Developing career aspirations of Information Technology students at Deakin University

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It is important for students to develop informed and realistic career aspirations to gain the most value from their university studies towards achieving their initial career goals. However developing students' career aspirations, goals, and expectations is a complex and discipline-specific process. In Information Technology (IT) no clear career development framework is evident in the literature. Recent research in Australia argues that electronic portfolios are a useful way for students to develop, articulate and document career objectives to enhance their employability. IT students at Deakin engage in formal training and assessment with respect to developing their professional skills and career understandings. Currently electronic portfolios feature as a useful method for evidencing professional competencies for employability. Through a combined quantitative and qualitative analysis of 306 students' articulated current career aspirations, qualitative analysis of 7 staff opinions of desired student career competencies, and a quantitative analysis of 28 students' current work personality traits assessments (Work Personality Index), this work presents an analysis of the current state of IT students' career development. The results indicate that while students reported short-term career aspirations, navigating to their long-term career goals is going to require addressing difficult barriers such as confidence (self-perception) and motivation. This research will influence a larger program-wide endeavour to build student career competencies for employability in IT at Deakin University.

Keywords: Career Development, Information Technology, Higher Education.

Introduction

Preparing graduates for employability is now, more than ever, a key goal for higher education (Docherty, 2014). Providers of higher education constantly grapple with the notion of employability and the discipline of Information Technology (IT) is not exempt from significant employability challenges despite the continued growth of IT jobs in the economy. IT as a computing discipline is in a state of constant change due to the pace of technological development. Additionally as argued by Koppi and Naghdy (2009, p. 14) "in contrast to more established disciplines such as arts, engineering and science, there is no unified definition of the ICT discipline and the employment opportunities it offers". Only as recently as 2005 was a formal IT curriculum defined by the ACM as a part of their computing curricula (Lunt et al., 2008).

It has become increasingly important to produce graduates that are best prepared for employment in the IT industry. Evidence continues to assert that employers, including those in IT, recruit for skills/competencies and experiences rather than grades (Graduate Careers Australia, 2013). The dynamic and ever-changing world of IT requires students to possess not only current technical skills, but also the professional skills to adapt and respond to changing technological developments. Yet the IT industry continues to report that graduates are exiting university without the required skills for effective employment (Qenani, MacDougall, & Sexton, 2014). In an attempt to better prepare graduates, universities have been required to re-focus on how best to support students to build graduate employability and career competencies. As Oliver (2014, p. 1) stated, graduate employability is not solely determined by obtaining an academic qualification; "the way employability is currently measured puts too much emphasis on universities' ability to get graduates into employment that matches their degree discipline, rather than on their readiness for a career".

Preparing graduates to be career ready requires higher education to assist in suitably preparing graduates to decide upon their career path (Qenani et al., 2014; Samarasekera, 2012). It is anticipated that at the university level students should be constructing career competencies that help them to understand, engage in and manage the career building process (Ministerial Council for Education Early Childhood Development and Youth Affairs, 2010). Furthermore, students at university should have a reasonably well formed understanding of career development and should consider their time at university as focusing their skills and expectations to match their chosen career path. To assist students in demonstrating their skills for employability many universities are incorporating a portfolio (often electronic) as a way for students to collect evidence during their course which demonstrates their learning and skills development.

Evidence continues to mount that supports a portfolio as an effective teaching and career preparation pedagogy (Eynon, Gambino, & Torok, 2014). Since the early 2000s many universities in the US and UK have encouraged students to produce a portfolio to demonstrate relevant skills, experiences, knowledge and competencies (Tubaishat, Lansari, & Al-Rawi, 2009). In 2012 Deakin initiated the use of an electronic portfolio tool within the online learning management system (internally branded as CloudDeakin), with the goal of students' using their portfolio to evidence learning outcomes and skills. The university hopes to utilize portfolio to develop graduates who can present their key employability skills and attributes (or graduate learning outcomes) in addition to discipline-specific skills. In IT the portfolio is being used across all courses, with each assessment task mapped to learning outcomes that can be evidenced by students.

Providing curriculum, learning activities and assessment that can build students' skills for employability is a key issue. While this issue is not new, finding the appropriate ways to build employability skills across varying disciplines is a challenge. This study is addressing career development for employability from the perspective of an IT student. 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 student expectations and aspirations of their career goals, so that future career development activities are better aligned with student beliefs and needs. With an understanding of the student experience, we can better educate our graduates to be responsive and adaptable professionals. This paper presents stage one of a multistage project that is building a framework to improve support for career development during students' studies at Deakin University.

Background

Preparing graduates for employability is a complex and discipline specific issue. To ensure students can achieve their career goals it is important to understand how the discipline of IT impacts issues on employability, electronic portfolio and career development.

Employability of IT students

Knight and Yorke (2003) defined employability as a set of achievements, skills, understandings and personal attributes obtained through successful education, that may lead to a job. Employability does not equate to successful acquisition of a job however. Qenani et al. (2014) argued that to increase chances of employability it is critical for students to improve their self-efficacy and self-perception. Since early 2000s, models of IT curriculum have been discussed in the literature (Alford, Carter, Ragsdale, Ressler, & Reynolds, 2004; Davis, Ein-Dor, King, & Torkzadeh, 2004; Ekstrom et al., 2006; Floyd, 2004; Hawk et al., 2012; Koppi et al., 2013; Lunt et al., 2008; Nagarajan & Edwards, 2009; Reichgelt, Zhang, & Price, 2002). Local and national economics, as well as institution specific issues, often direct curriculum models 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 asserted the value of an internship or 'work integrated learning' as a part of an IT students' course (Koppi, Edwards, Sheard, Naghdy, & Brookes, 2010). In IT at Deakin, competencies for employability are grounded within institution graduate learning outcomes (e.g. communication, teamwork) (Deakin University, 2014a) as well as professional society guidelines (e.g. systems analysis and design, project management) provided by the Australian Computer Society (Australian Computer Society, 2014).

Electronic Portfolios in IT

In education a portfolio, in its most basic form, is a collection of artefacts relating to the abilities of students or pupils (Meeus, Questier, & Derks, 2006). Although the idea of a 'portfolio' is not new, the application in the electronic domain has seen the concept expand to many disciplines not previously associated with portfolio work. With digital literacy now a big part of all levels of education, it is not surprising that electronic portfolios are now a common implementation of portfolio pedagogy. Blackburn and Hakel (2006) describe many uses for an electronic portfolio such as: assessing classroom learning, a tool for job applicants, and a tool for facilitating learning.

Deakin IT students are introduced to evidencing skills via an electronic portfolio in their first year of study. A dedicated online portal provides templates, examples and guidance on how to construct a portfolio for employability. Additionally, during class students work on assessment activities which directly link into the portfolio tool. Thus using a portfolio becomes part of the career development of all IT students.

IT Career Development Framework

Patton (2005, p. 219) defined career development as a "spectrum of career related processes which include the provision of information, counselling, curriculum and program interventions such as career education, structured experience such as work experience…". In Australia, career development education lacks a formal program and the provision of services varies from state to state. Since 1977 career development education has been on the agenda for the Australian Government. As a result programs such as the Australian Blueprint for Career Development (Ministerial Council for Education Early Childhood Development and

Youth Affairs, 2010) were produced on the back of Organisation for Economic Co-operation and Development (OECD) (2002) recommendations. Recently the National Career Development Strategy (Australian Government, 2013) asserts the government's recommendations to bring forward career development as an educational objective. At Deakin career development is considered a key skill for increasing graduate employability (Deakin University, 2010).

In the role of career development, Lent, Brown and Hackett's (1994) work on social cognitive career theory (SCCT) describes socio-cognitive mechanisms that influence career development. Smith (2002) described SCCT from an IT perspective as a framework for describing both academic and career behaviours. Figure 1 shows the framework and variables included in SCCT, with particular reference to the choice/goals model as described by Janz and Nichols (2010).

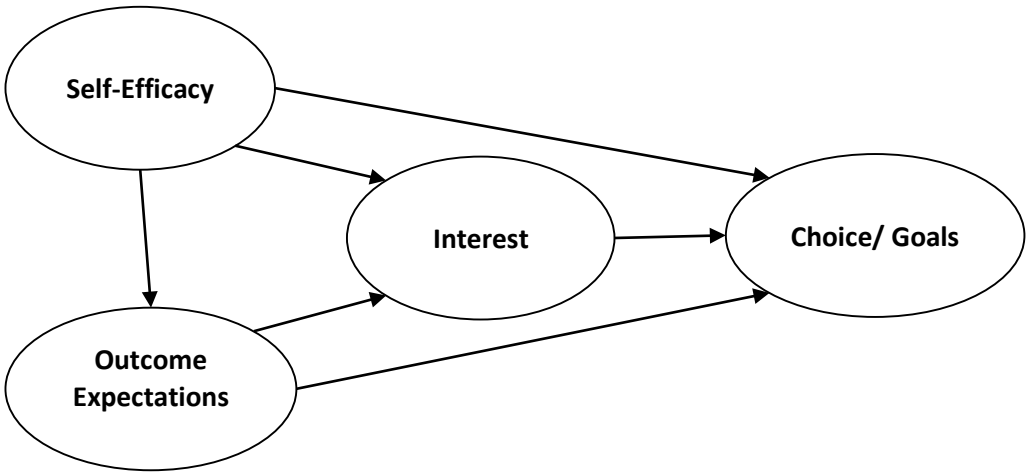

Figure 1: Social Cognitive Career Theory (SCCT) Framework

Applying SCCT to this study, we can define self-efficacy as a student's ability to judge how their possessed skills apply to performance (Lent et al., 1994). A strong sense of personal efficacy creates self-directed, life-long learners and influences aspirations (Smith, 2002). Qenani et al. (2014) contend that self-efficacy should be combined with self-perception to build the construct of self-perceived employability. Outcome expectations include a student's personal beliefs about a probable response outcome. Interest is defined as the curiosity and positive emotion in forming IT career development (Janz & Nichols, 2010). Choice/goals result from a combination of self-efficacy, outcomes expectations and interest contributing to the self-regulation of behaviour towards career development (Lent et al., 1994).

Methodology

To understand students' career aspirations and level of development, both qualitative and quantitative data were collected from staff and students. All data collection for this research has ethics approval from Deakin University.

Data Collection: Students

Data collected from students in this study were sourced from students studying within a unit (class) called 'IT professional skills' offered as a part of the Bachelor of Information Technology at Deakin University.

To better understand the student experience of career development, 375 IT students' current career aspirations were collected. Students presented their short- and long-term career goals and listed skills required to achieve these. The information was provided by students during assessment tasks within the unit. The assessment was based around career development activities as recommended by Deakin's career advisors (Deakin University, 2014b). 336 male and 39 female students' career aspirations were available for analysis. Some data were removed from the set as they were incomplete, resulting in 306 assessment documents being available. Quantitative count analysis as well as qualitative thematic analysis were performed on the data.

The work personality index (WPI) (Psychometrics, 2014) is a validated psychological tool for measuring an individual's preferences and their work behaviour. The index assesses 17 primary scales which generates five categories of student work personality. The categories include: working with others, energy and drive, work style, problem solving style, dealing with pressure and stress, and identifying and managing change. In this study the WPI was offered to students as a tool to supplement their studies in the unit, as it allowed them to receive a formal report which gauged their personality traits relative to their potential future career. By completing the WPI the students also voluntarily submitted their results for use in this study. Due to the voluntary nature, the number of respondents relevant to the population was 7.5% (28 of 375). Data were analysed using quantitative methods, with analysis of each WPI generated by the provider (Psychometrics, 2014). Significance testing of the student sample was undertaken to ensure that it was representative of the population.

Table 1: Work Personality Index demographic characteristics

Gender	**Sample**	**Population**	**Fisher's exact test**
Male	22	336	$p > 0.109$
Female	6	39	
Campus	**Sample**	**Population**	**Fisher's exact test**
Burwood	17	286	$p > 0.072$
Geelong	11	89	

Table 1 shows the demographic characteristics of the students who completed the WPI compared to the overall unit population. No significant difference was found in the proportions of the responses between the samples and the overall populations for gender (Fisher's exact test: $p > 0.109$) or campus ($p > 0.072$). While the number is small, the good match between the respondent sample and overall population enables extrapolations to be reasonably made about the overall population.

Data Collection: Staff

To gather staff opinion on the level at which career development needs to be facilitated for students, a needs assessment survey was deployed. Seven staff (both teaching and administrative) from Deakin University responded to the survey. The needs assessment survey asks staff about the level of student attainment of knowledge, skills and attitudes for career development. This information can assist those responsible for career development to understand the maturity of students' career competencies. The needs assessment survey is drawn from the Australian Blueprint for Career Development (Ministerial Council for Education Early Childhood Development and Youth Affairs, 2010). The data were analysed

qualitatively to group responses and produce themes which assert staff opinions of student career competencies.

Results

Career Aspirations of IT Students

Table 2 shows the outcomes of the count analysis of student reported short- and long-term career goals.

Table 2: Count Analysis of students' short- and long-term career goals

Developers or Programmers (Games, Web, Mobile)	136	Developers or Programmers (Games, Web, Mobile)	79
Networks and System Administration	40	Higher Management	56
IT Security	32	Networks and System Administration	37
Not sure - General IT	30	Not sure - General IT	29
Help Desk and IT Support	24	Own Business	26
Other	17	IT Security	21
Interactive Media designer	14	Project Management	15
Business or Systems Analyst	9	Other	12
Higher Management	3	Interactive Media Designer	8
Database Developer and Administrator	2	Business or Systems Analyst	5
Sales (Pre and Post)	1	Achieving work life balance	4
Telecommunications	1	Help Desk and IT Support	3
Testing and Quality Assurance	1	Database Developer and Administrator	2
		Expert in my field	2
		Self-employed	1
		Technical Writing	1
		Telecommunications	1
		Testing and Quality Assurance	1

Students listed the top four skills they need to achieve their career goals now, and in the future. See table 3.

Table 3: Count Analysis of students' skills requiring development

Top Four Skills	Short-Term	Long-Term
Analytical or Problem Solving	151	144
Communication	229	108
Initiative and Enterprise	47	123
Interpersonal	46	91
Management and Leadership	21	211
Planning and Organisation	96	158
Self-Management	109	67
Teamwork	159	98
Technical (IT Skills)	203	146
Time Management	130	83

Students were asked in the career assessment how they will know that they have progressed towards their career goals. Qualitative analysis resulted in 15 common attributes generated from the data. See table 4. To represent the spectrum of student views, a response was coded into more than one attribute where needed.

Table 4: Count Analysis of students' progression towards career goal

Achieve long term career goal	72
Educational qualifications	71
Built on experience from university	49
Self-analysis - career planning	40
Adequate portfolio of work incl. software programs	21
Increased technical knowledge	20
First job in an appropriate industry	19
Received promotion	12
Reviewing job advertisements	12
Feedback from peers	10
Gaining sufficient employment	10
Solving problems and comprehension	7
My own business	6
Networking with peers and industry	5
Graduate employment position	3

Students were also asked in the assessment what may stop them from achieving their career goal. Qualitative analysis resulted in 16 common attributes in the data, see table 5.

Table 5: Count Analysis of barriers to career goals

Motivation and enthusiasm	79
Confidence	51
Limited knowledge	48
Poor self-management	36
Issue with university or education	36
Personal problems	35
Job climate	34
Unable to secure an IT job after graduation	23
Change in direction	20
Emotional barriers	18
Financial barriers	18
Limited opportunities	14
Insufficient work experience	10
Limited industry experience	10
Poor working environment	7
Lack of self-study	6

From students reporting on career aspirations the results in table 2 indicate that the short-term career goal of developer or programmer (games, web, mobile) is an aspiration for many students. Table 2 also shows that the long-term goal of developer or programmer is less of a career goal, rather students aspire for progression to a role of seniority such as higher management. While students aspired for higher management their responses did not provide specific role information. For example a student commented regarding their long-term career goal that they would like a *"management or executive position"*.

Table 3 shows that students reported communication skills as most highly required in the short-term to enable them to reach their career goals, with management and leadership skills required in the long-term. Table 4 shows that students will know that they have progressed

towards their career goal when they have completed their university (or further) education. While some students mentioned that they will know that they have achieved their career goal when they have an adequate portfolio of work, it was not a frequent comment. Finally, table 5 shows that students reported a common barrier to achieving their career goals as motivation and enthusiasm or confidence related.

Work Personality Index

Tables 6-11 inclusive summarise the WPI results for the respondent sample across the 5 work personality categories with the average score and standard deviation presented for the contributing scales. The scoring on a WPI test is presented as a Sten Score from 1 to 10. The numbers represent the following level, which is relative to a larger sample of working adults: 1 to 2 low, 3 to 4 low mid, 5 to 6 mid, 7 to 8 high mid, and 9 to 10 high.

Table 6 WPI 'Working with Others'

Working with Others				
	Outgoing	**Teamwork**	**Concern for others**	**Democratic**
AVG	5	6	4.5	7
SD	2.19	2.35	1.98	1.95

Table 7: WPI 'Problem Solving Style'

	Problem Solving Style	
	Innovation	**Analytical Thinking**
AVG	5	6
SD	1.90	1.62

Table 8: WPI 'Energy and Drive'

Energy and Drive				
	Energy	**Ambition**	**Leadership**	**Persistence**
AVG	5	5	6	6
SD	1.83	1.99	1.80	1.58

Table 9: WPI 'Work Style'

	Work Style		
	Dependability	**Rule-Following**	**Attention to detail**
AVG	5	6	6
SD	2.00	2.19	1.66

Table 10: WPI 'Dealing with Pressure and Stress'

Dealing with Pressure and Stress		
	Self-Control	**Stress Tolerance**
AVG	6.5	6
SD	2.10	2.10

Table 11: WPI 'Identifying and Managing Change'

	Identifying and Managing Change	
	Imitative	**Flexibility**
AVG	5	5
SD	1.95	1.57

The results from the WPI, while more effective on an individual basis, show that across all 17 scales the students scored at the 'mid' level in comparison to the adult working population.

Desired Student Career Competencies

The staff assessment of students' career competencies revealed that the majority of staff felt that students had limited to moderate previous participation in career development activities. Staff reported that career development activities are available to students during their time at university, however student engagement with activities was considered low across the student cohort. Engagement with certain units in the IT degree was seen as key to helping the career development of students. The survey asked staff about students' previous (prior to attending university) career development activities. Staff reported that these have had a small impact on building students' career development. In regards to what career management competencies that should be the focus during a students' university education the staff reported the following as most important to develop: interact positively and effectively with others; participate in lifelong learning supportive of career goals; and understand, engage in and manage the career building process.

Discussion

The data about students' career goals and skills, staff opinion on students' career competencies, and results from the WPI build a picture of students' career aspirations. While students reported career aspirations it was evident that navigating to long-term career goals is going to require addressing difficult barriers such as confidence (self-perception) and motivation. In the short-term students want to build their professional skills in communication and technical (discipline) skills, with leadership in the long-term. The barriers to career goals indicate low self-efficacy, which makes it difficult for students to add to their choices/goals. It is important to ensure that based on their university education students not only mature during their studies, but also build a portfolio of skills for employability. It is the successful combination of many components that ensures students can continue their career development and be best prepared for the varied employment market of IT. In an effort to summarise what constitutes the components that make up an IT students' career development the model in figure 2 is proposed. Figure 2 shows a proposed simplified view of the IT students' career development. The successful interaction of: internship, discipline,

professional skills, and community all influence a student's identity and formation of career choice/goals.

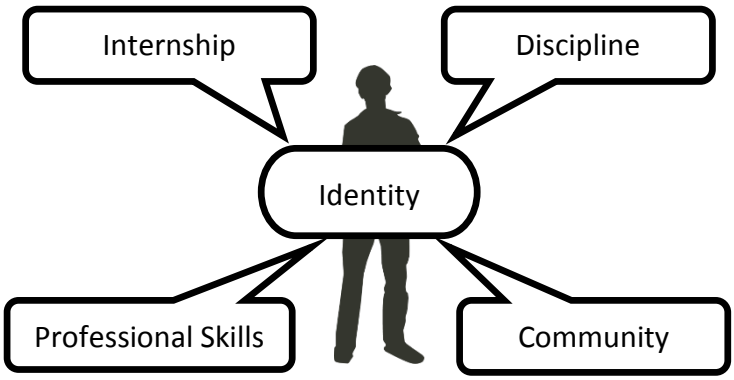

Figure 2: Simplified IT Career Development Model

Table 12 describes the attributes that make up the career development model shown in figure 2.

Table 12: Description of IT career development attributes

DISCIPLINE	Curriculum, assessment, guest lecturers/discipline professionals, industry advisory, professional society guidelines, university reputation	Regulated by: University and academic staff	Affects self-efficacy, interest, and choice/goals
INTERNSHIP	Work integrated learning, experiential learning, reflection, professional networking, Awareness of the labour market	Regulated by: University academic staff and industry	Affects outcome expectations
PROFESSIONAL SKILLS	Graduate attributes/skills for employability	Regulated by: University and Academic staff	Affects self-efficacy, and outcome expectations
COMMUNITY	Professional societies/networking, mentor, family and friends, social networking	Regulated by individual student	Affects self-efficacy, and choice/goals
IDENTITY	Personality, attitude, CV/Portfolio (Brand), interest, vision, personal career planning (face-to-face and online service), employment services, social capital, personal capital	Regulated by individual student	Affects self-efficacy, interest and choice/goals

As table 12 outlines, students in IT combine the components of: discipline, internship, professional skills, community and identity, throughout their course to prepare for their career. It is the successful combination of the components that enables students to engage with and manage building of relevant career competencies. Each component has various attributes that define what makes up the component. Qenani (2014) argued it is important for opportunities to combine career development activities, such as careers counselling, and taking advantage of internship opportunities. In addition it is noted in table 12 that the components are largely regulated either by the university or by the student themselves, which is reflective of the ways in which career development is influenced by all components of an

individual's life. Finally, the last column in table 12 demonstrates the ways in which the IT student's career development model interacts with SCCT (Lent et al., 1994). Overall, the model reflects the students' current stage of career development which is still maturing and being built from their experiences during university.

Conclusion

The results presented in this paper are phase one of a multi-phase research project which is implementing and testing a framework for IT students to build career competencies for employability. This paper has presented a summary of the career aspirations of IT students. A portfolio was a useful teaching tool to assist with career development, however the results show that students did not consider portfolio as an important requirement for career progression. Based on the results gathered a model of career development was proposed. The model is being tested with students from Deakin University over a three-year period (2014 to 2016). Based on future research, refinements will be made to the model as required.

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