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EDUCATING FOR PROFESSIONAL CAPABILITY IN THE FIELD OF INFORMATION TECHNOLOGY: INTEGRATING INDUSTRY-BASED LEARNING WITH THE ACADEMIC CURRICULUM

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Abstract
In response to the forces of globalisation, societies and organisations have had to adapt and even proactively transform themselves. Universities, as knowledge-based organisations, have recognised that there are now many other important sites of knowledge construction and use. The apparent monopoly over valued forms of knowledge making and knowledge certification is disappearing. Universities have had to recognise the value of practical working knowledge developed in workplace settings beyond university domains, and promote the value of academic forms of knowledge making to the practical concerns of everyday learning. It is within this broader systems view that professional curriculum development undertaken by universities needs to be examined.

University educational planning responds to these external forces in ways that are drawing together formal academic capability/competence and practice-based capability/competence. Both forms of academic and practice-based knowledge and knowing are being equally valued and related one to the other. University planning in turn gives impetus to the development of new forms of professional education curricula. This paper presents a contemporary case of a designed professional curriculum in the field of information technology that situates workplace learning as a central element in the education of Information Technology (IT)/Information Systems (IS) professionals.

The key dimensions of the learning environment of Deakin University’s BIT (Hons) program are considered with a view to identifying areas of strong integration between the worlds of academic and workplace learning from the perspectives of major stakeholders. The dynamic interplay between forms of theorising and practising is seen as critical in educating students for professional capability in their chosen field. From this analysis, an applied research agenda, relating to desired forms of professional learning in higher education, is outlined, with specific reference to the information and communication technology professions.

Keywords
Learning environments, professional education, workplace learning, education design, IT/IS profession
Introduction

‘Increasing numbers of teachers and practitioners of all kinds are realizing that the polarity between the intellectual and the practical is an absurdity which can no longer be supported and that we can only progress if we accept that thinking and action are entirely complementary’ (Boud in Weil & McGill 1989, Foreword, p.6).

In 2000 Deakin University launched a new Bachelor of Information Technology (BIT) Hons program to provide a fast track high quality professional educational experience to highly qualified and motivated students. The program attempted to differentiate itself from other such courses offered within the State of Victoria, Australia by incorporating both substantial periods of industry placement and a major, industry-based, honours minor thesis. The BIT program has a central goal of developing students with IS/IT skills relevant to the business context. The program also aims to develop in students leadership skills appropriate to the changing nature of the global IT industry. The program can be seen as an outcome of both external and internal environmental factors which are examined in the paper.

A central challenge for the development of such a program is to consider carefully what it means to create a high quality educational experience. Quality considerations are determined by a dynamic interplay of stakeholder needs. The stakeholders of critical importance to the BIT Hons program include the students, the academic teaching staff and the IS/IT profession and industry. This paper conceives quality in terms of a set of productive interactions between these stakeholders and through a set of well articulated integrations between the program’s academic curriculum, pedagogical and assessment requirements on the one hand, and the program’s fieldwork education requirements on the other. Essentially, this relates to the overall integration of the benefits of academic knowledge/knowing/learning with practical knowledge/knowing/learning.

With the course now well established, an in-depth research project has been formulated to investigate the actual experiences of students, teachers and industry mentors who have been actively involved in the program. Preliminary results of the research are reported in this paper. The case study aims to draw conclusions about the design of quality contemporary professional curricula in the field of IS/IT which enhance the integration and benefits of academic and workplace learning. Findings will be linked to similar research undertaken in such IS/IT-related programs elsewhere in Australia and generalised where appropriate to other fields of professional education.

Towards excellence in professional education

Universities in recent times have been challenged to make themselves relevant to the rapidly changing nature of a globalising knowledge economy and its associated workplaces. The knowledge economy is seen as being driven by intellectual capital for competitive advantage with the concomitant weakening of such advantage based on manual labour and natural resources. The most competitive societies, nations, organisations and individuals and now seen as those who are the smartest and quickest in shaping and responding to ever-changing human needs. Intellectual capital underpins the new employability skills and the marketability of the new generations of global economic workers. The following list of generic employability skills was formulated by the Australian Chamber of Commerce and Industry and the Business Council of Australia for the Department of Education, Science and Training (2002, pp.8-9) building on previous national studies undertaken over the 1990s and cross-country comparisons:
- Communication that contributes to productive and harmonious relations between employees and customers;
- Teamwork that contributes to productive working relationships and outcomes;
- Problem solving that contributes to productive outcomes;
- Initiative and enterprise that contribute to innovative outcomes;
- Planning and organising that contribute to long-term and short-term strategic planning;
- Self-management that contributes to employee satisfaction and growth;
- Learning that contributes to ongoing improvement and expansion in employee and company operations and outcomes;
- Technology that contributes to effective execution of tasks; and a lengthy list of
- Personal attributes that contribute to overall employability (e.g. loyalty, honesty & integrity, adaptability) (our emphasis added).

Universities increasingly confront the imperative to ensure that these types of employability skills are embedded into their undergraduate curricula in order to satisfy external industry and professional accreditation stakeholders.

Moreover, universities no longer have a natural monopoly over the creation, storage, dissemination and application of knowledge for these purposes. Universities have been seen as knowledge-based organisations creating highly specialised and fragmented bodies of knowledge, where the disparate knowledges are not necessarily harnessed to help solve the pressing problems of society. In response to competitive pressures from other forms of knowledge organisations, universities have attempted to re-integrate their knowledge for the purposes of applied research and the teaching of professional courses. In so doing, universities have had to assert their unique differences from other private, knowledge organizations, very much in terms of synergies built between the creation of knowledge on the one hand, and its use on the other (Pittinsky, 2003). Competitive pressures on universities have been exacerbated by globalising tendencies within the industry and those who believe they can enter it at low cost through the new information and communications technologies (Epper & Bates, 2001). Information and communications technologies (ICT) are reducing barriers to entry for private providers wishing to exploit niches in the virtual global higher education marketplace.

Universities then are confronted with a globalising higher education marketplace, emphasising new forms of vocationalism and new arenas of virtual competition. Not surprisingly, the subject of IT itself has been seen as a high potential area for the educational provision of global, virtual course offerings, with such offerings in turn providing the intellectual capital or skilled work forces required to fuel the global IT industry and the global knowledge economy. Australian universities have responded to these external environmental factors by (re)committing to institutional (some might argue corporate) approaches to enhancing the graduate outcomes of their students by providing them with systematic opportunities to develop and be assessed on a set of desired student attributes (many of them the employability skills mentioned above) valued by academia, industry and the professions. Along with graduate attributes, commitments can be seen to experiential learning, particularly expanded use of work placements, the internationalisation of the curriculum, and student-centred approaches to learning. These student-centred approaches see learning as:

- goal oriented (where goals are determined by teachers and understood by learners);
- personally meaningful/relevant and active (where learners actively construct their own knowledge understandings);
• **reflective** (where the emphasis is on knowledge use and problem solving);
• **collaborative** (where students at least part of the time work as members of groups);
• **inclusive** (where each student has the best possible opportunity to achieve desired learning outcomes and diversity of perspectives is highly valued); and
• **a partnership** (where teachers and learners work together productively) (Segrave & Holt 2003, in press).

Greater emphasis is being given to enhancing staffing capabilities in all areas of academic work and the design of innovative organisational and course structures and approaches to bring together related discipline areas around key professional concerns or fields of study.

All of these external and internal changes raise fundamental questions about the design of contemporary learning environments for quality professional education. Design considerations are shaped by the interplay of various stakeholder concerns: those of the different academic disciplines and departments contributing to the curriculum; the expectations of industry and professional associations; and the students themselves. These stakeholder interests can lead to tensions between the appropriate composition and balance of emphasis between various academic concerns, and the more practical concerns of external stakeholders. These tensions can manifest themselves around perceptions of emphasis and the relationship between academic knowledge and knowing within the academy, and practical knowledge and knowing rooted in the workplace. This therefore becomes a perceived tension between theory and practice. The contemporary professional curriculum in the field of IS/IT must grapple with these possible tensions, and find some balance and coherence between the academic and practice-based dimensions of the learning environment. Balance, coherence and integration in turn require some teaching philosophy shaping curriculum design valuing the coming together of the academic/theoretical with the practice of the workplace. Moreover, this requires a strong sense of the developing nature of the professional field of practice and associated capabilities required to be an effective entry-level practitioner in the field. A pedagogy supporting the student as active learner, progressively developing their conceptions of effective professional practice, scaffolded through the learning experience by a mixture of academic and practitioner guidance and direction seems essential to achieve this, as is an integrated virtual and physical environment of learning resources, interactional possibilities, etc. Students must be equipped with capacities to know what to do in professional practice but also the knowing of how to do it productively with the acquired knowledge.

A key pedagogy for shaping learning environments relating to educating for professional competence/capability is the practicum. Schon (1987, p.37) defines the practicum as ‘…a setting designed for the task of learning a practice. In a context that approximates a practice world, students learn by doing, although their doing usually falls short of real-world work. They learn by undertaking projects that simulate and simplify practice; or they take on real-world projects under close supervision.’ The practicum may be undertaken then in the university classroom, and/or through a virtual simulation and/or through real-world work settings, physical and virtual, assuming forms of appropriate institutional and local educative supervision. The professional education practicum needs to be clearly contrasted with forms of unsupervised work experience loosely aligned with the academic learning experience. These may provide opportunities for forms of technical training, but not for the development of real professional capability.

The embedding of real-world practica within the academic curriculum becomes a hallmark of a contemporary professional program. It provides the all-important contextual knowledge for allowing students to begin being and feeling like a professional practitioner. Students require
systematic preparation for undertaking real-world practica, guidance and mentoring during the actual practicum experience and opportunities for academic reflection and learning post practicum placement. The opportunities for further application and development of learning through subsequent practica can enhance the experiential learning cycle. Throughout the cycles of experience-reflection-theorising-experimentation, students should be strengthening their professional conceptions and practices with a growing understanding of the interplay between theorising and practising as it relates to engaging with the real problems of the workplace. It can be argued that the intersection between theory and practice and the valuing of both is the development of professional judgement making. Norris (2000, p.181) observes that, ‘The required mediation between abstract and general knowledge and concrete and specific situations is an activity requiring much professional competence and sound judgement.’

Other adult and professional educators like Schon (1987) see a more radical reconceptualisation of the theory/practice dichotomy by privileging in the educational enterprise practitioners’ learning to theorise their own practice, although in saying this he notes:

> Perhaps we learn to reflect-in-action by learning first to recognise and apply standard rules, facts, and operations [characteristic of the academic curriculum]; then to reason from general rules to problematic cases, in ways characteristic of the profession [characteristic of academic curriculum and the practicum]; and only then to develop and test new forms of understanding and action where familiar categories and ways of thinking fail [characteristic of extended practicum and ongoing professional experience]. (Schon 1987, p.40)

Whether it be theory-based practice or practice-based theory, professional judgement making capacities seem critical to both views. Importantly, theory and practice are brought in different ways into close alignment, a characteristic of a well designed professional curriculum.

The importance of the practicum (sometimes referred to as cooperative education) in higher education has a lengthy history in the US (Ryder, Wilson & Asociates,1987), with a more recent development in professional areas like IT (Swinburne University of Technology,1994; Calway & Murphy, 2000) and science/IT (Gardiner & Singh, 1991) in Australia. The importance and operation of the practicum as a defining design element of the BIT Hons program is considered later.

**Integration framework for understanding program design for quality professional education**

Building upon the above discussion, we believe that learning environments in higher education conducive to quality professional education in the field of information systems and information technologies can be best conceived in the form of a coherent set of integrations in accord with the following dimensions (see Figure 1):

- **Integration of IS/IT business and technical perspectives:** students able to synthesise their technical and business related studies of IS/IT;
- **Integration of academic curriculum with the world of work:** students able to use their academic learning in the workplace and workplace learning in their academic studies;
- **Integration of academic research with workplace concerns:** students able to undertake a major research project based on practical concerns and experiences faced in their periods of industry-based learning;
• Integration of ICT with academic curriculum and workplace learning: ICT is seen by students as a coherent area of study in the academic curriculum and practice in their work placements, and that ICT is used appropriately in supporting academic and practica learning experiences;

• Integration of work of academic supervisors with industry mentors and sponsoring organisations: students understand the respective roles of key academic and workplace educators in their overall learning, and that the contributions of both stakeholders benefit the students’ professional education;

• Integration of assessment with workplace learning: students see the workplace as a key site of learning in relation to academic, industry, self- and peer-assessment supportive of their professional development; and

• Integration of student peer group support: students see each other in their academic studies and in their work placements as key learning resources.

Figure 1: Integration framework for designing quality professional education: a student-centred approach
Designing the BIT Hons program learning environment

The BIT Hons program is a 32 credit point program which can be completed over 3 years of full-time study based on a tri-mester offering of units. The program is accredited by the Australian Computer Society. It has an annual intake of approximately 15 students. The program is taught jointly between the School of Information Systems and School of Information Technology in the Faculties of Business and Law and Science and Technology, at Deakin University, Australia, respectively. Students must complete:

- 12 credit points of compulsory IT units in technical and business related areas of IS/IT;
- 2 periods of industry placement amounting to 8 credit points;
- advanced coursework of 4 credit points;
- an industry based research project worth 4 credit points; and
- elective units amounting to 4 credit points.

The goal of the BIT Hons program is to provide students with the IT and business skills required to meet challenging and diverse career options in response to the world-wide demand for professional expertise in information technology. The following key skills are developed as part of the program:

- technical skills in systems analysis and design, software development, database management, electronic commerce, data communications, research methodologies and project management;
- problem solving skills in addressing real business problems;
- written and communication skills; and
- strategic skills in evaluating the IT imperative in a business context.

Two key areas of the BIT curriculum differentiate it from other IS/IT courses offered by the University, namely: the significant weight given to industry-based learning (IBL); and, related to this, the BIT Hons year involving a practice-based research project. The principal intent of undertaking IBL is to provide students with the opportunity to both apply their recently gained IT knowledge (mostly theoretically-based) in a real business environment, while at the same time gaining an appreciation of the commercial imperative. Specifically, the aims of IBL are to enable students to: develop their theoretical and practical skills in a real world business setting; practice their acquired computing and business skills on real problems; demonstrate their capacity to solve IT problems and to work as members of a team; and design solutions to complex problems as experienced in their workplace (Mackay, 2002b, pp.3-4). One academic teaching staff member interviewed as part of our research reflected on how IBL placements cultivated the maturation of the students and the consequent benefits for their academic learning in the program:

*When the student comes back from IBL they are significantly more mature. It is more than just the eight months. In the final year you are talking to a student who has a great deal of depth in all sorts of things. They tend to have an enhanced purpose because they have seen the workplace. They also have a way of presenting themselves because they have been working in an adult graduate world for eight months as a professional. When they return you can challenge them and engage them in discussion about issues at a depth that wouldn’t have been possible if they hadn’t had the eight months. They genuinely understand what it is like to be in the workplace. They understand how the technology fits in a way that their peers who haven’t had industry placement don’t have the ability to do*
...When I am working with students who have done IBL I tend to engage them in a discussion at a greater depth. (Staff interviewee 2).

A defining feature of cooperative education (read the industry practicum) is that students are involved in ‘planned, productive work’ and not merely where ‘the student’s primary function is to observe or “shadow” professionals at work’ (Ryder, Wilson & Associates, 1997, p.2 and p.3). The BIT IBL placements provide these opportunities for productive work in pursuit of the program’s goal. Moreover, beyond developing technical skills the IBL placements are designed to allow students to develop broader personal, social and career understandings. These understandings are developed through IBL journal keeping and reflective reporting at the end of each placement. The relationship between industry, students and Deakin University is depicted in Figure 2.

Figure 2: Relationship between industry, students and Deakin University

The two IBL placements must be of a different kind, usually undertaken in different organisational settings. They occur between students’ foundation studies in IT/IS and the final honours’ year. The placements are formally assessable as Pass/Fail only, with an industry mentor completing an evaluation report on the student and the academic supervisor assessing an IBL journal and report completed at the end of each placement. Students are briefed by academic supervisors before they undertake an IBL and visited by these staff on entering and exiting the placement. An exit presentation must be given by the student to both the academic supervisor and industry mentor as well. During the IBL placements students can take advantage of the University’s computer conferencing system to allow them to interact with their peers and academic supervisors. This provides a sense of online professional community support facilitative of learning in the workplace.

During the IBL placements students have the opportunity of negotiating with their organisational sponsor the possibility of undertaking a sponsor-selected research project as part of their final honours year. This is mutually advantageous to the students and the sponsors. It forms a key learning partnership characteristic of the latter stage of the program.

The other key differentiator, the BIT honours year, is designed to provide in-depth specialisation in a number of contemporary IT fields and to provide training in research techniques. Advanced coursework relates to research skills/methods and contemporary issues in IT/IS, with further options to develop advanced knowledge in both the technical and business context dimensions of
IT. The students’ research projects preferably, as noted above, relate to IBL sponsor concerns, consistent with the research interests of those academic teaching staff involved in the program. The project aims to give students experience in undertaking a fairly significant task, requiring the exercise of considerable initiative and dedication, and the development of research methods and potential for higher degree research if they so choose (Mackay, 2002a, pp.3-5). Another academic teacher interviewed as part of the research project outlined the distinctive nature of the applied research project in the program:

*It was a case of initially talking about research ideas. It was a case that many of them have generated their ideas from being out in industry and seeing real life problems and they were forward thinking that into their honours year. They came to me and said they knew this is an issue because they had seen it in their IBL and then we talked about the requirements for honours. We then formulated a project and they contacted their former company that they worked with and they agreed to be a partner of it in terms of the research. …They use the company to validate their research. It reflects applied research away from the more theoretical research which usually gets carried out for honours.*

*In terms of honours projects there is a very clear distinction between students who have very theoretical honours programs and those who are able to make it very applied within industry (Staff interviewee 5).*

**The aims of the study**

Deakin University has designated one of its key research priority areas as relating to quality learning. The University’s Teaching and Learning Management (now Development) Plan places particular emphasis on developing experiential learning through work placements, online teaching and learning and desired graduate attributes. Studying the BIT Hons program was seen as a significant opportunity as it embodied strongly the University’s strategic imperatives and therefore was seen as an interesting case of designing professional curricula for quality learning. The study is aimed at helping us understand and explain how learners and teachers approach the task of integrating and using academic and workplace learning in the educational field of information systems and information technologies. The study addresses the central question of the best ways of designing quality professional curricula to enhance the development of professional expertise in university graduates through the strong integration of study/theory and work/practice. The study’s aims are as follows:

- Examine students’ experiences of learning in the program, including their views on the value and importance of various aspects of the program’s curriculum, pedagogy and assessment practices;
- Examine students’ experiences of learning during their industry-based placements and applied research projects;
- Examine students’ experiences in developing and using academic and workplace learning;
- Understand students’ conceptions of the attributes of professional capability/competence on graduating from the program;
- Examine academic teachers’ experiences in supporting student’s learning in various aspects and at various stages of the program;
- Examine industry mentors’ views on desired student attributes for effective performance in the IT industry;
Identify key dimensions of contemporary learning environments enabling quality professional education in IS/IT and other professional fields where appropriate; Draw on and link to other relevant research being undertaken within Deakin, nationally and internationally; and Outline best practices in designing professional curricula to achieve desired integration and benefits of academic and workplace learning for key stakeholders.

Research methodology

Case study methodology has been chosen as the means of developing our understandings of the various stakeholders’ perspectives. Case study belongs to the interpretive qualitative research tradition, a tradition of research which has developed in distance education, of which Deakin University is a major provider (Morgan, 1984; 1991). We wish to understand how students, academic teaching staff and industry mentors interpret and act on various aspects of the BIT program. This requires empathetic understanding and exploration of key parties’ subjective realities of being involved in the program; that is, how they engage with the program’s learning environment, and attribute meaning and value to its key components (see Holt, 1993 for a study of off-campus MBA learner experiences relating to management conceptions and practices). Central to this is the focus on the students’ learning experiences. We are not necessarily interested in casual explanations of the phenomena under investigation but are more interested in deepening and extending knowledge of how and why the BIT program is perceived and experienced by the key parties the way it is. The constructed realities of learning and teaching within the BIT represent a set of interactions within and between the key parties involved in the educational enterprise and requires illumination. The cultures of academic teaching/learning and workplace teaching/learning and their interrelationships becomes an important area of research. This type of cultural analysis belongs to the ethnographic field of research (Hammersley & Atkinson, 1983; Hammersley, 1990), and many features of ethnography can be found in the research (with the exception of direct observation by the research team of students in their work placements which was deemed unfeasible given the constraints of the study).

It is intended that generalisations might be made about the Deakin BIT program as the case in action, or single setting/group, under investigation and that these generalisations might resonate with other providers of such programs in the field of IS/IT and practicum-based professional programs in higher education more generally.

The range of case study data gathering methods used in the research covers: surveys of IBL placements; focus groups with graduate students; surveys of graduate students; analysis of IBL journals and reports; interviews with academic teachers; interviews with industry mentors; analysis of student theses; and analysis of students’ IBL online communications.

Preliminary results and issues for further investigation

To date, a number of academic teaching staff members involved in the program have been interviewed and student feedback on the experiences of their IBL placements have been collected. We will soon be interviewing graduate students on their overall experiences of the program and receiving from them graduate surveys again examining the value they attributed to key components of the course. Already the following key issues have emerged requiring further investigation and consideration as part of the research project:
How and why did students’ experience significant/extensive development in some but not all generic attributes in their IBL placements?

Students report gaining significant value from their IBL placements (i.e. their direct experience in the workplace) and associated internship preparation and assessment tasks (i.e. preparation for IBL placements, diary keeping, exit presentation for academic supervisor and industry mentor, report preparation on IBL experience). See Figures 3 and 4, respectively, displaying IBL survey data collected on students’ perceptions of value derived from the work experience and the associated internship activities.

**Figure 3: Perceived value of IBL placement (N=28)**

**Figure 4: Perceived value of the internship unit (N=28)**
However, value derived was not seen as consistently high across all IBL placements and across the full range of desired student attributes. Students self-reported significant/extensive development through IBL placements in attributes like self-confidence, flexibility and adaptability, ethical judgement making and skills to implement change, but less so in the areas like oral and written communications. With the latter attributes relating to communication it can be surmised that while these skills developed in academic studies were practised in the workplace, the work context itself did not necessarily provide opportunities for further major development. The development of graduate attributes through IBL placements requires further investigation through other sources of student data gathering in progress.

- *Are IT and IS two separate sub-fields of professional theorising and practice? If so, how can they be best interrelated into a coherent academic curriculum to the mutual satisfaction of those who operate within the two areas?*

- *Alternatively, are these two areas coming together to such an extent that a new professional field is emerging, i.e. the field of IT/IS? What would be the implications of such merging for the design of an appropriate academic curriculum in the future? Does the significant emphasis on work placements and the applied research project demand such integration?*

- *Do changes in the IT/IS industry affect what is taught in the academic curriculum, and, if so, why might this be the case? And should it indeed be the case in areas of the program dealing with so-called generic computer programming knowledge and skills?*

As one staff member noted, ‘There has been a major move driven by moves in programming languages towards object oriented technologies. The style of programming languages have moved in the last decade or so and the way of specifying systems has therefore had to change as well. Our subject has followed that. In the last 12 months it has been substantially rewritten so that it now reflects the sorts of skills that people particularly need’ (Staff interviewee 2). Whereas another staff member believed that, ‘The units that I teach are fundamental to the technical programming side of computing. …These units are fundamental to computer programming and are presented in a generic way. The units are not affected by major trends in IS/IT. This question would be more relevant in third year units. I don’t teach these’ (Staff interviewee 4). The former was aware of changes in programming languages directly impacting his subject, while the latter seemed to be unaware of the possible impact such developments might have for the business information systems side of the BIT curriculum.

- *Are teaching staff involved in the program open to each others’ subject matter views and concerns for the betterment of the overall learning experience?*

- *Why do academic teaching staff emphasise certain desired learning outcomes over others in the BIT program? What should be the appropriate balance and relationships between technical computing, business context understanding, inter-personal/social, problem solving and life-long learning capabilities?*

- *How important do teaching staff believe it is to develop capabilities in knowing how to do something in addition to developing competencies in knowing what should be done?*
• Are the students able to form a coherent view of the ways in which the technical and business related dimensions of the academic curriculum work together in ways supportive of them developing the desired entry-level professional capabilities?

• How should Honours’ applied research projects be supervised and assessed vis-à-vis standard theoretically based research theses?

As one staff member observed, ‘The problem is the marking process. I don’t mark the work of the students I supervise. The problem is that the people who marked the honours’ thesis may not be up to date with what the industry was after. …This is a major concern that I see. …If you are talking about schools which are made up of academics who have no industry experience, it is very difficult for them to assess real life experiences. This means that there may be a problem with all the BIT courses. You can assess the research component but assessing the applied, real life applicability could be a major problem’ (Staff interviewee 5).

• What can academic teaching staff and industry sponsors/mentors do to create a workplace environment most conducive to identifying and conducting research projects of high quality and value to all stakeholders short and longer term?

As one staff member commented in relation to research opportunities provided to two students in different IBL placements: ‘[one student] ended up with a more exciting industry site than [the other]. That can affect the way a thesis turns out’ (Staff interviewee 2).

• To what extent did students’ applied research projects illuminate and help solve organisational problems from the perspectives of academic teachers and industry mentors? Should industry representatives contribute formally to the assessment of the relevance, practicality and utility of students’ theses? How can all parties help students in the presentation of, and publication from, their applied research?

• How should departments of IT and IS be structured and relate to each other in support of a cross-disciplinary program like the BIT course in supporting an emergent field of professional theorising and practice?

Conclusion

These questions, we believe, require ongoing critical reflection and informed action by those charged with the responsibility of designing and teaching within the BIT program. They require nothing less than a considered but flexible position on the future possibilities of IS/IT emerging as a coherent, integrated and collaborative field of academic and practical professional endeavour. This requires a holistic approach to continuous quality improvement as it relates to designing learning environments supportive of excellence in professional education. This process, and the supporting research, is ongoing.

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