Outline – Continued

☑ Job Design

☑ Labor Specialization

☑ Job Expansion

☑ Psychological Components of Job Design

☑ Self-Directed Teams

☑ Motivation and Incentive Systems
Outline – Continued

- Ergonomics and Work Methods
- Methods Analysis
- The Visual Workplace
- Ethics and the Work Environment
- Labor Standards
Learning Objectives

When you complete this chapter you should be able to:

1. Describe labor planning policies
2. Identify the major issues in job design
3. Identify major ergonomic and work environment issues
4. Use the tools of methods analysis
5. Understand the contribution of the visual workplace
Rusty Wallace’s NASCAR Racing Team

- NASCAR racing became very popular in the 1990s with huge sponsorship and prize money.
- High performance pit crews are a key element of a successful race team.
- Pit crew members can earn $100,000 per year – for changing tires!
Rusty Wallace’s NASCAR Racing Team

☑ Each position has very specific work standards

☑ Pit crews are highly organized and go through rigorous physical training

☑ Pit stops are videotaped to look for improvements
The objective of a human resource strategy is to manage labor and design jobs so people are effectively and efficiently utilized.

1. **People should be effectively utilized within the constraints of other operations management decisions**

2. **People should have a reasonable quality of work life in an atmosphere of mutual commitment and trust**
Constraints on Human Resource Strategy

Product strategy
- Skills needed
- Talents needed
- Materials used
- Safety

Schedules
- Time of day
- Time of year (seasonal)
- Stability of schedules

Location strategy
- Climate
- Temperature
- Noise
- Light
- Air quality

Process strategy
- Technology
- Machinery and equipment used
- Safety

Individual differences
- Strength and fatigue
- Information processing and response

Layout strategy
- Fixed position
- Process
- Assembly line
- Work cell
- Product

Figure 10.1
Labor Planning

Employment Stability Policies

1. Follow demand exactly

- Matches direct labor costs to production
- Incurs costs in hiring and termination, unemployment insurance, and premium wages
- Labor is treated as a variable cost
Labor Planning

Employment Stability Policies

2. Hold employment constant

- Maintains trained workforce
- Minimizes hiring, termination, and unemployment costs
- Employees may be underutilized during slack periods
- Labor is treated as a fixed cost
Work Schedules

☑ Standard work schedule
  ✔ Five eight-hour days

☑ Flex-time
  ✔ Allows employees, within limits, to determine their own schedules

☑ Flexible work week
  ✔ Fewer but longer days

☑ Part-time
  ✔ Fewer, possibly irregular, hours
Job Classification and Work Rules

- Specify who can do what
- Specify when they can do it
- Specify under what conditions they can do it
- Often result of union contracts
- Restricts flexibility in assignments and consequently efficiency of production
Job Design

- Specifying the tasks that constitute a job for an individual or a group
  1. Job specialization
  2. Job expansion
  3. Psychological components
  4. Self-directed teams
  5. Motivation and incentive systems
Labor Specialization

- The division of labor into unique tasks
- First suggested by Adam Smith in 1776
  1. Development of dexterity and faster learning
  2. Less loss of time
  3. Development of specialized tools
- Later Charles Babbage (1832) added another consideration
  4. Wages exactly fit the required skill
Job Expansion

- Adding more variety to jobs
- Intended to reduce boredom associated with labor specialization
  - Job enlargement
  - Job rotation
  - Job enrichment
  - Employee empowerment
Job Enlargement

Task #3
(Lock printed circuit board into fixture for next operation)

Present job
(Manually insert and solder six resistors)

Enriched job
Planning
(Participate in a cross-function quality improvement team)

Control
(Test circuits after assembly)

Task #2
(Adhere labels to printed circuit board)

Figure 10.2
Psychological Components of Job Design

Human resource strategy requires consideration of the psychological components of job design
Hawthorne Studies

- They studied light levels, but discovered productivity improvement was independent from lighting levels
- Introduced psychology into the workplace
- The workplace social system and distinct roles played by individuals may be more important than physical factors
- Individual differences may be dominant in job expectation and contribution
Core Job Characteristics

Jobs should include the following characteristics

- Skill variety
- Job identity
- Job significance
- Autonomy
- Feedback
Job Design Continuum

- Specialization
- Enlargement
- Enrichment
- Empowerment
- Self-directed teams

Increasing reliance on employee’s contribution and increasing responsibility accepted by employee

Job expansion

Figure 10.3
Self-Directed Teams

✓ Group of empowered individuals working together to reach a common goal

✓ May be organized for long-term or short-term objectives

✓ Effective because
  ✓ Provide employee empowerment
  ✓ Ensure core job characteristics
  ✓ Meet individual psychological needs
Self-Directed Teams

To maximize effectiveness, managers should

☑ Ensure those who have legitimate contributions are on the team
☑ Provide management support
☑ Ensure the necessary training
☑ Endorse clear objectives and goals
☑ Financial and non-financial rewards
☑ Supervisors must release control
Benefits of Teams and Expanded Job Designs

- Improved quality of work life
- Improved job satisfaction
- Increased motivation
- Allows employees to accept more responsibility
- Improved productivity and quality
- Reduced turnover and absenteeism
Limitations of Job Expansion

1. Higher capital cost
2. Individuals may prefer simple jobs
3. Higher wages rates for greater skills
4. Smaller labor pool
5. Higher training costs
Limitations of Job Expansion

1. Higher capital cost
2. Individuals may prefer simple jobs
3. Higher wages rates for greater skills
4. Smaller labor pool
5. Higher training costs

Average Annual Training Hours/Employee

<table>
<thead>
<tr>
<th>Country</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>7</td>
</tr>
<tr>
<td>Sweden</td>
<td>170</td>
</tr>
<tr>
<td>Japan</td>
<td>200</td>
</tr>
</tbody>
</table>
Motivation and Incentive Systems

- **Bonuses** - cash or stock options
- **Profit-sharing** - profits for distribution to employees
- **Gain sharing** - rewards for improvements
- **Incentive plans** - typically based on production rates
- **Knowledge-based systems** - reward for knowledge or skills
Ergonomics and the Work Environment

- **Ergonomics is the study of the interface between man and machine**
  - Often called **human factors**
  - Operator input to machines
Ergonomics and Work Methods

- Feedback to operators
- The work environment
- Illumination
- Noise
- Temperature
- Humidity
Job Design and Keyboards

Figure 10.4
# Levels of Illumination

<table>
<thead>
<tr>
<th>Task Condition</th>
<th>Type of Task or Area</th>
<th>Illumination Level</th>
<th>Type of Illumination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small detail, extreme accuracy</td>
<td>Sewing, inspecting dark materials</td>
<td>100</td>
<td>Overhead ceiling lights and desk lamp</td>
</tr>
<tr>
<td>Normal detail, prolonged periods</td>
<td>Reading, parts assembly, general office work</td>
<td>20-50</td>
<td>Overhead ceiling lights</td>
</tr>
<tr>
<td>Good contrast, fairly large objects</td>
<td>Recreational facilities</td>
<td>5-10</td>
<td>Overhead ceiling lights</td>
</tr>
<tr>
<td>Large objects</td>
<td>Restaurants, stairways, warehouses</td>
<td>2-5</td>
<td>Overhead ceiling lights</td>
</tr>
</tbody>
</table>

Table 10.2
<table>
<thead>
<tr>
<th>Environment Noises</th>
<th>Common Noise Sources</th>
<th>Decibels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jet takeoff (200 ft)</td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>Electric furnace area</td>
<td>Pneumatic hammer</td>
<td>100</td>
</tr>
<tr>
<td>Printing press plant</td>
<td>Subway train (20 ft)</td>
<td>90</td>
</tr>
<tr>
<td>Pneumatic drill (50 ft)</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Vacuum cleaner (10 ft)</td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>Speech (1 ft)</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Large transformer (200 ft)</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Soft whisper (5 ft)</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Ear protection required if exposed for 8 or more hours Intrusive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quiet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very quiet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very quiet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table 10.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Methods Analysis

✓ Focuses on how task is performed
✓ Used to analyze
  1. Movement of individuals or material
     ✓ Flow diagrams and process charts
  2. Activities of human and machine and crew activity
     ✓ Activity charts
  3. Body movement
     ✓ Micro-motion charts
Figure 10.5 (a)
Flow Diagram

Figure 10.5 (b)
**Process Chart**

**Figure 10.5 (c)**

<table>
<thead>
<tr>
<th>DIST. IN FEET</th>
<th>TIME IN MINS</th>
<th>CHART SYMBOLS</th>
<th>PROCESS DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>3</td>
<td></td>
<td>From press machine to storage bins at work cell</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td></td>
<td>Storage bins</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td>Move to machine 1</td>
</tr>
<tr>
<td>2.5</td>
<td>4</td>
<td></td>
<td>Operation at machine 1</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td>Move to machine 2</td>
</tr>
<tr>
<td>3.5</td>
<td>4</td>
<td></td>
<td>Operation at machine 2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td>Move to machine 3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td>Operation at machine 3</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td></td>
<td>Move to welding</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Poke-yoke</td>
<td>Poka-yoke inspection at welding</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td></td>
<td>Weld</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td>Move to painting</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td>Paint</td>
</tr>
<tr>
<td>97</td>
<td>25</td>
<td></td>
<td>TOTAL</td>
</tr>
</tbody>
</table>

- ○ = operation; □ = transportation; ■ = inspection; □□ = delay; ▽ = storage
Activity Chart

<table>
<thead>
<tr>
<th></th>
<th>OPERATOR #1</th>
<th>OPERATOR #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>%</td>
<td>TIME</td>
</tr>
<tr>
<td>WORK</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td>IDLE</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

OPERATION: Oil change & fluid check
EQUIPMENT: One bay/pit
OPERATOR: Two-person crew
STUDY NO.: ANALYST: NG

SUBJECT: Quick Car Lube

<table>
<thead>
<tr>
<th>TIME</th>
<th>Operator #1</th>
<th>TIME</th>
<th>Operator #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Take order</td>
<td></td>
<td>Move car to pit</td>
</tr>
<tr>
<td>4</td>
<td>Vacuum car</td>
<td></td>
<td>Drain oil</td>
</tr>
<tr>
<td>6</td>
<td>Clean windows</td>
<td></td>
<td>Check transmission</td>
</tr>
<tr>
<td>8</td>
<td>Check under hood</td>
<td></td>
<td>Change oil filter</td>
</tr>
<tr>
<td>10</td>
<td>Fill with oil</td>
<td></td>
<td>Replace oil plug</td>
</tr>
<tr>
<td>12</td>
<td>Complete bil</td>
<td></td>
<td>Move car to front for customer</td>
</tr>
<tr>
<td>14</td>
<td>Greet next customer</td>
<td></td>
<td>Move next car to pit</td>
</tr>
<tr>
<td>16</td>
<td>Vacuum car</td>
<td></td>
<td>Drain oil</td>
</tr>
<tr>
<td>18</td>
<td>Clean windows</td>
<td></td>
<td>Check transmission</td>
</tr>
</tbody>
</table>

Repeat cycle

Figure 10.6
## Operation Chart

### PROCESS: Bolt-washer assembly

**EQUIPMENT:**

**OPERATOR:** KJH

**STUDY NO:** ANALYST:

**DATE:** 8/1/08  SHEET NO. 1 of 1

**METHOD:** (PRESENT / PROPOSED)

**REMARKS:**

<table>
<thead>
<tr>
<th>SYMBOLS</th>
<th>PRESENT</th>
<th>PROPOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LH</td>
<td>RH</td>
</tr>
<tr>
<td>OPERATION</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>TRANSPORT</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>INSPECTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELAY</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>STORAGE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEFT-HAND ACTIVITY</th>
<th>DIST.</th>
<th>SYMBOLS</th>
<th>SYMBOLS</th>
<th>DIST.</th>
<th>RIGHT-HAND ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>Method</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Reach for bolt</td>
<td>6&quot;</td>
<td>○⇒□□□□</td>
<td>○⇒□□□□</td>
<td>Idle</td>
<td></td>
</tr>
<tr>
<td>2 Grasp bolt</td>
<td></td>
<td>○⇒□□□□</td>
<td>○⇒□□□□</td>
<td>Idle</td>
<td></td>
</tr>
<tr>
<td>3 Move bolt</td>
<td></td>
<td>○⇒□□□□</td>
<td>○⇒□□□□</td>
<td>Idle</td>
<td></td>
</tr>
<tr>
<td>4 Hold bolt</td>
<td></td>
<td>○⇒□□□□</td>
<td>○⇒□□□□</td>
<td>Reach for washer</td>
<td></td>
</tr>
<tr>
<td>5 Hold bolt</td>
<td></td>
<td>○⇒□□□□</td>
<td>○⇒□□□□</td>
<td>Grasp washer</td>
<td></td>
</tr>
<tr>
<td>6 Hold bolt</td>
<td></td>
<td>○⇒□□□□</td>
<td>○⇒□□□□</td>
<td>8&quot; Move washer to bolt</td>
<td></td>
</tr>
<tr>
<td>7 Hold bolt</td>
<td></td>
<td>○⇒□□□□</td>
<td>○⇒□□□□</td>
<td>Place washer on bolt</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 10.7**
The Visual Workplace

- Use low-cost visual devices to share information quickly and accurately
- Displays and graphs replace printouts and paperwork
- Able to provide timely information in a dynamic environment
- System should focus on improvement
The Visual Workplace

Visual signals can take many forms and serve many functions

- Present the big picture
- Performance
- Housekeeping
The Visual Workplace

Visual utensil holder encourages housekeeping

A “3-minute service” clock reminds employees of the goal

Figure 10.8
The Visual Workplace

Visual signals at the machine notify support personnel

Visual kanbans reduce inventory and foster JIT

Line/machine stoppage

Parts/maintenance needed

All systems go

Andon

Reorder point

Part A

Part B

Part C

Figure 10.8
The Visual Workplace

Quantities in bins indicate ongoing daily requirements and clipboards provide information on schedule changes.

Process specifications and operating procedures are posted in each work area.

Figure 10.8
Ethics and the Work Environment

✔ Fairness, equity, and ethics are important constraints of job design

✔ Important issues may relate to equal opportunity, equal pay for equal work, and safe working conditions

✔ Helpful to work with government agencies, trade unions, insurers, and employees
Labor Standards

- Effective manpower planning is dependent on a knowledge of the labor required.
- Labor standards are the amount of time required to perform a job or part of a job.
- Accurate labor standards help determine labor requirements, costs, and fair work.