Lecture # 8

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Job Design

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HR

- The most important resource that a company has is the human, so we have to pay attention to the way we manage it.

Human Resources In Strategic Planning

- TQM recognizes importance of employees
- Education & training viewed as long-term investments
- Employees
  - have broad latitude in jobs
  - are trained in wide range of skills
  - are empowered to improve quality & service

Behavioral Influences In Job Design

- Horizontal job enlargement
- Vertical job enlargement
- Responsibility for job reliability & quality
- Job rotation
- Communications between workers

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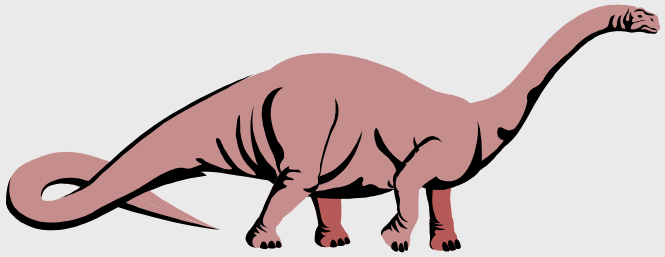
Trends In Job Design

- Job and task flexibility
- Responsibility & empowerment
- Increased skill & ability levels
- Employee involvement
- Technology & automation
- Temporary employees

Evolution of Job Design
1900s to 1960s
Scientific Management/Assembly Lines

- Task specialization
- Minimal worker skills
- Repetition
- Minimal job training
- Mass production
- Piece-rate wages
- Time as efficiency
- Minimal job responsibility
- Tight supervisory control



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Evolution Of Job Design
1970s to 1990s

- Horizontal job enlargement
  (the addition of tasks at the same level of skill and responsibility)
- Vertical job enlargement
  (the addition to a job of tasks that increase the amount of employee control or responsibility)
- Extensive job training
- Job responsibility & empowerment
- Job control
- Training & education
- Job rotation
- Higher skill levels
- Team problem solving
- Employee involvement & interaction
- Focus on quality

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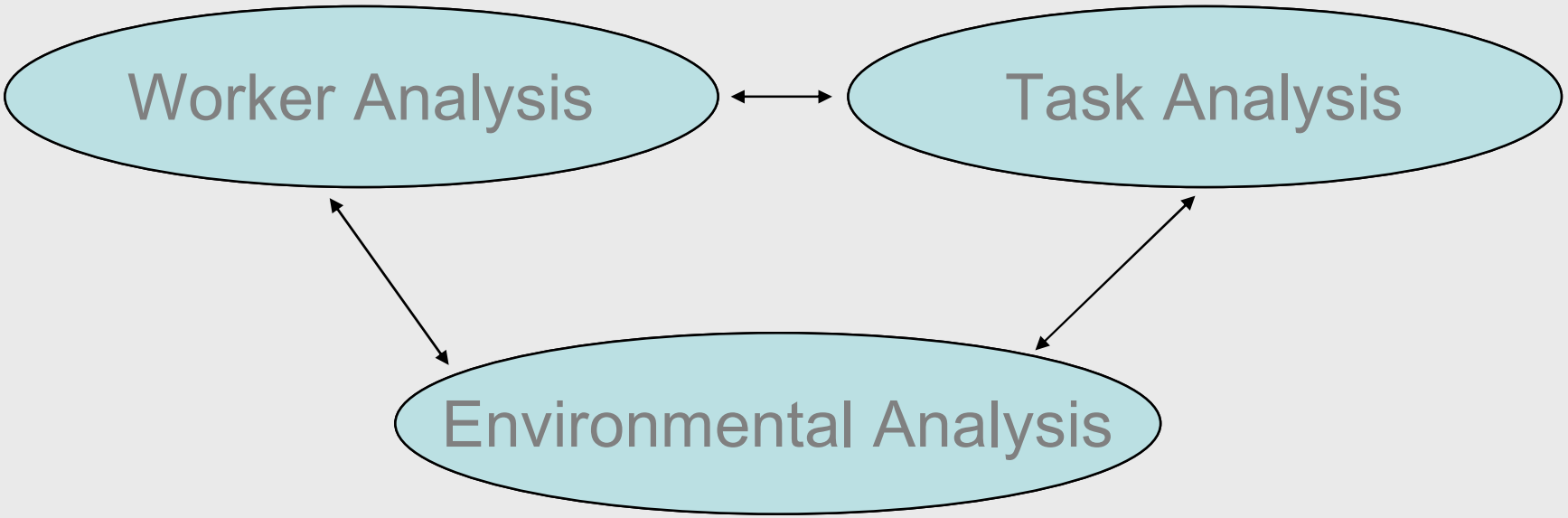
Elements of Job Design



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Task Analysis

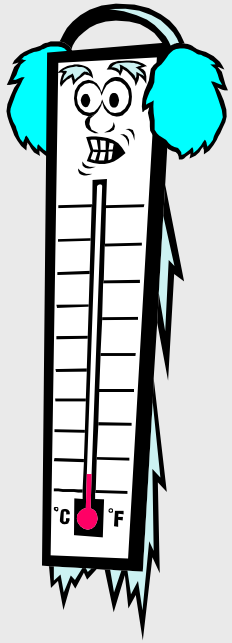
- Description of tasks
- Task sequence
- Function of tasks
- Frequency of tasks
- Criticality of tasks
- Relationship with other jobs/tasks
- Performance rqmts
- Information rqmts
- Control rqmts
- Error possibilities
- Task duration(s)
- Equipment rqmts

Worker Analysis

- Capability rqmts
- Performance rqmts
- Evaluation
- Skill level
- Physical rqmts
- Mental stress
- Boredom
- Motivation
- Number of workers
- Level of responsibility
- Monitoring level
- Quality responsibility
- Empowerment level

Environmental Analysis

- Work place location
- Process location
- Temperature and humidity
- Lighting
- Ventilation



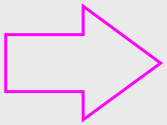
- Safety
- Logistics
- Space rqmts
- Noise
- Vibration

Job/Tasks Analysis

- Study how job should be done
- Tools:
  - Process flowchart - analyze process steps
  - Worker-machine chart - study time utilization
  - Motion study - study human motions in tasks

Process Flowchart Symbols

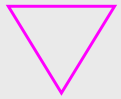
•Operation - direct contribution to product/service



•Transportation - move to another location

•Inspection - examine for completeness, quality

•Delay - process has to wait

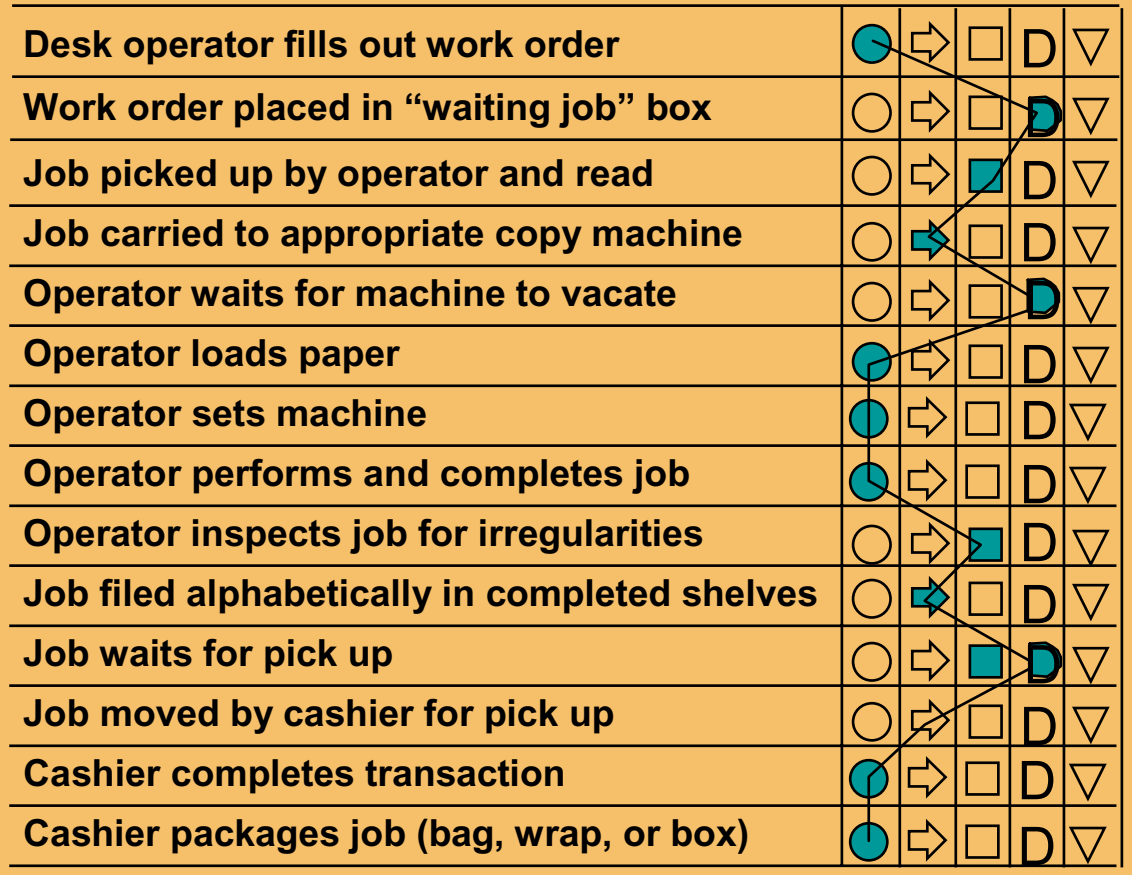


•Storage - store product/service for later use

Process Flowchart

Job: Copying Job **Date:** 9/11

Page: 1 **Analyst:** Calvin



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Worker-Machine Chart

Job Photo-Id Cards **Date** 10/14

Time	Operator	Time	Photo Machine
-1 -2	Key in customer data on card	2.6	Idle
-3	Feed data card in	0.4	Accept card
-4	Position customer for photo Take picture	1.0 0.6	Idle Begin photo process
-5 -6 -7	Idle	3.4	Photo/card processed
-8 -9	Inspect card & trim edges	1.2	Idle
-10			

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Number Of Cycles

$$n = \left(\frac{zs}{e\bar{T}} \right)^2$$

where

z = z value for desired confidence level

$$s = \sqrt{\sum \left(x_i - \bar{x} \right)^2 / n-1}$$ = sample standard deviation

$\bar{T}$ = average job cycle time

e = degree of error from true mean

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Number Of Cycles

- Average cycle time =0.361
- Computed standard deviation = 0.03
- Company wants to be 95% confident that computed time is within 5% of true average time

$$n = \left(\frac{zs}{e\bar{T}}\right)^2 = \left(\frac{(1.96)(0.03)}{(0.05)(0.361)}\right)^2 = 10.61 \rightarrow 11$$

Predetermined Motion Times

- Predetermined times for micromotions
- Divide tasks into micromotions
  - grasp, reach, move, etc.
- Time Measurement Units (TMU)
  - 0.0006 minutes, 100,000 per hour

Just as a reference… MTM Table For MOVE

Distance moved (inches)	Time (TMU) A	B	C	Weight Allowance Weight (lb)	Dynamic factor
3/4 or less	2.0	2.0	2.0		
1	2.5	2.9	3.4	up to 2.5	1.00
…					
20	19.2	18.2	22.1	37.5	1.39

A. Move object to other hand or against stop

B. Move object to approximate location

C. Move object to exact location

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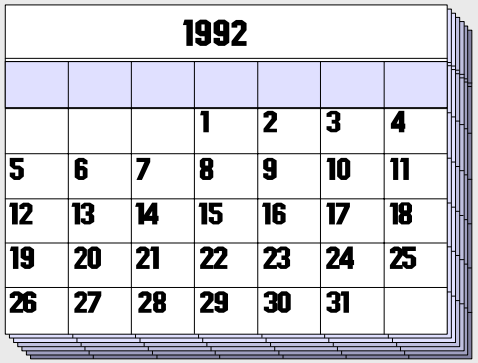
How accurate?

- Criticisms of PMTS relate to their inability to provide data for movements made under "unnatural" conditions (such as working in cramped conditions or with an unnatural body posture) or for mental processes and their difficulty in coping with work which is subject to interruptions. However, various systems have been derived for "office work," which include tasks with a simple and predictable mental content.

Learning Curve For Mass Production

- Processing time decreases with worker learning (experience)
- Time per unit decreases by constant percentage each time output doubles
- Use to plan labor, budget & scheduling requirements



Computing Time For Nth Unit

$$t_n = t_1 n^b$$

- Where
  - t_n = time required for nth unit
  - t_1 = time required for first unit
  - n = cumulative number of units produced
  - b = ln r/ln 2, where r is the percentage rate of improvement

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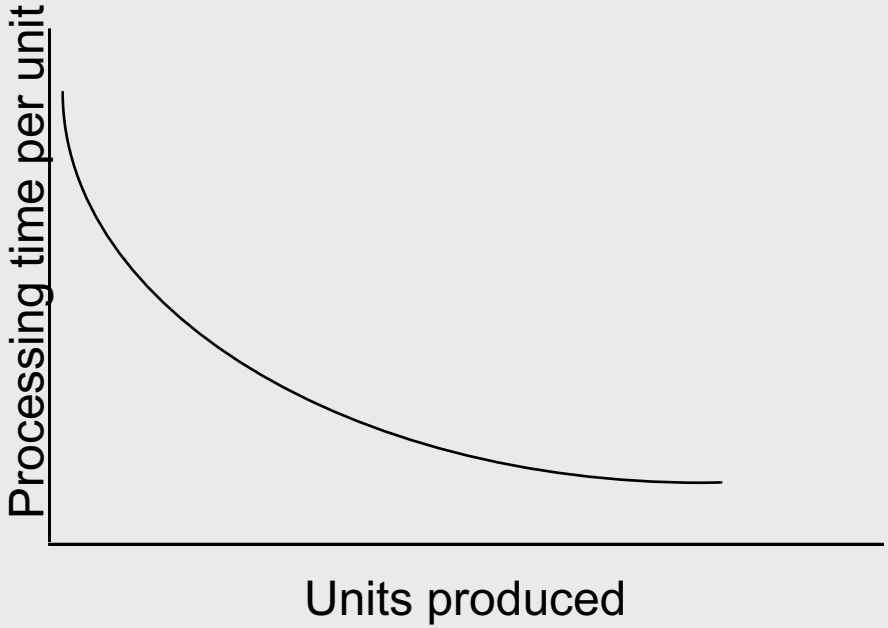
Learning Curve



Learning Curve Example

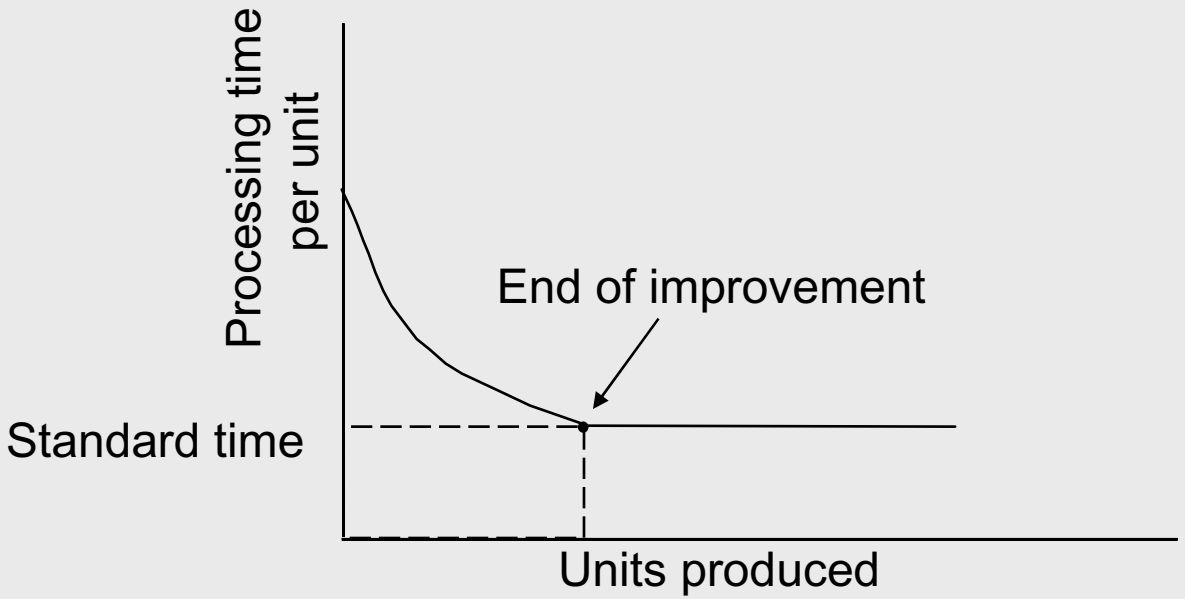
Contract to produce 36 computers
t_1 = 18 hours, Learning rate = 80%
What is time for 9th, 18th, 36th units?

$t_9 = (18)(9)^{\ln(0.8)/\ln(2)} = (18)(9)^{-0.322}$
$=(18)/\ (9)^{-0.322} = (18)(0.493) = 8.874\text{hrs}$

$t_{18} = (18)(18)^{\ln(0.8)/\ln(2)} = (18)(0.394) = 7.092\text{hrs}$

$t_{36} = (18)(36)^{\ln(0.8)/\ln(2)} = (18)(0.315) = 5.674\text{hrs}$

Learning Curve For Mass Production Job



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More On Learning Curves

- Is learning the only source for improvement?
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