



Informing the career development of IT students by understanding their career aspirations and skill development action plans

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Abstract

Attending university can assist students to make informed and realistic choices regarding their career. However, career development is a complex process and there are discipline-specific aspects to consider. In Information Technology (IT), no clear career developmental 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 understand better the career aspirations and expectations of tertiary IT students so that their beliefs and needs can be taken into consideration when supporting them in career development. This study uses both qualitative and quantitative analyses to explore the career aspirations of 306 students. The results demonstrated variability in students' short-term aspirations and a lack of understanding regarding effective actions to achieve their career goals, highlighting issues with setting realistic expectations. Outcomes show that undergraduate IT students may require assistance with negotiating career choice.

Keywords: Career aspirations; career development; career skills; Information Technology; higher education.

Introduction

In the past 10 years, the graduate employment landscape in Australia has changed considerably. It was reported in the Australian Labour Market Update (Australian Government, 2016), that 10,000 positions in Information Technology (IT) were created since 2015. The financial rewards from working in IT also continue to increase; Phillips (2016, p. 1) suggested that IT professional salaries were the highest on average, closely followed by healthcare, nursing, and legal services. The Graduate Careers Australia (2015) outlook reported that for the sixth consecutive year graduates from IT were in especially high demand. A recent report by the Australian Computer Society and Deloitte Economics (2015) noted that in the next five years there will be a projected gap of 100,000 workers in the IT employment landscape.

A subsequent report by the Australian Computer Society and Deloitte (2016) stated that employers are looking for IT graduates with a mix of technical and business skills. This was reinforced by the chief scientist of Australia in a recent Information Communication Technologies (ICT) education forum (AIIA, 2016). The report by Graduate Careers Australia (2015) concluded that employers value interpersonal and communication skills equally and as important as discipline-specific skills. This was validated by research conducted by Carbone, Hamilton, and Jollands (2015), which investigated employer, student, and academic perspectives on employability skills and found that generic skills were as important as technical skills.

However, it is becoming increasingly complex for IT graduates to negotiate the various and changing job roles that make up the IT industry. In 2014, approximately 41% of employers had difficulty sourcing enough graduates for open positions and found that IT graduates, while in demand in the employment market, often do not have adequate skills or career maturity to enable them to successfully engage with employers (AIIA, 2016; Graduate

Careers Australia, 2015). Career maturity is the ability to make age-appropriate, informed decisions that contribute to sound career choice decisions (Betz & Luzzo, 1996).

There is pressure on higher education institutions to design curricula and experiences that provide the greatest chance of employability for graduates (Docherty, 2014). Providers of higher education constantly grapple with the notion of skills for employability and IT is not exempt from these significant challenges, despite the continued growth of IT jobs in the economy (Qenani, MacDougall, & Sexton, 2014). Models of employability appear in the literature (Dacre Pool & Sewell, 2007; Heijde, 2014; Jollands, 2015; Qenani et al., 2014); however, a uniform definition across the disciplines is lacking.

Employability skills can be defined as a set of generic and discipline-specific skills developed through education and work experience that contribute towards opportunities to secure a relevant job (Australian Government, 2006; Heijde, 2014). In IT, employability skills are grounded within institutional graduate learning outcomes (e.g., communication, teamwork) as well as in professional society guidelines (e.g., systems analysis and design, project management) as provided by the Australian Computer Society (2014)(Australian Computer Society, 2014).

To pursue their chosen career path, students need to prepare themselves for employment by building employability skills and forming an identity. To assist students in forming their identity, 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. By building employability skills, students are contributing towards building effective career competencies, which are a collection of skills that relate to a chosen profession. As

individuals progress through life they build competencies composed of skills learnt from previous experiences or learning activities. To be successful at constructing career-related competencies an individual needs to self-regulate their activities towards further skill development.

Finding appropriate ways to build competencies and identity across varying disciplines is a challenge (Jollands et al., 2014). 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 student beliefs and needs can be taken into consideration when developing pathways aimed at supporting their 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.

The Discipline of IT

IT, as a discipline, 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. A recent announcement of funding by the Australian Government (2014) acknowledged the decline of students in STEM (Science, Technology, Engineering, and

Mathematics) based education. Over \$10 million in funding has been allocated to provide continued promotion and development of STEM education programs. Debate 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).

Since the early 2000s, IT pathways and curricula have been discussed in the literature (Alford, Carter, Ragsdale, Ressler, & Reynolds, 2004; Davis, Ein-Dor, King, & Torkzadeh, 2004; Floyd, 2004; Hawk et al., 2012; Koppi et al., 2013; Lunt et al., 2008; Nagarajan & Edwards, 2014). Local and national economics, as well as institution-specific issues, often direct curriculum development and teaching practice; however, the underlying theme across the literature is a preference for flexible and competency-based approaches to higher education course construction (Floyd, 2004). Furthermore, many authors have suggested the value of an internship or “work integrated learning” as part of an IT student’s course (Koppi, Edwards, Sheard, Naghdy, & Brookes, 2010). Evidence continues to support that employers, including those in IT, recruit for skills/competencies and experience rather than grades (Graduate Careers Australia, 2013). This requires graduates to articulate technical and non-technical skills within a complex web of industry requirements, accreditation board statements, and university learning statements on graduate abilities (Jackson, 2009).

IT curricula offered at universities focus on a core body of knowledge, with various specialist discipline streams and relevant “soft skills”. Stemming from the knowledge base of computer science, IT education now addresses many 21st century technology innovations such as mobile application development, games development, and IT security. Lunt et al. (2008), commenting on the Institute for Electricals and Electronics Engineers curriculum guidelines, a globally recognised curriculum framework for computer science and IT, noted that IT is the newest discipline covered by the computing curricula. Alford et al. (2004)

detailed the difference between an IT and computer science curriculum and identified trends relevant in each type of program. For IT, this included skill sets such as problem solving, project experience in software system integration, system management, end user support, and fundamental principles of science and mathematics. Debate around the core body of knowledge required in IT education is ongoing. To remain relevant, universities must remain cognisant of industry and professional society recommendations and requirements.

Career Development

Research across disciplines such as psychology, organisational behaviour, and workplace management demonstrates various applications and validations of 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 agentive (self-directed) skills informed by social-cognitive processes (Bandura, 1986; Hackett & Betz, 1981; Lent, Brown, & Hackett, 1994). 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). 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. Stated simply, young people generate career interests by developing confidence in activities related to the interests (i.e., self-efficacy) and by learning that outcomes for them are contingent on the effort expended (i.e., outcome expectations). As interests develop, this leads young people to set related career goals and to self-regulate their behaviour towards these goals (Janz & Nichols, 2010; Lent et al., 1994). This model is relevant in this study because of the way in which it helps us understand the factors that affect student choice regarding career goals or aspirations.

Efforts to contextualise career development were presented in the Australian Government (2013) National Career Development Strategy, which was based on recommendations from the Organisation for Economic Co-operation and Development (2002). The strategy outlines the role that government, education, industry, and individuals can play in career development for people at all stages of life (Australian Government, 2013). However, the Strategy did not provide information about how career competencies were to be developed in specific disciplines. Some direction for this is contained in the Australian Blueprint for Career Development (Ministerial Council for Education, Early Childhood Development and Youth Affairs, 2010). According to the Blueprint, students at university 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. For example, in IT, work experience such as programming would contribute to the field-specific competency of a computer systems engineer. Despite these models of career development, not all students consider career development as an important factor in helping them understand what skills are required for the future. With this in mind, this study seeks to understand the expectations and aspirations of undergraduate students enrolled in IT. Understanding discipline-specific

needs will provide information for students about building their career direction, guide teachers, trainers, and career counsellors regarding the support they can provide and inform policy makers at institutional and government levels. Addressing a discipline-specific focus to career development will inform our understanding of the complex and varied ways by which students navigate career choice.

Research Questions

This paper addresses research questions related to (a) short-term and long-term career aspirations of undergraduate IT students, (b) the criteria students use for achieving these aspirations, (c) the barriers related to achieving career aspirations, and (d) the skills required to achieve these career aspirations.

Methodology

Data on the career aspirations and career action plans of 375 second-year IT students enrolled in an IT professional skills course were collected in 2014. 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 their assessment task, the students were asked to describe, via text messaging, their short- and long-term career aspirations by answering the following questions: "What job do I want to get once I finish my degree?" and "What is my career goal - long term?". They 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?" and "What may stop me from successfully achieving my goal?". To describe the short- and long-term skills that they planned to develop, students were asked "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?”. To elaborate further, students selected one skill from their short-term nomination and one from their long-term set and were asked to describe the actions for building the nominated skills, using the following question: “Proposed action/resources required to achieve my career goal”. Demographic variables collected included gender, campus, and mode of study.

Qualitative analysis was performed on the career aspirations data, grouping students’ career aspirations, progression mechanisms, barriers, and actions to achieve skills development into relevant categories, and quantitative count (frequency) analysis was performed on the skills data collected. The exact, two-sided version of Fisher’s test was used to compare the proportions of the demographic variables in the sample. 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.

Results

Of the 375 student responses, 306 (276 male and 30 female) were viable for analysis. First, we cross-tabulated the data using Fisher’s exact test for gender, campus, and mode of study. There was no significant difference between the proportions of the demographic variable categories in the respondent sample and the entire enrolled class. These results suggest that the respondent sample is representative of the entire enrolled class.

Career Aspirations and Skill Development Action Plans of IT Students

Students’ responses regarding their career aspirations and action plans were analysed using both quantitative and qualitative methods. For the quantitative analyses, we categorised and graphed the responses to the questions related to students’ current short- and long-term

career aspirations: “What job do I want to get once I finish my degree?” and “What is my career goal - long term?” (see Figure 1). Students most frequently nominated the short-term aspiration of developer or programmer (games, web, mobile). In the longer-term, students also mentioned developer as an aspiration, but aspirations to work in higher management or maintain their own business were also mentioned frequently. Jobs listed in the other short-term category included 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.

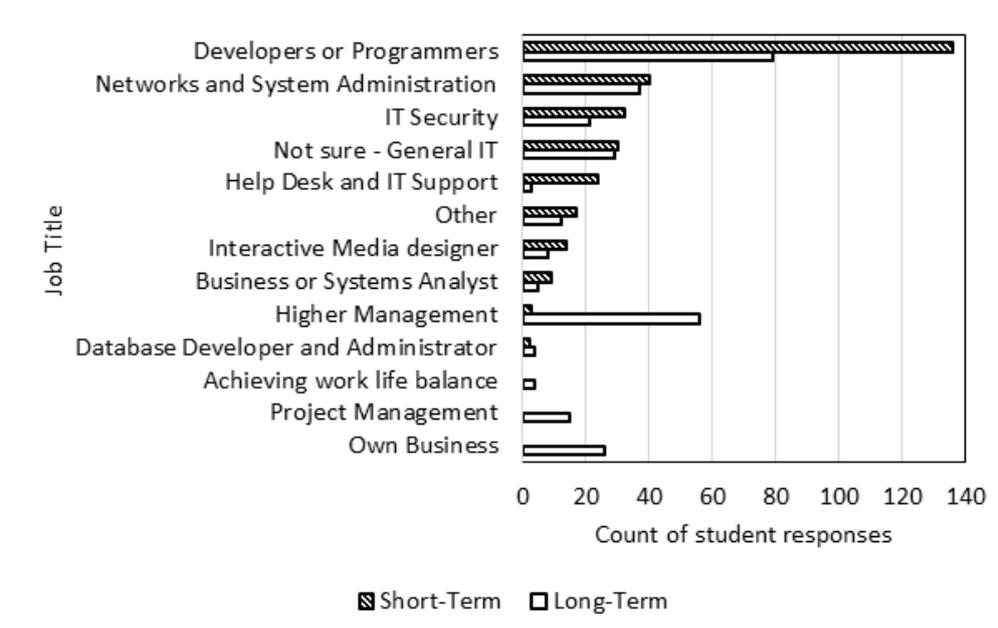


Figure 1. Short-term and long-term career aspirations of IT students.

In addition to reporting career aspirations, qualitative thematic analyses were completed on each student’s answer to the question “How will I know when I have succeeded towards my career goal?” (see Figure 2). Note that some responses are coded more than once. The largest category, “achieve long-term career goal”, included a range of responses such as

greater experience, my own studio, company, or business and promotion. For “educational qualifications”, completion of both undergraduate (current degree) and further postgraduate qualifications were regarded as ways by which to measure progression; whereas in the category “built on experience from university” students indicated building of technical skills and interpersonal and communication skills as criteria for ways to achieve their career goal. Additionally in this category, students reported that more general gathering of experience (such as time in the workplace) as another criterion.

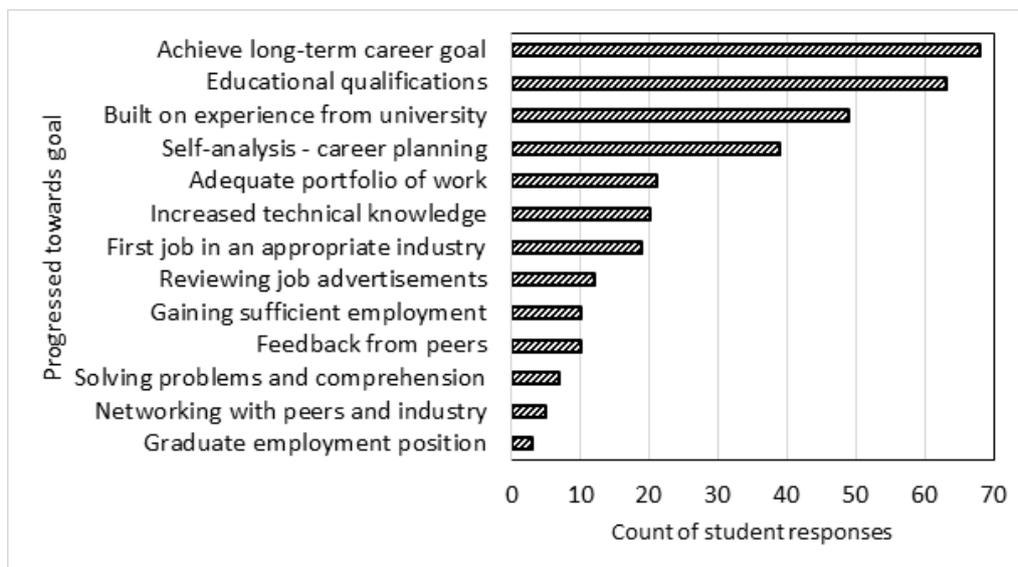


Figure 2. Criteria for achieving career aspirations.

Figure 3 shows the results of the qualitative thematic analysis of answers to the question “What may stop me from successfully achieving my goal?”. The most commonly reported barriers were motivation and enthusiasm or confidence related. A further barrier noted was limited knowledge, which included lack of experience, poor practice of technical skills, and limits of soft skills.

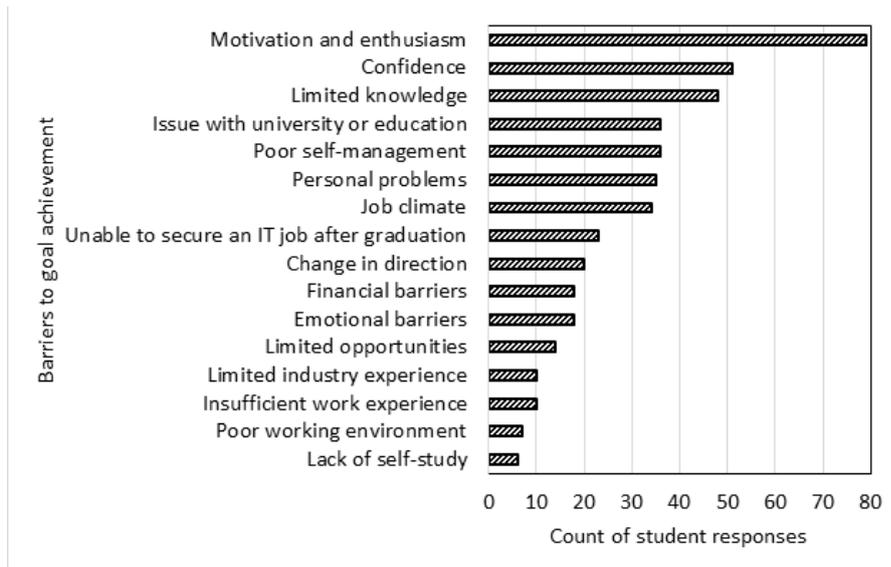


Figure 3. Perceived barriers to achieving career aspirations.

Responses 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. Students reported communication skills as the most highly required in the short-term, with management and leadership skills required in the long-term. These outcomes align with the study from Graduate Careers Australia (2015) as well as with research conducted by Carbone et al. (2015).

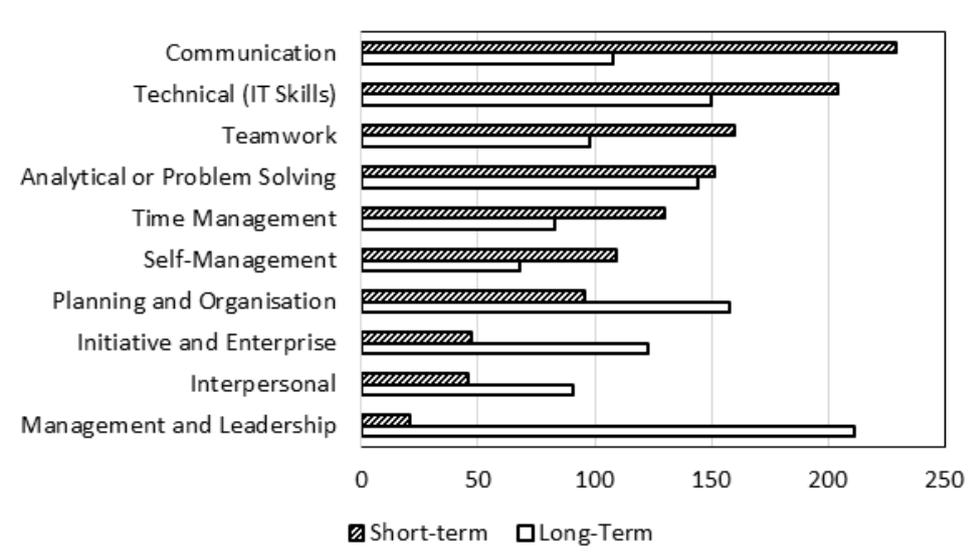
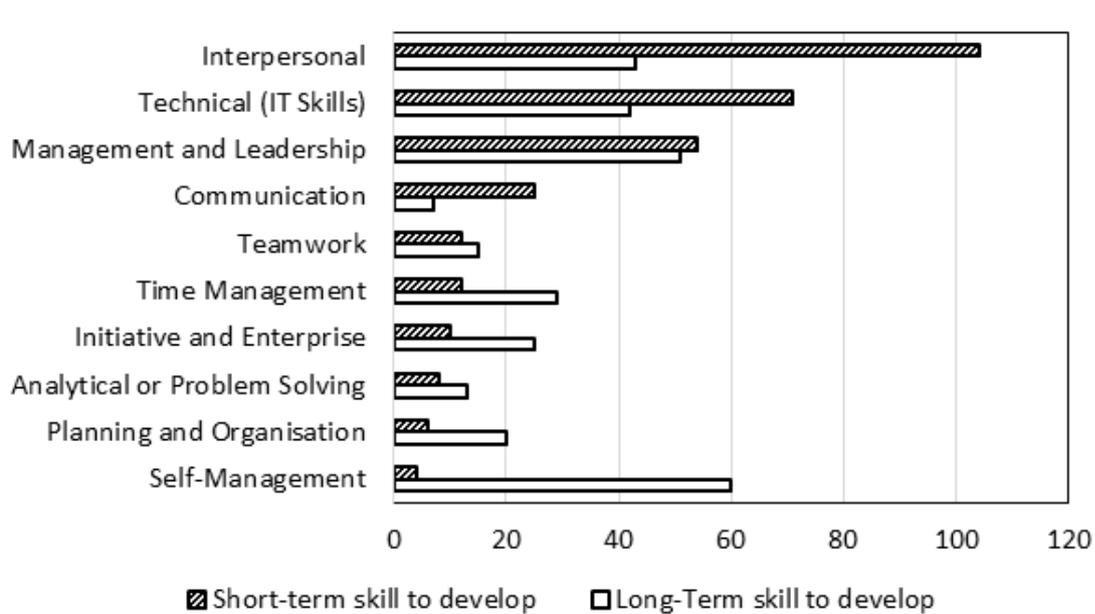


Figure 4. Skills required in the short-term and long-term to achieve career aspirations.

In addition to reporting career aspirations and skills, students also selected one short-term and one long-term skill that they plan to develop to achieve their career aspirations (see Figure 5). The most frequently mentioned short-term skill was interpersonal skills, with self-management as the most important long-term skill.



Figure

5. Skills to develop in the short-term and long-term.

Last, students also reported actions they planned to take to help them achieve their skill development. Thematic analysis suggested the top reported themes regarding short-term actions were to improve communication skills, improve organisational and problem solving skills, increase technical knowledge, and complete university/education. When describing action to develop long-term skills, the most reported themes were improving communication skills, problem solving, time management, group work, leadership skills, and the ability to make decisions and be responsible.

Discussion

The results provide an understanding of students' career aspirations and stage of career development, which helps to inform ways in which the building of career competencies can be facilitated better for tertiary IT students. Specifically, this paper addressed research questions related to (a) short-term and long-term career aspirations of undergraduate IT students, (b) the criteria students use for achieving these aspirations, (c) the barriers related to achieving career aspirations, and (d) the skills required to achieve these career aspirations.

When addressing the first research question students reported various career aspirations, with Figure 1 showing programming and development roles are clear career aspirations in the short- and long-term. Additionally, students reported higher management as a long-term career aspiration. Interestingly, some students reported a role on help desk as a long-term career aspiration. In the field of IT, roles on the help desk are often seen as low-level or entry-level positions. Some students also appeared to be unclear of their specific career aspirations, reporting they were "unsure" or happy to aspire for any role in IT. When addressing research question two, the criteria used for achieving career aspirations, students largely reported achievement of their long-term career goal, with their experiences of working, along with general gathering of experience, as a way in which they will do this. However, relying on work experience and the traditional notion of career, as composed of mobility within a single organisation, is an unrealistic way to inform identity in today's employment market (Greenhaus, Callanan, & DiRenzo, 2008). When addressing research question three, while students reported career aspirations, it was evident that there are many barriers for students to overcome before they can achieve these (see Figure 3). There was some similarity in the themes presented in Figures 2 and 3, with completing "university/education" and "technical knowledge" both appearing as a criteria for achievement and a barrier. Specifically, Figure 3 demonstrates achieving career aspirations

will require students to address potentially complex issues such as confidence (self-perception), motivation, and enthusiasm. The results here could indicate that students lack the ability to self-regulate aspirations that assist in forming a career identity despite career education opportunities (McKenzie, Coldwell-Neilson, & Palmer, 2015; Nadelson et al., 2015). As Smith (2002) argued, a strong sense of personal efficacy creates self-directed, life-long learners and influences aspirations. Reflecting on SCCT by Lent et al. (1994), it would appear that some IT students exhibit low self-efficacy which could impact their ability to negotiate their choices that lead to clear career aspirations.

This paper also addressed the research question related to (d) the skills required to achieve these career aspirations. As shown in Figure 4, students reported communication and technical (discipline) skills as key to achieving their short-term aspirations, with leadership and management in the longer-term. However, when reporting what skills to develop (Figure 5), students listed interpersonal skills to be developed in the short-term, with self-management in the long-term. While the most recent Graduate Careers Australia (2015) outlook report asserted that employers rated communication and interpersonal skills as key requirements of a graduates skill set, this discrepancy between skills required and those to develop suggests a potential issue for students with understanding effective actions to achieve career aspirations. Further thematic analysis of “actions” to achieve skill development (Figure 5) revealed students plan to work in both the short- and long-term on improving their communication, organisational, and problem solving skills, as well as completing university/education as a determinate of skill development. Actions to achieve interpersonal and self-management skill development are not as highly mentioned during thematic analysis. Interestingly, the importance of time at university was highlighted as both an action to achieve skill development and a criterion that students have for achieving their career aspirations (Figure 2). This information demonstrates the importance of a student’s time at

university to help them build career choice. An analysis of the actions students expect to take to achieve skill development is useful, as it helps uncover a more accurate representation of students expectations regarding abilities required to achieve their career aspirations (as was found in the study conducted by Nadelson et al. (2015) on professional identity).

Overall, the responses from students highlight that discipline and professional skills, experience, and identity are important components to support career development. In addition to these components, the literature suggests that work integrated learning and community are important parts of a student's career action plan. Work integrated learning provides experiential learning opportunities that help students to form realistic expectations regarding work requirements (Australian Government, 2006; Dacre Pool & Sewell, 2007; Heijde, 2014; Koppi et al., 2010; Patton, 2005; Qenani et al., 2014). Further, Qenani et al. (2014) argues that it is important for students to take advantage of internship opportunities and combine these experiences with career development activities, such as careers counselling, to help them progress their career maturity. Maintaining community links is also important to assist in career development. From an assessment of higher education business students, Fearon, Nachmias, McLaughlin, and Jackson (2016) determined that community/social capital, such as peer-to-peer and professional networks, mediates an indirect relationship between students development of identity and career maturity.

Further research is required to evaluate how the social cognitive career theory framework (Janz et al. 2010) assists in exploring IT students' decision-making processes that contribute to career choice. Specific consideration of IT students' beliefs and needs, as revealed in the results of this study, should be incorporated in further analyses to help articulate IT discipline-specific factors that influence choice.

Conclusion

This paper addressed research questions related to (a) short-term and long-term career aspirations of undergraduate IT students, (b) the criteria students used for achieving these aspirations, (c) the barriers related to achieving career aspirations, and (d) the skills required to achieve these career aspirations. A demographically representative sample of 306 survey responses was used to analyse the career aspirations of undergraduate Bachelor of IT students at an Australian university. The results demonstrate varied short- and long-term career aspirations, with the role of programmer or developer desired by many. The results provide an understanding of how students expect to achieve their career aspirations and skills and show that they may not appreciate all that is required for successful career development. Students require assistance to develop their career maturity, in particular with support provided to help them identify the priorities that enable them to understand, engage in and manage their career building progress, and set a realistic career development plan.

Limitations

The data collected in this study are limited to one discipline (IT) and one-year level (second year), at one university. The limited group sampling, as well as the particular strategic vision and teaching and learning practices adopted within the university, may limit the generalizability of the results. Additionally, the data were collected from students participating in one unit/class of study called IT Professional Skills and were collected at the same time as students were involved in career development activities; thus, reporting on their career aspirations and skills expectations may have been influenced by these activities. Further research is required to broaden the understanding and generalizability of what are IT students' career aspirations and skill expectations, including surveying students at different periods during their studies to see if their perceptions change and surveying those at other institutions to allow comparison of data.

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