Lab of Production Planning and Control

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Industrial Engineering Program

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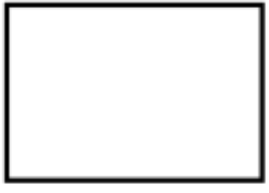
Lab 1

Production System and Process

Learning Objectives

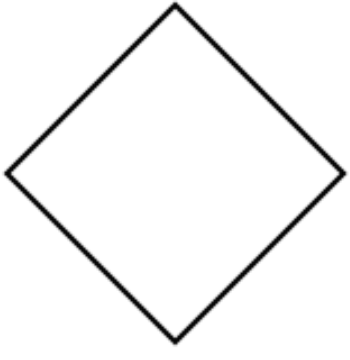
- Understand how to use a process flowchart
- Understand how describe and classify production systems
- Understand how to use process performance metrics

Flowchart Symbols



Tasks or operations

Examples: Giving an admission ticket to a customer, installing a engine in a car, etc.



Decision Points

Examples: How much change should be given to a customer, which wrench should be used, etc.

Process Analysis Terms

Process (Set of activities): Is any part of an organization that takes inputs and transforms them into outputs

Flowchart Symbols

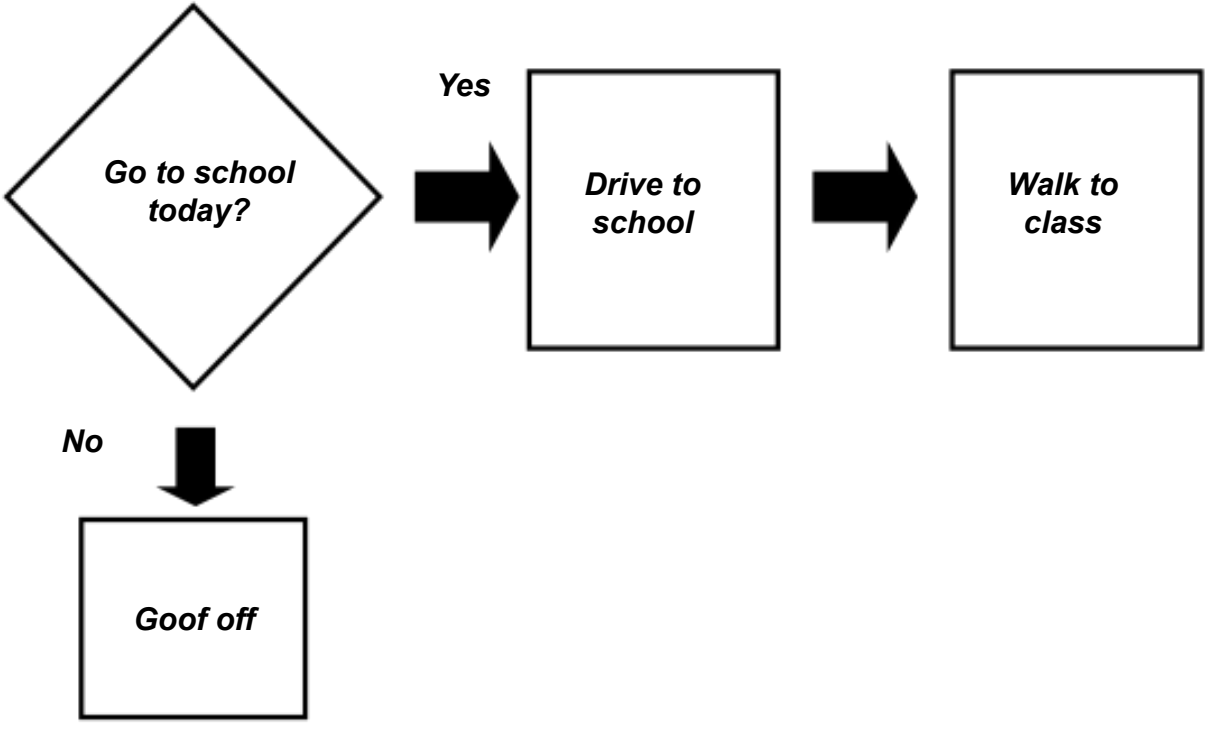
Storage areas or queues

Examples: Sheds, lines of people waiting for a service, etc.

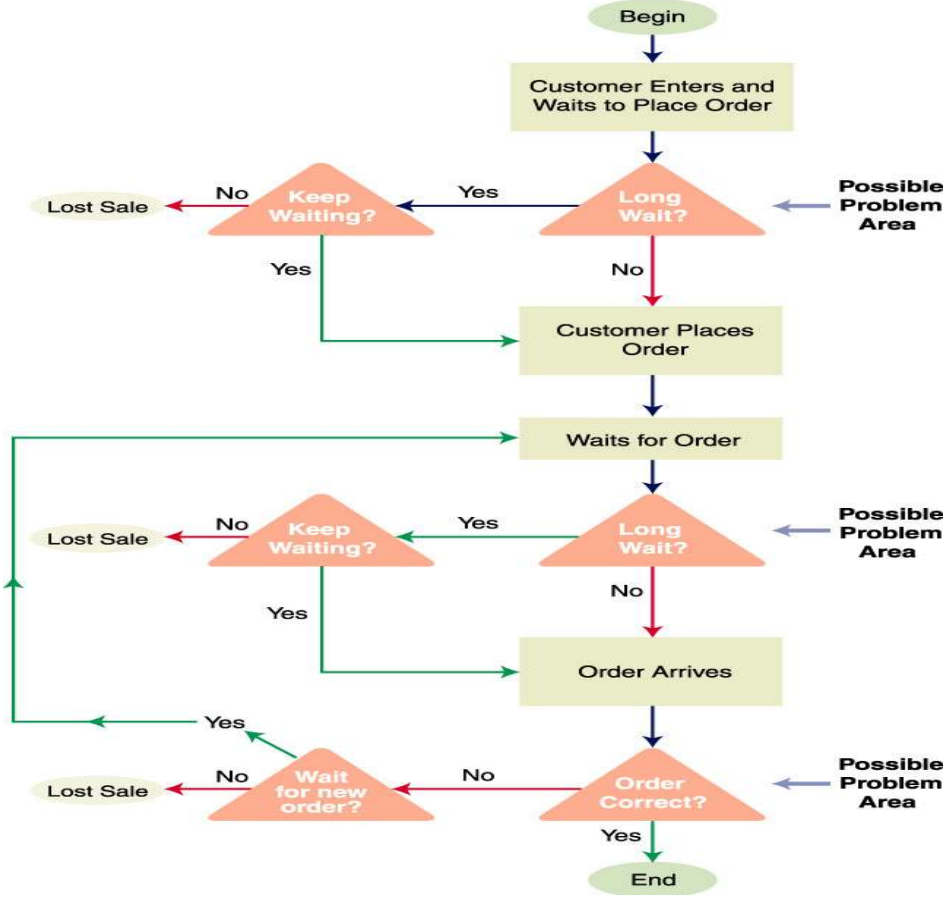
Flows of materials or customers

Examples: Customers moving to a seat, mechanic getting a tool, etc.

Example: Flowchart of Student Going to School



Process Design Tools



Some Process Terminology

- Utilization: Is the ratio of the time that a resource is actually activated relative to the time that it is available for use
- Cycle Time: Is the average successive time between completions of successive units
- 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

Bottleneck

E.g. If an employee works too slow in a multi-stage process, work will begin to pile up in front of that employee. In this is case the employee represents the limited capacity causing the bottleneck.

- Pacing
  - Refers to the fixed timing of the movement of items through the process
  - Blocking: Occurs when the activities in a stage must stop because there is no place to deposit the item just completed
  - Starving
  - If an employee is waiting at a work station and no work is coming to the employee to process.

Process Performance Metrics

Process performance metrics – **defined**: Measurement of different process characteristics that tell us how a process is performing

- Determining if a process is functioning properly is required
- Determination requires measuring performance

A basic process performance metric is **throughput time**. A lower throughput time means that more products can move through the system. One goal of process improvement is to reduce *throughput time*.

Process Performance Metrics

- **Operation time = Setup time + Run time**
- **Cycle time = Average time between completion of units**

Measure	Definition
1. Throughput time	Average amount of time product takes to move through the system.
2. Process velocity $= \frac{\text{Throughput time}}{\text{Value-added time}}$	A measure of wasted time in the system.
3. Productivity $= \frac{\text{Output}}{\text{Input}}$	A measure of how well a company uses its resources.
4. Utilization $= \frac{\text{Time a resource used}}{\text{Time a resource available}}$	The proportion of time a resource is actually used.
5. Efficiency $= \frac{\text{Actual output}}{\text{Standard output}}$	Measures performance relative to a standard.

Metrics Example: At Zelle's Dry Cleaning, it takes an average of 3 ½ hours to dry clean & press a shirt, with value-added time estimated at 110 min. Workers are paid for a 7-hour workday but work 5 ½ hr/day, accounting for breaks and lunch. Zelle's completes 25 shirts per day, while the industry standard is 28 for a comparable facility.

Process Velocity = (Throughput Time)/(Value-added time)

= (210 minutes/shirt)/(110 minutes/shirt) = **1.90**

Labor Utilization = (Time in Use)/(Time Available)

= (5 ½ hr)/(7 hr) = .786 or **78.6%**

Efficiency = (Actual Output)/(Standard Output)

= (25 shirts/day)/(28 shirts/day) = .89 or **89%**

Lab 1 Work Requested (2 Weeks)

Choose a case study of an organization and a specific process

1) Present the company (organization)

2) Elaborate the flowchart of the studied process

3) Estimate the (max possible) process performance metrics

4) Classify the studied production system (according to the type of Customer Order, according to the produced quantity, according to the resources layout, according to the routing, and according to VAT analysis). Explain