PROFESSIONAL WORK EXPERIENCES OF RECENT AUSTRALIAN INFORMATION TECHNOLOGY GRADUATES

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presented to the University of Technology, Sydney
in partial fulfilment of the
requirement for the degree of

Doctor of Education

UNIVERSITY OF TECHNOLOGY SYDNEY

Faculty of Arts and Social Sciences
2011
CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not been previously submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

___________________________________________

Signature of Student
ACKNOWLEDGEMENTS

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Finally, I would like to thank UTS for providing me with the best facilities and a pleasant environment during my study.
ABSTRACT

There is an increasing expectation amongst students and employers in professional fields such as Information Technology (IT) that university studies will provide sufficient skills to enable graduates to find employment in the industry. However, little research, particularly in the IT field, has been carried out in following graduates into their professional practice. The professional work experiences of recent Australian IT graduates are the focus of this thesis. Professional work experiences are defined in this thesis 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. 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 are investigated in this study. An understanding of what the professional work experiences of recent Information Technology graduates in professional practice tell us about their university studies is sought by this thesis. Then the role of universities, employers, professional associations and graduates themselves in the professional preparation of IT graduates are examined.

Some key ideas from grounded theory (theoretical sampling, constant comparison, theoretical saturation, open coding, axial coding and selective coding) are used for data collection and analysis. Interviews and qualitative online surveys are the research methods used to capture recent Australian IT graduates’ professional work experiences.

It is shown in this research that IT graduates face a number of challenges when they first enter employment. Major categories of professional skills that IT graduates believe they require for their work are communication, time management, teamwork, working with people, working across cultures, project management, business skills and personal attributes. The study found that graduates’ professional skills are developed in multiple ways including academic, social, personal, professional and other work experiences or a combination of these. IT graduates in the study believe the most useful components of their
university studies are work placements and “real life like” projects. The perceived lack of preparation of IT graduates to face new, unfamiliar, unknown or unknowable situations is highlighted by the study. The findings demonstrate the complexity involved in the development of professional skills, how and where they are developed and who (university or employers or graduates) assumes responsibility for their development. Other findings suggest that some professional skills can be developed only outside the university studies.

Accordingly, it is argued in this thesis that the development of professional skills is a distributed responsibility and different players (professional faculties, employers, professional associations and graduates) have different contributions to make to the development of these skills. It is proposed that universities cannot be solely responsible for developing work ready IT graduates. It is suggested that universities take responsibility for preparing graduates to learn how to learn in uncertain situations, assisting with the graduates’ development of knowledge and awareness of work environments and helping in the graduates’ development of initial job expectations. It is argued that IT faculties need frameworks beyond graduate attributes in their degrees for the development and inclusion of specific professional skills for the IT profession; Employers should move away from thinking that adding topics to the IT curriculum would solve all their concerns about the lack of professional work skills in IT graduates and it is suggested that they take responsibility for training graduates when they commence work, facilitating workplace learning, increasing workplace socialisation and working with universities to provide work placement opportunities for students. It is urged that graduates to take personal responsibility for developing their professional skills both within and outside university studies. It is proposed that professional associations take responsibility for increasing IT students’ exposure to the IT industry through scholarships, research and job ready programs.

Given the results of this research and its recommendations, there is a need to raise the issue of the management of expectations of employers, universities and graduates of each other. It is clear that these may need to change before employer and academic concerns about skills of new IT graduates can be addressed.
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<td>ALTC</td>
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<tr>
<td>ABET</td>
<td>Accreditation Board for Engineering and Technology (USA)</td>
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<td>ACDICT</td>
<td>Australian Council of Deans for Information and Communication Technology</td>
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<td>ACM</td>
<td>Association of Computing Machinery</td>
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<td>ACS</td>
<td>Australian Computer Society</td>
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<td>ACS CPEP</td>
<td>Australian Computer Society Computer Profession Education Program</td>
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<td>ACS F</td>
<td>Australian Computer Society Foundation</td>
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<td>AIIA</td>
<td>Australian Information Industry Association</td>
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<td>AQF</td>
<td>Australian Qualifications Framework</td>
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<td>AUTC</td>
<td>Australian Universities Teaching Committee</td>
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<td>CBOK</td>
<td>Core Body of Knowledge</td>
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<td>Computing Curricula 1991</td>
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<td>CC2001</td>
<td>Computing Curricula 2001</td>
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<td>DEEWR</td>
<td>Department of Education, Employment and Workplace Relations</td>
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<td>DETYA</td>
<td>Department of Training and Youth Affairs</td>
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<td>HECS</td>
<td>Higher Education Contributory Scheme</td>
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<td>Graduate Skills Assessment</td>
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<td>ICT</td>
<td>Information and Communications Technology</td>
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<td>ICT-Ed</td>
<td>ICT Education</td>
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<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
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<td>IEEE-CS</td>
<td>Computer Society of the Institute of Electrical and Electronics Engineers</td>
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<tr>
<td>IT</td>
<td>Information Technology</td>
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<td>IS</td>
<td>Information Systems</td>
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<td>MIS</td>
<td>Management Information Systems</td>
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<td>NBN</td>
<td>National Broadband Network</td>
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<td>SFIA</td>
<td>Skills Framework for Information Age</td>
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<td>SIGITE</td>
<td>Special Interest Group for Information Technology Education</td>
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<td>SME</td>
<td>Small to Medium Enterprises</td>
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<td>SWOT</td>
<td>Strengths Weakness Opportunities and Threats</td>
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<td>WWW</td>
<td>World Wide Web</td>
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GLOSSARY

Some terms commonly used in this thesis are defined in this Section.

Axial coding: Crosscutting (series of interlinking) or relating concepts to each other. (Corbin and Strauss, 2008)

Categories: High-level concepts under which analysts group lower level concepts according to shared properties (Corbin and Strauss, 2008). In this research, a major category is comprised of one or more low level 1 categories. A Low level 1 category is comprised of one or more low level 2 categories.

Coding: Deriving and developing concepts from data (Corbin and Strauss, 2008)

Concepts: Words that stand for groups or classes of objects, events and actions that share some major common property(ies) though the property(ies) can vary dimensionally (Corbin and Strauss, 2008)

Constant comparison: The analytic process of comparing different pieces of data for similarities and differences (Corbin and Strauss, 2008)

Core category: A representation of the main theme of the research. It is the concept all other concepts will be related to. (Corbin and Strauss, 2008)

Data analysis: The examination of a substance (or system) and its components in order to determine their properties and functions, then the use of the acquired knowledge to make inferences about the whole. (Corbin and Strauss, 2008)

Deductive analysis: An analytic approach that uses a framework created and decided before the investigation (Reid, 2006)
Diagrams: Visual devices that depict relationships between analytic concepts (Corbin and Strauss, 2008)

Dimensions: Variations within properties that give specificity and range to concepts (Corbin and Strauss, 2008)

Employability Skills: Skills required not only to gain employment but also to progress within an enterprise so as to achieve one’s potential and contribute successfully to enterprise strategic directions (Business Council of Australia (BCA) and Australian Chamber of Commerce and Industry (ACCI), 2002)

Forcing: Act of forcing pre-existing or pre conceived ideas on the data by looking for evidence to support established ideas (Glaser and Strauss, 1967).

Generic skills: Non-technical skills such as communication skills, time management skills, teamwork skills, etc.. Also referred to as soft skills or non-technical skills, graduate attributes.

Grounded theory: A specific methodology developed by Glaser and Strauss (1967) for the purpose of building theory from data. (Corbin and Strauss, 2008)

Grounded theory (as defined by Glaser) “Grounded theory data analysis is the “generation of emergent conceptualisations into integrated patterns, which are denoted by categories and their properties ….. woven together by the constant comparison process which is designed to generate concepts from all the data” (Glaser, 2002 p. 1)

Grounded theory (as defined by Strauss and Corbin) ".....inductively derived from the study of the phenomenon it represents. That is, it is discovered, developed and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon. Therefore, data collection, analysis and theory stand in reciprocal relationship with each other." (Strauss and Corbin, 1990)

Inductive analysis: An analytic approach where theory is generated from observations (Reid, 2006)
**Memos**: Written records of analysis (Corbin and Strauss, 2008)

**Open coding**: The breaking apart of data and then the delineation of concepts to stand for (or represent) blocks of raw data (Corbin and Strauss, 2008)

**Phenomena**: Ideas that emerge from data that answer the question “What is going on here?” (Corbin and Strauss, 2008)

**Professional skills**: Professional skills refer to skills such as communication, teamwork, etc., i.e. non-technical skills.

**Professional work experiences**: Professional work experiences are non-technical work experiences that include all parts of graduates’ work that does not involve specific Information Technology activities. Experiences directly linked with Information Technology work activities may include tasks such as programming, database administration, computer security, systems analysis and design, etc. A non-technical experience includes tasks such as communicating ideas and information, working with others and in teams, etc.

**Properties**: Characteristics that define and describe concepts (Corbin and Strauss, 2008)

**Sandwich courses**: Sandwich degree courses offer six months or a year of work placement (with an employer in the relevant field of study).

**Saturation**: Saturation occurs when no new data are emerging from analysis. It also denotes the development of categories in terms of their properties and dimensions, including variation, and, if theory building, the delineating of relationships between concepts. (Corbin and Strauss, 2008)

**Selective coding**: The process of establishing links between the core category and other categories, integrating categories along the dimensional level to form a theory and validating the statements of relationship among concepts (Strauss and Corbin, 1998)
**Theme:** The common meaning or an idea that runs through most of the data or a minority idea that captures a particular emotion or factual idea.

**Theoretical coding:** The process of conceptualising how categories and properties may relate to each other as hypotheses to be integrated into a theory (Glaser, 1978)

**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 (Corbin and Strauss, 2008)

**Theoretical saturation:** The point in analysis when all categories are well developed in terms of properties, dimensions and variations. Further data gathering and analysis adds little new to the conceptualisation, though variations can always be discovered. (Corbin and Strauss, 2008)

**Theoretical sensitivity:** The ability to pick up on subtle nuances and cues in the data that infer or point to something (Corbin and Strauss, 2008)

**Work integrated learning:** According to Patrick et al. (2009), work integrated learning includes a “range of approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum”. The ACDICT and ACS industry forum (2010) states that the main purpose of work integrated learning is to include professional experience, employability and job ready skills for all ICT students using a combination of external models (industry-based work experiences such as placements and internships) and internal models (university-based experiences such as project work, case studies and simulated or virtual opportunities).

**Work ready skills:** Work ready skills include communication, ethics and professionalism, global and local perspectives, information literacy and management, initiative, enterprise and creativity, planning and organising, problem solving and critical thinking, research, self-management and life-long learning, teamwork and leadership and technology literacy (Litchfield and Nettleton, 2008)
CHAPTER 1 INTRODUCTION

1.0 Research background

The importance of being able to produce university graduates ready to be employed in order to meet rapidly changing business and employer needs is growing. It is becoming a major part of research on understanding the relevance of higher education to work. A number of authors have studied this relationship and the associated transition from study to work life.¹

Johnston (2003) states more research is essential to understanding the relationship between (a) higher education and work (working conditions and culture) and between (b) employers’ explicit expectations and graduates’ expectations of work experiences particularly in the early employment years. Dahlgren et al. (2006) state that there is sparse knowledge about how graduates construe themselves as professionals or how they experience transition. According to Dahlgren et al., 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. Teichler (2007) says,

> information on the relationship between higher education and the world of work is far from satisfactory (Paul, Teichler and van der Velden, 2000). It is amazing to note the scarcity of the sources of information on a topic that is so high on the agenda in public debates.

While there is in the literature, a focus on academic, employer and professional associations’ perspectives of Information Technology (IT) graduates (ACS 2005a-2005d; O’Keefe, 2006), little exists on understanding graduate perspectives of their work experiences or how graduates relate their courses of study to their work experiences or use

¹ Brennan, Kogan and Teichler (1996); Kaufman and Feldman (2004); Rogers and Mentkowski (2004); Dahlgren, Hult, Dahlgren, Härd af Segerstad and Johansson (2006); Allen and van der Velden (2008); Little (2008).
the skills and knowledge they acquire from their studies at workplaces, especially during the early employment years. However, there has been an increasing interest in recent years in developing work ready IT graduates (Nettleton, Litchfield and Taylor, 2008; ACS, 2008g; ACS F, 2009; Koppi, Edwards, Sheard, Naghdy and Brookes, 2010). Begel and Simon (2008) call for increased research on computer science professional novices. From a study conducted at Microsoft, they suggest that many of the problems faced by professional software novices were directly attributed to poor communication skills and social naïveté.

### 1.1 Research on graduate skills

It is suggested in the literature that graduates from all disciplines are lacking in job skills and are ill prepared for real work situations.² The findings in a Department of Education, Training and Youth Affairs (DETYA) report on Employer Satisfaction with Graduate Skills by AC Nielsen Research Services (2000) were:

(a) The greatest skill deficiencies in new graduates were perceived to be in the areas of – creativity and flair, oral business communications and problem solving;

(b) Skill deficiencies commonly cited by employers were the lack of communication skills, interpersonal skills and understanding of business practice; and

(c) Large businesses rated new graduate performance better than small businesses did (although large businesses may attract better students or provide more orientation or training).

O’Keefe (2006) surveyed businesses in Australia and New Zealand and found that employers value good communication and people skills above academic qualifications and work experience. Similarly, the findings in the Graduate Careers Australia (2006) survey were that more than half (57.5%) of the 127 respondents wanted good interpersonal and communications skills in job applicants whereas 35% rated academic qualifications the most important. Four out of ten employers told Graduate Careers Australia they would not hire applicants who did not have good communication skills. Other authors have also

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² AC Nielsen Research Services (2000); Australian Chamber of Commerce and Industry (2002); Hagan (2004); Snoke (2004); Maiden and Kerr (2006); Business Council of Australia (2006)
discussed the increasing importance of soft or generic skills and specifically employer dissatisfaction with the soft skills of IT graduates.³

According to Wong, von Hellens and Orr (2006), non-technical skills and personal attributes such as teamwork, communication skills, integrity, reliability and self-motivation are considered more important than purely technical skills in IT graduates. They also found that 78% of jobs advertised for IT graduates specified non-technical skills, which were rated more highly than all the other skills. There was a general consensus in both job advertisements and employer questionnaires that non-technical or soft skills are more important for graduates than technical skills in terms of employment prospects.

Other researchers, for example, Scholarios, van der Schoot and van der Heijden (2004) and Bradley, Noonan, Nugent and Scales (2008) analysed business and industry perspectives of graduate skills and found that technical skills were as equally important as the generic employability skills. Bradley et al. encourage universities to work closely with employers to provide industry relevant university curricula. However, Petersen, Revill, Ward and Wehmeyer (2004) state that employers do not always present a clear indication of the graduate skills they are seeking.

1.2 Research on relevance of curriculum to industry needs

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, 2009a). 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;

³ 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).
• 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.

In this ALTC (2009a) 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. The relationship between universities and the ICT industry must be improved to identify clearly the skills industry requires of graduates. Further, it is noted that there is a lack of information from graduates in the ICT industry about the relevance of university curricula to their work. The major criticism from the ICT graduates surveyed in this ALTC project was the lack of association with industry and real world experiences in their university courses.

The focus of another recent ALTC project (2009b), *Addressing ICT curriculum recommendations from surveys of academics, workplace graduates and employers*, is the lack of industry involvement with university curricula and the benefits of integrating work experiences into the curriculum.

Billett (2000) looks at the gap between the requirements of the workplace and the ability of educational institutions to meet these requirements and the subsequent effect there might be on work performance. Such gaps between graduate perceptions of university preparation and industry requirements are identified by some studies that surveyed recent IT graduates (Yen, Chen, Lee and Koh, 2003; Sumner and Yager, 2008). These gaps have major implications for many (the workforce, profession, employers and universities). The need to close the gaps by having ongoing consultation between academics and employers is important. However, the fast changing and complex nature of IT means that employer
expectations of universities to prepare graduates to suit their needs may well be overly demanding, unrealistic and unjustified.

More research is needed to find out why this mismatch seems to be present and what kinds of issues may be the source(s) of this mismatch.

1.3 Focus on graduate perspectives

Insights, of interest to the whole higher education community, are provided into understanding the transition of graduates from university to the workplace by research that pays attention to graduate perceptions of the practical relevance of their courses or the development of knowledge and skills applicable to their work experiences (Richardson and Kabanoff, 2003; Dahlgren et al., 2006).

Literature exists in which tips and strategies for landing a first job, graduate expectations of employers and coping with initial employment challenges are covered. However, there has been minimal focus on describing the work experience itself once graduates have actually begun working. Some researchers have surveyed graduates and have captured the feelings, frustration and challenges of the experiences from an individual graduate's perspective. The ICT-Ed (ICT-Education) projects were concerned with graduates' perspectives of university courses and employer attitudes towards ICT education (AUTC, 2001; Hurst and Lynch, 2001). 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.

Understanding this issue from the graduates’ perspective and trying to address it by incorporating appropriate material into the curriculum is one of many options to develop work ready graduates. However, it is essential to note that some graduate perspectives such as their impressions of difficulties and challenges at work may arise from a lack of understanding of the workplace and other related issues.
1.4 IT stakeholder expectations

Employer concerns with IT graduate skills as discussed in Section 1.1, often imply problems with university IT curricula. However, not all the deficiencies may reside in the universities. It is possible that the real issue lies in a mismatch of expectations between universities and employers. A detailed literature review of this issue is presented in Chapter 2.

A lack of strong links and ongoing conversations between academics and IT professionals may be a source of this mismatch. What is required from an IT graduate from a tertiary course can vary from one employer to another due to different workplace requirements. Most Australian university IT degree programs meet the Australian Computer Society’s (ACS) accreditation criteria which include some alignment between industry requirements and the curriculum. Despite such efforts, the result is not always satisfactory. The time between course accreditation and re-accreditation is normally 5 years. This may introduce some level of discrepancy in the currency of attributes expected of an IT graduate by the IT industry, IT professional associations and what is delivered via university programs of study.

Major challenges to be faced by universities and the IT industry include:

- Constantly changing workforce requirements (virtual, onsite, off-site, multinational);
- Constantly changing technical skills (new technologies, new techniques, new ways of developing systems);
- The lack of adequate coverage within the curriculum of soft or non-technical skills needed by IT graduates;
- The lack of adequate coverage of specific technical skills that are relevant to specific work contexts (that is skills that are not generic); and
- Limited or lack of work experience or real work like opportunities for all students.
The result can be poorly prepared IT graduates who struggle to gain employment or stay in employment. The question as to whether or not the expectations of employers are realistic in relation to the skills of new IT graduates is highlighted by this issue.

1.5 Research problem

For many IT students, one of the main objectives of studying at university is to prepare for employment in the IT workforce. The concept of how well a university prepares its graduates to take up the challenges of the workplace and meet the needs of industry has been widely debated. There are suggestions in the literature (as we have seen in Section 1.1) that this is not always achieved. Several factors may be relevant, two of which are:

- Inadequate preparation of graduates for real work situations; and
- A mismatch in expectations (amongst students, employers, universities).

To address these issues, a better understanding of the employer, academic, professional association and graduate perspectives on the professional skill requirements of IT workplaces is needed. Hence, in this research, the professional workplace experiences (defined formally in Chapter 2, Section 2.3) of recent Australian IT graduates are analysed and described. The aim is to derive meaning from such experiences and to develop a rich conceptual description of the relationship between graduates’ lived professional workplace experiences and their university studies. This research is informed by the traditions of the grounded theory.

1.5.1 Research question

The main research question in this thesis is:

What do the professional work experiences of recent Information Technology graduates in practice tell us about their preparation for the profession?

First, it is essential to determine what IT graduates believe are the professional skill requirements of their work and the challenges they face at work. Second, it is necessary to associate these professional skills with the sources that assist graduates with acquiring or
developing these professional skills. Third, an understanding of the useful elements of their university courses that contribute towards fulfilling the professional skills requirements of graduates’ practice is required. Then, an overall understanding is needed of how well graduates’ believe their university studies prepare them to meet the needs of their professional practice. Finally, it is important to examine the role and responsibilities of individual stakeholders (professional faculties at universities, employers, professional associations and graduates themselves) in the professional preparation of IT graduates.

1.5.2 Research domain

The research domain involves three elements of study. They are

- **University** (academics, students, courses of study);
- **Profession** (IT industry and professional associations); and
- **Workplace** (professional practice sites).

The area of analysis, the intersection of these three elements, is shown in Figure 1.1.

1.6 Research motivation

The motivation for this research came from my personal experience as a lecturer in Information Technology during 2000-2005. I noticed that IT students I taught (both in vocational diplomas and Bachelor’s degrees) struggled to acquire graduate employment despite good technical skills. During my interaction with the students, fellow academics at the workplace and recruitment agencies, several issues in relation to IT graduate skills came to light. These primarily pointed to a lack of soft or non-technical or generic skills. Through a series of observations, informal interviews with students, staff, professional association representatives and recruitment agencies representing IT employers, I gained further insight into the IT industry’s concerns about graduate skills. While employers were concerned about the lack of soft skills of new graduates and skill shortages in the sector, students and staff were concerned about the difficulties faced by young IT graduates in securing employment in the Australian workforce.
These concerns were supported by considerable anecdotal evidence and some literature (ACS, 2005a-2005d). The indications are that graduates struggle during their initial employment years, change jobs often, do not have the right technical skills needed by the industry, are not able to communicate effectively or work in teams, and have poor ethical, professional and social skills. It was difficult to substantiate the claim that there were deficiencies with the university education these graduates received before seeking employment, if this claim were based only on anecdotal evidence. I realised that more systematic research was required to explore and understand the sources of the problem, so that new initiatives could bridge the gap between the expectations of the IT industry and the education provided to students at tertiary institutions. The lack of systematic research in this area and the magnitude of the problem were the two most significant factors that motivated me to conduct research in this direction. Additionally, there was the potential for such research to contribute to both the profession and the workplace.
1.7 Significance of this research

Understanding and studying the lived experiences of IT graduates at work has not been given the attention it deserves. The research findings have specific implications for IT academics, students, graduates and employer groups and some general implications for the whole higher education sector.

The following groups should benefit from this research:

**IT students/graduates** – Insights will be provided into the kind of issues and challenges graduates face when they commence employment post graduation by this study of professional work experiences of recent IT graduates into their professional practice. Current students will be informed about the professional skills that IT graduates in practice believe are required for work. IT students can gain some understanding of how graduates in the industry cope with practical situations. IT students will appreciate the importance and usefulness of certain elements of IT courses of study (such as work experience or project work) in terms of their contribution towards the development of professional skills IT graduates need for their practice.

**IT academics** – IT academics will be better informed of graduate perspectives of what IT graduates actually do at their workplaces, the challenges graduates encounter when they commence work, elements of study that graduates believe assist with work requirements and graduates’ reaction to university preparation for the workforce. IT academics will be encouraged to have ongoing collaboration and conversations with industry and past graduates in the workforce to align IT curricula to industry and graduate needs. Hence there are also implications for curriculum design, development and assessment.

**Universities** – Universities will be assisted by lived experiences of graduates at work to understand what experiences and opportunities need to be provided for graduates while they are at university so as to enable graduates to develop some of the professional skills they will need for their work. The study findings are relevant to improving student learning experiences, maximising and using diversity in university environments to develop social
and cultural skills of graduates and strengthening relationships with industry both within and outside Australia for better alignment of curricula with industry needs.

**IT Industry** - Employer groups will gain a better understanding of some of the challenges that IT graduates face at workplaces (from graduates’ viewpoints). Employers will understand the importance of becoming involved in curriculum development, working closely with universities and supporting initiatives such as work placements, internships and capstone projects to prepare work ready graduates. Employers informed by perspectives from graduates can develop appropriate induction and mentoring programs tailored to an individual organisation and graduates’ needs, particularly, during the initial few years of employment. Given the study findings and conclusions, employers will also be able to reflect on their own expectations of the professional skills of new IT graduates.

An overview of the thesis is presented in the next Section.

### 1.8 Thesis overview

The V Model is a useful graphical display technique to present levels of abstraction against time (Sheffield, 2004a; Sheffield, 2004b; Reid, 2006) and for testing the relationship between intentions and outcomes. Therefore, the thesis structure was developed using this model, as shown in Figure 1.2. Higher levels of abstraction (such as the literature review and discussion of the findings) are represented in the top levels and the lower levels of abstraction (research methodology and data analysis and findings) in the bottom levels. Reid (2006) combines Sheffield’s approach with the principles of Habermas’ theory of communicative action (Habermas, 2000) by incorporating ‘Why?’ ‘What?’ and ‘How?’ questions at the three levels indicated in Figure 1.2. A similar approach has been applied to the organisation of this thesis.
This thesis is presented in seven chapters. In Chapter One, an introduction to the research area along with some background information about the research problem is provided. Then, the motivation for this research and its significance and benefits are highlighted. The structure and overview of the thesis along with a summary of each chapter form the conclusion.

In Chapter Two there is an initial literature review covering an overview of the IT profession, employer, academic and professional association perspectives in relation to the development of professional skills of IT graduates. Some literature on the transition of graduates from university to workplace is also given followed by some major issues for Information Technology education. In addition to the outline in Chapter 1, further information to support the focus of this research and a justification for why the focus of this research is the professional skills and work experiences of Information Technology graduates is given. Then, the major research question and the related sub research questions are presented. A similar literature review is carried out again in Chapter 6 following the presentation and discussion of the research findings in Chapters 4 and 5. Hence, the link between point 2 (Chapter 2) and point 5 (Chapter 6) in the V model.
In Chapter Three, the process used in determining the methodology and methods for this research is discussed. The justification for using ideas from grounded theory is given. Two different grounded theory approaches are discussed along with a description of the evolution of grounded theory, followed by a rationale for why ideas from Strauss and Corbin’s approach have been used in this study. Other procedures associated with the study such as participant recruitment, their selection criteria, ethical considerations, interview and online survey design and implementation are described. Lincoln and Guba’s (1985) criteria are used to establish the trustworthiness of this research. Finally, the data analysis procedures used in the three phases of open coding, axial coding and selective coding are detailed along with an overview of the themes and the main research issue or core category that emerged in this study.

In Chapter Four, the findings from theme 1- Professional skills IT graduates believe they need for their work are analysed. These include findings for all the major issues or categories and the low level categories along with quotes from interviewed and surveyed participants as to what graduates actually do at their workplaces and what professional skills they think they need to perform their roles. From these, relationships between these skill categories are derived.

In Chapter Five, the implications of the research findings presented in Chapter 4 and the initial challenges graduates believe they face at their workplaces are discussed. The findings for theme 2, the varied sources that contributed to the development of professional skills of IT graduates are given along with the discussion of the relationships between them. This leads to theme 3, the most useful aspects of their university studies that IT graduates believe contributed towards their professional skills development. Theme 4 is informed by the challenges IT graduates believe they face at their workplaces. The intertwined complex relationships that exist amongst the issues or categories both within and across themes are explored. This is followed by a discussion on graduate perceptions on the points of difference between the applications of a professional skill at university and in the workplace and some recommendations graduates have for university IT courses. The emergence of the primary concern for all IT graduates and the development of a conceptual framework that arises from the research findings through exploring the relationships between the themes are described.
In the light of the study’s findings in Chapter Six, the argument is made that the development of professional skills is a distributed responsibility and different players (such as professional faculties at universities, employers, professional associations and graduates) can contribute differently. There is a further literature review with a particular focus on the contributions each of the stakeholders could make in the development of professional skills of IT graduates.

In Chapter Seven, the conclusions drawn from the results of this research are presented. The research questions are revisited and some answers provided. This is followed by the contribution of this research to the body of knowledge and the implications of the research findings for the Information Technology profession. The limitations of this research are discussed and some ideas are given for future research directions.
CHAPTER 2 LITERATURE REVIEW

2.0 Chapter overview

The emphasis in this chapter is on research into the preparation of IT graduates for professional practice (as introduced in Chapter 1) and the discussion of relevant literature. The foundations upon which the research questions are framed are laid. Key terms, applicable for this research, such as Information Technology, professional skills and professional work experiences are defined and discussed. There is an extensive discussion of the literature on employer, academic and professional association perspectives of IT graduates and their professional skills. This leads to an examination of the gaps in IT education and general issues related to the transition from education to the workplace. Finally, the research objectives and questions are presented.

2.1 Introduction

Professional faculties in today’s universities are under pressure from employers and, to some extent, society, to produce graduates who can move smoothly into the workplace and develop into expert practitioners in their chosen professional fields. According to Clanchy and Ballard (1995), it is unrealistic for universities to guarantee that their students will graduate in possession of all the desirable generic skills and attributes spelled out in their university’s mission as such a guarantee may leave universities vulnerable to litigation in the most extreme cases. However, they state that universities could guarantee that their students will have opportunities to learn and develop generic skills and abilities during their university studies. Questions then arise about the role that universities play in producing employable graduates.

Universities are portrayed as being both adaptable and enduring institutions that are undergoing a multitude of changes in response to imperatives of neo liberal pragmatism, focussing on learner-worker performance issues (Candy, 2000). McWilliam, Taylor, Thompson, Green, Maxwell, Wildy and Simons (2002) acknowledge that universities, like nations, operate in a complex and volatile environment in the context of a new knowledge-
based economy that is global in its scope and orientation. They believe that investing in knowledge acquisition and development is a crucial issue for Australia and that universities should change to cope with this environment.

Catts (2004) sees the role of professional faculties in universities in contemporary times as twofold: to help students develop lifelong learning skills for their chosen profession and to help students to attain disciplinary or professional knowledge. The role of universities has been widely debated because of the tension between liberal education and the moulding of well-rounded graduates against a more vocational concern of producing (immediately) employable graduates. However, Catts concludes in favour of a more encompassing form of higher education that integrates both liberal and vocational education.

A challenging task for all universities is planning, promoting, developing, delivering and reviewing courses of study with appropriate content to meet the demands of students, professions, and the immediate as well as future needs of industry. For a university IT department, one of the main objectives is to prepare graduates for employment in the IT workforce. However, Hagan (2004), Snoke (2004) and Begel and Simon (2008) suggest that this is not always achieved. As we have seen in Section 1.1, graduates from all disciplines are often lacking in job skills and are not prepared for real work situations.

Employers assess the quality of a university program from the abilities of its graduates at work. They prefer graduates who are productive from the start rather than after a training period. Therefore, the focus within many university programs to address some of the skill shortages prevalent in IT today is seen increasingly as an attraction and advantage by potential students and employers. However, the IT industry is multi-dimensional and simple definitions of the needs of employers are not possible. This has resulted in discussion over many decades as to how to fit graduates to the professional IT workplace. The Australian definitions of the components of Information Technology and descriptions of key stakeholders for IT education are presented in the next Section.
2.2 Australian definition of the term *Information Technology* and key stakeholders for IT education

In 1992, the professional body in Australia, the Australian Computer Society (ACS) defined Information Technology as:

> the development and application of computers and communications-based technologies for processing, presenting and managing data and information (ACS, 1992a)

![Figure 2.1 Scope of Information Technology (Source: ACS (1992b))](image)

In a submission made by ACS to the 1992 Discipline Review of Computing Studies and Information Sciences Education, the term IT was defined further as:
the application of science spanning the application of electronics to
the creation, storage and dissemination of information and non-
technical user involvement, that is, IT is a generic term spanning
activity from Engineering to business systems and other
applications (ACS, 1992b)

Figure 2.1 is a diagrammatic representation of the scope of Information Technology. Though this definition is not universally acknowledged, it remains the ‘Australian’ definition for the scope of IT. The ACS guidelines developed for accreditation of the courses offered by Australian and some overseas universities use the term ICT (Information and Communication Technologies) to mean – Computer Science, Information Systems, Computing Systems Engineering and Software Engineering, including directly related subjects and technologies and their use in the analysis, design, construction and application of computer and communications based systems. Over the years ACS has used the terms ICT, IT and IT&T (Information Technology and Telecommunications) interchangeably in many of its publications. This is also common practice by many IT professionals.

For the purposes of this research, the ACS definition of IT applies. In many Sections of this thesis, I have used the term ICT (instead of IT) if the source or referenced material has used the term ICT (Information and Communication Technology) so the accuracy of the particular source material is maintained.

The key stakeholders in IT education are shown in Figure 2.2. They directly influence issues related to IT professional practice and workforce performance. Since IT is now the underpinning of business sustainability and success, a collaborative approach to trying to understand relevant issues in IT education and maximising the effectiveness of this education to meet the needs of the industry is important for universities, the IT profession, graduates and society as a whole.
Lee, Green and Brennan (2000) discuss the important role of the university in knowledge production and the creation of knowledge workers. They state that contextualised knowledge (knowledge production in the context of its application) is an advantage in a competitive environment because it helps in the development of an increase in the supply and demand for specialised knowledge. According to Lee et al., this requires the integration of knowledge from university, workplace and profession. This is particularly of interest to Information Technology professionals. Seeing the relevance of theory in practice and having opportunities during education to access work practice sites for learning from the real world is increasingly seen as an invaluable experience for students. In Australia, a relocation of knowledge production from university to workplace in tandem with changes in workplaces and their practices and modes of learning is seen to be increasing (Lee et al., 2000).
2.3 Definition of Professional Skills and Professional work experiences

The terms *Skill* and *Competence* are sometimes used interchangeably. Boyatzis (1982) argues that competence in a particular skill is how well the actions are performed and sequenced to attain a goal. Attenwell (1990) defines *Skill* as the ability to do something but the word also connotes a dimension of increasing ability. Thus, while skill is synonymous with competence, it also evokes images of expertise, mastery and excellence. Skill is the terminology that will be used in this thesis.

A recent consultation paper released by the Australian Qualifications Framework (AQF) Council provides a draft AQF Generic Skills Policy as a part of the framework for Australia’s qualifications (AQF, 2010). The policy states that,

The AQF uses the term ‘generic skills’ to refer to those skills that are not discipline specific and may be acquired throughout education, work and life; they are a feature of every learning experience;

The purpose of the policy on generic skills is to inform how the embedded skills in the levels criteria and qualification type descriptors are made more explicit in the development, accreditation and provision of AQF qualifications.

The policy defines generic skills as:

Generic skills are skills that are not specific to work in a particular occupation or industry, but are important for work, education and life in general. Generic skills are the key transferable skills a graduate may achieve through learning that have application in study, work and life contexts. They are also referred to as graduate attributes or capabilities, employability skills or general capabilities.

The four broad categories of generic skills mentioned in AQF (2010) are:

- Basic fundamental skills such as language, literacy, numeracy and ICT literacy skills;
- People skills such as being respectful to others, communication and teamworking skills;
• Thinking skills such as analytic, problem solving, synthesis, creativity and learning skills; and
• Personal skills such as self-management, cultural understanding, having a global perspective and acting with responsible, ethical behaviour.

Such skills are also referred to by terms such as soft skills, generic skills, employability skills, graduate attributes and non-technical skills. Soft skills are those, which are of “non-technical nature” (Woratschek and Lenox, 2002; Litecky, Prabhakar and Arnett, 2006). Aken and Michalisin (2007) define soft skills as “those, which are related to an individual’s personality traits, work ethics, interpersonal skills, problem-solving skills, and language skills”.

For the purposes of this research, all the parts of a graduate’s work that do not involve specific Information Technology activities are included in their professional (or non-technical) work experiences. The generic, soft or professional skills discussed above are typically required for these experiences. IT work tasks such as programming, database administration, computer security, systems analysis and design, etc. may be part of an IT graduate's technical experience. On the other hand, skills shown in the list below are included in their professional work experience (or non-technical work experience):

• Communicating ideas and information;
• Working with others and in teams;
• Oral Communication;
• Written business communication;
• Leadership and entrepreneurship;
• Time management;
• Interpersonal communication and relationships; and
• Comprehension of business processes.

Professional skills or professional work experience is the terminology that will be used in this thesis.
2.4 Historical background to global and Australian IT education and profession

In this section, the development of IT syllabi over the past forty years is traced along with the key developments related to IT education, the role of Professional associations (such as IEEE and ACM) in the development of IT curriculum including the development of IT as a separate area from other computing disciplines. There is also an overview of the IT industry in Australia.

2.4.1 IT Syllabi

In 1968, the International (but USA based), Association for Computing Machinery (ACM) released its first computer science curriculum, Curriculum ’68, comprised of topic areas and extensive course descriptions (Atchison et al., 1968). In the 1970s, a joint review of computer science curricula was undertaken by the Computer Society of the Institute of Electrical and Electronic Engineers (IEEE-CS) and the ACM. This resulted in Curriculum ’78 (Austing et al., 1979). This proposed a standard syllabus for a set of courses that encompassed the core knowledge of computer science as a discipline. Curriculum ’78 was significant as it took a much broader view than Curriculum ’68 of the computing discipline and bridged the gap between software and hardware oriented courses.

In the 1980s, another joint curriculum review by IEEE-CS and ACM resulted in Computing Curricula 1991 (CC1991). Unlike the previous curriculum reports, in CC1991 the body of knowledge associated with computer science was divided into individual knowledge units. These provided education institutions with flexibility as to how and when they would cover a knowledge unit during the undergraduate curriculum (Association of Computing Machinery, 2001). The ACM and IEEE-CS undertook a further review resulting in Computing Curricula 2001 (CC2001). The need for this review was the latest developments in the computing profession, including technical changes (such as the introduction and development of the WWW, new networking technologies, human–computer interaction, security and cryptography) and cultural changes (such as the major increase in the use of computing throughout the world, the economic influence of computing technology, the broadening of the computing discipline and greater acceptance of computing as an academic discipline).
According to Gorgone, Lidtke and Leone (2003), the first time IT course accreditation (as a separate computing discipline) was seriously considered was in June 2001 when a small group of educational institutions from the US set out to define IT as an academic discipline. In December 2001, a conference on IT curriculum was held in Utah attended by 15 educational institutions and representatives from IEEE, IEEE-CS, ACM and ABET (Accreditation Board for Engineering and Technology). The goal was to form an IT curriculum, an IT society and IT accreditation criteria. By the end of 2002, the participants at several discussion groups and conferences contributed to the development of a draft proposal that spelled out the accreditation criteria for Bachelor programs in IT. These were presented for public comment at the Frontiers in Education Conference 2002 in Boston. Some of the major challenges encountered were the lack of agreement on a national model IT curriculum and the lack of agreement on the definition of IT. The standards for the curriculum were divided into general (focusing on the development of lifelong learning habits, collaborative skills and communication skills), Information Technology (core IT areas such as computer networking, databases and web technologies) and supporting courses (coverage of mathematics and science to support learning of IT specializations). The participants at this conference also set out to capture other requirements for the support of curriculum delivery such as the technology infrastructure, institutional support and financial resources, program delivery and facilities (Gorgone et al., 2003).

The more than 450 members of ACM’s special interest group for IT education (SIGITE) who represented IT programs both within and outside the US played a key role in driving the efforts to develop a model IT curriculum during 2001-2005. In 2005, Computing Curricula 2005 was issued by IEEE-CS and ACM (Shackelford et al., 2006). Computing Curricula 2005 consisted of a framework for five main computing undergraduate programs namely computer engineering, computer science, information systems, information technology and software engineering. The primary focus of each of the five discipline areas is described in the Computing Curricula 2005 report as shown in Table 2.1.
Table 2.1 Primary focus of discipline areas described in Computing Curricula 2005
(Aken and Michalisin, 2007)

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Primary focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Engineering</td>
<td>Development of hardware and interfaces to the hardware in computing systems; Heavy emphasis on electrical engineering and mathematical skills</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Theoretic and algorithmic foundations of software systems and new applications of existing and newly developed hardware</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Application of technology to fulfil an organisation’s needs. IT programs emphasise the utilisation of technology components and typically include installing, customising and maintaining applications, network administration, security etc.</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>Development and maintenance of software systems. Heavy emphasis on systems design and programming</td>
</tr>
<tr>
<td>Information Systems</td>
<td>Integration of business processes with Information Technology. Heavy emphasis on organisational principles, management techniques and business processes.</td>
</tr>
</tbody>
</table>

In 2008, IEEE-CS and ACM published *Information Technology 2008: Curriculum Guidelines for Undergraduate Degree Programs in Information Technology*. This clearly describes the development of IT as a separate computing field of study (Gowan and Reichgelt, 2010). In Australia, the professional body, the Australian Computer Society developed in 1992 a core body of knowledge (CBOK) for Information Technology professionals. This was based on past ACM curriculum models. The ACS extensively reviewed CBOK and produced a new version of it in 2008 (ACS, 2008i). This was based on the ACS’s broad definition of IT, rather than the specific view outlined by (Gowan and Reichgelt, 2010) below.

Historically, IT was considered as part of the computing discipline or as a generic term for it. Gowan and Reichgelt (2010) state that in the past decade, IT has emerged as a separate and a new computing discipline as increasingly, many of the skills imparted through traditional computer science (CS) and information systems (IS) courses fail to meet many organisations’ needs. The focus of, computer science programs is on lower-level computing concepts with an emphasis on programming for systems software and its applications, that of information systems programs is business processes and applications to support these
processes while information technology programs cover IT infrastructure, advanced networking, network security, storage, web technologies, human computer interaction and IT system acquisition, implementation, integration including systems development and integration methodologies and processes.

2.4.2 IT skills and employment

An understanding of the IT industry and its composition, key historical events, fluctuating skills forecasts, particular areas of skill shortages and past, current and future employment trends is important to provide a picture of the Australian IT industry today. In turn, such a picture is necessary to understand the skill requirements for both experienced IT workers and new IT graduates, as well as the implications for IT education and the preparation of new graduates for the IT profession.

During 1995-2000, because of the growth of the internet and the use of world wide web based networks there was a rapid commercialisation of IT businesses and many internet based companies were born. This period is referred to as the dot com boom. With the growth of technology driven businesses, there was an immediate need for labour with the required IT skills sets. Hence the demand for IT courses also grew rapidly, though there was an equally rapid decrease in student number after the dot com bust in 2000.

According to an IT skills forecast project report from the ACS (2008e), general economic trends (the pace of innovation), employment supply constraints (education outputs, migration targets and caps), the brain drain of skilled and competent workers to external destinations and changes in employment structure are some of the factors that can influence IT employment. Further, the authors state that accurately quantifying IT technical and professional employment in Australia is difficult but satisfying future Australian ICT skills demand is possible through the domestic supply of IT graduates and domestic entrants to the IT technical and professional workforce. However, the kind of IT jobs that will be in demand in 5-10 years time are not identified. An overview of the ICT industry in Australia as reported in the ACS ICT industry report (ACS, 2008a) is shown in Table 2.2. The trends are declining domestic ICT enrolments, growing skills shortages and a slowing growth in the number of ICT workers in Australia.
Table 2.2 Overview of Australia’s ICT industry
(Source: ACS, 2008a; ACS, 2009a; ACS, 2010a)

<table>
<thead>
<tr>
<th>Australian ICT Measures</th>
<th>Period</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ICT workers in</td>
<td>545,500 (February 2010)</td>
<td>Slowing but steady growth with shortages</td>
</tr>
<tr>
<td>Australia</td>
<td>532,500 (February 2009)</td>
<td>apparent</td>
</tr>
<tr>
<td></td>
<td>514,000 (January, 2008)</td>
<td></td>
</tr>
<tr>
<td>Employees in the ICT</td>
<td>283,000 (December 2009)</td>
<td>Slowing but continued growth with major</td>
</tr>
<tr>
<td>industry</td>
<td>268,000 (2007-2008)</td>
<td>state and sectoral variations</td>
</tr>
<tr>
<td>Revenue of the ICT</td>
<td>$82 Billion (December 2009)</td>
<td>Contraction from 2008 in</td>
</tr>
<tr>
<td>industry</td>
<td>$85-$98 Billion (2006-2007</td>
<td>telecommunications revenue</td>
</tr>
<tr>
<td></td>
<td>and 2008-2009)</td>
<td></td>
</tr>
<tr>
<td>Estimated ICT skills</td>
<td>11,225 (2008)</td>
<td>Growing</td>
</tr>
<tr>
<td>shortage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total domestic ICT</td>
<td>7470 (2008)</td>
<td>Declining (but showing signs of increase in</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.5 Some issues in Information Technology education

University preparation of IT graduates for professional practice has been widely debated. Based on my personal experience (dealing with some recent IT graduates (ex-students) and recruitment consultants) and as suggested by anecdotal evidence, some employers are reluctant to employ new IT graduates. Some reasons for this are discussed in Sections 2.5.1 and 2.5.2.

2.5.1 Mismatch in expectations

There is evidence that there appears to be a mismatch between expectations of employers, universities and graduates of each other. A model of expectations of the three players is shown in Figure 2.3. Expectations of each player are represented by each side of the triangle. The sides of the triangle (that is, expectations of players) are affected by any change on a side of the triangle. When these expectations are not managed, an imminent mismatch in expectations occurs. In particular, there is evidence that there appears to be a mismatch between employers' expectations of graduates and the skills of graduates.
Figure 2.3 Model of Expectations of employers, universities and graduates of each other

Aken and Michalisin (2007) define the expectation gap as “the difference between what skills industry expects from college graduates and what level of skill they feel the graduates possess”. Figure 2.4 is my illustration of the gaps in expectations and gaps in skills. The expectation gap is due to the difference between the skills obtained through the education that universities provide and the skills employers (or recruiters) expect or would like IT graduates to possess. Trauth, Farwell and Lee (1993) refer to this gap as the ‘curriculum gap’. Todd, McKeen and Gallupe (1995) refer to the same gap as the ‘education gap’.

Another significant factor contributing to the mismatch in expectations is due to the lack of agreement on clear definitions of the IT workforce. In relation to Information Systems (IS) programs, Yen, Chen, Lee and Koh (2003) state,

*It will not be possible to develop an IS program and a curriculum that represents the true needs of the IS industry until IS educators reduce the gap perception and IS practitioners’ perception of IS knowledge and the technical skills that the industry might need.*
They discuss two significant gaps between the perception of IS academics and the perceptions of IS practitioners in Taiwan.

- A gap between the perception of the level of proficiency required in the workplace versus that achieved in the academic subjects covering the knowledge and skills and personal traits determined by IS academics and practitioners; and
- A gap between perceptions of the level of proficiency required in the workplace versus that possessed in the technical skills determined by both IS academics and practitioners. The latter rated subjects in organisation behaviour, strategic management, teamwork and leadership and oral and written communication as more important than academics did.

Yen et al. (2003) say that a *time lag* between IS curricula and industry needs is inevitable. Sometimes, industry is ahead of academia and at other times academia leads the advancement of industry. It is not possible to develop an IS program/curriculum to reflect the true needs of the IS industry until the IS academicians reduce the perceived gap between academia and practice. Snoke (2004), a PhD student carried out a general study of the generic attributes of IS graduates in Queensland, Australia, followed by a nation-wide
study of the generic attributes of IS graduates. Then he analysed their courses and mapped the objectives of individual subjects against the specified generic attributes for the degree. His research showed that the objectives did not meet either industry or academic requirements in relation to generic attributes. Snoke concluded that IS tertiary courses in Australia do not meet the needs of the IS industry.

In relation to IT, Sutharshan, Torres and Maj (2001) raise the question - is it education or training that is necessary to meet student and employer expectations? They state that both at the local (Western Australia) and national levels, surveys demonstrate that the primary reason students attend university is either to find employment or to improve their employment prospects. Universities are coming under increasing pressure to meet student expectations in collaboration with the industry and employers.

Some Australian Universities have long offered Sandwich courses, in which students spend a substantial period, six months to a year working in the IT industry. However, there seems to be some decline in the delivery of sandwich courses due to poor employer support. But sandwich programs and other work experience course components, industry guests and lectures have the potential to contribute towards balancing the education and training needs of students and the demands of employers. There remains a challenge for the universities to strike a balance between education in theoretical knowledge and training (product-specific such as Oracle, Cisco, Microsoft etc.). Some Australian universities have made such product-specific training (often with an added theoretical component) an integral part of their IT degrees and have included curriculum that may prepare students for additional vendor qualifications such as Cisco Certified Networking Associate (CCNA) and Microsoft Certified Systems Engineer (MCSE) etc. (James Cook University, 2010).

Adding to the complexity, increasingly, IT related skills and tasks are seen in non-IT jobs. Kaarst-Brown and Guzman (2005) state that even within IT roles, there is a conflict about who (the IT department or the business) controls the IT functions of an organisation. “The IT function is required to understand the business needs, emerging technologies, process issues, data structures, security and privacy issues and last but not the least - the customer”. This is a sign that IT roles now require knowledge across a wider variety of issues than traditional IT functions.
Another example of mismatch in expectations occurs when graduates’ expectations of employers differ from employers’ expectations of new graduates. In a study of performance expectations for newly hired IT professionals in a systems development organisation of a large telecommunications company in the US, the newly hired were asked their expectations from the telecommunication company they were working for and employers were asked their expectations of the newly hired workers (Bandow, 2004). A mismatch in expectations was apparent. The graduates in Bandow’s study expect competitive pay for performance and benefits, flex time, health benefits, bonuses, opportunities for career development and advancement, interesting, challenging work, fair performance evaluation, safe work environment, opinions respected, encouragement to work “outside the box”, opportunities to contribute and to use skills and abilities. The employers in Bandow’s study expect individuals to take necessary training (paid for by the company), manage their own careers and take advantage of opportunities for training, learning and to demonstrate competence. A summary of Bandow’s study findings on graduate employee expectations and employer expectations on three levels - individual, project/team and organisational level is shown is Table 2.3.

<table>
<thead>
<tr>
<th>Level</th>
<th>Employer expectations</th>
<th>Graduate employee expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>Technical skills, interpersonal, verbal and written communication skills, the ability to learn constantly (new technologies and different systems), the ability to learn how teams work, work with people with different skills, complexities in the organisation, decision making and problem solving, willingness to learn, recognition of need to learn, ask questions, contribute at the team and individual level, find mentors, exhibit energy, enthusiasm and potential, and balance personal and professional interests.</td>
<td>Competitive pay for performance, flex time, health benefits, bonuses</td>
</tr>
<tr>
<td>Project/team</td>
<td>Understand business problem to be solved, be aware of work commitments, learn about the organisation and understand that the best solution is not necessarily the personal choice of a team member</td>
<td>Interesting and challenging work, opportunities to contribute and use skills</td>
</tr>
<tr>
<td>Organisational</td>
<td>Learn and understand about organisations, systems, corporate policies and direction, the nature of market demands, specify business related to their area of expertise, to act as owners and stakeholders of the company, fit into an organisation by being involved, participate, be open and honest, establish a network, communicate and be themselves, not waiting for work to be handed to them, develop a trusting relationship with managers, listen and learn for a few months and talk to seniors.</td>
<td>Opportunities for career development and advancement, safe work environment, fair performance evaluation, encouragement of innovative ideas</td>
</tr>
</tbody>
</table>
It is shown in Bandow’s study that the priorities of the employer are somewhat different from those of the graduates. Such a misalignment in the expectations could be one of the reasons why employers are often concerned about graduates’ readiness for work. This issue is explored further in Chapter 6.

Rousseau (1995) highlights the importance of performance expectations for employers and professionals and states that often employers fail to convey these expectations to employees (both new and existing) due to the rapidly changing nature of the industry and the market. Ideally individual and organisational goals should be aligned. Rousseau refers to “psychological contracts” in organisations as “beliefs that individuals hold regarding promises made, accepted and relied on between themselves and another (employee, client, manager, organisation”).

Thus an important question for future research is: **How to address any mismatch between employer, university and graduate expectations?** Miller and Dettori conducted interviews with ten IT employers in the Chicago area and sought their perspectives on skills they were looking for in IT graduates when they were hiring. While many employers know what professional skills they require, many are unclear as to how a university program could achieve these professional skills and whether additional attention to them might come at the expense of other needed technical skills (Miller and Dettori, 2008). They state that, “an employer’s immediate needs and a student’s long term interests often do not call for the same learning outcomes” and “practices of employers differ from how student work is evaluated within the context of an academic course”. Such mismatches in expectations have implications for the growth of a nation’s economy. In Australia, the then CEO of the ACS (2009a) warned the federal government that ICT skills are essential for the health and survival of Australian business and that a potential mismatch between course content and the skills required by the industry may cause an undermining of future economic opportunities. She says,

*Within a student demand driven system, there is potential for an undesirable mismatch between the ICT courses that students are studying and the skills required by the industry. The focus on attracting and developing student skills within Technology and Science areas has been part of the strategic growth plan for numerous Governments overseas. It’s crucial to see a similar approach adopted here. This requires acknowledgement and focus by governments, and not necessarily a greater allocation of funding.*
2.5.2 Emerging work practices and the ability of educational institutions to meet the requirements of the industry

The requirements of workplaces are changing to support the evolving nature of global IT projects. Graduates need the skills to cope with unfamiliar situations and to use opportunities at work to learn about their work requirements, work practices and build their organisational knowledge. Work practices of organisations are frequently changed and differ from one organisation to another. Because of the difficulty in understanding the requirements of emerging and constantly changing work practices, formal training received from institutions may not ever be able to prepare individuals for all work situations even within the same profession. However, workplace and educational institutions should collaborate on addressing the gap as much as possible.

2.5.2.1 Uncertain and ambiguous workplace requirements

A particular challenge for the IT workforce is the complex and dynamic nature of the IT profession along with globalisation and employment practices such as outsourcing. How can gaps between IT courses and IT workplaces be identified and solutions in education systems be suggested to prepare workers for this environment? A key is to educate graduates to learn how to cope with this new world and help them to develop abilities to cope with the varied range of work practices. For example, undergraduates would be helped to acquire some adaptability and response skills and provided with much needed exposure to the real world by work placement and practice work experience components in a course. However, a commitment from employers is required to assist in providing such work placements to help develop elements of professional practice as shown in Figure 2.5. These elements, represented as blocks in the diagram, together with instances of them, are work practices, work performance, nature of work, workload and responsibilities, worker competencies, worker identity, level of training and support for staff, hierarchy at work, worker behaviour, worker engagement, work patterns and diversification and intensification of the work practice.

Worker engagement in IT often ranges from onsite or offsite work to virtual and global work. Different types of work patterns such as full-time, casual, part-time or contract exist. Work situations differ in areas such as goals, work practice, services, division of labour, and culture of practice as these are determined by situational factors (Billett, 2000).
Students need to be aware of these differences so that they have realistic expectations of their employers and their work roles. It is difficult to develop educational strategies to address the needs of all students, as the approach of “one size fits all” cannot be applied. Individual students differ in their aptitude, interest, background, level of motivation and reasons for studying courses. Under these circumstances even the best educational strategies are likely to fail.

**Figure 2.5** The many and varied elements of Professional Practice
(adapted from Billett, 2000)

In addition, IT has permeated many industries. The types of skills required to work in diversified workplaces are not always clearly identified, understood or defined by employers leading to uncertain and ambiguous workplace requirements. It is not an easy task for universities to prepare graduates with the skills that individual employers require at their workplaces. Inevitably gaps or a mismatch in expectations between the University and
employer expectations of graduate skills is introduced as a result of such ambiguous workplace requirements.

From Figure 2.5, some questions relevant to this thesis are:

- How do we define work practices?
- How realistic are the expectations of employers in relation to universities preparing workers (who can meet their workplace requirements)?
- How do we track and measure the attributes of emerging work practices?
- What mechanisms are used by universities to address the gaps?
- Can the gaps be closed at all? or can they be prevented from widening? and
- What should be done to reduce the gaps?

University and graduate expectations of workplaces will be assisted by understanding work performance and how it is evaluated at IT workplaces.

2.5.2.2 Understanding work/worker performance

Building a smart workplace is key for the success of enterprises operating in a competitive environment. Prescriptions for smart workplaces will be different even where the same vocational activity is conducted but in different settings (Billett, 2000). Within the IT profession, workplace requirements vary based on the priorities of the business, scope, budget and timelines associated with a work task. As a result of this issue a challenge for evaluating the work performance of individuals and teams is presented. Supervisors have to take into account a variety of internal and external factors that influence a team or a worker’s performance. The experience of the worker/team, the constraints associated with the project, the workload of a worker/team and a measure of how successfully the worker/team accomplished their work goals in a given context needs to be given consideration in evaluating worker performance. Workers and employers who share the same understanding of the workplace's requirements are more likely to perform effectively.

Workplace structures evolve in a variety of ways. Some are hierarchical and use a top-down structure. However, in other workplaces ‘peer’ status may be promoted over ‘command’ status. Organisation structures can be either vertical or horizontal depending on
the ‘culture’ and the nature of the activities undertaken within organisations (Billett, 2000). There is a link between work performance, worker competence and the hierarchies at workplaces. Another set of questions is raised:

- How do different hierarchies influence worker performance or productivity? and
- What are the influential factors in hierarchical structures that affect the work performance of individuals and groups?

In turn, other questions arise that present a more sophisticated view of the problem and the need to balance perspectives on the gaps of different stakeholders, that is, university, workplace, and professional.

- What are the different work practices in the IT industry and how do we understand and prepare graduates for emerging work practices?
- What are the different worker engagement and work patterns in the IT industry and how do graduates know or learn about them?
- What are the different responsibilities IT workers take on and how do the cultural practices of IT organisations impact worker performance?
- What is the level of training and support employers are willing to provide when graduates commence work after graduation?
- How do the different natures of tasks impact worker performance? and
- How is worker performance understood and measured?

In the analysis of such questions, there is the potential to contribute towards building an efficient and a competitive workplace for small, medium and large scale organisations alike. The answers have implications for the expectations of employers, graduates and universities of each other.

2.6 Employer perspectives of university graduates

Some employer concerns about the lack of skills in graduates were discussed in Section 1.1. More detailed discussion along with the skills employers are seeking and employers’ expectations of graduates is presented in this Section.
2.6.1 **Lack of professional skills**

AC Nielsen Research Services (2000) found many employers had concerns related to graduate skills in the areas of written and oral communication. In their report, the gap between the importance of skills (as identified by employers) and the performance of new graduates in those skill areas was analysed. For example, it was found that Computer Science graduates have high performance ratings for time management, comprehension of business practice and academic learning but low ratings for the ability to benefit from on the job training, written and oral communications skills, leadership qualities, personal presentation, numeracy and problem solving skills. The reasons why employers recruit graduates appear to be affected by the size of the employer. Large businesses were generally interested in long-term objectives such as the need for future business leaders. Hence they were willing to provide ample training opportunities for new graduates and were, overall, satisfied with their performance.

However, in Australia, the ICT industry is largely small to medium enterprises (SME) and over 96% of software and computer service firms are small to micro sized (ACS, 2008a). SMEs are more likely to hire experienced workers or outsource some of their IT operations, as they do not have the resources that many large employers have to train new and inexperienced graduates. Therefore, many SMEs are reluctant to recruit inexperienced graduates, as they believe that the new graduates do not possess skills that serve SMEs’ immediate needs. Similarly, Hagan (2004) found small businesses are increasingly seen to be pessimistic about the likelihood of employing recent ICT graduates. A significant limitation on the employment prospects for ICT graduates is placed as a result of such a finding. IT employers (small, medium and large) surveyed by Hagan expressed concerns and suggested improvements in the following areas:

- Work experience (graduates have no or poor work experience, inability to relate material studied to real life settings);
- Industry consultation and awareness (more links and communication with industry, the use of industry lecturers);
- Generic skills (more training in written and oral communication, teamwork and problem solving skills); and
- Business skills (more understanding of business practices).
Hagan recommended that universities focus on giving students broad knowledge and understanding rather than specific skills and applications to ensure that graduates have a flexible mindset and are able to learn new technologies as and when they evolve or are needed.

A list of generic skills that have been identified in the literature as required or lacking in graduates is shown in Table 2.4. Some of those skills are communication (written and oral), business skills, troubleshooting skills, interpersonal communication skills, project management skills, teamwork skills, self-confidence, adaptability skills, time management and leadership skills. Most of the authors (in Table 2.4) highlighted the need for the development of professional skills in graduates and recommended a balanced focus of technical and non-technical skills during university preparation.

2.6.2 Some professional (non-technical) skills required

Different oral and written communication skill strategies are required at IT workplaces. Pine and Barrett (2005) surveyed a small group of software engineers and managers in the US and developed a list of oral and written skills they believe graduates require for their jobs. Tasks such as presentation of incidents, sales briefs to a customer, interpretation of technology, help desk sessions and elevator speech (being able to communicate key points of topics in a very short amount of time and thus reinforcing the importance of conciseness and brevity) are included in oral skills development. Tasks such as writing budget and time progress reports, requests for quotes, quick reference guides (with the most frequently used features of a product), product comparisons, evaluation and recommendations, incident reports (problem, cause, containment action, corrective action, follow up, verification), executive summaries, internal rationales for development, short memoranda, self-evaluation and personnel evaluations (performance reviews) are included in written skills development.
Table 2.4 Skills believed to be required or lacking in graduates

<table>
<thead>
<tr>
<th>Source</th>
<th>Comments on skills required/lacking</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Computer World survey of IT professionals in the USA von Dran (2004)</td>
<td>IT graduates lack business skills, troubleshooting skills, interpersonal communications, project management and systems integration skills</td>
</tr>
<tr>
<td>A survey of employers in a large telecommunication company in the USA. Bandow (2004)</td>
<td>Employers state that new hires lacked time management skills and were often overloaded and over committed. Employers desire and expect technical skills but most of their expectations of new hires in IT involve social skills, interpersonal skills and communication, time management and written and verbal skills.</td>
</tr>
<tr>
<td>The 2006/2007 graduate outlook survey Graduate Careers Australia, (2006, 2007, 2008)</td>
<td>More than half (57.5%) of the 127 respondents (all employers including IT) want good interpersonal and communications skills in job applicants; 35% rate academic qualifications as most important; 4 out of 10 employers said they do not hire applicants who do not have good communication skills.</td>
</tr>
<tr>
<td>A summary of Wong, von Hellens and Orr (2006)</td>
<td>Job advertisements and questionnaires have shown that non-technical or soft skills such as interpersonal communication, the ability to communicate with others, adaptability, self-motivation, teamwork, integrity, reliability and self-motivation are considered more important than purely technical skills in IT graduates; 78% of jobs advertised for IT graduates specified non-technical skills.</td>
</tr>
<tr>
<td>Structured interviews with 13 IT executives from ten companies in the USA. Benamati and Mahaney (2007)</td>
<td>Project management skills are both highly desired and lacking; communications skills and business knowledge and leadership skills, understanding business and technology, multi tasking, analysis skills and integrity are also important, leadership skills being the most deficient. Project and change management are also missing skills along with communication skills; skills desired in three to five years time for entry level jobs included project management, leadership and soft skills in general.</td>
</tr>
<tr>
<td>Survey of over 6000 Scottish employers about work readiness of recruits from Scottish universities Futureskills Scotland (2008)</td>
<td>Need for graduates to take time to familiarise themselves with routines and practices of the organisation and willingness to learn, good communication skills and good work ethic and to bring fresh ideas to an organisation.</td>
</tr>
<tr>
<td>Interview of ten IT employers in the Chicago area, USA Miller and Dettori (2008)</td>
<td>Need for practical, project-oriented skills and experience particularly working as a part of a team, recognising trade-offs when developing project plans; fresh graduates lack the experience of appropriately adjusting the project’s scope.</td>
</tr>
<tr>
<td>Interview of IT managers in 94 non-IT companies, USA Gallagher, Kaiser, Simon, Beath and Goles (2010)</td>
<td>Project management, problem and opportunity knowledge and relationship skills are the three non-technical skills that are important to those who work in internal IT departments in non-IT firms.</td>
</tr>
</tbody>
</table>

Gartner Inc. (2005) claims that project management and application development skills whether for service providers, software developers, or IT organisations are now essential. Gartner believed that by 2010, six out of ten people affiliated with IT would assume business-facing roles. The need for professional skills development in IT graduates to ensure they are work ready is reinforced by such beliefs. Collett (2006) aptly sums up the professional skills requirements for IT workers in 2010 as, “an IT worker of 2010 won’t be...
a technology guru but rather a versatilist”. Collett states that consumer behaviour, increases in corporate mergers and acquisitions, outsourcing, the proliferation of mobile devices and the growth in stored data are all driving the need for a versatile workforce.

Fernandez and Tedford (2006) surveyed employers of graduates from Texas A & M University – Corpus Christi about employer expectations of computer science graduates. They highlight the need for such graduates to be able to do much more than programming. They state that employers are seeking employees who not only understand both technical aspects of computer science and IT but are also well versed in other non-computer related areas. Further, they state that providing students with an education heavily based on technical skills is no longer adequate to prepare them for entering the workforce. The employers they surveyed rated non-technical skills as the most essential attribute of graduates.

"Any program heavily weighted in specific technical areas with little emphasis on general communication, critical thinking, problem solving, engineering and design skills are doing their students a disservice. ............ The days of “pure” computer science are long gone."

According to Benamati and Mahaney (2007) topics which should be in an IT curriculum are project management, business knowledge and business process knowledge, methodologies (e.g. Six Sigma (General Electric, 2010)), communication skills, global perspective or cultural awareness, negotiation and vendor management, IT sourcing, innovation and career planning. These are emphasised by Gallagher et al., (2010) who say that IT departments in non-IT companies require both technical and non-technical skills such as project management, business domain knowledge and relationships.

"Non-technical skills leverage technical skills to augment the organisation’s effectiveness in designing and delivering solutions to meet an organisation’s challenges and opportunities."

Some key questions arising from the literature review about employer expectations of graduates are discussed below.
**What skills do employers need and from whom (graduates or experienced workers)?**

Aken and Michalisin (2007) say employers need to establish which skills are essential for their organisation. They state that the assumption that the skills an organisation expects their new hires to have as vital to the organisation are not always correct. Employers may want that skill but not necessarily from a new hire. They question to what extent employers would change which schools (or universities) they recruit at and hire from because of any perceived skills gap and the relative importance of those skills for recent MIS (Management Information Systems) graduates. They further ask if this is likely to change the recruiting practice broadened by the normative and control beliefs of the employer.

Aken and Michalisin hypothesise that the skills gap for soft skills, business skills, technical skills and programming skills will have a significant and positive impact on the intention to change where a firm recruits. This intention will be moderated by the importance of each of the skills. The more important the skill is to the firm, the greater the intent to change where a firm recruits if there is a gap in the skill.

However, different companies have different skills needs. Nelson, Ahmad, Martin and Litecky (2007) asked if the profession needs different sets of IT/IS skills for Fortune 500 (or large) companies and another set for small sized firms. They state that although IT/IS job skills are a significant and recurring topic in professional literature, there has been little academic research in the IT/IS job skills area. Their study was aimed at determining various skill sets for IT/IS jobs that are in demand in large and small organisations. Nelson et al. statistically tested the skill classifications (based on job classifications) between the skills required by large and small to medium enterprises. They found that highly significant differences existed between the IT/IS skills sets that IT Fortune 500 companies and SMEs were seeking. Such findings have the potential to inform students about the needs of the employers, both large and small, and to guide students in the selection of their courses and subjects for career preparation.

As we have seen in Section 2.5.1, a lack of agreement between industry and educators on what constitutes IT job skills is a major challenge for IT educators to overcome. Huang, Kvasny, Joshi, Trauth and Mahar (2009) examined and compared the IT job skills literature in academic studies, practitioner literature and online job advertisements with a view to understanding what IT job skills are required by industry. They classified these job skills into three categories – technical, humanistic and business skills. Humanistic job skills
include skills such as teamwork, leadership, ability to teach others, communication, etc. Business skills include project management, decision making, business knowledge, business problem solving and global awareness. They found that academic articles provided a rich understanding of humanistic and business skill sets, practitioner literature provided a forward looking view of the job skills and gave a rich understanding of the technical skills and that online job advertisements were balanced in the coverage of technical, humanistic and business skill sets.

Another study by Joseph, Ang, Chang and Slaughter (2010) states that technical knowledge and skills alone are insufficient for success in IT given dynamic, distributed and complex workplaces. They say that IT professionals also need practical intelligence (defined as “the managerial, intrapersonal and interpersonal skills that are used to resolve IT-related work problems”). They say that there are four dimensions of practical intelligence namely managing tasks, managing career, managing self and managing others. They argue that practical intelligence is typically acquired through work experience. Joseph et al. point out that despite the increasing importance of professional skills in IT, there is little systematic research to conceptualise and measure these skills. They also compare the soft skills of novice and experienced IT professionals using their SSIT (soft skills for IT) instrument. Experienced IT professionals took less time to respond to incidents and managed others better than novices. However, experienced staff and novices performed as well in managing self. They concluded by stating that IT practical intelligence of novices can be developed and refined through work experience, relevant training and mechanisms such as mentoring. Other recommendations from Joseph et al. included an increased focus on experiential learning, increased internships and co-operative programs and hiring after test-driving through internships. Employers in their study also believed that the requirements for soft skills would continue to increase.

**Are employer expectations in line with the current generation?** Employers are seeking a number of skill sets with several studies calling for reforms in curricula and pedagogy with increasing focus on soft skills or non-technical skills (Keen, 1988; Green, 1989; Stokes 1995; Gallivan, Truex III and Kvasny, 2004; Beard, Schwieger and Surendran, 2008). While most of the literature on employer perspectives alerts graduates to employer expectations of graduates, Beard et al. suggest employers now need to understand the millennial learner (i.e., the current generation Y compared to the previous generation X)
and their graduate characteristics and hence accommodate the needs and expectations of a new generation of workers. They present a SWOT (Strengths Weakness Opportunities Threats) analysis for the millennial learner which shows that employers and universities have to recognise the differences in the current generation of students and graduates and that these differences should be kept in mind while preparing graduates for work.

By understanding these difficult issues, different stakeholders can work together towards addressing the development of IT graduates who meet employer expectations. However, it is still likely that employer expectations will never be totally met. Hence, there is a need for a different approach to this issue. A possible approach is to consider changing stakeholder expectations.

2.7 University perspectives of teaching and learning in IT

As we have seen in the previous section, it has been suggested in many studies that a strong disciplinary knowledge base alone is insufficient for a new graduate to obtain a job. The ICT-Ed Project was funded by DETYA in 2000 to look at innovation and best practice in ICT education in Australian universities and their capacity to respond to ICT industry needs (Hurst and Lynch, 2001). The focus was on issues of teaching and learning, graduate and employer satisfaction, academic staff shortages and professional development, assessment of quality teaching and dissemination of innovation. Strategies for ICT educators to develop their education evaluation methods were recommended. Some of the findings are (Lynch and Collins, 2001):

- There is a constant need in ICT to develop new material because of the rapid development of information and communication technologies;
- The development of innovative new material takes longer hours than preparation of teaching materials using existing resources for ICT educators. Sharing of scholarship was noticed to be comparatively less in teaching than in research;
- ICT educators' lack of pedagogical knowledge was taken as evidence of the lack of support from university management, which was perceived to promote research over teaching; and
• University wide challenges include the growing diversity of the student population. This is both an inhibiting and a driving factor for innovation due to the diversity in ability and skills of students entering first year.

However, it is difficult for any tertiary course to meet all the demands of the industry in terms of industry's expectations of the qualities of an IT graduate. The fact that university courses differ in length, coverage of content, focus within subjects, etc., complicates the task of developing overall focus and programs of study that would all provide the same set of generic attributes for an IT graduate, even if this were desirable. The professional development levels of the academics who plan, conduct and deliver such programs also vary significantly making the uniform application of the concept of generic attributes of IT graduates difficult to achieve.

2.8 Industry relevant university curricula

Maximising curriculum alignment with industry needs is possible if curriculum requirements are dictated strictly by industries’ needs. However, such an approach is not the traditional way of developing university curricula. Pak, Rho and Chang (2006) describe how the South Korean Government directed the university system to develop curriculum requirements based upon industries’ needs by applying the concept of supply chain management to human resources development. Aken and Michalisin (2007) say that although such a measure seems too drastic for application within the US, it is certainly worth investigating because they found that many studies in the US concluded that the MIS graduates in the US seem to be generally lacking in the quality of the skills that are of most interest to the employers.

In relation to Australia, Koppi, Naghdy, Chicharo, Sheard, Edwards, and Wilson (2008) state,

*It is widely thought that industry could do more to promote the ICT profession and that government could address the issue at all levels. In general, the relationship between industry and universities needs to be improved particularly with respect to the development of industry-integrated curricula.*
The Australian Computer Society (ACS), which is the peak representative body for the IT profession in Australia, is concerned with IT course accreditation, IT professional skills forecasting and shortages and IT employment matters. Although it is optional, most Australian universities and other IT degree granting institutions work hard to obtain accreditation for their IT courses. It is important to students to study an ACS accredited course. Accreditation requires a certain depth and breadth of knowledge in key areas. More importantly, the learning of generic skills such as project management, ethics and written and oral communications is required for accreditation. Very little is understood about how effective this learning is as graduates move into the workplace.

Course accreditation bodies have a significant role to play in ensuring IT faculties offer courses that align with the IT industry needs. For example, the Accreditation Board for Engineering and Technology (ABET) in the USA has accredited IT and Computer Science programs since the 1980s. One of the conditions of accreditation is that the faculties offering IT programs assess and evaluate both the educational objectives and outcomes of programs (Lending and Mathieu, 2010). A program's education objectives are broad statements describing the career and professional accomplishments to be achieved by students in the program and attained a few years after graduation. Program outcomes are designed to demonstrate the skills students should have achieved by the time of graduation. Lending and Mathieu (2010) examined the requirements of IT accreditation bodies in the USA. They measured the success of IT programs using mechanisms to follow graduates after graduation. They found that students said that the most frequently used business skills are analysis, spreadsheets, collaboration, client consulting and project management. The greatest difference in expectations between employers and graduates is in non-technical writing skills. Such findings have implications for university IT courses and the coverage of such skills in their courses.

2.9 Professional association perspectives

The previous Section discussed the role of the ACS in IT course accreditation. The ACS also lobbies universities and employers to work closely to develop the professional skills of IT graduates and workers. The ACS funds professional development programs such as ‘from graduation to employment’ to provide a much needed boost to the employment
prospects of the final year university students and recent graduates (ACS, 2005a). In the program graduates are taught how to prepare for the interview process, learn to tap into the hidden job market, network with graduates and gain insight into skills needed for success in the workforce, where the industry is heading and how they can best leverage their skills. They also learn about workforce issues not necessarily covered in university studies such as the organisational culture and management of workload.

2.9.1 Lack of industry training/professional development of current staff

The need for Australia’s ICT employers and professionals to address potential skills shortages in the industry amidst increasing pressure to develop new skills, boost innovation and close the gap between the needs of ICT and business was highlighted in an ACS (2005d) survey. Claims were made that workers are not being trained in soft skills, new technical developments, general business training, communication and business presentation skills and dispute resolution skills. In addition, employers provide a low level of training to their staff (between one to five days of training per year), which is well below the twenty days of training per year that the ACS considers acceptable. A lack of commitment is indicated by ICT employers to contribute to upgrading workforce skills. Several questions for employers arise:

- Will employers contribute towards the development of the professional competence of their staff? and
- At what cost would employers be willing to provide quality training to their staff?

The ACS recommends that workers should not rely on their employers to stay up-to-date with technical advances in the market. It is a responsibility of all professionals to keep their own skills up to date.

2.9.2 IT skills forecast and ACS initiatives

IT educators and the profession have a responsibility to drive initiatives to address IT skills demands and periodic shortages. ICT is important to Australia’s economy and is one of the biggest contributors to productivity gains across all sectors in Australian economy (ACS (2008e) report on the ICT Skills Forecast).
Continued ICT skills shortages will continue at current or worse levels until at least 2010, regardless of optimistic presumptions in respect to forecast levels of graduates and migration settings.

There was a prediction in an accompanying ACS (2008b) media release that the national ICT skills shortages will grow by 29% in the year 2010 to just over 14,000 jobs. The prediction for gaps in ICT employment for 2020 is estimated to be around 25,000 jobs with a negative impact on the performance of every Australian industry sector. These forecasts were made before the implementation of the National Broadband Network (NBN) (NBN, 2011) which is likely to exacerbate the present skills shortage. There are implications in such forecasts for the Australian economy, student enrolments and the preparation of IT graduates with the skills likely to be required by employers in the future (ACS, 2008f; ACS, 2010b). According to Koppi, Edwards, Sheard, Naghdy and Brookes (2010), one of the major reasons for a crisis in IT education is the decline in IT enrolments despite increases in industry demand for IT professionals (ACS, 2008e). The ACS recommends that the government foster ICT education so that innovation needs for the future can be met by qualified ICT professionals. However, federal government funding for additional student places at universities alone is insufficient to address any skill shortages in ICT. The then CEO of the ACS, Kim Denham (ACS, 2009a) stated that

The higher education initiatives and funding are a great start to implementing the Bradley reforms; however, pressing questions remain as to whether these will drive our students towards high need, high growth sectors such as ICT.

National ICT careers week (ACS, 2008c) is an example of many ACS initiatives to overcome negative perceptions of young people about the ICT industry and to encourage school leavers to undertake ICT career options.

Prior to the Global Financial Crisis, Australia had significant skills shortages in many professional disciplines, including in ICT. Despite the growth of the ICT sector, students have been steadily moving away from “technical” based courses, like ICT, with significant falls in enrolments over the past five years. The ACS is concerned that in a system that provides funding to Faculties and Courses on the basis of student demand, this situation could further deteriorate unless we also put into place measures to attract students into ICT courses (ACS, 2009a).

The ACS also lobbies the government and the industry to promote better work opportunities for women undertaking ICT careers. Women in the ICT sector feel
undervalued with fewer opportunities than men and find the lack of flexible working hours makes it difficult to achieve work life balance (ACS, 2008d). The IT profession should not be viewed as a male dominated industry.

Some of the key recommendations made by the ACS (ACS, 2009b) to the Bradley review (Bradley et al., 2008) and the Government’s response to the Higher Education Report (Department of Education Employment and Workplace Relations) (DEEWR, 2009a) are:

- Greater collaboration between industry, government and the education sector to develop relevant skill sets needed for the future;
- Inclusion of a work experience component as a part of the degree in ICT curricula; and
- Development of (rolling) 3 to 5 year skills forecasting plans jointly developed by Industry and government.

According to a recent report from ACS (ACS, 2010a) some of the major factors affecting ICT skills development in Australia are:

- A significant decrease in the number of students enrolling in ICT courses despite growing demand nationally and internationally for ICT skills; and
- IT graduates often not considered ‘work ready’ and not as employable as they should be.

Some possible approaches from the report to solving the ICT skills concern in Australia are:

- Developing a supply and demand model for the ICT sector using the Industry Leadership Group – a joint initiative of the ACS and AIIA (Australian Information Industry Association) with wide ranging industry, government and academic participation;
- Conducting awareness programs promoting the benefits of a career in ICT to students to help increase enrolments in ICT courses – being done by industry, industry associations, governments and universities;
Developing and promoting programs such as the ACS Professional Year Program (ACS, 2008g), ACS CPEP (Computer Professional Education Program) and ACS graduate diploma aimed at making graduates more work ready; and

- Changing the ACS accreditation process and requiring universities to align their courses to industry needs and to include work placement programs in ICT courses to improve industry readiness of graduates.

Given the industry and professional association concerns about ICT skill shortages forecast for the future, attracting students to IT courses and preparing IT graduates to face the challenges of IT industry becomes critical for IT education and the profession. Employers, academic and professional association perspectives of IT graduates were discussed in previous sections. The little existing research on graduate perspectives about work following graduation is discussed in the next Section.

### 2.10 General graduate perspectives

Since 1992, the CEQ (Course Experience Questionnaire) has been used by Australian universities to obtain graduate feedback on curricula, teaching and assessment practices and to measure the quality of the outcomes of the learning process. A series of closed Likert style questions and two open-ended questions on the best aspects of a graduate's course and those aspects that most need improvement are covered. Richardson and Kabanoff (2003) state the CEQ fails to pay attention to the graduate perceptions of the practical relevance of their course and the development of knowledge and skills applicable to their workplace experiences because not all graduates are employed when they undertake a CEQ. Such information would help educators understand the transition of graduates from university to workplace. However, graduate satisfaction as measured through the CEQ was used by the Federal government as one of the performance indicators for determining learning and teaching performance funding across universities in Australia. Respondent age, field of education, institutions attended, timeliness of the data, influence of a particular year of study, statistical complexity, response rate and changing field structures are factors that need to be considered to understand the CEQ data for comparisons between university performances.
Australian higher education providers administer a DEEWR funded Graduate Destination Survey (GDS) to graduates four to six months after completion of their qualifications. The GDS is a measurement of success in finding employment and the average salaries of graduates when they enter the workforce. The relative success of university graduates in finding employment is compiled by the Australian Bureau of Statistics (ABS) and DEEWR (Australian Bureau of Statistics (ABS), 2004; DEEWR, 2008). The GDS is not designed to capture skills needed in the workplace or employment outcomes for graduates more than six months after graduation. However, it can take several years for graduates to settle in to their chosen careers (Coates and Edwards, 2009). In May 2008, DEEWR commissioned ACER (Australian Council for Educational Research) to investigate the outcomes and job transitions of graduates five years after the completion of a Bachelor degree. This was the first such nation wide study of Australian Bachelor degrees. The Graduate Pathways Survey (GPS) was administered to most Bachelor degree graduates from Australian Higher Education providers to obtain data on the graduates’ demographics, Bachelor degree(s), education and employment activities in their first, third and fifth years after graduation. However, again the GPS was not designed to identify or analyse the skill requirements graduates need for their employment.

Hambur, Rowe and Luc (2002) tested graduates over a range of skills (written communications, problem solving, critical thinking and intrapersonal understandings). They made major contributions to the discussion on graduate skills assessment (GSA). They analysed data from GSA exit 2000 and GSA entry 2001 tests totalling 3663 students from nine fields of study across 27 Australian Universities. They found that variables such as field of study, year level at university and familiarity with English (native speaker) appear to be related to performance on all GSA dimensions. Several institution specific data collections aimed at understanding graduate experiences and destinations have also been carried out in Australia. Some examples are:

- Law graduate destinations (Vignaendra, 1998);
- Views of graduates from the University of Melbourne (James, 2001);
- Views of teacher graduates (University of Wollongong), two years after being in employment (Booth and Runge, 2005); and
- A study of Business and Commerce and Tourism Students at Monash University (Goyal and Weiler, 2006).

### Table 2.5 Some International research following graduates after graduation

<table>
<thead>
<tr>
<th>Country/Reference, Study focus</th>
<th>Study details and findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canada</strong> - Finnie (2000); Finnie (2004); Five years after graduation</td>
<td>Graduates expressed high satisfaction over their educational choices (Finnie, 2004); majority of graduates were employed in the jobs appropriate for their qualification</td>
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<tr>
<td><strong>USA</strong> – Rogers and Mentkowski (2004) Effectiveness of graduates five years after college (Alverno College, USA) to meet quality and transferability requirements by employers;</td>
<td>Provides a picture of complex multidimensional abilities in the most effective five year alumna performances; skilled collaboration, use of specialised knowledge, balanced self-assessment and breadth of theory-based frameworks for constructing action are the key sources of alumna effectiveness from a faculty staff perspective</td>
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<tr>
<td>Bradburn et al. (2006) Ten years after graduation</td>
<td>40% of Bachelor graduates had enrolled in a master’s or doctoral degree within ten years of graduation; 90% of USA graduates 10 years after graduation indicated that their degree was worth the time, cost and effort; 78% agreed their degree prepared them for work/career</td>
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<tr>
<td><strong>UK</strong> - Purcell et al. (2005a) Followed the early labour market experiences of graduates three to four years after leaving university;</td>
<td>Benefits of university study only noticeable a few years after leaving the university; the importance of monitoring career progression to understand benefits of university degrees; 70% of men and 66% of women were in full-time employment; 57% of graduates had undertaken training related to career (after 4 years); majority of graduates were employed in the jobs appropriate for their qualification; 70% of graduates left their first job gained after graduation</td>
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<tr>
<td>Northern Ireland - Purcell et al. (2005b) Investigates early careers of graduates from Northern Ireland over a three and a half to four years period following graduation (1995 and 1999)</td>
<td>1999 cohort of graduates immediately employed following graduation – 63% of the graduates indicated that they used the skills that they had developed on their course, 54% stated that they used the subject knowledge they acquired from the course, 43% claimed that their qualification was required for their job</td>
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<td></td>
<td>Graduates after four years of graduation – 84% of graduates indicated that they used the skills they acquired from the course; 71% indicated that they used the subject knowledge they acquired from the course, 68% claimed that their qualification was required for their job</td>
</tr>
<tr>
<td>Scotland – Futureskills Scotland (2006) Surveyed employees in Scotland about broad skills required in jobs, the use of</td>
<td>Three quarters (72%) of the Scottish respondents reported that the qualifications requested by employers were either essential or fairly necessary to do the job; most generic skills are considered to be important in jobs in Scotland; higher</td>
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computing skills and other generic skills and the level of employee task discretion. Part of 2006 Work Skills in Britain Survey

Transition from study to work/ study of skills required for work

Europe - Teichler (2007) CHEERS (Careers after Higher Education – a European Research study) included 11 European countries, more than 36000 graduates surveyed about three to four years after graduation

Transition from study to work

Allen and van der Velden (2008); Little (2008); Schomburg and Teichler (2006);
Five years after graduation

Transition from study to work

4 years after graduation one fifth of the European graduates surveyed saw little or no use in their job of the knowledge and skills acquired from their study; when asked how the field of study is linked to their area of employment, 40% of the respondents said their field was the only one possible or by far the best; more than 40% perceived their work situation four years after graduation as better than expected compared to 20% who perceived their work situation to be worse than expected

Most graduates felt their skills were used in their employment Allen and van der Velden (2008);

Within five years of graduation, the majority of graduates in European countries had undertaken work related training (Little, 2008); 59% of graduates left their first job gained after graduation

These Australian studies were specific to a field of education / discipline within an institution. The majority focussed on the transition of students from study to employment. Booth and Runge’s study examined the work experiences of teacher graduates after two years in employment. Little attention was paid in these studies to the skill requirements of work or the work experiences of recent graduates.

Some international research in following graduates after graduation also exists. Some examples are given in Table 2.5. There was a mixed response as to how satisfied graduates were with the relevance to work of their Bachelor degrees studied at various periods (two, four, five and ten years post graduation). In some studies, statistical information was gathered such as the number of graduates in full time and part time employment, the relationship between their field of study and area of employment etc. In most, the transition experiences of graduates from study to work were studied and, in a few cases, the skill requirements for work, that is, what graduates actually do at work.

Crebert, Bates, Bell, Patrick and Cragnolini (2004a) investigated a selected group of university graduates (Microelectronic Engineering; Criminology and Criminal Justice and
Leisure Studies) about their perceptions of the contributions that the learning contexts of their universities, work placement and post graduation employment made to the development of their generic skills. The graduates' response showed that they greatly valued the experience of learning in the workplace in their subsequent employment. However they also were appreciative of the skills acquired from their university studies that in their opinion provided a good foundation for further learning. Three main factors for effective learning were identified within the three different learning contexts (university, work placement and post graduation employment) jointly as: teamwork, being given responsibility and collaborative learning. Crebert et al. point to a number of studies in which the expectations of employer groups in relation to university education appear to have been influenced by highly context-bound interpretations of desirable graduate attributes, capabilities and competencies.

Wood and Petocz (2003) say that there is a lack of readily available data on students’ entry levels and demographic information. They believe this lack of data makes it difficult to study feedback about what graduates do in their professional practice and how they cope with the challenges, or what helps or hinders their development from their studies. They state that all students need more than just technical skills and that lecturers need to elaborate on learning situations and make more explicit connections between work and learning. Bringing the professional world into classrooms is one way of showing this connection. They suggest that to assist in the development of such teaching and learning, universities should improve connections with their alumni and track the destinations of all their graduates. According to Yorke and Knight (2003), higher education can be a preparation for a profession and can be seen as a preparation of students for any job by developing generic skills so that employability is enhanced by the development of generic achievements. Knight (2003) states that graduates' lack of work experience, unrealistic aspirations, competition for jobs, poor academic results, poor career planning, degree-work mismatch, lack of communication skills, self-presentation and self-motivation can present huge problems for employability. When new graduates enter employment they are faced with multiple, conflicting identities that are in contestation with each other. Coping with such multiple identities can be challenging. Scott, Brown, Hunt and Thorne (2004) highlight that knowing how to deal with multiple identities such as personal lives and study and professional identities is demanding and that compartmentalisation of workers' lives is essential.
2.11 IT specific graduate perspectives

There have been a few studies on IT graduates and their workplaces following their university studies. Sumner and Yager (2008) 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. They concluded that graduates need a balance of technical and non-technical skills for industry relevance.

Some findings specific to the Information Technology sector reported in the 2008 Australian Graduate Pathway Survey funded by DEEWR (Coates and Edwards, 2009) are:

- Five years following graduation, Information Technology graduates were employed across many industries with the highest proportions in property and business services (26%), education (16%), finance and insurance (12%), government administration and defence (10%) and manufacturing (10%);
- There were slight declines across the five year period in the perceptions of graduates of the relevance of their Information Technology degree;
- Across a 3-5 year period, a decline in participation in further study was noted among Information Technology graduates in comparison with education and engineering graduates; Five years out, IT graduates tended to see their Bachelor degrees as less relevant to further study in comparison with graduates from science and health degrees;
- A notable increase in full-time work participation was observed in IT (first year after graduation (81%), three years after graduation (90%) and five years out it was 93%) in comparison with graduates from humanities, science and health degrees. In the fifth year after graduation, Information Technology graduates were seen to have high levels of full-time employment; and
- Information Technology courses are more popular among males than females.
The main aim of the ALTC (2009a) study, funded by the Australian Learning and Teaching Council, 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. Limited research is available in understanding the relevance of university degrees to workplace requirements. However, the transition of graduates from education to the workplace has been described by several studies.

2.12 Transition from education to workplace

Most universities provide services to graduates to cope with the significant change from student status to employee. Many have career services that assist students about practical matters such as what to wear to work, understanding office hours, making first impressions, orientation sessions and introduction to work sessions. Universities could do more to alert graduates that the theories and ideal models learned at university may not apply exactly in the workplace and that graduates need to be aware of organisational details and procedures. For example, they could encourage student to ask questions when they do not understand something, to be realistic, have patience, be courteous and respectful, do research and network. Graduates would benefit from sessions on the importance of good communication in the workplace and different methods of communication (phone, voice mail, email, written and verbal) and how to deal with ethical, legal, confidentiality dilemmas in the workplace to handle the transition from study to work.

Generic skills during employment could be enhanced by the skills of transfer – learning how to learn, awareness of context, capacity to move between different viewpoints, languages and systems of knowledge, self-regulation and critical self-reflection (Marginson, 1994). Further, if universities can prepare students entering the workforce with the realisation that “The whole of life is learning. Therefore, education can never end” and
that learning is a never-ending process of input, change and confrontations, their graduates will be able to engage in divergent thinking and accept feedback about their performance non-defensively (Vaughan, 2000). Hamel (1999) found that the move from university to work requires certain job knowledge, skills and attitudes (KSA). He argues that how and where the new employee acquires these KSAs is mired in the transition between education and the world of work.

Some recommendations from Crebert et al. (2004a; 2004b) to help graduates cope with the transition from university to workplace, particularly in relation to generic skills development, are: greater practical emphasis in undergraduate courses; more work placements; greater input from industry; more oral and written assignments, team project work, leadership training and case studies; more practice with technical content and a greater emphasis on business administration skills. Crebert et al. (2004b) further point out that the list of desirable graduate attributes used by employers is becoming longer and more complex.

Some examples of research studying transition from university to work across different professions are discussed in the next Section. However, much of the findings and conclusions from these studies are equally applicable to IT.

2.13 Related research in other professional areas

In a Canadian study, Evers and Rush (1996) collected views from university students and graduates working with corporate employers. They found the need for all employees to possess managerial skills irrespective of whether or not they are in managerial positions and that such a notion is increasingly becoming essential not just desirable. They stated that in the battle between content and skills, content usually takes precedence over skills in most university courses. The four bases of competence for skill development during the transition from university to work in Evers and Rush’s model (shown in Table 2.6) are: mobilising innovation and change, managing people and tasks, communicating and managing self. From their findings, they believe that courses in social skills and humanities are essential to all university graduates as they enter work.
Table 2.6 Evers and Rush model of four bases of competence for skill development during transition from university to work

<table>
<thead>
<tr>
<th>Mobilising innovation and change</th>
<th>Managing People and tasks</th>
<th>Managing self</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ability to conceptualise</td>
<td>• Coordinating</td>
<td>• Learning</td>
</tr>
<tr>
<td>• Creativity/Innovation/Change</td>
<td>• Decision-making</td>
<td>• Personal strengths</td>
</tr>
<tr>
<td>• Risk-taking</td>
<td>• Leadership/Influence</td>
<td>• Personal organisation/</td>
</tr>
<tr>
<td>• Visioning</td>
<td>• Managing conflict</td>
<td>Time Management</td>
</tr>
<tr>
<td></td>
<td>• Planning and organising</td>
<td>• Problem solving</td>
</tr>
</tbody>
</table>

| Communicating                                                          |                                                                 |                                 |
| • Interpersonal                                                        |                                                                 |                                 |
| • Listening                                                           |                                                                 |                                 |
| • Oral communication                                                   |                                                                 |                                 |
| • Written communication                                                |                                                                 |                                 |

In Europe, Hult, Dahlgren, Dahlgren, Hård af Segerstad and Jeffery (2003) followed graduates from political science, psychology and engineering disciplines in the Journeymen project. Their argument that the clarity of the professional role is perhaps too much taken for granted in engineering education applies to IT education as well. Psychology students in the Journeymen Project studied courses which had a fairly significant component of generic skills intermingled with theory that was transposed into practice during their studies (Hult et al., 2003). For relevant courses, an emphasis on work life experiences integrated with theoretical parts of study is a key recommendation from Dahlgren et al. (2004) which is also applicable to IT courses.

Dahlgren et al. (2008) developed a model to represent the theory of student engagement and situated identity formation in the context of professional knowledge and perceptions for work based on the findings from two international projects - the Journeymen project discussed above and the professional entity project based in Australia. According to their model, areas of professional identity include:

- **Extrinsic technical** (professional work is constituted as a group of technical components that can be used when work demands it);
- **Extrinsic meaning** (professional work is about developing meaning inherent in discipline objects); and
• **Intrinsic meaning** (professional work is related to a person’s own personal and professional being).

Dahlgren et al.’s model is shown in Figure 2.6. Identity and engagement are strongest at the far ends of the two dimensions (bottom-right) and weakest at the most limiting positions (top-left) as shown by the diagonal arrow in the model. The aspects of knowledge for work are described as **Ritual** and **Rational** (*Rational substantive* skills and *Rational generic* skills). These skills are described in Table 2.7.

![Figure 2.6 Dahlgren et al.’s (2008) model for understanding professional learning](image)

<table>
<thead>
<tr>
<th>Aspects of knowledge for the profession</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ritual</strong></td>
<td>The exchange value of knowledge - where connection to a specific context of application is lacking</td>
</tr>
<tr>
<td><strong>Rational</strong></td>
<td>The utility value of knowledge - preparing for a specific field of knowledge or professional field of work</td>
</tr>
<tr>
<td><strong>Rational substantive</strong></td>
<td>Rational substantive skills are content specific and contextually situated</td>
</tr>
<tr>
<td><strong>Rational generic</strong></td>
<td>Rational generic skills are transferable between different contexts.</td>
</tr>
</tbody>
</table>

Table 2.7 Aspects of knowledge for work
Useem (1989) suggests that liberal arts graduates perform better in corporate employment compared to business and engineering graduates due to the former's liberal learning. He believes that graduates from all disciplines can benefit from such liberal learning approaches.

Anecdotal evidence implies that many employers fail to provide graduates with sufficient induction and support to understand their work roles. Herrington and Herrington (2004) compare the experiences for new teachers as the closing of one door (university training) and the opening of another (a new position as a teacher) and highlight the lack of effective induction procedures at schools. Employers (irrespective of the industry) have a responsibility to formally induct and establish support/service networks to assist employees settle well in their early years of employment. While large companies can afford to do extensive induction and offer employee assistance, small companies either are not interested or do not have the resources to run such induction programs and hence take the easier options of hiring well experienced graduates or outsourcing work.

The importance of understanding learning experiences and their relevance and the implications of the teaching-learning process for employers, graduates and academics is the focus of the next Section.

2.14 The relevance of learning experiences

Hounsell (2005), an author and one of the editors of the book, *The Experience of Learning: Implications for teaching and studying in higher education* analyses several themes and findings from the book and their implications for our thinking about the teaching-learning process. Hounsell examined the experience of learning, first from perspectives adopted by groups such as lecturers, researchers, psychologists, etc. and then from the student’s perspective with a view towards exploring the meaning of learning as it is understood by different groups. The student’s perspective is then examined with a view to developing a new conceptualisation of learning. Hounsell shows that students were given a back seat observer role while teachers centred the teaching-learning processes around their own perceptions, one in which they, rather than their students, engaged. Little is known about how IT graduates respond at workplaces to issues, challenges and the kind of difficulties or
problems they encounter. Hounsell’s argument that the experiences of students have been taken for granted rather than systematically explored also applies to IT graduates who have moved to workplaces from a university education.

The approach taken in this research will be similar to Hounsell's. The aim is to understand the relevance of IT courses to graduates’ work experience. As we have seen in Sections 2.6, 2.7 and 2.9, that experience is examined first from the perspectives adopted by other groups such as employers, universities and professional organisations in an attempt to explore the meaning of ‘work experiences’, ‘learning’ and ‘graduate skills’. Then the graduates’ perspectives on these issues are examined to understand if there is a relationship between their university studies and workplace experiences.

Hodgson (2005) explains three types of experiences of relevance. They are:

- **Intrinsic experiences of relevance** (very much about the student’s making use of their knowledge and skills);
- **Extrinsic experiences of relevance** (surface learning approaches with a focus on what is necessary to fulfil external demands such as being able to reproduce text or answer a specific question); and
- **Vicarious experiences of relevance** (for example, experiences which establish the relationship between the characteristics or skills of lecturers and student learning)

The vicarious experiences of IT graduates are studied so that academics and industry are able to help students go beyond the outward demands of learning or work situations. This approach will help students' connect their studies to their understanding of the world around them.

Taking into account the many perspectives and issues discussed in this chapter, the reasons for the focus of this thesis on professional skills and graduate perspectives are discussed next.
2.15 Summary of the focus of this research on professional skills and graduate perspectives

The rationale for this research was discussed in Chapter 1. The research problem and main research question sought were used to provide an understanding and analysis of the professional work experiences of recent Australian IT graduates and the preparation of such graduates for their professional practice. Some supporting arguments to justify the research problem and focus of this research are presented from the literature. The following factors influenced my decision to focus on professional or non-technical skills:

a) Many IT graduates with good technical skills do not obtain jobs, mainly because of their poor non-technical skills;
b) There are a number of studies on IT technical skills but few on non-technical skills; and
c) The viewpoints of graduates are examined in this research rather than the more usual view from employers.

The fact that professional skills may be more important for employment does not mean that technical skills are not important. However, they receive considerably more attention via regular curriculum reviews. This leads to the next Section where the research questions for this study are presented.

2.16 Research Questions

The main research question is:

*What do the professional work experiences of recent Information Technology graduates in practice tell us about their preparation for the profession?*

To address this broad question, a series of (sub) questions will be examined:

*Research Question 1: What are the typical professional skills requirements of IT professional practice?*
**Research Question 2:** From graduates’ viewpoints, which sources assisted them to acquire the professional skills required for their professional practice?

**Research Question 3:** From graduates’ viewpoints, which elements of their University study program contributed towards fulfilling the professional skills requirements of their practice?

**Research Question 4:** From graduates’ viewpoints, how well did their university studies prepare them to meet the professional needs of their professional practice?

**Research Question 5:** What is the role of different players (universities, employers, professional associations and graduates themselves) in the professional preparation of IT graduates?

### 2.17 Conclusion

The major issues arising from the literature in relation to: 1) the preparation of graduates for industry (gaps in education, training, work requirements) (2) the need for more systematic research into following graduates into professional practice and the resulting perceptions of the synergy between their course and their preparedness for professional practice and (3) the research questions were described in this chapter. As a result of the literature review, questions about how to analyse professional practice sites in IT were developed. By identifying key elements of work performance, work tasks and work practice we can develop a holistic picture and better understanding of work practices. By looking through the lens of recent IT graduates in the industry, this research study will assist IT employers and IT academics to identify and understand those factors and issues that matter most for IT graduates.

Developing a better understanding of the professional work experiences of IT graduates is important. There is evidence that there appears to be a mismatch between employers' expectations of graduates and the skills of graduates. Our current understanding of IT graduates and their professional work experiences during the early years of work is inadequate for identifying the source of some of the problems discussed in the literature.
concerning this mismatch. The IT industry is multi-dimensional and simple definitions of the needs of employers are not possible. There is no *one size fits all* approach to these issues. Little has been resolved over many decades in terms of fitting graduates to the professional IT workplace. Thus, understanding graduate perceptions and describing the professional workplace experiences of recent IT graduates together with the professional skills they require for their work and the challenges they face at their workplaces is the major aim of this research. The research findings and recommendations have implications for employers, educational institutions and IT graduates. The research methodology and methods used in this research are discussed in the following chapter.
CHAPTER 3 RESEARCH DESIGN AND METHODOLOGY

3.0 Chapter overview

The research design, methodology and methods used to seek answers to the main research question below are explained in this chapter.

*What do the professional work experiences of recent Information Technology graduates in practice tell us about their preparation for the profession?*

The different research methodological approaches and their appropriateness to this study are discussed. Then, explanations and justifications for using traditions of grounded theory to inform this research are given. Other aspects of the research methods and procedures used in this research such as interviewing, in-depth qualitative surveying, sampling, data analysis and coding are discussed.

3.1 Research design considerations

The three key factors considered during the design of this research were the nature of the research questions (evaluation, description and investigation), the type of the expected research results (answer, judgement, report on observations and illumination of problems or issues) and the type of validation to be used.

Two steps were involved in the research design process: exploration of possible methodologies and having then chosen a methodology, the design of how to conduct the research (using research methods and techniques).

3.2 Research methodology

Understanding the professional work experiences of recent IT graduates is the main objective of this research. Some key elements of this investigation related to the nature of questions that could be asked, the nature of data collected, the purpose of the data, the
opportunities presented to the researcher, the emphasis on validity and reliability checks as well as the ease of data analysis. The choice of a suitable methodology was possible once an understanding of the above issues was gained.

In this study, the aim of any proposed data collection was to understand phenomena, explore ideas and insights but not to measure any variables. Hence, uniqueness and illuminative responses took precedence over statistical measures of significance, frequencies and sampling criteria. I needed to be able to ask questions that were responsive and open-ended. Any research approach chosen had to allow for explanation and clarification opportunities for the researcher. The data collected needed to enable comparison studies amongst responses from study participants.

Markus and Robey (1988) state that qualitative approaches have the potential to yield data from which process theories and richer explanations of how and why processes and outcomes occurred can be developed. According to Denzin and Lincoln (2000), qualitative studies “put the emphasis on the qualities of entities and on processes and meanings that are not experimentally examined or measured in terms of quantity, amount, intensity or frequency”.

Experimental design or questionnaires/surveys (with questions and pre lists of possible answers) were regarded as inappropriate for this research because:

- It was not the intention of the research to measure variables or trends based on set scales and ratings;
- The research was not planned to test any pre-determined hypothesis or pre-conceived ideas. The study would be inductive not deductive;
- Statistical significance, variance or causation relationships were also not of interest; and
- A deep understanding of the problem area was needed by probing for responses from participants. This could not be achieved in the restrictive and simplified nature of quantitative approaches. This research was to be exploratory rather than confirmatory.
Other quantitative approaches such as correlational studies (quantifying the relationship between two variables) or longitudinal studies (studying or measuring developmental changes over a period of time) were also unsuitable for this study. The research questions, the objectives, the expected outcomes of this research and the nature of the population under study sat within the realm of a qualitative approach.

Qualitative research can refer to a collection of methodologies some of which are interviews, action research, ethnography, case studies, qualitative surveys, phenomenography and grounded theory. Characteristics of these approaches are word by word analysis, time consuming data analysis stages and the use of appropriate measures to check for reliability and to check and approve interpretations of the responses from respondents.

Creswell (2003) defines qualitative research as:

> Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a natural setting.

Creswell states that where minimal research exists or few theories have been developed, qualitative research is suitable. In a qualitative study, the question often starts with a how or what as does the research question under study: *What do the professional work experiences of recent Information Technology graduates in practice tell us about their preparation for the profession?*

The characteristics of qualitative research and their suitability for this research (using the framework provided by Creswell (2003)) are listed in Table 3.1. Two methodologies were considered suitable for this research. The first was exploratory research informed by the traditions of grounded theory using interviews and qualitative surveys. Although it is not the intention of this research to deduce or test any theories or produce generalisable results, some key ideas from grounded theory such as constant comparison, theoretical sampling, theoretical comparison and data analysis procedures were appealing to me and these techniques seemed to fit the needs of the research.
Table 3.1 Qualitative research characteristics and their applicability for this study

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Applicability to this research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher as the key instrument of data collection</td>
<td>Yes</td>
</tr>
<tr>
<td>Data collected as words or pictures</td>
<td>Yes, as words</td>
</tr>
<tr>
<td>Outcomes as process rather than product</td>
<td>Yes</td>
</tr>
<tr>
<td>Analysis of data inductively, attention to particulars</td>
<td>Yes</td>
</tr>
<tr>
<td>Focus on participants’ perspectives, their meaning</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of expressive language</td>
<td>Yes</td>
</tr>
<tr>
<td>Persuasion of researcher by reason</td>
<td>Yes</td>
</tr>
<tr>
<td>Scientific method approach – (inductive-bottom-up) - Researcher generates new hypotheses and/or rich and detailed explanation from data collected</td>
<td>Yes</td>
</tr>
<tr>
<td>View of human behaviour – Behaviour is fluid, situational and personal</td>
<td>Yes</td>
</tr>
<tr>
<td>Research objective is description and exploration</td>
<td>Yes</td>
</tr>
<tr>
<td>Behaviour is studied in natural environments - the context in which behaviour occurs</td>
<td>Yes</td>
</tr>
<tr>
<td>Data collected is qualitative in nature and includes in-depth interviews, open-ended questions</td>
<td>Yes</td>
</tr>
<tr>
<td>Data analysis is a search for patterns, themes and holistic features</td>
<td>Yes</td>
</tr>
<tr>
<td>Results present multiple perspectives, particularistic findings</td>
<td>Yes</td>
</tr>
<tr>
<td>Final report will be a narrative report with contextual description and direct quotations from research participants</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Another possible approach was a naturalistic ethnographic research that would use a combination of accounts, observation, video and audio recording, interviews and field notes. The description and illumination of issues relevant to the research problem and investigation of the research questions is possible using both approaches. A comparison of the two approaches is shown in Table 3.2.

Table 3.2 Comparison of possible methodological approaches

<table>
<thead>
<tr>
<th>Methodological approaches</th>
<th>Methods</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploratory research</td>
<td>Interviews (Qualitative) and/or Surveys (Qualitative)</td>
<td>Professional work experiences of IT graduates at professional sites can be described, classified and interpreted; Move towards description and data</td>
</tr>
<tr>
<td></td>
<td>Accounts, observation, video and audio tape recording, interviews and field notes</td>
<td>Supports description, explanation, inferential, holistic approach, insider account, description and interpretation of phenomena; Move towards inference, explanation, suggestion of causation, theory generation</td>
</tr>
<tr>
<td>Naturalistic ethnographic research</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
An insider account or view of both the description and the interpretation of the phenomena under investigation is promoted by naturalistic ethnographic studies. There is a move in the focus of such studies from description and data to inference making, explanation and suggestions of causation as well as generation of theories (Cohen et al., 2004). Ethnographic research methods are characterised by their multi-modal (multi-method) omnivorous approach for data gathering and their potential to reveal the underlying elements and processes at work. Ethnographic methods are characterised by the following attributes (Cohen et al., 2004):

- Description rather than prediction – they aim at describing the phenomena;
- Induction rather than deduction - arguments tend to be inductively built rather than deductively reasoned;
- Generation rather than verification of theory – helps to generate more data to support a hypothesis rather than actually verifying a theoretical notion;
- Construction rather than enumeration – helps to construct a picture from smaller pieces and not provide an illustration; and
- Subjective rather than objective knowledge – has a unique and a specific meaning in relation to a particular scenario.

Because of the practical challenges it posed for this research, ethnography was not chosen. For example, observing IT graduates at workplaces could have been a possible research and data collection method. However, that would have restricted the research sample to a selected few individuals and organisations and the observations would have involved a considerable amount of time to gather data across several such organisations. Further, in this research, I was not specifically interested in case studies as I wanted to maximise variation in the samples studied. Observation at IT workplaces posed logistical implications. There would have been difficulties associated with obtaining permissions from IT employers and organisations and there would be issues concerning employee and employer privacy and confidentiality. Additionally, I was unable to be on employer sites for long time periods because of my full-time work commitments.

The research problem needed detailed exploration. There is little literature, variables could not be easily identified, there are no available theories to explain the behaviour of the participants and the population of study and a better understanding and explanation of the
research problem needed to be developed. Quantifying issues or generating numbers would be insufficient to generate the answers needed for this research question. Therefore, considering the scope of the research, the research question under investigation and accessibility to data, an exploratory approach informed by ideas from grounded theory was chosen for this research. A detailed discussion on the ideas and techniques used from grounded theory and its suitability to this research is presented in Section 3.4. Data was produced by the use of the following research methods:

- Interviews (qualitative, descriptive and exploratory) – using standardised open-ended interviews; and
- Surveys (questionnaire-based (online), qualitative) – a small heterogeneous group was used to cover as many aspects as possible as opposed to a quantitative study where a large group is normally needed for statistical significance.

Major assumptions of this research that led to the choice of research design are:

- The experiences of the graduates at professional sites were viewed as an opportunity to illuminate details of the perceived relationship between workplace requirements and university studies in IT. The view taken was holistic. It recognised that workplaces are complex, messy and diverse, that personal experiences differ from person to person, university to university, degree to degree and that multiple perspectives on graduate work experiences exist; and
- The workplace experiences were viewed as a social construction (rather than a specification of objectives) where individuals perform in a specific context in varied ways or a variety of work settings. The focus was on the graduate experiences in those contexts (including the relationship between their preparation for work and their workplace experiences).

The philosophical position of this research is presented in Table 3.3 using the framework provided by Creswell (2003). The ontological perspective of this research is one that emphasised that multiple realities of the world exist. They are constantly produced and constructed by individuals and their interactions with the others in the world around them. The perceptions of IT academics, IT graduates and IT employers are all likely to be different. As the researcher, my task was to analyse and interpret the IT graduate
experiences and to convert those experiences into a public language that would communicate the experience to others (Taber, 1991).

Table 3.3 Philosophical views taken by this research

<table>
<thead>
<tr>
<th>Philosophical view taken</th>
<th>Position of this research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontological assumptions (nature of reality)</td>
<td>Multiple realities exist (realities of individual graduates, readers who are interpreting the study). Multiple statements (graduate responses) represent diverse perspectives on the phenomena being explored</td>
</tr>
<tr>
<td>Epistemological assumptions (relationship between researcher and what is being researched)</td>
<td>The researcher collaborates with participants to obtain a clear meaning of their responses</td>
</tr>
<tr>
<td>Axiological assumptions (role of values)</td>
<td>Interpretive views are presented, it is acknowledged that bias is present in the sample and that the research is value-laden</td>
</tr>
<tr>
<td>Rhetorical assumptions (language of research)</td>
<td>Use of qualitative terms, use of direct quotes from participants, based on definitions that evolve during the study (rather than being defined by the researcher at the start of the study)</td>
</tr>
<tr>
<td>Methodological approach</td>
<td>Inductive logic, study of the topic within a particular context, development of categories/issues from responses of graduates rather than specifying them in advance.</td>
</tr>
</tbody>
</table>

According to Crotty (1998), epistemology is “a theory of knowledge embedded in the theoretical perspective and thereby in the methodology” and “each theoretical perspective embodies a certain way of understanding what is (ontology) as well as a certain way of understanding what it means to know (epistemology)” . In qualitative research, the epistemological assumption relates to the relationship between the researcher and what is being researched. As the researcher, collaboration with the participants helps to clarify and obtain clear meanings of their responses and thereby minimises the distance between the participant and the researcher.

The role of values or ethics in research is described by the axiological assumptions. This research is interpretive and it is acknowledged that there is bias in the sample as the participants are all currently employed in the IT industry and those graduates who were unemployed were not included in the study. This research is value-laden as enriched knowledge about the attitudes, feelings and experiences of IT graduates is sought. The goal of this research was not to make generalisations or quantify issues using numbers but to present contextual findings grounded in data, staying as close as possible to the construction of the world as participants originally experienced it (Maykut and Morehouse, 1994; Creswell, 2003). As a result, some features of grounded theory (discussed in Section
3.4) were used to generate a rich conceptual description and illumination of the concepts relevant to the problem studied.

Direct quotes from participants are used in this research. Based on these quotes, categories and themes were developed rather than the researcher defining them at the start. Thus inductive reasoning is used, where rather than starting with a theory or hypotheses, theory (or detailed explanation) is generated from the observations. In contrast, deductive reasoning is a technique whereby a framework is created and predetermined before the research is carried out. Since the aim of this study is to develop a rich detailed description of IT graduates' professional work experiences drawn from the graduates’ responses, the methodology adopted in this research is inductive.

3.3 Theory and its meaning in the context of this research

Several definitions of theory exist. Some of them are:

Kerlinger (1973) states that,

\[ A \text{ theory is a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena.} \]

According to Strauss and Corbin (1998),

\[ A \text{ theory is a set of well-developed concepts related through statements of relationship, which together constitute an integrated framework that can be used to explain or predict phenomena.} \]

Gregor (2002) states that,

\[ \text{theory answers a human need to make sense of the world and to accumulate a body of knowledge that will aid in understanding, explaining, and predicting the things we see around us, as well as providing a basis for action in the real world.} \]

Four types of theory discussed by Gregor (2002) are applicable for this research.

- Theory for analysing and describing (classifies or describes properties of individuals, groups, situations, events);
- Theory for understanding (explains how and why something happened);
- Theory for predicting (predicts outcomes from a set of factors without necessarily understanding the causal relationships between the dependent and independent variables involved); and
- Theory for explaining and predicting (predicts a phenomenon and explains the underlying causes);

Gregor states that the above categories of theories are related to each other and hence are not mutually exclusive. She states that theories for analysing and describing are descriptive in nature.

They describe or classify specific dimensions or characteristics of individuals, groups, situations, or events by summarising the commonalities found in discrete observations. They state ‘what is’. Descriptive theories are needed when nothing or very little is known about the phenomenon in question. (Fawcett and Downs, 1986 in Gregor (2002))

According to Gregor, there are two types of theory for understanding that can be used to inform practice. She describes theory for enlightenment (DiMaggio, 1995) as a good example of the first type of theory for understanding. According to DiMaggio, such a theory does not aim to generalise anything as generalisations are regarded as widely known and dull. Further, a theory of enlightenment has the potential to address “a set of categories and domain assumptions aimed at clearing away conventional notions to make room for artful and exciting insights”.

Conjectures, the second type of theory for understanding, is drawn from a study of how and why things happen in a real world situation. These conjectures can aid in the development of a subsequent theory and be used to inform practice.

The theory developed, or conjectures, need to be new and interesting, or explain something that was poorly or imperfectly understood beforehand. (Gregor, 2002)

This study did not begin with a pre-conceived theory that needed to be validated. Based on the literature review, the research began with a general area of interest. According to Strauss and Corbin (1998, p.12), avoiding preconceptions helps the researcher to be more
faithful to the data and more open to what the data is saying. They say that the theory derived from data is more likely to resemble “reality” than a theory derived by putting together a series of concepts based on experience or solely through speculation. So the research question simply identified the phenomenon of interest to this research. The definition and characteristics of Gregor’s theory for analysing and describing were used. Aids used in this thesis to explain the theory arising from this research included:

- *Relationship Tables* showing the relationship between the major categories and the low level categories and the relationship between themes (provided in Chapters 4 and 5);
- *Explanatory text with selected quotes* describing the categories, concepts, emergent themes and their relationships (discussed in Chapters 4 and 5);
- *Concept maps and diagrams* illustrating the relationships between the major categories and their relationships with each other (Ryan and Bernard, 2000) and between the major themes and the core category (provided in Chapter 5); and
- *Assumptions* made, *propositions* put forward and *conclusions* drawn from this research (described in Chapter 6 with reference to the relevant literature).

### 3.4 Research method

The focus of this study is on an area that lacked in-depth understanding, that is, of the professional skills and work experiences of recent Australian IT graduates. There was a need to explore the graduate perspectives and to understand what graduates actually do in their professional practice and the challenges graduates face at workplaces. Further, there was a need to understand the role and responsibilities of universities, employers and professional associations in the professional skills development of IT graduates. It was important to allow concepts and themes to emerge from data. All these issues required an approach that generated a rich conceptual description of the professional skills and professional work experiences of IT graduates. Some key ideas from grounded theory were suitable to address the research problem. They enabled the generation of a detailed conceptual description of, and deep insight into, the issues related to the research area. It is essential to note that the generation of a grounded theory was not the intention of this research.
In this Section, the evolution of grounded theory, the different approaches used by researchers and the similarities between thematic content analysis and grounded theory are described. Then the reasons for why this research was informed by ideas from Strauss and Corbin’s grounded theory approach are given. One of the primary reasons is the ability of such an approach to generate a rich conceptual description of the problem areas grounded in the data collected from IT graduates. Further, a grounded theory approach is best suited for preliminary, exploratory and descriptive studies (Chenitz and Swanson, 1986) and collection of the kind of data this research is seeking.

3.4.1 Introduction to grounded theory

An inductive methodology is used by grounded theory to generate theory through the application of systematic research procedures. The development of conceptual categories occurs after following a set of rigorous procedures. The goal is then to generate a conceptual theory that accounts for a pattern of behaviour, which is relevant and problematic for the study subjects that are involved. The concepts are obtained from the data. No ideas that need to be tested subsequently to force data are formed in advance. (Glaser, 1992, p.67).

According to the Grounded Theory Institute (2009), grounded theory can be used with both quantitative and qualitative data. There are two types of theory that can be developed using grounded theory - formal theories and substantive theories.

Substantive theories evolve from the study of a phenomenon situated in a particular context while formal theories deal with a conceptual area of enquiry derived from studying phenomena under a variety of conditions (Strauss and Corbin, 1998).

Several grounded theory approaches have evolved since the development of the original method by Glaser and Strauss in 1967. Eaves (2001) lists some assumptions that are common to all approaches to grounded theory development:

- Inquiry is structured by the discovery of social and socio psychological processes;
- Data collection and analysis occur simultaneously;
- Both the processes and products of research are shaped from data rather than from preconceived logically deduced theoretical frameworks;
- The theory development rather than the verification of pre-existing theories is aided by the analysis process; and
- Conceptual categories are refined, elaborated and exhausted using theoretical sampling.

The major evolution stages of grounded theory showing the different approaches researchers have taken since the original version of Glaser and Strauss’s grounded theory are captured in Figure 3.1 (adapted from Harwood (2002)).

**Figure 3.1** Evolution of grounded theory  
(adapted from Harwood, 2002, p.67; Warburton, 2005)

There are two main grounded theory approaches – the Glaserian approach and the Strauss and Corbin approach. It is generally acknowledged that the major difference between the two approaches is that Glaser’s approach uses a less structured approach with an emphasis
on the emergence of theory by data conceptualisation while Strauss recommends the use of a systematic approach to coding and analysis of data using the constant comparison technique. This research is informed by key ideas from Strauss and Corbin’s approach and the constant comparison technique is used with an emphasis on the emergence of themes and identification of the core category. Some of the steps in Strauss and Corbin’s approach are the same as those in the Glaserian method. However the major difference is that in the Strauss and Corbin approach there is no requirement for a single theory at the end of the data coding and analysis process. Strauss and Corbin’s approach allows for purely descriptive accounts in place of a theory. Glaser has a ‘purist’ approach that relies on an open attitude (no pre-conceived ideas) to theory generation while Strauss and Corbin have a ‘pragmatic’ approach with a more structured attitude to theory building. Strauss and Corbin’s approach prescribes the use of analytical tools and guiding principles providing for flexibility to the researcher to mix or use other methods and methodologies. Strauss’s transition from a realist (Glaserian view) to a more relativist view on the nature of reality, in which the theory development occurs, reflects a constructed reality.

Strauss and Corbin’s approach also involves cycles of inductive and deductive analysis occurring concurrently during data collection and analysis and this approach is best captured as a ‘grounded theory data dance’ in Kelsey (2003) and shown in Figure 3.2.

The constant comparison technique, theoretical comparisons and theoretical sampling are central to any grounded theory data analysis using ideas from Strauss and Corbin’s approach.

### 3.4.2 Constant comparison technique

Comparison techniques have long been used in social sciences research. Glaser and Strauss (1967) suggest that constant comparison of one piece of data with another helps to identify the relationship between the two pieces of data. The similarities and differences between them can also be studied. This information is then used to classify or code the data to a category. Incidents of data that are similar can then be grouped together under a category. Although the incidents of data are coded under the same category, it is probable that they will uncover different properties and dimensions of a category thus bringing out different aspects of the same phenomenon (Corbin and Strauss, 2008).
3.4.3 Theoretical comparisons

Theoretical comparisons are used in situations where there is confusion about the meaning of an incident in data. Then it is necessary to go beyond the usual raw data comparison to look more deeply at the properties and dimensions of the data. This technique was useful in this research when there was confusion about the classification of data on some occasions. Corbin and Strauss (2008) summarise the use of comparison techniques (including theoretical comparison) as used to:
• Obtain a grasp of the meaning of events that might otherwise seem obscure;
• Help reveal the properties and dimensions of data;
• Move from one level of description to abstraction;
• Force examination of findings and the researcher’s own or initial interpretations; and
• Help shape future research questions based on evolving theoretical analysis;

3.4.4 Theoretical sampling

Corbin and Strauss (2008) state that “the purpose of theoretical sampling is to collect data from places, people, and events that will maximise opportunities to develop concepts in terms of their properties and dimensions, uncover variations and identify relationships between concepts”. It is concept driven and hence is responsive to data rather than being established before the data collection process. This sampling technique is open and flexible. The objective is to maximise the variation in the concepts during the data collection process. Corbin and Strauss (2008) state, “The basis for sampling is concepts, not persons”. Relevant concepts are expanded and refined through purposeful gathering of data pertaining to these concepts. It is through theoretical sampling that concepts are elaborated. As such, it forms the basis for thick rich description and theory construction.

Harwood’s diagrammatic representation of the grounded theory analytic process in Figure 3.3 captures the process involved during the different coding stages.

Glaser and Strauss stress that verification is built into grounded theory and that it is reinforced by the claim that a means of testing the theory against evidence (Dey, 1999, p.37) is provided by the constant comparison method. The resulting theory is an integrated set of propositions not findings. This is a limitation of this approach.
3.4.5 Data collection methods

Strauss and Corbin (1998) do not specify data collection methods and state that a researcher needs to be guided by his or her thinking and imagination and may be guided by practical considerations while making decisions about the methods for data collection. According to Charmaz (2000), grounded theory methods specify analytic strategies, not data collection methods. She states that observation, interviews, respondents' diaries and journals and public records are all rich sources of data for grounded theory studies.

According to Warburton (2005), surveys and questionnaires that include ‘open’ questions that resemble interviews can have considerable potential to supply rich data, in addition to interviews alone, as they are likely to produce a wider range of responses and are useful to test responses gathered through other methods such as interviews for saturation. He believes that categories derived from questionnaire responses could be combined with categories derived from interviews in a grounded theory analysis if care is taken to ensure
that the responses are to the same kinds of questions. Further, Charmaz (2006) states that the grounded theory approach is a set of principles and practices that researchers can fine tune to suit their particular research context. She urges researchers to use the method flexibly and to avoid any prescriptive way of using the method. Her comments on data collection methods are,

*how you collect data affects which phenomena you will see, how, where, and when you will view them, and what sense you will make of them*

She advocates that any method that allows the researcher to collect data that would help answer the research questions is acceptable and that the researcher can change data gathering techniques during the data collection and analysis process.

For this research, interviews were used. Their advantages and disadvantages are listed below.

Advantages of interviews:

- Greater depth than other research methods;
- Personal element in collection of data;
- Opportunities for asking questions are extensible;
- Opportunities for probing questions exist; and
- Limited emphasis on writing skills.

Disadvantages of interviews:

- Prone to subjectivity and interviewer bias;
- Number of respondents who can be interviewed are limited;
- Limited overall reliability of the data gathered; and
- Open ended questions and responses have to be summarised.

Qualitative online surveys were also conducted. According to Robson (2002) the purpose is not to, by statistical means, test a hypothesis nor to give quantitative measures on the situation. Rather, the purpose is to observe and characterise the situation as objectively as
possible and to obtain a general overview of different perspectives. The analysis is focused on summarising the experiences and identifying the areas of interest from different perspectives. A heterogeneous group is used to cover as many aspects as possible.

Semi-structured interviews with open-ended questions and a qualitative survey, which had fixed-alternative questions (yes or no; agree or disagree and don't know), scale-items (degrees of agreement/disagreement) and open-ended items (with no restrictions on answers) were used in this research.

3.4.6 Thematic analysis

Thematic analysis is an approach to identify, analyse and report patterns (themes) within data. It can be used to create and apply codes to data collected from such items as interview transcripts, field notes and policy documents. A framework for carrying out such coding processes along with the use of techniques such as the constant comparison method (Miles and Huberman, 1994) is used. Themes that are strongly linked to data as is the case in grounded theory where the researcher does not try to fit the data into a pre-existing coding frame are identified by Inductive thematic analysis.

Thematic analysis is generally considered to be a process performed within the analytic traditions of qualitative methods such as grounded theory (Ryan and Bernard, 2000; Braun and Clarke, 2006) rather than a method in its own right. However, Braun and Clarke (2006) argue that it deserves to be considered as a method in its own right. They state that the benefits of thematic analysis lie in its flexibility of use.

However, in our experience, grounded theory seems increasingly to be used in a way that is essentially grounded theory 'lite' – as a set of procedures for coding data very much akin to thematic analyses. Such analyses do not subscribe to the theoretical commitments of a 'full-fat' grounded theory, which requires analysis to be directed towards theory development. We argue, therefore, that a 'named and claimed' thematic analysis means researchers need not subscribe to the implicit theoretical commitments of grounded theory if they do not wish to produce a fully worked up grounded theory analysis.

As thematic analysis does not require the detailed theoretical and technological knowledge of approaches such as grounded theory, it can offer a more accessible form of analysis, particularly for those early in a qualitative research career.
Floersch et al. (2010) describe their medication experiences study, which integrated thematic analysis, grounded theory and narrative analysis. They applied these three different methods to the same qualitative data and concluded that, when integrated, these three methods have the ability to produce a multidimensional understanding of the research topic. They state that thematic analysis alone would have limited their understanding and would have not allowed them to question their findings. However, with grounded theory, they were able to subsume emergent themes under the conceptual dimension and with narrative analysis they were able to account for the storied nature of people’s experiences, temporality and sequencing of data. Their work encourages the use of mixed methods with overlapping techniques with a view towards generating a multidimensional understanding of the research topic.

Braun and Clarke’s (2006) account of thematic analysis, its flexibility and resemblance to a grounded theory analytic process seemed to fit my needs. Of particular interest was the fact that thematic analysis did not require the generation of a theory. Strauss and Corbin’s approach along with the discussion from Charmaz (2006) also seemed to provide the structure required for the coding processes along with the flexibility that was needed to fine tune the data collection and analysis to suit the particular research context. Therefore, this research was informed by the traditions of Strauss and Corbin’s grounded theory approach, which allows for thematic analysis to occur during data analysis.

3.4.7 Summary of this study’s approach

As mentioned before, the aim of this research is to study and understand a phenomenon better. Key ideas from the grounded theory approach for data collection and analysis will be used. The differences between Glaser and Strauss and Corbin’s approaches and this study’s approach are summarised in Table 3.4.
Table 3.4 Comparison of the Glaserian, Strauss and Corbin and my study’s approach

<table>
<thead>
<tr>
<th>Steps</th>
<th>Glaser</th>
<th>Strauss and Corbin</th>
<th>This study’s approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory Development</td>
<td>Involves coding, theory saturation and is purely inductive</td>
<td>Rigorous coding followed by verification. Grounded theory can develop purely descriptive accounts</td>
<td>Rigorous coding, theory in the form of purely descriptive accounts and for understanding and illumination of issues (Gregor, 2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grounded theory can be used for developing non-theory (conceptual ordering or elaborate description)</td>
<td>Grounded theory is used for developing conceptual ordering or elaborate description. Possible to also identify a core category</td>
</tr>
<tr>
<td>Goal is to generate a conceptual theory that accounts for a pattern of behaviour which is relevant and problematic for those involved</td>
<td>Grounded theory can be used for developing non-theory (conceptual ordering or elaborate description)</td>
<td>Motivation of this study comes from my personal experience as an IT academic, IT course administrator and as an IT graduate</td>
<td></td>
</tr>
<tr>
<td>Use of literature</td>
<td>Start study with no preconceptions</td>
<td>Use prior experience, professional and personal knowledge</td>
<td>Literature is a good source of ideas for shaping the problem</td>
</tr>
<tr>
<td></td>
<td>Literature is not studied. Remain neutral – allow both topic and understanding to emerge</td>
<td>Literature is a good source of ideas for shaping the problem</td>
<td>Literature is a good source of ideas for shaping the problem</td>
</tr>
<tr>
<td>Use of procedures</td>
<td>Strictly follow</td>
<td>Optional</td>
<td>Pragmatic approach to application of procedures</td>
</tr>
<tr>
<td>Coding</td>
<td>Open, selective and theoretical</td>
<td>“force” coding; Open, axial and selective coding</td>
<td>Open coding, axial and selective coding</td>
</tr>
<tr>
<td></td>
<td>Identification of a core category</td>
<td>Selective coding is an emergent process, employs “forcing” and memo sorting is used.</td>
<td>Selective coding is an emergent process, employs “forcing” and memo sorting. It was also possible to identify a core category at the end of the coding process.</td>
</tr>
<tr>
<td>Induction versus deduction during analysis</td>
<td>Induction important compared with deduction and verification</td>
<td>Role of induction should not be overstressed.</td>
<td>Involves cycles of induction, deduction and elaboration</td>
</tr>
<tr>
<td>Criteria for judging adequacy of theory</td>
<td>Fit, work, relevance and modifiability (Glaser, 1992)</td>
<td>Fit, understanding, generality and control (Strauss and Corbin, 1990)</td>
<td>Plausibility, credibility and validity of the arguments, assumptions, propositions and conclusions (Gregor, 2002)</td>
</tr>
</tbody>
</table>

My previous work experiences and involvement with the extensive literature review in the research area assisted in shaping the research problem and questions for further investigation. Knowledge from literature and work experience is valued by Strauss and Corbin’s approach unlike the Glaserian approach’s dismissal of literature review and work experience knowledge suggesting that a researcher should enter grounded theory research without undertaking any literature review. Glaser also advocates that the researcher should be free of any bias when using grounded theory. It was difficult for me not to go into the
research with some form of pre-conceived ideas given my background in the research area. However, the utmost care was exercised during data collection and analysis to ensure no personal bias influenced the data collection and analysis process. For example, when participants responded to a question, rather than reading my ideas into a response or assuming it related to a particular issue, clarification was sought and they were requested to elaborate on their responses until their answer was quite clear.

Thus, a pure or orthodox grounded theory approach to the depth indicated by Strauss and Corbin (1998) was not used in this study and this is evident from my decision to conduct online surveying in addition to interviews as these helped achieve the study’s objectives. Suddaby (2006) discusses why a pure grounded theory approach is sometimes neither efficient nor comprehensible to the majority of researchers and promotes a pragmatic application of grounded theory.

Further, it was in the interest of this research to develop a rich conceptual description of the professional experiences of IT graduates and the development of a single theory was not the major intention of this research. The ideas from a Straussian approach encouraged the development of such descriptive accounts in place of the importance of theory development proposed by the Glaserian approach.

The theoretical sampling process flowchart used in this research is shown in Figure 3.4. The theory arising from this research takes the form of a rich description of insights gained and illumination of issues previously little studied. For me, as a novice researcher, Strauss and Corbin’s guidelines for the processes to be used for data collection, coding and analysis proved useful, logical and relevant for this study. In particular, their encouragement to researchers to not use the techniques prescribed rigidly but to use those techniques or steps needed for a study was helpful (Strauss and Corbin, 1998). Clearly, a researcher who takes another world view may have used different approaches from this research. But the purpose of this research was to observe and characterise the situation as objectively as possible and to obtain a general overview of different perspectives as opposed to a quantitative study.
where the focus is on the statistical significance of the data collected. A research methodological map showing the research design used in this study is presented in Figure 3.5.

**Figure 3.4** Theoretical sampling process flowchart

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Exploratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Nature of research)</td>
<td>Qualitative</td>
</tr>
<tr>
<td>Exploration</td>
<td>Ideas from Grounded Theory</td>
</tr>
<tr>
<td>Level 2</td>
<td>Interviews and Online Surveys</td>
</tr>
<tr>
<td>(Research Approach)</td>
<td></td>
</tr>
<tr>
<td>Level 3</td>
<td></td>
</tr>
<tr>
<td>(Research Tradition/Inquiry)</td>
<td></td>
</tr>
<tr>
<td>Level 4</td>
<td></td>
</tr>
<tr>
<td>(Research Methods)</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.5** Research Design (Methodological Map)
3.5 Research procedures

In this Section, the criteria used for the selection and exclusion of research participants and the procedures used for determining sampling strategies, sample sizes, accessing and recruiting participants and the profiles of the participants who took part in the study are discussed. The procedures used for interviewing and online surveying are described followed by a description of the data management procedures used.

3.5.1 Selection and exclusion criteria for participants

Since this research was interested in understanding the professional work experiences of recent IT graduates and the relationship between their university studies and professional work experiences, I specified for the purpose of this study that:

- All participants should have 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 as this research focused only on Bachelor's degree graduates.
- They were to be recent graduates, i.e. from the last three years and who had studied at university as a full-time student. Graduates who did not study as full-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 their part-time or full-time 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 misunderstanding or distorting of data.
- Graduates included domestic students and international students.
- The participants were to be currently employed and to have been working in a paid IT professional position for 0.5 - 3 years and accessible to me.
- 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. Graduates who had work experience in IT or related areas before completing their university degree (but not as part of their university course) were also excluded, as their
experiences would have been different from those of fresh graduates with no prior work experience.

3.5.2 Recruitment procedures

I collected the data as a sole researcher using interviews and online surveys. 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) to their YIT (Young IT) members were used for participant recruitment. The interviewees were contacted regarding a convenient location, date and time for the interviews. 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 made.

3.5.3 Sampling techniques and size for this study

Three sampling techniques, purposive sampling, snowball sampling and theoretical sampling were used in this study. Sampling was based on a purpose (to understand the perceptions of one group of IT professionals (practising) who are recent graduates) and samples were chosen based on the selection criteria discussed in Section 3.5.1. Snowball sampling developed because IT graduates, academics at several universities, ACS, alumni members and peers were asked for their suggestions about people I could approach for participation in my study. Theoretical sampling (discussed in Section 3.4.4) is a necessary sampling technique that should be used in any study using a grounded theory approach. The sample of interest for the next data collection depends on the collection and analysis of preceding data. For example, when one female participant raised the issue of gender domination and gender related issues, I was interested in finding out whether this was an issue for male participants and other female participants. When one participant mentioned that he used strategies he learned from his formal induction at work to cope with the challenges he faced during the initial year of employment, I was interested in recruiting a participant who had no formal induction at the time of commencement of work to understand what strategies s/he used to cope with the challenges s/he faced during the early stages of her/his employment. 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).

A key idea from grounded theory is to generate in-depth data that can illuminate the patterns, concepts, categories, properties and dimensions of a given phenomenon (Glaser and Strauss, 1967; Strauss and Corbin, 1998). To generate enough data, an appropriate sample size is essential (Greg, Arwen and Laura, 2006). This sample size is usually achieved through a process called theoretical sampling (or) theoretical saturation. Theoretical saturation occurs when no new relevant data seems to emerge regarding a category. This means with interviews there is no set number for when theoretical saturation can occur (Glaser and Strauss, 1967; Strauss and Corbin, 1998). According to Morse (2000), the sample size is dependent upon the scope of the research question. A review of fifty grounded theory studies from various disciplines over a three-year period (2002-2004) that used interviews found that the average sample size was 31 (Thomson, 2006). After excluding one study that had a sample size of 350, the average sample size was 24. Seventeen of the studies had an average sample size between 20 and 30 and seventeen others between 10 and 19. It has been suggested in the literature on this topic that saturation normally occurs between 10 and 30 interviews. The sample size for my research depended on the point of theoretical saturation. In total, twenty four graduates, mostly from NSW participated in the study. Eleven were interviewed and the other thirteen responded to the in-depth online survey. After analysing the eleven hours of in-depth interviewing and the thirteen lengthy qualitative surveys, the theoretical saturation point was reached, as there were no new concepts or categories emerging at that point. Guest, Bunce and Johnson (2006) experimented with data saturation and variability on interviews and reached saturation with twelve interviews. They found that although saturation occurred within the first twelve interviews, the basic elements for metathemes were present as early as six interviews. Their argument is that approximately twelve interviews were sufficient to reach data saturation, particularly if the research is to understand common perceptions and experiences among a group of relatively homogeneous individuals. My experiences and findings with the data sets I was working with were similar. After the initial eight or nine interviews, new major concepts and categories failed to emerge but I continued to collect data so as to maximise the diversity of the sample used in the study. Although some new minor concepts emerged they were all able to be fitted into an already existing major category.
3.5.4 Profile of participants

Twenty four participants were involved in the study. Participants’ full personal details, job descriptions, and their 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. The profile of the participants recruited for this study is shown in Tables 3.5 (a) and (b). All the details about the study participants such as their location, educational background, years of experience and a brief snapshot of the responsibilities they held in their IT work roles are listed in Table 3.5 (a). The interview participant’s gender and their organisation’s characteristics are shown in Table 3.5 (b). It is noted that there is a gender balance in the number of interviewees who participated in the study. Information Technology covers a wide area with a variety of roles for IT professionals. The Australian Computer Society uses definitions of the following occupational classifications shown in Table 3.6. All of the IT graduates who participated in this study belonged to one of the ACS categories. Some categories are for senior and experienced IT professionals and others are more relevant for recent graduates or those with a few years of IT work experience. In particular, based on their descriptions of their responsibilities, the graduates who participated in the study were from the systems designer, systems programmer, applications and analyst programmer and software designer roles. This was not unexpected. These are typical roles for new graduates. Minimal previous experience is required in such roles in comparison with some of the other job categories and it is generally assumed that university IT courses would cover the technical content/knowledge required for these job roles. All participants, except for one, had less than three years of experience. During the interview with the participant who had over three years experience, the focus was on understanding his professional work experiences during the first three years of his employment. 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. In addition to the participants listed in Table 3.5(a), two pilot interviews were conducted. These responses were not part of the data analysis.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Location/ Data collection</th>
<th>Participant background</th>
<th>IT Work experience</th>
<th>Responsibilities/work areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor of Science degree in IT from a Sydney University</td>
<td>&lt; three years</td>
<td>Web design, marketing and coordination of web based campaigns, sales of IT services and products and solutions</td>
</tr>
<tr>
<td>2</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&lt; three years</td>
<td>Professional services to telecommunication companies, technical and strategic solutions, advisory role, training</td>
</tr>
<tr>
<td>3</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in Software Engineering from a Sydney University</td>
<td>&lt; three years</td>
<td>Business analysis, client management, training in a consulting firm</td>
</tr>
<tr>
<td>4</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&lt; three years</td>
<td>Software development, systems integration, network management, business reporting, support marketing of IT services and solutions</td>
</tr>
<tr>
<td>5</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&lt; three years</td>
<td>In a two year graduate program. Currently doing IT auditing of internal company systems, previously in business analysis, architecture, design, programming and testing roles</td>
</tr>
<tr>
<td>6</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&lt; three years</td>
<td>Network administration, hardware replacement, team member in a networking company</td>
</tr>
<tr>
<td>7</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&gt; three years</td>
<td>Applications development, programming roles during the first three years of IT work</td>
</tr>
<tr>
<td>8</td>
<td>ACT (Interviewed)</td>
<td>Bachelor degree in IT from a regional NSW University</td>
<td>&lt; three years</td>
<td>Systems development, database administration, systems testing</td>
</tr>
<tr>
<td>9</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&lt; one year</td>
<td>IT support, troubleshooting, network management role in an academic institution</td>
</tr>
<tr>
<td>10</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&lt; three years</td>
<td>Team leader for software development team, project management, testing, support, defect management</td>
</tr>
<tr>
<td>11</td>
<td>Sydney NSW (Interviewed)</td>
<td>Bachelor degree in IT from a Sydney University</td>
<td>&lt; three years</td>
<td>Business rules, system navigation and flow, legal &amp; regulatory requirements, customer experience requirements, and controls.</td>
</tr>
<tr>
<td>12</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>1 year</td>
<td>Customer support role</td>
</tr>
<tr>
<td>13</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>3 years</td>
<td>Security compliance functions</td>
</tr>
<tr>
<td>14</td>
<td>VIC (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from VIC</td>
<td>1 year</td>
<td>Programming and database administration</td>
</tr>
<tr>
<td>15</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>2 years</td>
<td>Network administration and management</td>
</tr>
<tr>
<td>16</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>2 years</td>
<td>Business analysis and project management</td>
</tr>
<tr>
<td>17</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>1 year</td>
<td>Database administration, report generation IT audit</td>
</tr>
<tr>
<td>18</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>1 year</td>
<td>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</td>
</tr>
<tr>
<td>19</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>2 years</td>
<td>Project manager, business analyst and developer for 4 small automation projects</td>
</tr>
<tr>
<td>20</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>2 years</td>
<td>Database administrator, system administrator and general support.</td>
</tr>
<tr>
<td>21</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>2 years</td>
<td>Business analysis - risk mitigation, requirements determination, business process redesign, facilitate interviews/meetings.</td>
</tr>
<tr>
<td>22</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>2 years</td>
<td>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</td>
</tr>
<tr>
<td>23</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>1 year</td>
<td>Website design and development</td>
</tr>
<tr>
<td>24</td>
<td>NSW (Surveyed online)</td>
<td>Bachelor degree in IT or related discipline from NSW</td>
<td>2 years</td>
<td>Quality assurance, software testing, team leader</td>
</tr>
</tbody>
</table>
Table 3.5 (b) Profile of the interviewed participants: Gender and Organisation Characteristics

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Organisation Size</th>
<th>Organisation Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>Medium</td>
<td>Multinational, Consulting</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>Large</td>
<td>Multinational, Consulting</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>Large</td>
<td>Multinational, Consulting</td>
</tr>
<tr>
<td>4</td>
<td>Male</td>
<td>Medium</td>
<td>Multinational, Software Development</td>
</tr>
<tr>
<td>5</td>
<td>Male</td>
<td>Large</td>
<td>Australian Banking Sector</td>
</tr>
<tr>
<td>6</td>
<td>Male</td>
<td>Large</td>
<td>Multinational, Network management</td>
</tr>
<tr>
<td>7</td>
<td>Male</td>
<td>Small</td>
<td>Australian small sized, software development</td>
</tr>
<tr>
<td>8</td>
<td>Female</td>
<td>Medium</td>
<td>Australian Government agency</td>
</tr>
<tr>
<td>9</td>
<td>Male</td>
<td>Small</td>
<td>Australian Education sector</td>
</tr>
<tr>
<td>10</td>
<td>Female</td>
<td>Large</td>
<td>Multinational, Consulting and Software Development</td>
</tr>
<tr>
<td>11</td>
<td>Female</td>
<td>Large</td>
<td>Multinational, Consulting and Software Development</td>
</tr>
</tbody>
</table>

Table 3.6 ACS IT Occupational Classifications

<table>
<thead>
<tr>
<th>IT Occupation Category</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology Manager</td>
<td>Computer Services Manager, Information Systems Manager, ICT Project Manager, ICT Quality Assurance Manager, Network Manager</td>
</tr>
<tr>
<td>Systems Manager</td>
<td>Database Administrator, LAN/WAN Administrator, Network Administrator, Systems Administrator and Web Administrator</td>
</tr>
<tr>
<td>Software Designer</td>
<td>Database Designer, Software Engineer</td>
</tr>
<tr>
<td>Applications and Analyst Programmer</td>
<td>ICT Analyst/Implementer, Analyst Programmer, Applications Programmer, Systems Designer, Analyst Designer, Applications Developer</td>
</tr>
<tr>
<td>Systems Programmer</td>
<td>Software Programmer, Systems Communications Programmer, Software Analyst, Software Engineer, Software Developer</td>
</tr>
<tr>
<td>Computer Systems Auditor</td>
<td>ICT Security Manager</td>
</tr>
<tr>
<td>ICT professionals (other)</td>
<td>ICT Supervisor, ICT Lecturer, ICT Multimedia Specialist, Electronic Engineer, ICT Consultant</td>
</tr>
</tbody>
</table>

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 were employed across a variety of IT roles.
3.5.5 Interview and Online Surveys

In this Section, the process used in the design and implementation of interviews and online surveys and how the coding and analysis approaches were applied to both of these data collection methods are discussed.

3.5.5.1 Interview design and implementation

Interviews were chosen because they could assist me in collecting sensitive and complex data to understand, in depth, the professional work experiences of the IT graduates. Opportunities to probe for deeper meanings of the graduates’ responses were possible. Yin (1994) states that the strength of interviews lies in their targeted nature, their focus on the topic and their insightful nature as they assist in understanding perceived causal inferences. The initial literature review assisted with determining the research focus and direction, as the problem area was extensive. It was decided that the key area of focus for the research would be the professional work experiences of recent Information Technology graduates. Once the research approach and methods were determined, the interview approach was designed.

The interview style chosen was semi-structured as having a structured interview might have been an obstacle for graduates discussing issues of interest to them related to the research topic. An initial twenty questions were devised. Any questions that seemed to be leading were deleted. The wordings of some questions were amended to remove implied bias. The questions were intentionally left open to allow for other questions to emerge based on the graduate responses. There were some (questions) that remained consistent across participants so that the graduate responses could be compared. These questions were then grouped logically to reduce the chances of flow problems or repetition of issues. The data collection followed the process shown in Figure 3.6. From the data analysis of the early interviews, several questions were added with a view to exploring new concepts in later interviews.
The focus of the interview questions was based on the four main elements that arose frequently in the discussion of the literature in Chapter Two.

- To understand the kind of work graduates perform at their workplaces with a view to understanding the kinds of professional skills they believe they required for work;
- To understand where and how they obtained their professional skills with a view to understanding the role of university studies in the development of these professional skills;
- To understand what graduates believe were the most useful aspects of their university IT studies that were relevant to the skills they believe they required at their workplaces; and
- To understand their overall professional workplace experiences and the challenges they face and the adequacy of university preparation for facing those challenges.

There were ten questions in the final interview question set (Appendix C). These questions were submitted to the University ethics committee for their approval as a part of the ethics application process. After seeking ethics approval, the interview questions were piloted in
an informal manner with two recent IT graduates (who were excluded from the study data). Minor adjustments were then made to the interview questions. Depending upon the convenience of the participants, some interviews were conducted at meeting rooms in UTS and others were conducted at participants' workplaces. At the time of recruitment, an information letter (Appendix B) was provided to participants about the nature of the research and its objectives with details about the interview including duration and location along with my contact details and that of my research supervisors. They were informed that the interviews would be audiotape recorded assured of confidentiality and protection of privacy and anonymity. The participants were also asked to sign a consent form (Appendix A) before the interview. Participants were informed that they were free to withdraw their participation from the research project at any time, without consequences and without giving a reason. They were made aware that they had access to their responses including the interview transcripts at any time during the research project. Their consent was also obtained to use the anonymised research data in publications. An offer was made to send participants a copy of the results of the research when the study concluded. They were advised of the ethics approval obtained for this study and were provided with the contact details of the UTS research ethics officer in the event they had any complaints or reservations about any aspect of their participation in this research, which they could not resolve with me. No participants withdrew from the study or lodged complaints against the study.

Where it was necessary to clarify some responses after the interview, email follow ups were done. Yin’s (1994) four points of weakness of interviews - question bias, response bias, poor recall inaccuracies and reflexivity are noted. How my research addressed these points is discussed in the following two subsections.

3.5.5.2 Addressing question bias and response bias

Question bias results from poorly constructed questions. This can be avoided by following a well thought out and tested interview design. The initial literature review combined with my own personal experience in IT and the education sector helped to identify the research problem. After this step, key elements related to the research area were identified. The broader focus area or boundary was established after discussion with professional associations, IT academics, IT graduates, and IT employers.
The question clusters as discussed in the previous Section were developed through several stages and refined with supervisors at a number of meetings. The final set of ten broad questions while targeting specific information was open ended and provided me with the flexibility to seek deeper responses or clarify matters as they arose during the interview. The questions aimed at similar focus areas that enabled me to compare the responses from different graduates during the data analysis, a key idea used in grounded theory approaches.

The interview data was examined carefully to check for response bias. If there was response bias then the plan was to include more data collection. Fortunately response bias was not noticeable during the data collection.

3.5.5.3 Addressing poor recall and reflexivity

The information letter sent to the participants provided details of the anticipated activities during the interview, the focus of the interview and the sorts of issues that were of interest to the study. Participants were encouraged to ask any questions they might have in order to make an informed choice about their decision to participate. An email reminder confirming the meeting details was sent with a copy of the information letter and the consent form (required before the start of the interview) as attachments.

This interview preparation and provision of information well in advance and on the day before the interview helped to address the poor recall problems. The participants were also assured of anonymity and the confidentiality of their responses. A few repetitive questions to confirm their responses were used indirectly during the interview process to address the ‘reflexivity’ (interviewee provides responses to suit what interviewer wants to hear) issue identified by Yin (1994).

3.5.5.4 Online survey design and implementation

During the recruitment process for interviews, a few participants indicated that they were interested in participating in the research study but were unable to travel to the interview location. Also, as most of the interview participants were from the Sydney region, I was interested in gathering some responses from graduates of other areas. Therefore, it was decided that an online survey designed and administered through UTS’s Survey Manager
A qualitative survey (Appendix D) in the form of a questionnaire (with open-ended questions) was posted online to those participants who were interested in the research and wish to take part but could not be interviewed face-to-face. The 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. The ethics committee was advised of the changes to the data collection plan and a copy of the survey was submitted to them.

3.5.5.5 Interview and online survey data coding and analysis

Because of the concurrent data collection and analysis, data from interviews as well as surveys were being analysed as they were being completed. In the first phase, eleven interviews were completed between January 2007 – June 2008. The interview questions explored the professional work experiences of IT graduates. The issues covered their non-technical or professional experiences at work, their relationship with superiors and peers, the typical nature of their work, how they linked their university preparation to the skills required at work, etc. The interview transcripts were examined to identify key issues. This was achieved by searching for themes. From this analysis, dominant themes were identified and described. The data analysis steps and activities discussed in Creswell (2003) and used in this study are shown in Table 3.7.

<table>
<thead>
<tr>
<th>Data Analysis and representation</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data managing</td>
<td>Create and organise files for data</td>
</tr>
<tr>
<td>Reading, memoing</td>
<td>Read through text, make notes, form initial codes</td>
</tr>
<tr>
<td>Describing</td>
<td>Describe the meaning of the experiences</td>
</tr>
<tr>
<td>Classifying</td>
<td>Find and list statements of meaning for individuals, group statements into meaningful units; engage in axial coding (causal condition, context, intervening conditions, strategies, consequences), engage in open coding (categories, properties, dimensions)</td>
</tr>
<tr>
<td>Interpreting</td>
<td>Develop textual, structural descriptions, overall description of the graduate's experience, the 'essence'; selective coding and development of stories, conditional matrix</td>
</tr>
<tr>
<td>Representing, visualising</td>
<td>Present a narration of the 'essence' of the experiences and present a visual model or theory, propositions</td>
</tr>
</tbody>
</table>
Many issues and themes emerged repeatedly in the interviews (both expected and unexpected ones). I developed the survey based on those emerging themes. I then analysed and compared the data collected from surveys with those collected during the interviews. The survey responses were then carefully coded and interpreted during the analysis phase. The surveys helped me establish if the identified themes applied to a broader range of IT graduates and helped to identify any additional issues that were not captured during the interviews. Upon receipt of the survey responses, a written/textual description was derived as in the case of interviews. Two to three new minor categories emerged but each belonged to a major category that had already emerged from interview data. The specific steps that were used to analyse the data are described in Sections 3.7, 3.8, 3.9 and 3.10. The trustworthiness of this research is discussed in the next Section.

### 3.6 Trustworthiness of this research

Lincoln and Guba's (1985) four criteria for establishing the trustworthiness of qualitative studies are

- Credibility;
- Dependability;
- Confirmability; and
- Transferability or applicability.

In this Section, I describe the trustworthiness of this research using Lincoln and Guba’s criteria. Using the strategies described in Shenton (2004), I have listed in Table 3.8, each quality criterion and the strategy adopted in this research to address trustworthiness.
Table 3.8 Trustworthiness of this research

<table>
<thead>
<tr>
<th>Quality criterion</th>
<th>Provisions made in this research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credibility</td>
<td>• Adoption of appropriate, well recognised research methods</td>
</tr>
<tr>
<td></td>
<td>• Triangulation techniques</td>
</tr>
<tr>
<td></td>
<td>• Strategies to ensure honesty in informants</td>
</tr>
<tr>
<td></td>
<td>• Iterative questioning techniques</td>
</tr>
<tr>
<td></td>
<td>• Negative case analysis</td>
</tr>
<tr>
<td></td>
<td>• Debriefing sessions with supervisors</td>
</tr>
<tr>
<td></td>
<td>• Peer scrutiny of the project</td>
</tr>
<tr>
<td></td>
<td>• Use of reflective commentary</td>
</tr>
<tr>
<td></td>
<td>• Description of the background, qualifications and experience of the researcher</td>
</tr>
<tr>
<td></td>
<td>• Thick descriptions of phenomena under scrutiny</td>
</tr>
<tr>
<td></td>
<td>• Examination of prior research to frame findings</td>
</tr>
<tr>
<td>Transferability</td>
<td>• Thick description of phenomena under scrutiny</td>
</tr>
<tr>
<td></td>
<td>• Provision of background data to establish study context to allow for comparisons</td>
</tr>
<tr>
<td>Dependability</td>
<td>• In-depth methodological description to allow for the study to be repeated</td>
</tr>
<tr>
<td>Confirmability</td>
<td>• Triangulation to reduce researcher bias</td>
</tr>
<tr>
<td></td>
<td>• Admission of researcher’s beliefs and assumptions</td>
</tr>
<tr>
<td></td>
<td>• Recognition of shortcomings in the study’s methods and their potential effects</td>
</tr>
<tr>
<td></td>
<td>• In-depth methodological description to allow for the study to be repeated</td>
</tr>
<tr>
<td></td>
<td>• Use of diagrams to demonstrate the audit trail</td>
</tr>
</tbody>
</table>

3.6.1 Credibility

Credibility refers to the researcher’s (and reader’s) confidence in the truthfulness of the data, that is, is the data accurate? According to Pitney (2004), it is also related to whether the researcher’s findings capture what is actually happening in that context. The credibility of my research comes from:

- The prolonged engagement I have had with the data and in the research area (about ten years work experience in the education sector involving interaction with students in Information Technology as well as other disciplines);
- Triangulation techniques (Section 3.6.2) used to verify findings;
- Peer review of research findings published in education and IT conferences which included findings during different stages of the data analysis and collection; and
- Discussion of the data analysis and findings during the process with my doctoral supervisors who are experts in the area of my research involving the two disciplines of education and Information Technology. My supervisors acted as my research debriefers and posed “devil’s advocate” questions throughout the research process.
3.6.2 Multiple sources of data and triangulation

Multiple sources of data have the potential to enhance the validity, reliability and credibility of research (Parry, 1998). In this study, I have used interviews as well as online qualitative surveys. According to Patton (2002), multiple sources of data can assist in reconciling observations and interviews, comparing statements made in public versus those made privately and comparing existing literature with the findings of the study. He believes multiple sources of data should be used to test for consistency rather than proving that different sources of data deliver similar results. However, he states that different results may also emerge and they should be thought of as something that enriches our understanding of the phenomenon studied as opposed to reflecting on the credibility of the research.

Patton (2002) describes four types of triangulation. They are methodological triangulation, source triangulation, analyst triangulation and theory/perspective triangulation. The consistency of the findings generated by different data collection methods is checked by methodological triangulation. The consistency of different data sources within the same method such as comparing the perspectives of people with different viewpoints is checked by source triangulation. Two or more people are used to independently analyse the same data for analyst triangulation. Multiple perspectives or theories to interpret data are used to understand how differing assumptions and premises affect findings and interpretations in theory/perspective triangulation.

A combination of triangulation approaches was used rather than strictly adhering to one form or the other. Two sources of data were used, namely interviews and online surveys. Methodological triangulation was achieved by online surveying of participants (who did not participate in interviews) and this assisted with confirming the findings generated through the interview data. Source triangulation was also used because participants belonged to different type of organisations (small, large, medium; local or international and were working in different kinds of IT roles (project management, consulting, software development, etc.). My supervisors were involved during the data analysis process in every step. One of my supervisors had access to both interview transcripts and survey data and looked at the data sets and made a separate analysis, which was then compared with my analysis and after further discussions with both supervisors, the concepts, categories and
themes were reviewed, merged, deleted, and additional categories developed to reflect our discussions. This approach was used many times during the data collection and analysis. Supervisors who are experts in their fields took on a role as another analyst but they also assisted by reviewing the data and my analysis of it. Hence analyst triangulation was achieved. Further the conclusions and data analysis findings were evaluated in the light of other recent findings in the same research area of interest, the available literature and my own personal experiences and observation of IT graduates. The findings of the study were also presented at both education and IT conferences that attracted education and IT researchers who provided feedback that was supportive of the study findings and in particular the themes and core category for this study. This is a form of theory/perspective triangulation.

3.6.3 Negative case analysis

Negative cases are those cases (individual or individuals) that seem to be exceptions in the research (Lincoln and Guba, 1985). In my study, each interview and online survey was re-examined after the completion of the initial data analysis to see whether the characteristics and dimensions of the themes developed were applicable to all the data collected. When there was no evidence confirming the contrary, the negative case analysis concluded (Lincoln and Guba, 1985; Padgett, 1998). That is, there were no negative cases encountered in this research.

3.6.4 Transferability or applicability

The generalisability of the study’s findings, that is the extent to which the findings from a study can be transferred or applied to other settings, is referred to as transferability (Chiovitti and Piran, 2003). This is possible only when the theoretical parameters of the research (Marshall and Rossman, 1995) are well described.

A detailed description and discussion of the following research aspects is provided in this thesis:

- Participant profile and characteristics;
- The processes used for data collection and data analysis;
- The sampling strategies;
• Theoretical sampling and constant comparison techniques used; and
• Discussion of data, emergent categories and core category.

The phenomena and meanings of the professional work experiences of recent Information Technology graduates were captured in the “thick” description that was created. This enabled me to assess the transferability of my research and allowed the wider generalisation of my study findings. For example, the work should be generalisable to IT graduates in the rest of Australia and much of it can be generalised to other professional studies, such as engineering or accounting.

Glaser and Strauss (1967) state that in practical applications of grounded theory approaches,

\[ \text{it must be sufficiently general to be applicable to a multitude of diverse daily situations within the substantive area not to just a specific type of situation and it must allow the user control over the structure and the process of daily situation as they change through time} \]

\[ 3.6.5 \text{ Dependability} \]

Lincoln and Guba (1985) argue that credibility and dependability are closely related and that demonstrating credibility ensures dependability to a great extent. Denzin and Lincoln (1994) relate dependability to the stability of the findings over time and reliability. According to Shenton (2004), it is possible for a study to address dependability issues directly if the readers are given details of the processes used in the research such as the research design and its implementation, the operational details of data gathering and reflective appraisal of the project so that future researchers can follow the same set of procedures to repeat the work and obtain the same result. The dependability of this research is accounted for in the detailed nature of the research design and processes presented in this chapter. The outcomes are presented in-depth in Chapters 4, 5 and 6. It should be noted that the research topic is of considerable current interest to the IT education community. However, were the research to be repeated in say five years time, it would be hoped that the results would be different in that some of the existing challenges would have been addressed in IT degrees.
3.6.6 Confirmability

The internal coherence of the data in relation to the findings, interpretations and recommendations is referred to as confirmability (Denzin and Lincoln, 1994). Miles and Huberman (1984, 1994) suggest that a key criterion for confirmability is the extent to which the researcher admits his or her predispositions. It is essential to ensure that the study findings are, as far as possible, the results of the experiences and ideas of the participants rather than the characteristics and preferences of the researcher (Shenton, 2004). Liamputtong (2009) states that confirmability is comparable to objectivity or neutrality.

3.6.6.1 Researcher predisposition

Patton (2002) states that researchers can inadvertently or unconsciously develop bias towards a study's findings. My previous experiences in the role of IT lecturer, course coordinator and as someone involved in liaising with recruitment agencies and my previous role as an IT student could all influence my feelings about the findings. This issue is addressed explicitly by identifying any potential bias and the implications it could have on my study. It is a requirement of the constant comparison technique that is the core principle of grounded theory to constantly compare the findings against any new data. The influence of bias was greatly reduced by this practice. There was minimal literature on the topic I was studying and that assisted me in avoiding influence from preconceived ideas.

Inquiry audits can be used as a means of establishing confirmability (Polit and Hungler, 1999). Confirmability was ensured by the development of audit trails. By employing systematic collection of data and documentation, any external auditor can follow the same process used in this research to derive conclusions about the data. Confirmability is also evidenced by the detailed discussion of the research background information, literature review, research design methodology and methods, data analysis, findings and implications of the research findings. The data from interviews and online surveys is stored (anonymously and securely) along with the relevant data coding documentation to allow for audit.
3.6.7 Limitations of this study

A sample bias against those not currently in employment is acknowledged in this research. All the graduates chosen for the study are employed. There will always be a group of graduates who might have developed abilities or attributes (relevant to work skills that interest employers) from their life experiences or hobbies and pastimes. It is essential to note that their obtaining employment might have been influenced by their personal attributes (such as the ability to handle problems or complex situations, sort out issues for themselves, “get up and go” attitudes) rather than their courses or the subjects they studied at university. In many IT jobs, determining who gets the job and who does not depends on an individual’s personal attributes and employers’ recruitment is not always based on the course or what graduates studied at their university. Further, individuals with any experience in any workforce, even if part-time, develop work related skills. Some of the skills graduates use in their current IT job may have come from their past experiences in non-IT or casual jobs during or before university studies. Such graduates may be better positioned for success at an interview or in a workplace than those graduates who have no prior work experience. The reasons for their employment may not be purely because of their preparation in university courses but may include other factors such as an individual graduate’s abilities and previous part-time jobs, etc. This is a limitation of this study.

3.7 Application of ideas from grounded theory data analysis to this study

An account of the specific steps that were used in applying the ideas from the grounded theory data analysis approach employed in this study is discussed in this Section. The overall process used to analyse the data is shown in Figure 3.7.

Data collection approaches and data analysis occurred concurrently. The data analysis process is called coding. There are three main coding steps if using guidelines from Strauss and Corbin’s approach. They are open coding, axial coding and selective coding. As explained before, 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. The detailed task list for each of the coding phases is shown in Table 3.9.
**Figure 3.7** Coding process used for data analysis in this study

**Table 3.9** Detailed task list for each coding stage (Eaves, 2001)

<table>
<thead>
<tr>
<th>Coding stage</th>
<th>Task list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open coding</td>
<td>Naming, labelling, coding of concepts, then categories, then sub categories and identifying the properties and dimensions</td>
</tr>
<tr>
<td>Axial coding</td>
<td>Understanding conditions, actions, interactions (strategies) and studying consequences</td>
</tr>
<tr>
<td>Selective coding</td>
<td>Writing story lines, drawing diagrams, reviewing and sorting through memos, selection of core or central category and refining the theory</td>
</tr>
</tbody>
</table>
3.8 Open coding process

This is the first stage of data analysis. The aim of open coding is to label, code and categorise data according to their properties and dimensions. As the interviews were completed, they were transcribed. Each transcript was then read carefully and the phrases were chunked and any key words were highlighted. Then phrases of each interview were taken and each piece of ‘chunked data’ was coded with a code name or label. The main idea or message of each phrase is reflected in the code names. Sometimes some phrases of ‘chunked data’ were assigned with multiple codes allowing for multiple interpretations of each phrase. Initially the code names were loosely assigned but as experience was gathered with more data, I started assigning and using code names, which were more direct. After repeating this exercise many times, open codes were merged or collapsed even further depending on the circumstances. Chunked data that were assigned with multiple codes were revisited and were assigned the one most appropriate code. The data from one interview were constantly compared with the other interviews and the same codes were used in all the transcriptions when there were similarities identified. Some examples of initial open codes are shown in Table 3.10.

<table>
<thead>
<tr>
<th>‘Chunked data’ from interview transcript</th>
<th>Initial open codes</th>
<th>Revised open codes (concepts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well basically my current job probably required a lot more of the non-technical skills than my other roles down there, mainly because I guess we need to be able to communicate and present properly to clients</td>
<td>Communication skill, Presentation skills, communication with client</td>
<td>Client communication</td>
</tr>
<tr>
<td>I usually do about three or four marketing campaigns of that nature at any given time in tandem.</td>
<td>Marketing skill, time management, planning</td>
<td>Time management</td>
</tr>
<tr>
<td>There could be a budget that I have got to do for the partners or whether it be a presentation that we have to do for something else.</td>
<td>Budgeting, presentation skills, preparation of reports</td>
<td>Project planning</td>
</tr>
<tr>
<td>A lot of my time is also spent in meetings helping discuss the methodology for future tasks as the need arises.</td>
<td>Meeting management, time management, teamwork, planning, project management</td>
<td>Project meetings</td>
</tr>
<tr>
<td>Because we get problems that we’ve never worked on in our lives before because it’s a very general thing. We replace every hardware for everything. So you’ve got to find out about it, how to fix that one and that one</td>
<td>Facing uncertain situations, research skills, problem solving, information processing</td>
<td>Research and information management</td>
</tr>
</tbody>
</table>
For each of the codes a list was created. The list included all the relevant chunked data associated with the code. Several such lists were created for all the open codes. The chunked data was then rechecked for relevance to the code. If the data were relevant, they remained on the list. Where they were not relevant, they were moved to an appropriate code list or a new code list was created to accommodate the chunked data if they did not fit well under any of the existing codes. Microsoft Excel Spreadsheets were used for recording, analyzing and linking codes. Strauss and Corbin (1990) suggest researchers ask questions such as who, why, where, how, when and what to gain a better understanding of the data. It is also essential to compare and contrast data across interviews and review the codes in the light of such comparisons. At the end the aim is to have concepts (codes), phenomena and categories.

Once concepts are identified they can be grouped to form categories. Categories are group of concepts that are derived from data and pertain to the same phenomenon (Strauss and Corbin, 1998). Once a category has been developed, it is essential to analyse its specific properties and dimensions. Strauss and Corbin (1998) state that properties are the general or specific characteristics or attributes of a category while dimensions point to the location of a property along a range. Both properties and dimensions help to uncover relationships between categories and sub categories. The end product of one such iteration is shown below in Table 3.11.

<table>
<thead>
<tr>
<th>Table 3.11 Sample codes to illustrate transformation from concepts to different levels of categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2 low level categories</td>
</tr>
<tr>
<td>Ability to work with people from different work culture (business, IT, interstate offices)</td>
</tr>
<tr>
<td>Ability to work with international people from different work culture</td>
</tr>
<tr>
<td>Cultural communication style (choice of correct writing style)</td>
</tr>
<tr>
<td>Being aware of language issues and local customs when working on international sites</td>
</tr>
<tr>
<td>Language barriers</td>
</tr>
</tbody>
</table>
3.9 Axial coding process

In axial coding, the codes were reviewed again and grouped into low level categories (level 2 low level categories). As interview and survey data were subjected to the constant comparison analysis process it was necessary to create new categories and merge some existing categories. When some open codes fitted into more than one category, a new category was created to address the duplication issue. After further iterations, it was noticed that the level 2 low level categories could be grouped again into more abstract categories and hence these categories were called level 1 low level categories. After identifying the level 1 low level categories and associated level 2 low level categories, the level 1 low level categories were grouped into broader major categories which summarised the key elements beginning to emerge from the data. An example of the output at this stage of the coding process is shown in Table 3.12.

<table>
<thead>
<tr>
<th>Level 2 low level categories</th>
<th>Level 1 low level categories</th>
<th>Major Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of language in communication with clients/peers/superiors</td>
<td>Appropriate use of language for different purposes</td>
<td>Communication skills</td>
</tr>
<tr>
<td>Communication style (formal versus informal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication mode (verbal, written, e-mail, online, face-to-face meetings)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documenting communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure of messages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice of language in business and technical communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to communicate bad news – tactical communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication with senior or more experienced colleagues</td>
<td>Communication with senior or more experienced colleagues and people from different cultures</td>
<td></td>
</tr>
<tr>
<td>Communication in an international work environment with people from different cultures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting facilitation</td>
<td>Communication while working in a group</td>
<td></td>
</tr>
<tr>
<td>Feedback communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication to solve problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication to sell ideas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timeliness of communication</td>
<td>Timing of Communication in project work matters</td>
<td></td>
</tr>
<tr>
<td>Type of work and communication (project scope communication etc..)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The properties for level 2 low level categories were represented in open codes. The properties for the level 1 low level category were represented by Level 2 low level
categories. Level 1 low level categories became the properties of the major category. For example, the low level 1 categories - managing expectations, professional relationships, conflict resolution and negotiation, human resources skills and customer service were grouped together to form a major category called ‘Working with people’. This was a laborious process but the engagement with the data provided me with insights into the concepts that were emerging from the data. This process also helped me to gain an understanding of the relationships around the ‘axis’ of a category being focussed (Strauss, 1987). The four step process Strauss and Corbin suggested during axial coding is:

- Properties and dimensions are laid out as they emerge in the open coding process;
- A variety of conditions, actions, interactions and consequences associated with a phenomenon are identified;
- A category is related to its sub categories; and
- Then, the data is examined for clues to see how major categories are related to each other.

For example, the relationship between two major categories is shown in Table 3.13.

**Table 3.13** Sample memo to describe the relationship between two categories

<table>
<thead>
<tr>
<th>Category 1</th>
<th>Category 2</th>
<th>Relationship captured in a memo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Communication</td>
<td>3.Teamwork</td>
<td>Affects management of team meetings, ability to work with multicultural global teams, ability to work with mature age seniors, superiors, ability to resolve conflicts and team communication</td>
</tr>
<tr>
<td>skills</td>
<td>skills</td>
<td></td>
</tr>
</tbody>
</table>
to low level 2 categories and then to low level 1 categories through to major categories finally resulted in the emergence of five themes under which the major categories could be grouped. The five major themes identified during the selective coding process are:

**Theme 1**  Professional skills IT graduates believe are required for their work  
**Theme 2**  Sources of professional skills for IT graduates  
**Theme 3**  Most useful aspects of university studies that IT graduates believe contributed towards their professional skills development  
**Theme 4**  Challenges faced by IT graduates at workplaces  
**Theme 5**  Graduate perceptions of differences between University and the Workplace in the application of professional skills

Theme 1 is discussed in detail in Chapter 4. Themes 2, 3, 4 and 5 are discussed in Chapter 5. Analytic memos (or short notes) on the concepts, categories and themes were written. The relationships that existed between the major categories were explored. Descriptions of the relationships were also captured in the memos. A relationship diagram was then developed at the end of the comparison process and an examination made of the categories' relationships with each other. All the low level categories were again rechecked to confirm the relationships. A sample relationship diagram representing the link between the major themes is shown in Figure 3.8.

**Figure 3.8** Relationship between themes in the axial coding stage
During selective coding, many memos were written and many diagrams were drawn. Other major tasks included sorting memos multiple times, rearranging categories in themes, and rearranging blocks in relationship diagrams showing links between themes. Memos were short notes written on post it notes or short texts written against certain categories, themes to capture my thinking through the coding process. Since the data collection and data analysis were done over several years, these memos served as a way of analysing how my thinking and understanding of the data developed over a period of time. Diagrams were useful to capture the relationships between categories and themes. Many small diagrams were then combined to form a major relationship diagram. Diagrams along with some explanatory text serve as a powerful tool to illustrate relationships, directions and the flow of concepts within and across categories and themes. Diagrams were also particularly useful in the final phase for both identifying and representing the core category. Examples of such diagrams are discussed in Chapter 5 as a part of the discussion of the findings.

The next step after understanding the relationship between the themes was to identify the main theme or a core category that pulled all five themes together. All the themes, categories and sub categories are gathered in a core category which is usually a common concern in all themes. Being prepared for overcoming challenges at IT workplaces emerged as the core category for my research study. The relationship between the themes and the core category or the primary concern for the graduates is shown in Figure 5.5 in Chapter 5. The core category and the related themes are shown in Figure 3.9, which is a subset of Figure 5.5.

Throughout the study, several iterations occurred in the open coding, axial coding and selective coding phases. Whenever there was a problem categorising data or concepts or categories, I went back to the raw data, enhanced my knowledge in that area through the literature, looked through my memos written over a period of time, and consulted the meeting minutes with my supervisors to seek clarification. This resulted in the merging and unpacking of some categories. After many iterations, several versions of the categorisation, coding, recoding and relationship diagrams now exist in my research folder. Although the data analysis was time consuming, laborious and at times a frustrating process, at the end of the research I believe I have been able to apply ideas from Strauss and Corbin’s grounded theory coding process systematically to generate a good understanding of the research
topic. The rigorous and systematic data coding process not only assisted with some answers to my research questions but also exposed many interesting areas for further investigation.

Figure 3.9 Using a diagram to develop the core category

3.10.1 Theoretical sensitivity

Theoretical sensitivity is a key feature of grounded theory. It refers to the researcher’s ability to have insight, to understand and attach meaning to the data and to differentiate relevant from irrelevant data. Glaser (1978) states that researchers should develop conceptual rather than concrete insights. He states that theoretical sensitivity leads to the formulation of a conceptually dense theory. My theoretical sensitivity skills came from both the literature review I undertook during the study and from my professional work experiences. Both provided a secondary source of data, enabled questioning of the data and the validation of the research findings and the core category.

Theoretical sensitivity skills enabled me to decide what concepts to look for and different associated indicators. I could explain the issues arising out of the data analysis and their
relevance to the literature. Developing theoretical sensitivity was essential as it enabled me to engage with the data right from the beginning until the emergence of major themes and the core category.

3.11 Conclusion

Given the nature of the topic and the research questions, an inductive approach to knowledge generation was required. An explanation of why a qualitative research approach informed by ideas from Strauss and Corbin’s grounded theory would be suitable for understanding the professional work experiences of recent Information Technology graduates and for investigating the identified research questions, even though there was no intention to develop a theory at the end of the research study, is provided in this chapter. The research processes used in this study covering the selection and exclusion criteria, sampling techniques, sampling size and participant’s profiles, data collection procedures used in interviews and online surveys were discussed. Then, the issues surrounding the trustworthiness of this research were addressed. Finally, the process used for data coding and analysis has been explained with examples. In particular, the open coding, axial coding and selective coding stages of the grounded theory analysis were described. The generality of the theory arising will be constrained by the fact that it was generated from a single study conducted within NSW. It is possible that comparing experiences of participants from different states in Australia could result in a modified research/theory. Avenues for future research are provided by such a possibility. In subsequent chapters, the research findings will be reported and discussed. Findings from Theme 1, the professional skills that IT graduates believe they require for their work is the focus of the next chapter.
CHAPTER 4 RESEARCH FINDINGS

4.0 Chapter overview

The study was introduced in the previous chapters along with a discussion of some ideas from grounded theory methodology that were used for data collection and analysis. The questions for this research were presented in Section 2.15. The research procedures (Sections 3.1-3.5) and the data analysis procedures (Sections 3.7-3.10) were described. As we have seen in Section 3.10, five main themes emerged from this study following the data analysis process. The research findings in relation to Theme 1- Professional skills that IT graduates believe they require at IT workplaces are presented in this chapter. The details of the findings are discussed using several quotes from the IT graduates. Eight major categories, thirty five low level 1 categories and eighty nine low level 2 categories were developed for Theme 1.

An introduction to this chapter is presented in Section 4.1. The findings for all the major categories and the low level categories along with several quotes from interviewed and surveyed participants will be presented in Sections 4.2-4.9. Theme 1 is focused on identifying and understanding the professional skill requirements of IT graduates. Considerable literature on employer, academic and industry professional association views exists on this topic. However, the findings presented in the chapter discuss what graduates actually do at their workplaces and what skills they think they need to perform their roles. A conclusion with a summary of the key points from this chapter along with a brief introduction to the following chapter is provided in Section 4.11.

The five themes relate to the sub research questions and overall research problem identified in previous chapters. The relationship between the research questions and the five themes is shown in Table 4.1 below.
Table 4.1 Relationship between Themes and research questions

<table>
<thead>
<tr>
<th>Related research questions</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the typical professional skills requirements of IT professional practice?</td>
<td>Theme 1: Professional skills IT graduates believe they require at IT workplaces</td>
</tr>
<tr>
<td>From graduates’ viewpoints, which sources assisted them to acquire the professional skills required for their professional practice?</td>
<td>Theme 2: Sources of professional skills for IT graduates</td>
</tr>
<tr>
<td>From graduates’ viewpoints, which elements of their university study program contributed towards fulfilling the professional skills requirements of their practice?</td>
<td>Theme 3: Most useful aspects of University studies that IT graduates believe contribute towards their professional skills development</td>
</tr>
<tr>
<td>What are the typical professional skills requirements of IT professional practice?</td>
<td>Theme 4: Challenges IT graduates believe they face at their workplaces</td>
</tr>
<tr>
<td>From graduates’ viewpoints, how well did their university studies prepare them to meet the professional needs of their professional practice?</td>
<td>Theme 5: Graduate perceptions of differences between University and the Workplace in the application of professional skills</td>
</tr>
</tbody>
</table>

4.1 THEME 1- Professional skills IT graduates believe they require at IT Workplaces

An introduction to the rest of this chapter is presented in this Section. The major skill categories that IT graduates in the study believe they require for work are presented in Sections 4.2 to 4.9. The low level 1 and associated low level 2 categories are discussed (using several quotes from participants in the study) in a subsection within each Section (for example, 4.2.1). The main objective of this chapter is to understand from graduates’ perspective what the typical professional skill requirements of IT professional practices are. This understanding is essential before we can determine the relevance of professional skill experiences of IT graduates to their university studies.
The eight major categories of professional skills considered important by the IT graduates in the study are listed (in the decreasing order of importance to graduates) in Table 4.2. The order of importance of the skills was determined by counting how often they were mentioned by the graduates. *Majority* means more than 75% of them considered a skill important and required for their work, *Minority* means fewer than 25% found the skill important for their immediate work.

**Table 4.2** Professional skill requirements IT graduates believe they need for their work

<table>
<thead>
<tr>
<th>Professional skills (Major Categories)</th>
<th>Proportion of participants who considered this skill as important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>All Graduates</td>
</tr>
<tr>
<td>Time management</td>
<td>All Graduates</td>
</tr>
<tr>
<td>Teamwork skills</td>
<td>Majority</td>
</tr>
<tr>
<td>Working with people</td>
<td>Majority</td>
</tr>
<tr>
<td>Working across cultures</td>
<td>Majority</td>
</tr>
<tr>
<td>Project management</td>
<td>Majority</td>
</tr>
<tr>
<td>Business skills</td>
<td>Majority</td>
</tr>
<tr>
<td>Personal attributes</td>
<td>Minority</td>
</tr>
</tbody>
</table>

A snapshot of the major categories and low level 1 categories for Theme 1, Professional skills IT graduates believe are required for their work is presented in Table 4.3. A detailed view of the eight major professional skill categories along with the thirty five low level 1 categories and the eighty nine low level 2 categories is presented in Appendix E.

### 4.2 Communication skills

Graduates identified communication skills as the most important professional skill for workplaces. Almost all graduates surveyed and interviewed agree that this is the most important set of skills that they require for work. Both written and verbal communication skills are important. The following graduate comments highlight the significant role communication skill played in their workplace activities.
Communication, I would probably rate that as number one.

I would say you had to be a very good communicator. In particular have excellent written communication skills because reporting as such is a large component both in the talking of the campaign and simply explaining the concepts to the sales team, which is you know a lot of it. You have to be very concise in the way in which you communicate. That will be the number one...

Table 4.3 Major categories and low level 1 categories for Theme 1- Professional Skills IT graduates believe are required for their work

<table>
<thead>
<tr>
<th>Major Category</th>
<th>Level 1 low level category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>Appropriate use of language for different purposes</td>
</tr>
<tr>
<td></td>
<td>Communication with senior colleagues and people from different cultures</td>
</tr>
<tr>
<td></td>
<td>Communication while working in a group</td>
</tr>
<tr>
<td></td>
<td>Timing of Communication in project work matters</td>
</tr>
<tr>
<td>Time management skills</td>
<td>IT project time management in an international work environment</td>
</tr>
<tr>
<td></td>
<td>Use of appropriate time management strategies</td>
</tr>
<tr>
<td></td>
<td>Ability to handle time management challenges both as an individual and as a team</td>
</tr>
<tr>
<td>Teamwork skills</td>
<td>Understanding different team structures and composition</td>
</tr>
<tr>
<td></td>
<td>Cultural issues and strategies that affect teamwork</td>
</tr>
<tr>
<td></td>
<td>Meeting Management</td>
</tr>
<tr>
<td>Working with people</td>
<td>Managing expectations</td>
</tr>
<tr>
<td></td>
<td>Professional Relationships</td>
</tr>
<tr>
<td></td>
<td>Conflict resolution and negotiation</td>
</tr>
<tr>
<td></td>
<td>Human resources</td>
</tr>
<tr>
<td></td>
<td>Customer Service</td>
</tr>
<tr>
<td>Working across cultures</td>
<td>Ability to work with people from different cultures</td>
</tr>
<tr>
<td></td>
<td>Awareness of cultural barriers</td>
</tr>
<tr>
<td>Project management</td>
<td>Managing processes in projects</td>
</tr>
<tr>
<td></td>
<td>Managing project constraints</td>
</tr>
<tr>
<td></td>
<td>People related project management issues</td>
</tr>
<tr>
<td></td>
<td>Use of creative design skills in product and documentation development</td>
</tr>
<tr>
<td></td>
<td>Understanding the big picture and complexity of IT projects</td>
</tr>
<tr>
<td></td>
<td>Risk Management</td>
</tr>
<tr>
<td></td>
<td>Adherence to standards</td>
</tr>
<tr>
<td></td>
<td>Problem solving</td>
</tr>
<tr>
<td>Business skills</td>
<td>Knowledge of organisational procedures</td>
</tr>
<tr>
<td></td>
<td>Understanding business needs</td>
</tr>
<tr>
<td></td>
<td>Marketing Skills</td>
</tr>
<tr>
<td></td>
<td>Leadership skills</td>
</tr>
<tr>
<td></td>
<td>Information Management</td>
</tr>
<tr>
<td>Personal attributes</td>
<td>Adaptability</td>
</tr>
<tr>
<td></td>
<td>Self-assessment</td>
</tr>
<tr>
<td></td>
<td>Self -confidence</td>
</tr>
<tr>
<td></td>
<td>Work enthusiasm and ethics</td>
</tr>
<tr>
<td></td>
<td>Ability to learn from mistakes</td>
</tr>
</tbody>
</table>
In general, communication skills covered listening as well as speaking skills. A graduate recalled how she developed her listening and speaking skills at work by becoming involved in meetings with peers and other stakeholders.

Speaking skills. This would be the skill that I have trouble with most, but again, it is developed through experience. I have found that the more that I choose to talk and speak in meetings, the better I get at it and the less nervous I am...

I think listening skills are really important. If you - I think listening is more valuable than talking a lot.

The four low level 1 categories identified under communication skills are:

1) Appropriate use of language for different purposes
2) Communication with senior colleagues and people from different cultures
3) Communication while working in a group
4) Timing of communication in project work

4.2.1 Appropriate use of language for different purposes

According to graduates, the use of appropriate language while communicating with clients, peers and superiors is an essential aspect of their day-to-day work.

A professional as well as a friendly approach is required for communication with clients. It is essential to understand clients and their business needs when interacting with them. In particular while communicating with international clients, the use of simple and clear language that communicates the message effectively is essential, particularly when there is no possibility of having face-to-face meetings. A graduate said,

Because I'm in Consulting, I need to be able to clearly and accurately communicate to client management. I need to be able to translate tech speak into plain English

There are occasions when graduates need to be aware of using formal communication methods as opposed to informal communication. The following scenario described by a
graduate highlights the need to make the correct choice when it comes to handling client communication. It appears that graduates learn how to make these choices through the experience in the workplace.

*I spoke to my manager on the job and I said, what do I do about this and he said, well what you need to do is don’t let him [client] get away with it, you need to manage him so when he comes up to you and asks you something, what you need to do is say, hang on, let’s get a meeting room and talk about this a bit more formally and rather than it just being an informal thing on the fly, sit down and actually write down, okay this is this, let me clarify and then get some action points and say, okay, so this is what I have to do, this is what you’ve agreed to do and do this by this date. Just put a little bit more of a framework around it*

IT workers use several communication modes to communicate with clients and colleagues. They use e-mails, online chat tools and face-to-face meetings to discuss work related matters. They need the skill to choose the right mode to communicate so they can achieve effective communication. Sometimes face-to-face meetings and presentations are appropriate and at other times, e-mail or the use of online tools are sufficient. Whichever communication mode is used, it is essential to keep messages simple and expressed in plain language.

*One reason why I am not always a big fan of e-mail is that, even though we have to use it, it is very easy to interpret people the wrong way. Especially when you are instructed perpetually, do not put in Smiley faces; be very specific about what you are requesting from people. It is very easy to come across as quite rude and quite brusque*

Documenting information is another significant work task for IT graduates. Creating documentation for technical personnel and non-technical users needs different approaches. Understanding the audience while creating documentation is key to developing user-friendly documentation. Business documents used for communication should be written in simple and plain language without any use of technical jargon. So readability and usability are key elements to consider during documentation work.

*I am often required to write requirements documents or design documents for the new developments we are undertaking. This entails a communication skill in tailoring the documents for different audiences. A requirements or specification document is reviewed internally by project management and also externally by*
global stakeholders (North American, European and Asia-Pacific representatives from product leadership groups). Writing so that both audiences are able to glean information from the document is paramount. This is contrasted with the design documents, which are for a developer audience and by necessity, need to be more technical in nature.

Being able to understand documentation received from various sources and communicate in relation to that is also a skill that graduates require. How the messages are structured in any form of communication is vital. To achieve maximum effectiveness, IT workers need to have the skill to tailor messages to suit the intended audience and the intended purpose. A graduate said,

I suppose you need to work out how to structure your message in a different way, so that’s something that we’ve sort of learned how to sort of present your ideas and exactly what you’re trying to get across to them in a clear way, it sort of has to be clear and especially with audit, it has to be sort of clear exactly what we’re doing and what we’re not doing and so on so they don’t sort of come back to us.

Delivering bad news or unfavourable developments to management teams and other stakeholders is another essential aspect of communication skills. Graduates use both oral and written communication to present bad news tactfully without offending any parties involved. It is felt to be particularly important to deal carefully with non-technical management staff or users in a diplomatic way especially when they lack an understanding of the technical nature of IT systems and products.

when you take all that comes to light it really becomes quite crucial to both be able to talk about what you are doing with a lot of clarity and a lot of frankness, even if it is bad news which sometimes there is a lot of. You need to be able to write quite explicitly.

it really was communication skills as well, because to tell somebody that …….you will never get your data back, all that really important stuff where you’ve made – you’ve kept copies of your general ledger on there and it’s all up to date and you’ve got three months’ work on there and you’ve lost it, well, that’s too bad. We had to say that in a nice kind of a way. It’s like, it’s terrible, that should never have happened, it wasn’t your fault. You had to be able to deflect things away.
4.2.2 Communication with senior colleagues and people from different cultures

Sometimes communication with senior or more experienced colleagues in both technical and non-technical areas is essential. While interacting with senior colleagues (in particular the ones resisting the introduction of technology) it is essential to communicate the use of a particular technology and its usefulness so their support can be obtained for successful implementation of IT systems and products.

IT graduates constantly come into contact with international stakeholders. This brings many challenges. It calls for understanding of the cultural and language barriers as well as the local customs and politics.

Communication skills: being able to talk, email, present on a variety of technical and non-technical topics to different audiences, including customers. This can often involve an element of cultural awareness as many of our colleagues and customers are overseas.

Graduates found it difficult to build trust while establishing communication channels with various stakeholders, in particular with both employers and clients.

But now it has got, that trust gets built, you can be trusted to send out e-mails and you can be trusted to send out letters.

4.2.3 Communication while working in a group

IT graduates require communication skills to run and manage meetings effectively so no one person dominates and they need to ensure that all information is communicated properly to the group. Graduates processed feedback from and to stakeholders with great care so that it is constructive and not seen as de-motivational. A graduate in the role of a project team leader said,

With feedback you can’t pass on everything, you have got to be diplomatic. You would say, let’s turn down the volume and pick up on these areas. Sometimes you may ignore it because you know that is something that yes they do have a fault and everybody does have faults. But really growing that and probably softening that message and giving them a more active way rather than saying, look, they think you are XXXX, type of thing.
Giving feedback and receiving feedback are two separate yet related skills that graduates require. Being able to process the feedback on their performance in a positive way is essential. Different stages and types of feedback can be received based on the project or the role graduates have at their workplaces.

Gender domination is prevalent in IT companies. It is essential for graduates to be conscious of this issue. In particular it has implications for female graduates working in a male dominated industry. Since there appeared to be different management styles based on gender, graduates need additional skills to adapt to the professional culture within their individual organisations by understanding these respective management styles. One female graduate described how she felt under acknowledged for her efforts in the feedback sessions she had with her male manager at the time.

According to graduates, it is quite challenging to provide feedback to supervisors and juniors, as they required different tone and presentation skills. But this balancing act is essential to establish successful teams. Graduates also require skills to be able to sell their ideas to their clients, superiors and peers. They need to highlight to all the parties involved that their ideas are worthwhile and provide benefits. The challenges associated with this skill are highlighted by the following comment.

*Getting sign-off and agreement on things that is selling the work we have done and having everyone approve, agree with decisions that have been made. This can be very challenging and frustrating…*

### 4.2.4 Timing of communication in project work

Communicating or reporting on critical issues at the right time is a necessary skill. Graduates need to escalate any issues that they are unable to handle themselves to superiors or for expert attention in order to avoid any stakeholder relationship problems. They need to put aside the thought that it might reflect badly on their (in) ability to handle or resolve the situation.

*You have to understand that it’s not a personal type thing, they’re just angry and upset that the problem was there. So had to*
Communication regarding projects, time and risk management are priorities at all times. Keeping all the stakeholders well informed about developments is a key work skill. This is particularly important as graduates are often working on several projects at one time and they need to keep all clients and stakeholders involved up to date with work progress.

Communication skill is by far the most important skill that all IT graduates in this study believe they need for their work. As we have seen in this Section, it has several connotations. Communication skills involve a complex mix of skill sets and are related to all the other major professional skill categories (discussed in Section 4.10.1) such as time management, which is the next major category of professional skills to be discussed here.

4.3 Time management

IT graduates are required to manage their time effectively by being able to understand their workload and work priorities and hence schedule work for themselves appropriately. Time management ranges from managing one’s own time to managing a team’s time, not just domestically but also on an international level.

4.3.1 IT Project time management in an international work environment

IT projects vary in their size, complexity and duration. Time management becomes even more important when the graduates work on international projects, which involve peers and clients from different countries and time zones.

Today the major non-technical issues surround time management. I am going to Hong Kong tomorrow, for a week, and have quite a number of things to do before I go. Most important of these things
is ensuring my team have enough information to continue with our current development through next week while I am gone.

Time management is also closely related to communication skills as it is really about the coordination of tasks in consultation with all the stakeholders.

In the past week at work I have been reviewing and providing feedback on Work Instructions that are being prepared by my team ......so that we can send these off to the training team. The training team are utilising these documents to design their simulation training materials. They therefore have a dependency on us in terms of fast delivery.

4.3.2 Use of appropriate time management strategies

One of the ways in which time management is needed is the ability to handle and coordinate multiple tasks. Multi tasking ability is seen as an essential skill for time management.

think you need to know how to multitask and manage, because these tasks that come in, they don’t just come in where you can schedule it for a time, it’s whenever – the contract is with us and then when they raise it. So within four hours – our quickest contract is two hours. So they raise it, within two hours we’ll send the part and the personnel on site. So over this time you can have two and four hours, or next business day contracts where they all just jumble up and happen at the same time. So you’ve got to be able to manage three calls at once and ensure you know the next step for each in there. So time management is important.

Apart from multitasking within a project there is also a need to be able to multi task across many different projects with the majority of them requiring action on global levels. A multitude of reporting lines, team relationships, client and stakeholder management has to be managed. Graduates are required to be completely aware of their roles and responsibilities on each project.

As expected, graduates use a variety of tools, techniques and technology to manage their time as well as their team’s time. Tools used ranged from simple spreadsheets or Gantt charts to use of organisation specific time management systems. Programs such as Microsoft™ Outlook helped with scheduling tasks, meetings and setting up reminders and alarms. Some of the techniques used included logging of work tasks and management
teams such as helpdesk system or quick weekly meetings to catch up on task allocations and progress of tasks.

IT graduates need to draw the attention of superiors or experts in a timely manner in order to solve a customer issue. This is important, as it decreases the risk of many conflicts with the customer or the stakeholders involved. Graduates need to be knowledgeable enough to make a decision on when, how and to whom to escalate matters.

4.3.3 Ability to handle time management challenges both as an individual and as a team

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 a part of time management in an IT environment.

What I have found, I guess, the most interesting component is not just scheduling for me. We know how long it takes for us to do very specific tasks, but actually having to schedule for other people as well. A lot of that has been quite a novel experience.

Delivering work on time is not usually negotiable and this places a huge amount of stress on the graduates. Using strategies to handle stress especially in relation to time management is a skill all graduates need as they are constantly under pressure to meet project timelines. The pressure came from all sides – managers, clients and team members within the same organisation.

....if you’re on a project and the scope is too large or the expectations are too high or time frames are being pressed and being able to, I guess, sit down and put forward what the issues are and then discuss through with the person what potential solutions are and work through that together. Sometimes there’s a lot of force being put on you to - doesn’t matter what’s needed, just deliver.
I also found in my data analysis that graduates are concerned that their university studies did not contribute to development of this particular aspect of time management skill and as a result many struggled with the ability to handle and survive the pressure at work.

With university you can hand things in a day late or a week late and you might lose five percent, whereas at work, there’s a deliver date and sometimes that even gets brought forward and you have to deliver on that date.

4.4 Teamwork skills

Often IT graduates work as a part of a team. They require skills to listen to what their team members say as well as be able to communicate their own ideas to the team members. Work requires graduates to manage several different tasks simultaneously both within their own department teams and in cross-departmental teams. There are also instances when they have to replace a colleague for a short while due to absenteeism or because of a lack of human resources.

4.4.1 Understanding different team structures and composition

It is essential for graduates to be a team player. Teams varied in size and composition. Graduates need skills to adapt to varying team sizes, compositions and interacting. One graduate recalled his teamwork experience as being more interactive with some parts of the business than the others.

We usually worked on our own little project, which meant that we didn’t have to interact too much with each other as coders, however, because we had to do pretty well everything ourselves we did have to interact as individuals with other parts of the business, with people in the business, looking for their requirements.

Graduates often find their teams grew over the years at work as business expanded. Some graduates claim that there are pros and cons of working in big teams. Big teams are helpful for work sharing and bouncing ideas off each other. However, it becomes important to handle several personalities in one team and this adds to the complexity of teamwork.

……. having extra members on the team adds an extra degree of complexity but it also helps a lot too, in a way. For me it was a pretty new experience to have someone who, even though we,
theoretically have the same job role, is an understudy as such. Having to schedule not just so that everything is business as normal but also train her and gradually bring her onto projects and as things have gone along give her bigger pieces of projects and projects that are more complex.

One graduate described the teamwork skills she needs at work as an intertwined mix of other skills. She talked about having to work as a part of big teams as well as sub teams both in leadership as well as member roles.

In recent months, we have begun adopting an agile process methodology and part of this has been the creation of smaller development sub-teams within our larger development team. I am currently leading one of these teams which means I am responsible for the day-to-day project responsibilities and tracking of our development, as well as working as a productive member of the team to produce the end product.

Some teams are formal, others informal. Some are more technical, others business oriented. Graduates need to understand the nature of the team they are in and be a team player accordingly. Some graduates find themselves working with much older and mature or experienced team members. This is very different from their experience at university. One graduate’s experience brings out the challenges they face when working in teams with mature aged team members or managers. This particular graduate faced the challenge of convincing mature age workers to introduction and adoption of a new tool for team collaboration.

...the actual head of the team who’s actually not as old as some of the other people in the team and he wanted to implement new ways of doing stuff but some of the other people in the team who had been there for a while resistance against changes and that.

Some work roles are heavily team based whereas others involve less teamwork. Graduates use good communication skills and time management skills to ensure all team members understood work allocations and resources. If the team faces any problems those matters will be brought to the attention of the team managers. Team communication is the most challenging part for some graduates who struggle with the distraction of the pressures from the multiple projects they manage.
Communicating to my team what needs to be done - it's difficult to get messages to your team when you have something in mind that needs to be done and you need to explain what you are after.

4.4.2 Cultural issues and other strategies that affect teamwork

Working as a part of an international team requires more than teamwork skills. Graduates require good time management, project management and communication skills to ensure their teams work efficiently.

We are working with a number of simultaneous timelines or project life cycles here each part of which really has to be communicated to; my manager, the sales team and anybody else who is interested, folks overseas who I might need to schedule with.

Communication skills are paramount while working in multicultural teams. Graduates require not only good cultural understanding but also good collaboration skills. Some female graduates who work in a male dominated international work environment grapple with gender domination issues within their teams.

I think that because the team I work with is very international, dealing with lots of cultural diversity and it’s also very much of a boy’s club, so there’s very high standards with the males and so working sort of definitely come across lots and lots of obstacles and challenges.

Graduates experience conflicts within and across teams and they need good conflict resolution skills to resolve any conflicts. It is essential not to dominate as well as not to allow any one member to dominate and intimidate the other team members. The following quote from a graduate’s experience explains the challenges to both resolve a conflict and to keep up the team spirit at the same time.

Generally there’s going to be someone shirking that you sort of and it’s hard, you can either confront them or just keep your mouth closed. It’s hard because you want to keep a good team spirit, but then as soon as you start challenging people, then that, there’s a balance between everyone having a fuzzy feeling and actually being productive.
It is clear that graduates use several techniques to interact with their team members. In some cases graduates are part of a team where all the team members are co-located and have plenty of opportunities to interact face-to-face. In other cases, team members and clients are spread across offices or at different locations. So graduates use online chat tools to communicate with them. Graduates also need to determine when it is appropriate to use casual or formal and face-to-face or online conversations. When graduates are working as a part of team they are required to provide feedback to other team members. They also receive feedback from other team members. Graduates require understanding of the importance of managing feedback from both superiors and subordinates. Effective communication, management of people’s expectations as well as feedback management are fundamental to professional relationship management. Providing timely feedback is essential to ensure that deliverables produced met the due dates and adhere to the standard processes. Not all graduates cope with both positive as well as negative feedback. In particular they require the ability to provide constructive feedback both upwards and to subordinates. The amount of feedback and the type of feedback graduates are required to provide also varies across work roles and workplaces. One graduate highlights the kind of things on which feedback is provided to the team.

*My days over the past week have been spent reviewing these for my team and providing feedback for them. My feedback is mainly focused on Business Rules, System Navigation and flow, Legal & Regulatory Requirements, Customer Experience Requirements, and Controls.*

Graduates seem to spend considerable time on providing feedback to teams to ensure that all the deliverables produced meet the due dates and adhere to the standard processes. Although teamwork is collective work, it is essential to ensure individual team members contribute and, where junior members are involved, graduates are required to provide guidance so both the team members as well as the project benefit. As a team it is important to assess the team’s performance on a project-by-project basis. So graduates need to conduct team performance appraisals to learn lessons from both positive and negative experiences while working on projects.

Graduates who are in team leader roles need good leadership skills to monitor and motivate team members so the team delivered quality work on time. The challenge they face and strategies they use to overcome the obstacles is highlighted by the following quote.
I think the team did pull through it very well in that the good thing was it was a group effort within Australia. ...We really collaborated well we really spoke to each other well.... I think we did hold up very well indeed.

4.4.3 Meeting management

IT graduates often attend meetings within their teams, with client teams and with business or management teams. Hence graduates are required to plan and manage meetings, conduct meetings and also complete post-meeting tasks. Meeting management skills included preparation for meetings, being able to conduct meetings, facilitate discussions, resolve any conflicts during meetings, control meetings to an agenda, write or report on meetings and manage any feedback received during meetings. Some graduate comments illustrating the need for various aspects of meeting management are shown in Table 4.4.

From the interviews and surveys it is clear that different aspects of meeting management skills are an essential part of a graduate’s day-to-day work. They are also strongly related to communication skills. Graduates need good communication skills and understanding of clients, peers and managers and organisation culture to run effective and successful meetings. The teamwork skills graduates believe they need for their work are discussed in this Section. A related major category, working with people and the associated challenges is discussed in the next Section.

4.5 Working with people

As we have seen in previous sections, IT graduates require good communication, time management and teamwork skills while working with different project stakeholders. The particular issues that arise for graduates while working with people are described in this Section.

4.5.1 Managing Expectations

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. Graduates work with a variety of people particularly when they are working on multiple projects or tasks. While dealing with clients, other peers and
supervisors, they are required to be both patient and empathetic and ensure that their own work or personal problems do not distract them during interactions with other people.

**Table 4.4** Meeting management skills IT graduates require for their work

<table>
<thead>
<tr>
<th>Meeting management Skills</th>
<th>Some quotes from interviews and surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting organisation</td>
<td>So usually at the beginning of the audit we’d have a meeting with the client, whoever we’re auditing and we’d do the introdution meeting and see who to contact and then throughout the first week we sort of talk to the relevant people within that team, get all the information.</td>
</tr>
<tr>
<td>Meeting facilitation</td>
<td>So when we’re meeting the clients I guess we sort of most of the time we’re actually running the meeting, so it’s usually a one on one or one on two like with the clients so we need to sort of be prepared. So we need to know how to run a meeting and how to get our message across.</td>
</tr>
<tr>
<td>Meeting documentation/reporting</td>
<td>I think you had to be more planned, more organised. So it did help with planning and organising, being able to take minutes, communicating with other people to the stakeholders how you were tracking, so status reporting, all of that</td>
</tr>
<tr>
<td>Participation</td>
<td>I did not have much experience with speaking for presentations at university, and I believe that is a bit of a drawback (although at the time, I preferred not to do public speaking). The best way I have developed this one is though practice, by speaking when opportunities arise. And in the case of meetings, when it is relevant to your project, you have no choice but to speak up.</td>
</tr>
<tr>
<td>Information collection and dissemination</td>
<td>It was a struggle. I think that there was lots of information and it was hard to sort of disseminate through all of that, information that was available and it was hard to know whom you had to talk to, you kind of had to Figure it out for yourself as opposed to having everything spoon fed, which is what happens at uni. Everything’s given to you, but here you had to go seek it out, so that was quite hard.</td>
</tr>
<tr>
<td>Problem solving and analytical skills</td>
<td>Problem solving and analytical skills: being able to take large amounts of information and organise it, being able to connect experiences and observations to detect patterns and draw conclusions being able to prioritise different pieces of information as having differing importance</td>
</tr>
<tr>
<td>Meeting control and structure</td>
<td>Meeting management, keeping everyone on the correct topics and scope of meeting, managing time for discussions. Most of the time we need to learn how to control the meeting and make sure they’re doing most of the talking rather than us, which is important in audit.</td>
</tr>
<tr>
<td>Meeting mode (online, face-to-face)</td>
<td>I set up a meeting with the clients for later today so we can discuss the test plans that I asked them, via email, to develop late last week.</td>
</tr>
<tr>
<td>Feedback management</td>
<td>So a short term project will only have a feedback session on the end, but a long term project will have one maybe every four weeks and then at the end. …at the end of the year there’s upward feedback that’s anonymous that goes to the individual that’s then seen by their peers……… So there’s many ways it can be captured and there’s formal processes in place to make sure it’s regularly happening.</td>
</tr>
</tbody>
</table>
Graduates have to stay calm even when under extremely stressful situations and they are expected to have good people skills. This is somewhat against the common perception of what is needed in IT professionals.

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.

Understanding manager’s expectations is vital for graduates as it affects their performance appraisals and future opportunities for promotions. Managers also typically assess the performance of the graduates at the end of every project. Gender domination also complicates understanding a manager’s expectations. Male managers appear to act and think differently from female managers. Female IT graduates, especially professional novices find it tricky to understand their manager’s expectations.

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.

A few graduates understand their manager’s expectations as time goes on and from their interactions with the manager. Also, across different offices, managers’ expectations differ and graduates need to exercise special effort to understand what their managers expect them to do. One graduate recalled his not so good experience as,

I worked at an interstate office and every culture’s different, every city’s different, even though it’s domestic. While I was there I had meetings with other superiors as well, but the person I was working with wasn’t too happy about that, like she didn’t tell me. So generally, see in the local office, it’s accepted to talk to other team members, like within the office, even though you’re not working for them, but in another office, it’s inappropriate.

In addition to managing expectations of managers, graduates are also required to manage client expectations. Mismanagement of clients reflects poorly on not just the project outcomes but also their own performance. Almost all graduates indicated that clients have high expectations and demand value for their money. When conflicts arise graduates need to resolve them. More importantly, it is necessary to identify and avert
any future conflicts that may involve clients. It is a major challenge for many graduates when clients kept changing what they need and it is important for the business to deliver the product clients wanted at the end and not what they wanted at the start of the project. Flexibility is essential, however graduates still need to be conscious of the project resources and constraints and work towards meeting the timelines in the project plans.

*We had the client themselves who were at their own end causing a number of delays and then getting incredibly frustrated that things were not coming out on time. They were expecting effectively a finished product ..... and were very unhappy when it did not turn out to their liking. ....... we were pushing the broadcast date out further and further in our calendar and this was really fouling people up.*

Graduates also need to manage the expectations of their own team members and those of the other teams they are collaborating with. It is essential to have good communication across teams and within teams to ensure everyone knows exactly where the project is going and what their individual roles and responsibilities are. Although graduates do teamwork and learn to manage team members at university it is different at work because the work team members have different profiles such as different personalities, are from different age groups with different levels of work experience and cultural background. Managing team expectations becomes even more complicated when graduates are working with teams from overseas offices as they are teaming up with total strangers and understanding their attitudes and an expectation of anything and everything is both time consuming and difficult.

*A lot of it is to do with managing expectations. You have to learn not to make any assumptions. You cannot tell the sales guys it is going to take four days and then have the translator tell you it is going to take eight. A lot of it is sort of very much having things formalised, put in writing and not jumping the gun when the sales team are pressuring you for a campaign schedule.*

Additionally, managing the expectations of their family and friends also becomes a personal challenge. One graduate explained his struggle to strike a work life balance and how sometimes he is unable to keep everyone happy.

*Yes, time management but also meeting people’s expectations I would say whether it be - Clients, partners, managers, my family and my friends also. Sometimes I have to say no to them as well*
Earning a superior’s trust can be the key to a long-term prospect for several graduates. The image of graduates in the minds of their managers was enhanced by good communication and professional networking and relationships. As a result the managers start entrusting the graduates with major responsibilities. So building trust and winning the manager’s support is essential for some graduates. Good professional relationship management is required for achieving this employer support.

4.5.2 Professional Relationships

Several professional relationships exist for graduates at their workplaces – clients, peers and managers. One graduate described the complicated nature of client interactions that is dependent on project timeframes, location, team sizes and workloads.

Yep, I think you can break it across people, client, firm. So on a client perspective I could be on a project that goes for a year or a project that goes for a day. Then whether that project is just one person or a team of 20 and whether it’s local or interstate or overseas, so any of those combinations could take place. I probably spend 70 per cent of the year on client work.

Forming professional relationships with superiors and senior or more experienced colleagues requires understanding of business hierarchies and power distribution. Understanding hierarchy and gender domination do not seem to affect the graduate’s performance however it has implications for their social skills. Graduates also work in mentoring roles and hence have to maintain cordial as well as professional relationships with their junior colleagues.

So I think generally when you look at the hierarchy of people’s status, it’s very male dominated, so the lower levels you might have a combination of females and males, but the higher you go towards partnership, the less and less females there are. Because females and males operate and think differently, the higher you go the more you just need to factor that in when you’re relating with your colleagues.

Having effective communication with the team and its manager at all times is an essential requirement for many graduates in their workplaces. There is little work done in isolation
from others. Novice graduates struggle at times in professional relationship management and they attribute this to the unfamiliar work environment and tasks. They overcome this challenge by seeking the advice of and support from their mentors, managers or senior colleagues. It is essential to draw the attention of someone before uncertainties at work affect performance.

Graduates need good networking skills to form good professional relationships with many people at their workplaces. Some graduates used their social networking skills to obtain their current job. One graduate believed her life experiences and workplace experiences have contributed to the shaping of the people networking skills she now needs at her workplace.

*People skills: I believe this one has gradually developed over time by just interacting people, both strangers and friends/relatives. I don’t believe it is an implicitly learned skill. But with each different area I’ve dealt with (school, university and now work), my people skills have changed and developed (for the positive, I believe) as I deal with people at a more increasing level. I guess I am trying to say that it is a lot more important with how you deal with peers/people higher than you at work than it was to deal with classmates and lecturers at universities, and as I am exposed to the different environments, my skills have developed and improved.*

Graduates also had plenty of opportunities at work socialisation events to develop the networking skills they need for their workplaces. It is essential for graduates to be aware of cultural issues, gender issues, seniority and experience levels while interacting with other professionals at work. Some of these issues have implications for professional relationship management for graduates.

*whenever you start a new job….you are a little bit worried that you can’t – it’s like being a brand new car. People don’t want their brand new car to be scratched, so they are really careful about it …. but after a while they get used to it and then they don’t do that anymore.........But that’s I suppose how I always felt with most jobs. So you are a little bit sort of sensitive to what is happening around the place and you walk a bit gingerly and you try extra hard to be nice to people because you never know if you give the wrong first impression. You know, you may come to grief.*

Graduates use their professional relationships and networking skills to seek advice from much senior colleagues and their connections and networks to other professionals in their
workplace. Graduates also use experienced colleagues to find out about business directions and seek future opportunities within the company that align with the graduate’s interests.

4.5.3 Conflict resolution and negotiation

Graduates 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 are required to have good risk management skills by thinking ahead about the project activities and work they are involved in so as to identify and manage any issues/risks that are likely to arise. The 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. The following quotes illustrate this point.

*When 2 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...*

Where there are peers or clients involved in a conflict, a tactical approach to resolve the issue is essential. A graduate recalled how conflict management skills assisted in bringing peer behaviour related conflict under control.

*An un-cooperative Team Member was on my team last year..... ....A particular situation arose where she was quite impolite to me in a client meeting after she had been asked to do something.....I was... shocked at her behaviour during this situation in front of others. The challenge was what to say/do there (at the time) and then after the situation... At the time, I needed to consider moving forward with the meeting and not providing the client with bad impressions of us. ..... I ended up saying .... "well how about after the meeting we can discuss who is going to look after the work, let's just take note that it needs to be done and we can talk resourcing later". This resolved the immediate problem. Later that day I... gave her some constructive feedback about needing to reflect good manner and attitude in front of the client and to raise issues with her workload outside meetings. She was apologetic for making a scene. This was an example of conflict resolution skills that I have recently used.*

Another graduate felt helpless when some of her peers were quite rude and demanding to her. She had to develop the ability to put up with it because she understood the workmates are also under immense pressure. A potential area of conflict in any IT project is the project scope and the management of client expectations. Coming up with reasonable solutions that
benefits all stakeholders is essential. Good communication skills and rapport with customers assist with conflict management. Where conflicts cannot be managed by graduates themselves they use the assistance or advice of a senior colleague and/or escalate the issues to the attention of their superiors so appropriate action can be initiated. A graduate who was in a role that required support and providing maintenance to an IT system or product that failed, described many upset customers and the need, at times, to escalate some issues for a manager’s attention as he could not handle the customer conflicts himself.

4.5.4 Human resources (HR)

Some graduates require HR skills to assist their business managers with activities such as exploring future opportunities for business growth, recruitment of staff required for projects and for other business expansion requirements. A graduate explained his experiences:

_We also started advertising for another [grad] position so I have been dealing with HR and making sure that we have mapped out what we are looking for in this person and also making sure that we get those applications come through and then looking at the applications themselves_

Few graduates have the choice of workmates. Another essential aspect of HR skills is the ability to interact with both competent and incompetent people at work. Graduates need to understand that some of their colleagues may not really be competent and that they still need to have the skills to cope and work with them without discriminating against them.

_People who weren’t really competent or confident, I could handle them okay, but it wasn’t just putting up with them I actually understood what they were going through so I sort of had a bit of empathy for them._

4.5.5 Customer Service

Some graduates are in a service role that includes customer support via phone, online or face-to-face. Being flexible when dealing with customers is a skill that is required for many graduates. A graduate states sometimes he is left facing the customers when a senior
colleague has promised the customer something without having consulted the team members.

*Because I work in professional service, flexibility is being able to do any job that’s been thrown at you. In my occupation…. more senior people promise clients this is what we can do, not knowing if the resource can do it or not. So you are put forward, so you have to learn on the spot whether that’s required to do the job…. that could be development of technical skills. Sometimes it can be a stressful job.*

It is difficult to perform in a customer service role if graduates do not have the skill to demonstrate to customers that they understood the problem and are able to propose cost effective solutions to assist the customers. An equally essential skill is being able to communicate the benefits of proposed solutions to customers in a convincing manner. Customers come from across the globe from many different cultures and hence a good understanding of cultural issues involved in customer interaction is essential. One graduate stated that his exposure to different cultures through his friends assisted him to perform in his customer service role.

Customers sometimes are annoyed and frustrated when graduates asked them several questions to understand the problem better so as to suggest corrective solutions for customer problems. But it seems to be a challenge when dealing with customers who are impatient, rude and immensely upset.

*I know for one that if you ask a lot of questions, people do get frustrated, especially when you’re new. You don’t know anything and people ask a lot of questions so you’ve got to have patience in order to get them the right information and help them learn so that they don’t ask you again.*

It is also essential to be patient with customers who digress from the problem topic and are uncooperative with providing the required information.

*when you go to interview people you might be there to get answers, right, that’s why your interviewing people and sometimes some interviewees might ramble on on all sorts of crap. So you have to be patient to let them unwind but also direct them to the path that you want to as well. So you can’t just be abrupt and be rude and things like that because you need to get, talk to them again, interview them again, so like a follow up interview, they won’t be too happy about that.*
Having empathy while dealing with customers not proficient in the use of IT products is another essential skill. Troubleshooting and documenting problems or issues faced by customers are some examples of technical customer service tasks that graduates do. While most of the troubleshooting was done over the phone often graduates need to go on site to troubleshoot problems. A graduate explained how she needs variety of skills to provide the required level of customer service.

*I have also had involvement in face-to-face customer support - meaning actually visiting sites to perform Beta upgrades or look at problems. In my early years in the job, I went perhaps once or twice per year to sites. Last year I went to nine different sites, including some in North America. (requiring communication, leadership, organisation, planning, decision making, time management, groupwork (working with the site staff), problem solving skills).*

IT graduates need good communication skills, time management, business and problem solving skills to perform in customer support roles as highlighted by their experiences. Good rapport with customers means forming cordial relationships both face-to-face as well as virtually, thereby enhancing the customer’s trust in the work the company is doing for them and providing for an efficient customer service.

*You’ve got to know where you stand. You’ve got to understand where you stand. And you’ve also got to build rapport with the customer as well. You’ve got to get them to side with you so whatever you want done, they will be inclined to do it, and also your team member as well that’s out on the side.*

Customer service applies to both internal and external customers. However, one graduate felt dealing with internal customers is easier than with external customers. Dealing with customers from different cultural background comes with its own challenges and is discussed in the next Section.

4.6 Working across cultures

Working across cultures requires graduates to be able to work with people from different cultures and to be aware of the cultural barriers that they may encounter while working on international IT projects.
4.6.1 Ability to work with people from different cultures

Multinational and often global teams or clients are involved in IT projects. As a result cultural complexity arises as different cultures may have different values and beliefs. Graduates have to take extreme care in composing all communication including e-mail messages to deliver their message in a simple, clear, professional as well as timely manner. Cultural awareness and communication are strongly related skills. Often graduates’ work requires them to communicate with a variety of people from different departmental groups with different cultures within their own organisation both locally and overseas. They use communication skills, time management and cultural awareness to manage projects.

Graduates need to be aware of the nature of the group with whom they are talking. As mentioned earlier, communicating with technical teams is different from communicating with business teams. These two groups have varied professional culture and language requirements. Even within the same professional group, the use of technical language can be complicated, especially if the peers are from different overseas offices. Graduates need to be conscious of the recipient ‘culture’. Gender differences can sometimes introduce yet another form of culture.

International clients from different cultures can place demands on IT graduates. One graduate described her experience with an international client as stressful, tedious and frustrating because of the language as well as cultural differences that arose during the interactions between their Australian office, overseas offices and the client’s overseas office.

We had an e-book campaign………..This e-book had to get translated into let me see, simplified Chinese, traditional Chinese, Korean and then it was sent over to Europe to get translated into Russian, Spanish and a couple of others….However, because we had a really lengthy backwards and forwards with the client ….. it was an international campaign and I can understand that. …..They were immensely particular about everything…. manager who was working with me must have recorded in excess of 100 emails with said client about this project, which is insane.

The use of language appropriate to a particular culture is required for cultural communication. When a graduate is working on a project that uses different language
4.6.2 Awareness of cultural barriers

While working on international sites it is important for graduates to be aware of local customs, values and beliefs. For example, having knowledge of local politics, holiday periods and food habits. One graduate was surprised when the customer made them wait until after a certain time because he did not like to be disturbed during certain times during the day.

Language barriers are usually overcome by use of translators. When the translators are not reliable that affects the project management plans. A graduate described her dilemma in working with translators and how that affected her project management plans.

Another graduate in a helpdesk role stated how he had to communicate with clients who had a strong accent, and, as a result, their English was hard to understand. Graduates in those situations have to be polite as well as try to enable communication either by use of a slow pace or by using translators.

4.7 Project management

Most IT graduates work on IT projects. Irrespective of the project size and duration, they need good project management skills to participate and complete such project work successfully. Good communication, time management, teamwork and people management skills are requirements for successful project management. In addition to these, graduates
need additional skills to manage scope, cost, resources and risks. These issues as they apply to the IT graduates in this study are discussed in this Section.

4.7.1 Managing processes, constraints and people in IT projects

Project management skills are another important and complex skill set for all IT graduates. They are perceived as a mix of several management and monitoring skills that are directly applicable to managing IT projects. Multiple definitions of necessary project management skills are provided by the IT industry and literature. My data analysis found eight project management areas of skills that IT graduates require for their work. They are scope management, resource management, research and information management, infrastructure management, work delegation, change management, quality management and cost and time management skills. It is important to engage the clients in a dialogue to resolve any mismatch in expectations in relation to project scope, timing and costs and, to achieve this, good communication skills and rapport with clients are required. Graduates are required to have resource management skills to coordinate the resources available and to map them to the project scope, time and cost.

The ability to find needed information, manage details about a project and use available information to manage projects efficiently are key to research and information management. Graduates require infrastructure management skills to analyse and foresee the required infrastructure, whether technical or business, to run or manage projects. Work delegation is the ability to allocate work to team members after understanding a peer’s competencies. Change management skills are required for managing project changes. Graduates also need to be aware of the quality assurance processes used within their company.

There was a project like a 6 months project ... I was given a lot of responsibilities and there was about seventeen different systems that I have to have ownership over and... lots of moving targets... everything was constantly being iteratively tweaked every week....... everything was still early days. I was told here is your assistant, Figure out who your contacts are, learn what these systems do and then determine if they are actually in scope for this project and if they are in scope then start engaging for the subject matter, experts so forth and so forth...There were so many different things happening all the time and I was often I guess overwhelmed and confused and no one has time to sit down with you for maybe four days straight and walk through with you step by step.
The project management skills that graduates believe they need for their work and some graduate comments illustrating the need for such project management skills are listed in Table 4.5.

**Table 4.5 Project management skills IT graduates require for their work**

<table>
<thead>
<tr>
<th>Project Management Skills/areas</th>
<th>Some quotes from interviews and surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope Management</td>
<td>for example, if you’re on a project and the scope is too large or the expectations are too high or time frames are being pressed and being able to, I guess, sit down and put forward what the issues are and then discuss through with the person what potential solutions are and work through that together.</td>
</tr>
<tr>
<td>Resources management</td>
<td>… when I was working on a project and one of my team members who specialises in a particular area was about to go on leave. It wasn’t a big issue at the time; however, I knew a deadline would be looming in a month or so later. In order to mitigate the issue of being left without resources and to stop it becoming an issue, we had to mitigate the risk by training up another resource in preparation.</td>
</tr>
</tbody>
</table>
| Research and information management          | Sometimes when a problem goes wrong and you need help with it, so you have to call people across or someone else, you go and help them. You’ve got to make sure that you know – you’ve got all the information ready so they can help you or you can help them.  
Well a lot of research, so 50% of the time I was researching; well industry benchmarks and working on proposals, so researching on organisation, things like that, so for the first couple of weeks of our report. |
| Infrastructure management                    | That is one side and the other side I am also doing network management and reports. Essentially what we’ll have is say for instance, managing the company’s infrastructure and things like that and any requests they may have we also look after on a day-to-day basis. |
| Work delegation                              | When you are dealing with four campaigns on one day and you have to work out exactly how you are going to manage your workload and how to allocate work to other people. I currently have one girl who works beside me. She is a little more junior so when things get a bit crazy on my end I have to know when it is the right time to start giving jobs to her and what jobs are good for her so that she can learn her role better. |
| Change management                            | Change management skills: at the moment we are moving to a new development process. This involves being able to maintain the progression of our development while the process and its artefacts templates, documentation, audit procedures etc are in flux. |
| Quality management                           | being able to lead and motivate my development team to completing our development on schedule at appropriate quality.  
The company I work for is very big in Six Sigma for example and we often use DFMEAs to assess risk in a particular development path (which in itself encompasses facets of project management). |
| Cost and time management                      | At any given time there are probably about ten or twelve different things that are going on. Whether that would be implementation stuff, whether it would be supporting staff whether there would be a marketing drive. There could be a budget that I have got to do for the partners or whether it be a presentation that we have to do for something else. |
4.7.2 Use of creative design skills in product and documentation development

In addition to their technical work, graduates are expected to have a good eye for detail or design. This is typically the ability to see things beyond the obvious tasks/activities of the projects they are working on. According to a graduate it is a requirement to always consider how your clients will respond to the product you have created. It is essential to be proactive and be a critical thinker as well as provide consideration to the several stakeholder reactions.

When there is a requirement to write or develop documentation it is essential to use good creative design skills so the document is easy to read, understand and use. This applies to IT products as well as websites.

A lot of that was more focused around creating a document that was very usable that was designed to be easily referenced with lots of coloured pictures... On from that I was doing a lot of design......
Given a corporate style guide what I effectively would have to do is, design......, an html creative, a text creative and then a small website with a number of features.

4.7.3 Understanding the big picture and complexity of IT projects

IT projects 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 their projects accordingly. A graduate said,

It’s not hard to do, but thinking, I guess part of that is planning and seeing the big picture and thinking ahead. So seeing the landscape and going, hang on, red flag, red flag, and making sure that you highlight it early so that there’s no sudden surprises.

The ability to look for potential risks or problems and picking up on vital information in a timely manner and escalating issues to superiors is part of learning about risk management.

4.7.4 Risk Management

Graduates need to identify, analyse and handle possible future threats to resources or projects and work out a way to overcome any such risks.
... when you’re on a project, rather than thinking, what am I doing this week, constantly think about all the milestones, are there any, ... hang on is this going to put something three months away ahead at risk? Is this changing scope or do I have enough resources lined up for a month’s time? So not just thinking about day by day or week by week, but always thinking about everything that needs to be done.

Extreme caution is required when dealing with legal risks. One graduate said that he is required to be conscious whether any legal implications of what he states or does might have an effect on the relationship of the company with their customers.

Then you’ve also got to ensure that you protect yourself and also the company, because you’re representing the company. Protect as in – so say if something happens to their network you’re not liable for it because you’ll be working on live environments. Say for example you have a company that has a network and Company X has a service level with them and you want to make sure that you don’t do anything to take down or break that service level.

Another graduate said the risks surrounding contracts management had to be discussed with the company’s legal team prior to discussion with clients.

Basically what we do is ........ we do write it initially and then get a lawyer to look at it. We have the company lawyer who initially looks at and then as a second opinion we use an outside source as well.

Graduates need to be aware of the security issues and controls surrounding any IT systems they are troubleshooting for clients. Foreseeing future risks including staffing issues and developing effective management plans to handle them along with risk identification, exposure, analysis and timely management of any identified risks are essential but challenging for successful project management.

Trying to mitigate a risk before it becomes an issue is difficult. Tracking the success of mitigation is also tricky.

This [Risk management] is something that is learnt from role models such as managers at my company. This isn’t something we learnt at university.

Defect management is a later stage in project management involving troubleshooting and testing any bugs identified in the system being developed and tested. It is necessary to be
aware of the different standards and methodologies applicable to every stage of project management. Auditing is used to check for compliance and find unidentified risks or issues whereas troubleshooting is used to focus on solving or fixing problems. For either, it is essential to document any communication in relation to risk management, project meeting minutes with clients and other stakeholders for future reference.

4.7.5 Adherence to standards

Strict adherence is needed to appropriate policies and procedures and standards, for example, quality standards that define processes that are to be used for IT system development. Many IT graduates are actively involved in monitoring as well as developing and implementing new and current technical and business compliance measures.

So it could be reviewing a call centre, it could be looking at a building system to see if it’s complete and accurate, it could be looking at seeing if there was compliance in place for something, it could be low level data analytics. It’s very varied but it’s just around, I guess, you can theme it as professional services.

Graduates hold responsible positions and are accountable for their actions and decisions and compliance and overall adherence to company policies and procedures. This was a new experience compared with their university studies where they felt there was little or no accountability for their actions.

4.7.6 Problem solving

Having good problem solving skills is key to project management to assist graduates to handle their work effectively. Different aspects of problem solving that came to light included problem communication, problem management, use of analytical and logical reasoning skills, problem based learning, the ability to follow company procedures to handle/resolve problems and being innovative. Graduates need communication skills and the ability to abstract and generalise concepts for problem handling and solving.

Good problem solving skills... The ability to talk with people and communicate really well...... The ability to abstract and generalise, which are both essential to really good problem solving.
Problems that graduates face include purely technical problems, pure business or operational problems or problems that involve both technical and business issues. Good understanding of the problem and any underlying conditions are required for solving some technical problems at work. Where a graduate was unable to progress with his work as a result of an uncooperative client who was unable to understand what the problem was, it was essential to approach the client personally and communicate the problem or issue and seek their support to resolve the problem. Once problems are identified it is then necessary to handle and manage them appropriately so they do not go out of control.

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.

As for my IT role, interacting with the business, just making sure we’re keep them up to date of how you’re progressing with the problem. So sometimes there were maybe one or two problems where it’s fixed but any other problem comes back later on in a different form so you sort of have to then go back and explain to them exactly what you did last time and why it’s working this time.

Another graduate described the problem solving skills she uses at work as a complex concept that requires a variety of intertwined skill sets. She found herself using her decision-making skills based on her understanding of the business needs and the product causing problems. She refers to the development phase of the projects at her work as assessment. Management of problems also plays a predominant role. Graduates referenced the use of tools and techniques to document the assessment and management of problems.

When dealing with clients, graduates found that the clients demand quick explanation and solutions to problems they are facing. A graduate who was in a helpdesk role said,

Most of the time….., you have to find the cause or the problem very quickly. You may have time to work on the solution, but try to find the cause and getting back to them about the cause because most of the time they want to know what’s wrong relatively quickly…..

There has been a time where I had a task where we sent our parts and then the customer wasn’t too happy…. The part got in an accident. Everyone was under the impression that the new part was being sent out but they actually delivered the faulty part…. It
was already delayed…… So the customer wasn’t impressed and started yelling and being abusive. And then you’ve got to try and calm them down. It was very difficult and I still didn’t manage to calm them down.

Graduates need good logical reasoning and analysis skills as they are working with large amounts of information and across several projects and products and services. Graduates said time management as well as information analysis and management skills assist them to solve problems. According to many graduates in the study, adherence to company policies and procedures or any relevant standards while resolving problems is essential. Understanding the magnitude of a problem and, if required, working in collaboration with peers across different departments to troubleshoot a problem is essential. A graduate recalled his experience,

…..we had a major incident with the actual application we were working on because there were certain processes in IT, as in if certain things go wrong for too long then they put the system in a situation management period which usually goes for about two or three weeks. I was in that team when that happened. So it usually means that we stop doing whatever we’re doing and pretty much everyone in the team has to be involved in fixing that problem….

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. A temporary change in roles and responsibilities may be involved. As a result, they learn lessons both positive and negative from those problem situations or experiences. Communication is key to resolving many problem situations. A graduate said that she needs to constantly think about new ways of handling and solving problems at work and that her university studies did not assist enough with development of this skill. This point is emphasised by the following recommendation.

I think more activities around I guess maybe putting someone under pressure on something complex where the only real solution is what wouldn’t come to them naturally. So maybe escalating, oh there’s risks here, or having to actually actively seek out something that wasn’t the most obvious pathway, or maybe, I guess, having to be organised and used to do lists and just little things that help around that.
4.8 Business skills

4.8.1 Knowledge of organisational procedures

IT graduates are generally appreciated for their technical skills. However, most managers are concerned about their lack of business or professional skills. A particular need is for graduates to have a good knowledge of relevant organisational procedures and business needs. A way of acquiring insight into the organisational culture and understanding of organisation policies, procedures and overall work hierarchies is to develop professional networking skills to connect to staff members at work. Induction programs, orientation support, mentoring and work social events are required to network and establish professional relationships with their colleagues.

I think starting on the graduate program you start with other people who are also starting on the graduate program, so we had an induction I think in the first week which, wasn’t really training, it was more around just getting to know other people like who was starting the graduate program and also getting to know what’s available at the bank and stuff.

Knowledge in relation to the products and services relevant to that organisation and the organisational departments responsible for them is organisational knowledge. Graduates may be actively involved in the promotion of such products and services or required to forward queries appropriately. Learning and adapting to workplace politics is another skill necessary for graduates. It is essential to be generally aware of what is happening to their team and the overall department and how the rest of the business is performing. Such knowledge is often acquired by gossip and casual corridor conversations.

4.8.2 Understanding business needs

Understanding business needs applies to not only understanding the business needs of companies where graduates work but also understanding the business needs of their client companies and other third party business stakeholders affected by an IT project. This is a specific professional skill unique to a particular business unlike a generic professional skill such as time management that is readily transferable to other workplaces.
something like time management is a generic and transferable skill, whereas understanding business needs is specific to a business. Just because I understand the business needs of my company does not mean that I could walk into any company in any industry and instantly understand their business needs.

When some graduates felt they were unclear about organisational issues or work issues, they dealt with it by drawing it to the attention of their immediate supervisors and requesting more information to understand the business.

…..you just ask questions when you don’t have any ideas. There’s no point standing around for hours if someone else knows the answer. You remove yourself from university lines, oh do everything yourself, PBL, problem based learning, to just asking someone how to do it.

The positive experience of one graduate when he first started work is captured in his comments below.

….. in my first team, the person I was working with was really great and he helped me get set up, make sure I know what I’m doing and they’re usually aware of what you need to do with a new starter, so what systems you need access to and like what you should know about and so on .......... you have a buddy who is someone who has previously been on the grad program and you have the mentor ... who is like a high up manager in IT, so if you have any problems or questions you ask them so you find out about it that way

Having acquired business knowledge and understanding of the business needs, graduates are required to promote the products and services of their business to other businesses. Both clients and the graduate’s company need to see value for money in any joint project. More importantly, the benefits of working with a company for a project need to be communicated and highlighted to clients, both for their immediate satisfaction and to generate repeat business. Graduates can use their business knowledge and understanding of business needs to help develop highly profitable and expanding business relationships.

Basically I had developed a web site and that actually is what they used to get them in the door and then explaining to them, yes we can do this and fix this problem. Initially we went there for a $3,000 job or something like that but now we’ve covered maybe more than half a million with them.....
For most graduates, understanding of business needs is relevant to developing best-fit technical solutions to any business problems that the clients bring. In some cases graduates legally represent their employer’s business while performing some activities. On those occasions, it is even more important to have a thorough understanding of overall business knowledge and the client’s business needs. Graduates need to protect themselves and the company while representing the company during customer interactions. An intertwined set of professional skills to cope with work requirements especially at customer sites is often required.

4.8.3 Marketing skills

Several graduates indicated that they participated in the promotion of relevant IT products and services and that they are expected to contribute to the development of appropriate marketing materials. A better understanding of products and services their company offers is developed from such participation and an opportunity for graduates to put their ideas on display is provided.

One graduate used his marketing skills to attract new clients to his firm and offer ideas for developing new products and services.

I told this guy who called up and said do you this? I explained exactly what we do and literally I almost made up something and I didn’t realise we didn’t actually do it, but I had the background and the skills to do it anyway. So I explained it to my manager as well as some of the other staff; well we can do it because I’ve got this, this and this.....

Because graduates are working on international projects, a good understanding of global marketing efforts is essential. Skills that assist with forming good relationships with potential customers and constantly analysing the opportunities for future business growth are also sometimes required. A related skill is to put on a marketing hat to sell ideas within the company to stakeholders. Overall, good communication skills are required to market products, services or ideas to various stakeholders, both existing and potential, internal or external.
4.8.4 Leadership skills

Many graduates said that they need leadership skills in their work roles especially if they are leading teams. Good leadership skills are strongly related to other skills such as time management, project management, teamwork and communication with stakeholders. One graduate described leadership skills as,

*Leadership skills: being able to lead and motivate my development team to completing our development on schedule at appropriate quality*

As leaders, graduates are involved in conducting performance appraisals. They also need to manage several different tasks they do on a daily basis as well as continuously monitor and perform appraisals on team members. As leaders they are required to multitask yet motivate and lead their teams.

4.8.5 Information Management

Identifying required information, understanding and processing that information and using it, as and when required, is an information management skill. IT Graduates require such skills at their workplaces. On some occasions there is too much information and other times too little. Graduates need good research skills as well as knowledge about whom to approach for assistance to understand anything that is unclear. When graduates find themselves in new and unexpected situations they need research skills to look for information that may assist them in handling such situations. They are required to search for technical as well as other kinds of information that are industry related.

*I think finding the information is really the biggest challenge... I think researching is hard. ‘Cause information just keeps getting added and then it’s not sorted properly..... say you get a part and then you’ve got to find out how to install it or configure it. It’s not always readily available where you just search here, search there. Sometimes it’s all embedded in and you have to search it.*

Again 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. Graduates need good interviewing skills especially when they had
interactions with clients so they can clearly understand what the client’s needs are. They are required to clarify any questions or doubts they have in their minds in relation to the project work they are assigned. They also learn quickly that they should not make any assumptions about other stakeholder’s expectations. One graduate who learnt his lesson the hard way describes his experience as,

I got a slap on the hand a few times because I assume too much. So they go, you need to, you shouldn’t assume too much, you need to ask questions. So hence I worked on my communication skills. So any time I have a question or a query or once I clarify something I always communicate to the appropriate party. So from that point forward things went a lot better.

As a part of information management, graduates must document any discussions from meetings, information or documents exchanged with clients and any information assessed and processed. Constant monitoring, reviewing and status reporting to project stakeholders, both clients and managers are required while managing project constraints.

4.9 Personal attributes

Graduates quickly learn that what they learn at university does not always translate directly to their workplace requirements. They need to constantly update their skills and knowledge. It is accepted by most managers that professional novices who start work might not have all the skills they need to perform in their role. But it is expected that they have positive attitudes to updating and educating themselves about new techniques or tools that may be required at workplaces. The attributes they need for this are adaptability, self-confidence, self-assessment, work enthusiasm and the ability to learn from mistakes.

4.9.1 Adaptability

The ability to adapt to workplace requirements is essential. Although graduates may have a role and responsibilities statement, the kind of work they do changes on a day-to-day basis and they need to constantly approach new situations with an open mind and have the ability to tailor their personality and skills to achieve success in those situations. For example, tools and processes different from those a student learned at universities may be used at work. Graduates need to demonstrate to their supervisors that they can learn such tools quickly and are intelligent enough to handle new roles and situations.
I don’t think that you really needed training…before you got there, because it was a start-up role you didn’t really need to know anything about the products involved, because you kind of got that on site when you showed up. But you had to prove that you were sufficiently clever to be able to handle the role, whatever that means.

Graduates can obtain the ability to develop new skills from practical learning and varied work experiences. Adapting to the new work environment especially when the graduates first entered the workforce is key to their success in their work roles.

4.9.2 Self-assessment

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. One graduate described this as having emotional intelligence. Whenever graduates struggle and are unable to carry on with their work they seek assistance from their peers or mentors. Graduates require self-assessment reports on their work performance. They receive performance reviews periodically from their managers. When they are aware of their weaknesses, they are in a better position to understand and process any negative feedback given to them during performance reviews.

4.9.3 Self-confidence

Having the ability to demonstrate confidence in one’s message in high-pressure situations is important. Graduates need to be friendly but at the same time be in a position to convincingly refuse extra or inappropriate workload. One graduate described being assertive as complex. When and in what way to be assertive requires developing experience to assess their work situations.

Being assertive…as you must get your views across to other people so that your project can be benefited. … is related to people skills in a way. Part of being assertive is knowing the appropriate way/time to be assertive……. This skill is needed to help ensure that a project is carried out to completion and you have to deal with all the different stakeholders in an assertive manner. Again, it is time and experience that helps develop it. I also think that making mistakes (even minor ones that are immediately corrected) is important because that is one of the best ways to find out a method doesn’t work.
While assuming mentoring roles, some graduates are required to train their juniors to develop confidence and be assertive. The mentor’s confidence level was strengthened as a result.

4.9.4 Work enthusiasm and ethics

Many graduates are required to work long hours and show commitment to their job. They need to have enthusiasm and passion and demonstrate it at work. This can favourably draw the attention of peers and managers. However, it can be a struggle to achieve work-life balance.

Being a consultant you have got to quite a bit of hours as well, and you have to be committed to your job as well as your personal life, so there is a balancing act. Balancing that was quite difficult initially but I have settled in and everything is fine.

Only one graduate explicitly stated that he had a good work ethics from his previous work and life experiences and that it assisted him in coping with varying work hours and workloads.

4.9.5 Ability to learn from mistakes

Graduates require the ability to improve themselves by learning lessons from the mistakes they commit at work.

...we sent our technician and a part out as well.....then the customer got upset .... wanted the whole router replaced. And after a certain point we have to get approval from a manager in order to send out that many parts – all those parts out 'cause it costs a lot of money. The manager wasn’t impressed that we had to send it out. She said that inadequate troubleshooting and things like that. .......when you’re doing the job you can panic, I think, and then you feel stressed. Stressed as in so you don’t think straight. You don’t know – you don’t think logically ...and also follow the procedures you’re meant to follow.

The skills graduates require to cope with new and unexpected situations are provided through practical learning from their day-to-day activities.

Yes in fact one of them I didn’t realise that the deadline was at a particular day, I thought it was a week after and I had to work the whole night through, in the end I got it done. Sometimes you slip up but you would learn from the mistakes take some action so it doesn’t happen. Really that’s what somebody taught me, whatever mistakes you make you actually learn from them.
One graduate learnt that it is not realistic to overload work for herself in order to keep everyone at work happy.

*It was a learning experience. Initially I would say yes to everything and try and keep them happy but I realised by keeping them happy it was making me unhappy. So just telling them the facts, I’ve got this, this and this and I’ll come back next week maybe, or whatever.*

Many IT graduates face new and unexpected situations and as a result commit mistakes at work. This is expected of novices by managers. While mistakes are inevitable, it is essential to make sure they are not repeated as careers or promotions could be affected. Graduates also need to be calm and patient at work so they can avoid making mistakes.

*Then although it's not natural, you adjust your style, you go, right, not going to make that mistake again, this time I’m going to have this to do list, I’m going to have key points to talk off, have additional detail to refer to if necessary. But I’m going to be calm and have everything as sound bites as opposed to rattling off all the detail and being flustered and setting up just times to talk through things.*

One graduate explicitly stated that making mistakes is essential because it is the best way to learn what not to do.

**4.10 Relationships across professional skill categories**

The previous Sections discussed the professional skill categories that IT graduates believe they need for their work. As discussed in Section 3.10, the selective coding process of the data analysis involved the following three steps. First, all open codes from stage 1 were grouped together into eight major categories (from the initial 23 categories) after several iterations of unpacking, merging, collating and constant comparisons. Second, short notes (or memos) as they are generally referred to in the grounded theory literature were written. These memos are useful to explain key concepts, categorisation, and relationships with other categories and helped to develop the eight major categories of professional skills. I made several short notes about my thinking and started writing memos from the moment the data was collected in the first interview. Memos were written on sticky notes and further notes were added as the data collection and analysis progressed.
Third, the constant comparative process was used to help identify multiple relationships amongst the categories and across themes. The multiple relationships that exist between the eight professional skills (Theme 1) are shown in Figure 4.1. The relationship mapping across the eight professional skill categories along with some quotes from graduates to support the relationship are presented in Appendix F. Those relationships are discussed in Sections 4.10.1-4.10.7.

4.10.1 Relationship between communication skills and other professional skills

Communication is related to all the professional skills identified in this research. Communication skills are needed for:

- Interaction with various project stakeholders (teams, colleagues and superiors across the globe) in a timely manner;
- Feedback to the team, interaction with team members, teamwork documentation and the management of team meetings;
- Professional relationships, good customer service, negotiation and conflict resolution and management of the expectations of various project stakeholders;
- Working with people from different cultures as graduates need to be culturally aware, overcome cultural and language barriers and use appropriate language or writing style for communication with business or technical staff;
- Management of IT projects including project scope management, risk management, problem solving and reporting of project progress or status;
- Understanding business needs, to sell ideas, market or promote IT products, ideas and services and demonstrate leadership; and
- Demonstration of personal attributes such as self-confidence and the ability to adapt to new work settings.

4.10.2 Relationship between time management and other professional skills

Time management is related to:

- Teamwork as the ability of teams, particularly those in different time zones to work effectively, develop and implement teamwork schedules is affected;
• Working with people as timely interactions are needed to provide customer service, maintain professional relationships with clients, peers and superiors and to resolve conflicts;

• Project management as project progress, completion and management of processes, people and products and other resources are affected by poor time management; and

• Personal attributes because graduates need to learn quickly from their mistakes and experiences and adapt to new work requirements in a quick and efficient manner.

4.10.3 Relationship between teamwork skills and other professional skills

Teamwork skills are required for:

• IT graduates to work with people from different cultures and languages with differing values and beliefs and different work styles. For female graduates this includes the ability to work in male dominated teams; and

• Project management as all IT projects involve teamwork and management of people resources.

4.10.4 Relationship between working with people and other professional skills

Working with people in IT is related to:

• Communication and interaction with project stakeholders from different cultures, different work cultures, languages, workplaces with gender imbalances, business and technical people;

• Project management tasks such as work delegation, understanding project needs, schedules and resources, people and job competencies required and work accountability; and

• Business skills required to maintain relationships with business teams, understand different management styles and work procedures, sell ideas and promote products and services.
Figure 4.1 Relationship diagram for Professional Skills
4.10.5 Relationship between working across cultures and other professional skills

In project management, project stakeholders typically come from a variety of different cultures.

- IT graduates require the ability to communicate with project teams and work with them on project requirements, scope, schedules, planning, implementation and risks; and
- Graduates need to be more than just culturally aware. Graduates visit clients offsite and travel to different places around the globe to work on projects.

4.10.6 Relationship between project management and other professional skills

Project management is related to all the professional skills identified in this research. Good business skills and personal attributes are required for project management.

- Graduates need good leadership skills, marketing skills, understanding of business needs and information management to understand the big picture scenario in which many of the IT projects are situated;
- Good business skills are essential for managing the project constraints effectively; and
- Project management is affected by personal attributes such as the ability to learn from mistakes, experiential learning and the ability to adapt to dynamic work requirements.

4.10.7 Relationship between business skills and other professional skills

- Personal attributes such as self-confidence and the ability to develop new skills are affected by business knowledge and information management skills.

4.11 Summary

The research findings on theme 1 - Professional skills IT graduates believe they require at IT workplaces were presented in this chapter. The key points noted from the findings are:
• There are eight major categories of professional skills IT graduates believe they require for their work: communication, time management, teamwork, working with people, working across cultures, project management, business and personal skills. The findings have implications for university courses and their commitment to preparing work ready graduates.

• There are multiple relationships across the categories of the eight professional skills. Communication is the dominant skill category that is related to all the other skill categories. Some skills are applied differently in different work contexts across different organisations as shown in the study. Professional skill requirements vary from one employer to another although the nature of work may remain the same.

The finding that multiple relationships exist across the eight professional categories demonstrates the complexity involved in the development of those skills. It has implications not only for the development of those skills but also for how and where they are developed and who (university or employers or graduates) assumes responsibility for the development of such professional skills. There are difficulties associated with developing mechanisms within course material to incorporate the development of such skills. There are implications for employer expectations of skills of graduates. These issues are explored in detail in Chapter 6. The next chapter is a continuation of the discussion of research findings on themes 2, 3 and 4 and implications of the research findings presented in Chapter 4. The challenges faced by graduates at workplaces are discussed and the points of differences between the application of a skill at university and in the workplace are given. Then, the primary concern of IT graduates regarding preparation for professional practice is presented along with a summary of the key findings.
CHAPTER 5 THE RELEVANCE OF UNIVERSITY STUDIES TO PROFESSIONAL SKILLS DEVELOPMENT

5.0 Chapter overview

In this chapter the implications of the research findings presented in Chapter 4 are analysed and the challenges graduates believe they face at their workplaces are discussed. First, the varied experiences and sources that contributed to the development of professional skills of IT graduates will be discussed followed by the most useful aspects of their university studies that IT graduates believe contributed towards their professional skills development. Next, the challenges IT graduates believe they face at their workplaces are highlighted and the implications of the intertwined complex relationships (that were introduced in the previous chapter) that exist amongst the categories both within and across themes are discussed. While doing so, the graduates’ perceptions on the differences between the application of a skill at university and in the workplace are explored. Finally, the emergence of a core category (the primary concern for all IT graduates) and the development of a conceptual framework that emerges from the research findings by exploring the relationships between the themes are discussed. While the chapter is specifically based on findings from recent IT graduates, it seems likely that most of the findings would be equally applicable to graduate in many professions.

5.1 THEME 2 - Sources of Professional Skills for IT Graduates

In the second part of the interview and survey, I looked at how and where graduates developed their skills. Graduates learn their professional skills from 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, extra curricular activities, hobbies and pastimes and through mentoring as well as in formal university study. The list of sources and some quotes from the graduates are provided in Table 5.1.
Table 5.1 Factors that contributed to the development of graduates’ professional skills

<table>
<thead>
<tr>
<th>Sources</th>
<th>Some quotes from interviews and surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>University IT degree</td>
<td>University taught me the deadlines, taking my own responsibility for submitting work on time. University takes a lot of initiative and self-motivation. This is something that I found to very helpful in moving from uni to the workforce.</td>
</tr>
<tr>
<td>Other University degrees (sociology, psychology, business etc...)</td>
<td>I did business administration and I also did computer science so in the business degree obviously there was lots of assignments that involved more like business writing and there was even a business communication skills subject, which focused on writing.</td>
</tr>
<tr>
<td>Other formal courses (short courses)</td>
<td>As part of my Diploma in IT Professional Practice I did a one year internship overseas, which was pretty cool. We had some training courses at uni and at work as well, so at uni…. we had training courses in communication, written and presentation skills.</td>
</tr>
<tr>
<td>Previous careers</td>
<td>I worked as a brickie’s labourer and as a boilermaker and other things like that, and so when I went for this role I had to show that I was competent and capable of being able to grasp the concepts. So being articulate was an extremely useful thing</td>
</tr>
<tr>
<td>Previous work experience (IT related)</td>
<td>So I’d actually have a class of 20 or 30 students and I would take them through the course material…..and I was doing tutoring and practical supervising.</td>
</tr>
<tr>
<td>Previous work experience (non-IT related)</td>
<td>Any kind of part-time jobs really because when you’re working in a team, so I worked in McDonalds for two years, worked at a pub, things like that help you with your communication, so verbal communication and negotiation and conflict skills</td>
</tr>
<tr>
<td>On the job mentoring</td>
<td>I had opportunities to see my managers do this and I learned from it. This is definitely a skill you look at in other people and think - yes they do that really well, or no they are bad at that. Meeting management is something that I have always looked at other people do to learn my skills.</td>
</tr>
<tr>
<td>Family relationships</td>
<td>My mother was the best at teaching me time management as a child. This comes from having a large family. I have always been the mediator of the family and this is definitely where I have learnt all my conflict resolution skills from</td>
</tr>
<tr>
<td>Friends</td>
<td>…..not to mention letters to penpals, emails to friends and numerous experiences which don’t rate as formal training but still go toward the development of these types of skills….</td>
</tr>
<tr>
<td>Overseas travel experience</td>
<td>I also did any number of presentations and debates during primary and high school, not to mention experiences travelling to foreign countries where it is a different experience again to try and communicate effectively in the most basic of scenarios.</td>
</tr>
<tr>
<td>Social networks/clubs</td>
<td>I was brought up in a Church that encouraged people to communicate, so we had to go into Church and give talks in Church, actually get up in front of everybody and have to speak to them</td>
</tr>
<tr>
<td>Extra curricular activities at school, college, University</td>
<td>My parents also encouraged me to be involved in various outside school activities when I was younger (e.g. Dancing, Sports etc.) where I learnt to communicate with various people that were not always familiar</td>
</tr>
<tr>
<td>Hobbies and pastimes</td>
<td>I would say quite an early component came from the fact that for the longest time I have been doing photography…..my web development and design was not a part of the university curriculum as such. I have always had the interest in web design but it is something that I never really came across in my studies</td>
</tr>
<tr>
<td>Life experiences</td>
<td>Though &quot;change management&quot; is often a corporate buzzword, who is to say that trying to lose weight and going on a diet isn’t an exercise in change management? Who is to say that taking out a mortgage and having to re-evaluate finances isn’t an exercise in change management? These are all common life experiences, which go toward development and maintenance of such skills, but aren’t often considered as such in our linear views of corporate life.</td>
</tr>
</tbody>
</table>
Overall, there are four categories of sources that contributed to the development of professional skills of IT graduates. These are academic, social, personal and work experience related sources.

5.1.1 Academic sources

It is shown in the findings that the development of professional skills for IT graduates can occur from IT or non-IT degrees and courses.

*University IT Degree:* Many graduates stated that they developed some of their professional skills from their university IT studies.

*Other University degrees:* Attending other non-IT related university courses also assisted IT graduates in developing their professional skills.

*Other formal courses:* Graduates who studied other courses or subjects (such as psychology, sociology, international business) during or before their IT courses, think that those subjects greatly helped to enhance their professional skills such as communication and presentation skills and a good understanding of business knowledge and skills.

5.1.2 Social sources

Many professional skills required by IT graduates for work develop outside academic studies.

*Family relationships:* Graduates feel their family relationships help bring out their social skills and overcome their fear of speaking out. They learn to work with others and develop discipline and organisation skills.

*Friends/Social networks:* Friends and social clubs enable the development of understanding different points of view, backgrounds, and multiculturalism as well as the graduates’ ability to communicate their ideas to varied audiences.
**Extra-curricular activities at school:** Some extra curricular activities at high school helped graduates understand the importance of teamwork and team dynamics. They also contributed to the development of self-confidence.

**Overseas travel experience and entertainment sources** also improve skills such as communication and cultural awareness.

### 5.1.3 Work experience

The graduates made frequent references to the importance of work experiences (in comparison to other sources) for their professional skills development.

**Previous careers:** For some graduates their professional skills came from a totally unrelated (non-IT) career such as boiler-making, bricklaying, customer service at hotels or in the hospitality sector, etc.

**Previous work experience (IT and non-IT related):** Part-time work such as tutoring while at university was helpful in the development of social skills, the ability to communicate with a large group of people and the management of time and priorities.

Graduates also develop some professional skills from the *informal training* and *mentoring* that occur while on the job.

### 5.1.4 Personal experiences

**Life Experiences:** Many IT graduates indicated that a combination of their overall life experiences including academic, personal, social and work experiences contribute to the development of their professional skills over time. Hobbies and pastimes are also included. For example, a graduate said she developed an eye for detail and design because of her interest in photography (see Table 5.1).

The relationships found between sources of professional skills and the skill itself are shown in Figure 5.1.
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. Furthermore, the development of a professional skill is an ongoing and a continuous process.

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.
5.2 THEME 3 - Most useful aspects of University studies that IT graduates believe contribute towards professional skills development

During the final stage of the interview, IT graduates were asked questions about the most useful aspects of their university studies. Some common answers emerged.

Exposure to clients and professionals helps develop students’ social engagement skills and self-confidence. This is provided by Work placement, which through real work situations tests the graduates’ maturity and responsibility away from the safety of the university learning environment. There was unanimous agreement on the value of practical work experience subjects. Almost all those interviewed and surveyed think that the best part of their studies at university and the most useful for when they commenced full-time work was when they undertook a work placement in the IT industry. Subjects where assignments or projects involved teams are also regarded as useful for developing teamwork and report writing skills.

Subjects such as project management taught students key professional skills that were needed at work. These included using planning tools, coordination of a variety of tasks and organising their thinking. Thesis subjects are valued for the research skills and the documentation skills they help develop. Confidence and presentation skills are developed by subjects where there is a requirement for students to do presentations in front of the class and academics. Presenting reports and findings in their own words helps them feel that they are accountable and responsible for their actions and ideas. Further, it helps them to put their education and theory into practice.

Some quotes from the study participants on useful aspects of their university course are presented in Table 5.2.
### Table 5.2 Most useful aspects of university courses

<table>
<thead>
<tr>
<th>Subject</th>
<th>Some quotes from interviews and surveys</th>
</tr>
</thead>
</table>
| Work placement/industry experience as a part of the course | *The best subjects I did at Uni to cover these were the Industry placement studies as part of the BIT course. I did two 6 months placements during which I worked fulltime. These were the most practical studies I did.*  
  
  *I did my first industry placement at a company called …and my second at ….. (where I currently work). The kinds of things I did ranged... Why helpful... Being able to have exposure to clients and professionals helped to practice professional social engagement skills.. Having to present reports that have your own name on them (being responsible for the content) helps to feel more accountable for success. Meet contacts and network! I got my job from the networking I did on my second industry placement, Put education and theory into practice, to test maturity and responsibility in situations where things can go wrong - i.e. away from the safety of a learning environment.* |
| Project work (simulated projects, assignments, teamwork) | *I would say, definitely, the final year project subject.... That was really cool because it resembles what we now do at work, which is work in multi disciplinary teams on complex projects with different life cycles and concurrent tasks as well.* |
| Project management                            | *a lot of the project based subjects within the unit probably helped because most of them went through the whole IT life cycle, so having an understanding of that helps in the workforce* |
| Subjects that involved presentations          | *Any presentation where you have to be ... to be able to answer questions on the fly. So that is definitely a confidence thing, to be able to think straight when given the situation.* |
| Subjects that involved formal written reports | *Throughout university, of course, I have always had subjects where I have had a lot of report writing* |
| Business related subjects (e-business, marketing etc..) | *Micro and macro economics was useful, conception was very useful because we had, if you understand the concept of the demands at play, things like that, well it definitely helped me in my job.* |

**Work placement and industry experience** done as a part of their university studies is by far the most useful subject for the IT graduates in the study. Graduates state that industry experience:

- Provides exposure to the IT industry culture and practices;
- Helps practise teamwork, develop time management skills;
- Helps develop the ability to sell one’s work with confidence;
- Provides practice for the theories studied at university;
- Allows learning on the job;
- Provides opportunities to network and build contacts with other professionals; and
- Teaches graduates that they are accountable for the work they do.
There is a particular subject that we did it was a software engineering subject. The objective of the subject was that you actually worked on a real industry problem out at the sponsoring company … it also gave an opportunity to be out in the industry to see how people dress and how people communicate……. It takes away from that brand new, the unknown and makes you more comfortable because you have already had exposure ...

When working on **practical IT project work**, graduates:

- Learn to balance their individual contribution against the group’s work;
- Manage teams and varying workloads;
- Develop awareness of professional and ethical issues;
- Experience different project life cycle stages;
- Build relationship networks;
- Use different software development methodologies and modelling techniques; and
- Work on multi disciplinary teams with different project complexities and durations;

All these aspects assist graduates with a smooth transition when they first enter the workforce.

Students are given several opportunities to practise tasks that are relevant to IT work situations in their **Project management** subjects. These include:

- Working on real or simulated IT projects;
- Undertaking individual as well as team assignment work;
- Using appropriate planning, tools, techniques;
- Understanding the project life cycle stages from start to finish;
- Assuming multiple roles (systems analyst, designer, tester, programmer);
- Coordinating resources;
- Delegating work to team members;
- Developing project documentation; and
- Using decision making skills.
The development of written skills, business documentation skills, research skills and the ability to develop and structure arguments occur in Subjects that involve formal written reports or theses. The development of written and spoken skills, planning and presentation skills and overall confidence in being a professional develops from Subjects that involve presentations. Graduates who did business subjects such as e-business, marketing, economics state that they are valued for the business skills and knowledge they provide. The development of problem solving and understanding abstraction and generalisation principles is achieved from studying mathematics. The theory subjects are seen as useful for providing the underpinning technical skills needed in practice.

Some graduates see university study and campus life as a useful contributor for their future work roles in terms of:

- Social education;
- Development of confidence, teamwork, communication, problem solving, flexibility, initiation and self-motivation skills;
- Professional and friends networks;
- Identification of passion areas; and
- Acknowledgement as a professional from others;

Obviously, the technical subjects that graduates studied at university were important for their work. However, discussion on technical subjects and technical skills was omitted from this study as the focus was on the professional skills needed for work. They are, of course, critical as evidenced by this response.

The absolute, most important aspect of my formal university study which proved to be useful when I first entered the workforce were the technical skills.
My IT degree was technical in nature. I learnt about technology and programming. I didn't do an IT degree to learn about soft skills ……This then begs the question as to whether the university course SHOULD have done more to prepare students for the workforce...

On the one hand, sure - why spend so many hours at university if at the end of it all you have the qualifications for a job, but not the ability to pass a job interview. On the other hand, we are talking about a technical degree here. As such, it's main focus should be the learning of technical skills and non-technical skills should only ever be a background motivation.

5.2.1 Some recommendations from graduates for improvement of university IT courses

IT graduates believe that they could benefit from longer and multiple internships or work experience components with a variety of companies (employers) during their university studies. More project work and practical assignments that had relevance to real world work scenarios involving teamwork are also recommended. Project work that used live or work examples where scope changes occur one week out from a deadline could help with developing skills such as changing the ways of thinking, developing open mindedness, being open to changes and being flexible and adaptable. Any faculty initiatives to increase industry involvement, for example, the use of industry practitioners for lectures are also seen as highly valuable.

Some graduates felt forced by their university lecturers to do the same project that was provided for all the project groups. Graduates would have liked more choice on the different projects/ assignments they were asked to do during their studies.

Another specific recommendation is inclusion of communication related courses customised to IT workforce requirements. IT graduates believe they could benefit from dedicated courses in professionalism (speech, emails, use of memos, presentations, phone calls/ voicemail, negotiation and sales). Graduates feel that although most university IT courses include a subject about communication, such subjects are theoretical and do not seem to provide sufficient practice at developing communication skills. The inclusion of management and business subjects that increase understanding of businesses and connect the material learned in technical subjects with assignments that reflect business requirements are other recommendations.
5.3 Multiple relationships between the most useful aspects of University studies and the major professional skills IT graduates believe they need for work

The complex and multiple relationships that exist between the eight professional skill categories are shown in Figure 4.1. The relationship between professional skills IT graduates believe they need and the sources of the professional skills is shown in Figure 5.1. It is clear that multiple sources can contribute to the development of a particular skill. Similarly, the multiple relationships between the most useful aspects of university studies and the professional skills required at work are shown in Figure 5.2.

**Figure 5.2** Multiple relationships between the most useful aspects of university studies and the major professional skills identified in this study
5.4 THEME 4 - Challenges IT graduates believe they face at workplaces

IT graduates face many challenges at their workplaces. The areas of challenges and the related professional skill categories are shown in Table 5.3. Many of these challenges were discussed in Chapter 4. In this Section, I discuss additional challenges that emerged during data analysis.

Table 5.3 Areas of challenges for IT graduates at workplaces and related professional skills

<table>
<thead>
<tr>
<th>Areas of challenges at work (major categories)</th>
<th>Related Professional skill category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>1. Communication skills</td>
</tr>
<tr>
<td>Time and priority management, handling stress</td>
<td>2. Time management</td>
</tr>
<tr>
<td>Teamwork and meeting management</td>
<td>3. Teamwork skills</td>
</tr>
<tr>
<td>Ability to sell ideas</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Age differences / Hierarchy</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Customer service</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Gender domination</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Insufficient induction, limited mentoring</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Lack of recognition</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Limiting reaction</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Managing expectations</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Professional development</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Professional relationships</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Trust</td>
<td>4. Working with people</td>
</tr>
<tr>
<td>Cultural awareness</td>
<td>5. Working across cultures</td>
</tr>
<tr>
<td>Learning curve with new systems</td>
<td>6. Project management</td>
</tr>
<tr>
<td>People and resource coordination</td>
<td>6. Project management</td>
</tr>
<tr>
<td>Problem solving</td>
<td>6. Project management</td>
</tr>
<tr>
<td>Project management</td>
<td>6. Project management</td>
</tr>
<tr>
<td>Reliance on tools</td>
<td>6. Project management</td>
</tr>
<tr>
<td>Risk management</td>
<td>6. Project management</td>
</tr>
<tr>
<td>Information gathering</td>
<td>7. Business skills</td>
</tr>
<tr>
<td>Ability to learn from mistakes</td>
<td>8. Personal attributes</td>
</tr>
<tr>
<td>Personality related skills</td>
<td>8. Personal attributes</td>
</tr>
</tbody>
</table>
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 at the right place at the right time. They sometimes feel 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. Using the right communication style and being able to cope with and overcome the resistance to technology and innovation from older less technical colleagues are two specific issues in this category. With respect to hierarchy, graduates are cautious in their interactions with management staff because they think they might lose their jobs if they say something to upset their superiors.

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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.

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You had to be very sensitive, meaning careful not to say anything which could be offensive or which could get you into trouble, because when you are dealing with the upper echelons of guys, you know, you are the lowest of the low and they are right at the top and you got up their nose and you’d be in fear of your job.

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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:** The IT industry is male dominated. It is necessary at times for graduates to be aware of their roles and the gender imbalances surrounding their work environment. According to one,

....... 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...
I never really thought about male/female back at uni, it never crossed my mind. But it never really crossed my mind because we all came with, I guess, on a level playing field.

e) **Insufficient induction and limited mentoring**: Some graduates were thrown into their jobs with little orientation or mentoring. They had to ask around for more information to learn about the organisation, their team’s role, or the projects the department was working on. They found this stage a struggle because they were unsure about many things at work and had to converse with people at work in a slow yet impressive way. According to a graduate,

   Yes, once I got chucked in the deep end I was very scared, like what do I do? Just a fear of doing something wrong and making a fool out of myself…… Really relying on my manager…. he was like 50 something and we didn’t get along really as well as the others. But he was told to keep an eye on me and he would come in and say what are you doing type of thing? Then he left me with some tasks to do ….they said, look rather than just sitting around twiddling your thumbs, let’s do something productive.

One graduate said that she felt lucky because her company provided an extensive induction, which assisted her in understanding her workplace before commencing projects with clients.

   We were very lucky at our company as we had graduate orientation where we were allowed to mingle and learn about the new company without getting thrown straight into having to face work/clients etc. We had an opportunity to do some light training and ask a lot of questions whilst getting to meet some people from the company to assist us (e.g. HR Advisors, Career Counsellors etc.). This induction went for 3 weeks. The following few weeks I was put onto an assignment and started to work on a project with some experienced employees who knew what they were doing.

f) **Lack of recognition**: Graduates are also frustrated by the employer’s lack of recognition of their work. They find such attitudes de-motivational.

   Feedback sessions were always filled with destructive feedback never with praise or these were your accomplishments. So you slowly feel smaller and smaller and I guess that makes you unmotivated and takes away from you the feeling of being a good work employee
g) **Limiting reaction:** Some graduates find 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. Some graduates also think that by saying something their manager dislikes they risk their promotional opportunities. In another example, a graduate who used his expertise to help a staff member from a different department was advised not to go beyond his duties to assist staff under another manager.

> ...every time something popped up try not to react to it straightaway. Understand that often things are complicated and then move slowly and if you react instantly you have not necessarily factored in everything that is involved so when something happens pause think about it cross reference with a peer or senior and maintain I guess the to do lists and using an issue log and constantly tracking all of that....

> All of a sudden you have a hierarchy in place. You can challenge but you still have to be respectful. You are no longer on the playing field...

h) **Managing expectations:** Juggling between different client expectations 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 very high achiever and keen to develop and get positive feedback..

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.

> Challenges? I guess personal development and self training development. Because you don’t want to put out your own money, so you want the firm to pay for it. So the challenge is getting this firm to pay.
j) **Professional relationships:** In this category (as discussed in Chapter 4), IT graduates find feedback management, relationship management and development of people networking skills quite challenging.

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 the correct decisions is essential. Graduates need to be cautious of how they use this concept of trust while representing their business.

```
So then you've got to make them trust you and believe you so they
give you work.

It is really that trust as well, making sure that the trust was there.
Really, it is just experience after experience that has got me to
where I am at the moment.
```

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.

```
You also need an ability to pick up new things as you have to learn
new skills when you start your job as a new graduate
```

m) **Coordination of 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 were quite challenging as graduates need to be aware of several factors such as personalities, experience, expertise, budget etc.

```
We replace routers and switches and ... XXXX products. Anything
to do with content systems, firewalls, anything that ... fails ... we
send the part out, ... we have to manage our call so it’s completed.
And if there’s a problem that we encounter we have to escalate it
internally and get the right people involved to solve the problem.
```

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.
The main technical issues we have had are, first of all the learning curve with the system... New folks that come in have to be oriented for a good two weeks or three weeks before they become very comfortable with it. I guess, our absolute reliance on it is another issue. The fact is if it stops working..... it can instantly just cripple our business.... I would say the main technical issue we have is our undying reliance on our tools.

o) **Information gathering:** Some of the challenges in this category are 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 all the time.

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

This was when I was still new. I guess I didn’t follow the procedures properly...... If it does happen again... First of all I’m pretty experienced with what to do now, following the procedure, so that should be okay. So I know how to escalate to the right team and get them to troubleshoot on the line.

The graduates’ perceptions of the differences between professional skills developed at university and their application at workplaces is described in the next Section.

**5.5 THEME 5 - Graduate perceptions of differences between university and the workplace in the application of professional skills**

IT graduates believe that although they learned some professional skills as a part of their university studies they are applied differently in workplaces.
a) *Acceptable time management practices:* Although university requires submission of assessment by due dates it sometimes allows for late submissions and extensions while work does not allow for such flexibility. While not delivering work on time at university often has few implications, at work it can affect a graduate’s performance and possibly his/her entire career.

b) *Standard of work:* Graduates are required to learn many new things at work. They believe that many of the tools, processes and technologies needed at work are not sufficiently covered by subjects at university. The expected standard of work is many times higher than university work requirements.

c) *Motivation to learn:* Graduates point out that mature students with many life experiences grasp concepts and progress more quickly at university than immature students who may lack motivation for doing a course. Also those working in the industry while studying tend to be highly motivated.

d) *Emphasis on non-technical skills:* Many graduates believe that university does not place sufficient emphasis on non-technical skills while those skills are important at workplaces. For example, they believe that university did not prepare them for multi-tasking or dealing with stress.

e) *Work environment, accountability and transparency:* There is a difference in the assessment environment in university and workplaces. Graduates believe that unlike university there is transparency in assessment at workplaces. Furthermore, graduates do not have the option to avoid routine work tasks while at university it is easy to ignore those activities.

Many graduates believe that universities need to do more to reduce the initial shock of formal workplace environments and cultural issues at workplaces when graduates first enter the workforce.

f) *Other’s perception of graduates with university qualifications:* Some graduates believe that university studies did not make a difference to them personally but it made employers think that they knew something.
g) **Nature of Relationships:** At university, graduates experience working in ad hoc teams often composed of friends but at workplaces they are in more formal, professional teams. There are also differences in the relationships with peers or superiors at work compared with relationships with classmates. For example, they need to be careful when making jokes at work as they may not be well received by certain groups of individuals. IT graduates in the study believe that university did not sufficiently prepare them to get to know people in the industry and their expectations of graduates. They also feel university did not assist them in understanding implications of not performing in a role at work. There is also concern that university does not teach graduates to listen to other people’s needs, be patient and empathetic.

h) **Gender imbalances and age difference:** The ratio of males to female is not as noticeable at university as it is at IT workplaces. At university, friends are mainly of the same age and equal but at workplaces it is usually people from mixed generations working at different levels in a hierarchy.

i) **Dress code:** Some graduates mentioned that they were unaware of the acceptable dress codes in the industry especially because of the lack of any such dress codes while at university.

j) **Support available:** While some graduates believe that career related support is available at university others believe that the support is absent. Similarly, some graduates feel they have support from employers and others disagree. The employer interest in assisting students with careers is different before obtaining a degree and post degree. Some graduates are fearful of asking questions at university while they feel freer to ask questions at work.

k) **Information processing:** Unlike university where graduates are sometimes spoon-fed with most required information, workplaces require them to seek out needed information, to filter irrelevant information and absorb what is required. Throughout university, graduates are often advised what work they need to do, whereas at work they are required to find out what work they need to do.
5.6 Graduate reaction to University’s preparation for the workforce

When graduates were asked how well their university course prepared them for the IT workforce, mixed responses were received as shown in Table 5.4.

Some graduate comments are positive. They believe university prepared them well for the workforce by providing opportunities to develop their professional skills not just inside class but throughout university life. For others, work placements and opportunities to tutor classes provided opportunities to develop self-confidence and exposure to the IT industry.

Those who made critical comments believe that university courses should attempt to align themselves with the needs of the industry. However, only a few feel that their study was not directly relevant to their current role. One graduate commented that university IT courses should provide opportunities for graduates to study subjects outside IT in order to enable overall personality development.

The majority of the graduates in the study reacted positively to their university’s preparation for the workforce. However, the majority also believed that university preparation alone was insufficient to meet professional skill requirements for work.
### Table 5.4 Graduate responses to university preparation for the workforce

<table>
<thead>
<tr>
<th>Participant</th>
<th>Graduate responses to the question: How well the university course prepared you for the workforce?</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A summation might be that university prepared me well for the workforce, though the preparation given was defective in some aspects. That does not mean that I (or the generic graduate) did not have all the skills needed by the time I entered the workforce... it just means that they were not gained by sitting in lecture halls and tutorials at university.</td>
<td>Mixed</td>
</tr>
<tr>
<td>2</td>
<td>The problem is a university degree was a prerequisite for the job and ensured you got hired or put you in the basket.</td>
<td>Average</td>
</tr>
<tr>
<td>3</td>
<td>..... basically all the technical skill, most of the technical skills are gained at uni but as I said most are non-technical skill we sort of talked over before, ... you sort of pick up with from uni and work. So basically just doing your uni degree probably you might not be able to pick up all those skills, but if you do extra stuff, as I did at uni, you know, helped out with various activities around uni as well as doing the tutoring and things like that, probably gave me a bit more of an advantage of actually getting the job in the first place and having, making my way through the job because I have had experience more in those skills other than what the normal university student may have picked up.</td>
<td>Very positive</td>
</tr>
<tr>
<td>4</td>
<td>I think my BIT degree prepared me well for the workforce (especially with the element of 2 industry placements). It did a great job in helping me obtain practical non-technical skills that I could take with me. University takes a lot of initiative and self-motivation. This is something that I found to very helpful in moving from uni to the workforce</td>
<td>Very positive</td>
</tr>
<tr>
<td>5</td>
<td>I think they should align themselves to industry more. Companies and so forth because then they will teach students relevancy ....So if they want to go and find a job in a good company, what do they need to do to work there, you know, really expose them to the industry, because it’s a big shock to a lot of people when they hit the industry, a massive shock. I mean a lot of people find they don’t succeed. Yeah, I guess I’m surviving, still in the job, haven’t been sacked, so I guess university has done a reasonable job.</td>
<td>Average</td>
</tr>
<tr>
<td>6</td>
<td>Preparation? I think it made me feel like I was – personally for me, I don’t think it actually made a heck of a lot of difference. I don’t think I knew much more. But what it did it made other people think that I knew something……..but it filled in some gaps that wouldn’t have otherwise have been filled in.</td>
<td>Neutral</td>
</tr>
<tr>
<td>7</td>
<td>I did the Bachelor of IT, or BSC the Bachelor of Science and IT. That also had the optional Diploma of IT Professional Practice component as well. Once upon a time it was compulsory that you did a year of industrial training. However, now it is an optional extra and a lot of people, unfortunately, choose not to do it, which I think is a little bit sad. People do not realise how much there is to gain from it. ...I would say that the degree did provide quite a sound base for my experiences in the workplace. However it has to be noted that not all my studies have mapped directly onto my job. I think a lot of it really comes down to your capacity to pick up</td>
<td>Positive</td>
</tr>
</tbody>
</table>
concepts and adapt, as well. I would say it was a very grounded base there but it is also quite a subjective thing.

<p>| | | |</p>
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<tbody>
<tr>
<td>8</td>
<td>Good question. From a technical aspect probably I would say average, I wouldn’t say it overly helped me. Because the things that I do now are not what I did at uni. But the non-technical aspects such as problem-solving, thinking also the really one experience was being dropped in the deep end and there is all this freedom. At school you used to have, okay, you must do this homework type of thing, at uni nobody cares, you know, like they do care but you are on your own type of thing.</td>
<td>Positive</td>
</tr>
<tr>
<td>9</td>
<td>I’d say, I wouldn’t go more positive than satisfactory, like I just, I don’t think it, I think there’s lots of potential for improvement. I think students are definitely challenged and working really, really hard, but I think there’s - maybe another area could be, university so, well it depends on the degree really, but sometimes it’s - my degree, it was so focused and specific there wasn’t any area for, to make you more of a rounded person. So any area for things like humanities and arts, political things, just to make you a bit more spread.</td>
<td>Average</td>
</tr>
<tr>
<td>10</td>
<td>There was a little bit of benefit there, but not like – I mean if I had to rate it out of 100 per cent, I’d say there’d be five per cent benefit.</td>
<td>Negative</td>
</tr>
<tr>
<td>11</td>
<td>Did not comment.</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Excellent</td>
<td>Positive</td>
</tr>
<tr>
<td>13</td>
<td>Very good</td>
<td>Positive</td>
</tr>
<tr>
<td>14</td>
<td>Very good</td>
<td>Positive</td>
</tr>
<tr>
<td>15</td>
<td>Good</td>
<td>Positive</td>
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<td>16</td>
<td>Good</td>
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<td>17</td>
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<td>Good</td>
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<td>19</td>
<td>Good</td>
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<td>20</td>
<td>Average</td>
<td>Positive</td>
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<tr>
<td>21</td>
<td>Average</td>
<td>Positive</td>
</tr>
<tr>
<td>22</td>
<td>Average</td>
<td>Positive</td>
</tr>
<tr>
<td>23</td>
<td>Poor</td>
<td>Negative</td>
</tr>
<tr>
<td>24</td>
<td>Poor</td>
<td>Negative</td>
</tr>
</tbody>
</table>

5.7 Primary concern of IT graduates in this study

The data analysis stages and the emergence of a key issue related to the themes (or) primary concern of IT graduates in this study are described in this Section. As we have seen in Sections 3.7-3.10, the data analysis in this study involved three steps: open coding, axial coding and selective coding. The three stages and the aim of each stage are shown in Figure 5.3.
In the first stage, data was organised into categories based on similar property(ies) they share. Then, I looked at the meaning of these categories as it applied to the participants and to this study. A theme emerged out of such an analysis. This phase is called open coding where all the data was linked to open codes (based on the meaning of the data). These were then refined after a few iterations to develop categories. Some examples of initial open codes are shown in Table 3.10. In the next stage, the categories developed in phase 1 were compared with each other to determine links and any relationships amongst them. The relationships between the categories are understood by constantly comparing categories with each other, taking note of repetitions and cross references. Repetitions are avoided by collapsing categories. A final list of categories is developed. A study of the links between these categories is carried out. Memos and notes are written to describe these links (relationships). This phase is called axial coding. Examples of open code and axial code development are shown in Appendix G. Many common and major themes emerged and they are:

- Theme 1, professional skills IT graduates believe they require at workplaces, is concerned with requirements for work;
• Theme 2, sources of skills, is concerned with where the professional work skills come from;
• Theme 3, most useful aspects of university studies, is concerned with aspects of university IT studies that are relevant to work;
• Theme 4, challenges at IT workplaces, is concerned with challenges faced by IT graduates and the strategies they use to overcome those challenges; and
• Theme 5, graduate perceptions of differences between university and the workplace in the application of professional skills, is concerned with some professional skills that are applied differently in university and workplaces.

A further step in axial coding is to sort those memos and explore the relationships across the different categories and across themes. For example, relationships across categories in theme 1 are discussed in Appendix F. The relationships between themes are shown in Figure 5.4. Finally, when the relationships between the categories are established and the relationships across themes studied, memos are written to capture all the relationship discussion. The list of categories and themes are finalised at this stage. Then, I looked for a dominant theme (primary concern of IT graduates) that runs across the five themes that emerged in this study. The dominant theme that emerged (referred to as the core category) is **Being prepared for overcoming challenges at IT workplaces.**

![Figure 5.4 Relationship between themes in axial coding stage](image-url)
The relationship between the themes and the core category or the primary concern for all graduates is shown in Figure 5.5. The professional skills graduates believe are required for work is discussed in the findings from Theme 1. This is linked to graduates’ concerns about preparation for overcoming challenges at work. The variety of sources from which those professional skills could be developed is discussed in Theme 2 which is concerned with sources that assist with preparation for facing challenges at work. The most useful aspects of their university studies relevant to work are identified in Theme 3. Then a discussion of graduate recommendations for university IT courses is also linked to the preparation for facing challenges at work. Theme 4, the challenges IT graduates face at work is related to graduates’ concerns about preparation for work. Finally, it was shown in Theme 5 that although IT graduates learned some professional skills as a part of their university studies some skills are applied differently in workplaces. This finding is linked to the primary concern of graduates about being prepared to face challenges at work.

Were we ready for work? – This is the question that is at the centre of all issues discussed by this study. As we have seen in Section 5.7 the response to this concern is mixed. Some graduates feel that they are ill prepared for work situations. For others, university studies assisted in settling at their workplaces but were not the complete solution. They needed other skills that they picked up either on the job or from a previous experience.

The key findings discussed in Chapters 4 and 5 are summarised in the next Section.
Figure 5.5 Relationship between themes and core category or primary concern for all IT graduates

Communication skills
- Appropriate use of language in communication, timing of communication
- Communication with international teams, ability to communicate bad news
- Handling stress, multitasking
- Time management for self and team
- Meeting management, work with international teams
- Age differences, hierarchy, gender domination, customer service
- Ability to sell ideas, insufficient induction, limited mentoring, lack of recognition
- Limiting reaction, managing expectations, professional development
- Professional relationships, Trust
- Learning curve with new systems, people and resource coordination
- Problem solving, reliance on tools, risk management
- Information management
- Ability to learn from mistakes

Teamwork skills

Working with people

Working across cultures

Project management

Business skills

Personality attributes

Project management subjects

Project work (simulated projects, teamwork)

Work placement/industry experience in the course

Subjects involving formal written reports, thesis

Business/management related subjects

Mathematics, theory subjects

University IT degree

University non-IT degree

Other formal courses

Previous careers

Previous work experience (IT-related)

Previous work experience (Non IT-related)

On the job training / Mentoring

Family relationships

Friends

Overseas travel experience

Social networks

Extra curricular activities school, University

Arising from hobbies and pastimes/interest

Life experiences

Core Category: Primary concern
Being Prepared for overcoming challenges at IT workplaces

Most useful aspects of University studies

Graduate recommendations for University courses

Differences between application of professional skills at University and workplaces

Longer and multiple internships

Relevance of project to suit real world scenarios

Practical relevance between theory and practice

Increasing teamwork

Communication related courses

Soft skills course

Understanding student mentality/expectations

Sources of Professional Skills

Challenges at IT workplaces

University IT degree

University non-IT degree

Other formal courses

Previous careers

Previous work experience (IT-related)

Previous work experience (Non IT-related)

On the job training / Mentoring

Family relationships

Friends

Overseas travel experience

Social networks

Extra curricular activities school, University

Arising from hobbies and pastimes/interest

Life experiences
5.8 Key findings from data analysis

Key findings from this study will be presented in three levels of analysis using the terminologies (micro, meso and macro levels) described in Dahlgren et al. (2007). At the micro level (Sections 4.1- 4.9 and Sections 5.1, 5.2, 5.4 and 5.5), the IT graduate’s work experiences are illuminated by the findings from the data analysis. For example, What are the professional skill requirements IT graduates believe they need for their work? What are the challenges for them at work?

At the meso level (Section 4.10 and Sections 5.1, 5.3, 5.6 and 5.7), insights into what conditions, factors or sources contribute to such experiences are provided by the findings from the data analysis. For example, What are the relationships between sources of professional skills and professional skills development? What is the primary concern of recent IT graduates in this study?

At the macro level (Chapter 6), broader implications of the empirical findings from the micro and the meso level analysis will be studied in conjunction with the much higher level questions that study relationships across the findings from the micro and meso levels. For example, the finding that there are complex and multiple relationships amongst categories of professional skills IT graduates believe they need for work and sources of development of these professional skills has implications for the role and responsibility of professional faculties at universities, employers, and professional associations in preparing IT graduates for work.

I present the key findings from the micro and meso levels of analysis below. The macro level analysis will be presented in the next chapter (Chapter 6).

5.8.1 Micro level key findings

There are eight major categories of professional skills that IT graduates believe are required for their work namely: communication, time management, teamwork, working with people, working across cultures, project management, business skills and personal attributes (Chapter 4). There are multiple sources from which a professional skill can be developed, only one of which is university studies. The categories of sources may be
academic, social, personal, work experience, on the job or a combination of these sources (Section 5.1).

According to the IT graduates, specific sources of professional skills are: University IT degree, University non-IT degrees, formal courses (short courses), family relationships, friends, overseas travel experience, social network and clubs, sports or extracurricular sources, arising from hobbies and pastimes, life experiences, previous careers, previous work experience (IT-related), previous work experience (non-IT) related and on the job (Section 5.1). Multiple professional skills can be developed from a skill source. 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 these 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. The eight professional skills have multiple and complex relationships amongst themselves and can be developed from a variety of sources within and outside university studies from social, personal and work experience and on the job (Figure 5.1). Some aspects of university IT studies are more useful and relevant for IT workplaces than others. Work placement and project work are two important aspects of the university that all IT graduates found most useful in the workforce. (Sections 5.2 and 5.3).

IT graduates face challenges at work. In particular, the majority of the challenges lie in the category – Working with people. As indicated in Table 5.3, issues such as age differences, gender domination, managing expectations, lack of recognition, lack of support, insufficient induction, mentoring, professional relationships and professional development are particular challenges in this category. These challenges are distributed across the professional skill areas identified in this study (Section 5.4). Some graduates struggle while others cope well and overcome these workplace challenges. Graduates use a combination of strategies to cope with their workplace challenges. For example, time management strategies were learnt from both university studies as well as on the job. IT graduates also believe that some professional skills developed at university are applied differently at work contexts. For example, acceptable standards of work submission are different at university from IT workplaces (Section 5.5).
5.8.2 Meso level key findings

The professional skills development of IT graduates appears to occur across university, workplace experiences, personal experiences and social contexts. University studies do not seem to be solely responsible as they are just a part of the setting in which professional skills development occurs (Section 5.1). It is evident that a professional skill can be learned from different learning environments and developed or practised in different work environments. The following questions are raised:

a) What skills can be taught within university courses?

b) What skills need to be developed outside university?

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

Many IT graduates in the study believe that university did not sufficiently prepare them to meet the challenges at workplaces. Graduates use a variety of strategies they learn through their university studies, work experiences, personal life experiences and social contexts to overcome workplace challenges. A question that arises is – if university is only one of the 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?

5.9 Implications of findings

The research findings, the themes that emerged in the study and their relationships were discussed in this and the previous chapter. It is suggested by the core category from the data analysis that the major area of concern for the participants is being prepared for facing challenges at IT workplaces. There is a connection between all the themes from the data analysis to this core category. IT graduates believe they require certain categories of professional skills (communication, time management, teamwork, working with people,
working across cultures, project management, business skills and personal attributes), which they acquire from a variety and combination of sources (academic, work experience, social and personal life). These assist them to face the challenges at IT workplaces. Graduates believe that some aspects of their university studies are useful for their work.

The relationship between the major themes is summarised by the statement below:

Recent IT graduates believe they need many **professional skills** acquired from several **sources** outside their **University studies** to face and cope with the **challenges at their workplaces**.

Being prepared for IT workplace challenges is the primary concern for participants of this study. The strategies graduates use to prepare themselves for the workforce are shown in Figure 5.6. The question raised by this finding is – is university solely responsible for producing graduates ready for work? If graduates themselves believe that they draw from a variety of sources and strategies both from within and outside their university studies to face the challenges at their IT workplaces, how realistic is the expectation that universities are responsible for producing work ready graduates?

![Figure 5.6 Strategies for being prepared for work challenges](image-url)
There are several questions raised by the findings from this study.

- What responsibilities do graduates have to develop themselves to become work ready?
- What is the role of universities in the development of professional skills of graduates?
- If, as some universities claim, they are preparing graduates for the workforce why are employers still complaining about ill prepared graduates?
- Are universities’ expectations that employers accept more responsibility to prepare graduates for work readiness by providing dedicated orientation, induction, mentoring programs justified?
- Are employers’ expectations of skills of university graduates justified? and
- What is the role of employers in the development of professional skills of graduates?

The study findings have implications for many players and issues as shown in Figure 5.7. These are explored further in Chapter 6.

It appears that employers, universities, academics and graduates need to move from the naïve idea that adding more subjects and focus tasks to already existing IT courses will produce work ready graduates. A holistic approach to the issue is necessary rather than temporary quick fix solutions.
The argument in the next chapter is that the shared responsibilities to produce work ready graduates lie with employers, universities, academics and professional associations and graduates (Figure 5.8).
Figure 5.8 Shared responsibilities for the development of professional skills of IT graduates

5.10 Conclusion

The research findings on three themes 1) sources of professional skills for IT graduates 2) most useful aspects of university studies that contribute towards professional skills development for IT graduates and 3) challenges faced by IT graduates at workplaces were presented in this chapter. An analysis of the relationships between the categories and across themes, differences in the application of a professional skill at university and workplaces and key findings from the data analysis at micro and meso levels were described. Then the primary concern of the IT graduates in this study was discussed. The findings have implications for university, employer and graduate expectations of each other.

In the light of these findings, the macro level, the role and responsibilities of - universities, employers, professional associations and graduates themselves in the development of professional skills of IT graduates and the implications of the overall study findings are discussed in the next chapter.
CHAPTER 6 THE ROLE OF DIFFERENT PLAYERS IN THE DEVELOPMENT OF PROFESSIONAL SKILLS OF IT GRADUATES

6.0 Chapter overview

The role universities and others play, and possibly could play, in the development of professional skills in IT graduates is the focus of this chapter. As we have seen in the previous Chapters, 4 and 5, there is a strong suggestion from the study findings that IT graduates believe that they have acquired the professional skills that they require at workplaces from a variety of academic, social and personal sources as well as previous work experiences. Questions are raised about the role of universities in preparing graduates for work and what universities could be responsible for. Complex relationships amongst the categories of professional skills were uncovered by the data analysis. There is an indication from the data that some of the professional skills that IT graduates believe they need appear to be acquirable only on the job. A rich description of the challenges and problems faced by IT graduates in their initial professional employment was provided by the data. Questions which have major implications for the role of universities in the development of professional skills of IT graduates are raised from this study for both IT educators and employer groups.

The argument presented in this chapter is that the development of those professional skills is a distributed responsibility and different players (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 players accepts its responsibilities and cooperates with the others. The overall argument is based on several elements:

- Universities cannot be solely responsible for developing work ready IT graduates (assumption);
• IT faculties need frameworks beyond graduate attributes in their degrees for the development and inclusion of specific professional skills for the IT profession (suggestion);

• Employers should move away from thinking that adding topics to the IT curriculum would solve all their concerns about the lack of professional work skills in IT graduates (suggestion);

• IT graduates have a personal responsibility to develop their professional skills both within and outside their university studies (assumption); and

• Certain IT work skills are difficult to develop except on real world sites (conclusion).

First, the underlying phenomenon of supercomplexity that is relevant to preparing graduates to face the complex world of work will be described. Then, the role of universities and other players in the development of professional skills of IT graduates will be discussed. This is in support of the assumption that universities are not solely responsible for the development of professional skills of IT graduates and that there is a distributed responsibility between IT faculties at universities, employers and graduates themselves. Some suggestions for what professional faculties at universities could be responsible for will be provided. Following this, I describe why the graduate attributes approach currently used by many Australian universities appears to be inadequate for the development of professional skills in IT graduates, especially given the global nature of IT companies and the IT workforce. Some further evidence from the literature about some employers’ perceptions of university preparation for the IT workforce is given. Based on my study findings, suggestions for how employers could assist in the development of professional skills of IT graduates are given. This will refute the argument of some employers that adding topics to the IT curriculum will be sufficient to address their concerns about the lack of professional work skills in graduates. Next, the focus is on the importance of making graduates aware of their personal responsibility to develop their professional skills both within and outside their university studies. It appears that certain IT professional skills can be acquired only in the real world. Some responsibility is placed on both graduates and employers by this finding. Work placement and work experience are believed to present the optimum opportunities for the development of professional skills of IT graduates as shown by my study findings.
<table>
<thead>
<tr>
<th>Chapter 6 main Sections</th>
<th>Subsection (Elements)</th>
<th>Features</th>
</tr>
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</table>
| 6.1 Preparation of IT graduates for a supercomplex world                               | 6.2.1 Foci of university studies                                                     | 6.2.2.1 Preparing IT graduates to face new, complex, unfamiliar, unknown and unknowable situations  
6.2.2.2 Preparing graduates to learn how to learn  
6.2.2.3 Increasing student’s knowledge and awareness of workplace environment  
6.2.2.4 Assisting IT graduates for initial job expectations  
6.2.2.5 Assisting IT graduates with career management and self-management  
6.2.2.6 Preparing IT graduates for self-assessment beyond graduation  
6.2.2.7 Developing well-rounded graduates  
6.2.2.8 Maximising and using diversity in university environments to assist IT graduates develop social and cultural skills for the global workplace |
| 6.2 Universities cannot be solely responsible for developing work ready IT graduates   | 6.2.2 IT graduates have a personal responsibility to develop their professional skills both within and outside University studies |                                                                                                                                                                                                         |
|                                                                                      | 6.2.3 What universities could be responsible for                                       | 6.2.2.1 Preparing IT graduates to face new, complex, unfamiliar, unknown and unknowable situations  
6.2.2.2 Preparing graduates to learn how to learn  
6.2.2.3 Increasing student’s knowledge and awareness of workplace environment  
6.2.2.4 Assisting IT graduates for initial job expectations  
6.2.2.5 Assisting IT graduates with career management and self-management  
6.2.2.6 Preparing IT graduates for self-assessment beyond graduation  
6.2.2.7 Developing well-rounded graduates  
6.2.2.8 Maximising and using diversity in university environments to assist IT graduates develop social and cultural skills for the global workplace |
| 6.3 IT faculties need frameworks beyond graduate attributes in their degrees for the development and inclusion of specific professional skills for the IT profession | 6.3.1 Generic graduate attributes should not be an add-on to existing courses         |                                                                                                                                                                                                         |
|                                                                                      | 6.3.2 Cultural awareness and ability to work with cultures is a skill needed in IT but is often absent from graduate attributes |                                                                                                                                                                                                         |
| 6.4 Employers should move away from thinking that adding things to the IT curriculum would solve their concerns about the lack of professional work skills in IT graduates | 6.4.1 Curriculum alone cannot address work readiness of IT graduates                  | 6.4.3.1 Training IT graduates when they commence work  
6.4.3.2 Facilitating workplace learning and organisational learning  
6.4.3.3 Increasing work socialisation                                                                                                                                                                    |
|                                                                                      | 6.4.2 Development of some professional skills takes time and new IT graduates are learners in workplaces |                                                                                                                                                                                                         |
|                                                                                      | 6.4.3 What employers could be responsible for                                         | 6.4.3.1 Training IT graduates when they commence work  
6.4.3.2 Facilitating workplace learning and organisational learning  
6.4.3.3 Increasing work socialisation                                                                                                                                                                    |
| 6.5 Certain IT work skills are difficult to develop except on real world sites         | 6.5.1 Work placement and experience opportunities offer opportunities for the development of professional skills | 6.5.1.1 Linking theory and practice and learning on the job  
6.5.1.2 Developing employability and work ready skill sets  
6.5.1.3 Facilitating work placement experiences  
6.5.1.4 Encouraging part-time employment in parallel with university studies  
6.5.1.5 Providing work based learning options                                                                                                                                                         |
|                                                                                      | 6.5.2 The role of professional associations such as the Australian Computer Society (ACS) on the development of professional skills of IT graduates | 6.5.2.1 Increasing IT students’ exposure to IT industry through scholarship, research and job ready programs  
6.5.2.2 Making recommendations to the government and employers on issues that matter most for IT professionals and profession  
6.5.2.3 Using course accreditation processes to ensure that IT program design focuses on the development of IT professionals rather than using a strict curriculum-driven approach |
| 6.6 Conclusion                                                                        |                                                                                      |                                                                                                                                                                                                         |
I also describe some of the contributions that professional associations such as the Australian Computer Society (ACS) could make to the development of professional skills of IT graduates. A summary is presented in the final Section. A roadmap for this chapter is presented in Table 6.1. It is worth noting that while the focus of this work is on new IT graduates, much of the discussion is relevant to other professions or indeed to all graduates.

6.1 Preparation of IT graduates for a supercomplex world

Complex relationships amongst the categories of professional skills were uncovered in my study along with some evidence that they could be developed from a variety of learning, social and work environments. Barnett (1998) states that we live in a supercomplex world not just a complex world, and defines a complex and a supercomplex world (Barnett, 2000a) as

Complex world: is one in which we are assailed by more facts, data, evidence, tasks and arguments than we can easily handle within frameworks in which we have our being.

Supercomplex world is one in which we have the very frameworks by which we orient ourselves to the world are themselves contested.

He states that the four concepts that characterise supercomplexity are contestability, challengeability, uncertainty and unpredictability and believes that supercomplexity arises when our approaches to thinking and responding to complex problems are themselves questioned. Brew (2010) further describes a supercomplex world as one that is uncertain, ambiguous, perplexing and pluralistic. Barnett believes universities have a difficult task of coping with supercomplexity because of the multiplicity of knowledge frameworks where knowledge is continuously transformed into multiple knowledges and because knowledge is no longer concentrated just within universities. In addition, supercomplexity is compounded by factors such as change, turmoil, turbulence, risks and chaos. He questions the role of universities in such a supercomplex world given that knowledge is produced across different knowledge societies. He responds by stating that rather than trying to analyse supercomplexity and becoming distracted by uncertainty, it is important for universities to teach their students about uncertainty and the unpredictability of the modern world, assist them to live with ease in such a world and to enable them to act purposively in
an environment where everything is uncertain and unchallengeable, a view shared by (Barrie, 2005).

According to Barnett (2000b),

*In an age of supercomplexity, a new epistemology for the university is – open, bold, engaging, accessible and conscious of its own insecurity. It is an epistemology for living amid uncertainty.*

He believes that university curricula will be unlikely to yield the human qualities that the current age of ‘supercomplexity’ requires. He states the challenge is not to prepare students for a complex world but to prepare them to learn to live in a supercomplex world. Some of the ways in which universities could prepare students for supercomplexity are to equip them with the power of reflection, the capacity to act in the world, a greater awareness of self and metacapacities that generate personal and interpersonal resources not just for coping with supercomplexity but also a mode of effective being within it (Barnett, 2000a; 2000b).

While supercomplexity is a phenomenon applicable to all disciplines in a university, it is particularly important and relevant to IT faculties. They have to prepare their graduates for a world of rapid change and to have the ability to respond to these changes and for unfamiliar, unexpected or unknown situations and, in particular, for the global nature of IT workplaces and their workforce. IT graduates need skills to suit international or multinational employers. In addition to complex work scenarios, complex work patterns have also emerged. For example, similarly to other industries, in response to globalisation and competition, the IT industry has adopted slimming down and speeding up of the traditional career structure, which once involved a stable linear progression through one organisation (Hall and Mirvis, 1996; Arnold et al., 2005). As a result, the changing nature of workplaces and worker patterns has given rise to complications due to varying patterns of work. Hence, individual workers must adapt to rapidly changing work environments and their requirements (Butterwick and Benjamin, 2006). In particular, the IT profession is one such profession where worker engagement can be anywhere from belonging to an on-site workplace to belonging to a ‘virtual’ or a ‘global’ workplace. For example, IT graduates in the study worked with peers who were in overseas offices and others travelled to interstate and overseas offices. Employment has diversified in the form of virtual, casual or contract
work as opposed to traditional office style permanent roles. Peripheral workers (part-timers, virtual workers, etc.) need to work hard to maintain contact and currency with their peers (Billett, 2000, p.128).

It was shown in my study that graduates have to understand that they need to be flexible and be prepared for a lifetime of change and development. Transformation in the ways in which employers conduct business is a direct result of globalisation and competition in the IT industry and new demands are placed by these transformations on what is required for work practice (Billett, 2000, p.146). Identifying those demands and developing mechanisms to meet them (via training and support) is an essential survival strategy for all professionals. University courses should make graduates aware of these varied work patterns and the special demands they place on IT professionals. One way of assisting graduates to live with ease in such a supercomplex and dynamic workforce is to help them learn how to learn when they find themselves in such uncertain, complex and dynamic situations. This issue is discussed in Section 6.2.3.

From the above discussions, it is clear that preparing graduates to face a supercomplex world is not an easy task for universities and the difficulty is compounded by the ever-changing needs and expectations of employers. 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 (Brew, 2010). This is a challenging task because the problem solving abilities students need from higher education are largely required by external interest groups. Brew argues that students should be able to evaluate knowledge critically and develop the ability to reflect on what they are doing and why. Further, critical inquiry skills and creativity skills are central to living in a supercomplex world. Barnett has a similar view and recommends that students should be encouraged to bring their own critical insights to evaluating knowledge (Barnett, 2000b).

Individual perceptions and responses of universities to needs and expectations of employers are likely to 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 IT graduates. However, there are certain things that universities could and should do.
6.2 **Universities cannot be solely responsible for developing work ready IT graduates**

The role of universities in preparing graduates for the workforce is a longstanding and controversial issue (Barnett, 2000a). In the current business world, employers are increasingly interested in what their employees can do and less interested in what they know. In recent years there has been a 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 somehow possible to develop work ready skills simply by undertaking three or four years of university education (Crebert et al., 2004b). According to some anecdotal evidence few students would be interested in entering higher education if it did not lead to employment.

6.2.1 **Foci of university studies**

The primary purpose of universities in historical times was to educate people and many universities offered few or no professional degrees. The notions of service, expertise, trust, knowledge, understanding, enlightenment, personal development and citizenship are invoked by University ideals (Barnett, 1998). He states that the university is no longer the main source of knowledge production and new forms of knowledge have emerged that focus on action. There has been a movement from university based knowledge to additional knowledge areas such as experiential learning, knowledge in use, etc. Knowledge has increasingly become a commodity tested by consumer reaction where the concept of skills is increasing in prominence and needs to be tied to knowledge. In the modern age, according to Barnett, universities are no longer controllers of knowledge. Hence, universities have positioned themselves in the world to assume a more ‘entrepreneurial’ outlook. He states that the concept of knowledge organisations that value learning at work is explored by this new style of university which also acknowledges that knowledge is created outside universities.

Over the past few decades, many universities have somewhat controversially moved their focus from a knowledge based education to a skills based approach. This is related to employers’ changes in expectations from what graduates know to what graduates can do. Gibbons et al. (1994) explain that universities have long embraced the need for knowledge
in use or at work as both employers and graduates increasingly seek to acquire pragmatic knowledge. Symes and McIntyre (2000) provide an account of ‘learning by doing’ versus generic learning. Working knowledge or knowledge that can be put to work in the professional workplace has become an important focus of higher education.

Professional faculties at universities are attempting to adapt to employer demands. In recent years, many have incorporated or increased their focus on the work ready skills of their graduates. Still there is a mismatch in employer expectations of graduates. This issue was discussed in detail in Chapter 2. One of the main reasons is that many employers now see the role of universities as skill training centres for their workforce. Yorke (2006) states that employers seek multi-competent graduates. However, as shown in my study, some aspects of employment related capability can be developed only in the employment context (for example, communication with senior colleagues and people from different cultures). Therefore, a major challenge is to overcome the view of employers that universities are solely responsible for preparing graduates for all work situations.

6.2.2 IT graduates have a personal responsibility to develop their professional skills both within and outside University studies

I found in my study that many IT graduates took a personal responsibility to develop their own professional skills both within and outside their university studies and during employment. However, personal experience with some IT graduates and anecdotal evidence has suggested that IT graduates tend to rely on the university for the development of work ready professional skills. This is an expectation that universities cannot meet on their own. Graduates have a personal responsibility to use the opportunities provided to them during university studies, work placements or when beginning employment to develop their professional skills. For example, working in part-time jobs or participating in extra curricular activities during university studies can assist with the development of some professional skills. However, it is also vital that the university assists with preparing graduates to handle their own personal and social development. University education can help to develop the notion of self that addresses personal development, personal fulfillment and personal realisation (Barnett, 1998). Therefore, 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 development of their
skills and the responsibility the universities have to assist graduates with the development of an awareness of personal responsibilities such as career management, self-management and self-assessment skills that graduates may need beyond graduation. A detailed discussion of this is provided in Section 6.2.3.5.

Similarly, graduates also have a responsibility to develop themselves and their professional skills during employment. This is a two-way responsibility between graduates and the employers - the personal responsibility graduates have towards development of their own professional skills and the responsibility of the employers to assist graduates with the training required when graduates commence work. Employer responsibility includes facilitating workplace learning and organisational learning, supporting professional development of graduates during employment and increasing work socialisation to assist graduates settle in the organisation. The responsibilities of the employers are discussed in detail in Section 6.4.

Given that graduates themselves and employers play a part in the development of professional skills in IT graduates, what can universities do?

6.2.3 What universities could be responsible for

6.2.3.1 Preparing IT graduates to face new, complex, unfamiliar, unknown and unknowable situations

One of the major issues highlighted by my research is the lack of preparation of IT graduates to face new, unfamiliar, unexpected, unknown and unknowable situations. Professional faculties in universities have some responsibility to prepare graduates to learn how to learn in such situations. Crebert et al. (2004b) describe some major challenges faced by graduates concerning how to learn and function in unfamiliar unpredictable situations and how to cope with multifaceted, multi-skilled, multinational work that requires collaboration, cooperation, flexibility and inter-cultural awareness.

Universities could use workplace socialisation theories as a means to understand the behavioural patterns of new or recent graduates and how they respond to uncertain situations. Feldman and Brett (1983) describe two such behavioural perspectives namely: stress and career perspectives. The stress perspective is helpful for graduates to perceive
and evaluate if unfamiliar situations are a threat to old valued outcomes or an opportunity to achieve new valued outcomes. Many people are able to develop new behavioural patterns to deal with stress. The career perspective is helpful for graduates to face uncertainty in new job situations and to focus on expectations they might have about their new job. They are able to respond based on the information they have about their new job and this enables or inhibits their ability to socialise with others at work (Feldman and Brett, 1983).

Some graduates need a more reflective learning which assists them to make meaning from their own experiences (Boud and Miller, 1996). Graduates’ survival depends on self-confidence, learning on the job, extent of support, learning opportunities, supervision and mentoring or collegial induction and enculturation (Crebert et al., 2004a; 2004b). Although the IT graduates in the study find it difficult to cope with uncertain and unfamiliar situations they respond to such situations reasonably well and develop their own strategies to deal with stress and unfamiliar tasks.

Bennett et al. (2000) believe that for new graduates, adjusting and adapting to the workplace environment results in the form of a “culture shock”. This is where universities could assume some responsibility and better prepare graduates to face new, unfamiliar situations when they first enter the workforce (Barnett, 2004). However, there is a limitation in that the educational experiences of graduates can provide them only with propositional knowledge (that is, knowledge derived from discipline-based theories and concepts) (Eraut, 1994). But there are other experiences that enable people to learn from unexpected situations where there is no direct educational purpose. As a result, graduates are expected to develop their own personal cognitive frameworks. Then their propositional knowledge becomes personalised through the process of being used in different work 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). Barrie (2005) suggests that through studies, students need to develop a habit of mind that is about living with multiple solutions and perspectives. He recommends using teaching and learning strategies such as active learning, inquiry learning, peer assisted learning, student centric teaching, authentic
learning, collaborative learning and learning communities. 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.

Similarly to most professions, work situations in IT workplaces vary in their degree of complexity, the diversity of processes involved and the degree of uncertainty and ambiguity (Billett, 2000; Beckett and Hager, 2002; Rhodes and Scheeres, 2003; Kerosuo and Engrstrom, 2003; Groundwater-Smith and Dadds, 2004; Hodkinson and Hodkinson, 2004). Thus, 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. IT professionals also need imaginative, creative and strong disciplinary skills to be able to respond to unknown and unknowable situations (Reich, 1991; 2002). Such skills could be developed at university by focusing on the development of skills such as abstraction, system thinking (seeing parts, as well as the big picture), analytical, teamwork and communication skills. According to Yorke (2006) universities have a responsibility to develop such creative thinking skills in graduates. Therefore, universities through their graduate outcomes should 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 (Bowden et al., 2000; Barrie, 2006).

IT graduates I interviewed, stated that being able to handle complexity (where complexity is understood in terms of difficulty) is an essential skill they believe is required for their work because they work in a global environment, on multiple projects simultaneously, all with pressing due dates. When working with people across different cultures, and in different time zones, graduates come across many complex problems and issues. They are expected to “work smart”. Smartness has different meanings in different workplaces and can include attributes such as being flexible, adaptable and self-directed. Self-directed
smart workers have high morale, good teamwork skills, are multi-skilled and are independent but interdependent (Billett, 2000).

As we have seen in Chapter 4, IT graduates in my study face a variety of day-to-day events, which require them to use creative thinking and problem solving skills. For example, in addition to their normal duties, they need to cope with increasing workload and responsibilities during busy or peak periods or when staff shortages occur. When workloads increase, graduates need the ability to plan ahead, to prepare in order to manage their workload, to possess the ability to prioritise tasks and to use strategies to best manage the workload at a particular point in time, delegate or stage activities in order to balance the intensity of the workload as described in Billett (2000).

However, the abilities to manage workloads and prioritise work tasks are skills that build up as part of the experience gathered by professionals over a period of time. In some cases, the expectations of some employers can become ‘unrealistic’ and/or ‘unreasonable’. Knowing the various roles and staff responsibilities, understanding the priorities of the business operation and the nature of the problem at hand and its urgency and familiarity with other entities that might be affected as a result of an action to prioritise in a particular manner are some factors to be considered while prioritising tasks in specific settings or workplaces.

Simulating such real world complexity to educate students could be achieved during university project work or work placements. It is shown in my research that work placements are able to provide graduates with some insight into the complex world of work. However, universities cannot train graduates in all possible complex scenarios.

6.2.3.2 Preparing graduates to learn how to learn

As previously discussed, IT workplaces are diverse and this is suggestive of the fact that requirements for work performance are not uniform across workplaces. Prescriptions for smart workplaces will be different even if the same vocational activity is conducted but in different settings (Billett, 2000). Brown and Hesketh (2004a, 2004b) argue that professional skills developed during a degree will be of little value if not needed by an employer for a particular job. However, it is important to be conscious that the skills
needed for a small company are different from those needed by larger ones. How can universities design to such a broad spectrum of requirements? Employers’ expectations that universities should better prepare graduates to fit immediately into IT workplaces are unrealistic. However, universities have the capacity and the potential to educate graduates about diversity, and unfamiliar and uncertain and unknowable situations and prepare them to live in such a world (Barnett, 2004).

Rather than struggling to develop professional skills in IT graduates to suit all IT workplaces, universities could use an alternative approach which fosters flexible attitudes, self-autonomy, learning capacity and personal entrepreneurship in graduates (Meager et al., 2001). For example, simulated or real life projects, internships, work placement experiences, role plays, teamwork and problem-solving tasks during project work or assignments could be strategies used to develop ‘self-learning’ skills. Many IT faculties at Australian universities have been using all or some of these approaches successfully.

Situational knowledge and situated learning

The IT graduates in my study dealt with issues by being in those situations and either learned quickly how to resolve the issues or received support from peer groups and supervisors. While most of them cope well, they believe it would have been beneficial if they had had exposure to such real work experiences during their university studies. An observation from the study findings is that students need more preparation on how to learn while at work. Opportunities to develop such situational knowledge are provided by work placements.

Situational knowledge is knowledge about how people ‘read’ the situations in which they find themselves (Eraut, 1994). People learn about situations by being in them rather than studying them. For example, it is helpful to achieve cultural diversity within assignment or project groups within a university project subject. This is likely to occur 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 in university projects. 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 IT and other sectors.

There is evidence from my study that an excellent opportunity for learning transfer (applying theory to practice) is provided by work placements because of the nature of the ‘situated learning’ (Lave and Wenger, 1991; Greeno, Smith and Moore, 1993). Specific job knowledge for a role can be developed only when a graduate is in a particular role. For example, meeting management skills such as planning, conducting or chairing meetings are needed by IT graduates. However, such skills are often not given the importance they deserve in IT courses. These skills are covered in many soft skills courses but running a meeting in industry is different from conducting a meeting with friendly teams in university. Graduates’ understanding of how meetings are run in the industry can be developed through mock interviews, shadowing some IT industry meetings and team-meeting sessions.

IT graduates in my study found the concept of ‘learning’ at work was different from the ‘learning’ they did at university. One has to be a professional learner to become an effective learning professional (Eraut, 1994). Eraut states that how people use the knowledge they have already acquired depends on learning knowledge and using knowledge and that these two are not separate processes but a single process. Therefore, universities have a responsibility to assist graduates to become professional learners so they can learn effectively at work, acquire knowledge and use this knowledge.

Acquiring and using knowledge

IT graduates in the study used their existing knowledge from the discipline, their own conceptual framework, their skills in collecting and in interpretation of information to guide their decisions in facing unfamiliar situations. Knowledge can be acquired in many different ways and be put to use in different ways (Eraut, 1994). That is, knowledge use can be in the form of replication (e.g. university exams which rely on memory and rehearsing) or in the form of application (applying theory) or in the form of interpretation (interplay between theory and practice and practical contexts where theoretical knowledge has to be interpreted for application) or in the form of association (the use of images, metaphors, intuitive, associative use). Eraut also identified three categories of interpretation
of information - rapid interpretation (monitoring in an interview), instant interpretation (recognising a person) and deliberative interpretation (returning to collect information and analysing it). He said that university acquired propositional knowledge alone is insufficient to develop these skills. While technical and vocational education is in the applicative mode, professional education such as IT education involves understanding and judgment and hence is ‘interpretive’ (Broudy, 1980).

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. According to Eraut, using an idea in one context does not mean it can be used in another context without considerable further learning taking place. For example, although the IT graduates in the study had attended many courses in communication to develop their written and oral communication skills, the communication skills they required at work were different from what they had learned at university. Hence the need for skills to continue learning because a significant proportion of the learning associated with any change in workplaces takes place in the context of its use.

*Preparing graduates for lifelong learning*

As with most graduates, IT graduates also need continuous education, which involves learning beyond the initial qualification and attendance at courses as well as informal and on the job learning. It is essential that universities prepare themselves 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). This positioning is particularly important in IT because knowledge creation and use can occur outside university. Universities are therefore required to prepare their graduates to be effective lifelong learners.

There is a need to establish a ‘learning society’ where graduates need to be self-reliant and are able to take responsibility for their own careers (The European Commission, 1995). In the Dearing Committee (1997) report the focus is on the key skills of communication, numeracy, use of IT and learning how to learn. The need to teach students to learn to learn for new job opportunities is highlighted in the International Labour Organisation (2000)
report. There is extensive literature to show that the concept of lifelong learning is central to the ‘learning age’ in which we live and that personal development for graduates occurs throughout their working life (Fallows and Steven, 2000). Barrie (2004) emphasises the need for capacities for scholarship, global citizenship and lifelong learning in all graduates. Raybould and Sheedy (2005) also report that willingness to learn is a key skill that many employers require in graduates. Yorke and Knight (2006) use an old saying to best capture their discussion on lifelong learning skills,

*Give someone a fish and they will be fed for a day. Give them fishing skills they will be fed for life*

They state that universities can enhance employability skills by instilling lifelong learning attitudes in graduates and that measures such as curriculum auditing provide a holistic approach to the test of how employability skills related learning occurs in a course. Employability skills of graduates are a measure of a student’s potential and their ability to obtain and maintain a job (Yorke, 2006).

Within the literature, there seems to be some agreement with the expectation that instilling lifelong learning skills in the graduates is one contribution universities can make. One way of enhancing lifelong learning skills is to provide graduates with exposure to real world work environments and increase their knowledge of workplaces. In particular, taking graduates out of their comfort zones and increasing exposure to ambiguous problems may assist in the development of learning skills suitable for workplaces.

*Using deep learning approaches to enhance self-development of students*

Universities can assist students to take responsibility for their own personal development by using deep learning approaches. These provide opportunities for the development of independent learning, personal development, and 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. Deep learning approaches using group work aid in the development of collaborative networks that can act as links between individuals and communities they serve and a sense of community is developed through shared language, shared experiences,
trust, self-development and fostering identification within community (Kilpatrick et al., 1999).

Fallows and Steven (2000) discuss a study of University of Luton graduates in England, who attended an undergraduate curriculum in which employability skills were embedded. It was found that academic achievement and motivation of graduates increased manifold when lecturers used innovative teaching, learning and assessment practices and made students aware of their learning, skills acquired and personal development. Fallows and Steven found that where vocational links (such as in engineering or IT) exist, skills initiatives were strongly recognised, valuable and seen.

Coherence in curriculum design (referred to as ‘Constructive alignment’) has the potential to promote deep learning from students (Biggs, 2003). Yorke and Knight (2006) warn teachers to be considerate of learners by creating modules that complement one another. They stress the importance of engaging students both within and outside formal classes to make them aware of their own progress in learning.

Self-development and personal growth can occur through experiential (deep) learning (Rossin and 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 and Clark, 2009). There is too much focus on grades and the accompanying artifacts than the actual process of learning in some assessments. 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.

As many opportunities as possible should be provided in IT courses for the development of graduates on both an individual and social level. Group work on projects, assignments and work placement experiences seem to provide the best opportunities to achieve this development as shown in my study findings.
Woodill (2004) states students take the role of learners who are generally required to take a passive role and simply “absorb” information. The focus clearly is on presentation of content rather than on the process of learning. It is important for universities to present favourable learning conditions using learner engagement methods to accelerate the rate of learning and motivation for further learning (Blank, 1982).

IT faculties are well known for their focus on technical content but recently have started focusing more on the generic skills required by employers. Are university IT courses still too focused on content rather than on the process of learning? IT lecturers at universities have to balance between the amount of time available and the content to be covered and assessed. One of the major steps in this direction is to ensure that IT graduates understand why it is worthwhile to undertake the learning and the assessment tasks they undertake as part of their studies. This understanding can occur when graduates see the connection between the knowledge they obtain from their studies and its relevance to work.

6.2.3.3 Increasing students’ knowledge and awareness of workplace environments

Increasing students’ knowledge and awareness of workplace environments is another area where universities could assist. Beckett and Hager (2002) portray daily work as being ‘messy, filled with confusing problems’. One way of preparing students for this chaotic world is to make them work in typical IT work settings. That is, the development of graduates’ situational knowledge (Section 6.2.3.2) could be aided by IT courses. 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. 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.

For example, the IT graduates in the study like to work with groups or friends of the same age. They did not like ambiguous problems. Graduates need to realise that the real world is not often like this. An approach is to put IT students into project groups that have diverse personalities and skills to resemble project teams at workplaces. Project work and assignment problems could be open and intentionally ambiguous. When problems that have multiple solutions are provided, graduates are forced to think hard, justify how they make
their choices, consult and cooperate with their team members in decision-making, and more importantly, learn that real world problems do not always have a single simple solution. Students should realise that the choice of solutions depends on the context, resources and individuals involved. For ill-defined problems, there may be no solutions or more than one solution (Elstein, Schulman and Sprafka, 1978). Sometimes, even when small changes to a problem occur, large changes are required to the solution. In such situations it is essential for graduates to rely on known strategies and not engage in speculative problem solving strategies (Eraut, 1994). In IT courses, academics or the project supervisor can revise the scope, time and budget of IT projects for student teams. Such situations can help them develop skills to deal with project changes and enhance their problem solving abilities. Many of these approaches are used in Australian IT courses but they need to occur more frequently and in all university IT courses.

Eraut (1994) believes students must be able to develop broader vision, view or analyse different perspectives, see many courses of action and be in a position to handle multiple interpretations. He states that courses should avoid being too narrow or prescriptive. According to Crebert et al. (2004a, 2004b) problem solving skills can be enhanced in graduates if universities take input from employers in setting open problems for university projects where several solutions may exist (as in the real world) as opposed to the closed problems that are sometimes used in universities.

Another area that could be emphasised at universities in relation to workplace environments is the work roles and hierarchies at IT workplaces. I found in my study that such an understanding is required for IT graduates. It should be emphasised in university IT courses that most entry-level jobs require teamwork and followership roles. It is essential for graduates to know that they are unlikely to have supervisory or management responsibilities in their first job and that supervisory roles are relevant in later management jobs (Shruptrine and Willenborg, 1998). IT workplaces in which the graduates worked tended to be hierarchical in nature and the graduates need to be aware of the hierarchical structures and the organisational culture. However, while public sector workplaces promote use of a top-down structure other workplaces may use ‘peer’ status over ‘command’ status. Organisation structures can either be vertical or horizontal depending on the ‘culture’ and the nature of the activities undertaken within organisations. Based on ‘accountability’ or ‘responsibility’ or ‘significance’ attached to work roles, hierarchies could be set up (Billett,
Professional faculties such as IT also have a responsibility to ensure their graduates develop realistic job expectations when they first enter employment.

### 6.2.3.4 Assisting IT graduates for initial job expectations

Several problems arise due to mismatches in expectations between employers, universities and graduates of each other (Chapter 2). 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., 2004b). When there is a mismatch in expectations, graduates feel disappointed and their performance is affected.

Losyk (1997) and Montana and Lenaghan (1999) asked generation Xers their expectations of employers. The graduates in their studies wanted the freedom to work with minimal supervision, wanted guidelines and access to management if they had questions or needed direction. They also preferred a highly unstructured, flexible work environment but wanted basic guidelines such as month by month learning and outcomes to the year. They preferred their fellow workers to be like them. Others found that graduates have uninformed and unrealistic expectations of employment both in terms of salary levels and career development opportunities (Harvey et al, 1997; Harvey, 1999; Bennett et al., 2000; Hesketh, 2000; Business Council of Australia (BCA) and Australian Chamber of Commerce and Industry (ACCI), 2002).

IT graduates in my 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. Holton (1995) surveyed 378 college graduates during their first year of graduate work experiences. He found overall satisfaction with the first year of employment but the standard deviations in his results suggested many respondents had unsatisfying experiences. In relation to performance, he suggests that students be taught to expect to focus their goals in their first year of work on more than just productivity but also knowledge and skill development.
Shruptrine and Willenborg (1998), who studied marketing graduates, encourage universities to clarify the focus of their degrees and advise students whether the study focus is on research-oriented knowledge and skills or preparation for work or both. This ensures that the expectations of students are set in advance even before they commence their studies. This clarity about the focus of study preparation is a complex issue for many universities.

According to Knight and Yorke (2002), so many attributes, skills and qualities have emerged over the years based on employers’ and industry expectations of graduates that universities are struggling with where to focus their efforts. For example, is being a good ethical citizen (an individual attribute) as important as being a competent professional (development of skills)? This leads to the question of whether universities should be designing courses based on industry demands and/or motivational factors for student learning, attitude and participation and possibly whether they should compromise on deeper subject knowledge in place of work ready skills (Sleap and Reed, 2006).

Crebert et al. (2004b) believe that graduates’ expectations have increased rapidly recently because recruitment agencies generally exaggerate some of the extra benefits and offers (world travel, club memberships, escalating opportunities etc.) attached to job opportunities. However, at entry level, graduates are often in routine, poorly paid not very interesting jobs and, as a result, feel frustrated. Graduates’ commercial awareness, development of personal transferable skills, set up of the right level of expectations from graduate employees, provision of tips on networking with employers and other graduates, etc. could be improved using intensive workshops. But normally only large employers can offer this. It is known that graduates like to see the value of their learning through the eyes of the employers and it is essential to provide work experience/placement opportunities to support this expectation (Raybould and Sheedy, 2005). However, they also observed that graduates find smaller businesses have the opportunity to offer more responsibility and wider range of experiences in the early stages of a graduates’ career.

Internships, practical work examples, simulated project work, and career services should be used by universities to provide graduates with knowledge about the nature of IT workplaces and what to expect during their first few years of employment. Universities should prepare graduates for both entry-level skills and a knowledge base that they can
adapt to changing environments. However, while some graduates wish to pursue careers in the industry others may wish to pursue further education and research careers. In DfEE’s (1997) study in the UK, no conflict was seen between the development of skills for employment and the development of skills for learning. Such a finding has implications for learning within and outside university studies. Yorke and Knight (2006) warn that skills development cannot be ‘boxed off’ from the rest of the curriculum since skills development occurs through a range of curricular and extra curricular activities.

6.2.3.5 Assisting IT graduates with career management and self-management skills

As we have seen in Section 6.2.2, graduates increasingly need to take personal responsibility to develop themselves both during their studies and beyond their graduation. Personal and social development can occur when graduates have the ability for career management (career building discipline specific skills) and self-management. Career management and self-management skills are shown in Bridgstock’s conceptual model of graduate attributes (Figure 6.1). How career building skills and self-management skills assist in the acquisition and use of discipline-specific and generic skills is highlighted in the model. Another model relevant to career and self-management is the USEM model of employability (Yorke and Knight, 2006) (Figure 6.2). This is based on the assumption that employability issues are influenced by four broad, interrelated components namely:

- Understanding;
- Skills;
- Efficacy beliefs, students’ self-theories and personal qualities; and
- Meta cognition (self-awareness requiring a student’s learning (how to learn) and capacity for self-reflection).
Figure 6.1 Conceptual model of graduate attributes showing career management and self-management skills (Bridgstock, 2009)

Figure 6.2 The USEM account of employability (Yorke and Knight, 2006)
Career management skills

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. However, the potential for student career management skill development remains mostly unrealised in university programs (Watts, 2005; Bridgstock, 2009) and many graduates are under prepared for facing the employment and training options, which assist them to construct a career (Lamb and McKenzie, 2001; OECD, 2002). A possible approach for universities to consider to develop career management skills in their graduates is to introduce counselling sessions to assist students to clarify their personal aims and abilities and information sessions on understanding the requirements of the labour market. Such initiatives are strongly supported by the Council of Australian Governments as a part of their objectives to prepare graduates adequately for transition to the world of work and to maintain their employability (COAG, 2006).

Fallows and Steven (2000) propose that an emphasis on greater student responsibility for personal development should be a central feature in any skills initiative program. However, according to DfES (2002) individual attributes such as honesty, integrity and commitment are as important as the development of skills. Employability is a process of personal development rather than just a checklist of attributes (Moon, 2004). Yorke (2006) states that measures such as facilitating the development in students (during the orientation or induction sessions) of the understandings, skills and attributes that will help them make a success of their course will assist with the realisation that universities can help only to a certain level and that graduates have to deal with the challenges that employment throws at them in their own way. Accordingly, Yorke argues that employability is for life and lifelong learning is a way of retaining one’s employability skills. This argument applies to all graduates including IT graduates.

In UK universities, graduates are able to access the services of careers staff even after they have graduated (McGuire, 2005 p38). Such continuing university based career support is invaluable for graduates as many graduates tend to think more about their career after graduation (Lau and Pang, 1995; Perrone and Vickers, 2003; Bridgstock, 2009). Raybould and Sheedy (2005) state that the role of careers service is crucial in assisting with completing applications, interview techniques, assessment centres and personal
development. It is vital that such services be available even after graduates have left the university, at least for the first few years of their employment.

Resourcing of Australian university careers services is uneven (OECD, 2002). They tend to emphasise course choices and student retention rather than career management and the facilitation of a graduate’s transition to work (Watts, 2005). 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 I interviewed raised the lack of career management support from either universities or employers as an issue.

Graduates can be engaged personally by the use of innovative teaching, learning and assessment methods in career management programs using methods such as role plays, self-audit of resumes, problem based group work, peer review, work-integrated learning etc (Watts, 2006). IT graduate careers occur in a global industry across a variety of hybrid professions (such as e-commerce, e-health, e-business etc.) and the career management skills required will vary based on disciplinary, geographical, social, cultural and individual differences. Hence, serious consultation between academic staff, industry partners, careers service staff and students is required for both curriculum design and the implementation of any customised career management programs (Bridgstock, 2009).

Students will develop their readiness for a career in ways that reflect their particular circumstances (Yorke, 2006). Graduates who have confidence in their ability will be able to take effective and appropriate action, explain what they are seeking to achieve, live and work effectively with others and continue to learn from their experiences both as individuals and as a group (Stephenson, 1998). It is advocated by social cognitive career theory that higher education rather than concentrating on specific attributes must concentrate on encouraging students to reflect about their competence to be successful in a particular career.

**Self-management skills**

In my study, I found that IT graduates needed to have good 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). Several
education researchers (Eraut, 1994; Dweck, 1999; Yorke and Knight, 2006) have argued strongly for increasing universities’ efforts to develop the self-management skills of their graduates, key aspects of which are self-control and self-knowledge. Eraut describes self-control as controlling one’s own behaviour which involves evaluation of what one is doing and thinking, one’s priorities and the adjustment of one’s cognitive frameworks and assumptions, in other words, self-knowledge and self-management. He states that processing feedback is vital for improving self-knowledge. Self-management and self-awareness can be developed through reflection and feedback. As a result, self-directed workers are in a better position to make judgments in order to improve workplaces (Groundwater-Smith and Dadds, 2004).

Others argue that self-theorising and self-efficacy should be accelerated by degrees to enhance self-management skills in graduates (Swanson and Fouad, 1999). For better self-management, students need to develop malleable abilities about self rather than fixed self-theories or beliefs about self because it is essential that they see tasks as opportunities for learning rather than as performance-oriented opportunities to demonstrate competence (Dweck, 1999). Knight and Yorke (2002) suggest that universities should focus on malleable self-theorising rather than attempt to develop specific personal attributes. Brown (2003) discusses the importance of developing student self-confidence, self-esteem, relating their university experiences, work placements and work-related learning in the academic curriculum to the world of work. Students who have malleable self-theories have more belief in their ability to be effective when faced with novel challenges (Yorke and Knight, 2004). According to Yorke and Knight (2006), a good curriculum design should assist with the understanding and development of skilful practices as well as the development of positive efficacy, beliefs, meta cognition and complex achievements that employers value. IT graduates I interviewed, indicated that attributes such as self-confidence, the ability to assess one’s strengths and weakness, experiential learning and the ability to learn from mistakes are important for their work. Sufficient preparation for these are possible at university through the adoption of some approaches discussed in this Section. Self-assessment is discussed in detail in the next Section.
In my study findings, one of the professional skills IT graduates believe they need for work is self-assessment, that is being able to assess their own performance and be aware of their strengths and weaknesses.

University IT studies have the potential to prepare IT graduates for this by reviewing current assessment practices. Self-assessments and peer assessment and portfolio assessments are some areas that can be incorporated to promote long-term learning and assessment. Assessments should be designed so that the consequences for student learning take priority over effectiveness in measuring student achievement. Black and Wiliam (1998) state that assessment to aid learning should be “timely, focused on specifics, based on standards and designed to encourage students to make their own judgments”. Universities should teach students how to manage their own learning and how to do their own assessment. Students can benefit most from assessments that link assessment tasks with normal professional tasks typical of IT workplaces. Where possible, course assessments in higher education should be designed to foster lifelong learning (Boud, 2000) that is, learning beyond the point of graduation. Self-assessment should be promoted as a constructive form of assessment and not an act of subjugating to others but as one of assessing control over one’s own learning (Boud and Falchikov, 2005) unlike much traditional assessment such as examinations. Yorke and Knight (2006) state that summative assessments are generally not desirable because they provide limited feedback and are not useful for further learning.

Alverno is a small private college in the USA, which uses the philosophy of assessments as learning where learning is integrative and lasting. All teaching, learning and assessment are coherent not only across course modules but across courses and programs (Mentkowski et. al, 2000; Boud and Falchikov, 2005). To achieve this effect, explicit criteria, diagnostic feedback and reflective self-assessments are used by Alverno College. However, it is debatable if all universities could afford to adopt the Alverno approach due to systemic, institutional and resource constraints and the applicability of such approaches for larger universities and institutions. It is probably not practical for IT faculties across the world to adopt this approach.
Since self-assessment and reflective assessment are key skills graduates need after their graduation at workplaces, students should be given many opportunities to develop these skills during their time at the university. According to Boud and Falchikov (2005), long-term learning and effective engagement in self-assessment after graduation is a function of both the assessment practices to which they are exposed and the teaching and learning activities in which they take part. Their discussion states that there is a rigid divide between teaching and learning and assessment activities and that there is often a need to take a more holistic view for student long-term learning. Where possible, self-assessment should be promoted by IT faculties as a sustainable form of assessment to prepare their graduates for future learning and assessment. Some universities now require their students to use electronic or web-based portfolios and reflective writing exercises to assist students to develop self-reflection and self-assessment capabilities and to integrate employability skills arising from their studies and from their broader life experiences (for example, Curtin University’s iPortfolio). 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. Graduates do not know what they know. 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 and Reed, 2006). According to Yorke and Knight (2006), students do not always appreciate what they have to offer a potential employer. Self-analysis of their strengths and weaknesses helps in self-development. Some educators promote the use of self-development approaches while others promote the development of particular skills more strongly within university courses. But both groups fail to address the constraints involved. For example, by increasing the number of presentations, graduates’ self-confidence could be developed but this means less time to teach in courses.

6.2.3.7 Developing well-rounded graduates

One of the study findings is that IT graduates need the ability to work with and across people from other disciplines and professionals. 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 focussed leave university looking for employment within a chosen area and are slow to recognise the generic skills that have been developed during university. In IT courses, transferable attributes such as retrieval and handling information, communication and presentation, planning and problem solving, social development and interaction are delivered through academic curriculum (Fallows and Steven, 2000). To maximise and tap into the real professional potential hidden in graduates, all IT faculties should try to make their graduates become aware of their strengths and keep their minds open to work pursuing opportunities in not just the IT sector but also in other sectors where IT skills are required.

According to Fuller and Scott (2009), job-ready and employable graduates are those who possess strong generic skills as well as strong professional qualifications through the completion of a university degree. Raybould and Sheedy (2005) report that according to the learning and teaching support network in the UK, “producing employable graduates is becoming more and more complex and more important”. In their UK study, nearly two thirds of vacancies that were on offer were open to graduates of any discipline. Therefore, it is becoming increasingly essential for universities to develop graduates who can cross their own professional boundaries and contribute across disciplines. This boundary crossing can be encouraged by universities for students to explore the relevance of their own course learning outcomes beyond university, as it is this attitude employers are increasingly seeking (Chambers and Clark, 2009). In the context of IT, boundary crossing has occurred many times and as a result, new disciplines have risen. Some examples of cross disciplines with IT (or previously computing) are listed below in Table 6.2.

<table>
<thead>
<tr>
<th>Professional Practice site 1</th>
<th>Professional Practice site 2</th>
<th>New Practice site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology</td>
<td>Public Health, Medicine</td>
<td>E-Health/E-Medicine</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Education and Training</td>
<td>E-Learning</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Biological Sciences</td>
<td>EBio-Technology</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Security</td>
<td>E-Security</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Control Engineering</td>
<td>Automation</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Business, Commerce</td>
<td>E-Business/E-Commerce</td>
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</tbody>
</table>
The strengths of individual disciplines are brought together by the new practice sites to create a raft of opportunities where one profession can work with another to serve a multiple number of services. A variety of questions that arise with the development of new practice sites are raised by such boundary crossing. As we have seen in Section 2.6, there is evidence that employers like to see transferable skills in graduates. Most employers focus on soft skills obtained during study and periods of work experience rather than degree specific knowledge.

6.2.3.8 Maximising and using diversity in the university environment to assist IT graduates develop social and cultural skills for the global workplace

The IT industry is global, multi-national and involves clients and peers from different countries and cultures. Cultural awareness and being able to work with cultures is a professional skill that the majority of IT graduates in the study believe that they need at their work. In addition, IT graduates need to be aware of local customs and practices when they go on overseas business trips. As well as the ability to work with people from different cultures, IT graduates need skills to work with people from different industry sectors, people from different age groups and with different experience levels in the hierarchy. Oliver et al. (2007b) 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 how issues might impact on people from other cultures.

According to Jenkins (1995) the link between the effectiveness of graduates in the workplace and generic skills, job-readiness, employability and a global perspective cannot be ignored. Universities could be responsible for developing graduates who fit into global workplaces. Worldwide, employers demand that graduates they hire should “fit” and add value to the business in the short-term and long-term (Nankervis, Compton and Baird, 2005). Many employers assume that graduates have the required academic skills (Yorke, 2006). Yorke discusses the preparation of graduates for work as a two-layered approach. Job-readiness is the first layer of a student’s preparation for the workforce and it is linked to professional knowledge. Employability is the second layer of student preparation and involves the ability and willingness of graduates to think beyond knowledge. The employer perspectives are reflected by this layer. Similarly, Fuller and Scott (2009) discuss the need
for global graduates and the development of job-readiness and employability skills in a
global context. This is particularly relevant for the IT industry. IT graduates need the
ability to work across different cultures and understand the global nature of business.

An approach to developing the necessary social and cultural skills for such global
graduates is to maximise and utilise diversity in the university environment. Social and
cultural skills are those skills that graduates need to work effectively with people from
different cultures and different professions (technical and non-technical), such as building
and maintaining professional relationships with peers and customers. 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.

Universities should tap into a different form of diversity they possess and encourage
collaboration between students in different disciplines and promote and facilitate
socialisation between students from different courses both on academic as well as cultural
and social issues. IT faculties should consider the possibility of developing cross faculty
projects for students although this provides practical challenges. While forming IT project
groups, the ideal is to form diverse groups with a mix of students from different age
groups, with or without previous work experience either related or not to IT. The
development of socio-cultural and professional skills could be encouraged by healthy intra
and inter-university competitions such as debates. Encouraging student volunteers to plan
and conduct major events on campus and increasing the interaction between students from
different cultures will also help in the development of culturally sensitive global graduates.

Universities need to consider allocating dedicated resources to develop cultural awareness
amongst their students through whatever is realistic and affordable although there are
several practical challenges to overcome. Many university students cannot afford the time
for social activities because they are working in part-time jobs to fund their living and
study expenses. These jobs are often low level and offer few opportunities for the
development of social skills. Another obstacle for socialisation is the ‘language’ issue. In
many Australian universities, IT student teamwork groups are comprised of either local
(native and non-native speakers of English) students or of international students. Most
international students require appropriate English language testing scores for admission to
IT courses. Although such students meet the course entry requirements, their language skills are often not adequate for the oral and written communication required in many of the IT courses. Some students, local or international, who are not native speakers of English tend to have friends who speak the same language and are from the same culture. This does not give these students many opportunities to enhance their English language skills and hence such students are sometimes reluctant to participate in socialisation processes at universities. It is a challenge for universities to engage all their graduates in socialisation processes while they are studying.

The graduates in a study conducted by Crebert et al. (2004a), chose ‘group work’ (from a list of options) as the most effective context for the development of the university’s stated generic skills and abilities. In addition, during work placements, graduates believe, that being given specific responsibility in employment and working collaboratively with colleagues are effective contexts for skill development. Graduates also believe that while their teams at university were based on friendships, socio-cultural backgrounds and academic standards, at work it was different because they had to team up with people who might be different socially and professionally. In my study, IT graduates believe that the teamwork they did at university assists to some extent with teamwork skills. However, the type of teamwork skills required in typical IT work settings (for example, working with culturally diverse international teams in different time zones) were quite different. However, they indicated that any group work based learning had greater impact than solo learning on personal and social development.

The value of teamwork (Engestrom, 1996), lifelong learning that views learning as ‘inescapably a social creation’ (Ranson, 1998) and the notion of collective intelligence (Brown and Lauder, 1995) are highlighted by group work based learning (both at university and workplaces). Guile and Hayton (1999) suggest that this is the case, even in the sphere of Information Technology in which solitary learning seems to predominate. Lave and Wenger (2002) describe the social context of 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. Rossin and Hyland (2003) propose group work based learning to provide opportunities for training for employment and for personal and social development (moral, cognitive and social benefits to its members and to the wider community). There should be a balanced approach to social as well as individualistic learning in group work based learning. The process
rather than just the learning outcomes are emphasised by the social context of learning. According to Rossin and Hyland (2003) social learning and communities of practice serve as mechanisms for personal and social development of graduates. Self-development opportunities for graduates within the wider context of social development are provided by group work based learning (Rossin and Hyland, 2003).

Socialisation at university could be achieved through encouraging student participation in work placements, internships, involvement in student organisations, networking and career building contacts. Socialisation has the potential to provide IT graduates with opportunities to develop their social and interpersonal skills. Universities should maximise and utilise their environments to develop the social and cultural skills of their graduates. For example, my study showed that communication requirements vary across IT workplaces, based on the scope and kinds of communication and norms of workplace requirements and culture. Communication in a hierarchical, oral, directive (command culture) is different from negotiations with self-managed teams in a workplace for a work based decision-making process (Billett, 2000, p.145). These workplace cultural differences should be highlighted to graduates before they enter the workforce so they do not experience ‘culture shock’.

Communication skills, teamwork skills and the ability to work with people from different cultures are the most obvious skills that were developed from increased socialisation with university friends and professional peers as shown in my study findings. It has been reported in previous studies that graduates who actively participated in student organisations, internships and in organising or planning social and cultural events during university studies perceived their courses as more relevant and useful than those who had not been involved (Shruptrine and Willenborg, 1998; Sleap and Reed, 2006).

So far I have discussed some roles universities could play in the development of professional skills of IT graduates. An increasingly important aspect of university preparation for the workforce is graduate attributes.
6.3 **IT faculties need frameworks beyond graduate attributes in their degrees for the development and inclusion of specific professional skills for the IT profession**

I first describe the role of graduate attributes in Australian universities followed by a discussion of the relationship between graduate attributes and employability skills. Then, I focus on why graduate attributes should not be an add-on to existing courses and the need to have graduate attributes embedded in IT subjects. Following that, I discuss an area of professional skills that does not appear to be addressed adequately by existing graduate attributes for IT graduates.

All Australian universities have graduate attributes. Graduate attributes are normally to be attained by all graduates of a university. Often, particular programs have their own attributes in addition to the university’s generic graduate attributes. The graduate attributes framework was introduced to almost all Australian universities as a policy led initiative for the design and accreditation of courses (Boud and Solomon, 2006). Graduate attributes are defined by the Australian Technology Network (Bowden et al., 2000) as:

```
........ the qualities, skills and understandings a university
        community agrees its students would desirably develop during their
        time at the institution and consequently shape the contribution they
        are able to make to their profession and as a citizen.
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Graduate attributes are sometimes referred to as generic skills, transferable skills, core skills, soft skills, work ready skills and key skills. Graduate attributes are no longer seen as being independent of discipline knowledge because graduate attributes interact with discipline knowledge and help shape it. Such 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 (Barrie, 2004). James et al. (2004) emphasise that graduate attributes development takes place mostly within disciplines of study. Kamvounias and Thompson (2008) say that the term ‘generic’ is sometimes misinterpreted as independent of the field of study and so it implies development in a separate unit of study. They refer to this as a ‘bolted on’ approach.
Graduate attributes are often translated by Information Technology departments into a set of specific learning goals and outcomes to define their IT graduates. The details of knowledge, skills and values that will be developed within undergraduate and postgraduate programs are provided by these graduate attributes so that students and employers know what to expect from an IT graduate from that university. Sometimes there are unrealistic expectations of universities to guarantee that their students possess the desirable skills using some predefined institutional documentation. Instead what is reasonable is a guarantee that their graduates will be provided with as many opportunities as possible to acquire and develop their generic skills during their study.

Compared to a few decades ago, many specialised generic skills or soft skills have been added to IT courses today which have integrated such skills into technical subjects such as project work and work placement. Learning outcomes have also been linked to graduate attributes. The graduate attribute is a statement of what graduates should be able to do, that is, a statement of their non-technical work ready skills. If this approach is working, why do many employers express concerns about the lack of work ready IT graduates? As shown in my study, graduates were not sufficiently prepared in some professional areas (for example, working across cultures). Questions such as the following are raised: What purpose do graduate attributes serve in the light of these findings? Does the graduate attribute approach work? The unavoidable question then becomes, is the graduate attributes approach a sufficient approach to develop work ready graduates?

Academics within any given university have different views about how graduate attributes translate into curricula. This disagreement and differences in opinion mean not all academics are committed to using a particular approach to teaching graduate attributes or beliefs about what graduate attributes should be and how they should be taught or even if they should be taught at all. Boud and Solomon (2006) state that graduate attributes will work only if those to whom they are exposed are willing players in the process and are in a position to appreciate the qualities developed. It is mandated by most Australian universities that academics include graduate attributes in their curriculum documentation. Kamvounias and Thompson (2008) state that graduate attributes can be conceptualised at different institutional levels such as university, faculty, school, department, program of study and specific subjects within which students develop graduate attributes. Using
overarching graduate attributes that are then broken down to specifics that can be implemented at lower levels is one approach. Then these graduate attributes are translated by the faculty to a set of more specific learning goals relevant to the degrees. By alignment of learning design, learning outcomes with graduate attributes, teaching and learning activities, assessment tasks and assessment criteria, the best possible chance exists for the development of graduate attributes.

Such a top-down approach can lead to a tick-box mapping exercise where, in reality, only learning goals are matched with graduate attributes. In some cases graduate attributes are mapped to learning outcomes and assessment tasks but not necessarily mapped to the assessment criteria (Kamvounias and Thompson, 2008). Further the students’ focus is often just on obtaining the required marks or grades. They are sometimes unaware of or uninterested in graduate attributes.

According to Scott and Yates (2002), it is when things go wrong that professional capability is most tested. At such times, graduates want to combine the most appropriate knowledge for that situation, i.e. both job-specific skills and generic skills, to develop an ability to read the situation and determine a suitable strategy. Scott and Yates (2002) describe this as professional capability. They discuss whether individual graduates can be “emotionally intelligent” (graduates with higher order personal and interpersonal skills who can problem solve, think creatively, communicate, negotiate and find solutions rather than know them) and whether or not, universities have contributed to the initiation or fostering of such skills. They conclude that “while technical enterprise is a necessary capability…. it is certainly not sufficient to produce a successful graduate”.

James et al. (2004) conclude that the development of graduate attributes is a shared responsibility of teachers and students. Further, graduate attributes should not just be viewed as a compliance issue but instead used as a medium for good teaching practice and development of a community of practice. They discuss knowledge, purpose and graduate attributes where knowledge includes cognitive understanding (disciplinary) and affective knowledge (values and attitudes, such as commitment capability etc.). They propose some ways to illuminate graduate attributes in teaching. They suggest sharing teaching strategies across different faculties through online web-based platforms. The development of communities of practice within a university to collaborate on graduate attributes and
teaching strategies is another approach (Wenger, McDermott and Snyder, 2002, p.76). Interviewing lecturers across the university and obtaining input about strategies used in teaching to develop graduate attributes would assist a wide dissemination of information about teaching strategies used and how they are used to achieve graduate attributes. It is important that these implementation processes for graduate attributes parallel what lecturers want their students to achieve (Oliver et al., 2007a). Stakeholder feedback should consider student surveys/feedback along with information such as retention rates and the effort and interest academics put into designing and mapping curriculum. Student feedback should capture learning experiences on student engagement, the tuition pattern for student interactions, and the development of work-readiness through applications of knowledge and skills. The complexity of course structures such as the flow-on effect such curriculum changes can have on other university systems are some of the practical challenges to overcome.

Barrie (2004) states that universities often find it difficult to embed and assess graduate attributes and there are not really tested until students enter the workforce. Oliver et al. (2007b) ask do graduate themselves, and their employers, believe that they have achieved the graduate attributes? To date, graduate attributes do not appear to be a well-advertised concept among graduates. Universities and departments need to do more to make their graduates aware of the attributes they should acquire as a result of undertaking a particular degree. Explicit connections between learning and assessments and graduates attributes are required for graduates so they can appreciate and be aware of the development of such graduate attributes within themselves (Thompson et al., 2008).

One way of measuring whether graduates have acquired specified graduate attributes is using psychometric tests at a student’s entry and exit from university (Chanock, 2003). A student’s work assessed by university assessments often does not frame any judgment on the students’ acquisition of graduate attributes. However, not all graduate attributes could be measured using such approaches. The Australian government funded a Graduate Skills Assessment (GSA) project commissioned by the Department of Education Science and Training (now known as DEEWR) and developed by the Australian Council for Educational Research (ACER) in 1999. The objective was to understand graduates’ generic skills after the completion of their higher education courses. The results of the initial stage of the project are available (ACER, 2006). The Australian Government decided as a part of
their 2010-11 budget to discontinue funding for the GSA from 2010-11. However, a discussion paper titled, An indicator framework for Higher Education, released by the Australian government in December 2009 considers the use of GSA in the future to determine performance funding arrangements for universities (DEEWR, 2009b).

The Australian Government’s initiative to introduce the Higher Education Graduation Statement (Gillard, 2008; James and Meek, 2008) aimed at building an understanding among students, universities and employers about the expectations of skills acquired by Australian graduates. Such initiatives could be helpful in addressing the mismatch in expectations of skills of IT graduate amongst the different stakeholders.

Stakeholders are also confused by use of the terms, skills and attributes. Although skills and attributes are often used interchangeably they have different meanings. Crebert et al. (2004a) found that employers desire loyalty, commitment, honesty and integrity and state that these are qualities or attributes rather than skills. Skills are typically practical such as communication, time management and teamwork. Attributes can be broader than skills and are often contained in Australian graduate attributes.

Universities have been under pressure by recent moves in education and labour market policy to produce employable graduates (Bridgstock, 2009) and this has increased the focus on graduate attributes and their relation to employability skills. Several authors have also tried to link graduate attributes to employability skills. Graduates increasingly need the ability to navigate the world of work and self manage the career building process. The importance of self-management and career building skills to lifelong career management should be acknowledged by a model of desirable graduate attributes (Bridgstock, 2009).

Harvey (2001) define employability skills as:

_Those that pertain to an individual’s capacity to obtain and maintain work and contribute to economic productivity – employability_

Employability skills are represented by the Business Council of Australia (BCA) and Australian Chamber of Commerce and Industry (ACCI) (2002) as:
Skills required not only to gain employment but also to progress within an enterprise so as to achieve one’s potential and contribute successfully to enterprise strategic directions.

Several sets of graduate attributes, employability skills and work readiness definitions have been compiled by different organisations. The employability skills framework (DEST, 2002) developed by the Australian Chamber of Commerce and Industry (ACCI) and the Business Council of Australia (BCA) named eight employability skills and broad personal attributes across all industry sectors. They are

- Communication;
- Teamwork;
- Problem solving;
- Self-management;
- Planning and organising;
- Technology;
- Lifelong learning; and
- Initiative and enterprise;

Employability skills and work readiness have also been used interchangeably. In relation to IT, Litchfield and Nettleton (2008) gathered definitions for work readiness as defined by professional societies such as the Australian Computer Society (ACS) and the Department of Education, Science and Technology (DEST) now known as DEEWR. A common list of key graduate attribute descriptors was found. They were global perspectives, communications capacity, ability to work well in teams, ability to apply knowledge, creative problem solving and critical thinking skills, professionalism and ethics and the ability to apply knowledge.

However, there is no systematic framework in the higher education sector to embed these skills as such. Hence the sector is reliant on graduate attributes to deliver these employability skills during the course of study. The sector is of the view that employability skills are a subset of graduate attributes (Oliver et al., 2007a). It is desirable to ensure aligned curricula by embedding and assessing learning outcomes derived from institutional graduate attributes (Biggs, 2003). At many universities, graduate attributes remain at the
level of intended or desired outcomes for students and a major move in educational thinking is called for. Barrie and Prosser (2004) observe that graduate attributes

*have their roots in the contested territory of questions as to the nature of knowledge and nature of a university*

Etzkowitz and Leydesdorff (2000), cited in McWilliam et al. (2002) view graduate attributes not as a representation of displacement of one approach to knowledge production by another but rather a change in priority for the types of knowledge sought. The debate about whether universities see themselves as major players preparing graduates for work is not over. A related issue is the changing role of the university from being a knowledge producer to a knowledge facilitator (Section 6.2.1).

### 6.3.1 Generic graduate attributes should not be an add-on to existing courses

While the importance of the soft skills in any workplace is pointed out by some studies, in Information Technology it is essential not to separate these generic skills from the technical nature of IT work. It was found in past studies such as Harvey et al. (1997) that employers in the UK tended to value generic skills more highly than disciplinary based understanding and skills. Purcell and Pitcher (1996) reported that over 40% of graduate jobs were relatively indifferent to the applicant’s course of study. In the real world, IT graduates face situations where they need to integrate their professional skills and technical skills as indicated by IT graduates in my study. Litchfield and Nettleton (2008) as a part of their work ready project at the University of Technology (UTS) recommend sharing across faculties tasks designed to assist the acquiring of generic work skills. This is appropriate as long as those tasks are contextualised to a profession so a student sees the relevance (Frawley and Litchfield, 2009).

Many IT undergraduate degrees have a capstone course in the final year. Project work on a real world problem with a focus on the interaction of theory and practice is usually involved. The aim of most such projects is to give students exposure to the IT industry and can include real workplace assessors and possibly real or simulated interviews with clients and supervisors. The assessment of these projects should take into consideration not just assessment of the technical content based on the project deliverables but also assessment of the development and use of professional skills such as communication skills, time
management, teamwork, project management, business skills and self-reflection abilities. As discussed in Section 6.2.3.3, it is beneficial to design project problems to be open, ambiguous and broad with students from different cultures and languages interacting with real workplace supervisors and university supervisors. Students should be asked to present their work at industry meetings to gather feedback.

Rossin and Hyland (2003) studied two project work groups from the information systems departments in two UK universities in which students acted as consultants to clients and tutors assumed an advisory role to facilitate the project work. They found that the advantages of the group work based learning included students training each other both in technology and non-technical areas (the cascading effect of skills and knowledge was strong), conducting peer assessment, individual self-assessment (personal diaries) and submission of group-based work deliverables for assessment. Such capstone projects have great potential to develop contextualised professional skills for IT graduates.

An issue is that some lecturers do not conceptualise or understand the transfer of generic skills between contexts and are not always familiar with learning theory. Hence, students are disadvantaged because of the approaches such lecturers might use in classrooms (Crebert et al., 2004a; 2004b). Bridges (1993) describes ‘transferring skills’ as higher order skills that enable a person to select, adapt, adjust and apply his or her skills to different situations across different social contexts and across different cognitive domains. A particular obstacle for consistent implementation of a graduate attributes framework across IT faculties is presented by these different understandings and interpretations about generic graduate attributes. Further, the challenges that remain for all universities are how to encourage student self-development and assessment for lifelong learning and reflective practice. This seems to be an area of deficiency in many graduates and development of this attribute through existing teaching, learning and assessment practices is often lacking.

6.3.2 Cultural awareness and ability to work with cultures is a skill needed in IT but is often absent from graduate attributes

In Section 6.2.3.8 I discussed the need for global IT graduates. 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. These are of particular importance for IT degrees and courses. 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. Oliver et al. (2007b) found that employers surveyed in their study highlighted that their graduates lacked international perspective and intercultural understanding. Section 6.2.3.8 discussed how universities could maximise the use of diversity on their campuses to assist with the development of cultural skills in IT graduates. In addition to this, IT faculties need frameworks beyond current graduate attributes to successfully address the development of skills such as the ability to work across different cultures.

In conclusion, graduate attributes have significance at university, faculty and course level but are still often seen to be compliance rather than a teaching and learning focus. More needs to be done so students are aware of the importance of graduate attributes and that their acquisition can be from the students’ learning and assessment experiences. Further, graduate attributes frameworks for IT graduates need to be reviewed for specific professional skills for the IT profession.

Some responsibilities employers could take in the development of professional skills of IT graduates are the focus of the next section.

6.4 Employers should move from thinking that adding topics to the IT curriculum would solve their concerns about the lack of professional work skills in IT graduates

Employer concerns about the lack of professional skills in IT graduates and employer expectations of skills required were discussed in Chapter 2. The implication of the study findings for employers and some roles they could assume to assist with the development of skills of IT graduates are discussed in this Section.

Crebert et al. (2004b) report that employers believe that new graduates are ill equipped to deal with aspects of the workplace such as working in teams, learning for themselves and problem solving. Employers imply that universities should pay greater attention to these
issues. According to Crebert et al., employers believe that new graduates have uninformed expectations of their work environment (supervision, control etc.) and that they will founder unless universities prepare them for more realistic workplace conditions.

Hagan (2004) states that rather than focus on specific skills and applications, universities should focus on broad knowledge and understanding to make sure their graduates have a flexible mindset to learn new technologies as and when they evolve or are needed. Many employer groups and recruitment consultants argue that non-technical or soft skills are important for professional novices (Begel and Simon, 2008). In an interview with graduates, Paul Rush, a CIO practice leader of a recruitment firm warns “Having the qualifications (alone) won't get you the job, companies want appropriate soft skills and good cultural fit as well. We can teach people C++ but we can't change Joe Bloggs' personality. We are more interested in the soft skills than the technical skills” (Head, 2006). The important role of soft skills for IT employment is highlighted by such a warning but the warning falls short of recognising that those skills are unlikely to develop from university courses alone and that employers have a role in the development of those skills when new graduates enter workforce.

It was shown in my study findings that IT graduates believe they acquire some of the professional skills they needed for their jobs from their on the job experiences. This is an indication that employers’ expectation that universities are solely responsible for work ready graduates is somewhat unreasonable. Employers’ responsibilities to support new graduates during the transition from study to work using training and other support mechanisms (Crebert et al., 2004b) are also ignored. Atkins (1999) argues, “it is possible that employer’s criticisms of the shortcomings of graduate recruits are not so much a result of failure in the university curriculum, as of failure in the transfer process.”

6.4.1 Curriculum changes alone cannot address the work readiness of IT graduates

University IT curricula have undergone numerous changes over the years to cope with industry changes including employer requirements. Curriculum changes are complex and such changes alone cannot yield the qualities that the current age of supercomplexity requires (Barnett, 2000a; 2000b). He describes curriculum using nine dimensions and three elements. The dimensions are:
• Internal and external;
• Epistemological, practical and ontological;
• Truth and performance;
• Managerial, academic and market;
• Local, national and global;
• Past, present and future orientations;
• Context-specific and context-generic;
• Endorsing and critical orientations; and
• Reflexivity and the promotion of self

and the three elements of curriculum are:

• Skills;
• Markets; and
• Knowledge;

A detailed discussion on supercomplexity and curricula is covered in Section 6.1. Barnett states that the real complexity arises when cross cuttings occur when these dimensions and elements enter the curriculum in numerous and inchoate ways. He states that as industry involvement in framing problems for study programs increases, (including concerns about curricula and how they address graduate attributes), preparation for work emerges stronger than ever. Those factors that influence curriculum changes (Barnett, 2000a; 2000b) are highlighted in Figure 6.3.

![Figure 6.3 Forces that impact curriculum change (Barnett, 2000a, 2000b)]
Universities have a challenging task in perceiving the world of change and responding to social and global changes. Dynamics between the curriculum and its total environment have to be taken into effect. Hence, it is justifiable to state that although some curriculum changes can occur, such changes alone are unlikely to address all of the concerns employers have about the professional skills of IT graduates.

Yorke (2006) concurs stating that employability related learning occurs at the workplace not at university. Unless there are agreements between employers and universities that promote the use of sandwich programs or multiple periods of work experience, employability skills are hard to develop. However, it is not always possible to have such work placement programs for all university degrees. Before examining the role and responsibilities employers could have in the development of professional skills, questions must be raised about how realistic employers’ expectations of graduates and their university preparation are.

Employers also have different conceptions of competence. This is confusing for graduates. For some employers, competence could be construed as ready to start work based training. For others it is being highly reliable and proficient. McMahon and Carter’s (1990) *The Great Training Robbery* defines competencies in a two-stage process. Job analysis is the first level in which the tasks and activities are analysed. Skill analysis is the second level in which the key competencies required to perform those tasks and activities for a job are analysed.

The questions that arise from Crebert et al.’s (2004a, 2004b) study and, to some extent, my study, are concerned with the role of employers in assisting graduates during the transition from university to work and whether employers have realistic expectations. It is inevitable that there will always be a discrepancy between what employers would ideally like (a graduate perfectly attuned to their needs) and what universities can reasonably supply. Perhaps employers should change their thinking and develop realistic expectations that the graduates need to be inducted into their particular organisation’s culture and given support to succeed (Yorke, 2006). It is unlikely that universities can meet employer expectations on their own. As a result, it is inevitable that employers will be dissatisfied if they are not
prepared to contribute to the development of professional skills of graduates when graduates first enter the workforce.

6.4.2 Development of some professional skills takes time and new IT graduates are learners in workplaces

Some employers assume that certain professional skills are sufficiently developed at university when they really need to be further developed at workplaces (Eraut, 1994). For example, ‘communication’ is one such where graduates and professionals are expected to master this skill during university. Thus the need for the further development of ‘communication’ is generally denied the attention it deserves. A map of what is actually covered under ‘communication’ within a particular profession will reveal that many contextualised communication related issues are not covered in formal education. Some findings that arose from my study are the use of language for different purposes, communication with senior colleagues and people from different cultures, communication while working in a group and the timing of communication in a project. IT graduates from my study indicated that communication skills can be improved by practice with feedback. They also need to be tuned to person and context and this includes ‘reading situations’ and communicating. For example, while communicating with a client, IT graduates need to use intelligible vocabulary, ascertain what information is most needed by the client and relate it to the client’s level of understanding, listen with care and translate information to a form the client can understand. Several interpersonal processes and skills come into play and they need to be developed through many such client interactions as well as drawing on the propositional knowledge graduates acquire from their IT studies.

Critical thinking skills, conflict resolution skills and project management skills take time to develop. It is not sufficient to assess such skills in a subject at university and decide that the students have acquired those skills (Yorke and Knight, 2006). For example, the pressure of variables such as scope, budgets and due dates can be realised only at workplaces as these constraints are usually artificial in university subjects. If students miss an assignment due date they might lose some marks but in workplaces a missed due date can have a dramatic effect on their career. It is suggested by such an example that graduates slowly develop and acquire these workplace skills through their on the job experiences. Yorke (2006) states that employability skills are not just applicable for new graduates. They are equally
applicable for experienced workers, as employability skills need to be continuously refreshed throughout a person’s working life.

Dreyfus and Dreyfus (1986) developed a model of skill acquisition. They say that skills are acquired in five levels namely: novice, advanced beginner, competent, proficient and expert. An emphasis on perception and decision making at each level rather than routinised action is placed in their model (Table 6.3). In discussing this model, Eraut (1994) raises the questions:

- What is best learned in higher education?
- What is best learned in professional practice? and
- What is best learned through an integrated course involving both contexts?

**Table 6.3** Dreyfus’ s model of skills acquisition
(Dreyfus and Dreyfus, 1986; Eraut, 1994)

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Novice</th>
<th>Rigid adherence to taught rules or plans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Little situational perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No discretionary judgment</td>
</tr>
<tr>
<td>Level 2</td>
<td>Advanced Beginner</td>
<td>Guidelines for action based on attributes or aspects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Situational perception is limited</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All attributes and aspects are treated separately and given equal importance</td>
</tr>
<tr>
<td>Level 3</td>
<td>Competent</td>
<td>Coping with crowdedness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sees actions at least partially as longer term goals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conscious deliberate planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standardised and routinised procedures</td>
</tr>
<tr>
<td>Level 4</td>
<td>Proficient</td>
<td>Sees situations holistically rather than in terms of aspects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sees what is most important in a situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceives deviations from the normal pattern</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision-making less laboured</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uses maxims for guidance, whose meaning varies according to the situation</td>
</tr>
<tr>
<td>Level 5</td>
<td>Expert</td>
<td>No longer relies on rules, guidelines or maxims</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intuitive grasp of situations based on deep tacit understanding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analytic approaches used only in novel situation or when problems occur</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vision of what is possible</td>
</tr>
</tbody>
</table>

Where possible, Eraut recommends less time gap between theory and practice. For example, significant interaction between teaching and professional workplaces is needed for a well-planned and integrated project at university. It is also an opportunity for graduates to practise the process knowledge and prepositional knowledge they have learned.
at university. Further, Eraut states that the time required for learning propositional knowledge is considerable as is the time required to learn how to use it (some is suitable for learning after qualification). The quality of professional performance can be developed through learning from practical experience and progress considered from competence to proficiency to expertise. In IT, a direct responsibility is placed on employers to assist graduates progress from novice to higher levels.

IT graduates in my study gave as an example that compared with the time they had for decision making during projects at university, they had to make decisions more quickly at work with little time for reflection when solving problems and that they needed to use several strategies. They indicated that they became better at decision making and self-reflection after some work experience. An argument of Hammonds’ (1980) cognitive continuum theory is that most thinking is neither purely intuitive nor purely analytical. Similarly, Schon (1983) states that professionals are intuitive as well as self-reflective of what they do.

My study findings show that both time and speed are essential in graduates’ professional work. According to Eraut (1994), exercising some skills take time but they also need to be supported with appropriate speed. The link between speed and mode of cognition is shown in Table 6.4.

<table>
<thead>
<tr>
<th>Speed – Time</th>
<th>Analysis</th>
<th>Instant recognition</th>
<th>Rapid interpretation</th>
<th>Deliberative analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision</td>
<td>Instant response</td>
<td>Rapid decisions</td>
<td>Deliberative decisions</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Routinised unreflective action</td>
<td>Action monitored by reflection</td>
<td>Action following a period of deliberation</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.4 Link between speed and mode of cognition (Eraut, 1994)
For example, Eraut states that good written and oral communication requires both time and skill as oral communication is guided by rapid intuitive decisions while written communication is a deliberative process. In relation to written communication skills, Eraut states that how people respond to a graduate’s report is the measure of the real outcome of whether a graduate has been able to or knows how to influence their audiences. Again, it takes time for graduates to develop such skills.

Employers need to understand that competence in IT graduates should be viewed as an end point of a qualification (achievement of a Bachelor degree) but not necessarily a state of mastery (Eraut, 1994). Pearson (1984) defines competence as knowing how to do something competently in a continuous spectrum ranging from knowing how to do something at one end to knowing how to do something well at the other. Yorke and Knight (2006) discuss four conclusions from social and cognitive psychology that suggest that any skill development takes time (months and years of practice) and that students need to understand what they need to learn to understand, and have the ability to judge what they have achieved and assess further areas for improvement.

For IT graduates, professional competence is affected by the range of tasks they do, roles they take on and the different challenging situations they face and the quality of their work. According to Oakeshott (1962) and Aristotle (1908), technical knowledge (i.e. theoretical knowledge expressed in books) can be codified but practical knowledge can be learned only through experience with practice. Graduate performance and quality of work will develop only as experience is gained on the job. The argument that universities alone are not responsible for the development of professional skills of graduates is supported by such a finding. One way in which employers could support graduates is to help graduates learn in the workplace. However, both employers and universities have a general expectation that graduates will learn from their own experience whether employers help or not.

Several IT graduates in my study indicated during their interviews that they need to learn many things in order to perform in their work roles. For some there was peer support and for others there was nothing but the pressure to perform and meet due dates. Polach (2004) states that in relation to performance, graduates need to be taught to expect to focus first year goals on more than just productivity as knowledge and skills development are also essential. Many graduates in their study wanted to start contributing straightaway. Others
allowed sufficient time to understand the bigger picture in which their role fitted and asked
more questions or observed others at work before they could become productive and form
their own identity. New graduates need to understand that although they may have gained
experience they are still learning in an informal way in the workforce. Rhodes and
Scheeres (2003) discuss the impact of training programs on post-modern workers and the
tensions they create in relation to worker identity.

Worker identity is not a case of isolating or elaborating the
existence of ‘new’ workers or ‘new’ training programmes as
designed in neatly defined courses. Instead it is one of engaging in
an understanding of the continuities, discontinuities and
contestations over identity; particularly in terms of how learning is
complicit in this process

Understanding graduate workers as learners is possible by increasing the understanding of
how people navigate between work and learning at work. Elements such as work,
experience and learning, performance and practice can be bound together (instead of
tension between them) if such elements are by facilitated and linked to each other properly
(Beckett and Hager, 2002). Hodkinson and Hodkinson (2004) claim that worker learning
occurs firstly, at the social level, secondly, at the workplace level and thirdly, at an
individual level. While these findings are applicable to all employers trying to understand
their workers as learners, they provide a strong argument and approaches for IT employers
to support graduates.

However, learning and work can be related in three ways (Seagraves et al., 1996) and
choosing the right learning approach is dependent on understanding the how, where and
when learning occurs.

- Learning for work (general vocational education);
- Learning at work (in-house education and training); and
- Learning through work (application of job related knowledge and skills to tasks
  and processes).

Rossin and Hyland (2003) believe that in higher education, learning for work can be
achieved through a combination of learning at work and learning through work. This view
is applicable to IT education. Additionally, Barnett (2002) believes that work and learning are not synonymous but that the two concepts overlap.

work can and should offer learning opportunities … the challenge here is that of bringing about the greatest overlap between work and learning

It is challenging for employers to manage and facilitate learning opportunities at work but IT employers’ commitment to understanding their workers as learners and supporting their learning from work during the first few years of their employment could greatly assist the development of professional skills of IT graduates.

6.4.3 What employers could be responsible for

6.4.3.1 Training IT graduates when they commence work

The implication from the previous subsections is that employers who demand skills from graduates have a responsibility to support the training of IT graduates when they commence work with their organisation. The question then becomes why is there resistance from employers to such support mechanisms? Raybould and Sheedy (2005) believe many employers are reluctant to invest in training because they are uncertain about the return on their investment of time and cost. Some avoid this investment by using the off shore services of experienced IT workers rather than inexperienced graduates. Employer attitudes range from the extreme of “work is not university” and provide no training while others offer extensive support for continuing professional development (Crebert et al., 2004a, 2004b). The latter view the training of graduates as a long-term investment and are willing to train graduates and accept responsibility for them 2-3 years after graduation (Chambers and Clark, 2009).

Personnel and systems for such support can be provided by larger organisations. However, small organisations are not normally able to provide such support mechanisms. Some of the benefits for employers if they invest in new employee training and induction support include staff loyalty and retention, the development of a skill base and a pool of future managers who have fresh ideas to grow the organisation. Disadvantages are that after
considerable investment in teaching an employee, that employee may decide to move elsewhere or be poached.

New employees need assistance to understand their own ‘identity’ in the organisation. Training programs alone are inadequate for the development of such identities. Rhodes and Scheeres (2003) state that the complexity of the ‘new’ worker cannot be constructed through learning and development programmes alone. They call for good engagement and interactions with a new employee because identity develops as a result of interaction happening between individuals and organisations. On most occasions, employers can overcome tensions at workplaces by customising training to suit new graduates. Rhodes and Scheeres present a case study, where in a training program, it was noted that on several occasions the workers were interested in discussing the organisation’s actual practices and culture which contradicted the training objectives. Tensions surfaced on topics such as organisational ethics and being able to speak openly in the company. The need for training programs to reflect a fit between the employee and the organisational culture is shown in this example. Rhodes and Scheeres say that at some workplaces, employee identity is in contestation with workplace realities and conflicting discourses. They recommend that training programs of organisations should focus on who the workers are or should or could be and develop their knowledge and skills to suit these work roles. IT employers need to ensure that any training programs scheduled for new IT graduate workers are customised to fit the employee and the organisation’s culture. Those IT graduates in my study that took part in such training or induction programs greatly valued them. The others who did not have such opportunities felt they could have benefited from such training programs.

Some organisations have a single new employee orientation. This is inappropriate as it takes considerable time for a graduate to evolve from novice to mature worker (Raybould and Sheedy, 2005). Employers should support graduates for a period of one or two years and assist them in the socialisation processes during this time. Raybould and Sheedy also suggest that after the initial training period, graduates should undergo a training needs analysis with their employers in relation to the requirements of their role. Then a training plan could be prepared for their professional development. They believe that skills are enhanced not only from attending training but also as a result of a mixture of learning and
development approaches. Such a competency-based focus is said to be effective in developing a new employee professionally.

Graduates develop many of their job competencies in their posts after they have been appointed (Elkin, 1990). An effective approach is for employers to use continuous professional development mechanisms designed in or around workplaces to develop professionals after they have left university. Sanders (2001) states that competencies are areas of knowledge or skill that are critical for producing key outputs in an organisation. There are two types of competencies, individual competencies (that are attained by an individual) and organisational competencies (that apply across an organisation). Therefore, in developing a graduate professionally, employers should consider developing the graduate’s individual as well as organisational competencies.

In the IT industry, workplace requirements vary based on the priorities of the business, scope, budget and timelines associated with a work task or project. Workplaces and workers who share the same understanding of the requirements of the work have a better chance of performing effectively. IT graduates in my study needed both individual and organisational competencies to perform effectively in their roles. For some graduates, support to develop these competencies came from employer sources but others had to fall back on personal initiatives.

Designing training programs 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.

**6.4.3.2 Facilitating workplace learning and organisational learning**

Another way of assisting new graduates to settle in to their roles in the initial years of employment and enhance their work performance is to facilitate their learning at work and from work. Billett (2000) discusses three perspectives in deciding work performance - *generic skills, cognitive skills and socio-cultural views*. Generic knowledge learned at university can be transferable to workplaces if it includes employer feedback about what is required. An individual’s expertise, level of experience and the ability to respond to routine or non-routine tasks, etc. is included in cognitive perspective. This is dependent on
an individual’s personal abilities. The already existing concepts of generic and cognitive views are enriched by the socio-cultural perspective to provide a much-needed understanding of situations and circumstances. This understanding assists in determining what makes an individual smart in their particular workplace or work practice. Those situational factors that surround the common attributes and domains of knowledge in workplace and work practice are accounted for by the socio-cultural view. Again, this ability in new graduates can be developed only over a period of time.

Employer programs such as succession planning, mentoring, performance development, career development, corporate culture programs, 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). ‘Workplace learning’ is automatically associated with ‘learning more of good habits and becoming experienced (with good)’ with less focus on acknowledging learning ‘bad’ habits (Hodkinson and Hodkinson, 2004). IT employers should facilitate such learning experiences and highlight good as well as bad practices to new IT graduates.

![Figure 6.4 Dubin’s model of technical updating (Dubin, 1990; Eraut, 1994)](image)

According to Dubin (1990), a positive work environment can facilitate the maintenance of competence and employers have a responsibility towards the professional development of
their employees. The factors that affect graduates’ motivation to keep up-to-date are described in his model (Figure 6.4). It is suggested in the model that a motivated individual in a positive work environment is likely to perform better and develop competencies. All IT 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. Some graduates appreciated employers’ enthusiasm to listen to their requests for professional development while other graduates found it challenging to seek employer interest and support.

Eraut (1994) says that there seems to be a tendency for professional development to place a focus on ‘new’ aspects of professional work rather than improving the quality of current professional performance. He believes this attitude discourages learning from the experience of problems and cases and makes continuing professional development separate, unintegrated and using professional knowledge only minimally. IT employers can focus graduates’ professional development on cases and problems from graduates’ work experiences to improve the quality of graduates’ performances instead of simply focusing on new aspects of their professional work roles. The confidence of the graduates could be developed as a result of such an approach.

Some of the factors that employers should consider in the development of professional learning frameworks include the various learning settings (on the job, home, library, course), the availability of time for study, consultation and reflection, availability of suitable learning resources, people who are prepared and willing to provide support and also the learner’s own capacity to learn (Eraut, 1994). Another factor in organisational learning is socialisation at work.

6.4.3.3 Increasing work socialisation

There is some evidence from my study that several graduates develop their professional skills from social sources (in Chapter 5) such as friends, sports and family and social networks. Friendships are important for new graduates and play a major factor in determining if graduates would like to stay or leave their employer. Rose (1985) studied 90 recent graduates and identified seven functions of their friendships: acceptence, help, loyalty, availability, recognition, intimacy and companionship and nine methods for the
formation and maintenance of friendships. These included physical proximity, demonstration of concern, willingness to make sacrifices, length of contact, sharing of ideas, and commonality of interests, initiation of affection, sexual interests and willingness to form friendships. Polach (2004) recommends more socialisation support for young graduates. Some suggestions are holding work barbecues, 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.

Employers could also use their human resources (HR) department for supporting graduate workers during transition and work socialisation. Holton (1995) suggests that human resources departments in all organisations should find a way to tap graduates’ desire to contribute quickly and hence increase both individual and organisational productivity. It is beneficial for the organisation to consider identifying areas where graduates are struggling and excelling. Some of the approaches could be to use graduates hired in previous years to provide peer mentoring to new graduates, provide specific ongoing job related feedback and provide continuous professional development support for learning about work tasks and social acculturation (Polach, 2004).

IT graduates I interviewed 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 professional skills they needed for their work. Jones (1986) classified individualised socialisation methods as informal, variable and random and as higher innovative role orientation versus collective socialisation requiring all graduates to go through common learning experiences. Gardner and Lambert (1993) studied the socialisation process of recent graduates and found that women socialise more quickly. New graduates use a variety of techniques to gather information including technical information by asking or by observation. Role related information is gathered from supervisors and social information is gathered from peers (Morrison, 1993).

The uneasiness of new employees during early months can be addressed if there are some general guidelines provided to them when they commence work so they know what to expect and what the organisation’s expects (Polach, 2004). It could be a simple list posted on the company’s intranet with learning outcomes for the year in stages and peer mentor details. HR departments can also assist with organisational socialisation. According to Van
Maanen and Schein (1979), “Organisational socialisation refers to the fashion in which an individual is taught and learns what behaviours and perspectives are customary and desirable within the work setting as well as what ones are not.” Organisational socialisation has three domains (Shibutani, 1962; Van Maanen and Schein, 1979) and they are:

- Understanding the functional domain (production, sales, finance …);
- Hierarchical domain (layers or reporting relationships); and
- Inclusionary domain (social fabric or interpersonal characteristics of organisational life).

New graduates need assistance to understand the functional units of the organisation they are working for to maximise the utility of the services available within the organisation. I found in the study that graduates need to respect the hierarchical layers and follow reporting relationships to maintain a professional relationship with their peers and managers.

Polach (2004) describes the six dimensions of the socialisation process for individuals as:

- Collective (e.g. involves group induction training for graduates, boot camps) versus individual (e.g. internships);
- Formal (conducted in academic, professional situations) versus informal (in relaxed settings);
- Sequential (for example becoming a doctor involves going through some stages) versus variable (becoming a manager can be random);
- Fixed (more certainty in expectations) versus variable (processes give less clues about when to expect something);
- Serial (experienced members are role models for new comers) versus disjunctive (no role models, e.g., women entering a profession dominated by men); and
- Investiture (ratify a newcomer’s personal characteristics) versus divestiture (deny or strip away newcomer’s personal characteristics e.g., bullying and harassment from experienced workers).
The different socialisation processes that could be a part of an organisation’s culture are shown in the dimensions listed above. Polach also suggests using hermeneutic phenomenology (capture essences of a phenomenon) to uncover graduates’ experiences. His findings were grounded in three themes namely,

- **Work environment** – He found that graduates in his study were surprised and relieved at the easy going work environment, frustrated that there was a lot to learn and the absence of a structured learning pathway or support. He also found that graduates like flexible and low stress environments. In my study I found that there is very little support for IT graduates during their initial years and some struggle because of the absence of formal learning structure or mentoring. IT employers should learn from these experiences and as discussed in the previous Section consider providing a positive work environment with the support of their human resources department.

- **Friendships** – Polach found that the graduates he studied spent 40 hours per week at work versus 20 hours per week at university and there were differences in making friends. He also found that friendship is significant to feeling settled and belonging and graduates move from one job to another to find a better sense of belonging. IT graduates in my study did not mention directly that friendships were important for them at work. However, this issue was discussed indirectly when they said that friendships are a source for developing their professional skills and for maintaining healthy professional relationships.

- **Performance** – New graduates are unsure of their performance due to lack of feedback when they commence work. Graduates also felt guilty about not producing much at work during the initial months. However they feel that they were contributing after few months or a year and this leads to personal satisfaction and growth (Polach, 2004). IT graduates from my study also feel that they could benefit from more feedback from their employers. Some peers and managers were too busy to provide any feedback while others provided consistent feedback and mentoring. IT employers need to take note of this and provide more structured learning pathways for graduates so they can become productive earlier than later.
A community of practice is a group of people who come together over a common interest to form a specific direction of focus in order to action issues by employing critical enquiry based on systematically collected evidence. They are important for maintaining successful practitioner inquiry (Groundwater-Smith and Dadds, 2004). The development of IT graduates’ professional networking skills, confidence in debating or discussing issues, sharing of ideas and strategies and study experiences can be achieved through establishment of such communities in the workplace.

In summary, employers can do many things to make the transition from studies to work smoother for IT graduates. First, IT employers should take some responsibility to provide graduates with comprehensive exposure to the whole organisation not just the departments they will be working for and to assist graduates to interact with other organisational units and understand the contribution made by each of the organisational units. Second, dedicated and customised training programs should be provided for all new IT graduates. IT employers should also consider placing graduates into training roles when they commence work instead of placing them into fully-fledged work roles. Third, the ‘cohort’ effect is enhanced by work socialisation, which makes graduates feel that they are a part of a bigger picture than their own department. Fourth, employers should develop strong relationships and involvement with education institutions, career consultancies and training firms using mentoring programs and university-employer sponsorships to assist graduates become work ready. Employers can also form partnerships with universities by offering work placements to undergraduates. This important role is discussed in the next Section.

6.5 Certain IT work skills are difficult to develop except on real world sites

From earlier chapters, it is clear that the transition from the world of higher education into the world of work is complex. Preparation can occur through university studies, co-curricular and extra-curricular activities, as well as professional work experiences acquired through work placements and on the job experience. Such experience can be gathered through semester break or vacation work placements, internships (in the form of a subject) and work shadowing options.
The graduates who did work placements found it the most useful part of their IT studies to prepare them for employment and help develop many of the work ready skills they require. Through such work experiences students can see their own progress and the development of personal skills such as self-confidence, independence and self-reflection. Experiential learning is learning from experience, a key adult form of education/andragogy. Scott et al. (2004) discuss experiential learning (this is what graduates who go into work placement and subsequent employment may be able to obtain) as a valuable addition to generic skills development and professional development. A foundation for new ideas, development of a new sense of self, extension of experience beyond academic learning and assistance for students to critique their own experience are some advantages of experiential learning. Through such experiences the capabilities of individuals can be enhanced to support the creation of a strong, confident and smart workforce. Multiple skills can be developed through multiple placements in different organisations. Many employers view work placements as a potential source of staff. Others may need incentives such as development opportunities for their senior supervising staff to take on such placements.

IT graduates in my study indicate that they need many business skills at work and that those skills were not developed sufficiently at university particularly in areas such as understanding business needs and knowledge of organisational procedures. The development of some of these skills can occur through work placement experiences.

6.5.1 Work placement and experience opportunities offer opportunities for the development of professional skills

A pathway between studies and the world of work is provided by work placement. The benefits are:

- Exposure to IT workplace culture and practices;
- First hand experience of how IT teams work and being a part of one;
- Opportunities to develop key skills such as communication and time management;
- Opportunities to work with people from different cultures and non-IT backgrounds;
- Building of networking skills with other IT professionals;
- Enabling students to take responsibility for their own work; and
• The putting of theory into practice.

There is strong evidence in the literature and from my study to support the claim that through work placement students are offered the chance to develop the abilities they need for employment, exposure to workplace culture and to become more reflective more quickly (Harvey, 1997). Hence a platform of consolidation and a springboard of opportunities (Crebert et al., 2004a) are provided by work placements.

If the numbers of work placement opportunities could be increased, IT graduates would gain the opportunity to develop different skills by possibly working with employers with different cultures or in large, small and medium sized companies. For example, in a small enterprise, individuals might be required to work in many different roles (technical and non-technical) while large employers may be able to provide more experiences of teamwork or well-defined roles and tasks.

6.5.1.1 Linking theory and practice and learning on the job

Many graduates feel their university studies should have more emphasis on practical, real-world examples that are applicable to small and medium sized organisations. Students are assisted by work placement to connect theory and practice and to engage in self-reflective learning with feedback from academic and workplace supervisors (Shruptrine and Willenborg, 1998; Harvey, 1999; Maher, 2004; Crebert et al., 2004a).

Practice or work based learning was often regarded as ‘informal’ when it occurred at a work site where it is difficult to observe. However, universities have moved away from thinking that workplaces are not the place for education or learning and started acknowledging that some work ready skills can be developed only at workplaces. More research is needed to study and explore the ‘learning’ that occurs at practice sites and how that can be understood (or quantified) and what challenges it presents for universities, employers and graduates.

6.5.1.2 Developing employability and work ready skill sets

Harvey (1999) highlighted that it is ‘graduate attribute’ variables that determine a graduate’s success in the workplace rather than a specific degree. Work placement is seen
as a model in which students learn principles of lifelong learning, situated learning and transformative learning. Students are provided with a sense of real life workplace settings and helped to exercise their disciplinary knowledge as well as their personal skills in a combination to achieve the employer/client needs. However, Harvey suggests that those graduates who become aware of workplace expectations also become demoralised as they may think they are unable to meet the needs of employers. The self-confidence of graduates can be affected as a result of this. The possibility that sometimes employers have unrealistic expectations and are themselves unclear in their own minds about what to expect in graduates cannot be ruled out.

It was found in a recent study by the Australian Learning and Teaching Council (ALTC) that Australia’s ICT graduates are technically proficient but not work ready (ACSF, 2009). The study reported that 70% of the ICT graduates wished they had undertaken more work experience at university and this observation aligns with most graduate views including my research on work experience and its relevance to work readiness. The professional body, the Australian Computer Society promotes mandatory work-integrated learning for all ICT students to develop their work ready skills. Another initiative in this direction is the national internship scheme advocated by the Australian Universities Vice-Chancellors’ 2008 paper to enhance the skills and work readiness of all Australian university graduates. The need for the increasing recognition of knowledge growth via learning by doing (at workplaces) in addition to the knowledge acquired from university studies is supported by these initiatives.

As we have seen in Chapter 2, it has been suggested in several studies that generic or work ready skills are more important in the work environment than discipline-based knowledge. Crebert et al. (2004a) state that graduates believe their workplace learning occurs through collaborative works, their own mistakes, and interaction with colleagues. They conclude that work placement plays a vital role in the preparation of graduates for employment. In my study, many graduates had learned their work ready skills from being “thrown in to the deep end” and “sink or swim” situations rather than through formal learning opportunities such as induction or mentoring programs and continuing professional development courses.
6.5.1.3 Facilitating work placement experiences

Provision of work placement opportunities alone is insufficient. The quality of a student’s work placement learning experiences is dependent on effective liaison between an academic supervisor and industry supervisors (Harvey et al., 1997). Yorke and Knight (2006) state that reports on student experience have previously counted for little in the final award hence marginalising the experience. In IT degrees, a year of placement or distributed placement experience during the study years is sometimes offered by so-called ‘Sandwich degrees’. Such degrees have the potential to successfully incorporate work based learning within the curriculum. However, accreditation of the learning from placement periods has been difficult (Yorke and Knight, 2002). They recommend that work experience be a separate component of a degree requiring students to produce a satisfactory report accepted by both the workplace supervisor and academic tutor. However, they acknowledge the practical problems involved because employer and academic schedules do not dovetail and small companies may be unable to afford the costs and time associated with such partnership commitments.

Both employers and universities need to manage work placements. Sleap and Reed (2006) stress the need to examine how the work placement is contributing to student learning outcomes. There are questions as to whether some work placement experiences transfer to other work environments.

6.5.1.4 Encouraging part-time employment in parallel with university studies

Students could be encouraged by universities to undertake part-time employment while they are studying. Any part-time work opportunities whether related to IT, or not, have the potential to provide students with many of the work ready skills they require at IT workplaces. Although, there is evidence that the additional burden of part-time employment can adversely affect graduates’ academic performance (Barke et al., 2000), it can be viewed as a learning opportunity rather than as a threat (Yorke and Knight, 2006). The relevance of studies to employment scenarios becomes more evident when graduates can see the knowledge they have gained from their studies has the potential to go beyond the subject or the degree (Yorke and Knight, 2006). IT graduates in my study said many of the professional skills they need were acquired from previous careers or work experiences whether related to IT or not. Work experience with large and small employers is equally
important. IT employers are interested in all work experience whether IT-related or not. It is essential for graduates to sell the learning from all their work experience to prospective employers.

6.5.1.5 Providing work based learning (WBL) options

Work based learning can serve both as a mode and field of study (Costley and Armsby, 2007). IT courses are familiar with the concept of WBL as a mode of study through work experience, sandwich courses and placements to gain practical knowledge about existing curricula. In this case, the work based learning option uses a theory-led approach where students learn the theory and then undertake work placements to see the application of theory to practice. Another approach to work based learning occurs using a practice-led approach where students are already workers and learn the theory behind the application.

Typically IT students who undertake work placements or internships need to meet assessment criteria set by their university academics. The normal approach is theory-led. The second approach departs substantially from the disciplinary framework of university study (Boud and Solomon, 2001). Knowledge can be presented and produced by the students guided by university staff and accredited or assessed according to broad applied learning descriptors (Costley and Armsby, 2007). However, they argue that both work based learning options share similar approaches to knowledge and understanding generated outside university and in the context of practice.

Partnership programs (involving university and employers in the design and assessment of learning) and individual learning programs customised to every worker are some popular models of work based learning. Partnership programs can also use a novel approach where subjects are taught in or outside the university. WBL is described by the university association for lifelong learning, Work Based Learning Network (2004) as ‘learning for, in and through paid and unpaid work’. Boud and Solomon (2001) state that work based learning falls within the paradigm of lifelong learning and learner centric and practice-led approaches. The role of the university moves slightly between the two approaches. The university assumes the role of knowledge provider when a subject curriculum for people at work is used by the work based learning option. When a curriculum of the workplace is used as work based learning option the university assumes the role of knowledge
facilitator. However, this approach will work only when employers fully support this idea, the individuals involved have appropriate work patterns (full-time or part-time permanent as opposed to contract positions) and supervisors from university are willing to facilitate the learning process. Opportunities for various forms of work based learning are often provided through professional associations such as the Australian Computer Society (ACS).

6.5.2 The role of professional associations in the professional skills development of IT graduates

The primary objective of the ACS is to represent IT professionals’ views to government, industry and the community. However, they are also engaged in providing IT professionals and IT students with opportunities for professional development and professional networking and certifications. The ACS is active in gathering information pertaining to employment, course enrolments and skills shortages in the IT discipline. Their findings then form the basis for their recommendations to the industry, government and universities. ACS has a major role to play in the IT education sector, as the body in charge of accrediting IT courses at Australian Universities using the ACS Core Body of Knowledge (CBOK).

6.5.2.1 Increasing IT students’ exposure to IT industry through scholarship and research and job ready programs

The ACS established the ACS foundation (ACS F) in 2001 and introduced two scholarship schemes aimed at the development of IT graduates (ACS F, 2010). Grow a Graduate is an ACS F initiative where a donor organisation provides a scholarship for a student to undertake an IT course and identifies the specific skills they expect the graduate to have upon completion of the course.

Work Integrated Learning is another initiative of ACS F where a donor organisation provides financial assistance for an undergraduate student to acquire experience in the workplace on a full-time basis for up to 48 weeks. The ACS F has raised over $24 million in contributions since 2001 and IT employers have enthusiastically supported these programs which assist both graduates and employers to understand each other and develop appropriate expectations before recruitment into graduate IT positions.
The ACS has been involved in developing and implementing Professional Year programs specifically for international students who have graduated with an Australian IT degree and are seeking permanent residency in Australia (ACS, 2008h). In this program international graduates are allowed to work with a host company in Australia as an intern for a period to understand the culture and workplace ethics of Australian workplaces. Overseas students benefit from local work experience while IT employers have access to a valuable source of potential employees. Students learn about effective communication, work safety, Australian legislative requirements, teamwork, providing effective service to clients and applying occupation specific skills and knowledge to complex professional situations. This program, although developed for overseas students, is open for all IT graduates.

Programs such as the ACS Bootcamp help young members kick start their career. The ACS’s involvement in funding professional development programs such as ‘from graduation to employment’ also provides a much needed boost to the employment prospects of final year university students and recent graduates (ACS, 2005a). Graduates are taught how to prepare for an interview, learn to tap into the hidden job market, network with other graduates and gain insight into skills needed for success in the workforce, where the industry is heading and how to best leverage their skills within the framework. Workforce issues not covered in university studies such as organisational culture and the management of workload are also covered.

The ACS Computer Professional Education Program (CPEP) program 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 more experienced mentor. CPEP can also be used as a pathway to gain professional membership in the ACS.

These ACS initiatives seem to provide the support that many IT graduates are seeking both during their university studies and beyond graduation to help develop their professional skills.
6.5.2.2 Making recommendations to the government and employers on issues that matter most for IT professionals and profession

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. In the ACS (2005c) survey, the top priorities for ICT professionals were: employment (67%), education and training (51%), professional networking (43%), offshoring (42%) and policy development. Education and the development of a skills base that would enable Australia to play a significant role in the global information economy were identified in a related ACS Media Release (2005d) as key issues for the ICT profession in the lead up to the then federal election. About half the ACS member respondents agreed that education and skills development are significant to Australia’s future.

Recently, an ACS (2010c) response to the 2010-11 federal budget, called for the technology sector to be identified as an area of specific economic focus. The ACS CEO stated that the ACS would like to see some progress on matters such as: 1) incentives for employers who host students as part of Work Integrated Learning schemes 2) HECS (Higher Education Contributory Scheme) relief for students who plan to undertake extra year of study in order to gain work experience and 3) additional support for universities to extend their courses to provide opportunities for work experience and internships. There is no direct contribution to the development of professional skills of IT graduates from such representations or recommendations. However, there is an indirect contribution because of the potential to encourage IT employers, graduates, universities and government bodies to work collaboratively in order to address concerns of the IT profession and IT professionals.

The ACS could encourage employers to assume some responsibility for the professional skills development of IT graduates rather than relying entirely on universities to prepare work ready graduates. There was a warning in the ACS (2005d) media release that ICT workers’ skills will become outdated over a five year period unless employers initiate professional training. This appears to be an indication of a lack of commitment and/or willingness of some ICT employers to contribute to the upgrading of the skills of the future workforce. Further, the ACS recommended that workers should not rely on their employers to stay up-to-date with technical advances in the market.
In my study, gender domination, maintaining professional relationships with seniors and peers, lack of trust in recent graduates, lack of professional development opportunities and cultural awareness are problematic areas for IT graduates. ACS surveys are a vehicle for professionals to voice their concerns so the industry as a whole can deal with those issues.

6.5.2.3 Using the course accreditation processes to ensure that IT program design focuses on the development of IT professionals rather than using a strictly curriculum-driven approach

Another function of the ACS is accreditation of IT courses at Australian universities in conjunction with senior IT academics. The skills of ICT professionals are defined in the Skills Framework for the Information Age (SFIA). This was developed by the SFIA foundation, consisting of a number of UK-based organisations and the British Computer Society (SFIA, 2008). The SFIA framework is widely used by accrediting bodies including the ACS to determine the skills attained by graduates of a study program (Von Konsky et al., 2008). The SFIA (2008) levels of autonomy and responsibility applicable to skills of IT professionals are shown in Table 6.5.

Table 6.5 SFIA levels of autonomy and responsibility

<table>
<thead>
<tr>
<th>SFIA Level</th>
<th>Description of the level of autonomy and responsibility</th>
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<tbody>
<tr>
<td>1</td>
<td>Follow</td>
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<td>2</td>
<td>Assist</td>
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<td>3</td>
<td>Apply</td>
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<td>4</td>
<td>Enable</td>
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<td>5</td>
<td>Ensure, advise</td>
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<tr>
<td>6</td>
<td>Instantiate, influence</td>
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<tr>
<td>7</td>
<td>Set strategy, inspire, mobilise</td>
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</table>

According to the ACS (2008i), an IT professional would be operating at levels equivalent to level 5 in their area of responsibility and it is expected that a new IT graduate from a Bachelor degree program would be ready to assume level 4 responsibilities in their area of specialisation.

The SFIA framework has two axes. The SFIA skills that apply to workplaces are represented in one axis. The skills are organised as categories and sub categories. The competence levels of IT practitioners are defined in the other axis. The SFIA framework is
shown in Figure 6.5. Unlike other professions where there is a postgraduate component of studies or work experience before graduates are accepted as professionals, IT graduates are generally considered by the IT industry and employers to be professionals upon graduation. A particular challenge is presented for graduates because employers expect them to be independent and fully competent to undertake their roles. However, in practice, such graduates need a longer time than the duration of their course to develop their professional skills, particularly when certain professional skills can be developed only on the job. SFIA levels that distinguish professionals at level 5 and graduates at level 4 are a step in the right direction to highlight to the industry that graduates need work experience before they progress to level 5 where they are considered to be full-fledged professionals.
### Framework summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory</th>
<th>Skill</th>
<th>Code</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
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<td>Information strategy</td>
<td>Corporate governance of IT, IRMG, ISCO, DBO, SCTY, INAS, IAN, ICPM</td>
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<td>CNSL</td>
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<td>Solution architecture, Emerging technology monitoring, Continuity management, Software development process improvement, Sustainability management for IT, Network planning, Methods and tools</td>
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Figure 6.5 SFIA Framework (Source: SFIA, 2010)

The current ACS framework for ICT program design is shown in Table 6.6.

### Table 6.6 ACS Framework for ICT program design as described in ACS (2008i)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory/Support</th>
<th>Skill</th>
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<th>5</th>
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<th>7</th>
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<td>Service strategy</td>
<td>IT management</td>
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<td>7</td>
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<td></td>
<td></td>
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</table>

**SKILL – Graduate skill sets (as defined in SFIA)**

<table>
<thead>
<tr>
<th><strong>CORE</strong> - Core Body of Knowledge</th>
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<tbody>
<tr>
<td>Technology building</td>
</tr>
<tr>
<td>Outcomes Management</td>
</tr>
<tr>
<td>ICT Problem Solving and</td>
</tr>
<tr>
<td>Professional Knowledge</td>
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<td>Technology Resources</td>
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<td>Services Management</td>
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<table>
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<tr>
<th><strong>SPEC</strong> - ICT Role Specific Knowledge</th>
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<tbody>
<tr>
<td>Additional knowledge building on one</td>
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<tr>
<td>or more of the core knowledge areas</td>
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<tr>
<td>Services Management</td>
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<table>
<thead>
<tr>
<th><strong>COMP</strong> - Complementary Knowledge</th>
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<tbody>
<tr>
<td>Knowledge from:</td>
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<tr>
<td>Business, Science, Engineering</td>
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<tr>
<td>Mathematics, Health, Psychology</td>
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<tr>
<td>Education, Government, Economics,</td>
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<tr>
<td>Statistics, Humanities, Arts</td>
</tr>
</tbody>
</table>
The ACS Framework for ICT program design framework has four blocks. It is implied in the \textit{SKILL} block of graduate skills that every program should identify the skills developed by its graduates including the level of autonomy and responsibility at which each skill is practised by graduates. The skill sets are defined in the SFIA framework.

The minimal fundamental knowledge required across all ICT programs of study is identified in the \textit{CORE} block of the Core Body of Knowledge. The core knowledge areas are less likely to change than specialised knowledge. The role of specific knowledge required based on a particular ICT discipline focus area is addressed in the \textit{SPEC} block. Advanced knowledge required for certain ICT specialist roles is included in the role specific knowledge. For example, a Business Analyst may need to have advanced understanding of database systems management. The \textit{COMP} block of Complementary Knowledge is of knowledge areas from outside ICT to support the graduate skill set (in the \textit{SKILL} block), enhance the employability of IT graduates and to prepare graduates to work as IT professionals in other industries such as banking, public administration, etc.

Many of my study findings are emphasised by the underlying principles and structure used in the SFIA framework (Figure 6.5) and the ACS framework for ICT program design (Table 6.6). For example, graduates need knowledge from other disciplines such as arts and business to perform their work roles. IT academics and IT graduates are encouraged (by the framework) to develop multidisciplinary knowledge and skills by collaborating with other disciplines in universities.

It is mandated by the 2008 ACS accreditation requirements that a significant capstone project is included in all IT degrees so that graduates can demonstrate both technical and professional skills required by employers. A major challenge for the IT profession lies not only in bringing together universities, employers and professional bodies and gaining their commitment to their responsibilities discussed in this chapter but also ensuring their expectations of each other are aligned.

\section*{6.6 Enhancing IT student learning and learning outcomes}

Fullan (2001) describes educational change as a technically simple and socially complex process because it is relatively easy to draw up a blueprint for changes but difficult to make the blueprint an operational reality. Several models for embedding employability skills
have been discussed in the past (Yorke, 2006). It is important to know that there is no ‘one size fits all’ solution. Curriculum designers need to consider four variables – student recruitment patterns, labour markets, contexts and traditions before making any curriculum changes. Yorke (2006) asks if student employability or work skills can be enhanced by improvement of the quality of student learning experiences in higher education.

Partially as a response to the Bradley review of the higher education (Bradley et al., 2008) in 2009, the Australian Government commissioned the Australian Learning and Teaching Council (ALTC) to work with discipline communities with a view to developing academic standards for learning and teaching. The aim of the resulting ALTC’s Discipline Scholars 2010 program is to enhance student learning and learning outcomes by working closely with the nation wide discipline specific bodies (ALTC, 2010a). The ALTC Discipline Scholars working on the Learning and Teaching Academic Standards Project (LTASP) for the Engineering and ICT sector developed five outcome areas for Engineering and ICT graduates (shown in Table 6.7) after consultation with the industry, academics, students, Engineers Australia and the Australian Computer Society (Cameron and Hadgraft, 2010).

According to an ALTC board member, Professor Daryl Le Grew (ALTC, 2010b)

Standards have not been well enough understood by the Australian community at large and the business community and this project will create the baseline expectations for our undergraduate and postgraduate degrees

It is important to note that these standards have identified the threshold learning outcomes, a minimalist approach to learning and teaching academic standards within the Engineering and ICT disciplines. These standards were developed taking into account the current accreditation process of Engineers Australia and the ACS (ALTC, 2010b). The threshold learning outcome areas (Table 6.7) for the ICT and Engineering disciplines are similar to many of the major professional skill categories identified in this study (communication, time management, project management, business skills, personal attributes, teamwork, working with people). However, there is no explicit reference to the ability of graduates to work across cultures (such as the ability to work with people from different cultures and awareness of cultural and language barriers), which was strongly indicated as a requirement by many IT graduates in this study. The details of the adoption of these
standards, their implementation across Australian universities and their success remain to be seen.

In 2010, Oliver conducted a separate ALTC Fellowship Project, *Benchmarking Partnerships for Graduate Employability* (ALTC, 2010c) which focused on encouraging course leaders or curriculum developers from Australian Universities to engage in benchmarking partnerships for graduate employability. The project involved 24 course leaders from 13 institutions who trialled the benchmarking process in late 2010. As part of the benchmarking, curriculum tools such as mapping tools, graduate and employer surveys and needs analysis templates were disseminated. These tools assist with gathering course quality indicators. Some of the tools used included Curtin University’s iPortfolio for students (which has a focus on self and peer assessment of graduate capability) and Course Portfolio for academics (which provides evidence for a course’s enhancement of graduate capability including graduate employability indicators). The assurance of learning for graduate employability framework provides a 360-degree evidence-based approach to curriculum enhancement. A capabilities proforma amalgamating outcomes such as attributes, skills, competencies for graduate employability was also developed. The final report (ALTC, 2010c) notes that the challenge in the future lies in continuing such benchmarking exercises and partnerships possibly through professional associations, the ALTC or government agencies. Initiatives such as these evidence-based approaches to curriculum enhancement and benchmarking partnerships have the potential to ensure that a focus of curriculum review and enhancement is the assessment of graduate capabilities for employability and the development of a shared understanding of the graduate attributes amongst graduates, employers and university.

### 6.7 Conclusion

The major issues that arose from my study are presented in this chapter. The principal argument is that different players (such as professional faculties at universities, employers, professional associations and graduates) have different contributions to make to the development of professional skills of IT graduates and that each of the players needs to accept responsibility and cooperate with the others. There is strong evidence from my research that universities are not solely responsible for the development of professional
skills of IT graduates. A discussion of the graduate attributes used at Australian IT faculties and their inadequate coverage of the development of some IT specific professional skills was given along with a recommendation that IT faculties need frameworks beyond graduate attributes in their degrees for the development and inclusion of specific professional skills for the IT profession. Employers and graduates themselves have a major role to play in the development of professional skills as some professional skills can be acquired only from practice sites. A justification has been provided to support the argument that simply adding topics to university courses is insufficient to make graduates work ready. Some professional skills need longer than the duration of a university course to develop. The ACS’s CPEP programs recognise this and as a result they are usually undertaken after a period of employment in the ICT industry following graduation from an accredited undergraduate course. One of the major issues arising from the research is the lack of preparation of IT 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. IT graduates have to take personal responsibility in relation to career and self-management and self-assessment both within and outside university studies. The main focus of this chapter has been that professional skills development of IT graduates is a shared, distributed responsibility and players such as universities, employers, professional associations and graduates themselves need to work with each other to maximise the opportunities to develop those professional skills both within IT degree studies and post graduation.
Table 6.7 ALTC Learning and Teaching Academic Standards Project 2010 Threshold Learning Outcomes for Engineering and ICT disciplines
(Source: Cameron and Hadgraft, 2010)

<table>
<thead>
<tr>
<th>Outcome Areas</th>
<th>Rationale</th>
<th>Graduates will have the knowledge and skills to ...</th>
<th>Relevance to the professional skills identified in this study (graduates believe are required for their work)</th>
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<tbody>
<tr>
<td>Needs, Context and Systems</td>
<td>Graduates must be able to recognise, understand and interpret socio-technical, economic and sustainability needs within the context of engineering and ICT challenges. Systems thinking enables graduates to represent the individual components, interactions, risks and functionality of a complex system within its environment.</td>
<td>Identify, interpret and analyse stakeholder needs, establish priorities and the goals, constraints and uncertainties of the system (social, cultural, legislative, environmental, business etc.), using systems thinking, while recognising ethical implications of professional practice.</td>
<td>Project management, Business skills, Working with people</td>
</tr>
<tr>
<td>Problem Solving and Design</td>
<td>Engineering and ICT practice focuses on problem solving and design, whereby artefacts are conceived, created, modified, maintained and retired (lifecycle assessment). Graduates must have capabilities to apply theory and norms of practice to efficient, effective and sustainable problem solution.</td>
<td>Apply problem solving, design and decision making methodologies to develop components, systems and/or processes to meet specified requirements, including creative approaches to synthesise alternative solutions, concepts and procedures, while demonstrating information skills and research methods.</td>
<td>Project management, Time management , Business skills</td>
</tr>
<tr>
<td>Abstraction and Modelling</td>
<td>Graduates must be able to model the structure and behaviour of real or virtual systems, components and processes. Decision making is informed by these processes of abstraction, modelling, simulation and visualisation, underpinned by mathematics as well as basic and discipline sciences.</td>
<td>Apply abstraction, mathematics and discipline fundamentals to analysis, design and operation, using appropriate computer software, laboratory equipment and other devices, ensuring model applicability, accuracy and limitations.</td>
<td>Time management, Project management</td>
</tr>
<tr>
<td>Coordination and Communication</td>
<td>Engineering and ICT practice involves the coordination of a range of disciplinary and interdisciplinary activities and the exercise of effective communication to arrive at problem and design solutions usually in team contexts.</td>
<td>Communicate and coordinate proficiently by listening, speaking, reading and writing English for professional practice, working as an effective member or leader of diverse teams, using basic tools and practices of formal project management.</td>
<td>Communication, Project Management, Teamwork, Working with people</td>
</tr>
<tr>
<td>Self-management</td>
<td>Graduates must have capabilities for self organisation, self-review, personal development and lifelong learning.</td>
<td>Manage own time and processes effectively by prioritising competing demands to achieve personal and team goals, with regular review of personal performance as a primary means of managing continuing professional development.</td>
<td>Personal attributes, Time management</td>
</tr>
</tbody>
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CHAPTER 7 CONCLUSION

7.0 Chapter overview

The professional work experiences of recent Australian IT graduates were analysed in this research via a main research question and five research sub questions.

The main research question is:

*What do the professional work experiences of recent Information Technology graduates in practice tell us about their preparation for the profession?*

Research (sub) questions addressed:

**Research Question 1:** What are the typical professional skills requirements of IT professional practice?

**Research Question 2:** From graduates’ viewpoints, which sources assisted them to acquire the professional skills required for their professional practice?

**Research Question 3:** From graduates’ viewpoints, which elements of their university study program contributed towards fulfilling the professional skills requirements of their practice?

**Research Question 4:** From graduates’ viewpoints, how well did their university studies prepare them to meet the professional needs of their professional practice?

**Research Question 5:** What is the role of different players (universities, employers, professional associations and graduates themselves) in the professional preparation of IT graduates?

The conclusions drawn from the results of this research, achievement of the research aims, the contribution made by this research to the body of knowledge and implications for IT
professional practice are discussed in this chapter. The limitations of this study are described and some ideas for future research work in this area are presented along with a conclusion to this thesis.

### 7.1 Achievement of the research aims

The details of the concepts, categories, themes and results that arose during this research were discussed in Chapters 4, 5 and 6. A summary of the main findings in relation to the five research sub questions and the details of the relevant thesis chapter is presented in Table 7.1 (a) and (b).

#### 7.1.1 Answer to the main research question

After analysis of the research findings and discussion of the implications of these findings for different stakeholders (universities, employers, graduates and professional associations), summarised in Table 7.1 (a) and (b), it is now possible to answer the main research question, *What do the professional work experiences of recent IT graduates in practice tell us about their preparation for the profession?*

The main response is that *IT graduates face a number of challenges when they first enter graduate employment*. Many of these challenges revolve around *working with people* but other major categories of professional skills that IT 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. Complex and multiple relationships exist between these professional skills, which, in turn, are developed by multiple sources including academic, social, personal, professional and other work experiences or a combination of these. IT graduates in the study believe that some professional skills developed at university are applied differently at work contexts. IT graduates also believe the most useful components of their university studies for developing the necessary professional skills are *work placements and “real life like” projects.*
Table 7.1 (a) Answers to research sub questions 1, 2, 3 and 4

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Brief response/findings</th>
<th>Discussion Chapter</th>
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<tbody>
<tr>
<td>What are the typical professional skills requirements of IT professional practice?</td>
<td>There are eight major categories of professional skills IT graduates believe they require for their work: communication, time management, teamwork, working with people, working across cultures, project management, business and personal skills. These professional skills are intertwined and have multiple and complex relationships with each other.</td>
<td>Chapter 4 discussion of Theme 1 - Professional skills IT graduates believe they require at IT workplaces. Refer to Sections 4.2 - 4.10 and Figure 4.1</td>
</tr>
<tr>
<td>From graduates’ viewpoints, which sources assisted them to acquire the professional skills required for their professional practice?</td>
<td>There are multiple sources from which a professional skill can be developed, just one of which is university studies. The categories of sources can be academic, social, personal, work experience, on the job or a combination of these sources. According to the IT graduates, specific sources of professional skills are: University IT degree, University non-IT degrees, formal courses (short courses), family relationships, friends, overseas travel experience, social network and clubs, sports or extracurricular sources, hobbies and pastimes, life experiences, previous careers, previous work experience (IT-related), previous work experience (non-IT) related and on the job mentoring.</td>
<td>Chapter 5 discussion of Theme 2: Sources of professional skills for IT graduates Refer to Section 5.1 and Figure 5.1</td>
</tr>
<tr>
<td>From graduates’ viewpoints, which elements of their university study program contributed towards fulfilling the professional skills requirements of their practice?</td>
<td>Some aspects of university IT studies are more useful and relevant for IT workplaces than others. Work placement and project work are two important aspects of university studies that all IT graduates found very useful in the workforce. Other useful aspects included project management subjects, subjects that involved formal written reports and presentations and business subjects that assisted with development of understanding of business needs and analysis.</td>
<td>Chapter 5 discussion of Theme 3: Most useful aspects of university studies that IT graduates believe contributed towards their professional skills development Refer to Sections 5.2 and 5.3 and Figure 5.2</td>
</tr>
<tr>
<td>From graduates’ viewpoints, how well did their university studies prepare them to meet the professional needs of their professional practice?</td>
<td>IT graduates believe that university studies prepared them for work reasonably well and that some aspects of university studies were useful and relevant for overcoming the challenges they faced at work. However, they believe that university studies alone are insufficient for the development of the professional skills required at work. For example, time management strategies were learned from both university studies and while on the job. IT graduates also believe that some professional skills developed at university are applied differently in work contexts. For example, acceptable standards of work submission at IT workplaces are different from university.</td>
<td>Chapter 5 discussion of Theme 4: Challenges IT graduates believe they face at their workplaces and Theme 5, Graduate perceptions of differences between University and the Workplace in the application of professional skills Refer to Sections 5.4 - 5.9</td>
</tr>
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</table>
Table 7.1 (b) Answer to research sub question 5

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Brief response/findings</th>
<th>Discussion Chapter</th>
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<tbody>
<tr>
<td>What is the role of different players (universities, employers, professional</td>
<td>Each of the players has a specific role to play and some specific responsibilities. University courses differ in length, coverage of content or focus within similar subjects and this complicates the task of developing programs of study which would provide the same set of generic attributes for an IT graduate. Nor should they!</td>
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<tr>
<td>associations and graduates themselves) in the professional preparation of IT</td>
<td>Universities have a responsibility to prepare graduates to face complex, unfamiliar and unknowable situations, learn how to learn, increase student’s knowledge and awareness of workplaces, assist with initial job expectations, career and self-management, and develop their social and cultural skills so they become well rounded global graduates.</td>
<td></td>
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<tr>
<td>graduates?</td>
<td>Employers have a responsibility to train graduates when they commence work, facilitate workplace learning, increase workplace socialisation and work with universities closely to provide work placement opportunities for students in IT degrees.</td>
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<td>Professional associations have a responsibility to increase IT students’ exposure to the IT industry through scholarship, research and job ready programs, to use the course accreditation process to ensure that IT program design focuses on the development of IT professionals rather than a strictly curriculum-driven approach and make recommendations to the government and employers on issues that matter most for IT professionals and the profession.</td>
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<td>Graduates have a personal responsibility to develop their professional skills both within and outside university studies.</td>
<td>Chapter 6 discussion of the role of universities, employers, professional associations and graduates themselves in the professional preparation of IT graduates. These are discussed in: Universities: Refer to Sections 6.2 and 6.3 Employers: Refer to Sections 6.4 and 6.5 Professional association: Refer to Section 6.5.2 Graduates: Refer to Section 6.2.2</td>
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</table>

A major issue arising from the study is the lack of preparation of IT graduates to face new, unfamiliar, unexpected or unknown situations. Professional faculties in universities have a responsibility to prepare graduates to learn how to learn in such uncertain situations, to assist with the development of knowledge and awareness of work environments and to help in the development of initial job expectations. Overcoming language barriers and using appropriate communication styles are essential skills for working with people from different cultures. The majority of IT graduates who participated in the study emphasise the significance of these intercultural skills. It is rare to see a direct reference to the development of skills required to work across different cultures in the graduate attributes used in many universities. University courses differ in length, coverage of content or focus within similar subjects and this complicates the task of developing programs of study which would provide the same set of generic attributes for an IT graduate. Nor should they!
However, *IT faculties in universities need frameworks beyond graduate attributes for the development and inclusion of IT specific professional skills in their IT degrees.*

From the analysis of IT graduate perspectives it appears that *work placement works well as a model of learning* to teach students principles of lifelong learning, both situated and transformative. Increasing the number and duration of work experience subjects and opportunities to spend more time at practice sites interacting with professional peers is desirable to develop the professional skills of IT graduates. Where work placements are not possible due to practical reasons, the use of simulated work environments seems to be highly valued. The inclusion of topics from subject areas outside IT such as business, management, sociology or psychology also seems to assist graduates with opportunities to understand and work with other professionals.

The following statement linking the four major themes of the study summarises, the perspectives of the graduates in the study:

Recent IT graduates believe they need many **professional skills** acquired from several **sources** outside their **University studies** to face and cope with the **challenges at their workplaces**. Being prepared for overcoming challenges at IT workplaces is the primary concern for participants of this study.

IT graduates can be assisted by University studies only in the development of some professional skills because **certain professional skills can be developed or acquired only through on the job work experiences**. For example, attending a course in communication skills during undergraduate IT studies does not prepare IT graduates to face the complex communication requirements of workplaces. In particular, employers need to think more broadly than assuming that adding professional courses or subjects as a part of university degrees would address employers’ concerns in relation to the lack of work ready professional skills in IT graduates. IT graduates themselves have a personal responsibility to develop their professional skills both within and outside university studies. Hence, **universities cannot be solely responsible for the development of professional skills of IT graduates.**
IT graduates in this study believe that their university studies prepared them reasonably well to cope with the challenges at work. They feel universities could do more to increase the relevance between theory and professional practice by introducing longer and multiple internships and the use of industry experts as lecturers. However, IT graduates believe that university studies alone are insufficient for the development of the professional skills required at work. For example, time management strategies are learned from both university studies and while on the job.

Analysis of professional skills requirements, the multiple ways in which they are developed, the interrelationships between professional skills, the known, unknown and unknowable challenges of IT work and workplaces and the skill expectations of different stakeholders complicate the issue of the professional skills development of IT graduates. Such development requires a collaborative effort from universities, employers, graduates and professional associations, leading to the conclusion that,

*The development of professional skills is a distributed responsibility and different players such as professional faculties at universities, employers, professional associations and graduates have different contributions to make to the development of these skills. Further, this approach will be successful only when each of the players accepts its responsibilities and cooperates with the others.*

### 7.2 Contributions to Body of Knowledge

#### 7.2.1 Contribution to IT education and higher education literature

A contribution towards the existing body of knowledge on graduate work experiences is made and, in particular, to the scant literature on recent Australian IT graduates’ professional work experiences. While employer and academic perspectives have been covered by several studies, few have analysed IT graduate perspectives. Similarly, of the other studies of experiences of graduates in the workforce and their perspectives of their university studies, few have focussed on IT. Major contributions from this study are:

- *Development of a rich description of professional skills IT graduates believe they require for work (Table 4.3; Section 4.10; Chapter 4 and Appendix E)*;
• A study of relationships across these professional skills (Figure 4.1);

• Identification and discussion of issues, challenges and concerns and the corresponding interlinked relationships that new IT graduates face in their professional practice (Figure 5.5; Chapter 5);

• Identification of a central, dominant and unifying concern of new IT graduates - Being prepared for overcoming challenges at IT workplaces which reinforces the connections between the data and the primary concern of all IT graduates in this study (Section 5.7);

• Identification of a central, dominant and unifying concern of new IT graduates - Being prepared for overcoming challenges at IT workplaces which reinforces the connections between the data and the primary concern of all IT graduates in this study (Section 5.7);

• The discussion and examination of the role of universities, employers, professional associations and graduates in the development of professional skills in the light of the research findings (Chapter 6); and

• Discussion and examination of the role of universities, employers, professional associations and graduates in the development of professional skills in the light of the research findings (Chapter 6); and

• The discussion and explanations provided in the thesis chapters are grounded in data from IT graduates but are generally broader and could be applicable to a wider section of the higher education community (Chapter 6). A feature of this research is a discussion of the important challenges for the role and scope of higher education and its ‘uneasy’ relationship with the workplace.

7.2.2 Implications for Practice

Many employers (including IT employers) have argued the need for work ready graduates. Through understanding recent IT graduates’ professional work experiences, a basis is provided for understanding if it is the lack of skills or a disconnect in expectations of ‘work-readiness’ that affects the development of professional skills of IT graduates. An understanding is given of what graduates actually do at work and what they believe are skills required for their jobs and also of the different ways in which those skills were developed. There are implications for:

**IT industry** - The conclusion from this research that - Certain IT work skills are difficult to develop except on real world sites is an important one for employers. They can gain a better understanding of the challenges that new graduates generally face at workplaces (from a graduate’s viewpoint) and can question their own expectations in relation to professional skills of graduates. Some ways in which they could assist new graduates settle in when they commence employment post graduation are discussed.
**IT students/graduates** – From this study, young IT graduates can gain insight into the kind of issues they are likely to meet during early years of employment through the many quotes from participants (Chapters 4 and 5). There is a description of how graduates cope with practical situations they encounter at their IT workplaces and what elements of their degree contributed to the professional skills needed in their workplaces. Hence, there are implications for new graduates' expectations of their employers and of IT faculties and an awareness of personal responsibilities for the development of the professional skills needed to become work ready.

**IT academics** - The suggestion that IT faculties need frameworks beyond graduate attributes in their degrees for the development and inclusion of specific professional skills for the IT profession needs significant consideration. IT lecturers are encouraged to have ongoing collaboration/conversations with industry so as to incorporate elements that are important for employability of graduates as a part of curriculum development, design, training and assessment. An example implication for IT curricula is, internationalisation of the curriculum for learning and teaching and increased use of work placements as a model of learning. Through findings of the lived experiences of graduates at work, universities will be able to better train their graduates to cope with major issues in relation to professional skills needed in workplaces.

### 7.3 Limitations of this research

This study was informed by ideas and techniques from grounded theory for understanding graduates’ lived experiences of their professional practice and its relation to their university studies. This may not be an adequate picture of what is going on at IT workplaces. **The graduates’ impressions of difficulties and challenges at work may indicate a lack of understanding of the workplace and other related issues.** Also these are not experiences, but reports of experiences. The analysis of data from graduates has been carried out in terms of discourses about work experiences, the development of graduates’ professional skills and the relationship of their university studies to the development of the skills required.
7.4 Future Research Opportunities

7.4.1 Holistic view of IT skills (technical and professional skills)

The technical skills of graduates were not examined in this research. The justification for the focus on professional skills was provided in Chapter 2 - major reasons were to keep the size of the research manageable and to focus on the issue of most concern to employers. In professional disciplines such as IT, graduate skills should be viewed holistically. It is not possible to totally detach technical skills from professional skills, as graduates need both. The skills of graduates could be examined holistically by future studies.

Potential questions include:

- How does the lack of, or overconfidence in technical skills interact with IT graduates employment experiences? (to help us understand the link between technical and non-technical skills and the relevance of theory to practice)

- Would the development of non-technical (professional) skills, while important, be at the expense of technical skills?

- Should there be any adjustments to the focus of IT courses? If yes, what adjustments need to be made to the curricula and learning and teaching approaches? What are employer and university academics’ perspectives on these issues?

7.4.2 Causal relationships between graduates’ academic experiences and success in their graduate work experiences

Several complex relationships between various professional skills were identified in this research (Chapter 5). It would be useful to develop a formal theory based on measuring the causal relationships between graduates’ academic experiences and success in their graduate work experiences. Following graduates from study to work over a period of years would provide valuable information and comparative data. Determining and understanding how university experiences can be transferred to work situations some years later is valuable information for all disciplines. Further investigation is needed to understand the adaptation
of work based training options for the development of work ready graduates. (For example, does a work based learning model provide a more effective approach to learning than whatever might be developed during a student’s time at university?)

IT is a fairly new discipline compared to traditional disciplines such as medicine and engineering. According to Eraut (1994), more effort to capture professional and practice knowledge is required by researcher and practitioner teams. He states “It needs a combination of the analytic skills of researcher, creative skills of practical problem-solver, observational skills of the naturalist and communication skill of the novelist”. IT academics, researchers and practitioners should team up to capture professional and practice knowledge for IT workplaces to gain a better understanding of the type of skills graduates need and the challenges they may encounter during the initial employment years.

What graduates see as the relevance of ‘formal training’ (from universities) and ‘informal training’ (from practice sites) is a particularly significant and interesting issue to investigate especially when trying to understand graduate perceptions of Australian tertiary programs of study.

7.4.3 Assessment of ‘generic skills’ or ‘graduate attributes’

Most universities have graduate attributes in their mission or their course designs either for the whole university or for specific disciplines or courses. Although the Australian Government's Graduate Skills Assessment test on university exit has not been widely implemented, there is a growing body of research on integrating the development of "graduate attributes" into assessment as a way of ensuring that more than lip service is paid to them. Additional research around the assessment of graduate attributes may be appropriate. For example, while important work IT skills such as teamwork can be and are taught in many courses, do all students absorb them or is the development of generic skills more a feature of personality and background than anything in a student's course? Prestudy interviews have always been conducted for IT scholarship courses. Interviewers are looking for the sorts of students the industry will want to employ but such interviews are not feasible for all Australian IT courses.
Kamvounias and Thompson (2008) suggest some questions in relation to the assessment of graduate attributes.

- How can multi level whole institution graduate attribute integration be achieved?
- Can the implementation of new technology assist learning and teaching to produce the desired graduate attributes?
- How can we make students aware of progressive development of their graduate attributes? and
- How would lecturers be able to evidence and assure a student’s learning?

7.4.4 Generalisability of the study results

The professional skill requirements identified in this study were specific to undergraduates from NSW, Australia. I believe that the conclusions of this study will be applicable to other IT graduates in the rest of the country. I also believe that many of the conclusions apply to more disciplines than just IT. These beliefs could be verified by similar studies in the future both within IT and other disciplines. Further, international researchers could collaborate and share their findings to reflect on broader issues that may address the skills requirements of IT professional practice around the globe. It may then be possible to determine, for example, if the themes identified in this study are local or global.

It would also be interesting to see if similar results arose out of data collected through workplace observations of new graduates and accounts of employer and graduate perspectives collected from practice sites through observation or case studies. Skills students do and do not have and where they may have come from is another avenue for research. The role of culture - the links between employer culture (small or large company, international or local) and graduate skills requirements in a variety of IT positions (business analysis, sales, web development, and project management) are other potential factors of interest. Results sorted by variables such as the type of company, job and graduates’ gender and the applicability of the results from this research to research conducted in other countries (for example, are the results from Australia transferable to USA or Europe) would be useful information for the IT industry.
7.4.5 Development of ideas for curriculum design

According to Eraut (1994) some new practices of a professional field are invented and developed in the field, with the role of academics being one that involves dissemination, evaluation and construction of theoretical rationales. This study is a discussion of the professional skills required by graduates from IT programs 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 programs? Project oriented pedagogy is recommended by Alverno College which argues that their graduates have better soft skills than students from traditional universities. Is this a feasible model for bigger universities and IT faculties?

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 association 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.

7.5 Conclusion

Ideas from a grounded theory approach were used to understand the professional work experiences of recent Australian IT graduates. In Chapter 1, a background to the research area is provided and the structure of this thesis laid out. The framing of the research questions followed a literature review presented in Chapter 2. Research methodology and methods used for this study were described in Chapter 3. In Chapters 4 and 5, the findings of the data analysis were presented along with description of the professional skills graduates believe they need and the challenges they face at work. In Chapter 6, the roles of professional faculties at universities, employers, professional associations and graduates
have in the development of professional skills of IT graduates were outlined. Suggestions and implications that these study findings have for the stakeholders above were given. Finally, some specific answers to the research questions were supplied and some avenues suggested for further research in this area.

There is a need for more intensive communication and joint responsibility between the industry and IT academics. Universities could do more to conduct regular assessments of industry needs and incorporate them into the university teaching curriculum. Eraut (1994) describes three assessment approaches that would help students to understand the relevance between theory and practice. The performance in the workplace during practical experience subsequent to completion of a university degree is assessed in the first approach. An on the job assessment which is an integral part of academic qualifications leading to professional recognition is carried out in the second approach. Practical performance both within academic courses and during a subsequent period of professional preparation is assessed in the third approach. IT employers and universities could do more to develop the professional skills of IT graduates by incorporating compulsory work experience and work placement opportunities or on the job training.

Employers could do more to plan and deliver support to graduates when they begin employment, (for example, standardisation of induction and orientation and mentoring programs to suit their specific organisational needs). Employers could involve themselves more with the professional practice of students during their studies and could use the opportunity to train students in the way suitable for their organisation so that when hired as graduates there will be minimal training required on paid hours. On employer sites, senior staff members who are appointed as mentors can be motivated to perform their duties through recognition of such efforts towards extra points for continuing professional development so employers have a pool of well trained on site trainers.

Professional associations could work with universities, employers and have open discussions with student involvement to set up some standardised processes related to training on the job correlating with the IT curriculum. Professional associations could lobby the government to ensure that all employers involved in the professional preparation of graduates are offered incentives to accept students for work placement (for example, tax breaks). More emphasis on continuing knowledge creation and development is required
(Longstaff, 2001). Overall, higher education and professional communities need to work more closely. 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.

A rich description is given in this study of the professional work experiences of recent Australian IT graduates. As we have seen in the previous chapter, the findings have implications for IT employers and IT education. 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 success. All parties have a responsibility to provide ample opportunities for IT graduates to develop the professional skills required for their work.

Many of the issues raised in this study and in the literature are related to ‘expectations’ and a possible mismatch in expectations amongst different stakeholders about the skill requirements of graduates. Even after decades of discussion and debates about the lack of professional skills of graduates, the development of curriculum models and efforts to align curricula to industry needs and the development of graduate attributes and accreditation standards to develop work ready graduates, employer unhappiness about graduate skills remains. Perhaps, the reason for this unhappiness is not due to deficiencies in curricula or efforts to develop work ready graduates, but to the expectations of the employers, universities and graduates of each other and poor management of these expectations. Do these expectations need to change? Unless such expectations are managed and balanced, there might be no real solutions for the industry, employers, academics or graduates about how to best develop professional skills in new IT graduates.
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PUBLICATIONS ARISING FROM THIS RESEARCH

The list of publications arising from this research and the chapters that draw on them are presented below.


APPENDICES

Appendix A - Consent form for Interview
Appendix B - Information letter for Interview
Appendix C - Illustrative questions for Interviews
Appendix D - Survey questions
Appendix E - Major categories, low level 1 and low level 2 categories for Theme 1 Professional Skills IT graduates believe are required for their work
Appendix F - Relationship mapping from selective coding process
Appendix G - Examples of open code and axial code development
Appendix A Consent Form

Consent Form

UNIVERSITY OF TECHNOLOGY, SYDNEY

I --------------- (participant’s name) agree to participate in the research project – Non-technical Work Experiences of Recent Information Technology Graduates, UTS HREC approval reference number: 2006-230A being conducted by Srivalli Vilapakkam Nagarajan, University of Technology, Sydney, for her degree, Doctor of Education. I am aware of her contact details as shown below:

Faculty of Education,
University of Technology, Sydney
Building 10, City campus, Broadway, NSW 2007
Telephone: 0419502554 e-mail: Srivalli.VilapakkamNagarajan@student.uts.edu.au

I understand that the purpose of this study is to describe and analyse the non-technical work experiences of recent IT graduates and to generate a substantive theory of the relation between workplace experiences of graduates and their University studies.

I understand that my participation in this research will involve taking part in an interview for no more than an hour at a location, date and time that is convenient for both myself and the researcher. I also understand that the interview will be audio recorded. I am aware that only the researcher and her supervisors will have access to the data collected.

I am aware that I can contact Srivalli Vilapakkam Nagarajan or her Supervisors Prof. David Boud or Prof. Jenny Edwards if I have any concerns about the research. I am aware of her supervisors’ contact details as shown below:
(1) Prof David Boud
    ph: 02 9514 3945 or e-mail: David.Boud@uts.edu.au
(2) Prof Jenny Edwards
    ph: 02 9514 3544 or e-mail: jenny.edwards@uts.edu.au

I also understand that I am free to withdraw my participation from this research project at any time I wish, without consequences, and without giving a reason. I also understand that I am able to access my responses/transcripts at anytime during this research project if I wish to do so.

I agree that Srivalli Vilapakkam Nagarajan has answered all my questions fully and clearly.

I agree that the research data gathered from this project may be published in a form that does not identify me or my workplace details in any way. I am aware that if I wish I can receive a copy of the results of this research.

Signature (participant) Date

Signature (researcher or delegate) Date

NOTE:
This study has been approved by the University of Technology, Sydney Human Research Ethics Committee. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact the Ethics committee through the Research Ethics Officer (ph: 02 9514 9615, Research.Ethics@uts.edu.au) and quote the UTS HREC reference number. Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.
Appendix B  Information Letter

Information Letter
UNIVERSITY OF TECHNOLOGY, SYDNEY

Dear …………

My name is Srivali Vilapakkam Nagarajan and I am a doctoral student at the University of Technology, Sydney.

I am conducting research into non-technical work experiences of recent Information Technology graduates and would welcome your assistance.

For the purposes of this research non-technical experiences include all parts of your work that does not involve specific Information Technology activities. Your experience directly linked with Information Technology work activities may include tasks such as programming, database administration, computer security, systems analysis and design etc.). A non-technical experience includes tasks such as:

- Communicating ideas & information
- Oral Communication
- Leadership and entrepreneurial skills
- Interpersonal skills
- Working with others and in teams
- Written business communication
- Time management skills
- Comprehension of business processes

The research would involve participation in an interview and should take no more than an hour of your time.

If you are interested in participating in the interview, I would be glad if you would contact me or my supervisors Prof. David Boud or Prof. Jenny Edwards. The contact details are as follows:

Preferred:
(1) Srivali Vilapakkam Nagarajan
ph: 0419502554 or e-mail: Srivali.VilapakkamNagarajan@student.uts.edu.au
(2) Prof David Boud
ph: 02 9514 3945 or e-mail: David.Boud@uts.edu.au
(3) Prof Jenny Edwards
ph: 02 9514 3544 or e-mail: jenny.edwards@uts.edu.au

You are under no obligation to participate in this research.

Yours sincerely,

Srivalli Vilapakkam Nagarajan
Doctor of Education student
ph: 0419502554
e-mail: Srivali.VilapakkamNagarajan@student.uts.edu.au
Appendix C Illustrative Interview Questions

Thank you for consenting to participate in this research. In this interview I am interested in your non-technical work experiences. I re-emphasise that I am interested only in your personal experiences and not those of your colleagues at work.

1. Could you please tell me what sorts of things have you been doing in the past week at work?

2. How typical is this of your normal work week? What else do you do in a normal week?

3. Based on your experiences, what non-technical skills are required for you to do your job?

4. Where did you get them? and how did you develop these skills?

If they mention teamwork, presentation skills etc… then ask Question 5.

5. Please describe your non-technical work experiences related to <teamwork, presentation skills, ..> at work. What issues arise for you?

6. Can you please think of a major issue/incident you have had so far at work? Please describe your non-technical experiences in relation to that issue/incident? How did you cope with the challenges if any?

7. In general what are the major non-technical challenges for you at work today?

8. What were the first few weeks or months at work like? Please describe your non-technical experiences and any issues. How did you deal with them?

9. What aspects of your formal University study proved to be useful for you when you first entered the workforce?

10. How well do you think the University course prepared you for the workforce?

Concluding statement (suggested)

Thank you for your participation in this research. I assure you once again that all the responses and your details will be kept private and confidential both during and after the research project. You will have access to the tape and the transcript of this interview if you need to access them in the future. If you wish, you can receive a copy of the results of this research.
Appendix D Survey Questions

Non-technical Work Experiences of Recent Australian IT Graduates

Introduction

Researcher Name: Srivalli Vilapakkam Nagarajan

Studying: Doctorate of Education

Thesis: Non-technical Work Experiences of Recent IT Graduates

Address: Faculty of Education, University of Technology, Sydney

e-mail: Srivalli.VilapakkamNagarajan@student.uts.edu.au

This survey is to look at the non-technical workplace experiences of recent IT graduates, ie those who studied fulltime and have been in the professional IT workforce for under three years.

It should take more no more than 10 minutes to complete. The survey is totally anonymous and participation is voluntary. By completing the survey you are not entering into any obligation or commitment.

For the purposes of this research, non-technical experiences include all parts of your work that do not involve specific Information Technology activities. Non-technical experiences include tasks such as - communicating ideas and information, working with others and in teams, oral communication, written business communication, time management skills, interpersonal skills etc..

The survey has been approved by the University of Technology, Sydney Research Ethics Committee. If you have any concerns about aspects of the survey which cannot be resolved with the researcher, you may contact the Ethics Officer, Ms Hadiza Yunusa at hadiza.yunusa at uts.edu.au. Alternatively, you may contact either of my supervisors, Professor Jenny Edwards or Professor David Boud at {jenny.edwards, david.boud} at uts.edu.au

Please complete ALL questions in the survey. If you skip any question(s) an error message will be displayed. If this occurs, please click on the BACK arrow in your browser to return to the previous page to answer the question(s).

Section 1a

How long have you worked in a professional role in the IT industry since graduation?

☐ Less than a year
☐ 1 -2 years
☐ 2-3 years
☐ More than 3 years

For this research we are interested in graduates who have less than three years work experience in the IT industry.

If you have more than three years experience please do not proceed with the survey.

Thank you for your time.
What are your responsibilities at work?

What are the five most important non-technical skills you require for your work?
(Please list them)

If there are additional non-technical skills you require for work please list them in the text box below.

Section 1b
<table>
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<tr>
<th>Skill Description</th>
<th>Very Important</th>
<th>Important</th>
<th>Somewhat Important</th>
<th>Neutral</th>
<th>Somewhat Unimportant</th>
<th>Unimportant</th>
<th>Very Unimportant</th>
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<tr>
<td>How important is the role of WRITTEN COMMUNICATION SKILLS for your work?</td>
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<td>How important is the role of SPOKEN COMMUNICATION SKILLS for your work?</td>
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<td>How important is the role of TEAM WORK SKILLS for your work?</td>
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<td>How important is the role of CONFLICT RESOLUTION SKILLS for your work?</td>
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<td>How important is the role of NEGOTIATION SKILLS for your work?</td>
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<td>How important is it to MANAGE EXPECTATIONS OF CLIENTS in your work?</td>
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<td>How important is it to MANAGE EXPECTATIONS OF PEERS in your work?</td>
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<td>How important is it to MANAGE EXPECTATIONS OF SUPERIORS in your work?</td>
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<td>How important is the role of TIME MANAGEMENT SKILLS for your work?</td>
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<td>How important is it to have an EYE FOR DETAIL for your work?</td>
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<tr>
<td>How important is it to have an EYE FOR DESIGN for your work?</td>
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<tr>
<td>How important is it to abstract and generalise concepts (removing the complex details to see the commonality between issues) for your work?</td>
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</tbody>
</table>

**Section 2**

**Thinking of the five most important skills you require for your job, where did you obtain these non-technical skills?**

(Select as many as you wish from the list below)
University Information Technology degree
Other University courses (sociology, psychology, business etc..)
Other formal courses (TAFE, short courses)
Previous Careers
Previous work experience (IT related)
Previous work experience (non-IT related)
Family Relationships
Friends
Social networks or clubs
Extra curricular activities at School, College, University
Natural talent and interest
Other

If there are any other areas you picked up your non-technical skills from please list them in the text boxes below.


Section 3
Thinking of ALL the NON-TECHNICAL SKILLS you require for your job, what were the most useful aspects of the IT course you studied when you first entered the workforce? (Select as many as you wish from the list below)

Subjects that involved presentations
Project Management
Subjects which involved formal written reports
Work placement / industry experience as part of your course
Project work (simulated projects, assignments, teamwork)
Other

If there were other useful aspects/features of the subjects you would like to mention please list them below in the text boxes.


Now, please think about your past and current work experience.

Then think of a SERIOUS PROBLEM you have had at work so far.

Section 4
What NON-TECHNICAL SKILLS did you need to overcome/cope with the problem?

Where did you learn these particular skills from?
(Select as many as you wish from the list below)

- University Information Technology degree
- Other University courses (sociology, psychology, business etc..)
- Other formal courses (TAFE, short courses)
- Previous Careers
- Previous work experience (IT related)
- Previous work experience (non-IT related)
- Family Relationships
- Friends
- Social networks or clubs
- Extra curricular activities at School, College, University
- Natural talent and interest
- Other

If there are any other areas where you picked up your non-technical skills please list them in the text boxes below.
Overall, which of the following are MAJOR CHALLENGES for you at work? (Select as many as you wish from the list below)

- Gender Domination
- Cultural awareness (working with international clients, non-English speaking cultures)
- Managing client expectations
- Coordination of people and resources
- Risk management and mitigation
- Providing feedback to superiors (knowing what to say and what not to say)
- Time management
- Learning curve with new systems
- Reliance on tools for management
- Professional development (not being able to study further formal courses, lack of support from employers)
- Ability to sell ideas
- Mentoring
- Other

If there are any other major challenges please list them in the below text boxes below.

Section 5

Thinking of your workplace experiences as a whole and in particular your non-technical experiences and your University IT degree, do you think the preparation your University course gave you for the professional IT workforce was?

- Excellent
- Very good
- Good
- Average
From the list below, select the areas you think your University studies helped you to be prepared for when you entered workforce?
(Select as many as you wish from the list)

- Collecting, analysing and organising information
- Communicating ideas and information
- Planning and organising activities
- Working with others and in teams
- Using mathematical ideas and techniques
- Solving problems
- Using technology effectively
- Cultural understanding
- Leadership and entrepreneurial skills
- Literacy and Numeracy
- Logical and orderly thinking
- Time management skills
- Written business communication
- Oral communication
- Creativity and flair
- Interpersonal skills
- Comprehension of business processes
- Ability to analyse complex issues, identify core problem and synthesise and integrate disparate elements
- Capacity for independent and lifelong learning

Do you think your University studies could have better assisted you to learn the skills you needed when you first entered the workforce?

- No
- Yes How could they have done this?
What suggestions, if any, (in terms of improving students' non-technical skills) would you have for the design of University IT courses?

Would you like to receive a copy of the summary of the research findings?

- No
- Yes (Please provide an e-mail address in the text box below)

Thank you for your participation in this research. We hope that one outcome will be students who are better prepared for the challenges they face in the IT workplace. I assure you once again that all the responses and your details will be kept private and confidential. If you have any feedback about the survey please e-mail Srivalli.VilapakkamNagarajan@student.uts.edu.au
### THEME 1- PROFESSIONAL SKILLS IT GRADUATES BELIEVE ARE REQUIRED FOR THEIR WORK

<table>
<thead>
<tr>
<th>Major Category</th>
<th>Level 1 low level category</th>
<th>Level 2 low level categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>Appropriate use of language for different purposes</td>
<td>Use of language in communication with clients/peers/superiors</td>
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<tr>
<td></td>
<td></td>
<td>Communication style (formal versus informal)</td>
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<td>Communication mode (verbal, written, e-mail, online, face-to-face meetings)</td>
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<td>Documenting communication</td>
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<td>Structure of messages</td>
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<td>Choice of language in business and technical communication</td>
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<td>Ability to communicate bad news – tactical communication</td>
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<td>Communication with senior colleagues and people from different cultures</td>
<td>Communication with senior or more experienced colleagues</td>
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<td>Communication in an international work environment with people from different cultures</td>
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<td>Communication while working in a group</td>
<td>Meeting facilitation</td>
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<td>Feedback communication</td>
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<td>Communication to solve problems</td>
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<td>Communication to sell ideas</td>
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<td></td>
<td>Timing of Communication in project work matters</td>
<td>Timeliness of communication</td>
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<td>Type of work and communication (project scope communication etc..)</td>
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<tr>
<td>Time Management Skills</td>
<td>IT project time management in an international work environment</td>
<td>Schedule management (projects, resources) with different project duration</td>
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<tr>
<td></td>
<td>Use of appropriate time management strategies</td>
<td>Time management in an international work environment with people from different time zones</td>
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<td></td>
<td></td>
<td>Use of technology, tools and techniques to manage time</td>
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<td></td>
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<td>Multitasking ability</td>
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<td>Timely delegation/escalation of issues</td>
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<td>Ability to handle time management challenges both as an individual and as a team</td>
<td>Handling different workloads (under, normal, over, crisis)</td>
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<td>Timeliness of work delivery and handling pressure</td>
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<td>Time management for self and for the team</td>
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<tr>
<td>Teamwork skills</td>
<td>Understanding different team structures and composition</td>
<td>Team dynamics</td>
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<tr>
<td>Cultural issues and other strategies that affect teamwork</td>
<td>Team size and composition</td>
<td>Nature of teams (formal, informal) and team player</td>
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<tr>
<td>Meeting Management</td>
<td>International team</td>
<td>Team dynamics</td>
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<td></td>
<td>Handling feedback to and from team</td>
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<td>Team monitoring and motivation</td>
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<td></td>
<td>Use of technology, tools and techniques for team interaction</td>
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<td>Handling team conflicts and negotiation</td>
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<td>Pre meeting planning and management</td>
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<td>Conducting meetings</td>
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<td>Post meeting tasks</td>
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<tr>
<td>Working with people</td>
<td>Managing expectations</td>
<td>Managing expectations of manager</td>
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<td>Forecast stakeholder reaction</td>
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<td>Managing client expectations</td>
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<td>Managing team expectations</td>
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<td>Work–life balance</td>
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<td></td>
<td>Building trust</td>
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<tr>
<td>Professional Relationships</td>
<td>Professional relationship with clients</td>
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<tr>
<td></td>
<td>Being aware of hierarchical work relationships</td>
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<tr>
<td>Conflict resolution and negotiation</td>
<td>Use of appropriate conflict management strategies to resolve problems at work</td>
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<tr>
<td>Human resources</td>
<td>Ability to work with competent and incompetent peers</td>
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<td></td>
<td>Assisting managers with recruitment of staff</td>
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<tr>
<td>Customer Service</td>
<td>Ability to care for customers and build good relationships</td>
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<td></td>
<td>Understanding customers from different cultural backgrounds and customer relationship management</td>
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<td></td>
<td>Use of appropriate customer service strategies</td>
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<tr>
<td>Working across cultures</td>
<td>Ability to work with people from different cultures</td>
<td>Ability to work with people from different work culture (business, IT, international and interstate offices)</td>
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<td>Ability to work with international people from different work culture</td>
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<td></td>
<td>Cultural communication style (choice of correct writing style)</td>
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<td></td>
<td>Awareness of cultural barriers</td>
<td>Being aware of language issues and local customs when working on international sites</td>
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<tr>
<td></td>
<td>Language barriers</td>
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<tr>
<td><strong>Project management</strong></td>
<td><strong>Business Skills</strong></td>
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<tr>
<td>Managing processes in projects</td>
<td>Knowledge of organisational procedures</td>
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<tr>
<td>Managing project constraints</td>
<td>Understanding business needs</td>
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<tr>
<td>People related project management issues</td>
<td>Marketing Skills</td>
<td></td>
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<tr>
<td>Use of creative design skills in product and documentation development</td>
<td>Leadership skills</td>
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<tr>
<td>Understanding the big picture and complexity of IT projects</td>
<td>Information Management</td>
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<td>Risk Management</td>
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<td>Adherence to standards</td>
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<tr>
<td>Problem solving</td>
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<tr>
<td>Managing risk issues in work processes</td>
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<td>Managing product related risks</td>
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<td>Compliance and work accountability</td>
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<td>Following company procedures while handling problems</td>
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<td>Use or development of appropriate problem solving strategies</td>
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<tr>
<td>Change management</td>
<td>Business knowledge</td>
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<td>Quality assurance</td>
<td>Promotion skills</td>
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<tr>
<td>Research and information management</td>
<td>Business analysis</td>
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<tr>
<td>Infrastructure management</td>
<td>Business representation</td>
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<tr>
<td>Scope management</td>
<td>Ability to promote products, ideas and services</td>
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<tr>
<td>Resources management</td>
<td>Understanding the importance of marketing and stakeholder relationships</td>
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<tr>
<td>Cost and time management</td>
<td>Understanding team dynamics</td>
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<tr>
<td>Work delegation</td>
<td>Performance appraisal skills</td>
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<tr>
<td>Job competency (analysis, research, logical, economical)</td>
<td>Information gathering skills</td>
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<tr>
<td>Communication management</td>
<td>Information processing skills</td>
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<table>
<thead>
<tr>
<th>Personal attributes</th>
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<tbody>
<tr>
<td>Adaptability</td>
<td>Adapting to dynamic work requirements</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>Ability to assess one’s strengths and weaknesses</td>
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<tr>
<td>Emotional intelligence</td>
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<tr>
<td>Self-confidence</td>
<td>Ability to confidently conduct oneself</td>
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<tr>
<td>Work enthusiasm and ethics</td>
<td>Passion/enthusiasm for the job</td>
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<tr>
<td>Work ethic</td>
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<tr>
<td>Ability to learn from mistakes</td>
<td>Experiential learning</td>
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<td>Ability to develop new skills</td>
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</table>
## Appendix F Relationship mapping from selective coding process

<table>
<thead>
<tr>
<th>Categories</th>
<th>Categories</th>
<th>Memo notes</th>
<th>Sample quote</th>
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<tbody>
<tr>
<td>1. Communication</td>
<td>2. Time Management</td>
<td>Affects project communication between stakeholders, progress of project work, ability to work with international people from different time zones, cultures, management of schedules</td>
<td>Planning the development schedule for the next three weeks for my team (three others, plus myself) and co-ordination with Business Analysts and Usability regarding what my team will need from them in the next few weeks (this happens in formal weekly meetings)</td>
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<tr>
<td>skills</td>
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<td>Just make sure you finish off the [client] interview properly and making sure that you’re saying to them, any problems we’ll come back to you, also making sure you manage the meeting time properly, so keep an eye on the clock and make sure you actually finish the meeting time on time. Control the questions so they’re actually talking a lot but not too much, that’s what the agenda’s there for if they’re getting off topic then you can point to the agenda and say, we’re talking about this and so on.</td>
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<tr>
<td>3. Teamwork skills</td>
<td></td>
<td>Affects management of team meetings, ability to work with multicultural global teams, ability to work with mature age seniors, superiors, ability to resolve conflicts and team communication</td>
<td>Communicating to my team what needs to be done - it's difficult to get messages to your team when you have something in mind that needs to be done and you need to explain what you are after. Feedback Skills - Something that not many people are particularly good at. It's vital to be able to give both upwards and subordinate feedback to encourage a high performing team.</td>
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<tr>
<td>4. Working with people</td>
<td></td>
<td>Affects ability to resolve conflicts, professional relationships, managing expectations of various stakeholders, customer service, ability to work with technical and business people, superiors and subordinates.</td>
<td>Like there’s some people that have very strong personalities and like you might achieve a resolution, but at the end of the day you’re exhausted and it wipes you out. You might have someone else who’s really friendly and easy going and they’ll take it on board themselves and so it depends on whether you can actually reduce how much pressure it’s putting on everyone or if someone ends up losing out and having to deal with the extra work.</td>
</tr>
</tbody>
</table>
| 1. Communication skills | 5. Working across cultures | Affects the ability to work with people from different cultures, awareness of cultural and language barriers, ability to cope with different work cultures at global and domestic sites | The United Kingdom had already sold off this campaign based on the concept of it without having even seen a mock design of the e-book or the website that went alongside it. We got a lot of pressure from them to produce it very quickly...... we ended up sending the designs over to the UK to get produced. Then they sent the files back to us and then we mucked around with those and then we sent them off for translation to get them translated...

But I can actually give you an example, I worked at an interstate office and every culture’s different, every city’s different, even though it’s domestic. |
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<tbody>
<tr>
<td>1. Communication skills</td>
<td>6. Project management</td>
<td>Affects ability to manage changes to projects, resources, processes, involves communication of project details to stakeholders in a timely manner, affects risk management, ability to solve problems, understanding and practising company procedures</td>
<td>Monday and Tuesday went to a client and had a workshop, so there’s a project that they’re going to be working on and this was just sort of scoping out, I guess, resources and how the project would be set up and different dependencies and risks to think about in terms of project office..... Wednesday went to a different client..... to test that the technology is scalable. Then just writing up the minutes from the meeting from that and putting together a communications pack from the two day workshop.</td>
</tr>
<tr>
<td>1. Communication skills</td>
<td>7. Business skills</td>
<td>Affects understanding of business needs, marketing skills, ability to sell ideas and demonstrate leadership</td>
<td>Speaking to the partners who own the business and saying, okay this is a good idea and selling that and communicating, being that positive energy type of person. You say, look, yes we can do it, we can make this much money or this is why we should do this because it will expand that side and things like that, so it’s not only that.</td>
</tr>
<tr>
<td>1. Communication skills</td>
<td>8. Personal attributes</td>
<td>Affects ability to demonstrate assertiveness, self-confidence, work enthusiasm, ethics, ability to adapt to new work settings and ability to learn from mistakes</td>
<td>ability to be assertive as you must get your views across to other people so that your project can be benefited. ... I believe this one is related to people skills in a way. Part of being assertive is knowing the appropriate way/time to be assertive.</td>
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</tbody>
</table>
| 2. Time Management | 3. Teamwork | Affects the ability of teams to work effectively, develop and implement teamwork schedules | Workload and Time Management...

Prioritising tasks for both myself and my team when we could easily work around the clock with all the tasks we have to do.

A busier week would probably involve a lot more scheduling. We have a number of offices overseas and for instance if we have international |
<p>| 2. Time Management | 4. Working with people | Affects relationships with clients and other stakeholders, customer services, conflict resolution and negotiation, achieving work-life balance | As a discrete example, I was a co-ordinator some time ago for an upgrade of a large customer to Beta software. We started at 4pm in the afternoon and were estimated to be finished by 9pm. Around 7pm we ran into some technical issues. This obviously affected our planned schedule. Myself and my colleague spent some time investigating the problem (problem solving skills). It soon became evident we weren't going to finish by 9pm. After assessing the problem I made a decision (decision making skills) about a possible solution and communicated this to the customer (communication skills), which involved gaining agreement on some extra time for the upgrade, rather than using our rollback procedure at that time. We ended up finishing, successfully, at 2am. That is when it was such a large task that of course you had to get people to choose their specialities, to work on very specific parts of the components of the project and then come back within a certain time. |
| 2. Time management | 6. Project management | Affects project progress, completion, risk management, problem solving, managing processes, products and people and other project resources in a timely manner | …..the design work in particular is something that is perpetually happening. Our projects have relatively short life cycles as such so I will always have a number of clients that I have to handle. Right now, we have some of the bigger players in for instance, XXX, XXX is our client as well, XXX and we do campaigns on behalf of them selling everything from service to business printers to all sorts of solutions. |
| 2. Time management | 8. Personal attributes | Affects ability to learn from mistakes and experiences, ability to cope with new work settings | I think you know, being well organised or someone who respects their time and respects other people's time is something that comes to people naturally. |
| 3. Teamwork skills | 4. Working with people | Affects the ability of teams to work in multicultural global team environment, affects team performance, ability to work with | with meeting facilitation and delegation I believe that part of what makes someone truly effective with these particular skills is understanding the personalities and agendas that certain people bring to a meeting, or knowing the way that different people will react |</p>
<table>
<thead>
<tr>
<th>3. Teamwork skills</th>
<th>5. Working across cultures</th>
<th>Affects ability of teams to work with people from different cultures and languages, different work styles, work in male dominated cultures etc.</th>
<th>A lot of it because we have friends around the world that we work in tandem with it is quite conversational as well. You have to be able to switch in and out of those two mindsets. I think the level [of written communication] expected at work still just took a long time to get to. I think other people struggled with that as well. But one thing to think of is most of my team is from the UK and maybe they just have better English</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Teamwork skills</td>
<td>6. Project management</td>
<td>Affects project performance, team communication, risk management, problem solving</td>
<td>I guess sort of learning how to work as a team because, basically unlike what I did last year, my current role is a lot more team based, so we pretty much always be working with a team, we sort of wouldn’t be working on something on our own. So we sort basically need to learn how to sort of manage our time and make sure that we basically interact and communicate with the actual rest of the team and the team manager because that always helps, especially if we have problems and anything…</td>
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<tr>
<td>4. Working with people</td>
<td>5. Working across cultures</td>
<td>Affects the relationship with project stakeholders from different cultures, different work cultures, workplaces with</td>
<td>I said to him [manager] at the end of one session, I go, well I’ve learnt a lot but you’ve not told me anything positive and walking away, just doesn’t leave me very motivated. He was from a different culture as well, so I guess he’s male and from a different culture,</td>
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gender imbalances, business and technical people; essential to have cultural awareness and have the ability to overcome barriers and he goes, well my approach is never to give anyone a big head and I’m not really for positive feedback. So I guess a feedback thing for him, which I later gave him an upward feedback, was ensure you balance out destructive feedback with positive feedback.

Some people have thought that – I think where you come from or who you hang around with also builds the person you are, where like you say something and then someone might think it’s sexist or racist. But really, with all your other friends they just disregard it. So you’ve got to know who you’re with and ….I think there is a cultural aspect there. What happened was one of my friends were asking – it was a guy – asking a girl to wash up the dish just to help him out. And then she refused and then we just had a bit of a joke around, things like that, everyone, guys and girls all around. And then I said okay, you can wash the lunch boxes next too. And then the girl and another girl thought that was sexist because they thought that I wouldn’t say that to a guy as well. And they thought it was degrading and things like that. ...

<table>
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<tr>
<th>4. Working with people</th>
<th>6. Project management</th>
<th>Affects work delegation, understanding project needs and resourcing required people and job competencies, communication management, work accountability</th>
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<td>It is often the nature of the environment that I work in however that risk management is a core part of daily experience. If we can't make something work, then it just doesn't work - such is the nature of R&amp;D. We do however identify these risks early, re-assess schedules often and if it looks like something is not achievable in the given timeframe we, as developers, work with management to either extend the schedule or drop some functionality. As such, when I face major problems in making some piece of code do what I want it to do, or when I have issues designing a solution for something within the constraints of the existing product, it's not considered an incident... it's just part of the job of creating a new product. I also wrote up a series of test plans for the instrument and database interaction and then carried out some testing. I set up a meeting with the clients for later today so we can discuss the test plans that I asked them, via email, to develop late last week. I’ve also been contacting a client in NSW regarding getting them</td>
</tr>
</tbody>
</table>
4. Working with people | 7. Business skills | Affects relationship with business teams, understanding of different management styles and work procedures, ability to sell ideas, promote products and services. 

| I think it’s the most important because it’s a professional services firm, you have to sell work. So presentation and building rapport are critical and if you can’t manage a team and you don’t have good people, like good relationships with your team members, then you’re not going to be able to deliver the job either. 

5. Working across cultures | 6. Project management | Working, communicating with project stakeholders from different cultures regarding project constraints, requirements, plans, implementation and risks. 

| If we want something from someone we do not have the luxury of just calling them up we have to be able to put into writing and be very specific especially when we are working with folks in the UK who work in a completely different time zone. A lot of it is quite technical in that it is good to have technical writing skills because we are talking to tech teams in Singapore as well. 

6. Project management | 7. Business skills | Good leadership skills, marketing skills, understanding of business needs, information management assists in understanding the big picture and complexity of IT projects, manage risks and other project constraints effectively. 

| Definitely I guess two other things are, around risk management, always like flagging things early, so as soon as you see a potential risk, so whether it’s maybe the client has a, they’ve got, I don’t know, they’re struggling with resourcing and they don’t have much time to help you, or someone’s going away, or there’s someone on the job that doesn’t have enough skills, or you realise that the scope’s too big, or whatever it is. So flagging things way in advance and saying, hey, we need an extension here or we need to cut back something. 

6. Project management | 8. Personal attributes | Affects ability to learn from mistakes; experiential learning; ability to develop new skills and adaptability to dynamic work requirements. 

| So those are probably the more beneficial subjects in the workplace because the workplace, you sort of have to adapt to doing things their way and they usually have their own processes and they’re own technologies and stuff. So I mean while the foundations of the first year subject help you understand what is programming and what is networking and what is an information system, the more technical skills that you learnt probably aren’t as relevant to the work environment because they sort of do things their own way anyway. 

7. Business skills | 8. Personal attributes | Business knowledge, information management skills affect self-confidence, ability to develop new skills, marketing and leadership skills. 

| The main issues were with having to learn information quickly to 'catch up' to everyone else to understand what they were talking about. Even project based information about what we were trying to achieve, learning the key stakeholders and client names etc. When I first started I felt completely
stupid and like I didn't know anything or anyone. I dealt with this by asking around for reading material and got hold of Project Background information to read. I also asked my Manager to take me out for lunch and explain the team org structure etc. In no time I knew as much as everyone else and didn't feel so ridiculous.
## Appendix G Examples of open code and axial code development

<table>
<thead>
<tr>
<th>Interview/survey text</th>
<th>Initial open code</th>
<th>Final open code</th>
<th>Axial code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During the past week I have also been attending various Issues/Status meetings in order to make sure we are going to meet our approaching deadline</strong></td>
<td>Attendance at meetings, project status, project due dates</td>
<td>Time management</td>
<td>Professional skills required at IT workplace</td>
</tr>
<tr>
<td><strong>Provide training and documentation to support users</strong></td>
<td>Presentation skills, written skills</td>
<td>Communication skills</td>
<td>Professional skills required at IT workplace</td>
</tr>
<tr>
<td><strong>Understanding business needs, interpreting business requirements and being able to link these to a technical solution</strong></td>
<td>Business analysis, business knowledge</td>
<td>Business skills</td>
<td>Professional skills required at IT workplace</td>
</tr>
<tr>
<td><strong>Being involved in extra-curricula activities at school and outside school. I participated in Rotary Youth Speaks competitions, in Business Experience placements at school. These all taught me to be professional and clear in communication in the workplace.</strong></td>
<td>Extra curricular activities/ participate in competitions for communication development</td>
<td>Social experiences</td>
<td>Sources of professional skills</td>
</tr>
<tr>
<td><strong>And so I remember the interview, because when I went for my first IT role I had previous to that worked in a number of other things. I worked as a brickie’s labourer and as a boilermaker and other things like that, and so when I went for this role I had to show that I was competent and capable of being able to grasp the concepts</strong></td>
<td>Previous careers/jobs</td>
<td>Previous non-IT related careers</td>
<td>Sources of professional skills</td>
</tr>
<tr>
<td><strong>So it was a one year subject, but rather than the university giving you a fictitious problem and you working with your team inside your university, you went out to a company, they gave you a small problem they had and then you had to interview people to understand more about the problem from the company and then work with them to come up with a solution. Then present that at the uni saying this is what our solution is. So it just gave it a little bit more of a real life feel to it.</strong></td>
<td>Project work Work placement during course</td>
<td>Industry experience as a part of the course</td>
<td>Most useful aspect of University study</td>
</tr>
<tr>
<td><strong>Language issue. Sometimes we deal with people in , I don’t know, China or Europe where it’s very hard to understand their accent as well. And then you’ve got to determine whether you can get all your information across or you have to conference in a translator.</strong></td>
<td>Language/cultural barriers</td>
<td>Work with international clients</td>
<td>Challenges at IT workplaces</td>
</tr>
<tr>
<td><strong>Challenges - Many! I have definitely been thrown in the deep end with having to facilitate meetings with clients when I am not completely aware of the topic (that is. a colleague is sick and I step in). This is always a good way of learning what not to do</strong></td>
<td>Experiential learning</td>
<td>Ability to learn from mistakes</td>
<td>Challenges at IT workplaces</td>
</tr>
</tbody>
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