

Operations Management

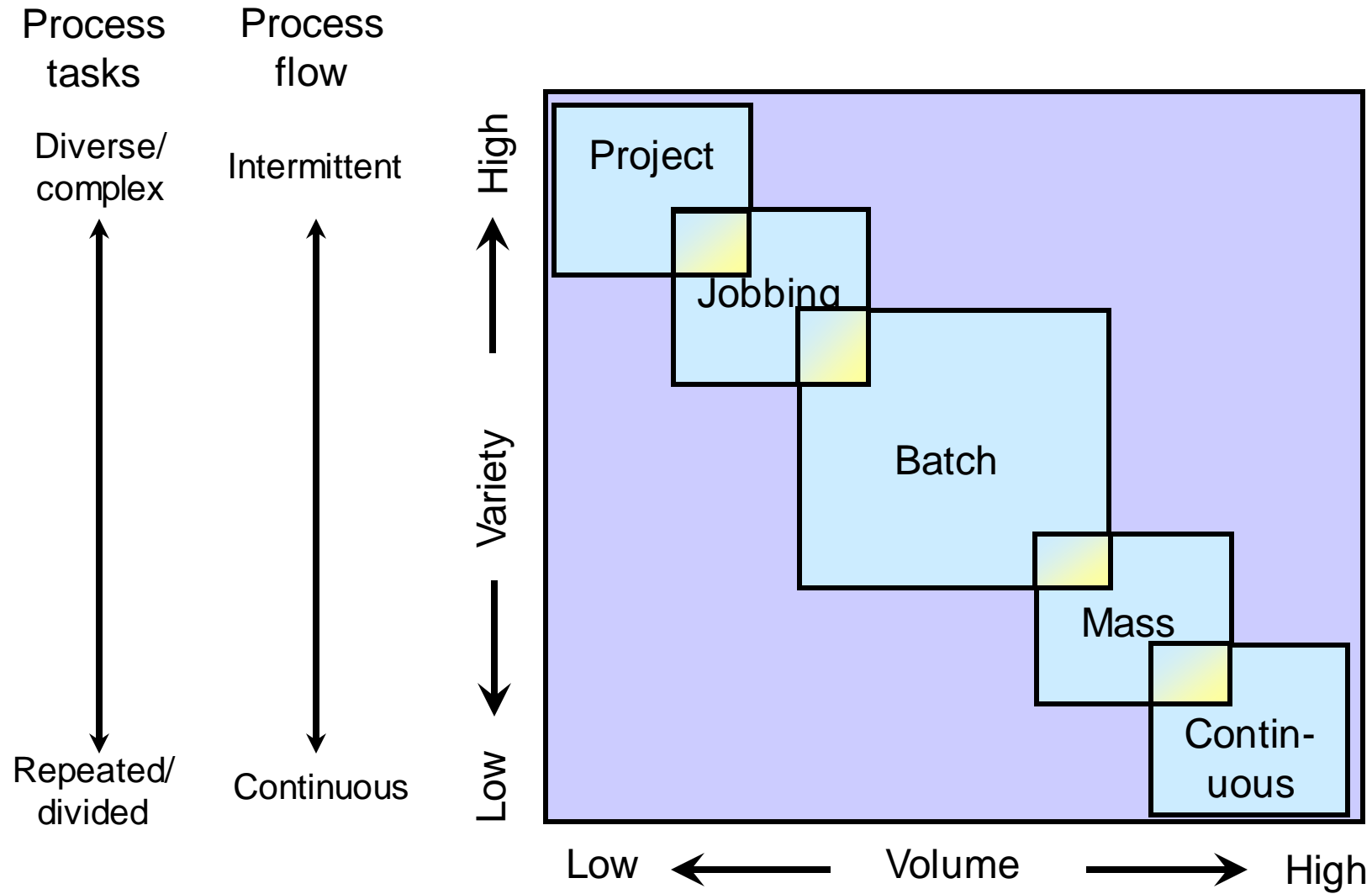
MGT355

Process design

Key operations questions

- ☐ *What is process design?*
- ☐ *How does volume and variety affect process design?*
- ☐ *How are processes designed in detail?*
- ☐ *What are the human implications of process design*

Manufacturing process types



Project Processes



- One-off, complex, large scale, high work content “products”



- Specially-made, every one customized”



- Defined start and finish: time, quality and cost objectives



- Many different skills have to be coordinated

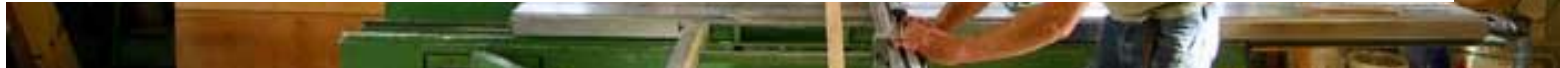
Jobbing Processes



- Very small quantities: “one-offs”, or only a few required



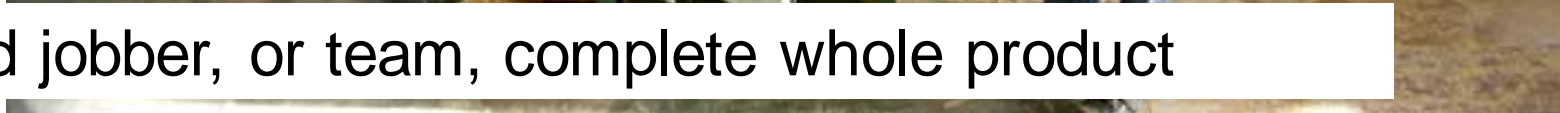
- Specially-made. High variety, low repetition. “Strangers” every one customized



- Skill requirements are usually very broad



- Skilled jobber, or team, complete whole product



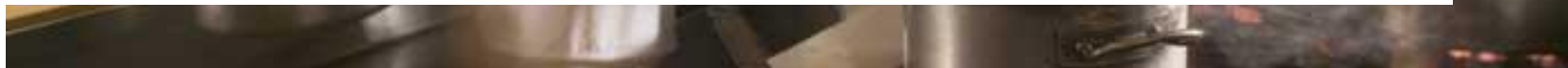
Batch Processes



- Higher volumes and lower variety than for jobbing



- Standard products, repeating demand. But can make specials



- Specialized, narrower skills



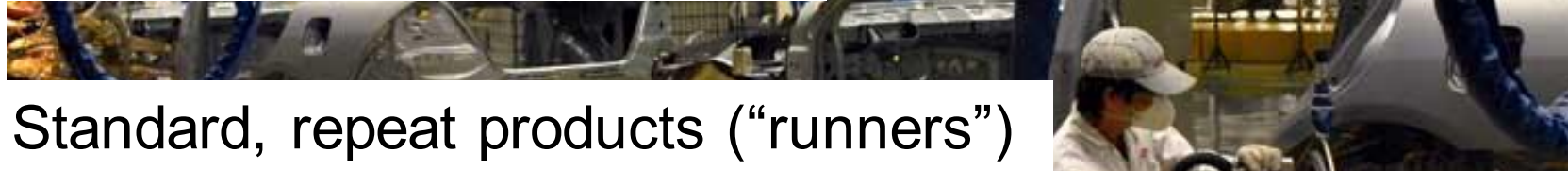
- Set-ups (changeovers) at each stage of production



Mass (Line) Processes



- Higher volumes than batch



- Standard, repeat products (“runners”)



- Low and/or narrow skills

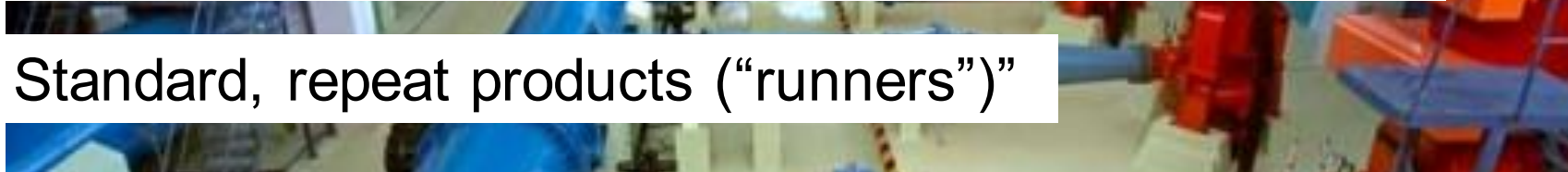
- No set-ups, or almost instantaneous ones



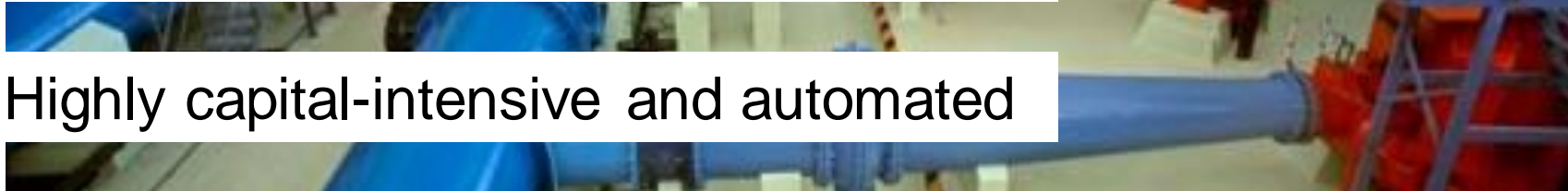
Continuous Processes



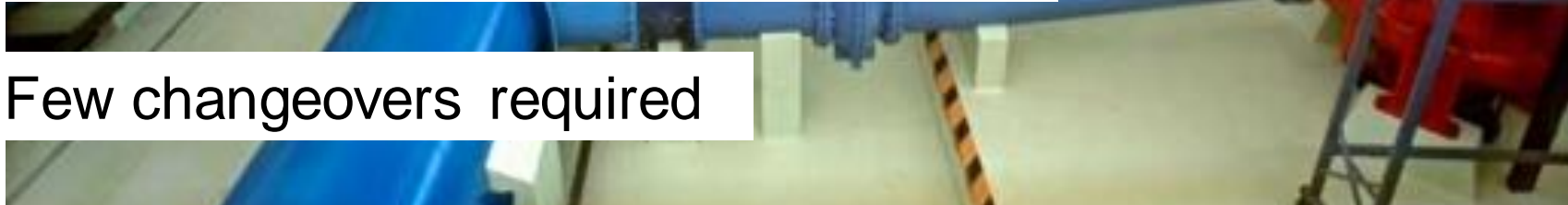
- Extremely high volumes and low variety: often single product



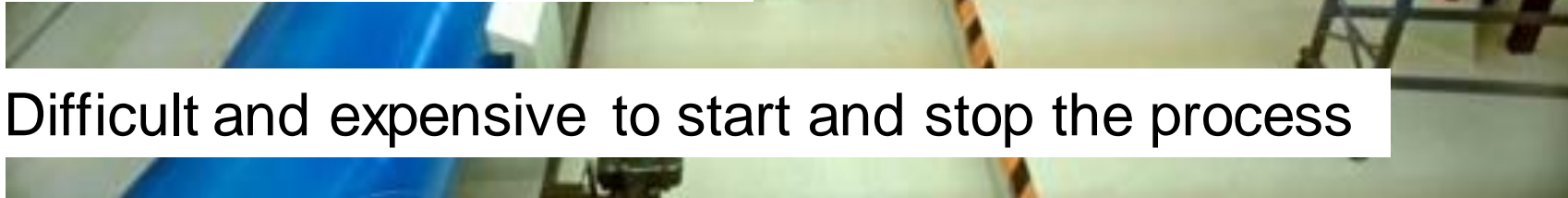
- Standard, repeat products (“runners”)



- Highly capital-intensive and automated

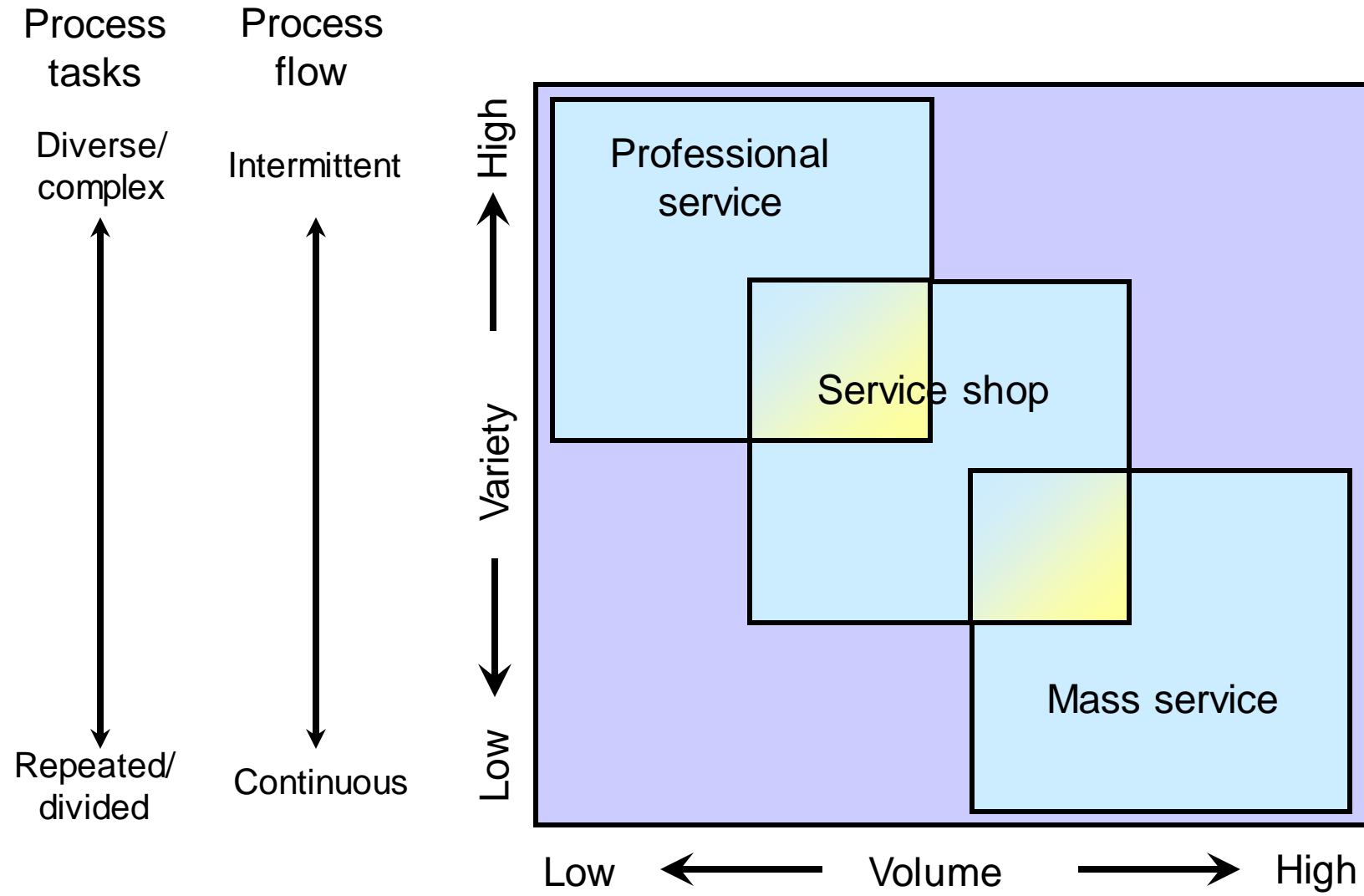


- Few changeovers required

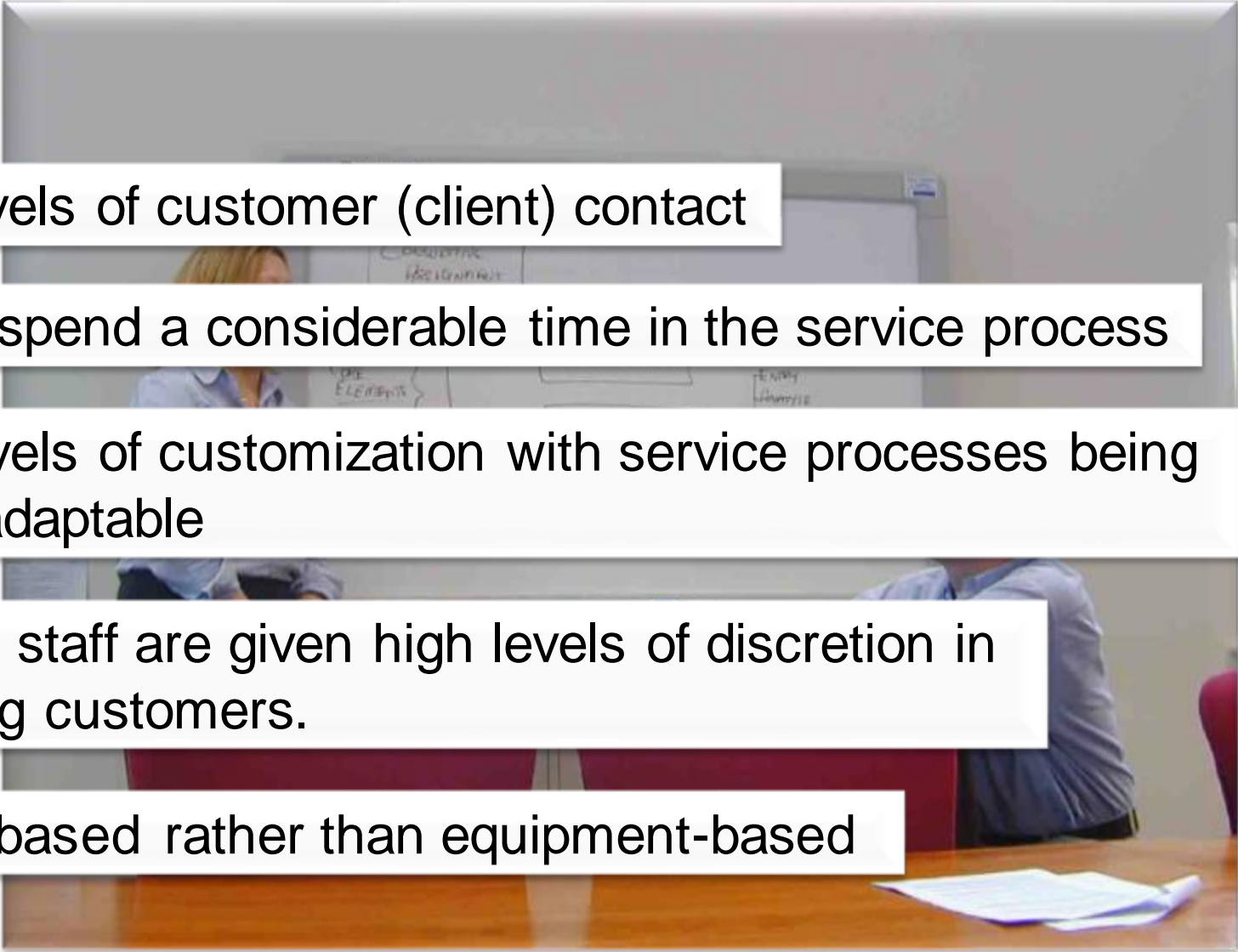


- Difficult and expensive to start and stop the process

Service process types



Professional service

- 
- High levels of customer (client) contact
 - Clients spend a considerable time in the service process
 - High levels of customization with service processes being highly adaptable
 - Contact staff are given high levels of discretion in servicing customers.
 - People-based rather than equipment-based

Service shops



- Medium levels of volumes of customers
- Medium, or mixed, levels of customer contact
- Medium, or mixed, levels of customization
- Medium, or mixed, levels of staff discretion

Mass service



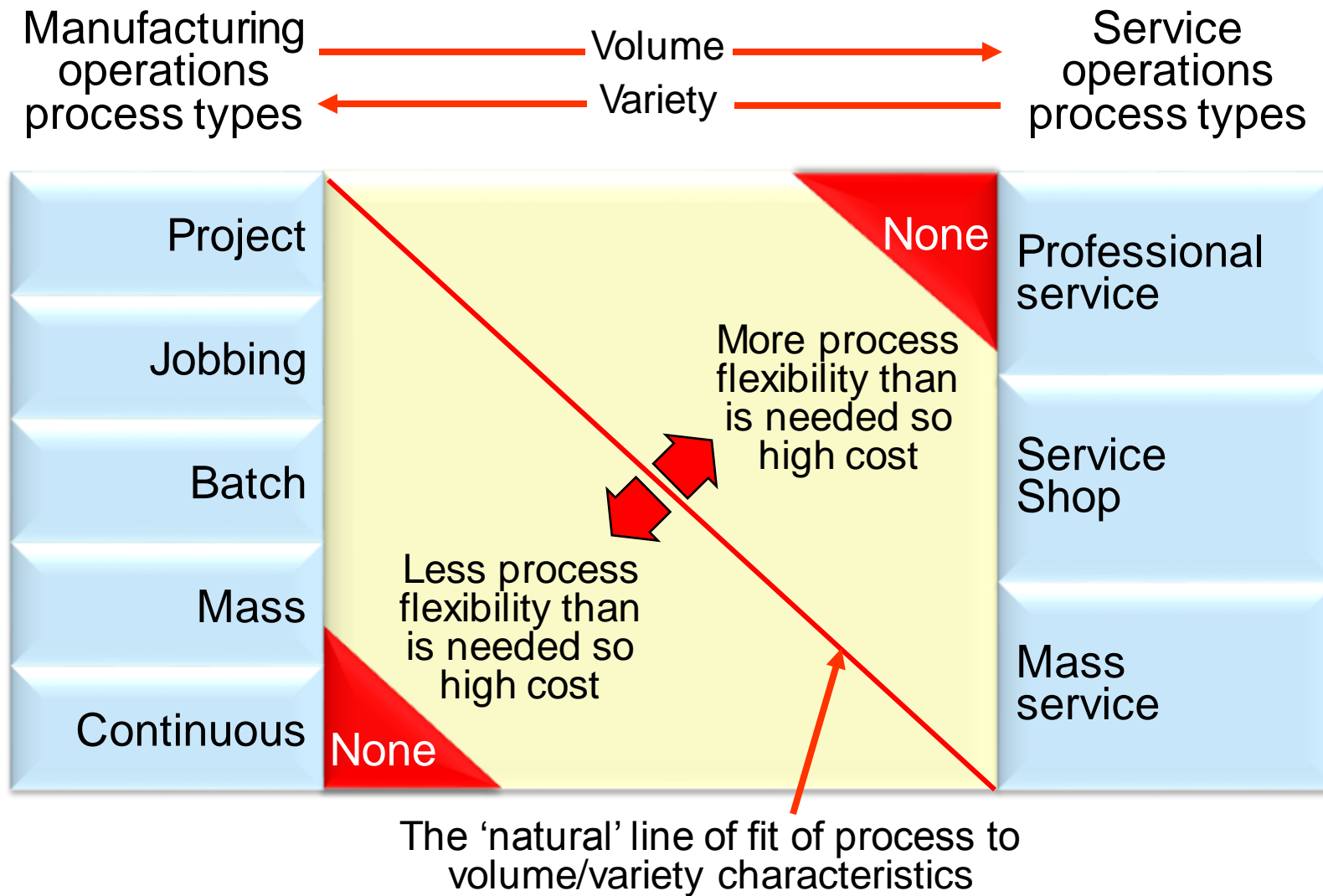
- High levels of volumes of customers

- Low to medium levels of customer contact

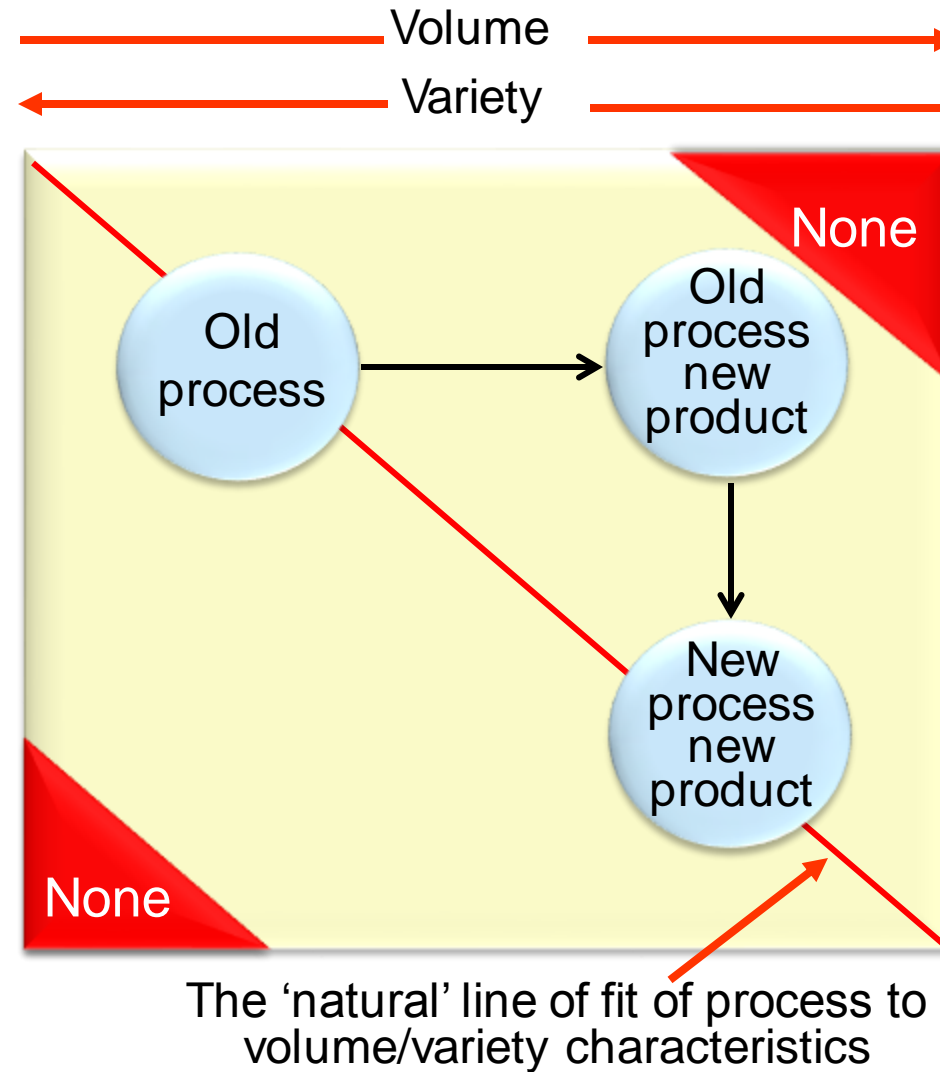
- Low, or mixed, levels of customization

- Low, or mixed, levels of staff discretion

Deviating from the 'natural' diagonal on the product-process matrix has consequences for cost and flexibility



Deviating from the 'natural' diagonal on the product-process matrix has consequences for cost and flexibility

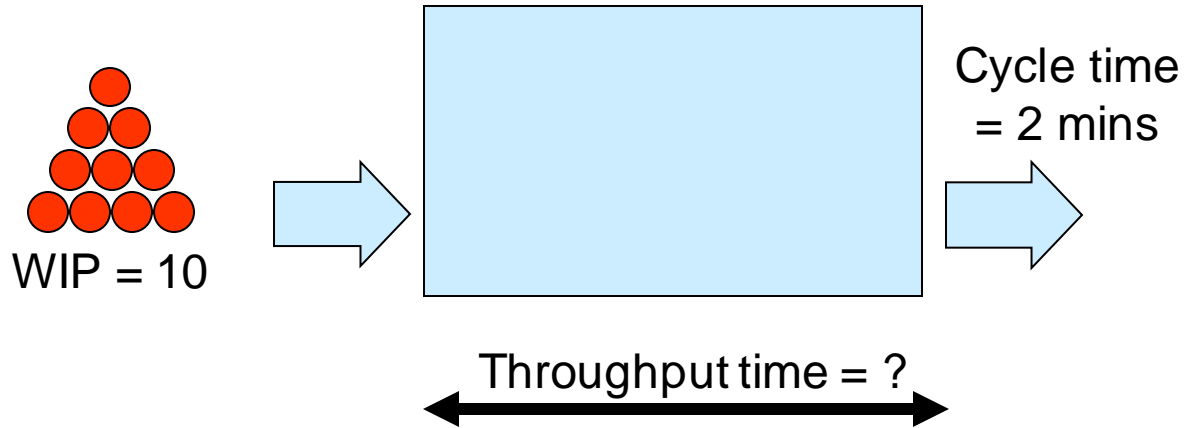


Some definitions

- **Work content:** The total amount of work required to produce a unit of output
- **Work-in-process (WIP):** Amount of customers/products in the process
- **Throughput time (TH) :** The time for WIP to move through the process
- **Cycle time (CT):** The average time between units of output emerging from the process

Little's law (a really quite useful law)

$$\text{Throughput (TH)} = \text{Work In Process (WIP)} \times \text{Cycle Time (CT)}$$



$$\text{Throughput time} = 10 \times 2 \text{ mins}$$

$$\text{Throughput time} = 20 \text{ mins}$$

$$\text{Number of employees} = \frac{\text{Work content}}{\text{Cycle time}}$$

Little's law (a really quite useful law)

$$\text{Throughput (TH)} = \text{Work In Process (WIP)} \times \text{Cycle Time (CT)}$$

Need to mark 500 exam scripts in 5 days (working 7 hours a day). Takes 1 hour to mark a script. How many markers are needed?

$$\text{Throughput time} = 5 \text{ days} \times 7 \text{ hours} = 35 \text{ hours}$$

$$35 \text{ hours} = 500 \text{ scripts} \times \text{Cycle times}$$

$$\text{Cycle time} = \frac{35 \text{ hours}}{500 \text{ scripts}} = 0.07 \text{ hours}$$

$$\text{Number of markers} = \frac{\text{Work content}}{\text{Cycle time}} = \frac{1 \text{ hour}}{0.07} = 14.29$$

Throughput efficiency

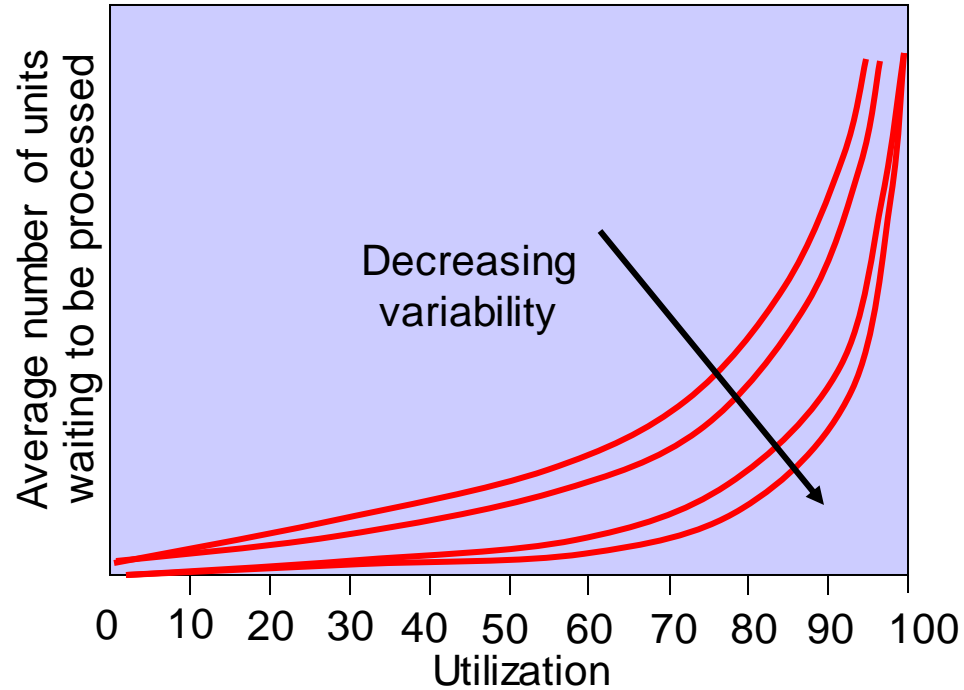
Throughput efficiency is the work content of whatever is being processed as a percentage of its throughput time

$$\text{Throughput efficiency} = \frac{\text{Work content}}{\text{Throughput time}} \times 100$$

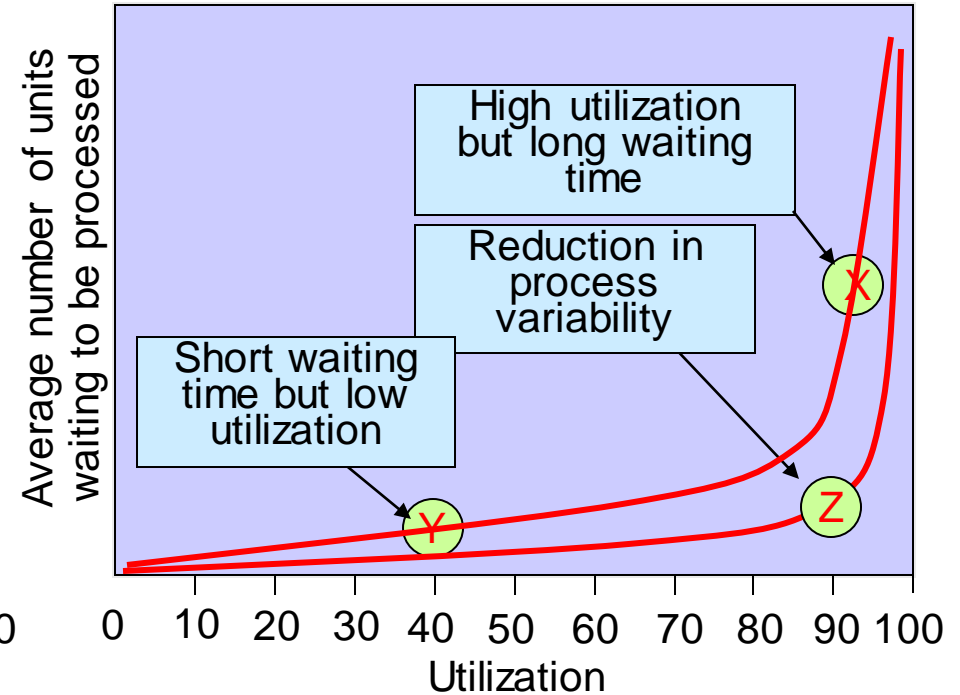
Your turn...

- There will be 530 workstation to renovate and renovation will take on average 1,5 hours. How many technicians will be needed to complete the renovation process within one working week (40 hours)?

Process utilization, waiting time and variability



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



(b) Managing process capacity and/or variability.

