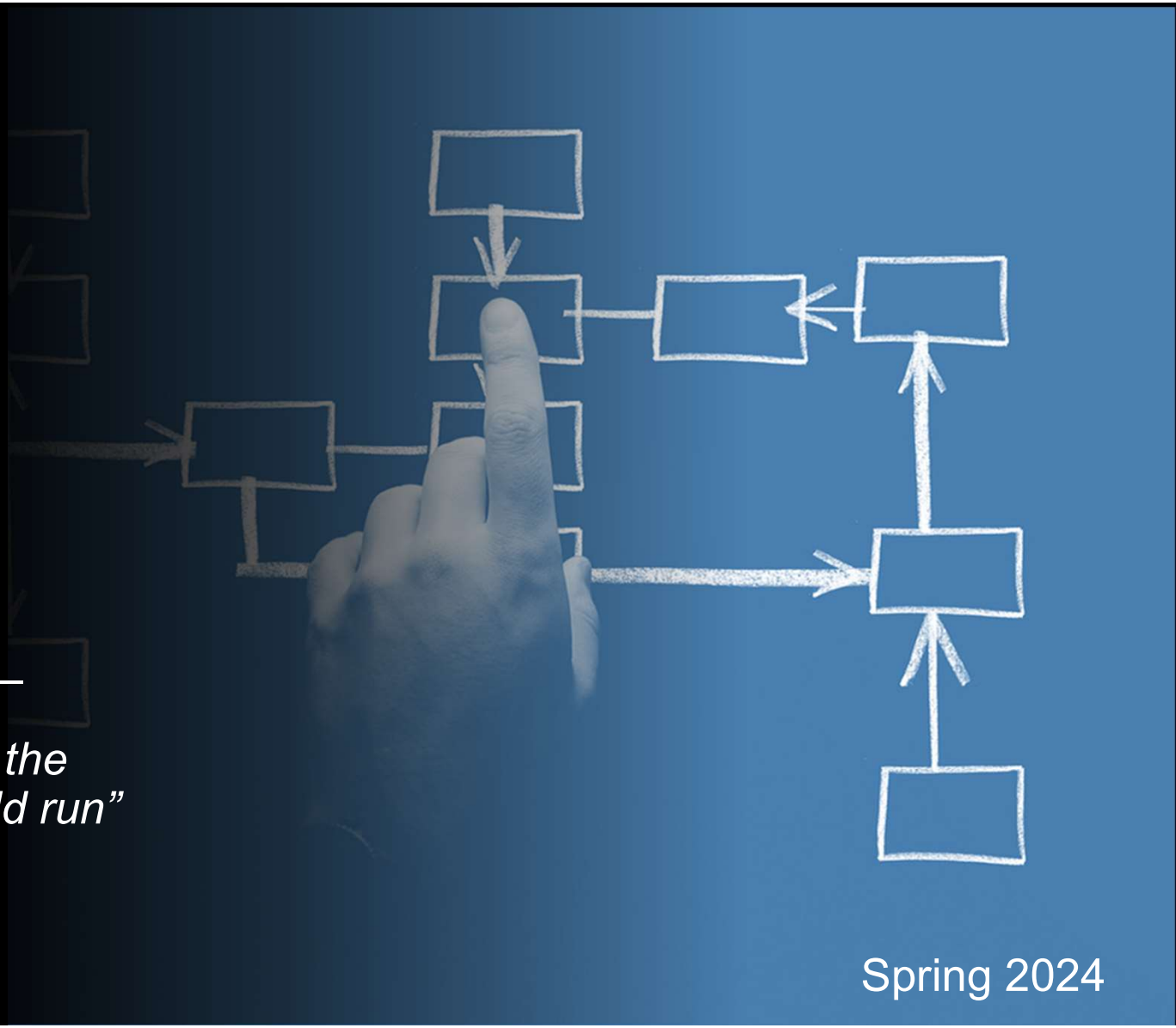
Operations Management **MLI21C617**

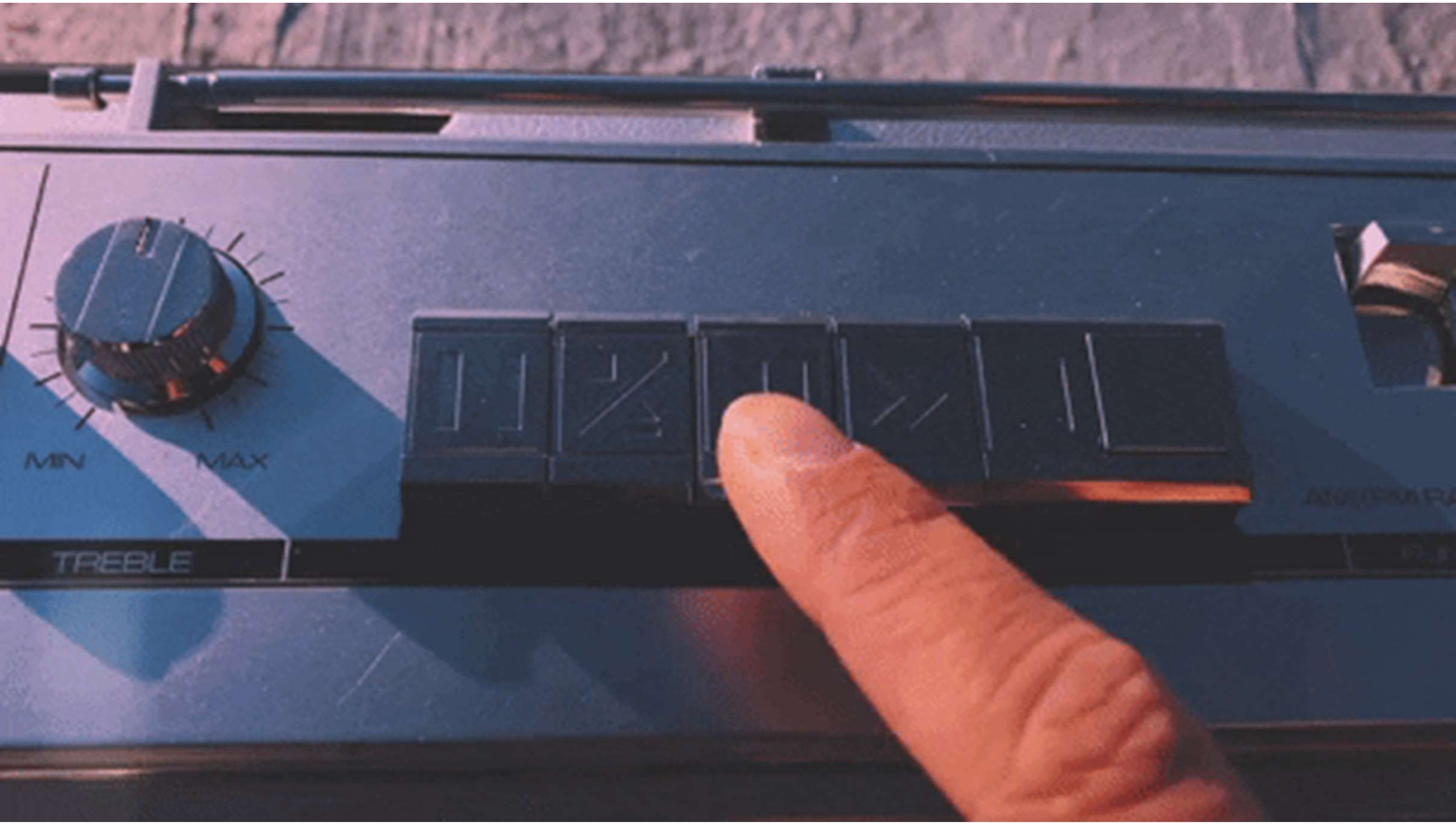
"Operations may not run the world, but it makes the world run"



Lecturer: Misa Bakajic

Spring 2024

Password: Richmond


MIN
MAX
TREBLE

Recap

1. OM is all about creating value by transforming inputs
2. There are differences between product VS services creation
3. 4Vs can be used to compare two operations
4. Operations have 5 performance objectives with internal/external effects

LECTURE 2 Designing Operations

Product Volume VS Product Variety

- What volumes are involved in each operation?
- How does product variety differ in each operation?








Service Volume VS Service Variety

- What is the rate of value being generated?
- What is the role of the customer in value creation?

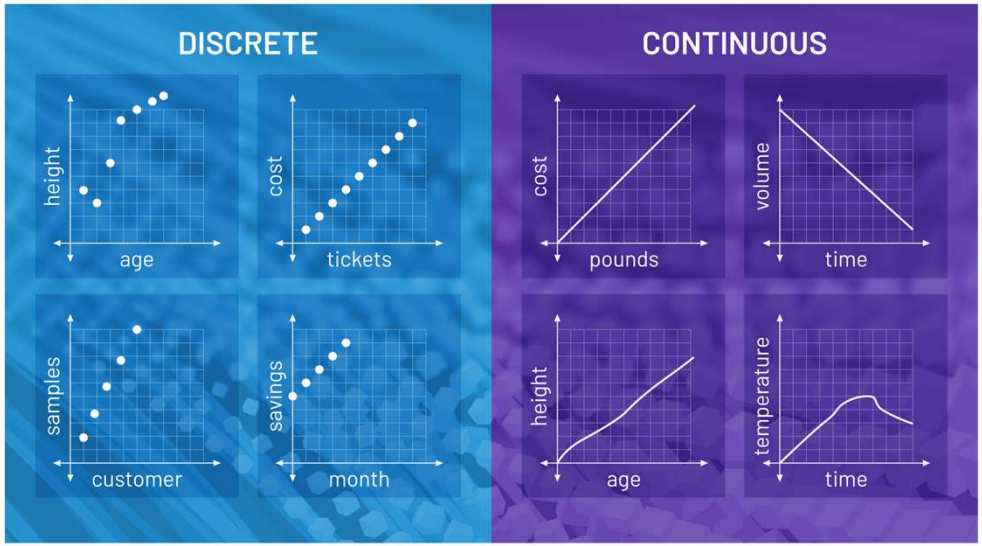
A!

Discrete VS continuous quantities

DISCRETE VS CONTINOUS QUANTITIES

Discrete	Continuous
• # of eggs in a basket • # of kids in a class • # of Facebook likes • # of diaper changes in a day • # of wins in a season • # of votes in an election	• Weight difference to 8 decimals before and after cookie binge. • Wind speed • Water temperature • Volts of electricity

DISCRETE VS CONTINOUS DATA



DISCRETE is unit countable (1,2,3,4,n)

CONTINOUS unit is measurable

Product-process matrix

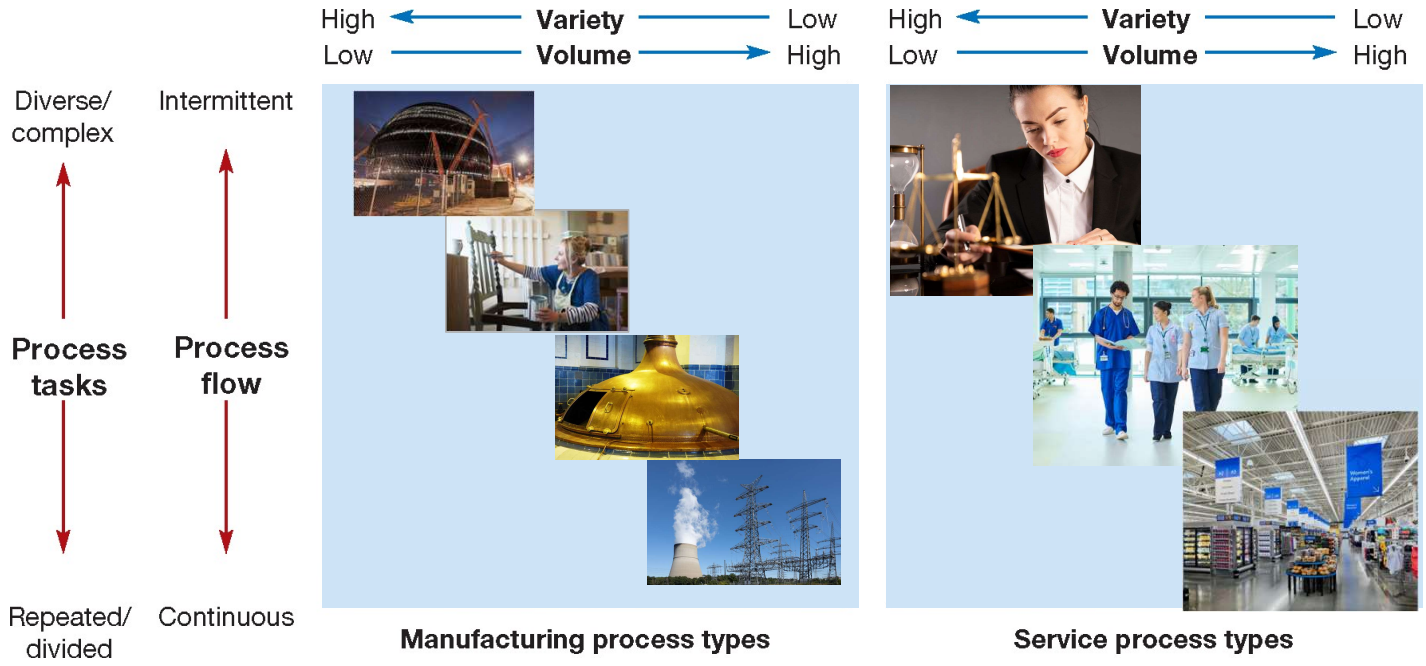
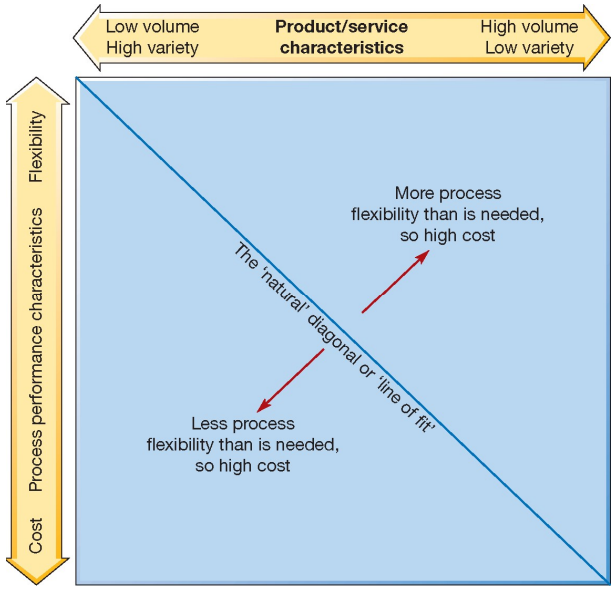


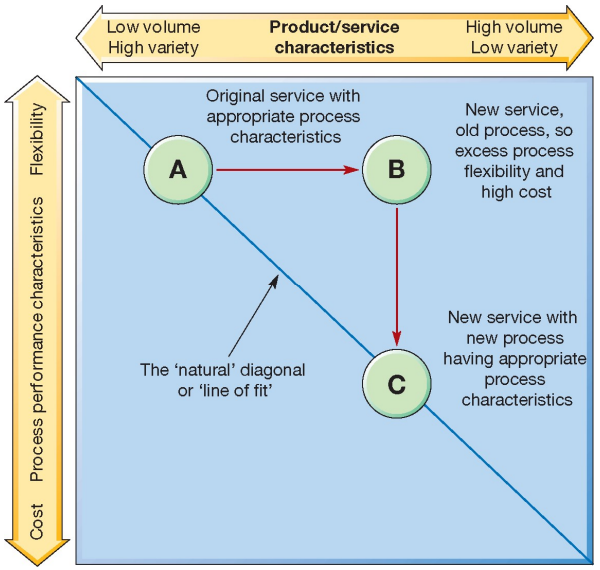
Figure 6.4

The ‘natural’ diagonal of the product–process matrix



CASE

- Water company installs water meters
- All customer have different pipe systems
- Supervisor must make assessment before installer is sent
- Water company wanted to install new remote-reading meters
- New meters were faster and easier to install
- However, installation costs increased!
- Decision was made to:
  - 1) eliminate supervisor assessment
  - 2) use less skilled installation staff



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Source: Based on Hayes and Wheelwright

Figure 6.5

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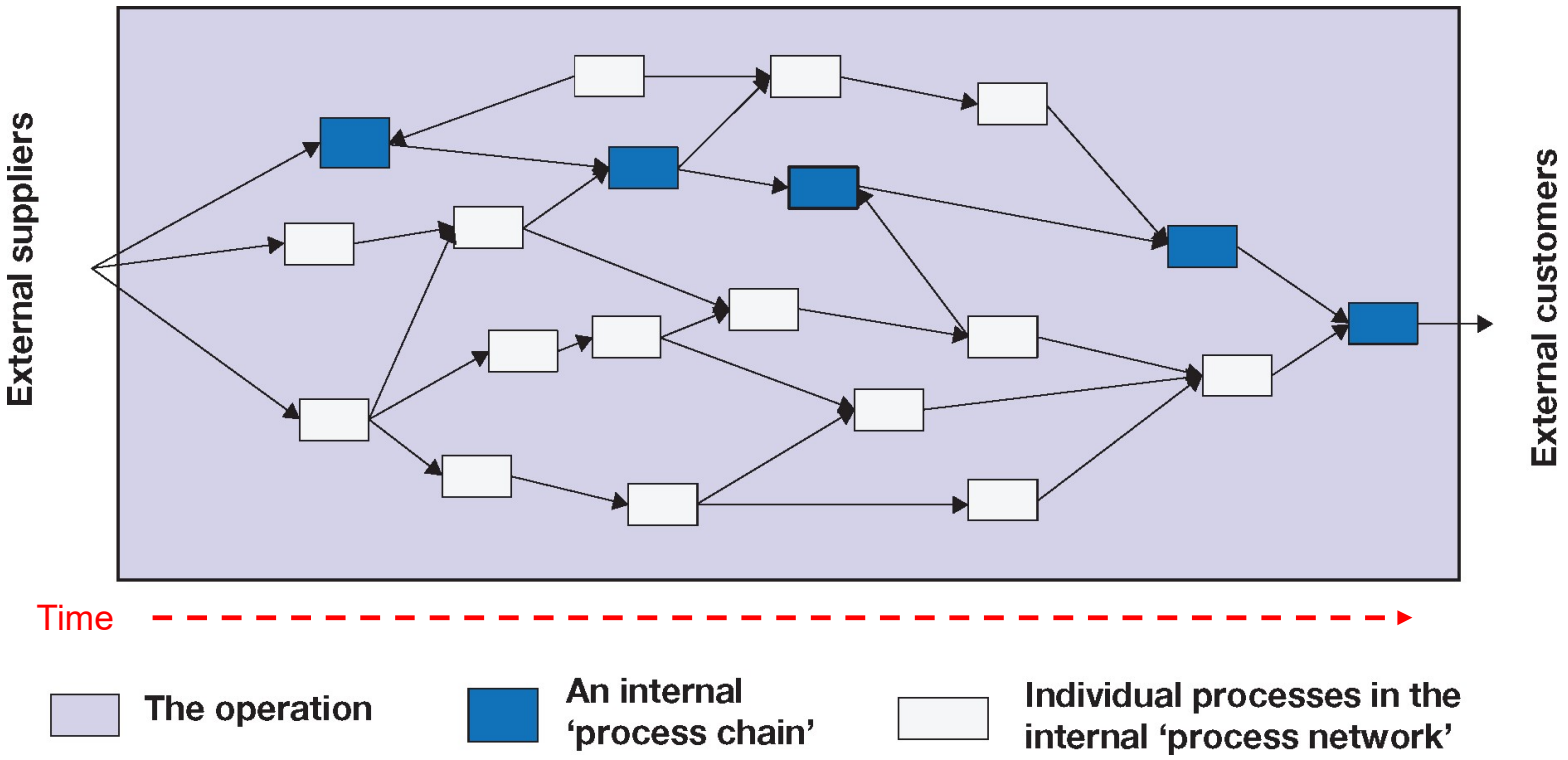
Process Design and Mapping

Example of a process network



A!

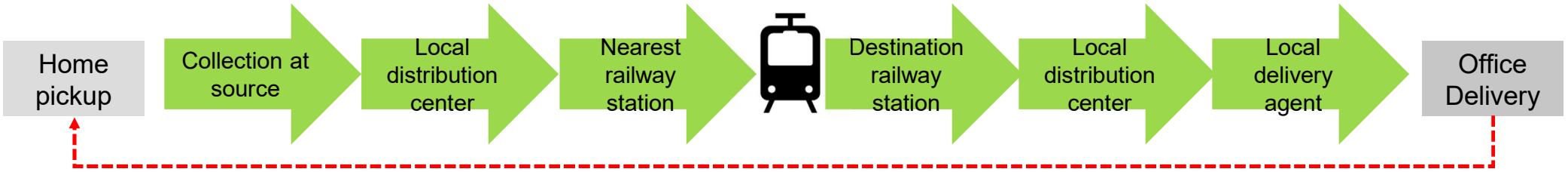
Figure 6.3

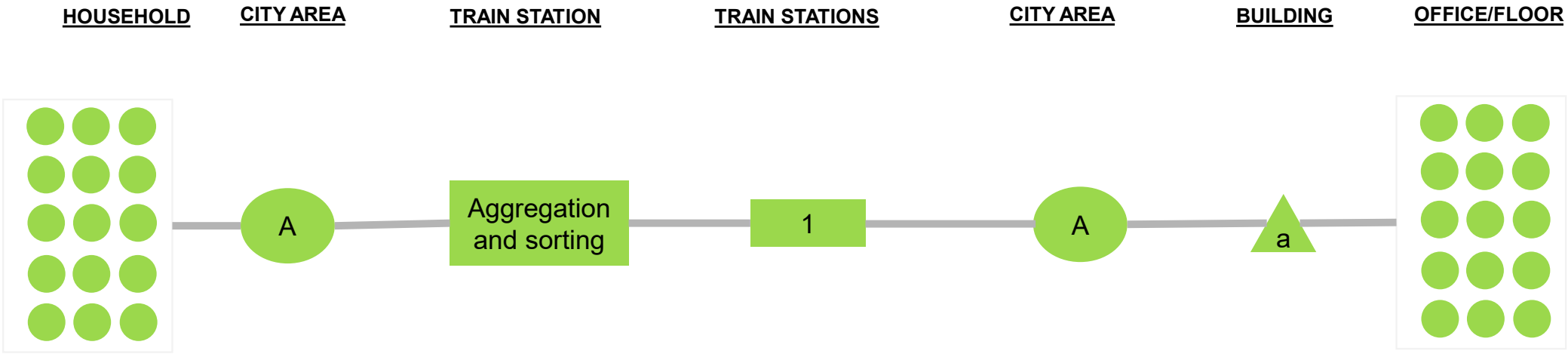
Dabbawalas

A!

Thomke, H., S. 2010. The Dabbawala System: On-Time Delivery, Every Time. Harvard Business School [online] Found at: https://www.hbs.edu/faculty/Pages/item.aspx?num=38410
Global News.2020.Dabbawalas: How India's 130-year-old food delivery system works.Global News [Youtube] Found at: https://www.youtube.com/watch?v=KDD32skx-zM

Process Analysis of Dabbawalas





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Business Process Change

Business Process Change

- Business Process Reengineering (BPR)
- Process Improvement
- Business Transformation
- Process Innovation
- Business Process Redesign

Radical re-design ⟵ ⟶ Incremental re-design

Kettinger, W.J., Teng, J.T. and Guha, S., 1997. Business process change: a study of methodologies, techniques, and tools. *MIS quarterly*, pp.55-80
Grover, V. and Kettinger, W.J. eds., 1995. *Business process change: Concepts, methods, and technologies*. IGI Global.

Front office VS Back-office operations

Front office VS Back-office operations

Businesses often separate their operations into front-office and back-office functions in to increase process efficiency or generate a seamless customer experience

Industry Example	Process Example	Process Example
BANKING	• Banking clerk interaction 	• Payment processing
RETAIL	• Sales associate interaction 	• Inventory ordering
HEALTHCARE	• Doctor examination	• Processing of patient records

FRONT OFFICE OPERATIONS
(High customer visibility)

BACK-OFFICE OPERATIONS
(Low customer visibility)

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Common process mapping symbols

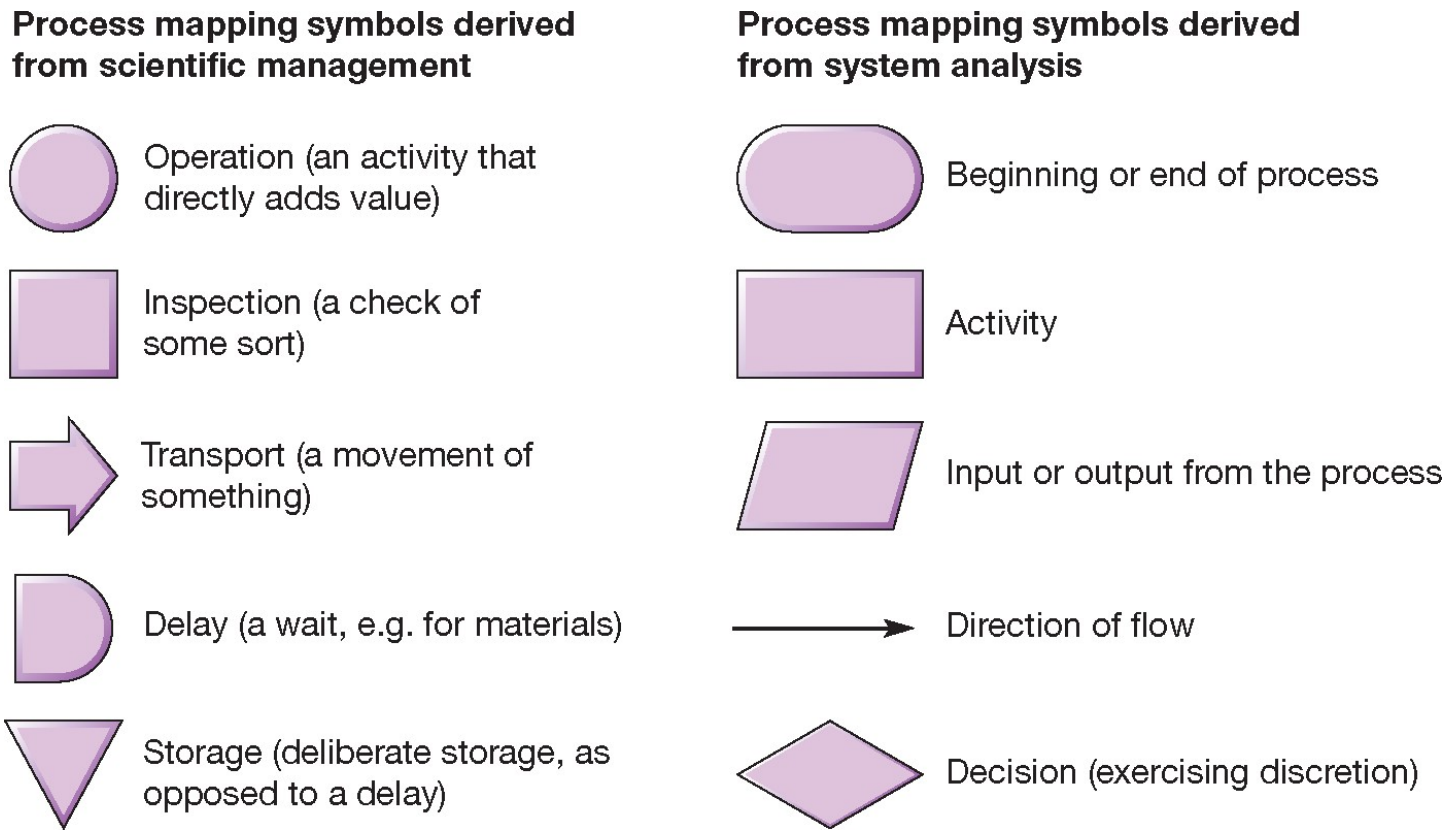

Figure 6.7

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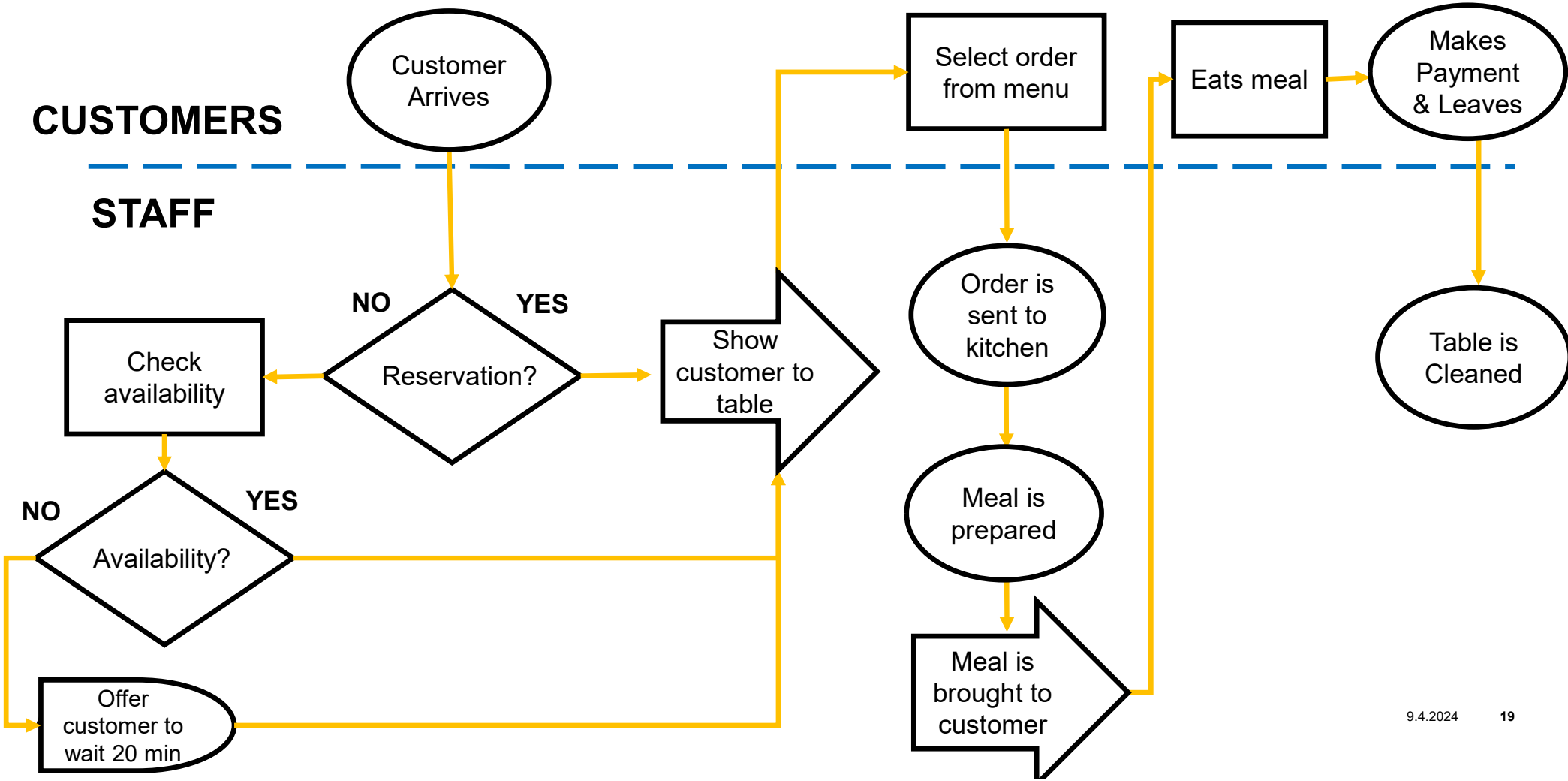
Example of a process map for restaurant



Describing work and process flow performance

Work in Process (WIP) number of items in the process as an average over a period of time
e.g. *number of people being served in a restaurant per hour, per day or per week*

FYI Work in progress VS Work in process
Work in process is used to report inventory items that are currently being constructed but are not yet done. Work in progress, on the other hand, is usually used to report capital assets on longer schedules that are not yet completed.

Throughput (TH) (flow rate) the rate at which items emerge from a process
e.g. time between customer food order is processed, paid and delivered

Cycle Time (CT) time between items emerging from the process (reciprocal of throughput)
e.g. time between orders emerging from the restaurant

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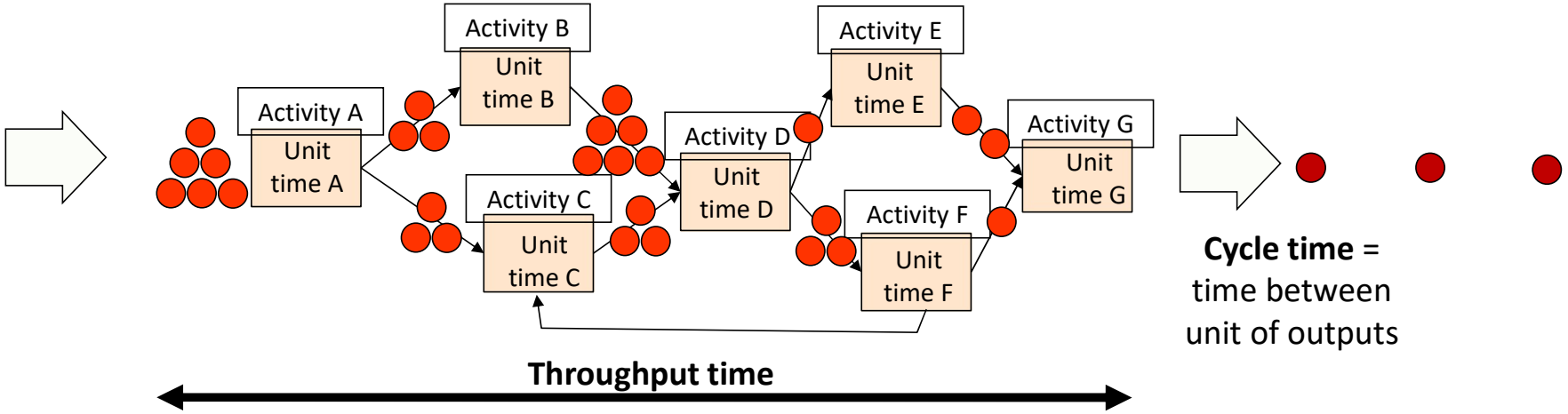
Process flow metrics



The individual activities that make up the process.

The sequence of the activities and the flow between them.

The time required for each activity (**Unit time** A, B, C, etc.).

The '**work content**' of the whole job (Unit time A + Unit time B + Unit time D, etc.).

The '**work in progress**' (WIP) within the process.

The number of staff allocated to the process.

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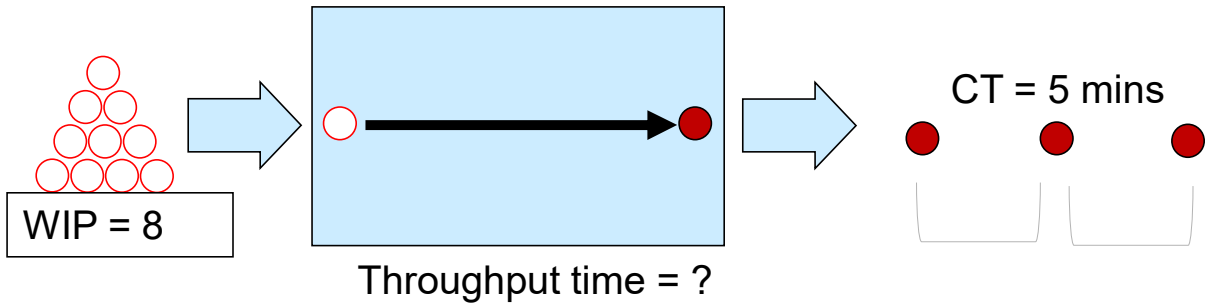
Little's law

Throughput time (TH) = Work In Progress (WIP) x Cycle Time (CT)



Throughput time = 8 x 5 mins

= 40 mins

Little's Law example (p.198)

Suppose it is decided that in a new sandwich assembly and sales process, the average number of customers in the process should be limited to around 10 and the maximum time a customer is in the process should be on average 4 minutes. If the time to assemble and sell a sandwich (from customer request to the customer leaving the process) in the process has been reduced to 1.2 minutes, how many staff should be serving?"

Little's Law formula

Throughput time (TH) = Work In Progress (WIP) X Cycle Time (CT)

Throughput time = 4 minutes

Work in Progress (WIP) = 10

$$\text{Cycle Time (CT)} = \frac{\text{Throughput time}}{\text{WIP}} \rightarrow \text{CT} = \frac{4}{10} = 0.4 \text{ minutes}$$

Workforce calculation formula

$$\text{Number of workers} = \frac{\text{Work content}}{\text{CT}} \rightarrow \text{Number of servers required} = \frac{1.2 \text{ minutes}}{0.4 \text{ minutes}} = \textbf{3 servers}$$

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In other words, 3 servers would serve 3 customers in 1.2 minutes, or a single customer would be served in 0.4 minutes.

Process bottle-neck

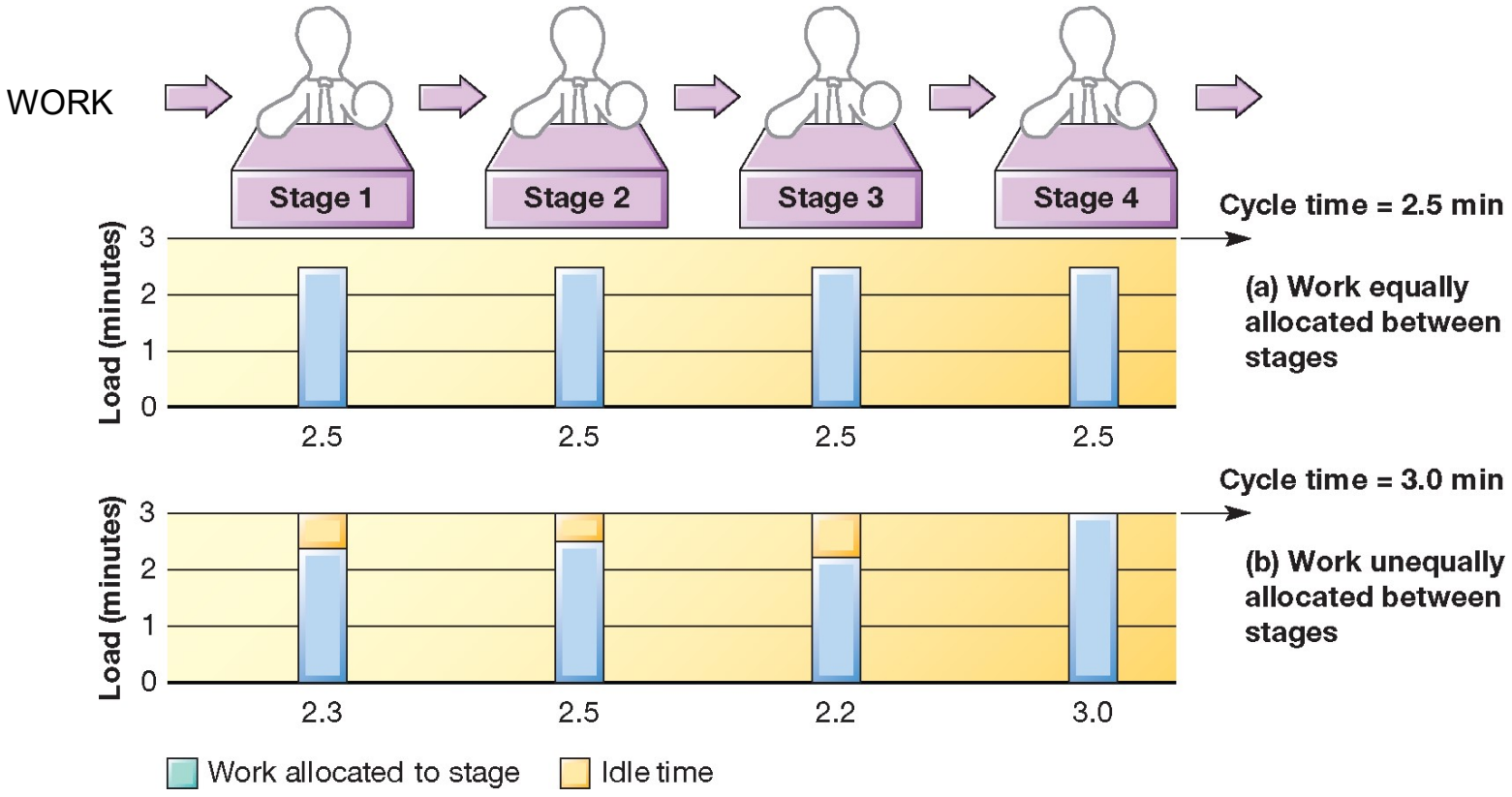

Figure 6.12

Reducing the bottle neck in people flow

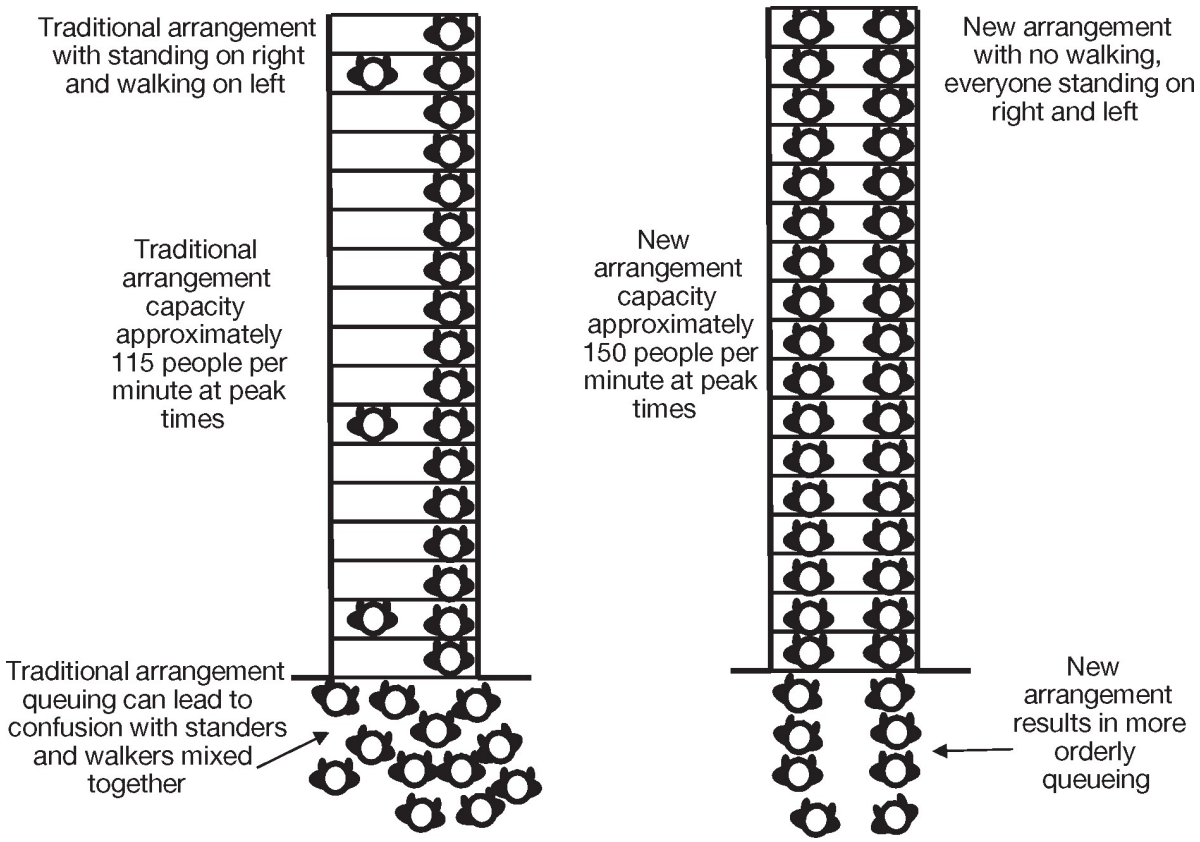

Figure 6.13

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‘Long thin’ VS ‘short fat’ process design

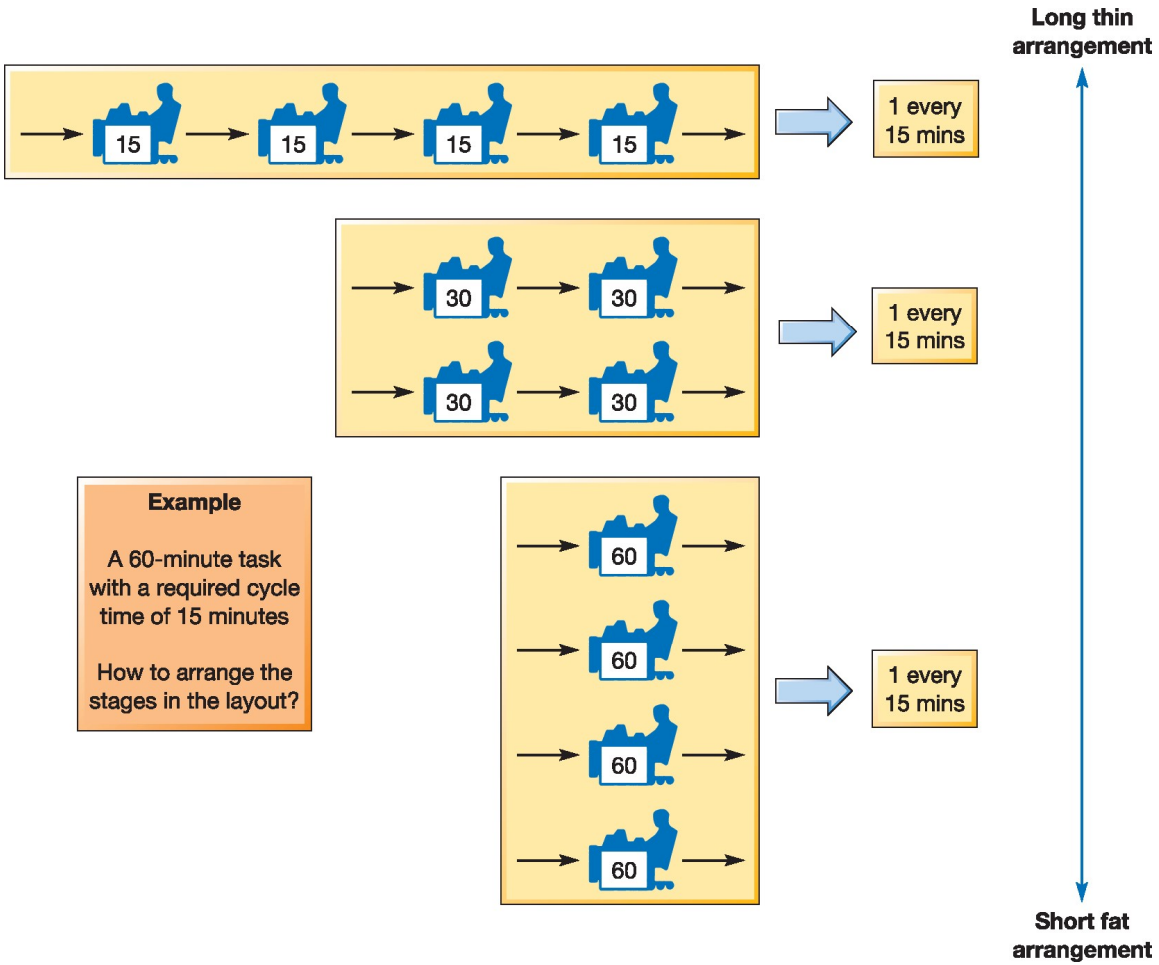

Figure 6.15

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Relationship between process utilization and number of items waiting

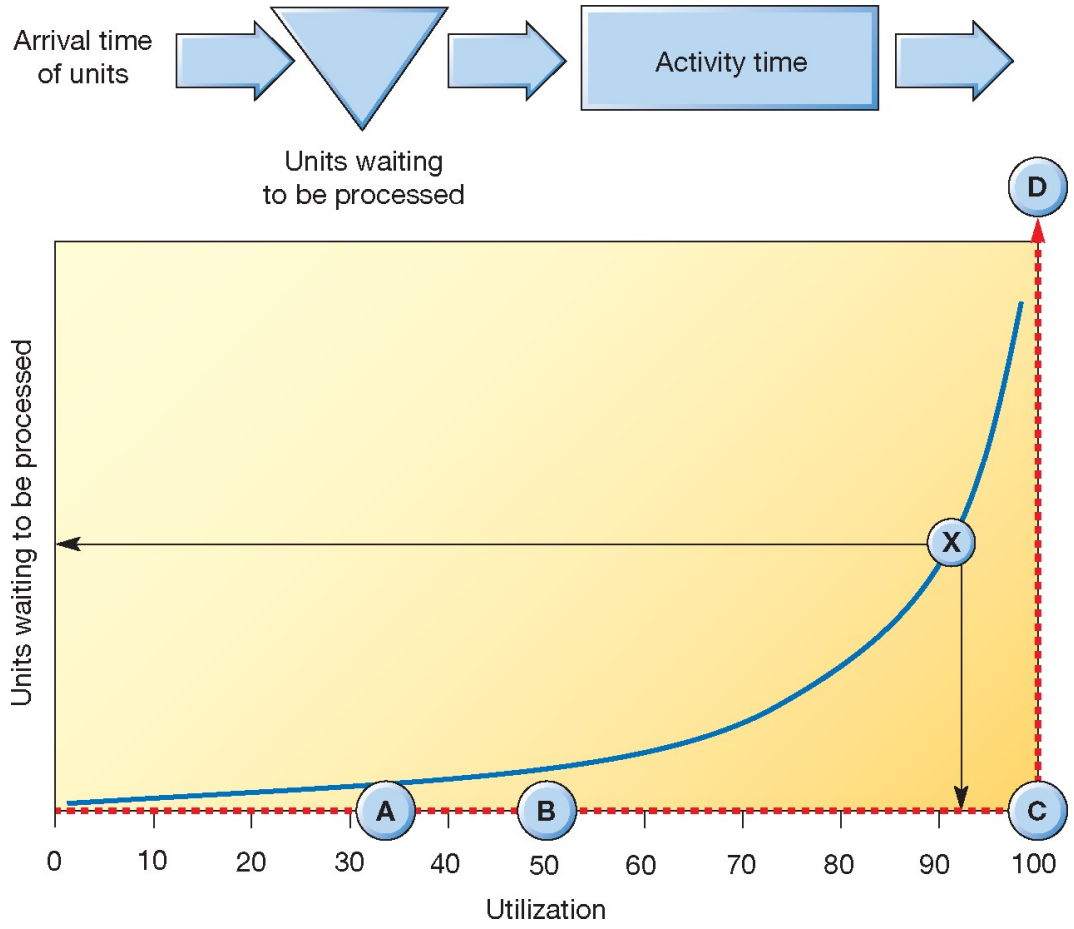

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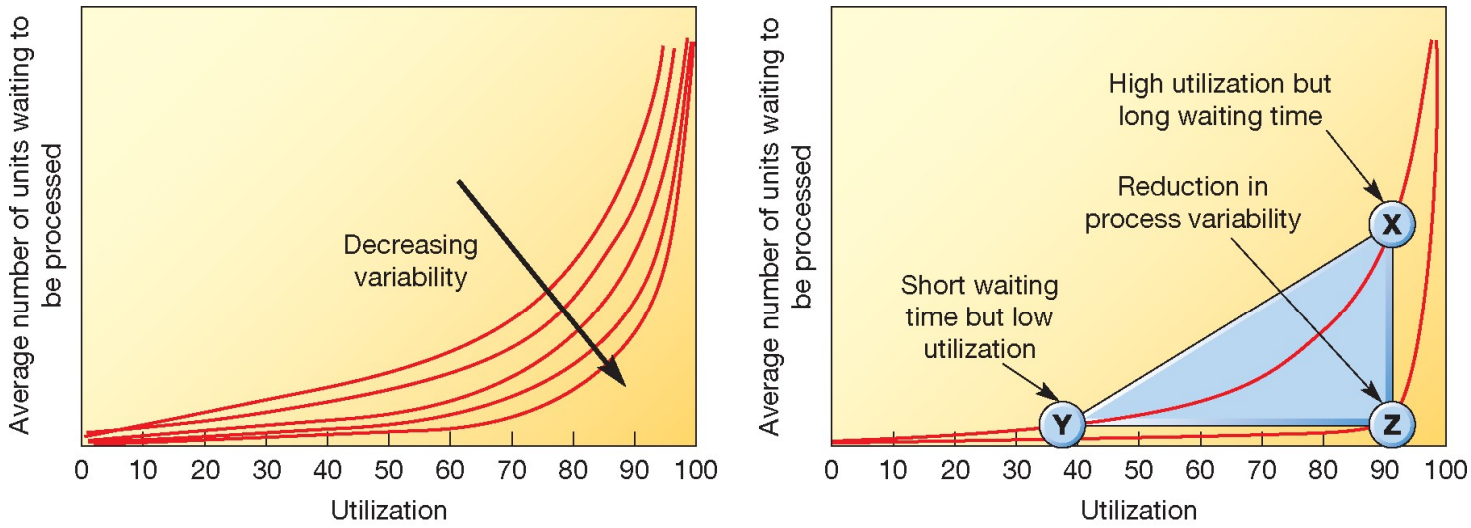
Figure 6.17

Relationship between process utilization and number of items waiting to be processed for variable arrival and activity times



(a) Decreasing variability allows higher utilization without long waiting times

(b) Managing process capacity and/or variability

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Figure 6.18

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Impact of process layout on performance

Impact of physical layout on operational performance

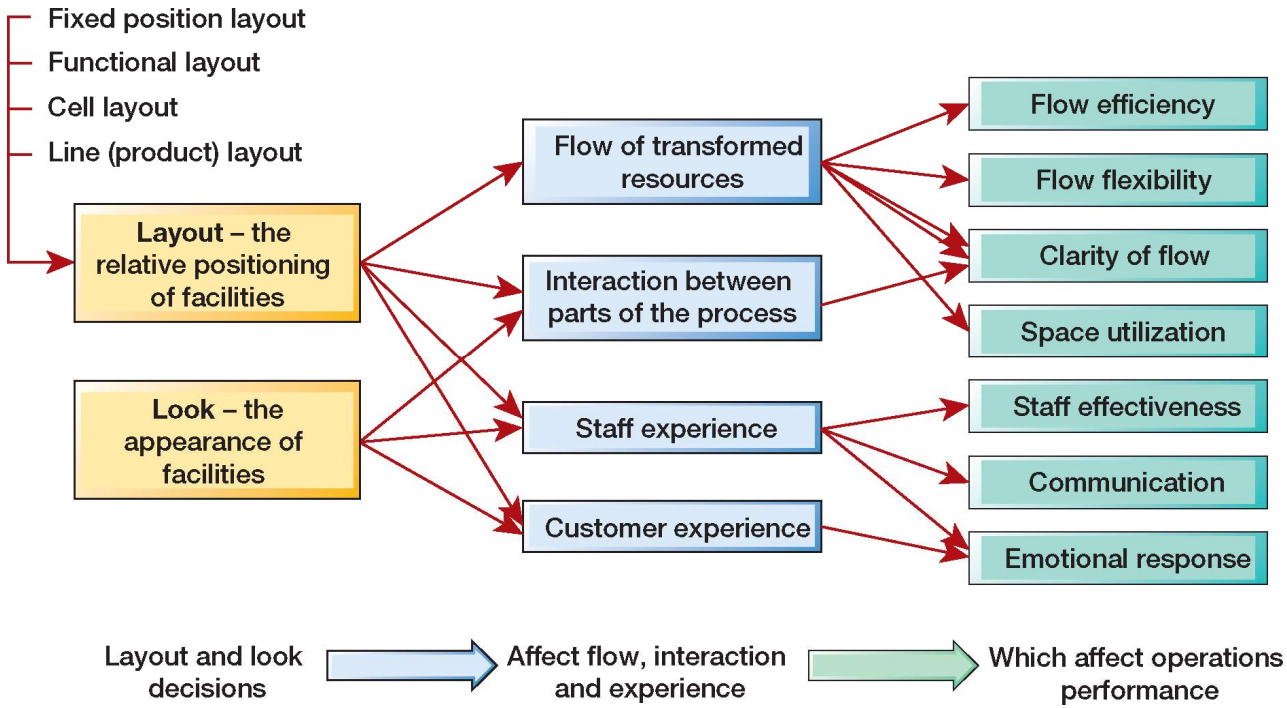

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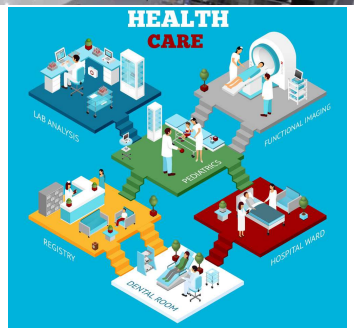
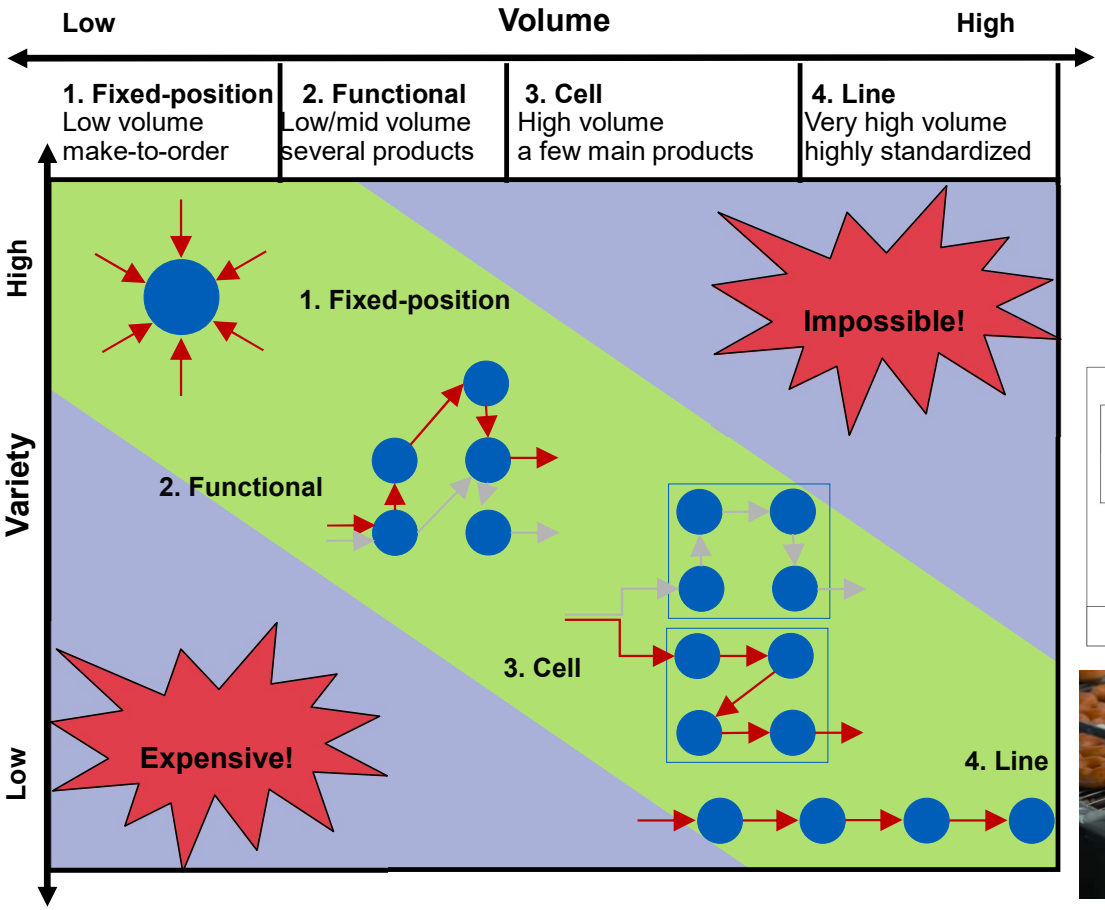
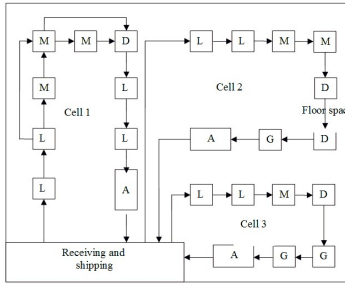
Figure 7.2

Volume–variety impact on process layout







Source: Hayes & Wheelwright (1979)

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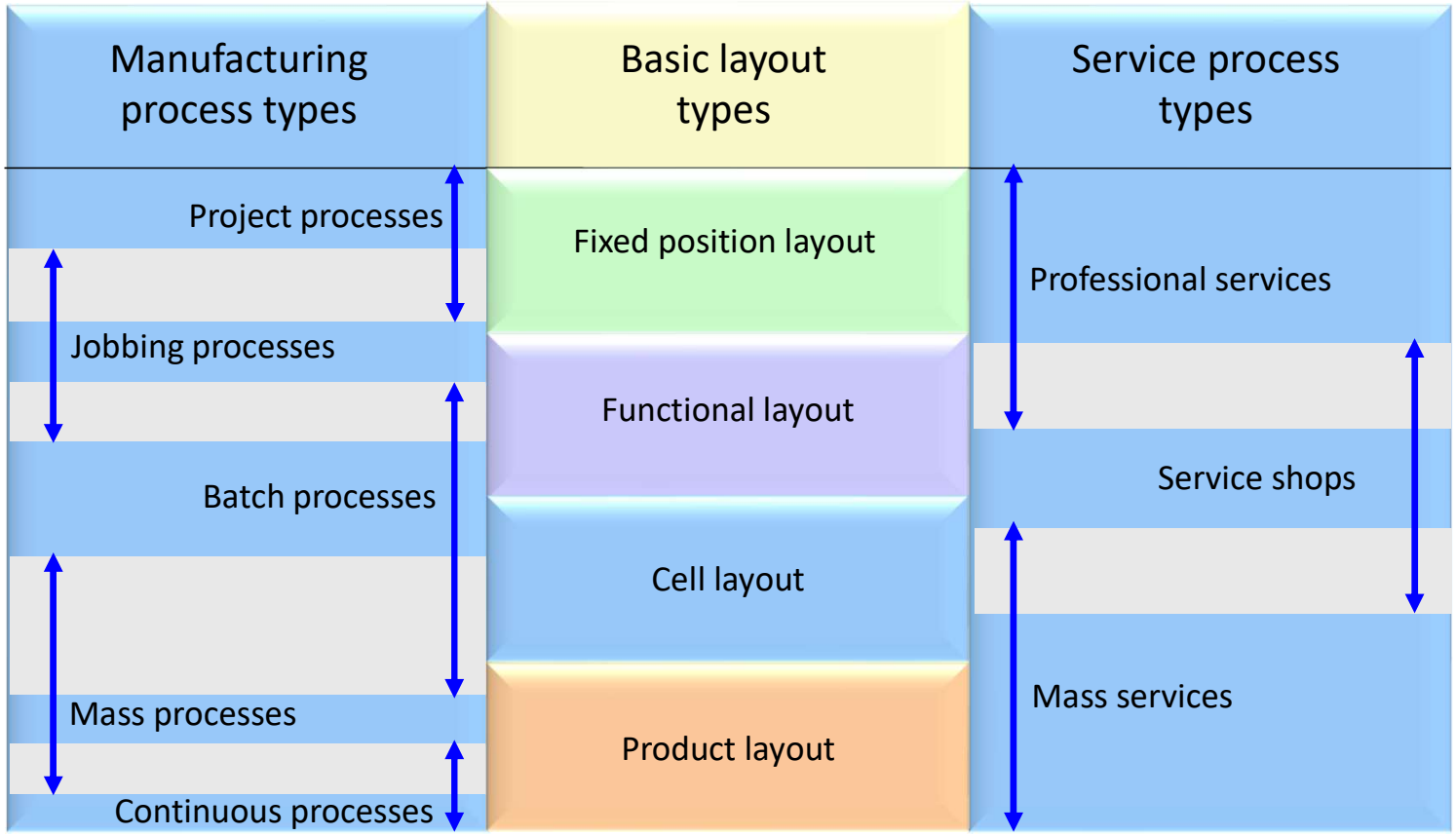
Process & layout types' relationship



Layout and Process Type ?

Production of Hubble Telescope

Construction engineering services

Layout and Process Type ?

Layout and Process Type ?

References

- Krajewski, L. J., Malhotra, M. K. & Ritzman, L. P. 2019. Operations management: Processes and supply chains. Twelfth edition. Global edition. Harlow, England: Pearson.

- Slack, N., Brandon-Jones, A. & Burgess, N. 2022. *Operations management*. Tenth edition. Harlow, England ; New York: Pearson.

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Process and layout types