Socio-technical perspective

• Learning objectives
  – Understand a socio-technical perspective
  – Able to apply a socio-technical perspective in the analysis and design of information systems

• Core reading
  – Mumford (2006)

• Supplementary reading
  – Boudreau and Robey (2005)
  – Kensing and Munk-Madsen (1993)

Both technical and social systems should be designed for

Robust work groups

Communication according to needs

Satisfactory psycho-social work environment

… in a democratic way
Enid Mumford
1924-2006

The story of socio-technical design: reflections on its successes, failures and potential
Information Systems Journal, 2006, 16, 317-342
• Background
• Socio-Technical principles 1-9
• International Developments
• Future

1. Compatibility

Democratic work structures require democratic change processes
Case 1a – Rena Paper Mill – 1975

- Cannot deliver on time
- Too much stock – no customers
- Can IT based production planning help?

Paper producing machinery
Is this a democratic change process?
2. Minimal Critical Specification

- Clear objectives
- Leave it to the workers how to reach the objectives

Case 1b – Ola the floor sweeper
The river in -30 °C

Drilling a hole in the ice
Did they give Ola a minimal Critical Specification?

3. The Socio-technical Criterion

- **Variances** to be controlled as close to their origin as possible
- To be solved by the group that experiences them
Work researcher’s hypothesis

1. Ole is not recording accurate temperatures, and there is no group around him to check and correct
4. Multifunctionality

- Groups need multiple skills
- They need more than their day-to-day activities requires

5. Boundary Location

- Boundaries occur where work passes to another group with a different skill set
- Boundaries should facilitate sharing of knowledge
### 6. Information

- Information must go where needed for action
- Often the next work group in the chain
- Not only to management

---

#### Work researcher’s hypotheses

1. Ole is not recording accurate temperatures, and there is no group around him to check and correct.
2. Temperatures not communicated to the machinists. Breach of design principles 5 and 6.
7. Support congruence

- To breed cooperation, incentives should be in place
- Management should cooperate with subordinates and support them when needed

Does Ola get support from colleagues or management?
8. Human values for job satisfaction

- Reasonably demanding
- Opportunity to learn
- An area of decision-making
- Social support and recognition
- Relate work to social life
- Leads to a desirable future

Does Ola have a satisfying job?
Work researcher’s hypotheses

1. Ole is not recording accurate temperatures, and there is no group around him to check and correct.

2. Temperatures not communicated to the machinists.

3. No need for the temperatures.

If you were the researchers, what would you do with Ola’s job?
9. Incompletion

- Design never stops
- New demands and conditions require rethinking of systems

---

Act relating to work environment – 1977

Section 12.2 Arrangement of work.

The individual employee’s opportunity for self-determination and professional responsibility shall be taken into consideration when planning and arranging the work.

Efforts shall be made to avoid monotonous, repetitive work and work that is governed by machine or conveyor belt in such a manner that the employees themselves are prevented from varying the speed of the work.

Otherwise efforts shall be made to arrange the work so as to provide possibilities for variation and for contact with others, for connection between individual job assignments, and for employees to keep informed about production requirements and results.

The work must be arranged so as not to offend the dignity of the employee.
Trade unions need knowledge about technology

- Socio-technique
  - all partners equal
- Trade union approach
  - Employers strong
  - Workers and unions weaker

Kristen Nygaard
1926-2002

Action research aims at

1. Generating new scientific knowledge
   published as academic papers or master theses
   AND
2. Improving life for the clients
   also after the research has finished

- Develop and evaluate a novel IT solution for clients, publish results and make the clients continue using the solution.
- Develop and evaluate a test installation of a novel IT solution for clients, publish results and remove the test installation.
- Train clients on a novel topic which improves their life and publish results.
Case 2 – Kongsberg Weapon factory

High-tech with highly skilled workers
8. Human values for job satisfaction

- Reasonably demanding
- Opportunity to learn
- An area of decision-making
- Social support and recognition
- Relate work to social life
- Leads to a desirable future

Are these jobs satisfying?

Recent changes

- Longer queues of tasks for the workstations → Stress
- More overtime work during weekends → Less family/leisure time

Why?
Was the introduction of this work planning system a democratic change process?

Act relating to work environment – 1977

Section 12.3 Control and planning systems.

The employees and their elected representatives shall be kept informed about the systems employed for planning and carrying out the work, and about planned changes to such systems. They shall be given the training necessary to enable them to learn these systems, and they shall take part in designing them.
Mutual Learning

1. Users learning about IT
   Experience and Understand
   AND

2. IT specialists learning about users’ work
   Experience and Understand

→ New knowledge for both groups
   • Improving life for both groups
   • Also after the development has finished


<table>
<thead>
<tr>
<th></th>
<th>Users’ present work</th>
<th>New system</th>
<th>Technological options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand</td>
<td>Relevant structures on users’ present work</td>
<td>Visions and design proposals</td>
<td>Overview of technological options</td>
</tr>
<tr>
<td>Experience</td>
<td>Concrete experience with users’ present work</td>
<td>Concrete experience with the new system</td>
<td>Concrete experience with technological options</td>
</tr>
</tbody>
</table>

To be developed

Known
Users and developers learning about the unknown future

- Visiting other installations
- Future workshops
- Evaluating and designing prototypes

Did mutual learning take place in Case 2?
Conditions for participation and mutual learning

• Selection
  – All relevant groups of users
  – Highly competent

• Involvement
  – Importance and personal relevance of a system
    • Also called Engagement
  – Strengthened through responsibility
  – Involvement requires time allocated for development
    • Without
      – Users become involved after implementation
      – Negative attitude

How is mutual learning related to a democratic change process?
• Poor development process
• Poor implementation process
• Unforeseen consequences

Socio-technical changes after installation

Case 3 – Public institution in USA

• 3000 employees
• Legacy IS → Enterprise Resource Planning (ERP)
  – Semi finished software covering all functions of a company
  – Tailoring
    • Configuration by parameters designed by the vendor
    • Customisation by adding functionality
  – Efficient data processing
  – Long and costly adaptation
  – Freezes the organizational structure
• Technical installation on time and on budget
• Voluntary training
  – Few attended

Three stages of implementation

1
- Superusers enter data
- Avoidance
- Superficious

2
- Improvised learning
- Initiated by other superusers
- No predetermined structure, schedule or method

3
- Experimentation
- Compensating for limited knowledge and perceived system deficiencies
- Workarounds

I'm not doing things online yet. I'm by printing off a copy and then I fill it in and then send it through to power users.

I can't tell you how many things that we learned, not because of training, not because the trainers knew it, but because somebody figured it out, and it became kind of folk knowledge.

On a purchase order, if you find that you have to add money, you can't just go and change the line amount. It's not going to work; something is going to happen and Disbursements won't be able to pay it. So, a workaround we have here is to add an additional line to say "Increase PO by x amount of dollar" just so the dollar amount equals what you need it to be equal.

Socio-technical principles for IT development

Knowledgeable users and developers
- who consider both technical and social systems
- in interactions during and after development

What happened to Ola?