

LOGISTIC REGRESSION FOR DETERMINING FACTORS INFLUENCING STUDENTS' PERCEPTION OF REPUTATION OF AN ODL INSTITUTION

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ABSTRACT

In today's competitive higher education environment, an institution needs to be pro-active in generating higher revenue and also to remain ahead of its competitors. There are basically two ways to increase revenue, that is, to increase new intakes and to retain a maximum number of existing students. In the case of the former, one of the best strategies to adopt is to utilise the institution's own students to attract others to enroll. The strategy will be successful if the students believe very strongly in the reputation of their university. The objective of this study is to determine the satisfaction factors that contribute positively to students' perception of reputation in OUM, the first ODL institution in Malaysia. The study employs logistic regression technique. Based on a sample of 2,662 students in 2007, the study found that the significant predictors for institution's reputation were "Teaching and Learning", "Learner Centredness" and "Student Affairs Management"; the odds ratio indicated that "Teaching and Learning" has the highest impact on the outcome variable, followed by "Learner-Centredness" and "Student Affairs Management". However, the logistic regression model adopted in this study explained only 19.0% of the variation in the outcome variable, indicating that there is a need to identify other variables in future research in this area.

INTRODUCTION

In the last two decades, Higher Education Institutions (HEI) have experienced quite a number of profound changes. The higher education environment is now very competitive, and it threatens the survival of some existing institutions; the institutions are forced to compete with scarce resources for a greater number of students, and even worse to face stiff competition from other institutions to recruit students from the same education market. In the future, as the mobility and employability improve for students, professors, researchers and technicians, the less competitive universities may face the risk of losing a good proportion of their students and human capital. Given this situation, many universities may not be able to sustain or survive.

In order to remain ahead of its competitors, an institution needs to be pro-active in generating higher revenue. There are basically two ways to increase revenue, that is, to increase new intakes and to retain a maximum number of existing students. In the case of the former, one of the best strategies to adopt is to utilize the institution's own students to attract others to enroll. The strategy will be successful if the students believe very strongly in the reputation of their university.

What does reputation mean? According to Selnes (1993) reputation refers to the customer's attitude towards the service provider or brand. It can also be interpreted as the overall perception of a company, what it stands for, what it is associated with, and what

may be supposed to get when buying the products or using the services of the company (MacMillan et al., 2005). Thus, a company's reputation reflects the history of its past actions (Yoon et al., 1993). Reputation is presumably established and developed in the consumers' mind through communication and experience. It is claimed that when customers are satisfied with the services rendered, their attitude toward the company is improved.

What about satisfaction? Satisfaction measurement is difficult to obtain as it is similar to attitude (Attiyaman 1997) and so is quality (Sureshchandar et al 2002). Customers are satisfied when they can get value and quality out of all the products and services provided to them. The correlation between the quality of goods and services and customer satisfaction has led many organizations to continuously upgrade their quality and measure their customer's satisfaction.

Past studies have shown that students' satisfaction is positively related to perception of the institution's reputation (Oyvind Helgesen & Erik Neset; 2007); however, they have been carried out under traditional campus-based environment, and therefore the findings may not necessarily reflect that of an ODL setting in Malaysia. For this reason, another study was needed for an ODL institution in Malaysia. Therefore, this paper looks at the factors that influence students' perception of reputation of their institution, taking Open University Malaysia (OUM) as a case study.

OPEN UNIVERSITY MALAYSIA (OUM)

OUM was established in 2000 as the seventh private university in Malaysia. It is the first ODL University and the main Open and Distance Learning (ODL) provider in the country. Its cumulative intake at the end of July 2008 was at 70,378 and current enrolment stands at 56,027 of which 95.5% are undergraduates and the remaining 4.5% are post-graduates. About 59% of students are teachers under the special Ministry of Education-OUM education programmes, and 41% are students in the open market programmes.

As an institution that puts quality as top priority, OUM through its quality management process has successfully obtained ISO9001:2000 certification from SIRIM in four of its support services departments, namely the Digital Library, Admission and Records, Centre for Instructional Design and Technology and Centre for Student Management. OUM also conducts regular surveys to determine students' satisfaction with the quality of services provided during their learning period.

In OUM, the impressive increase in student population from year to year poses a tremendous challenge, particularly in catering to the needs of its diverse students, who appear to be quite demanding for quality services, and who are particularly concerned about degree acceptance and the university's reputation. They have chosen to study at OUM mainly because of its flexibility in its delivery mode, convenience of time and place of study, relevance of curriculum to career, accessibility of digital reading materials and many other factors.

OBJECTIVE OF STUDY

The primary purpose of this paper is to identify the satisfaction factors that influence students' perception of the reputation of the institution in which they study. Having identified the satisfaction factors, the institution will be able to focus its efforts in improving on areas that are associated with each service item defined in the factors. It is hypothesized that improvement in students' satisfaction will benefit the institution,

because the satisfied students will most likely recommend the institution to prospective students.

METHODOLOGY

Statistical Technique and Data Source

An exploratory analysis was carried out using logistic regression to determine the factors that influence students' perception of reputation of OUM. This study was actually an off- shoot of the Importance-Satisfaction (IS) study to identify areas of strengths and weaknesses and gaps in the services provided to OUM's students. The data source for the present study is the IS survey of students carried out in all the learning centres of OUM in 2007. A total of 2,662 students enrolled in both the degree and diploma programmes were represented in the sample. The survey provided data on students' satisfaction ratings for 70 types of services, and responses to the question as to whether the students would encourage other people to study in OUM. These responses were used as a proxy to "students' perception of the reputation of OUM".

Equations and evaluation of model

For logistic regression analysis, the 70 service items covered in the survey were classified into six satisfaction dimensions or factors: Student Record Management (SRM); Student Affairs Management (SAM); Registration and Orientation (R&O); Learner Centeredness (LC), Assessment (A) and Teaching and Learning (T&L). These six satisfaction factors served as the independent variables, while the proxy to "students' perception of OUM's reputation" was treated as the dependent dichotomous variable.

The statistical package SPSS was used to identify the regression model that 'best' fits the data, and to estimate the regression coefficients, using the following estimating equations (Kleinbaum, Kupper, Muller and Nizamm, 1998; Marija J. Norusis/SPSS Inc, 1997):

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_6 X_6 \dots \dots \dots (1)$$

$$\text{Where } Z = \ln \left(\frac{P_{\text{eventA}}}{1 - P_{\text{eventA}}} \right)$$

P_{eventA} = the probability of the event A: 'positive perception of OUM's reputation

- X_1 = satisfaction ratings for student record management (SRM)
- X_2 = satisfaction ratings for student affairs management (SAM)
- X_3 = satisfaction ratings for registration and orientation (R&O)
- X_4 = satisfaction ratings for student centredness (LC)
- X_5 = satisfaction ratings for assessment (A),
- X_6 = satisfaction ratings for teaching and learning (T&L).

(β_o = constant; $\beta_1, \beta_2, \dots, \beta_6$ = logistic regression coefficients)

$$P_{eventA} = \frac{1}{1 + \exp^{-z}} \dots\dots\dots (2)$$

$$\text{Odds}_{eventA} = \left(\frac{P_{eventA}}{1 - P_{eventA}} \right) \dots\dots\dots (3)$$

$$\text{Odds ratio} = \frac{\text{odds}_{eventA}}{\text{odds}_{eventB}} \dots\dots\dots (4)$$

A series of tests was conducted to measure how well the estimated model fits the data. First, the value of -2LL (-2 times the log of likelihood) was evaluated for every new independent variable added to the constant in the logistic regression model. For the study data, it was found that the value of 952 for -2LL was least for Model 4 with three independent variables and a constant, suggesting that this model ‘best’ fits the data (Table 1). The three independent variables that were found to be significant predictors were Learner Centredness, Student Affairs Management and Teaching & Learning.

Next, the value of Nagelkerke R^2 was evaluated. With a value of 19.3% (Table 1), it suggests that about 19% of the variation in the outcome variable (perception of OUM’s reputation) is explained by the ‘best’ logistic regression model 4, and that about 81% of the variation were unaccounted for by variables not included in the model.

Table 1: Model summary – goodness of fit statistics

Model No	-2LL	Cox & Snell R^2	Nagelkerke R^2
Model 1 :Constant	1,137	-	-
Model 2: Constant and T&L	969	0.611	0.177
Model 3: Constant, T&L & LC	957	0.656	0.189
Model 4: Constant, T&L, LC & SAM	952	0.671	0.193

Finally, the ‘best’ model was evaluated by reviewing the classification table as shown in Table 2. The classification table reveals that the ‘best’ model produced a high rate of 99.8% (or 2,511) of correct predictions out of a total of 2,515 students for ‘Yes’ to the question: ”Would you encourage other people to study in OUM?” However, only 6.1% (or 9) were correctly predicted out of 147 students for ‘No’ to the question: ”Would you encourage other people to study in OUM?” Overall, the correct prediction rate was 94.7%, indicating that the model is still useful for the study.

Table 2: Classification ‘Table’

Observed	Prediction			% correct
	No	Yes	Total	
No	9	138	147	6.1
Yes	4	2,511	2,515	99.8
Total	13	2,649	2,662	94.7

RESULTS

The study finds that the logistic regression model accounts for only 19% of the variation in the outcome variable. Thus, research effort should continue to search for other predictor variables to improve the prediction model.

As shown in Table 3, the study identifies three significant predictors for students’ perception of OUM’s reputation and these are: Teaching and Learning (T&L), Learner Centredness (LC), and Student Affairs Management (SAM). The remaining three factors: Student Record Management (SRM), Registration & Orientation (R&O), and Assessment (A) were found to be insignificant.

The prediction equation is estimated using the coefficients (B) provided in Table 3 and from this equation the probability, odds and odds ratio for students’ perception of OUM’s reputation are derived for any given set of satisfaction ratings. The prediction equation is estimated to be as follows:

$$\ln \left(\frac{P_{eventA}}{1 - P_{eventA}} \right) = Z = -3.035 + 0.434*LC + 0.290*SAM + 0.626*T&L$$

Table 3: Variables in the logistic regression equation

Variables	B	S.E.	Wald	df	Sig.	Odds ratio: Exp(B)
Learner centredness (LC)	0.434	0.158	7.546	1	0.006	1.544
Student Affairs Management (SAM)	0.290	0.142	4.183	1	0.041	1.337
Teaching & learning (T&L)	0.626	0.186	11.377	1	0.001	1.870
Constant	-3.035	0.452	45.021	1	0.000	0.048

Let us illustrate how to use the logistic regression equation to compute probability, odds and odds ratio for students’ perception of OUM’s reputation. As given in Table 4, let us assume that in Scenario A, a student rates his satisfaction for each of the three significant predictors as: LC = 5; SAM = 6; and T&L = 4. From equation (1) and as shown in Table 4, the value of Z is computed as 3.379. Next, using equation (2), the value of probability is computed as 0.967. We would therefore predict that this particular student is likely to have a positive perception of OUM’s reputation since the probability

exceeds 0.5. As indicated by equation (3), the odds of an event occurring is defined as the ratio of the probability that it will occur over the probability that it will not occur. The same example, therefore, would yield a value of 29.3 ($0.967/1-0.967$) for the odds of having a positive perception of OUM's reputation.

Now, let us assume that the rating for LC increases from 5 to 6 while the ratings for the other two variables remain the same (Scenario B). In this situation, the probability of having a positive perception of OUM's reputation is increased to 0.978. Accordingly, the impact is that the odds are increased to 45.3, which is equivalent to 1.544 times larger than the odds (29.3) before the one point increment in Scenario A. Similarly, we can assess the impacts on the odds and probability when the SAM's rating (Scenario C) and the T&L's rating (Scenario D) are increased by one point, respectively.

The impact of an incremental point was greatest for T&L (Scenario D), with 0.982 (probability), 54.9 (odds) and 1.870 (odds ratio). This was followed by LC with 0.978 (probability), 45.3 (odds) and 1.544 (odds ratio) and finally by SAM with 0.975 (probability), 39.2 (odds) and 1.337 (odds ratio).

Table 4: Probability, odds and odds ratio

Variable	Coefficient (B)	Scenario			
		A	B	C	D
LC'	0.434	5	6	5	5
SAM	0.290	6	6	7	6
T&L	0.626	4	4	4	5
constant	-3.035	-3.035	-3.035	-3.035	-3.035
Z		3.379	3.813	3.669	4.005
Probability		.967	0.978	0.975	0.982
Odds		29.3	45.3	39.2	54.9
Odds ratio (odd2/odds1)			1.544	1.337	1.870

DISCUSSION

The study identifies that the significant factors for predicting students' perception of OUM's reputation are "*teaching and learning*", "*student affairs management*" and "*learner centredness*". This implies that in order to improve students' perception of OUM's reputation, due attention should be given to the service items defined in the three satisfaction factors. In this connection, OUM has actually taken a number of pro-active initiatives to target for continuous service quality improvement. These initiatives are discussed in the following sections.

Teaching and Learning: Among the 6 factors of service items, Teaching and Learning has been given highest priority and serious attention. Students have come on board with definite goals of achieving their degrees and diplomas for career advancement. To cater to this, the curriculum and the syllabus for the courses have been carefully

developed to ensure its relevance to the various industries. In order to provide a conducive learning environment, OUM has invested heavily in both its owned and rented learning centres and equipping them with appropriate facilities for teaching and learning. OUM's ICT infrastructure caters to all the ICT needs of the university, both for administrative and teaching and learning purposes, for example, providing the e-learning platform.

Faculties and the Centre for Instructional Design and Technology have worked hand in hand to review, revise and improve on the quality of modules. Good modules will make it easier for students to self manage their studies, and to further enhance their learning. CD-ROMs, learning objects, power-point slides and VCD are also provided to students to enhance their understanding of the courses. Most faculties introduce project-based course works, with the objective of giving greater exposure to our adult students on "real world" learning. The Digital Library is accessible to students anywhere, anytime, and for those who cannot access Internet, physical libraries are made available at the learning centres.

Tutoring is a major and most important activity to OUM students, thus tutor training is regularly enhanced to ensure more effective facilitation. Besides covering course contents, tutors are trained to provide the relevant pastoral care to adult students through the e-counseling platform. Students value the online discussion forum they have with their tutors; much of what they need to understand emanates from this online discussion.

Learner Centredness: OUM is a learner-centred institution which strives to remove administrative barriers and reduce bureaucracy in order to provide convenient, seamless, and "one-stop" service. Students must be given fair, prompt, responsible, user-friendly and caring services making them feel that OUM truly values the privilege of serving their needs. These needs include a vibrant and healthy environment that nurtures their personal growth, appropriate activities that can increase learning in various dimensions and personal experience that enhances sense of belonging to the institution.

Items such as "I am proud of being an OUM student; phone enquiries are handled well; OUM staff is caring and helpful and my problems are resolved immediately" reflect the degree or "learner-centredness" that is practiced in the day-to-day management of students at OUM. These results reveal that OUM will have to remove barriers and departmental bureaucracy to maximize student convenience and adopt the philosophy of "when you receive a problem, you own it until it is resolved". OUM continuously provides additional study support, improve the call centre and sharing the caring culture among all staff, particularly the front-liners, tutors, and administrators in ensuring that our students are served in the best manner possible.

Student Affairs Management: The main role of this unit is to coordinate programmes and services that will assist students in their learning journey at OUM. It does not only cater for students with specific problems; its role also covers all that students need starting from the time a new student steps in until they complete their study. An orientation program, for example, is vitally important to the new students: it provides an array of information that allows students to make informed decisions and establish realistic goals and assess their own circumstances. Good academic advising and counseling is a cornerstone to academic success. It calls for both tutor and counselor immediacy, that is prompt response to students' needs to sustain motivation, particularly

in the early part of the study. Guidance and counseling are being brought to students; tutors initiate contact instead of expecting the students to come and discuss with them. Workshops, seminars, peer support groups are conducted in the learning centres to serve as a natural forum for follow-up contact right through to finishing their studies and preparing for graduation. These are some of the initiatives taken by the different segments of OUM to meet the needs and expectations of the students, in ensuring a high level of satisfaction.

CONCLUSION

In conclusion, we wish to stress that this study is an off-shoot of the Importance-Satisfaction survey, and that the data used for the analysis serve as a close proxy to students' perception of institution's reputation. Thus, there may be a need to conduct a more comprehensive study to obtain further insights into the promotion of institution's reputation for the purpose of improving student enrolment. Despite the limitation, the present study demonstrates that logistic regression is a useful tool for predicting dichotomous outcome. There is scope to use this technique for more detailed analysis in the area of student retention and registration, beyond the mere reviews of percentages of dichotomous variables. In addition, the study suggests that students' satisfaction is a goal worthy of pursuing for OUM in particular and all other higher education institutions in general, and that it is central to shaping students' perception of their institution's reputation; the more satisfied they are, the better they will be as agents in promoting their own university by encouraging others to study in the same institution. Taking into consideration these findings, OUM would continue to manage effectively the three areas discussed above in order to bring further benefits in terms of increasing enrolment and retaining existing students in the institution.

REFERENCES

- Attiyaman, A (1997). Linking student satisfaction and service quality perceptions: The case of university education. *European journal of Marketing*, 31, 528-540
- Kleinbaum, Kupper, Muller and Nizam, 1998, *Applied Regression Analysis and Other Multivariable methods* (Chapter 23), Third Edition, Brooks /Cole Publishing Company
- MacMillan, K., Money, K., Downing, S. and Hillenbrand, C. (2005), "Reputation in relationships: measuring experiences, emotions and behaviors", *Corporate Reputation Review*, Vol. 8 No. 2, pp. 214-32.
- Marija J. Norusis/SPSS Inc, 1997; *SPSS Professional Statistics 7.5* (Chapter 1) Chicago, USA
- Øyvind Helgesen and Erik Nettet, What accounts for students' loyalty? Some field study evidence, *International Journal of Educational Management*, Vol. 21 No. 2, 2007, pp. 126-143
- Selnes, F. (1993): "An examination of the effect of product performance on brand reputation, satisfaction and loyalty", *European Journal of Marketing* Vol. 27 (9), pp. 19-35.

- Sureshchandar, G.S, Rajendran C,& Anantharam, R.N.(2002). The relationship between service quality and customer satisfaction: A factor specific approach. *Journal of services marketting*, 16(4), 363-379
- Yoon, E., Guffey, H.J. and Kijewski, V. (1993), “The effects of information and company reputation on intentions to buy a business service”, *Journal of Business Research*, Vol. 27, pp. 215-28.