International Journal of Data Engineering (IJDE)
Singaporean Journal of Scientific Research(SJSR)
Vol.6.No.4.2014 Pp.213-218
availableat:www.iaaet.org/sjsr
Paper Received:17-02-2014
Paper Accepted:10-03-2014
Paper Reviewed by:1Prof.Dr.Karthikeyan 2. ChaiChengYue

ANALYZING STUDENT ATTRITION AND RETENTION IN ENGINEERING COLLEGES OF SOUTH INDIA

Mohammed Hussain[1], Dr. P. Sheik Abdul Khader[2]
Research Scholar[1], Prof & Head[2]
Department of Computer Applications[1,2]
B.S. Abdur Rahman University, Chennai[1,2]

ABSTRACT

Engineering attrition is a concern for first year engineering programs and engineering colleges. The stress related to making the transition from high school to college has been suggested as one reason for the high attrition rate. Not only is there a disruption to student-family relationships, but students need to learn how to manage their time and resources, as well as to meet deadlines without the guidance and close supervision of parents, friends and relatives. Many first year engineering programs provide extensive academic and social support to help students make the transition and succeed the required courses, depending on their initial math placement. The authors studied 280 students who transferred out of engineering during their first or second year of that general engineering academically. All "engineering" students at this large land grant university in the southern region of India, both calculus-ready and not calculus-ready," must complete a common "first year experience" before moving to a discipline major. Students who are not calculus-ready at entry usually take one year to complete program. The students were mostly men who changed majors between December-January of every year. Analysis of exit surveys provided insight into the academic characteristics of those first year students who transferred out of engineering, reasons why they left, and the degree to which these students persisted to degree completion in another major at the university. Results indicate that factors different from academic difficulty are leading to the change of discipline among general engineering students. Students who are in good standing academically are leaving engineering because they lack interest in the subject. Additional explanations are considered and presented, as well as the implications for potential intervention programs to address increasing student interest as well as academic success in engineering. The study was conducted at affiliated colleges of Anna University, Jawaharlal Nehru Technological, Andhra Pradesh and Mahatma Gandhi University, Kerala. The authors studied 280 students that transferred out of engineering during their first or second year of a general engineering program. The data has been collected through a structured questionnaire survey and some source received from the internet. The study identified 12 factors affecting high student attrition in Engineering Colleges using Factor Analysis. Also multiple regression analysis was applied to analyze the collected data. It is found that the attrition factor has emerged as the most critical factor affecting high attrition in the Engineering institutions of the above four states of India.

Keywords: Student Attrition, Decision Tree Analysis, Data Mining, Engineering Colleges

1. INTRODUCTION

India is in need for well-qualified engineers. Obtaining high education degrees has been linked to economic growth and prosperity. There are concerns about a declining interest among students in pursuing engineering and about the lack of diversity among

engineering programs. Another concern is the fact that qualified students are not completing their degrees in engineering; these students are transferring into non-engineering programs like B.A., B.Sc., or Polytechnic Courses or dropping from college. Engineering attrition is a source of concern and several studies have been conducted to understand why students transfer out of engineering. Hewitt and Seymour have written several articles and a book in which the authors explain that "switchers are academically similar to non-switchers". The authors found that the main difference between these two groups is in the ability to cope with problems; non-switchers managed to cope, whereas switchers did not appear able to cope. Other studies attribute attrition to the lack of appropriate teaching techniques, and the student's inability to identify with their corresponding academic majors. In a study of first year engineering students, Ohland et al found that engineering students have the highest rate of persistence among disciplines. The study established that percent of students who matriculated in engineering are still enrolled in engineering in their eighth semester. Their findings state that 93 percent of students enrolled in engineering after eight semesters had matriculated in engineering. Ohland et al also found that "students who persist in engineering start out with a fairly low level of disengagement in both their engineering and liberal arts courses, and then their level of disengagement in both types of courses increases over four years of study". Many first year engineering programs provide extensive academic and social support to help students make the transition from higher secondary school to college, and succeed academically in college. While necessary, are these programs sufficient to keep students in an engineering program? Are students who leave engineering academically successful in their non-engineering field of study? This study was designed to address why students transfer out of engineering and to determine if students leaving engineering are able to succeed in their new major and graduate from the university. This information is essential to determine if an intervention is needed to assist those students leaving engineering in the successful completion of a degree.

1.1 Decision Trees

The decision tree algorithm we implemented (using SAS Enterprise Miner- similar to CART and CHAID) searches through the input space and finds values of the input variables (split values) that maximize the differences in the target value between groups created by the split. Splits are evaluated based on specified measures of 'worth'. The process for determining the best split is two stage. First, for each individual variable in the input space, the best splitting value is obtained based on worth. Then the level of worth is compared across all the inputs, and the input with the best level of worth is chosen. The data is partitioned at the best splitting value on the best input. Speaking heuristically, the variable chosen for the initial split in the tree may be analogously interpreted as 'the most important' or the variable that 'explains the most variation in the dependent variable.' The tree is 'grown' until all possible statistically significant splits are produced, and then 'pruned' based on cross validation misclassification to produce an optimal tree. The final model is characterized by the split values for each explanatory variable and creates a set of rules for classifying new cases.

2. RESEARCH PROBLEM

Engineering College have realized that competitive advantage resides mostly in students and that finding and keeping good Management, Faculty and student is a strategic necessity. The major issue faced by Engineering Colleges located in the states of Tamilnadu, Andhra Pradesh, Karnataka and Kerala today is the increased Student attrition, which varies between 20%–50%. Student attrition is the rate at which students leave an engineering college. Student Attrition as a normal flow of students out of an institutions through Course Change, Change the College, Shortage of amount, illness and so on.The impact of student attrition can be disruptive and costly. This research is designed to study the nature, state and the factors affecting high student attrition in the engineering colleges located in the states of Tamilnadu, Andhra Pradesh, Karnataka and Kerala. Also, an attempt has been made to conduct depth study to identify the critical and non-critical factors affecting high student attrition in the institutions of the above four states of India.

3. OBJECTIVES OF THE STUDY

i)To study the nature and state of high student attrition in Engineering institutions located in the states of Tamilnadu, Andhra Pradesh, Karnataka and Kerala.
ii)To identify the factors affecting more student attrition in institutions of Karnataka and Kerala states.
iii) To identify the critical factors causing high student attrition in the Engineering Institutions located in the states of south India.
iv) To identify the non- critical factors causing high student attrition in the institutions located in the above states.
v) To suggest innovative measures for reducing the high attrition in Engineering Colleges of south India.

4. LITERATURE REVIEW

The vast majority of the literature related to the empirical estimation of retention models includes a discussion of the theoretical retention framework established by Bean, Braxton, Tinto, Pascarella,

Terenzini and others (see Bean, 1980; Bean, 2000; Braxton, 2000; Braxton et al, 2004; Chapman and Pascarella, 1983; Pascarell and Ternzini, 1978; St. John and Cabrera, 2000; Tinto, 1975) This body of research provides a starting point for the consideration of which explanatory variables to include in any model specification, as well as identifying possible data sources. The literature separates itself into two major camps including research related to the hypothesis testing and the confirmation or empirical validation of theoretical retention models (Herzog, 2005; Ronco and Cahill, 2006; Stratton et al 2008) vs. research specifically focused on the development of applied predictive models (Miller, 2007; Miller &Herreid, 2008; Herzog, 2006; Dey&Astin, 1993; Delen 2010; Yu et al, 2010). Other areas of research seem to stand apart. While not particularly concerned with making accurate predictions or confirming or challenging the established literature, these researchers seek novel ways to measure student characteristics that may be theoretically important to retention, or provide predictive value. For instance, De Witz, Woosley, and Walsh (2009) investigate the relationship between Frankl's construct of purpose in life and Bandura's theory of self-efficacy and the possible impact of these measures on student retention. They claim: Many of the reasons that students leave college are outside Tinto's model: finances, poor academic performance, lack of family or social/ emotional encouragement, difficult personal adjustment. (De Witz, Woosley, and Walsh,2009).

5. RESEARCH METHODOLOGY

The study was conducted at Affiliated Colleges of Anna university, Jawaharlal Nehru Technological University, Andhra Pradesh and Mahatma Gandhi University, Kerala. The authors studied 280 students that transferred out of engineering during their first year or second semester of a general engineering program. The students were mostly men who changed majors between December - January month of every year. An exit questionnaire administered at the time of the transfer was utilized to determine their exit grade point average (GPA) and the reason for the switch. Furthermore, university databases were utilized to determine if those students were able to graduate from, or are still pursuing a degree(referred as active), at the university. The number of students who withdrew from the college, were academically suspended, or never returned to the college was also assessed, as was the percent of students who left engineering, but were later readmitted into the program.

6. SAMPLE DESIGN

The population of the study comes to 7.5Lakhs students(approx.) selected from the states of Tamilnadu, Andhra Pradesh, Karnataka and Kerala. Out of this about 1,75,000 students belongs to Tamilnadu state, 160000students are from the state of Kerala and 2,00,000 Students are from Karnataka. The sampling procedure adopted for the study is sampling technique. A representative sample of 280 was taken from engineering colleges located in the South India. A sample size of 280 respondents was fixed since a sample size of 280gives a statistical accuracy of ± 5% and is often considered as the most cost- effective sample size15. Out of the 280 respondents, 70(25%) were selected from student studying in different college areas located in Karnataka state and 70(25%) students were selected from different areas of engineering colleges located in Kerala state and 140(50%) students were selected from different areas of engineering colleges located in Tamilnadu and Andhra Pradesh of South India.

7. DATA COLLECTION

A structured questionnaire is the main tool used for collecting quantitative primary data. The scaling techniques used in the development of questionnaire used in the study are: nominal scale, Likert type scale under interval scale, itemized rating and rank-order scale under ordinal scale and word association under disguised structured scale. For the primary data collection, a well-structured questionnaire has been developed and pre-testing of the questionnaire has been done by choosing 50 students(the respondents) from different levels of 10 engineering colleges on a random basis from Karnataka, Kerala, Andhra states and Tamilnadu State. Reliability analysis for the questionnaire used in the present study has been done with a sample of 50 respondents and found that the reliability is good. The secondary data related to the study have been collected from different sources including text books, articles published in journals, newspapers, periodicals National Association of Software Companies (NASSCOM) websites, Mckinsey study reports, college websites, doctoral research thesis and various other related sources.

7.1 Freshman Engineering Program

All "engineering" students at this large technological university in the south India region, both enggmaths-ready and not enggmaths-ready," must complete a common "first year experience" before moving to a discipline major. Students who are not eggmaths-ready at entry usually take on 1.5 to 2 years to complete the required courses, depending on their initial math placement. This study includes both general engineering and engineering students. At the time of the transfer, none of the students have declared an engineering major.

7.2 Main reason to transfer from engineering

According to the results from the questionnaire, the main reason to transfer out of engineering was that the engineering majors offered do not match student's interest; the second and third most popular answers were that the student was in academic difficulty9due to lack English knowledge) or that they perceive an inability to succeed in engineering. For those students in academic difficulty (29% of the students), 34% of them described having difficulty in Engineering Mathematics-I and 17% in general Engineering Mathematics –II1. As table 1 indicates, students that transfer red due to problems with advising or that engineering is not challenging enough had the highest exit GPAamong all students.

7.3 Graduation rate after switching majors

A university database was utilized to determine if students who leave engineering are able to succeed in their new discipline and graduate from the university. The database was also utilized to determine the percent of students who left engineering, but were later readmitted into the program. Readmission to engineering was low; only 5.7% included in the study returned to engineering. Graduation rate was found to be related to the year of transfer. For years 2008, 2009, and2010, graduation rate was 12%, 3%, and 0%, respectively. Transferring out of engineering did not contribute to an improvement in student's GPA. For instance, after calculating the difference between the last reported GPA and the GPA at the time of the transfer, a difference of -0.13 ± 0.93 (mean ± std deviation) was obtained; this difference is not significantly different from zero.

8. CONCLUSION

In engineering institution, students are switching from engineering into a non-engineering major due to a lack of interest in engineering programs and fear about the Engineering mathematics subject offered in our universities. A high percentage of our switchers move into general studies, a program designed to assist students in the selection of a major. This study also indicates that the move from engineering to a non-engineering discipline does not guarantee a success in the new discipline. Students, especially those transferring to general studies, are not succeeding in their new major. A question to ask is which type of intervention is required to guarantee the academic success of students switching from engineering into non-engineering major?

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