ResearchLEAP

Journal of International Business Research and Marketing
Volume 6, Issue 3, 2021
journal homepage: www.researchleap.com

Inventive Higher Education: a Blending Passage

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DOI: *10.18775/jibrm.1849-8558.2015.63.3003*
URL: *http://dx.doi.org/10.18775/jibrm.1849-8558.2015.63.3003*

Keywords:
Career Advancements, Engineering degrees, Postgraduate studies, Professional and expertise substance

ABSTRACT

The massification of education has led to the perception in some disciplines that an undergraduate degree no longer provides sufficient competitive advantage in employment. While undergraduate degrees deliver sufficient professional and expertise substance for entry level positions, ultimately it is the postgraduate qualification which sets students apart and in turn assists with rapid career advancement. In ensuring that graduate students exceed the desired entry level of professional skills, the education institution needs to provide a linking passage between undergraduate and postgraduates studies. This blending passage offers a significant opportunity for students to further develop their overall expertise and skill set. Moreover, this blending passage needs to closely align with the specific professional requirements together with the potential for the graduate to seek possible career progression and advancements. Accordingly, postgraduate studies need to align with these specific professional requirements. The blending passage is an innovative approach which maximizes non-traditional learning and provides incentives to further augment the student's career. This rapprochement will be aligned with the relevant professional bodies that will also carefully consider the students' professional competencies. This paper will investigate three prominent Australian universities and their Engineering undergraduates' belief in the importance of further education and their desire to further develop their specialist expertise through postgraduate study. Minitab will be utilized as a statistical tool to analyze survey data and the findings and their implications for the provision of a blended passage to postgraduate study will be discussed.

1. Introduction

In Australia, the higher education participation and enrolment has increased significantly over the past couple of decades and particularly since 1980's. This ongoing growth of higher education creates plentiful challenges and confrontations. One of these challenges includes the perception in some disciplines that an undergraduate degree no longer provides sufficient competitive advantage in employment (Ribeiro and Lubbers, 2015). It is also correct to consider the Undergraduate programs as more general in nature. Generally, the Undergraduate programs provide general education courses in a wide variety of subjects and content which are not parts of postgraduate education (Bonaccorsi, 2014). Accordingly, there are many differences between undergraduate and postgraduate education including:

1. Although Undergraduate programs are exceptionally similar for the same field of study (regardless where they are taught), postgraduate courses allow more flexibility based on each institution's own strategic plan.
2. Where Undergraduate is mostly taught at the substance level, postgraduate courses require individuals to conduct detailed research and accordingly use their own initiatives and ingenuity.
3. While Undergraduate programs are generally less individualized, postgraduate courses are substantially Technical, Specific and much more highly developed.

More importantly, while the undergraduate degrees deliver sufficient and necessary professional and expertise substance for the entry level positions; ultimately it is the postgraduate qualification which sets students apart and in turn assists with rapid career advancement (Gharehbaghi, 2015). Furthermore, it is also the postgraduate qualification which conveys more innovative and specialized knowledge and in doing so, position students apart and in turn assists with rapid career advancement. Moreover, in the advanced economies, postgraduate qualification is highly desirable if not compulsory for further career advancement (Welpe et al, 2014).

2. Educational Aspirations and Career Advancement

Educational aspiration is defined as an individual's educational goals which are shaped by two classes of factors: student-related background and educational institution characteristics (Hanson, Paulsen and Pascarella, 2016). Internal student

influences like personal motivation and career ambition interact with external environmental factors like parental education, race, socio-economic status and income, family and peer group attitudes, past school experience, and scholastic achievement (Buchmann and Dalton, 2002) to influence aspirations to attend graduate school. While studies have extensively explored the individual student characteristics which motivate graduate studies (Buchmann and Dalton, 2002; Hanson et al., 2016), less is known about the second class of factors: the impact of institutional characteristics.

Furthermore, students from highly selective, elite universities are more likely to pursue graduate studies than those from less selective and lesser ranked universities (Mattern and Radunzel, 2015). Aspiration for graduate education is also influenced by field of study: disciplines with a pure theoretical focus like the biological, social, and physical sciences have higher graduate enrolment rates than disciplines with a more practical application focus, like engineering (Nevill and Chen, 2007). Careers like engineering are highly paid, and so continuing on to graduate education carries an opportunity cost (Mattern and Radunzel, 2015).

Length of the undergraduate degree also impacts graduate aspirations: those who complete a four-year undergraduate degree in a timely fashion are more likely to pursue Master's degree studies (Mattern and Radunzel, 2015). Students' satisfaction with their undergraduate experience is another important factor which fosters a positive perception of graduate school (Vance, 2015).

Positive and engaging relationships with faculty and effective pedagogical practices also increase the likelihood of students pursuing graduate studies (Hanson et al., 2016). Moreover, research shows that institutional prestige impacts the future career opportunities, economic prospects and earning capacity of graduates (Brennan and Naidoo, 2008). On the other hand, Graduate employability and career advancements are some of the most important concerns in Higher education (Hoffman and Välimaa, 2015).

Responding to these concerns requires the optimization of the graduates' skill sets. Generally, structural unemployment issues are concerning because the graduates' skill sets possessed do not comprehensively match the skills required (Stewart, 2012). The Graduate employability and career advancements association need to encompass fundamental issues including the Graduate's skills set, and employability as the key focus of the higher education implementation (Hunter, 2012). As Wankel and Blessinger (2013) correctly discussed, "a proven way to advance in Graduate's career is to be continually acquiring new knowledge. Doing so ensures that the Graduates stay on top of trends or developments in their fields". In addition, Turner (2011) pointed out that when graduate seek to advance their career, they should never be afraid to think outside the box and put their professional shrewdness to work. Thus it is clear a prominent way for career advancement is to keep learning.

In addition, as Bonaccorsi (2014) correctly argued "since career advancements are not a simple improvement, employers now want to barter performance for training, learning and further development that keep their employees viable". As it can be noticed this further validates the importance of learning and training to develop the individuals' aptitude and their skills set. This development of the skills set would in-turn further improve the career advancements of the individuals.

Graduate education is increasingly perceived as an aspirational pathway to enhance comparative advantage in employment opportunities and stimulate rapid career advancement in the competitive globalized labor market (Lin, 2011; Mattern and Radunzel, 2015). An undergraduate degree is no longer considered the pinnacle of educational aspiration. Given the increasing importance of developing a highly qualified and knowledgeable workforce to improve business productivity (Kim and Otts, 2010), and the impact of graduate study upon an individual's employability and career progress (Gerber and Shaefer, 2004), self-esteem and long-term earning capacity (Mattern and Radunzel, 2015), it is important to explore the factors which prompt engineering students to pursue advanced study in graduate engineering programs.

3. Results and Discussion

This section consists of the data examination and analysis of the conducted survey. This survey (total of 150 Undergraduate student responses) was conducted in early 2012 and was based on "satisfaction of Undergraduate generic skills" synopsis. This survey commenced with age group, study load (full-time/part-time), local or international based students, and the institution (selected from three prominent Australian universities) questions. In addition to these multiple choice queries, there were also twelve short and long answer questions. The general data analysis techniques consisted of Statistical analysis (using Cross Tabulation and Frequency testing development via Minitab), together with the Factor Analysis and measurements.

For the purpose of data analysis, the responses for the twelve questions were entered either as 1 (for yes), or 0 (for no) values. The important questions which required significant measurement (Factor Analysis) were:

• Question 5. Are you satisfied with the Professional and Expertise substance of your degree [General Knowledge Satisfaction]?
• Question 6. Are you satisfied with the development of your overall expertise skills [Specialize Skills Satisfaction]?
• Question 9. How important do you see Postgraduate studies to further develop your expertise skills [Grad Studies to Further Skills]?

• Question 10. How important do you see Postgraduate studies to further augment your career [Grad Studies for career Progress]?

These four questions were specifically targeted to provide the correlation between the actual survey and the scope of the research (Inventive Higher Education: A Blending Passage). Table 1 below provides the overall data demographic.

Table1: Data demographic

Who wants to do post graduate studies	N (Percentile)
• Degrees	
o Computer Engineering	35 (23.33)
o Civil Engineering	31 (20.66)
o Mechanical Engineering	29 (19.33)
o Electrical Engineering	22 (14.66)
o Chemical Engineering	19 (12.66)
o Aerospace Engineering	10 (6.66)
o Other	4 (2.66)
• Age group	
o <25	75 (50)
o <30	41 (27.33)
o <35	17 (11.33)
o <40	12 (8)
o >40	5 (3.33)
• Local/overseas	
o Australian Students	98 (65.33)
o International Student	52 (34.66)
• Study load	
o Full-time Student	131 (87.33)
o Part-time Student	19 (12.66)

As it can be noticed, Computer Engineering has the highest response followed by Civil Engineering. In addition, while most respondents were below the age of 25, they were also local students who were majority full-time Undergraduates. Table 2 (below) also provides a basic statistical analysis of the survey.

Table2: Statistical Analysis

Sample Standard Deviation (S) - [all questions]	0.7937
Variance (sample standard) (S^2) - [all questions]	0.63
Standard Deviation (σ)- [all questions]	**0.648**
Variance (population standard) (σ^2) - [all questions]	0.42
99% Confidence level - [all questions]	6.455

As it can be noticed, the σ is at 0.648 while the 99% confidence level was also at 6.455. Although both of these values represent low assertion of the data, further analyses were required to determine any correlations. Further analyses not only examined the association within the data set, but also determined any dynamics found. Accordingly, to further scrutinize specific correlation within the data set, Factor Analysis examination was carried out.

3.1 Factor Analysis

As already discussed, four questions (Questions 5, 6, 9, and 10) were selected to form the basis for the Factor Analysis examination. In addition, these four questions were then grouped into two relevant categories. While questions 5 (X1) and 6 (X2) were grouped as Undergraduate Degree Satisfaction (Factor 1); questions 9 (X3) and 10 (X4) were grouped as Career Advancement (Factor 2). The overall results are provided in Table 3 below.

Table3: Comparison of the three universities

Questions	A		B		C		
	Yes Y^1	No Y^2	Yes Y^3	No Y^4	Yes Y^5	No Y^6	
X^1	***44 (88%)***	6 (12%)	*31 (62%)*	19 (38%)	***42 (84%)***	8 (16%)	F1
X^2	*39 (76%)*	11 (22%)	*33 (66%)*	17 (34%)	*41 (82%)*	9 (18%)	
X^3	*29 (56%)*	21 (42%)	***31 (62%)***	19 (38%)	*25 (50%)*	25 (50%)	F2
X^4	*31 (62%)*	19 (38%)	***33 (66%)***	17 (34%)	*28 (56%)*	22 (44%)	

As it can be noticed Table 3 includes the four questions (Xn) together with the three (A, B, C) Universities surveyed. While Universities A and B were from Group of Eight (Go8), University C was an Australian Technological academe. Using the Minitab software, the questions were then tested based on Yes and No inputs. Furthermore, for each University, independent Yes and No (Yn) value were observed. To further investigate these results, comparison of X-axis (Xn) and Y-axis (Yn) were carried out (Figure 1).

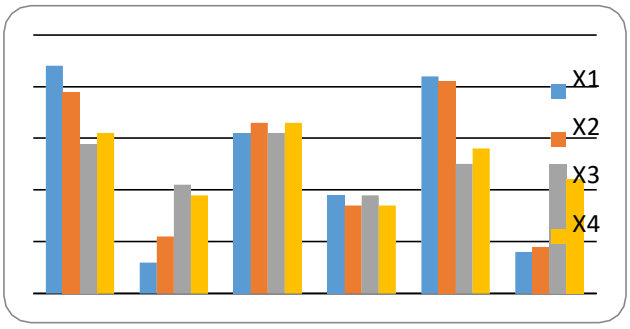

Figure 1: Response comparison.

Figure 1, represents Yes and No responses of the Questions 5 (X1), 6 (X2), 9 (X3) and 10 (X4). As it can be noticed, in general the Yes values are much higher than No responses, with Y1 (University A - yes) and Y5 (University C - Yes) have the most positive values (indicating factors). Generally stating, while University C is producing an even flatter association, while University A has the highest General Knowledge Satisfaction. On the other hand, University C has the lowest but linear correlation between all factors. To further examine the correlations between the two factors, specific analysis of all the three Universities is carried out and produced below.

Table 4: Factor Analysis and Testing.

Yes Y^1	No Y^2	Yes Y^3	No Y^4	Yes Y^5	No Y^6	
44 (88%)	6 (12%)	*31 (62%)*	19 (38%)	***42 (84%)***	8 (16%)	F1
39 (76%)	11 (22%)	*33 (66%)*	17 (34%)	*41 (82%)*	9 (18%)	
29 (56%)	21 (42%)	***31 (62%)***	19 (38%)	*25 (50%)*	25 (50%)	F2
31 (62%)	19 (38%)	***33 (66%)***	17 (34%)	*28 (56%)*	22 (44%)	

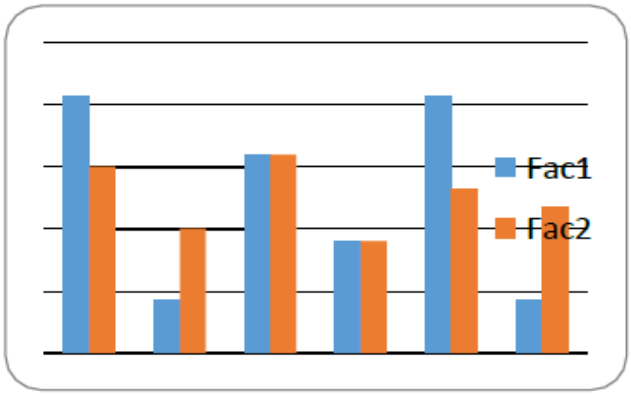

Figure 2: Factor 1 and 2 comparison.

Noting that all the three Universities have excellent Engineering schools, their overall comparison produces interesting findings. As it can be noticed, across all three Universities (overall) Factor 1 (Undergraduate Degree Satisfaction) is much more influenced value than Factor 2 (Career Advancement). This could possibly indicate that all Universities (in-particular A and C) overall were fulfilled with their course substance including specialized content. Although University B possesses lower correlation across the board, it is more static.

In addition, the positive values Y1, Y3 and Y5 are the strongest sub-factor indicators. These sub- factor indicators are key pointers in determining the overall need to pursue postgraduate studies. Once again, although across all three Universities Factor 2 (Career Advancement), seem to be within expected range; University B, has higher rate. Comparing Factors 1 and 2, it can be determined that University B not only has smallest Undergraduate Degree Satisfaction rate but also lowest need for the Career Advancement. Therefore, the final summary from this factor analysis denotes that the students which were surveyed from University B, overall were more positive in considering postgraduate studies as a way to advance their careers. This could also be linked back to their lower Factor 1 Results. This produces an interesting summary that the lower rate of Undergraduate Degree Satisfaction (Factor 1), the higher need to undertake postgraduate studies for career advancement (Factor 2).

4. Conclusion

The blending passage is an innovative approach which maximizes non-traditional learning and provides incentives to further augment the student's career. This rapprochement will be aligned with the relevant professional bodies that will also carefully consider the students' professional competencies. This paper has investigated three prominent Australian universities and their Engineering undergraduates' belief in the importance of further education and their desire to further develop their specialist expertise through postgraduate study. Minitab was utilized as a statistical tool to analyze survey data and the findings and their implications for the provision of a blended passage to postgraduate study will be discussed.

The result indicated that there was a strong correlation between how surveyed students perceived their postgraduate studies as a way to advance their careers. This produced an interesting summary that the lower rate of Undergraduate Degree Satisfaction, the higher need to undertake postgraduate studies for career advancement. Finally, as this paper demonstrated institutional prestige influences the future career advancements, prospects and capacity of graduates.

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