Developing university-industry partnership for work integrated learning: a case study

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Structured abstract

BACKGROUND
University-industry partnership is essential in providing opportunities for work integrated learning (WIL). Despite its importance, limited attention has been placed on it in the literature. Existing studies generally focus on other forms of university-industry partnership (UIP) associated with industry-related research and commercialisation. However, more research is needed on how to develop UIP for WIL as this is essential in developing a vital engineering workforce but also in strengthening further university-industry collaboration. This study contributes a framework for developing partnerships for WIL. Implications are discussed for universities embedding WIL into their engineering programs.

PURPOSE
The research question of this study is 'How to develop university-industry partnerships for work integrated learning?'

DESIGN/METHOD
This exploratory study conducted from September 2012 to February 2013 is based on a case-study of a medium sized university in Australia. The paper will first provide a review of the UIP literature and the factors influencing the development of partnership for WIL. The method involves qualitative research and its results will then be discussed to reflect both student and industry perspectives of UIP for WIL.

RESULTS
Based on qualitative analysis, themes emerged such as the important role of the individual such as alumni, communication efficiency (steps to bring about transparency, credibility, reduce communication costs and ensure confidentiality) and coordination (pre-placement, in-placement and post-placement activities) in developing partnerships for WIL.

CONCLUSIONS
Unlike prior studies that focus on other forms of UIP pertaining to commercialisation and research, this study focused on developing effective partnerships for education and specifically work integrated learning. Employing qualitative research based on data from both industry supervisors and students, it enabled a vivid investigation of UIP for WIL.

KEYWORDS
Work integrated learning, university-industry partnership.

Introduction

Work integrated learning (WIL) is particularly important in engineering degrees given the need for experiential learning in developing professional and practical engineering skills for a vibrant engineering workforce. Unlike basic work experience that students may undertake independently from the university, WIL involves three parties, the student, industry host and university; and incorporates learning outcomes towards the completion of studies (Groenewald, 2004). WIL has long been recognised as a core component of educational programs for many professions such as engineering, medicine, nursing, law, tourism, social work and teaching and typically involves a period of placement in the workplace as well as a range of pre-placement preparation activities and in-placement and post-placement reflection and assessment. More recently, as WIL becomes more prevalent in areas not traditionally associated with it such as business, non-placement forms of WIL are emerging to increase access to many students such as individual or team-based industry projects conducted outside of the workplace. However, accredited undergraduate engineering are usually required to include an industry placement of at least twelve weeks. Despite this requirement, opportunities for WIL placements are an increasing concern for universities in economic downturns or in periods of contractions of industries such as manufacturing where firms may experience difficulties in providing placements given budgetary constraints.

Hence, university-industry partnership (UIP) is critical in providing and sustaining WIL placement opportunities. However, academics generally see UIP as instrumental in their research rather than teaching efforts. Industry linkage research grants and forms of commercialisation such as contract research, consulting, spinoffs and licencing of intellectual property are usually seen as the key research outcomes of UIP (Etzkowitz, 1998). Scholarly literature on UIP has also stressed entrepreneurial activities stemming from university research and ignores WIL and the critical role that students also play in the UIP process. These WIL students not only serve in strengthening UIP but can also act as innovation catalysts within firms, provide key technical skills and talent, continue on as hired employees, contribute towards research publications and even pave the way for other forms of research collaboration and international partnerships between university and industry (Astebro et al., 2011).

Given the benefits of WIL, attention must be placed in ensuring that WIL relationships with industry are developed. Therefore, the research question of this study is 'how to develop university-industry partnership for work integrated learning?' The study will first review the UIP literature on factors for developing inter-organizational relationships. It will then conduct a qualitative study to determine the suitability of these factors to the WIL context. It will therefore contribute towards extending the WIL literature by integrating concepts from the UIP literature to provide a framework for building WIL partnerships.

Theoretical background

The UIP literature uncovers a number of factors for developing effective partnership including the role of the individual, communication, coordination and engagement.

Role of the individual

The role of the individual stakeholder is widely recognized as fundamental in facilitating successful UIP (Ankrah, Burgess, Grimshaw and Shaw, 2013). The synergy or the 'instant rapport' that is particularly important in the engagement phase of a collaboration is also reliant on the characteristics of the people involved in UIP (Plewa et al., 2013). The focus of existing literature, however, has been on the academic researcher or faculty member, rather than other university stakeholders such as the student. This is most likely a result of the literature focus to date on the impact of UIP on university commercialisation and research, as opposed to the impact on education and in particular on the student (Stephan, 2001). Understanding the role of the student is becoming increasingly important as WIL becomes

more prevalent as a form of UIP. A recent study by Fortune and McKinstry (2012) shows the value of evaluating WIL projects from the student perspective.

Communication
Communication is essential at every stage of UIP, only the nature of the communication in terms of topic, formality and the way in which the communication is carried out changes during the phases of engagement (Plewa et al., 2013). Communication is the transfer of information from one party to another through single or multiple channels. For communication to be effective there must be an intention to share the information and it must have an impact on the recipient of the information. To be efficient communication it must be achieved at the lowest cost possible (Moenaert, Caeldries, Lievens and Wauters, 2000). The importance of communication in the success of UIP is widely supported in the literature including the role of good communication in achieving successful WIL deliverables (Jeffries and Milne, 2013).

Coordination
Coordination at every stage of engagement is required to realize the objectives of UIP and to maximise the outcomes achieved. It refers to the "extent to which different parties in the relationship work well together in accomplishing a collective set of tasks." (Rampersad et al., (2010, pp. 796). The term refers to the overseeing and management of every stage of the interaction between a university and a firm, from the initial engagement to the delivery of the outcomes and termination of the collaboration (Morandi, 2011). Coordination in UIP may also rely on the ability of the stakeholders to update project plans to reflect unexpected changes in the project. The required level and type of coordination may vary according to a range of factors, for instance, the clarity of objectives but collaboration should only be moderate (Rampersad et al. 2010) and not too excessive as this may be seen by industry as a barrier to technology transfer(Siegel et al., 2003).

Engagement
Engagement refers to a psychological state based on interactive experiences with an actor (Brodie, Hollebeek, Juric and Ilic, 2011). While engagement can be a precursor or alternatively an outcome of interaction, Brodie et al. (2011), point out that engagement is an iterative process with various cognitive, emotional and behavioural dimensions. Wright's et al.(2008) discussion of the different types of engagement draws to some extent on a combination of both informal and formal interactions set up for both IP related and non-related purposes and include: spin-offs, licensing, contract research, consulting, outreach and mobility of graduates and researchers. Although not included in Wright's et al. (2008) categories of engagement, WIL represents a form of interaction that warrants separate discussion.

UIP outcomes
There are many outcomes of UIP, which is a reflection of the many different forms of engagement between university and industry. Barnes, Pashby and Gibbons (2002, pp. 283) provide a comprehensive list of UIP outcomes for stakeholders. They list proprietary benefit, technological innovation, continued support of research programs, papers published, patents/IP, student projects, and student recruitment. In summary, the most commonly cited outputs of UIP could be loosely grouped as scientific output, educational output and commercial output (Perkman et. al., 2013). Other outcomes, however, are also discussed in the literature. Cardozzo et al. (2001) discuss the additional outcome of 'public relations' from a WIL program that was run at the University of Minnesota as part of a new product design and business development course. Such programs can provide a 'talking point' among staff within the university but also within the wider community. During job interviews students also found that the WIL program provided a common ground for discussion as the interviewer used WIL as an opportunity to discuss the real life challenge of new product development.

Method

This study was conducted within the industry placement WIL component at a mid-sized university from September 2012 to February 2013. The Australian context is of particular significance as work place practice has gained increasing prominence nationally (Freestone et al., 2007). A case study of a university's placement program was chosen as case studies offer the advantage of capturing reality in considerably great detail (Galliers, 1993). The University chosen as the context of this research is a recognized leader in WIL which is included in all undergraduate degrees (Cooper, Orrell and Bowden, 2010).

Research examining the development of UIP for WIL is limited. Consequently, this research is exploratory and a qualitative approach is appropriate to facilitate the exploration of emerging themes (Cassell and Symon, 1994; Smith and Fischbacher, 2005). The research design for this study involves in-depth interviews with industry placement students and their Host firms whereby, participants were asked to discuss factors influencing effective UIP for WIL.

This data was triangulated by analyzing students' reflective log books as well as reports from dyads of students and industry supervisors at the completion of the placement experience. Each student in the degree completes a full-time industry-based placement of 20 weeks, during which he or she works on a project negotiated with the industry supervisor. All students and industry supervisors participating in the program were invited to participate in the research, and 80 participants from all 40 employer-student dyads provided data. Industry supervisors came from various sectors as detailed in Table 1.

Table 1: Research participants

Sector	Industry supervisors/ students codes
Software	1-26
Medical device	27-31
Mechanical	32-35
Environmental	36-40

All data for this study was analyzed qualitatively guided by UIP theory. Interview transcripts, content of log books and reflective reports from students as well as the evaluation reports from industry supervisors were analysed thematically. As themes emerged, data associated with each theme was coded and then assembled under the theme (Carson, Gilmore, Gronhaug and Perry, 2001).

Construct validity was fostered via triangulation of various sources of information (Yin, 1994) from multiple types of informants including employers and students. In addition, industry supervisors belonged to organisations from different industries, which allowed for several perspectives on a common construct. Considering a range of perspectives leads to an important type of triangulation of qualitative information sources by reducing the impact of biased opinions (Choudhrie, Papazafeiropoulou and Lee, 2003; Patton, 1990).

Results

The results uncovered emergent themes from data analysis. Figure two illustrates these emergent themes and will be discussed further in this section.
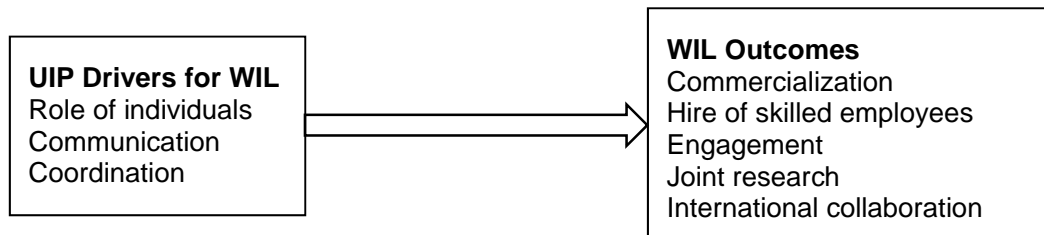
Figure 2. Framework for developing UIP for WIL

Role of individuals

The role of individuals such as alumni emerged as an important factor in developing UIP for WIL. For instance, industry supervisor 1 indicated that he undertook a placement eight years ago, was employed by the firm where he currently works as the Software Development Manager and has since provided placements for eight students and hired five of them. This alumnus has been engaged in a number of UIP activities including judging of presentations, guest lecturing and acting as a key advocate for the WIL program. Therefore, strategies to engage alumni, particularly those who participated in the WIL program during their studies may be useful in developing sound UIP for WIL.

In addition to alumni, results indicated that other university stakeholders such as past and current employees and research collaborators also play an important role in WIL partnerships. For instance, industry supervisor 32, who currently works in another country and hosts students on international placements, indicated that he worked at the University over a decade ago, continued joint research with the university and will be interested in taking future placement students. Hence, the role of the individual should be leveraged in continued partnership and advocacy for the WIL program.

Communication

The importance of communication efficiency also emerged as an important theme from the qualitative data and particularly, dimensions of transparency, credibility, codification, secrecy and costs (Moenaert et al. 2000). The university under investigation ensured transparency as information on the placement program was provided via brochures and websites. Additionally, the University required that a work plan be signed by three parties, the industry supervisor, student and university supervisor to ensure that the scope of the project was transparent. Interviewees also emphasised the importance of transparency in communication via both formal and informal channels. For instance, industry supervisor 8 attributed transparency via information sharing processes including formal and informal, small and large-group meetings, as being fundamental in the success of the WIL project. In addition to transparency, credibility was also seen as important by firms and students. The University built credibility by partnering with influential nodes which are third-parties with access to large pools of relevant organisations such as key industry associations (e.g. Engineers Australia, Australian Computer Society, Technology Industry Association, Business Enterprise Centre, and, Defence Teaming Centre) to promote the placement program in their newsletters and showcase relevant case studies to demonstrate the value to its member organisations. Additionally, codification emerged as an issue particularly in the use of commonly understood language and terminology away from technical academic jargon towards industry focussed language. The qualitative data also revealed that sensitivity to communication cost issues was important. The Agreement signed between organisations required meetings between industry supervisors and students to occur fortnightly while the University required Academics to visit students at least twice during the placement and maintain weekly contact. Students 1 and 6 expressed a preference for more frequent meetings while their supervisors had other external or overseas meeting obligations, thereby highlighting the issue of communication costs associated with the frequency, duration and mode of communication. Student 7 pointed out that the scheduling of meetings with his

supervisor was a difficulty in his placement. Confidentiality also emerged as a significant issue. A confidentiality clause was included in the Agreement and a guest lecture was arranged with a patent attorney to sensitise students to confidentiality issues prior to commencing their placements. Industry supervisor 8 indicated that students were well prepared for such confidentiality concerns:

Coordination

Additionally, the results confirmed the findings in the literature that coordination is important for developing UIP for WIL. Qualitative data reflected a number of pre-placement, in-placement and post placement coordination activities. Prior to the placement, participants expressed the value in each organisation articulating their capabilities and/or needs. The university developed brochures about the placement program which articulated the capabilities of students with information on their associated engineering degrees, skills, typical projects that they can work on for firms. The University then prompted firms to complete an online industry interest form outlining the project and any skills and capability requirements. These projects were then promoted to students who applied on a competitive basis. Once firms selected students, agreements and work plans were signed between each organization and academic supervisors were allocated to each student. During the placement, these supervisors visited the student at the placement. These visits provided face-to-face time to build rapport between organisations, to understand each other's interests and to identify future opportunities for collaboration. As the placement unfolded, The University required students to submit logbooks and interim reports. Post-placement coordination included final student reports and the completion of evaluation reports by both students and firms. A University Expo was also held at the end of the placement period involving student presentations and invitation of industry supervisors and academics involved in the placement process as a means of recognising work accomplished and cementing future collaboration. Industry Supervisor 4 commended the overall coordination of the WIL process indicating that it was 'well structured, had an effective matching process' and that he will be keen to continue involvement in the future. Despite the need for adequate coordination, Student 2 stressed that coordination should not be overly rigid, resonating with the UIP literature (Rampersad et al, 2010). This flexibility allowed them to demonstrate initiative whereby they can offer solutions rather than being overly directed through each step.

Outcomes

Qualitative data uncovered outcomes from the development of UIP through WIL. First, the commercialisation of new products and services was a key result. For instance, industry Supervisor 2 praised his placement student for designing and building a new product that the firm will release in the week following the placement completion. Second, the hiring of placement students was another key outcome. Industry Supervisor 1 indicated that he will employ his placement student in the role of Software Development Engineer following his placement. Third, renewed engagement in WIL is another important outcome and several supervisors (1, 2, 7, 10 and 28) indicated that they will continue involvement in the WIL program. Fourth, further joint research via research honours projects and academic publications was also seen as a key outcome. Industry Supervisor 10 indicated that his placement student collaborated with the university in publishing about his placement work and presented his work at a top conference and to relevant government agencies in the US. Fifth, WIL also led to international collaboration as it included inter-state and international placements. In 2012, students have been placed in Sydney and Melbourne and internationally in the US, Canada, Switzerland, Germany and Slovenia. A Canadian organization discussed the key role of the student and WIL in ongoing international collaboration. For instance, Supervisor 29 noted that the WIL relationships lead to further international collaboration between the universities directly resulting in the publication of scientific articles, while Industry Supervisor 33 invited the university to pursue further international funding opportunities via DAAD (see www.daad.de) for research projects and theses abroad.

Conclusion

The purpose of this study was to explore how to foster effective UIP for WIL. Unlike prior UIP studies, it focused on Education and WIL, thereby responding for calls for research in this important area (Astebro et al. 2011).Furthermore, it extended the WIL literature by applying UIP concepts to the WIL context. Employing qualitative research based on data from both industry supervisors and students, it enabled a vivid investigation of how UIP can be developed for WIL. It examined the important role of the individual, communication efficiency and coordination in developing UIP for WIL.

The study offers important implications for universities engaged in WIL as outlined in Table 2.

Table 2: Implications

Key factor	Implications
Role of individual	Alumni and university collaborators should be engaged in the placement program. They could be invited to sponsor placement projects and at the end of the placement they can be asked whether they are interested in other collaborative activities with the university and engaged in other forms of UIP such as acting a judges, participating on curriculum advisory boards, guest lecturing, mentoring students, sponsorship of research projects and acting as key advocates of the placement program in promotion activities.
Coordination	Coordination should involve pre-placement, in-placement and post placement activities and should be adequate in facilitating engagement with relevant parties (capability statements/ brochures, industry interest forms, clear agreements with roles/ responsibilities of parties outlined, work plans so that there are common agreement and evaluation mechanisms for feedback, supervisory visits and final reflective presentations post-placement). However, it should not be burdensome with excessive reporting arrangements to the extent that it distracts from the crux of the placement or the work that actually benefits each organization.
Communication Efficiency	In a networked world, people are getting busier and attention must be placed in fostering efficient communication via transparency – information should be accessible on a website; credible through official means and through key reputable nodes such as industry associations; in language that is accessible to all parties (many times universities and industry speak in different languages); and that caters for confidentiality/ intellectual property considerations by each organization.
Outcomes	Outcomes such as employment rates and recruitment of placement students, international collaboration, joint research, and commercialization of products and services should be promoted through case studies, showcases, word-of-mouth, expos and open-days to build awareness as these will provide opportunities to not only strengthen the WIL program but to leverage WIL for further UIP outcomes.

Despite its valuable implications, the study should be interpreted in light of its limitations. It was based on a case study of a single university and therefore further research can enhance findings. Nevertheless, this study is important as it provides in-depth understanding of key strategies in developing effective partnerships for WIL.

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