MBA 511 Final Exam Study Guide

Calculating averages

Simple moving average

$$\frac{\sum_1^n W_i}{n}$$

In other words, the average of the N most recent items

Weighted moving average

$$X_1 * W_1 + X_2 * W_2 + X_3 * W_3 + ... + X_n * W_n$$

$$Where \sum_n W_n = 1$$

Exponential Smoothing

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

$F_t =$ The exponentially smoothed forecast for period t $F_{t-1} =$ The exponentially smoothed forecast made for the prior period $A_{t-1} =$ The actual demand in the prior period $\alpha =$ The desired response rate, or smoothing constant

Little's Law

$L = \lambda W$ Where L is Average number of customers in the store λ is the effective arrival rate W is Average time customer spends in store

Chapter 01

$$ReceivableTurnover = \frac{AnnualCreditSales}{AverageAccountReceivable}$$

$$InventoryTurnover = \frac{CostofGoodsSold}{AverageInventoryValue}$$

$$AssetTurnover = \frac{Revenue(orSales)}{TotalAssets}$$

Quicker payments will reduce the average amount of accounts receivables, so the receivables turnover ratio will increase.
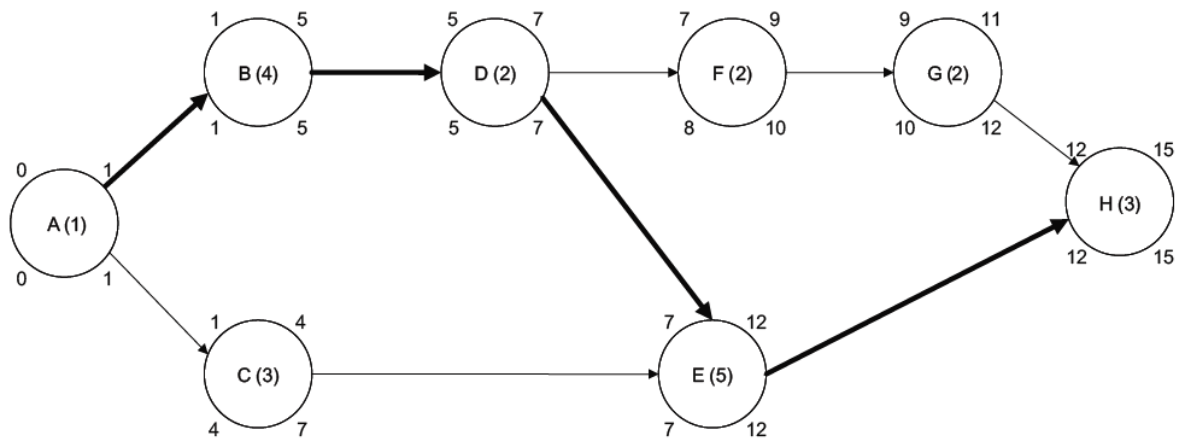
Chapter 4 Critical Path Method

- Top left - Early Start
- Top right - Early Finish
- Bottom left - Late Start
- Bottom right - Late Finish

First propagate through the early starts. Once that is calculated, use back propagation to determine late start.

`Late Start - Early Start = Slack Time`

Any path with 0 slack time is part of the critical path

Chapter 10 Waiting Line Analysis and Simulation

Phases and Channels

- Single channel, Single phase
  - Only one line, only one station
  - **Typical example is a single chair barbershop**
- Single channel, Multi phase
  - Only one line, multiple stations
  - **Typical example is a car wash**
    - Users move through vacuums, wetting, washing, rinsing, ect.
- Multichannel, single phase
  - Multiple lines to go through, but each station provides only a single stop
  - **Typical example is a bank teller**
    - A bank has multiple tellers, but a customer will only visit a single teller
- Multichannel, multiphase
  - Multiple lines for multiple services. Similar to a bank teller, except multiple stations.
  - **Typical example is a hospital admission.**
    - User must go to triage, insurance, reception, ect. and multiple help desks exist

Examples of working line problems start on page 231 of the textbook

---

Chapter 12 Six Sigma

Methodology

1. **Define (D)**
   - Identify customers and their priorities.
   - Identify a project suitable for Six Sigma efforts based on business objectives as well as customer needs and feedback.
   - Identify critical-to-quality characteristics (CTQs) that the customer believes have the most impact on quality.
2. **Measure (M)**
   - Determine how to measure the process and how it is performing.
   - Identify the key internal process that influence CTQs and measure the defects currently generated relative to those processes.
3. **Analyze (A)**
   - Determine the most likely causes of defects.
   - Understand why defects are generated by identifying the key variables most likely to create process variation.
4. **Improve (I)**
   - Identify means to remove the cause of defects
   - Confirm the key variables and quantify their effects on the CTQs.
   - Identify the maximum acceptance ranges of the key variables and a system for measuring deviations of the variables.
   - Modify the process to stay within an acceptable range.
5. **Control (C)**
   - Determine how to maintain the improvements
   - Put tools in place to ensure that the key variables remain within the maximum acceptance ranges under the modified process.

Six sigma charts

Chart examples are on page 305 of the textbook

- Flow Charts

  - Used in the define stage of a product

- Run charts

  - Depict trends over time and help in the define stage

- Pareto charts

  - These charts help to break down a problem into the relative contributions of its components, based on the idea that 80% of problems are caused by 20% of causes

- Checksheets

  - These are basic forms that help standardize data collections.

- Fishbone (aka Cause and Effect Diagram)

- To construct, start with a why? question. Why are pizza deliveries late on Friday and Saturday nights?
- The rest consists of lines drawn across the page, attached to the problem statement, and several lines or "bones" coming out vertically from the main line.

Fishbone diagram example
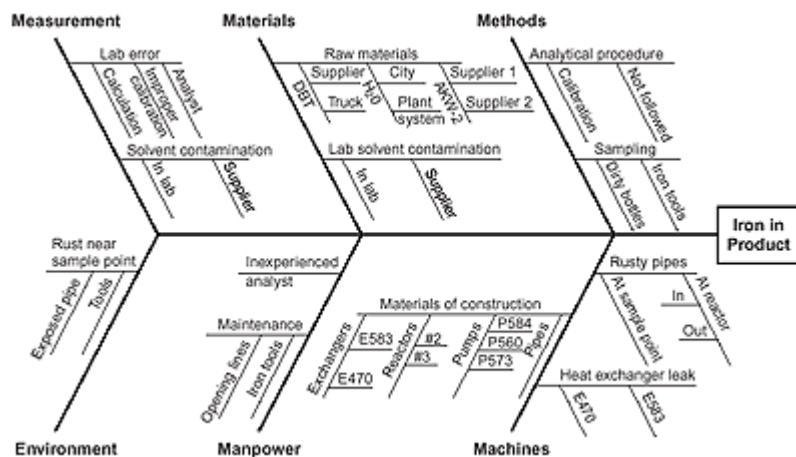
Chapter 13 Quality Control

P-charts

Used when a product is either good or it is bad

$$\overline{p} = \frac{Total\,number\,of\,defective\,units\,from\,all\,samples}{Number\,of\,samples * sample\,size}$$

Standard deviation $S_p = \sqrt{\dfrac{\overline{p}(1-\overline{p})}{n}}$ UCL $UCL = \overline{p} + zs_p$ LCL $PCL = MAX[\overline{p} - zs_p, 0]$ z is confidence rating. A typical value is $z = 3$ (99.7% confidence) or $z = 2.58$ (99% confidence)

C-charts

Used when the product can have multiple defects; such as a board of lumber with more than one knot

$\overline{c}$ = Average number of defects per unit Standard deviation $s_c = \sqrt{\overline{c}}$ UCL UCL = $\overline{c} + z\sqrt{\overline{c}}$ LCL LCL = $\overline{c} - z\sqrt{\overline{c}}$ or 0, whichever is greater

Same typical z values as p-charts

X-Bar and R-Charts

Used when taking samples that must fall within an acceptable range

See Page 329 of the textbook

Number of observations in each sample	A_2	D_3	D_4
2	1.88	0	3.27
3	1.02	0	2.57

A_2

Chapter 23 Theory of Constraints

Eli Goldratt in his book *The Goal* observed that improving flow time through a resource that was not a bottleneck would not improve over all production time.

Goldratt's Rules of Production Scheduling

1. Do not balance capacity - balance the flow
2. The level of utilization of a nonbottleneck resource is determined not by its own potential but by some other constraint in the system.
3. Utilization and activation of a resource are not the same.
4. An hour lost at a bottleneck is an hour lost for the entire system
5. An hour saved at a nonbottleneck is a mirage.
6. Bottlenecks govern both throughput and inventory in the system.
7. The transfer batch may not, and many times should not, be equal to the process batch.
8. A process batch should be variable both along its route and in time.
9. Priorities can be set only by examining the system's constraints. Lead time is a derivative of the schedule.