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## INTRODUCTION

For our senior design project, we wanted to look at something many people use daily. The complex nature behind vending machines and their locations are often overlooked. We use it often to quench our thirst for a fizzy drink, or even a cold bottle of water, sometimes we use it to satisfy our appetite. We often walk a few feet or a couple yards to get to it. We are going to look at optimizing the placement of vending machines across the Kennesaw State University Marietta campus.

This is something many students use daily, and depending on location, students may have to walk in the rain or a great distance to get to one. We plan to fix this problem, all while also increasing the profit the school makes from these machines. By placing them in higher foot traffic areas and areas with faster arrival times, we can conclude that the profitability will increase. We also will optimize the vendor route to refill the machines.

## PROBLEM-SOLVING APPROACH

To determine viable locations to place vending machines across Kennesaw State University Marietta Campus, we plan to collect data on the number of people walking past each vending machine and counting the amount of people that make a purchase.

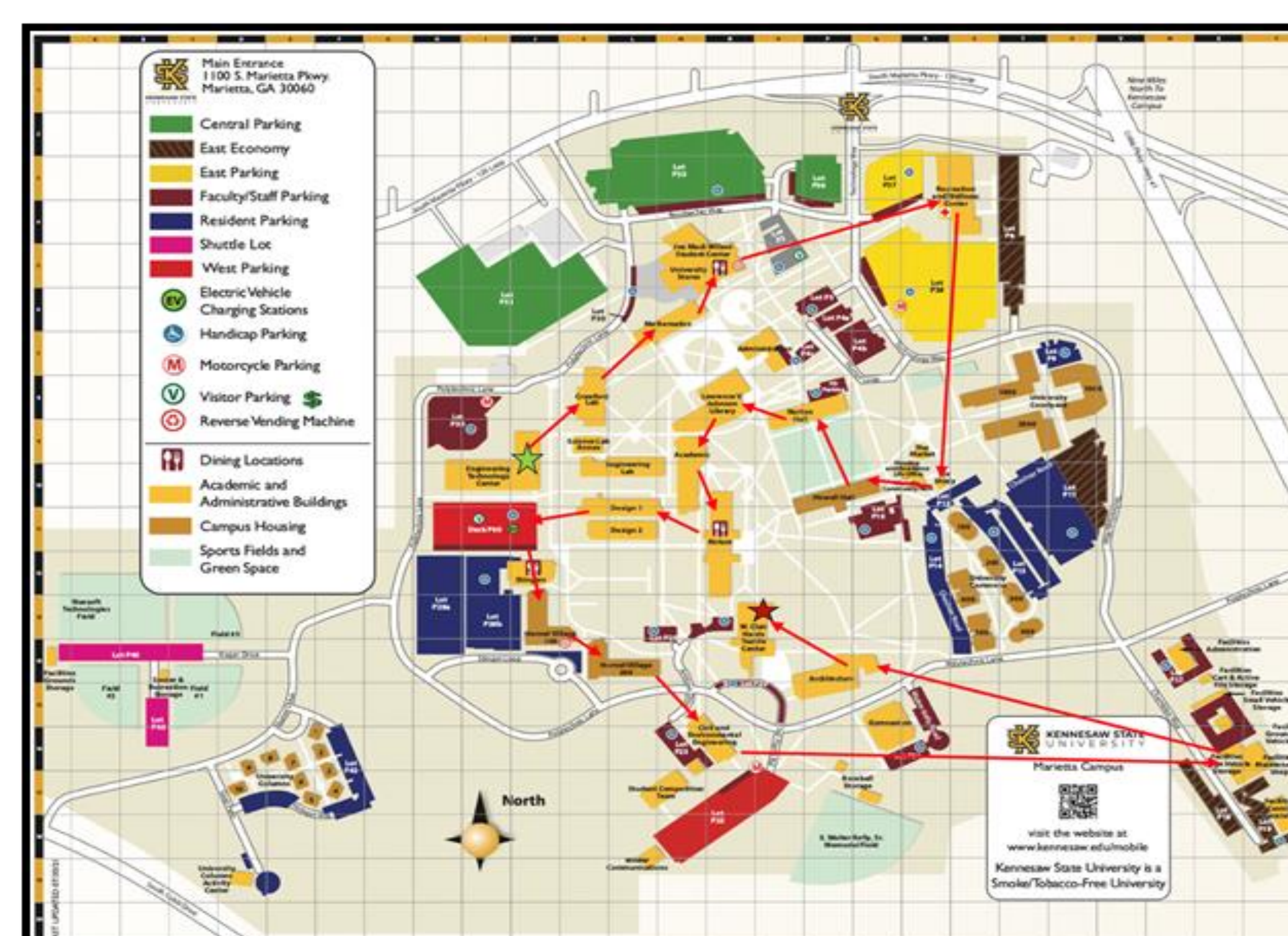
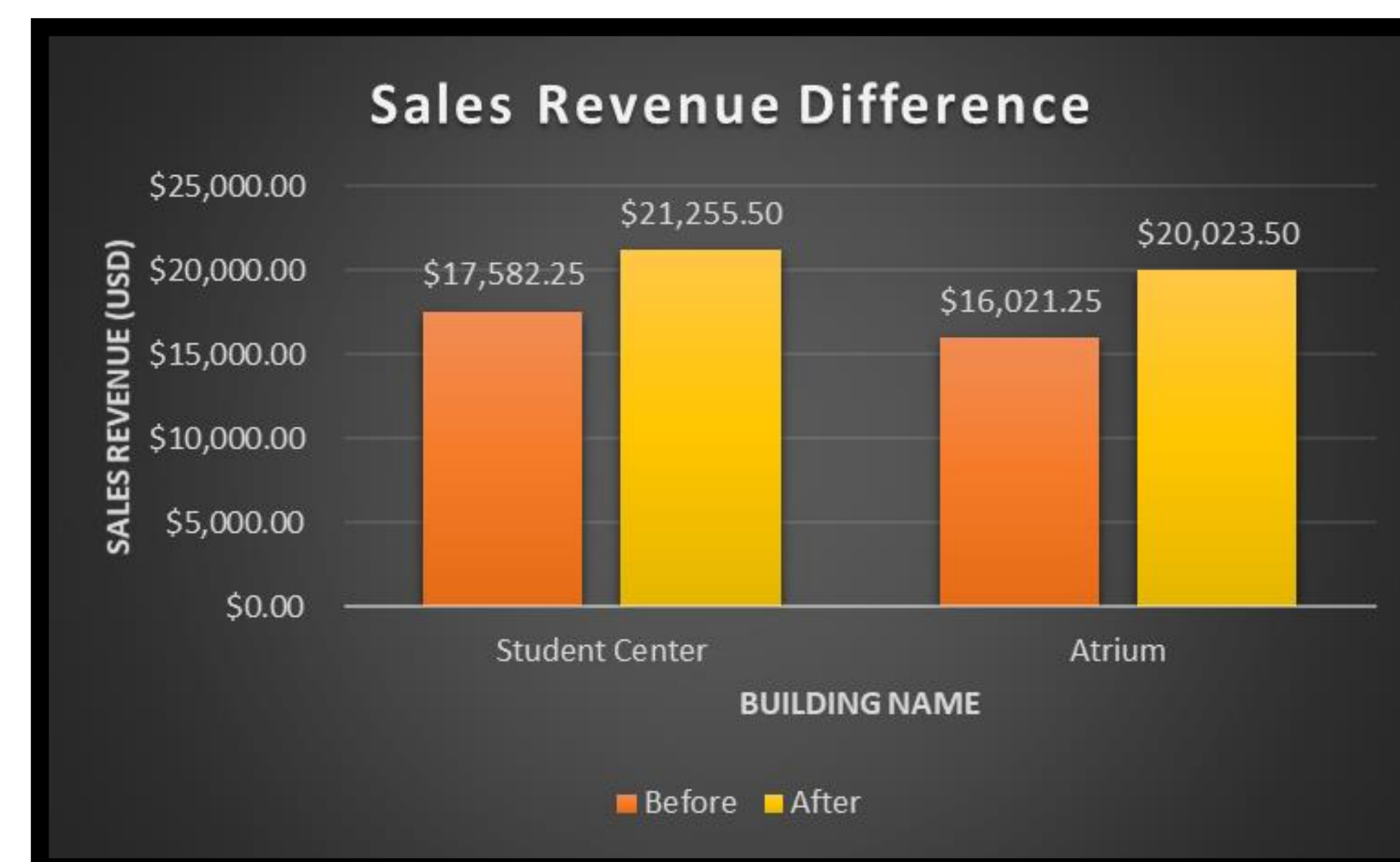
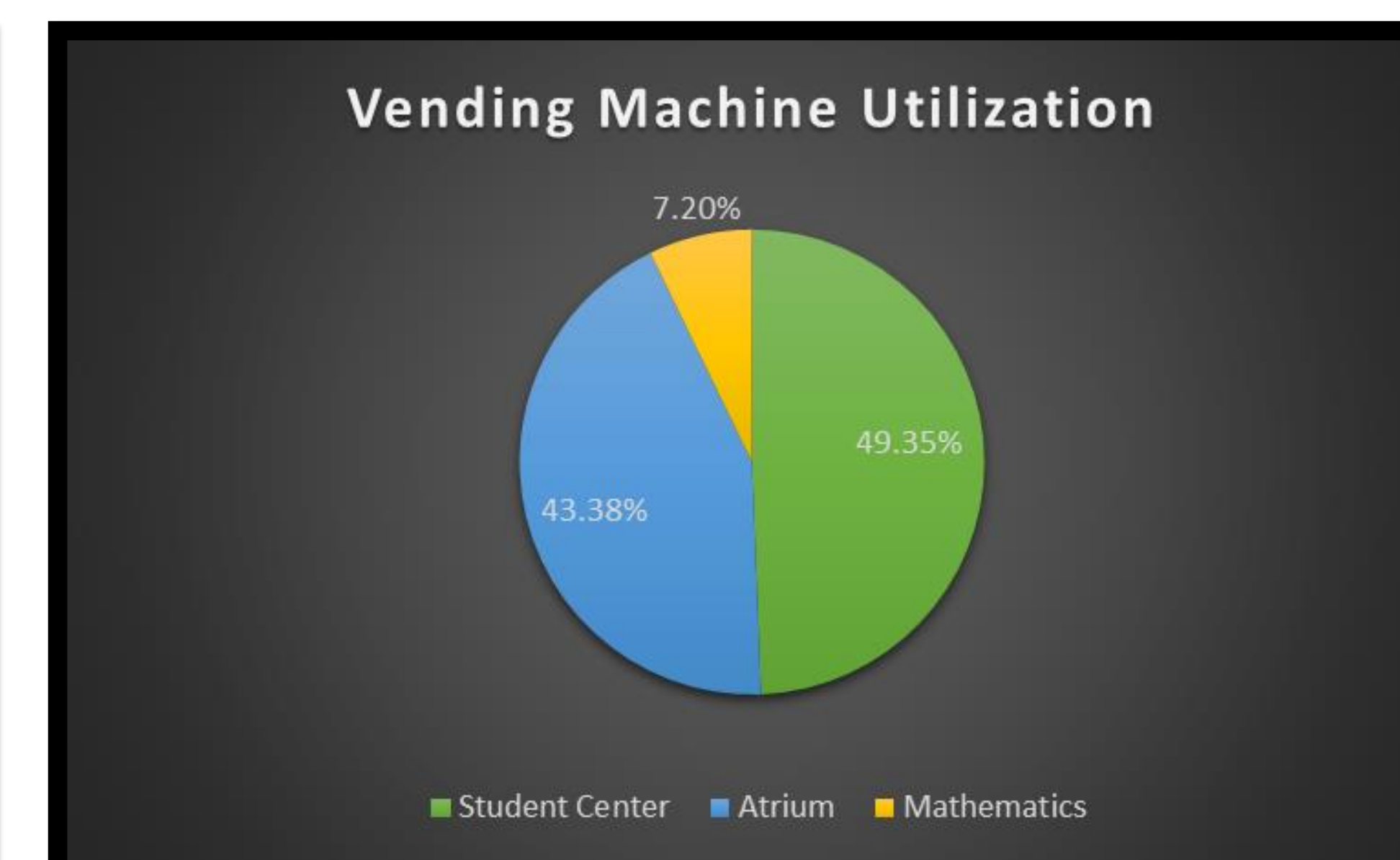
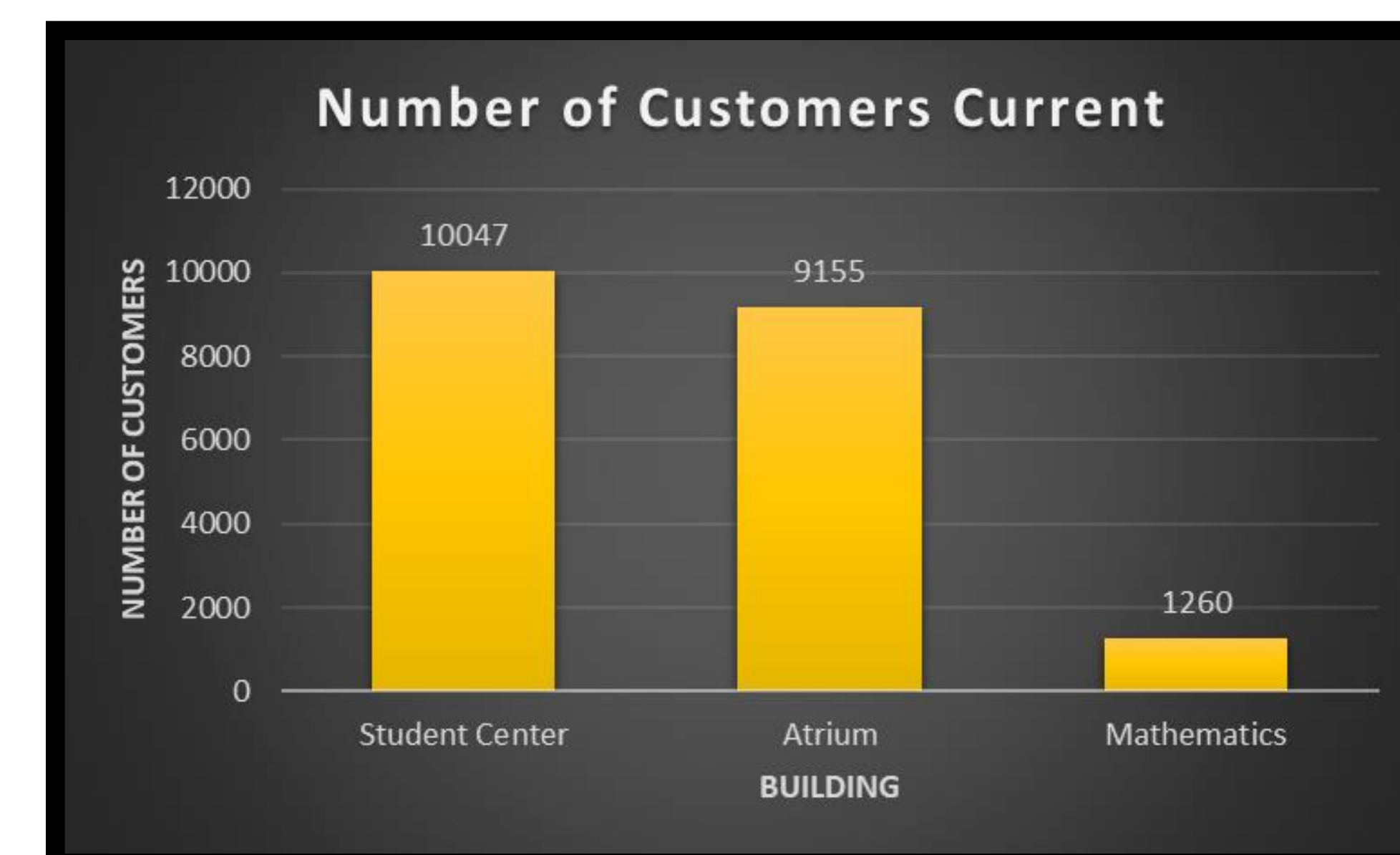
We will then scope out new locations and determine if the foot traffic is higher or lower. This will allow us to determine if the new location will provide more transactions based on foot traffic. We will then take this data and create a simulation in Arena software which will also allow us to analyze various locations and scenarios based on foot traffic and purchases, to determine if the new location will yield a higher profit.

This will also allow us to see if vending machines will need to be moved to new locations or if they need to stay where they are depending on the expected revenue and machine utilization rate. Our project also will be able to optimize the delivery route and provide faster route for the vendor to restock the machines using IOR tutorial.

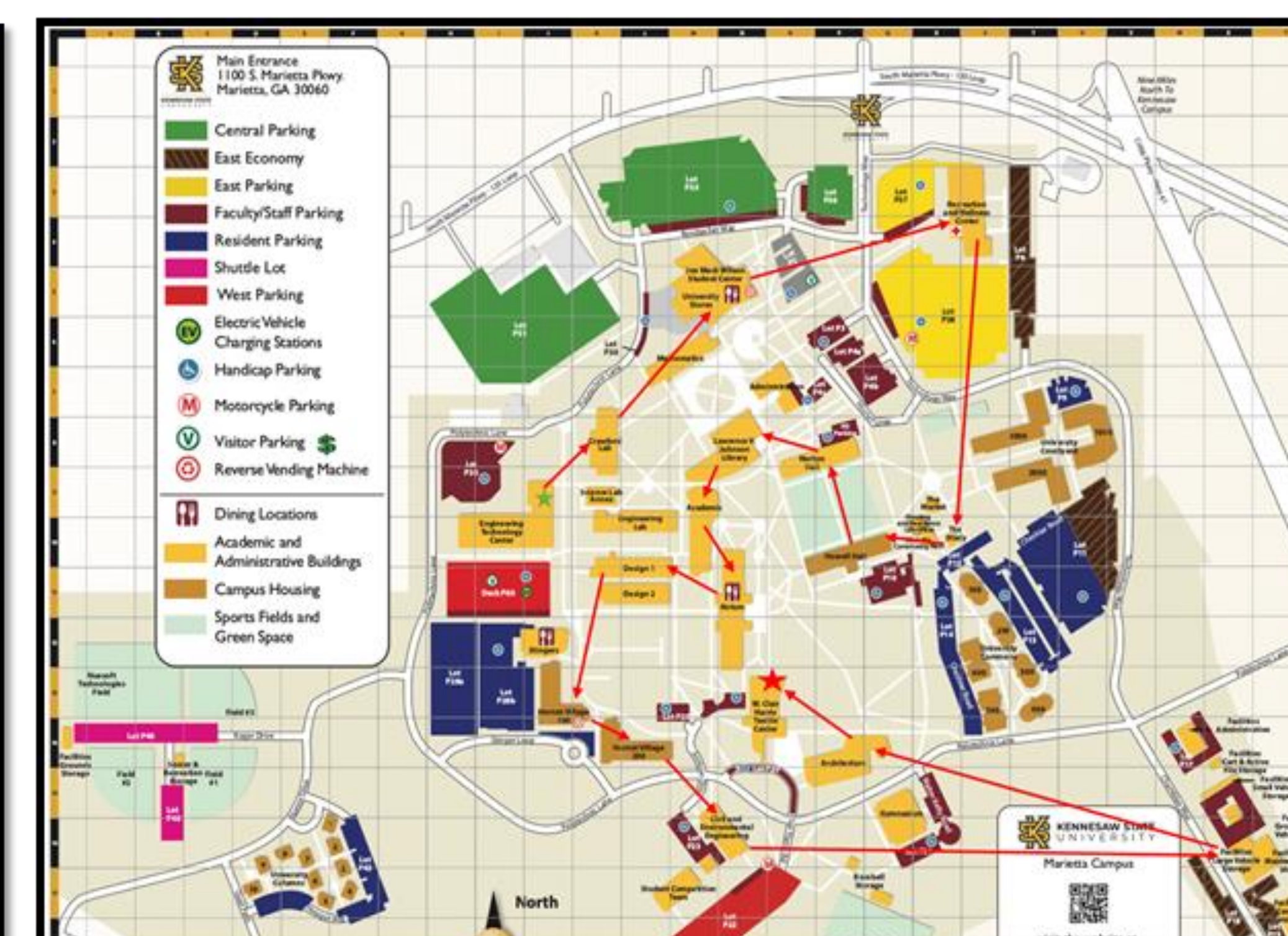
## SURVEYS

- We conducted 100 surveys to collect data on the vending machines
- We used survey questions to determine high foot traffic areas
- The areas selected were the Top 2 and Bottom 2 from survey results
- Student Center
- Atrium Building
- West Parking Deck
- Mathematics Building

S	Scenario Properties			Controls		Responses					
	Name	Program File	Reps	Vending Machine SC	Vending Machine Atrium	Number of Customers Atrium	Number of Customers Student Center	Sales Revenue Atrium	Sales Revenue Student Center	Student Center AVG.Total Service Time	Atrium AVG.Total Service Time
1	Current	48 : Vending	1	4	2	9155	10047	16021.25	17582.25	44.36	36.30
2	Scenario 1	48 : Vending	1	5	5	11348	12118	19859.00	21206.50	53.08	45.05
3	Scenario 2	48 : Vending	1	6	4	11442	12146	20023.50	21255.50	53.51	44.75
4	Scenario 3	48 : Vending	1	7	3	11271	12163	19724.25	21285.25	53.40	44.61
5	Scenario 4	48 : Vending	1	8	2	11282	12042	19743.50	21073.50	53.10	45.21
6	Scenario 5	48 : Vending	1	4	6	11352	12101	19866.00	21176.75	53.08	44.93



Original Delivery Route 4490m



New Optimized Delivery Route 4050m

## RESULTS

- Based on our analysis, we concluded that the vending machines from the West Parking Deck and the Mathematics building needed to be relocated
- A total of 4 Coca-Cola vending machines needed to be relocated
- Process Analyzer showed us that the optimal placement would be to add 2 into the Student Center and 2 into the atrium for maximum increase in sales revenue
- The sales revenue for the student center increased by \$3,673.25.
- The sales revenue for the Atrium building increased by \$4,002.25
- The grand total of sales revenue increased for both buildings is \$7,675.50.
- The total distance traveled to restock all the vending machines on campus decreased from 4,490 meters to 4,050 meters. We saved 440 meters in walking distance.

## REQUIREMENTS MET

- Will relocate a vending machine if the current locations utilization of the vending machine is below 20%
- The optimized delivery route for the new locations shall have a total walking distance of <=4200 meters
- Vending machines are moved to a new location within a building shall not increase the customer service time by more than 10s

## CONCLUSION

- We successfully determined viable locations to relocate vending machines that were providing little to no sales revenue.
- Using surveys, we were able to pinpoint and focus on the top two buildings on campus that have the highest foot traffic, and the bottom 2 with the lowest.
- Determine that the west parking deck and the mathematics building were not generating significant sales revenue
- Using process analyzer, we were able to see that relocating the vending machines would increase the sales revenue over \$7,000.
- We were also able to stay within our requirement of not increasing to total average service time by more than 10s.
- We were also able to determine the optimal path the vendor should take, when delivering to the campus, now that two locations would be removed.
- Using IOR, we produced a new optimized delivery route saving 440 meters in walking distance.