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INDUSTRIAL ENGINEERING

# Lesson 8

# Designing Processes

by

Dr. Gusman Nawanir

Faculty of Industrial Management, Universiti Malaysia Pahang

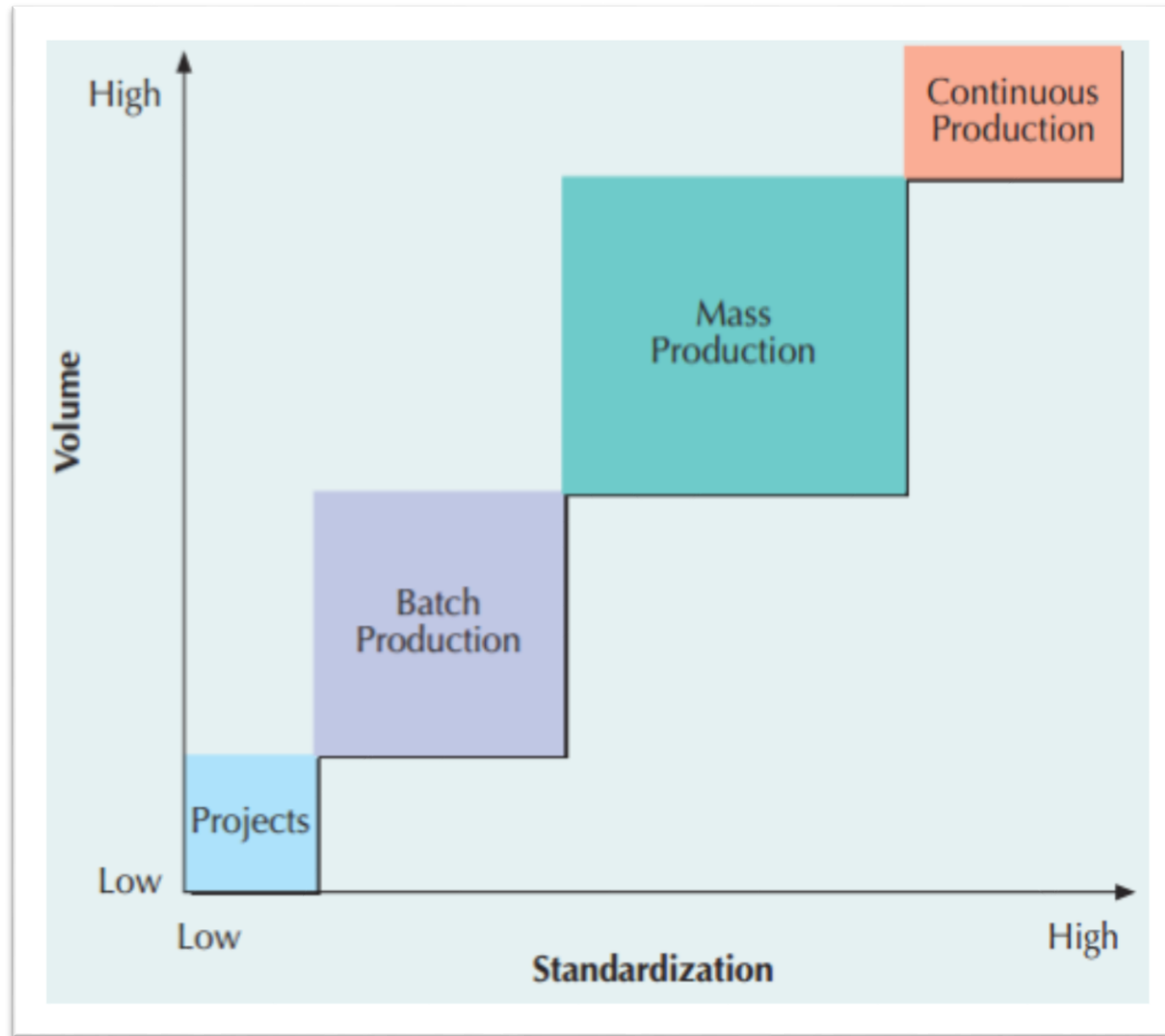
E-mail: [gusman@ump.edu.my](mailto:gusman@ump.edu.my)

# Synopsis

This chapter introduces the concept of designing production processes. The main considerations whether to buy the product from suppliers and to make it in house will be discussed. Four types of production processes along with the methods of selecting them will also be addressed. Subsequently, the techniques to analyze and design process will be presented. Finally, the concept of process innovation will be briefed.

# Expected Outcome

1. Understand the concept of designing production processes.
2. Distinguish four types of processes.
3. Understand the concept of breakeven point analysis.
4. Apply the techniques to analyze and design processes.
5. To understand the concept of process innovation.



Source: Russell & Taylor (2014)



# Process Selection

	Project	Batch Production	Mass Production	Continuous Production
<i>Type of product</i>	Unique	Made-to-order (customized)	Made-to-stock (standardized)	Commodity
<i>Type of customer</i>	One-at-a-time	Few individual customers	Mass market	Mass market
<i>Product demand</i>	Infrequent	Fluctuates	Stable	Very stable
<i>Demand volume</i>	Very low	Low to medium	High	Very high
<i>No. of different products</i>	Infinite variety	Many, varied	Few	Very few
<i>Production system</i>	Long-term project	Discrete, job shops	Repetitive, assembly lines	Continuous, process industries
<i>Equipment</i>	Varied	General-purpose	Special-purpose	Highly automated

Source: Russell & Taylor (2014)



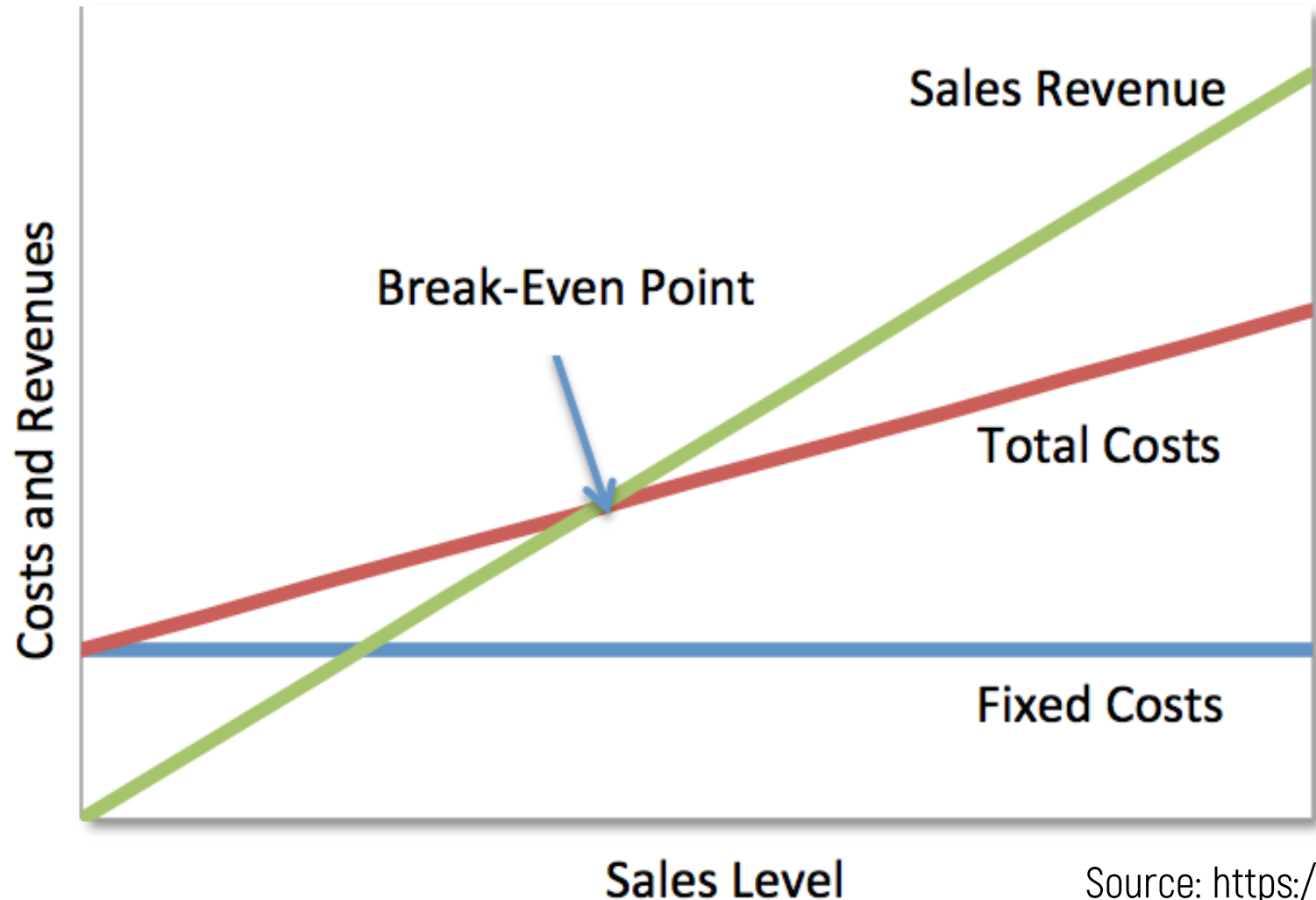
# Process Selection

	Project	Batch Production	Mass Production	Continuous Production
<b>Primary type of work</b>	Specialized contracts	Fabrication	Assembly	Mixing, treating, refining
<b>Worker skills</b>	Experts, craftspersons	Wide range of skills	Limited range of skills	Equipment monitors
<b>Advantages</b>	Custom work, latest technology	Flexibility, quality	Efficiency, speed, low cost	Highly efficient, large capacity, ease of control
<b>Disadvantages</b>	Nonrepetitive, small customer base, expensive	Costly, slow, difficult to manage	Capital investment, lack of responsiveness	Difficult to change, far-reaching errors, limited variety
<b>Examples</b>	Construction, shipbuilding, spacecraft	Machine shops, print shops, bakeries, education	Automobiles, televisions, computers, fast food	Paint, chemicals, foodstuffs

Source: Russell & Taylor (2014)



# Process Selection with BEP



## Break-even point (BEP)

Total cost = total revenue

Source: <https://vonbrocke.wordpress.com>



# Components of BEP



Total cost = fixed cost + total variable cost

Total revenue = quantity x price

Profit = Total Revenue - Total Cost



# Process Selection

Formulate a total cost equation for each process

Calculate the point of indifference between 2 alternative processes

If demand  $>$  point of indifference, choose the lowest variable cost

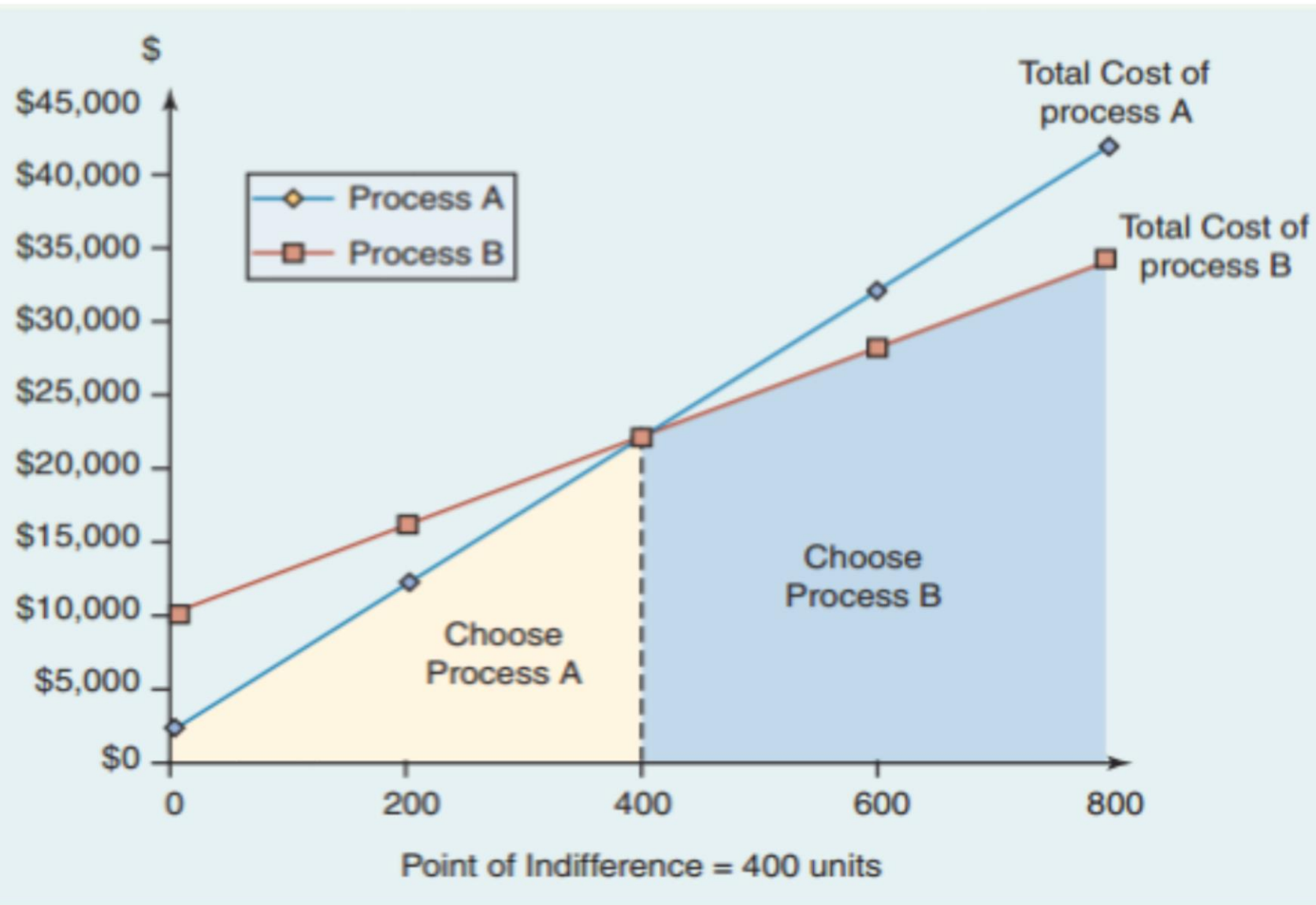
If demand  $<$  point of indifference, choose the lowest fixed cost

# Process Selection

Process A	Process B
$\$2,000 + \$50v$	$= \$10,000 + \$30v$
$\$20v = \$8,000$	
$v = 400 \text{ Units}$	

Below 400, choose A

Above 400, choose B

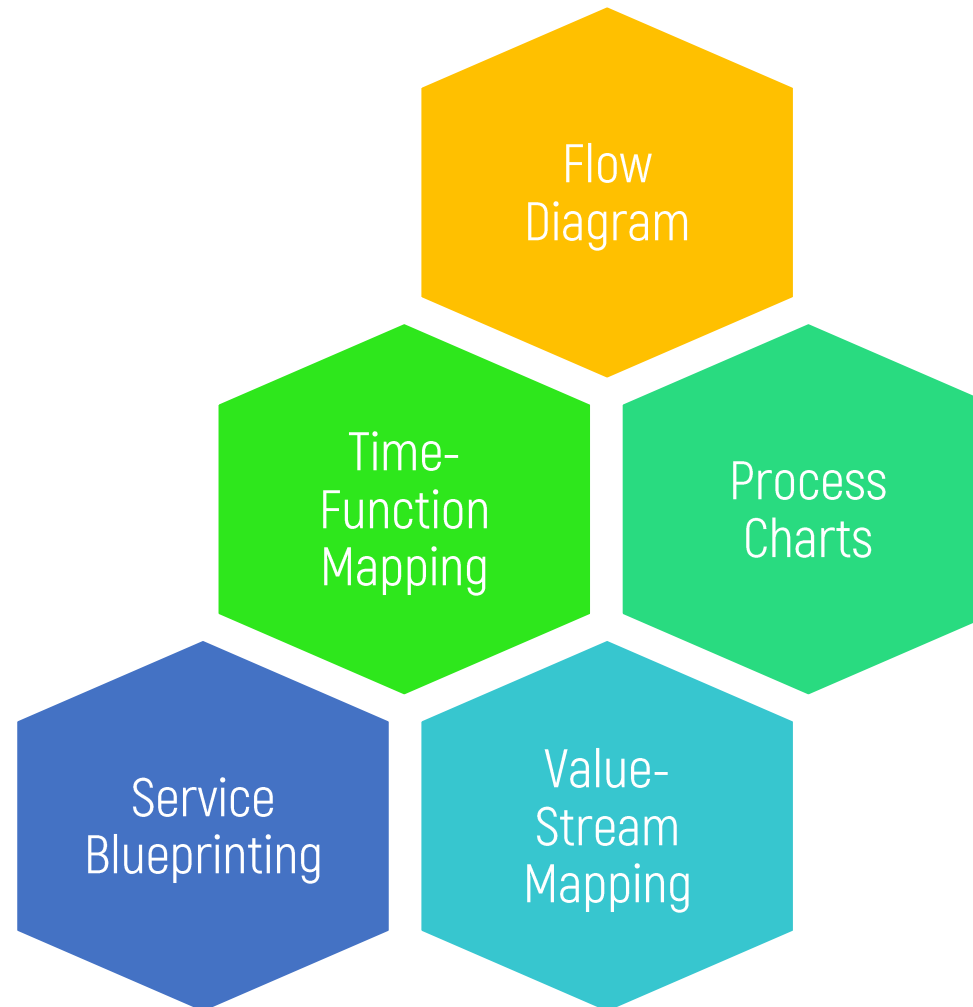


Source: Russell & Taylor (2014)

## Process Selection: Graph



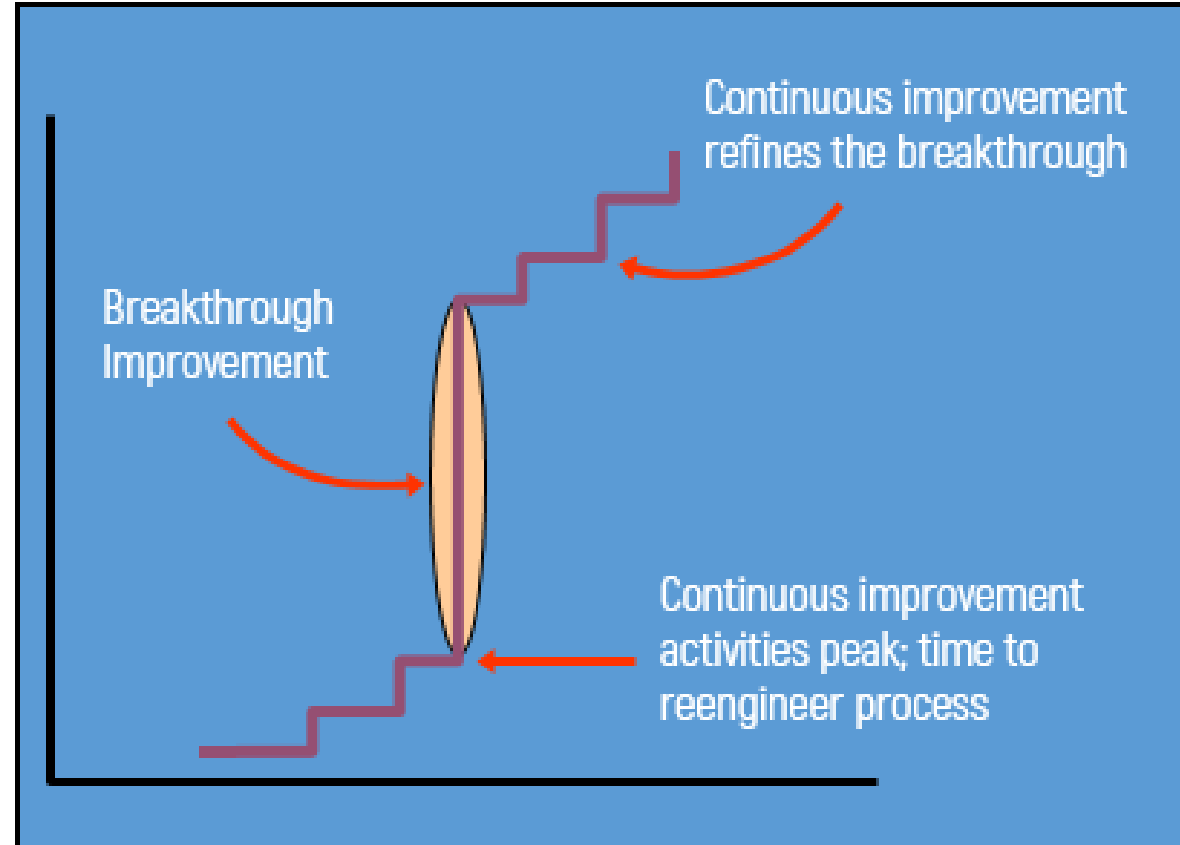
# Tools for Process Analysis & Design



# Process Innovation

Total redesign of a process for the purpose of breakthrough improvements.

System thinking is important to innovate the process.



Source: Heizer & Render (2014)



# References

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# Thank You