DSO 570 Final Project

Interim Deliverable I

Team 2

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Maximizing Revenue

The current course scheduling system at the USC Marshall School of Business has problems with tedious classrooms assignment flow, insufficient registration information from each department or academic program, and a lack of timely feedback between faculty and the registration office. It costs registrar's office, program directors, and instructors too much unnecessary time, money, and labor for coordinating a feasible schedule for the entire Marshall School of Business. A more streamlined course scheduling system can help registrar's office reduce workload and help instructors efficiently and accurately select and students successfully enroll in their desired courses.

Based on our analysis of current available data, we found several opportunities and have focused this report on the Revenue per course analysis for improvement to the current course scheduling system.

Revenue per course = Unit tuition price per credit * Course total credits * Number of students registered.

Revenue per course is a good measurement of a course value. Courses that are 3-5 credits provide a higher revenue than courses that are 1-1.5 credit classes, yet they require the same amount of time to schedule. It would be better to schedule the higher revenue courses by the Phase 1 deadline, leaving the courses which provide the less revenue post Phase 1.

There are other opportunities to improve the current course scheduling system. In this deliverable, we will be mainly focused on the feasibility and actionability of Revenue per course. We prepared an analysis for Utilization Rate and have submitted this in the Appendix.

Revenue Per Course

Justification

Define:

Actual Revenue Per Course = Number of Registered Students * Price Per Unit Rate* Number of Units for a Course

$$\mathbf{A}=[X_1 \quad X_2 \quad \dots \quad X_N],\ \mathbf{B}=\mathbf{P},\ \mathbf{N}=[N_1 \quad N_2 \quad \dots \quad N_N]$$

$$\textbf{Actual Revenue Per Course} = \mathbf{A*B*N} = [X_1PN_1 \quad X_2PN_2 \quad \dots \quad X_NPN_N]$$

Where:
X = Actual number of students registered for a specific course session
P = Price Per Credit Rate for a specific course
N = Number of Credits for a specific course

Computable:
The actual number of students registered for a specific course session (X) can be exported from DataFrame - *Student Group*. Price Per Unit Rate (P) is available on the USC Tuition and Fees Website. Number of Units for a course is accessible on Enrollment/Registration (USC Schedule of Classes). Therefore, all (3) variables can be easily accessed and calculated in Actual Revenue Per Course.

The actual revenue for each course can be compared to the revenue generated from each course (where X is the maximum number of registered students per class) to measure the difference. An aggregation method to calculate the total actual revenue of each department and compare it with the ideal revenue yields the difference which can be optimized.

METRIC INTRODUCTION

Actionable:

Revenue Per Course is a good indicator for USC to allocate resources. For high actual revenue courses, we can allocate more resources (e.g., taking professors' and students' room/time preferences into account). For low actual revenue courses, we can decide how to assign new rooms for conflicts.

Simple:

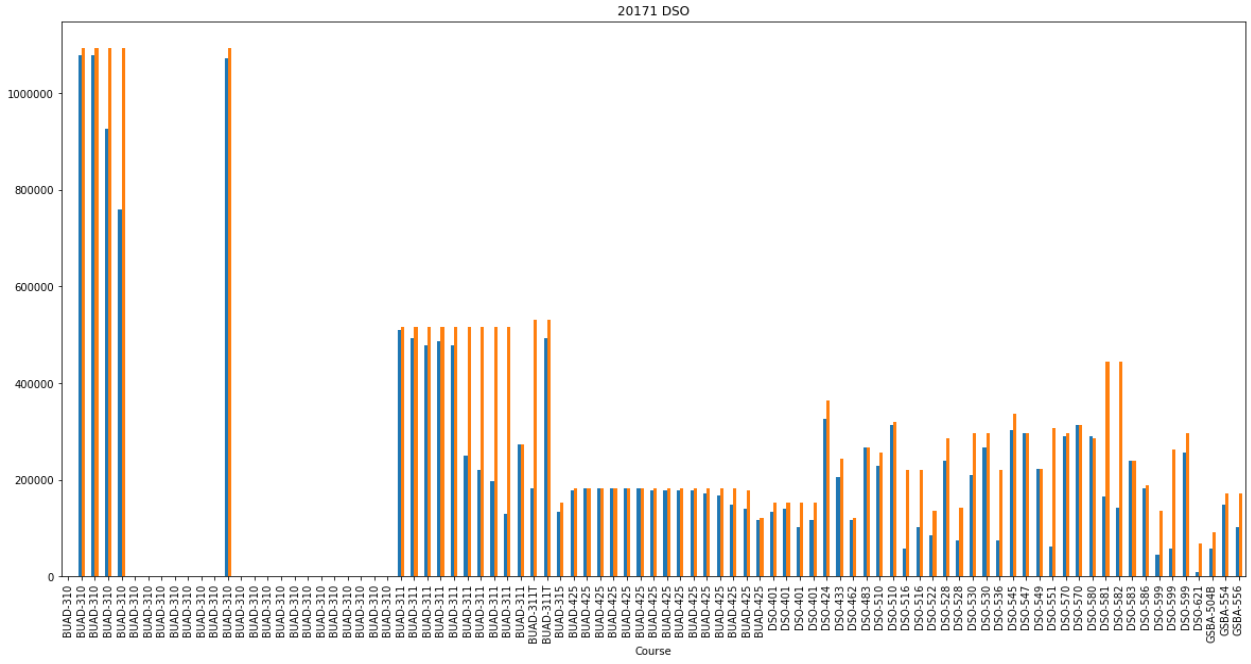
It is simple to use number of units, price per units and number of registered students to calculate the revenue for each course. Also, these variables are accessible on open sources or through the provided datasets. It is also easy to calculate.

Enlightening:

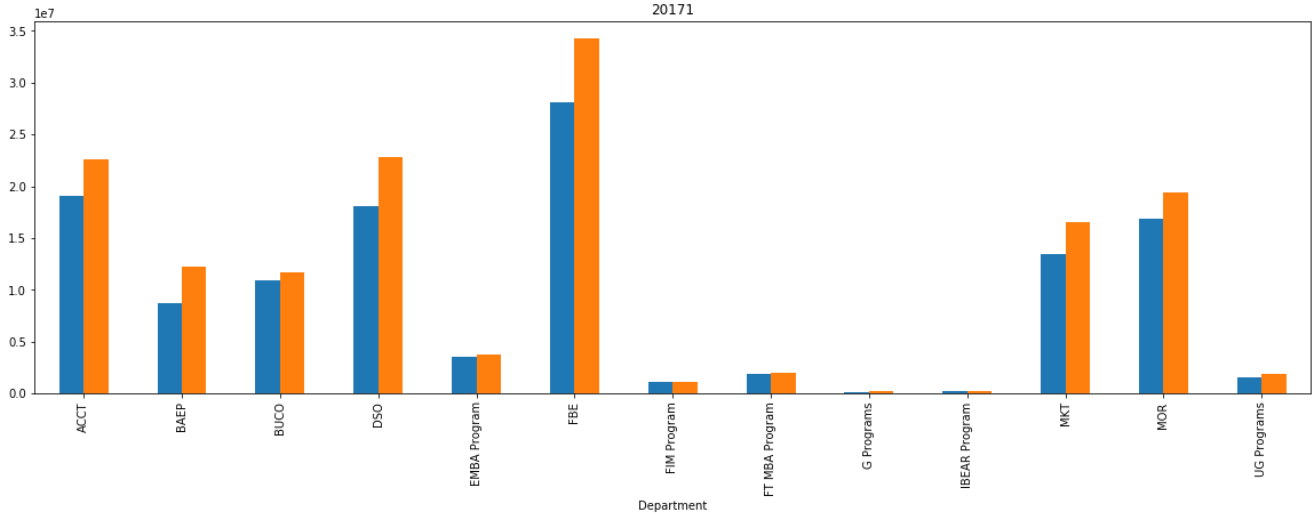
For students and faculty, this metric is a good way to help solve complex classroom allocation issue. Using the revenue as the indicator is clear to see the impact and result. For USC Marshall, if we are able to successfully optimize this metric, we can help them generate more profits.

METRIC ANALYSIS

The plot below shows revenues generated for each course in the DSO Department. Maximum possible revenue is in orange, and actual revenue generated is in blue. For some courses, the enrollment is not optimum or those courses were assigned to classrooms that are too big.



Revenue is aggregated to each department for this term, 20171. The difference between orange and blue bars demonstrates room for improvement.



APPENDIX

Metric 2

Utilization Rate

Utilization Rate = Number of students registered/Number of available seats in the classroom*100%

Justification

Define:

$A=\begin{bmatrix} X_1 \\ X_2 \\ \dots \\ X_N \end{bmatrix}$, $B=[Y_1 \quad Y_2 \quad \dots \quad Y_M]$

Utilization Rate = A/B*100% = $\begin{bmatrix} \frac{X_1}{Y_1} & \dots & \frac{X_1}{Y_M} \\ \vdots & \ddots & \vdots \\ \frac{X_N}{Y_1} & \dots & \frac{X_N}{Y_M} \end{bmatrix} * 100\%$

Where:

X = Actual number of students registered for a specific course session

N = Number of Courses

Y = Classroom Capacity

M = Number of Classrooms

Computable:

The actual number of students registered for a specific course session (X) can be exported from DataFrame - Student Group. The number of courses (N) relies on the course schedule, which is available on the Marshall website. The classrooms number (M) and capacities (Y) are the physical data for each of the buildings available to Marshall School of Business. All variables can be easily found and imported into the equation for the utilization rate.

Actionable:

Each row of the matrix includes different utilization rates for a specific course session in different classrooms. By eliminating the infeasible data (larger than 100%) and using the remaining data, the maximum utilization rate can be calculated and the corresponding classroom can be assigned to a specific course session. This process will repeat until all courses in the schedule are allocated. If (2) or more courses are assigned to the same classroom, we can schedule them in different time.

Simple:

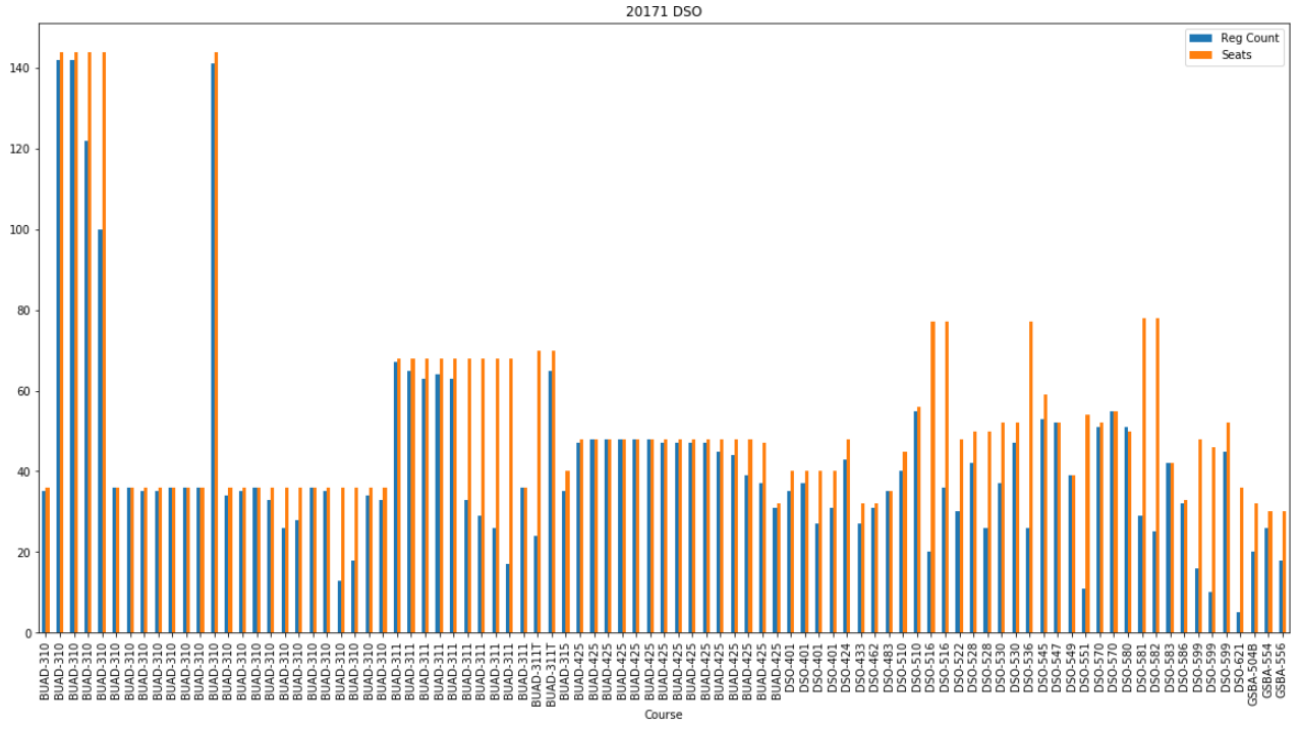
Variables can be visualized by using the defined utilization rate matrix. By following the procedures mentioned in Section 2, you can easily get the result.

Enlightening:

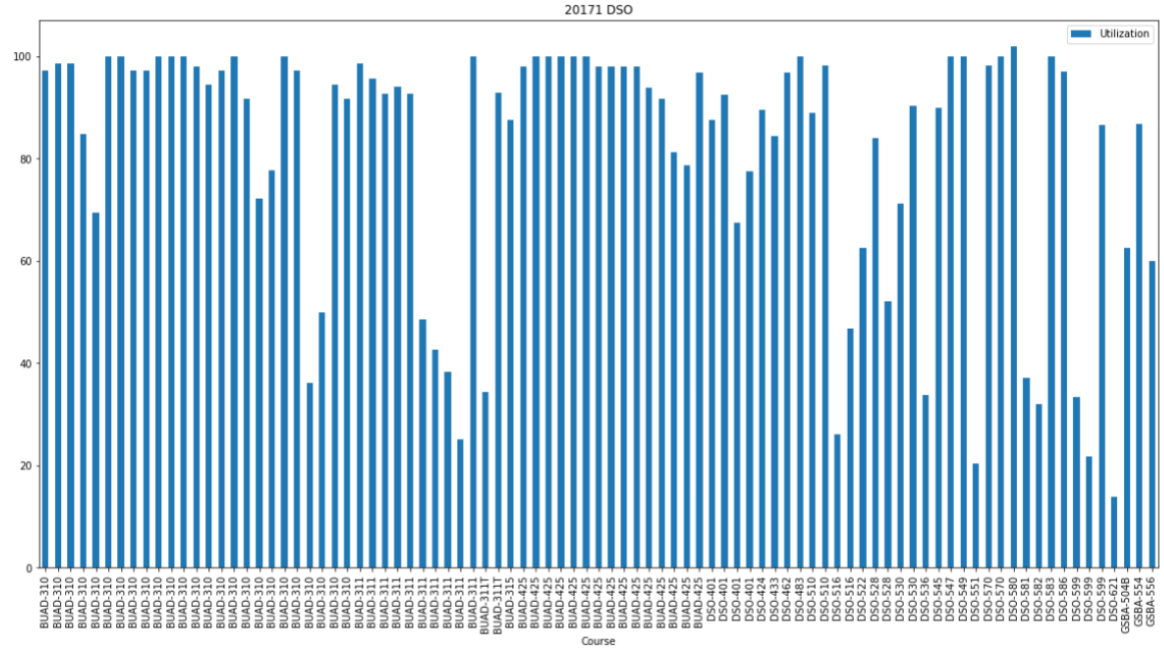
For student and faculty, this metric will ensure that the classroom capacity is larger or at least equal to the course capacity. For our client, this metric will increase the utilization rate based on the limited classrooms in Marshall School of Business. All courses are organized by size first. If a conflict occurs, we would use time of course re-assign the classrooms.

Analysis

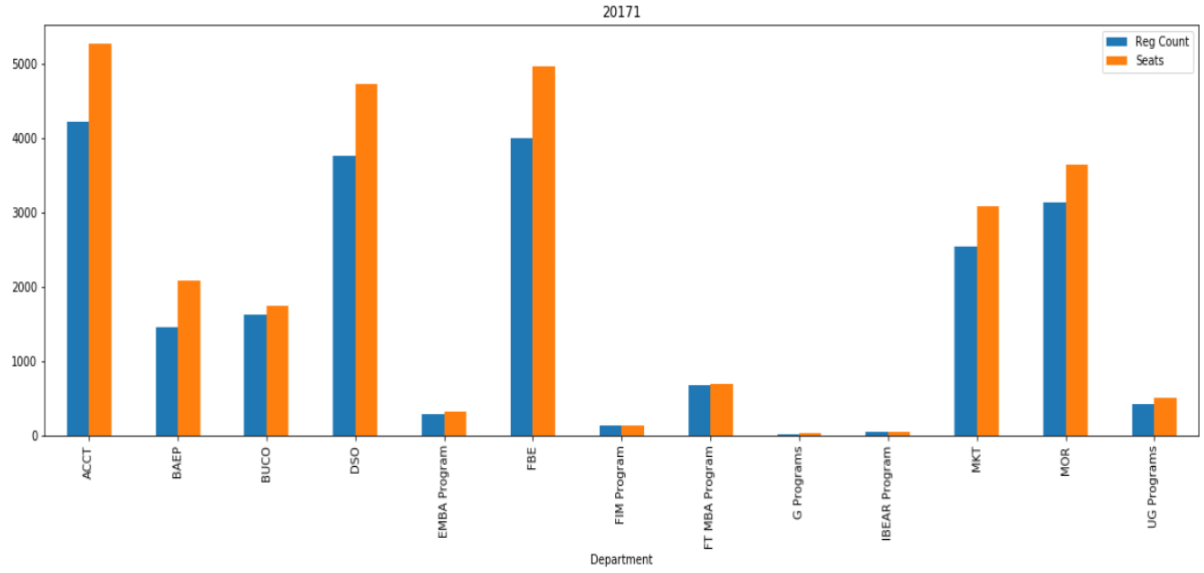
The plot below shows a comparison of the number of registered students and the number of seats available in each course the in the DSO department for Spring 2017.



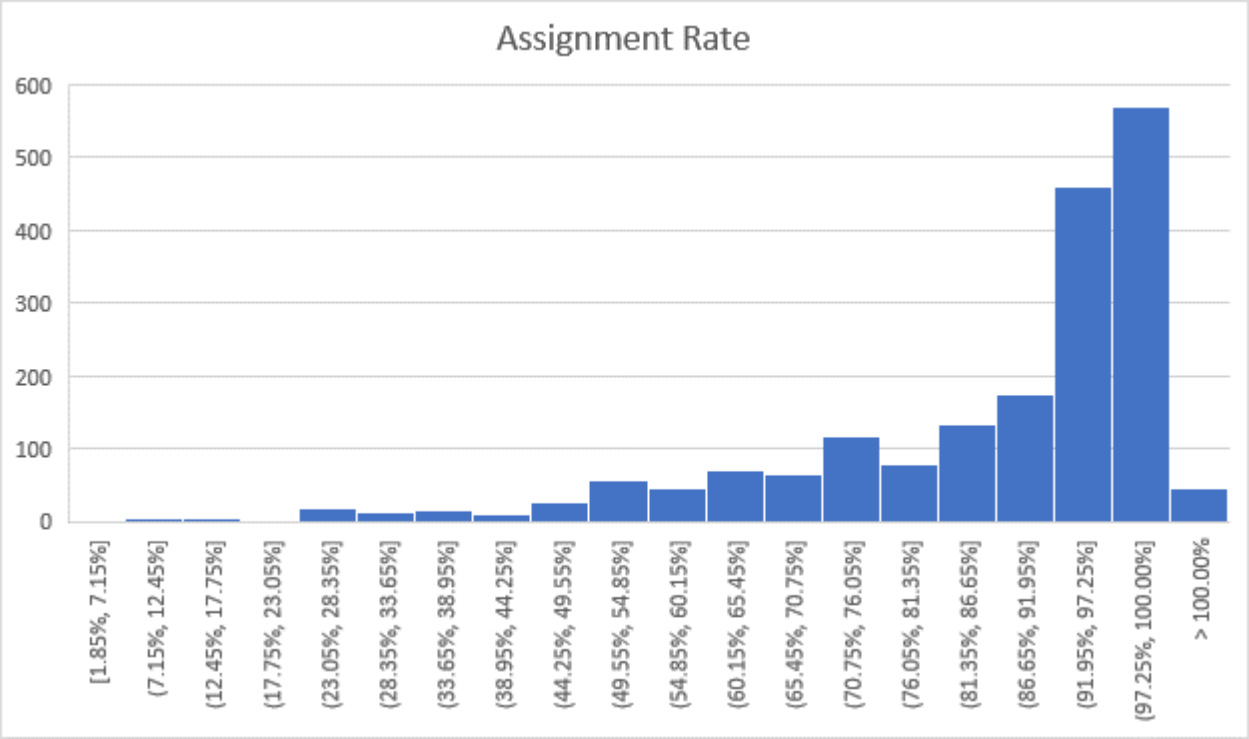
Utilization rate = Number of registered students/ Number of available seats*100.
The plot below shows the utilization rate for all the courses in DSO in Spring 2017.



The plot below shows the comparison of the number of registered students (blue) and the number of available seats (orange) across all the departments in Marshall.



Histogram of the Assignment Rate for each class section



Histogram of the Utilization Rate for each class section