Final Exam – Module 2 Questions

Please submit your answers via the Module 2 web form on the Coursera site.

Wind Tunnel Testing – Carbon Bike Frames

As an equipment provider for several Olympic cyclists, Carbon Bike Frames (CBF) operates a very expensive wind tunnel facility near San Diego, CA. The wind tunnel is used to find the best compromise between ergonomics and aerodynamics for the cyclist. Presently, more and more cyclists are interested in CBF's services, so the company considers building a second facility. However, given the enormous costs of the wind tunnel, they also want to explore a more effective use of the current facility. An initial data collection reveals that:

- The standard fitting time for a cyclist is 2h. On average, the wind tunnel is used for 7 fitting procedures per working day (new customers or customers who want a refit). The wind tunnel is available 24 hours per working day.
- CBF offers a free second session should the customer not be entirely satisfied with their bike fit (internally also known as "rework sessions"). About 2 out of 5 customers come back for such a "refit," which takes the same amount of time as the initial fit.
- 20 minutes of the each fitting procedure is spent on setting up the bike on a stationary trainer and getting the athlete ready. Almost all of this could happen outside the wind tunnel, i.e. while another fitting procedure is still going on.
- About one day out of 10, the wind tunnel is down for maintenance or repair.

CBF1. How many new fits are conducted on a typical day when the wind tunnel is in use (assume the wind tunnel is open that day)?

CBF2. What is the OEE of the wind tunnel? Recall that the wind tunnel can be used 24h in a working day.

Tasty Tim's

Tasty Tim's is a specialty taco restaurant. The following tasks are required for the successful assembly of a Tasty taco (times are in seconds per taco):

Chop and trim meat – 30
Chop vegetables – 20
Grill meat – 240
Grill vegetables – 180
Prepare toppings

Lettuce - 10
Tomato - 15
Guacamole - 40

Assemble taco
Add meat - 5
Add vegetables - 5
Add cheese - 5
Add toppings - 10

Wrap taco - 20

During the lunch hour, Tasty Tim's encounters demand for 120 tacos.

TT1. What is the labor content of one of Tasty Tim's tacos?

TT2. What is the takt time for Tasty Tim's taco shop?

TT3. How many workers should Tim hire to make tacos? Ignore any effects of idle time or inefficiency due to poor line balancing.

TT4. During off-peak afternoon hours, demand at Tasty Tim's drops to 40 tacos each hour. How many employees should Tim schedule to work during the afternoon? Again, ignore any effects of idle time or inefficiency due to poor line balancing.

<u>FastBus Inc.</u>

FastBus Inc. offers low-cost bus transportation between Philadelphia and New York City. The company has 2 buses, each bought for $300,000. Each bus can carry 40 passengers per trip and does 7 daily round trips between Philadelphia and New York City. The price of each one-way ticket is $12. The company sells 28 seats on average per one-way trip, so the load factor is 70%. The annual fixed cost of running the company is $3,000,000. The major variable cost in their line of business is gasoline, which costs $25 per one-way trip. Fast Bus Inc. buses operate 365 days a year.

Define the return on invested capital as the ratio of the profits (PER YEAR) and the invested capital. You can draw an ROIC tree in the same way that we drew a KPI tree in class. Simply have the ROIC as "the root" of the tree instead of profits. Then answer the following questions:

FB1. What is the current number of customers that are served each year? Assume that FastBus operates 365 days per day and that each customer buys only one one-way ticket per person.

FB2. What is the current ROIC? (Please give your answer in decimal form. For example, 0.25 for 25%)

FB3. What is the minimum load factor at which the company breaks even? (Please give your answer in decimal form. For example, 0.25 for 25%)