Penn State Dining Commons Scheduling Optimization- Spring 2020

Overview
PSU’s Dining Services is responsible for managing the staffing and supply of all the dining halls around campus. They maintain their data from each venue separately, so they have not had an opportunity to look at a unified dataset to easily compare the profitability of each venue as campus has undergone changes. They are worried that they could be misallocating staff through busy or dull times which can result in overstaffing. This results in suboptimal throughput at busy venues, and overstaffing at less busy ones. As such, they have created a capstone project through PSU Learning Factory to get a team to help them assess their allocation of staffing resources during busy hours.

Objectives
The first step involved gathering data from Pollock Dining Commons and performing analysis to determine which factors affect staffing needs per venue. The identified significant factors will be used to create a regression model to help Dining Services better understand their required staffing levels. Staffing assignments will be further broken up by the standard shift times currently employed by Dining Services. A secondary objective is to provide our sponsor with alternative recommendations for future process changes and projects.

Approach
○ Conduct biweekly site visits in order to understand the soup making process
○ Participate in weekly advisor and sponsor calls to receive feedback
○ Establish factors that may impact staffing levels and test their statistical significance
○ Collect sales and staffing data from pollock dining commons
○ Perform linear regression analysis and determine the goodness of fit from the model
○ Perform alternative analysis and compare versus the initial linear regression model
○ Design and develop the user interface to hold the recommended model
○ Test functionality of the model to ensure quality
○ Release the model to the sponsor
○ Identify further process improvements and business propositions to increase profit margins and be able to lower sales price

Outcomes
○ Percetnation of variance accounted for: R^2 = 76.13%
○ Estimator of out-of-sample prediction error: AIC of 31177.22
○ Frequency of differences between values predicted vs values observed: RMSE: 87, confirmed it by training the model on some portion of the data and testing it on the other portion of data.

Next Steps
○ Ultimate goal of higher efficiency
○ Holt-Winters model to track staffing since it tracks both trends and seasonality and may be best fit for the constantly changing dining environment.
  ○ Requires continuous data collection infrastructure
○ Consider expansion into large university park markets through a digital application.
  ○ Scheduled takeout & delivery
○ Continue to attempt to eliminate wastes by handling ‘low hanging fruit’
  ○ Limit food wastes