UW HFS Bay Laurel Catering Transportation Fleet Optimization

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BACKGROUND

INTRODUCTION

The University of Washington Housing and Food Services (UW HFS) and Bay Laurel Catering (BLC) are responsible for two main catering processes:

1) Grab-N-Go Catering Around Campus
- Caters to 15 campus-wide locations
- Occurs Mon - Fri (full & semi-full route), and Sat (small route)
- Multiple standard runs made per full and semi-full route
- Products should be kept in appropriate temperature upon delivery
- Uses 1 Dodge Sprinter vehicle and worked by 1 student and 1 truck driver

2) Daily Catering Events
- Start as early as 5:30 AM to as late as 9:30 PM
- Events are spontaneous, vary by time, type, size, and location
- Uses a fleet of 7 vehicles to transport people and catering items
  - 5 Isuzu Box Trucks with lift gates
  - 1 Ford Transit with lift gate
  - 1 Dodge Sprinter with no lift gate (same truck as Grab-N-Go)
- 9 different types of events - Alcohol, Breakfast, Breaks, Box Lunches, Coffee Breaks, Dinner, Lunch, Miscellaneous, and Reception.

Goal: develop solutions to evaluate and improve their fleet of vehicles in terms of Grab-N-Go process and daily catering process to cater to their future growth.

$9 Million Business | **Grab-N-Go & 5,400 Annual Catering Events** | **Fleet = 7 Trucks** | **10% Annual Growth**

METHODOLOGY

GRAB-N-GO

1. Data Collection	• Interviews with BLC staff and leadership to understand current daily routes, timing, and labor cost data. • Obtain travel times from Google Maps
2. Base Model Design & Verification	• Build current state model using Simio • Model verification and validation interviews with BLC staff and leadership • Ride-alongs to verify routes & timings.
3. Test Suggested Improvements using Simio	• Addition of refrigeration to vehicle • Remove accompanying student worker on Grab-n-Go runs
4. Cost-Benefit Analysis	• Gather and evaluate cost, timing, and vehicle utilization data from Improvement Simo models using Simio Experiments to determine if changes are feasible.

CATERING

1. Data Collection	• Collect relevant event information from BLC's Banquet Event Orders (BEO) and their Grand Catering Schedule • Obtain travel times from Google Maps.
2. Base Model Design & Verification	• Build current state model using Simio • Validate base model's metrics with BLC's historical data • Model verification and validation interviews with BLC staff and leadership
3. Test Suggested Improvements using Simio	• Addition of truck(s) to the current fleet • Subtraction of truck(s) from the current fleet
4. Cost-Benefit Analysis	• Gather and evaluate profit, cost, event volume, and vehicle utilization data from the Improvement Simio models using Simio Experiments to determine if changes are feasible. • Use OptQuest to determine fleet capacity.

GRAB-N-GO

OBJECTIVE

An analysis of the current state and suggested improvements of the Grab-N-Go delivery vehicle, delivery route, and surrounding processes. Specific goals include **reducing labor costs, evaluating the effect of adding refrigeration to the delivery vehicle, and maintaining a high level of quality and service for Bay Laurel's customers.**

CURRENT STATE

3 Base Simio Models:
- **Mon, Wed, Thurs Base Model:** Replicates the four runs of BLC's Grab-N-Go full route. *(See Figure 1)*
- **Tues, Fri Base Model:** Replicates the three runs of BLC's Grab-N-Go semi-full route.
- **Sat Base Model:** Replicate the one run of BLC's Grab-N-Go small route.
- After each run, the vehicle returns to BLC's base at Haggett Hall to reload for the next run. This is to prevent the food inside the vehicle from reaching unacceptable temperatures.

Model Assumptions:
- Uses the same Dodge Sprinter vehicle with no refrigeration and no lift gate for delivery.
- The route remains the same every week.
- Students are present 95% of the time, and absent 5% of the time.

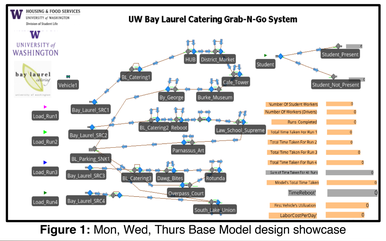

Figure 1: Mon, Wed, Thurs Base Model design showcase

Base Model Results & Validation:

	Base Model	Real World
Total Time Taken (Full Route)	5 Hrs 9 Mins	5 Hrs 15 Mins
Total Time Taken (Semi-Full Route)	4 Hrs 4 Mins	4 Hrs 10 Mins
Total Time Taken (Small Route)	55.52 Mins	1 Hour
Yearly Labor Cost	$39,744.96	$40,928.00
Average Vehicle Utilization	67.87%	N/A

IMPROVEMENT OPPORTUNITIES

IMPROVEMENT	Pros	Cons
Adding Refrigeration	Reduce multiple runs into a single run Maintain food temperature More profitable in long term	Initial cost is a hefty $40,000 Takes time to break even
Removing Student Worker	Eliminate daily labor cost allocated for additional student worker	Run takes additional 45 mins to complete Induces more stress on driver to complete tasks single-handedly

FINDINGS

Improvement Simio Models:
- Each improvement is modeled by making adjustments to the verified current state Simio model.
- Cost-benefit analysis were conducted to understand the feasibility and effectiveness of these improvements.
- 500 Simio experiment replications were used to obtain the following results.

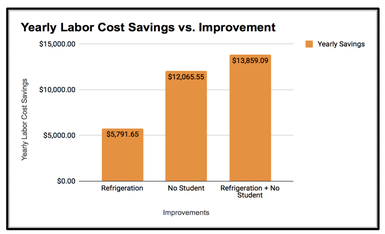

Figure 2: Yearly Labor Cost Savings vs. Improvement

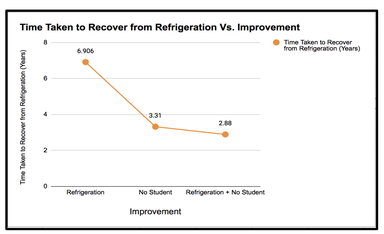

Figure 3: Time Taken to Recover from Refrigeration vs. Improvement

Yearly Labor Cost Savings: *(See Figure 2)*
- With refrigeration installed and no student workers working, BLC can save a yearly $13,859.09 OR 34.87% cost reduction from the current state base model's labor costs

Time To Recover from Refrigeration Costs: *(See Figure 3)*
- BLC can recover refrigeration costs 4 years faster with no student workers working than with students working.

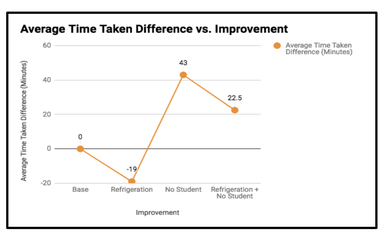

Figure 4: Average Time Taken Difference vs. Improvement

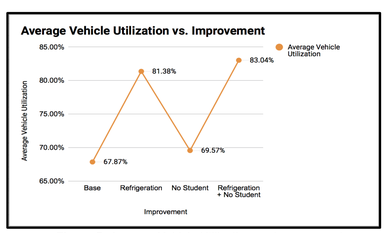

Figure 5: Average Vehicle Utilization vs. Improvement

Average Time Taken Difference: *(See Figure 4)*
- With refrigeration, BLC can decrease total time taken by 19 minutes as compared to the current state base.
- But with no student, it takes BLC an additional 43 minutes to complete the Grab-N-Go tasks.

Average Vehicle Utilization: *(See Figure 5)*
- Under the refrigeration and no student improvement, vehicle utilization increased from 67.87% to 83.04%.

CATERING

OBJECTIVE

An analysis of the current state and suggested improvements of the performance of BLC's catering fleet and its management processes, in terms of fleet utilization rate, labor cost, profit, and total number of events per day. Specific goals include an **exploration of the effects of altering fleet size while catering to the 10% annual business growth**.

CURRENT STATE

Current State Simio Model Design & Assumptions:
- All incoming events use the same catering system that includes a setup, service, and cleanup "stations". *(See Figure 6)*
- Events arrive on random from 5:30 AM to 9:30 PM according to a rate table consisting of daily per-hour rates obtained from historical real world data. *(See Figure 7)*
- Vehicles have daily work schedule that starts from 5:30 AM to 9:30PM or until the last event is worked.
- Take into account labor cost for working events & driving only
- Assume max average fleet utilization at 80%
- Assume no scheduling capabilities and vehicles are reserved until event finishes
- Assume 10% annual growth

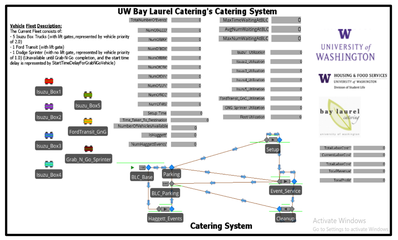

Figure 6: Catering Base Model design showcase

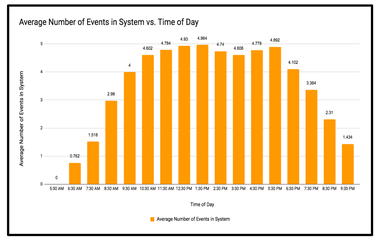

Figure 7: Average number of events in system vs. time of day

IMPROVEMENT OPPORTUNITIES

IMPROVEMENT	Pros	Cons
Removing a Vehicle	Increases utilization of the fleet Saves maintenance, fuel, and insurance costs immediately	Decreases potential geographical range of events Decreases flexibility to raise event volume per day
Adding a Vehicle	Increases potential geographical range of events Potential for larger growth in event volume per day	Increases idle vehicle time during slower business periods Additional annual maintenance, fuel, and insurance costs

FINDINGS

Base Fleet (7 Vehicles):

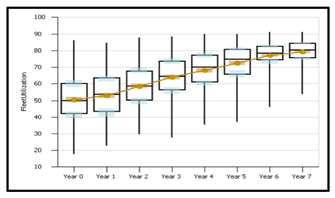

Figure 8: 7-Vehicle Fleet Utilization vs. Yearly Business Growth

Metrics	Current State	Max Potential Growth
Average Fleet Utilization	50.49%	79.31%
Total Events Per Day	18.31 Events	35.46 Events
Total Events Per Year	5601 Events	10,850 Events
Labor Cost Per Year	$463,727.64	$905,528.76
Motorpool Cost Per Year	$36,414.00	$70,960.58
Revenue Per Year	$4,421,231.82	$8,751,718.30
Profit Per Year	$3,921,090.18	$7,775,228.96

Removing a Vehicle (6 Vehicles):

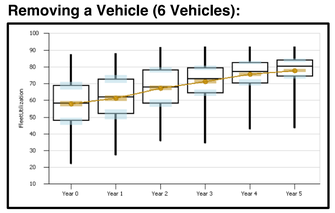

Figure 9: 6-Vehicle Fleet Utilization vs. Yearly Business Growth

Metrics	Current State	Max Potential Growth
Average Fleet Utilization	57.90%	77.82%
Total Events Per Day	18.27 Events	29.13 Events
Total Events Per Year	5589 Events	8912 Events
Labor Cost Per Year	$461,882.06	$736,093.71
Motorpool Cost Per Year	$31,212.00	$50,267.24
Sold Vehicle Revenue	$10,000	N/A
Revenue Per Year	$4,408,027.12	$7,204,268.07
Profit Per Year	$3,933,933.06	$6,417,907.12

Adding a Vehicle (8 Vehicles):

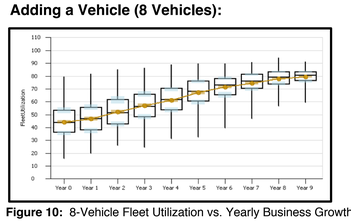

Figure 10: 8-Vehicle Fleet Utilization vs. Yearly Business Growth

Metrics	Current State	Max Potential Growth
Average Fleet Utilization	44.37%	79.50%
Total Events Per Day	18.38 Events	42.76 Events
Total Events Per Year	5624 Events	13083 Events
Labor Cost Per Year	$464,543.83	$1,086,931.68
Motorpool Cost Per Year	$41,616.00	$98,128.35
Additional Vehicle Cost	$65,000.00	N/A
Revenue Per Year	$4,473,248.55	$10,423,201.84
Profit Per Year	$3,902,088.71	$9,238,141.81

RECOMMENDATIONS

GRAB-N-GO

The model suggests:
Combination of:
1) ADDING REFRIGERATION TO THE DELIVERY VEHICLE
2) REMOVING THE ACCOMPANYING STUDENT WORKER FROM THE DAILY GRAB-N-GO ROUTE
- improve both the efficiency of the routing and reduce the labor costs associated with Grab-N-Go delivery.

ADD REFRIGERATION AND **REMOVE STUDENT WORKER** =

$13,859.09 Yearly Savings | **83.04%** Vehicle Utilization | **2.88 years** To Recover Costs

CATERING

Fleet Scenarios	Years of Potential 10% Growth	Max Potential Profit Per Year Gain	Profit Gain %
Base Fleet (7 Vehicles)	7 years	$3,854,138.78	98%
Reduce Fleet (6 Vehicles)	5 years	$2,483,974.06	63%
Larger Fleet (8 Vehicles)	9 years	$5,336,053.10	137%

The model suggests:
1) RETAIN THE CURRENT FLEET SIZE FOR NOW

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7 Years Potential Growth Before Maxing Out | **$3.9mil → $7.8 mil** Potential Profit Per Year | **98%** Potential Profit Gain

2) EXPAND BUSINESS GROWTH RATE FIRST, THEN ADD ANOTHER VEHICLE

IF **BUSINESS GROWTH** → **VOLUME OF EVENTS INCREASE** → **ADD VEHICLE**

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9 Years Potential Growth Before Maxing Out | **$3.9mil → $9.2 mil** Potential Profit Per Year | **137%** Potential Profit Gain

3) DON'T HAVE TO SELL-OFF/REDUCE VEHICLE
- With steady 10% growth, it is unwise to sell-off or reduce current fleet size because of business growth potentials with larger fleet.
- Maintenance, fuel, and insurance (Motorpool) costs are minimal compared to potential growth.
- Not worth the sell-off profit and vehicle repurchase costs later on.

FUTURE CONSIDERATIONS

GRAB-N-GO
- Explore route changes in daily Grab-N-Go routes.
- Determine improvements to daily physical process, such as loading and unloading during delivery.

CATERING
- Explore better event scheduling and fleet allocation system.
- Determine improvements to daily physical process, such as loading, unloading, setup, and cleanup during catering events.

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