

Matching Supply with Demand: An Introduction to Operations Management

Solutions to End-of-Chapter Problems

(last revised March 27, 2012; make sure to visit www.cachon-terwiesch.net for the latest updates, excel files, ppt files and other information)

Chapter 10

10.1. Quality

Wine: collect the temperature of the wine and use an x-bar chart to track it

Surgeon: collect data indicating if the surgeon washed her/his hands or not. Use a p-chart to track the data. In the extreme case (not practical) we might use an x-bar chart to quantify the number of germs on the hands

Airline audio system: collect data about customer complaints / if the audio system at a seat worked or not. Use a p-chart to track the data.

Underwriter: collect data about wrongly approved loans. Use a p-chart to track the data. If the underwriter uses a numerical credit score, it might also be possible to use an x-bar chart.

10.2. Process with Rework

We define four types of flow units:

- type a: breaks at #1 (20% of total)
- type b: breaks at #2 ($80\% \cdot 10\% = 8\%$, has to pass #1, but then breaks at #2)
- type c: breaks at #3 ($80\% \cdot 90\% \cdot 10\% = 7.2\%$)
- type d: does not break at all, i.e. does not require rework ($80\% \cdot 90\% \cdot 90\% = 64.8\%$)

Resource	Minutes available	Type a	Type b	Type c	Type d	Workload
1	60	$0.2 \cdot 6$	$0.08 \cdot 6$	$0.072 \cdot 6$	$0.648 \cdot 6$	6
2	60	0	$0.08 \cdot 5$	$0.072 \cdot 5$	$0.648 \cdot 5$	4
3	60	0	0	$0.072 \cdot 4$	$0.648 \cdot 4$	2.88
Rework	60	$0.2 \cdot 15$	$0.08 \cdot 10$	$0.072 \cdot 5$	0	4.16

(a) If flow units arrive at a rate of 5 units per hour, we have 4 units per hour arriving at #2 (the other 1 unit will – on average – break at #1). Thus, the utilization there is: flow rate/capacity = $4/12$

(b) The bottleneck is #1

(c) We can process up to 10 units per hour, at which point the utilization of #1 hits 100%. Note that all these are “good units”, since everything that breaks at #1 can be reworked.