darwin

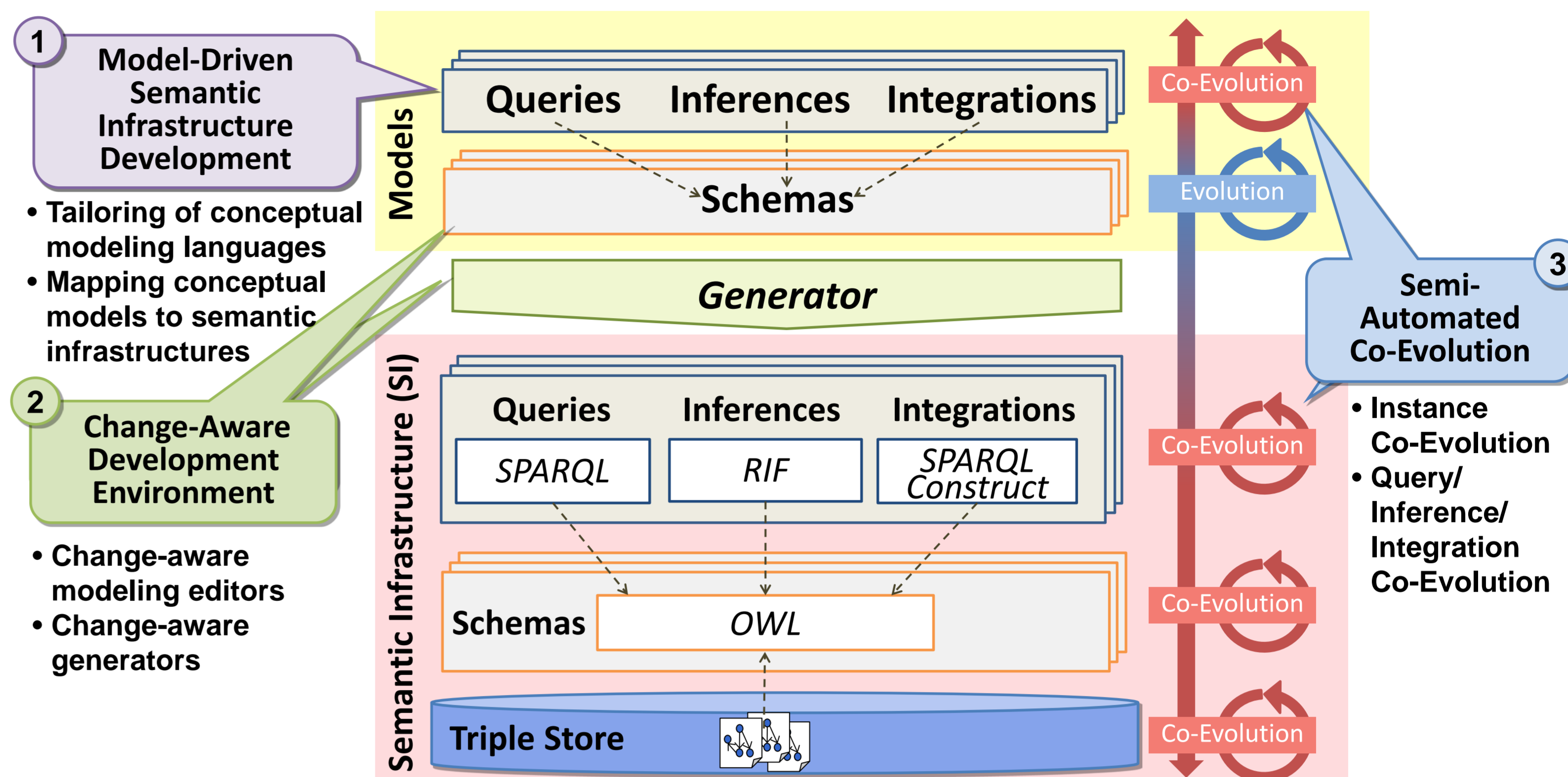# Model-Driven Development and Evolution of Semantic Infrastructures

Problems & Goals

Problems in **Semantic Infrastructure (SI) Development** and **Evolution**:
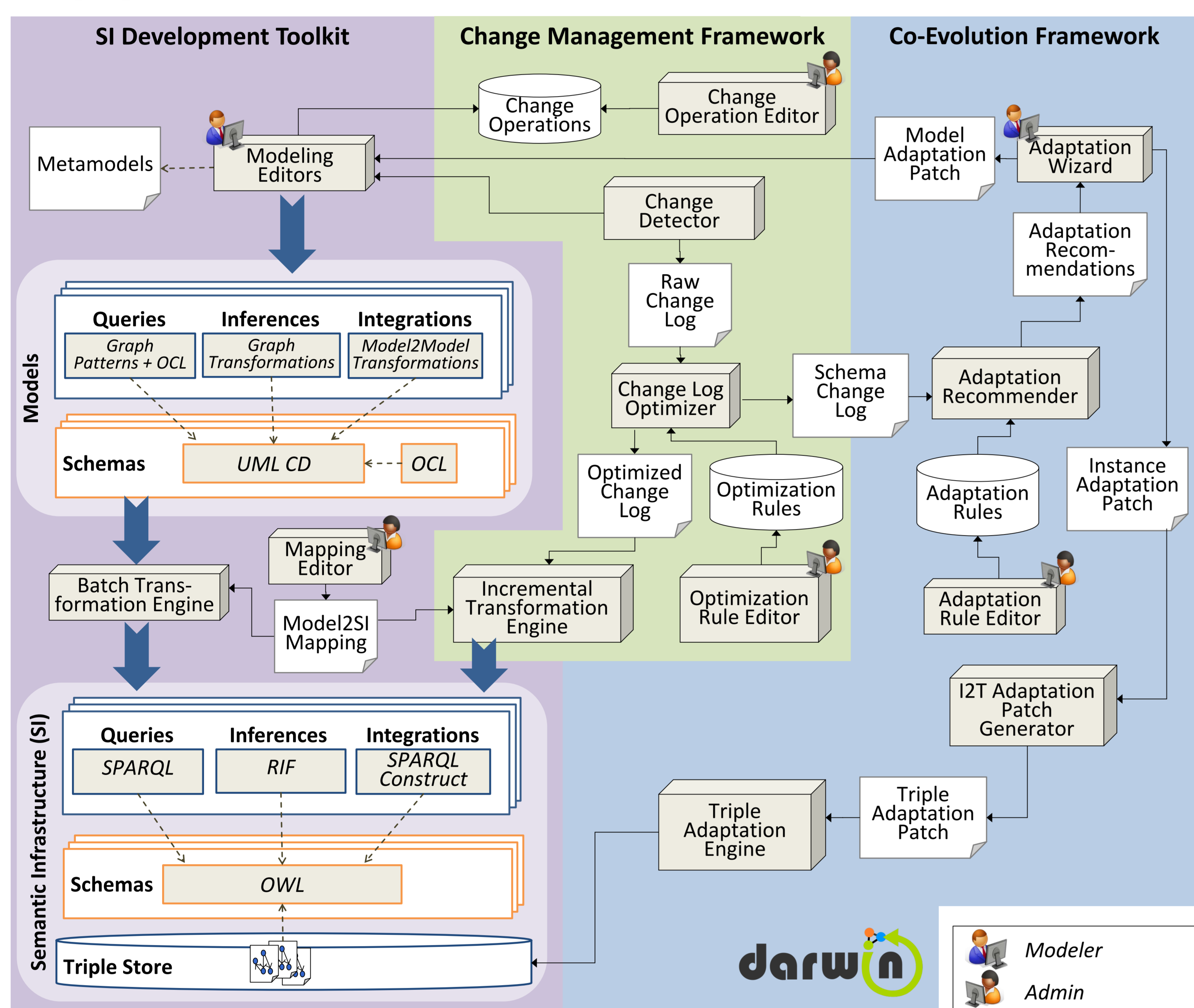- Inadequate Abstraction Mechanisms
- Change-Agnostic Development Editors
- Limited Co-Evolution Support

Goal is to provide an **Extensible Framework** by:
- Basing on Model-Driven Semantic Infrastructure Development
- Enabling a Change-Aware Development Environment
- Supporting Semi-Automated Co-Evolution

① Model-Driven Semantic Infrastructure Development
- Tailoring of conceptual modeling languages
- Mapping conceptual models to semantic infrastructures

② Change-Aware Development Environment
- Change-aware modeling editors
- Change-aware generators

③ Semi-Automated Co-Evolution
- Instance Co-Evolution
- Query/ Inference/ Integration Co-Evolution

Models: Queries — Inferences — Integrations / Schemas / Generator
Co-Evolution / Evolution

Semantic Infrastructure (SI): Queries (SPARQL) — Inferences (RIF) — Integrations (SPARQL Construct) / Schemas (OWL) / Triple Store
Co-Evolution

Approach

SI Development Toolkit / Change Management Framework / Co-Evolution Framework

Metamodels — Modeling Editors — Change Operations — Change Operation Editor — Model Adaptation Patch — Adaptation Wizard

Models: Queries (Graph Patterns + OCL) — Inferences (Graph Transformations) — Integrations (Model2Model Transformations) / Schemas (UML CD, OCL)

Change Detector — Raw Change Log — Change Log Optimizer — Schema Change Log — Adaptation Recommender — Adaptation Recommendations

Mapping Editor — Model2SI Mapping — Batch Transformation Engine — Optimized Change Log — Optimization Rules — Incremental Transformation Engine — Optimization Rule Editor — Adaptation Rules — Instance Adaptation Patch — Adaptation Rule Editor

Semantic Infrastructure (SI): Queries (SPARQL) — Inferences (RIF) — Integrations (SPARQL Construct) / Schemas (OWL) / Triple Store

I2T Adaptation Patch Generator — Triple Adaptation Engine — Triple Adaptation Patch

Modeler / Admin

SI Development Toolkit
Providing means for modeling SI:
- Schemas (UML class diagrams)
- Queries (graph patterns and OCL)
- Inferences (graph transformations)
- Integrations (model-to-model transformations)

Change Management Framework
Extending SI Development toolkit:
- Change Operation Editor and Optimization Rule Editor are utilized by admin enabling the
- Change Detector and Change Log Optimizer creating an optimized Change Log for the
- Incremental Transformation Engine

Co-Evolution Framework
Enabling semi-automated co-evolution:
- Adaptation Wizard used by modeler employs Adaptation Recommendations from
- Adaptation Recommender maintained by
- Adaptation Rule Editor used by admin for co-evolving artifacts with the
- Triple Adaptation Engine

Evaluation

Case-Study-Based evaluation of **SI Development Toolkit**
- Modeling reference applications of demonstrators

Experimental evaluation of **Incremental Generation**
- Propagating changes from external Model Mutation Framework to SI with Incremental Transformation Engine

Empirical evaluation of **Development & Co-Evolution Support**
- Evaluating DARWIN in "Model Engineering" master course

Partners

Department of Cooperative Information Systems
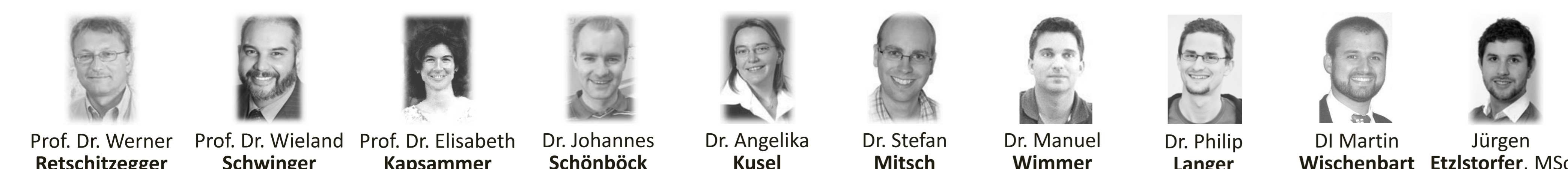Johannes Kepler University Linz
http://www.cis.jku.at

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www.model-evolution.net