PERCEIVED EMPLOYABILITY OF COMPUTER SCIENCE GRADUATES: AN ACADEMIC PREDICAMENT

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Abstract

Improving the employability of graduates is a global priority area for the tertiary education sector. Like many other countries, the Australian Government and Universities are under pressure to improve their graduate outcomes. While there has been extensive research into what industry requires of graduates in the workplace, little research is available about computer science academics’ perceptions of graduate employability and how they feel it should be addressed in the curriculum and implemented. Computer Science and Information Technology are rapidly changing areas with widely varying expertise requirements. Teaching employability skills in this context can be difficult.

There is little agreement over what the term employability actually means, and whether it can be taught. There is also little clarity around the specific skills required by technology graduates. In this paper we present results of our study of 20 (3 female and 17 male) Computer Science and Information Technology academics’ perspectives of employability and the emphasis they give it in their courses and assessments. Findings highlight that while many of the academics believed they were imparting technical skills to their students, which are essential for their employment, they did not believe it was their job to actually teach employability skills. The discussion of the soft versus hard/technical skill made for a very interesting discussion. Data revealed that the majority of academics believed hard technical skills were more important than the soft skills. Limitations of the study and implications for future research will be discussed.

Keywords: Employability, Computer Science Graduates, Skillset.

1 INTRODUCTION

Despite widespread agreement about the need to focus on employability and a substantial history of research in the area, there remains a surprising lack of clarity regarding the meaning of the term. A recent literature review concluded that the concept of employability has different interpretations depending on the stakeholder perceptions of employability.

Employability depends not only on the attributes of the individual graduates such as subject knowledge, experience, skills, and personality traits, but also on the faculty, curriculum, and pedagogy in university systems, and also on the employers who hire the graduates and their expectations [1].

Specific disciplines have undertaken focused attention to better understand the challenges unique to their fields. In the case of Computer Science and Information Technology (CS & IT) there are many rapid changes in technology facing the discipline. The Shadbolt Review, published in 2016, [2] examined issues relevant to the discipline of computer science in the UK. The recommendations of this review were aimed at improving the employability of computer science graduates. The review identified ten recommendations, including extending and promoting work experience, improving students so-called ‘soft skills’ and equipping students to upskill and adapt to the rapid pace of change. Research is needed in each country, including Australia, to examine the relevance of these recommendations within the local context.

This paper reports on series of interviews conducted with the academics from the CS & IT discipline at RMIT University. The interviews were conducted face-to-face, recorded and transcribed.

The overall aim was to explore the academic notions around the employability of our CS & IT graduates. The interviews uncovered many interesting themes around this notion and the key themes are identified and discussed in the “Results” section of this paper.

This paper examines how employability is understood by academics in the CS & IT discipline.
2 RELATED WORK

Various Meanings of the Term Employability

In the higher education context, a number of major projects have examined the need to enhance graduate employability, including Enacting strategies for graduate employability: How universities can best support students to develop generic skills [3], Developing graduate employability through partnerships with industry and professional associations [4] and Ruth Bridgstock's Australian National Senior Teaching Fellowship on Graduate Employability 2.0 [5]. All of these projects have highlighted the need for increasing attention to the issue.

The term “employability” has been long explored by various stakeholders such as industry, students and the academic world. However, it has different meanings depending on the one who sets out to define it. A recent paper on perspectives of employability suggests that one potential problem with trying to develop employability is a lack of coherence in what is meant by the term itself and the subsequent measurement of it [6]. The complex and multifaceted nature of “employability” has led author to formulate a variety of opinions about it.

Moore & Morton [7] build upon this, arguing that in the study-work arena universities should “not surrender too much authority and expertise”. Holmes [8] argues that adherence to graduates' skills and attributes, as related to employability, is especially hard due to the absence of clear recommendations around the outcomes. He further expands by stating that there is often no correlation between skills lists and employment outcomes.

A qualitative study by Carbone, Hamilton and Jollands [9] focused on the importance of employability outcomes in the ICT industry. It explored expectations of employers, professional bodies, academic staff, graduates and current students so as to identify good practice curriculum and pedagogical design. While some participants were of the view that employability should not be the cornerstone of university degrees, most saw the importance and relevance of employability skills in university curricula.

There have been various attempts to define the term “employability”. The Australian Government’s Core Skills Framework defines employability as “a set of non-technical skills, knowledge and understandings that underpin successful participation in work [10].”

The CBI/NUS model [11] published in the UK recommended graduates’ increased self-awareness of positive attitude resulting from skills such as: team working, problem solving, application of information technology, communication, application of numeracy, business and customer awareness and self-management.

These broad definitions beg the question of how employability is best understood and implemented within particular disciplines.

3 RESEARCH QUESTIONS

RQ1: How do CS & IT academics understand the term 'employability'?
RQ2: How can employability skills be implemented in the curriculum?

4 METHODOLOGY

To answer the research questions, we decided to follow a qualitative, phenomenographic research design of Marton [12]. This approach was chosen as it enables the collection of rich descriptions of participants’ understandings of employability through individual interviews. Open-ended questions were used to explore the construct of employability and the ways it is implemented in participants' courses. This approach was also used by both Bennett et al. [3] and Jollands et al. [4] in their explorations of employability.

To obtain data and facilitate the interviews, a set of questions was prepared. After the questions were approved by an Ethics Committee, emails to participate in the research survey were sent were sent to 25 academics in the CS & IT discipline at a large Australian university. Care was taken to insure a wide sample. Twenty academics (17 male and 3 female) responded to the emails ranging from professors to senior lecturers as well as experienced casual lecturers. All participants were
interviewed by the author of this paper in a 30-minute face-to-face session. Notes were taken, and the interviews were transcribed manually during and after the session.

One of the important things to note that CS & IT belongs to newly merged School of Science. Although the merger has led to the division of academics into various disciplines (as an example 25 in CS & IT discipline), it has also resulted in the emergence of rich profile diversity in each of the subsets. The 20 interviewed academics belonged to a wide spectrum of cohort. As an example, the professors are working closely with industry as a part of their research projects and grants; senior lecturers and lecturers are involved in supervising industry projects and casual academic work part time in the industry. A significant element of the sample size that emerged was the random diversity of the backgrounds of the subjects (interviewees). The divergent quality of the group included subjects from Algeria, France, China, South East Asia, etc.

Factoring in their varied age and experience too, the result is a rich and eloquent sample size at a number of levels. Together, the group made for a diverse tapestry of opinions concerning the relevance of employability in a higher education environment.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Number of interviewees</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Senior Lecturer</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Lecturer</td>
<td>5</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Casual Lecturer</td>
<td>4</td>
<td>3</td>
<td>1</td>
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</tbody>
</table>

Total: 20

The interview consisted of eight open-ended questions. The questions covered aspects of employability ranging from its perceived meaning, how the teaching of employability skills is being implemented in the classroom, what employability skills may consist of and the role of employability in the higher education curriculum. The questions have been attached as an appendix to this paper.

5 RESULTS

The transcribed data was uploaded in to NVivo. Multiple iterations of creating data encodings led to the creation of following emergent themes and sub-themes around the definition of employability and how employability skills might be implemented in the computing curriculum.

Academics varied in their definition of employability. While most of them expressed the need to implement employability via the curriculum, they were not clear about the specifics. Although the “need” was agreed, its importance was valued differently by each of the interviewees.

5.1 What is employability?

RQ1: What is employability?

Five major themes emerged in relation to the definition of employability, including seeing employability as:

1. the accumulated skillset of the student (mentioned by 12 interviewees)
2. student attitude (mentioned by 7 interviewees)
3. current industry or sector appropriate knowledge (mentioned by 6 interviewees)
4. a fad (mentioned by 3 interviewees) and
5. aligning program outcomes with the current needs of industry (mentioned by 3 interviewees)

The discussion around the accumulated skillset emerged as the dominant theme. To quote a few,
“When a student finished their degree, they should have accumulated minimum skillsets to survive in industry” (Participant number 18)

“The sum total of their skillset should give them an ability to work in different fields of the technical industry.” (Participant number 15)

While most of the academics focused on the need to accumulate skills, there was general confusion around the definition of employability among the group.

For example, one of the professors reiterated the need for a strong conceptual base to secure employability, while the senior lecturers focused on the adaptability and the ability to learn new skills as the cornerstone of employability.

The discussion involving theme 5 (aligning program outcomes with the current needs of industry) came from the casual academics. It is will be noteworthy to mention here that these academics work in industry on a part-time basis. As an example, one of them stated,

“The content of course should prepare the student for industry and be good enough to get student employed.” (Participant number 16)

The second casual academic added,

“Let us look at how employable students are because of their program.”

“Are there some courses that make them more employable than the others?” (Participant number 17)

The three academics who thought employability was a fad explained their reasoning behind such an assertion. According to them, the job of an educational institution is only to teach the students concepts and not make them job ready. The focus on job readiness impedes the learning process hereby defeating the purpose of true education. To quote such interviewees,

“All these buzzwords around employability do not tell me anything about what is needed, wanted and expected of the students?” (Participant number 5)

“Our education system is only focused on employability these days.” (Participant number 13)

Around 60% of the academics passed the burden of being employable to the student-

“The student needs to self-learn the skills that would make them more employable.”

5.2 What are employability skills?

RQ2: How can employability skills be implemented in the curriculum?

The following themes emerged as a result:

1. General practice around embedding of employability in curricula around technical teaching
2. Co-teaching with industry
3. Soft versus hard skills and,
4. Higher order thinking skills

Numerous suggestions were made around the general practice of embedding employability in the curriculum. These ranged from including more authentic assessment, use of analytical case studies, teaching current technologies, know how around the professional use of industry-popular tools and the importance of professional computing practice. While many academics stated they already used these approaches, they were not sure about their effectiveness. For example,

“We teach industry related material in isolation at times with no feedback from industry.” (Participant number 3)

One area of consensus across all 20 academics was the delivery of courses taught entirely by industry. None of the academics thought that it was a good idea to do so. The academics raised concerns about the teaching skills of industry:
“It is always preferable to co-teach with the industry personnel as they may not be able to
 teach well.” (Participant number 10)

“Some governance is needed in terms of the information passed to the students by the
 industry personnel. If they teach the whole course, how do we measure their performance
 and effectiveness as stipulated by an academic standard.” (Participant number 20)

Despite their reservations about courses delivered entirely by industry, all participants wanted to co-teach with industry. Courses seen as appropriate for this sort of partnership included technical courses that required the refreshing of teaching material on a regular basis to keep pace with the changing needs of industry.

The discussion of the soft versus hard/technical skill made for a very interesting discussion. Data revealed that the majority of academics believed hard technical skills were more important than the soft skills. When asked why many stated that the definition of soft skills is vague. It is not clear which soft skills are important for the technical industry. According to the academics at all levels the changing nature of soft skills makes it hard for them to be taught in university courses. In addition, according to three academics need regular refreshers from industry to teach relevant soft skills. For example,

“Industry keeps talking about the need of teamwork skills, but I am not sure if these are
 well-defined in the context of the technical work environment. Surely there is a difference
 when it comes to teamwork in a business environment as compared to hardcore technical
 environment.” (Participant number 8)

The casual academics introduced the notion of higher order skills based on their own professional experiences. They explicitly stated the difference between soft and higher order thinking skills. For these staff higher order skills included analytical acumen, ability to work in changing environments, to take initiative and be open to learning and adjusting to every changing technological platform.

Here are some of the observations:

“The ability to apply knowledge is more important than the hardcore technical
 implementation and that is what makes a student employable.” (Participant number 4)

“Technology comes and goes, but what stays behind is the art of conceptualisation.”
 (Participant number 1)

6 CONCLUSIONS

While most academics did not think it was their job to make students employable, they implement employability in their own teaching due to a growing pressure to do so. It is noteworthy to mention here that many implement employability as a result of the strategic direction adopted by the university, which focuses on being work ready. Nevertheless, they were strongly divided around implementation and different types of employability skills.

This division raises an interesting set of dilemmas for universities, including

- if large organisations, such as Microsoft and Apple, are creating their own training programs,
  what is the status of the university?
- who sets academic standards?
- and finally, what role should universities play in developing work ready graduates?

CS & IT disciplines are at the forefront of this disruption. Just as the academics we interviewed were divided around the definition of employability and who should be teaching employability skills, the literature is presenting another argument around the need to change teaching methodologies.

7 FUTURE WORK

CSIRO’s Tomorrow’s Digitally Enabled Workforce report [13] emphasised the need for new ways of teaching and equipping students with the skillsets of the future. They further suggested a deeper and a more meaningful collaboration between universities and industry.

Academics form the lynchpin in the above-mentioned arguments. In fact, a report to European Commission [14] made a recommendation stating there is a continuous need for professional
education of the teachers in higher education. The report stated that the teachers should be better equipped to face rapidly changing demands set by the technology and industry. The need for new ways of teaching is certainly a matter of conversation that involves stakeholders such as industry and academics. In future work, the author plans to write about soft skills versus higher order thinking skills in the context of CS & IT industry. We also plan to interview industry employers, as well as alumni, to determine their views around employability skills and how to best prepare CS & IT students for the world of work.

ACKNOWLEDGEMENTS

The author would like to thank the interviewees for their valuable insights and suggestions. This project was approved by the RMIT University, DSC CHEAN Ethics committee, approval number: 0000020760.

REFERENCES


APPENDIX. INTERVIEW QUESTIONS

The following questions were asked during the interview:

1. What does the term “employability” mean to you?
2. How do you implement the notion of “employability” in your courses?
3. Should we teach our students all of the important and widely-used frameworks in the CS & IT industry?
4. How important is the “technical capability” for a graduate who is seeking a job in the industry?
5. Should we teach soft skills in university courses? If yes, can soft skills be taught?
6. Should certain courses only be taught by guest industry personnel? If yes, what kind of courses make a good candidate for this category?
7. Is it our job to make students employable?
8. What makes a student employable?