PROCESS METRICS

Business 2710 – Class 7

Capacity

- Maximum output of a resource
- Measured in units per time period

- Example
  - An assembler of an electric motor can do her task in 30 seconds
  - Her capacity is 60 minutes per hour/0.5 minutes per unit = 120 unites per hour

Throughput

- Actual total volume of production through a facility (machine, department, factory, etc.)
- Units per time period

- Example
  - A company process 120 sales orders per day

Cycle Time

- Time between completion of two discrete units/cases.

- Example:
  - Motors assembled at a rate of 120 per hour
  - Cycle time = 30 seconds
- Example:
  - Sales order processed at a rate of 10 per business day
  - Cycle time = 8/10 = 0.8 hours = 48 minutes

Throughput Time

- Length of time when case begins until completed

- Example:
  - Electric motors assembled on a line with 15 operators, each with a labor time of 30 seconds
  - Throughput time = 7.5 minutes (15 x 0.5)
  - Capacity = 120 motors per hour
  - Cycle time = 30 seconds

Throughput Time

- Example:
  - Sales orders processed using 10 steps, each with a time of 10 minutes
  - Throughput time = 10 x 10 minutes = 100 minutes
  - Capacity = 6 sales orders per hour
  - Cycle time = 10 minutes

Utilization

- A measure of how intensively a resource is being used to produce a good or service
- Compares actual time used to available time
- Example:
  - A worker who is busy 45 minutes per hour
  - Utilization = 45/60 = 75%
- Example:
  - A worker capable of entering 10 sales order per day but enters only 8
  - Utilization = 8/10 = 80%

Lead Time

- The time between initiation of an order and the receipt of goods
- Includes
  - Order preparation time
  - Queuing/waiting time
  - Processing time
  - Move or transportation time
  - Inspection time

Setup Time

- The length of time require to change a specific machine, resource, work center or line from making the last good piece of one type of product to the first good piece of another type of product

- Costs associated with setup may include scrap costs, calibration costs, labor downtime costs, lost sales, etc.

Other Process Metrics

- Process cost (activity-based costing)
- Process “value added,” e.g. revenue
- Process variability (“six-sigma”)

Example

“A Tale of Two Invoices”

Example: Accounts Payable Process

- The accounts payables process has four steps that are done by four different employees (resources) in sequence
  - The mail clerk enters the invoice
  - The AP specialist analyzes and codes the invoice
  - The purchasing specialist sets up the vendor for the invoice
  - The controller issues and signs a cheque for the invoice

Example (continued)

- Invoice entry takes 15 minutes
- Analyzing and coding takes 20 minutes
- Vendor setup takes 30 minutes
- Issuing the cheque takes 20 minutes

- Analyzing and coding invoices is highly specialized and can only be performed by the AP specialist.
- On average, ProductIFF receives 15 invoices per 8 hour day

Example (continued)

- What is the capacity of the current process?
- What is the maximum number of invoices that ProductIFF Inc. can process per day?
- What is the average utilization of
  - The mail clerk?
  - The AP specialist?
  - The purchasing specialist?
  - The controller?

Example (continued)

- ProductIFF Inc. has suggested that the vendor for commonly purchased items must be set up before ordering, so that they are available when an invoice arrives. From experience, this would affect half of the invoices
  - What is the capacity of this modified process?
- ProductIFF Inc.’s business expands and there is an increase to 20 invoices per day
  - What (if any) changes would be needed in the process to support this invoice rate of 20 invoices per day? Assume early vendor setup as above.

Example (continued)

Resource	Number	Minutes per Order	Available minutes per day	Capacity of resources	% Utilization
Mail Clerk	1	15	480	32	46.875
AP specialist	1	20	480	24	62.500
Purchasing Specialist	1	30	480	16	93.750
Controller	1	20	480	24	62.500

Example (continued)

- Capacity = 16 invoices per day
  - Vendor setup is the bottleneck
- Throughput time for invoice = 15+20+30+20 = 85 min
- Throughput = 15 invoices per day (unconstrained)
- Average cycle time = 480 min per day / 15 invoices per day = 32 minutes
- Utilization of resources (See table)