CHARACTERISTICS THAT LEAD STUDENTS TO CHOOSE IT-RELATED MAJORS

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ABSTRACT

A survey has been administered in order to determine which traits or factors lead to students choosing a major. The survey consists of 28 questions that range from age to learning styles. The questions chosen target a variety of different factors in order to incorporate choices a student may have as well as involuntary life situations. Over 350 students at Georgia Southern University participated in the survey. All of the survey items relate to a student's choice of major either directly or indirectly as well as items that relate to demographic information.

INTRODUCTION

Students from different colleges and universities have all been faced with the challenge of picking a major that would accurately suit them. According to Paul Dressel, "students do not usually make a change in major except after considerable reflection or in reaction to significant disappointment with their current program."(Simpson 1987) The fact that so much work and dedication goes into changing a major, emphasis is placed more on the initial choice. Nahum Medalia believes "that choosing a specific major subject and choice is one of the most important decisions a college student must make." (Medalia, 1968) Most traditional students are not used to the new responsibility that a college student must take on. Living on his/her own is a scary thought especially in combination with choosing a major. Students entering college may not and usually do not know exactly what they want to be doing in their future. Among the inexperienced are the uncertainties of future plans that could potentially start with the initial major choice. "Identification of the major is very useful and helps explain why such a large population of students switch their majors." (Adamek, 1966) Students are required to choose majors but what major he/she chooses could potentially be because of factors that fit with the students personality and life style (Jacobs 1986).

People decide their life paths based on a variety of different reasons. Understanding trends in the traits that could potentially lead to why these particular choices are made is the key to this study. The traits/characteristics of students that chose a major within the College of Information Technology, Information Technology, Information Systems, and Computer Science, are compared against those of other majors. For the sake of the study, all three of the previously mentioned majors will be referred as Information Technology or

IT. In order to understand the methodology behind choosing Information Technology as an academic discipline, Information Technology should be defined. According to ABET, the accrediting organization for IT-related disciplines, defines Information Technology as "an umbrella, under which exists such disciplines as computer science, software engineering, management information systems, computer engineering, information systems, telecommunications and networking, and information technology." (Results of the ABET Information Technology Colloquium, 2003) Many different disciplines make up the information technology discipline. Although a wide range of fields make up the IT discipline the traits that are up held by these majors are very similar. As technology evolved the need for new IT disciplines also evolved. The type of people to fill these roles has not changed that much from one generation to the next but the abilities and skill sets has evolved with the times. The newest of the information majors is information technology. The major covers a wide variety of computer related aspects but its main focus is on the dissemination of knowledge at a faster rate than ever before seen. IT, now seen as a utility by some, is used in just about every field and is becoming an essential part of every day business.

It is said that most students who enjoy hands on work as well as math would enjoy and choose IT as a major. Problem solving and computational problems go hand in hand with the abilities an information technology major should possess. Some characteristics that people have no control over could also be potential factor as to why an IT discipline major was chosen. Family's income, first generation college student and future plans all could be factors why students choose a particular major. Data mining tools will help determine if there is actually a trend in traits among students that decide to choose IT as a discipline as opposed to other majors.

Determining the characteristics that lead to students choosing information technology as a major or a related discipline instead of any other available major is the sole purpose of this study. The relationship between an information technology discipline major and a non IT related majors should provide a distinct line based on the characteristics of information technology discipline majors.

BACKGROUND

For centuries, students have been going to college and following the American dream with the first step being choosing major. At Georgia Southern University there are 15,000+ students that all had to make this same decision. This very important decision is the focal point of this research project. The population of Georgia Southern University is diverse and the students being surveyed were randomly chosen. Most of the students at Georgia Southern University come from the state of Georgia. Throughout the years, the SAT scores of entering freshman have risen to at least 1000 for the math and verbal portions of the SAT. As the admission requirement increases, Georgia Southern's quest for national distinction becomes clearer to the students and faculty alike. Georgia Southern University is located in South Georgia and is only 45 minutes away from Savannah. The students at GSU come from a variety of backgrounds and household living arrangements. There are few international students that attend GSU as well.

The survey was administered on the campus of Georgia Southern University in various classes throughout the College of IT. Participants in the survey were from different majors outside of the College of Information Technology. The survey has a total of 29 questions. The questions are mainly closed-ended questions with a few short open-ended questions. The questions to be asked were carefully chosen and are used to represent the characteristics involved in choosing a major. See Appendix 1 for actual survey. The actual questions on the survey underwent two drafts before the survey was finalized. The first survey only has 19 questions and was not designed for closed-ended questions. A mostly closed ended survey was designed in order to minimize the amount of error and discrepancies among questions. The format for the survey was front and back placed on one page to encourage students to participate despite the length of the survey. Most of the surveys that were administered were in the classroom by the professors. The survey was paper-based so that the professors could easily have students fill out the survey at the beginning or the end of the class period without having to be in a computer lab.

A survey was chosen because it is a very effective way to retrieve information from a large sample size in a uniform fashion. A survey is also a way to differentiate among people who were all pursing a common interest which is a college degree. Gathering the data from college students to understand any relationships among those in the IT discipline could prove worthy after running data mining techniques.

RESEARCH FRAMEWORK AND METHODOLOGY

In order to understand clearly if characteristics of college students lead to certain major choices research on major choices and a survey was administered. The survey had 29 questions that not only related to personality but also test scores, abilities, preferences and hobbies. The dependent variable used in the study is the actual major that the students choose to pursue. The dependent variable has 2 possible values: IT-major or non-IT major. Originally, there was a third possibility of undecided. However, in the final sample, there were no students that were undecided in their choice of major. There are three IT-related majors at GSU: Information Technology (IT), Information Systems (IS) and Computer Science (CS). Once the survey was successfully designed, following draft three, professors were contacted in order to have students participate in the survey. Over 400 willing students participated in the survey but 339 surveys were complete enough to be used in the final results. Table 1 contains a list of the courses where the survey was administered. In addition to the courses in Table 1, a few surveys were completed by students in various areas of the GSU campus.

TABLE 1: SURVEY SAMPLE DESCRIPTION

CISM 1120 Computer Concepts	Mix of all GSU students (large class)
CISM 4130 Management Information Systems	Primarily business majors (non IS majors)
CISM 2530 Advanced Business Applications	Primarily business majors
CISM 2230 Advanced Java	IS and IT majors
CSCI 1301 Programming Principles I	CS majors
CSCI 1236 Intro to Java Programming	IS and IT majors
CSCI 5090 Special Topics in CS	CS majors

The sample consisted of 65% males. 92% of the students surveyed were between the ages of 18 and 23. 66% of the students had chosen a major that was IT-related. There was a fairly even split between freshmen (23%), sophomores (25%), juniors (27%) and seniors (24%) with the remaining students being graduate students or leaving the question blank. 33% of the respondents were first generation college students. 65% claimed they planned to continue their education after their bachelor's degree. 54% of the students had switched their major at least once during their college career.

The software used to conduct the data mining session was iData Analyzer or IDA (Information Acumen Corporation) and was available with the textbook *Data Mining: A Tutorial-Based Primer* by Roiger and Geatz (2003). The IDA software is a java-based Excel add-on. The data mining technique used was production rules. Production rules were chosen because the data is mainly categorical. 200 data instances were used as training and the rest of the instances were used to test the model. There were several runs of the software done before deciding on an appropriate set of independent variables for the model. The independent variables were

- Sex
- Age
- High school and college GPA
- Single parent home
- Favorite college and high school classes
- Prefer math or English, science or history
- Like problem-solving
- Hobbies
- Learning style (kinetic, auditory, visual)
- Switched majors
- Expected graduation date
- Variety of other personal characteristics

The dependent variable was whether or not they were an IT major. Production rules were generated after the software was utilized.

DATA ANALYSIS AND RESULTS

After analyzing the data interesting information was brought to the surface. Students deciding to have Information Technology as a major showed little difference in characteristics compared to those that choose other academic disciplines as their choice of major. The classes were separated into two different groups; class 1 represented those that choose Information Technology as an academic discipline and class 0 represented those that choose any major outside of the Information Technology academic discipline. The confusion matrix, provided in Table 2, for the test data classified 67% of the instances correctly indicating that the model being used for determining majors based on certain character traits could be a good model. This indicates that the characteristics chosen to represent the traits that influence major choices could be weak or there may not be any specific traits that accurately represent IT majors as a whole. It is very possible that there is no underlying characteristic or trait that distinguishes IT from any other academic discipline.

TABLE 2: CONFUSION MATRIX FOR TEST DATA

		Major Predicted by Data Mining Technique	
		0	1
Actual Major	0	59	31
	1	14	35

Percent Correct: 67.0%

No production rules were created for IT majors. However, production rules were created for non-IT majors. The two rules for non-IT majors were:
- If video games = no, then class = 0 (non-IT major). The accuracy for this rule is 85.98 % and it covers 68.66% of the instances.
- If Science or History=History, then class = 0. This rule indicates that those people whose major isn't IT related will have a knack for History instead of Science. The accuracy for this rule is 76.70% and the coverage is 58.96%.

The two rules cover 85.82% of the students who were not IT-related majors.

In addition to the two rules, there were a few characteristics/traits that were highly necessary for IT majors and non-IT majors. Table 3 summarizes these characteristics and traits. Since writing and crosswords were not hobbies for either group, these are not really distinguishing characteristics between the two groups. However, the majority of IT majors (85%) enjoy problem solving. Most of the non-IT majors do not enjoy learning (82%) and do not have art as a hobby (83%).

TABLE 3: ATTRIBUTES HIGHLY NECESSARY FOR CLASS MEMBERSHIP

IT Majors	Non-IT Majors
Enjoys problem solving = yes	Art as a hobby = no
Writing as a hobby = no	Writing as a hobby = no
Crosswords as a hobby = no	Crosswords as a hobby = no
	Enjoys learning = no

DISCUSSION AND CONCLUSION

The data from this study shows that there are no characteristics that clearly separate IT discipline majors from other majors. There were several indications that there might be a difference. First, the test data was classified correctly in 67% of the cases. There were two production rules formed for classifying the non-IT major: not having video games as a hobby and a preference for history over science. Finally, there were a few attributes worth noting that were necessary for IT majors and non-IT majors. IT majors tend to enjoy problem solving while non-IT majors do not claim to enjoy learning and do not enjoy art as a hobby. The lack of production rules for IT majors and the fact that there were so few for non-IT majors may indicate that there are not strong differences between the two groups. However, it could just be that the wrong questions were asked.

Just as there is a chance that the wrong questions were asked there is a chance that the right questions were asked and that there is not a difference. More and more students are pursuing a higher level of education and the once typical students of the past just may be molding into unique students with the same common interest. Classification of students based on traits and uncontrollable factors may have less influence on the student's major choice than expected. Some things are unexplainable or at least no formula can be used to pinpoint a typical student that would major in a discipline like IT. The hypothesis that there was a difference between the groups was refuted. Perhaps there is more to the picture in choosing a major, more than the survey that was administered could capture.

One limitation of the study is that the data was only collected at one university. Therefore, the results are not necessarily generalizable. In order to get more accurate results or at least a stronger model more data needs to be collected and the attributes or characteristics/ questions need to be analyzed and modified in order to retrieve better results. If the survey was administered online more students would be able to take the survey along with the necessary error checks to ensure the data was entered in a proper format. Once more data is collected the hypothesis of are there characteristics that lead to students choosing information technology as a major or a related discipline instead of any other available major could be better supported or even more strongly refuted.

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APPENDIX 1

Survey

Please answer the following questions by checking the response that best fits you or filling in the blank with your answer.

1. What is your sex?   _____ Male   _____ Female

2. What is your age? _____

3. What was your high school GPA?

   _____ 1.00 – 1.50   _____ 2.01 – 2.50   _____ 3.01 – 3.50

   _____ 1.51 – 2.00   _____ 2.51 – 3.00   _____ 3.51 – 4.00

4. What is your current GPA?

   _____ 1.00 – 1.50   _____ 2.01 – 2.50   _____ 3.01 – 3.50

   _____ 1.51 – 2.00   _____ 2.51 – 3.00   _____ 3.51 – 4.00

5. What do you plan to or what are you majoring in?

   _____Computer Science (CS)   _____Other

   _____ Information Systems (IS)   _____Undecided

   _____ Information Technology (IT)

   If "Other", please specify your major or intended major _____

6. What is your family's estimated income?

   _____ $0 – 20K   _____ $40 – 50K   _____ $70 – 80K

   _____ $20 – 30K   _____ $50 – 60K   _____ $90K+

   _____ $30 – 40K   _____ $60 – 70K

7. Do you come from a single parent home?   _____ Yes   _____ No

8. What is your expected starting salary?

   _____ $0 – 20K   _____ $40 – 50K   _____ $70 – 80K

   _____ $20 – 30K   _____ $50 – 60K   _____ $90K+

   _____ $30 – 40K   _____ $60 – 70K

9. What was your favorite class in high school? _____

10. What was your ACT/SAT score?   _____ACT   _____SAT

11. What was your favorite class in college? _____

12. Do you prefer Math or English?   _____ Math   _____ English

13. Do you prefer Science or History?   _____ Science   _____ History

14. Do you enjoy problem solving?   _____ Yes   _____ No

15. What are your hobbies? (Check all that apply)

    _____ Video games   _____Writing   _____ Crosswords

    _____ Playing sports   _____Learning   _____ Math puzzles
                                                          (like Sudoku)

    _____ Watching sports   _____Dancing

    _____ Music   _____Cooking

    _____ Art   _____ Reading

        _____ Other: Please specify _____

16. What is your preferred learning style?

    _____ Kinesthetic (Hands-on)

    _____ Visual (Understanding through seeing)

    _____ Auditory (Understanding through listening)

17. Have you ever switched majors?   _____ Yes   _____ No

    If yes, how many times?   _____ 1   _____ 2   _____ 3+

18. What is the number of credit hours you have completed? _____

19. What is your expected graduation year?

_____ 2007   _____ 2008   _____ 2009   _____ 2010   _____ 2011   _____ 2012

_____ After 2012

20. Are you a first generation college student?   _____ Yes   _____ No

21. Do you plan to continue your education after your bachelor's degree?   _____ Yes   _____ No

22. Do you plan to live with your parents after graduation?   _____ Yes   _____ No

23. Did you attend private or public high school?   _____ Private   _____ Public

24. Do you have any financial obligations due to attending school (i.e. loans)? _____ Yes   _____ No

25. Are you planning to stay in Georgia or move elsewhere?   _____ Stay   _____ Move

26. Were you forced to choose you're major by anyone other than yourself? _____ Yes   _____ No

27. What is your classification?

_____ Freshman   _____ Sophomore   _____ Junior   _____ Senior   _____ Graduate student

28. Do you currently work while attending school?   _____ Yes   _____ No

29. Do you have any prior experience in your major/field?   _____ Yes   _____ No