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IT Education vs. Employability Mismatch

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Full research paper

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Abstract

We live in a digitized era with rapidly evolving technology; consequently, educational curricula need to be adapted to meet the skills and demands of society. This paper analyses current trends within Australian undergraduate Information Technology (IT) curricula to better understand the education-employability mismatch. Secondary data collection from publicly available unit guides and primary data from interviews with IT employers were gathered to identify the strengths and weaknesses of current IT undergraduate curricula through a matrix. The matrix based on the information literacy framework, coupled with the Australian Qualifications Framework (AQF), will improve the tertiary education curriculum, with a view towards increasing employability rates post-graduation.

Keywords: Education, Employability, University, Curriculum, ICT

1 Introduction

Employers have raised concerns about the relevance of university education. Further to these concerns, has been the job vs. education mismatch, equating to a lack of correspondence between the qualification level required of a position, and the qualification level acquired through higher education. According to Yezdani (2017), some 29.1% of graduates feel they work jobs not fully utilising their skills and education, and that the university curriculum does not adequately prepare them for the workplace. The aim here is to reduce such a mismatch, ensuring graduates are work ready upon graduation (Støren and Aamodt 2010). This paper examines our proposed matrix based on the Australian Qualifications Framework (AQF) and the information literacy learning model, as well as interview questions and employer responses to assist in analysing current viewpoints of the educational curricula, coupled with employers' expectations to reduce the education-employability mismatch by being able to identify the strengths and weaknesses of the current curriculum. Future work will examine the perspectives of students and academics through first-hand data collection (i.e., interviews and surveys). The university curriculum should aim at enhancing graduate's skillset in ways that should increase their attractiveness to potential employers (Mason et al., 2009).

2 Background

Education is vital to an individual's development in life, career, and society in general, as education provides the required skills and knowledge to compete in the current world. Through the process of informed choices, people develop their own lifestyle such as personal habits, educational choices, family types, occupational status, health standards and consumption-driven behaviour (Vila 2000). Many if not most graduates, undertake education to gain employment. Due to a range of factors (such as the global pandemic), the global economy is constantly changing (Brown et al. 2003); Occupational role demand is dependent on while concurrently influencing contemporary society, which is especially evident today living through the Coronavirus disease (COVID-19) pandemic. Due to a changing society, we see certain jobs disappearing, as new ones emerge. Workplaces are also transforming, as they become more diverse, inclusive, flexible in employment and work practices, and generally less hierarchical. We live in a world where time is fluid with constant change (Granado 2018), as such the curriculum should also equip students for this fast-changing world - this is lacking today, as the school curriculum has remained static for decades. Some concepts are not only out of date but taught in isolation from the requirements of the workplace. As a result, the experiences of students immersed in this curriculum can be different from those working in relevant disciplines, resulting in a devaluation of graduates in the workforce, creating employment hurdles for today's graduates. The focus of today's educational curricula should provide greater priority to skills and attributes required for life and employment in the 21st century, ensuring individuals are well-trained (Granado 2018). This paper will focus specifically on university education, while acknowledging this may be a limitation. Higher educational institutions face increasing pressure to better prepare graduates for the workforce (Ryan et al. 1996).

Employability can be dependent on several factors such as an individual's qualifications, the skills they already possess, and the need for a position to be filled. Whilst employers may be satisfied in general with the technical skill level of new graduates, they are not often satisfied by their competency in non-technical abilities or their employability skills in general. Archer and Davison's (2008) survey demonstrates that graduate employers view personal attributes and soft skills more highly than degree classification, subject or university attended. A university degree, once seen as a bonus or differentiator, is now almost considered a prerequisite for a job, even in sectors which in the past would not have demanded a degree at entry level. Graduates are increasingly aware they require additional skills and attributes for career success, such that educational institutions now try to adopt such soft skills within their programs (Støren and Aamodt 2010). The employment sector is increasingly competitive; thus, it is vital educational institutions do not fall behind and remain current with what is taught. It is essential all education curricula are continuously reviewed, and suitable modifications made to adapt to global challenges. By reviewing current educational curricula, institutions can identify strengths, gaps, and weaknesses, which in return assists in developing and improving educational curricula for the future, rather than teaching outdated and irrelevant information.

Currently, there is a gap between experts who are exploring where the world of work and the state of learning will need to be in the future with those whose conception of 'good' education is framed by their own earlier experiences and the traditional format. This paper will aim to reduce this gap. Graduate employability has become a key objective for government and a performance indicator for higher education institutions. Whilst employers may be satisfied in general with the level of technical skill of new graduates, they are not convinced by their competency in non-technical abilities or employability

skills. The education-employment mismatch is a major concern for graduates, especially as universities may prescribe units, they deem valuable, while employers may not deem such knowledge useful. Employers have strong and growing expectations that graduates will be work ready and productive and in return, employees expect to have their skills and capabilities recognised and rewarded with ongoing opportunities for career and personal development. Today, the full-time employability rate for those with undergraduate degrees in New South Wales (NSW) hovers around 73% (2018 Graduate Outcomes Survey), down from 85.2% in 2008 (Singhal 2019), highlighting the competitive current job market and the need for of improvements to educational curricula.

3 Research Approach

Research is a systematic process of collecting, analysing, and interpreting data as a mechanism for increasing understanding of a certain topic (Leedy and Ormrod 2005). Relevant literature was reviewed, to ensure the research questions were not previously answered. Crotty (1998) identified the basic elements of any research process as Method, Methodology, Theoretical Perspective and Epistemology, while Saunders et al. (2015) designed a research onion model to better explain the stages of writing to develop an effective methodology. The onion model is an extension of Crotty's (1998) four elements and consists of six main layers: Philosophy, Approach, Strategy, Methods, Time Horizons and Techniques. Figure 1 displays a visual representation of this research using Saunders et al. (2015) onion.

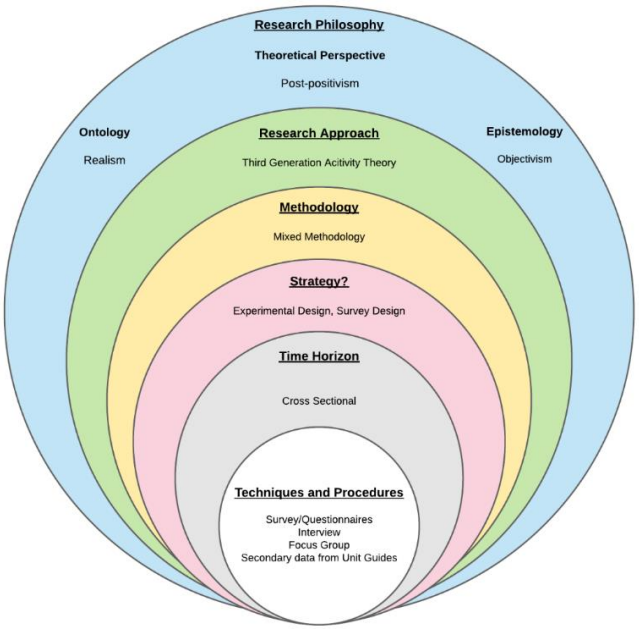


Figure 1 – Research Onion for this study

Our research questions were extrapolated, followed by choosing the research approach, methodology, theoretical perspective, epistemology, and ontology which studies the improvements to Australian university undergraduate IT educational curricula, with the aim of improving graduate employability rates. The literature review notes that to understand changes to the educational curriculum, it is essential to identify strengths and weaknesses in the current educational curricula. A combination of different approaches was necessary to reach a mutual understanding of expectations from students, graduates, employers, and academics or faculty. The research approach is determined by the research philosophy of the previous onion layer (research philosophy), where the data collection methods for data analysis will be Activity Theory. Our use of activity theory focuses on the interaction between students, tertiary educational institutions, and employers to better understand all possible viewpoints. The activity theory will be evaluated through primary data collection (interviews, surveys, focus groups) and secondary data (unit guides, educational annual surveys) to generate our final model. In the university system, the objective is primarily to produce quality graduates, who principally wish to obtain the skills to gain and maintain employment. Concurrently, the organisation's objective is to engage employees with the skills and knowledge to best perform their role.

4 Results and Discussion

4.1 The Education-Employability Matrix

The literature informed the development of a range of current learning outcomes using different Information Technology (IT) units offered by universities in Sydney, Australia initially, but our research is being expanded nationally. A matrix was developed using Lupton and Bruce's (2010) information literacy model as well as the framework from the AQF, to accurately represent the requirements of the educational curriculum. The informational literacy learning model demonstrates a hierarchical relationship through the literacy levels. The purpose of the matrix was to identify the strengths and weakness of the current undergraduate IT curriculum. The concepts and categories of the learning framework are comparable with concepts of the AQF, representing generic, situated, and transformative retrospectively. The three learning outcomes in the AQF are: knowledge, skills, and application (of both knowledge and skills). The knowledge learning outcomes represent theory and information, skills represent abilities required, and application represents acting based on knowledge and skills, which in turn allows people to adapt and apply what was learnt (AQF, 2020). Table 1 defines each of the category of the frameworks for a better understanding. These definitions and terminology were also provided during the data collection phase in sections 4.3 and 4.4

Literacy Level	Description	Examples
Generic	Cognitive skills and processes providing individuals with the ability to find, analyse, and manage information (Lloyd and Talja 2010). Generic refers to the basic skills needed in work and social life.	Learning about databases
Situated	Includes the above generic skills/processes and expands on these. Information evaluated and examined according to context of individual and/or social group as information can have different meanings in different contexts (Lloyd and Talja 2010; Lupton and Bruce 2010).	Creating an extension to a database or modifying it
Transformative	Includes generic level skills, social practices, and relevance of the situated level. Skills here are seen through a range of information practices used to transform oneself and society, by challenging norms (Lloyd and Talja 2010).	A specification is provided and asked to create a database
Fundamental	Refers to the basic non-technical skills, knowledge and understanding.	Self-Management/ Organisational
People	Includes skills needed to work and communication with other people.	Teamwork/ Collaboration
Thinking	Refers to the process of finding solutions to complex problems and issues.	Problem Solving
Personal	Personal Attributes refer to personality traits and needs of an individual.	Reliability, Integrity
Occupational Specific	Technical skills which vary in nature and complexity by discipline.	SQL, Python Coding
Application	Is the process of utilizing the skills learnt in the real-life scenarios	

Table 1– Education-Employability Matrix headings

The matrix was split into three categories: (1) theory - representing the knowledge element of the AQF - consisting of generic, situated, and transformative; (2) skills – which are further split into fundamental, people, thinking, personal and occupation specific; and (3) application (i.e., of both knowledge and skills) (Lin-Stephens et al. 2016; Lloyd and Talja 2010; Lupton and Bruce 2010). The matrix (Table 1)

provides analysis of skills taught at university level, which are then further converted to a visual representation for richer comparison.

4.2 Mapping of the Matrix via Learning Outcomes

Once the matrix was established, Bachelor of Information Technology (BIT) learning outcomes (LOs) were categorized into a matrix, to understand the strengths and weaknesses of the current curriculum. Core units from the named degrees were selected through this process via the publicly available unit guides were mapped for this study. The following steps were undertaken through this process

1. First, a list of all universities within Australia was collated
2. Research was conducted to see which of these Australian universities offer an IT Degree
3. Due to the time constraints, this was then further filtered out to only retrieve information from named “Bachelor of Information Technology" degree
4. All core units’ details (University, Unit Details, Year of Study, LOs) from these “Bachelor of Information Technology" degree were retrieved from a university’s latest publicly available handbooks (2021).
5. The LOs from these BIT core units were collated and mapped, based on the categories of the matrix. To avoid bias, university details were hidden during this process.
6. Once all LOs were mapped these were then cross-checked
7. Finally, the matrix mapping was complete, and a range of analysis could be concluded such as Occurrence per category, Occurrence of category per university etc.

Each of the occurrence’s percentages were calculated by category, using the following formula: Number of Occurrence in a category / (Count of Learning Outcomes per unit x 7). A multiplication by seven, served to demonstrate each individual category present (Generic to Application). Table 2 demonstrates a summary of the occurrence of a category based on the learning outcomes per university. The effectiveness column was calculated by adding all the occurrence in this stage. This is later to be improved by being coupled with Employer, student, and academics perspective to come up with an improved effectiveness matrix which is the end result of this theses. The aim of this is to ensure all key stakeholders’ perspectives are taken into consideration.

Category	Generic	Situated	Transformative	Fundamental	People	Thinking	Personal	Occupational Specific	Application	Effectiveness
Charles Darwin University	1.52%	7.79%	4.76%	3.03%	1.08%	2.81%	0.87%	8.66%	0.00%	30.52%
University of Newcastle	2.47%	4.95%	6.87%	6.87%	2.20%	1.37%	3.57%	5.49%	7.14%	40.93%
Average	4.86%	6.27%	3.13%	3.52%	1.89%	2.62%	1.29%	8.57%	1.72%	33.88%
Maximum	11.63%	8.79%	6.87%	7.94%	5.95%	7.14%	3.57%	12.19%	7.14%	40.93%
Minimum	1.52%	1.00%	0.52%	0.82%	0.52%	0.84%	0.00%	4.15%	0.00%	30.52%

Table 2 – Summary Percentage of occurrence per university

The outcomes discovered from this mapping process was that majority of the Australian IT curriculum were consistent in the skills being taught between the effectiveness percentage of 30-40%. The highest of these units were University of Newcastle with 40.93% and the lowest Charles Darwin University at 30.52%. There are some skills that are not taught by some universities such as Personal skills at ANU, CQ University and Deakin University, and Application Skills at ACU and Charles Darwin etc. Table two demonstrates this through the minimum category We surmise reasons for this zero score is due perhaps to an overcrowded curriculum or a lack of prioritization by that institution. The matrix permitted analysis of different trends to better understand Australian Information Technology undergraduate curricula. This matrix allows us to analyse a variety of different trends to better understand the

Australian ICT undergraduate curriculum and demonstrate the skills the universities are teaching, and which skills are being neglected.

The pie chart (Figure 3) clearly demonstrates a visual breakdown of the categories taught at universities across Australia, showing that overall Australian BIT degrees largely focus on Occupational (6.71%), Situated Theory (4.90%), and Generic Theory Skills (3.69%). It was also noted that, People (1.38%), Application (1.31%) and Personal (0.95%) constitute the least applied core skills within Australian BIT programs. Occupational Specific leads in all skills by a significant percentage with 868 of the 1438 learning outcomes mapping to this category, followed by Fundamental at only 351 (only 2.71%), highlighting a substantial gap in skills taught at university level. Personal skills are the least taught according to the unit learning outcomes (0.95%), which is not unexpected, as personal skills refer to the personality traits of an individual - something developed individually, rather than taught. Under theoretical skills - situated (4.90%) is more often taught at a university level in comparison to others. Transformative skills (2.52%) are least applied in the BIT curriculum.

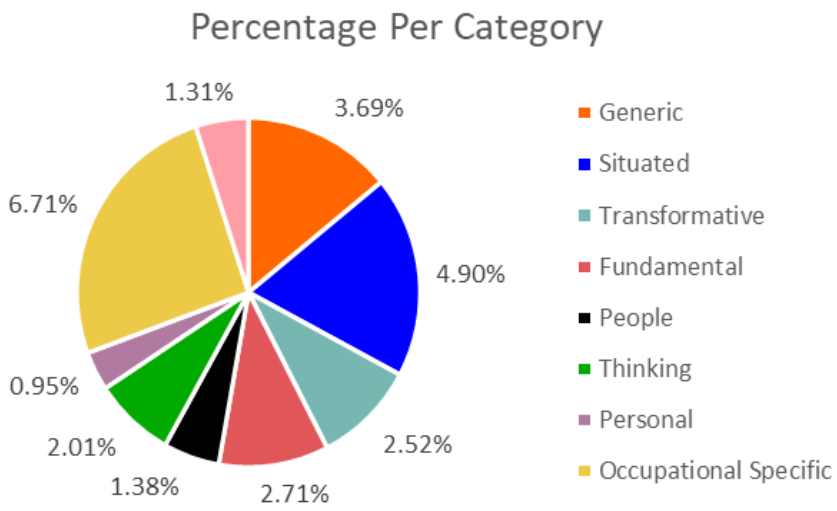


Figure 3 - Percentage Per Category

4.3 IT Employer Interviews

After completing the matrix by mapping the unit guides for BIT degrees, interviews were conducted with IT professionals who are responsible for recruitment for their companies. The following steps were followed:

1. Firstly, the ethics process for the university was completed,
2. A list of trial questions was created and matched with the research questions,
3. The trial questions were used for a trial interview with 3 employers,
4. The trial interview responses were then collated, and the transcript was typed up word-to-word for analysis,
5. An analysis was completed for a range of questions,
6. Then questions were tweaked based on these responses and analysis,
7. A final set of interview questions were set,
8. A range of employers who worked in some form of an “IT role” and also “responsible for recruitment within the IT department” were emailed for expression of interest,
9. Those who were interested were asked to fill and sign an interview consent form. 15 people out of 20 agreed to participate in the study,
10. Next, an interview was set up with a range of different times that worked around their availability. This was added in the calendar with a zoom link,

11. On the date of the interview, participants joined via zoom and were informed that the meeting was recorded for the purpose of transcribing,
12. Once the interview was complete, the responses were then collated, and the transcript was typed up word-to-word for analysis, and
13. When all the interviews were completed, each of the employer's transcript was analysed by individually highlighting key points to better collate and code the data. NVIVO was used to assist in analysis.

These 15 employers who participated in the study ranged from but were not limited to, the education, government, health, and sports sectors. Their experiences in recruitment within the IT sector ranged from one to twenty years. The purpose of interviewing IT employers responsible for recruitment was to ascertain and analyse the needs of employers, while matching these with skills taught at universities (as indicated through the matrix). Once the questions were finalized, 15 to 20-minute interviews were conducted with fifteen (15) employers working in different IT recruitment organizations. The interview included a range of open and closed, ranking and Likert scale questions and can be found in Appendix 1.

Each employer's transcript was analysed by individually highlighting key points to better collate and code the data. NVIVO was used to assist in analysis. Through this it was evident that employers clearly valued skills over theory. Basic skills, communication, attitude, and ability to learn on the job were a priority for recruiters. Generally, employers ranked People, Thinking and Fundamental skills as most important criteria when hiring. The matrix created through the unit guides demonstrate that curricula within BIT degrees focus on Occupational, Situated Theory and Generic Theory skills, which are not categories employers prioritize; this also matches feedback from employer interviews - clearly demonstrating an education-employment discrepancy. "So, for me it's critical that they have practical experience or applicable, I should say, experience". Several interviewees noted Occupational Specific skills are only tested by employers for very technical competencies, otherwise they are willing to teach the candidate with the right attitude and communicative ability. Such a finding also matches several studies (Business 2019; Trauth et al. 1993), suggesting IT management prefers to hire graduates with a foundation of technical skills but also other skills, ensuring graduates can also work closely with non-technical departments and users (Trauth et al. 1993). To foster such communication and collaboration, employers encourage students to undertake internships and view such training as a bonus to the degree, demonstrating a substantial education-employability mismatch, further highlighting the need for change to the BIT curriculum to meet employer needs, thus ensuring graduates are job-ready on graduation. According to the questions, regarding hiring, it was evident employers valued attitude *("Willingness to learn," "positive attitude," "enthusiasm," "interested and curious")* and skills ("*They know their fundamentals," "your communication skills are vitally important," "problem solve", "teamwork", "creativity"*) over theory overall. If the candidate is a student, employers make note of the student's degree (Figure 4), but the basic skills, communication, attitude, and ability to learn on the job are a priority for recruiters. One of the interviewees quoted *"Definitely, the more social skills and the ability to talk to people. I think that that is highly underrated in IT."*

When the categories from the matrix were ranked by interviewees – Fundamental, People and Thinking Skills were ranked highest on average. In comparison, the matrix demonstrated university curricula within BIT degrees focused on Occupational Skills, Situated Theory and Generic Theory skills, - i.e., categories not prioritised by employers in their interviews, clearly demonstrating an education-employment discrepancy. As shown in Appendix 3, Employers ranked People, Thinking and Fundamental skills the most important when hiring IT Graduates.

Several interviewees mentioned Occupational Specific skills are only tested by employers for very technical competencies, otherwise they are willing to teach the candidate with the right attitude and communicative ability "if you can communicate well to people what's going on, then it doesn't really matter if you don't have those (technical) skills to start with, it's something I can provide on the job with training." This finding also matches several studies (Business 2019; Trauth et al. 1993) suggesting IT management prefers graduates with a foundation of technical skills, but also other skills, ensuring they work closely with non-technical departments and users as well, especially as those who possesses sufficient HR skills can communicate effectively, which is a scarce and vital resource (Trauth et al. 1993). To foster such communication and collaboration skills, employers encourage students to undertake internships and view such training as a bonus to the degree, demonstrating a substantial education-employability mismatch, further highlighting the need for change to the BIT curriculum to meet employer needs, ensuring graduates are job-ready.

4.4 IT Student and Alumni Trial Survey

Next, a trial dataset was collected from a total of seventy-seven students (77) currently studying an undergraduate IT degree or are an IT bachelor alumnus. Out of these seventy-seven students, fifty-six participants were current students and twenty-one were alumni. The questions used in the trial survey are shown through Appendix 2 The purpose of this survey is to amend any questions based on any inconsistency or difficulties encountered during the capture or analysis phase. This analyses questions have been conducted, and the questions are ready for surveying. The following steps were conducted for the trial analysis:

1. Firstly, the ethics process for the university was completed,
2. Once ethics approval was granted, a couple of potential survey questions for students and alumni were drafted. These were then revised and edited based on feedback and the needs of the study,
3. The trial questions were used for the trial survey for current students and alumni. This was all collected anonymously,
4. The trial interview responses were then collated,
5. An analysis was completed for a range of questions,
6. Then questions were tweaked based on these responses and analysis. It was noted that having a lot of open-ended questions made it difficult and time consuming to analyse and participants were unwilling to spend that time, and hence Leichhardt scale and rankings were introduced further down the revisions. Several questions were re-added in different process flows and confusing questions were re-worded or eliminated. Around 75 students and alumni answered the trial survey. Once these trial results were analysed and the questions did not change, the list of questions were finalised for the actual surveys, and
7. A final set of interview questions were set but at the stage of this research paper the actual survey has not been live.

Similarly, to the employers, students also valued skills over theory. Generally, students ranked Thinking, Fundamental and Generic skills as the most important for them personally, as seen in Appendix 3 Thinking and Fundamental Skills were also the top two skills mentioned by employers demonstrating the similarities. Additionally, both students and employers ranked Personal skills as the least desired skill. Appendix 3 demonstrates how Students ranked the skills from the matrix which can be compared to how employers ranked the skills to get a side-by-side perspectives

Students believe that there needs to be some form of internship incorporated into their undergraduate degree (Average rating of importance of degree 6.15 out of seven on the Leichardt scale), with a majority of the students (87%) feeling that they were required to go out on their own to look for internships or work experience during their study. One student specified *"…we go out there for entry-level jobs or internships related to our majors they tell us we don't have enough experience in that field. I think maybe in future we can small internship program at the university…nowadays employees don't care much about degrees as much as the experience."* Several universities today provide students with opportunities to acquire practical skills to complement their university degree which can be useful in the real world, such as the Professional and Community Engagement (PACE) program at Macquarie University, and the sandbox program at University of New South Wales (UNSW); these extra skills are now seen as a bonus to the degree. Additionally, students believed a university degree is important but not essential when applying for work (average rating of importance of degree 4.73 out of 7 on the Leichardt scale), with GPAs not being as important (average rating of importance of degree 3.95 out of 7 on the Leichardt scale), with the majority of students doing so to obtain employment (30.67%). One of the anonymous comments from the survey was demonstrating the education-employability mismatch *"…rather than just have the qualifications in it, and more focus on practical critical thinking skills"*

The different methods of data collection, demonstrates the gap between the current curriculum which focuses on Occupational and Theory (Generic, Situated) across in comparison to the employers and students' perspectives which addresses the mismatch between several literature review (Granado 2018; Harvey 2001; Mason et al. 2009; Masters et al. 2020; Singhal 2019; Støren and Aamodt 2010; Tomlinson 2008; Yezdani 2017). Eighty-five percent of students and alumni believe there is a mismatch of qualifications and the skills required to perform in-demand jobs and that current UG IT curricula requires updating. Comments left by students and alumni include *"the university talks about job ready focus, but it really isn't. For example, in Cyber Security, employees look for certifications &*

experience. Uni doesn't provide any of these two attributes. The information taught are fundamental and generic which would be forgotten about because these are not the things used in an organisation" and *"The organisation employees people based on people skills, communication abilities, experience, certifications in a specialised field. University is holistic based where we learn a little about everything."*

5 Future Work

Our study is ongoing, and we will gain a better understanding of the potential employer vs. computing curricula mismatch, through understanding the perspectives of students, graduates, and academics. Future work requires collecting actual survey results from students and graduates, coupled with surveys from academics. Once all primary and secondary data is collected and analysed, a comparison will be made to create an improved matrix determining the effectiveness level of the units taught. The improved proposed matrix is shown in figure 6.

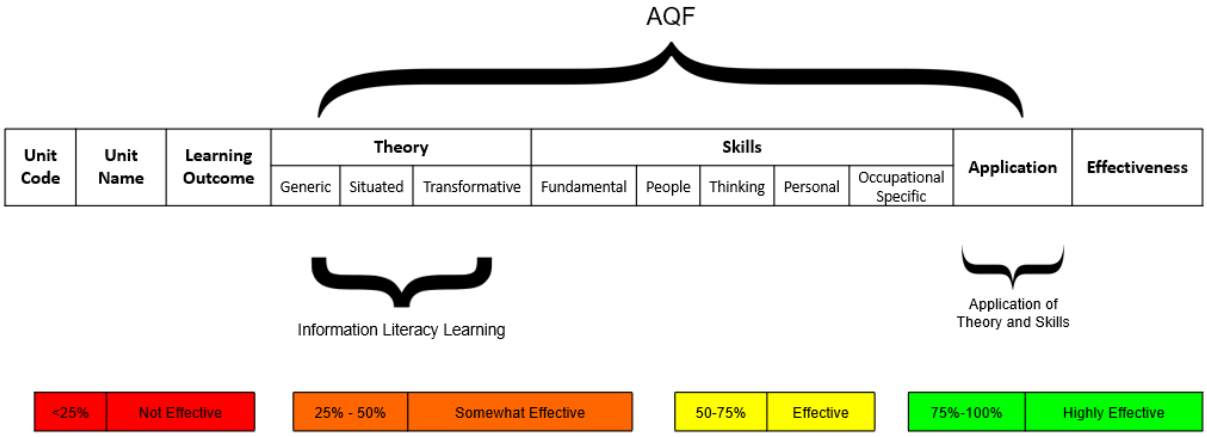


Figure 6– Improved Proposed Matrix

The aim here is to better understand the overall topic to make more informed decisions on educational curricula, through identifying the needs of students, graduates, and employers, while identifying which units and degrees provide students with the skills required to be employable post-graduation. The numbers of each category and overall effectiveness will depend on the primary data collected from employers (Figure 4), students/alumni (Figure 5), and academics (To be developed). This will allow universities to gather the effectiveness of the learning outcomes from unit guides based on all the perspectives to improve the employability rate.

6 Conclusion

The significance of this research lies in creating a contribution to knowledge and a deeper understanding of current undergraduate IT curricula to lift employability, which is emerging as a top priority for graduates and employers in Australia for all stakeholders. There are key knowledge, skills, and attitudes sought by employers and it is evident from the interviews as well as the literature review, that whilst employers may be satisfied in general with the level of technical skill of new graduates, they are grading these people skills during the recruitment process. This paper examines ways to improve current university curricula to match the skills employees seek, while ensuring institutions remain current through secondary data collection of unit guides, along with primary data collection through interviews of employers and trial surveys from students and alumni. Third-generation activity theory was applied in the analysis of the connection between universities, students/graduates, and employers. This research paper aims to better understand the education-employability mismatch and improve graduate employability to improve students' employability rates post-graduation. Such a process assists in creating a matrix to identify the current flaws of BIT degrees within Australia, ultimately improving Australia's economic wellbeing.

7 References

Archer, W., and Davison, J. 2008. "Graduate Employability," The Council for Industry and Higher Education).

Brown, P., Hesketh, A., and Wiliams, S. 2003. "Employability in a Knowledge-Driven Economy," Journal of Education and Work (16:2), pp. 107-126.
Business, D.o.J.a.S. 2019. "Australian Jobs 2019," A. Government (ed.).
Crotty, M. 1998. The Foundations of Social Research: Meaning and Perspective in the Research Process. Sage.
Granado, J. 2018. "The Challenges of Higher Education in the 21st Century." Retrieved 2 July 2019, from http://www.guninetwork.org/articles/challenges-higher-education-21st-century
Harvey, L. 2001. "Defining and Measuring Employability," Quality in Higher Education (7:2), pp. 97-109.
Leedy, P.D., and Ormrod, J.E. 2005. Practical Research. Pearson Custom.
Lin-Stephens, S., Smith, S., Peso, M., and Pang, V. 2016. "The Career Information Literacy Learning Framework: A Case Study of Information Systems, Information Technology and Engineering Capstone Units of an Australian University," in: PACIS 2016. Langkawi: pp. 1-15.
Lloyd, A., and Talja, S. 2010. Practising Information Literacy: Bringing Theories of Learning, Practice and Information Literacy Together. Elsevier, USA.
Lupton, M., and Bruce, C. 2010. Windows on Information Literacy Worlds: Generic, Situated and Transformative Perspectives.
Marginson, S., Tytler, R., Freeman, B., and Roberts, K. 2013. "Stem: Country Comparisons: International Comparisons of Science, Technology, Engineering and Mathematics (Stem) Education. Final Report." Deakin Research Online.
Mason, G., Williams, G., and Cranmer, S. 2009. "Employability Skills Initiatives in Higher Education: What Effects Do They Have on Graduate Labour Market Outcomes?," Education Economics (17:1), pp. 1-30.
Masters, G., Thomson, S., and Schleicher, A. 2020. "Towards a New Curriculum," in: teachermagazine.
Ryan, G., Toohey, S., and Hughes, C. 1996. "The Purpose, Value and Structure of the Practicum in Higher Education: A Literature Review," Higher Education (31:3), pp. 355-377.
Saunders, M.N., Lewis, P., Thornhill, A., and Bristow, A. 2015. "Understanding Research Philosophy and Approaches to Theory Development,"), pp. 122-161.
Singhal, P. 2019. "Full-Time Employment Rate for University Graduates Plummets," in: The Sydney Morning Herald.
Støren, L.A., and Aamodt, P.O. 2010. "The Quality of Higher Education and Employability of Graduates," Quality in Higher Education (16:3), pp. 297-313.
Sutton, J., and Austin, Z. 2015. "Qualitative Research: Data Collection, Analysis, and Management," The Canadian journal of hospital pharmacy (68:3), pp. 226-231.
Tomlinson, M. 2008. "'The Degree Is Not Enough': Students' Perceptions of the Role of Higher Education Credentials for Graduate Work and Employability," British journal of sociology of education (29:1), pp. 49-61.
Trauth, E.M., Farwell, D.W., and Lee, D. 1993. "The Is Expectation Gap: Industry Expectations Versus Academic Preparation," Mis Quarterly), pp. 293-307.
Vila, L.E. 2000. "The Non-Monetary Benefits of Education," European Journal of Education (35:1), pp. 21-32.
Yezdani, O. 2017. "Five Myths About Australian University Graduate Outcomes," in: The Conversation.

Appendix 1 – Employer Interview Questions

Q1. Can you please tell me the structure of your organisation?

Q2. How long have you worked with the organisation and what is your current role with the organisation?

Q3. On a scale of 1 – 10 how much emphasis do you place on education such as a university degree? (1 representing not at all and 10 being all the time).

Q4. On a scale of 1 – 10 how often do you look at a graduate's GPA when hiring employees?

Q5. When you hire a new IT graduate, looking through an application, what are the key criteria are you looking for?

The next two questions related to the matrix (Section 4.2). A summary of terminology was shown to the interviewees who were asked to rank them accordingly (Table 1). The ranking of skills included: Theory (Generic, Situated, Transformative Learning), Skills (Fundamental People, Thinking, Personal, Occupational Specific) and Application.

Q6. In your opinion, rank these skills in the order you think university students are learning.

Q7. In your opinion, rank these skills in order of importance for employment.

Q8. How do you measure the skills of a candidate?

Q9. Does your organisation provide internships to students who are currently studying a degree? If yes, how many approximate interns have you offered employment to in the company? If no, why not?

Q10. On a scale of 1 – 10, how essential is it to know the candidate previously? For example, the candidate might have worked as a summer intern for the organisation, or the candidate might have known to the organisation through [name withheld] University's PACE program.

Q11. What are your expectations when hiring graduates?

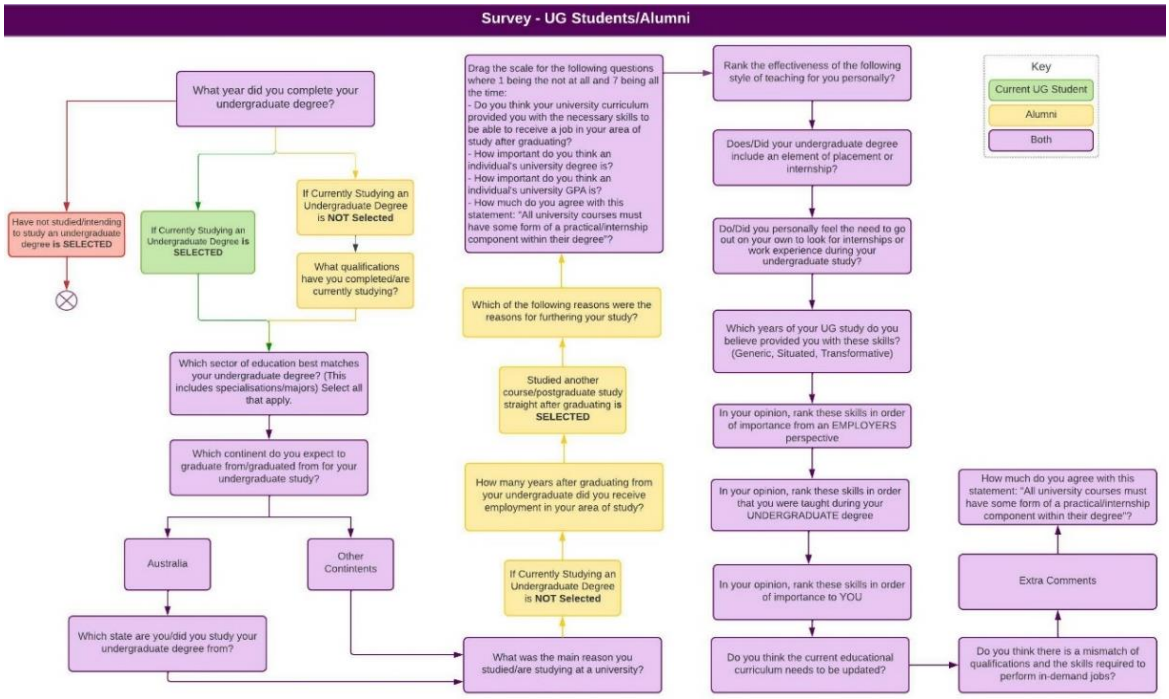
Q12. What are some benefits of hiring graduates in your company and department?

Q13. What are some issues you have had with hiring interns and graduates?

Other

Q14. Do you have any other comments?

Appendix 2 – Current Student/Alumni Survey Questions



Appendix 3 – Employer vs Student Ranking Perspectives

Category	Employer Rankings	Student/Alumni Rankings
Generic Theory Skills	6	3
Situated Theory Skills	5	8
Transformative Skills	6	5
Fundamental Skills	3	2
People Skills	1	4
Thinking Skills	2	1
Personal Skills	9	9
Occupational Specific Skills	4	7
Application of skills	8	6

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