Unit 6: Soft Systems

Objectives

- To contrast "soft" systems approaches to analysis & design with the "hard" systems approaches examined to date
- To introduce & work through a specific "soft" systems approach - *Soft Systems Methodology*

Frameworks for analysis & design

- Analysis & design involves requirements exploration, refinement & testing … amongst other things
- It helps to do this iterative form of early developmental work within the context of a *well-defined process model* - this adds structure, discipline & feedback potential
- We shall look at a radically different approach in this lecture - Soft Systems Methodology
  - "*Systems Thinking, Systems Practice*", by Peter Checkland, John Wiley & Sons, 1993, ISBN: 0-471-27911-0

"Hard" versus "soft"

- "Hard" problems
  - Problems can be well defined
  - Assumption of definite goals & solutions
  - Can pre-define success criteria
  - Technologically-oriented

"Hard" systems thinking

- "Soft" problems
  - Difficult to define - they are problem *situations*
  - High social, political & human activity component
  - Sometimes "wicked"!

"Soft" systems thinking

Checkland's Soft Systems Methodology

- **Premise** - reality is socially constructed & therefore requirements are not objective; response to "hard" systems thinking & reductionism

- **Rationale**
  - problem situations are fuzzy (not structured) & solutions not readily apparent
  - defining the objective is part of the problem
  - impact of a computerisation is not always positive
  - full exploitation of computerisation may need radical restructuring of work processes (i.e. not a given)

Derived from "action research"

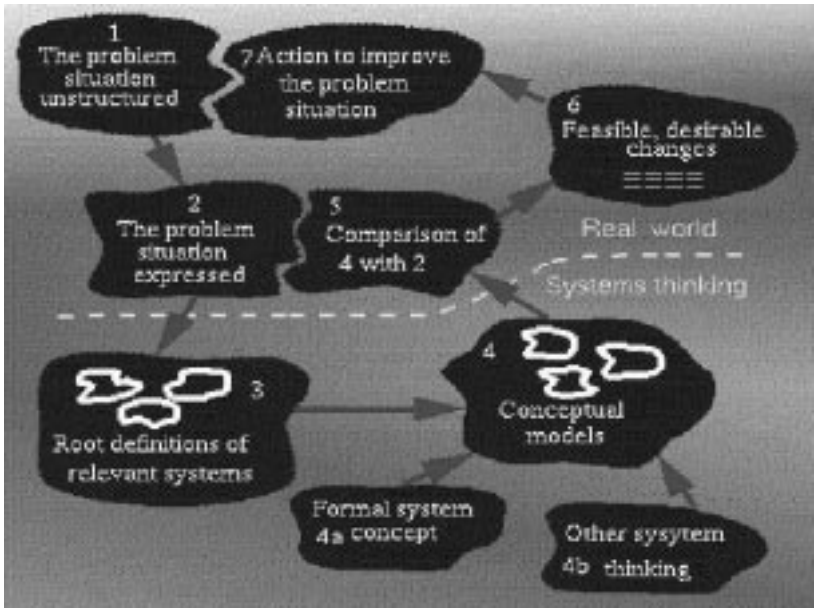
Broad approach

- Analyse problem situation using different viewpoints
  - Use root definitions (see later) to *describe* human activity systems
  - Use conceptual models (bubbles & links) to *model* the human activity system
- Determining the requirements is a discursive, bargaining & construction process
- Out of this process emerges a specification & plans for a modified organisational structure, task structure, objectives, environment, etc.

Detailed approach - 7 stages

- **Stage 1:** Problem situation unstructured
- **Stage 2:** Problem situation expressed (rich pictures)
- **Stage 3:** Naming of relevant systems (root definitions; CATWOE elements)
- **Stage 4:** Conceptual models
- **Stage 5:** Comparing conceptual models with reality
- **Stage 6:** Debating feasible & desirable changes
- **Stage 7:** Implementing changes

Iterative



1. Problem situation unstructured

- **Starting point:** recognition of some problem or scope for improvement; coupled with a decision that some change or review is required
- Find out about the problem situation - there may be the perceptual that there are many potential problems in need of solving
- Carry out some basic research into the problem area
  - Who are the key players?
  - How does the process currently work?
  - Etc.

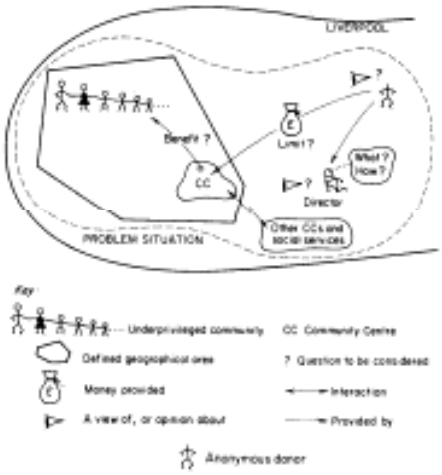
2. Problem situation expressed

- Analyst collects & sorts information about the problem situation (maintaining a broad scope)
  - Organisational structure, processes & transformations, gripes, etc.
  - Techniques & tools employed to assist (e.g. work observation, interviews, workshops)
- Analyst provides some expression of the problem situation using a *rich picture*
  - Visual form of communication
  - Captures the *situation* in which there is perceived to be a problem, not the problem itself

Rich pictures

- Represent structures, processes & organisational issues that could be relevant to the problem definition
- Provide a model for thinking about the system - a representation of how to look at & think about the system; a prompt for listing & grouping pertinent issues
- Help the analyst gain an appreciation of the problem situation & aid communication with the problem owner
- **Note:** there is no "right" or "wrong" picture - they are artistic & individual expressions … you can develop your own style!

Example rich picture



A community care problem situation [Wilson 1990] p.14

3. Naming of relevant systems

- Can look at problem situations from *many perspectives*
- Select how to view the situation & produce a *root definition* for each selected viewpoint
  - Choose an issue or task from the rich picture
  - Define a system to address the issue or to carry out the task

Determining the "whats"

- A root definition should be written as a sentence & expressed as a *transformation process* (i.e. one that takes some entity as input, changes or transforms that entity, then produces a new entity as output)
- Undertake CATWOE analysis of each root definition

CATWOE elements

- **C**: customer (who would be victims or beneficiaries of this system?)
- **A**: actor (who would do these activities & what special skills are needed?)
- **T**: transformation process (what input is transformed in to what output?)
- **W**: weltanschauung (what world view makes the system meaningful?)
- **O**: owner (who could abolish the system?)
- **E**: environmental constraints (what in the environment does the system take as given?)

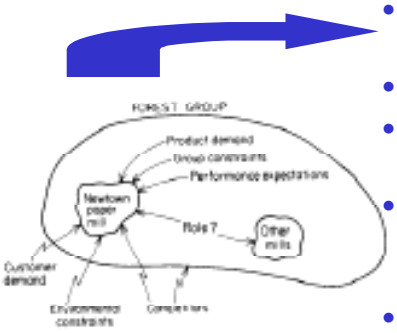
Can also use these to help formulate the root definitions

Example root definition

A Forest Group owned system for the continuously effective & efficient conversion of raw materials into a range of paper products to meet customer demand while achieving the Group expectations for performance, but within Group & environmental constraints

[Wilson 1990] pp. 71 & 72

Example CATWOE elements



- **C:** customers producing the demand
- **A:** not specified
- **T:** conversion of raw materials into a range of paper products
- **W:** continuously effective & efficient conversion will enable Group expectations to be met
- **O:** Forest Group
- **E:** Group & environmental constraints

[Wilson 1990] pp. 71 & 72

4. Conceptual models

- Construction of a conceptual model for *each* root definition of a system (i.e. what the system must do for each one)
- A conceptual model is a *human activity model* that strictly conforms to the root definition using the minimum set of activities; it therefore expresses the *core purpose* of some purposeful activity system
- Drawn as a directed graph with activities as nodes
- Requires systems thinking!

Defining the "hows"

Formal Systems Thinking

- Guides the development of the conceptual model
- Human activity system S is a formal system if & only if…
  - It has some mission
  - It has a measure of performance
  - It has a decision making process
  - It has components which interact such that effects & actions are transmitted through the system
  - It is part of a wider system with which it interacts
  - It is bounded from the wider system
  - It has resources at the disposal of its decision making process
  - It has long term stability or recoverability potential
  - Its component systems satisfy the same criteria

[Macaulay 1996]

Example conceptual model

Figure 31. A conceptual model

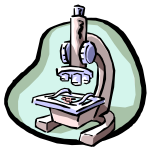
[Wilson 1990] p.73

5. Comparing models with reality

- Compare the conceptual models of stage 4 with the "real" world (i.e. problem situation as expressed in stage 2) to generate debate about possible changes
  - Where are they different?
  - Where are they similar?

Reiterate stages 3 & 4

- Ways to do this comparison
  - Use conceptual models as a basis for formulating questions about the existing situation
  - Compare history with model prediction
  - General overall comparison
  - Model overlay

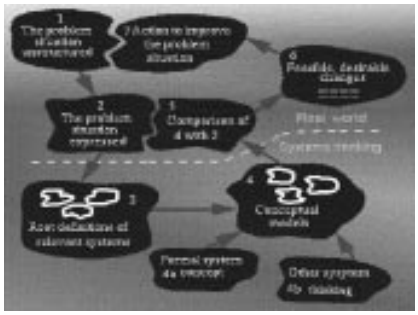


6. Debating changes

- Discuss whether there are ways of improving the situation, taking a *goal-driven* approach
- Identify feasible & desirable changes
- Types of change to consider
  - Changes in structure
  - Changes in procedure
  - Changes in attitude
- Make recommendations for taking action to improve the problem situation

7. Implementing changes

- Determine how to implement the changes identified during stage 6
- Implement changes & put them into action



Key points

- There are some problems you will face for which "hard" approaches to analysis & design are not so useful (esp. those involving human activity systems)
- Soft Systems Methodology is an attempt to apply science to human activity systems - the aim being to understand & improve such "soft" systems
- SSM is an iterative 7 stage approach to understanding a problem situation & determining a potential solution
- SSM gives structure to fuzzy problem situations such that they can be dealt with in a disciplined manner

Follow-on references

- "Soft Systems Methodology in Action", by Peter Checkland & Jim Scholes, John Wiley & Sons, 1990
- "Systems: Concepts, Methodologies & Applications", by Brian Wilson, John Wiley & Sons, 1990