Change of Major Policy and its Effects

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Abstract: Considerable attention has been paid to factors affecting student's selection of Engineering and related majors [1, 3, 5] and issues affecting retention and graduation in these majors [4, 7]. Lesser attention has been paid to change of major policies and their effects [2].

We study the history and effects of "change of major" policies in the Erik Jonsson School of Engineering and Computer Science at the University of Texas at Dallas. We further focus on two closely related degree programs (Computer Science and Computer Engineering) that are delivered by different departments within the School. A university-wide policy that just required "good standing" to change major up to four years ago has evolved into separate policies for multiple Schools that have become more restrictive over the years and especially so in the School of Engineering and Computer Science. Motivations for the policy and the updates to it included managing growth and maintaining, improving quality.

We look at a number of issues arising from the policies and the interplay between the School's change of major policy and policies at the University level. We study movement of students in and out of the School and each Department and its effects. We discuss issues with maintaining a common School-wide policy on change of major and the effects on the Departments.

Introduction

The School of Engineering and Computer Science was established in 1986 by moving an existing Computer Science Program with about 600 students from Mathematical Sciences to the new School and initiating an Electrical Engineering Program. At that time, the University offered undergraduate degree programs but only at the upper level, mainly enrolling undergraduates that had completed roughly two years at community colleges in the area. The University first admitted freshmen in 1992. The School expanded by adding new programs in Software Engineering (2001), Computer Engineering (2006), Mechanical Engineering (2008) and Biomedical Engineering (2011).

The change of major policy was a university wide requirement of "good standing" (i.e. a 2.0 GPA – C average); students not in good standing could still change major with approval from both Associate Deans for Undergraduate Education for the student's current and new major. The standard university-wide policy went through a series of changes starting in 2014. The

impetus was that the two largest schools at the University (the Schools of Engineering and Computer Science and the School of Management) felt that the standard policy did not serve their needs.   Both Schools sought more input and direct involvement in the process.

Change of Major Policies

The University's process for changing major required completing and submitting an "Undergraduate Change of Major Request Form" preferably before the start of registration for the next semester and no later than the first day of classes of a semester/term. Students with 54 or more semester credit hours needed to seek approval of the Associate Dean for Undergraduate Education in the school of the intended major.

Students with a cumulative GPA (grade point average) below 2.000 could only change their major with permission from the Associate Dean of their current major and the Associate Dean of their intended major. Both Associate Deans' signatures were required on the "Undergraduate Change of Major Request Form" prior to its submission to the Office of the Registrar. If the change of major was approved, the student would then be responsible for meeting all program requirements and course prerequisites of the catalog in effect at the time of the change. In the first semester of change to a new major, the student was required to meet with an academic advisor to prepare a degree plan for the new major.

Around 2014, multiple schools including the School of Engineering and Computer Science and the School of Management enforced the 2.0 GPA threshold more and more strictly. By 2016, approvals for change of majors to these Schools for students that did not meet the threshold were very rare. This extended to change of major requests from one major to another within the School of Engineering and Computer Science as well.   In the 2017 catalog multiple Schools sought more control over the process for a variety of reasons, mostly over concerns about the ability of the School to accommodate demand for its majors and allocation of resources to match growth. The 2017 academic catalog included the following language: "Students wishing to change majors in which the new major involves the schools of Arts, Technology, and Emerging Communication, Erik Jonsson School of Engineering and Computer Science or Naveen Jindal School of Management must have approval of the Associate Dean of Undergraduate Education from the school of the intended major".   This allowed introduction of stricter standards than "good standing".   The most significant change in the School of Engineering and Computer Science was that background, preparation for the desired major and good performance (grades) in that background were the main factors in such decisions.   In the School of Management, the focus was on preparation in Mathematics (having completed Applied Calculus).

With the 2018 catalog, the change of major policy was spelled out in the catalog for the first time:

Change of Major Application Minimum requirements:

All students wishing to change majors to ECS after enrollment should carefully consider the consequences of excessive hours and time to degree completion.

- 24 or more credit hours at the university; AND
- have completed at least 15 hours of major preparatory, major classes (3+ credit hours each) for the requested ECS major with a minimum GPA of 3.0 in them;

The most common path to changes of major to the School of Engineering and Computer Science involved taking major preparatory classes offered by other Schools at the University; for example: Calculus, Physics, Differential Equations, Linear Algebra. Programming and Discrete Mathematics classes offered by the Department of Computer Science were the most used classes within the School. Access to classes within the School was allowed usually at a later date than the start of registration so as to allow declared majors to make good progress towards graduation. Issues that arose included classed closing while demand from continuing majors was still not taken care of; for example, students that failed a class in the major and did not plan ahead.

In the 2019 catalog the policy became stricter with concerns over low graduation rates becoming an important factor.

- Applicant has completed 24 or more semester credit hours at the university and has a minimum GPA of 3.000 in this set of (24 or more) semester credit hours;
- Applicant has completed 15 or more university semester credit hours consisting of major preparatory, major required classes (3+ semester credit hours each) for the requested ECS major and has a minimum GPA of 3.000 in this set of (15 or more) semester credit hours;
- The above GPA requirements should be achieved without repeating classes;
- Applicant has earned at most 60 semester credit hours; these include semester credit hours earned at UT Dallas, transfer credit, credit by examination, etc.; also included are semester credit hours in progress at UT Dallas or elsewhere in any semester prior to the enrollment semester.

The last requirement above was the one that generated significant issues. The implementation of the 60-hour limit allowed grandfathering students that were already in the process of changing major and allowing some grace period for students entering with many credit hours (e.g. Advanced Placement, transfer credit). Ultimately it was concerns expressed by Admissions that the policy would hamper recruiting that led to a simplified policy that was approved and will replace the credit hour limit with a limit on the number of changes of major in the 2020 catalog copy:

- Applicant has completed 15 or more UT Dallas semester credit hours consisting of major preparatory, major required classes (3+ semester credit hours each) for

the requested ECS major and has a minimum GPA of 3.0 in this set of (15 or more) credit hours and a minimum GPA of 3.0 overall;

- Applicant has changed major at UTD at most twice (prior to the current application).
- Applications will be processed only after final grades for the current semester are posted.

The last bullet in this policy aims to allow better access to major classes for declared majors.

History and Statistics for Change of Major

Figure 1 illustrates the actual changes of major since the establishment of the School of Engineering and Computer Science in 1986.   The School started with moving an existing Computer Science Program from the Department of Mathematical Sciences in the School of Natural Sciences and Mathematics to the new School and initiation of an Electrical Engineering degree program.   Software Engineering was added in 2001, Computer Engineering in 2006, Mechanical Engineering in 2008 and Biomedical Engineering in 2011.

Overall, the University is in growth mode and most of the growth is in the School of Engineering and Computer Science which has managed to increase enrollments significantly while also improving the quality of the incoming class in terms of average SAT each year.   The average
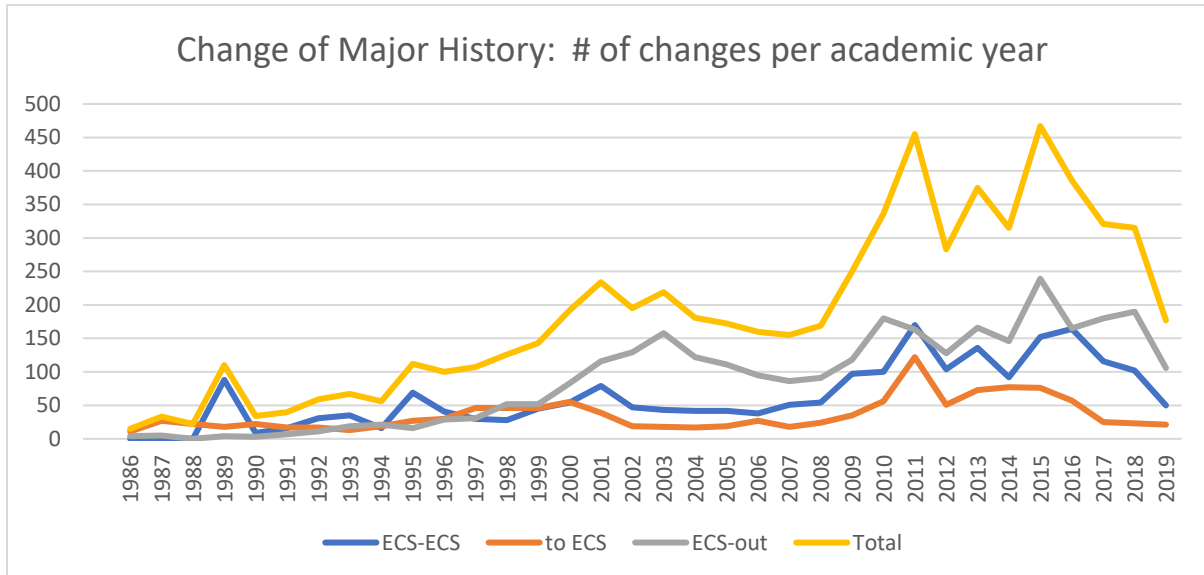

Figure 1. History of approved changes of major for the School of Engineering and Computer Science.

SAT for the 2017 freshman class in the School of Engineering and Computer Science was 1350, the highest among the seven Schools at the University.   Growth while also improving quality

has continued with the most recent freshman class (Fall 2019) in the School posting a 1410 average SAT.

The effect of the change-of-major policies is clearly illustrated by the strong downward trends in approved changes of major in the past few years. The GPA requirement of 3.0 in the major and overall is for approving a change of major is slightly higher than the average GPA for undergraduate students in the School and the University.   Also, preparation for the major was the main additional requirement for the approval by the Associate Dean for Undergraduate Education (2017 catalog) and the delayed drop in the blue line (changes of major within the School) is likely a result of the similarities in early preparation for all the ECS majors (Calculus, Physics, Linear Algebra, Programming are required for all majors in the School).

Effects of the Change of Major Policies

By reducing the number of approved change-of-major applications over the past two years, the policies resulted in a net outflow of students from the School of Engineering and Computer Science.   Noticeable trends in the flow of student are from all Engineering majors (besides Software Engineering) to Computer Science (often as a stop-over before leaving the School). Table 1 summarizes the departures by major to other majors in the School and outside the School and the top destination majors.

ECS Major	# leaving	to other ECS	top ECS destination (#)	to non-ECS destination	top Non-ECS destination (#)
BMEN	62	35	CS (15)	27	Biology (4)
CE	79	54	CS (21)	25	Math (3)
CS	87	30	SE (15)	57	Arts & Tech (15)
EE	46	28	CS (14)	18	Int. Manag. (5)
MECH	52	35	CS (15)	17	Info Tech (5)
SE	16	8	CS (4)	8	Undecided (3) Info Systems (3) Arts & Tech (3)

Table 1.   Movement of ECS majors

A natural linkage to investigate in looking at change-of-major policies is their effect on graduation rates.   Graduation rates for the School are below expectations especially given the quality of the incoming Freshman classes.   Freshman retention rates for the entering class in Fall 2018 were at 79% in the same ECS major, 80.6% in the School and 88.6% in the University. Four-year graduation rates were at 41% for the School (with all majors other than Computer Science below the School average) for the 2015 FTIC cohort, an improvement of 4 percentage

points over the previous two FTIC cohorts.   Five-year graduation rates for the 2014 FTIC cohort were at 50% improving over the 48% rate for the 2013 FTIC cohort which had a 51% 6-year graduation rate.   A study of possible reasons for these rates was reported in [6].

With the stricter change-of-major standards taking effect with the 2018 catalog, the number of graduations that involved a change of major is small and not a representative sample as most such graduations involve closely related majors (for example Computer Science to Software Engineering). Another complication is that declared and actual majors for many students are often not the same. Enforcement of schedules consistent with making progress in the student's declared major is getting stronger but an Electrical Engineering major could be taking classes consistent with a Computer Engineering major and not bother to officially change major until the graduating semester.   Changes of major early on in a student's career can have little to no impact on time to graduation if the majors involve have similar early requirements; for example, the first two to three semesters for majors in the School of Engineering and Computer Science all include "Introduction to the School, Major" classes, Calculus, Physics, Programming, Linear Algebra.   Calculus and Physics are common to all ECS majors; while the "Introduction to the Major", Programming, and Linear Algebra classes differ, the policy is to accept the completed version as a replacement for the requirements in the new major due to the high overlap in the content of these classes. A clear effect on graduation rates is when a student that started as a Liberal Arts, Management, Social Studies major changes to a major in the School of Engineering and Computer Science. The different Calculus requirements set the student back at least a year.

Computer Engineering and Computer Science

We next focus on two closely related programs delivered by different Departments within the School of Engineering and Computer Science.   Computer Science dates back to a concentration within Mathematical Sciences in the School of Natural Sciences and Mathematics in the 1970s that steadily grew.   It was moved to the newly formed School of Engineering and Computer Science in 1986 providing the vast majority of a 600-enrollment requirement for the new School.   Computer Engineering started as an inter-disciplinary program in 2006 that was jointly administered by interested faculty from the Departments of Computer Science and Electrical Engineering and is now administered by the new Electrical and Computer Engineering Department.   About half of the degree requirements for the two programs are cross-listed. The contrast is interesting because Computer Science is the largest Department in the School and has the highest enrollments of any Department at the University, i.e. maintaining, improving quality would likely be more important to the Computer Science Department than growth. On the other hand, Computer Engineering has among the lowest enrollments and would more naturally be in growth mode.

Another common aspect is that both Departments include another degree program (Electrical Engineering for Computer Engineering and Software Engineering for Computer Science) while the other two Departments in the School offer a single undergraduate program (Biomedical, Mechanical Engineering).

The origin of the 3.0 GPA requirement in the policy is that B level (3.0 GPA) coursework is required for students to join the Fast Track program, a program that allows undergraduates to enroll in graduate classes. As with Fast Track, it was felt that something higher than "good standing" (i.e. C-level work or 2.0 GPA) would be appropriate to avoid lowering the quality of the programs by flooding them with marginal students with poor backgrounds that would be enticed by the strong job market in these majors. The Biomedical and Mechanical Engineering Departments also felt that improving rather than risking quality would be preferable.

Looking at the set of changes of major into and out of the two Departments, we have: 23 BMEN majors changes major to the two Departments with none going to CE while 9 changed to CS, 6 changed to EE and 8 changes to SE. It seems that CE was not an attractive middle-ground with BMEN majors electing EE if interested in devices and CS/SE for the stronger job market. Of 15 MECH majors that changed into the two Departments, none went to Electrical with only 2 changing to Computer Engineering and 13 to CS/SE.

Of the 65 students that left CE, 14 went to CS, 14 to SE, only 4 to each of EE, MECH and 2 to BMEN while outside ECS, ATCMBA attracted 6, Data Sciences 5, and INTS 4. Of the 97 students that left the Computer Science major, the top destination was the School of Arts and Technology with 29, followed by 15 to SE, 11 to INTS, 10 to Data Sciences (Data Science is a new major attached administratively to the Department of Mathematics but delivered jointly with the Computer Science Department).

Concluding remarks

In terms of nationally reported statistics, Freshman retention for the School improved from 77% in 2016 to 80% in 2017 and 81% in 2018. Computer Science led the way improving from 77% to 82% and 85% over the same span. Four-year graduation rates rose from 37% for the 2014 class to 41% for the 2015 class. Change-of major policies do have an impact on these rates but other factors may be equally or even more important.

In terms of managing growth, the change of major policies are more important for the Departments of Computer Science and Mechanical Engineering. With the quality of incoming students consistently rising and resources following the growth, these Departments and the School are happily failing to manage growth.

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