

Employers' perceptions regarding graduates of engineering dual degrees

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ABSTRACT: This article presents findings from part of an Australian Learning and Teaching Council project regarding Australian dual degrees. Employers from 30 engineering-focused organisations were interviewed to solicit their views on their expectations and willingness to employ graduates with engineering dual degrees. The employers' organisations ranged from small to large engineering firms. Respondents indicated that recruiters are more concerned about graduates' engineering skills and academic results than whether the graduates had a single or a dual degree. However employers also indicated that they viewed dual degrees as equipping graduates with a broader skill set that could be valuable to the organisation over the longer term. Employers indicated that whereas graduates were expected to focus on engineering tasks over the first few years of their employment, a dual qualification, particularly engineering-business, could lead to a dual degree graduate being promoted more rapidly.

INTRODUCTION

In 1996 a report commissioned by the Institution of Engineers Australia (the IEAust, now Engineers Australia), *Changing the culture: Engineering Education into the Future*, recommended fundamental changes to engineering education including establishing stronger ties with industry and broadening the skills of engineering students to encompass such generic capabilities as communications and management skills [1]. In the year 2000, a survey conducted by ACNeilsen for the Department of Education, Training and Youth Affairs, *Employer Satisfaction with Graduate Skills*, highlighted employer dissatisfaction in relation to skill levels of graduates, particularly in creative and critical thinking and business communications. Engineering graduates were identified as being poor at problem-solving, communications, interpersonal skills and critical and independent thinking [2]. Such reports are examples of repeated calls for changes to engineering curricula. In many cases the calls for change are closely linked with representatives from industry [3]. In light of the above, it could be argued that satisfying the needs of industry has become a central focus of those seeking to establish change within engineering education.

Engineering organisations operate in an increasingly competitive and regulated market, and in many cases require engineering expertise linked with broader areas including business strategy, law, marketing and management. There is a growing body of research that suggests that employers expect graduates to be competent in a range of skills that move beyond disciplinary knowledge and encompass communication, interpersonal skills and critical thinking. A number of issues are raised in relation to the curricula of dual degrees (also known as double and combined degrees that are defined as two undergraduate degrees, in different disciplines, taken concurrently). For example, questions arise regarding the extent of integration between the disciplines and essential material that needs to remain within the core disciplinary syllabus. In some cases it has been argued that engineering material omitted *is more than made up by the increased breadth brought to their education by the second degree* and that certain traditional subjects in an increasingly crowded curriculum needed to be dropped [4].

In her study on *Employer Satisfaction with ICT graduates*, Dianne Hagen suggested that there is a tension between equipping students with the tools and methodologies required by industry at the time of graduation and the underpinning theoretical knowledge to deal with future requirements [5]. Issues relating to employability appear to be a major factor behind the growing numbers of students enrolling in engineering dual degrees [6].

According to Welsman *choosing a double-degree likely reflects student awareness of career market expectations and their need for competitive edge* [7]. Dual degrees combining engineering with arts, business, commerce, management and science have attracted students over the last two decades largely for their perceived broader scope and potential to increase career options [8][9]. There is also a perception by students that potential employers will respond positively towards those with skills ranging across more than one disciplinary area [9].

Russell et al concluded in their survey of the literature on dual degrees that by learning to develop skills in two disciplinary areas and to move between them, dual degree students may have an advantage of being better able to adapt their skills in a responsive way to new environments and technologies [8]. However, a barrier to this is the intransigence of defined disciplinary areas which resist transdisciplinary and cross disciplinary approaches.

Other studies have suggested that only a small number of graduates identified the skills they learnt through their dual degrees as actually contributing in a positive way towards their work. In their study of past and current students enrolled in dual degree programmes, Russell et al found that most students believed there were not enough *real world job skills* included in their programmes and that there was a lack of integration between the different subject areas [8]. Welsmen claims that dual degrees are rarely crafted as university programmes, rather they are two programmes essentially *bolted* together [7].

A study undertaken into the role of specialisation in the curriculum of chemical engineering indicated that employers were in favour of increased specialisation particularly where it related to the specific work of the company [10]. Similar conclusions were drawn by research regarding methods for improving safety in engineering, which found that greater emphasis on working in multidisciplinary teams may be preferable to attempting to produce graduates that are skilled in multiple disciplines [11][12].

A known concern regarding dual degrees is that they can make it difficult for students to specialise in certain niche areas because certain chains of subjects and sub-majors are not available to students of dual degrees. This is especially the case in areas such as biomedical engineering and robotics [13][14].

While some previous studies examine the perceptions of employers, graduates and students of the value of specific qualifications in the workplace, no previous studies have systematically sought employers' views specifically regarding graduates of engineering dual degrees.

METHOD

The findings reported here relate to a small part of a larger Australian Learning and Teaching Council (ALTC) project which investigates concerns regarding Australian dual degrees. The aim of this part of the project was to investigate employers' perceptions and expectations of the value that dual degrees graduates brought to the workplace. For this part, a qualitative approach was taken.

A sample of 30 organisations was selected based on the employer networks of four Australian universities: Curtin University, Queensland University of Technology, RMIT University and the University of South Australia.

The surveyed organisations ranged in size from small businesses to major resource companies. The interviewers asked open ended questions relating to the employers' experiences of employing dual degrees graduates, expectations in regards to the integrative abilities, discipline-interface attributes and expertise of these graduates, views on the benefits of dual degrees, and whether they would be more likely to hire dual degree students.

FINDINGS

The majority of the employers who were interviewed indicated that they had employed both single and dual degree graduates. In the broadest terms, the employers' comments suggested that the employers tended to hold views that dual degree graduates have a greater breadth of knowledge and operating skills than graduates of single engineering degrees. These traits were seen as particularly valued by employers in companies that are small and span several areas.

However, whereas some viewed breadth of knowledge as an advantage, others stressed that graduates coming into the organisation were expected to initially focus on their core engineering discipline. This was particularly true for those interviewees from large resources companies. One employer used the example of a graduate with a dual degree in chemical engineering-commerce, and indicated that the graduate would typically be expected to work in the role of a chemical engineer for the first 10 years. Hence, it is essential that these graduates have sufficient expertise in chemical engineering so that they might competently satisfy the requirements of the graduate role.

Some of the surveyed employers indicated that they had no additional expectations of dual degree graduates, as opposed to single degree graduates, in areas such as technical skills. However, in areas such as project management, leadership and customer interaction, dual degree students were expected to perform at a higher standard. The respondent from a prominent multinational company, for example, believed that graduates with a dual degree in chemistry-chemical engineering often had the ability to lead research projects which traverse interdisciplinary boundaries because they had an understanding of the need to involve experts from both disciplines in the development process. This was in contrast to those who were trained as either chemists or as chemical engineers who, he said, had a tendency to overstate their own expertise rather than involve experts from the other discipline.

A different employer noted that an advantage of dual degree graduates is their demonstrated willingness to work outside of their technical area and thus to potentially move across to other roles in the business. An employer from a major resource company expected dual degree students to have slightly higher potential to progress further within the company due to their breadth of skills, although he indicated that initially these graduates lack the depth of knowledge of graduates of single degrees.

Another interviewee, representing a small company, found that the breadth of skills of dual degree graduates were of immediate value in terms of their productivity. He indicated that the business side of their training gives them a better overall perspective of the operation of the business, and the extra chemistry has been very useful in those dual degree graduates because the business is very dependent on understanding chemistry, as opposed to chemical engineering.

Where graduate employees had studied in an appropriate second disciplinary area, this was regarded by some employers as an advantage in the longer term because it would assist the graduates in their transition into other areas of the business without the need for further university study. It seems that employers, particularly in manufacturing industries, can easily see the benefit of a dual degree if there is a clear synergy between the two areas. That said, many respondents stressed that career progression within the organisation is performance based and degree qualifications have little influence.

The findings suggest that many employers perceive the calibre of a graduate to be more important than whether or not the graduate completed a dual degree. Employers emphasised that strong abilities in the engineering discipline are paramount, and other qualifications/degrees are a lesser consideration.

The findings also suggested that a candidate with appropriate industrial experience is much more desirable than one without, regardless of dual or single degree qualification.

However, in assessing the calibre of a candidate, the findings suggest that some employers perceive graduates of engineering dual degrees to be of a higher calibre than single degree graduates, in part due to the higher entrance requirements - for some employers, completion of a dual degree was perceived as a crude indicator of greater academic ability.

The findings also suggest that employers tend to expect graduates of engineering dual degrees to have superior generic capabilities such as communication skills. For example, an employer representing a major resource company reported that from his experience dual degree graduates were high quality and well-rounded engineers, although he also stressed that the company tends to only select those graduates who are in the top quartile.

Some employers expressed concerns regarding a lack of expertise in dual degree graduates' core engineering discipline because key subjects had been removed from the curriculum. This finding is consistent with findings of other reports [7][15], and the views of academics of the engineering department at the University of Western Australia [16].

Some employers indicated that the ability to fit in to the organisation is another major consideration. For example, one employer said: *More importantly is the graduate's fit with the organisational goals and style - getting the right person for the job is critical; the wrong person can be an expensive mistake.*

It was found that many employers tended to prefer a well-rounded candidate, with generic skills (such as communication and teamwork) being as important as the engineering technical skills, and more important than whether a graduate has a single or dual degree.

The responses of employers were mixed regarding the value of a dual degree against other engineering qualifications such as honours and Masters degrees and diplomas. For example, one employer indicated that the qualifications a company looks for depends on the nature of the role - if a specialist is required then an honours degree or a masters degree which is technically relevant to the position is more desirable than a dual degree, but where versatility is considered important then a dual degree is perceived as adding value. Another offered the view that where candidates were ranked equally for a position then the dual degree candidate would be at an advantage.

Another employer indicated that an employer will try to gauge and compare potential employees by looking for core competencies, and that the type of degree is unlikely to make a difference. Others stressed the importance of industry experience, and one indicated that a *sandwich* programme, giving a graduate up to 12 months industrial experience prior to graduating was more valuable than holding a dual degree.

Employers tended to indicate that the grades a candidate achieved on graduation were considered important. Overall, the interviews suggested that a candidate with a high ranking honours degree would be considered more highly than a low ranking dual degree. In addition, long term promotional prospects were viewed as more likely to be performance based than related to prior studies, although it was acknowledged that prior studies may influence on-the-job performance. A representative sample of employers' comments is given in Table 1.

Table 1: Representative sample of employers' comments.

<p>Graduate attributes sought by employers</p>	<ul style="list-style-type: none"> • Attitude to work and profession • Some projects require more than one aspect • Expectation solely around base discipline • More versatile, especially small company • Engineering only required. Could see where business could be useful • Mainly electrical engineering but has helps on business side • Mainly engineering • Mainly interested in engineering side • Engineering only required • Both areas used • Only interested in IT side • Engineering side • IT side only • Strong abilities in engineering are paramount, other degrees only minor consideration. Generic skills as important as technical skills. Work experience more desirable than a candidate without
<p>Employers' perceptions of dual degree graduates</p>	<ul style="list-style-type: none"> • None • No difference • Roundedness • Useful to have broader knowledge. Mainly consultants so knowledge Eng/Law would really suit • Experience in engineering and business useful • Good for long term career as long as 2nd subject is appropriate • A definite advantage if combined with business • Good although primarily concerned with IT • Too bookish, no more intelligent than single degree graduates. • Advantageous for future broader management roles. Would help their progress after junior engineering positions • Longer term would be useful but initially need to focus on technical content in engineering (first 5 years) • No direct benefits • Concerns about removing fundamental subjects • Might have more success at advancement • Hard to say, really depends on role • Dual degree chemical engineering and chemistry could be an advantage and with additional mathematics, computing and business
<p>More likely to hire dual degree students?</p>	<ul style="list-style-type: none"> • No difference • May help with getting an interview, thereafter no benefit. • Prefer masters • No, more important to get the right candidate. Industrial experience also valuable. Suggest <i>sandwich programmes</i> where students get up to 12 months industrial experience before graduation • No more likely. If perform better in first couple of years then may promote more rapidly • More likely as not looking for a specialist • Might help when looking at CVs and marks but then dependent on interview • Prefer industry experience • Most important is they have an engineering degree. Broader education then could be an advantage • If two candidates were even then it would be an advantage. Prefer merit and experience rather than dual degree • Not really necessary, it wouldn't make much difference • It would only make a difference to the total score when recruiting. Both good options • Definitely an advantage • Not really, it would depend entirely on the role • Calibre of person more important than the degree. If masters or honours technically relevant then definite advantage. Little difference in starting salaries. Advancement is often discipline based and/or opportunities. Academic performance might be considered at first level of promotion • Depends on need of the company, more likely if it met specific targets or needs. Only advantageous over honours or masters if very technical/specific focus • Probably more likely to hire. Shows broad skills and person willing to work outside one particular discipline area. Specialist technical roles postgraduate is preferred. Generalist technical role probably prefer dual degree • Do not look specifically for dual degree students. More concerned about marks

CONCLUSIONS

All of the employers had an understanding of the nature of dual degree programmes. Overall, the findings suggest that graduates of engineering dual degrees are regarded by many employers as having a greater breadth of knowledge than their single degree counterparts. Employers tend to expect graduates of dual degrees to have more-developed communication skills and greater versatility. Some employers raised concerns that this breadth comes at the expense of depth of technical expertise. Although the breadth of knowledge and skills may hold graduates of dual degrees in good stead for future work in areas such as management, many employers expressed a view that they must demonstrate technical ability as engineers in the first few years of their career.

On the question of whether employers are more likely to recruit graduates of dual degrees than single degrees, mixed responses were seen. Some employers indicated that it made no difference, while others indicated that, all other things being equal, a dual degree graduate would be preferred.

Clearly, this is a complex issue that is confounded by the individual perceptions of employers, the size of the organisation and whether the business of the organisation is specialised or multi-disciplinary. However, no employer indicated that they would be *less* likely to recruit a dual degree graduate.

Some employers indicated that they would prefer masters or honours to a dual degree. Most employers indicated that good academic results were far more important than the type of degree undertaken. Some employers indicated that relevant industry experience was also a far more influential factor than whether a candidate had a single, dual, honours or masters degree.

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