KENNESAW STATE
UNIVERSITY

Delivery Route Optimization

Team Drive Fast

Adam Esasky
Mark Iltsenko
Matthew Tharakan
Sean Jones

Overview

- For the sake of the company's business, their official name and their clients will not be listed or called out, specifically in this report. The company will be referenced as the "Carrier Company" and the clients will be numbered accordingly to allow for distinguishment in the results section.
- The Carrier Company is a delivery service that caters to motorcycle body shops, repair shops, and retailers where they deliver parts and products associated with all types of motorcycle manufacturers across the country.
- The main scope of work for the Carrier Company is to take products and parts from a manufacturer/distribution center and deliver those items to clients on a bi-daily basis.
- The company is conducted of multiple drivers who handle routes that encompass locations across the nation.

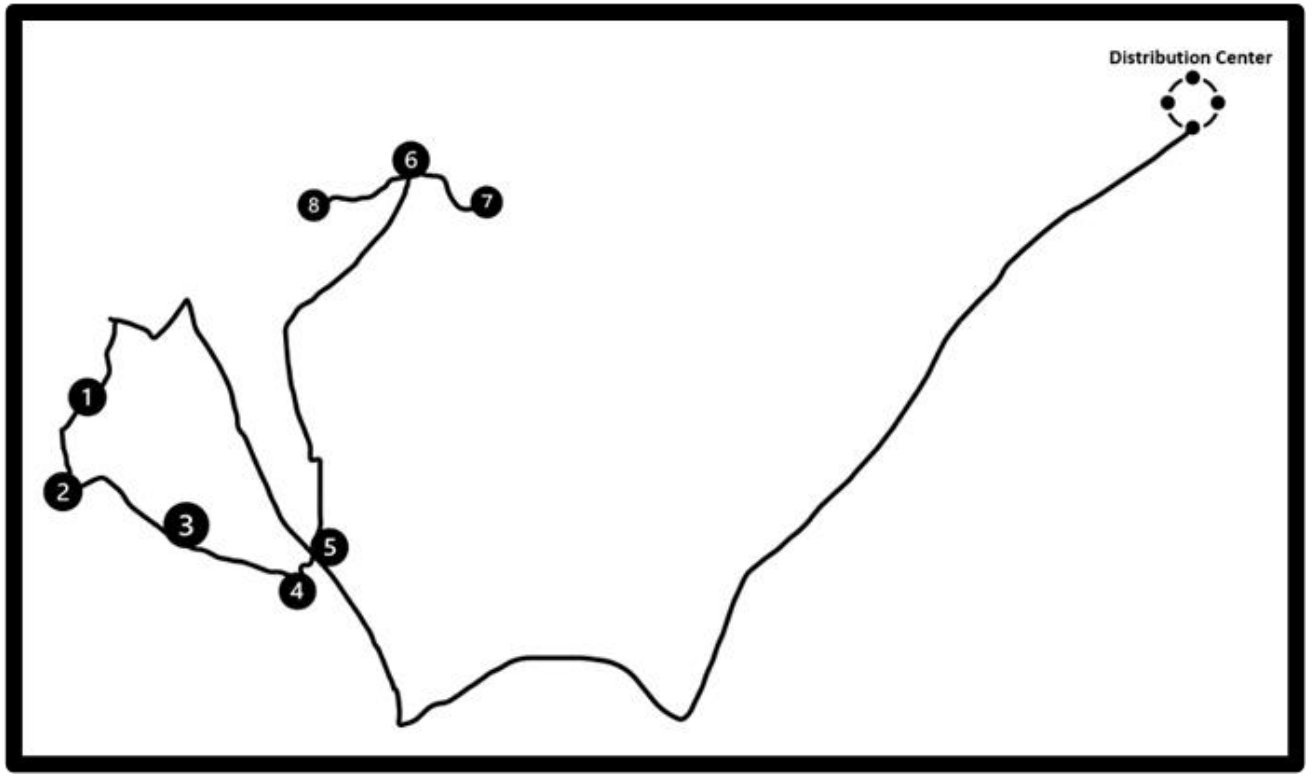
KENNESAW STATE UNIVERSITY

Current Delivery Method

- The Carrier Company does not have a specified and laid out plan as to how they deliver products to their clients. The current method involves a driver typing in the address of the client into a map search engine and then traveling to that location.
- Once the driver arrives at the first stop, the driver then maps out the next delivery location and continues the same process until all of the products are delivered to their respected locations.

KENNESAW STATE UNIVERSITY

Current Delivery Route



Delivery route method before implementing program

KENNESAW STATE UNIVERSITY

Objective

- The objective of this project is to design and implement a program that will optimize the route that drivers take to deliver their parts and products to their corresponding clients. By improving and optimizing the route, the total cost to deliver an item should be lowered and the time it takes to deliver an item should also be decreased. A decrease in time equates to a decrease in company spending.

KENNESAW STATE UNIVERSITY

Requirements

- Microsoft Excel with Solver Add-In
- Computer, tablet, or phone to run the program on
- Ability to select route options from a “List Feature”

KENNESAW STATE UNIVERSITY

Verification Approach

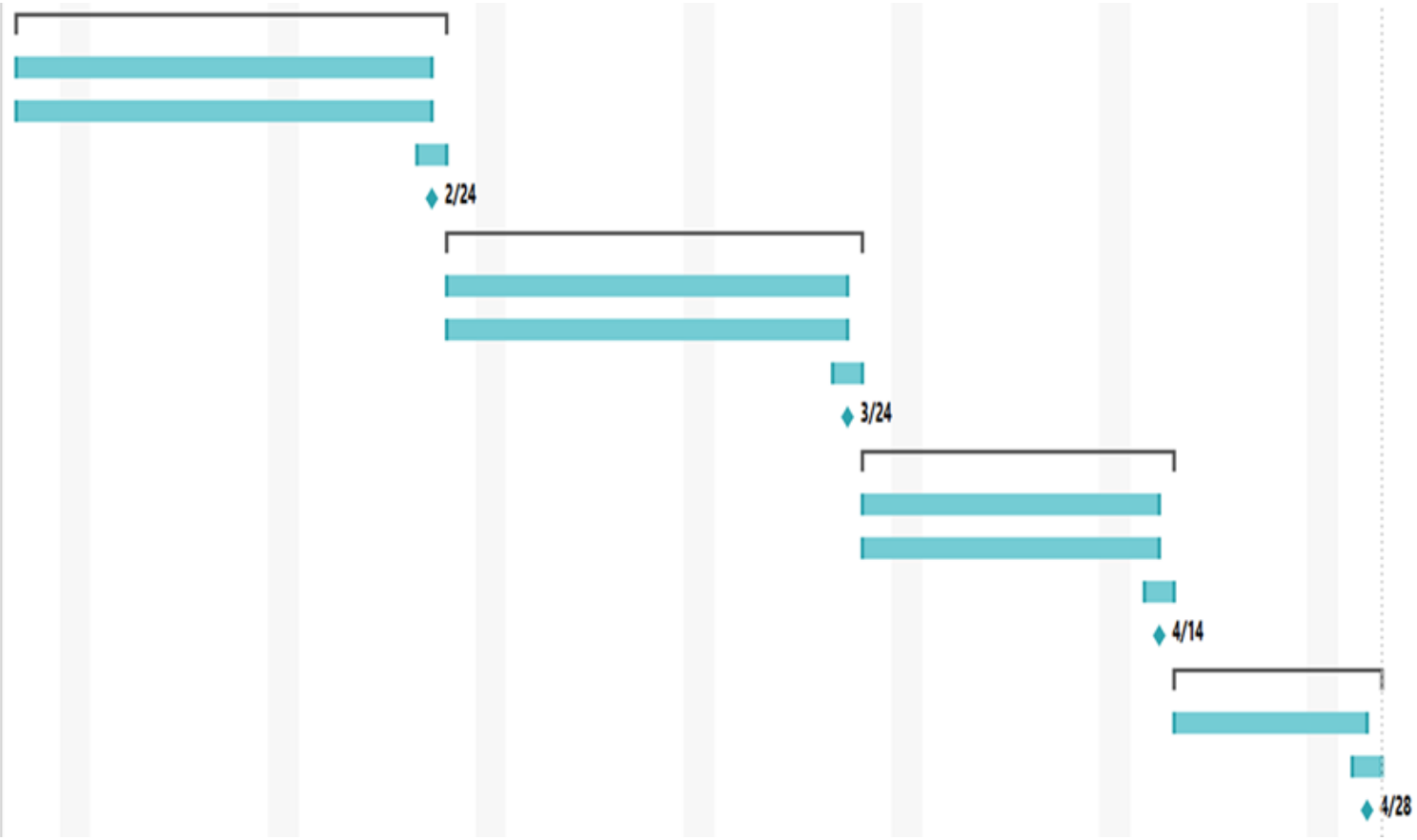
SEE IF OPTIMIZED ROUTE WAS MORE EFFICIENT THAN PREVIOUS METHODS

RUN AN ECONOMIC ANALYSIS TO SEE IF THE NEW PROGRAM SAVES THE COMPANY MONEY

KENNESAW STATE UNIVERSITY

Ghantt Chart & Schedule

1	PDR	21 days	Wed 1/27/21	Wed 2/24/21
1.1	Work on PDR	20 days	Wed 1/27/21	Tue 2/23/21
1.2	Collect Data	20 days	Wed 1/27/21	Tue 2/23/21
1.3	Prepare PDR Presentation	2 days	Tue 2/23/21	Wed 2/24/21
1.4	PDR Due	0 days	Wed 2/24/21	Wed 2/24/21
2	IPR	20 days	Thu 2/25/21	Wed 3/24/21
2.1	Work on IPR	19 days	Thu 2/25/21	Tue 3/23/21
2.2	Data Analysis	19 days	Thu 2/25/21	Tue 3/23/21
2.3	Prepare IPR Presentation	2 days	Tue 3/23/21	Wed 3/24/21
2.4	IPR Due	0 days	Wed 3/24/21	Wed 3/24/21
3	CDR	15 days	Thu 3/25/21	Wed 4/14/21
3.1	Work on CDR	14 days	Thu 3/25/21	Tue 4/13/21
3.2	Verify Results	14 days	Thu 3/25/21	Tue 4/13/21
3.3	Prepare CDR Presentation	2 days	Tue 4/13/21	Wed 4/14/21
3.4	CDR Due	0 days	Wed 4/14/21	Wed 4/14/21
4	FDR	10 days	Thu 4/15/21	Wed 4/28/21
4.1	Work on FDR	9 days	Thu 4/15/21	Tue 4/27/21
4.2	Perpare PDR Presentation	2 days	Tue 4/27/21	Wed 4/28/21
4.3	FDR Due	0 days	Wed 4/28/21	Wed 4/28/21



Budget

Software Expenses		**Rate**
1 year Microsoft home and office subscription		$100
Labor charges (Hourly rate $100)	Hours	**Rate per Hour**
Research	14/14	$1,400/$1,400
Analysis	9/9	$900/$900
Development	7/7	$700/$700
Testing	10/10	$1,000/$1,000
Data Collection	5/5	$500/$500
	TOTAL	**TOTAL**
	45/45	**$4,600/$4,600**

KENNESAW STATE UNIVERSITY

Resources Used

- Microsoft Excel (Solver Add-In)
- Google Maps
- The “Carrier Company” Employees
- YouTube

KENNESAW STATE UNIVERSITY

Minimum Success Criteria

- A working program that computes logical results
- A complete economic analysis
- A sensitivity analysis

KENNESAW STATE UNIVERSITY

Design Solutions

- ***VRP*** *(Vehicle Routing Problem)*
  - Multiple trucks delivering to a set of stops
- ***TDP*** *(Truck Dispatching Problem)*
  - Trucks make deliveries based on who is closest to delivery stop
- ***TSP*** *(Traveling Salesman Problem)*
  - One truck delivers to multiple stops on a route

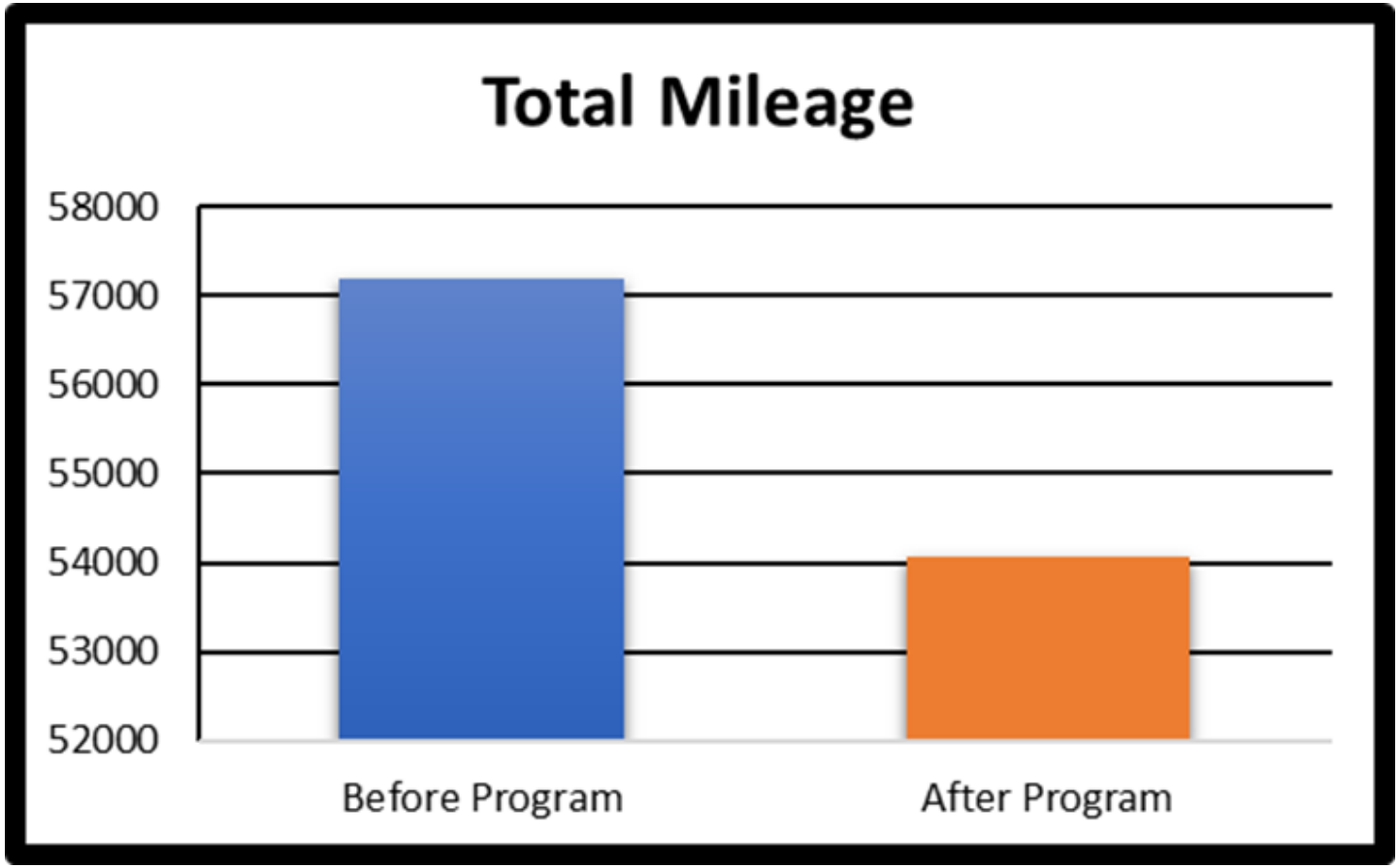
KENNESAW STATE UNIVERSITY

Sensitivity Analysis

- After running the test through all three routing options the results showed that the optimal delivery order did not change depending on external factors.

		Travel Order								
Option	1	6	5	4	3	2	9	8	7	1
1	Time in Min:	45	14	8	6	8	18	9	11	47
		Travel Order								
Option	1	6	5	4	3	2	9	8	7	1
2	Time in Min:	54	14	8	6	8	18	9	11	49
		Travel Order								
Option	1	6	5	4	3	2	9	8	7	1
3	Time in Min:	55	14	8	6	8	18	9	11	53

Mileage Difference

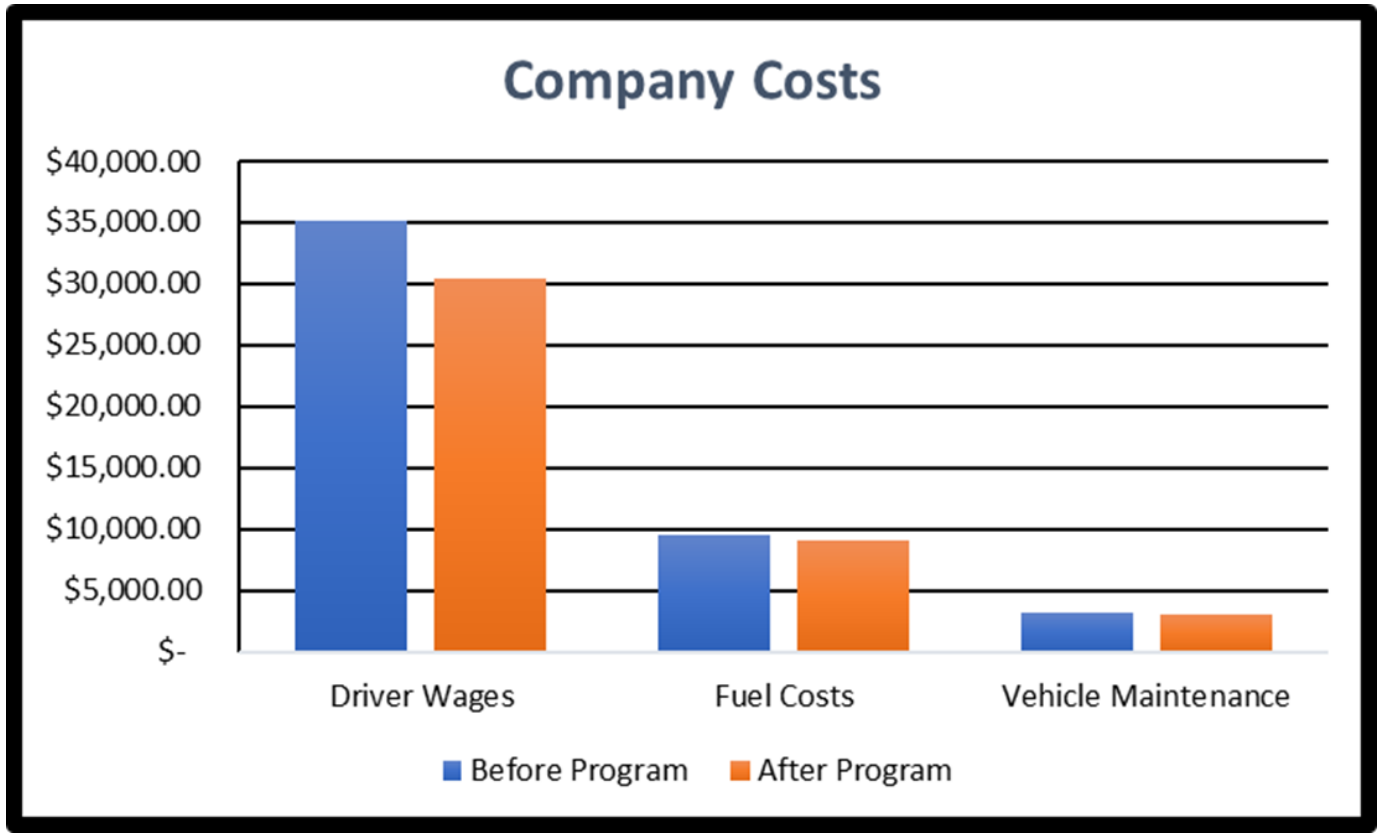


Difference

3,120 miles

KENNESAW STATE UNIVERSITY

Company Cost Breakdown

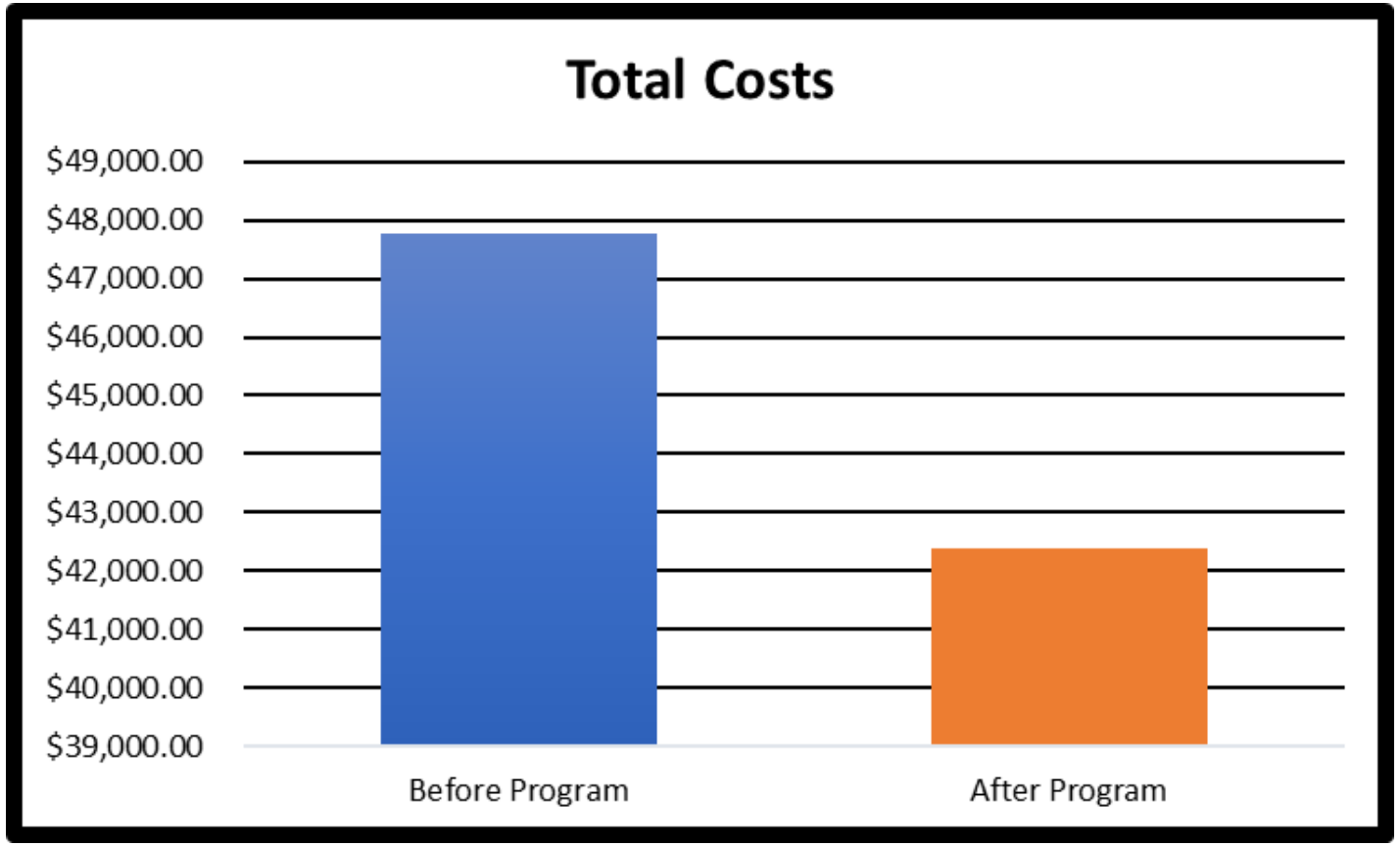


Savings

- **Driver Wages** – $4,701
- **Fuel Costs** – $504
- **Vehicle Maintenance** - $172

KENNESAW STATE UNIVERSITY

Total Costs



The total annual saving from this route alone is over $5,000 and if the program was to be implemented into the remaining 38 routes, then the company could expect to see over $200,000 in total annual savings

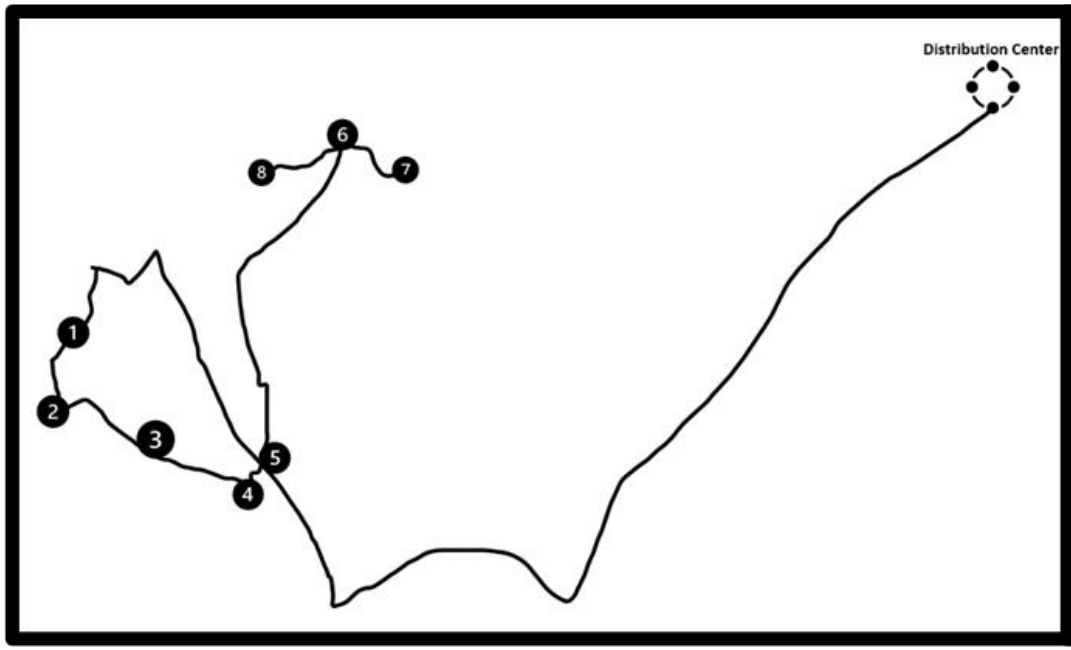
KENNESAW STATE UNIVERSITY

Results

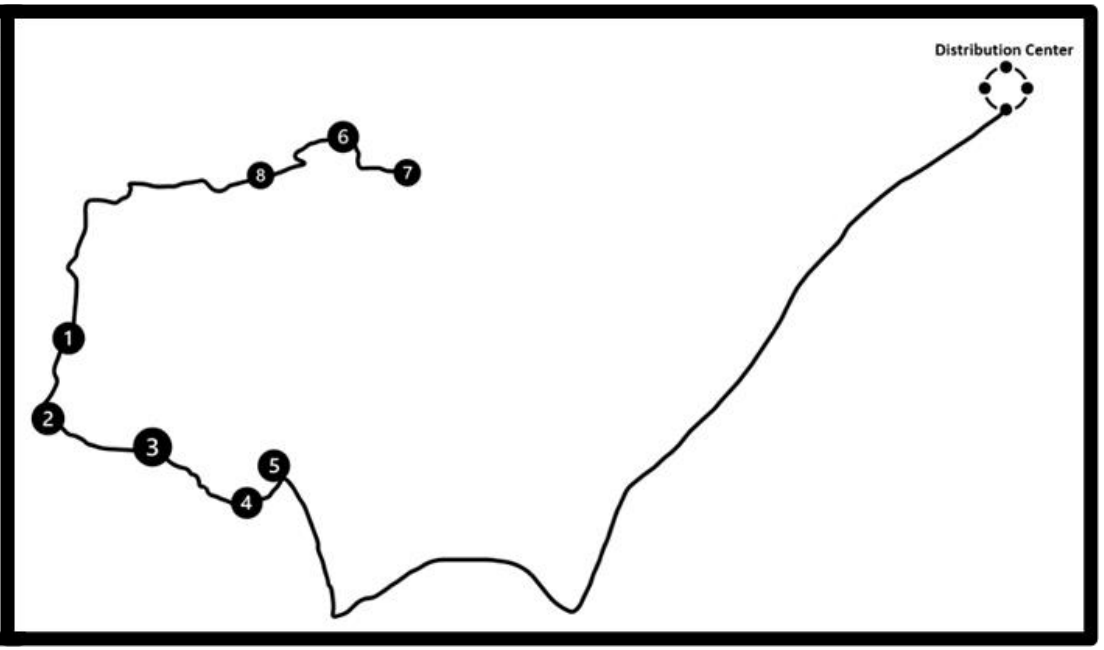
Optimal Route Order

Distribution Center	5	4	3	2	1	8	7	6	Distribution Center

Before Program



After Program



Conclusion/Recommendations

- Our recommendation to the Carrier Company would be to implement the new optimized program into the remaining routes.
- Not only does the optimized program compute the fastest route for the drivers but it also delivers alternative route options that take into account traffic, road construction, natural disaster, and any other emergencies that would result in delivery time delays. The total time saved on delivering products will cut costs on driver payouts, vehicle maintenance, and loss of clients.
- By delivering products to their clients quicker, the Carrier Company will not only be saving themselves money on delivery costs but will also be ensuring the satisfaction of their clients.

KENNESAW STATE UNIVERSITY

KENNESAW STATE
UNIVERSITY

Thank You

Any Questions?

KENNESAW STATE
UNIVERSITY