University of British Columbia
Sauder School of Business
COMM 399: Logistics and Operations Management

Problem Set 1

1. Solution:

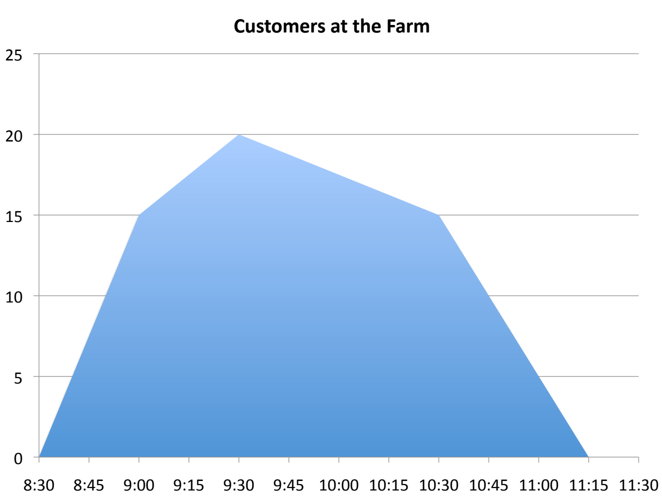
   (a) Some ideas that you can expand on:
   - Organizational barriers
   - Business culture undervalues operations
   - Top managers often uninterested in operations
   - Lack of "ownership" of operations

   (b) Some ideas that you can expand on:
   - Identify and break constraints
   - Make the special case the norm
   - Rethink critical dimensions of work

   (c) Yes, even though it may seem that operational innovations can be easily imitated by competitors. There could be many reasons why this could be so, for example:
   - Organizational inertia
   - Denial of competitor superiority

2. Solution:

   (a) Inventory build-up diagram:



   (b) The average number of customers in the system is 12.95. Probably the easiest way to calculate this number is by calculating the area under the graph and then by dividing by the entire time. The area under the graph is a summation of four triangles or trapezoids which we obtain by drawing vertical lines at 9:00, 9:30 and 10:30. The areas of each triangle/trapezoid is

$$\begin{aligned} \text{8:30-9:00:} &\quad 0.5 \cdot 15/2 = 3.75 \\ \text{9:00-9:30:} &\quad 0.5 \cdot (15+20)/2 = 8.75 \\ \text{9:30-10:30:} &\quad 1.0 \cdot (20+15)/2 = 17.5 \\ \text{10:30-11:15:} &\quad 0.75 \cdot 15/2 = 5.625 \end{aligned}$$

Thus, the total area is 35.625. Now, divide 35.625 by 2.75 hours and we find that on average there are 12.95 customers in the system.

(c) Between 8:30am and 11:15am, the number of customers is $30 + 15 = 45$. Thus,

$$\begin{aligned} \text{Throughput Rate} &= \text{Actual Output Rate} = \frac{\text{45 customers}}{\text{2.75 hours}} \\ &= \text{16.36 customers/hour} \\ \text{Average Flow Time} &= \frac{\text{Average Inventory}}{\text{Throughput Rate}} = \frac{\text{12.95 customers}}{\text{16.36 customers/hour}} \\ &= \text{0.792 hour} = \text{47.5 minutes} \end{aligned}$$

3. Solution:

(a) The resource requirements are as follows:

Resource	Cheddar & veggie	Veggie only	Cream cheese	Product mix
Cut	3	3	3	540
Grilled cheddar	**10**			300
Veggies	5	**5**		**700**
Cream cheese			**4**	160
Wrap	2	2	2	360

The bottleneck for each kind of bagel is: Grilling for cheddar & veggie, Veggie for the veggie, and Cream cheese for the cream cheese.
The bottleneck for the product mix (30 cheddar & veggie, 110 veggie only, and 40 cream cheese) is Veggies, as shown above.
Note that the demand in this product mix cannot be fully satisfied – as Veggies requires 700 minutes per day while we have only 600 minutes available.

(b) If there are 700 minutes available, then the process can produce 30 cheddar & veggie, 110 veggie only, and 40 cream cheese. In other words, we need 11.67 hours to produce this mix of bagels. In one hour (assuming the same mix), we can produce

$$\begin{aligned} 30/11.67 &= 2.57 \quad \text{grilled cheddar \& veggie,} \\ 110/11.67 &= 9.42 \quad \text{veggie only, and} \\ 40/11.67 &= 3.42 \quad \text{cream cheese.} \end{aligned}$$

(You may round your answer, which is also acceptable.)

4. Solution: Walmart has been more successful than K-Mart. An answer here should discuss mainly the issue of inventory turn-over. For K-mart, the inventory turnover is

$$\frac{29,732}{6,500} = 4.57 \text{ times/year,}$$

and for Walmart, it is

$$\frac{129,664}{19,793} \;=\; 6.55 \text{ times/year},$$

Alternatively, you can say that Kmart has $365/4.57 = 79.8$ days of inventory and Walmart has $365/6.55 = 55.7$ days of inventory.

5. SOLUTION: Given above data, we can assume the following:

$$\begin{aligned}\text{Average Inventory} &= 414\\ \text{Average Throughput Rate} &= 3.5 \text{ per day}\end{aligned}$$

By Little's Law, this gives us

$$\text{Average Flow Time} = \frac{414}{3.5 \text{ per day}} \;=\; 118.3 \text{ days}$$

But according to the table, the flow time $= 64$ days. Thus, the report is not consistent with Littles Law.

6. SOLUTION: See lecture notes. Primarily, discuss *Low Utilization and High Capital Costs* (below the diagonal) versus *Lost Sales and Opportunity Costs* (above the diagonal).

7. SOLUTION: From the description, and applying Little's Law,

$$\begin{aligned}R &= 10000 \text{ claims/day}\\ T_{old} &= 8.5 \text{ days}\\ I_{old} &= R \cdot T_{old} = 10000 \cdot 8.5 = 85000 \text{ claims}\end{aligned}$$

By reducing the flow time to 1 day, we obtain

$$\begin{aligned}T_{new} &= 1 \text{ days}\\ I_{new} &= R \cdot T_{new} = 10000 \cdot 1 = 10000 \text{ claims}\end{aligned}$$

Thus,

$$\text{Savings} \;=\; (T_{old} - T_{new}) \cdot \$28 \;=\; \$2.1 \text{ million}$$