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An analytical model to assess the efficacy of the British HND programme in the Arabian Gulf region

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ABSTRACT By developing a logit model, this study attempts to identify the determinants that influence the efficacy of the HND programme. The total sample comprised of 104 final-year students surveyed in two university sector colleges in Oman and the UAE. The most statistically significant determinants were found to be the gender of students, their desire for vocational course content, their desire for varied and on-going assessment methods and whether or not they had taken the HND as a last resort. The model was found to be a reasonably effective model of qualitative choice for rating an educational programme good or otherwise as it correctly classified 77.5 per cent of the students' ratings for the in-sample (80 students) and 71 per cent for the hold-out sample (24 students). The study suggests that such a model could be effectively used by educational policy makers to assess the efficacy of any academic programme.

Keywords: Higher education, United Arab Emirates (UAE), BTEC Higher National Diploma (HND), student attitudes and characteristics, logit model

Introduction

The internationalisation of higher education is one feature of the general trend towards globalisation in trade, commerce and communication. Increasing competition at home, decreasing public funds for higher education and the general trend towards globalisation have all encouraged western universities and awarding bodies to expand their operations overseas. The market leaders in offering higher education to foreign students in their home country are the USA, the UK, Australia and Canada (British Council, 1999b). The number of foreign students taking British university courses overseas has increased from virtually nothing fifteen years ago to over 100,000 today (Buerkle, 1999). BTEC, a subsidiary of the Edexcel Foundation, is a British awarding body that offers a great range of qualifications from school level to the Higher National Diploma (HND). The HND is offered internationally by both BTEC and several UK universities. The HND equates to an American Associate Degree or an Australian Advanced Diploma.

Philosophy of HND

The BTEC Higher National Diploma has been designed to meet the following aims (Edexcel Foundation, 1998):

- to provide an educational foundation relevant to individual vocations and professions in which students are working or intend to seek employment,
- to enable students to make an immediate contribution in employment,
- to provide flexibility, knowledge, skills and motivation as a basis for future studies and career development,

- to develop a range of skills and techniques, personal qualities and attitudes essential for successful performance in working life.

The HND is offered in a variety of vocational subject areas including Computing, Travel & Tourism and Business, the latter being available with a number of specialisms (pathways) such as Finance, Marketing and Personnel. The pathway qualifications ensure professional progression through recognition by relevant professional bodies. Full-time students normally take two years to achieve an HND while part-time students usually take three years, although this may vary depending on prior experience and learning. To achieve an HND students must complete sixteen units (subjects) while the completion of ten units gives a student the Higher National Certificate (HNC).

Centres delivering the HND are advised by BTEC to ensure that the structure, content, delivery and assessment methods adopted enable the programme's learning outcomes to be achieved in a motivating way (Edexcel Foundation, 1998). The qualification has been designed on the assumption that it will be made available, without artificial barriers that will restrict access and progression, to everyone who can achieve the required standard. Candidates are usually at least 18 years of age on enrolment and they normally hold at least one GCE A Level pass or an equivalent qualification. The HND, therefore, provides school leavers who do not meet the requirements for entry onto a bachelor degree programme with access to higher education study. Older candidates with suitable work experience but no academic qualifications beyond compulsory schooling are also usually admitted onto HND programmes.

Fisher (1998) reported that BTEC qualifications are well regarded by most employers in the UK and that the programmes usually motivate students and improve their understanding, confidence and competence. The status and credibility of the HND have often been questioned however, because the qualification does not typically attract the students with the highest academic attainment and because the pass rates are high.

BTEC/Edexcel qualifications are available in over 100 different countries worldwide including several in the Arabian Gulf region. Like those of other universities and awarding bodies, BTEC's qualifications are usually exported from the UK "off-the-shelf" with little modification done to reflect the political, economic, social and cultural differences in the different countries in which they are offered.

HND in the Arabian Gulf region

The HND has been available in the Arabian Gulf region since the early 1990s. Countries such as the Sultanate of Oman and the United Arab Emirates (UAE) were among the first in the region to adopt the HND with the medium of instruction being English. Some observations on the actual implementation of the HND in the Gulf region should be noted. Institutions in the Gulf region offering the HND probably make assumptions about their students or the qualification, which may be valid in the UK but not in Oman or the UAE. For example, in the Gulf region attitudes to higher education may be different, working hours in the private sector tend to be much longer than in western countries thus affecting the participation of working candidates, religion and social values affect the participation of females in education, and different governments implement different policies with regard to recognition and accreditation of foreign qualifications. While employed candidates studying on a part-time evening basis in the UK typically aim only for the Higher National Certificate (HNC) which consists of ten units as opposed to

the HND's sixteen and which often allows progression to a top-up bachelor degree, the term "certificate" is not widely appreciated or valued in the Gulf region, therefore, virtually all students register and aim for the HND only. This has implications for the length of time the candidate has to study and the amount they have to pay for fees. Given the instability of the Gulf region labour markets, especially for expatriate workers, it is not surprising that completion rates for HND are below the UK average, although factors such as the fact that the majority of candidates are not native speakers of English must also be considered.

Aims of the study

Taking into account the vocational, flexible and motivational aspects of the HND programme, the study aims to:

1. Identify the features of both individual students and the HND which influence the efficacy of the programme.
2. Develop a model to quantify the extent of impact of the factors identified in (1) so that the efficacy of the HND programme can be assessed.

It is hoped that the results of this study could facilitate educational institutions in the Gulf region and policy makers at BTEC to address the issues identified in the study, to further increase the efficacy and adoption of the HND programme overseas. The model developed could, however, be applied to any academic programme anywhere in the world.

General hypotheses about the HND

The specific programme features which are hypothesised to increase the efficacy of the HND are its vocational course content and the fact that it is a UK qualification; while motivational aspects are provided through the programme's flexibility, non-conventional assessment methods and links with local organisations (such as Chambers of Commerce and Industry).

Similarly, the specific features of students that are hypothesised to increase the efficacy of the HND relate to their gender, age, mode of study, and their perception of HND as an alternative to other programmes of higher education. A discussion of these factors follows.

It is a feature of the education system in several Gulf countries that female students outnumber males in higher education, and that they are more hardworking and more successful than male students (Allen, 1999). It is expected, therefore, that enrolment of more female students on to the HND would increase the efficacy of the programme.

Mature students with work experience are particularly suited to vocational education as they bring with them relevant skills, knowledge and experience, and can then better understand and apply the theory they learn. They also tend to be more highly motivated, often grateful to be given a second chance after not progressing to higher education immediately after completing high school. Often they are nervous about examinations and formal assessment, and they consequently find the HND's on-going assessment less intimidating and more satisfying. It is expected, therefore, that enrolment of more part-time mature students on to the HND would increase the efficacy of the programme.

Being a modular course, the HND typically allows flexibility with regard to the order and timing of delivery of the units and to the total duration of study. For example, part-timers studying in the evening are often permitted to take additional units during the day to speed up their completion of the programme. In contrast, students are also usually permitted to postpone units if work or personal circumstances make it necessary. For these reasons, it is expected that students who are motivated by the flexible aspects of HND and its varied assessment methods tend to rate higher the efficacy of the programme.

Expatriate students often want a qualification that will be internationally recognised rather than one which will only be recognised locally. Many plan to continue their education overseas and therefore it is vital that they perform well on the HND if they are to progress onto a one-year bachelor degree top-up programme in the UK or elsewhere. Successful expatriate students are likely to be happy and content with their student life in general and this general satisfaction may lead to an increased likelihood of them rating the HND good.

Empirical Model

The logit model developed in this study is a qualitative non-linear binary-choice model, where individuals are faced with a choice between two alternatives and that the choice they make depends on a set of characteristics of the individuals. Such choice models have been extensively used to address classification problems in the fields of finance, medicine, and the social sciences such as:

- whether a prospective loan borrower is a good or poor risk for granting credit,
- whether an existing credit customer defaults or not in their loan repayment to the creditor,
- whether a particular medicine manufactured and being tested has the potency to cure the disease or not without lethal effect,
- whether a candidate standing for election in a constituency will be chosen or not by the local electorate given a set of voting behaviour.

The nature of all these problems involve binary choice situations which require estimates of the odds of either of the two choices occurring given a set of individual characteristics for granting credit, the effects of a medicine, the voting behaviour in an election etc. (Pindyck and Rubinfeld, 1981). Evidence is, however, hard to find for the application of such binary choice models in the field of education. Hence, this study explores the feasibility of applying such binary choice modelling techniques to the efficacy issue of HND.

Rationale for choice of Logit Model

In most surveys, behavioural responses are generally qualitative; one either votes yes or no in an election; one uses either the bus, train or car; one is either in the labour force or out of the labour force etc. In these surveys, the dependent variable is discontinuous i.e. binary responses yes (1) or no (0). An equation is required to estimate the likelihood or the probability of the dependent variable given a set of independent attributes from the survey. Such estimates require non-linear iterative methods. The existing non-parametric methods do not adequately generate reliable likelihood estimates, hence the need to resort to qualitative choice models.

There are several forms of these qualitative choice models: the linear probability (regression) model, the probit and the logit. The linear probability model has the disadvantage that estimates fall outside the probability range of 0 and 1. Although the probit model constrains the probability range to between 0 and 1 it generally involves non-linear estimation and thus added computation cost. The logit model is widely used for survey analysis and although it is similar to the probit model it is more appealing and computationally more tractable (Pindyck and Rubinfeld, 1981).

Logit Model

In this study, the choice facing students is to rate the efficacy of HND as either good (coded 1) or not good (coded 0). The model determines the odds that an individual student with a given set of individual and programme attributes will make one choice rather than the other, that is to say, rate the programme either good or not good.

Gessner et al (1988) have analysed the theoretical and empirical aspects of estimating models with binary dependent variables. They observed that each of the classification techniques (e.g. linear discriminant analysis, binary probit, binary logit, ordinary least squares (OLS), and quadratic discriminant analysis) has a set of underlying assumptions that must not be violated by the data. Linear discriminant analysis (LDA) can be used to model binary variables, but one must assume that the predictor variables are distributed multi-variate normal which frequently may not be true with survey type data as used in this study. Although there are no multivariate distributional assumptions for the predictors underlying logit analysis, strict error term distributional assumptions underlie the logit technique (Maddala, 1983).

The logit model is based on the cumulative logistic probability function and is specified as: $P_i = F(Z_i) = F(\alpha + \beta X_i) = 1 / (1 + e^{-Zi}) = 1 / [1 + e^{-(\alpha+\beta Xi)}]$
where P_i is the dependent variable in the binomial choice model i.e. the likelihood that an individual student will rate the HND good given the knowledge of their attributes X_i i =1, 2,….n such as the gender of students, the maturity of students, the nationality of students and other programme features. The term e represents the exponential which is approximately equal to 2.718. The model when simplified is stated as:
$\text{Ln} [P_i / (1 - P_i)] = Z_i = \alpha + \beta X_i$

The dependent variable in this regression equation is simply the natural logarithm of the odds that a particular choice will be made. One important advantage of the logit model is that it transforms the problem of predicting probabilities within a (0, 1) interval to the problem of predicting the odds of an event occurring within the range of the entire real line. The slope of the cumulative logistic distribution is greatest at P = ½. In terms of the regression model, this implies that changes in independent variables will have their greatest impact on the probability of choosing a given option at the midpoint of the distribution i.e. when the likelihood P = ½.

The logit model is estimated as:
$\text{Ln} [P / (1 - P)] = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots\ldots\ldots\ldots + \beta_n X_n$
where, P is the odds that the HND is rated good, 1 - P is the odds that the HND is rated not good, α_0 is the intercept or constant term, X_i are the independent variables as defined and coded as in Table 1, and β_i, i = 1, 2,….n are the logistic regression coefficients associated with each independent variable.

TABLE 1. Definition and coding of independent variables

X_i	Variable name	Variable acronym	Coded as 0	Coded as 1
X_1	Gender	GEN	Male	Female
X_2	Age	AGE	Less than 22	22 or over
X_3	Nationality	NAT	Local	Expatriate
X_4	Country	CTY	UAE	Oman
X_5	Mode of study	MDE	Full time	Part time
X_6	Relevant course content	RCC	Not selected	Selected
X_7	Wanted UK qualification	UKQ	Not selected	Selected
X_8	Local links e.g. with Chambers of Commerce	LOC	Not selected	Selected
X_9	Flexibility of programme	FLX	Not selected	Selected
X_{10}	Assessment methods	ASS	Not selected	Selected
X_{11}	Course was last resort	LRT	Not selected	Selected

Note: X_6 - X_{11} were the options presented to students in the survey questionnaire, which represented their reasons or motivations for doing an HND.

Data

A questionnaire completed by final year HND students (graduating in June or December 2000) produced the data for this study. The questionnaire had ten questions in addition to the required personal data responses about the gender, age, nationality, course taken and mode of study of the respondents. The questionnaire had questions with a Likert rating scale, list or category questions, a yes/no question and two open questions. The questions covered, among other things, the reasons for their choice of course, their rating of the HND overall and their opinion on its usefulness as a preparation for employment.

The questionnaire was distributed to students at one institution in the UAE and one in Oman in May 2000. The size and composition of the student sample with respect to course studied and the country in which it was taken is shown in Table 2.

TABLE 2. Size and composition of the student sample

HND	UAE	OMAN	TOTAL
Business	27	22	49
Business Information Technology	23	3	26
Graphic Design	5		5
Media & Marketing	8		8
Tourism & Hospitality Management	16		16
	79	25	104

All of the HNDs in the survey were accredited by BTEC. The Business and Information Technology programmes were standard "off-the-shelf" BTEC programmes but the Graphic Design, Media and Tourism programmes were institution developed. The student responses did not seem to be influenced by the origination of the programme

syllabus. Of the total student sample, 37.5 per cent were male, 62.5 per cent were female, 52 per cent were aged under 22 years, 43 per cent were aged between 22 and 30, and 5 per cent were aged over 30. Some 61.5 per cent of students were studying full-time and 38.5 per cent part-time. In the Oman college, 92 per cent of the sample were Omani nationals. In the UAE college only 48 per cent were UAE nationals, 13 per cent were from other Arab speaking countries, 24 per cent were Asian (with the majority from India) and the remainder came from a variety of countries including Iran, Iraq, the UK and the Philippines.

Some 39 per cent of the respondents from the total sample reported that wanting a British qualification was a major factor in them choosing to do an HND while 31 per cent were influenced by links between their local college and local organisations such as chambers of commerce and industry, which either directly or indirectly seemed to support or validate the HND.

Procedure

The dependent variable *y* was the students' rating of the HND. Two separate questionnaire responses were used to determine whether an individual student had rated the programme good or not good. The two questions were "How would you rate the HND overall?" and "How well do you think the HND prepared you for a job in industry?". The student was only considered to have rated the HND good if they assessed the HND overall as excellent, very good or good, and if they thought that the HND had prepared them (at least to some extent) for work. The rationale for this decision is that the HND is supposed to be a vocational programme and if it did not prepare candidates for employment then it is not meeting its objectives and should not be rated good.

All the student data was converted to binary digits (0 or 1) as explained in Table 1. A total of 104 responses were received. A hold-out sample of 24, selected randomly, was created for model validation, leaving an in-sample of 80. Of these, 60 had rated the HND good (coded 1) and 20 not good (coded 0). The logit model was estimated using the LIMDEP software program developed by William Greene (Greene, 1989).

Estimation

The LIMDEP software has a built-in utility to estimate logit model coefficients (β_i) using a non-linear maximum likelihood estimation procedure. The estimated equation is shown below with the t ratio shown in brackets.

$$y = \text{Ln}[P/(1-P)] = \underset{(1.02)}{1.139} + \underset{(1.09)}{0.666}\,\text{GEN} + \underset{(0.23)}{0.210}\,\text{AGE} + \underset{(0.23)}{0.199}\,\text{NAT} - \underset{(-0.58)}{0.551}\,\text{CTY} + \underset{(0.20)}{0.179}\,\text{MDE}$$

$$+ \underset{(1.04)}{0.906}\,\text{RCC} - \underset{(-0.44)}{0.265}\,\text{UKQ} - \underset{(-1.20)}{0.758}\,\text{LOC} - \underset{(-0.59)}{0.410}\,\text{FLX} - \underset{(-1.17)}{1.244}\,\text{ASS} - \underset{(-1.09)}{1.555}\,\text{LRT}$$

where P = the odds of a good rating, (1 - P) the odds of a not good rating and Ln is the natural logarithm. The full software printout is shown in Table 3.

TABLE 3. Logit model maximum likelihood estimates

Log-likelihood:		-39.67				
Variable	Coefficient	Std. Error	T ratio	Prob | t | > x	Mean of x	SD* of x
Constant	1.1395	1.1222	1.015	0.3099	1.0000	0.0000
GEN	0.6664	0.6093	1.093	0.2743	0.6625	0.4758
AGE	0.2103	0.8993	0.234	0.8151	0.4375	0.4992
NAT	0.1987	0.8847	0.225	0.8223	0.4375	0.4992
CTY	-0.5510	0.9554	-0.577	0.5641	0.2125	0.4117
MDE	0.1793	0.8925	0.201	0.8408	0.3750	0.4872
RCC	0.9060	0.8679	1.044	0.2965	0.2625	0.4428
UKQ	-0.2651	0.6083	-0.436	0.6630	0.4125	0.4954
LOC	-0.7582	0.6335	-1.197	0.2313	0.3125	0.4664
FLX	-0.4102	0.6982	-0.588	0.5568	0.4000	0.4930
ASS	-1.2445	1.0614	-1.172	0.2410	0.0750	0.2651
LRT	-1.5551	1.4245	-1.092	0.2750	0.0375	0.1912

Frequencies of actual & predicted outcomes:

		Predicted	
Actual	TOTAL	0	1
TOTAL	80	6	74
0	20	3	17
1	60	3	57

* SD = Standard Deviation

By looking at the signs of the coefficients we can state the relationship between the independent variables and the dependent variable. A positive sign on the β coefficient indicates that an increase in the independent variable would increase the value of the dependent variable and therefore the likelihood of a good rating. For example, as expected there is a positive relationship between variable x_2 (AGE) and y.

For y: 0 = HND rated not good
1 = HND rated good

For x_2: 0 = Aged under 22
1 = Aged 22 or over

We can state that as the respondent becomes more mature, the likelihood of the matured respondent rating the HND good is greater.

In contrast, if the coefficient is negative this implies that an increase in the value of the independent variable (x) decreases the likelihood of a good rating for the HND. For example, the coefficient of x_{11} (LRT) is negative. If LRT was 1, then the respondent considered that the HND was taken as a last resort. This implies that taking the HND as a last resort reduces the likelihood of a good rating. We may conclude, therefore, that candidates were able to distinguish the HND programme from other alternatives when they enrolled, as the HND was *not* taken as a last resort for those rating it as good. The gender variable x_1 has a positive coefficient. It was not surprising, for the reasons stated earlier, that female students ($x_1 = 1$) rather than male students ($x_1 = 0$) tended to rate the HND good.

The negative coefficient on x_9 (flexibility of the programme) indicates that the candidates' desire for flexibility is not likely to increase the odds of them rating the HND good. This was quite a surprising result. Flexibility is difficult to define however. Different candidates may have different ideas about what flexibility means, and different institutions, and even different departments in those institutions may be more or less flexible and may themselves define it differently. The statistical t-ratio indicates that x_9 was not a significant variable however, and therefore was not significantly influencing the rating process.

The candidates' desire for varied and less formal methods of assessment (variable x_{10}) was also found not to positively increase the likelihood of them rating the HND good. In fact, all of the independent variables relating to the candidates' original motivations and reasons for doing a HND except x_6 (relevant course content) were found not to significantly (statistically) increase the likelihood of a good rating for the HND. This was another surprising result as the variables do represent some of the major attractions and distinguishing features of the HND programme relative to other undergraduate programmes.

Variable x_6, relating to course content, has a positive coefficient. This can probably be explained to a large extent by our using the candidate's assessment of how well they thought the HND prepared them for a job in industry to determine whether the candidate had rated the programme good or not good. As the HND is a vocational qualification it is likely that if the student perceived it as having relevant and desirable course content then it will also prepare them better for employment, hence the positive relationship between x_6 and y.

Variable x_3 (nationality) also has a positive sign on its coefficient indicating that expatriates were more likely to rate the HND good rather than Emirati students in the UAE or Omani students in Oman. While individual students may understand the benefits of the HND, employers in the region are often not familiar with the qualification. When recruiting new staff many employers favour candidates with locally accredited qualifications. Closer to graduation, when students are thinking about entering the labour market many become frustrated by the difficulty they face in securing a good position and this often leads to dissatisfaction with the HND. The labour nationalisation policies of most Gulf countries already positively discriminate in favour of nationals and expatriates are, therefore, more prepared for the problem of finding employment after graduation. There is also the problem of formal government recognition. In the UAE, for example, the Ministry for Higher Education has not accredited the HND along with the vast majority of foreign qualifications. Regulations forbid the public sector from recognising non-accredited qualifications. Consequently, an HND graduate taking up employment in the public sector will only be offered the package of terms and conditions that would be offered to a high school leaver having completed 12th grade. Unfortunately, the public sector offers significantly higher salaries and shorter working hours than the vast majority of firms in the private sector and the public sector is, therefore, the preferred choice of nationals for employment (Weston, 1998; Al Roumi, 1999).

National students study in their second, or even third, language. Many of the expatriates students, especially those from India and other parts of Asia, are fluent in English as their high school education was done using the English language. The expatriate students generally perform better than the local students and this therefore may be a reason for

discontent among locals, especially as most Arab cultures value success, recognition and respect (Dakhil, 1988; Abdalla and Al-Homoud, 1995; Hunt and At-Twaijri, 1996). The success of expatriate students, as stated earlier, probably increases the likelihood of them rating the HND good.

The negative coefficient of x_4 indicates that students in the UAE are more likely to rate the HND good compared to students from Oman. This result was surprising given that Oman has committed itself much more to the British system of education widely implementing British qualifications such as the NVQ, a work-based, competence-based qualification, and GNVQ, a college-based vocational qualification aimed mainly at the 16-19 age group (Al-Dhahab, 1997; British Council, 1999a). It is likely that students were influenced not only by HND-related factors but also by institution-related factors and other external factors, and these may have distorted the expected result.

Significance of model results

One of the criteria for evaluating the logit model, besides chi-squared value, is the percentage of correct classification predicted by the model relative to the actual data. Though the t-ratios of each of the variable's coefficients indicate that none of the independent variables are significant at even the 90 per cent level, the in-sample model accurately predicted the actual outcome 75 per cent of the time. Sixty respondents had rated the HND good; the model predicted 57, giving an accuracy of 95 per cent [(57 / 60)* 100]. However, twenty respondents had rated the HND not good and the model only predicted three, giving a success rate of only 15 per cent [(3 / 20)* 100].

Although all the independent variables were considered as potential determinants of ability to rate the HND as good, there was no theoretical justification for including them in the model since they had lower t-ratios implying lower levels of statistical significance with the dependent variable. The insignificant variables were dropped from the model one at a time to assess the impact on the model's success of predicting the actual outcomes (Table 4).

TABLE 4. Frequencies of predicted outcomes against actual outcomes

Variables dropped	0 (n = 20)	1 (n = 60)	Overall accuracy (%)
None	3	57	75
X_5	3	57	75
X_3, X_5	3	57	75
X_2, X_3, X_5	4	57	76
X_2, X_3, X_5, X_7	4	57	76
X_2, X_3, X_5, X_7, X_9	4	57	76
X_2, X_3, X_4, X_5, X_7, X_9	3	57	75

It can be seen that dropping the less significant variables had little impact on the model's overall predictive ability. Whether or not particular variables are discarded from the regression equation may be left to the individual user although it may be argued that if personal experience or other information leads one to believe a particular variable relevant then it may be left in the equation. It is possible that such variables may have a more significant influence on the y variable when applied to a different sample, perhaps

in a different country. Equally, we may decide to use an equation which only retains the x_1, x_6, x_{10} and x_{11} variables as these had relatively higher t-ratios which indicate a more significant effect on the dependent variable (y).

Final Model Estimation

The final model after dropping the less statistically significant variables is estimated as:

$$y = \text{Ln}\,[P / (1 - P)] = \underset{}{0.655} + \underset{(1.34)}{0.669}\,\text{GEN} + \underset{(1.17)}{1.161}\,\text{RCC} - \underset{(1.50)}{1.464}\,\text{ASS} - \underset{(-1.57)}{1.813}\,\text{LRT}$$
$$(-1.42)$$

The t ratios are shown in brackets.

The individual factors viz. GEN and LRT and the HND programme features viz. RCC and ASS were found to be primary determinants of rating the efficacy of the HND programme. The chi-square value was significant at the 93 per cent level. The model correctly classified 97 per cent (58 out of 60) of the good HND ratings and 20 per cent (4 out of 20) of the not good ratings, with total correct classification of 77.5 per cent (62 out of 80). This is an improvement over the previous model which included all of the original variables that were thought might be significant in determining the rating of the HND.

Model validation

The model was applied to the hold-out sample which contained 24 responses; 18 had rated the HND good (1) and 6 had rated it not good (0). The estimated results are shown in Table 5.

TABLE 5. Hold-out sample estimates

		Predicted	
Actual	TOTAL	0	1
TOTAL	24	5	19
0	6	2	4
1	18	3	15

The model correctly classified 83 per cent (15 out of 18) of the good ratings and 33 per cent (2 out of
6) of the not good ratings, with total correct classification of 71 per cent (17 out of 24). The model has performed relatively well in the hold-out sample compared to in-sample classification, thus, the model results are validated.

Model application

The final logit model developed in this study can easily be used to make predictions on the efficacy of the HND programme. We could, for example, predict the likelihood of a

good rating by a male student who was motivated to do a HND because of the relevant course content and the varied assessment methods, but who did not choose the HND as a last resort. If we use our final model which only retains the x_1, x_6, x_{10} and x_{11} variables, the coding would be as follows: x_1 (GEN) = 0, x_6 (RCC) = 1, x_{10} (ASS) = 1 and x_{11} (LRT) = 0.

The estimated equation becomes:

$$y = \text{Ln}[P / (1 - P) = 0.655 + 0.669\ \text{GEN} + 1.161\ \text{RCC} - 1.464\ \text{ASS} - 1.813\ \text{LRT} = 0.3521$$

When solved, the value of P is 0.587. Since P = 0.587 > 0.5, the critical point where the slope of the cumulative logistic distribution is greatest, it implies that the probability of the student rating the HND *good* is 58.7 per cent. Using this illustrative case, if the student was a female, but all of the other factors were the same, then P would be 0.735, implying that the probability of the female student rating the HND good is 73.5 per cent. By varying the other three independent variables (i.e. RCC, ASS and LRT) one at a time and holding the remainder constant it is possible to determine an individual student's rating for HND.

Limitations

This exploratory study has some potential limitations which should be noted when considering the results. It was not possible to examine the ways in which the respondents differed. At the UAE institution, students are based on two different campuses and it may not be valid to assume that how the Business School run their HNDs is how the School of Information Technology run theirs. For example, one school may run the programme in a flexible manner with regard to the students' attendance at lectures at different times, the sequencing of modules and the number of modules that may be taken each semester, while the other may run a standardised programme with less flexibility, perhaps because of smaller cohorts.

It was noticed that there were great variations in the responses of students according to the subject they studied. For the total sample (n = 104) 78 students (75 per cent) had rated the HND good. Of the sixteen students on the Tourism and Hospitality Management programme at the UAE college, fifteen rated it good, representing 94 per cent of the sample. In other words, 94 per cent were satisfied with the HND overall *and* thought that it had prepared them for a job in industry. In contrast, 60 per cent of the Graphic Design students at the UAE college were classified as rating the HND not good because three of the five respondents thought that the course had not prepared them for a job in industry. This is despite the fact that every student (100 per cent) was satisfied with the programme overall. Clearly, there may be differences in the different subjects and the way in which different institutions or departments deliver them and this may affect the ratings given by students.

The author had no direct contact with the majority of respondents and so was unable to direct them by offering appropriate guidance or answering any specific queries. It is likely that respondents interpreted some questions in different ways, such as the questions on flexibility or methods of assessment. It is clear from the open questions that many respondents were prone to assessing their lecturers and their institution rather than the

HND programme but it is believed that the design of the questionnaire did help minimise this problem.

The majority of questionnaires appear to be answered openly and honestly but certain individuals may have been influenced or constrained by the fact that it was their lecturer that handed out and then collected in the completed questionnaires. It is quite possible that the author omitted independent variables that would have been significant in the logistic regression equation, and this may be one way that the basic model discussed can be developed to further improve its effectiveness in predicting course ratings and the satisfaction of students.

Conclusions

It has been demonstrated that the logit model can be a reasonably effective model of qualitative choice for rating an educational programme good or otherwise. The final model used in this study correctly predicted the outcome 77.5 per cent of the time for the in-sample and 71 per cent for the hold-out sample. The model can be useful, therefore, in determining reasonably correctly the likelihood that an individual with a given set of attributes will make one choice rather than the alternative. It is hoped that the study findings will encourage other educational institutions and authorities administering and regulating the HND, or indeed any other academic programme, to use and modify the model in different countries or situations, and to perhaps vary the explanatory variables to assess the effect on the model's reliability. It would then be possible for organisations involved with the delivery or accreditation of educational programmes to use the model with confidence to improve their decision making and focus their marketing effort appropriately.

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