Process Analysis Terms

- **Process**: Is any part of an organization that takes inputs and transforms them into outputs
- **Cycle Time**: Is the average successive time between completions of successive units
- **Utilization**: Is the ratio of the time that a resource is actually activated relative to the time that it is available for use

Process Flowcharting Defined

- **Process flowcharting** is the use of a diagram to present the major elements of a process
- The basic elements can include tasks or operations, flows of materials or customers, decision points, and storage areas or queues
- It is an ideal methodology by which to begin analyzing a process
Flowchart Symbols

**Purpose and Examples**

- **Tasks or operations**: Examples: Giving an admission ticket to a customer, installing an engine in a car, etc.
- **Decision Points**: Examples: How much change should be given to a customer, which wrench should be used, etc.

Example: Flowchart of Student Going to School

- **Go to school today?**
  - Yes: Drive to school → Walk to class
  - No: Goof off

Types of Processes

- **Single-stage Process**
  - Stage 1

- **Multi-stage Process**
  - Stage 1 → Stage 2 → Stage 3

**Example**: Flowchart of Student Going to School

- **Go to school today?**
  - Yes: Drive to school → Walk to class
  - No: Goof off

*cf. p. 157*
Types of Processes (Continued)

A buffer refers to a storage area between stages where the output of a stage is placed prior to being used in a downstream stage.

Multi-stage Process with Buffer

Stage 1 → Buffer → Stage 2

Other Process Terminology

- **Blocking**
  - Occurs when the activities in a stage must stop because there is no place to deposit the item just completed.
  - If there is no room for an employee to place a unit of work down, the employee will hold on to it and not able to continue working on the next unit.

- **Starving**
  - Occurs when the activities in a stage must stop because there is no work.
  - If an employee is waiting at a work station and no work is coming to the employee to process, the employee will remain idle until the next unit of work comes.

Other Process Terminology (Continued)

- **Bottleneck**
  - Occurs when the limited capacity of a process causes work to pile up or become unevenly distributed in the flow of a process.
  - If an employee works too slow in a multi-stage process, work will begin to pile up in front of that employee. In this case, the employee represents the limited capacity causing the bottleneck.

- **Pacing**
  - Refers to the fixed timing of the movement of items through the process.

Other Types of Processes

- **Make-to-order**
  - Only activated in response to an actual order.
  - Both work-in-process and finished goods inventory kept to a minimum.

- **Make-to-stock**
  - Process activated to meet expected or forecast demand.
  - Customer orders are served from target stocking level.

- **Hybrid**
  - Combine the features of both make-to-order and make-to-stock.

  *c.f. p. 161.*
Process Performance Metrics

- Operation time = Setup time + Run time
- Throughput time = Average time for a unit to move through the system
- Velocity = \( \frac{\text{Throughput time}}{\text{Value-added time}} \)

Process Performance Metrics (Continued)

- Cycle time = Average time between completion of units
- Throughput rate = \( \frac{\text{Output}}{\text{Cycle time}} \)
- Efficiency = \( \frac{\text{Actual output}}{\text{Standard Output}} \)

Process Performance Metrics (Continued)

- Productivity = \( \frac{\text{Output}}{\text{Input}} \)
- Utilization = \( \frac{\text{Time Activated}}{\text{Time Available}} \)

Cycle Time Example

Suppose you had to produce 600 units in 80 hours to meet the demand requirements of a product. What is the cycle time to meet this demand requirement?

Answer: There are 4,800 minutes (60 minutes/hour x 80 hours) in 80 hours. So the average time between completions would have to be: Cycle time = \( \frac{4,800}{600} \) units = 8 minutes.
Process Throughput Time Reduction

- Perform activities in parallel
- Change the sequence of activities
- Reduce interruptions

- cf. New product/process design- Gortac Manufacturing (GTE6.avi)

Question Bowl

Which of the following are possible examples of “cycle times”?

a. Time for each television to come off an assembly line.
b. Time it takes for a stock purchase
c. Time it takes for an instructor to grade an exam
d. Time it takes to build an automobile
e. All of the above

Answer: e. All of the above

Question Bowl

Which of the following are used as symbols in a Process Flowchart?

a. Decision points
b. Blocking
c. Starving
d. Bottleneck
e. All of the above

Answer: a. Decision points (A diamond shaped symbol.)

Question Bowl

Which type of process is configured as follows?

1 → 2 → 3

a. Single-stage process
b. Multi-stage process
c. Make-to-order process
d. Make-to-stock process
e. All of the above

Answer: b. Multi-stage process
Question Bowl

When an assembly line employee is waiting for a unit of work to come down the line so they can stop being idle and get back to work, it is an example of which of the following process terms?

a. Buffering
b. Blocking
c. Starving
d. Bottleneck
e. All of the above

Answer: c. Starving

Question Bowl

When a company waits until they have an order for their product in hand before beginning any production for that order, we can characterize their operation as which of the following processes?

a. Single-stage process
b. Multi-stage process
c. Make-to-order process
d. Make-to-stock process
e. All of the above

Answer: c. Make-to-order process

Question Bowl

If the Run Time for a batch of parts is 45 minutes on a machine, and the Setup Time is 65 minutes, which of the following is the Operation Time?

a. 75 minutes
b. 110 minutes
c. Only 45 minutes
d. 65/45 minutes or 1.44 hours
e. Can not be computed on the data above

Answer: b. 110 minutes (Operation Time is the sum of Run Time and Setup Time, or 65 + 45 = 110 minutes)

Question Bowl

If the standard expected phone calls for a telephone marketers is 24 per hour, and one telephone marketer did 27 per hour, which of the following can be used to describe their Efficiency?

a. 88.8%
(b. 100% (Ratio of actual performance/expected performance, or (27/24) x 100 = 110 minutes)
c. 112.5%
d. Well over 150%
e. Can not computed on the information given.

Answer: c. 112.5%
Course Project Proposal

- October 22, 2008
- At most ten minutes
- Content should cover:
  - Group members
  - A detailed description of your product or service
  - Idea development
  - Preliminary design
  - Description of resources necessary to manufacture your product
  - Preliminary process flowchart
- Each team member must have taken part in the presentation
- Prepare a hard copy of your slides to instructor