How Students Choose Their Majors in Information Technology

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Abstract— this research summarizes the results of a study conducted at the Faculty of Information Technology at Misurata University. The study was a survey intended to clarify the motivation behind students' choices of their majors at the faculty. The aim was to understand the reasons behind the overwhelming demand on some departments and the students' reluctance to join some other departments. The study showed that not only does the numbers of current students differ widely among the different departments, but also the number of expected students. The study also showed that students are only affected by their colleagues with regard to choosing a major.

Index Terms: **Information Technology, Choosing Major, Students, Study, Comparison, Influences.**

I. INTRODUCTION

At the Faculty of Information Technology in Misurata University, students are accepted based on their final average grade in high school. If the student is accepted, they are assigned to the general department. They stay there and study several courses including different levels of mathematics, statistics, and English. They also study introductory courses to the different branches of information technology available at the faculty. When the student accumulates 45 units in the general department, they have the right to major in one of six departments: (1) computer science, (2) communications and networks, (3) software engineering, (4) internet systems, (5) information systems, or (6) multimedia.

The current status shows that in some departments such as internet systems, the demand is expanding and the number of students is dramatically increasing. On the other hand, some departments are having fewer and fewer students every semester. This situation—shown in Table 1—necessitates looking into the reasons behind tendency towards some departments over others. The study investigated reasons behind students' choices of majors, their motivation, and the departments targeted most in the field of information technology. In this study, students were asked about different important aspects related to the process of choosing their majors. Those aspects are:

1- The students average grade at the end of high school before entering the faculty of information technology.
2- The current average grade of the student.
3- The number of units the student accumulated so far.
4- The department the student wishes to join or had already joined.
5- The reasons for choosing the department.
6- The motivation behind the choice of major.
7- Majors the student wishes to enter and which are not available now.

Table 1. Number of Current Students in Each Department (Fall 2014-2015 Stats.)

Department	# Students
Computer Science	17
Internet Systems	36
Communications and Networking	46
Multimedia	4
Software Engineering	3
Information Systems	7

The study results showed that "personal preference" is the most important reason behind students' choices of major. It also showed that students are motivated by the choices of departments their friends have selected. In terms of what department is wanted most, the study demonstrated that there was no significant difference between any two departments.

The remainder of this paper is divided as follows. Section 2 discusses some work in the area. Section 3 describes the research methodology. The study results are presented in Section 4. Section 5 concludes the paper and provides some valuable recommendations.

II. RELATED WORK

The demand of employment and the earning streams usually influence the choice of major for students (Claude and Cannings, 1997). Moreover, the probability of success may also play a role in choosing one's major (Duru and Mingat, 1979). In the work of Claude and Canings (1997), it was shown that the probability of success in choosing a major is influenced by the student's abilities, culture, and background. Most importantly, the expected earnings and the stuent's plan in the case of failure are what influences the choice of major most.

Choosing a major can also be influenced by personality. This hypothesis was tested in the work of (Fizer, 2013). Personality can be seen as a result of the interaction between a person and its environment (Fizer, 2013). Students—as they develop their skills—start to see the connections available between the major of choice and their expected work environment. Since the personality is influenced by the environment, the major is, therefore, formed accordingly.

The work of (George-Jackson, 2015) demonstrated that the student's family influences their choice of major the most. According to the survey conducted in that research, 27% of the participants (students) chose their 'family' as their main influence followed by 20% who selected 'a rewarding career' as the main reason for choosing a major. The research also showed that 89% of the students believed that they would work in their choice of career after completing their degrees.

In the work of (Jones, 2014), student participants indicated that the most important influence in choosing their major was the student him/herself (25.9%). This was followed by parents (22.2%) and high school teacher (16.4%). After considerable analysis, the results showed that race, ethnicity, and gender further influenced the choices students made for most influential reasons.

There has been several other studies in which the question of what motivates students to choose a major has been investigated. In this paper, the question was reinvestigated with concentration on the field of information technology with the majors and specialties available in Libya. Those majors involved six departments in the Faculty of Information Technology at Misurata University as described earlier.

III. STUDY METHODOLOGY

The study relied on a survey that was given online to students in the Faculty of Information Technology at Misurata, University. The survey is shown in Figure 1. Students were given the survey online (https://www.surveymonkey.com/s/NKQSXR2) at the beginning of the Spring term of 2015. The investigators asked students to complete the survey and to give their names and student ids to ensure honesty in answering the questions. The survey remained open for two weeks. The number of participants who took the survey was 43. Of those, 24 were males and 19 were females.

Students answered the survey while they were registering for the new semester. This time was chosen specifically since this is usually when students think about their major. After the two weeks passed, the responses were collected for analysis.

IV. STUDY RESULTS

The first two questions in the survey were intended to collect the name and identification numbers of students. This was done to ensure, to a certain extent, that the rest of the questions are answered with honesty. The questions of the survey and the answers of the participants are discussed as follows.

A. What was your average grade in high school?

This question was intended to measure whether the average grade of students changed over time at the faculty since the admission of the student. We also wanted to know if the student grade had any effect on their choices of department (major). In Libya, grades are given as shown in Table 2.

Table 2. Grading System Followed in the Faculty of Information Technology

Numerical Range	Grade
85-100	Excellent
75-84	Very Good
65-74	Good
50-64	Acceptable
0-49	Weak

As seen in the students answers, those who had an average grade of "excellent" at the end of high school were 44.19% (19 out of 43). Students with average grade "very good" were 14 out of 43 (32.56%). The grade "good" had 20.93% of the students (9 out of 43). The last percentage (2.33) or (1 out of 43) was for the grade "acceptable". No one with a high school grade average of "weak" was accepted to the faculty.

B. What is your current accumulated average?

The goal of this question was to measure any changes to the average of students from its level in high school to the current time. According to the student answers, the current students with an average of "excellent" represented 18.60% (8 out of 43) of the total participants, recording a decrease from the case in high school as discussed in the previous question. Students with an average of "very good" were 32.56% (14 out of 43). The average of "good" received responses from 20.93% (9 out of 43) students. The average of "acceptable" received responses from 11 students (25.58%). Finally, one student had an accumulated overall average of "weak" (2.33%).

The study wanted to see if there is any significant differences between the average grades of students at the end of high school and their average grades after joining the faculty. The results are shown in Table 3.

Table 3. A Comparison of Student Average Grades before and after Joining the Faculty

Average Grade	Before		After		z test results
	%	No. out of 43	%	No. out of 43	
Excellent	44.19%	19	18.60%	08	$z=2.55, p<0.02$
Very Good	32.56%	14	32.56%	14	$z=0, p=1$
Good	20.93%	09	20.93%	09	$z=0, p=1$
Acceptable	2.33%	01	25.58%	11	$z=3.11, p<0.002$
Weak	0%	0	2.33	01	$z=1.00, p<0.31$

By taking the results above into consideration, one notices that the level "excellent" has dropped significantly after joining the faculty. The z test results that compared the number of students with an average overall grade of "excellent" before (44.19%) and after

(18.60%) being a part of the faculty shows a significant statistical difference (z=2.55, p<0.02). There was not any significant differences between students who achieved lower averages except for those who had an average of "acceptable". The difference in the case of "acceptable" was also significant.

C.   How many units have you already accumulated?

This question was meant to identify students who already majored and those who did not. According to the standards of the faculty, when a student reaches a number of 45 units, they have the right to choose a specialty (major) of the six identified above. Therefore, the study considered students with a number of units under 45 (18 out of 43) as students who have not chosen a major yet while the remaining students (25 out of 43) were considered to have already chosen their majors.

When compared—using the z test for the difference between two proportions—the number of students we had and who have not yet chosen a department did not differ significantly from those who have not (z= -1.5, p=0.13). As a result, the sample is representative of both cases almost equivalently. In both cases, we still wanted to investigate the reasons behind choosing a major for both proportions of the sample.

D.   What department do you wish to choose for your major or you have already chosen?

This question concerned the students' preference of department. Students were given the six departments (choices of major) to choose either their potential major or what they have already selected prior to the time of the study. The numbers and percentages of students with each department are shown in Table 4.

Table 4. Number of Students and Their Choice of Department

Department	# Students	Percentage
Communications and Networks	10	23.26%
Internet Systems	9	20.93%
Software Engineering	6	13.95%
Computer Science	6	13.95%
Information Systems	6	13.95%
Multimedia	6	13.95%

In addition to the list of departments given to students, there was a choice of "other" which was intended to allow students to write their own choice of major (department) even if it was not available. Some students indicated that they were not sure about their major and some others showed interest in more than one department.

By comparing the percentage of students who chose the communications and networks department—the highest percentage—with those who chose the internet systems' department—the second highest—using the z test for comparing two proportions, the results (z=0.26, p=0.79) show no significant difference. No significant difference was shown by comparing the highest and the lowest percentages either (z=1.11, p=0.27).

By calculating the correlation between the current number of students and the number of students willing to join the different departments (as shown in Table 5), the results (r =0.96, using Pearson Product Moment, R2 (the coefficient of determination) = 0.92) show a strong positive correlation. Students in the past and in the further are following the same path with choices of majors.

Table 5. Currents Students vs. Future Students

Department	Current number of students	Number of students willing to join
Communications and Networks	46	10
Internet Systems	36	9
Software Engineering	3	6
Computer Science	17	6
Information Systems	7	6
Multimedia	4	6

E.   What was the reason for your choice of major?

The goal of this question was to decide on the factors that lead students to what they either already chose or about to choose. Studying those factors might help with balancing the numbers of future students who would join the different departments. By considering the students' answers, it appeared that most students (30 out of 43) or 69.77% chose "personal preference" as the most affecting factor in joining a particular department. Of the participants, 20.93% (9 out of 43) indicated that the choice is "appropriate for a future career". Those who selected "high chances of pursuing postgraduate studies" represented 9.30% (4 out of 43) of the overall number of participants. Participants who chose the reason "easiness of the core courses in the department" represented 16.28% (7 out of 43). Some other students (2 out of 43) or 4.65% chose "Introductory lectures to the department" as the main reason for selecting their major.

In this question, students were given the chance to select more than one reason for picking a particular department. They were also given to add information to the choices they selected. Of the participants, 11.63% (5 out of 43) indicated that they chose a department because it did not have too many students. One student indicated that their choice came from the interactive nature of the courses in the department. Finally, some students indicated that they selected a department for personal reasons they did not like to reveal.

By comparing the reason chosen by most students (personal preference) to—for example—the second most popular reason (appropriate for future career) using the z test for comparing two proportions, the results indicate a significant difference (z=4.55, p=0).

F.   Who had an effect on you when choosing your major?

For answering this question, the survey gave its participants three choices: (1) friends who chose the same major, (2) student advisor, and (3) faculty member. Most students (31/43) or 72.09% chose "friends with the same major" as the main factor in selecting their department. The choice of "student advisor" received responses from 11.86% (5 out of 43) students. Finally, 25.58% (11 out of

43) students selected the choice "faculty member". The question gave the participants the chance to add their own reasons; accordingly, two students indicated that their choice came without any motivation from others. In addition, one student stated that their family motivated them to choose the major they selected.

By using the z test for comparing the proportion of students who selected "friends who chose the same major" and those who selected "student advisor", there appeared to be a significant statistical difference between the two proportions (z=5.68, p=0). There was also a significant difference (z=4.31, p=0) in the case of comparing "friends who chose the same major" to "faculty member".

G. Is there another department that is not available and you wish to join and consider for majoring?

This question was put in the survey to understand whether the student is satisfied with their current choice of departments or not. Most students answered this question with "No", 92.86% (39 out of 43). The remaining students (4 out of 43) wanted two departments to be added to the current list. Those were microcontrollers and artificial intelligence.

The study although had a limited number of participants, it revealed potential problems that the faculty may have with departments and the distribution of their students. The study also showed the ineffectiveness of the current motivations to students to joint certain departments. These issues are further discussed in the following section.

V. DISCUSSION

The first point of discussion concerns the change in the average grades that dropped significantly after joining the faculty. This can be considered from different angles. First, either students changed because they found it difficult to deal with the courses offered at the faculty or achieving higher averages in high school was easier. It is actually hard to point out a specific reason in this case except that we are certain that changes to the worse have happened. The grade "excellent" decreased while "acceptable" increased. Further studies should look specifically into reasons for such changes.

The second point of discussion regards the students' preferences of departments. There was neither a significant difference among the current numbers of students in the different departments nor in the numbers of students who intend to join the different departments in the faculty. This result indicates that, perhaps, students lack sufficient knowledge about some departments, those departments have no effective approach to stand out among the different departments, or there is further need for research to solely identify more specific reasons.

Actually, the correlation between the current numbers of students in each department and the number of students willing to join the different departments indicates that similar percentages of students among the different departments may continue in the near future.

Hence, any change requires the faculty to study the reasons further and to find strategic methods to improve the students' tendency to join some departments if the faculty wants those departments to remain.

The third most important point of discussion is related to the reasons behind choosing a particular department. Students in the study chose the departments with similar degrees of preference. However, their main reason came as "personal preference", which also differed significantly from any other reasons. This is due to their lack of knowledge about the importance of the other reasons. For example, they may have little idea about the connection between every major and the chance of getting a good job after graduation. They may also lack important knowledge about which department has higher chances of pursuing a postgraduate degree. This information is recommended to be known to all students so that their choice of major comes after careful consideration.

Students were also questioned about factors that may have affected their choices. Although the choices of "student advisor" and "faculty member" were thought to be important factors student might consider, the main effect came from "friends who chose the same major". This situation could actually be the main reason behind having crowded and abandoned departments. "Word of mouth" is very common as a way of advice in this country and it may actually have a strong influence on people's choices (especially young people). Encouraging students to research and carefully read before considering a choice of major may play a significant role in improving how they make their decisions.

Finally, to summarize the main recommendations that came out of this study, one shall mention first that the main goal was to investigate the current situation regarding how students choose their major (department) at the faculty. Therefore, the faculty should take into account the following recommendations:

1- Making students aware of the importance of researching and reading before selecting a major.
2- Identifying the most important sources of advice to students, which is the advisor in the first place and then the faculty members.
3- Providing thorough definitions of the departments, future careers, and future higher studies and their connections to each major.

VI. CONCLUSION

This study investigated factors behind students' choices of departments (majors) at the Faculty of Information Technology, a part of Misurata University. The study focused on identifying those factors and other aspects that may contribute to the students' decisions. The results showed that students choose their majors based on their personal preferences and ignore their advisors and faculty members. They are also motivated by choices of other students whom they consider friends or colleagues. The faculty should focus on educating its students about the choices of departments. It should also

emphasize the role of the advisor in the choice of department for the student. The faculty should look further into current courses in every department and whether or not some departments should even exist in the first place.

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BIOGRAPHIES

Anwar Alhenshiri has a PhD in computer science from Dalhousie University in Halifax, Canada (2013), and an MSc degree also in computer science from the University of Western Ontario in London, Canada (2007). He completed his BSc in computer science in Misurata University in 1997. Dr. Alhenshiri has contributed to several conferences in North America and Europe in the fields of computer science and information science. He has many publications in well-renowned journals and conferences. He is currently an assistant professor at the Faculty of Information Technology in Misurata University.

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