10th IFIP WG 8.1 Practice of Enterprise Modelling Conference
Workshop on Practicing Open Enterprise Modelling within OMiLAB (PROSE)
Nov. 22th-24th, 2017, Leuven, Belgium

Engineering the Cooking Recipe Modelling Method: a Teaching Experience Report

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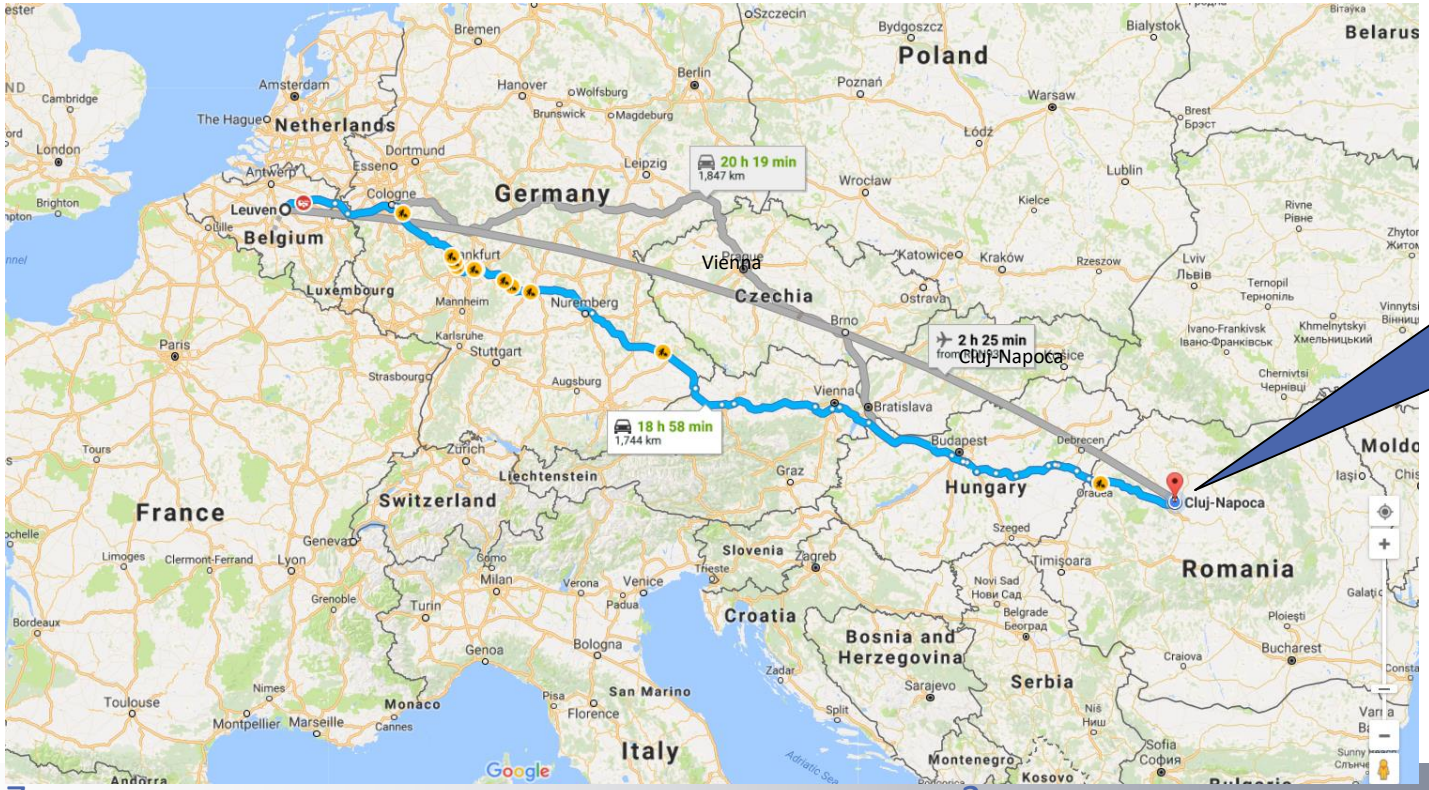
Agenda

- Motivation
- Teaching artefact
  - including the artefact building blocks
- Teaching method
  - including the targeted engineering method
- Example
- Conclusions

Where am I from?

- Babeş-Bolyai University of Cluj-Napoca, Romania
- biggest city in Transylvania & friendliest city for foreigners in Europe (cf. UK's Office for National Statistics)
- largest and oldest Higher Education Institution in Romania



The Faculty of Economics and Business Administration

- largest faculty in Babeș-Bolyai University
- offers a study track on **Business Information Systems** that involves Conceptual Modelling on several study levels:

	TOPICS	Means of involving Conceptual Modelling
Professional Level (PhD or PostDoc Research)	Semantic Technology, Enterprise Modelling, Knowledge Management Systems, Business Process Management Systems	• As a Design Science approach • As a Knowledge Externalization approach • As an enabler for engineering novel Modelling Methods, Languages and Tools • As an enabler for Agile model-driven engineering
Master Level	Challenge: **How to bridge the gap between Bachelor level and Professional level?**	
Bachelor Level	Database Design, Software Design	UML & ER modelling **subordinated to Software Engineering** disciplines (perceived as "means-to-an-end" subserving Software Engineering

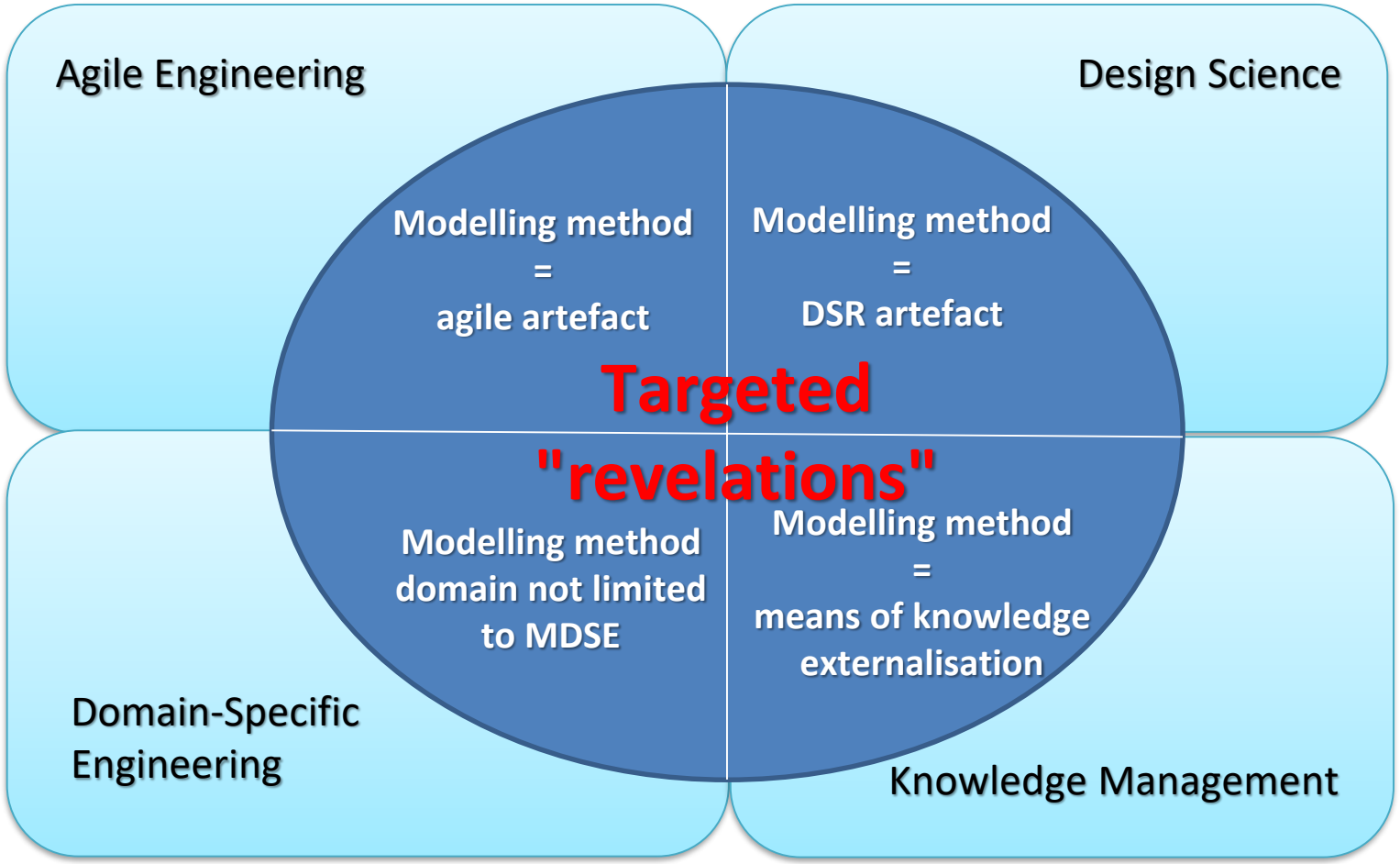
The typical BIS Master Student profile

- **Majority**: Business Information Systems and Computer Science graduates.
  Minority: Business Administration graduates
- **Dominant modelling experience**:
  - UML and ER diagrams to document their bachelor thesis projects
  - Tools: MS Visio, Powerpoint, various free "drawing tools" providing UML templates
- **Dominant perception on Conceptual Modelling (CM)**:
  - It is a form of "drawing" with "predefined" symbols
  - It aims to support human understanding of system designs (as alternative to text)
  - CS graduates are familiar with the "code generation" use case, but rarely employed it
  - Generally, CM is a technique subordinated to Software Engineering and employs established standards

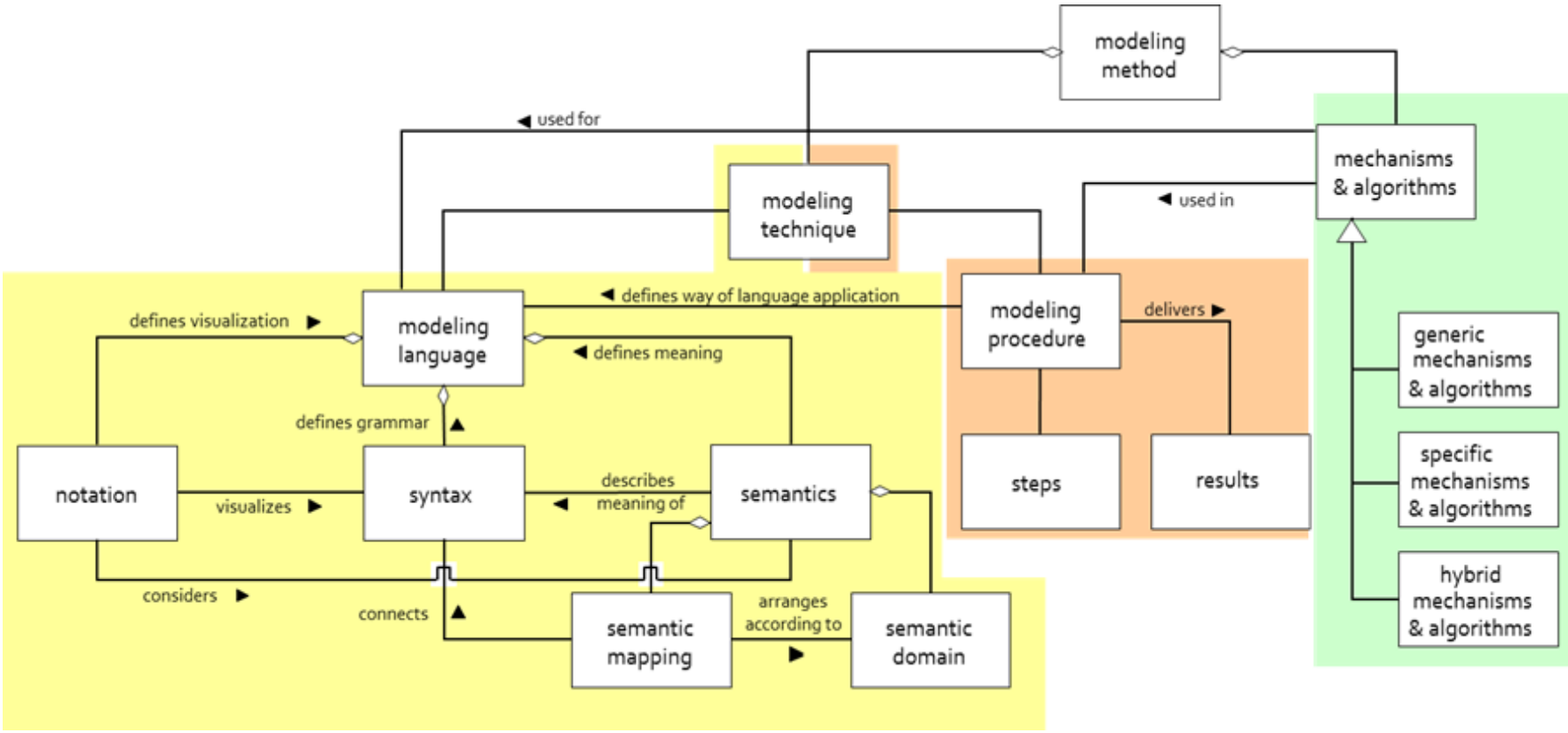
Common fallacies in CM perception

- Limited understanding of CM goals and its application areas
  - "CM is a Software Engineering activity"
- Lack of awareness on the distinction between CM and "drawing with predefined symbols"
  - "main purpose of CM is graphical documentation with predefined symbols"
- Lack of awareness on the modelling method building blocks (semantics, syntax, notation etc.)
  - general confusion between modelling method, modelling language, modelling tool
- Lack of awareness on the agile conceptualization of CM methods
  - "modelling languages are fixed, invariant standards"
- Weak understanding of model qualities and model-to-reality relation
  - "good models are those that accurately(!?) reflect reality"

The targeted revelations



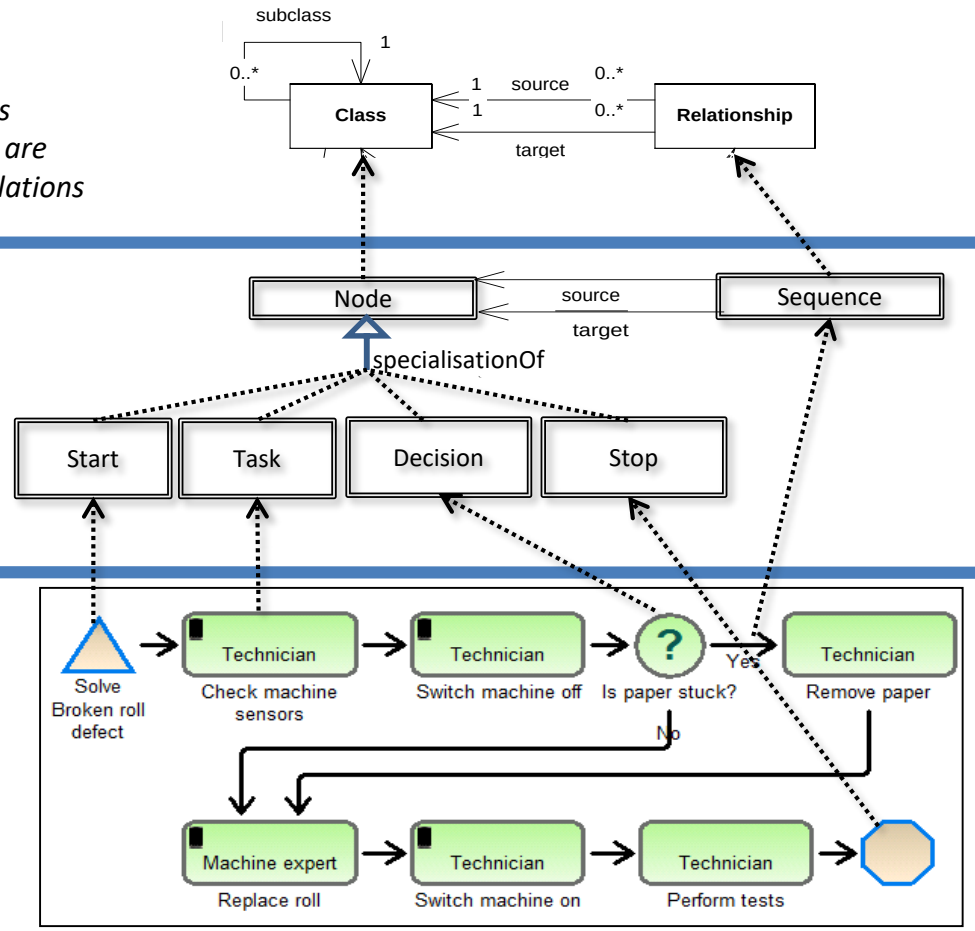
The teaching artefact: a Modelling Method



cf. Karagiannis, D., Kühn, H.: Metamodelling platforms. In: Bauknecht, K., Tjoa, A.M., Quirchmayr, G. (eds.), Proceedings of the Third International Conference EC-Web 2002 – DEXA 2002. LNCS 2455, pp 182, Springer (2002)

Underlying method: Agile Modelling Method Engineering*

Edges that cross between layers are "instanceOf" relations



META-META LAYER

The (fixed) concepts that can be used to agilely evolve modelling languages (metamodels)

META LAYER

The agile terminology (metamodel) of the modelling language

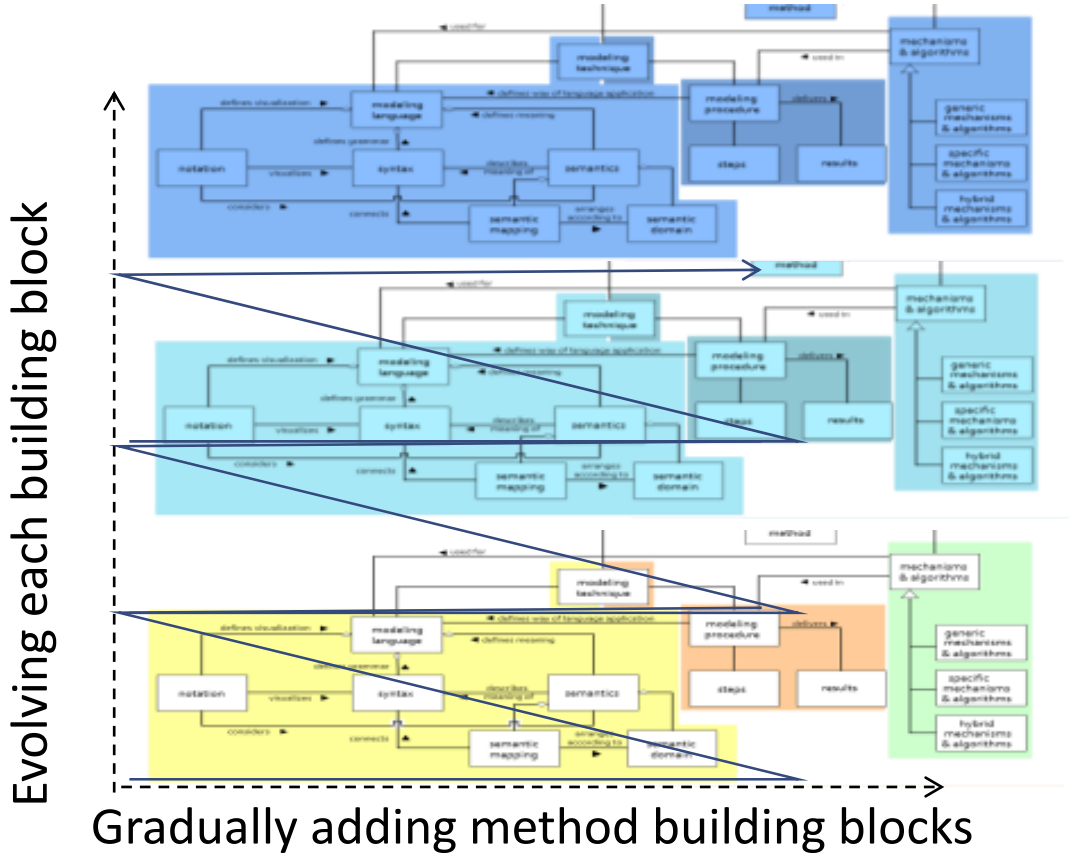
Modelling language increments (AMME iterations)

MODELS LAYER

Models describing application case knowledge

* cf. Karagiannis, D. (2015). "Agile modelling method engineering" In: *Proceedings of the 19th Panhellenic Conf. on Informatics*. Ed. by N. Karanikolas, D. Akoumianakis, N. Mara, D. Vergados, X. Michalis, ACM, p. 5-10.

Interactive Teaching Method



Re-inspecting the modelling method and reflect on

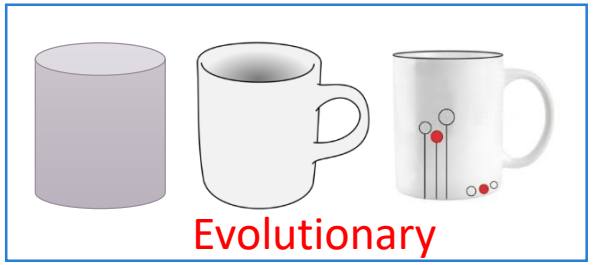
- how it was specified
- how it was (re)implemented

*ADOxx as fast prototyping environment
**AMME as conceptualization methodology

Design rationale for the modelling method

Key characteristics of the **modelling method** developed interactively:

1. The application domain detached from Software Engineering
2. Minimalism (requires minimal domain knowledge, fully deployed in 2 hands-on meetings plus 1 for theoretical reflection)
3. Domain-specificity manifests in all building blocks (notation, semantics, functionality etc.),
4. Targets Knowledge Externalization (rather than Software Design)
5. It is a Design Science artefact (i.e., driven by some situational requirements)
6. It can itself evolve agilely (i.e., agility manifests at modelling method level, not limited to model contents level)
7. It stimulates lateral thinking (i.e., clashes dominant perception with what is revealed by hands-on experience)



The Application Scenario

Application Domain: Cooking

Use Case: Knowledge Management in a Food Establishment

Modelling Method goal: to externalize cooking recipes in a diagrammatic knowledge base (i.e., can be queried for analysis and knowledge retrieval)

Rationale:

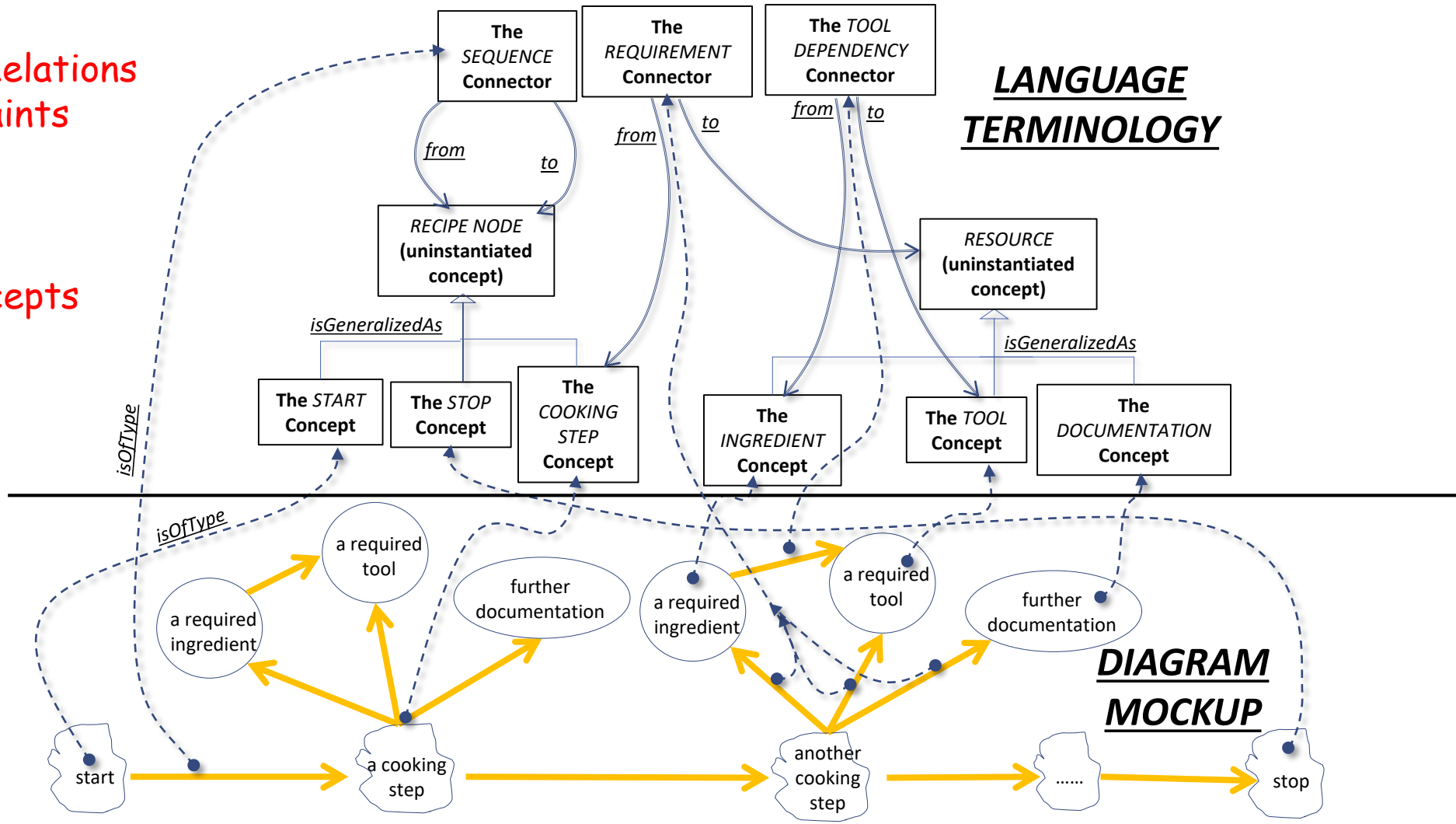
- a uniform starting point for all students, regardless of background and modelling experience;
- defuses the dominant perception that CM is a Software Engineering task
- emphasizes a generalizable Knowledge Management use case
- emphasizes the distinction between "graphical documentation" and "query-able knowledge"
- illustrates domain-specificity without requiring rich domain expertise
- supports analogies with business process modelling

Distinguishing Conceptualization Tasks

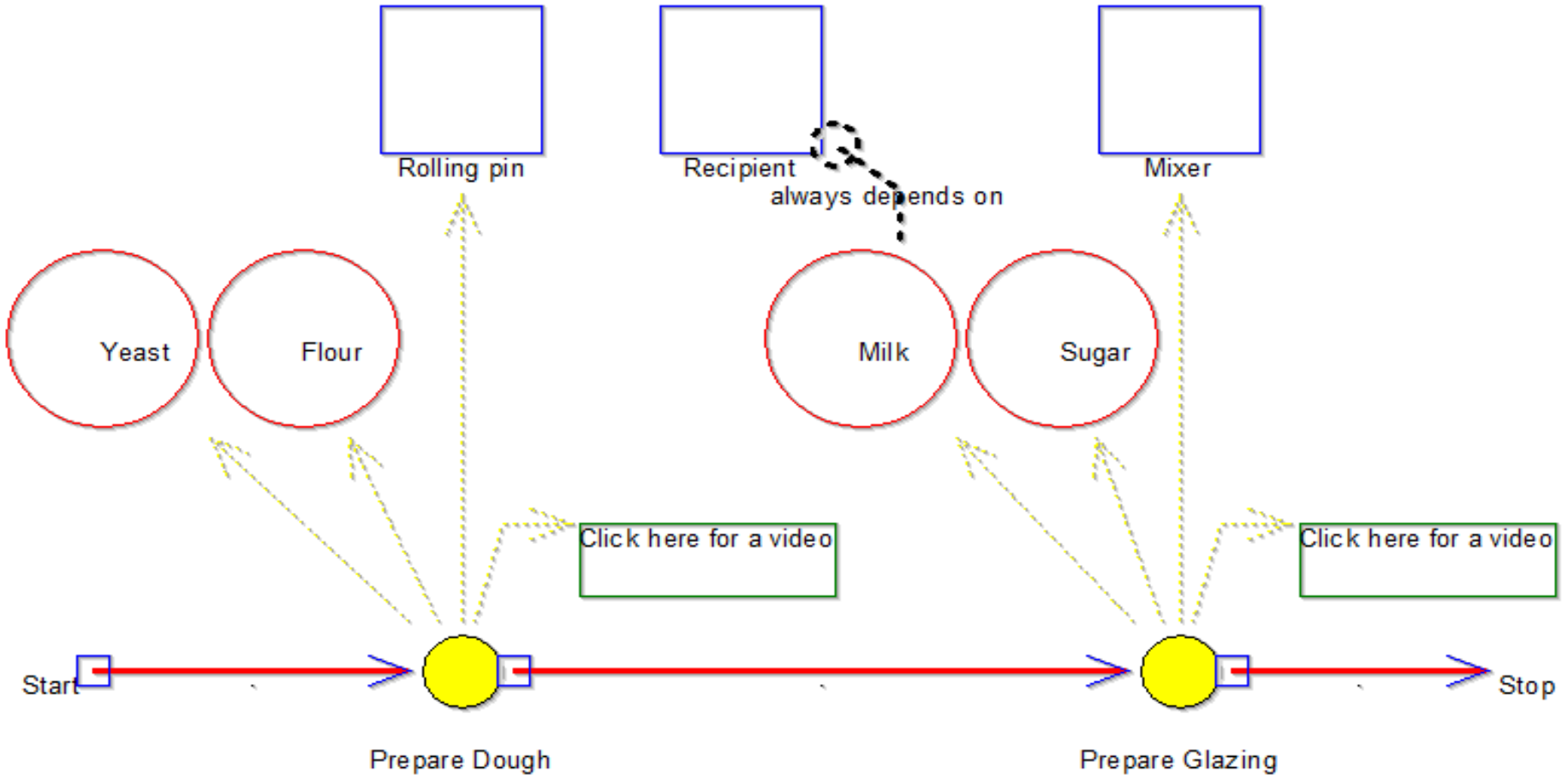
3. Bridging Concepts and Relations through Syntactic Constraints

2. Identification of Concepts and Relations

1. Mockup Diagram



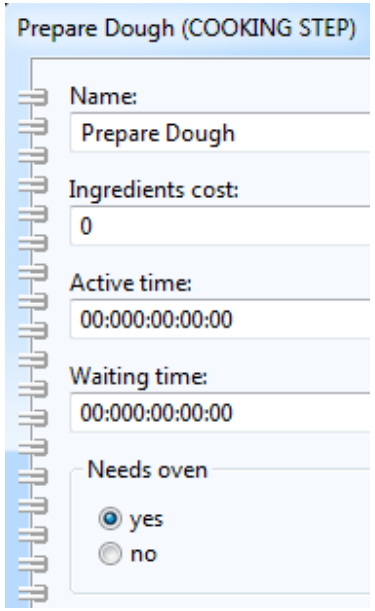
Initial implementation (concrete syntax)

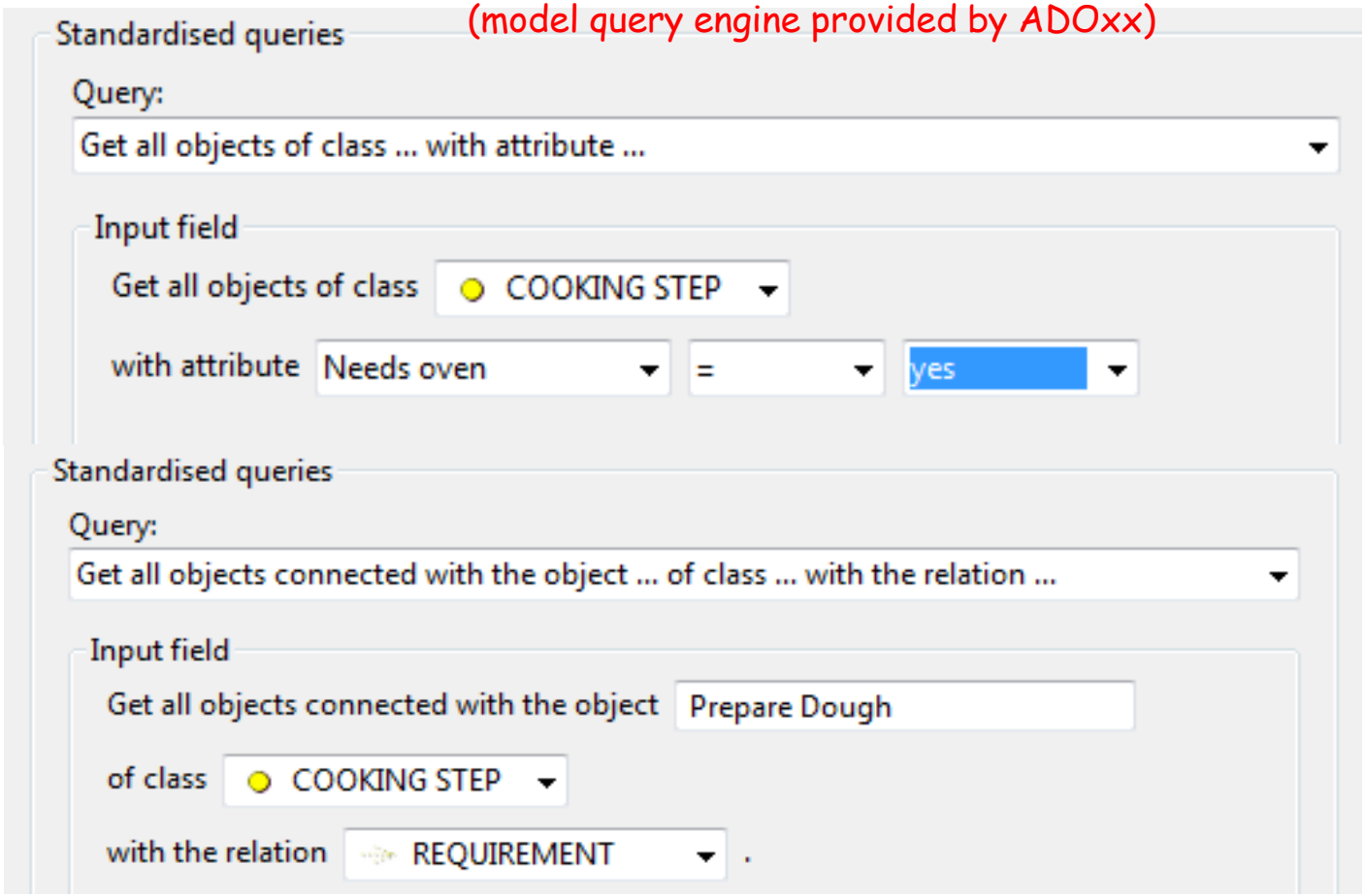


Emphasizing "models as knowledge"

Model queries relying on the machine-readable semantics
(model query engine provided by ADOxx)

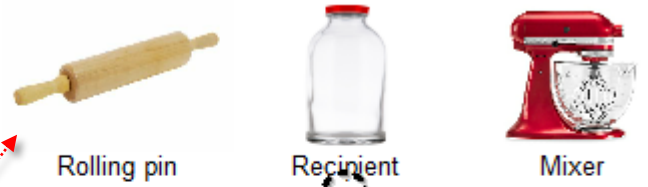
Domain-Specific Semantics captured in machine-readable *conceptional schema*





Agile Method Evolution: 2nd Iteration

REQUIRED TOOLS



always requires

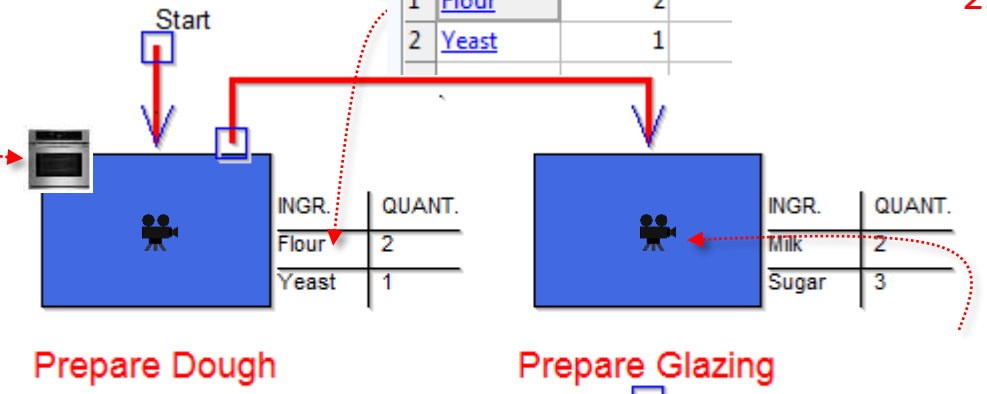
REQUIRED INGREDIENTS
(now including unit prices in their schema)

Requirement: Domain-specificity should also manifest in notation =>

1. *Ability to replace default notation with custom graphics*
2. *Visual cues reflecting key properties*

requires ingredient quantities:

	Ingredient	Quantity
1	Flour	2
2	Yeast	1



COOKING RECIPE
(now including domain-specific hyperlinks and visual cues)

Requirement: Mitigate risk of visual cluttering =>

1. *Partition the language in distinct model types*
2. *Establish semantic links between models*

Requirement: Eliminate "Documentation" concept =>

instead, have hyperlink to live Web resources

Conclusions

Strengths	**Weaknesses**
• minimalism and ease of implementation • reveals the notion of modelling method as an evolving Design Science artefact • detached from software engineering • domain-specific without requiring prior domain expertise • relies on free OMiLAB resources	When presenting their own homework projects, all students reported process-centric methods. For some, the exercise creates the impression that all CM is process-centric (non-behavioural model types should be emphasized more)
Opportunities By decoupling CM from software engineering, students are stimulated towards lateral thinking and the ability to devise modelling methods… • …for domain-specific goals or • …for research (experimentation) purposes	**Threats** Dominant practices around the local industry generate a "tunnel vision" with restricting consequences: - the limited goal of models as graphical documentation - limited understanding of modelling agility - lack of awareness on the "models as knowledge representation" perspective

Thank you!

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