Module 2 – Homework Questions

Please submit your answers to these homework questions via the Coursera website.

Chiemsee Knee Replacement Clinic

The Chiemsee Knee Replacement Clinic (CKRC) is a sports clinic located at the northern edge of the German Alps. It specializes in knee replacements for skiers who come to CKRC from Germany, Austria, Switzerland, and Italy. The clinic currently has one operating room (OR). However, since the clinic has dramatically more demand than capacity, the management team contemplates investing in a second OR. A lean consulting firm, however, suggests that before going ahead with installing new capacity, the clinic should first look at how it uses its existing capacity. The data collected by the consulting firm reveal that:

- The OR is available for 12 hours a day; the hospital has decided to not perform any procedures between 7pm and 7am. This time is equally divided across three surgeons.
- The standard procedure time for the knee surgery done at the clinic is 1h.
- The cleaning and housekeeping that needs to happen after each procedure takes 20 minutes. Almost all of this time could be saved if the cleaning crew were notified earlier on.
- 10 minutes are spent on patient preparation / anesthesia work before each procedure. (Note: this is not part of the 60-minute procedure time). Proposals have been evaluated to move these 10 minutes to outside the OR, and there exists no medical reason that would prohibit doing this.
- A surgeon only starts a case if all of the work associated with the case (preparation, procedure, and cleaning) can be completed in the 4h allotted to each surgeon. Surgeons never start BEFORE their allotted time.
- Though the clinic aims to operate 7 days a week, holidays, vacation, and construction time lead to an average of one day a week that the OR cannot be used at all.

CKRC1. How many cases are going through the OR per day when the OR is in use?

CKRC2. What is the OEE of the operating room? Assume a 12h window in which the OR could be used.

Parsa Real Estate

Parsa Real Estate is a company that buys and rents real estate. The company is looking into buying an office building for $1M. The building has 10,000 square feet of rentable office space.

The company analysts predict that they can rent the office space for $6 per square foot per month, but demand is a function of price in the following way:

% Occupied = 2 - 0.2*Rent

(Rent is in dollars per square foot per month. Also, at $6.00, Oscar thinks he can fill about 80% of the office space.)

The building needs to be maintained (security, insurance, maintenance, etc.), which costs $10,000 per month regardless of occupancy. Also, there is a variable cost of $2 per month for each square foot occupied.

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.

PR1. What is the ROIC? (Please give your answer in decimal form. For example, 0.25 for 25%)

PR2. What would be the new ROIC be if Parsa Real Estate decides to charge rent of $8.00 per square foot per month? (Please give your answer in decimal form. For example, 0.25 for 25%)

12 Tasks to 4 Workers

Consider the following tasks that must be assigned to four workers on a conveyor-paced assembly line (i.e., a machine-paced line flow). Each worker must perform at least one task. There exists unlimited demand unless stated otherwise.

Time to Complete Task (seconds):
Task 1: 30
Task 2: 25
Task 3: 15
Task 4: 20
Task 5: 15
Task 6: 20
Task 7: 50
Task 8: 15
Task 9: 20
Task 10: 25
Task 11: 15
Task 12: 20

The current conveyor-paced assembly-line configuration assigns the workers in the following way:

• Worker 1: Tasks 1, 2, 3
• Worker 2: Tasks 4, 5, 6
• Worker 3: Tasks 7, 8, 9
• Worker 4: Tasks 10, 11, 12

12T4W1. What is the capacity of the current line?

12T4W2. What is the direct labor content?

12T4W3. Assume a demand rate of 20 units per minute. What would be the takt time of the process?

12T4W4. Assume a demand rate of 20 units per minute. What would be the target manpower?