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Career aspirations and skills expectations of undergraduate IT students: Are they realistic?

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Attending university can assist students to make informed and realistic choices regarding their career. However developing a student's career aspirations, goals, and expectations is a complex and discipline-specific process. In Information Technology (IT) no clear career development pathway is evident in the literature despite recent efforts by employers, educators and professional societies to help students improve their career expectations and employability upon graduation. This study aims to better understand the career aspirations and expectations of tertiary IT students, so that future curriculum and career development activities are better aligned with their beliefs and needs. An exploratory mixed method study captured students' career aspirations and skills expectations over two phases. A qualitative inquiry in 2014 (n = 306 students) followed by a quantitative study in 2015 (n = 159 students) delved into the aspirations of IT students. Across both phases students reported similar skills they expect to build during their time at university, as well as comparable ways in which they plan to progress towards career and skill building. Overall, the results indicate that students have varied career aspirations and while realistic, the criteria they have regarding achievement of their career goals are not clear. This may highlight issues with students setting realistic expectations in the career development process.

Keywords: career development, information technology, employability

Introduction

It is becoming increasingly complex for Information Technology (IT) graduates to negotiate the various and changing job roles that make up the IT industry. In 2014, approximately 39% of employers had difficulty sourcing enough graduates for open positions in Information Technology (Graduate Careers Australia, 2016). Furthermore, a report by Graduate Careers Australia (2015) highlighted that some graduates have unrealistic expectations about their employment prospects, and employers commented that universities need to better prepare graduates expectations of career advancement. While in demand in the employment market, IT graduates often do not have adequate skills or career maturity to enable them to successfully engage with employers (AIIA, 2016; Graduate Careers Australia, 2016). Career maturity is the ability to make age-appropriate, informed decisions that contribute to sound career choice decisions (Betz & Luzzo, 1996).

In recent years a focus on the development of students' professional skills for employability has become a key requirement of tertiary course design (Australian Government, 2013; Docherty, 2014; Qenani, MacDougall, & Sexton, 2014) with the Australian Computer Society (2012) reiterating this for Information Technology in their course guidelines framework, with a focus on supporting IT professional skills such as cognitive, technical and communication skills. Development of professional skills not only assists students in building their employability but also contributes to forming their career competencies. Career competencies are skills that relate to a particular profession, composed of those learnt from previous experiences or learning activities, and the ability of the individual to self-regulate their activities towards further skills development. Career competencies are realised through activities that lead to meta-cognition to assist a person in making appropriate career choices (Lent, Brown, & Hackett, 1994). Development of career competencies and professional skills is complex, particularly when attempting to cultivate a skills set that will satisfy the diverse job roles that can be found in the IT industry. In addition to developing skills, students also need to actively think about and develop their career goals and aspirations, and mature their career competencies, so that they can contribute to a productive working environment. In Australia, the Ministerial Council for Education Early Childhood Development and Youth Affairs national guidelines on career development (2010) assert the ways in which we should be supporting students for career development, defining that, at the university level, they should be developing career competencies that help them to understand, engage in and manage the career building process, and contribute to effective choice/goal setting in their discipline.

As a discipline, IT is in a state of constant change due to the pace of technological development. Koppi and Naghdy (2009, p. 14) argued that "in contrast to more established disciplines such as arts, engineering and science, there is no unified definition of the Information Communication Technologies (ICT) discipline and the employment opportunities it offers". IT (or ICT) education has been a formal program in higher education institutions the world over since the 1980s. Globally, IT education was at its peak in the early 2000s with IT professionals in high demand in a technology hungry economic climate. More recently, enrolment of students into IT studies in higher education has declined (Koppi & Naghdy, 2009); however, employment opportunities have continued to rise resulting in a skills shortage. Investigations into the reasons for the declining interest in formal IT education (Koppi & Naghdy, 2009) has not fully addressed the issue. Whatever the case, the need remains to offer IT higher education training and produce high quality graduates to meet industry demand (Koppi & Naghdy, 2009). To remain relevant, universities must remain cognisant of industry and professional society recommendations and requirements.

To pursue their chosen career path, students need to prepare themselves for employment by building their career competencies, employability skills and adding to their professional identity (Jollands et al., 2014). To assist students in identity building, universities need to provide opportunities for them to develop into workforce ready graduates (Jollands et al., 2014; Nagarajan & Edwards, 2014; Qenani et al., 2014). Opportunities include a transitional framework between school and the workforce, a curriculum framework of connected generic and discipline learning outcomes, opportunities for experiential learning, and curriculum-integrated career development. Provision of these opportunities can assist students to build effective career competencies.

Career development in Information Technology

Research in disciplines including psychology, organisational behaviour, and workplace management has produced theories and models to support career decision-making and career development. Decision-making models are conceptual frameworks useful for understanding how decision makers process information and arrive at conclusions (Harren, 1979). Career decision-making explains an individual's internal psychological process that occurs as part of a broader career development process (Harren, 1979). Generally, the theories and models of career development can be classified into four categories: (a) matching personal traits to occupations (Parsons, 1909), (b) aligning personality types to the work environment (Holland, 1985), (c) the development of skills appropriate for different developmental phases (Crites, 1978; Super, 1980), and (d) developing career and life agentic (self-directed) skills informed by social-cognitive processes (Bandura, 1986; Hackett & Betz, 1981; Lent et al., 1994). Career development is an activity that a person conducts during their entire life, however without active participation in relevant career activities during secondary and tertiary education, skills development and career aspirations may not mature. Career development can be mistaken for skills development (MCEECDYA, 2010), and while both are important to progress and mature, they need to be constructed side-by-side to ensure that skills can be developed into competencies useful for a chosen career path.

From an IT perspective, social cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994) has been utilised as a way to characterise career development of students and explain both academic and career behaviours (Janz & Nichols, 2010; Smith, 2002). SCCT considers individual cognitions and psychosocial states as well as economic and sociological factors to explain the acquisition of career development attributes (Lent et al., 1994). SCCT is a derivative of social cognitive theory, as proposed by Bandura (1986). Simply stated, SCCT suggests that a combination of self-efficacy, outcome expectations and interest inform a student's choice/goals regarding their career. Applying SCCT to this study, we can define self-efficacy as a student's ability to judge how their current skills apply to performance (Lent et al., 1994). Outcome expectations include a student's personal beliefs about a probable outcome resulting from effort. Interest is defined as the curiosity and positive emotion for constructing a career in IT (Janz et al., 2010). Choice/goals result from a combination of self-efficacy, outcome expectations and interest contributing to the self-regulation of behaviour towards career development (Lent et al., 1994). A strong sense of personal efficacy creates self-directed, life-long learners and influences aspirations (Smith, 2002). SCCT is a particularly useful framework as it incorporates environmental and contextual factors to help understand an individual's career development, yet few studies have applied SCCT to the IT discipline. SCCT is relevant in this study because of the way in which it helps us understand the factors that affect students' career choices/goals. Additional factors that may impact upon a person's ability to make career choices include: disciplinary knowledge, relevant professional skills, professional society guidelines, experiential learning opportunities (work integrated learning), social capital and community links, and personal identity.

Koppi and Naghdy (2009) argued that more IT higher education research should consider the student experience of careers and employability. With that in mind, the starting point of this research is to understand the career aspirations and expectations of tertiary IT students, so that their beliefs and needs can be taken into consideration when constructing pathways aimed at supporting career development. With this understanding, we can better educate our students to

be responsive and adaptable IT professionals and provide them with appropriate opportunities for career development during their studies.

Research questions

As highlighted by Koppi and Naghdy (2009), having a better understanding of the student experience of careers is required to prepare them for their employment future. To better understand the factors that affect career choice (Lent et al., 1994), the following four research questions are addressed in this paper to explore the career aspirations and skill development plans of undergraduate IT students at an Australian university.

1. What are the short-term and long-term career aspirations of undergraduate IT students?
2. What are the criteria which students use to assess whether they have achieved these aspirations?
3. What are students' perceived barriers in relation to achieving their career aspirations?
4. What skills do students perceive are required to achieve these career aspirations?

Methodology

To assist in addressing the research questions a mixed methodology was adopted in this study. This employs techniques from both quantitative and qualitative domains, and will allow this research to rigorously explore the assumptions central to the topic of career development for IT students, and to facilitate a strong exploratory stance on the topic (Gelo, Braakmann, & Benetka, 2008). Data collected over two phases is used to help explore the career aspirations and skill expectations of undergraduate IT students at an Australian university. While both phases queried IT students regarding their career aspirations and skills expectations there were differences in the two populations – one a second-year class; the other based on the whole course enrolment. Hence, it was not automatically presumed that both groups would yield the same results. However, finding strong agreement between the two populations would be considered indicative of a generalizable result.

In phase one in 2014, 306 second-year IT students enrolled in an IT professional skills class reported on their career aspirations and skills expectations. The data were provided by students during a career development assessment task, which was based on activities recommended by the authors' university career advisors. The career development activities included goal setting, development of a brand/identity, understanding the job market, job searching, and networking. In the assessment, the students described in text their short- and long-term career aspirations by answering the following questions:

- What job do I want to get once I finish my degree?
- What is my career goal - long term?

Furthermore, students were asked to describe the ways by which they plan to achieve their career aspirations and negotiate barriers by answering these questions:

- How will I know when I have succeeded towards my career goal?
- What may stop me from successfully achieving my goal?

To report the short- and long-term skills that they planned to develop, students selected their answer to the following question from a list of generic graduate skills (i.e. team work, communication, self-management, etc.):

- What are the top four skills I need in the short-term which are important for my first job post-graduation?
- What are the top four skills I need in the longer term which are important for me to achieve my career goal?

Qualitative analysis was performed on the career aspirations data, grouping students' career aspirations, progression mechanisms, and barriers into relevant categories, with quantitative count (frequency) analysis performed on the skills data collected. All categories identified during the qualitative analysis informed phase two of data collection.

In phase two in 2015, 159 undergraduate students enrolled across an IT degree program, as opposed to the single class in phase one, reported on their career aspirations and skills expectations using the same questions as in phase one. For example, when asserting their short- and long-term career aspirations students either selected a category from the list provided (i.e. 'developer', 'IT security', 'higher management') or entered their own answer via a free text entry box. When asked about the ways by which they plan to achieve their career aspirations and negotiate barriers, students either selected a category from the list provided (e.g. 'When I have achieved my long-term career goals', 'Via self-reflection on my career progress') or entered their own answer via text. When reporting skill expectations in phase two, students used the same generic list as provided in phase one. Overall, phase two was conducted to get a 'broader' picture of IT students' career aspirations. Presented alongside phase one, the results help build a picture of IT students aspirations, expectations and perceptions of career development.

In both phases demographic variables collected included gender, campus, and mode of study. The two-sided version of Fisher's exact test was used to compare the proportions of the demographic variable categories observed in the respondent student group and the overall enrolled student group. Fisher's exact test makes no assumptions about the source data other than that the variable categories (i.e., gender and student group, campus and student group, and mode of study and student group) are not associated. The test computes a significance (p) value for the observed proportions of the variable categories in each student group. Ethics clearance was obtained from the authors' university human research ethics committee for the data collection in both phases.

Results and discussion

Sample and demographic information

In phase one, completed responses were obtained from 306 students out of a class enrolment of 375. Using Fisher's exact test, there were no significant differences between the respondent sample and the entire enrolled class on the demographic proportions of gender ($p>0.88$), campus ($p>0.71$) and mode of study ($p>0.89$). The good demographic match and relatively high response rate (81.6 per cent) gives us confidence that the respondent sample is representative of the entire enrolled class for phase one. In phase two, completed responses were obtained from 159 students out of a course enrolment of 1153. Using Fisher's exact test, there were significant differences between the respondent sample and the entire course population on the demographic proportions of gender, campus and mode of study (all p values less than 0.01). The lower response rate and significant differences in the respondent sample demographic make-up compared to the enrolled population lead us to treat the results from phase two with more caution, especially where findings depart from those observed in phase one.

Career aspirations and skill expectations of IT students

As an illustration of the outcome of thematic coding performed on the students' responses in phase one, the following are examples of student text responses and corresponding induced coding categories. For short-term career aspirations:

Student response – "To be a highly skilled software designer with skills in various programming languages and produce professionally made programs for clients while earning a living from my work."
Induced coding category – 'Developer or programmer'.

Student response – "I would like to work as a Network Administrator, as Networking is my major. But I will keep my options open."
Induced coding category – 'Network and system administration'.

Student response – "My goal when I complete my degree is to get in a graduate program for a larger company that requires IT experts to gain relative experience after which I would go for a consulting or managing position."
Induced coding category – 'Not sure: general IT'.

For long-term career aspirations:

Student response – "My long term career goal is to become a professional software developer, working for an established organisation."
Induced coding category – 'Developer or programmer'.

Student response – "I would like to advance my career into a more managerial position."
Induced coding category – 'Higher management'.

Figure 1 summarises the results of the career aspirations thematic analysis. To permit a direct comparison of the data from phase one and two, the results are plotted together in Figure 1. The same visualisation method is used in all figures. The vertical axis lists all of the career aspiration categories identified by thematic analysis. For each of short-term and long-term career aspirations, in phase one and phase two, the bars represent the proportion of all coded responses recorded for the identified response category. A legend identifies each time/phase, and the bars in Figure 1 are arranged from top to bottom in order of decreasing proportion of all coded responses for short-term career aspirations recorded in phase one.

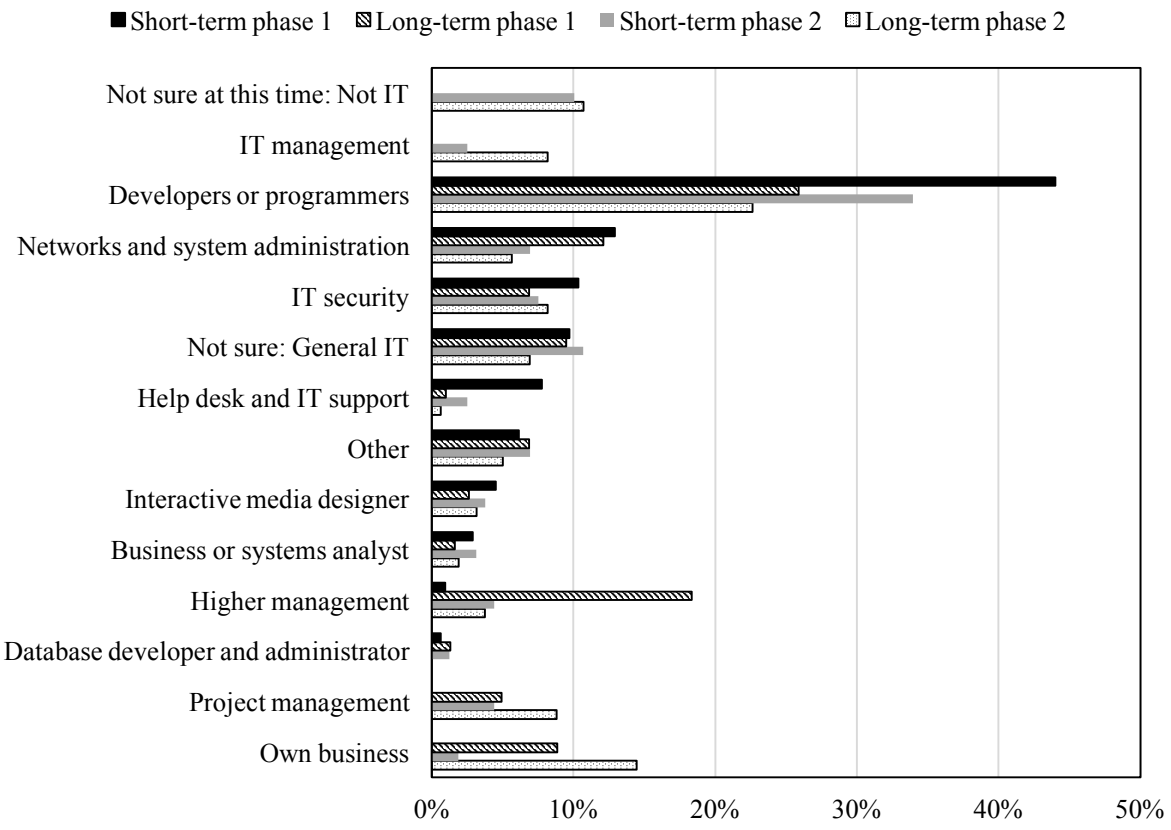

Figure 1: IT students' career aspirations phase one and two

Across both phases students most frequently nominated the short-term aspiration of developer or programmer (games, web, mobile). In the longer-term across both phases, students also mentioned developer as an aspiration, but aspirations to work in higher management or maintain their own business were also mentioned. Jobs listed in the other short-term category included: teacher, engineer, technical writer, advertising, 2D animator, medical engineer, and retail business owner. Long-term aspirations listed in other included leader in a firm, market share in Australia, and professor. Job types that received only one mention, such as roles in telecommunications, sales, testing and quality assurance, and technical writing, were not included in Figure 1. The results in Figure 1 help to address research question one by presenting IT students' short- and long-term career aspirations. Overall the results demonstrate developer or programmer as a career aspiration, as well as a number of other, often generic, aspirations of IT students. The varied and generic nature of aspirations could be evidence that IT students do not have a clear view of what work post-graduation might look like. The direct text examples of students' short- and long-term career aspirations further emphasise the observation that they may have a limited view of their career aspirations.

In addition to reporting career aspirations, in both phase one and two, each student answered the question "How will I know when I have succeeded towards my career goal?" The responses were analysed using qualitative count analysis techniques and then categorised and graphed (see Figure 2). Note that some responses are coded more than once in each phase, and some responses were only mentioned by students in a single phase. A legend identifies each time/phase, and the bars in Figure 2 are arranged from top to bottom in order of decreasing proportion of all coded responses recorded in phase one.

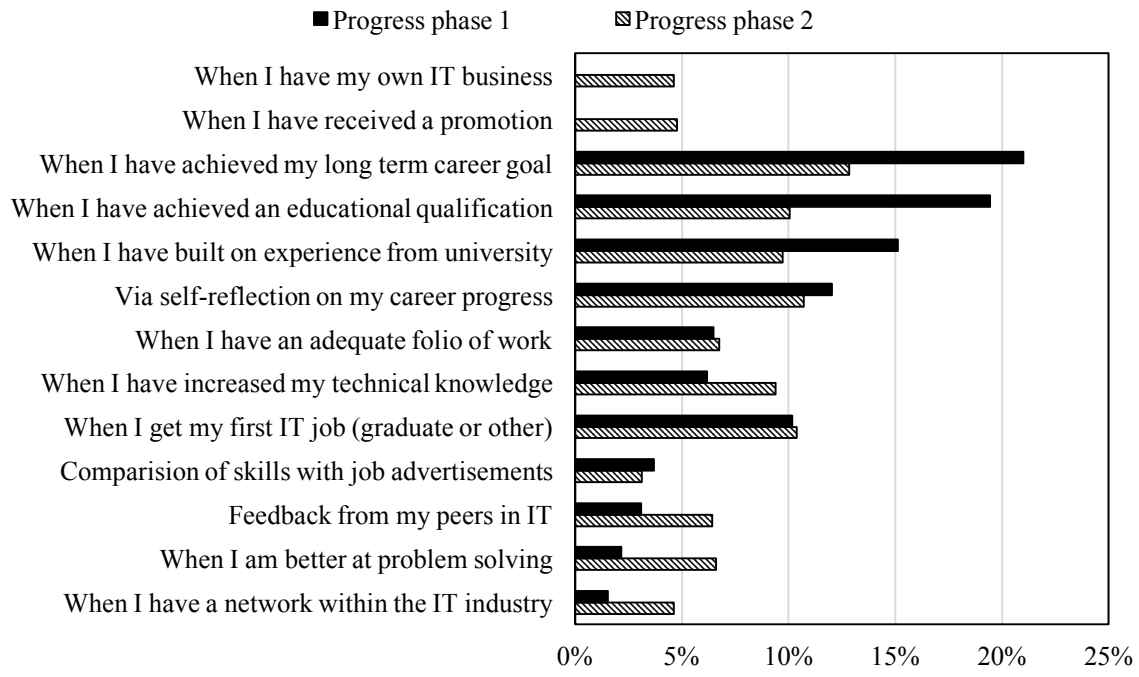

Figure 2: IT students' achievement of career goals phase one and two

The largest category for both phase one and two was "when I have achieved long-term career goal". "When I have achieved an educational qualification" was the second largest category in phase one, with "via self-reflection on my career progress" the second largest category in phase two. The results in Figure 2 help to address research question two, the criteria used for achieving career aspirations. Across both phases students largely reported achievement of their long-term career goal as a measure of progress. It appears problematic that they are relying on "achieving my long-term career goal" and "when I have achieved an educational qualification" as their measures of success. This may indicate that students have issues with understanding how to navigate towards effective career choice/goals. In addition, they may be relying on their university qualification to be a key determinant of career progress. Yet, employers asserts that achievement of relevant quantifications are often secondary to a demonstration of appropriate career competencies/skills (Jackson, 2009).

After reporting achievement of career goals, students reported barriers to their career in both phase one and two by answering the question "How will I know when I have succeeded towards my career goal?" The responses were analysed using qualitative count analysis techniques and then categorised and graphed (see Figure 3). Note that some responses were coded more than once in each phase, and some responses were only mentioned by students in a single phase. A legend identifies each time/phase, and the bars in Figure 3 are arranged from top to bottom in order of decreasing proportion of all coded responses recorded in phase one.

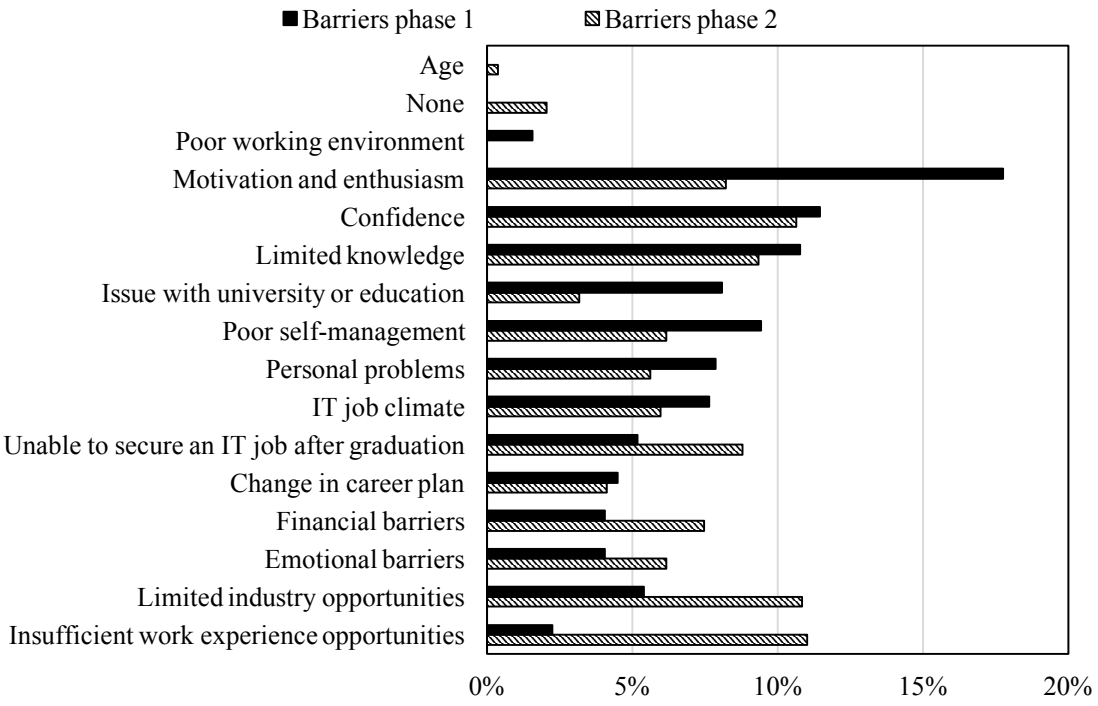

Figure 3: IT students' career barriers phase one and two

The most commonly reported barriers from phase one were "motivation and enthusiasm" or "confidence" related, with confidence also a highly reported barrier in both phase one and two. For phase two "limited industry" and "insufficient work experience" opportunities were reported by students as barriers. The results in Figure 3 assist in addressing research question three, showing that there may be many barriers for students to overcome before they can achieve their career aspirations. It is possible that the barriers as presented in phase one could be attributed to "the sophomore slump" (Whittle, 2015), a noted phenomenon of disengagement/dissatisfaction amongst second year higher education students.

Lastly, comparison between students' responses from phase one and two in relation to the questions "What are the top four skills I need in the short-term which are important for my first job post-graduation?" and "What are the top four skills I need in the longer term which are important for me to achieve my career goal?" are reported in Figure 4. Quantitative count (frequency) analysis collated each student's top four reported skills. A legend identifies each time/phase, and the bars in Figure 4 are arranged from top to bottom in order of decreasing proportion of all coded responses of skill expectation recorded in short-term phase one.

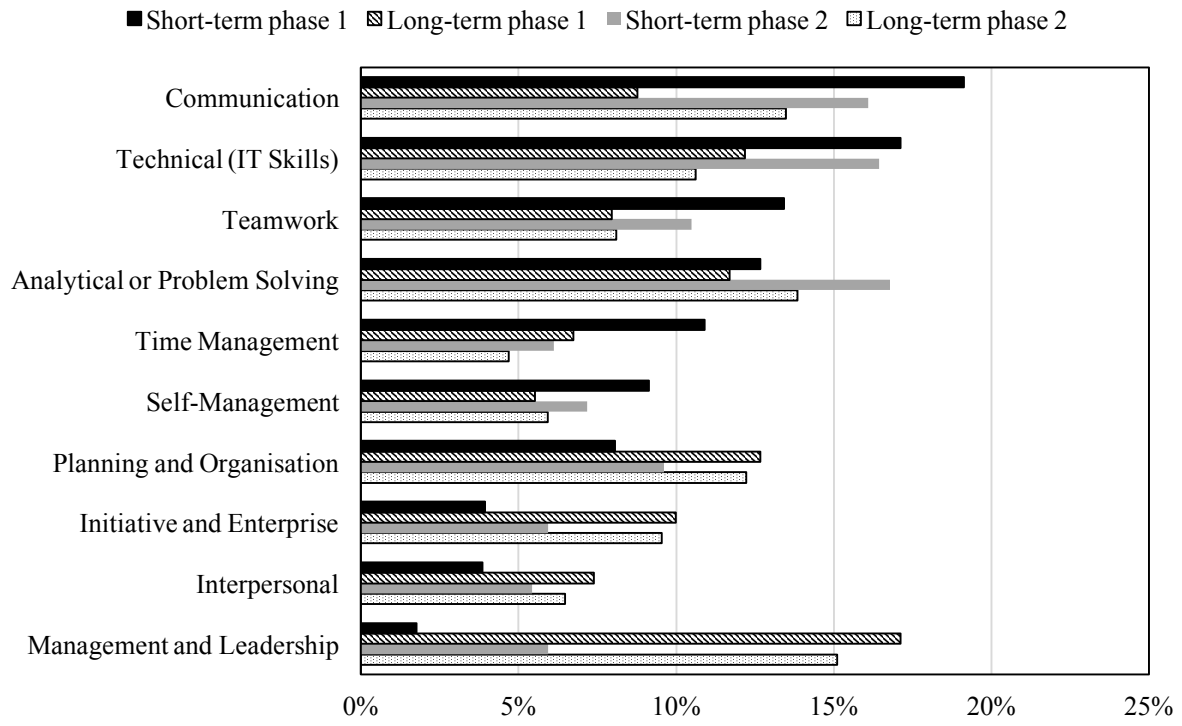

Figure 4: IT students' skill expectations phase one and two

While the ordering is slightly different, when comparing reported skills, the same top four are asserted in the short-term across both phases. For example, in the short-term for both phases students reported their top four skills to develop as: communication, technical (IT), analytical or problem solving, and teamwork. Furthermore, a similar result occurred in regards to long-term skills, over both phases students reported three similar top rated skills to develop including: management and leadership, analytical or problem solving, and planning and organisation. The results in Figure 4 address research question four, the skills perceived by students to achieve their career aspirations. As shown in Figure 4, students reported across both phases that communication, technical (IT), analytical or problem solving, and teamwork are key skills to achieving their short-term aspirations. In the longer-term leadership and management skills are reported across both phases as important to achieving aspirations. These skills nominated by students are similar to the key skills/selection criteria employers used when recruiting in 2014 (Graduate Careers Australia, 2016; Hamilton, Carbone, Gonsalvez, & Jollands, 2015). Carbone, Hamilton, and Jollands (2015) found good alignment when comparing the employability skills expected by IT employers, current students and academic staff. However, Carbone et al., (2015) concluded that students did not know how to bridge the gap between their current skills and employer expectations. Further evidence of this is presented in McKenzie, Coldwell-Neilson, and Palmer (In Press) which reported that students lack the ability to report effective 'actions' that will enable them to successfully contribute towards career choice. The outcomes of Carbone et al., (2015) and McKenzie et al. (In Press) are similar to the results of this study, in that students can identify career aspirations and skills expectations, but cannot clearly identify how they plan to achieve their choice/goals, nor navigate barriers that may be apparent.

Conclusion

As evidenced by Graduate Careers Australia (2015), opportunities for graduate recruitment is more competitive than ever before, with only 4.5% of graduate applications resulting in successful employment. Preparing graduates to have realistic expectations requires a clear understanding of the factors that impact upon their career choice, such as self-efficacy, outcome expectations and interest as defined by (Lent et al., 1994). Through the lens of IT students' career aspirations and skills expectations, this mixed method study explored whether students have realistic expectations regarding their future career. The results presented indicate that students have varied career aspirations and interest and, while realistic, they have no clear strategies for achievement of their career goals. A number of barriers to career goals were identified, with 'confidence' an issue for students' across both phase one and two. A lack of confidence could relate to IT students having lower levels of self-efficacy, which could impact on students determining the best ways to increase their technical proficiency. In regards to expected skills, students are reasonably aware of employer expectations, but need to adjust their outcome expectations regarding skill development to better align with long-term career goals.

Recommendations from this research include scaffolded career activities that build students' self-efficacy, and opportunities for experiential learning through all stages of their education. The benefit of work-integrated learning is recognised (Docherty, 2014), with IT students' also noting limits to work opportunities as a barrier to achieving their career goals (Figure 3). It is a combination of activities that contribute towards students building their career competencies and successfully navigating the complex world of employment.

This research contributes towards a better understanding of the student experience, and opens up opportunities to explore the ways in which we may assist them with career choice and goals. Further work is required to integrate students' beliefs and needs regarding career choice into a framework that supports career education initiatives at the higher education level.

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