TOOL-SUPPORT OF SOCIO-TECHNICAL COORDINATION IN THE CONTEXT OF HETEROGENEOUS MODELING

A RESEARCH STATEMENT AND ASSOCIATED ROADMAP

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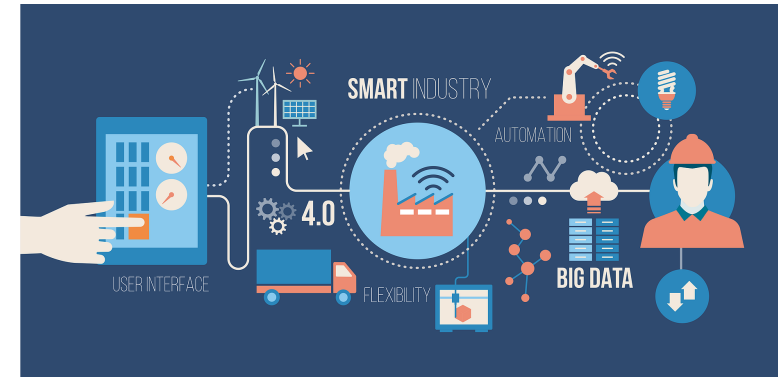Romina Eramo
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INTRODUCTION

Fast growing complexity of everyday life systems

Many development techniques for many systems aspects

- Different disciplines
- Different skills and expertise
- Different modeling techniques, language and tools

Model Driven Engineering (MDE)

- Main focus on supporting specific modeling context and domain
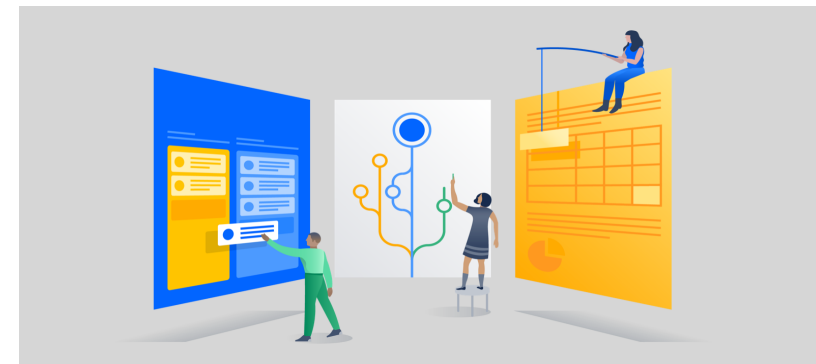- Little focus on supporting cross- or multi- disciplinary modeling

OUR VISION

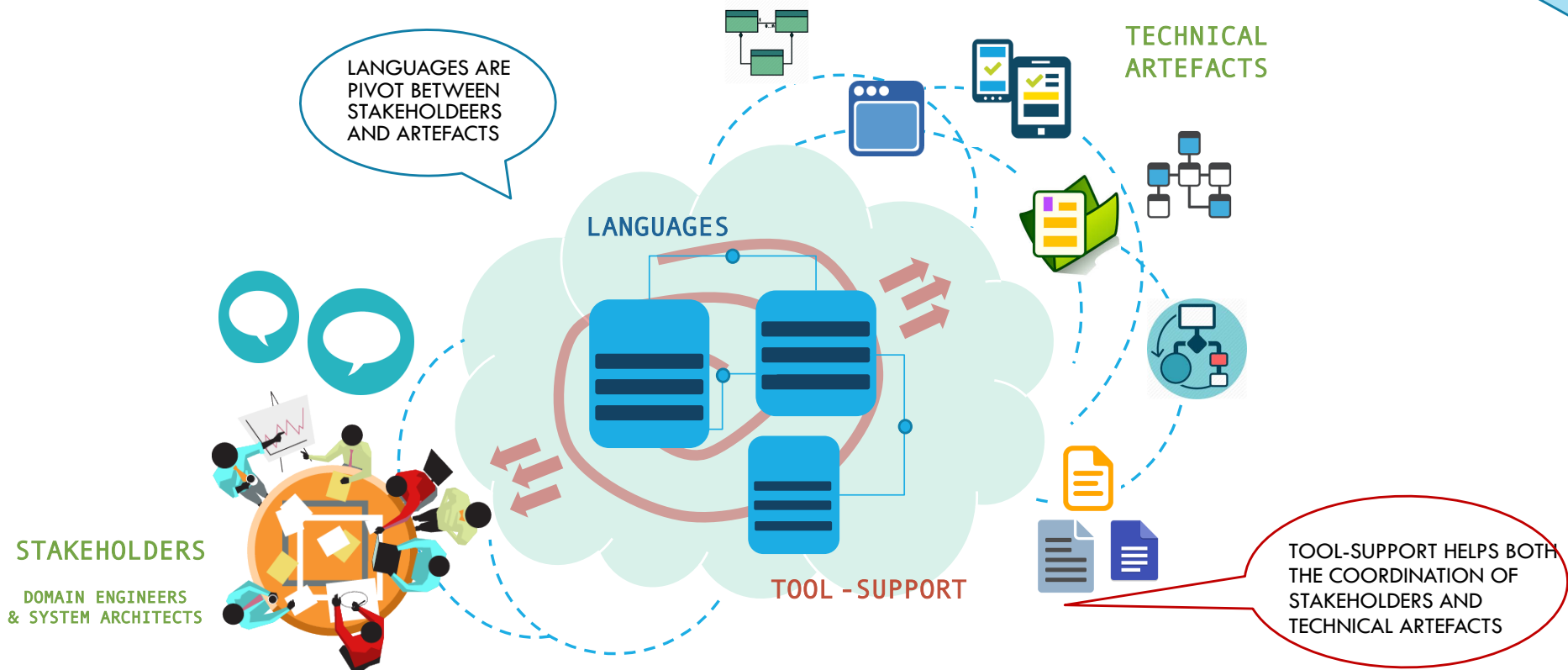# TOOL-SUPPORT IN THE CONTEXT OF HETEROGENEOUS MODELING

Socio-technical coordination within the system development

- Maintenance of coherence and consistency between models
  - Different modeling languages are used
  - Different engineers and teams are involved
- Government of models
  - Evolution of systems and related models

TOOL-SUPPORT IN THE CONTEXT OF HETEROGENEOUS MODELING

ENVISION

LANGUAGES ARE PIVOT BETWEEN STAKEHOLDEERS AND ARTEFACTS

TECHNICAL ARTEFACTS

LANGUAGES

TOOL -SUPPORT

STAKEHOLDERS

DOMAIN ENGINEERS & SYSTEM ARCHITECTS

TOOL-SUPPORT HELPS BOTH THE COORDINATION OF STAKEHOLDERS AND TECHNICAL ARTEFACTS
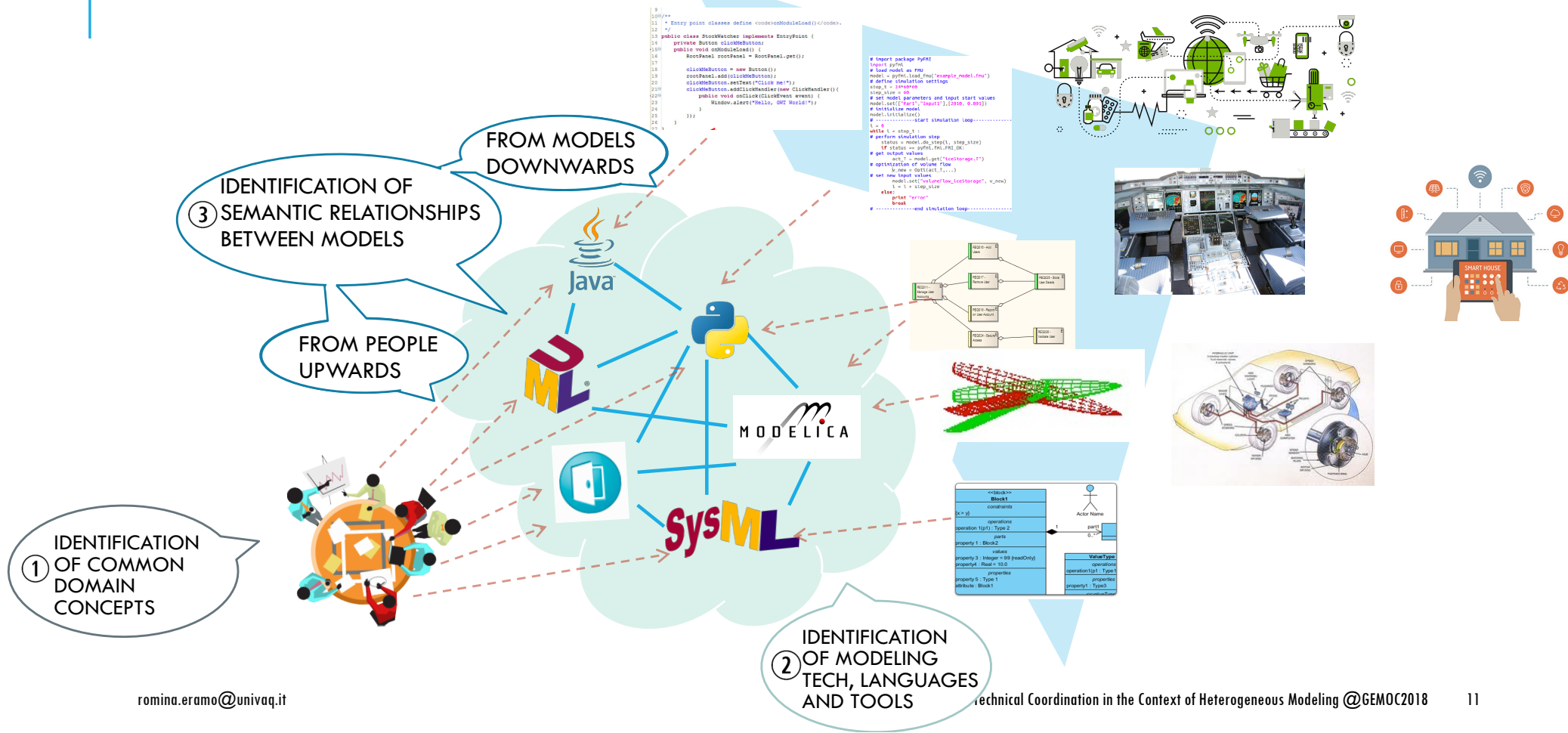
LAYERING IN HETEROGENEOUS MODELING

① Definition of the overall domain model independent of specific modeling techniques, languages and tools

"organizations which design systems ... are constrained to produce designs which are copies of the communication structures of these organizations."
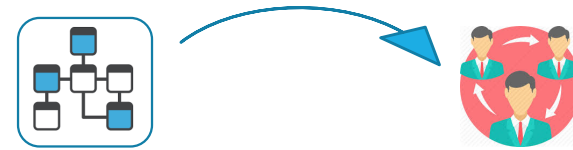
— Melvin Conway's Law

② Definition of the role of different modeling techniques, languages and tools

③ Definition of semantic relationships between different models and model elements

LAYERING IN HETEROGENEOUS MODELING
LANGUAGE-ORIENTED SOCIO-TECHNICAL COORDINATION

FROM MODELS DOWNWARDS

③ IDENTIFICATION OF SEMANTIC RELATIONSHIPS BETWEEN MODELS

FROM PEOPLE UPWARDS

① IDENTIFICATION OF COMMON DOMAIN CONCEPTS

② IDENTIFICATION OF MODELING TECH, LANGUAGES AND TOOLS

LAYERING IN HETEROGENEOUS MODELING
# FROM MODELS TO PEOPLE

Relationships intra models of a specific discipline are maintained by means of current tools

Inter-relationships among models from different disciplines have to relate objects adhering to the same concept

- Common concepts have to be ==clearly related== (e.g., by using the same name)
- Common concepts have to be ==acknowledged== by the domain engineers or the (system) architects

LAYERING IN HETEROGENEOUS MODELING
FROM PEOPLE TO MODELS
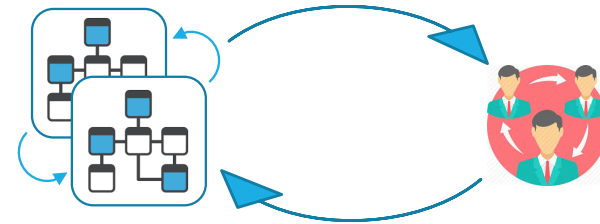
The natural evolution of domain objects causes ==temporal dependencies==

Implicit relationships have to be made explicit by domain engineers and system architects
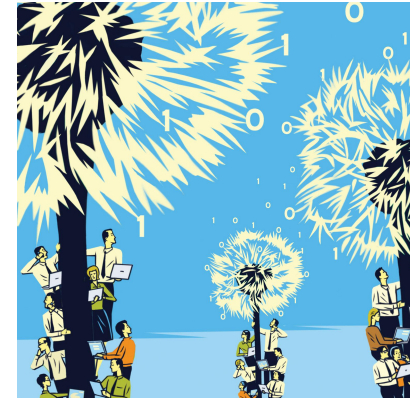
- Domain concepts have to be ==mapped==
- Relationships have to be ==maintained== during the development

A global tool has to deal with multidisciplinary models and their relationships

CHALLENGES ROADMAP

ENVISIONED MDE FRAMEWORK

External infrastructure to relate heterogeneous models in different tools

Explicit connection points to allow a systematic interlinking and integration of models

▪ Rich linking support to work across discipline boundaries

Governance for evolving linked models to ensure effective and efficient engineering processes

MODEL INTERFACES

Links potentially defined between every model in large-scale projects

Interfaces of models to other disciplines explicitly defined to coordinate work without exploring full models

Interface management on both provider and customer sides

Integration for supporting functional chains (eg., separating a part of the functional architecture of the system to deal with it separately)

MODEL LINKING 1/2

Traceability relationships to understand associations and dependencies among heterogeneous models and their correspondences

Coordination of activities without impacting the current way to work

Knowledge of involved concepts rather than any used language

MODEL LINKING 2/2

Traceability links relate one or more source model elements to one or more target model elements

Common metamodel for traceability links

Consistency relationships between the connected models
- (Bidirectional) model transformations and constraints
- Multi-view modeling
- Megamodeling

MODEL GOVERNANCE

Establishment of a clear governance to ensure coherence and consistency between the models

- Who is responsible for updating the different models and how model changes

Cross-model change impact capability that accounts for the maintenance and evolution of the trace links

A life-cycle model for inconsistencies may be established

- Trace links have to be versioned
- Meta-information on current validity have to be added to trace links

CONCLUSION & FUTURE WORK

We elaborated on our vision about the language- support of the socio-technical coordination in the development of complex systems

We derive a roadmap of concrete and actionable challenges to be further addressed by the community

We hope this paper raises interesting discussions, and initiates and federates various related research activities

THANK YOU.

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