Staged Evolution with Quality Gates for Model Libraries

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Motivation

- Model Libraries
  - „Place to store your models"
  - Enables model reuse
- Challenges
  - What model should I reuse?
  - What happens if models change?

- Research challenges:
  - Structuring models for reusability
 - Describe model evolution in model libraries

Agenda for Today

1. Define model evolution for model libraries
   - More formal approach based on graphs
2. Provide model quality characteristics
   - 4-dimensional quality model
3. Show Prototype implementation

1. Define Model Evolution for Model Libraries

- Model Evolution means changes during a period of time
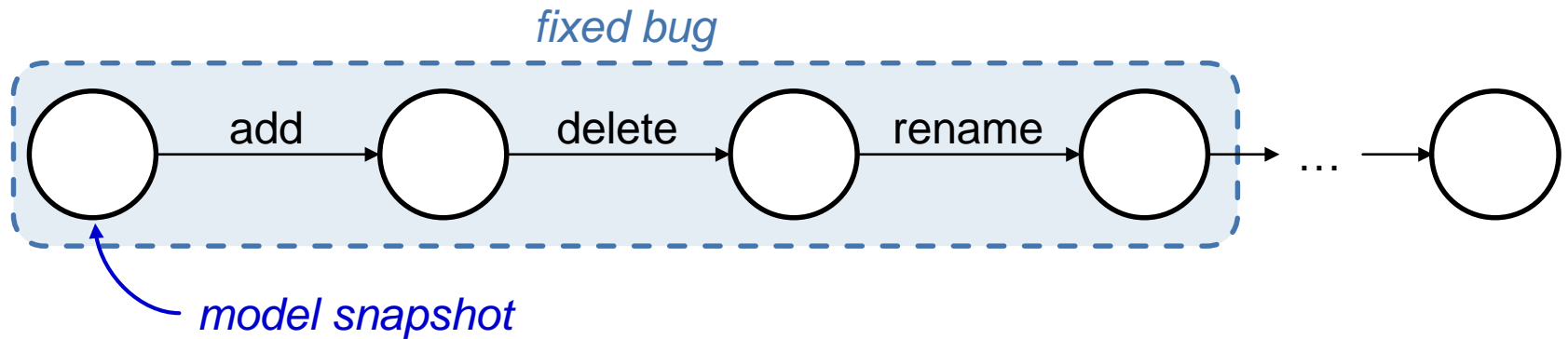 - Only add, delete, rename, and retype operations

evolution steps
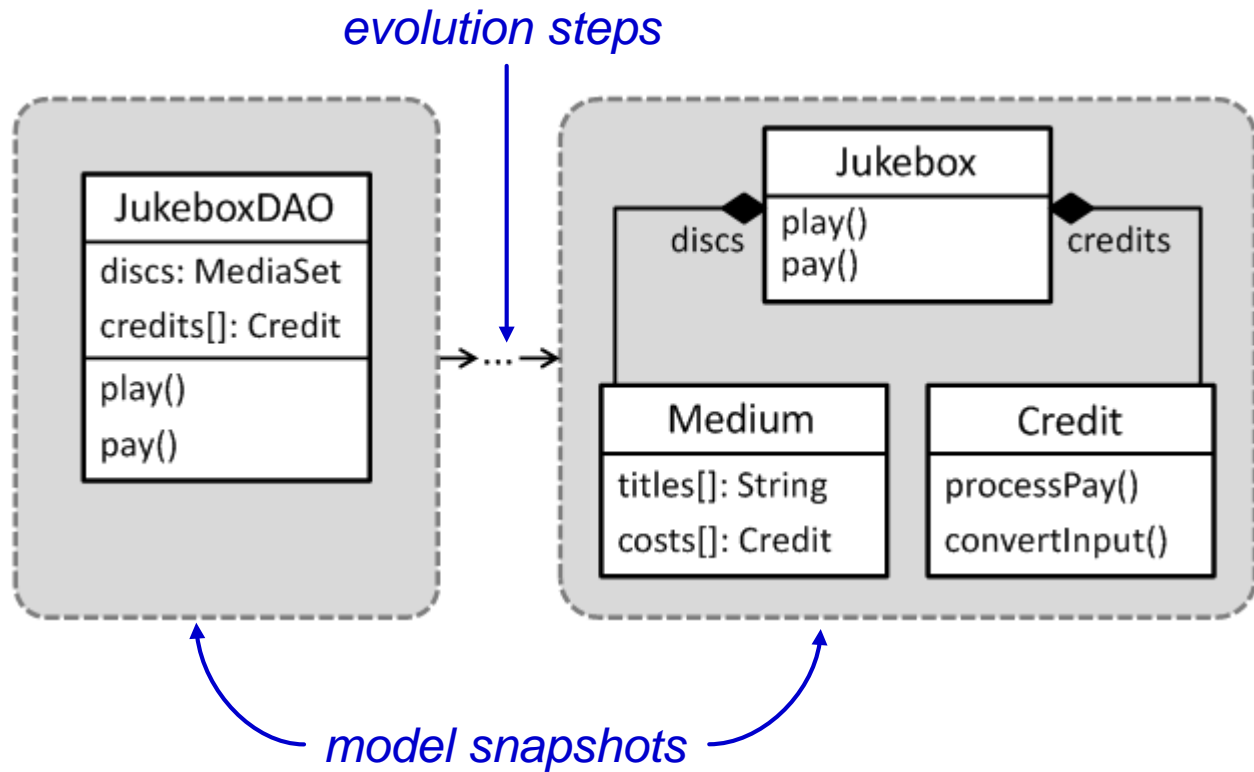
model snapshots

- Model Evolution = sequence of model snapshots

Model Evolution Stages

- Hypothesis: „Model evolution can be partitioned in stages"

- Performed small field study

    - Task

        - Create a model
   - Describe how you created the model

Model Evolution Stages – Results

fixed bug

model snapshot

- Some sequences of model evolution steps belong together
  - Rough Idea
    - First, create a sketchy model
    - Then, make it better
    - Finally, make it productive
- Each partition influences reusability of models

Staged Model Evolution

- Simplification
  - Keep the identified three stages
  - Reusability is rooted on traffic lights
    - Red = not recommended to reuse
    - Yellow = reuse with caution
    - Green = free for reuse
  - Side effect: cognitive load is small
- Resulting stages with respect to reusability
  - Vague – red
 - Decent – yellow
  - Fine – green
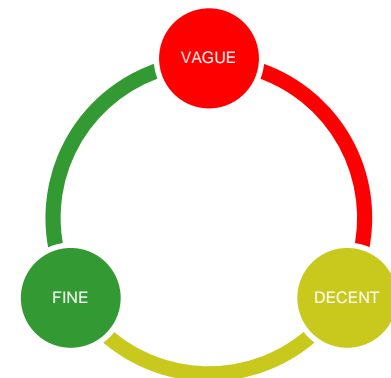
Staged Model Evolution

- Vague stage – red
  - Initial stage of the model after added to a model library
  - Needs further processing
  - Modelers should be cautious, when reusing because of
    - … technical oriented naming („DAO" suffix)
    - … technology dependent elements
    - … adapters for legacy use
    - … errors
- Models in vague stage are thought to be reusable but need further improvements

VAGUE

FINE
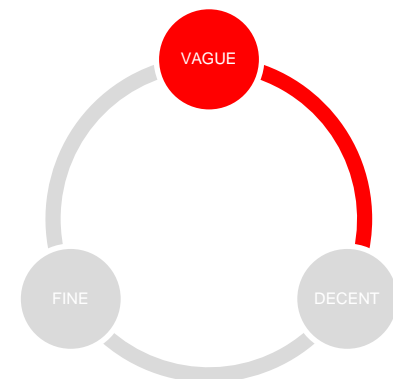
DECENT

Staged Model Evolution

- Decent stage – yellow
  - All major issues of the vague stage are fixed
  - However, it might be that …
    - the overall purpose of the model has changed
    - design decisions require improvements
    - Layout might not be pleasing
    - Qualitative statements rely on assessments rather than experience
- Models in the decent stage, are mostly separated from their original context
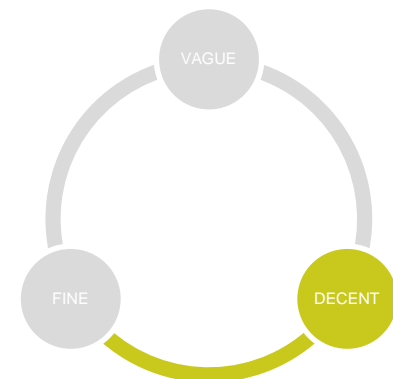
Staged Model Evolution

- Fine stage – green
  - Model focuses on one aspect (is in line with purpose)
  - Quality is most reasonable
  - However, model is not reusable „out-of-the-box"
    - Template mechanisms (modeler needs to fill the holes)
    - Adaptions
- Models in fine stage can be recommended to other modelers
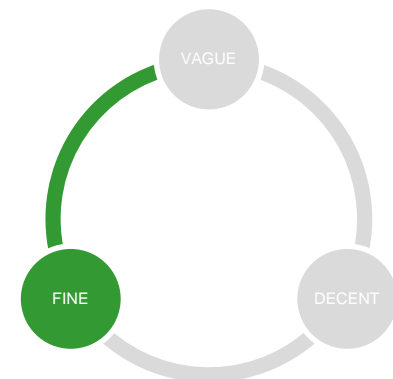
2. Provide model quality characteristics

- Providing a structure for model evolution is not sufficient
- How to separate one stage from another? – Quality?!
- Challenges with model quality
  - Very subjective
  - Not really measurable

- Benefits of model libraries
  - Only generic qualities are of interest
  - Simplified model is sufficient
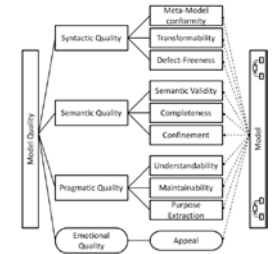
Quality Model and Quality Gates

- Quality Model
  - Four dimensions
    - Syntactic quality
    - Semantic quality
    - Pragmatic quality
    - Emotional quality
  - Each quality dimension contains quality characteristics
 - How to measure: model metrics, model smells, model reviews

- Quality Gates
  - Separate each stage in the staged model evolution
  - Defined by a set of model quality characteristics

3. Prototype implementation

- Eclipse plugin prototype
  - Shows staged model evolution
  - Uses *proactive approach*
  - Uses color encoding

EXTRA

- Evaluation
  - Most participants understood and accepted the staged evolution model
  - Some identified the fine stage as the initial stage
    - „My model is reusable!"
  - Some were missing automated traversing
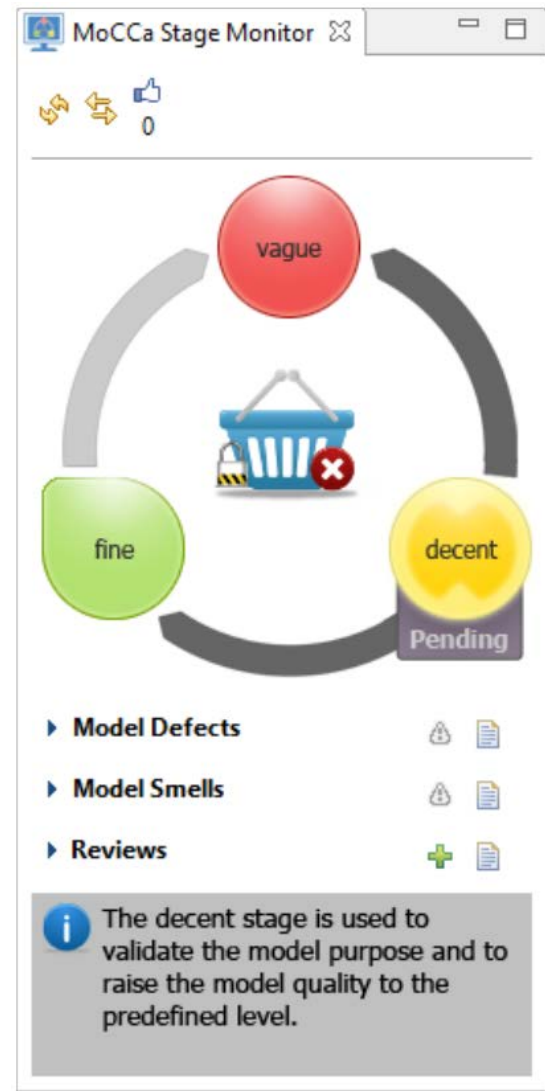
What to take home?

- Described staged model evolution in model libraries via stages
    - Enable model recommendation
- Lightweight quality model with measurable characteristics
    - Simplified reviews with views
- Define quality gates to guide users through staged model evolution
    - Mapping of quality model
    - Proactive quality guidance

Bibliography

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