Sonic Drive-In

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Introduction

Sonic Drive-In

- Founded in 1953 by Troy Smith
- Drive-in style fast food restaurant with carhop delivery

Purpose

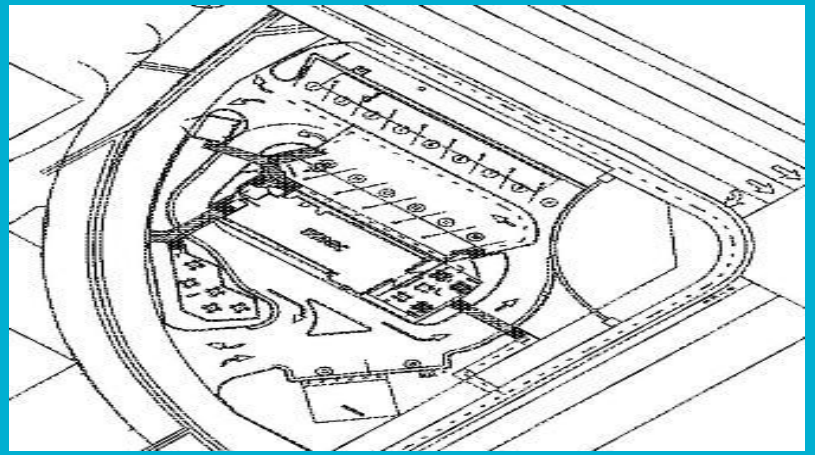
- Use simulations to determine the efficiency of using carhop delivery

Assumptions

- 8 Hour Shift from time (10 am - 5 pm)
- Only one Sonic Restaurant
- Cars that would show up per hour on a Saturday
- Customers are equally likely to park in any spot
- Exact amount of steps to reach each parking space

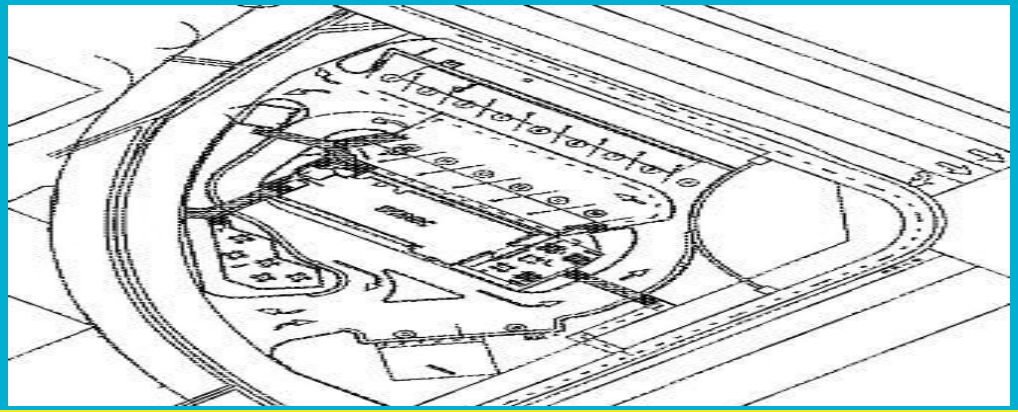
PS	1	2	3	4	5	6	7	8	9	10	11	12
S	5	10	15	20	30	20	24	29	35	38	53	60

Time	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM
Vistits	4	5	8	10	8	6	5	7



Simulation Design

- Assigned number to each parking space
- Used RANDBETWEEN() to assign which parking space a car occupies
- Used IF() to check the parking spot number and assigned a number to the cell, equal to the amount of steps it takes to reach the parking space
- Took mean of 10 distinct totals across 10 different trials, and used normal distribution to represent data



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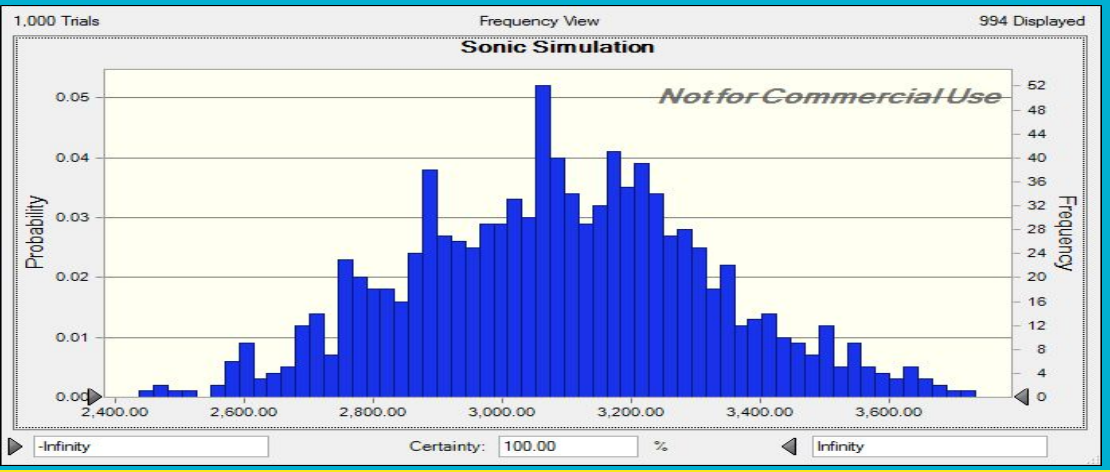
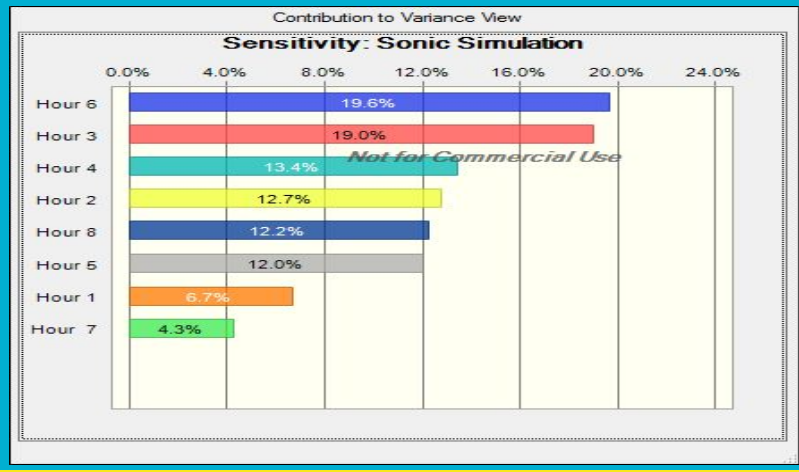
Findings

- Highest average amount of steps taken is: 3,085 with a Max of 3,900 steps and a Minimum of 2,356 steps
- Hour 6 (3 PM) had employees taking the most steps (Highly Volatile)
- Small Standard Deviation of 239 steps
- Statistics remain somewhat similar when the simulation is run multiple times





Chi Square Goodness of Fit Test

- Used to see if the sample data represents the distribution of a certain population
  - Can use the test on the data we collected at the Sonic restaurant
- First Parameter
  - Observed range
    - Range we observed
    - Average number of steps taken in an hour
      - 27.833
      - Multiply number by customers in hour to get number of steps each hour

Hour	1	2	3	4	5	6	7	8
AVG Steps observed	111.333	167	222.667	306.167	222.67	167	139.167	194.833

Chi Square Goodness of Fit Test

Hour	1	2	3	4	5	6	7	8
AVG Steps expected	116.6	167.5	223.9	268.6	232.2	172.7	157.9	200.3

- Second Parameter
  - Expected Range
    - Range we got
    - Add the average steps at each trial per hour and divide by ten
- Returned 0.32
- What does this mean?
  - P value of > 0.1 is considered not significant
  - 0.1 < 0.32
  - Fail to reject the null hypothesis
  - Simulation failed to properly represent Sonic average employee steps

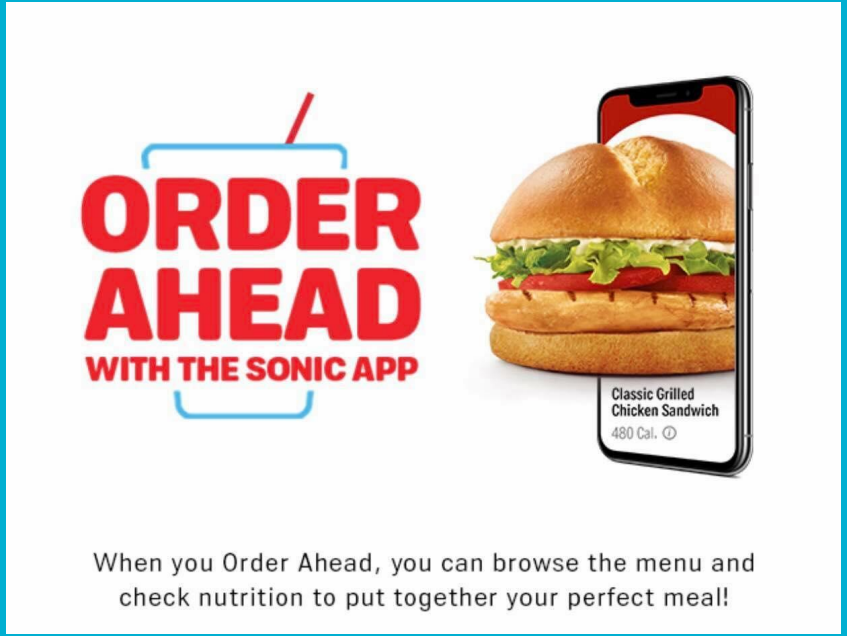
$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Chi Square Goodness of Fit Test

- Why?
  - Number of variables that can cause this
    - Initial observed steps could have not been perfect representation of average steps taken
    - Number of steps taken is different between people
    - Shoe sizes among people differ
    - Time restriction played role in gather other useful data
    - Data was not completely accurate

Solution 1: Order Ahead App

- Encourage more customers to use Order Ahead App
  - Reduces steps and saves time
  - Pay in advance so it saves one trip to the car for servers
  - Food is delivered to them when they are parked
- Have designated parking spots for customers who use the app so that it is closer to the food exit which reduces steps and time.

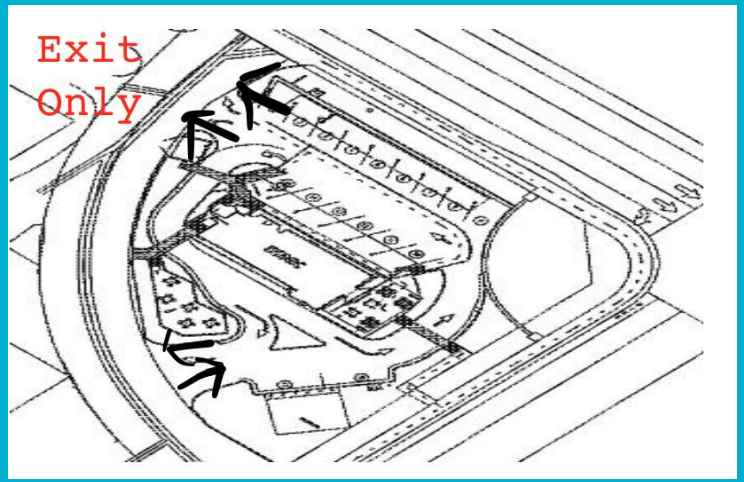


Solution 2: Cone Placement

- During downtime hours, simply put cones in faraway parking spots to prevent cars from parking
- Does not require extensive employee training and does not disrupt workflow
- Cheap Solution
- Makes potentially expensive expansion obsolete

Solution 3: Exit Only

- Physical layout of Sonic can be changed to help reduce average number of steps taken
- Two entrances and two exits
  - People park in closest spot when they pull in
- Remove further entrance and change it to exit only
  - Force customers to park closer to the physical store
  - Employees have to take fewer steps to get to cars
  - Restricts where customers can park without actually restricting their choice



Conclusion