Segmenting Business Students Using Cluster Analysis Applied To Student Satisfaction Survey Results

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ABSTRACT

This paper demonstrates a new application of cluster analysis to segment business school students according to their degree of satisfaction with various aspects of the academic program. The resulting clusters provide additional insight into drivers of student satisfaction that are not evident from analysis of the responses of the student body as a whole. The results show how predictors of satisfaction cited in prior studies, such as quality of advising and degree of social integration, are important to some students but less important to others.

Keywords: student satisfaction, segmentation, cluster analysis

INTRODUCTION

A common method of obtaining feedback from students on their degree of satisfaction with an academic program is to administer a survey that allows respondents to rate individual program components and their degree of overall satisfaction with the program. The survey results are analyzed using a variety of statistical techniques to summarize the important conclusions. For example, stepwise regression is sometimes used to find the best predictors of students' overall satisfaction (see Thomas & Galambos, (1994), for example). Prior studies, such as the one by Douglas et al, (2006), provide excellent guidance as to which aspects of a university or academic program are most important to overall student satisfaction. It is of operational value to know which specific attributes of a program consistently appear to be both important and significant predictors of satisfaction (Elliot & Shin, 2002). This knowledge by itself, however, is usually not sufficient to identify specific groups of individuals who may be more or less satisfied, nor will it point out where improvement is needed in specific operational units, such as an academic department or administrative area.

Cluster analysis is a technique that has been used in marketing studies to segment customers into subgroups with similar demand characteristics. This technique can also be used to segment student populations to provide additional insight about patterns of satisfaction and to facilitate identification of possible operational improvements. For example, Borden, (1995), used Ward's method (see Everitt et al, 2001) to segment university students by demographic variables and then examined overall satisfaction within the subgroups. Subgroups were found to differ according to variables, such as marital and family status, work status, course load, gender, age, etc.

Another approach to segmentation is to use linear regression to identify the items that are the best predictors of satisfaction for the student population as a whole, followed by a clustering procedure, such as the CHAID procedure (Borden , (1995); Thomas & Galambos, 2004) that is used to group subjects into clusters with similar predictors of overall satisfaction. In using this method, Borden, (1995), found that the single best predictor of students' general satisfaction was the academic unit in which the student was enrolled. In comparing the results of using Ward's method and the CHAID method, Borden, (1995), concluded that the CHAID clusters were not as easily interpreted as the clusters found using Ward's method. Other examples of using cluster analysis in business education include the paper by Morrison et al, (2003), who used a K-means approach to segment marketing students according to their learning styles and the paper by Duff, (2004), who used a K-means procedure to segment business students according to learning effectiveness.

This paper demonstrates a different application of Ward's method to segment students responding to a satisfaction survey. While Borden used Ward's method to first separate students according to demographic characteristics and then observed the differences in overall satisfaction among clusters, the application described in this paper uses the variables found by stepwise regression to be the best predictors of overall satisfaction for the entire student body as a basis for further segmentation. Clusters are formed using Ward's method to separate subjects according to their ratings of the best predictors of satisfaction. The resulting clusters are then examined to determine demographic characteristics that differentiate each cluster from the other clusters.

The methodology described in this paper may be particularly useful for relatively homogeneous student bodies. For example, Borden's study included students from a large university with multiple colleges and areas of concentration with both undergraduate and graduate students. In the application described in this paper, the student body includes only undergraduate business students. Although the stepwise regression results for the entire student body provide a good understanding of the most important determinants of satisfaction for the aggregate student body, a number of questions remain unanswered such as; (1) What characteristics, if any, distinguish less satisfied students from more satisfied students? (2) Is there a small group of unhappy students, thus hurting the overall averages, or do the ratings reflect the opinions of the vast majority of students? (3) Are some students happy overall, yet dissatisfied with particular attributes of a program? (4) To what degree is overall satisfaction influenced by unhappiness with particular aspects of the program? The aim of this study is to segment students to gain additional insight into the determinants of satisfaction for different subgroups of the student body and to provide descriptors of these subgroups.

METHODOLOGY AND RESULTS

A survey of approximately 250 undergraduate senior business students was conducted using a 5-point rating scale; 155 usable responses were obtained. Stepwise regression resulted in five significant predictors of overall satisfaction: (1) a strong sense of community, (2) grades accurately reflect performance, (3) the quality of teaching, (4) the application of concepts to new situations, (5) and receiving advice needed to plan. An R^2 value of .66 indicates that these variables account for 66% of the variability in overall satisfaction. Using Ward's method, the 155 students were segmented into six clusters using six variables: the student's rating of overall academic satisfaction and the aforementioned five most significant predictors of overall satisfaction. A six-cluster solution provided a reasonable number of clusters for analysis without having respondents with large distance separation located in the same cluster. For example, the rate of increase in the Euclidean distance measure approximately doubled when six clusters were combined to form five clusters.

Analysis of variance was used to find survey variables for which the mean ratings differed significantly across clusters. The mean ratings for the six clusters and the entire group of 155 respondents are summarized in Table 1. The distribution of cluster members, by major, is also given in Table 1. A summary of the observations is discussed below using the cluster designations C1 – C6 corresponding to the labeling in Table 1.

As suspected, there is a small group of students (Cluster C4) who are relatively unhappy with multiple aspects of the program (mean ratings of approximately 2 on a 5-point scale) and a second group (Cluster C6) who are also uniformly less happy, but with a higher average rating of approximately 3. Thus, about 25% of the students are only somewhat or moderately happy with the program. These students tend to have less advisor contact and lower grade point averages than the student body as a whole. Although not statistically significant, the least happy group (C4) has an overrepresentation of minority students (43% compared to 28% overall); the least happy cluster also shows a higher degree of involvement with university activities and less involvement in business school activities, suggesting possible dissatisfaction with the degree of social integration within the business school itself. Marketing and Finance majors are somewhat overrepresented in these groups. The most significant predictor of overall satisfaction for students within cluster C4 is their response to the question on the degree to which the business program improved their ability to work in teams. For students in C6, the most significant predictor was their rating of advising help received. Thus, different attributes of the program appear be important determinants of overall satisfaction for the two less satisfied groups of students**.**

Table 1

Variables Used to Form Clusters														**Significance of Differences (ANOVA)**
	All	**C1**		**C2**		**C3**		**C4**		**C5**		**C6**		
N =	**155**	**37**		**23**		**27**		**15**		**30**		**23**		
	mean	**mean**	**rank**	**mean**	**rank**	**mean**	**rank**	**mean**	**rank**	**mean**	**rank**	**mean**	**rank**	**p-value**
Overall Satisfaction with Program	3.7	3.9	4	4.0	2	3.9	3	2.1	6	4.6	1	3.0	5	0.00
Strong Sense of Community	3.2	3.4	3	2.5	5	3.9	2	1.8	6	4.0	1	2.5	4	0.00
Grades Accurately Reflect Performance	3.5	3.9	3	4.0	2	2.9	5	2.0	6	4.2	1	3.0	4	0.00
Quality of Teaching	3.5	3.6	3	3.8	2	3.3	5	1.7	6	4.3	1	3.3	4	0.00
Apply Theories or Concepts to New Situations	3.2	3.3	2	3.0	4	3.3	3	1.9	6	3.9	1	2.8	5	0.00
Receive Advice Needed to Plan	3.1	2.5	4	4.0	2	4.2	1	1.7	6	3.7	3	2.0	5	0.00
No. times ranked 1 or 2			1		3		2		0		4		0	
No. times ranked 5 or 6			0		1		2		5		0		2	
Demographic Variables (in order of significance)														
% Commuting	**61%**	**68%**	**3**	**57%**	**4**	**30%**	**6**	**80%**	**1**	**80%**	**1**	**52%**	**5**	**0.00**
Times Meet with Adviser per Semester (1-5)	2.5	2.4	4	2.7	2	2.8	1	2.2	5	2.7	3	2.2	6	0.01
Advisor Visits (no.)	1.6	1.4	4	1.8	2	1.9	1	1.3	5	1.8	3	1.2	6	0.01
College GPA	3.2	3.2	2	3.4	1	3.2	4	3.0	6	3.2	3	3.0	5	0.05
% Minority	28%	29%	4	13%	5	33%	2	7%	6	31%	3	43%	1	0.10
% Belonging to University Clubs or Orgs	57%	46%	5	70%	1	67%	2	67%	2	43%	6	64%	4	0.18
% by Major														
Accounting	15%	22%		22%		7%		13%		13%		9%		
Economics	3%	3%		9%		0%		0%		3%		0%		
Finance	23%	27%		9%		37%		40%		20%		9%		
Management	15%	22%		17%		11%		7%		13%		13%		
MIS	12%	8%		13%		4%		7%		20%		17%		
Marketing	21%	11%		17%		22%		27%		17%		39%		
Sport Management	10%	3%		13%		19%		7%		10%		13%		

The students in C5 (20% of the sample) provided the highest ratings of the most important predictors of overall satisfaction (4.6 out of 5), although least happy with advising. In fact, a common theme from these results is that advising needs to be improved. The importance of advising to business student satisfaction has also been noted

previously (see, for example, Keaveney & Young; 1997, DeShields et al; 2005). Eighty percent of the students in C5 do not reside on campus compared to 61% of all students. These students seem to be less involved in clubs and organizations, and the distribution by major is representative of the entire set of respondents.

Three groups (C1, C2, and C3) are relatively satisfied with the overall program (average ratings of 3.7-4.0) although somewhat less satisfied than C5. These three groups account for 55% of the respondents. The groups are distinguished from each other in the following ways:

- C1: The members of this cluster are less satisfied with advising. Finance, Management and Accounting are well represented and these students appear to be less involved in organizations and clubs. The most significant predictor of satisfaction for students in this cluster is satisfaction with advising help.
- C2: This cluster has the highest average grade point average. Its members are relatively dissatisfied with the sense of community in the business school, yet demonstrate a high level of involvement in clubs and organizations. The Accounting major is somewhat overrepresented. The most significant predictor of satisfaction within this cluster is the degree to which the business school improves their ability to be analytical in solving problems.
- C3: These students are relatively satisfied with advising but are least satisfied with the degree to which their grades reflect their performance and the quality of teaching. Seventy percent reside on campus compared to 40% overall. This group has a lower average grade point average (consistent with the response to their grades). A relatively high percentage are involved in clubs and organizations compared to all respondents, and the Finance major is somewhat overrepresented. The most significant predictors of satisfaction for students in this group are whether or not the students are part-time or full-time (11% are part-time vs 4% overall) and the degree of satisfaction with the use of technology to be productive.

CONCLUSIONS

The methodology provides insight into the different responses to overall satisfaction that are not readily seen from the stepwise regression results for the respondents as a whole. For example, different variables, such as grade point average, major, and the degree of involvement with clubs and activities, appear to play a role in students' overall satisfaction. In addition, individual clusters have different predictors of overall satisfaction compared to the entire student body. For example, advising is cited as important by members of several clusters. One cluster attaches greater importance to a sense of community, another cluster to the development of analytical skills, and still another to grades and quality of teaching. Even students who are relatively satisfied overall may have particular areas of dissatisfaction that become evident with segmentation. In addressing possible program improvements, the needs of different groups of students should be kept in mind.

Other observations include the following. One area for operational improvement appears to be the need for better advising for some departments. In addition, there is a suggestion that resident students may have different needs than commuting students in order for them to feel a sense of community with the business school. As a follow-up to this survey, a separate analysis, by major, was used to pinpoint areas for improvement within each department. Fortunately, gender and ethnicity do not appear to be significant influences on overall satisfaction but bear watching over time to make sure problems do not develop.

In the words of Borden, (1995), referring to the use of cluster analysis for student satisfaction studies, "far more research is needed to guide the choice of method given the many potential applications of these classification procedures". Some particular areas for future research include observing changes in segmentation results over time. In addition, further validation efforts should include comparing different clustering methods for consistency of results. The K-means method used in the studies mentioned previously by Morrison et al, (2003) and Duff, (2004), for example, would be a good candidate for comparison to the Wards and CHAID methods.

AUTHOR INFORMATION

Allen Gibson is an instructor at Stillman School of Business at Seton Hall University. He teaches Statistics, Quantitative Methods and Supply Chain Management. He also has extensive business experience as a result of a career in the telecommunications industry.

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NOTES