Professional Skills Requirements of IT Professional Practice: Australian IT Graduate Perspectives

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This paper examines the professional work experiences of recent Australian Information Technology graduates. The aim is to understand and describe the typical professional skill requirements of IT professional practice, identify graduate perceptions of the practical relevance of their university courses to the professional skill requirements of their work and to identify the challenges that graduates face when they commence employment. The research findings, collected from new IT graduates, will provide IT faculties in universities with evidence to support the preparation of graduates for professional practice through the development of appropriate curricula. Similarly, the evidence will help IT employers develop transition strategies for new IT graduates.

1. Introduction

To meet rapidly changing business and employer needs requires university graduates who are work ready. This relationship of higher education to work and the associated transition from study to work life have been studied by Brennan, Kogan and Teichler (1996); Kaufman and Feldman (2004); Rogers and Mentkowski (2004); Dahlgren *et al* (2006); Allen and van der Velden (2008) and Little (2008). Dahlgren *et al* (2006) state that there is sparse knowledge about how graduates construe themselves as professionals or how they experience transition, and that much of the research studying the relationship between higher education and work looks at the match between the outputs of higher education and the demands for trained workers. They state that few studies examine what the work requirements are or the relevance and impact of education to such work requirements. While the literature has a focus on academic, employer and professional

associations' perspectives of Information Technology (IT) graduates (AUTC, 2001; Hurst and Lynch, 2001; ACS 2005; O'Keefe, 2006; Wong, von Hellens and Orr, 2006 and ACS, 2012), little exists on understanding graduate perspectives of their work experiences or how graduates relate their courses of study to their work experiences or use the skills and knowledge they acquire from their studies at workplaces, especially during the early employment years. Recently, however, there has been increasing interest in developing work ready IT graduates (Nettleton, Litchfield and Taylor, 2008; ACS F, 2009; Koppi *et al*, 2010). Based on a study they conducted at Microsoft, Begel and Simon (2008a) suggest that many of the problems computer science professional novices faced were directly attributable to poor communication skills and social naïveté.

Existing literature includes tips and strategies for landing a first job, graduate expectations of employers and coping with initial employment challenges. However, there has been minimal focus on describing the experience of work itself once graduates have begun working. Some researchers have surveyed graduates and have captured the feelings, frustration and challenges of the experiences from an individual graduate's perspective while others have studied employer attitudes towards ICT education (AUTC, 2001; Hurst and Lynch, 2001; Coates and Edwards, 2009). However, Yorke (2006) suggests that more research is required to ascertain the extent to which graduates are concerned with their lack of preparedness for the world of work.

Many authors have also discussed the increasing importance of soft or generic skills and, specifically, employer dissatisfaction with the soft skills of IT graduates (Forth and Mason, 2003; Hagan, 2004; Sami, Mari and Tarja, 2004; Vu, Tan and Maneerat, 2004; Petrova and Claxton, 2007; Webster, 2007; Al-Mahmood and Gruba, 2007; Pauling and Komisarczuk, 2007; Doucek and Novotný, 2007). The few studies on IT graduates and their workplaces following their university studies include Sumner and Yager (2008) who surveyed 55 Management Information Systems (MIS) graduates from a Midwest university in the US about their view of what they learned in their MIS program and their perceived job requirements. The graduates rated soft skills as the most important to their job success and felt best prepared in professionalism, team building, leadership and personal skills and project management. Sumner and Yager concluded that graduates need a balance of technical and non-technical skills for industry relevance.

In 2006, the Australian Government Department of Education, Employment and Workplace Relations (DEEWR) funded an Australian Learning and Teaching Council (ALTC) Information and Communications Technology (ICT) project, *Managing educational change in the ICT discipline at the tertiary education level*. The focus was on university ICT curricula and their perceived relevance by ICT stakeholders (ALTC, 2009). Major findings were:

- Most academics believe that ICT graduates are adequately prepared for industry but acknowledge that graduates need training once they enter the ICT industry;
- Some academics believe that industry contributions to the curriculum are minimal while others feel that industry involvement is achieved through faculty advisory committees;
- More opportunities should be provided for graduates to gain workplace experiences to develop industry ready skills;
- Improvements are needed in the management of industry related project work experiences; and
- Former graduates should be involved in providing perspectives on existing curricula.

The main aim of this ALTC (2009) study into the perceptions of recent ICT graduates in the workplace was to help inform the curriculum. Many graduates felt satisfied as to how their university had prepared them for their work. However, they perceived themselves as being under

prepared in areas such as interpersonal and business skills. The question was raised as to whether the graduates' feeling of under preparedness was due to the lack of opportunities at university or the lack of graduates' engagement in the development of those skills at university because graduates did not realise their importance for the workplace. In the report, it is stated that there is a tension between how and what universities want to teach and the perceived requirements of the ICT industry. It recommends that the relationship between universities and the ICT industry be improved to identify clearly the skills industry requires of graduates. Further, it notes that despite this study, there is a lack of information from graduates in the ICT industry about the relevance of university curricula to their work.

As a direct response to this need, professional work experiences of new Australian IT graduates are the focus of this paper. Such experiences are defined as the parts of a graduate's work that cover professional or non-technical skills such as communication, teamwork, etc. In the IT education literature, there are a number of studies on IT technical skills but few on the non-technical aspects of professional work and those studies focus on the employers' viewpoints (Woratschek and Lenox, 2002; Begel and Simon, 2008b; Sumner and Yager, 2008). The research in this paper investigated IT graduates' viewpoints on the challenges they face at work, the typical professional skills requirements of their practice and how they acquired or developed them, the elements of their university study that are relevant to their work professional skills requirements and how well their studies prepared them to meet the professional needs of their practice.

2. Research Design and Procedures

This study focussed on exploring the perspectives of recent IT graduates to understand what graduates actually do in their professional practice and the challenges they face at workplaces. Further, there was seen to be a need to understand the role and responsibilities of universities, employers and professional associations in the professional skills development of IT graduates. These issues required an approach that generated a rich conceptual description of the professional skills and professional work experiences of IT graduates. To allow concepts and themes to emerge from the data, some key ideas from grounded theory (theoretical sampling, constant comparison, theoretical saturation, open coding, axial coding and selective coding) were used for data collection and analysis (Strauss and Corbin, 1998). Interviews (face-to-face) and qualitative online surveys were used to capture new Australian IT graduates' professional work experiences. The results included the generation of a detailed conceptual description of, and deep insight into, issues related to the research area. A research methodological map showing the research design used in this study is in Figure 1.

Level 1 (Nature of Research)	Exploratory
Level 2 (Research Approach)	Qualitative
Level 3 (Research Tradition/Inquiry)	Ideas from Grounded Theory
Level 4 (Research Methods)	Interviews and Online Surveys

Figure 1: Research Design

All participants had an Australian Bachelor's degree in IT or a related discipline. Graduates who held qualifications higher or lower than a Bachelor's degree in IT were excluded. They were recent graduates, i.e. from the last three years, who had studied at university as full-time students. Part-time students were excluded from this study as they may have been working full-time or part-time during university study and could have developed some workplace skills from these jobs. It is difficult to clearly demarcate the sources of professional skills development (within or outside university, IT or non-IT related jobs) in part-time students and there is the possibility of mis-understanding or distorting of data. The study graduates included domestic students and international students. The participants were currently employed and had been working in a paid IT professional position for 0.5–3 years. Graduates could have completed work experience as a part of their university course but not had any other previous full-time paid IT work experience. Purposive sampling, snowball sampling and theoretical sampling were used. Snowball sampling developed because IT graduates, academics at several universities, Australian Computer Society (ACS) and alumni members were asked for their suggestions about people who could be approached to participate in the study. Theoretical sampling was also used. For example, when one female participant raised the issue of gender domination and gender related issues, there was interest in finding out whether this was an issue for male participants and other female participants. This sampling approach was used until theoretical saturation occurred. That is, no new categories emerged because what participants were saying offered no further insights into the concepts that were being explored in the study (Cutcliffe, 2000).

The profile of the twenty four participants recruited for this study is shown in **Appendix** Table 1a, with their gender and their organisation's characteristics shown in Table 1b. It was the intention of this research to maximise variation by targeting young graduates employed in several different IT capacities even within a particular role classification. Overall, 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 across a variety of IT roles. Approximately equal numbers of males and females participated in the study. Some participants were interviewed while others, who were remote, participated in an online survey.

The issues required an approach that would generate a rich conceptual description of the professional skills and professional work experiences of IT graduates. As it was important to allow concepts and themes to emerge from data, some key ideas from grounded theory were used to address the research problem. The constant comparison technique (the analytic process of comparing different pieces of data for similarities and differences), theoretical sampling (data collection based on concepts that appear to be relevant to the evolving story line or sampling based on the basis of concepts derived from data) and theoretical saturation (the point in analysis when all categories are well developed and further data gathering and analysis adds little new to the conceptualisation, though variations can always be discovered) are central to any grounded theory data analysis (Corbin and Strauss, 2008). These techniques enabled the generation of a detailed conceptual description of, and deep insight into, the issues related to the research area. Data collection approaches and data analysis occurred concurrently. The data analysis process used open coding, axial coding and selective coding from Strauss and Corbin's approach. The open coding and axial coding phases occurred concurrently as soon as the data collection began and the coding processes were continued during further data collection and until theoretical saturation occurred. These are detailed in Nagarajan (2011).

3. Research Findings

The five major themes identified in the data analysis are:

- Professional skills IT graduates believe are required for their work;
- Sources of professional skills for IT graduates;
- Challenges faced by IT graduates at workplaces;
- Most useful aspects of university studies that IT graduates believe contributed towards their professional skills development;
- Graduate perceptions of differences between university and the workplace in the application of professional skills.

Major categories of professional skills that IT graduates believe they require for their work, sources of graduates' professional skills and the challenges when they first enter employment will be the focus of this paper. Other themes are discussed in detail in Nagarajan (2011).

3.1 Professional Skills IT Graduates believe they require at IT Workplaces

To determine the relevance of university studies to the professional skill experiences of IT graduates, it is important to first understand graduates' perspectives of what the typical professional skill requirements of IT professional practices are. The eight major professional skills identified along with their categories and sub categories are presented in Table 3. Nagarajan (2011) presents a full discussion of and relevant quotes for each category of professional skills but this paper is restricted to a brief summary of professional skills and selected quotes.

Communication Skills

Every graduate who participated in this study agreed that written and verbal communication skills are the most important set of work skills. The respondents stated that the use of appropriate language while communicating with clients, peers and superiors was an essential aspect of their day-to-day work. As well, they needed to communicate with senior or more experienced colleagues in both technical and non-technical areas and frequently with international stakeholders. The latter is particularly challenging as it requires an understanding of cultural and language barriers as well as relevant local customs and politics. Details of communication skill requirements are shown in Table 1.

Time Management

IT graduates are required to manage their time effectively by understanding their workload and work priorities and hence scheduling themselves appropriately. Time management ranges from managing one's own time to managing a team's time as shown in Table 2. It becomes even more important when the graduates work on international projects, which involve peers and clients from different countries and time zones. Some graduates find scheduling their own work not difficult. What they find challenging is the ability to be able to schedule work for their colleagues and for teams that are operating across the globe. This calls for understanding of the project needs, the resources available and the capabilities of the team members and is part of time management in an IT environment. In industry, unlike university assignments, project specifications can change considerably during a project, deadlines are rigid and can sometimes even be brought forward thus placing considerable stress on the graduates to deliver work on time. The pressure comes

Major Category	Sub Categories	Detailed Categories
Communication skills	Appropriate use of language for different purposes	Use of language in communication with clients/peers/superiors
		Communication style (formal versus informal)
		Communication mode (verbal, written, email, online, face-to-face meetings)
		Documenting communication
		Structure of messages
		Choice of language in business and technical communication
		Ability to communicate bad news – tactical communication
	Communication with senior colleagues and people from different cultures	Communication with senior or more experienced colleagues
		Communication in an international work environment with people from different cultures
	Communication while working in a group	Meeting facilitation
		Feedback communication
		Communication to solve problems
		Communication to sell ideas
	Timing of Communication in project work matters	Timeliness of communication
		Type of work and communication (project scope communication etc.)

Table 1: Communication skills IT graduates believe are required for their work

Major Category	Sub Categories	Detailed Categories
Time Management Skills	IT project time management in an international work environment	Schedule management (projects, resources) with different project duration
		Time management in an international work environment with people from different time zones
	Use of appropriate time management strategies	Use of technology, tools and techniques to manage time
		Multitasking ability
		Timely delegation/escalation of issues
	Ability to handle time management challenges both as an individual and as a team	Handling different workloads (under, normal, over, crisis)
		Timeliness of work delivery and handling pressure
		Time management for self and for the team

Table 2: Time management skills IT graduates believe are required for their work

from all sides – managers, clients and team members within the same organisation. Such findings have also been reported in ALTC (2009). At least 75% of the graduates in this study felt their university studies did not contribute to development of this particular aspect of time management. As a result many struggled with the ability to handle and survive this pressure.

Teamwork Skills

Often IT graduates work as a part of a team, the skills for which are shown in Table 3. They are required to plan and manage team meetings, and complete post-meeting tasks. They need to listen to understand their team members and to communicate their own ideas to the team members. They are often required to manage several different tasks simultaneously both within their own department teams and in cross-departmental teams. They may also have to replace a colleague temporarily due to absenteeism or because of a lack of human resources. Graduates need skills to adapt to varying team sizes, compositions and interactions. Some teams are formal, others informal, some are technical, others business oriented. Graduates need to understand the nature of the team to be a useful team player. Some also need to work with much older and/or more experienced team members, often from different language and cultural backgrounds. This is different from their experiences at university where team members tend to be of similar age and experience. Similarly, working as a part of an international team requires more than teamwork skills.

Major Category	Sub Categories	Detailed Categories
Teamwork skills	Understanding different team structures and composition	Team dynamics
		Nature of teams (formal, informal) and team player
		Team size and composition
	Cultural issues and other strategies that affect teamwork	International team
		Handling feedback to and from team
		Team monitoring and motivation
		Use of technology, tools and techniques for team interaction
		Handling team conflicts and negotiation
	Meeting Management	Pre meeting planning and management
		Conducting meetings
		Post meeting tasks

Table 3: Teamwork skills IT graduates believe are required for their work

Working with People

While dealing with local and international clients, graduates are required to understand their client's expectations, manage meetings effectively and establish reliable and timely communication channels. Many IT graduates in our study were expected to have good people skills, as listed in Table 4, even while working in extremely stressful situations.

The first and most important one would definitely be people skills. This is important because you are constantly meeting and interacting with new people as well as ones you already know. You also have to interact with groups in meetings and know how to talk to the different people.
[Female in a large company]

Understanding a manager's expectations is important for graduates as it affects their performance appraisals and future promotion opportunities. Gender domination (ACS, 2013) can complicate this understanding. Male managers appear to act and think differently from female managers (Burke and Collins, 2001). Two of the female IT graduates who were interviewed noted that could be problematic.

> *But when you're at work and you're dealing with a male boss versus a female boss – and I've worked with some female bosses that are like males and some male bosses are like females. So you do get a combination, it really depends on the person's style. But just generally, I guess, males can be a bit more hardball.* [Female in a multi-national company]

Major Category	Sub Categories	Detailed Categories
Working with people	Managing expectations	Managing expectations of manager
		Forecast stakeholder reaction
		Managing client expectations
		Managing team expectations
		Work-life balance
		Building trust
	Professional Relationships	Professional relationship with clients
		Being aware of hierarchical work relationships
	Conflict resolution and negotiation	Use of appropriate conflict management strategies to resolve problems at work
	Human resources	Ability to work with competent and incompetent peers
		Assisting managers with recruitment of staff
	Customer Service	Ability to care for customers and build good relationships
		Understanding customers from different cultural backgrounds and customer relationship management
		Use of appropriate customer service strategies

Table 4: Working with people skills IT graduates believe are required for their work

Mismanagement of clients reflects poorly on not just the outcomes of a project but also on the graduate's performance. While flexibility is essential, graduates need to be conscious of a project's resources and constraints and work towards meeting the project timelines. They require good negotiation skills to resolve in a professional manner, any conflicts or problems that might arise within their team or with their clients. They need good risk management skills by thinking ahead about project activities and their workload so as to identify and manage any issues/risks that are likely to arise. This ability to foresee potential conflicts and arrive at proactive strategies to avoid conflicts or manage conflicts if they have already occurred is essential. This is a major challenge.

> *When two teams are arguing about scope ownership I am the one who needs to arrange compromise and agreement and ensure all parties are happy ... very difficult to do…*[Typical comment, in this case from a Female in an IT department of a Government department]

Working across Cultures

IT projects involve multinational, and frequently, global teams or clients. As different cultures may have different values and beliefs, cultural complexity often arises. Cultural awareness and communication are strongly related skills as shown in Table 5. Graduates' work may require communication with a variety of people from different departmental groups with different cultures within their own organisation both locally and overseas or with other organisations. Graduates have to take extreme care in composing all communication including email messages to deliver their message in a simple, clear, professional and timely manner. They need these communication skills, time management and cultural awareness to manage projects, especially those involving international clients from different cultures (Oliver *et al*, 2007; Nagarajan and Edwards, 2008).

Major Category	Sub Categories	Detailed Categories
Working across cultures	Ability to work with people from different cultures	Ability to work with people from different work culture (business, IT, international and interstate offices)
		Ability to work with international people from different work culture
		Cultural communication style (choice of correct writing style)
	Awareness of cultural barriers	Being aware of language issues and local customs when working on international sites
		Language barriers

Table 5: Working across culture skills IT graduates believe are required for their work

Project Management

Most IT graduates work on projects of varying size and duration. To complete such projects successfully, they need good communication, time management, teamwork and people management skills as well as additional skills to manage scope, cost, resources and risks (Table 6). IT projects in industry are complex. IT graduates need to understand the big picture for themselves and the team so they are able to recognise and forecast future risks and problems and plan projects accordingly. Graduates hold responsible positions and, in addition to compliance and overall adherence to company policies and procedures, are accountable for their actions and decisions and those of their teams as well as the company's reputation. This was considerably more demanding for the graduates than the projects undertaken during their studies.

Problems they face include purely technical problems, pure business or operational problems or problems that involve both technical and business issues. Solution requires understanding the problem and any underlying conditions. Problem reporting or communicating with all the stakeholders about the status of the problem and how it is being managed is seen as important. Problems are logged, lessons are learned and solutions proposed are used when similar problem situation arose in the future. Many graduates recalled how their university experiences are different from work experiences. At university, graduates are solely responsible for the work and management of problems. However, at work, they are able to seek support and advice from their peers while resolving any problems.

Major Category	Sub Categories	Detailed Categories
Project management	Managing processes in projects	Change management
		Quality assurance
		Research and information management
		Infrastructure management
	Managing project constraints	Scope management
		Resources management
		Cost and time management
	People related project management issues	Work delegation
		Job competency (analysis, research, logical, economical)
		Communication management
	Use of creative design skills in product and documentation development	
	Understanding the big picture and complexity of IT projects	
	Risk Management	Managing risk issues in work processes
		Managing product related risks
	Adherence to standards	Compliance and work accountability
	Problem solving	Following company procedures while handling problems
		Use or development of appropriate problem solving strategies

Table 6: Project management skills IT graduates believe are required for their work

Business Skills

Graduates need good knowledge of relevant organisational procedures and business needs (Table 7). A way of acquiring insight into the organisational culture and understanding of organisational policies, procedures and overall work hierarchies is to develop professional networking skills to connect with other staff members.

Understanding products and services relevant to the business is essential for promotion and troubleshooting. When dealing with new and unexpected problems or when they are overwhelmed with information, graduates turn to experts or senior colleagues at work for their advice. Graduates sometimes need to engage technical experts in projects to assist with product or systems development. All these interactions call for leadership and research skills.

Personal Attributes

Graduates quickly discover that what they learn at university does not always translate directly to their workplace requirements. They need to constantly update their skills and knowledge. Attributes, which may have been developed at university, such as adaptability, self-confidence, self-assessment, work enthusiasm and the ability to learn from mistakes, need enhancement once

Major Category	Sub Categories	Detailed Categories
Business Skills	Knowledge of organisational procedures	Understanding management style and work procedures
		Product knowledge
	Understanding business needs	Business knowledge
		Promotion skills
		Business analysis
		Business representation
	Marketing Skills	Ability to promote products, ideas and services
		Understanding the importance of marketing and stakeholder relationships
	Leadership skills	Understanding team dynamics
		Performance appraisal skills
	Information Management	Information gathering skills
		Information processing skills

Table 7: Business skills IT graduates believe are required for their work

the graduate is working (Table 8). Having the ability to assess one's own performance and being aware of one's strengths and weaknesses is particularly relevant when it comes to handling positive as well as negative feedback from peers and superiors at work. The ability to demonstrate confidence in one's message in high-pressure situations is needed. Many graduates are required to work long hours and show commitment to their job by demonstrating enthusiasm and passion. This can favourably draw the attention of peers and managers. However, many IT graduates face new and unexpected situations and as a result commit mistakes. While managers expect this of novices, it is important to make sure that lessons are learned and they are not repeated.

Major Category	Sub Categories	Detailed Categories
Personal attributes	Adaptability	Adapting to dynamic work requirements
	Self-assessment	Ability to assess one's strengths and weakness
		Emotional intelligence
	Self-confidence	Ability to confidently conduct oneself
	Work enthusiasm and ethics	Passion/enthusiasm for the job
		Work ethic
	Ability to learn from mistakes	Experiential learning
		Ability to develop new skills

Table 8: Personal attributes IT graduates believe are required for their work

3.2 Sources of Professional Skills for IT Graduates

In the second part of the interview and survey, graduates discussed how and where they developed their skills. They listed a variety of sources such as vocational short courses, previous careers, previous work experience either part-time or fulltime, IT-related or non-IT related jobs, family and

social networks, friends and overseas travel, extracurricular activities, hobbies and pastimes, life experiences and mentoring as well as formal university study. The graduates in the study believe that they developed the professional skills they needed for work from many of these sources, just one of which is university study. The most useful part of their IT degrees when they first commenced work were work placement and real-life like project work. However, the development of a professional skill is an ongoing and continuous process. One graduate said,

> *This is not a simple question. The very nature of non-technical skills means that often you cannot point to a single point in time where you did not have a particular skill, and then point to a later point in time where you had become skilled. As human beings, the non-technical skills we require at work are often the same non-technical skills that we would have if we never worked and are those that we simply require in order to function in any given society or community. The way in which we develop a skill – which is not always necessarily "development" in terms of "growth", but may actually be "development" in terms of "tailoring" the skill to a particular application – is the differentiating factor.* [Female in a large company]

3.3 Challenges IT Graduates believe they face at Workplaces

IT graduates face many challenges at their workplaces. Some were discussed in previous sections. Additionally:

a) *Ability to "sell" ideas:* It is difficult for some graduates to speak out about their innovative ideas. They need a tactical approach to present their ideas to the superiors but are unsure about the reactions they might draw from their immediate managers and peers.

b) *Seniority and hierarchy:* Graduates need to be aware of the age differences amongst their peers and also be cautious while interacting with senior and more experienced people at different levels of the hierarchical relationships at work.

> *So coming from uni where you worked with people around your age, going to work with, usually you're the youngest in your team and you're working with people who are maybe 10, 20 or 30, 40 or 50 years older than you. So just trying to know how to communicate with them is probably something else to get used to as well.* [Male in an IT department of a Bank]

c) *Customer service:* The challenges in this category are to overcome language barriers, provide flexibility to customers, be able to extract information from clients in a timely manner and to be patient and empathetic to all customers.

d) *Gender domination:* As discussed above in 3.1, the IT industry is male dominated and some discrimination based on gender has been reported. It is necessary at times for graduates to be aware of their roles and the gender imbalances surrounding their work environment.

> *… it is very male-dominated … it is probably not impacting on how well you can deliver or perform but just in terms of your social networking skills. It influences, I guess, your approach to how you socialise. It is not really the work that you do but then the social environment at work is very largely a part of your work …* [Female in a large multinational company]

e) *Insufficient induction and limited mentoring:* Those graduates (over half) who were thrown into their jobs with little orientation or mentoring struggled because they were unsure about many things and had to converse with work colleagues in a slow yet impressive way.

f) *Lack of recognition:* Half of the interviewed graduates were frustrated by their employer's lack of recognition of their work which they find de-motivating.

g) *Limiting reaction:* Similarly half of the interviewed graduates found it difficult to keep their emotions in check. They feel they have to be extremely cautious in providing feedback and waiting for the right moment or right place to discuss their opinions in a professional manner. More than half believe that by saying something their manager dislikes they risk their promotional opportunities.

h) *Managing expectations:* Managing expectations of different clients is another challenging task. It is essential for graduates to keep in touch with their clients on a regular basis and provide them with the required status reports so they are able to develop or create effective solutions.

> *I think at work there's lots of expectations and people are being assessed and that affects their career and everyone's a very high achiever and keen to develop and get positive feedback.*
> [Female in a medium-sized company]

i) *Professional development:* Some graduates are interested in professional development but the challenge is to convince their employers to invest in the graduate's professional development activities such as undertaking a part-time master's degree or attending professional development activities.

j) *Professional relationships:* IT graduates find managing the feedback they receive and/or provide on other colleagues' work, relationship management and development of people networking skills quite difficult. Providing or managing formal critical feedback on other colleagues' work is not normally a part of university study.

k) *Trust:* Building trust in employer's minds is a challenge. In addition, once an employer's trust is gained then being able to use it to make correct decisions is essential. Graduates need to be cautious of how they use this concept of trust while representing their organisation.

l) *Learning curve with new systems:* Graduates feel that they have a steep learning curve with new systems, tools and technologies that are used at their workplaces. They are given limited coaching or mentoring.

m) *Coordination of people and resources:* Three quarters of the study graduates were in roles that required them to coordinate people and resources. Determining the resources required for the work to be done, scheduling meetings, coordinating attendance at meetings, venue selection and discussion item development are quite challenging as graduates need to be aware of factors such as personalities, experience, expertise, budget etc.

n) *Reliance on tools:* Graduates must acknowledge that although they have systems and tools in place, for example, project planning, it is essential to expect changes as they are dealing with people. Too much reliance on tools alone is not sufficient for success.

o) *Information gathering:* Some of the challenges in this category include to have the ability to research and locate required information, to cope with information overload, to interact with experts and understand their advice, and update knowledge and skills to work efficiently. More importantly, it is essential to not assume anything.

p) *Ability to learn from mistakes:* Most graduates fear committing mistakes. They think they are under pressure to make sure those mistakes do not recur which is a challenge they need to be conscious of at all times.

q) *Personal attributes:* A further challenge is the ability to adapt to dynamic work requirements quickly and maintain motivation even if not everything is well at work.

4. Summary of Major Findings and Implications

The professional skills development of IT graduates occurs across university, workplace experiences, personal experiences and social contexts, that is, university studies are just one way in which professional skills are developed. A professional skill can be learned from different learning environments and developed or practised in different work environments. Some skills (such as working with international clients in different time zones and from different cultures) are currently developed only outside university studies. The IT graduates who participated in the study did not develop many professional skills from their university studies. However, the development of these skills at university is not impossible and would be a useful addition to the IT curriculum. This raises the following questions:

a) What skills can be taught within university courses?

b) What skills can be developed only outside university?

c) How realistic is it to provide opportunities for students to learn these professional skills from the external world when they are at still at university?

d) For example, could multiple work placements across multiple workplaces during the course of the study be a good approach to develop such professional skills?

So, if university is only one of many players in preparing graduates for overcoming workplace challenges, do IT graduates and IT employers have realistic expectations of universities to prepare work ready graduates? The role of universities, employers, professional associations and graduates themselves in the professional preparation of IT graduates are discussed in Nagarajan (2011).

There are implications for the graduate attributes approach currently used by many Australian universities. Barrie (2004) argues that graduate attributes are not generic graduate attributes as they are a specialised and differentiated form of understanding generic abilities, which are developed to meet the needs of a specific discipline or field of knowledge. In spite of the significance for IT graduates of cultural awareness and the ability to work with different cultures, there is little reference to the development of these skills in the current graduate attributes of many universities. Even where such an attribute, often expressed as "global citizen", is listed, there is no assurance that such skills are translated into learning and assessment resources. Graduate attributes frameworks for IT graduates need to be reviewed for specific professional skills for the IT profession. This is discussed in detail in Nagarajan (2011).

5. Conclusion and Future Work

Our current understanding of IT graduates and their non-technical work experiences during the early years of work is inadequate for identifying the source of some of the problems discussed in the literature/anecdotal evidence as well as dealing with the challenges posed by the mismatch in employer expectations of graduates and graduate skills. Further, many of the challenges described in this paper are applicable to all new graduates in professional positions. Nagarajan (2011) describes the role employers could play in assisting new graduates cope with such challenging work situations.

It is clear from the study's findings (Nagarajan, 2011) that the development of IT graduates' professional skills is a distributed responsibility and different stakeholders (such as professional faculties at universities, employers, professional associations and graduates themselves) have different contributions to make to the development of these skills. Further, this approach will be successful

only when each of the stakeholders accepts its responsibilities and cooperates with the others. By looking through the lens of new IT graduates in the industry, this study has made a step forward in assisting IT employers and university course designers to identify and understand those factors/issues that are important for IT graduates in their early professional workplaces. International researchers are encouraged to collaborate and share their findings to reflect on broader issues that may address the professional skill requirements of IT professional practice around the globe and use these as evidence to assist with the preparation of work ready IT graduates and the development of appropriate employer support programs for professional development of IT graduates.

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Appendix

Table 1a: Profile of participants: Education, Experience and Responsibilities

Participant	Location/Data collection	Participant background	IT Work experience	Responsibilities/work areas
1	Sydney NSW (Interviewed)	Bachelor of Science degree in IT from a Sydney University	< three years	Web design, marketing and coordination of web based campaigns, sales of IT services and products and solutions
2	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	< three years	Professional services to telecommunication companies, technical and strategic solutions, advisory role, training
3	Sydney NSW (Interviewed)	Bachelor degree in Software Engineering from a Sydney University	< three years	Business analysis, client management, training in a consulting firm
4	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	< three years	Software development, systems integration, network management, business reporting, support marketing of IT services and solutions
5	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	< three years	In a two year graduate program. Currently doing IT auditing of internal company systems, previously in business analysis, architecture, design, programming and testing roles
6	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	< three years	Network administration, hardware replacement, team member in a networking company
7	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	> three years	Applications development, programming roles during the first three years of IT work
8	ACT (Interviewed)	Bachelor degree in IT from a regional NSW University	< three years	Systems development, database administration, systems testing
9	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	< one year	IT support, troubleshooting, network management role in an academic institution
10	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	< three years	Team leader for software development team, project management, testing, support, defect management
11	Sydney NSW (Interviewed)	Bachelor degree in IT from a Sydney University	< three years	Business rules, system navigation and flow, legal & regulatory requirements, customer experience requirements, and controls

Continued on following page

12	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	1 year	Customer support role
13	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	3 years	Security compliance functions
14	VIC (Surveyed online)	Bachelor degree in IT or related discipline from VIC	1 year	Programming and database administration
15	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	2 years	Network administration and management
16	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	2 years	Business analysis and project management
17	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	1 year	Database administration, report generation IT audit
18	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	1 year	IT / Network Security - Ensuring phishing sites targeting are disabled, reverse engineering malware, predicting future malware threats and improving online collaborative environment for large decentralised team
19	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	2 years	Project manager, business analyst and developer for 4 small automation projects
20	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	2 years	Database administrator, system administrator and general support
21	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	2 years	Business analysis – risk mitigation, requirements determination, business process redesign, facilitate interviews/meetings

22	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	2 years	IT project manager, develop computer solutions for business processes, assist in the development of strategies that demonstrate best practice, change management and communication, liaise with users to assist with business and system related issues, project manage the implementation of applications, overall IT project testing, implementation and maintenance
23	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	1 year	Website design and development
24	NSW (Surveyed online)	Bachelor degree in IT or related discipline from NSW	2 years	Quality assurance, software testing, team leader

Table 1b: Profile of the interviewed participants: Gender and Organisation Characteristics

Participant	Gender	Organisation Size	Organisation Characteristics
1	Female	Medium	Multinational, Consulting
2	Female	Large	Multinational, Consulting
3	Male	Large	Multinational, Consulting
4	Male	Medium	Multinational, Software Development
5	Male	Large	Australian Banking Sector
6	Male	Large	Multinational, Network Management
7	Male	Small	Australian small sized, Software Development
8	Female	Medium	Australian Government Agency
9	Male	Small	Australian Education Sector
10	Female	Large	Multinational, Consulting and Software Development
11	Female	Large	Multinational, Consulting and Software Development

Biographical Notes

Dr Srivalli Nagarajan is a postdoctoral research associate in the Work Integrated Learning portfolio at the Faculty of Health Sciences, the University of Sydney. Her research interests are: work readiness expectations of employers, universities and graduates and alignment of university curricula with industry needs. Her doctoral work investigated the professional work experiences of recent IT graduates in practice to understand the relevance of their university studies to work. It examined the role of universities, employers, professional associations and the graduates themselves in the preparation of IT graduates for the workplace. She has presented her research in national and international conferences.

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Jenny Edwards is a professor of Information Technology at UTS. She is a fellow of the Australian Computer Society and the Australian Learning and Teaching Council. She has had many years of experience with industrial training students, graduate placement and work integrated learning. She is active in many OLT grants and projects in these fields and in curriculum design, ACS accreditations and Faculty reviews.

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