The decision to select a major in college: an application of the analytic hierarchy process

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ABSTRACT

For college students, selecting a major is a requirement that must be fulfilled to ensure proper and timely graduation. In many cases, students rethink the original decision made and consider a different major of study. The factors impacting students' decisions are well-documented throughout the literature. What are these factors and how do students judge their relative importance? Does gender play a role in assessing the importance of these factors to the major selection decision?

This study reports on the analysis of data from a survey of 132 college students enrolled in the School of Business at a four-year college during the academic year 2023. The framework used to collect data was the analytic hierarchy process (AHP). As one of the well-known and widely applied decision-making tools, the AHP offers a process for assessing the relative importance of factors or criteria. Relying on the literature, three criteria were presented to the students: compensation, job outlook & growth, and influence of others.

The results for this sample showed that, overall, students surveyed judge the criterion compensation as more important than job outlook & growth, which in turn is more important than the influence of others. Further, these findings reveal that males ranked job outlook & growth ahead of compensation when it was the opposite for females. In addition, a T-test revealed that there is a statistically significant relationship between gender and the relative importance of the factor compensation, but not with the two factors job outlook and growth, and the influence of others.

Keywords: Higher education, College major decision, Analytic hierarchy process (AHP)

INTRODUCTION

The decision to select a major is an important step to complete for university students (Silver, 2024). Some may elect to delay it; however, it is a requirement to ensure proper degree completion. This decision is the most significant for students since it determines their future careers and earnings (Roach et. al., 2012). In some cases, students rethink the original choice made and decide to change their majors (Leu, 2017). Studies identified a variety of criteria that students use for the choice of a major, such as earnings, career opportunities, career characteristics, and characteristics of the major (Simons et. al., 2003). Other factors cited but were found to have less impact on the major selection decision are the influence of professors and family members (Noland et. al., 2003).

The selection of a major based on personal interests could have a positive impact on the academic performance of a student (Messerer et. al., 2023). In a study that tracked students from middle school through college graduation, Bottia et. al. (2020), found that attending a community college could increase students' likelihood of pursuing a STEM major in college.

For Business majors, Lowe & Simons (1997) found the most important criteria to be future earnings, career options, initial earnings, and individual ability, while the influence of parents and professors was found to be less important. In another study, three categories of criteria were identified: influence of others, personal interest, and unique career opportunities (Walstrom et. al., 2008). This study found that the students ranked personal interest in the subject matter as the top factor impacting their major selection decision, while the influence of others was ranked the lowest. A survey of students enrolled at a college of business investigated the importance of factors impacting students' major selection, such as interest in the field, compensation, influence of others, job availability, and job security (Roach et. al., 2012). Their findings suggested that job security and availability were more important than interest in the field. However, the influence of others, as a factor, was found to be more important than previously reported in the literature.

Considering ethnicity, African American students were found to select a major based on marketability, enjoyment of the area of study, and working conditions (John-Charles & Walstrom, 2000). Considering gender, a survey of undergraduate students majoring in business found that interest in the field was the most important factor regardless of gender (Malgwi et. al., 2005,). However, they reported a gender difference for the next most influential factor. That is, for women it is mainly individual ability/aptitude, when for men it is career advancement, job opportunities, and compensation. The cultural norms regarding a woman's role in the society were found to impact the college major selection and career choice decisions, among young female students (Beutel et. al., 2018).

The current study uses the analytic hierarchy process (AHP) to identify students' judgment of the relative importance of three criteria identified in the literature as relevant to the choice of major decisions. The AHP is a multi-criteria decision-making method developed by Saaty (1980). It is a powerful tool that has been successfully used in a variety of domains such as higher education, among many others (Anis & Islam, 2015). The AHP was used to rank categories of university majors (Rad et al., 2010). A model for the selection of a major by college students was built using the AHP (Strasser et al., 2002). This model suggested that students base their decision on three criteria. These are the subject area, others' influence, and career outlook & opportunities. An Excel-based decision support system was developed using the AHP to aid

students with selecting a college major according to criteria such as compensation, job availability & growth, and others influence (Hayrapetyan, 2012).

The AHP is a method that assists individuals with decomposing a complex problem with multiple variables by providing a structured process for determining the relative importance of each variable. The AHP process starts with the construction of pairwise comparison matrices, based on the judgment of the domain expert. One of the most important features of the AHP is its ability to capture subjective opinions of decision-makers. It is flexible enough to be combined with other analysis tools. According to Zahedi (1986), the AHP process involves four steps. These are structuring of the decision problem; making pair-wise comparisons and obtaining the judgmental matrix; computing local weights and consistency of comparisons; and aggregation of local weights.

METHODOLOGY

Data

The data used in the study was collected through an online survey of undergraduate students enrolled in multiple sections of two junior-level courses at the School of Business of a four-year college in the southeast USA, over two semesters in 2023. During the online survey, students were asked to perform pairwise comparisons of three criteria through a series of multiple-choice questions, and according to the pairwise comparison scale adopted from Saaty (1980). The three criteria selected, based on the findings from previous studies, were compensation (COM), job availability & growth (JAG), and influence of others (IoO). This yielded three pairwise comparisons, COM vs JAG; COM vs IoO; JAG vs IoO.

The responses collected from each student were processed to compute that student's judgment of the relative importance or weight of each one of the three criteria. Also, the student's gender was recorded. In addition, a consistency ratio (CR) was computed for each student. According to Saaty (1980), if the value of CR is smaller or equal to 10%, the inconsistency is acceptable, otherwise, we need to revise the subjective judgment. In the current study, there was no mechanism implemented to provide students with instant feedback regarding the CR in case of inconsistency. Therefore, the students were not given the opportunity to revise their judgments. Also, the survey was administered to the students on the last day of classes. There were 132 students who participated in the survey. During the data preparation process, 77 (58%) of the responses were eliminated due to having CR > 10%. The characteristics of the data that will be used in the analysis are shown in Tables 1 and 2 (Appendix). Historically, enrollment at this school of business is higher for females than males which might explain the proportions in the data of Table 2 (Appendix).

Analysis

As previously stated, only 55 cases with a CR <= 10 will be used for the analysis. During the first phase of the analysis, the statistical package SPSS was used to obtain the descriptive statistics shown in Tables 3 and 4 (Appendix). The results shown on Table 3 (Appendix) indicate that on average, students consider the criterion compensation as slightly more important than job outlook & growth, with influence of others judged as the least important criterion. This is consistent with several previous studies. Considering gender, a difference in

judgement is detected based on the averages for females and males for each criterion. Regarding the consistency ratio, as shown in Table 3 (Appendix), the max value (8.34%) is far below the 10% considered acceptable, per Saaty (1980). As shown in Table 4 (Appendix), females judge compensation as more influencing than job outlook & growth (COM (47%) > JAG (41%) > IoO (12%)). For males, it is the opposite, with (JAG (44%) > COM (39%) > IoO (17%)).

A T-test was performed to investigate the role of gender in the students' judgment of the importance of each one of the three criteria in the decision to select a major of study in college. The results of the T-test are shown in Table 5 (Appendix). The criterion compensation represents the only statistically significant difference between female and male students in their judgment of the influence of the three criteria.

During the second phase of analysis, a cluster analysis was performed, and the results are shown on Table 6 (Appendix). There were three (3) clusters with the largest cluster containing most of the cases (80%). In this cluster, job availability & growth (48%) was judged as slightly more important to the decision than compensation (45%). Cluster 3, with mostly female students that clearly consider compensation (58%) as the most important factor. Cluster 1, with mostly male students that consider the influence of others (58%) as the most important factor.

The results of the two statistical analyses discussed above reinforce the trend reported in most of the literature reviewed regarding the fact that the impact of the influence of others is negligible compared to compensation and job availability & growth. In a future study, the authors plan to include other factors, and drop the factor influence of others.

CONCLUSION

This study reported on the analysis of data from a survey that used the AHP to illicit students' judgement of the relative importance of three criteria in the context of the major selection decision in college. The application of the AHP has proven again to be helpful in providing a structured and reliable process for collecting data about judgments.
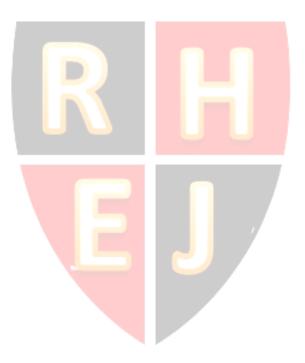
The results in this study revealed that overall, the students in this sample consider the factors compensation and job outlook & growth as having more impact on their major selection decision than the factor influence of others such faculty and family members. In addition, there was a statistically significant difference between females and males when evaluating the impact of the factor compensation. Male students judge job outlook & growth as more important than compensation when selecting a major, when it is the opposite for female students.

There are some limitations to this study which should be considered. First, the sample size of this study is small, making it difficult to generalize to a larger population. Furthermore, this sample was predominantly students who were most probably business majors, their majors were not asked for in the survey. Other majors may have been influenced by a dominating factor other than compensation. For example, one could envision a sophomore student selecting a major in art with an emphasis in early Italian renaissance art is likely not to have made that decision thinking about making a living, i.e., compensation or job availability & growth in mind.

Likewise, a nursing student may have been influenced by a need to help others. or, one who chooses a military career could have possibly been influenced by a desire to "protect and defend" the nation. It is easy to hypothesize these "influencers" may vary across different areas of study in higher education. and, these decision influencers may vary across generations such as seen in the differences between "Millennials" and "Gen Z's". There is certainly a need for

additional research in this area as this knowledge could be invaluable to academic counselors and advisors.

Future research should consider other demographics such as age. Older and non-traditional students have work experience and might judge the importance of the criteria used in this study differently from younger students. In addition, other criteria not currently used in this study might be relevant to some students. For example, the impact of career choice on society might be relevant to students seeking careers in nursing and the military. Also, once again, the AHP has proven to be useful in multi-criteria decisions. In a future study the authors plan to (1) increase the size of the sample; (2) provide students with instant feedback in case of inconsistency; (3) survey students from across a variety of disciplines. In addition, the inconsistency level in subjects' responses might be reduced from the start by introducing students to the AHP prior to the data collection process.

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APPENDIX

Table 1. Participants & Consistency Ratios

Consistency Ratio (CR)	Number	Percentage
CR <= 10%	55	42%
CR > 10%	77	58%
Total	**132**	100%

Table 2. Gender of Participants with CR >= 10%

Gender)		Number	Percentage
Female		34	61.8%
Male		21	38.2%
Total		**55**	100%

Table 3. Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
COM	55	7.8166%	71.4286%	43.974049%	12.2711917%
JAG	55	7.0069%	66.8864%	42.472652%	12.7672573%
IoO	55	5.2632%	77.7778%	13.553299%	15.1942230%
Consist_R	55	0.0000%	8.3384%	1.432438%	2.1366879%
Valid N (listwise)	55				

Table 4. Group Statistics

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
COM	F	34	47.078809%	10.3318974%	1.7719058%
	M	21	38.947295%	13.6937410%	2.9882193%
JAG	F	34	41.374449%	12.9614392%	2.2228685%
	M	21	44.250695%	12.5514833%	2.7389582%
IoO	F	34	11.546741%	14.3134642%	2.4547389%
	M	21	16.802011%	16.3512457%	3.5681344%
Consist_R	F	34	1.193259%	1.7373680%	0.2979562%
	M	21	1.819679%	2.6629931%	0.5811127%

Table 5. Independent Samples Test

Independent Samples Test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
| | | | | | | Significance | |
		F	Sig.	t	df	One-Sided p	Two-Sided p
COM	Equal variances assumed	4.159	.046	2.501	53	.008	.016
	Equal variances not assumed			2.341	33.99	.013	.025
JAG	Equal variances assumed	.400	.530	-.809	53	.211	.422
	Equal variances not assumed			-.815	43.57	.210	.419
IoO	Equal variances assumed	2.768	.102	-1.253	53	.108	.216
	Equal variances not assumed			-1.213	38.22	.116	.232
Consist_R	Equal variances assumed	3.406	.071	-1.057	53	.148	.295
	Equal variances not assumed			-.959	30.62	.172	.345

Table 6. Results of Cluster Analysis

Cluster	Criteria Relative Weights			Cluster Size
	Compensation	Job Availability & Growth	Influence of Others	
1	12%	30%	58%	4 (7%) (F: 1; M: 3)
2	45%	48%	7%	44 (80%) (F: 28; M: 16)
3	58%	18%	24%	7 (13%) (F: 5; M: 2)
Total				55 (100%) (F: 34; M: 21)