

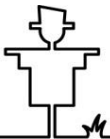
MBSE in slide (Spread over 20 slides!)

Prof Jon Holt

Scarecrow Consultants

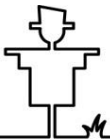
Technical Director, INCOSE UK

Professor of Systems Engineering, Cranfield University



1. Overview

1. The need for MBSE
2. MBSE in a slide
3. The Evolution of MBSE
4. Conclusions



1. The need for MBSE

- Complexity
 - Accidental
 - Essential
- Communication
 - Common language
 - Different stakeholders
- Lack of understanding
 - Across life cycle



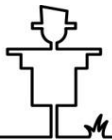
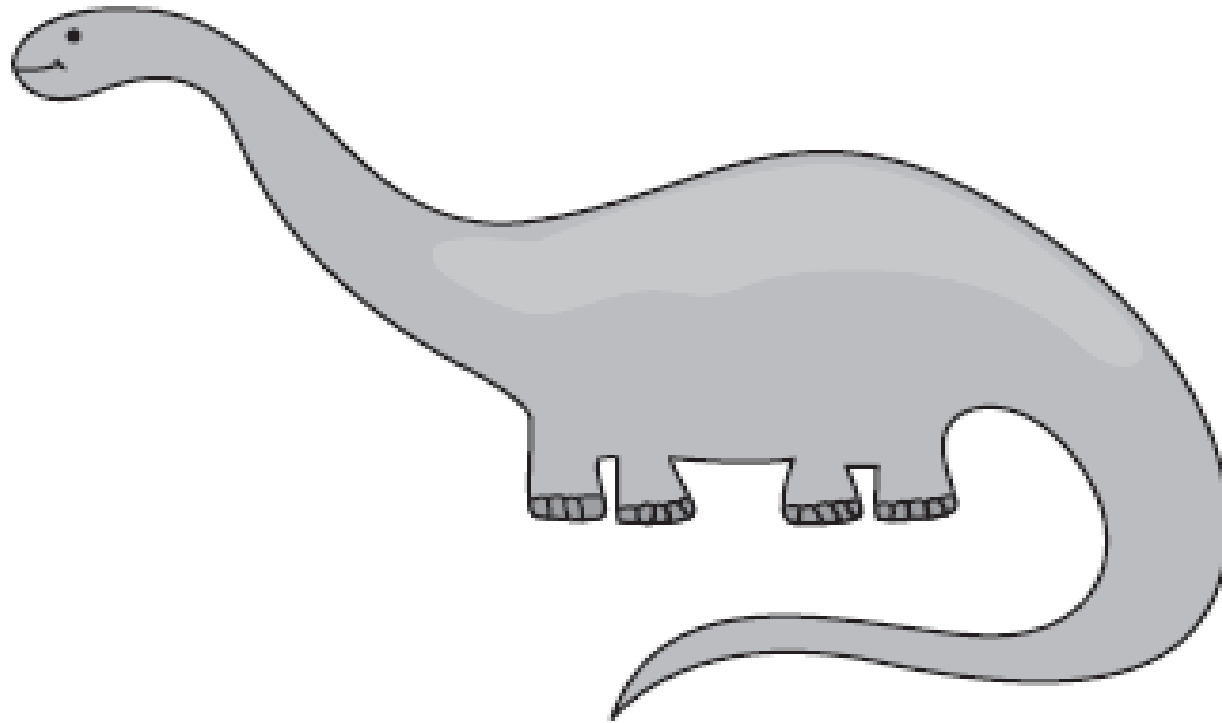
Consider a car...



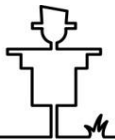
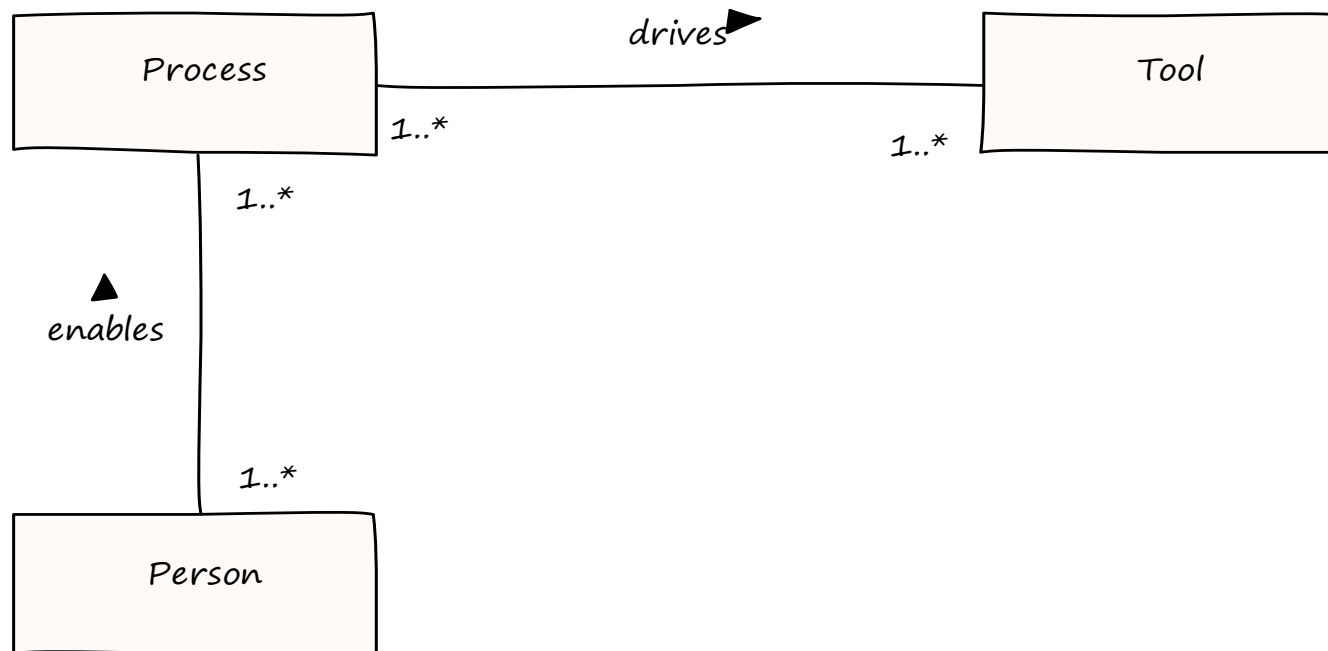
Consider a car...



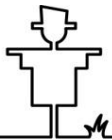
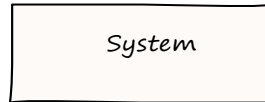
The Brontosaurus of Complexity



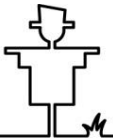
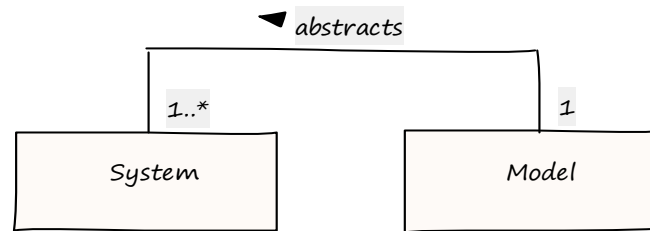
The MBSE Mantra



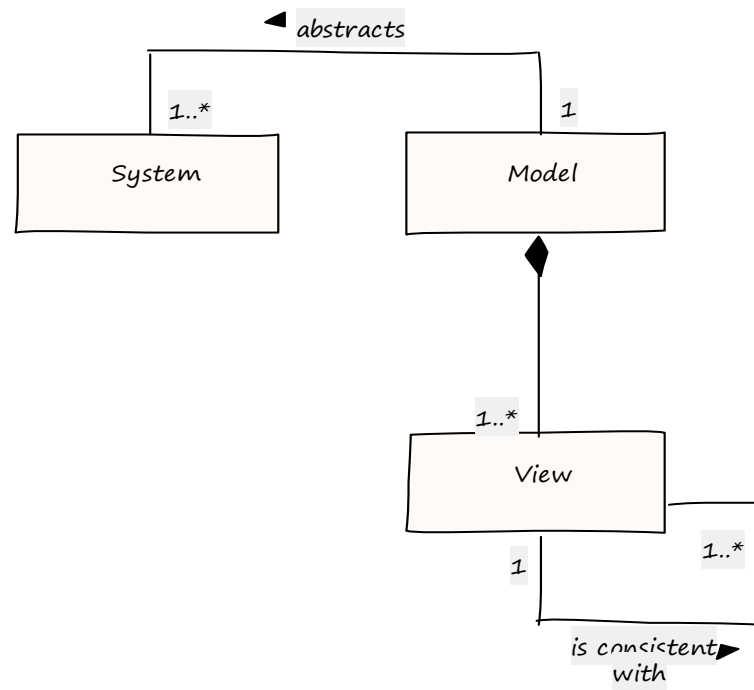
2. MBSE in a slide



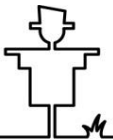
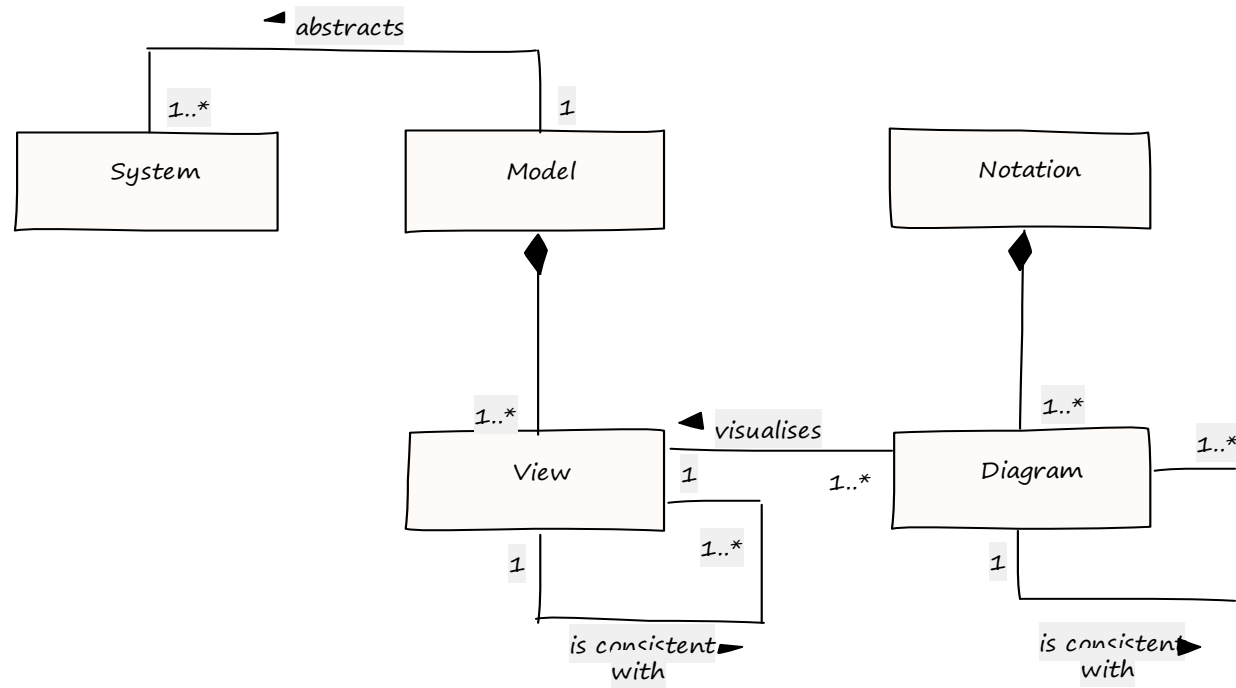
MBSE in a slide



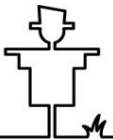
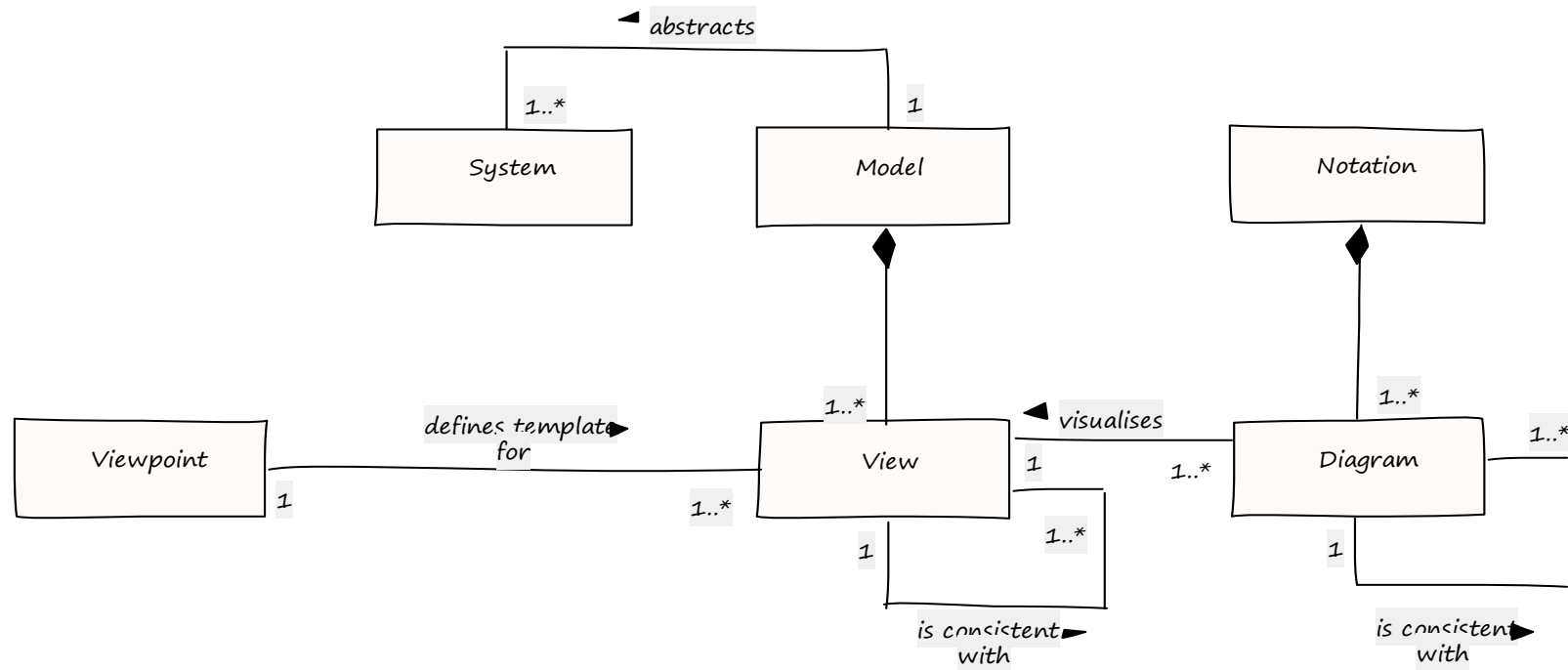
MBSE in a slide



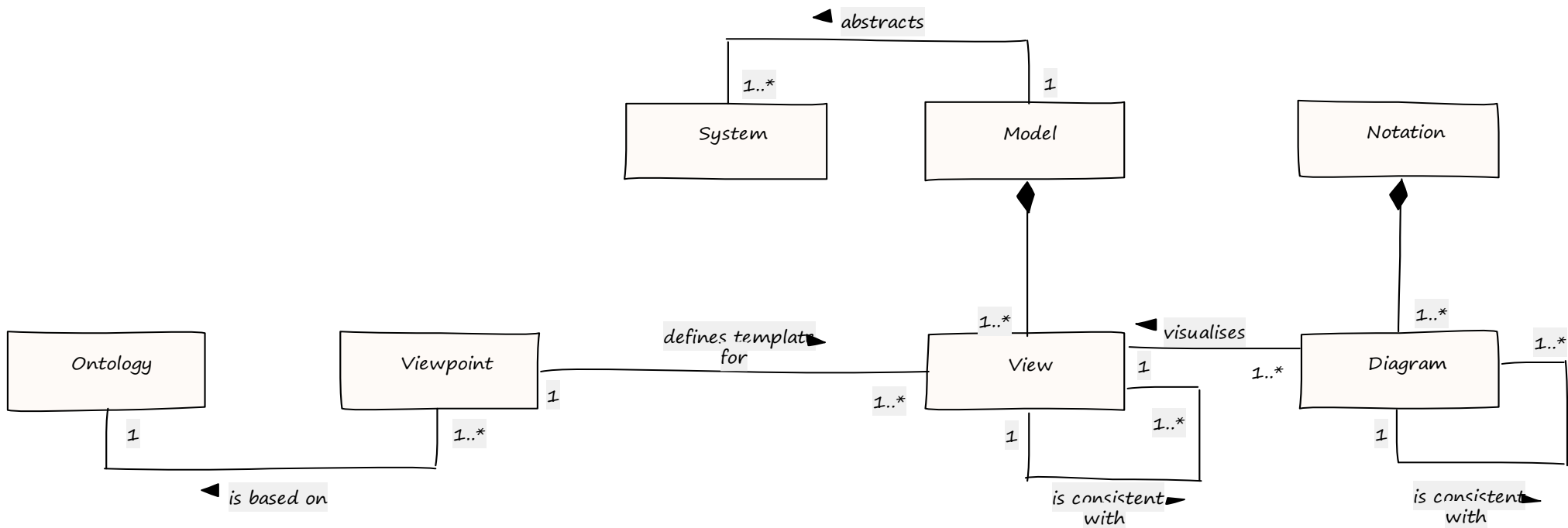
MBSE in a slide



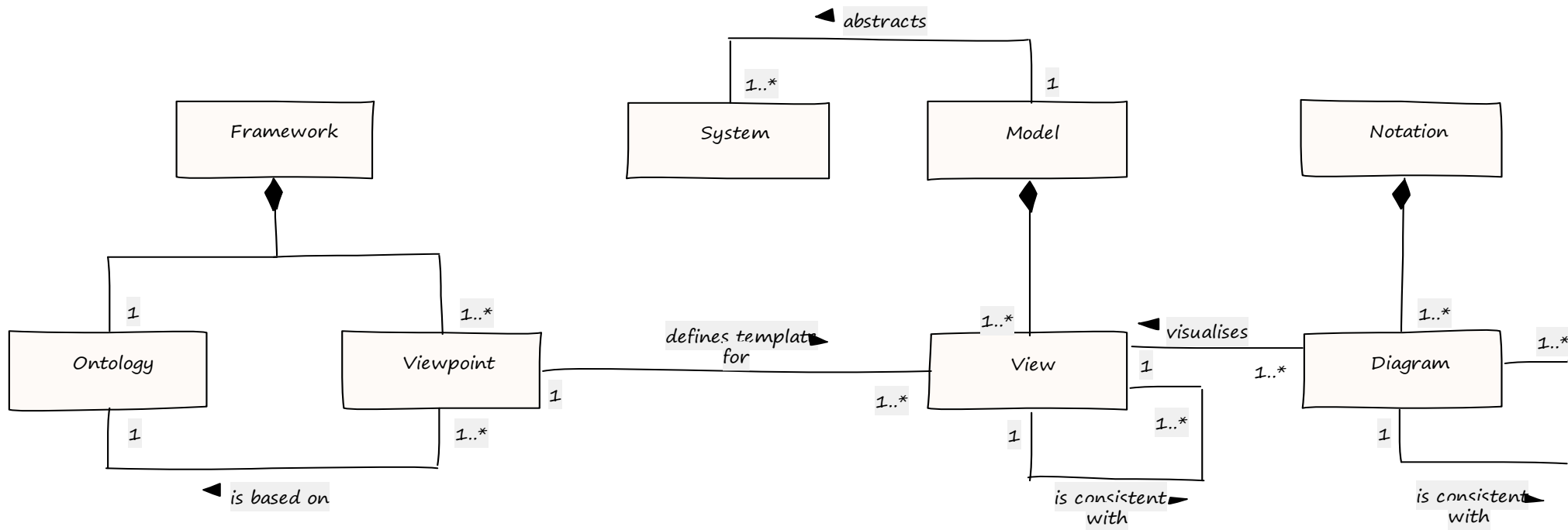
MBSE in a slide



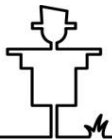
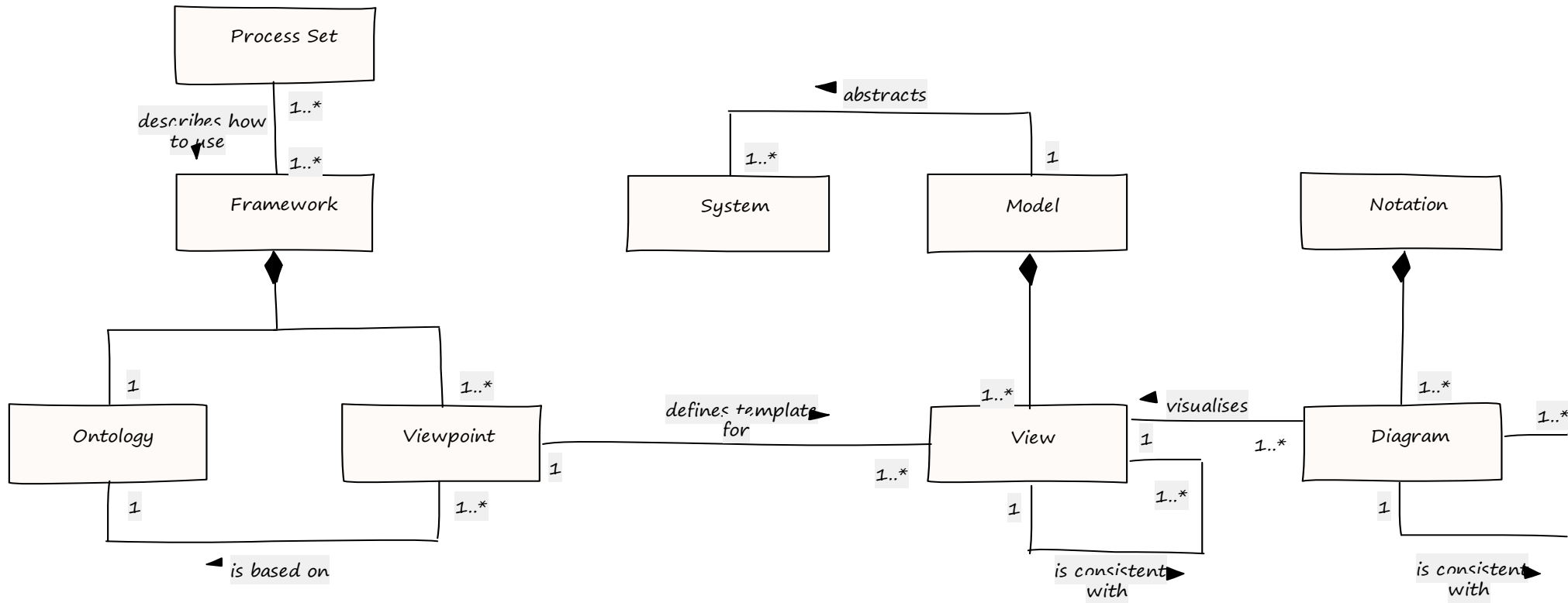
MBSE in a slide



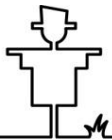
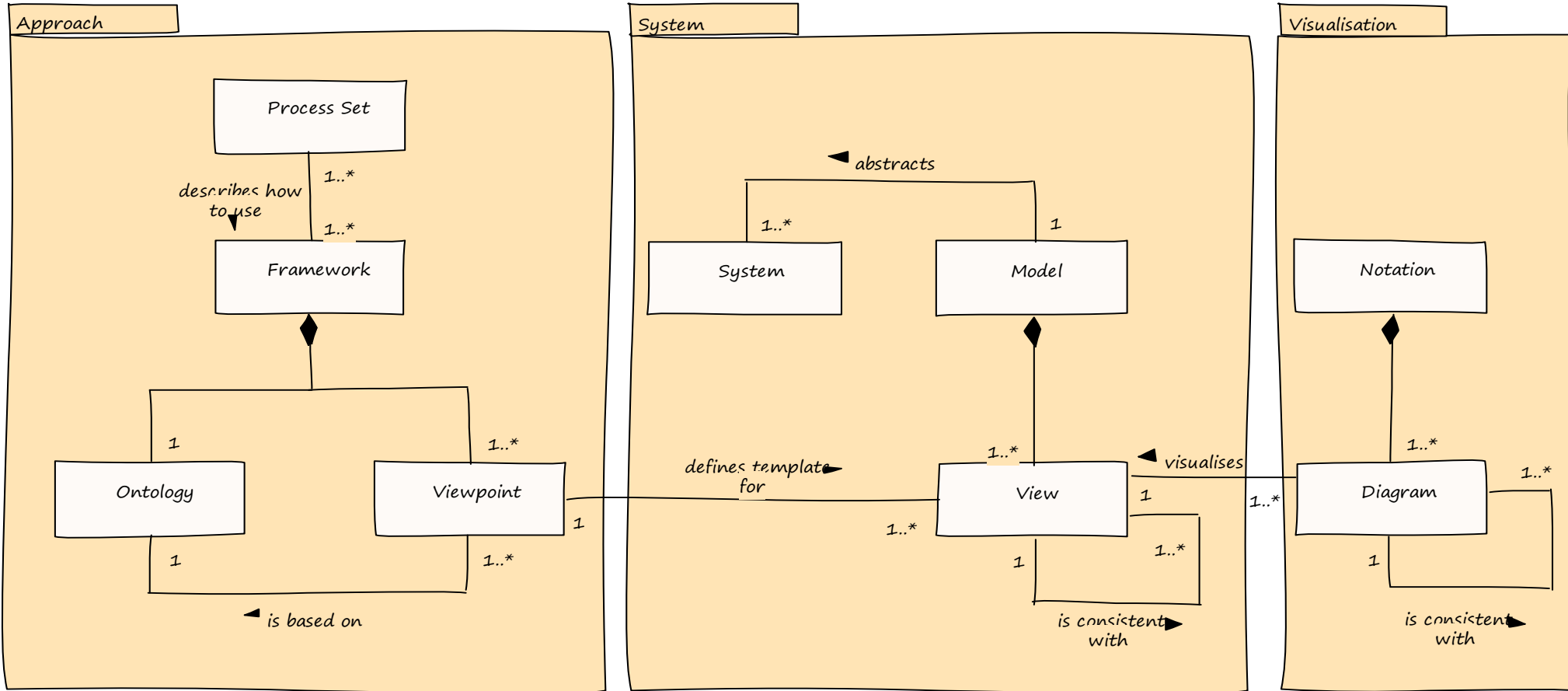
MBSE in a slide



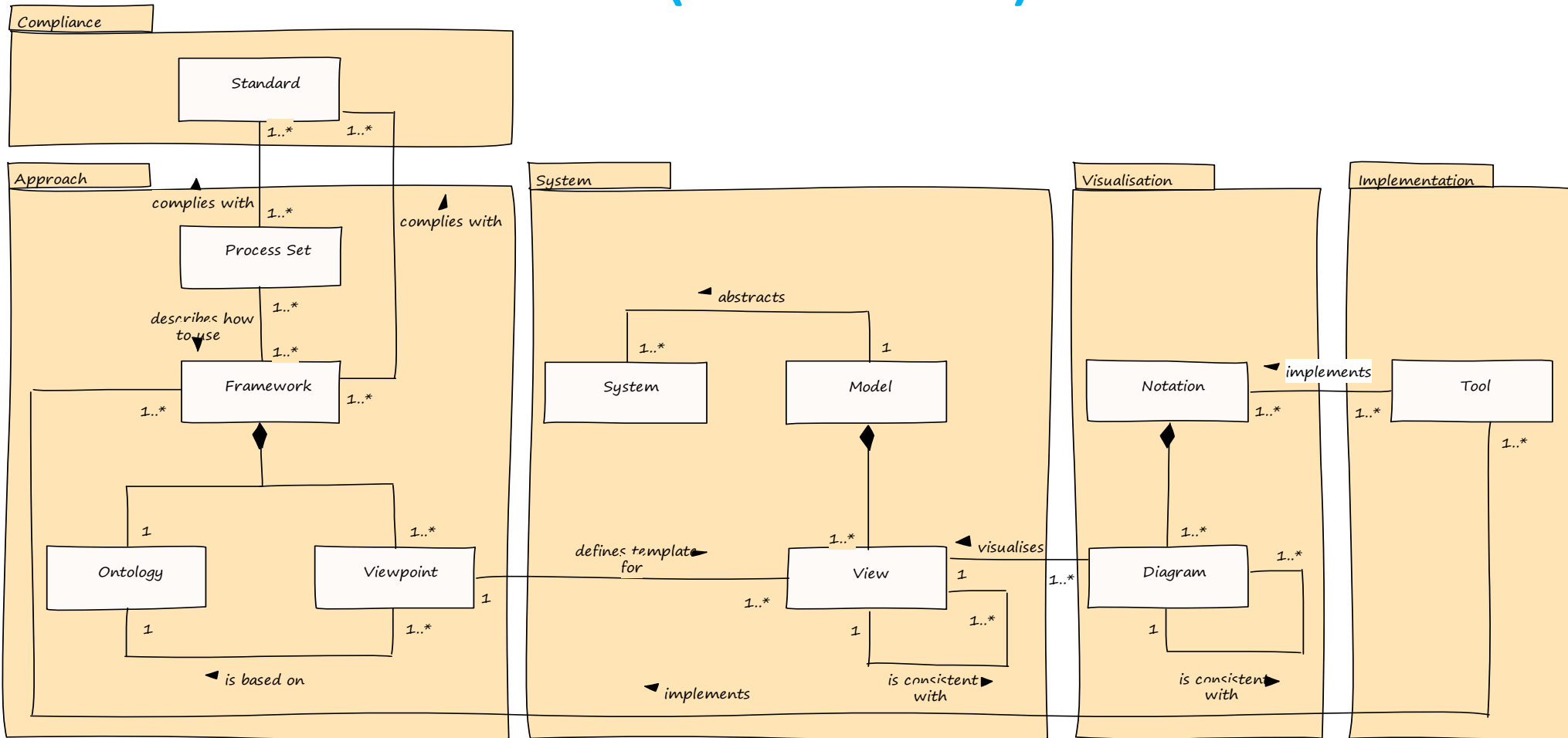
MBSE in a slide



MBSE in a slide

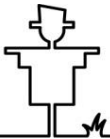


MBSE in a slide (and a bit)

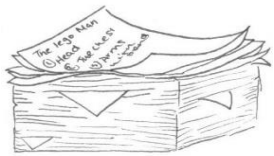


3. The Evolution of MBSE

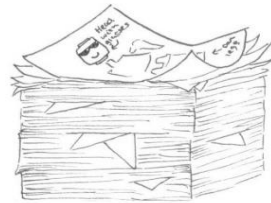
- MBSE evolution comprises a number of Stages



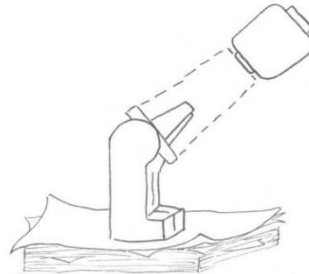
MBSE Evolution - Stages



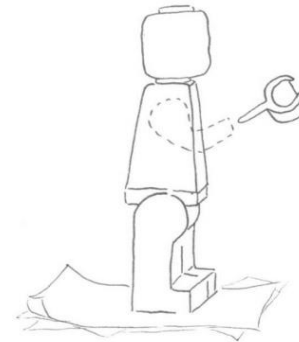
Stage 1:
Document-
based



Stage 2:
Document-
centric



Stage 3:
Model-
enhanced



Stage 4:
Model-
centric

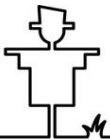


Stage 5:
Model-
based



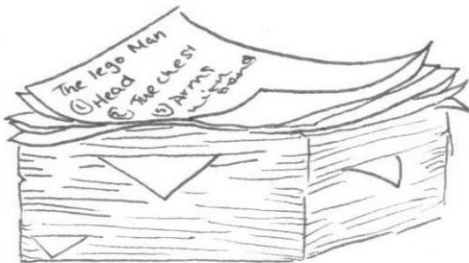
MBSE Evolution

- MBSE evolution comprises a number of Stages
- Each Stage has a number of Outcomes associated with it
 - People
 - Process
 - Tools



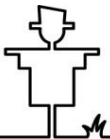
Stage 1: Document-based Systems Engineering - outcomes

- People
 - SE competence
- Process
 - All artefacts documents
 - Tables, lists, graphs etc
- Tools
 - Office tools – spreadsheets, word processors



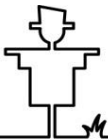
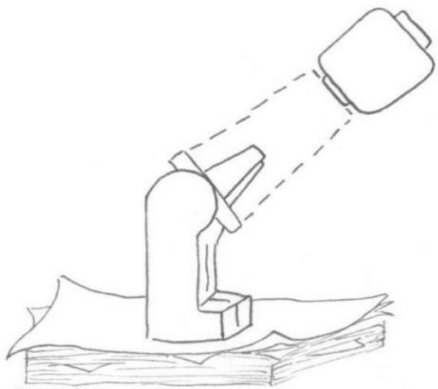
Stage 2: Document-centric Systems Engineering - outcomes

- People
 - SE competence
 - Informal notational skill
- Process
 - All artefacts are documents
 - Tables, lists, graphs etc
 - Some pictures
- Tools
 - Office tools – spreadsheets, word processors, drawing packages

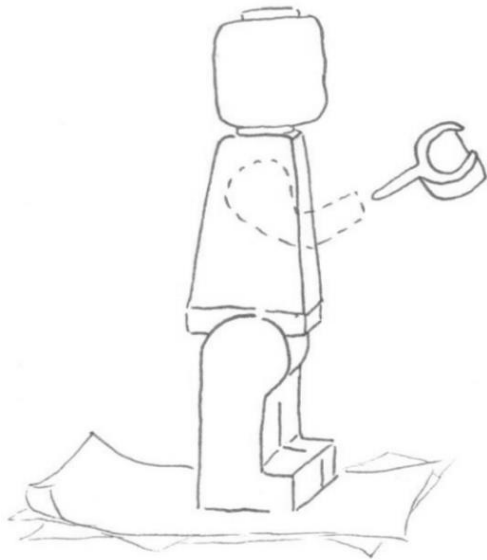


Stage 3: Model-enhanced Systems Engineering - outcomes

- People
 - Notational competence
 - MBSE awareness
- Process
 - Models start to emerge
 - Documents and models
 - Small pilot project
- Tools
 - Multiple candidate tools



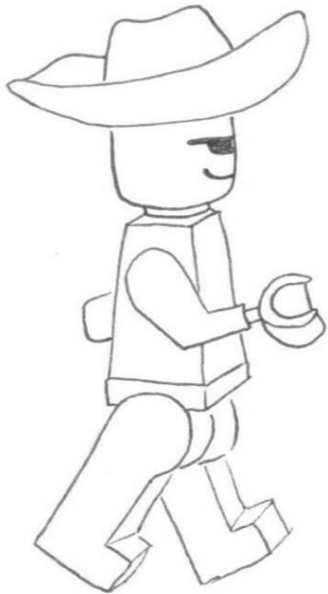
Stage 4: Model-centric Systems Engineering - outcomes



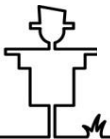
- People
 - MBSE competence
 - Tool competence
- Process
 - Initial ontology, framework, processes
 - Measurement and assessment of pilot
- Tools
 - Tool(s) selected



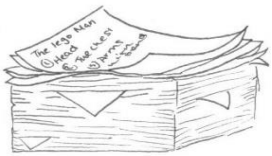
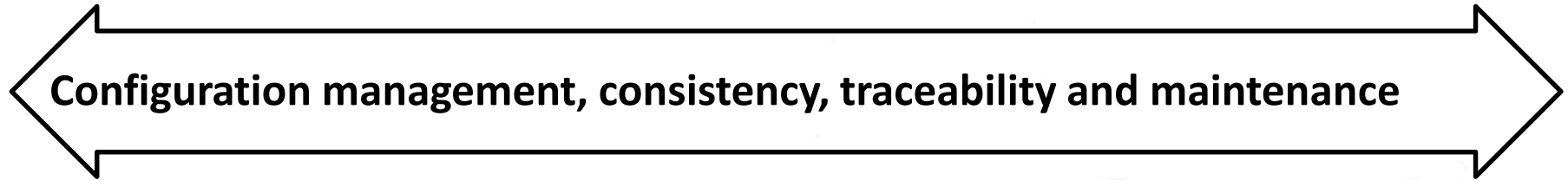
Stage 5: Model-based Systems Engineering - outcomes



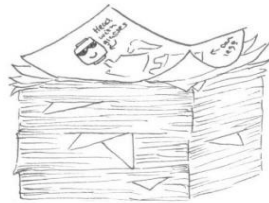
- People
 - MBSE competence
- Process
 - Mature ontologies, frameworks, process sets
 - Patterns, applications
 - Company roll-out
- Tools
 - Integrated toolsets
 - Profiles
 - Automation



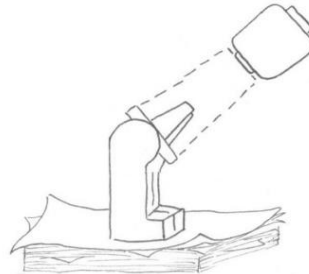
Cross-cutting concerns



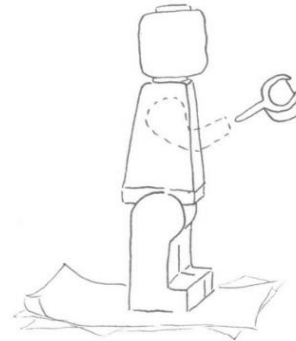
Stage 1:
Document-
based



Stage 2:
Document-
centric



Stage 3:
Model-
enhanced



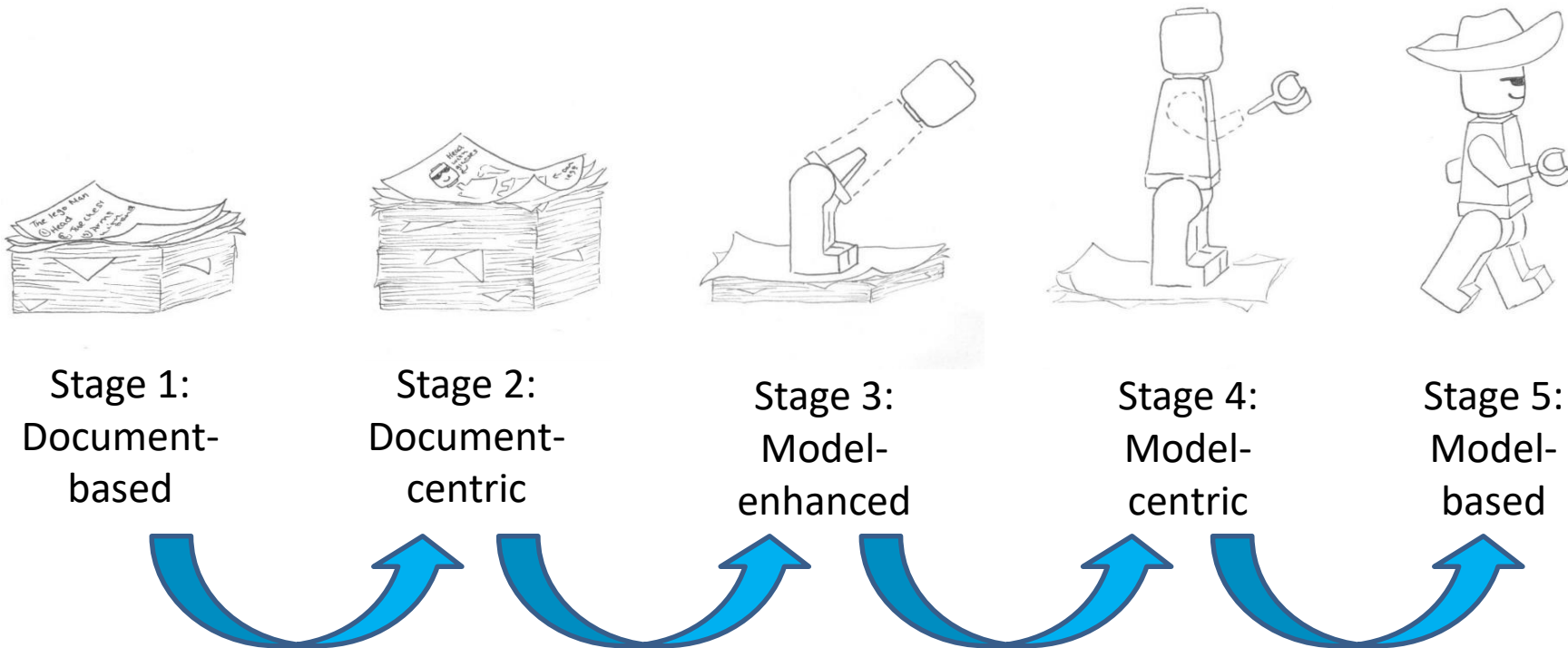
Stage 4:
Model-
centric



Stage 5:
Model-
based



MBSE Evolution – transition between stages



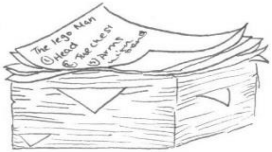
MBSE Evolution

- MBSE evolution comprises a number of Stages
- Each Stage has a number of Outcomes associated with it
 - People
 - Process
 - Tools
- In order to evolve from one Stage to another, we need to consider a number of Activities

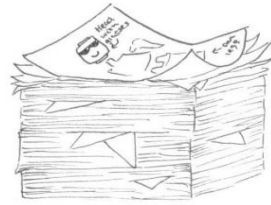


MBSE Evolution – Stage 1-2 - Activities

Assessment
Identify goals
MBSE by stealth



Stage 1:
Document-
based



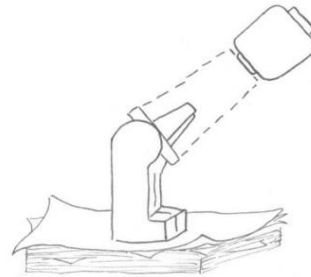
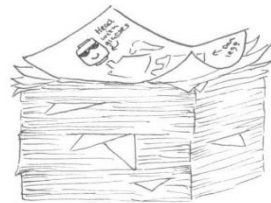
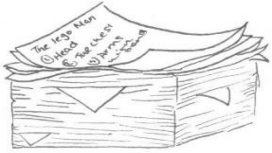
Stage 2:
Document-
centric



MBSE Evolution – Stage 2-3 - Activities

Assessment
Identify goals
MBSE by stealth

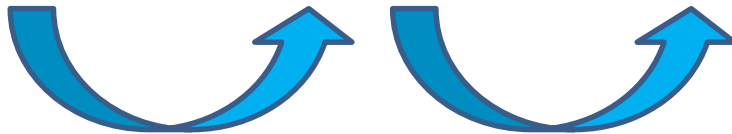
Notation training
Tool evaluation



Stage 1:
Document-
based

Stage 2:
Document-
centric

Stage 3:
Model-
enhanced

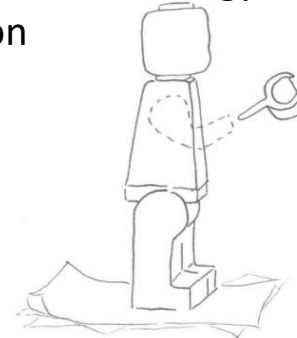
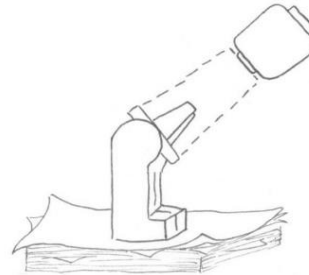
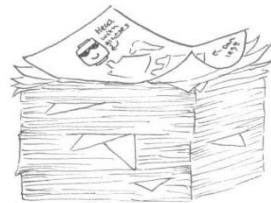
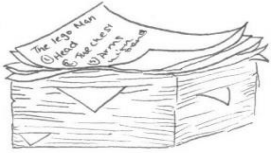


MBSE Evolution – Stage 3-4 - Activities

Assessment
Identify goals
MBSE by stealth

Notation training
Tool evaluation

MBSE training
Process definition
Tool selection
Tool training
Framework & ontology
definition



Stage 1:
Document-
based

Stage 2:
Document-
centric

Stage 3:
Model-
enhanced

Stage 4:
Model-
centric



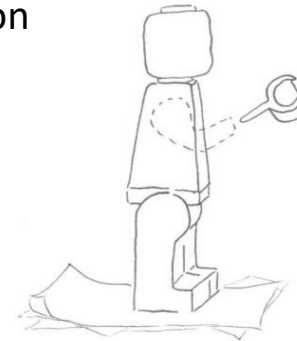
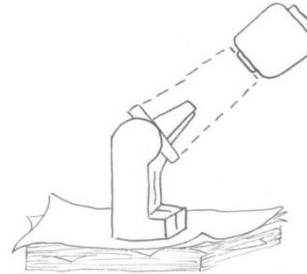
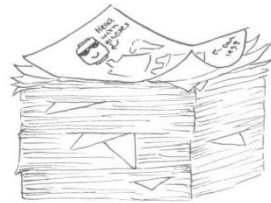
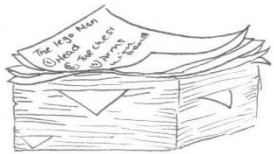
MBSE Evolution – Stage 4-5 - Activities

Assessment
Identify goals
MBSE by stealth

Notation training
Tool evaluation

MBSE training
Process definition
Tool selection
Tool training
Framework & ontology
definition

Advanced applications
Competency assessment
Model maturity
Process maturity
Tool tailoring



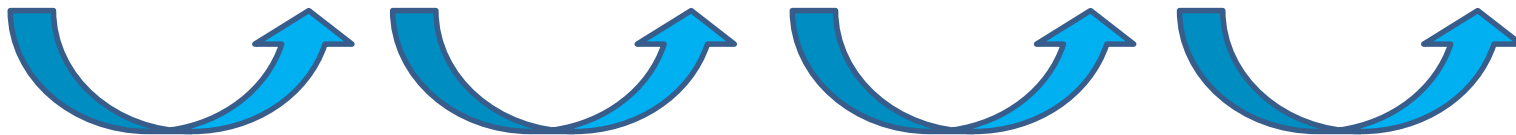
Stage 1:
Document-
based

Stage 2:
Document-
centric

Stage 3:
Model-
enhanced

Stage 4:
Model-
centric

Stage 5:
Model-
based



4. Conclusions

- There is a pragmatic need for MBSE
- Key parts of MBSE include:
 - Framework (Ontology & Viewpoints)
 - Model (Views)
 - Notation (Diagrams)
- There is a natural evolution for applying MBSE

