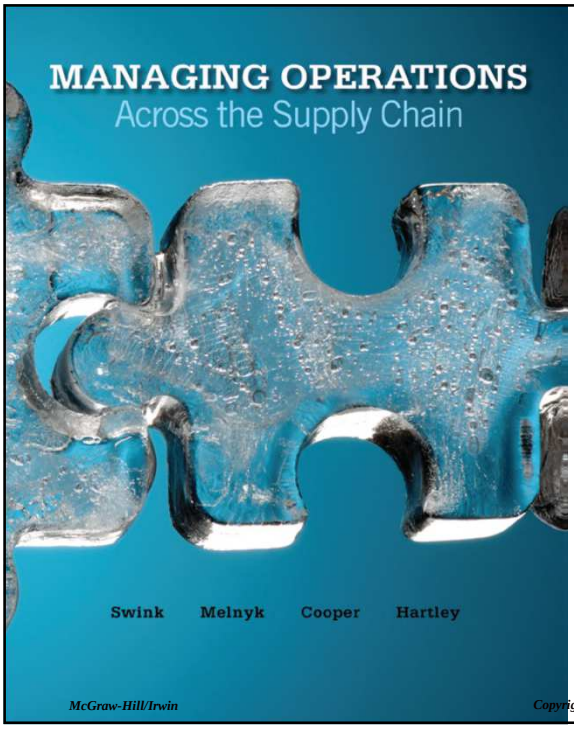
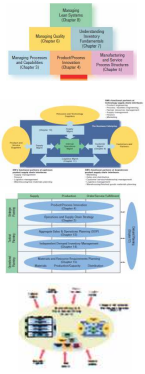


CHAPTER THREE

Managing Processes and Capabilities

Where We Are Now



Chapter	Relationships	Sustainability	Globalization	Organizational Culture/Ethics	Change Management	Measurement
Part 1 Supply Chain: A perspective for Operations Management						
1. Introduction to Managing Operations Across the Supply Chain	X	X	X			
2. Operations and Supply Chain Strategy	X	X	X	X	X	X
Part 2 Foundations of Operations Management						
3. Managing Processes and Capabilities	**X**					**X**
4. Product/Process Innovation	X	X	X		X	
5. Manufacturing and Service Process Structures	X		X	X		X
6. Managing Quality	X	X	X	X	X	X
7. Understanding Inventory Fundamentals	X		X			X
8 Lean Systems	X		X	X	X	X
Part 3 Integrating Relationships Across the Supply Chain						
9. Customer Management	X					X
10. Supplier Management	X	X	X	X		X
11. Logistics Management	X	X	X			
Part 4 Planning of integrated Operations Across the Supply chain	X					
12. Demand Planning: Forecasting and Demand Management	X		X			X
13. Sales and Operations Planning	X		X			X
14. Independent Demand Inventory Planning	X					X
15. Materials and Resource Requirements Planning	X		X			X
Part 5 Managing Change in Supply Chain Operations						
16. Project Management	X	X	X	X	X	X
17. Evolving Business Models and Change Drivers in the Supply Chain	X	X	X	X	X	

Learning Objectives

1. Understand the importance of processes and process thinking
2. Define the components of a process
3. Estimate capacity and utilization of processes
4. Explain the impact of multiple factors on process performance
5. Describe process improvement methodologies

3–3

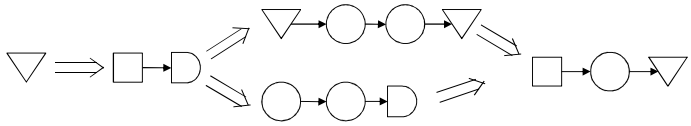
What is a process?

- A system of structured activities that use resources to turn inputs into valuable outputs.
- Process thinking views activities in an organization as a collection of processes
- Processes consist of:
  - –Activities
  - –Inputs/Outputs/Flows
  - –Process structures
  - –Management policies

3–4

Activities of a process

- ***Operations*** change inputs
- ***Transportation*** moves an input from place to place
- ***Inspection*** verifies the results of an activity
- ***Delay*** unintentionally stops the flow of an input
- ***Storage*** is the formal inventorying of an input



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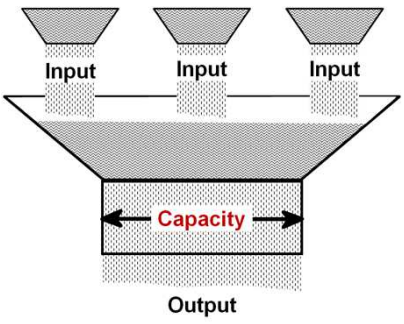
Process Capacity

- ***Capacity:*** amount of input that can go into or the amount of output that can be created by a process, at a given level of resources over a given time period



3–6

Process Capacity Definitions

- ***Maximum capacity***: highest achievable level under ideal conditions, for a limited time
- ***Effective capacity***: achievable level under normal conditions, for an extended time
- ***Utilization***: how much available capacity is actually used
- ***Efficiency:*** how well a resource is used compared to set standards
- ***Yield***: usable output from input

Process Capacity Definitions

Maximum capacity = 200,000 units per day

Effective capacity =120,000 units per day

Actual orders = 150,1000 units per day

Utilization of *maximum capacity* =
(150,000/200,000) x 100% = 75%

Utilization of *effective capacity* =

(150,000/120,000) x 100% = 125%

Example 3-1

Expanding Process Capacity

- **Increase Utilization**
  - Increase up-time
  - Reduce changeovers and set-up times
  - Improve scheduling)
- **Improve Efficiency**
  - Improve layout
  - Break bottlenecks
  - Reduce or buffer variation
  - Increase labor productivity
- **Increase Yield**
  - Voice of the customer
  - Poka-Yoke
  - Increase process capability and control
  - Improve in-coming materials quality

Creativity Before Capital

3–9

Theory of Constraints (TOC)

1. Every process has a constraint
2. Every process has variance that consumes capacity
3. Every process must be managed as a system
4. Process measures are crucial to the process's success
5. Every process must continually improve

For more information go to http://www.goldratt.com/toctpwhitepaper.pdf

3–10

1. Every process has a constraint

- ***Bottleneck:*** anyplace demand ≥ capacity; this limits the ability of the process to generate output
- A constraint or "scarce resource"
  - A facility, a department, a machine, a skill type, etc.
  - Demand
- Defines the maximum capacity of a *system*
- Go look for:
  - The process operation with the largest cycle time
  - Inventory or delay in front of the bottleneck
  - 'Vacuum' behind the bottleneck

3–11

1. Every process has a constraint

- ***Serial/Sequential Structure***: processes occur one after another
- ***Parallel Structure***: two or more processes occur simultaneously

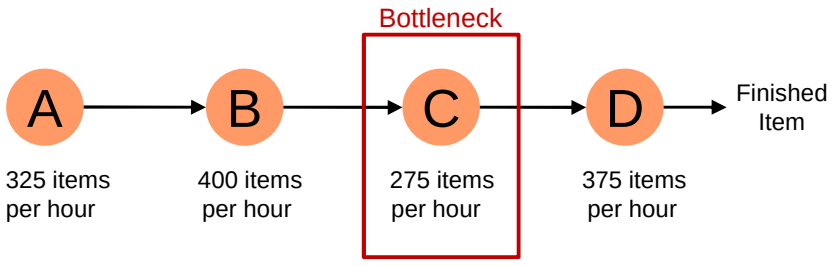


Figure 3-1 and Example 3-2

3–12

1. Every process has a constraint

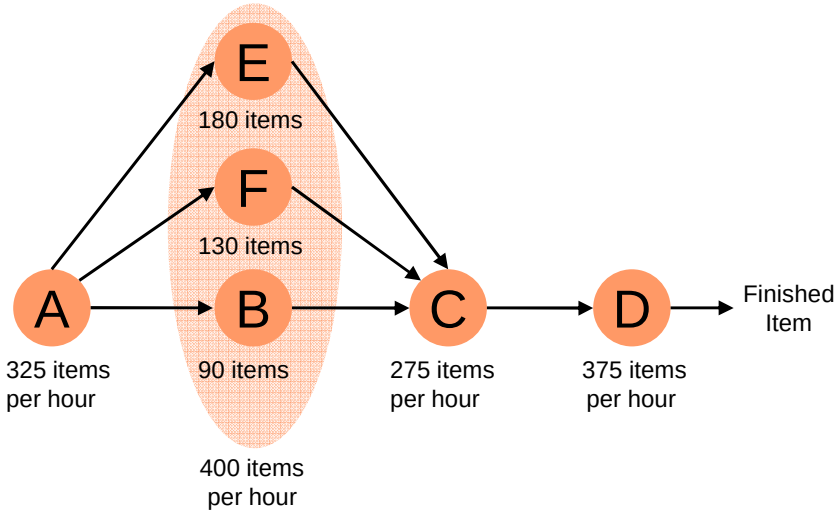


Figure 3-2 and Example 3-3

3–13

1. Every process has a constraint (cont'd)

- Measures of process flow:
  - ***Flow time***: time for one unit to get through a process
  - ***Cycle time***: time it takes to process one unit at an operation in the overall process
  - ***Little's Law***: there is a relationship between flow time (F), inventory level (I) and throughput rate (TH)

$$F = \frac{I}{TH}$$

In order to process 18,000 'items' in 12 hours, what throughput rate is needed?

12 hours = 18,000 / TH

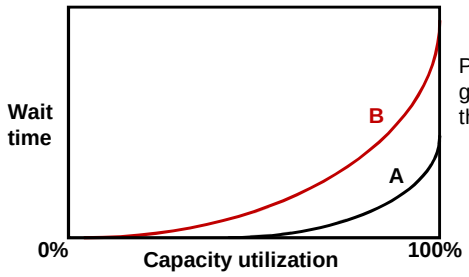
TH = 1,500 per hour

Example 3-4

3–14

2. Variance consumes capacity

- Variance occurs in a process's inputs, activities and outputs.
- Increased complexity and uncertainty makes it difficult to create plans to efficiently and effectively use resources.



Process **B** has greater variability than process **A**

3–15

2. Variance consumes capacity (cont'd)

$$\text{Wait time} = \left(\frac{c_a^2 + c_p^2}{2}\right)\left(\frac{u}{1-u}\right)t_p$$

c_a = coefficient of variation (standard deviation/average) of job arrival times
c_p = coefficient of variation of job processing times
u = utilization of the work center
t_p = average processing (cycle) time for jobs

3–16

2. Variance consumes capacity (cont'd)

$$\text{Wait time} = \left(\frac{c_a^2 + c_p^2}{2}\right)\left(\frac{u}{1-u}\right)t_p$$

$$= \left(\frac{2^2 + 1.5^2}{2}\right)\left(\frac{.85}{1-}.85\right)3$$

$$= 53.125 \text{ min}$$

c_a = 2
c_p = 1.5
u = 85%
t_p = 3 minutes

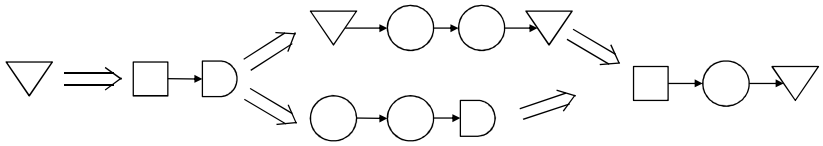
Example 3-5

2. Variance consumes capacity (cont'd)

- Variability in:
  - **Products**: changeovers
  - **Schedules**: batching creates complex, moving bottlenecks
  - **Quality**: rework, scrap, starving
  - **Resource availability**: downtime
  - **Process speed**: blocking / starving
  - **Input deliveries**: starving

3. Processes managed as systems

- Changing one element of a process may impact other elements, sometimes in unexpected ways.
- Process elements are interdependent
  - –Activities
  - –Inputs/Outputs/Flows
  - –Process structures
  - –Management policies



3–19

4. Measures processes for success

- ***Metrics*** should address aspects of performance that are important to both customers and the organization.
  - –They should be verifiable and quantifiable.
  - –They should align with standards and rewards.
  - –They should support strategy and priorities.
  - –They provide the basis for monitoring, controlling and improving processes.

3–20

5. Continuous improvement of processes

- ***Kaizen***: focused, incremental improvement efforts

small + small + small + small + … + n = **LARGE**

  - **Team focus:** utilize the knowledge and experience of the people associated with the process
  - **Short term and focused:** quick, local improvement
  - **Action-oriented**: quick implementation
  - **Repetitive**: regular events

3–21

Process and Capabilities Summary

1. Businesses are defined by their capabilities, which determine how they can satisfy customers.
2. Processes are collections of activities to convert inputs into valuable outputs.
3. Processes are characterized by activities, flows, structures, resources and metrics.
4. Bottlenecks determine the maximum output level.
5. Process variability consumes capacity, cost and lead times.
6. Process can be modified or replaced.

3–22