
DO AUSTRALIAN UNIVERSITIES PREPARE INFORMATION TECHNOLOGY GRADUATES FOR PROFESSIONAL PRACTICE?

Srivalli Vilapakkam Nagarajan and Jenny Edwards
University of Technology, Sydney

ABSTRACT

A responsibility of universities is not only to prepare their graduates for employment but also to ensure that their graduates have developed lifelong learning skills for use in the workplace. This paper explores aspects of Australian information technology education to highlight issues related to the transition of information technology graduates from university to workplace.

INTRODUCTION

Upon leaving university, the majority of information technology (IT) graduates try to gain employment in the IT industry. Minimal research has been carried out in following graduates into their professional practice. Since 1992, CEQs (Course Experience Questionnaires) have been used by universities to obtain graduate feedback on curriculum, teaching, and assessment practices in order to measure the quality of the outcomes of the learning process. Richardson and Kabanoff (2003) state that the extent to which graduates attribute a successful transition into the workplace to their university education can be understood by the feedback they can provide on their university study experience and their employment outcomes. However, they argue that the CEQ fails to pay attention to graduate perceptions of the practical relevance of their courses or the development of knowledge and skills applicable to their workplace experiences. Information such as this is important to provide insights into understanding the transition of graduates from university to workplace, and is of interest to both the IT and the higher-education communities. Universities, along with the other key players shown in Figure 1, directly (as well as indirectly) influence issues related to IT professional practice and workforce performance. Hence, a collaborative approach to trying to understand relevant issues in IT education, and maximising the effectiveness of education and training methods to meet the needs of the industry, is a priority for universities, the

IT profession, graduates, and society as a whole, since IT now underpins economic success and business sustainability.

In Australia, the professional body, The Australian Computer Society (ACS) (1992) has developed a core body of knowledge for IT professionals. It defines information technology as “the development and application of computers and communications-based technologies for processing, presenting and managing data and information.”

This paper examines issues in Australian IT education or, occasionally, ICT (Information and Communication Technologies) education, raised by employers, professional organizations, academics, and graduates. This is followed by the identification of both gaps in IT education and in industry expectations of graduates, and the level of preparation of IT graduates to cope with the needs of their professional practice. Some recommendations for further research into following graduates to their professional practice – with a view to understanding their perspectives on their courses of study and its relevance to professional practice – are presented. Finally, an argument is developed showing the need for universities to foster not just technical, professional, ethical, and social skills in their graduates, but also lifelong learning skills – so they can evolve into successful professionals both during and after their transition from study to the workplace.

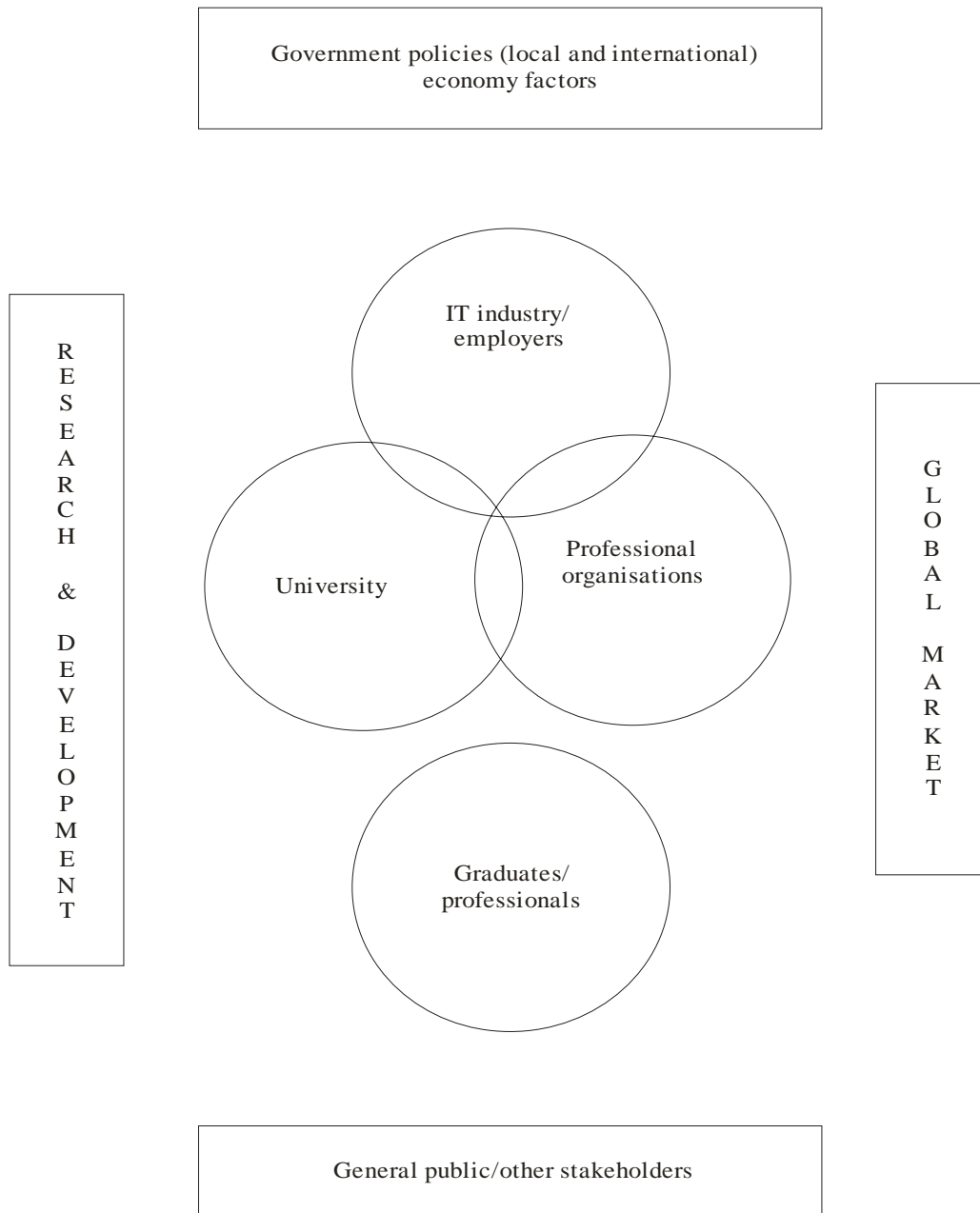


Figure 1. A diagrammatic representation of the key participating entities in the IT profession.

SOME ISSUES FOR INFORMATION TECHNOLOGY EDUCATION

A mismatch in expectations between universities and employers:

Anecdotal evidence suggests that IT employers are increasingly reluctant to employ new graduates. In the past, employers were more willing to provide training to graduates but, increasingly, they now seem to be looking for work-ready graduates. Does the problem lie with

universities, a mismatch of the expectations between universities and employers, or both?

A gap between requirements of emerging IT work practice and the ability of educational institutions to meet these requirements:

A particular challenge is posed by the complex and the dynamic nature of the IT profession, along with its globalization and employment practices such as outsourcing. How can gaps between IT courses and this new reality be

identified, and solutions in education and training systems be suggested, to prepare workers for this environment (Billett, 2000)? A key is to educate graduates to learn how to cope with this new world and to help them to develop abilities to cope with the varied range of work practices. Work placement and practice work-experience components would help undergraduates to acquire adaptability and response skills to some extent, and provide them with much needed exposure to the real world. However, this also requires a commitment from

increasingly reluctant employers to assist in providing such work placements. In addition, the fast changing and complex nature of IT is such that it is unlikely that either employers or the IT industry know what constitutes work practice for IT professional practice. Hence, their expectations of universities to prepare graduates to suit their needs may well be overly demanding and unjustified. Figure 2 illustrates some important elements of professional IT practice.

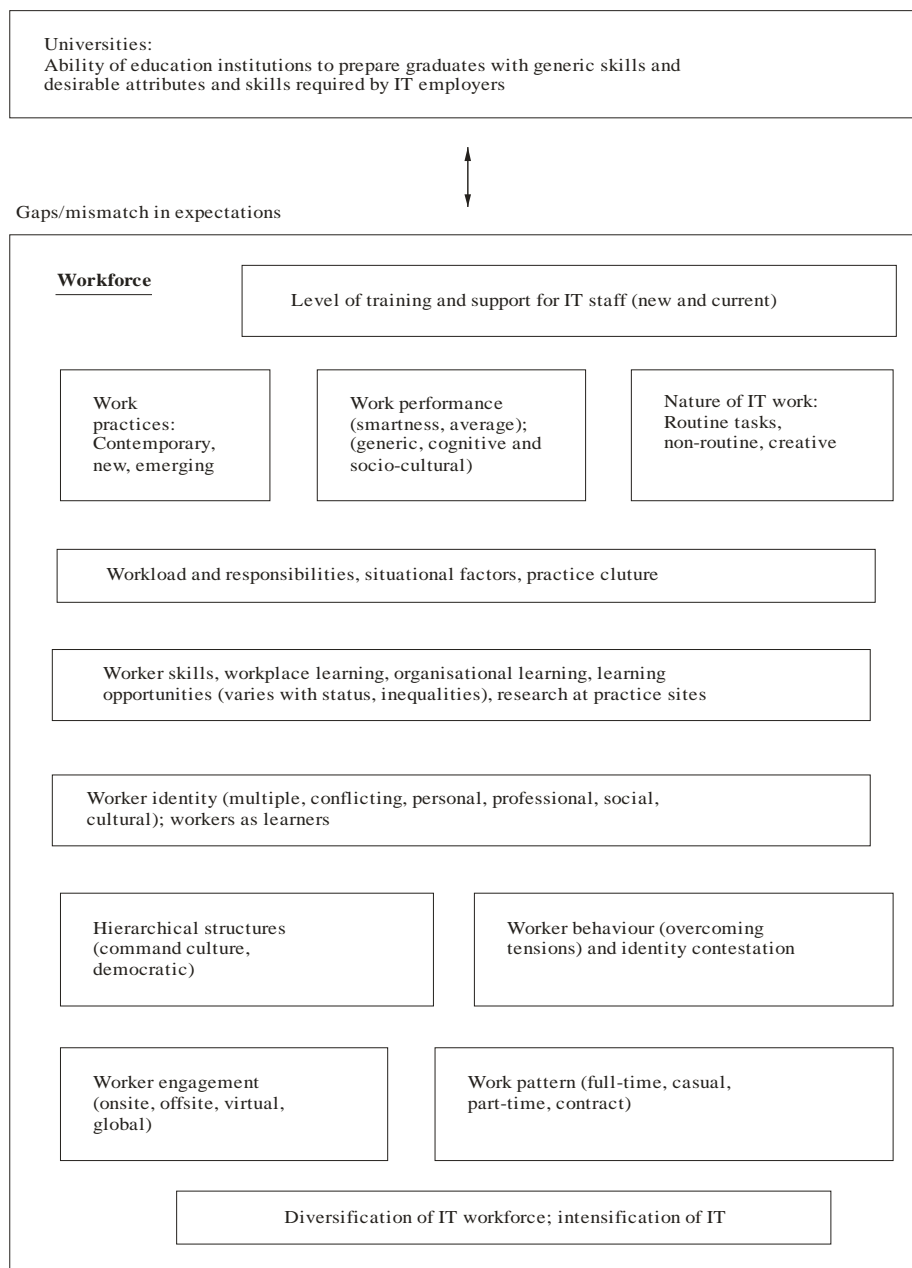


Figure2. Analysing professional practice – elements of analysis.

Analysis of Figure 2 suggests the following questions: how do we define work practices? How can we track or measure the attributes of emerging work practices? How realistic are the expectations of employers in relation to universities preparing graduates (who can meet their requirements)? Can this gap be closed at all, or can it be prevented from widening? What mechanisms are used by universities to address the gap?

EMPLOYER PERSPECTIVES ON UNIVERSITY GRADUATES

A study sponsored by the Department of Education, Training and Youth Affairs (DETYA) into employer satisfaction with graduate skills – carried out by AC Nielsen Research Services (2000) – found: (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 lack of communication skills, lack of interpersonal skills, and lack of understanding of business practice, and (c) large businesses rated new graduate performance better than small businesses (although large businesses may attract better students). It was found that IT graduates have high performance ratings for time management, comprehension of business practice, and academic learning, but low ratings for written and oral communications skills, leadership qualities, personal presentation, numeracy and problem solving skills, and the ability to benefit from on-the-job training

Many undergraduate IT degrees are accredited by the Australian Computer Society. Accreditation requires a certain depth and breadth of knowledge in key areas. More importantly, it also requires the learning of generic skills such as project management, ethics, and written and oral communications. How effective is this learning as graduates move into the workplace?

A further outcome of the AC Nielsen Research Services (2000) report is that large businesses generally recruit on the basis of long-term objectives such as the need for future business leaders. Hence, they were willing to provide ample training opportunities to graduates – with whose performance, overall, they were satisfied. Small companies seem to be more interested in

the short-term use of skilled graduates. Unfortunately, Hagan (2004) shows that Australian industry is dominated by small business, which tends not to employ recent ICT graduates. This finding featured in a study funded by the Australian Universities Teaching Committee to investigate learning outcomes and curriculum development in major ICT disciplines in Australian universities. The main objectives of the study were to capture the reaction of universities to changing demands, to discover innovation and good practices in teaching, to understand graduate feelings about how and what they had been taught, and to capture employer perspectives on their needs and their satisfaction with their recent ICT graduate employees.

Employers surveyed expressed the need for improvements in the following areas:

- Work experience – Graduates have poor or no work experience (an ability 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, team work, and problem solving skills;
- Business skills – more understanding of business practices.

The research recommended that universities focus on broad knowledge and understanding – rather than specific skills and applications – to make sure their graduates have a flexible mindset to learn new technologies as and when they evolve or are needed.

TRANSITION FROM EDUCATION TO WORKPLACE

This section examines the challenges graduates will encounter during their transition from studies to workplace, and the necessary skills and knowledge required for a successful transition.

Creation of knowledge workers

The work of Lee, Green, and Brennan (2000) discusses the increasingly important role of the university in knowledge production and the creation of knowledge workers. The concept of a hybrid curriculum which is an integration of

university, workplace, and profession shows the relevance of theory to practice. Having opportunities during education to access a professional work environment is increasingly seen as an invaluable experience for students to develop aspects of lifelong learning. Such opportunities will assist the development of the students' professional performance skills such as the ability to learn from experiences, form new ideas or innovate, critique their own experiences, and reflect on their own lived experiences and abilities to contribute in new areas.

Necessary skills for successful transition

Hamel (1999), who studied the transition from the college classroom to the workplace, states that this move requires certain job knowledge, skills, and attitudes (KSAs). He argues that how and where the new employee acquires these KSAs is mired in the transition between education and the world of work. Knight (2003) says that lack of work experience, unrealistic aspirations, competition for jobs, poor academic results, poor career planning, degree-work mismatches, and the lack of communication skills, self-presentation, and self-motivation can present huge problems in terms of employability. According to Scott and Yates (2002), it is when things go wrong that professional capability is most tested. Such situations require professionals 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. They discuss whether individual graduates can be emotionally intelligent and if 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". Wood and Petocz (2003) argue that 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 also 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.

Showing the link between theory and practice

Crebert, Bates, Bell, Patrick, and Cragnolini (2004) asked a selected group of university graduates about their perceptions of the contributions that the learning contexts of the university, work placement, and post graduation employment made to the development of their generic skills. The graduate responses showed that they greatly valued their prior experiences of learning in the workplace in their subsequent employment. However, they were also appreciative of the skills acquired from their university studies – skills that they believed provided a good foundation for further learning. The main factors for effective learning identified within the three different learning contexts were teamwork, being given responsibility, and collaborative learning.

Need for lifelong learning skills

Many studies, including that of AC Nielsen Research Services (2000), suggested that a strong disciplinary knowledge-base alone is insufficient for a new graduate to get a job. Work placement was also seen as a model of learning that taught students principles of lifelong learning, situated learning, and transformative learning. It provides students with a sense of real-life, workplace settings, and helps them to exercise their disciplinary knowledge as well as their personal skills to meet an employer's needs. Where industry placement and traineeships are not possible for practical reasons, students should be allowed to take part in some kind of "practice firms" which provide a simulated work environment. Harvey (1999) highlighted that it was the graduate attributes that determined a graduate's success in the workplace rather than a specific degree. However, Crebert et al. (2004) further point out that the list of desirable graduate attributes used by employers is becoming longer and more complex. In this context, 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 is our recommendation that universities foster lifelong learning skills in their graduates by providing opportunities for them to learn: (a) how to relate unknown, unexpected professional situations to learning contexts; (b) how to read

informal learning and/or work situations and to employ effective strategies based on prior knowledge; and (c) the use of a variety of skills (generic, job-specific, and personal) to promote situational learning. Marginson (1994) points out how 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; could be used to enhance generic skills during employment.

FOSTERING LIFELONG LEARNING SKILLS BY UNDERSTANDING LIFELONG LEARNING

The IT industry is divided on the issue of formal and informal learning. What is learned from workplaces, how is it learned, and how it can be quantified are questions that arise. Groundwater-Smith and Dadds (2004) argue that if workplace learning is formalised through the structured and systematic collection of evidence, then it has huge potential to deliver results that would improve the performance of workers at their specific workplaces. Lifelong learning has led to a move to name workplaces as “learning organizations”. Beckett and Hager (2002) refer to research-based theory and techniques as the “high ground”, and day-to-day concerns of work as the “swamp”. Worker learning occurs in a context where learning is not the main intention or purpose. Looking into how learning occurs in workplaces, and how to quantify it so as to measure and compare against measures of formal training, is of interest to all professions alike.

Practice based learning is informal when it occurs at a work site where it is difficult to observe. A particularly challenging issue is how the data that is gathered from practice sites should be interpreted. What scales should be used and why? How should the scales be used and how will they help in understanding the data? Will an accurate interpretation depend on qualitative or quantitative or observational data, or on the means of data collection? The notion that knowledge from formal education should be transferable to the workplace to drive the idea of generic skills is important. Billett (2000) suggests employer surveys about generic skills required in the workplace can be carried out. How can this knowledge be used within tertiary courses?

It is important to realise that it is almost impossible for any tertiary course to meet all the demands of the industry in terms of its expectations of qualities of an IT graduate. The fact that university courses differ in length, coverage of content, or focus within similar subjects, complicates the task of developing programs of study that would all provide the same set of generic attributes for an IT graduate; nor should they. It is important that graduates, universities, and employers have realistic expectations of each other and their roles and responsibilities to ensure they allow for both formal learning as well as lifelong learning (experiential, situational, and organizational learning) in order to shape a confident and efficient workforce. 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).

CONCLUSION

This paper has looked at (a) major issues that arise from literature in relation to the preparation of IT graduates for industry (gaps in education, training, and work requirements); (b) 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 (c) the need for lifelong learning skills to help graduates evolve into successful professionals. There is no one-size-fits-all approach to these issues. The IT industry is multi-dimensional, and simple definitions of the needs of employers are not possible. Little has been resolved over many decades in terms of fitting graduates to the professional IT workplace.

Our future work will be a phenomenological and grounded theory study that will both describe the non-technical workplace experiences of recent IT graduates to derive the meanings and/or essence of such experiences, and develop a substantive theory of the relationship between workplace experiences of graduates and their university studies. Finally, we strongly believe that our

current research – aimed at understanding what is it that the perceptions of the graduates can contribute to the understanding of information technology education is not only of importance to the IT profession but also for the wider higher education community.

REFERENCES

- AC Nielsen Research Services. (2000). *Employer Satisfaction with Graduate Skills: Research Report*. Canberra: Department of Education, Training and Youth Affairs.
- Australian Computer Society (ACS). (1992). *Report of the task force on ACS towards 2000*. Sydney: Australian Computer Society.
- Beckett, D., & Hager, P. (2002). Introduction: Life in the Swamp. In *Life, Work and Learning: Practice in Post Modernity*. London and New York: Routledge..
- Billet, S. (2000). *Performance at work: identifying smart work practice* (pp. 123-150). London and New York: Routledge.
- Crebert, G., Bates, M., Bell, B., Patrick, C., & Cragnolini, V. (2004). Developing generic skills at University, during work placement and in employment: graduates' perceptions. *Higher education research and development*, 23(2), 147-165.
- Groundwater-Smith, S., & Dadds, M. (2004). Critical Practitioner-Inquiry: towards responsible professional communities of practice. In C. Day, & J. Sachs, (Eds.), *International Handbook on the Continuing Professional Development of Teachers*. Berkshire, UK: Open University Press.
- Hagan, D. (2004). Employer Satisfaction with ICT Graduates. *Proceedings of the sixth Australasian Computing Education Conference (ACE 2004)* (pp. 119-123).
- Hamel, J. (1999). *The college-to-work transition through temporary employment services: A case study in an information technology company*. Unpublished doctoral dissertation, Virginia Polytechnic and State University, USA.
- Harvey, L. (1999). *New realities: The relationship between higher education and employment*. The European Association of Institutional Research Forum, Lund, Sweden. Retrieved August 10, 2005, from www.uce.ac.uk/crq/publications/cpeair99.html
- Knight, P. (2003). *Higher Education and employability skills – some views from recently unemployed recent graduates*. Retrieved July 10, 2005, from www.open.ac.uk/vqportal/SkillsPlus/documents/Notes_onastudy.pdf
- Lee, A., Green, B., & Brennan, M. (2000). Organisational Knowledge: Professional Practice and the Professional Doctorate at Work. In J. Garrick, & C. Rhodes, (Eds.), *Research and Knowledge at Work: Perspectives, Case Studies and Innovative Strategies* (pp. 117-136). New York and London: Routledge.
- Marginson, S. (1994). Is competency-based education a good enough learning framework? In *Competency-based education: a compilation of views* (pp. 1-11). Melbourne: Australian Education Union.
- Richardson, A., & Kabanoff, B. (2003). Graduates' perceptions of University study and its contribution towards the development of workplace competence. In *proceedings of the AARE/NZARE 2003 Conference* (pp. 1-14) [CD-ROM].
- Scott, G., & Yates, K. W. (2002). Using successful graduates to improve the quality of the undergraduate engineering programs. *European Journal of Engineering Education*, 27(4), 363-378.
- Vaughan, G. (2000). But it's not real training! Non-formal learning in the workplace. *Training and Development in Australia*, 27(4), 7-11.
- Wood, L., & Petocz, P. (2003). Preparing for the transition to professional work. In *UniServe Science, Improving Learning Outcomes Symposium Proceedings* (pp. 72-97).