2013

The Skills Framework for the Information Age as a Means for Investigating Work-Integrated Learning

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Information Systems: Transforming the Future

24th Australasian Conference on Information Systems, 4-6 December 2013, Melbourne

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Abstract

This paper reports on a pilot study using the Skills Framework for the Information Age (SFIA) as a means for examining interns' roles in the workplace, the skills they utilise or lack, and their levels of preparedness and capability. Data was collected and analysed in two ways. Firstly, interns responded to a survey questionnaire where their experiences were classified using SFIA. Secondly, interns' journals and reports which contain reflective content were analysed to delve more deeply into aspects of work-integrated learning (WIL) identified from the survey. The findings suggest that interns are generally placed in areas suited to their university experience; nevertheless, there are gaps between what the interns learn at university and what they require in industry. This study makes contributions to literature and in proposing a method for investigating the alignment between the academic preparation of interns and the expectations of technology intensive organisations.

Keywords

SFIA, work-integrated learning, internships, education design, ICT

INTRODUCTION

In *The Idea of a University,* Newman argues that, at its heart, a university education is about the "training of the intellect, which is best for the individual himself, best enables him to discharge his duties to society" (1852, Discourse 7: Part 10). He is critical of the narrow utilitarian argument and rejects the "notion that no education is useful which does not teach us some temporal calling, or some mechanical art, or some physical secret *[as]* a cultivated intellect, because it is a good in itself, brings with it a power and a grace to every work and occupation which it undertakes, and enables us to be more useful... If then a practical end must be assigned to a University course, I say it is that of training good members of society" (op.cit.). Newman celebrates professional education, but as a vehicle or locus for a liberal education.

In relatively stable and well-established professions such as law or medicine, the alignment of the profession and that part of a university course which equips students specifically for professional life is relatively unproblematic. The ICT profession, however, is characterised by seemingly constant re-structure as technological and organisational changes interact and dynamically redefine each other. Specific professional skills dominant ten years ago are not required today. Furthermore, nomenclature of ICT roles and university courses is confusing. In an attempt to establish a more stable and global description of the ICT disciplines, the Skills Framework for the Information Age (SFIA) was created.

Those objectives of university courses that relate to the ICT profession are increasingly being aligned with SFIA, for reasons of professional accreditation and meaningful interaction between 'town and gown'. Various work-integrated learning (WIL) educational techniques are deployed both to educate students about the realities of professional work and to align their education courses with professional needs. WIL takes many forms, but it is the internship that is the subject of this research. Many studies of WIL are concerned with the quality of the WIL experience and whether WIL improves student's academic grades as well as employment prospects (Billett 2009; Orrell 2004). Instead, this pilot study focuses on outcomes of WIL to reveal gaps between the curriculum

and skills and knowledge the students need for their roles in the workplace and proposes an alignment methodology that can be replicated in other academic settings.

The present study was based on the research questions, "what roles are ICT internship students performing in the workplace?" and "are the university's offerings relevant for the skills, knowledge and capabilities required for the workplace?" The paper describes a means for investigating these questions by analysing work-integrated learning (WIL) in terms of the Skills Framework for the Information Age (SFIA).

The structure of the paper is as follows. A review is provided of the pertinent literature on SFIA, WIL, and professional education generally. This is followed by an outline of the research strategy used, the rationale for a multiple methods approach, the conduct of the study including data collection and analysis section. The findings section of the paper contains a discussion of the results of the study where findings are related back to the literature. In the conclusion section, responses to research questions are provided, and directions for future research proposed.

REVIEW OF THE LITERATURE

There are competing demands on the ICT sector from government, industry and academic sources. Reviews of the literature indicate that the nature of ICT employment is changing, information and technology skills are in high demand, and the sector currently suffers from spiralling low numbers of suitably skilled employees. Australian data identifies a disconnect between the 31 per cent *growth* in ICT industry employment and a 53 per cent *decline* in domestic graduates with a expected growing shortfall in the number of young people starting and completing relevant courses (Australian Computer Society 2012; Kennan, Cecez-Kecmanovic, Willard and Wilson 2009; MacKrell 2009; Parr, Streater, Hinton, Bromley, Rae and Palmer 2011). Furthermore, the Bradley Review identified that Australia's higher education system needs to "provide students with a stimulating and rewarding higher education experience" and to "meet the needs of the labour market and industry for high level skills" in order to "operate internationally" (Bradley, Noonan, Nugent and Scales 2008, p.2).

The brief literature review below lends support to addressing employability and professionalism of graduates for both a domestic and international workforce by improving the alignment between practical know-how as described in SFIA and theoretical learning through WIL for the benefit of students, educational institutions, and industry.

Employability and Professionalism

Employability or work-readiness, it is argued, has consequent outcomes for university reputations, retention rates and course demands (Orrell 2004). Graduate employability and employment levels are pivotal interests of higher education institutions which regularly monitor academic achievement and employment rates as part of their quality assurance procedures. These indicators can be crucial to the performance and reputation of educational institutions (Bullock et al. 2009). Employability is also a concern for students for whom a good degree leading to a satisfying career is also a major aspiration.

The concept of graduate 'employability' is complex. It is generally agreed that a combination of skills, 'hard' (frequently referred to as disciplinary or technical skills) and 'soft' (frequently referred to as generic or non-technical skills), is needed to produce work-ready graduates. While the core notion is to obtain a job, Harvey (2001) emphasises that employability is often construed as an institutional achievement without taking into account the propensity of students to find employment and the efforts of employers to convert employability into employment. Universities are responding to the challenge by re-evaluating graduate professional learning objectives and outcomes with curriculum design and renewal (Litchfield, Nettleton and Taylor 2008). Cranmer (2006) states, despite the best intentions of academics, it is unrealistic to expect universities to guarantee that students will possess both the necessary disciplinary and generic skills on graduation.

In a study aimed to identify and contextualise work-ready skills, Litchfield et al. (2008) developed a conceptualisation of professionalism. Professionals need to learn how to work in and manage complex situations that encompass uncertainty, instability, uniqueness, and value conflicts. Professional attributes include demonstrating integrity and maturity when dealing with others and, at the highest level, acting in a way that encompasses leadership and emotional intelligence. Learning activities must therefore prepare students to develop disciplinary and generic skills for work in dynamic, complex and ambiguous situations (Fitch 2011, p.14). The work-ready skills being discussed here are, for the ICT profession, increasingly being defined in terms of SFIA.

Skills Framework for the Information Age

The Skills Framework for the Information Age (SFIA) is a common reference model for describing and assessing ICT practitioners' occupational skills and capability levels. It originated in the United Kingdom and has found global acceptance. SFIA is a 2-dimensional framework presented as a matrix with categories of skills on the vertical axis and capability levels of skills on the horizontal. The skills on the vertical axis are represented in a hierarchical formation consisting of three categories: category 1 is ICT skill streams or practice, such as 1 Strategy and Architecture; category 2 is a sub-category, for example, 1.1 Information Strategy; and, category 3 is the most granular, with examples such as 1.1.2 Information Security. On the horizontal axis, are the seven capability levels of competence and complexity in workplace skills, from level 1 (follow) to level 7 (set strategy, inspire, mobilise).

SFIA is used in organisations as a baseline for what skills and capabilities an information technologist may possess in the workplace. For example, the Australian Public Service (APS) has adopted it saying "the whole-of-government strategic ICT Workforce Plan is underpinned by an ICT Capability Framework, which is built upon an internationally recognised ICT capability model – the Skills Framework for the Information Age (SFIA)." (Australian Public Service Commission 2010). Professional bodies, including the Australian Computer Society, are stipulating the use of SFIA skills and levels by academic institutions for course accreditation (ACS 2010). At the personal level, employees and persons seeking to join the workforce can use MySFIA as a benchmark to assess themselves and work towards improving their skills as ICT professionals.

Universities are using SFIA as a basis for curriculum development and education. The Open University (OU), for example, the largest higher education institution in the United Kingdom (UK), announced academic modules, qualifications and continuous professional development courses using SFIA as a baseline. Streater (nd), a leading proponent of SFIA in the UK, titled this initiative 'The OU SFIA Project'. It aims to have the following outcomes:

1. Understand strengths/weaknesses of the existing curriculum in respect to today's ICT profession
2. Determine where future module development activities could be targeted at the OU
3. Provide better information to potential future students through self-help tools for the OU careers service

Our study has similar objectives in that outcomes 1 and 2 would be most useful to the Australian university of the study where basic subject mapping using SFIA version 4 had been undertaken some time back. In our study, SFIA version 5 was adopted as a baseline for determining the disciplinary educational activities of students. While SFIA does not ostensibly identify generic skills, we found it had a category, namely Skills Management, which enabled us to recognise some generic skills. It was noted that our mapping needed to be updated to SFIA version 5 in response to the changing nature of technology.

Given the above general discussion on employability and the specific discussion of ICT skill categories provided by SFIA, we turn lastly to the one of the primary means for linking university and industry - WIL.

Work-Integrated Learning

Work integrated learning (WIL) is an umbrella term for learning activities such as activity-based learning, work-based learning and co-operative education, with attempts to link learning in academic and practice settings. WIL is not easily defined because it covers a diverse range of activities from internships and placements to real client projects and other practical, contextualised tasks (Fitch 2011). Orrell (2004) classifies WIL as deliberate and intentional learning at work, supported by the appropriate induction of students and supervisors, and imaginatively embedded assessments.

From a study of students in workplace settings, Fitch (2011) advocates the encapsulation of authentic practice situations, engagement in workplace activities by students, and integration with curriculum. Smith (2012) confirms Fitch's findings to propose a framework for evaluating the WIL experience that incorporates the concepts of authenticity, alignment, integration and engagement by dividing the WIL curriculum into six domains:

1. Authenticity regarding the work placement
2. Alignment of teaching and learning activities with integrative learning objectives
3. Alignment of assessment with integrative learning objectives
4. Integrated learning support (across university and workplace sites)
5. Supervisor access, and
6. Induction and preparation processes

While there are many reports of successful WIL experiences (Bullock, Gould, Hejmadi and Lock 2009), there are also less successful versions. Fitch (2011) claims an analysis of student reflections reveals high levels of

dissatisfaction with the experience of working with an employer organisation. Of particular concern is the lack of awareness some employers demonstrate around their duties regarding interns, suggesting that, far from developing the professional capacity of these future practitioners, the experience of working with an employer has limited impact on some interns. As well, some students are reluctant to experience the authentic intern-employer relationship.

RESEARCH STRATEGY AND CONDUCT OF THE STUDY

The motivation for our study was to gauge where ICT students were placed during their internships, what roles they assumed, and whether the skills and knowledge they acquired during university fitted them for these roles. The study was set in Canberra at a small-size university. Canberra is Australia's capital city with employment prospects heavily dependent on the public sector and ancillary services. The university is promoting WIL as part of its purpose and vision, stating that WIL programs support education for all stages of life, being a valuable learning experience while preparing people for successful and adaptive careers in the professions. A WIL internship is offered as a semester subject in a variety of configurations (single or double subject, core or elective, paid or unpaid) to final year ICT students, who are enrolled in the Bachelor of IT or the Bachelor of Business Informatics. These courses were established a decade ago under the guidance of an industry panel. In the context of fast-paced change in ICT, and the need for ACS re-accreditation, the degree offerings are being reviewed.

During the period of the internship, students are required to attain authentic roles in a technology intensive organisation, maintain a reflective journal, write critically of their progress, and present their experiences to peers and supervisors. Each intern has a WIL supervisor who is the internship convenor, plus a mentor at their place of employment. The intern receives feedback from their workplace mentor on their performance and overall engagement. This arrangement is formalised in a non-legal placement agreement which also identifies the projects and tasks interns are expected to engage in over the time allotted. Of recent times, an increasing number of interns from the end of the first year of tertiary study are engaged as APS cadets in ICT roles. This situation is another compelling reason for examining the viability of internship at the university and whether internship placements are redundant in these circumstances

For our study, evidence for the outcomes of WIL was gathered and analysed in multiple ways. This meant a pluralist approach was adopted as a form of data and theory triangulation with reliance on multiple methods of data collection, and multiple theories to analyse the data and present the findings. The study design consisted of both a quantitative method, being a survey questionnaire administered to interns face-to-face, and a qualitative method, namely document analysis of reflective journals and reports of interns. This approach is apt for the phenomenon being investigated, in that qualitative research relies on data in the form of words as distinct from quantitative research, which relies on the use of numeric data (Schwandt 2001). That is, the emphasis in qualitative research is on understanding the context, meanings, and processes, while in quantitative research, quantity, measurement, frequency, and causal relationships between variables are central (Denzin and Lincoln 2000).

The research reported here is a pilot study to assess the research approach and, tangentially, to give some preliminary pointers to the sort of information it might reveal.

Data Collection and Analysis I - Internship Survey by Questionnaire

The survey (as conveniently termed in this paper) was framed as a protocol - a set of procedures and instruments used to specify interactions between researchers and study participants. It consisted of designs for participant contact, the survey instrument, the interview script and analysis techniques. The protocol was desk-checked by the researchers before use and the full protocol is available on request.

Participants: Participants were selected from students enrolled in ICT internships and emailed with an invitation to participate, project information sheet and consent form. It was made clear to the interns that there was no penalty for non-participation. Five undergraduate interns (from a probable 20) with diverse employment placements consented to be interviewed.

Survey Instrument: The challenge was to collect data about the intern roles in terms of SFIA. The assumption was made that SFIA version 5 level 4 for competence and complexity would be the default level adopted, as this is the level used by the Australian Computing Society for accreditation. All skills listed in the SFIA framework up to and including level 4 skills were listed in the interview instrument and available for selection by participants. Levels 5-7 were disregarded.

The survey instrument was structured around the categories of SFIA and allowed participants to identify (a) the skill categories in which they had been active during their internship, and (b) the work they performed in those

categories and the university units that supported that work. Figure 1 shows a fragment of a completed survey. The fragment is not intended to be read, but to give the look and feel of the instrument. The upper part of the figure, part (a), shows a small section of the full SFIA classification where the intern has ticked 1.1.2 Information Security while the lower part of the figure, part (b), shows the detail of actual tasks done "security and risk analysis of deployed bus. apps". Similarly, in a lower line against SFIA category 1.4.3, the intern has described another task as "analyse customer data types" and noted that this was supported by what they learned in their university unit "Database Design".

(a)

Job Title: **Employer:**

Skill Number	Skill Name	Skill Code	Task Performed?
1	**Strategy and Architecture**		
1.1	**Information Strategy**		
1.1.1	Information Management		
1.1.2	Information Security	SCTY	✓
1.1.3	Information Analysis	INAN	
1.1.4	Information Content Publishing	ICPM	
1.2	**Advice and Guidance**		
1.2.1	Technical Specialism	TECH	
1.3	**Business Strategy and Planning**		
1.3.1	Research	RSCH	

(b)

Skill Number	Notes	Units Undertaken
1.1.2	Security and Risk analysis of employed bus apps.	
1.3.1	contribute to team research on new COTS products	
1.4.3	Analyse customer data types and models.	Database design
1.4.4	Teach the new colleagues of methods and tools	
2.1.1	manage small internal projects on customer deployments	
2.2.1	Seek opportunities and methods to ...	
2.2.4	create AOS system requirements	
2.4.1	Work on ...	

Figure 1: Sample survey instrument showing (a) an intern's view of the SFIA categories in which he/she worked and (b) the detailed tasks performed and the relevant university subject that supported the task.

Interview Script: The interviews followed a script to ensure consistency. The interviewer engaged in discussion with participants to ensure their responses were appropriately coded in SFIA categories. Once both parties in the interview were satisfied, the interview concluded and the populated interview instrument was deemed as raw data.

Strategy and Architecture	Information Strategy	Information Management	1
		Information Security	2
		Information Analysis	4
		Information Content Publishing	1
	Advice and guidance	Technical Specialism	1
	Business Strategy and Planning	Research	3
		Business Risk Management	1
	Technical Strategy and Planning	Emerging Technology and Monitoring	1
		Continuity Management	0
		Data Management	3
		Methods and Tools	5
Business Change	Business Change Implementation	Project Management	3
		Portfolio, Project and Programme support	0
	Business Change Management	Business Analysis	3
		Requirement Definition and Management	1
		Business Process Testing	0
		Business Modelling	1

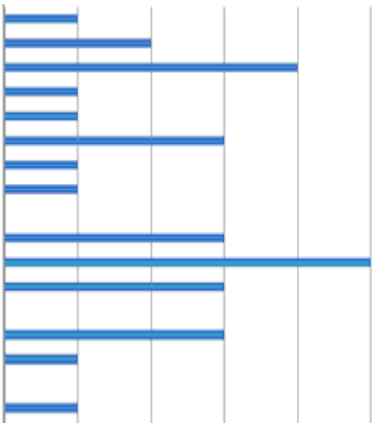

Figure 2: Summary of the number of interns whose experience fell in the various SFIA Categories

Analysis of the raw survey data was in two parts, one for each of the sections of the survey. Firstly, part (a) data, the SFIA categories in which interns had been active during their internship, were tabulated in Excel, counted across the population and summary statistical reports produced as shown in Figure 2.

Secondly, part (b) data, the types of work performed in those categories, were extracted as keywords, sorted and thematically clustered. The purpose of this analysis was to provide a view of the raw data to see what non-SFIA insights might be found, particularly those that concern generic skills and non-ICT tasks that lie outside SFIA, and so on. Figure 3 shows an example of this analysis.

Role	Keywords
Information Management	Information Disclosure, Formatting, Confidential
Information Security	Security and Risk analysis, of applications
Information Analysis	Integrity of data, presentation, reports, KPIs, Financial trends, business practices, policies and procedures, security threats, sexual harassment policy
Information Content Publishing	User friendly, writing
Technical Specialism	Writing
Research	Study product, competitors, writing, list topics, present, team research contribution, COTS products, demand analysis, student placements, comparisons to other universities,
Business Risk Management	Financial, System based, using collected data.
Emerging Technology and Monitoring	Monitoring data to devise new suitable solutions, future needs
Data Management	Tools, Ownership, Storage, Unique style, Customer data types, trends
Methods and Tools	Tools, Ownership, Storage, Unique style, Software, teaching, Efficiency investigations, capture and process, Skype for branch communication
Project Management	Small team, projects, manage, CBA, Scheduling, customer deployments, create project charter and WBS
Business Analysis	Improve current processes, analyse AIIA requirements for website design

Figure 3: Summary by keyword of interns' task descriptions

Lastly, the interns identified which of their university subjects had contributed to their capability to undertake each of the tasks they described. This data was analysed to reveal the participants' perception and recollection of the structure and content of their university course and the relevance they saw of their course to the tasks they performed.

Data Collection and Analysis II - Internship Journals and Reports

As part of the internship, students kept a reflective journal and a report of their internship activities. With their consent and under strict confidentiality, six interns, who may or may not have been survey participants, agreed to their journals and reports being analysed by an academic researcher. These documents were expected to provide deeper and more meaningful understanding of employment settings and of the skills and knowledge required for workplace roles. These are presented in the paper as extracts in the intern's own words against the skills identified by survey. As well, an elevated perspective of the internship program was obtained and discussed in the findings of this paper by utilising the concepts of authenticity, alignment, integration and engagement from the framework by Smith (2012).

RESEARCH FINDINGS

From the survey data, some fundamental patterns were generated. The list below shows the percentage of interns' activity against the major SFIA skill streams of category 1. In order of activity, they are:

1. Strategy and Architecture	28%
2. Business Change	25%
4. Service Management	20%
3. Solution Development and Implementation	15%
5. Procurement Management and Support	9%
6. Client Interface	2%

The number prior to the skill description is the number used by SFIA to indicate the ICT skill practice stream or category. From the analysis, it is evident that Strategy and Architecture is the most common ICT occupational stream in the workplace, emphasising that the demand by employers for high-level technically-focussed thinking is dominant. Other streams signify a business purpose which is appropriate to business informatics. In order to gain further insight into the patterns, the researchers examined the qualitative reflective data. Extracts from journals and reports were used to illustrate points which were pertinent, or novel, or which highlighted deficiencies in the range of subjects on offer. There was much favourable commentary from the interns commending university subjects such as Project Management, Systems Analysis and Modelling, and Document Workflow Management. In a comment associated with Solution Development and Implementation, one intern remarked:

> *I am not saying that I can now go and analyse and provide a solution to every business problem I may come across but I can say that I now have the confidence to get in and have a go, actively engage with all stakeholders and if I cannot provide a solution, discuss the issues with other team members or peers to find a resolution.*

From further analysis of the survey data, the five most common skills in SFIA category 2 are:

2.4 Skills Management	13%
1.4 Technical Strategy and Planning	11%
3.1 System Development	11%
4.4 Service Operation	11%
1.1 Information Strategy	9%

Skills Management is one of the common generic-style skills signifying that interns have transferred a process adopted from university into the workplace. In his journal entry, an intern noted the acquisition and use of problem solving and critical thinking skills in lieu of robust technical skills:

> *Although my degree [business informatics] did not provide me with the technical skills to resolve the issue it gave me the skills needed to help me tackle the problem. Throughout your degree you are often challenged with assignments where you need to undertake thorough research to obtain an answer. These assignments have taught me how to take a structured approach in finding a solution to a problem.*

While this comment speaks favourable of the mastery of generic skills by interns, it highlights the fact that there needs to be exposure at our university to a range of software tools. These would provide interns with work-ready technical skills so they can 'hit the ground running' once they graduate. In this aspect, our study corroborates with that by Kennan et al (2009) in finding that employers value recent graduates with competent technical and critical thinking skills. These qualities are seen as foundations for mid to senior ICT positions.

Service Operation and Information Strategy could both be considered business-related while Technical Strategy and Planning can be classified in the technical tools space. Regarding System Development, an intern discerned a gap with respect to learning how to debug code:

> *In university I did learn inherently how code works though writing it, but it was quite difficult for the first time fixing bugs in a system where I did not know how to tackle the problem. I would have like to have seen either a semester unit on debugging practice and working with systems that have already been built.*

Drilling down to category 3, the most finely-grained SFIA sub-category, showed the five skills in SFIA terms being utilised are:

1.4.4 Methods and Tools	6%
2.4.1 Learning and Development Management	6%
1.1.3 Information Analysis	5%
1.3.1 Research	4%
1.4.3 Data Management	4%

The reported activity of the skill Methods and Tools indicates a demand for significant technical skills. This is confirmed by the qualitative data from journals and reports which also point to the use of Methods and Tools by interns in the workplace. While methodologies are taught at the university in several subjects, business informatics students in particular may be at a disadvantage with limited exposure to technical tools, even for Web design. As one intern commented:

> *I was quite nervous going into the [workplace] training because I had never done any Web development during my BBI [Bachelor of Business Informatics] degree.*

Information Analysis is embedded in a Systems Analysis and Modelling subject. Several interns observed that learning to analyse for systems development is taught soundly. All the same, learning to analyse an existing system requires a different set of skills. This was expressed by one intern:

> *At university, while we are required to do some analysis for our courses I can't recall a situation where we had to analyse existing design documents for university. I think it may be useful if the university incorporated this into its IT degree as most graduates won't be designing new systems but rather maintain and add to existing systems.*

Another significant gap identified was in technical writing:

> *I really felt the need for a unit in university which teaches about technical writing and analysing a system. That unit would have helped me a lot in improving my writing skills. But thanks to the reviewer [at work], I came to know about how to write a technical document.*

Knowledge was both business and technology-related with some skills being disciplinary and others generic. The importance of generic skills was commented upon by both intern cohorts, that is, Bachelor of IT and Bachelor of Business Informatics. In particular, the requirement to work in teams throughout the degree equipped the interns for the reality of the workplace.

> *Team work is an important component of these projects and having experienced this in numerous units throughout this course, provides that little bit more confidence your ability to work as part of a team and contribute successfully.*

The significance of generic skills was corroborated from the analysis of the clusters of keywords describing the actual roles performed by interns. See Figure 3. The largest cluster listed below contains generic skills along with some disciplinary ones.

> Information Skills (analysing, writing, teaching, managing, monitoring)
> Information Systems (bookings, financials, operations)
> Software Development Life Cycle (analysis, development, testing)
> Issues (integrity, security)
> Technologies (database, web)
> Methods (project management, support)

This data gives a rather different perspective from that offered by SFIA with its focus on disciplinary skills in the workplace. It has long been said that employers prize graduates with strong generic skills (Harvey and Knight 1996) and to have this evidence coming so clearly from interns reinforces that message.

DISCUSSION OF FINDINGS

As stated in the literature, the WIL evaluation model by Smith (2012) provided theoretical concepts (authenticity, alignment, integration and engagement) which were useful to consider in the analysis of the reflective material provided by the interns. Below is an overview of the study's internship program derived from a utilising those themes.

Work experience for all interns was authentic. Several interns were employed in government positions, either as APS cadets or on notable public sector projects. Other interns were working in the private sector or in community organisations, embassies or consulates on useful projects. In the internship program, efforts to constructively align teaching and learning with integrated learning objectives has been made through the design of assessments such as presentations, reflective journal entries and critiques in report format. Supervisor access, to date, has not been an issue. Each internship convenor as academic supervisor has a different modus operandi which varies depending on workload and other commitments. Nevertheless, workplace visits take place and there is an informal internship event each semester at the university when current and potential interns meet with employers and staff. This forms part of the induction and preparation process, but there are others such an introductory session at the start of semester. As well, the convenor is readily available for consultation throughout the semester. Regarding workplace mentoring, most interns appreciated that their mentors were busy people who set aside time to carry out their mentoring roles to the satisfaction of interns. This is interesting in light of comments by Fitch (2011) that not all students benefit from the internship experience.

In returning to the literature, Smith (2012) proposes that the aim of WIL is to develop students' professional identities and abilities; to emphasise linkages between theory and practice; to reflect on the nature of work and the application of skills and knowledge in the workplace; and to allow transfer of learning from university to the workplace and back to university. This last point has relevance for the internship program in that it is offered to students in their final semester. It may be more useful to students if they have an opportunity to complete a semester after the internship for the purpose of filling gaps in their skills and knowledge identified specifically during the internship. This makes better use of reflective learning by the student and enables the student to undertake subjects in their final semester which they may have overlooked as valuable to their future career. This corroborates the findings of the Australian Learning and Teaching Council report that students undervalue the importance of skills especially soft skills for future work (Koppi and Naghdy 2009).

Findings which address the research questions given in the introductory section are: 1) in the main, roles that ICT interns are performing are suited to their university learning, however, 2) gaps are appearing between skills and knowledge acquired by the interns in a university setting and what is needed in the workplace. These gaps include a scarcity of technical know-how (from the business informatics interns), no technical writing subject,

limited background in analysing existing systems, and the recurring emphasis by interns and the workplace on strong generic skills. While the interns' ability to see the links between their university subjects and the tasks they were performing at work was reasonably clear in the technical areas, it was less so when tasks were being done in a context different from that at university. For example, one intern did not associate a risk analysis task as having been taught in a project management subject since it was not conducted in a project setting. In other cases, interns did not make the link at all.

CONCLUSION

This research makes several contributions, one being to the WIL literature. WIL research is largely concerned with practice and values that are trans-disciplinary. The use of a discipline framework or domain specification, in this case SFIA, provides a content-rich link between the experiences of WIL and the offerings in ICT courses that universities present. Similar specifications of other professional domains would provide the same link between courses in those disciplines and WIL in their professions.

A contribution to the alignment literature is suggested by the research reported here. In 2012, McDonald presented the case for university course design being based on principles of embodied design, explicit design, requisite design, and responsible design; the role of SFIA and WIL as means for the achievement of these criteria is clear. The results of the research enhance curriculum design within the university and, importantly, bring a new view for organisations that host interns.

As a contribution to practice, the research method is appropriate for local analysis and industry alignment. The data presented in this paper is local, relating to specific courses and a specific slice of industry in a unique setting. While the actual results are significant for one institution, they may be only suggestive to another. However, the results achieved here suggest that replicating the method in other settings may well reveal equally useful, although probably quite different, insights into the local situation. From the research method perspective, a benefit of multi-method research is that different points of view are made known. In this research, the kinds of vocabulary used in the interns' journals and in the free text part of the survey reveal themes that are not readily captured in the SFIA ontology. This suggests a contribution to teaching and learning, as SFIA could be adapted to become part of an internship education, alerting interns to the wider professional context of their WIL experience. As explained earlier, the Open University in the UK is developing self-help tools for careers and university course advice through information provided by SFIA. This is something we could emulate.

The contribution to practice indicates ways of extending our study. One of our study's limitations is the small number of participants, and the emphasis by SFIA on technical skills. A future study could involve the input of more interns, employers from a range of employment sectors, and possibly academics from other universities, both local and international, and an investigation into the recognition of generic skills by SFIA.

This paper began by placing professional education within a wider context of the idea of a university and its role in educating the citizen. Newman (1852) recognises the importance of useful, professional education but argues that a university "if it refuses the foremost place to professional interests, does but postpone them ... while it subserves the larger interests" (Discourse 7: Part 6). WIL ought not be conceived of as just a smoothing of the path to employment, or the production of appropriately moulded industrial resources, but as a part of a much bigger agenda. While this research shows different sorts of mismatches between particular university courses and local employers, it may never reveal the need for improved education of principles and theory.

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