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Double degree programmes in engineering with business, commerce, economics and related fields offered by Australian universities

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ABSTRACT: This article is an outcome of a research project undertaken by the UNESCO International Centre for Engineering Education (UICEE) under the occupational training programme offered to undergraduate overseas students. There have been several projects already accomplished under this programme. Generally, by participating in this unique programme, students acquire fundamental, essential and critical skills to carry out such academic activities. The engineering profession presently requires the introduction of additional skills into the curriculum such as non-professional skills, science skills, specialised technical skills, individual personal skills, etc, to ensure the proper development of an engineering graduate for the 21st Century. The objective of the project was to determine how those skills are being developed through the double degree programmes, and in particular how Australian universities realise the provision of double degree programmes, combining engineering with such specialities as business, economics, commerce, accounting, management, etc. The paper provides some information on this matter. Particular emphasis, however, is being placed on the double degree programmes offered by the so-called *Great 8* Australian universities.

INTRODUCTION

When examining the current situation in engineering education, one can find it quite different to what it was ten years ago. Presently, industry demands from engineering graduates more than just perfect technical knowledge [1]. A broader understanding of business, economical, political and social issues is required [2][3]. Due to the increasing trend of globalisation, these changes are not limited to national boundaries as they take place on an international scale.

When considering the Australian scene, the Review of Engineering Education Exposure Draft states that engineering education in Australia has a good reputation for its outcome of graduates who are adaptive and flexible. However, due to the drastic changes occurring, it was also recommended that the engineering education system must also undergo radical changes; otherwise, Australia will not be able to *maintain and further develop its position in an increasingly complex and demanding world*. This is a big challenge for Australian engineering education as it means that *fundamental changes* in universities have to be made as a matter of urgency [4].

To include the so-called soft skills in the engineering curriculum, which can be developed through business, commerce, economics, communication, etc, could be a first step to make engineering students familiar with fundamental aspects that are different from pure engineering concepts.

A double degree programme represents an even more efficient alternative in comparison to the single degree programme, which may only include very limited non-engineering concepts and ideas. By attending a double degree, which combines engineering with business or commerce, economics, etc, engineering students would not just receive an introduction to these particular fields but they would also have the opportunity to acquire a deeper understanding of related issues from different disciplines, augmenting not only their professional knowledge base, but also the necessary soft skills.

The advantage of attending a double degree programme is to reduce the time of studying the two degrees separately from seven to five years of full-time study. Another advantage of a double degree is that the graduates develop skills in different areas, expanding their horizons and enhancing their chances in labour markets, both nationally and internationally. Offering a BE/BBus or BE/BCom, BE/BEcon, etc, could also be seen as a chance to gain a greater gender balance in engineering education by getting more women into engineering, thereby providing many new perspectives in a traditionally male-dominated field [5].

Determining what methods Australian universities use to offer double degree programmes in these particular areas of study is an objective of the paper. How the so-called *Great 8* Australian universities perform, as these are the leading institutions of higher education across Australia, is of particular interest to this research.

AUSTRALIAN UNIVERSITIES - AN OVERVIEW

Australian institutions of higher education consist of 31 colleges and 39 universities. As can be observed in Table 1, just under 50% (actually 17 out of 39) of Australian universities do not offer the combined degree programme in the engineering and commerce area of study.

Geographically, across Australia, it can be noticed that neither Tasmania nor the Northern Territory give the opportunity for students to enrol in this kind of double degree programmes.

Table 1: Bachelor double degree programmes in engineering and business, commerce, etc, in Australian universities.

University	Double Degree Bachelor Programmes	
	Engineering	Commerce, Economy, Business (Adm.)
The University of Adelaide	Engineering Engineering	Economics Finance
The Australian Catholic University	-	-
The Australian National University	Engineering Engineering	Commerce Economics
University of Ballarat	Engineering	Commerce
Bond University	-	-
University of Canberra	-	-
Central Queensland University	Engineering	Business Administration
Charles Sturt University	-	-
Curtin University of Technology	Engineering	Business Administration
Deakin University	Engineering	Commerce
Edith Cowan University	Engineering	Business
The Flinders University of South Australia	-	-
Griffith University	Engineering	Business Management
James Cook University of North Queensland	-	-
La Trobe University	-	-
Macquarie University	-	-
The University of Melbourne	Engineering	Commerce
Monash University	Engineering	Commerce
Murdoch University	Engineering	Commerce
The University of New England	-	-
The University of New South Wales	-	-
The University of Newcastle	Engineering	Business
Northern Territory University	-	-
University of Notre Dame Australia	-	-
The University of Queensland	Engineering Engineering Engineering	Business Management Commerce Economics
Queensland University of Technology	Engineering	Business
Royal Melbourne Institute of Technology	Engineering	Business Administration
Southern Cross University	-	-
University of South Australia	Engineering Engineering Engineering	Management Management (Marketing) Commerce
University of Southern Queensland	Engineering	Business
Swinburne University of Technology	Engineering	Business
The University of Sydney	Engineering	Commerce
University of Sunshine Coast	-	-
University of Tasmania	-	-
University of Technology, Sydney	Engineering	Business
Victoria University of Technology	-	-
The University of Western Australia	Engineering	Commerce
University of Western Sydney	-	-
University of Wollongong	Engineering	Commerce

Note: The so-called *Great 8* Australian universities are listed in bold.

Most universities, 18 of those 22, provide one business option to be combined with the BE in a double degree programme. Only four universities offer more than one business discipline for this double degree programme. The BCom as a partner with the BE represents the biggest percentage with 39% or 11 programmes. This is followed by the BBus with 21%. Both are the most frequent options available in Australia.

This observation raises the question whether it is more convenient for engineering students to obtain a broad understanding of basic business and commerce aspects, which are offered in those specific Bachelor programmes, rather than by the combination with a too specialised Bachelor course, like the BFin or the BBusMan. Industry demands engineering graduates with a thorough understanding of broad issues related to engineering and the development of business and social skills.

THE *GREAT 8* AUSTRALIAN UNIVERSITIES

The term *Great 8* is synonymous for those eight Australian universities (see highlighted universities in Table 1) that have been established as the leading universities in Australia. They also provide a benchmark for Australia's higher education nationally and internationally.

When looking at the engineering specialisations, they are almost the same at every university. As investigated, nearly all faculties of engineering of the *Great 8* make all engineering specialisations available within the double degree

programme. However, the University of New South Wales, as part of this group, provides the combination of the BE only with the MCom in this area.

When examining the number of fields of study within the BCom, at least four of the *Great 8* universities' students can choose their course of specialisation from more than 10 options. The University of Sydney offers within the BCom the highest number of specialisation options, which are actually 16. Accounting & finance, economics, marketing, management, and business & economics statistics can be regarded as the main commerce disciplines.

The University of Sydney is the only university currently to offer the BE in E-Commerce. Moreover, the University of Sydney and the University of Western Australia are the only universities to actually provide E-Commerce as a commerce specialisation. Furthermore, it should be noted that almost every university of the *Great 8* gives the faculty of engineering general supervision over the double degree programme.

Having a critical view on the credit point count of the double degree programmes, it was noted that several universities give the engineering part preferential treatment, compared to the non-engineering part. Considering that the amount of credit points is connected with the number of courses suggests that some universities offer a BE degree with additional business, commerce, economics, etc, aspects instead of introducing a double degree programme.

COMPARISON OF THE COMPULSORY COMMERCE COURSES WITHIN THE BE/BCOM PROVIDED BY THE *GREAT 8*

Table 2 shows the compulsory commerce subjects that have to be taken within the BE/BCom offered by six of the *Great 8* Australian universities. These give students a basis for subsequent studies in one of the provided commerce disciplines. The number of the compulsory commerce courses ranges from four to 12. Table 2 shows that the compulsory commerce courses usually have to be taken within the first three years of study of the BE/BCom programme.

Table 2: Overview of the compulsory commerce subjects within the BE (Mech.)/BCom programmes at the *Great 8* universities.

Univ.	Year				
	1st	2nd	3rd	4th	5th
Australian National Univ.	• Financial Accounting Fundamentals • Accounting & Financial Management	• Economics I • Quantitative Methods for Business & Economics 1 • Quantitative Methods for Business & Economics2	• Business Information Systems • Intro to Commercial Law		
Univ. of Melb.	• Introductory Microeconomics • Introductory Macroeconomics • Quantitative Methods 1	• Introductory Econometrics			
Monash Univ.		• Principles of Microeconomics • Principles of Macroeconomic • Business & Economic Statistics 1 • Business & Economic Statistics 2 • Accounting Principles • Introductory Financial Accounting	• Introductory Management: Managing People & Org. • Introductory Management: Management & Org.		
Univ. of Queens-land	• Computer-based Information Systems • Quantitative Economics & Business Analysis A • Quantitative Economics & Business Analysis B • Intro to Financial Acctg	• Financial Reporting • Financial Management • Business Law • Fundamentals of Cost Accounting	• Introductory Microeconomics • Introductory Macroeconomics	• Intro to Marketing	• Intro to Managem't
Univ. of Sydney	• Accounting IA • Accounting IB	• Data Analysis • Hypothesis Testing	• Introductory Microeconomics • Introductory Macroeconomics		
Univ. of Western Australia	• Financial Accounting • and • Management Accounting • or • Organisational Behaviour	• Microeconomics, Prices & Markets plus either • HR Management and • Management & Organisation or • Intro to Finance and either • Corporate Financial Policy or • Derivatives: Markets & Products			

Monash University is the only university where the commerce part of the BE/BCom begins in the second year of study, hence the compulsory commerce subjects cannot be taken any earlier than in the second year of study. Notably, the compulsory commerce subjects offered by the University of Queensland, within the BE/Bcom, are distributed over all five years of study. Furthermore, the University of Queensland provides the highest number of commerce disciplines.

It was also observed that the compulsory commerce subjects within the double degree programme are almost the same as within the single degree programme.

When looking at the variety of those particular courses offered by the *Great 8* Australian universities, the most common courses are introductory courses in micro- and macroeconomics, in the areas of accounting and finance, and in business and economics statistics.

Surprisingly, essential commerce disciplines, such as organisational management, marketing and business law, are not that well represented as compulsory commerce courses. Interestingly, the University of Western Australia has some compulsory units that vary according to the commerce major chosen for subsequent studies.

SUMMARY AND CONCLUSION

To sum up the investigation's results, it must first be mentioned that 22 out of 39 Australian universities provide the BE/BBus or BE/BCom, BE/BEcon, etc. When looking back, it has to be taken into consideration that half of all Australian universities is quite a large proportion, because double degree programmes have become more and more popular over the last few years. But is it not more important to look for what the future world will demand and to determine what number and combination of double degrees would be the right one?

Moreover, an interesting observation was made that in two out of seven Australian States, there is no possibility for students to enrol in this particular type of double degree programmes, thereby diminishing student opportunities and those states' knowledge base. Ultimately, graduates from other States will have industry-demanded skills, and with that a competitive advantage over university graduates from Tasmania and the Northern Territory. As such, the long-term prospects of the economy of these two States will suffer, as they will need to *import* soft-skills qualified graduates.

One recommendation to be drawn here is that at least one university in each state, established as that state's centre of excellence, should provide a double degree programme covering the BE/BBus or BCom, BEcon, etc.

Further investigation yielded interesting results on the leading universities of Australia.

As already recognised, while looking at all Australian universities, the *Great 8* also showed the highest frequency in business-related fields to be combined with the BE; the BCom had the highest frequency (11 programmes across Australia's universities). The reason for this is may be that it is more convenient for engineering students to become familiar with business skills in a more general sense, instead of focusing on just one commerce stream.

The University of Sydney, Australia's first university, was found in this study to be very up-to-date with a vision for the planning of future academic activities. Currently, It is the only university among the leading universities that provides E-Commerce as an engineering speciality, as well as a commerce major. Given the considerations of the growing trend of information technology in all areas of daily life, students with qualifications and skills in this area would be well prepared for labour markets, both nationally and internationally.

Further research on the ratio of both components of the programmes also generated some interesting observations. By having had a closer look at the credit point count of the double degree programme, it was found that some universities privileged the engineering when compared with the non-engineering discipline. Keeping in mind that the credit point count is related to the number of courses, a conclusion can be drawn that the double degree is not meant to be interpreted as being completely equitable. Interestingly, there were just three universities out of the *Great 8* that realised the meaning of the term *double degree* in this respect.

Further investigations showed that there were compulsory commerce units (with some variation) at all six of the *Great 8* universities offering a BE/BCom degree.

It is seen as an advantage for engineering students to have a basic knowledge of several different commerce aspects, acquired by attending compulsory commerce courses, in order to become familiar with the complexity of commerce issues. The University of Queensland must be cited as a good example because it is the only university of the *Great 8* where every significant commerce discipline is being represented within the compulsory core subjects undertaken by all students.

It is suggested that most universities offering a BE/BCom programme should reconsider the programme's delivery structure in these particular fields of study so as to familiarise engineering students in these programmes with all commerce disciplines that are considered important to meet the needs of industry.

A general conclusion that can be drawn from this study is that the 22 Australian universities are on the right path with regard to providing the double degree programmes in the fields of engineering and business, commerce, economics, etc. Nevertheless, looking at our *increasingly complex and demanding world* should be a prime objective concerning the further development of double degree offerings [6]. Finally, more double degree programmes should be launched at additional Australian universities. Furthermore, inequalities that are apparent between the two components should be eliminated.

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