



## The Role of Universities, Employers, Graduates and Professional Associations in the Development of Professional Skills of New Graduates

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### ABSTRACT

We examine the role of universities, employers, professional associations and graduates in the development of professional skills of new university graduates through studying the professional work experiences of recent Australian information technology graduates as a particular case to inform our wider analysis and argument. We argue that the development of professional (or work-ready) skills is a distributed responsibility, and different stakeholders have different contributions to make. Furthermore, this approach will be successful only when each player accepts its responsibilities and cooperates with the others. It is suggested that: universities take responsibility for preparing graduates to learn how to learn in uncertain situations; employers take responsibility for training graduates when they commence work; graduates take personal responsibility for developing their professional skills both within and outside university studies and professional associations take responsibility for increasing students' exposure to the industry through scholarships, internships, research and job-ready programmes. Although the findings are grounded in data collected from new IT graduates, much of the discussion is relevant for other disciplines.

**Keywords:** work-ready graduates; professional skills; graduate work experiences; university preparation and employer expectations

### Introduction

The role of universities in preparing graduates for the workforce is a longstanding and controversial issue (Barnett, 2000a). It is compounded by the ever-changing needs and expectations of employers, who are increasingly interested in what their employees can do and less in what they know. Recently, there has been tension between universities and their curricula and employer expectations of graduates. Many employers and students believe that university education has the primary purpose of preparation for work and that it is possible to develop work-ready skills simply by undertaking three or four years of university education (Crebert, Bates, Bell, Patrick, & Cragnolini, 2004). Individual perceptions and responses of universities to needs and expectations of employers vary from one university to another. Curriculum changes are complex, and such changes alone are unlikely to be sufficient to address work readiness or the development of all the professional skills needed by new graduates. Brew (2010) states that university education should focus on preparing students to solve a range of unforeseen or unknown problems by reinforcing new ways of thinking and acquiring new kinds of knowledge. She argues that students should be able to evaluate knowledge critically and develop the ability to reflect on what they are doing and why. Such critical inquiry and creativity skills are central to living and working in a 'supercomplex' world (Barnett, 2000b), but universities alone cannot be solely responsible for developing work-ready graduates.

There is evidence that there appears to be a mismatch between employers' expectations of graduates and the skills of graduates (AC Nielsen Research Services, 2000; Precision Consulting, 2007; Garling, 2008). Similarly, many graduates' expectations of employers differ from employers' expectations of new graduates (ALTC, 2009; Bandow, 2004; Walker et al., 2012).

Understanding the roles that universities, employers, graduates and professional associations could play in the professional preparation of new graduates for work can help the alignment of these expectations. The next section has details of the study we conducted with new IT graduates. Analysis of the findings informed our discussion on some of the responsibilities these stakeholders could assume to assist with the development of graduates' work-ready skills.

**Study context and details**

Many employers argue the need for work-ready graduates. It is suggested in the literature that graduates from all disciplines are lacking in job skills and are ill prepared for work situations (AC Nielsen Research Services, 2000; Snoke, 2004; Maiden & Kerr, 2006). To address these issues, a better understanding of the employer, academic, professional association and graduate perspectives on the professional skill requirements of workplaces is needed. We studied the professional workplace experiences of recent Australian IT graduates.

Firstly, we determined what IT graduates believe are the professional skill requirements (also known as soft skills) of their work and the challenges they face at work. Secondly, we associated these professional skills with the sources that assisted graduates with acquiring or developing these professional skills. Thirdly, an understanding of the useful elements of their university courses that contribute towards fulfilling the professional skills requirements of graduates was developed. Then, we analysed how well graduates believe their university studies prepared them to meet the needs of their professional practice. Finally, we examined the role and responsibilities of individual stakeholders (professional faculties at universities, employers, professional associations and graduates themselves) in the preparation of professional IT graduates.

Table 1 provides a snapshot of the study's research questions, profile of the participants, methodological approaches used, focus of data analysis and key findings.

**Table 1** Snapshot of Study Scenario in Information Technology

Topic	Description
<b>Study focus</b>	Professional work experiences of recent Australian IT graduates.
<b>Research question</b>	What do the professional work experiences of recent Information Technology graduates in practice tell us about their preparation for the profession?
<b>Sub-questions</b>	<ul style="list-style-type: none"> <li>• What are the typical professional skills requirements of IT professional practice?</li> <li>• From graduates' viewpoints, which sources assisted them to acquire the professional skills required for their professional practice?</li> <li>• From graduates' viewpoints, which elements of their university study programme contributed towards fulfilling the professional skills requirements of their practice?</li> <li>• From graduates' viewpoints, how well did their university studies prepare them to meet the professional needs of their professional practice?</li> <li>• What is the role of different players (universities, employers, professional associations and graduates themselves) in the professional preparation of IT graduates?</li> </ul>
<b>Participant criteria</b>	<ul style="list-style-type: none"> <li>• Australian Bachelor's degree in IT or a related discipline.</li> <li>• Recent graduates from the last three years who had studied at university full-time.</li> <li>• Domestic or international students.</li> <li>• In current employment and had been working in a paid IT professional position for 0.5–3 years.</li> <li>• Could have completed work experience as a part of their university course but not had any other previous full-time paid IT work experience.</li> </ul> <p>The 24 participants came from a broad spectrum of cultural and ethnic backgrounds, worked for small, medium and large sized companies that were either multinational or local and were employed across a variety of IT roles.</p>
<b>Methodology</b>	<ul style="list-style-type: none"> <li>• Key ideas from grounded theory.</li> <li>• Data collection using interviews and online surveys.</li> </ul>
<b>Key study findings</b>	<ul style="list-style-type: none"> <li>• Major categories of professional skills that graduates believe are required for their work are communication, time management, teamwork, working with people, working across cultures, project management, business skills and personal attributes.</li> <li>• Professional skills were developed in multiple ways including academic, social, personal, professional and other work experiences.</li> <li>• The most useful components of their university studies are work placements and 'real life like' projects.</li> <li>• Graduates face a number of challenges when they first enter employment.</li> <li>• Some professional skills can be developed only outside the university studies.</li> <li>• There is perceived lack of preparation to face new, unfamiliar, unknown or unknowable situations.</li> </ul>

The study used a qualitative methodology, as there was a need to explore the graduate perspectives to understand what graduates actually do in their professional practice and the challenges graduates face at workplaces. A research method that assisted with the generation of a rich conceptual description of the professional skills and professional work experiences of IT graduates was needed. It was important for the study to allow concepts and themes to emerge from data. Semi-structured interviews (with open-ended questions) were conducted. A qualitative survey in the form of a questionnaire (with open-ended questions) was posted online to those new graduates who were interested in the research and wished to take part but could not be interviewed face-to-face. The

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questions were similar in nature to those asked in the interview. The online survey enabled both geographical diversification and a chance to recruit extra IT graduates (who are generally time poor and frequent travellers and hence challenging to interview face-to-face) for the research. University of Technology, Sydney Human Ethics approval was obtained before data collection. The first author collected data. Letters, telephone, e-mail and the World Wide Web were used for recruitment of participants. Academic contacts in the universities in Sydney, advertising through university alumni associations (via their newsletters or e-mail groups), advertisements on university notice boards and circulation of advertisements through ACS (Australian Computer Society) members assisted with participant recruitment. The duration of interviews varied between 45 minutes and an hour. An offer to mail a copy of the research findings/summary to interview and survey participants was also made. Twenty-four participants were involved in the study. Participants' full personal details, job descriptions and workplace details were not collected due to privacy reasons. However, they were asked to provide a brief description of the kind of IT work they did at their current job. This information was used to see if there was enough representation from different sectors of IT where graduates could be working following their graduation from university Bachelor IT degrees. Detailed information regarding methodology, recruitment procedures, profile of the participants and study findings is available in Nagarajan and Edwards (2014a) and Nagarajan (2011).

The data analysis phase used Strauss and Corbin's (1990) approach for coding. First, all interview data were transcribed, grouped and coded. Then the data from one interview were constantly compared with the other interviews for similarities. Where similarities were identified same codes were issued. All the codes were reviewed and grouped into categories (minor). These categories were then merged to form major categories. Detailed discussion of the coding procedures and the analyses of particular themes which emerged are presented in Nagarajan (2011).

Table 2 shows some of the responsibilities stakeholders could assume to assist with the development of work-ready skills. These are discussed in the following sections.

### What universities could be responsible for?

#### Preparing graduates to face complex, unknown and unknowable situations

One of the major outcomes of our study is the lack of preparation of IT graduates to face unfamiliar, unexpected, unknown and unknowable situations. Professional faculties in universities have some responsibility to prepare graduates to learn how to learn in such situations. New approaches to teaching and learning, new ideas about knowledge and new ways to engage students are essential to address some of the challenges faced by universities in preparing students for supercomplexity (Brew, 2010). Yorke and Knight (2006) recommend that curriculum auditors at professional faculties at universities should focus on the 'core' units within a curriculum to assess the extent of opportunities they might provide for students to learn to deal with complex and unfamiliar problems. They say that it is essential to check the extent of alignment of assessments with module learning outcomes, employability skills and the criteria used for assessment. This approach can serve as a starting point for universities to think about how they could better prepare their graduates to face unfamiliar, unknown and unknowable situations.

Requirements for work practices such as the ability to monitor and prioritise tasks and develop non-routine and creative thinking rather than merely deploying standardised procedures become essential skills graduates need to learn. Many professionals also need imaginative, creative and strong disciplinary skills to be able to respond to unknown and unknowable situations (Reich, 1991, 2002). There could be a focus at university on the development of skills such as abstraction, system thinking (seeing parts, as well as the big picture), creative thinking, analytical, teamwork and communication skills. Graduate attributes should be designed to place an emphasis on work-ready graduates who are competent within their discipline fields and possess the abilities necessary to negotiate a world of work that is in constant flux (Barrie, 2006; Nagarajan & Edwards, 2014b).

**Table 2** Responsibilities of different stakeholders

Stakeholders	Responsibilities
<b>University (Professional Faculties)</b>	<ul style="list-style-type: none"> <li>• Preparing graduates to face unfamiliar, unknown and unknowable situations.</li> <li>• Preparing graduates to cope with complex and dynamic work requirements.</li> <li>• Preparing graduates to learn how to learn.</li> <li>• Increasing students' knowledge and awareness of workplace environments.</li> <li>• Assisting graduates with initial job expectations.</li> <li>• Developing well-rounded global graduates.</li> <li>• Maximising and using diversity in university environments to assist graduates in developing social and cultural skills.</li> </ul>
<b>Employers</b>	<ul style="list-style-type: none"> <li>• Training new graduates when they commence work.</li> <li>• Facilitating workplace learning and organisational learning.</li> <li>• Increasing work socialisation.</li> </ul>
<b>Professional associations</b>	<ul style="list-style-type: none"> <li>• Increasing students' exposure to industry through scholarships, internships and job ready programmes.</li> <li>• Making recommendations to the government and employers on issues that matter most for their professionals and profession.</li> <li>• Using course accreditation processes to ensure that university programme design focuses on the development of professionals rather than using a strictly curriculum-driven approach.</li> </ul>
<b>New graduates</b>	<ul style="list-style-type: none"> <li>• Developing professional skills both within and outside university studies.</li> <li>• Managing their career.</li> <li>• Managing themselves.</li> <li>• Self assessing in the workforce.</li> </ul>
<b>Shared responsibilities</b>	<p>Certain professional skills can be developed only in practice sites. Stakeholders have to cooperate with each other to:</p> <ul style="list-style-type: none"> <li>• Link theory and practice and learning on the job.</li> <li>• Develop employability and work-ready skill sets.</li> <li>• Facilitate work placement experiences.</li> <li>• Encourage part time employment (in discipline specific areas or otherwise) in parallel to university studies.</li> <li>• Provide work based learning opportunities.</li> </ul>

### Preparing graduates to learn how to learn

Universities could use approaches which foster flexible attitudes, self-autonomy and learning capacity. For example, simulated or real-life projects, internships, work placement experiences, role plays, teamwork and problem-solving tasks during project work or assignments are strategies used successfully by many faculties at Australian universities to develop 'self-learning' skills.

Situational knowledge and situated learning can be developed by being in situations rather than studying them (Eraut, 1994). For example, it is quite easy to achieve cultural diversity in many Australian IT project groups at universities because of the mix of local and international students. However, group diversity in terms of age and experience levels may not be as easy to replicate. This diversity (in age, gender, culture, hierarchy) is naturally present in many workplaces. Hence work placements have the ability to enhance the quality of the studying experiences for graduates and assist them to gain first-hand experience with working in culturally diverse groups of people from within discipline-specific or other sectors. Lave and Wenger (2002) describe the social context of



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learning in terms of “legitimate peripheral participation” and the different ways in which newcomers move from being an outsider to an insider (in workplace learning). They view learning as a part of social practice.

Graduates in the study found that the concept of ‘learning’ at work was different from the ‘learning’ they did at university. Eraut (1994) claims the assumption that knowledge is first acquired and then put to use is false. At universities, learning occurs when graduates first learn theory from textbooks. But learning continues to occur when they actually put it into practice at their workplaces. For example, the communication skills graduates required at work were different from those learned at university. Universities have a responsibility to assist graduates to become professional learners so they can learn effectively at work and acquire and use knowledge. Yorke and Knight (2006) state that measures such as curriculum auditing provide a holistic approach to the test of how employability skills related learning occurs in a course.

### Using deep learning approaches to enhance self-development of students and prepare graduates for lifelong learning

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Universities can assist students to take responsibility for their own personal development by using deep learning approaches. Universities need to extend their role from that of creator and transmitter of generalisable knowledge to that of enhancing the knowledge creation capacities of individuals and professional communities (Eraut, 1994).

Deep learning approaches in universities provide opportunities for the development of independent learning, personal development, problem-based learning, reflective learning and learning by doing within a group setting (Marton, 1975). Where deep learning occurs, students feel they play an active role in their own learning and this contributes to self-development and preparation for lifelong learning. Self-development and personal growth can occur through experiential (deep) learning (Rossin & Hyland, 2003). Personal learning that is situated in a social context also leads to the social development of group members. Rossin and Hyland found that students formed social bonds of friendship during their project work and the learning took on a moral dimension because values are shared and individuals support each other to get the job done. Experiences of facing and working with some uncooperative individuals with different views made teamwork realistic. During assessments, the tasks should be such that they engage students and allow them to focus on the process of learning not ‘artefacts’ (Chambers & Clark, 2009). It is important to facilitate sufficiently the assessment process for graduates so their personal and social development can occur and they are aware of their own progress in learning.

Recent studies in Australia (Barrie, Hughes, Crisp, & Bennison, 2014; Lawson et al., 2013) have highlighted the need for assessment of student learning in Universities to take an outcomes-based approach to student learning and assessment and provide convincing evidence to relevant stakeholder groups of achievement of learning outcomes for graduates. Assurance of assessment tasks and of the judgments made using those tasks directly contributes to assurance of learning (Barrie et al., 2014). Their investigation into the types of assessment tasks that are most likely to provide convincing evidence of student achievement of or progress towards learning outcomes and the best process that will assure the quality of assessment of graduate learning outcomes highlights some of the efforts that Australian universities have channelled into areas such as assurance of learning in the recent years. These initiatives ensure that deep learning is fostered during students’ university studies.

Coherence in curriculum design (referred to as constructive alignment) has the potential to promote deep learning from students (Biggs & Tang, 2011). According to Biggs and Tang, constructive alignment takes an outcomes-based approach to education by promoting alignment of the student learning outcomes with teaching and assessment. In such an approach, the focus for learning shifts from what a university lecturer does during teaching to what learning activities students undertake to achieve the intended learning outcomes. Similarly, the focus during assessment shifts from what a university lecturer has asked students to demonstrate to how well students have achieved the intended learning outcomes. Yorke and Knight (2006) stress the importance of engaging students both within and outside formal classes to make them aware of their own progress in learning. Our study found as many opportunities as possible such as group work on projects, assignments and work placement experiences should be provided at university for the development of graduates on both an individual and a social level.

### Increasing students’ knowledge and awareness of workplace environments

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Universities also need to increase their industry connections and expose students to the business world throughout their university studies so students do not have ‘culture shock’ when they commence work. Work-integrated learning using work placements and internships is popular because it provides workplace exposure for students and enables understanding of theory–practice relevance. In many disciplines (e.g. Health Sciences and Nursing), they are compulsory. Another way to prepare novice graduates to face the industry is to bring in alumni currently in the workforce to share their job experiences and the obstacles they faced when commencing work and how they overcame them. Universities could prepare graduates for the fact that most entry-level jobs require teamwork and followership roles and that leadership roles come later in a career – that is, students are informed about different workplace hierarchical structures and organisational cultures. For example, while public sector workplaces promote top-down

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structures, other workplaces may use 'peer' status over 'command' status. These structures are based on the 'accountability', 'responsibility' or 'significance' attached to work roles.

### Assisting graduates with initial job expectations

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Problems arise due to mismatches in expectations between employers, universities and graduates of each other. Harvey (1999) states that the initial expectations that many graduates have such as job satisfaction, salary levels and professional development opportunities are not met by employers. As a result, the transition from university to work brings disappointment, insecurity and unease amongst new graduates (Crebert et al., 2004). For example, IT graduates in our study wanted more support and mentoring from their employers during their initial employment. Those who received such support were appreciative and valued such employer initiatives. Those who didn't have that support struggled but used their own strategies to cope with uncertain and challenging situations.

### Assisting graduates with career management and self-management skills

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Career management skills are the ability to build a career and to manage the interaction of work and learning (Bridgstock, 2009). Universities can certainly assist students with the development of career management skills by using role plays, self-audit of resumes, problem-based group work, peer review, work-integrated learning etc. (Watts, 2006). However, the potential for student career management skill development remains mostly unrealised in university programmes (Watts, 2005; Bridgstock, 2009). Australian universities could support and fund already established career services to help graduates through their transition from university to work. However, none of the IT graduates we interviewed raised the lack of career management support from either universities or employers as an issue, although they did raise self-management skills. These address graduates' abilities to identify their individual perceptions of self and appraise themselves in terms of values, abilities, interests and goals (Bridgstock, 2009). Self-management and self-awareness can be developed at universities through reflection and feedback exercises.

### Preparing graduates for self-assessment beyond graduation

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Students should be given opportunities to develop self-assessment and reflective assessment skills during their degrees. Some universities now require their students to use electronic or web-based portfolios and reflective writing exercises to assist students to develop these capabilities and to integrate employability skills arising from their studies and from their broader life experiences. Students are encouraged to collect evidence to demonstrate how their extracurricular and broader social or life experiences complement the skills arising from their university studies (iPortfolio, 2011). However, in the early stages of their careers, graduates' perceptions of their own development are problematic because they may over- or underestimate how much their personal work skills have developed. One possible way to address these issues is to establish the level of work skills at entry to university and the level at graduation (Sleap & Reed, 2006).

### Developing well-rounded graduates

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IT graduates in the study found the need to work with professionals from other disciplines. Fallows and Steven (2000) state that some graduates are rarely employed directly in their discipline but are fast to recognise the need to use general skills gained during their university education. Other graduates, whose degrees are more vocationally focused, leave university looking for employment within a chosen area and are slow to recognise the generic skills that have been developed during university. To maximise and tap into the real professional potential hidden in graduates, all faculties should try to make their graduates become aware of their strengths and keep their minds open to work-pursuing opportunities not just in the discipline-specific sector but also in other sectors where they are likely to gain employment.

### Maximising and using diversity in the university environment to assist graduates in developing social and cultural skills for the global workplace

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Cultural awareness and being able to work with different cultures are professional skills that the majority of IT graduates in the study required. They also needed skills to work with people from different industry sectors, age groups and experience levels in the hierarchy. Oliver, Jones, Tucker and Ferns (2007) state that graduates with international perspectives are able to consider how issues might impact on people in other parts of the world, and graduates with intercultural perspectives are able to consider the effects of issues on people from other cultures. An approach to developing the necessary social and cultural skills for such global graduates is to maximise and utilise diversity in the university environment. Within Australian universities, particularly in IT departments, both staff and students come from a diverse range of ethnic and cultural backgrounds. This diversity in students' learning of professional skills should be used. Socialisation at university could be achieved through encouraging student participation in work placements,

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internships, involvement in student organisations, student cultural events organisation, networking and career building contacts. Communication and teamwork skills and the ability to work with people from different cultures were developed from increased socialisation with university friends and professional peers as shown in our study findings.

### What employers could be responsible for

#### Training graduates when they commence work

Employers who demand skills from graduates have a responsibility to support the training of graduates when they commence work with their organisation. However, there is some resistance from employers to such support mechanisms due to uncertainty about the return on their investment of time and cost. The graduates in the study who were provided with training or induction programmes by their employers greatly valued them. Those who had not had these opportunities felt they could have benefited from such training programmes but instead had to rely on personal initiatives. Designing training programmes to induct new graduates into their roles is challenging for employers. However, they should customise the training to individual needs and provide long-term support as a minimum for the first few years of their employment.

#### Facilitating workplace learning and organisational learning

Another way of assisting new graduates to settle in their roles in the initial years of employment and enhance their work performance is to facilitate their learning at work and from work. Employer programmes such as succession planning, mentoring, performance development, career development, corporate culture programmes, team building and other organisational learning are seen to be effective mechanisms to engage individual employees with the aim of developing 'identity' about who and what to be in the workplace (Usher, 1997). All the graduates in the study who had positive experiences with their employers were grateful for the support and motivation the employers provided, particularly in relation to professional development.

However, Eraut (1994) believes that there is a tendency for professional development to place a focus on 'new' aspects of professional work rather than improving the quality of current professional performance. The confidence and subsequent performance of graduates could be developed if employers focused graduates' professional development on cases and problems from their work experiences instead of simply focusing on new aspects of their work roles.

#### Increasing work socialisation

Socialisation support is recommended for young graduates. Some suggestions are holding work barbeques, inviting graduates from previous years to talk about their experiences, emailing a list of previous years' graduates to new ones and helping new hires find ways to make connections. Using graduates hired in previous years to provide peer mentoring to new graduates, providing specific ongoing job related feedback and providing professional development support for learning about work tasks are further ideas (Polach, 2004). Graduates in the study found both formal and informal work socialisation events beneficial because they help them to know more about the organisation and their peers and also assist with the development of needed professional skills. Role related information is gathered from supervisors, and social information is gathered from peers.

### The role of professional associations in the professional skills development of graduates

#### Increasing students' exposure to industry through scholarship and research and job ready programmes

Professional associations have a responsibility to engage with students and provide them with the exposure to industry through their events, work-ready programmes and funded research opportunities, competitions and scholarship programmes. For example, the ACS Computer Professional Education Program (CPEP) is a workplace-oriented postgraduate ICT course developed by IT professionals for IT professionals with a view to filling the gap between university education and work experience (ACS CPEP, 2011). CPEP requires participants to use an electronic portfolio to reflect on the development of their employability skills under the supervision of a mentor. Such initiatives assist in providing support that many graduates need during their university studies and beyond to help develop their professional skills.



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### Making recommendations to government, employers and universities on issues that matter for their professionals and profession

Professional associations have a role in lobbying the government on matters related to their professional workforce. For example, The ACS, as the peak representative body of the Australian IT sector, has the capacity to make recommendations to the government on matters that impact the ICT sector. For example, they can lobby government to provide incentives for employers who host students as part of Work Integrated Learning schemes or provide fee relief for students who plan to undertake an extra year of study in order to gain work experience. Indirectly, these contribute to the development of professional skills of IT graduates. Professional associations could also use their course accreditation processes to ensure that the design of university courses considers the development of professionals rather than just a content approach.

#### Graduates have a personal responsibility to develop their professional skills both within and outside university studies

In our study, many graduates took personal responsibility to develop their own professional skills both within and outside their studies and during employment. However, personal experience and anecdotal evidence has suggested that many IT graduates rely on their university for the development of work-ready professional skills. This is an expectation that universities cannot meet on their own. All graduates should use the opportunities provided to them during university studies, work placements or when beginning employment to develop their professional skills as well as working in part-time jobs or participating in extracurricular activities during university. However, university education can help to develop the notion of self that addresses personal development, personal fulfillment and personal realisation (Barnett, 1998). There is a two-way responsibility between graduates and universities in the process of the development of professional skills of graduates – the personal responsibility graduates have towards their own skills development and the responsibility the universities have to assist graduates in developing an awareness of personal responsibilities such as career management, self-management and self-assessment skills. Similarly, there is a two-way responsibility between graduates and employers – the personal responsibility graduates have towards development of their own professional skills and the responsibility of employers to assist graduates with training when graduates commence work.

#### Conclusion and future work

Our principal argument is that stakeholders such as professional faculties at universities, employers, professional associations and graduates can all contribute to the development of professional skills of graduates and that each stakeholder needs to accept responsibility and cooperate with the others. There is strong evidence from our study that universities are not solely responsible for the development of professional skills of IT graduates. Employers and graduates themselves have a major role to play in the development of those professional skills that can be acquired only in practice. Some professional skills need longer than the duration of a university course to develop. One of the major issues arising from the research is the lack of preparation of graduates to face new, unfamiliar, unexpected or unknown situations. Professional faculties in universities have a responsibility to prepare graduates to face a supercomplex world and to learn how to learn in uncertain situations, to assist with the development of knowledge and awareness of work environments and to help in the development of initial job expectations. Employers have responsibilities to assist students through work placements or to help with the acquisition of work-ready skills. All graduates have to take personal responsibility in relation to career and self-management and self-assessment both within and outside university studies. Professional skills development of new university graduates is a shared responsibility between stakeholders such as universities, employers, professional associations and graduates themselves to maximise the development of these skills both during and after university.

This study is a discussion of the professional skills required by graduates from IT programmes when they reach the workplace. This work would be enhanced by further research to explore ideas for IT curricula that are aligned with industry needs. For example, as a result of this work, would recommendations such as integrating work experiences into the curriculum and team-based capstone projects with project planning and reporting be incorporated in all IT degree programmes? Links are made in these research findings between the issues of teamwork, leadership skills and, by implication, curricula and assessment practices with integrating work experiences into the curriculum, which may be informed by future research. Providing incentives for academics to undertake continuous professional development or industry-based study leave is one of the ways to ensure the development of industry-relevant curricula. More work is needed to establish the role and responsibilities of curriculum designers, employers and professional associations and graduates in the development of curricula aligned with industry needs but which maintain the theoretical underpinning of a university education as distinct from vocational education. Customised follow-up support for new graduates during the initial employment years can be provided through jointly planned continuing professional education, reflection on such experiences, sharing and interpretation of such experiences and using them as a basis for future learning and development of on-the-job activities. It is impossible even with the greatest amount of collaborative effort from all the stakeholders to prepare graduates to face all the challenges they will encounter in the workplace. However, equipping them with the right kind of skills such as learning how to learn and to cope with complex, unknown and unknowable situations are some approaches that will assist their career

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success. All parties have a responsibility to provide ample opportunities for IT graduates to develop the professional skills required for their work.

### Biographies

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