level of complexity in their understanding of employability, as is expected after periods in the workforce:

An understanding of the importance of being able to write a report is probably one thing whilst you do assignments and all that sort of stuff. I think that was one of the surprises to me that when I came out just purely the reliance on your capability to articulate things. You know

whether it's reports, fee proposals, letters, and also that communication side of things. I'd probably a significant part of my week is spent on the phone or on emails. So that's probably some of the things that surprised me a little bit when I came out of uni that wasn't really touched on while we were there.[graduate]

You know you can put someone in a position that requires them to develop their communication skill and work in a team and all that sort of stuff but at the end of the day if that's not one of their sort of underlying qualities and they don't really have the confidence to do that irrespective of what they've done previously in their work, then it's probably not going to be a position that's best suited for them.[graduate]

The dominance of simplistic comments by students perhaps reflects the *ad hoc* approach of academic staff to developing employability in the curriculum. This is surprising – and disappointing for the teaching staff - as their programs included multiple project based learning courses, and many students had completed twelve weeks work experience.

When employers were asked about gaps in current graduates, no specific gaps were identified, contrary to reports in the literature that employers identify large gaps in current graduates (Graduate Careers Australian 2015b). This may reflect that relatively little time was available to address this question at the end of the focus group.

Overall, this study suggests that despite students having a comprehensive understanding of employability conceptions, they have been inadequately prepared to meet the needs of real working situations, where multiple skills are required concurrently depending on context, accepted work practice and expectations of graduate conduct. This idea was reflected by graduates:

I wouldn't say I've used all of [my university studies], a lot of is just basic learning on the job and I think finishing a degree is just getting a ticket in the door.[graduate]

I would say [work experience] helped more than uni. Well it teachers you real life experience. It teaches you how to deal with people at work and how to deal with work place pressures. I don't think uni prepares you for that. [graduate]

I think for a lot of students, I know for myself, it's a bit of a surprise that how little they actually knew and it's probably one thing that the university doesn't tell the students is what they're providing them with their education is just the very basics for the industry or the people that they go and work for, to then build upon and develop their knowledge further.[graduate]

Conclusions

Australian Higher Education engineering employers, students and graduates share similar conceptions of 'employability', which map well to the CareerEDGE framework developed by Dacre Pool and Sewell (2007).However, students' conceptions are simplistic compared to graduates and employers, even where students had undertaken work experience.

Curricular out-of-class work, extra-curricular volunteer, life and work experience contribute to the development of students' conceptions of employability. In a project-based learning program where minimal in-class time is spent on developing graduate employability,

Academics showed resistance to teaching employability skills. The academics focused on teaching discipline specific knowledge. They worked in isolation, keeping industry at arm's length and minimised contact with students or graduates. It is no surprise that their students and graduates reported their employability skills were developed outside the classroom.

The characteristics of programs with effective learning affordances for employability have been identified and published elsewhere (Jollands et al*.,* 2015). In essence, they integrate employability seamlessly with discipline curriculum. In the best programs staff, students and industry share a professional identity, developed through constant flow of ideas through collaborative teaching, student-focused pedagogy, authentic projects, guest seminars, and part-time staff positions for practitioners. It is recommended that educators design curriculum

and assessments to develop students' employability systematically from the beginning to the end of their program of studies. Team teaching and working closely with industry is also recommended.

References

Baitch, A. (2014). Engaging the academic community. *EA Engineers Australia*, 86(7), 3.

Barrie, S. C. (2004). A research-based approach to generic graduate attributes policy. *Higher Education Research and Development*, 23(3), 261-275.

Barrie, S., Hughes, C., & Smith, C. (2009). The National GAP Issues Paper 1; Conceptualisation. University of Sydney. Retrieved Jun 9, 2013, from http://www.itl.usyd.edu.au/projects/nationalgap/resources/discussionpapers.htm.

Biggs, J., & Tang, C. (2011). *Teaching for Quality Learning at University: What the Student Does*. Maidenhead: McGraw-Hill Education.

Bridgstock, R. (2009). The graduate attributes we've overlooked: enhancing graduate employability through career management skills. *Higher Education Research & Development*, 28 (1), 31-43.

Cranmer, S. (2006). Enhancing graduate employability: best intentions and mixed outcomes*. Studies in Higher Education*, 31(2), 169-184.

Dacre Pool, L., & Sewell, P. (2007). The key to employability: Developing a practical model of graduate employability*. Education+Training*, 49(4), 277-289.

Goleman, D. (1998). Working with Emotional Intelligence. London: Bloomsbury.

Graduate Careers Australia. (2015a). *Graduate Destination Survey 2014*. Melbourne: Graduate Careers Australia.

Graduate Careers Australia. (2015b). *Graduate Outlook 2014: The Report of the Graduate Outlook Survey: Employers' Perspectives on Graduate Recruitment*. Melbourne: Graduate Careers Australia.

Hillage, J. and E. Pollard. (1998). *Employability: Developing a Framework for Policy Analysis*. Suffolk, England: Department for Education and Employment.

Jackson, D. (2013). Student perceptions of the importance of employability skill provision in business undergraduate programs. *Journal of Education for Business*, 88(5), 271-279.

Jollands, M, Clarke, B, Grando, D, Hamilton, M, Smith, J, Xenos, S, Carbone, A, Burton, L, Brodie, M & Pocknee, C. (2015). *Developing graduate employability through partnerships with industry and professional associations Final Report 2015*. Strawberry Hills: Office for Learning and Teaching.

Keller, S., Parker, C. M., & Chan, C. (2011). Employability Skills: Student Perceptions of a Final Year Capstone Subject. *Innovations in Teaching and Learning in Information and Computer Sciences*. 10 (2), 4-15.

Knight, P.T. & Yorke, M. (2003). Employability and Good Learning in Higher Education. *Teaching in Higher Education,* 8(1), 3-16.

Male, S. A. & King, R. (2013). *Best Practice Guidelines for Effective Industry Engagement in Australian Engineering Degrees*. North Melbourne: Engineers Australia.

Oliver, B. (2011*). Assuring Graduate Outcomes*. Strawberry Hills: Australian Learning and Teaching Council

Orrell, J. (2011). *Good Practice Report: Work Integrated Learning*. Strawberry Hills: Australian Learning and Teaching Council

Smith, C, Ferns, S, Russell, L & Cretchley, P. (2014). *The impact of work integrated learning on student work-readiness*. Strawberry Hills: Office for Learning and Teaching, Sydney.

Smith, J. & Jollands, M. (2014). *Employability of Engineers Relative to Other Graduates*. Paper presented at the Australasian Association for Engineering Education Annual Conference, Wellington, NZ.

Spinks, N, Silburn, N & Birchall, D, (2006). *Educating engineers for the 21st century: the industry view.* Henley-on-Thames:Henley Management College.

Tymon, A. (2013). The student perspective on employability. *Studies in Higher Education*. 38(6), 841-856.

Wilson, A., Åkerlind, G., Walsh, B., Stevens, B., Turner, B. & Shield, A. (2013). Making "professionalism" meaningful to students in higher education. *Studies in Higher Education*. 38(8), 1222-1238.

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