ADAPTIVE SUPPLY CHAIN MANAGEMENT

COMPARISON AMONG DIFFERENT QUEUING SYSTEMS

Due on (insert date)

**Note:** This is meant to be a supplemental assignment for a data set determined by the instructor. The assignment can be easily reformatted to fit your existing global supply chain curriculum.

Seaports are important in global supply chains. Their management plays an important part in minimizing the waiting time for ships that visit seaports for loading and unloading cargo and port utilization. The Oakland seaport is a busy container seaport on the West coast of America, but it is a bit relaxed in the month of December. Based on the past data, it is observed that 6 ships arrive there, on average, per day, and it takes 3 hours to unload a ship on average, with a standard deviation of 4 hours. Determine the following:

1. The minimum number of unloading facilities.
2. Probability (each unloading facility is busy)
3. Probability (each unloading facility is idle)
4. Probability of 2 ships in the system and 4 ships in the system
5. The average number of ships in the system, that is, the number of ships in the line including the one being unloaded.
6. The average number of ships waiting to be unloaded, that is, the number of ships in the line excluding being unloaded.
7. The average time a ship spends in the system, that is, waiting time plus unloading time.
8. The average time a customer spends in the waiting line before reaching the unloading berth.
9. Redo (e) to (g) above if the ship’s unloading time has an Exponential distribution.
10. Based on the statistics computed in (e) to (g) above in Question 1, you (as an expert) realized that too many ships are in the line for service and there have been complaints recently. In view of your knowledge of queuing analysis, you would advise as a consultant to install the state-of-the-art unloading facility which can unload or load a ship in exactly 3 hours. Redo (e) to (g) above if the ship’s unloading time is exactly 3 hours for each ship.
11. Tabulate (a) to (h) statistics for the three queueing systems

The cost of unloading and the ship’s time in the port is $15,000 and $25,000 respectively. Determine the optimal number of unloading facilities so as to minimize the total cost for all three queue systems.

Hint: Compute the cost for service facilities, ship’s time, and the total cost. Assume that the arrival rate is equally divided among unloading facilities.