Engineering employability: Local and international student views in an Australian context

Iresha Ranaraja[a], Margaret Jollands[a], Colin Kestell[a] and Abhijit Date[a]

School of Engineering, RMIT University[a]

Corresponding Author Email: iresha.ranaraja@student.rmit.edu.au

ABSTRACT

CONTEXT

Employability has been an important topic for research over the years with many definitions and models emerging. Owing to the changing nature of engineering careers, the concept of 'self-managed careers' is emerging, with the importance of sustainable employment for a successful career. Diversity in the Australian engineering higher education sector is significant, owing to representation of international students. The literature identifies differences in international students' learning behaviour and challenges relating to employability compared with locals. Student understanding is the 'missing perspective' in employability studies.

PURPOSE OR GOAL

The goal of this study is to explore engineering students' understanding of the concept of employability and employability categories, and investigate differences in understanding between local and international students.

APPROACH OR METHODOLOGY/METHODS

A qualitative phenomenological study was conducted. Data were collected from local and international engineering undergraduates at RMIT University, through focus groups and interviews in both face-to-face and online modes. To analyse participants' views on the concept of employability, thematic analysis was used. Qualitative content analysis was carried out to analyse views on employability categories, mapping data into the categories in the CareerEDGE model of employability. NVivo aided the analysis.

OUTCOMES

The results reveal that the students' understanding of employability is more in terms of 'getting employment' than 'sustainable employment'. The most valued employability categories were generic skills, experience, and understanding & application of degree knowledge. Local students valued experience more while cultural intelligence was important for international students. Personal attributes and emotional intelligence emerged as noteworthy categories while career planning was discussed minimally. An unanticipated finding is the emergence of employability categories not present in the chosen CareerEDGE model, namely cultural intelligence and personal attributes.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

The results of this study indicate that the approach taken by Higher Education Institutes (HEIs) to develop students' understanding of employability may need to change. Implications are identified for researchers and educators in terms of employability research and pedagogical practices with international students. Recommendations are made for further research work.

KEYWORDS

Engineering employability, CareerEDGE model, international students

Introduction

Employability of graduates is an area which has been researched upon widely, owing to the gap between industry demands and what graduates can actually offer. According to the literature, the concept of employability is defined as "the capability to move self-sufficiently within the labour market to realise potential through sustainable employment" (Hillage & Pollard, 1998, p. 2). Thus, employability is not about initial employment or simply getting employed (Brown, Hesketh, & Wiliams, 2003; McLeish, 2002). Employability models (Dacre Pool & Sewell, 2007; Hillage & Pollard, 1998; Yorke & Knight, 2004) define employability categories such as knowledge, skills and other attributes that contribute to graduate employability. The literature also identifies employability as a relational, contextual and individual phenomenon (Clarke, 2008; Nilsson & Senior, 2010).

Interest in Engineering employability has been mainly driven by the economic impact from skill shortage, growing diversity in engineering programmes globally and high student attrition rates (Winberg et al., 2020). The expectation of graduates of a linear career with lifetime job security is being replaced by career patterns that are more flexible, boundaryless and of short-term nature (Clarke, 2008). This decreasing job security, coupled with engineering being a 'heterogenous' profession encompassing a wide array of positions and tasks (Nilsson & Senior, 2010), has augmented employability challenges for engineering graduates.

In the Australian engineering higher education sector, international students are over-represented in the cohort of graduates who face employment challenges. Difficulties in securing work placements is the most prominent (Gribble, 2014; Jackson, 2017) while low self-perceived employability is reported despite positive work-related experiences (Barton, Hartwig, & Le, 2019). Further, international students (mainly non-native English speakers) are seen as silent and passive characters in learning activities (Heron, 2019; Lin, 2018) as well as showing differences in perception in terms of self and career competencies (Bennett, Kapoor, Singh, Kaur, & Maynard, 2015). However, students who are native English speakers could be passive as well, suggesting persona as an influencer (Remedios, Clarke, & Hawthorne, 2008).

Employability research is largely carried out focussing on different stakeholder perspectives (such as employers, graduates and educators), different contexts, disciplines or industries. However, student views could be seen as the 'missing perspective' (Gedye & Beaumont, 2018) despite recent efforts (Thirunavukarasu, Chandrasekaran, Subhash Betageri, & Long, 2020). A deeper understanding of the student view is important for effective employability learning and teaching, enhancing attractiveness of study programs and universities, as well as countries as international education destinations.

As such, the goal of this study is to explore employability from both local and international student perspectives and investigate any differences between the two cohorts. The two research questions examine 1) participants' understanding of the term employability and 2) their views on what employability categories are important for engineering graduates.

Method

A qualitative approach was taken for this phenomenological study, as the intention was to examine the essence of the phenomenon of employability through participants' perception (Richards & Morse, 2012). The study is exploratory in nature rather than for verification of previous findings, thus it is not intended to draw generalisations.

Data were collected from local (n=17) and international (n=13) engineering undergraduates at RMIT University (mixed year group), through focus groups and interviews in both face-to-face and online modes. The international students were all non-native English speakers with a majority from Asian countries (n=11). The two cohorts were similar in terms of work experience (considering both engineering work placements and part-time work): only 2 participants from each cohort had no work experience.

Transcription was done verbatim, by the principal researcher. Participants' views of the term 'employability' were analysed using thematic analysis (Braun & Clarke, 2013). Directive qualitative content analysis (Hsieh & Shannon, 2005) was used to analyse student views of employability categories. Data were then mapped to the categories of the CareerEDGE model of employability (Dacre Pool & Sewell, 2007). NVivo was used as a supporting tool for analysis.

CareerEDGE model of employability

The CareerEDGE model (Dacre Pool & Sewell, 2007) is widely known as a comprehensive (Small, Shacklock, & Marchant, 2018) and practical model (Jollands, 2015) of graduate employability, extensively used for career management teaching and research. There are five basic categories described as Career (learning and development), Experience (work and life), Degree (knowledge, understanding and skills), Generic Skills and Emotional Intelligence (EQ). Through reflection and evaluation of these components, the higher-order categories of self-efficacy, self-confidence and self-esteem are built, leading to employability.

Findings

Employability as a concept

Students' responses towards their understanding of employability as a concept are presented under two themes – 'gaining employment' and 'beyond employment'. ('I' and 'L' are used to identify international and local students respectively).

Theme 1 - Gaining employment

Most participants viewed the concept of employability as gaining employment, as seen from Table 1. They discussed employability as 'the ability to find employment'. The probability of finding employment was associated with an individual's employability – "How much you are likely to be employed in a workforce" (I9). Some participants associated employability as an assessment of their competencies leading to employment – "A measure of how easy it is to assess your skills and see how it is for someone to employ you" (L1).

The concept of employability was also discussed in terms of suitability or 'fit for a role' – "Here's a box we want you to fit into, how well would you fit into that box?" (L10). If an individual's knowledge, skills and personal attributes are fitting the requirements of the role, then such a person was seen to be employable. Participants also discussed 'fit' in terms of matching of goals between potential employee and employer-

> *If a company sees you and your goals align with them, that makes your employability much easier. (I5)*

It was also identified that fitting into the culture of the work environment and alignment of values adds to employability.

> *Do you encourage inclusivity and creativity... [the potential employee is] not someone [who is] just going to be completely against what they [the company] believe in and what they want to try and create. (L3)*

Another emerging idea was about being the 'right candidate' among others in the recruitment process. Employability was seen as an attractiveness to employers compared with other candidates - "It's how likely you are to be selected from a bunch of students or graduates" (I10).

Some participants seemed to equate the concept of employability to the 'possession of specific components' that help them secure employment such as skills, experience and extra-curricular activities. 'Skills' was recurrently mentioned by students as an important competency.

You have to have the all the skills to leave university which is kind of like a bubble wrap thing and be exposed to the real world. I think that's what I feel employability is, having the actual skills you need. (L14)

As such, employability is seen as a 'readiness for transition from university', from a place of security to the realities of the actual world.

Theme 2 – Beyond employment

This theme covers participants' responses that associates the concept of employability beyond simply getting employment. Although this was not a recurrent idea in the data (as seen from Table 1), it is nevertheless identified as an important theme, as the concept of employability not only includes gaining employment but maintaining employment ((Brown et al., 2003; Hillage & Pollard, 1998; McLeish, 2002). In thematic analysis, something in data can be important without appearing very frequently (Braun & Clarke, 2013).

A few participants viewed employability as being successful at work – "How effective someone is when they are employed" (L5) while another associated employability as "Finding the correct career path going forward" (I7). Another viewed employability as contributing to the society.

Table 1: NVivo coding results - Concept of employability

	Total (# of codes)	Local students, n=17 (# of codes)	International students, n=13 (# of codes)
Theme 1 - Gaining employment	24 (86%)	16	8
Theme 2 – Beyond employment	4 (14%)	2	2
	28 (100%)	18 (64%)	10 (36%)

Local vs International perception

Table 1 also presents a comparison of the results between local and international students. Two main observations can be made. One finding is the striking similarity between the two groups in their view of employability as 'getting employment' as opposed to maintaining employment. This finding has both similarities and differences to a study with engineering students (Kövesi & Kálmán, 2020), where Hungarian students are reported to have short-term perspectives while French have long-term vision on employability. Secondly, Table 1 suggests that the local students were more forthcoming than their international peers, consistent with the latter's reputation for passiveness (Heron, 2019; Lin, 2018). The local students contributed 64% of the comments, but as a cohort were only 17 (57%) of the 30 participants.

Employability categories

Students' responses about the most important employability categories are presented in this section, mapped against the basic categories of the CareerEDGE model. In addition, two other categories emerged from data, namely 'Cultural Intelligence' and 'Personal Attributes'.

From the results in Table 2, it is clear that 'Generic Skills' is the category of employability most familiar to the students. Teamwork and communication were the generic skills mentioned most frequently. Communication was seen to be important as "Engineers never work alone" (I1). Participants also viewed teamwork and communication as inter-related skills.

You cannot go outside and build your own wing as everything is based on teamwork. And being able to communicate within a team, so communication either verbally or written. (L14)

Leadership, time management, people skills and adaptability were some of the other generic skills discussed by participants, but to a lesser degree than teamwork and communication.

After 'Generic Skills' the second most discussed category was 'Experience'. The participants recognised "A high desire for experience, practical hands on experience" (L10). The

experience gained through internships, cadetships or placements were discussed as important, not only for gaining technical expertise, but for developing generic skills as well.

> *Experiences are generally the best… Metric for knowing if someone's going to do a good job, but also in parallel with that are interpersonal, collaboration and communication skills. (L16)*

Students also talked about how experience gained through extracurricular activities such as projects, competitions and technical clubs help them in their employability as they -

> *…ticks the box to the academics, but also ticks the box of that experience and practical knowledge that's outside the classroom. (L10)*

The third most frequently cited category from the CareerEDGE model was 'Degree' (which includes subject knowledge, skills and understanding). Most participants viewed the degree as a basic qualification and discussed the importance of understanding the topics learnt, going beyond the use of degree as a mere qualification.

> *The degree you have like, yes, I have a paper... I graduated [on] this, but like do you know what you graduated? Did you just like copy the answers? (L14)*

The technical skills and expertise related to the degree were highly regarded by participants, and some even saw as contributing to their social responsibility as well.

> *The [technical] skills would definitely also be one of the most important ones because you are dealing with structures or whatever that are supposed to function and keep people safe. (I1)*

'Emotional Intelligence' was discussed infrequently by participants. This concept is explained as the ability for a person to manage individual emotions and those of others to foster better relationships and happier work life (Dacre Pool & Sewell, 2007). Participants views were about the importance of engineers demonstrating "Empathic listening and similar attributes" (L16).

The four elements of the 'Career Development Learning' category (Dacre Pool & Sewell, 2007) namely decision learning, opportunity awareness, transition learning and self-awareness (Dacre Pool & Sewell, 2007), were not mentioned by participants.

'Cultural intelligence' was important for some candidates, as they saw that understanding "the workplace and Australian culture" (I6) were important for their employability, as previously reported by (Tran & Pham, 2016). This may be distinguished from emotional intelligence, as cultural intelligence "picks up where emotional intelligence leaves off" (Earley & Mosakowski, 2004, p. 1) and is defined as "…an individual's capability to function and manage effectively in culturally diverse settings" (Ang & Van Dyne, 2015, p. 3), hence may be considered in addition to the five basic categories of the CareerEDGE model.

Another category to emerge in addition to those in the CareerEDGE model was the importance of 'Personal Attributes'. Participants discussed how qualities such as initiative, commitment, motivation and resilience are important for engineers. Several studies have critiqued limitations of the CareerEDGE model (Jollands, 2015; Smith, Ferns, & Russell, 2014; Tymon, Harrison, & Batistic, 2019), but not often in respect to need for more categories (Jollands, 2015).

Local vs International perception

Table 2 also presents a comparison of the results between local and international students. Again, local students were more forthcoming in their comments, making 70% of the overall comments. Two other observations may be made. 'Experience' was mostly discussed by local students. In addition, it is interesting to note that only local students talked about 'Emotional Intelligence' while only international students discussed 'Cultural Intelligence'.

Higher order categories

The higher order categories of the CareerEDGE model were rarely mentioned. This contrasts with findings of a study of engineering graduates, who identified soft skills such as self-initiative, self-esteem and self-efficacy as important 'soft skills' (Nilsson & Senior, 2010). This suggests the focus of undergraduates is on 'getting a job' rather than maintaining work.

Table 2: NVivo coding results - Employability categories

	Categories	Total (# of codes)	Local students, n=17 (# of codes)	International students, n=13 (# of codes)
CareerEDGE model	Generic Skills	26 (38%)	18	8
	Experience	14 (20%)	13	1
	Degree (knowledge, skills & understanding)	13 (19%)	10	3
	Emotional Intelligence	4 (6%)	4	0
	Career Development Learning	0 (0%)	0	0
New	Cultural Intelligence	5 (7%)	0	5
	Personal Attributes	7 (10%)	3	4
			48 (70%)	21 (30%)

Discussion

This study set out to explore the perceptions of engineering undergraduates in terms of employability as a concept and employability categories. One of the significant findings of this study is that participants perceived employability as 'getting employment' rather than in the long-term sense. This finding has been previously reported in the literature (Kövesi & Kálmán, 2020). The study has also found that the categories of employability identified by the participants are generic skills – mostly teamwork and communication, experience and understanding & application of degree knowledge, as reported in a number of previous studies (Jollands, 2015; Shuman, Besterfield-Sacre, & McGourty, 2005; Winberg et al., 2020). One unanticipated finding is the emergence of employability categories that are not present in the Career EDGE model, such as cultural intelligence and personal attributes.

In the literature, employability is discussed as a phenomenon that goes beyond 'getting employment', with an emphasis on the long-term aspect of sustaining employment becoming more prominent in definitions (Brown et al., 2003; Hillage & Pollard, 1998; McLeish, 2002). However, in this study, the participants had a narrower and lower level of understanding of employability. This may be attributed to their career stage (Nilsson & Senior, 2010). It is perhaps not surprising that engineering students may be more focussed on the transition to the working world and gaining employment, rather than longer-term aspects, compared to graduates. Nevertheless this raises concerns, as employability cannot be seen simply as a bridge that needs to be crossed, but rather a journey in a dynamic working world with complexities and insecurities (Nilsson & Senior, 2010). In a study comparing employability perceptions of French and Hungarian undergraduates, Kövesi and Kálmán (2020) found that French students had a more well-developed conception of employability with well-defined job preferences and long-term goals, while the Hungarian students' was more short-term without clear career goals. This suggests undergraduates can develop a mature conception of employability depending on their career education.

The findings of this study on employability categories are broadly consistent with other literature reporting on employability categories important for engineers (Jollands, 2015; Shuman et al., 2005; Winberg et al., 2020) as well Engineers Australia's Stage 1 Competencies for Professional Engineers - knowledge, skills, application and personal attributes (Engineers Australia, 2017).

'Career development learning' was not identified as an employability category, but certain elements, such as 'transition learning' were discussed under the concept of employability. This may reflect the positive labour market outlook with growth in graduate opportunities in the job market (Jackson, 2017). Other studies have reported an awareness of career development learning in engineering undergraduates (Jollands, 2015; Okay-Somerville, Allison,

Luchinskaya, & Scholarios, 2020) but these included data collection using surveys where career planning was explicitly included.

Personal attributes and cultural intelligence emerged as noteworthy employability categories, as these are not explicitly included in the CareerEDGE model. Employability is now seen more as an individual phenomenon (Clarke, 2008) and the importance of personal attributes for engineers is becoming more prominent in the literature (Creasey, 2013; Nilsson & Senior, 2010).

The second aim of the study was to investigate the differences in perception among local and international students. The results showed several significant differences. Firstly, local students were more forthcoming in their comments, consistent with reports that international students may be more passive (Heron, 2019; Lin, 2018). Further, international students were less vocal about the relationship between experience and employability. This is an interesting result considering the majority of international student participants had work experience (Barton et al., 2019). Another Australian study reported a similar finding, attributed to the international students not seeing work placement as contributing to their perceived employability (Barton et al., 2019), but without elucidating why this might be. This difference between local and international students may be an interesting area for further investigation.

Finally, another important finding of this study concerns emotional and cultural intelligence. Elements related to emotional intelligence were mentioned by only a few participants, reflecting a recognised gap in engineering education exacerbated by lack of teamwork (Román-Calderón, Aguilar-Barrientos, Escalante, Barbosa, & Arias Salazar, 2021). Of particular interest for this study was that while a few local students mentioned these elements: none of the international students did so. Conversely, a few international students identified cultural intelligence as part of employability, while none of the local students did. The importance of cultural intelligence for employability was previously identified in one study as more prominent for international students (Tran & Pham, 2016). These differences between local and international students may be another interesting area for further investigation.

Conclusions

The findings from this study make several contributions to the current literature and have implications for HEIs, educators as well as researchers.

The results of this study indicate that the way conceptions of employability are developed in students in HEIs may need to change. Students need to develop a broader understanding of employability as a long-term phenomenon that depends on the dynamic nature of the labour market. This would prepare them better for the realities of a future with non-linear short-term career paths (Clarke, 2008). Students could be encouraged to develop their individual career approach beyond initial employment with a focus on well-defined long-term goals (Kövesi & Kálmán, 2020). As self-managed careers are looking more likely the future of engineers, highlighting the importance of personal attributes such as initiative, adaptability and resilience, career planning and emotional intelligence would add value to employability education.

New employability learning activities should also consider adoption of pedagogical practices specifically designed to enhance international student contribution (Bennett et al., 2015) such as the use of socio-cognitive strategies at classroom level to improve self-esteem (Bennett et al., 2015). This study also suggests new research data collection methods may be needed for research with international students, beyond traditional methods of focus groups and interviews in verbal format. In addition, for employability research, a possible extension of the CareerEDGE model is suggested, to consider employability categories such as cultural intelligence and personal attributes, depending on the target population and study context.

This exploratory study helped the researchers identify rich areas for future research – why do international students seem to undervalue work experience? How could students be made more aware of emotional and cultural intelligence, to better prepare them for culturally diverse

work environments? How do factors other than local/international status such as work-related experience and individual persona influence students' employability learning? Research is continued under these areas, aimed at further unpacking the story behind the data.

It is important to bear in mind that study participants were volunteers who are deemed to be proactive and thus might not be representative of the whole student population. Internet connection issues experienced by two (international) students acted as a limitation for online data collection. Since this is a qualitative study, aimed at exploration rather than verification, the findings may not be generalizable and the qualitative nature of the research needs to be countered when interpreting results. Despite its exploratory nature, this study offers valuable insights into the perceptions of engineering students' employability and future research, with possible contributions to enhancing attractiveness of Australian study programs as an international education destination.

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