RUNNING HEAD: Tracking Upper-Division Student Graduation Rates

DRAFT: Completion Rates: A process for tracking upper-division students by major and semester

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Completion Rates: A Process for Tracking Upper-Division Students by Major and Semester

1.0 Introduction

In 2014, the Florida Board of Governor's (FLBOG) awarded Florida State University a Targeted Educational Attainment (TEAm) Grant to increase the recruitment, retention, and employment of students pursuing technology and computing degrees in information technology (IT), computer science (CS), and computer engineering (CE). The resulting project, the Florida IT Career Alliance (FITC), included annual reporting to the FLBOG on enrollments, completions, and completion rates (CR) (also referred to as graduation rates), and completer outcomes of targeted student majors. This reporting activity afforded us a tremendous opportunity to use these data to discern patterns and methods to better detect student needs.

In this paper, we focus specifically on completion rates and outline the process used to track and report this performance metric using Business Intelligence (BI) and other IR-related techniques. Specifically, we tracked upper-division students in targeted computing and technology majors by semester cohorts from the time they entered the major to the time of graduation (if applicable), which is different from the traditional method of tracking students annually, and of monitoring First Time in College (FTIC) students from freshman year to graduation. This method is specifically useful at the college, departmental, and program levels for deans, department chairs, or program directors to understand the extent to which students are on-track for graduation once accepted into their majors.

1.1. Focus on Graduation Rates

Performance-based funding has changed the way in which a majority of states have shifted funding for institutions of higher education (IHEs) from enrollment-based funding to priorities based on state goals (NCSL, 2015). Some researchers have disputed that aligning funding to graduation rates improves student outcomes (Douglas-Gabriel, 2016) and others have recognized many intended and unintended effects of making institutional funding contingent upon graduation rates (Dougherty et al., 2016). Specifically, many public institutions are now pressured to improve graduation and retention rates by aligning funding to graduation and similar performance metrics (Crisp, Doran, & Reyes, 2017; McClendon & Hearn, 2013).

Federal law also requires IHEs to calculate and disclose completion or graduation rates of certificate- or degree-seeking, full-time students eligible for Title IV funding under the Higher Education Act of 1965. Moreover, the Student Right-to-Know Act (SRK), passed by the U.S. Congress in 1990, requires the disclosure of completion rates for the four most recent years and the most recent completing class of all students. IHEs must also reporting completion and graduation rates for students who receive athletically related

student aid, by race, gender, and sport to current parents, coaches, and potential athletes, with few exceptions (NPEC, 2009).

IHEs often collect much of the required data through national surveys. For example, the Graduation Rate Survey (GRS), a part of the Integrated Postsecondary Education Data System (IPEDS), used to promptly collect the data required by the SRK for appropriate and mandated disclosure. Additionally, the National Collegiate Athletic Association (NCAA) uses the GRS for its annual collection of graduation-rate data (AIR, 2000). As a result, the calculation of completion rates for required federal reporting is often at the hands of institutional researchers (IR) and analysts, and therefore enhancing understanding this performance metric and its utility is of particular relevance to IR professionals.

2.0 Background

2.1. The Graduation Rate Statistic.

Graduation rates (GR) are often reported as the percentage of full-time students who graduate “on-time” or in four years for those students who receive a Bachelor’s degree. However, SRK requires that IHEs report the percentage of students who graduate within 150% of the typical time to a degree (or a six-year graduation rate) at a four-year college. While this paper is specific to four-year institutions, it should be noted that two-year institutions may count a student graduate as one who completes the "equivalent of an associate degree” within three years for a two-year transfer program that is acceptable for full credit toward a bachelor’s degree and that qualifies a student for admission into the third year of a bachelor’s degree program (AIR, 2000).

In the FITC project, we explored graduation rates for students once they entered their majors (or reached upper-division undergraduate status and were accepted into their majors). We adhered to the FLBOG’s requirement to track upper-division undergraduate students in the major by monitoring the percentage of students who graduated within 150% of the time to a degree, but instead of referring to this rate as a three-year graduation rate, it was termed a “nine-semester” completion rate. The term was used to refer to the percentage of upper-division students in IT, CS, and CE who graduated in or within nine-semesters from the first semester that they first had 60 or more credits hours in the targeted academic plan or major.

2.2. Beyond the GR Statistic.

Certainly, performance-based funding heightens the need to be accountable for the rate at which our students graduate, but to truly be accountable, institutions need to look beyond calculating completion rates for the sake of obtaining and reporting the statistic. The true value of completion rates are not in the final figure, but in the components that make up the performance metric. For example, the standard of a 9-semester completion rate meant that all the qualifying students in a designated cohort would be expected to graduate in a total of 9 semesters. Each Cohort would be established by starting courses in their major for the first time as an upper-division student. Tracking by

semester allowed the project team to understand true completion rates (without moving Spring students to the Fall or not accounting for Spring students as often done with annual completion rates) and instead explore circumstances when students graduate earlier or later than expected. As a result, the 9-semester completion rate is useful for making comparisons between student graduation rates for those who start in different semesters.

Exploration of student graduation rates, once they enter their major, can significantly improve completion rates if done correctly. For instance, it became clear that to truly impact the student's completion rates, we also needed to know more about the students who did not graduate. By pairing non-completer data with demographic information, we learned many interesting things. For instance, one of our programs had an 85% graduation rate, but data on non-completers indicated that those who did not complete within nine-months were primarily African American males. For another program, there was not one demographic variable that could explain the low completion rates in the program, but when non-completer data was paired with course-taking records, it became evident that several “weeder” courses accounted for many student transfers out of the major or academic issues leading to probation and then exit. In yet another program, we found that the majority of the students were not graduating in nine-semesters, simply because even transfers needed an extra year of pre-requisites before entering the major-specific courses.

As a result, programmatic and curricular changes could be made in each of the situations described. For the first program, the culture was examined on why Black males were exiting. Discussions revolved around faculty composition, academic counseling for students, and academic flags that could be put into place. For the second program, course sizes were reduced, and a separate (or new) major was developed for those whose careers did not require excessive and rigorous coding. In the third example, we reported a 9-semester graduation rate, but realized that the major needed a 12-semester graduation rate to truly capture the percentage of students who graduated 150% of the time to a degree from the time they “entered” the major, since during their first semester as an upper division undergraduate these students were indeed “pursuing” the major, but not yet “in” the major (or taking core courses).

3.0 Using Business Intelligence to Calculate Semester Completions

Our aim is to share or provide IR with a model or process for obtaining semester-based completion rates using Business Intelligence (BI) systems. While there are many ways to define cohorts and many variables that can be used to create semester cohorts in BI, this process simply serves as a model by which others can fine tune or monitor the appropriate or desired completion rates for a specific student population given the needs of the institution.

3.1. Step 1. Identify Students Enrolled in Each Semester Cohort.

In this project, we established cohorts by semester and placed students in cohorts by identifying the first semester that a full-time student: (1) was enrolled in an IT, CS, or CE academic plan and (2) had more than 60 hours in their major. Figure 1 depicts a BI snapshot of filters and variables used to identify a cohort's enrollment (i.e., Spring 2015 Cohort).

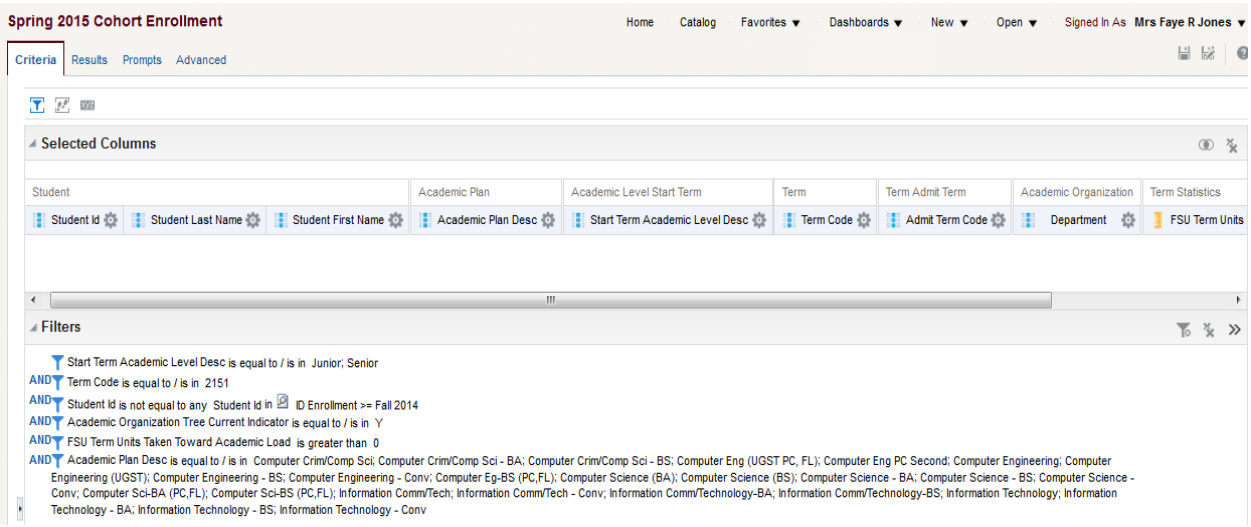

Figure 1. Selecting student enrollment variables and creating filters.

As Figure 1 shows…

3.1.1. Identify variables of interest for monitoring a specific cohort's enrollment in BI. In BI select the variables that are of interest for your cohort tracking. Recognizing that your student table can contain any variables that you choose such as student ID, Student Last Name, Student First Name, Academic Plan Description, Term Code, FSU Term Units Taken Toward Academic Load, and demographic data (such as race, gender, or residency). Use the information in your table as a reference and to analyze cohort data as needed. This step is your opportunity to add other demographic data to your table, which might be useful in future analyses.

3.1.2. Apply filters for extrapolating the cohort enrollees. To establish your cohort's enrollment data, the following variables are needed, although these terms may vary from institution to institution. The example below is based on how a semester cohort's enrollment was determined for Spring 2015.

- Term Code. For a Spring 2015 semester, the term code for the semester of interest was applied. In this case, term code was equal to 2159. Other institutions may vary on how term codes are listed.
- Start Term Academic Level Description. Requirements were set so that only students classified as juniors and seniors would populate. Another way to think of this is that we only wanted students who for the first time had 60 or more credit hours regardless of their classification, which is why Junior and Senior status were selected (meaning that a system knows the minimum credits needed to be a junior

or senior). Why select seniors? Some students transfer from community colleges into the major and possibly take courses in other majors before entering the one being tracked. Other students might enter as special students and have earned senior status (with credits), but never have been in the academic plan. These examples often need deeper analysis and can show students completing earlier than projected. However, for this project, we were more interested in focusing on the students who did not graduate in the designated window.

- Student ID. It was necessary to set criteria in BI so that we only identified students who were “new” or “first time taking courses” as an upper-division student in a specific semester (i.e., Spring 2015) and not in any prior semester. To accomplish this task, a filter was entered to specify "Student ID is not equal to any Student ID Enrollment >= Fall 2014” (or the semester before Spring 2015), meaning that we didn't want any student in our Spring 2015 cohort who was enrolled in Fall 2014 or prior.

  To create a filter to exclude students, we created a file telling BI which Student IDs to remove from the cohort, as shown in Figure 2. To do this, we ran and saved a report in BI and titled it appropriately for archival purposes (Ex: ID Enrollment>=Fall 2014). This report includes for all Student IDs in the targeted majors or students who first became juniors or seniors before or in Fall 2014. We used the same variables or filters as described for the Spring 2015 cohort, except that we changed the term code to be less than or equal to the semester before the cohort being established (in this case Term Code is less than or equal to Fall 2014). It should be noted that ID Enrollment files are more easily created before the Cohort Enrollment file to eliminate this step while creating a semester cohort.

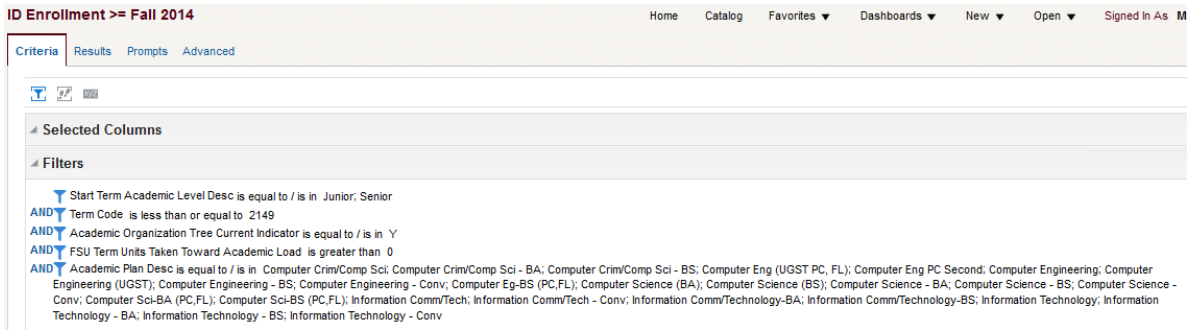

Figure 2. Filters for identifying previous students to exclude.

The filters illustrated in Figure 2 include:

- FSU Term Units Taken For Academic Load. We only wanted students who were both enrolled and taking courses. To do this, we set filters so that term units taken were greater than zero.
- Academic Plan Description. To target specific majors, we selected all IT, CE, and CS majors for all campuses of interest, to include BA and BS programs.
- Academic Organization Tree Current Indicator. The academic tree filter was designated as yes (or Y) was done to maintain students that are part of the institution’s Degree Program Inventory (DPI).

3.1.3. Create a table that summarizes the enrollment data in a useful way. *Figure 3* provides an example of new students (juniors and seniors) that comprise the Spring 2015 cohort. A title has also been included to signify that this cohort is expected to graduate in nine semesters (or by Fall 2017).

Spring 2015 Cohort (Completed, Ending at Fall 2017)

Spring 2015 Cohort Enrollment

	Junior	Senior	Student Id
	2151	2151	
Department	Student Id	Student Id	
Computer Engineering	14	5	**19**
Computer Science	51	14	**65**
Information Technology	53	11	**64**
Grand Total	**118**	**30**	**148**

Figure 3. Spring 2015 cohort enrollment summary table.

Figure 3 depicts…

3.2. Step 2. Identify Cohort Completers.

3.2.1. Select variables of interest for monitoring a specific cohort's completions in BI. Similar to establishing a table for cohort enrollees, analysts should create student tables with as many variables of interest as needed such as student ID, Student Last Name, Student First Name, Academic Plan Description, Term Code, FSU Term Units Taken Toward Academic Load, and demographic data (such as race, gender, or residency). Information in the tables can later be used to conduct analyzes on cohorts as needed.

3.2.2. Apply filters for extrapolating cohort completer data

When outlining the criteria for the cohorts (in this example, Spring 2015), we used the following filters:

- Term Code. The code for the term of interest was entered (or 2159)
- Student ID. IDs were extracted from the Spring 2015 cohort enrollment file. The IDs were then entered as a filter so that we were sure to be tracking the exact students from the cohort enrollment file. We found it easiest to copy the IDs from the Spring 2015 cohort table and paste the IDs as a filter in the Spring 2015 cohort completions criteria tab.

3.2.3. Create a table that summarizes completers in a useful way. To summarize cohort completion data, a summary table, shown in *Figure 4*, was created to track students by semester and major.

Spring 2015 Cohort Degrees Awarded

	MAJ									Grand Total
Department	2015 Spring	2015 Summer	2015 Fall	2016 Spring	2016 Summer	2016 Fall	2017 Spring	2017 Summer	2017 Fall	
Computer Engineering	2			1			7			10
Computer Science	1		2		2	6	12	7	2	32
Information Technology		1	4	17	14	9	15		3	63
Grand Total	3	1	6	18	16	15	34	7	5	105

Figure 4. Spring 2015 cohort degrees awarded summary table.

As Figure 4 shows…

3.3. Step 3. Display Majors by Semester Completions Using the BI Dashboard.

The dashboard view, shown in Figure 5, was created to provide a more holistic view of all of the cohorts, with each semester cohort depicted in rows with corresponding cohort enrollment and degrees awarded side-by-side for easy comparison

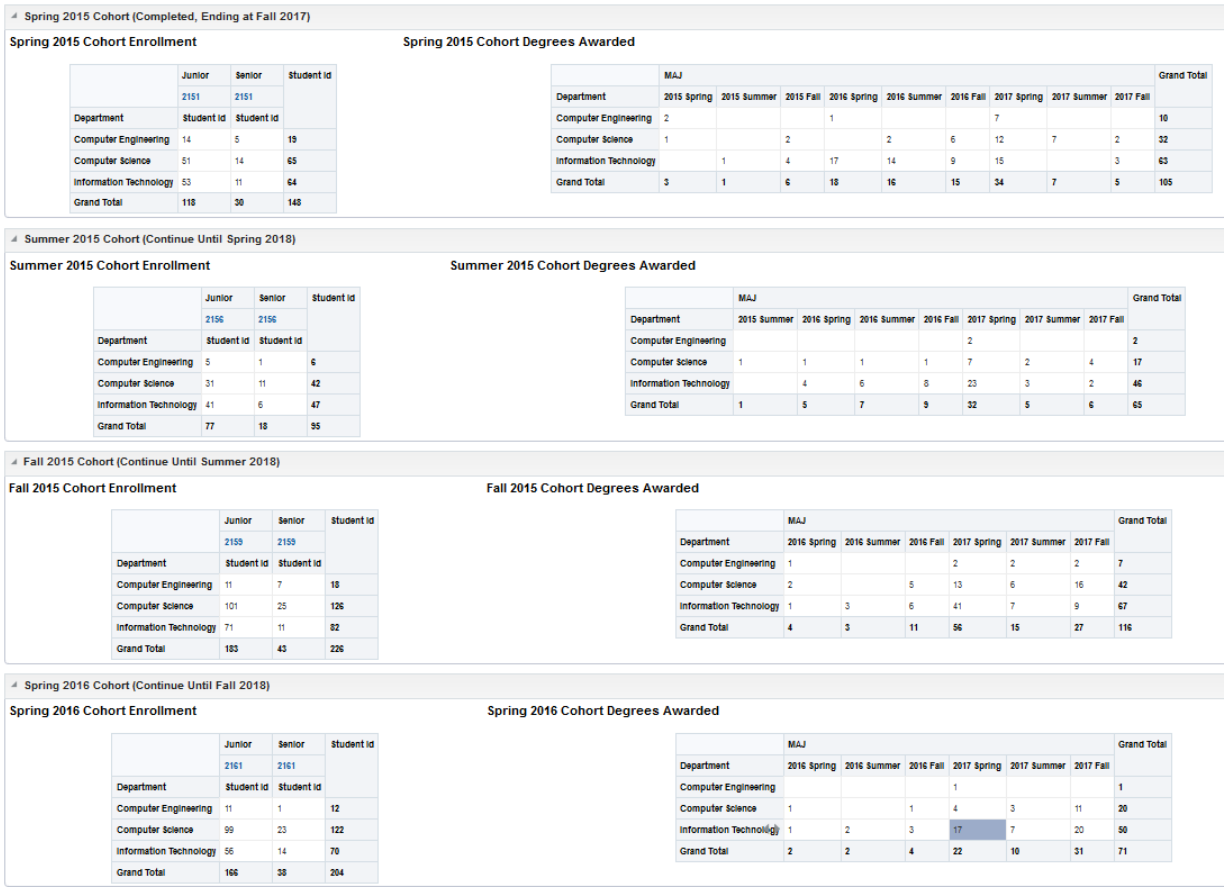

Figure 5. Semester cohorts displayed using a BI dashboard.

As depicted but not detailed in Figure 5, the dashboard takes created tables from previous steps outlined in this paper and displays them in a manner that allows analysts to see multiple cohorts' data simultaneously. Additionally, the pairing of cohort

enrollment and completions data provides useful ways to check for errors or limitations (for example, the number of completions should never exceed the number of enrollments) and utilize the data to create other graphics or images.

3.4. Step 4. Create Other Useful Graphics to Tell a Story.

FITC used data from BI to provide a more detailed depiction of completions rates by semester cohorts and by degree program, in this example, Information Technology, as shown in Figure 6.

IT & ICT			Graduation Semester																								
COHORT	Jun	Sen	2121	2126	2129	2131	2136	2139	2141	2146	2149	2151	2156	2159	2161	2166	2169	2171	2176	2179	2181	2186	2189	2191	2196	Totals	CR
Spring 2012	52	4	0	0	1	4	9	11	11	3	3															42	75.0%
Summer 2012	39	3		0	0	1	5	8	13	5	1	3														36	85.7%
Fall 2012	64	6			0	1	1	7	29	8	8	7	2													63	90.0%
Spring 2013	69	4				1	0	4	17	13	16	17	2	2												72	98.6%
Summer 2013	34	4					0	0	1	4	5	15	3	1	3											32	84.2%
Fall 2013	77	7						0	1	1	5	47	14	8	2	2										80	95.2%
Spring 2014	61	4							0	0	0	13	10	17	12	2	1									55	84.6%
Summer 2014	28	4								0	0	1	1	8	15	2	3	3								33	103.1%
Fall 2014	46	9									0	2	5	5	29	5	7	5	3							61	110.9%
Spring 2015	53	11										0	1	4	17	14	9	15	0	3						63	98.4%
Summer 2015	42	6											0	0	4	6	8	23	3	2						46	95.8%
Fall 2015	71	11												0	1	3	6	41	7	9						67	81.7%
Spring 2016	56	14													1	2	3	17	7	20						50	71.4%
Summer 2016	20	9														0	0	3	2	6						11	37.9%
Fall 2016	61	15															0	4	9	11						24	31.6%
Spring 2017	47	13																1	0	1							
Summer 2017	18	8																	0	1							
Fall 2017	50	11																									
Spring 2018	29	8																									

Figure 6. Summary of completion rates by semester cohorts.

As Figure 6 shows, the areas in green indicate the nine-semesters that were being monitored for completion by each cohort. A double line in the middle of the graphic indicates the semester cohorts which have completed all nine semesters allotted for the completion rate, with those CRs shown in orange. Below the double line, semester cohorts which have not yet completed nine-semesters in the program and were still being monitored are shown in blue.

3.5. Step 5. Refine the Process.

Halfway through the project, we observed that our IT programs had completion rates higher than 100% (as shown in Figure 6, for Summer 2014 and Fall 2014 cohorts), which was one of the errors we mentioned should alert analysts of a potential problem. In this case, we explored completion files for both semesters and found that the student IDs were not erroneous or duplicated, but that our collection of all majors at one time as a filter for cohort enrollments were creating the error. With all of the student IDs used later used as filters for student completions, the system did not know to keep students in the same major-silos that they started in. In this instance, we found students who rightfully started and were placed in correct cohort initially, but who began their studies majoring in computer engineering or computer science, but during the 9-semester period changed majors, and then received a degree in IT. To correct the issue for reporting, our policy was to remove students from the original cohort and add them to

the new major they graduated from, with the completion also being credited to the major in which the student graduated. The policy or approach to these types of issues can vary depending on the needs of the institution, but should always be disclosed in reporting.

Although this policy was used for reporting on this project, we could have used other processes. For future projects, and in hindsight, semester cohorts should be established with only one major, so that the corresponding student IDs remain attached to the original major, or at a minimum, completion files should be created separately by major. Nevertheless, had we not observed the CR rate overages in this manner, we would not have been as likely to think about the major switching that was occurring. A decision was therefore made to continue tracking major switches and explore the pathways of these students.

4.0 Conclusion

In this paper, we described the process we used to track computing and technology students' graduation and completion rates for the FLBOG-funded FITC project. In our project, we explored graduation rates by grouping students in semester cohorts for targeted majors and monitoring student success at achieving graduation within nine-semesters. During the process of calculating completion rates, we observed that when data are disaggregated to the student level, and when the components of the graduation rates are explored (enrollments, completions), and when data are reviewed in combination with other demographic or curricular information (i.e., race, gender, and course-taking), these data can reveal important phenomena about student successes and failures. Additionally, these data can alert administration of areas of concern and catalyze making important curricular and programmatic changes.

Establishing and refining this process allowed us to see the many ways in which IR professionals can explore completion rates as a useful and powerful performance metric. Data available through BI, and in combination with other graphics, can also provide academic leaders with a useful tool for identifying leaks in the pipeline and sharing student success patterns with faculty and higher administration.

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