

Supplementary Material E for “Beyond Normal: Preparing Undergraduates for the Work Force in a Statistical Consulting Capstone” by Smucker and Bailer

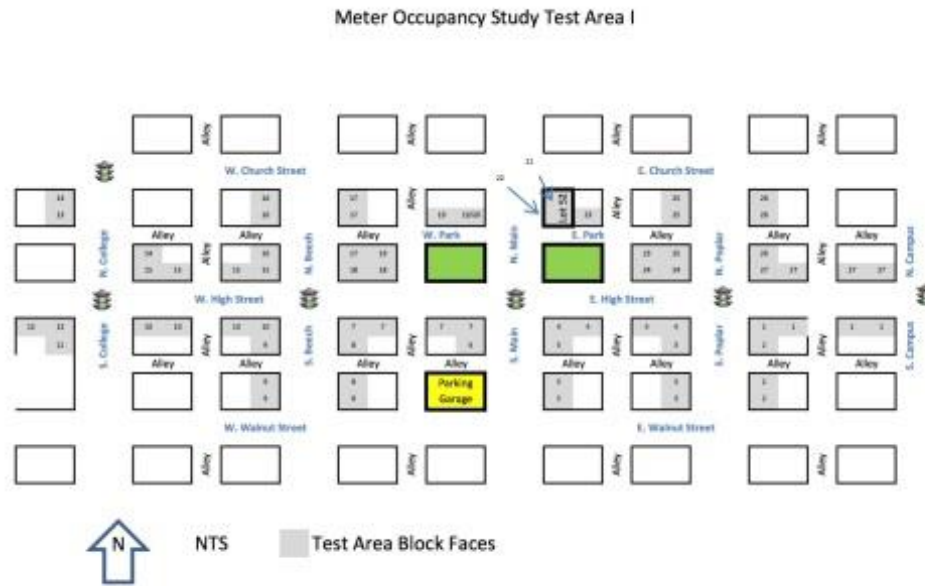
E.1 Motivation

Oxford, Ohio is the home of the main campus of Miami University. In addition to 17,700 students, the town has 21,000 other residents. In recent years, new mixed use spaces (retail on first floor and residential rental spaces on upper floors) were being built throughout town. It should come as no surprise that parking is at a premium along High Street, Oxford’s main thoroughfare (see Figure E.1), and that pressures for spaces was, at the time of the project, anticipated to increase.

The class was asked to conduct an occupancy study of the various parking areas in town so that the Oxford Parking & Transportation Advisory Board (OPTAB) could make data-based decisions regarding meter rates, hours, fines, etc. The OPTAB represents nearly every constituency in town: City Council, Miami University, Chamber of Commerce, Oxford Landlords, etc., and includes as ex-officio members the Chief of Police and the City Manager.

E.2 Problem Statement

The liaison to OPTAB was a police officer, and he helped frame the problem. The problem for the class was to conduct an analysis of a sample of the 790 metered spots in Oxford as well as the parking garage. The goal was to investigate different rates based on location to spread occupancy from “hot spots” to outer locations as well as into the unoccupied city garage. In addition, “meter feeding”—occupants of parking spaces extending their time for periods longer than the maximum time by adding coins to the meter before the time expires—could be removing spaces from circulation for extended periods of time; detecting the occurrence of such behavior was also of interest. Another issue of interest was extending meter hours past the current 6 p.m. deadline which could force many vehicles to park away from the High and Main intersection as well as produce additional income for the City of Oxford.



2/12/2010

Figure E.1. Parking in uptown Oxford. Figure extracted from STA 475 class presentation to client in spring 2010.

E.3 Solution

The class restricted attention to 27 block faces and the parking garage for a total of 377 parking spaces.

The students developed a data collection plan that was implemented in March of 2010. Four days

(Monday, Thursday, Friday and Saturday) during a one week period during the semester were sampled

hourly (11 a.m.-3 p.m.; 4 p.m.-8 p.m.). Other days were omitted because parking occupancy patterns on

Tuesdays and Wednesdays were believed to be similar to Monday and meter fees did not need to be paid

on Sundays. Each of the 14 students collected data on at least two occasions. Logistics of the data

collection (order that spaces were checked—see Figure E.2; data collection sheets; decisions about what

information to record, such as license numbers) and appropriate documentation and emergency numbers

(phone number of police contact if challenged when reviewing meter status) were key components of

preparation before entering the field to collect the data.

For each metered spot, occupancy was recorded along with whether the meter was in violation.

Summaries of the collected data include:

- Proportion of spaces occupied/available by time, day and block, on street parking or in garage
- Proportion of spaces with violations by time, day and block, on street parking or in garage
- Proportion of spaces with evidence of meter feeding



Figure E.2: Paths for checking spaces for hourly data collection. The red (blue) path designates the route taken to check occupancy on the southern (northern) block faces. Figure extracted from STA 475 class presentation to client in spring 2010.

Results reported to the OPTAB clients included a heat map of occupancy that was animated for display to the client, a presentation originated fully from the students; this proved to be a powerful depiction of how the occupancy varied over time (see Figure E.3 for one map that was included in the animated set).

Other tables and graphs include occupancy/violation rate per day in block, occupancy/violation rate per day in garage, and length of stay. Plots faceted by day and block face provided insight into underutilized spaces (e.g. Figure E.4).

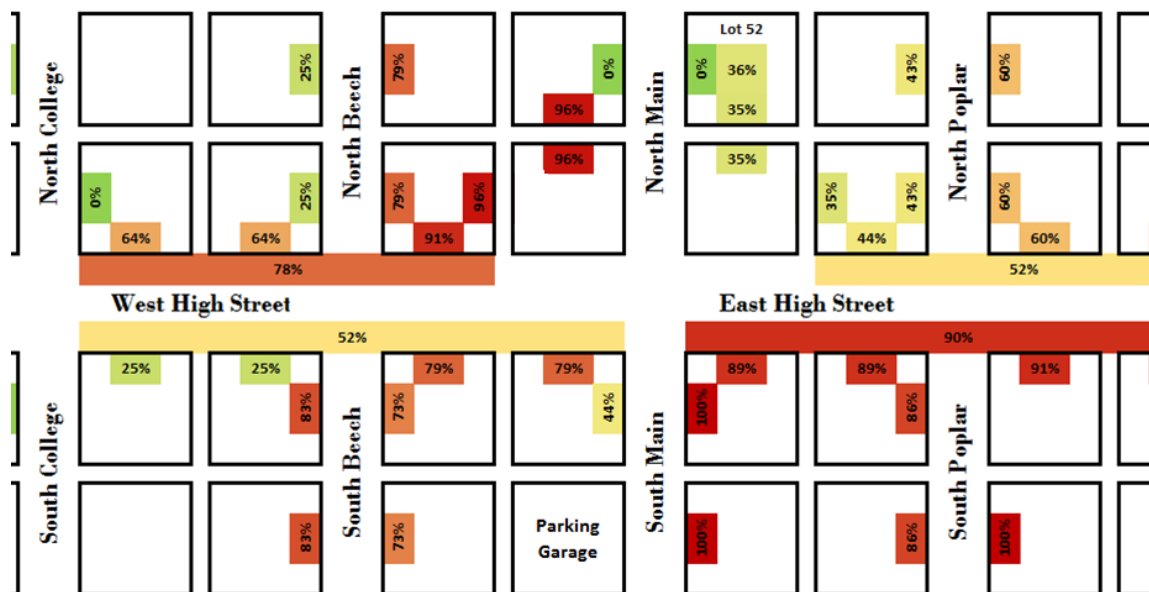


Figure E.3: Example of Heat Map of occupancy for one sampling time (Monday at 1 p.m.) where red signifies high occupancy, yellow moderate occupancy and green low occupancy for each block face. Figure extracted from STA 475 class presentation to client in spring 2010.

E.4 Impact and Follow-up

Students presented the results of their data collection and analysis effort to the OPTAB. The board was very impressed with the depth, quality and insight provided by the students, and mentioned that these data would be relevant for setting parking meter rates that might include differential rates for underutilized spaces.

The OPTAB members also commented that the level of work displayed by the students may have exceeded the value of a previous report that cost over \$20,000 to conduct. The students were flabbergasted and made to understand in a new way the value of their work.

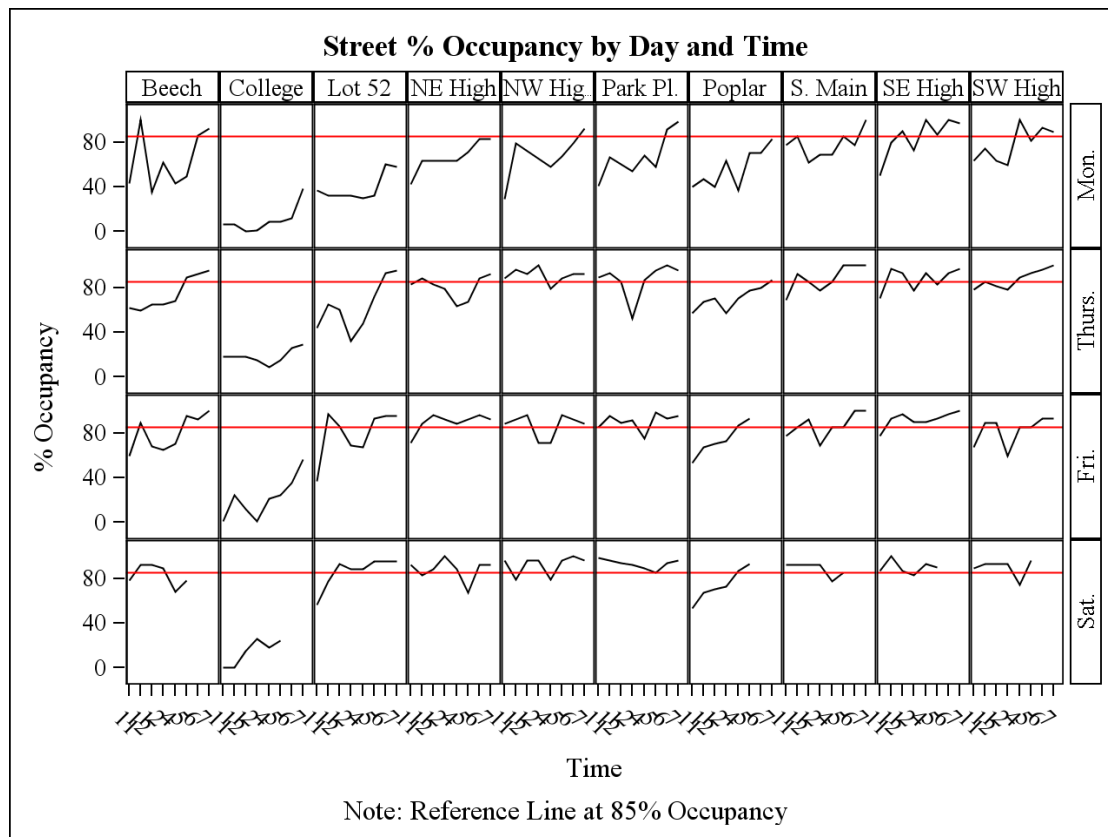


Figure E.4: Occupancy of block face over time on different days for different days (rows) and for different block faces (columns). A horizontal red reference line at 85% occupancy is included in each graph. Figure extracted from STA 475 class presentation to client in spring 2010.

In addition to the experience of working with a local government organization and contributing to information needed to support decision making, the students had to coordinate an extensive data collection effort, process the data into an analysis data set, construct displays and summaries to give insight and develop a presentation and report that represented their work. The students did an outstanding job and were praised accordingly by the client. The comment about the cost of previous parking studies led to an interesting class exercise in which the students developed a cost estimate of how much billable work was reflected in the analysis, and what they would charge if they did performed the work as part of a consulting company. Building in a project budget for future classes has become more common as a consequence of the experience with this project.