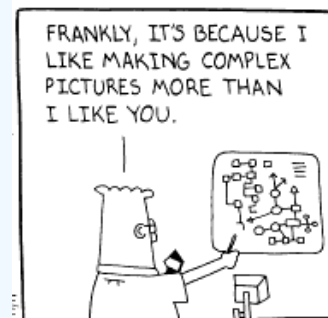


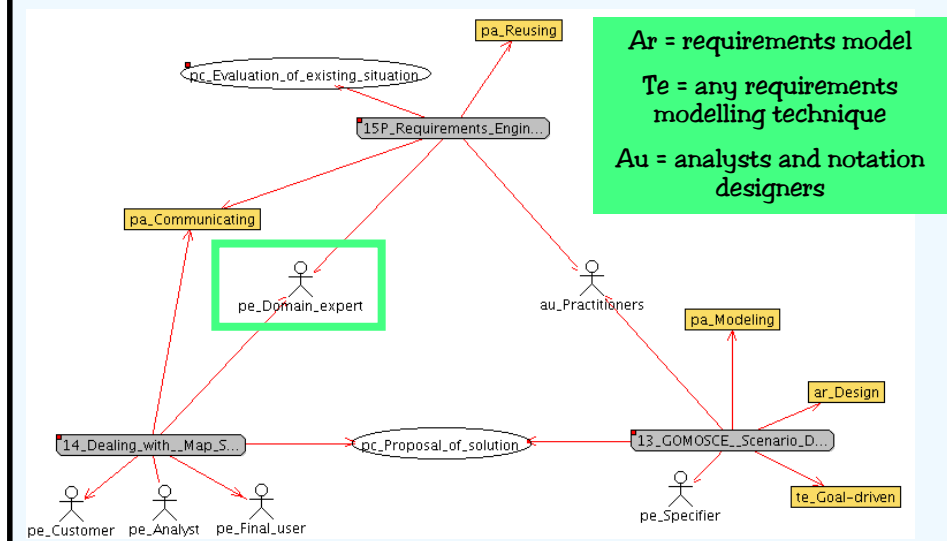
Dealing with “Map Shock” Managing Complexity in Requirements Modelling

Daniel Moody

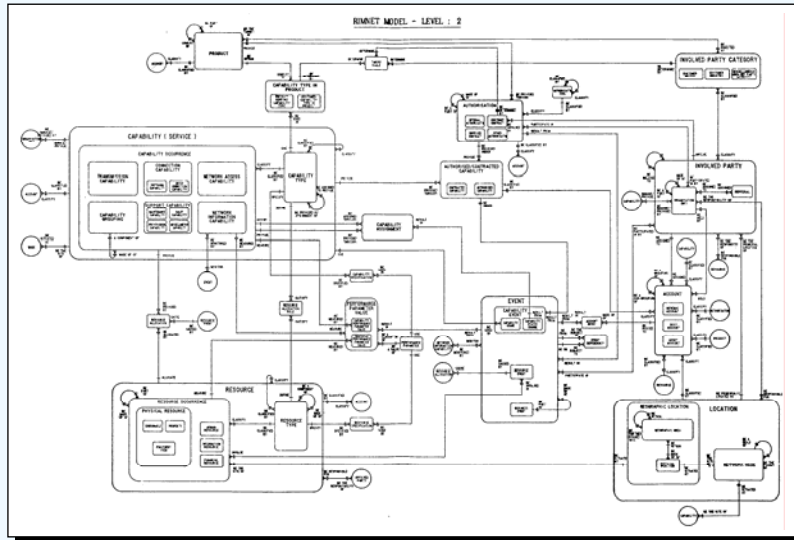
**Department of
Information Systems
University of Twente**



Context



Research Question



Why Complexity is Such a Problem in Requirements Engineering

1. The complexity of the underlying systems being modelled

- ★ Dijkstra: the complexity of modern software presents an intellectual challenge that has no precedent in human history

2. Lack of complexity management mechanisms in most RE notations

3. Models used to communicate with people who are not technical experts

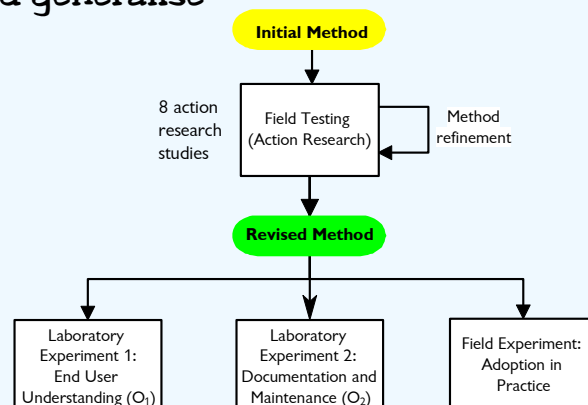
“Map Shock”

Amount of information that can be effectively conveyed by a single diagram limited by human perceptual and cognitive abilities:

- ★ Perception: ability to discriminate between diagram elements reduces with their number and proximity (≈ 20 elements on A4 paper)
- ★ Cognition: number of diagram elements that can be comprehended at a time limited by working memory capacity ($\approx 7 \pm 2$ elements)

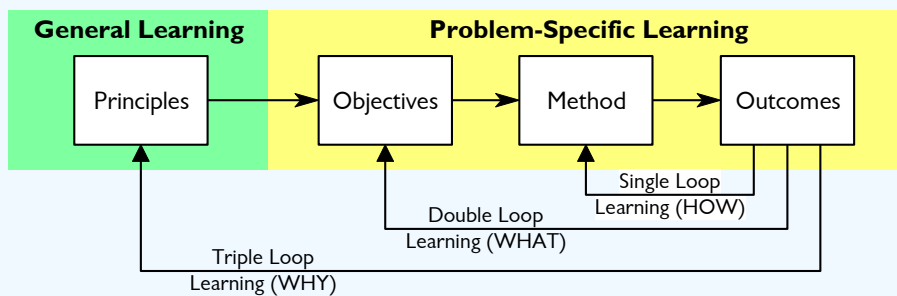
Research Method

Solve problem for particular modelling technique (ER modelling) and generalise

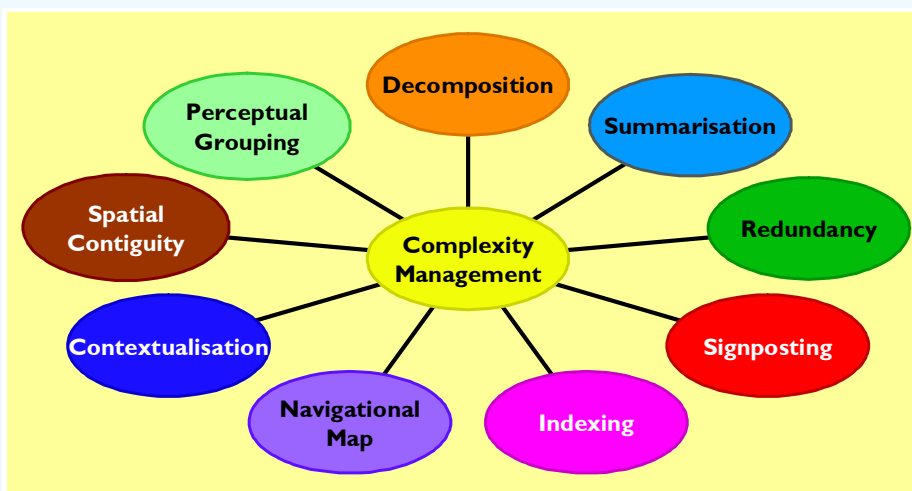


Research Method

Solve problem for particular modelling technique
and generalise

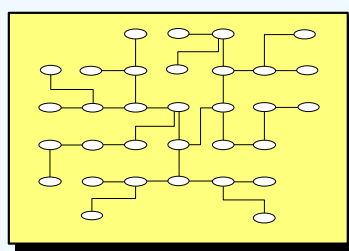


Research Results

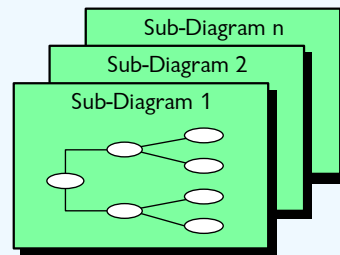
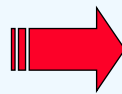


Principle 1: Decomposition

Divide large diagrams into cognitively and perceptually manageable chunks

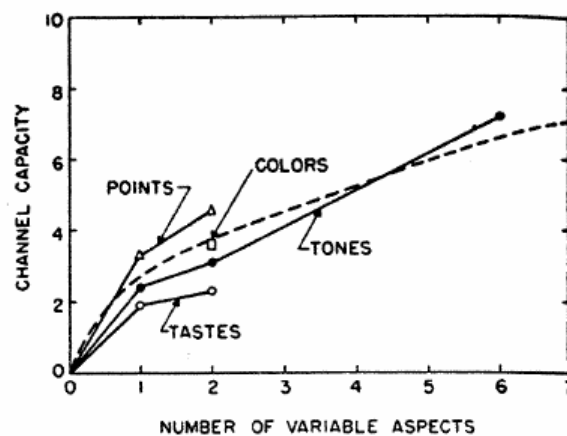


Single interconnected diagram

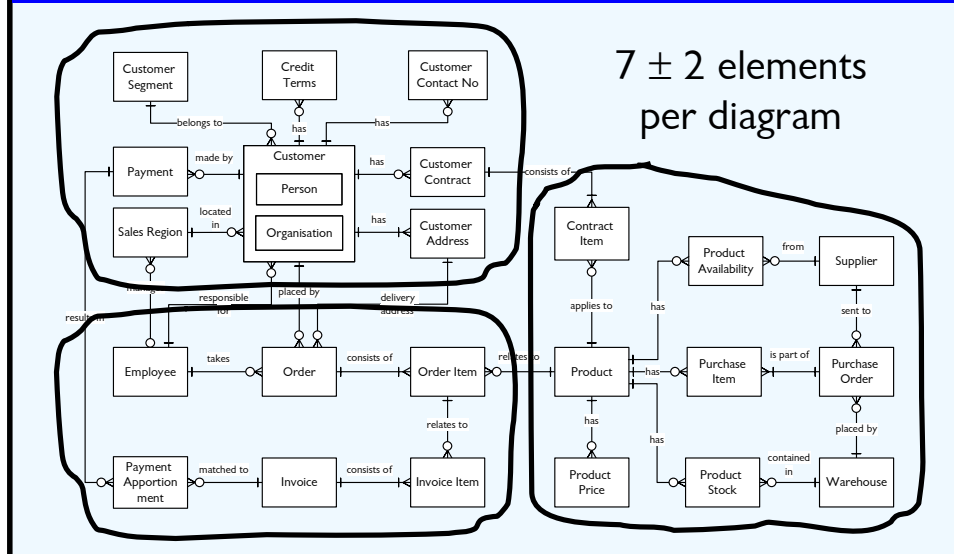


Set of manageable sized sub-diagrams

The Magical Number, Seven, Plus or Minus Two



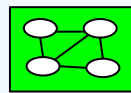
Divide Large Diagrams into Manageable Sized Chunks



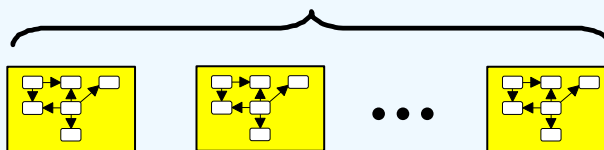
Principle 2: Summarisation

"Big picture" view: provides overall map into which information from different diagrams can be integrated

Summary Diagram



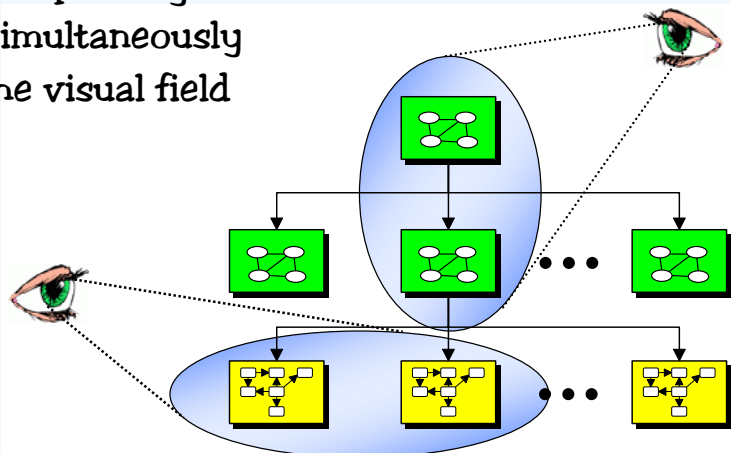
summarise
(possibly recursively)



Detailed Diagrams

Principle 8: Spatial Contiguity

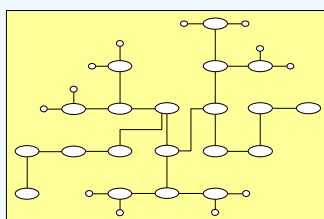
Allow multiple diagrams to appear simultaneously within the visual field



Principle 9: Perceptual Grouping

Use *Gestalt* principles to group elements together into manageable sized chunks

★ Both an alternative to and complementary to decomposition



Unstructured Diagram

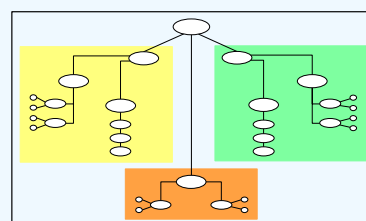
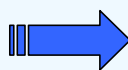


Diagram organised into perceptual groups

Summary

Quality features: understandability $\Rightarrow$ completeness, accuracy

Contribution: definition of 9 principles for incorporating complexity management into diagrams and/or notations

How will this improve practice/research:

- ★ Help RE practitioners communicate complex models to end users
- ★ Help notation designers incorporate complexity management into RE notations

Main problems: needs to be tested on other types of models

Scaling up: based on a real world solution

Interdisciplinary Generalisation

Requirements models an instance of a more general class of diagrams called node-link diagrams:

- ★ Used in a wide range of disciplines: business, education, communications, engineering, psychology

Potential applications of the research beyond the IS field

