UT DALLAS | Naveen Jindal School of Management

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OMCC

OPERATIONS MANAGEMENT CASE COMPETITION

Texas Level Operations Management Case Competition 2017

Business Case

Background

ABC Inc. is a leading construction company based out of Dallas, Texas. After successfully completing 4 major multifamily projects in the city, ABC Inc. is now venturing out into the commercial real estate space. The company has finalized a new project to construct an office space for their newly acquired client, XYZ Technology Solutions, a multi-national company looking forward to opening an office at Dallas.

ABC Inc. is known for its exceptional service standards and has a record of completing its projects on time with customer satisfaction. Entrusting the company to uphold its reputation, XYZ Technologies have come up with the timeline for this project and is scheduled to begin on Nov 21, 2017. The entire construction activity would take 6 months, and the final deliverable would be on May 21, 2018. XYZ Technologies aim to start using their new office space from June 2018.

Mr. Smith, Chief Engineering Officer of ABC Inc., is the project manager for this construction activity. As a first step, he holds a meeting with all the construction engineers and together they come up with a list of all the machines and equipment required to start the construction. After assessing the resources available with the company, Mr. Smith identifies that there are some machines which are not in good condition, while there are some which the company would have to purchase. He makes a list of the products that need to be acquired which is as follows:

ITEM
CATERPILLAR 365CL HYDRAULIC EXCAVATOR
CATERPILLAR D10R CRAWLER TRACTOR
CRATE OF PLASTIC INJECTION MATERIAL
CATERPILLAR 777 ROCK TRUCK
CATERPILLAR C3000 FORKLIFT

[**Note**: The details with respect to quantity and dimension of the above products can be found in the PRODUCTION DESCRIPTION sheet in the dataset.]

Also, after doing a thorough analysis, Mr. Smith and his team have identified the best vendors, in terms of cost to company and quality, from which the machines can be purchased. All the locations of these vendors for all products have been populated in the PRODUCT LOCATIONS sheet in the dataset. Note that all these machines can be brought to Dallas with one specific mode of transportation, i.e., Over The Road (OTR), Air or Rail. The details of the mode of transportation options available for each product are also populated in the PRODUCT LOCATIONS sheet.

Mr. Smith understands that shipping all the products is a complex process and includes a lot of costs. He believes that his team and company do not have the required expertise in the transportation sector and might end up spending a lot of money to ship these products than required. He therefore decides to hire a transportation company that will help him come up

with the best plan to ship all the machines and on time. He advertises his requirements and states that he is looking for a vendor to help him in this project.

Your Transportation Company

Your team runs a transportation company and you stumble upon Mr. Smith's advertisement. You believe that this is a good opportunity for your company and therefore decide to set up a meeting with him to understand his requirements. He shares the product details with you [Refer to the PRODUCT DESCRIPTION sheet in the dataset]. In addition to the product details, he mentions the following timeline:

Nov 18: The products need to be picked up from all locations
Nov 20: The products need to be delivered to the Dallas construction site
Nov 21: The project starts

After performing the time vs cost analysis for the project, Mr. Smith realizes that for every day that the project start date is delayed, ABC Inc. incurs a cost of $10,000. That is, **the late penalty of the project is $10,000 per day.** Therefore, all machines need to arrive at Dallas on November 20 to begin the project on November 21. The project begins one day after all the machines arrive. For instance, if 4 machines arrive on Nov 20, but 1 arrives on November 21, the project starts on November 22 leading to a $10,000 penalty.

He shares the data of all the available product locations from where the machines can be picked up [PRODUCT LOCATIONS sheet]. The data also specifies the mode of transportation that can be used to ship those products.

After going through the data, your team believes that you can come up with an optimized solution to help Mr. Smith with his logistics.

Building an Optimized Solution

Your team decides to build a proposal for Mr. Smith. The main goal of the proposal would be to come up with the routes for transporting the machines to the construction site on time and at the most optimal cost.

Mr. Smith would be accepting proposals from transportation companies all over Texas. He, along with his team, would analyze the proposals and select the best 12 to present to the board of directors of ABC Inc. on November 17. Your team, representing your transportation company, would be submitting your proposal by November 13.

Problem Statements

Every transportation mode has a different set of constraints and parameters that need to be taken care of while calculating the total costs. For this business case, you have three modes of transport available with you. Depending upon the type of transport you use for every product, following are the constraints that you need to utilize to solve this problem:

Transportation by road

Refer to the PRODUCT LOCATIONS sheet to find out which products need to be transported by road.
Refer to sheets OTR RATES – LANE RATES, OTR PERMIT TABLE, and HISTORICAL DIESEL PRICE of the data set to get costs associated with transportation by road.

Calculating rates/mile (OTR RATES – LANE RATES)
This sheet provides the data for calculating the per mile cost of transporting the machine from a particular city to Dallas. Columns A through D populate the origin city, origin state, destination city and destination state respectively.

Column E populates the rate/mile for transportation from a particular location to Dallas.

Column F or FSC/mile needs to be calculated. This would be a constant value for all lanes. FSC, also known as Fuel Surcharge, is a way of adjusting the amount paid to transport goods and materials by taking into account the significant variation in fuel prices compared to historical prices. For road transportations, the Fuel Surcharge needs to be calculated to adjust the costs per mile.

The formula for calculating the fuel surcharge is as follows:

$$\frac{(current\ diesel\ price + lowest\ historical\ diesel\ price)/2}{Truck\ Gallon\ per\ mile}$$

Use the following assumptions for your solution:

- The truck consumes 6 Gallons per mile
- For the current diesel price, you can visit https://www.eia.gov/petroleum/gasdiesel/. Select the diesel price for **the U.S on-highway Diesel Fuel Price for October 30, 2017.**

To find the lowest historical price, refer to the HISTORICAL DIESEL PRICE sheet.

Column G represents the final LINE HAUL/mile, which is calculated by subtracting the FSC from the rate/mile. This rate would be the final rate/mile that you would use to calculate your total costs.

*[**Hint:** Use data analysis tools to project the distances, routes and rates to transport the machines from different cities to Dallas]*

Choosing a type of trailer

Logistics companies use various kinds of trucks and trailers to transport products all across the United States. Each trailer comes with a different dimension and can scale a specific amount of weight. The following page [Figure 1] gives a detailed description of the various types of trailers used.

Your transportation company has only the following trailers available to help Mr. Smith with his logistics:

1) 48' and 53' Flatbed
2) 53' Drop Deck with Sliding Rear Axle
3) Double drop lowboy RGN 2 or 3 Axle
4) 6 & 9 Axle High Tonnage Double Drop Expandable (Floor Deck)

For dimensions of the above trailers, refer the trailer diagram on the following page. Note that the height of the trailer is measured from the ground.

Each axle (pair of wheels) can carry a weight of 15000 lbs. The given diagrams only show the trailers. These trailers are pulled by the truck. Each truck that pulls the trailer has two axles. While estimating the total weight capacity of a particular trailer, the two axles on the truck must also be considered. For example, the 48' and 53' flatbed trailers have two axles, additionally the truck that pulls it will have two axles, hence the total number of axles for this trailer type will be 4, and can therefore carry a maximum load of 60000 lbs.

You can add extra axles only on the trailers to be able to carry the weights of the given products at a cost of $2000 per axle.

Using Trailer 1 would cost the normal OTR Lane rates mentioned in the OTR RATES – LANE RATES sheet of the dataset. Trailer 2 and 3 would cost 15% more for all the base rates per mile mentioned in the dataset and Trailer 4 would cost 20% more for all the base rates per mile mentioned in the dataset.

The product dimensions and weight are provided to you in the PRODUCT DESCRIPTION sheet of the dataset. Refer to the same to find out the best trailer option for your transportation.

Calculating state permits

State permits are costs incurred for transporting materials that exceed the dimensions and weight specifications of the trailer carrying the materials. After selecting a route and a trailer type, you would need to refer to the OTR PERMIT TABLE sheet of the dataset to find out the various state permits (based on your route), if any, that need to be paid.

This is an additional overhead cost for transportation of materials by road. The OTR PERMIT TABLE lists the following:

- Column A and B – State Details
- Column C, D and E – costs for over width, over height and overweight respectively.

Note:

- For calculating over height permits, if the combined height of the trailer and product exceeds 13’5’’, then an over height penalty would be incurred based on the values given in the table
- For calculating over width permit, if the width of the product exceeds 8’6’’, then an over width penalty would be incurred based on the values given in the table

Final Cost

The final cost of transporting the product by road would thus depend upon the route selected, the trailer type and the various state permits to be paid.

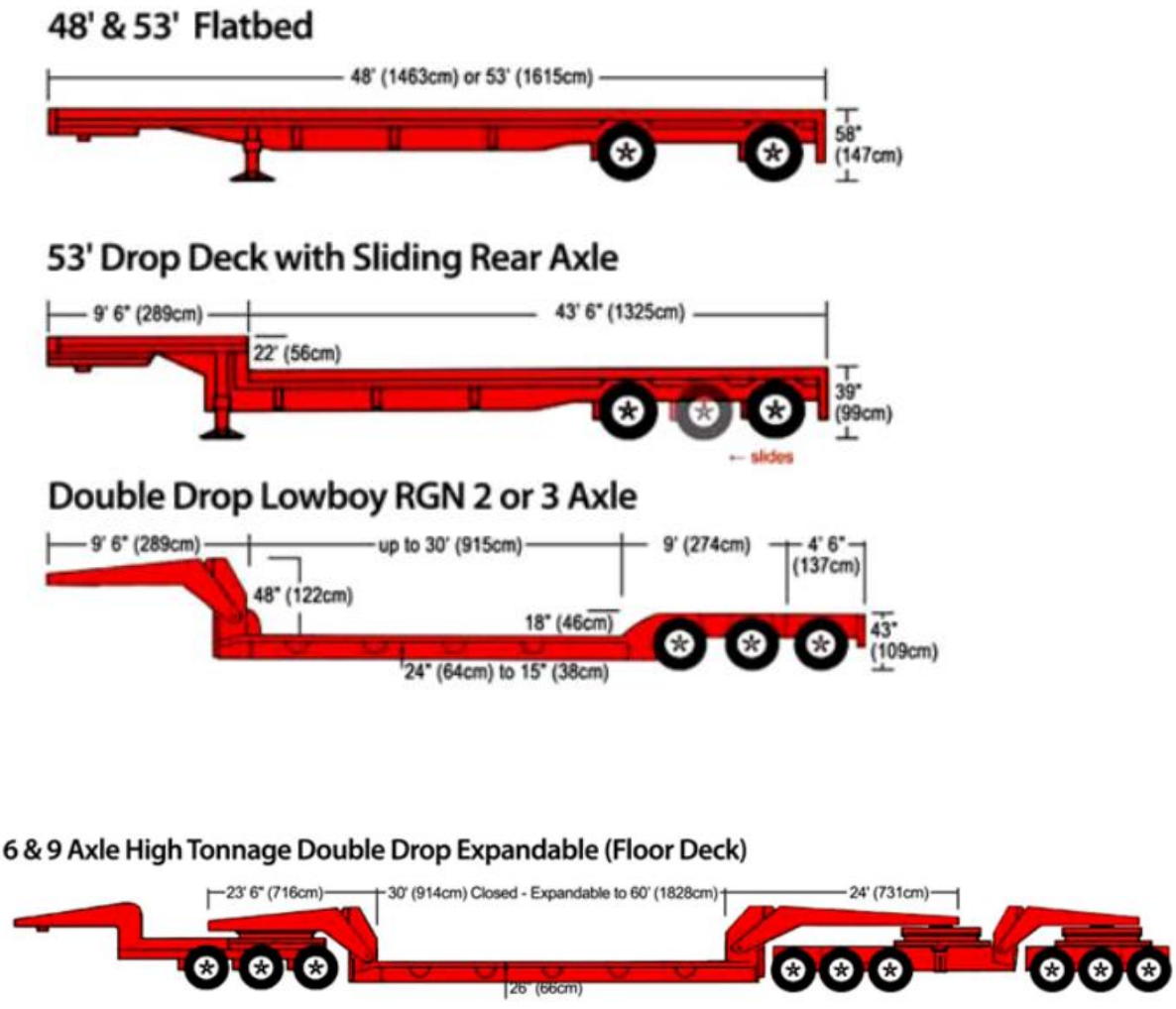

Figure 1: Trailer Types

Transportation by Air

From all the products that need to be transported to the Dallas Construction site, there is one product which can use this mode of transportation. The constraints that need to be taken care of, are as follows:

Dimension and Cost of Carriage
The carriage in the airplane that can carry your product has a dimension of 20'x10'x8' [Length X Width X height] and this total space costs $6,000. For your product, based on the product dimensions given in the dataset, find out what percentage of the carriage space will the product occupy and calculate the cost for the same.

Air Transit Cost and Time
The cost of air transit as well as the total time that it would take from the three cities to Dallas to ship the product are as follows:

ORIGIN CITY	DESTINATION CITY	AIR TRANSIT COST	TRAVEL TIME
Detroit, MI	Dallas, TX	$3000	1 day
Columbus, OH	Dallas, TX	$2500	2 Days
Cleveland, OH	Dallas, TX	$2500	3 Days

Transportation cost to and fro airport
The product needs to be picked up from the vendor location and transported to the airport. Also, the product needs to be picked up from the Dallas Fort Worth Airport and transported to the Dallas construction site. The various costs associated with these are listed in the table below:

FROM	TO	COST
Vendor at Detroit	Detroit Metropolitan Airport	$400
Vendor at Columbus	John Glenn Columbus International Airport	$250
Vendor at Cleveland	Cleveland Hopkins International Airport	$200
Dallas DFW Airport	Dallas Construction Site	$400

Total Cost
The total cost for air transportation would thus take into account the carriage cost, transit cost and transportation cost to and from the respective airports.

Transportation by Rail

The product "Caterpillar C3000 Forklift" needs to be transported by rail. In this mode of transportation there are two things that need to be considered:

1) Drayage: The trucking service from the warehouse to the rail ramp
2) Rail transit: The actual transportation of the product by rail

The consolidation warehouse is the place where the trucks are parked. The products are available at two vendor locations. After loading the machines from the vendors, the truck needs to go to the rail ramp, where the products are loaded on to the rail carriage to be transported to San Antonio, Texas. The product is then loaded again on a truck at San Antonio and transported to the Dallas construction site.

Therefore, the transportation from the consolidation warehouse to the rail ramp and from the San Antonio rail ramp to the Dallas construction site is considered as drayage. Also, the transportation from the rail ramp from either Joliet or Carmel to San Antonio would be the rail transit.

Note that the drayage needs to be calculated using the OTR rates and the rail transit cost needs to be calculated using the RAIL LANE RATES sheet in the dataset.

Vendor 1 has 5 forklifts and vendor 2 has 12 forklifts available.

Based upon the above explanations, In the PRODUCT LOCATIONS sheet, for the Caterpillar C3000 Forklift product, there are two route options available:

Consolidation warehouse	Vendor 1	Vendor 2	Start rail ramp	End rail ramp	Construction site
Chicago	Aurora	Joliet	Joliet	San Antonio	Dallas
Indianapolis	Bloomington	Carmel	Carmel	San Antonio	Dallas

Utilizing the drayage and rail transit details, find out the most optimal route for transportation of this product to the Dallas Construction site.

Final Proposal and Deliverable

After finding the most optimized costs to the above problem statement, build a power point presentation to share your proposal with Mr. Smith. The presentation would be the final deliverable of this business case competition.

A few points to consider:

- The presentation should be short and concise which delivers all your ideas
- You can use tables, graphs, charts and other such visual aids to justify your transportation choices
- You can utilize tools for data analytics and present the outcomes in your proposal as well
- Focus more on approach than numbers. Yes, numbers matter, but if the approach is rock solid, Mr. Smith might consider you for future contracts as well.
- Think from the aspect of customer satisfaction also. Mr. Smith is a new customer that you are looking forward to acquiring. Your team needs to have a unique selling point which not only leads to securing this contract, but also aims to build a long-term relationship with Mr. Smith. Yes, you need to find the most optimized route in terms of cost and time, but make sure that a reduction in cost is not leading to significant time penalties. At the same time, in order to protect time penalties, you might not want the cost to overshoot as well. Do an in-depth trade-off analysis before making a decision and make sure to explain the motivation behind your decision clearly in the proposal