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Problem Structuring in Decision Analysis Processes

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- Theory and Methods
 - Introduction
 - Methods
 - SODA
- Problem Structuring - Pavitra Ganga Case
 - Issue mapping
 - Objectives Hierarchy
 - Alternatives and Solutions
- Concluding remarks

Problem Structuring - Introduction

Key issues:

1. Relevant stakeholders
2. Uncertainties due to randomness and
lack of knowledge
3. Appropriate decision frame

Problem Structuring - Introduction

Value focussed thinking

Alternative focussed thinking

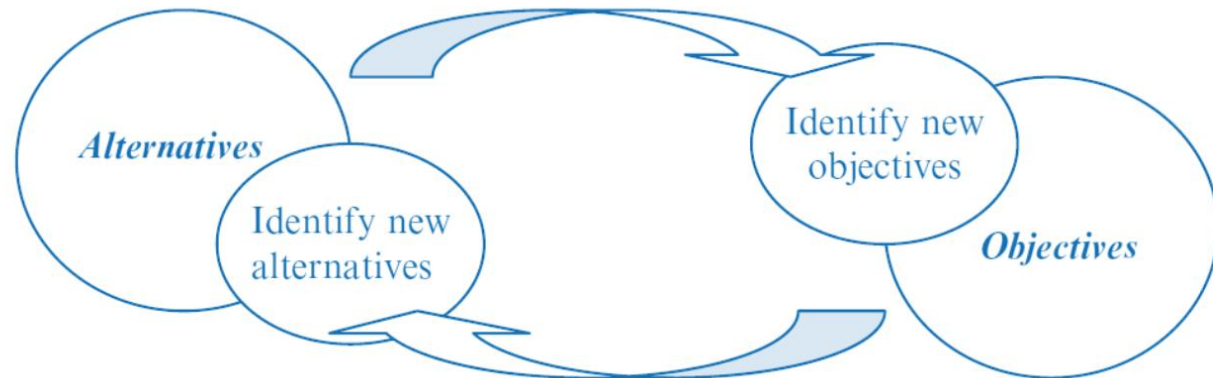


Fig. Dynamic Problem Structuring Source: Corner et al. (2001)

Problem Structuring - Phases



- Done individually or in group.
- post-it or computer systems

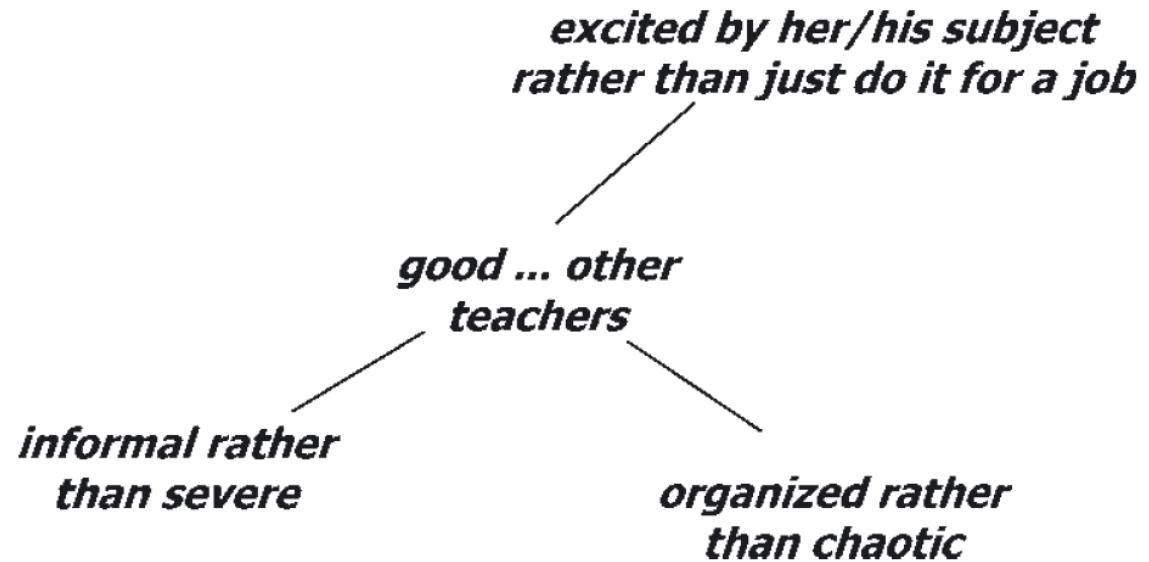
- Clustering of generated issues.
- Establishing causal links

- critical evaluation either in Further workshops or individually

Problem Structuring - Methods

1. DPSIR (Drivers, Pressures, States, Impacts, Responses)
2. SWOT
3. Cognitive and Group Maps (CMs/GMs)
4. Scenario Planning
- 5. Strategic Options Development and Analysis (SODA)**
6. Soft Systems Methodology (SSM)
7. Strategic Choice Approach (SCA)
8. Robustness Analysis
9. Drama Theory

Strategic Options Development and Analysis



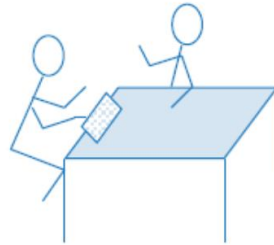
Source: Achermann & Eden, 1989

- Foundation in 'subjectivism'
- Involves managing **process** as well as
content
- Cognitive and causal mapping
- Context is important

Strategic Options Development and Analysis

One possible route...

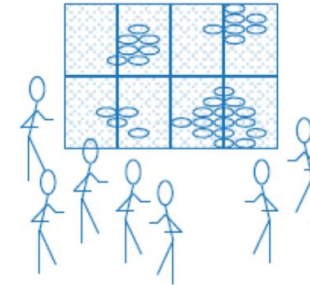
Stage 1
The interviews



Stage 2
computer modelling and
analysis using Decision
Explorer



Stage 3
the focus group
meeting



Stage 4
computer modelling and
analysis using
Decision
Explorer



Stage 5
Group Decision Support
Workshop



Stage 6
Control and
review



Source: Achermann & Eden, 1989

Problem Structuring – Pavitra Ganga

- <https://pavitra-ganga.eu/en>
- Long access negotiations
- SODA method for problem structuring



The process

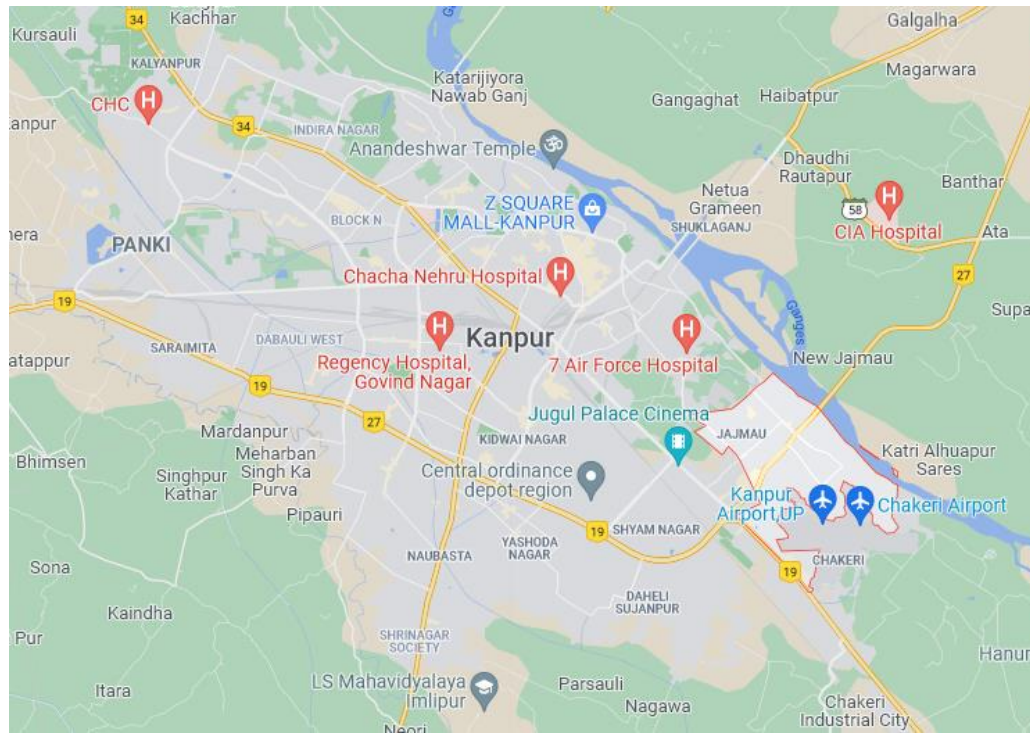
Setting the Scene

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graph TD; A[Setting the Scene] --> B[Situational & System Analysis]; B --> C[Building Objectives]; C --> D[Generating Alternatives];
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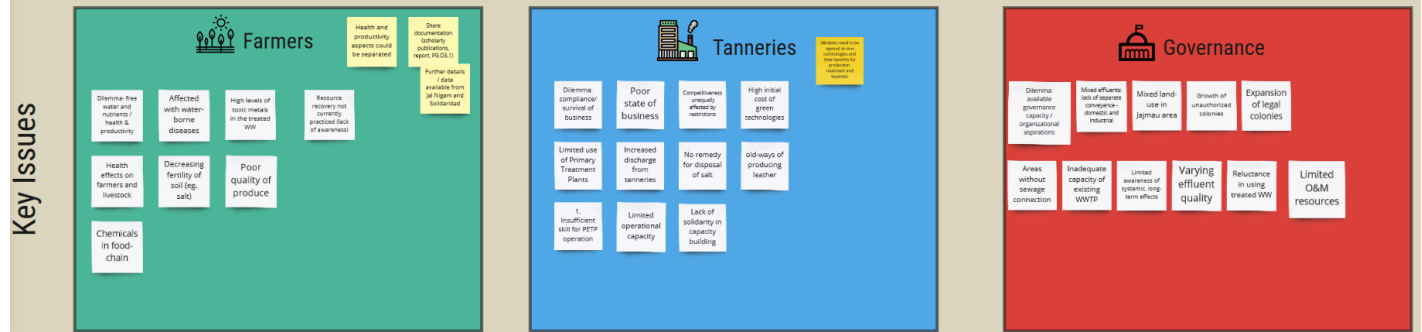
Situational & System Analysis

Building Objectives

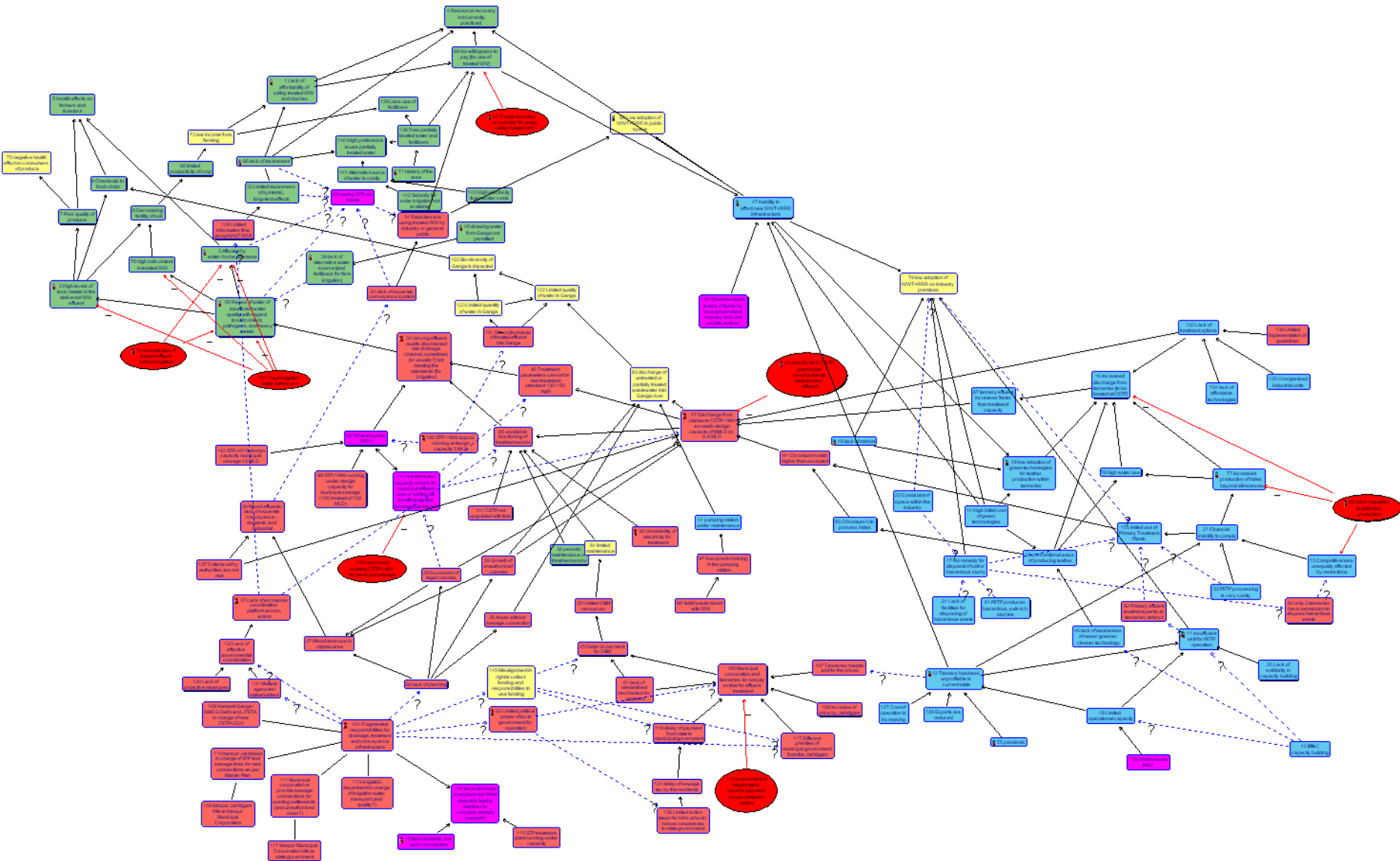
Generating Alternatives



WW treatment RRR in Jajmau area Kanpur

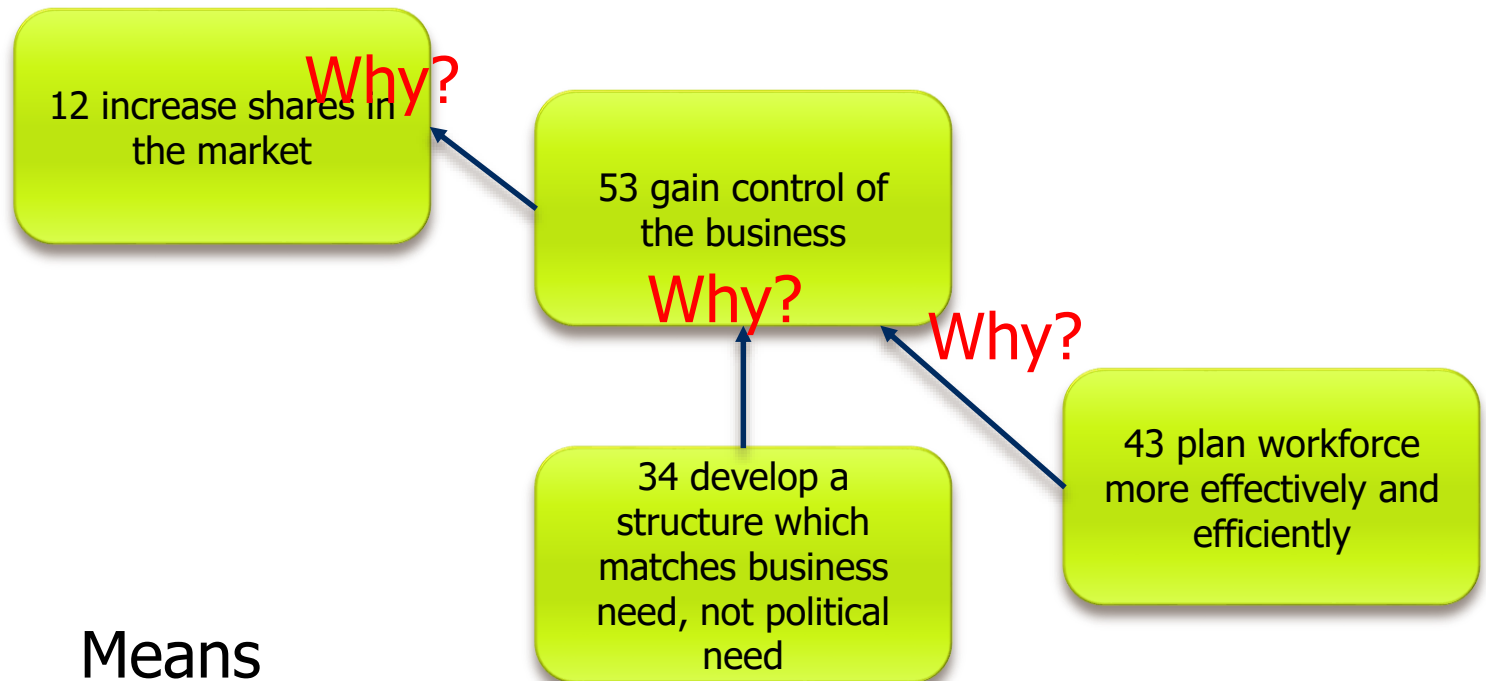


Mapping issues



Explaining links

- Linking issues helps managing interdependencies between issues
- Why it matters and what needs to be done to change it



Expected Outcomes of Problem Structuring

- Mapping priorities and values of DMs
 - Group cognitive map
 - Strategic statement
 - Key issues
 - Key goals
- Objectives hierarchy
- Alternative solutions

Concluding remarks

- Most **overlooked** yet most **crucial** part of decision analysis.
- Aids in addressing the **complexity** and the **differing perspectives, values and preferences** of those responsible for and impacted by decisions taken.
- Lack of problem structuring:
 - Poor framing and alternatives
 - Different goals
 - Solutions that do not matter for DMs

Selected reading materials

Books:

- Ackermann, F. , & Eden, C. (2010). *Strategic options development and analysis* . London: Springer.
- Belton, V. , & Stewart, T. J. (2010). Problem structuring and multiple criteria decision analysis. In M. Ehrgott, J. R. Figueira, & S. Greco (Eds.), *Trends in multiple criteria decision analysis* . Springer.
- Gregory, R. , Failing, L. , Harstone, M. , Long, G. , McDaniels, T. , & Ohlson, D. (2012). *Structured decision making: A practical guide to environmental management choices* . Chichester: Wiley-Blackwell.
- Keeney, R. (2007). Developing objectives and attributes. In W. Edwards, R. , F. Miles, & D. Von winterfeldt (Eds.), *Advances in decision analysis* . New York: Cambridge University Press.
- Keeney, R. L. (1992). *Value-focused thinking a path to creative decisionmaking* . Cambridge, Massachusetts [etc.]: Harvard University Press.
- Rosenhead, J. (1989). *Rational analysis for a problematic world: Problem structuring methods for complexity, uncertainty and conflict* . West Sussex, England: John Wiley and Sons Ltd .
- Rosenhead, J. , & Mingers, J. (2001). *Rational analysis for a problematic world revisited: Problem structuring methods for complexity, uncertainty and conflict* . Chichester, London: John Wiley & Sons. Ltd.

Journal Articles:

- Ackermann, F., & Eden, C. (2011). Strategic management of stakeholders: Theory and practice. *Long range planning*, 44(3), 179-196.
- Corner, J., Buchanan, J., & Henig, M. (2001). Dynamic decision problem structuring. *Journal of Multi-Criteria Decision Analysis*, 10(3), 129-141.

Selected reading materials

Journal Articles:

- Franco, L. A. , & Montibeller, G. (2011). *Problem structuring for multicriteria decision analysis interventions* . Oxford: John Wiley & Sons, Inc .
- Hermans, L. M., & Thissen, W. A. H. (2009). Actor analysis methods and their use for public policy analysts. *European Journal of Operational Research*, 196 , 808–818. doi: 10.1016/j.ejor.2008.03.040.
- Kotiadis, K., & Mingers, J. (2006). Combining PSMs with hard OR methods: the philosophical and practical challenges. *Journal of the Operational Research Society*, 57 , 856–867. doi: 10.1057/palgrave.jors.2602147.
- Lienert, J., Scholten, L., Egger, C., & Maurer, M. (2015). Structured decision-making for sustainable water infrastructure planning and four future scenarios. *EURO Journal on Decision Processes*, 3 , 107–140. doi: 10.10 07/s40 070- 014-0030- 0.
- Marttunen, M., Lienert, J., & Belton, V. (2017). Structuring problems for Multi-Criteria Decision Analysis in practice: A literature review of method combinations. *European Journal of Operational Research*, 263(1), 1-17.
- Marttunen, M., Mustajoki, J., Dufva, M., & Karjalainen, T. (2015). How to design and realize participation of stakeholders in MCDA processes? A framework for selecting an appropriate approach. *EURO Journal on Decision Processes*, 3 , 187–214. doi: 10.10 07/s40 070- 013- 0016- 3.
- Mingers, J., & Rosenhead, J. (2004). Problem structuring methods in action. *European journal of operational research*, 152(3), 530-554.
- Neves, L. P., Dias, L. C., Antunes, C. H., & Martins, A. G. (2009). Structuring an MCDA model using SSM: a case study in energy efficiency. *European Journal of Operational Research*, 199 , 834–845. doi: 10.1016/j.ejor.2009.01.053.

Selected reading materials

Journal Articles:

- Rosenhead, J. (2006). Past, present and future of problem structuring methods. *Journal of the Operational Research Society*, 57, 759–765. doi: 10.1057/palgrave.jors. 2602206 .

Web sources:

- The Operational Research Society - <https://www.theorsociety.com/get-involved/society-groups/special-interest-groups-and-networks/problem-structuring-methods/>

Dissertations:

- Rouwette, E.A.J.A. (2003) *Group model building as mutual persuasion*. Doctoral Thesis published at Radboud University, The Netherlands.

