Module 1:
Integrating Social and Technical Systems
Module 1

Overview and Expected Outcomes – Module 1

Overview
- Welcome and overview
- The “big picture”
- Social and technical framework
- Exercise: Focus on the Seven Wastes and the 5 S’s
- Sample Socio-Tech Implementation
- Exercise: Cellular Design Socio-Tech Analysis
- Conclusion

Expected outcomes
- Awareness of shifts in social and technical systems over time
- Understanding of the interdependency between social and technical systems
- Identification of potential “guiding principles” for designing, implementing and sustaining change in social and technical aspects of new work systems
The “Big Picture”

<table>
<thead>
<tr>
<th>Social Systems</th>
<th>Technical Systems</th>
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<tbody>
<tr>
<td>Craft Production</td>
<td>Decentralized Enterprises</td>
</tr>
<tr>
<td>Mastery of Craft</td>
<td>Custom Manufacture</td>
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<td>Mass Production</td>
<td>Vertical Hierarchies</td>
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<td>Scientific management</td>
<td>Specialized Tools</td>
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<td>Knowledge-Driven Work</td>
<td>Assembly Line</td>
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<td>Network Alliances</td>
<td>Interchangable Parts</td>
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<td>Team-Based Work Systems</td>
<td>Flexible Specialization</td>
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<td>Information Systems</td>
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</tbody>
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Sample Social System Transformation Initiatives

- Socio-Technical Work Systems . . . . . . Semi-autonomous teams
  - 1950s-1980s
- Employee Involvement/QWL. . . . . . . . . . . EI/QWL groups (off-line)
  - Late 1970s-1990s
- Total Quality Management . . . . . . . . . Quality circles (off-line)
  - Early 1980s-1990s
- Re-engineering . . . . . . . . . . . . . . . . Work-out events (off-line)
  - 1990s
- Six Sigma . . . . . . . . . . . . . . . . . . Black belt let project teams (off-line)
  - 1990s-present
- Lean Production/Enterprise Systems . . Lean production teams/Integrated product & Process teams
  - 1950s-present
Social and Technical Systems Framework: Delivering Value to Multiple Stakeholders

Social Systems

- Structure & Sub-Systems
- Social Interaction Processes
- Capability & Motivation

Technical Systems

- Methods & Processes
- Equipment & New Technology
- Materials & Supply Chain

Outcomes for Multiple Stakeholders
- Customers
- Workforce
- Shareholders
- Suppliers
- Society

Feedback
Focus on Social Systems

Structure & Sub-Systems
- Structure
  - Groups
  - Organizations
  - Institutions
- Sub-Systems
  - Communications
  - Information
  - Rewards & reinforcement
  - Selection & retention
  - Learning and feedback
  - Conflict resolution

Social Interaction Processes
- Leadership
- Negotiations
- Problem-solving
- Decision-making
- Partnership

Capability & Motivation
- Individual knowledge, skills & ability
- Group stages of development
- Fear, satisfaction and commitment
Focus on Technical Systems

Equipment & New Technology
- Equipment and machinery
- Physical infrastructure
- Information technology
- Nano-technology, bio-technology, and other frontiers of science

Methods & Processes
- Job design/office design
- Work flow/process mapping methods
- Value stream mapping
- Constraint analysis
- Statistical Process Control (SPC)
- System optimization and decomposition methods

Materials & Supply Chain
- Interchangeable parts and mass production systems
- Just-In-Time delivery (JIT) systems
- Synchronous material flow systems
- e-commerce
Exercise: The Seven Wastes and the Five S’s

The Seven Wastes

- Over Production
- Waiting
- Transportation
- Inventory
- Processing
- Motion
- Defects

The Five S’s

- Simplify or Sort
- Straighten or Simplify
- Scrub or Shine
- Stabilize or Standardize
- Sustain or Self-Discipline

How are social and technical systems interdependent when it comes to addressing the Seven Waste?

How are they interdependent when it comes to the 5S’s?
Sample Socio-Tech Implementation

**Social Path**
- Work Group Selection
- Team Building Training
- Vender Technical Training
- FPS Measurables Training
- Error Proofing Training
- Work Group Coordinator Selection

**Socio-Tech Path**
- Preliminary Work Cell Design
- FPS Measurables Input/Feedback System Design
- SMF Inventory and Order Estimates
- FPS Measurables Input/Feedback System Staffing
- Finalized Work Cell Design

**Technical Path**
- Equipment Vender Selection
- Equipment Vender Interviews
- Rack Size Calculation
- Equipment and Rack Installation
- Error Proofing Installation
- Test Production
- Production

**Launch**

Adapted from MIT Sloan Fellows thesis by Sean Hilburt
Module 1

Socio-Tech Data

Adapted from MIT Sloan Fellows thesis by Sean Hilburt

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**Exercise: Cellular Manufacturing Socio-Tech Analysis**

**Step 1: Group Formation and Stakeholder Analysis**

Form small groups of 2-3 people (individuals at remote locations may link by phone), study the “current state” and “desired state” illustrations on a hypothetical cellular manufacturing intervention (next slide), and list stakeholders involved in your phase of this intervention.

*Note: Some groups will be assigned to “Preparing,” “Implementing,” and “Sustaining” phases of this intervention*

**Step 2: Social Systems**

Identify the most important social system changes in this work system that are relevant to your phase of the intervention.

**Step 3: Technical Systems**

Identify the most important technical changes in this work system that are relevant to your phase of the intervention.

**Step 4: Integration and Guiding Principles**

Discuss ways in which the social and technical changes are or are not interdependent. Derive 1-3 “Guiding Principles” for implementing a systems change of this type.
Exercise: Cellular Manufacturing

Current State

Desired State
Revisit the Social and Technical Systems Framework

Social Systems
- Structure & Sub-Systems
- Social Interaction Processes
- Capability & Motivation

Technical Systems
- Methods & Processes
- Equipment & New Technology
- Materials & Supply Chain

Outcomes for Multiple Stakeholders
- Customers
- Workforce
- Shareholders
- Suppliers
- Society

Feedback

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Conclusion

- A unique historical moment
- The constant challenge and opportunity presented by social and technical interdependency
- A fragile foundation for a global transformation
Appendix: Japanese Model of Production System and “Humanware”

Key Features of Production System
- Continuous Adjustment of Labor Input
- Low Buffer Stock
- Even Flow
- Small Lot
- J-I-T Production System

Key Areas of Human Resource Involvement
- Self-Inspection
- Continuous Adjustment of Labor Input
- Human Control
- Reduced Set-Up Time
- Self-Management of Work Standards
- Skill
- Adaptability
- Motivation

Human Resource Effectiveness
- Growth
- Profits
- High Quality
- Low Price
- Low Inventory Cost
- Low Labor Cost
- Low Defects
- Reduced Set-Up Time
- Low Labor Cost
- Low Inventory Cost
- Low Defects

Corporate Goals
- Growth
- Profits
- High Quality
- Low Price
- Low Inventory Cost
- Low Labor Cost
- Low Defects

Source: Haruo Shimada and John Paul MacDuffie, Industrial Relations and “Humanware” (Sloan School of Management Work Paper, September, 1986)