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Tracking and Profiling Successful IT
Graduates: an exploratory study

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Tracking and Profiling Successful IT Graduates: An Exploratory Study

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Abstract

Data from the Course Experience Questionnaire (CEQ) and an internal UTS Student Satisfaction Survey repeatedly demonstrate that key factors in students' judgements about the quality of their course are its relevance to professional practice, how up-to-date its content is and how well it continuously links university theory with workplace practice. This study addresses such issues by developing a tracking project that, in collaboration with existing UTS industry partners, taps the experience of 'successful' recent graduates and their views on the above issues.

The results demonstrate that successful graduates are not just technically competent. What distinguishes them is their emotional intelligence (both personal and social), a sharp, focused, contingent intellect and the possession of a specific set of generic skills. The results have important implications for current curriculum design and assessment in universities and for recruitment criteria in the areas investigated.

Keywords

IA01 IS Curriculum; IA03 Computer Science Education; ID03 Future Information Professional

INTRODUCTION

Data from the Course Experience Questionnaire (CEQ) and an internal UTS Student Satisfaction Survey (for details of the UTS SSS and other UTS tracking instruments see <http://www.qdu.uts.edu.au/activities/tracking.html>) repeatedly demonstrate that key factors in students' judgements about the quality of their course are its relevance to professional practice, how up-to-date its content is and how well it continuously links university theory with workplace practice. Some 200,000 comments have been recorded on the CEQ from graduates of all 38 publicly funded Australian universities since it was first administered in the mid 1990s. These are currently being analysed as part of an Australian government supported Evaluations and Investigations Project led by Professor Scott (UTS) and Alan Richardson (QUT) in partnership with a consortium of seven other Australian universities – preliminary analysis of 10,000 of these comments aligns with these factors. It is often asserted that universities' use of external advisory committees helps ensure that their courses are relevant to the needs of industry and the professions. However, recent studies indicate that the members of such committees are typically senior executives who may be too removed from the daily work realities of recent graduates to know what would make their professional preparation most relevant¹. There are indications also that course development teams rarely have access to a comprehensive and robust data base on the daily work experience of recent graduates across a wide range of work environments against which to test the appropriateness of their proposed assessment approaches and learning designs.

¹ This emerged in the recent (2001) review of course accreditation and review procedures by Geoff Scott at Queensland University of Technology.

This study addresses such issues by developing a tracking project that, in collaboration with existing UTS industry partners, taps the experience of 'successful' recent graduates and their views on the above issues. The study operates from the assumption that graduates who have been working in professional practice for between two to six years are well positioned to identify what is likely to be most relevant for those currently studying at university and to suggest enhancements to the design, assessment and delivery of the courses they are undertaking. Such people have sufficient experience to know what counts in the real world of the profession whilst not being too far away from their university course to have forgotten what it covered. They are also better positioned to make valid comment on the quality of their tertiary course than those who have just completed their program of study (the target group for the CEQ).

This paper reports an exploratory study of IT graduates that is one of a parallel series being undertaken in various professions across Australia and New Zealand. The study of successful engineering graduates is complete and has been published (Scott and Yates, 2002); those with Architecture, Nursing and Accountancy graduates are near completion with studies on graduates in Applied Sciences and Law scheduled for 2003.

There is much confusion about the exact meaning of terms such as 'competence', 'generic skills', 'generic attributes', 'graduate attributes' and 'generic knowledge' in current discussions of education. We prefer to use the term 'capability' and see it as including a combination of emotional intelligence (Damasio, 1994; Goleman, 1998), cognitive intelligence and creative thinking (Dewey, 1933; Csikszentmihalyi, 1996) as well as appropriate profession-specific skills and knowledge and 'generic skills'. We see 'generic skills' as involving skills and associated knowledge that are more readily transferable from one practice situation to a quite different one. This would include, for example, things like basic word-processing and email skills, the ability to chair meeting, filing, data-management, self-managed learning skills, information literacy and so on.

The aims of this paper are to:

- Identify the capabilities that are most important to successful professional practice in the first few years after graduation;
- Identify the extent to which the Universities at which the participating graduates studied had focused on these capabilities;
- Apply and validate the professional capability framework (see Figure 1) as a basis for curriculum design and assessment.

The results demonstrate that successful graduates are not just technically competent. What distinguishes them is their emotional intelligence (both personal and social), a sharp, focused, contingent intellect (an ability 'read' what is going on in each new situation and 'match' an appropriate course of action) and the possession of a specific set of generic skills. The results have important implications for current curriculum design and assessment in universities and for recruitment criteria in the areas investigated.

PROFESSIONAL CAPABILITY FRAMEWORK

This framework has been developed and refined using a wide range of research over the past two decades, including:

- Research on professional competence and expertise by Schön (1983), Boud (1985), Morgan (1988), Gonczi *et al.* (1990), Tennant (1991), and, more recently, by Gardiner (1995), Murphy (1996), Scott (1996), Goleman (1998), UK Centre for Research into Quality (website); Scott and Yates (2002); UTS Quality Development Unit (website)
- Research undertaken on professional leadership and effective teachers in education (Scott, 1999)
- Studies of what distinguishes the most effective performers in the Skill Olympics (Workskill Australia, 1995).

The recurring findings from this research are that professional capability is comprised of 5 interlocked components: these are represented in Figure 1. Figure 1 suggests that the

possession of generic or job-specific skills (D and E) is necessary but not sufficient for effective professional performance. What is of equal importance is that the person possesses:

- A high level of social and personal emotional intelligence (A);
- A contingent way of thinking, an ability 'read' what is going on in each new situation and 'match' an appropriate course of action, and a capacity to deftly trace out and assess the consequences of alternative courses of action (B);
- A set of 'diagnostic maps' (C) developed from handling previous practice problems in the unique work context. It is these maps that enable the person to accurately 'read the signs' and figure out what is really going on in each new situation and to determine when and when not to deploy different generic and technical skills.

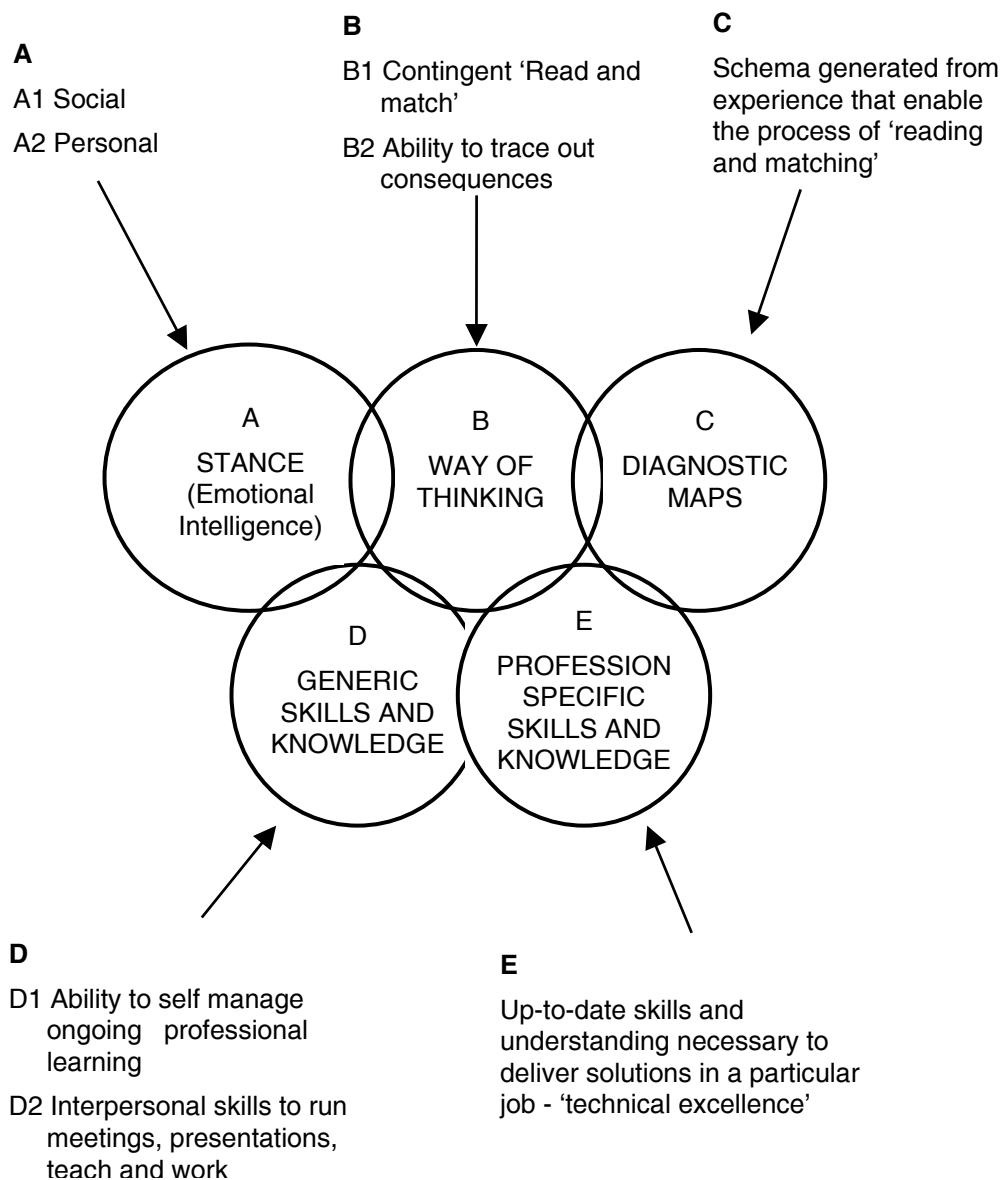


Figure 1: Professional Capability Framework

These studies also indicate that it is when things go wrong, when a troubling problem or dilemma emerges that professional capability is most tested, not when things are running smoothly or routinely.

TEACHING AND LEARNING QUALITY

A robust research base on what leads students to conclude that one higher education course is of high quality whereas another is not is also available. This research includes:

- Analysis of individual and group interviews in Australia, Canada and more recently in New Zealand with experienced educators and students on what, for them, distinguishes the most effective learning programs in post-secondary and higher education (Foley, 2000);
- Analysis of quantitative and qualitative data from the UTS Student Satisfaction Survey (over the period 1994–2000) and qualitative data from the UTS Course Experience Questionnaire (Scott, 2000);
- Research on determining different levels of performance in academic assessment tasks (Biggs, 1992);
- Recent U.S. research on quality in higher education courses (American Association for Higher Education, 1998; National Education Association, 2000).

The recurring findings can be summarised as a set of quality checkpoints for Higher Education Learning Programs. They indicate that students are most impressed when their University Courses:

- Are immediately **RELEVANT** to their particular Background, Abilities, Needs and Experiences;
- Provide more opportunities for **ACTIVE** learning than they do for passive learning – in particular when they include frequent opportunities for students to make contact with people who are further down the same learning path and to actively search a range of relevant databases;
- Consistently link **THEORY WITH PRACTICE**;
- Effectively manage students' **EXPECTATIONS** right from the outset;
- Ensure that learning proceeds in a clear **DIRECTION** and is 'digestible';
- Use a valid graduate **CAPABILITY** profile to specifically generate appropriate assessment tasks. They then use these assessment tasks to identify the specific learning design that will optimise students' performance on them. Care is taken to ensure that the subjects used directly address the full capability profile and do not duplicate each other;
- Provide them with opportunities to pursue flexible **LEARNING PATHWAYS**. Although students are allowed greater flexibility and choice in the subjects undertaken, careful attention is given to ensuring that they still end up with the same spread and quality of capabilities at graduation;
- Ensure that feedback on **ASSESSMENT** tasks is both timely and detailed. Students are especially impressed when they are told where they are performing well against an agreed capability framework, where improvement is needed and how such areas for enhancement might best be addressed;
- Not only include opportunities for **SELF-MANAGED LEARNING** using both digital and paper-based resources, but actively coach students on how to undertake it;
- Provide **SUPPORT AND ADMINISTRATIVE SERVICES** that are easily accessed, responsive to students needs and that specifically work together to optimise the total experience that a student has of the university or college;
- **ACKNOWLEDGE** prior learning and make provision for its recognition in both learning and assessment.

Overall, what this research repeatedly suggests is that the most effective learning programs have successfully engaged in a process of 'reading and matching'². The curriculum design process must, then, take into account the varied Backgrounds, Abilities, Needs and

² This concept is hardly new. The notion was first put forward by the U.S. educational psychologist, David Hunt in the early 1970s after extensive study of the most successful learning programs in schools and training organisations. See, for example, Hunt, D (1971): *Matching Models in Education*, OISE Press, Toronto.

Experiences of each group of students and clearly establish the capabilities to be developed. If validated by the study, the Professional Capability Framework can contribute to this process.

METHODOLOGY

A two-phase methodology has been adopted in the first part of the study:

Phase One

Semi-structured interviews were undertaken with recent graduates selected by employers as being successful performers in the first three to five years of professional practice in the IT industry. Parallel interviews were undertaken with the supervisors/ managers who nominated them.

Phase 1 was conducted as follows:

- A range of IT employers were identified by the Associate Dean (Education) in the Faculty of Information Technology and the involvement of these industry partners was secured. The companies involved employ significant numbers of IT graduates and have a firm association with UTS.
- Senior staff contacts in each company called for nomination by their supervisors of two 'high performing' graduates. Those nominated did not necessarily have to be UTS graduates.
- The graduates selected and their supervisors were interviewed using questions that addressed:
 - The Professional Capability Framework;
 - The adequacy of the framework, including: its ability to account for the data generated in the interview; and its usefulness as a tool for demonstrating how the various aspects of professional capability are linked;
 - Views on how the framework and findings could be used to enhance the focus, assessment, design and learning experiences in relevant UTS courses;
 - The interviewee's perceptions of the relevance and quality of the university course s/he had taken in the light of these reflections.
 - An assessment of the study's relevance and methodology and whether or not scale up would be justified.

Phase Two

An expanded number of employers were used to identify a larger sample of successful graduates. These graduates were contacted first by senior staff in the UTS partner company to request their participation. Respondents were then sent the URL for the web-based online survey. This process achieved a particularly high response rate.

The key findings and issues identified in Phase 1 were used to validate the capability framework (Figure1) and to inform the specific aspects of capability investigated in Phase 2. The capability statements generated from an analysis of the in-depth interviews in Phase 1 align closely with the emerging results from the parallel studies in Engineering, Nursing, Architecture and Accounting and were comfortably accommodated by the study's capability framework.

In the online survey respondents first provided a range of demographic data and were then invited to rate each of the statements identified in phase one in two ways:

- First on how important this aspect of capability was to their current professional success; and
- Second the extent to which their University had focused on this area.

The criteria used by supervisors/ managers to identify 'successful' graduates for the study (both Phase 1 and Phase 2) were:

- Consistent completion of assigned jobs on time and to agreed standards.
- Direct observation that the individual was working positively and constructively with fellow workers and was able to remain calm under pressure.
- Consistently positive feedback from clients regarding the individual’s attitude and expertise.
- Skill in making public presentations to clients and staff.

RESULTS AND IMPLICATIONS

The results for the online survey with the IT graduates are summarised in this section; the results for engineering graduates are reported elsewhere (Scott and Yates, 2002).

Four (4) IT graduates from two (2) Sydney-based IT companies or departments were interviewed (Phase 1); fifteen (15) IT graduates from six (6) Sydney-based IT companies or departments responded to the online survey (Phase 2). The Phase 2 respondents had graduated from a variety of computing degree courses offered at Macquarie University (1), University of Sydney (4), UNSW (4) and UTS (6). A majority were employed in a business or technical analyst/ development role (9), but there were also network engineers (2), consultants (2), a technical leader (1) and a support manager (1). It is important to note that, although the sample size was relatively small, an analysis of the demographic data indicates that it was comparatively representative of the field in general.

Respondents were asked to rate items from the capability scales on their importance for successful performance in their current professional work and then to rate the extent to which the University they attended focused on them. Respondents were also asked to justify and discuss their ratings. The graduates’ comments were grouped as follows: first on what they said about the nature of their professional experience overall and then on the particular aspects of professional capability and the role of their University in developing them.

The top five capabilities in order of importance are shown in Table 1. Emotional intelligence dominates the factors identified by graduates as important to their professional careers; thinking and generic skills are also rated highly. The top three items are from A: Stance (Emotional Intelligence) of the capability framework; the 4th and 5th items are from B: Way of Thinking of the framework. The ability to work in teams, particularly cross-disciplinary teams that are common in the IT workplace, is also considered vital.

The responses indicate that the various aspects of capability identified in the study do not operate in isolation from each other. When the unexpected occurs, what is most telling is being able to tolerate the uncertainty and ambiguity of the situation, having well developed reciprocal networks upon which to call to identify potentially relevant solutions, being able to ‘read’ the total technical and social components of a troubling situation, and then being able to apply a high level of appropriate technical skill in partnership with other team members to resolve the situation.

Statement	Mean/ 5 point scale		Scale
	Importance in Grad Success	Performance of University	
8. Being willing to take responsibility for projects, including how they turn out	4.73	3.53	Personal Abilities
1. Being willing to face and learn from my errors and listen openly to feedback	4.73	2.53	Personal Abilities
19. Being able to develop and contribute positively to team-based projects	4.67	4.29	Interpersonal Abilities
23. Being able to diagnose what is really causing a problem and then test this out in action	4.67	4.00	Intellectual Abilities
22. The ability to use previous experience to figure out what is going on when a current situation takes an unexpected turn	4.67	3.13	Intellectual Abilities

Table 1: Top 5 Capabilities

The following themes recurred in respondents' comments:

- The sudden unexpected event is inevitable and it is then, not when things are going predictably, that your capability is tested.
- Intense time pressures and the need to manage time effectively to get through.
- Having to deal with people with a range of backgrounds, attitudes, power and expectations.
- The importance of using networks to help solve problems.
- How it is impossible to teach the specific technical skills you will need to do the job you end up in.

Technical knowledge (Item 29: *Having a high level of current technical expertise relevant to my work area*) rates only 35th of 38 factors and the highest rated item of 'profession-specific skills and knowledge' (Item 37: *Understanding how organisations like mine work*) rates only 31st of 38. IT graduates regard technical knowledge as necessary but not sufficient for successful professional practice.

A: Stance

Respondents' comments regarding stance (emotional intelligence) confirm Goleman's (1998) findings and the results of an earlier study of Deans at UTS (Kemmis and Scott, 1997) – that it is the combination of a particular set of social and personal affective capabilities that is most telling.

In terms of *social-emotional intelligence* the distinguishing capabilities identified by the respondents included an ability to empathise with the perspectives of others, to work constructively in a team, engage in reciprocal relationships, to be patient and to allow others 'room' to do things for themselves. In terms of *personal-emotional intelligence* the distinguishing capabilities included a capacity and willingness to try new things, take informed risks, tolerate uncertainty, ambiguity and change, admit and learn from errors, defer judgement, pursue excellence and persevere, to work independently, withstand personal attacks, behave ethically, keep work in perspective, lead a balanced life and to 'pitch in' and do 'drudge work'.

Emotional intelligence is so important because, said respondents, it is how the young graduate reacts when things go wrong, not when things are running smoothly that is a precondition for effective professional performance.

The idea of emotional intelligence is really interesting. Just labelling it and showing how it works in each profession would be a great start in every university course. In my experience since leaving university it is critical – yet it was never even touched on in my course.

[IT Graduate 1]

B: Way-of-thinking

Respondents emphasised that lower order cognitive skills such as memory are necessary but not sufficient to handle the constantly shifting nature, problems and dilemmas of professional practice in IT. What is needed is an ability to think 'contingently' and creatively, to be able to trace out and assess the consequences of different options for action, to identify and accommodate conflicting interests and perspectives, to set priorities, identify the core issue in any situation and to think holistically, laterally and iteratively not rigidly, technically or in a linear manner. This finding aligns with other research (Schön, 1983; Kolb, 1984; Workskill Australia, 1995; Csikszentmihalyi, 1996) and is consistent with preliminary findings from a government funded Evaluations and Investigations Project that is analysing the extensive database of comments provided over the past five years on the CEQ. Respondents repeatedly noted that this way of thinking cannot operate well if the individual lacks the emotional intelligence to work with continuing complexity, uncertainty and ambiguity and in collaboration with a wide range of people.

This is the time when you lean back on your learning's from University and past experiences to think of potential options/solutions and decide (with input from your technical team and business partners) which options would make the most business sense.

[IT Graduate 2]

C: Diagnostic Maps

Of particular interest is the finding that a 'contingent' way of thinking can only operate effectively if the individual possesses the 'diagnostic maps' necessary to give meaning to what an outsider or novice would find a complex and hard-to-fathom set of work-specific factors and relationships.

Respondents indicate that these 'maps' can only be generated by:

- Experiencing the dilemmas and recurring challenges of a particular practice context.
- Reflecting on them using a framework such as that outlined in Figure 1.
- Figuring out what responses do and don't work well in such cases.
- Gradually testing and refining the resulting 'meaning-giving' schemas through subsequent experience in similar, but never identical situations.

It is also clear that these 'maps' are most effectively developed if the individual has been able to deploy a high level of social-emotional intelligence to build networks and relationships with other professionals in the same area. Respondents indicated how they were able to draw upon the 'collective brain-power' of these informal networks to gain insights into the nature and possible ways of resolving particular practice dilemmas as they arose and how it was through this process that they developed their ability to more accurately interpret what was going on in subsequent situations of a similar nature. They emphasised that such networks only operated well if each member reciprocated when others in the network called them for help.

This finding closely aligns with Schön's (1983) discovery that it was *problem forming*, working out what the problem really is in a perplexing situation that is a critical for successful professional performance, not problem-solving, as it has been traditionally portrayed. This process requires the practitioner to accurately 'read' the whole context, both technical and human, in any particular situation in order to identify what needs to be done. As one respondent said:

The daily problems we have to handle in making a project work don't present themselves on a plate... you just know that something is not quite right and the challenge is to figure out what the problem actually is... I ask myself things like 'have I seen this before? What did we do then?' It's never exactly the same but as you get more experienced you come to recognise familiar patterns and signs... you can only learn this by getting out there and experiencing real world and then discussing what happened with colleagues.

[IT Graduate 2]

I find that when things are going wrong that the most demands are placed on my professional capability. It tests my ability to make decisions under pressure; make quick decisions; making informed decisions based on experience.

[IT Graduate 3]

D/E: Generic Skills and Technical Expertise

The study consistently illustrated that 'the top circles' of the capability framework are far more important than the actual technical and generic skills (the bottom circles) in professional lives. This is not to deny, as all respondents emphasised, that the successful professional must possess a high level of profession-specific technical expertise. In fact

such knowledge actively assists with the process of problem interpretation and diagnosis. Nor does it deny the importance of possessing requisite generic skills such as the ability to effectively undertake team work, network, communicate and present ideas, project manage, learn one's organisation, mentor, carry out self managed learning or to organise one's work and life. The point is that possessing such skills comes to nought if one is unable to handle uncertainty, work productively with people from a wide variety of backgrounds, accurately diagnose what is going on when events take an unexpected turn or if one is unable to figure out when and when not to deploy particular components of one's repertoire of generic skills and technical expertise.

The most relevant skills learnt at uni were not skills with specific technology, but rather general skills such as learning how to learn, communicating, problem solving, working in a group. prioritising and managing time.

[IT Graduate 1]

CONCLUSION

The results of this preliminary investigation of successful IT graduates align with the outcomes of studies underway or complete in other professions. They demonstrate that successful graduates are not just technically competent. What distinguishes them is their emotional intelligence (both personal and social), a sharp, focused, contingent intellect and the possession of a specific set of generic skills.

What also emerged is that organisational and individual capacities to effectively manage continuing change (learning) are intimately linked. For example, there were clear indications that organisations populated by large numbers of people with the profile identified in this study have a much greater chance of being successful. Similarly, there are suggestions that when an organisation has a culture ('the way we do things around here') that is emotionally intelligent and contingent it is more likely to succeed than one where the culture is unresponsive, negative, blocking, rigid, technical and uncontingent. These findings have important implications also for recruitment, promotion and organisational development.

Overall, what respondents said about the capabilities that they have found to be central to their professional performance in their first years of practice has fundamental implications for current curriculum design and assessment in universities. A key issue for universities is the extent to which capabilities such as stance and way-of-thinking can be directly developed (the nurture argument) and the extent to which they are unchangeable, simply something one is born with (the nature argument). The results of this study indicate that social experiences, including education, can optimise or minimise the extent to which one's potential or limitations in such areas is achieved. There are also possible links between the findings on stance and the ethics of professional behaviour that might be explored further.

The outcomes of this initial study are particularly encouraging. There is little doubt that the notion of tracking and profiling successful graduates and 'backward mapping' from their experiences during their first few years of professional work to evaluate the quality of university learning and assessment experiences has proven to be especially productive. As the respondents said:

The nexus between academic life and the real world needs a lot of attention – this project hits the issue fair and square... The idea of using younger, successful graduates to tell new students what really counts is a very good idea. New students like to hear from their peer group not older people... What you are doing is making university education more relevant... There is a lot of talk about universities getting closer to industry. This project shows how to do it properly.

[IT Supervisor 1]

What the respondents in this and the parallel studies in other professional areas emphasise aligns closely with the quality tests for teaching and learning identified earlier in the paper. It also affirms the current emphasis at UTS on taking a more consistently integrated, practice-based, trans-disciplinary approach to learning design and the University's distinctive

approach to flexible learning. Respondents consistently observed that too much of the teaching in their courses had been didactic and in the bottom two circles of Figure 1, especially area D, and that too little had been done about the top three areas (A-C).

The next phases of the study are to:

- Compare and contrast the results for IT and engineering respondents – to review and comment on significant differences and to reinforce findings where there is agreement;
- Conduct similar studies in other faculties and disciplines;
- Compare current approaches to UTS course design, delivery and assessment in IT against the aspects of capability identified as most important in the findings.

The authors are currently preparing a paper comparing results between IT and engineering graduates and identifying proven approaches to developing and assessing emotional intelligence in the university context.

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