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Modelling Method Conceptualization within OMiLAB: The 4EM Case

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OMiLAB, ADOxx, 4EM, PoEM'2017

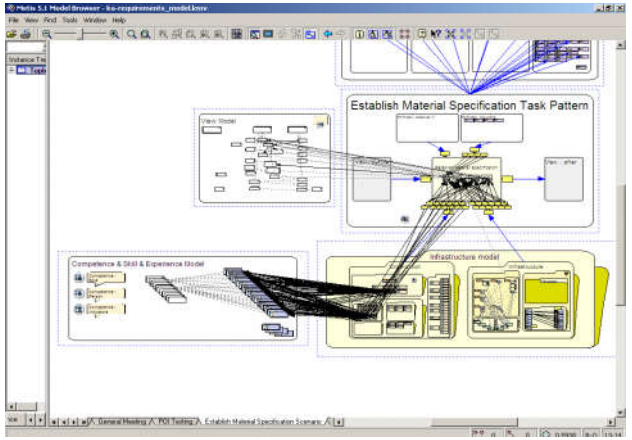
Outline

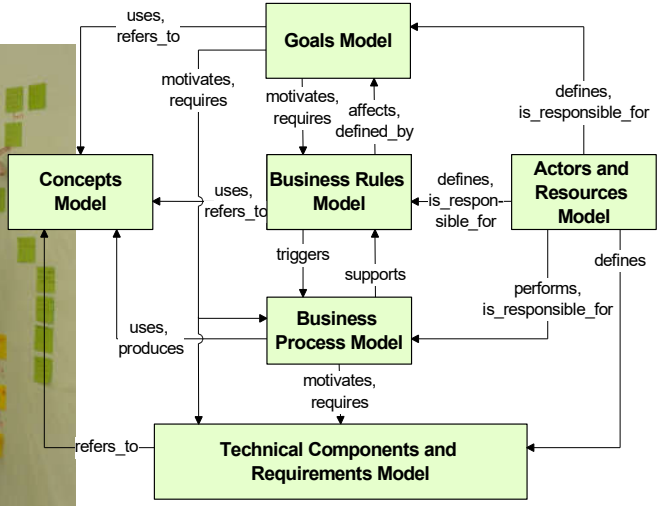
- Introduction 4EM
- Conceptualization of the 4EM tool on ADOxx
- 4EM Goal Modeling and Theory
- Case Study: Goal Modeling with ADOxx
  - Introduction of the Book case
  - Hands on goals modeling with ADOxx
- Summary and discussion

INTRODUCTION TO 4EM

Enterprise Modelling (EM)

- EM is a **method** for developing, acquiring, and communicating enterprise knowledge and user requirements by a structured, iterative, and modelling approach.
- The approach is guided by a number of **conceptual sub-models**, each focusing on a particular aspect of the application.
- The EM process **involves a group of stakeholders** and a modelling facilitator
- EM application in practice is usually supported by computerized tools – **EM tools**





4EM

- 4EM in general
  - is a framework for EM, which was designed for ill-structured ("wicked") problem situations, typically occurring in organisational planning and/or design.
  - focuses on "systems" of human as well as technological components

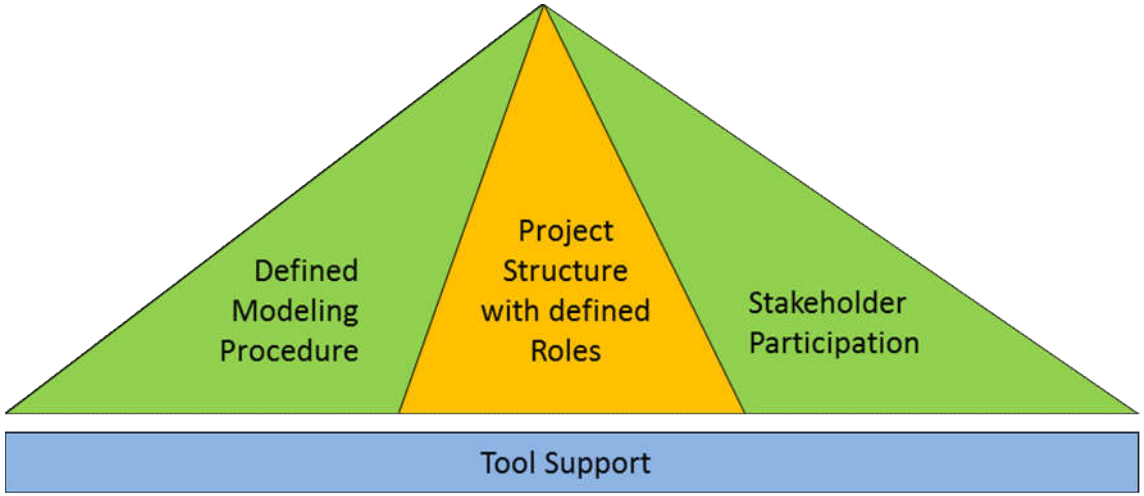
- 4EM is the successor of the "Enterprise Knowledge Development" method EKD
  - EKD originates from the EU-financed projects F3, ELEKTRA, HyperKnowledge
  - Other contributing projects: MAPPER, InfoFlow, CaaS

- 4EM is used for teaching purposes at several universities

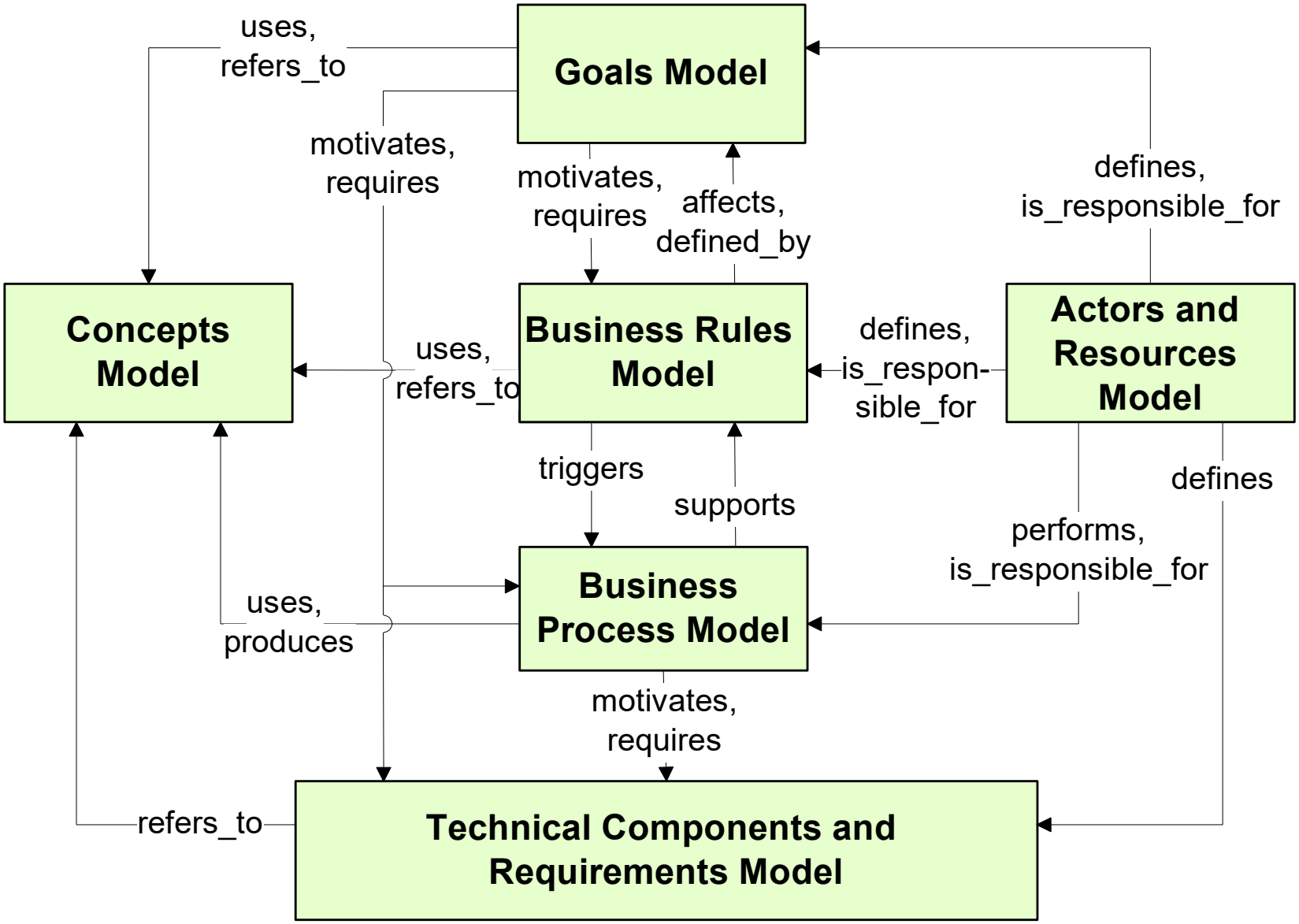
4EM modelling

4EM consists of three core elements:

- A defined procedure to modeling using a fixed notation (defined procedure and notation)
- Performance of enterprise modeling in the form of a project with predetermined roles (project organization and roles)
- A participatory process to involve enterprise stakeholders and domain experts (stakeholder participation)



Product models of the 4EM framework



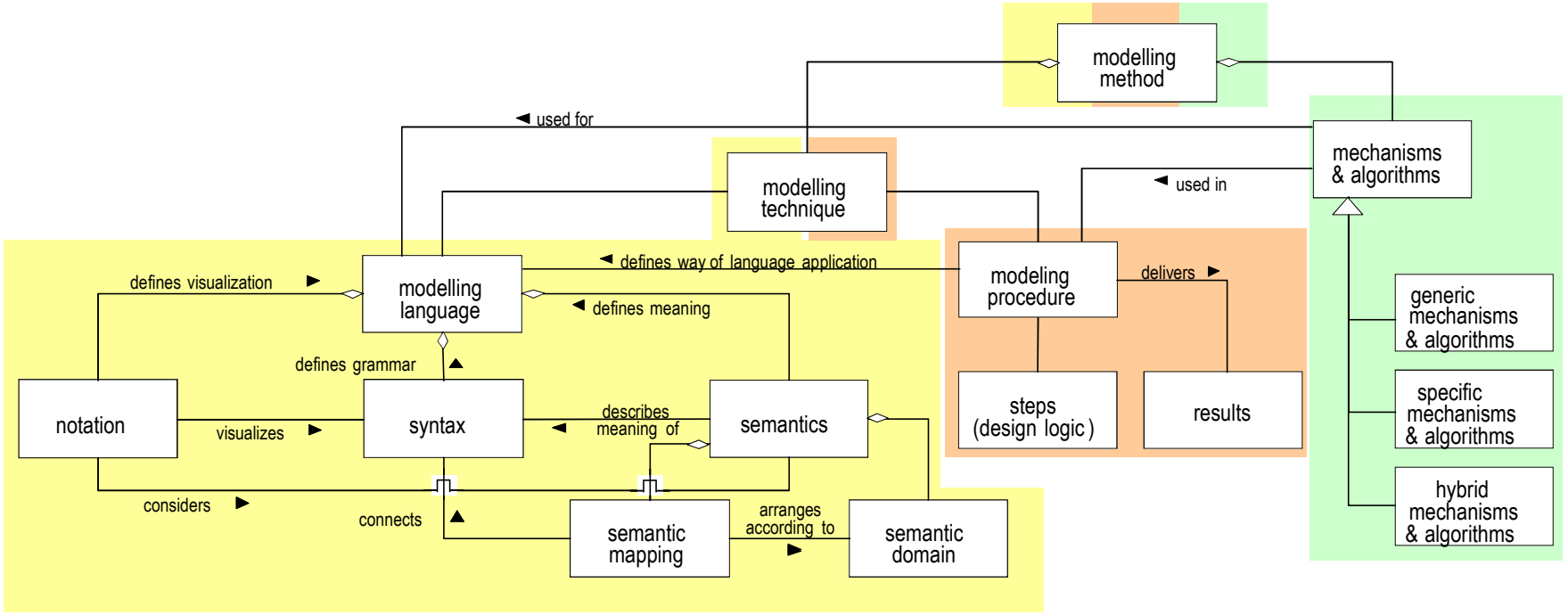
Efforts on tool support for 4EM

- MetaEdit+ (90s)
- Flowcharter (90s and early 00s)
- Metis (early 00s)
- Visio (00s and onwards)
- Experiments with DIA
- Partial support developed in the CaaS project (2013-2016)

- **Current development – ADOxx**

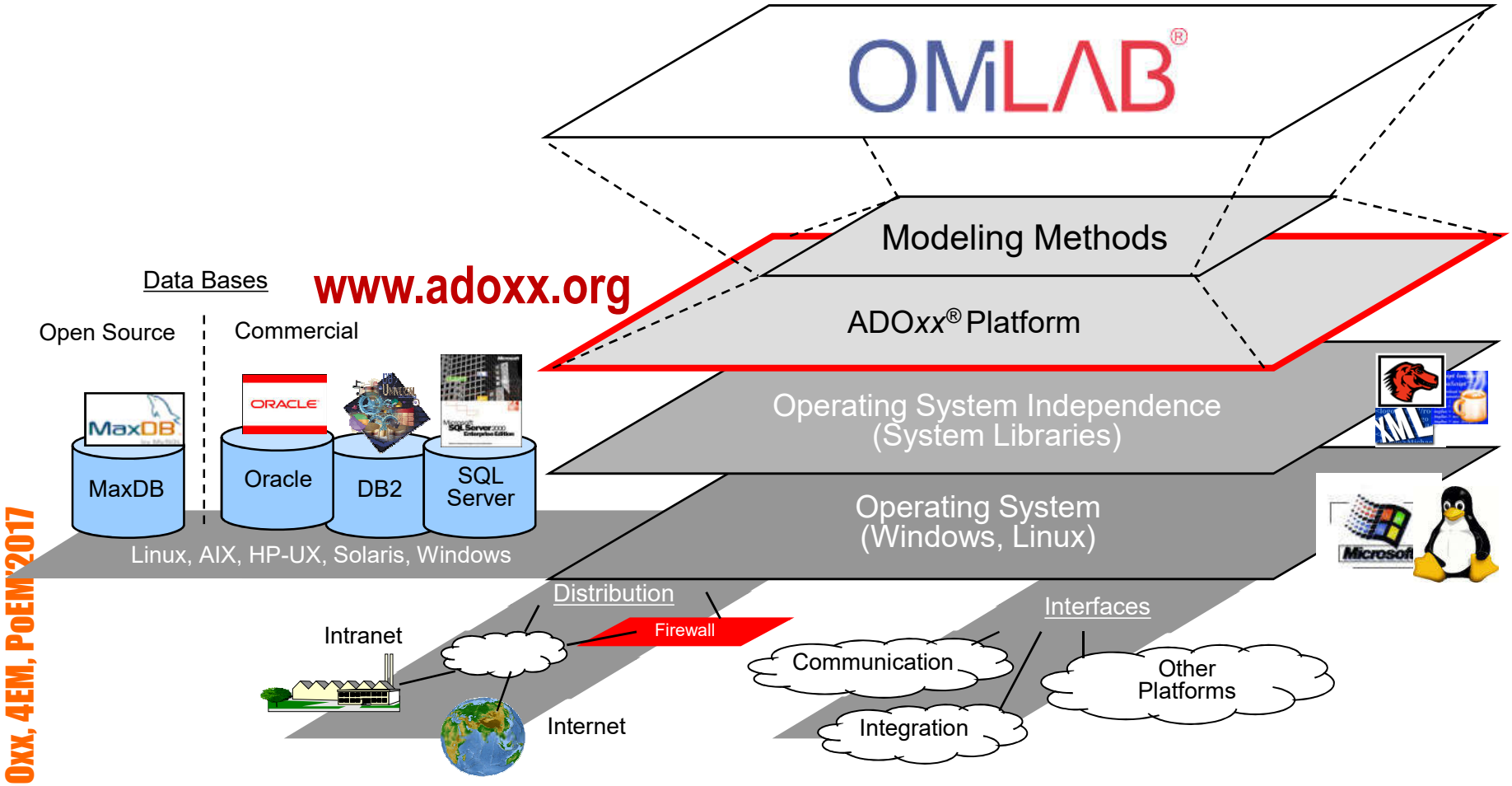
CONCEPTUALIZATION OF THE 4EM TOOL ON ADOxx

GENERIC MODELLING METHOD FRAMEWORK

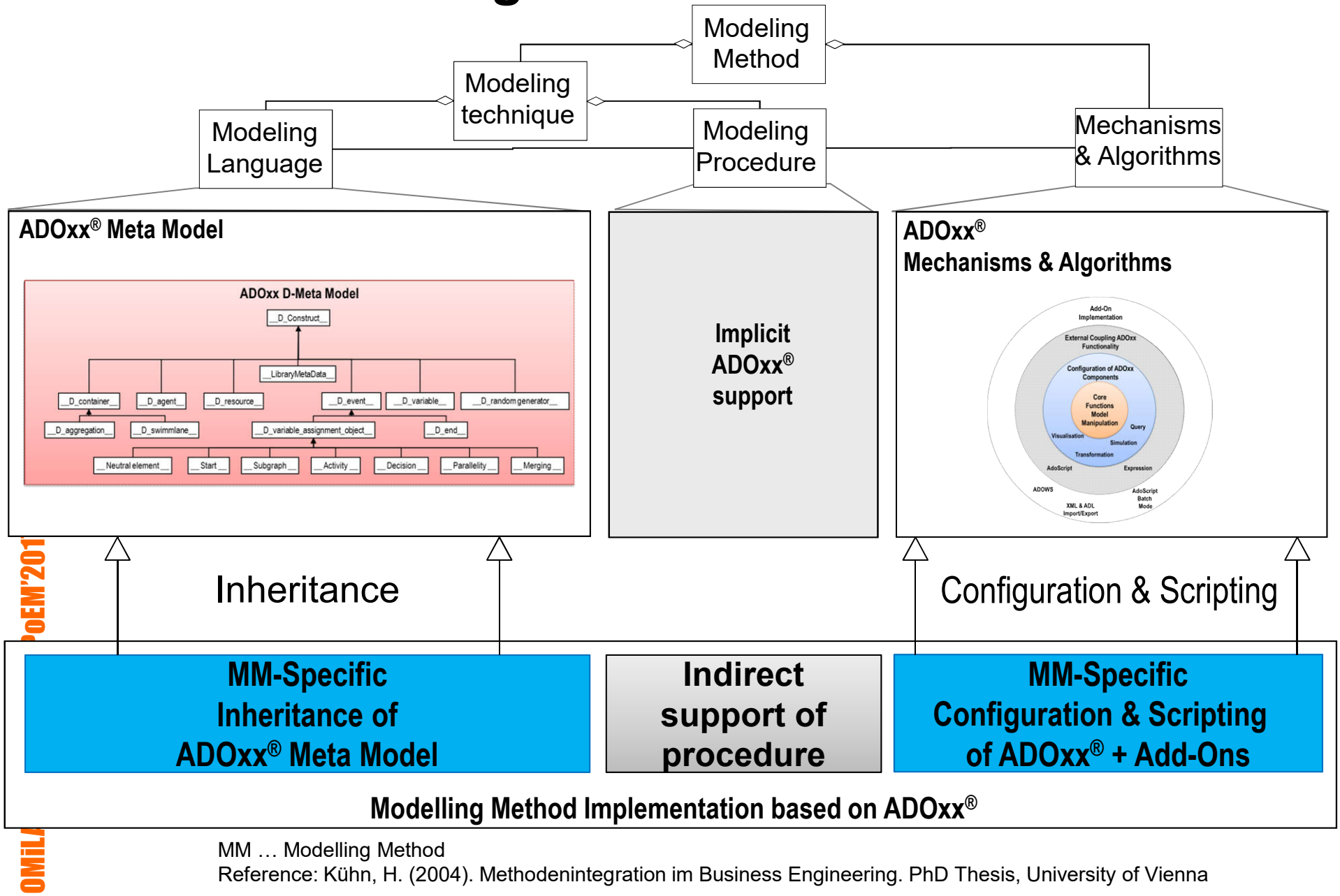


Reference: Karagiannis, D., Kühn, H.: „Metamodelling Platforms“. In Bauknecht, K., Min Tjoa, A., Quirchmayer, G. (Eds.): Proceedings of the Third International Conference EC-Web 2002 – Dexa 2002, Aix-en-Provence, France, September 2002, LNCS 2455, Springer, Berlin/Heidelberg, p. 182 ff.

OMiLAB: Core Development Environment



Metamodelling in ADOxx



MM … Modelling Method

Reference: Kühn, H. (2004). Methodenintegration im Business Engineering. PhD Thesis, University of Vienna

GOAL: DEVELOPMENT OF MODELLING TOOLKITS

Menubar

Actionbar

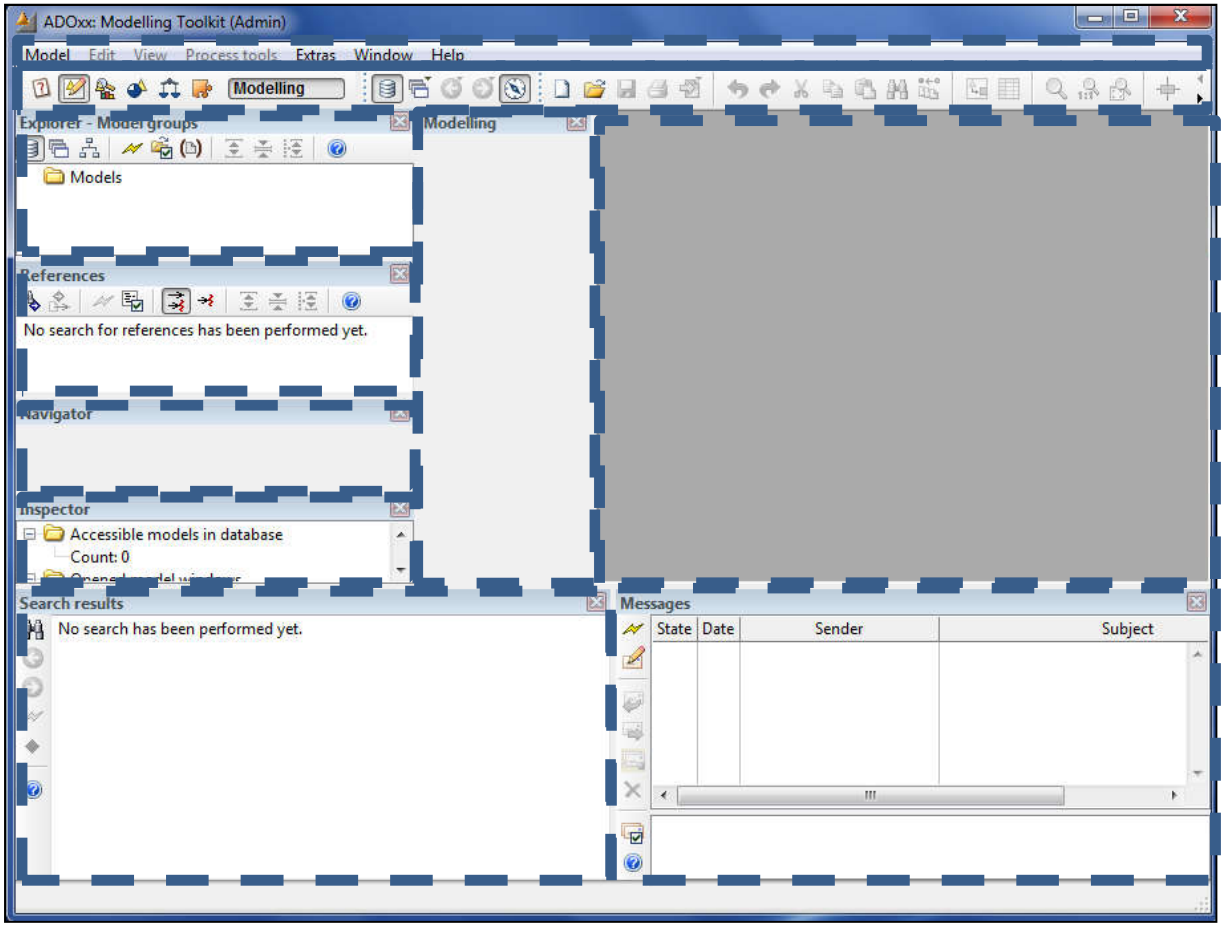
Explorer

References

Navigator

Inspector

Search Results

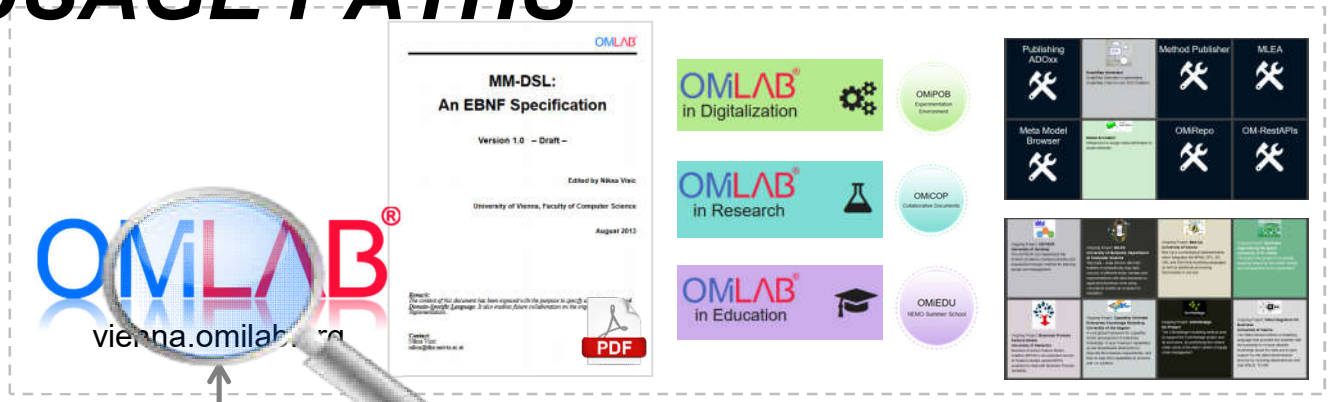


Modelling Bar

Drawing Area

Messages

ADOxx USAGE PATHS



OMiLAB®
korea.omilab.org

OMiLAB®
vienna.omilab.org

Proof of Concept
Modelling Tool Conceptualization

DSM
Domain-Specific Modelling

Open-Use
Development Environment

ADOxx
Meta Modelling Platform

ADOxx.org

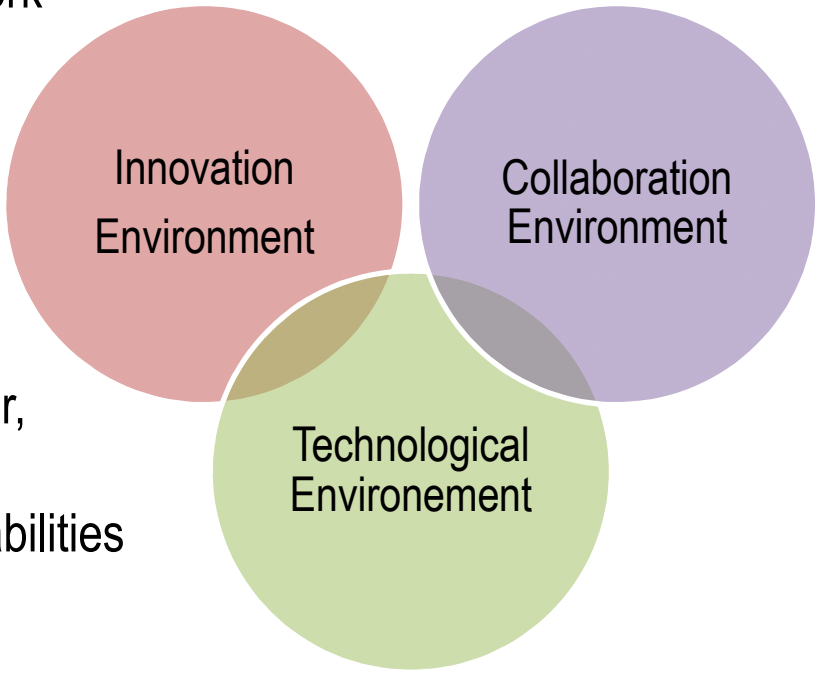
ADOxx Community Edition

OMiLAB, ADOxx, 4EM, PoCEM'2017

OMiLAB ENVIRONMENT

Innovation Environment consists of

- Agile Modelling Method Engineering Framework
- Conceptualisation Lifecycle
- Tools and support Services
- Trainings



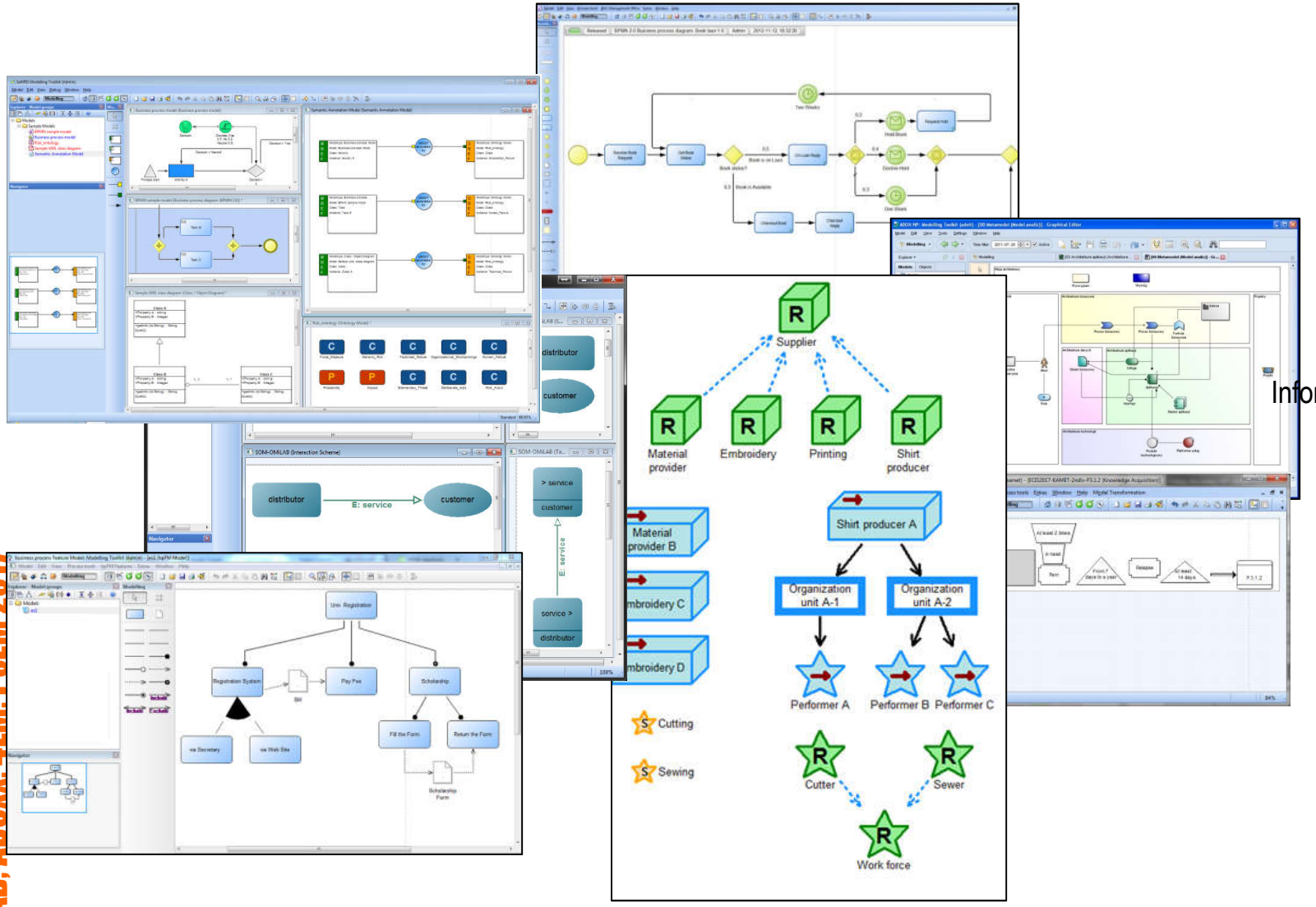
Technological Environment supports

- Platforms, i.e. ADOxx, ConceptBase, olive
- Tools (open source): e.g. GraphRep Generator, Model Annotator, MLEA-Assistant etc.
- Services, i.e. packaging and deployment capabilities

Collaboration Environment provides

- Web-platform for virtual interaction
- Nodes with physical and virtual infrastructure
- Community events like **conferences**, workshops, **summer schools**
- **Publications** like books, conference and journal papers
- Exploitation of results and project networking activities
- Communication and public relations (newsletters, media and OM-TV)

SUCCESSFUL MODELLING TOOL IMPLEMENTATIONS



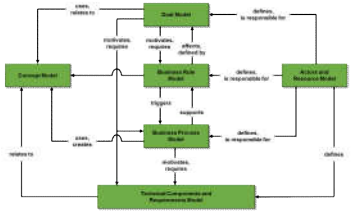
ADOxx Horus Method
BEE-UP
BEN
BIM
BWW
CIDOC
ComVantage
COPROM
DIBA
EC
eduWeaver
eGPM
EKD
IMP2.0
Information Security
iStar
iStarSuperSet
JCS
MeLCa
MoLAP
MoSeS4eGov
OKM
OMiStarT
PetriNets
pmSOA
PROMOTE
SDbD
Secure Tropos
SemFIS
SOM
VLML

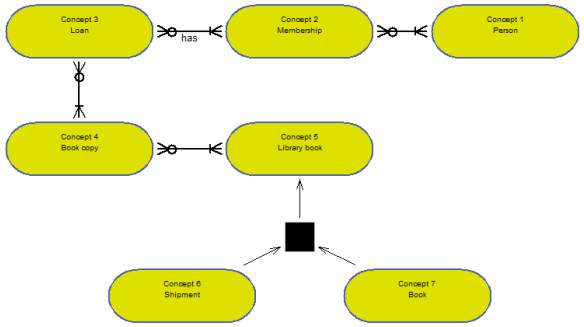
http://www.omilab.org/psm/content/ep/globalnetworkservice?view=tilestools

OMiLAB, ADOxx, 4EM, PoEM'2017

General Representation Structure of the 4EM Tool

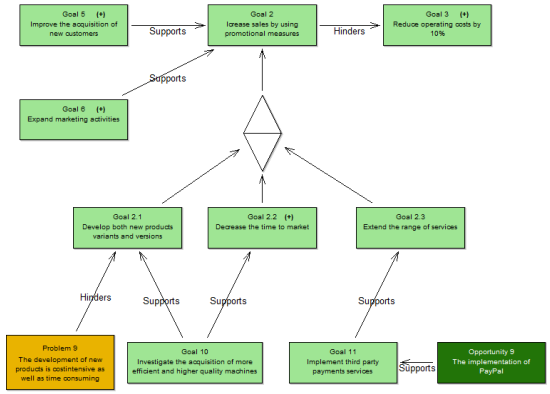
1. Individual 4EM Sub-Models (1/2)





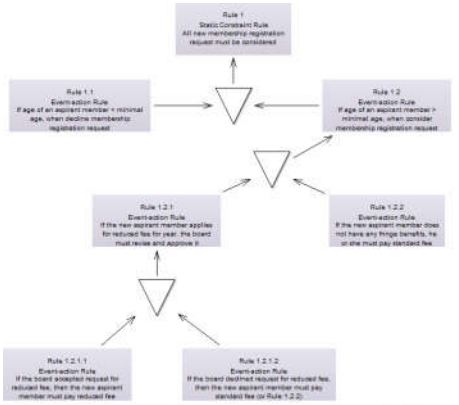
Concept Model

- _D-construct_ (Metamodel)
  - _4EM_Concept_Model_
    - _Concept_Model_Component_
      - Concept
      - Attribute
    - _4EM_Concept_Model_Gateways_
      - PARTIAL-ISA
      - TOTAL-ISA
      - PARTIAL-PartOF
      - TOTAL-PartOF
  - Relation classes
    - CM Binary Relation
    - CM Generic Relation



Goal Model

- _D-construct_ (Metamodel)
  - _4EM_Goal_Model_
    - _Objective_
      - Goal
      - Problem/Threat/Weakness
      - Cause
      - Constraint
      - Opportunity
    - _4EM_Goal_Model_Gateways_
      - GM AND
      - GM OR
      - GM OR AND
  - Relation classes
    - GM Supports
    - GM Hinders
    - GM Conflicts
    - GM Generic Relation

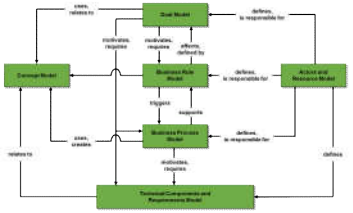


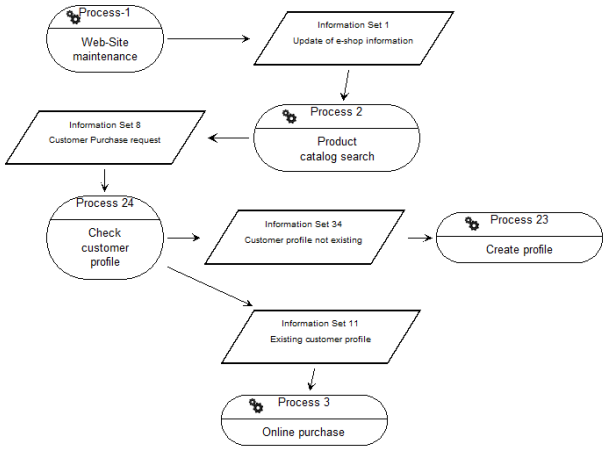
Business Rule Model

- _D-construct_ (Metamodel)
  - _4EM_Business_Rule_Model_
    - _Rule_Component_
      - Rule
    - _4EM_Business_Rule_Model_Gateways_
      - BRM AND
      - BRM OR
      - BRM OR AND
- Relation classes
  - BRM Supports
  - BRM Hinders
  - BRM Generic Relation

OMiLAB, ADOxx, 4EM, PoEM'2017

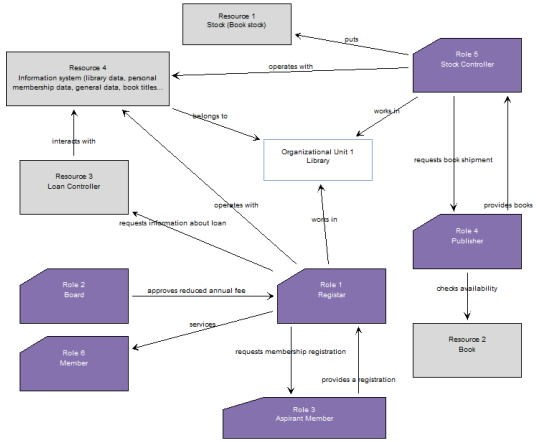
General Representation Structure of the 4EM Tool
1. Individual 4EM Sub-Models (2/2)





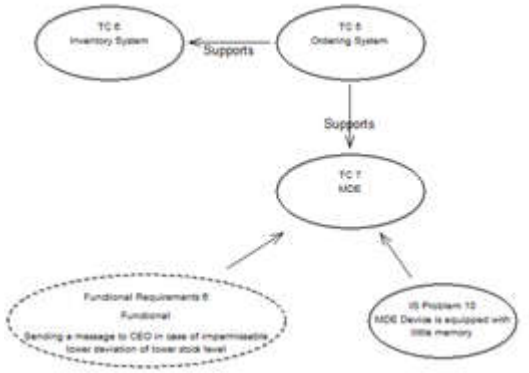
Business Process Model

- _D-construct_ (Metamodel)
  - _4EM_Business_Process_Model_
    - _BPM_Components_
      - Process
      - External Process
      - Information Set
    - _4EM_Business_Process_Model_Gateways_
      - Split (AND)
      - Join (AND)
      - Split (OR)
      - Join (OR)
  - Relation classes
    - BPM Relation



Actors & Ressources Model

- _D-construct_ (Metamodel)
  - _4EM_Actors_and_Resource_Model_
    - _Actors_and_Resources_Components_
      - Individual
      - Role
      - Resource
      - Organizational Unit
    - _4EM_Actors_and_Resources_Gateways_
      - ARM-PARTIAL-ISA
      - ARM-TOTAL-ISA
      - ARM-PARTIAL-PartOF
      - ARM-TOTAL-PartOF
  - Relation classes
    - ARM Generic Relation



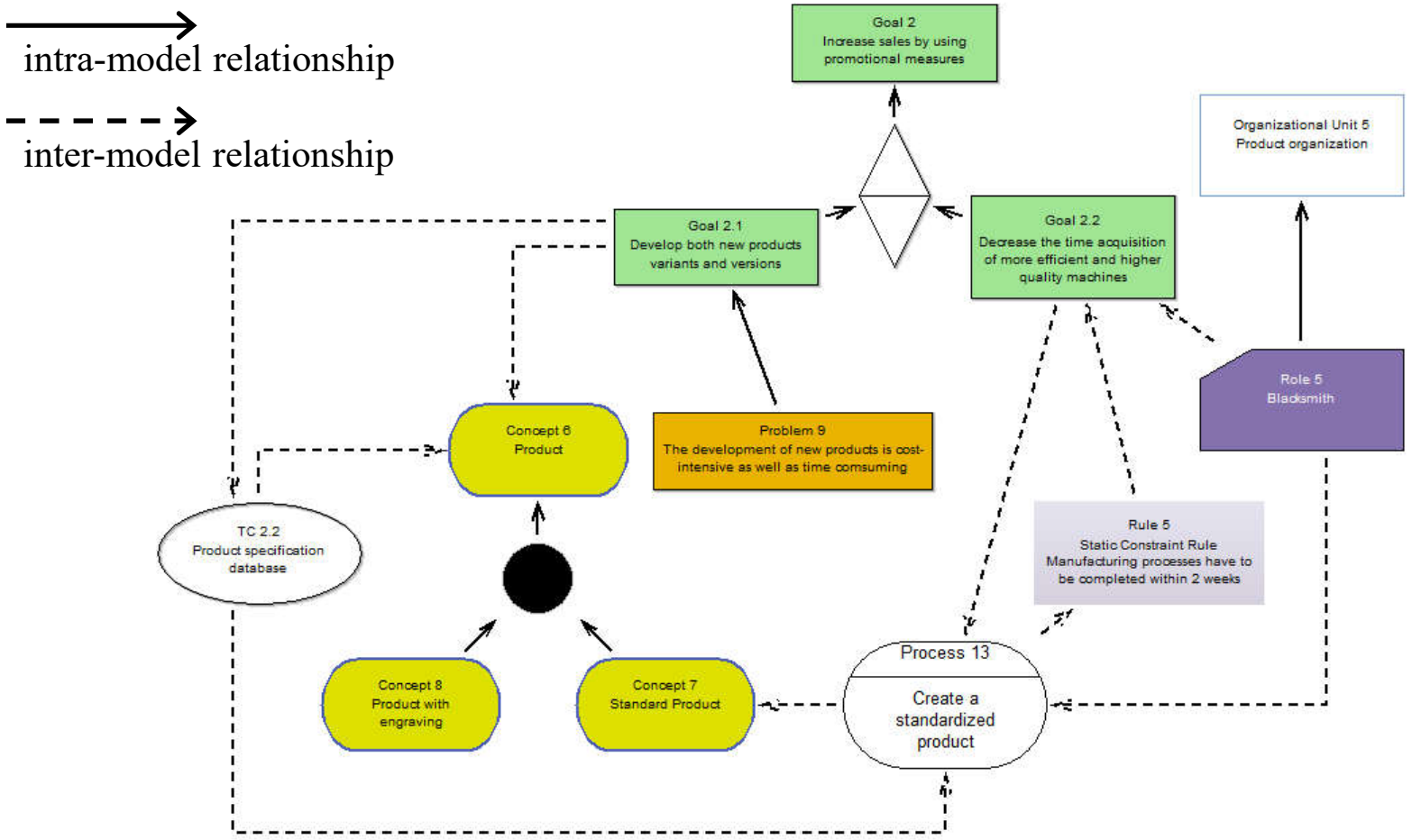
Techn. Comp. & Requirements Model

- _D-construct_ (Metamodel)
  - _4EM_Technical_Components_and_Requirements_Model_
    - _TC_and_REQ_Components_
      - IS Goal
      - IS Problem
      - IS Technical Component
      - IS Requirement
    - _TC_and_REQ_Model_Gateways_
      - TCRM AND
      - TCRM OR
      - TCRM OR AND
      - TCRM-PARTIAL-PartOF
  - Relation classes
    - TCRM Supports
    - TCRM Hinders
    - TCRM Has Goal
    - TCRM Has Requirement
    - TCRM Generic Relation

OMiLAB, ADOxx, 4EM, PoEM'2017

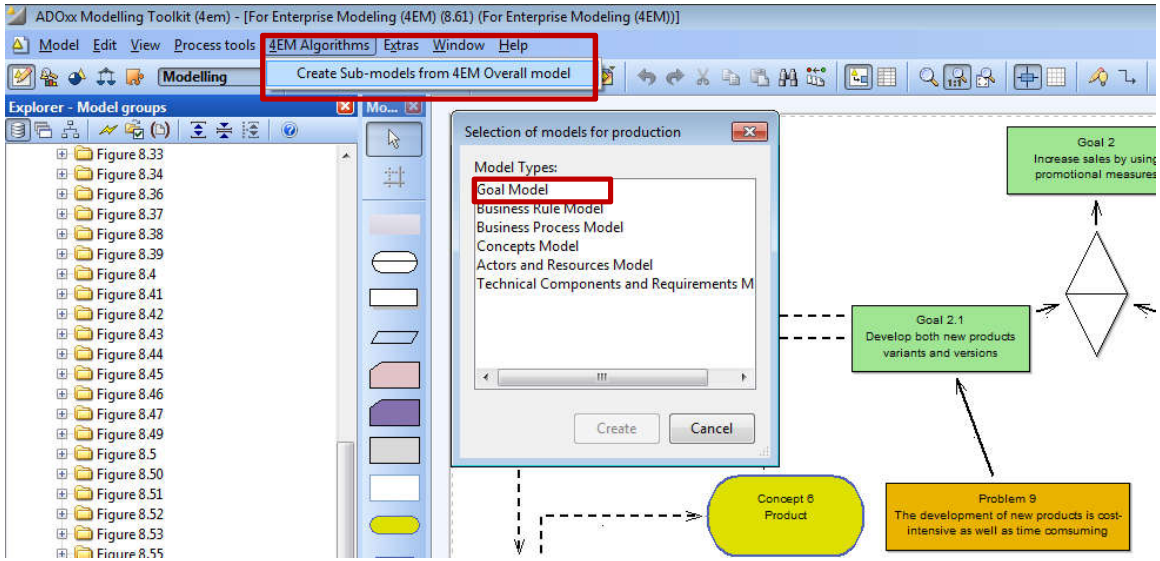
General Representation Structure of the 4EM Tool
2. Overarching 4EM Model

- A combination of all other sub-models
- Used to visually encode model-spanning relationships



4EM Modeling Procedure

- The 4EM ADOxx modelling tool features two ways of creating 4EM models
  - Construction of all single sub-models and then linking the concepts of different models via semantic links (ongoing implementation)
  - Construction of an overarching 4EM model and then automatically decomposing this model into its constituting sub-models via algorithms



4EM GOAL MODELING AND THEORY

Goals Model

Purpose:

- to describe what the enterprise and its employees want to achieve, or to avoid, and when
- to describe the goals of the enterprise along with the problems associated with achieving these goals
- to explain **why**, or why not, processes, rules and requirements exist or do not exist

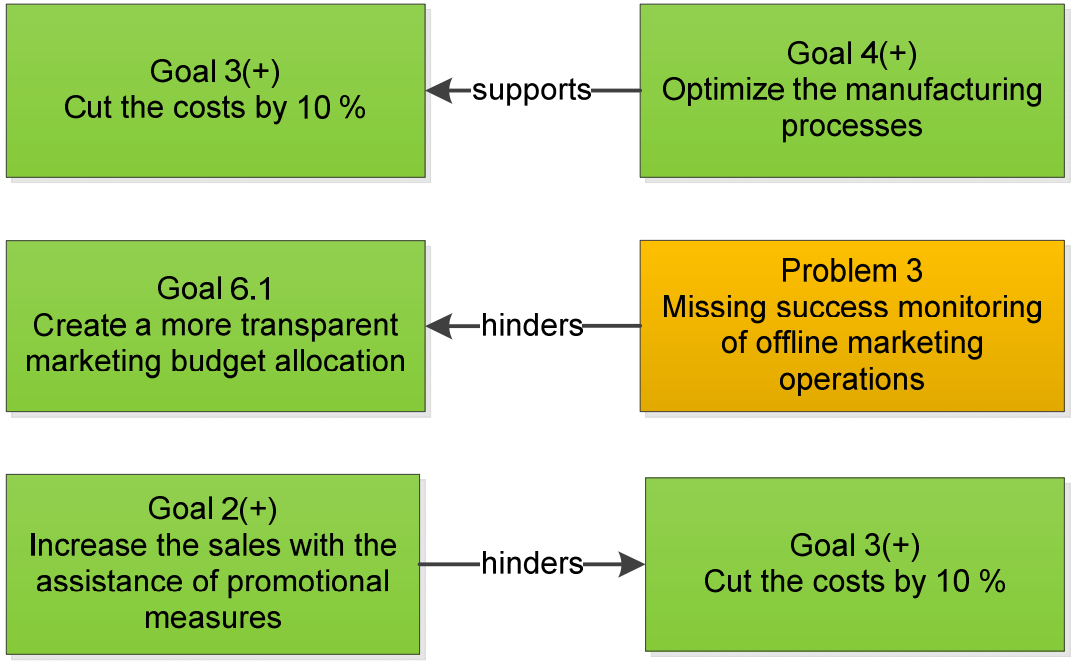
Goals Model

Components:

- **goal**, used for expressing goals regarding the business or state of business affairs the individual or organisation wishes to achieve. They may be expressed as a measurable set of states, or as general aims, visions or directions. Goals can be several meanings, such as, goals, needs, requirements, desired states, etc.
- **problem**, used for expressing that the environment is, or may become, in some non-desirable state, which hinders the achievement of goals. There may be two sub-types of problems: **threat** and **weakness**.
- **constraint**, used for expressing business restrictions, rules, laws, policies from outside world affecting components and links within the Enterprise Model.
- **opportunity**, used for expressing situations that we may want to take advantage of. If so, the Opportunity should be transformed into a Goal.

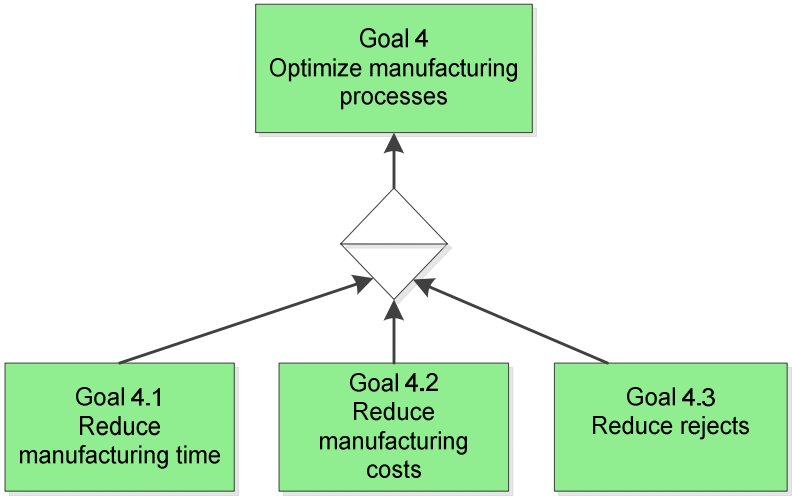
Relationships – supports, hinders, and conflicts

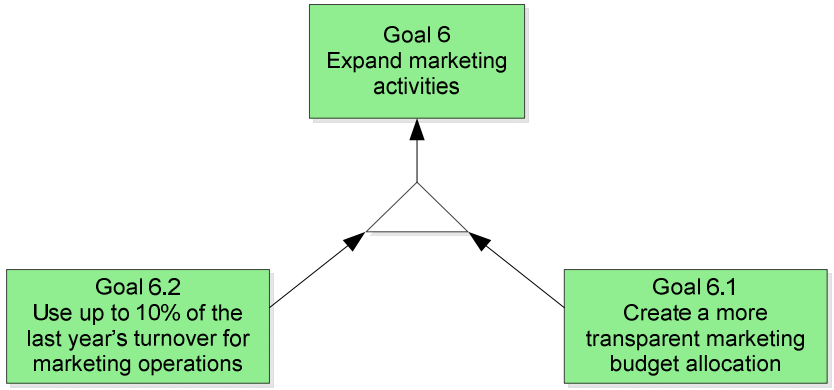
- **supports** relationship used to show that fulfilling one goal supports fulfilling another.
- **hinders** relationship used to show negative influences between components of the Goals Model, and can be considered as opposite to "supports".
- **conflicts** relationship used in a situation when an achievement of a goal is in conflict with another.

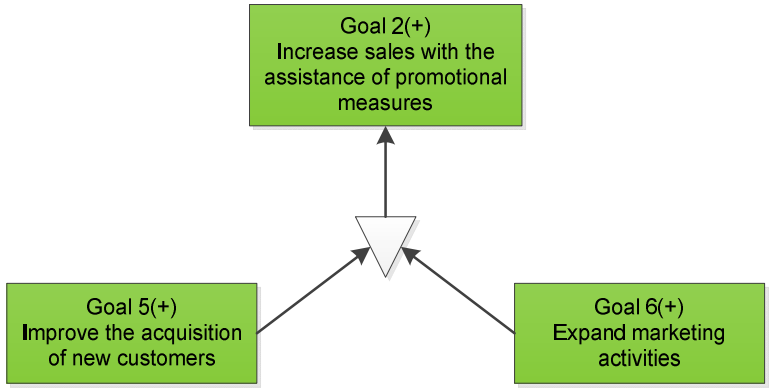


Goal decomposition – AND, OR, AND/OR

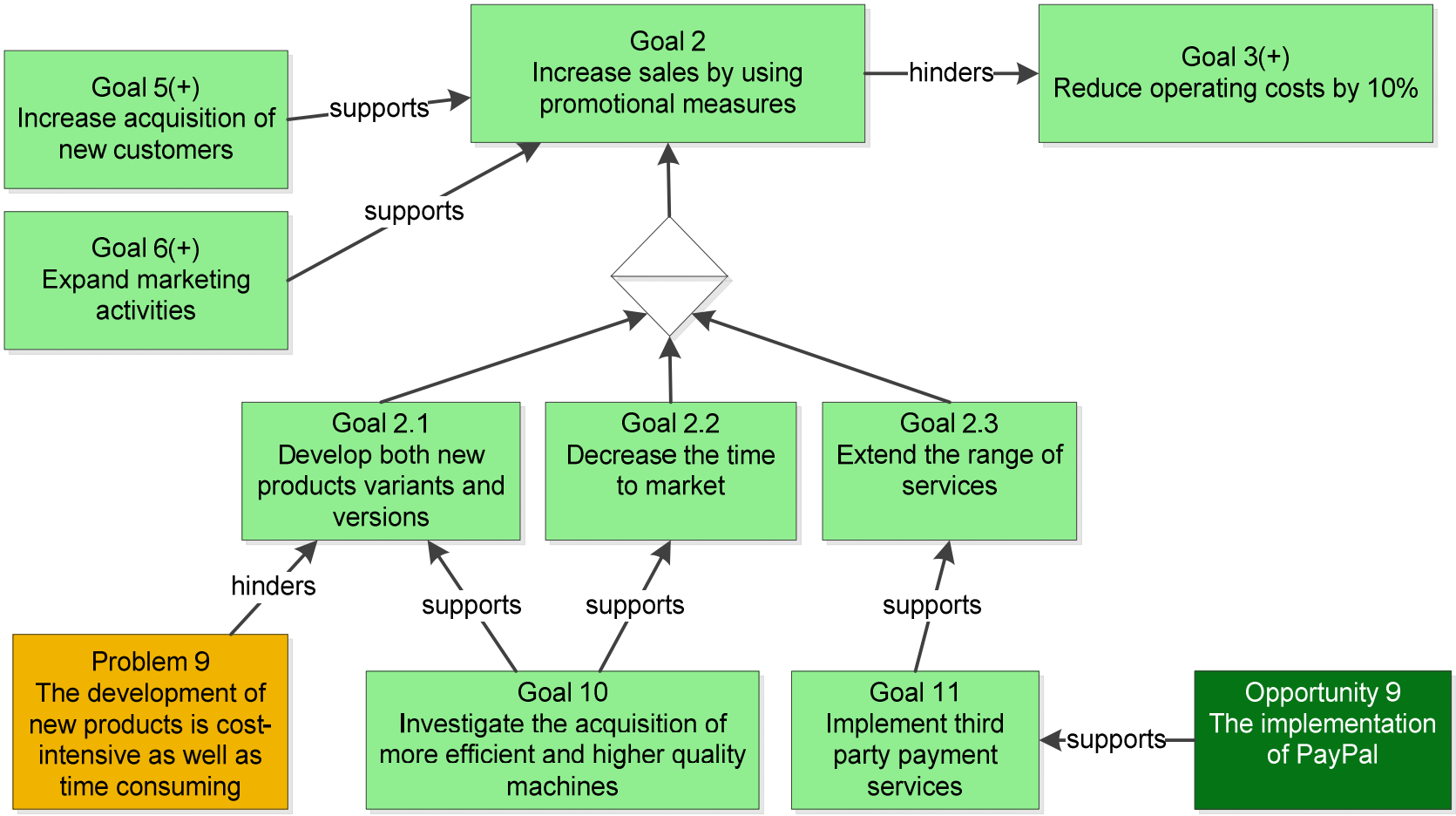
- *The AND*-decomposition relationship specifies a set of unique sub-goals that are necessary to satisfy a goal.
- *The OR*-decomposition relationship specifies a set of alternative sub-goals that support a goal. It is sufficient to satisfy only one goal from the set.
- The AND/OR decomposition specifies a set of alternative sub-goals – to support a goal. A combination of sub-goals from the set will satisfy a goal.





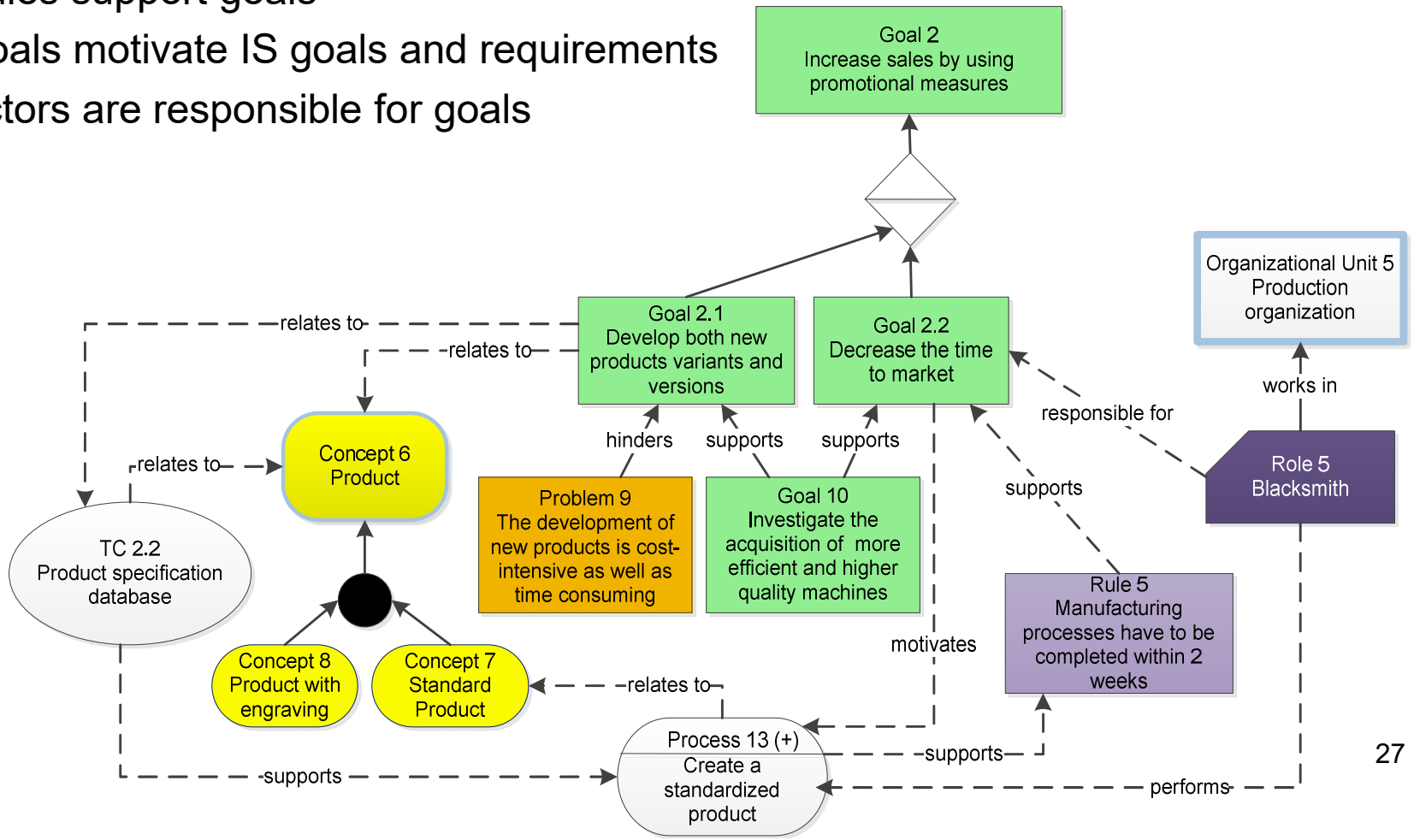


Example of a Goals Model



Most important inter-model relationships of goals

- Goals refer to concepts
- Goals motivate business processes
- Rules support goals
- Goals motivate IS goals and requirements
- Actors are responsible for goals

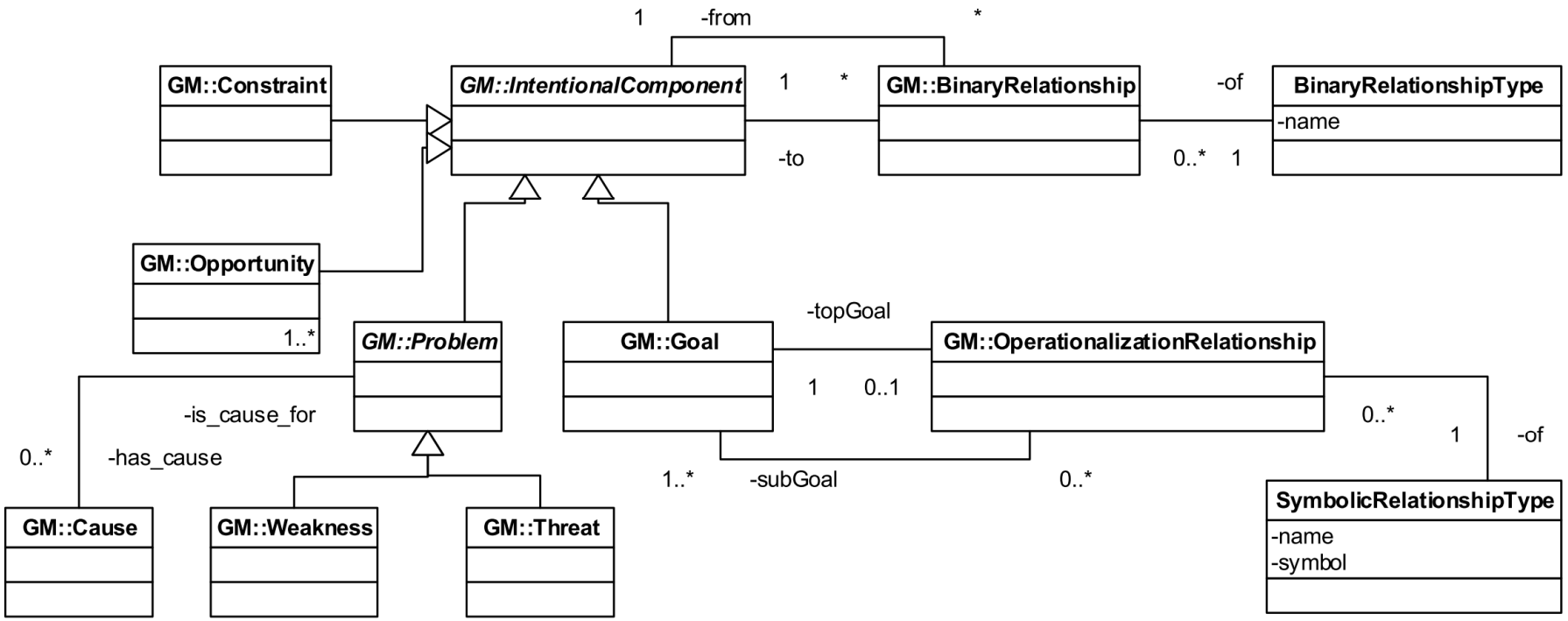


Driving questions of Goals Modeling

- *What are the strategies of this part of the enterprise?*
- *Are there stated policies in the enterprise that may influence this model?*
- *Which conventions, rules, regulations and laws are relevant?*
- *What would you like to achieve?*
- *Taking a particular goal, how can we make this goal more specific, more relevant to our project/company?*
- *Are there any particular problems hindering this?*
- *Is this problem related to a particular goal?*
- *What is the cause of this problem?*
- *How can this problem be eliminated?*
- *Are there any particular opportunities that one could use?*
- *What actions could be taken to improve the situation?*
- *How can this goal be achieved? Can this goal be defined in operational terms, by identifying a number of supporting sub-goals?*

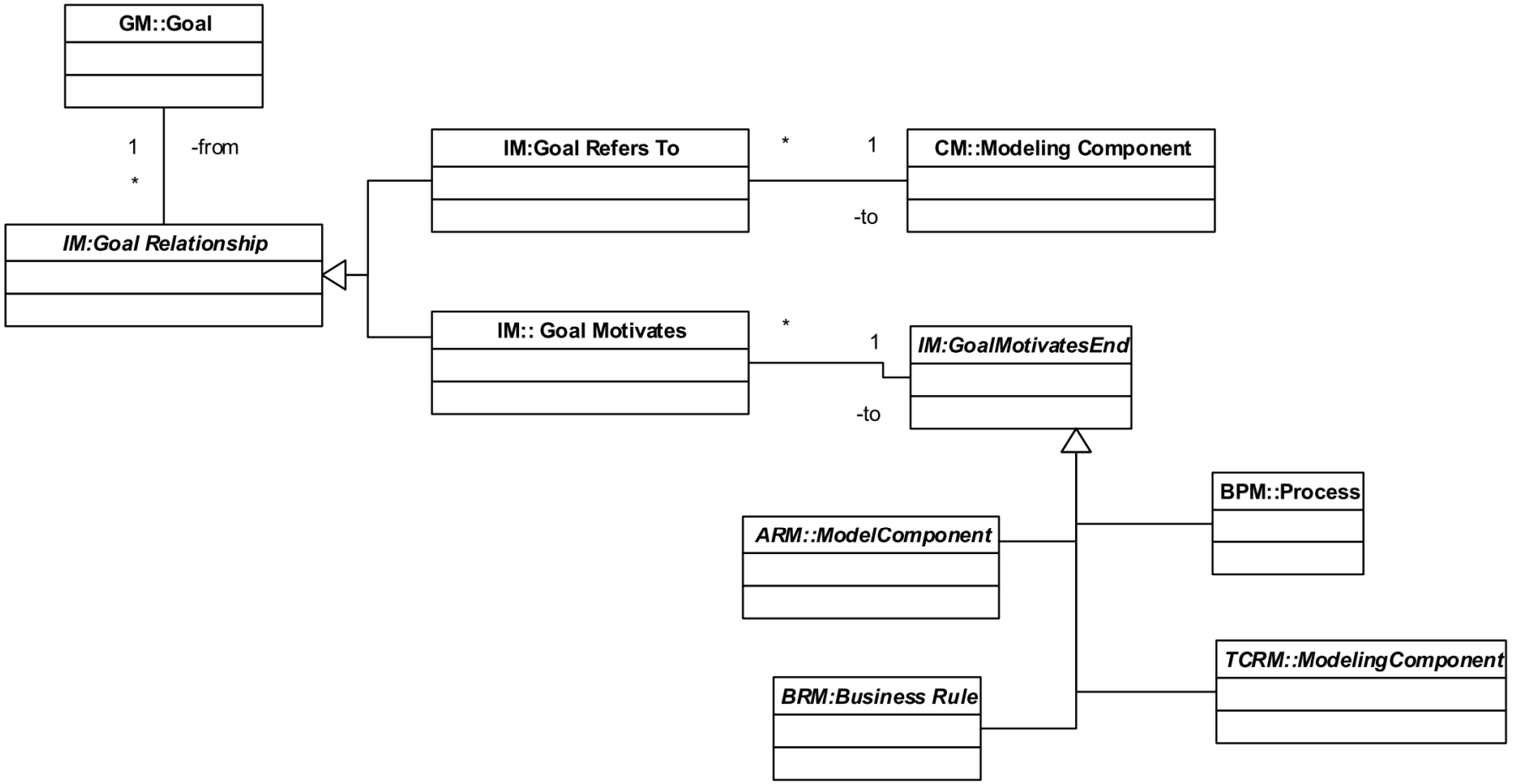
Meta-model of 4EM Goals Model

(Intra-Model)



Meta-model of 4EM Goals Model

(Inter-Model)

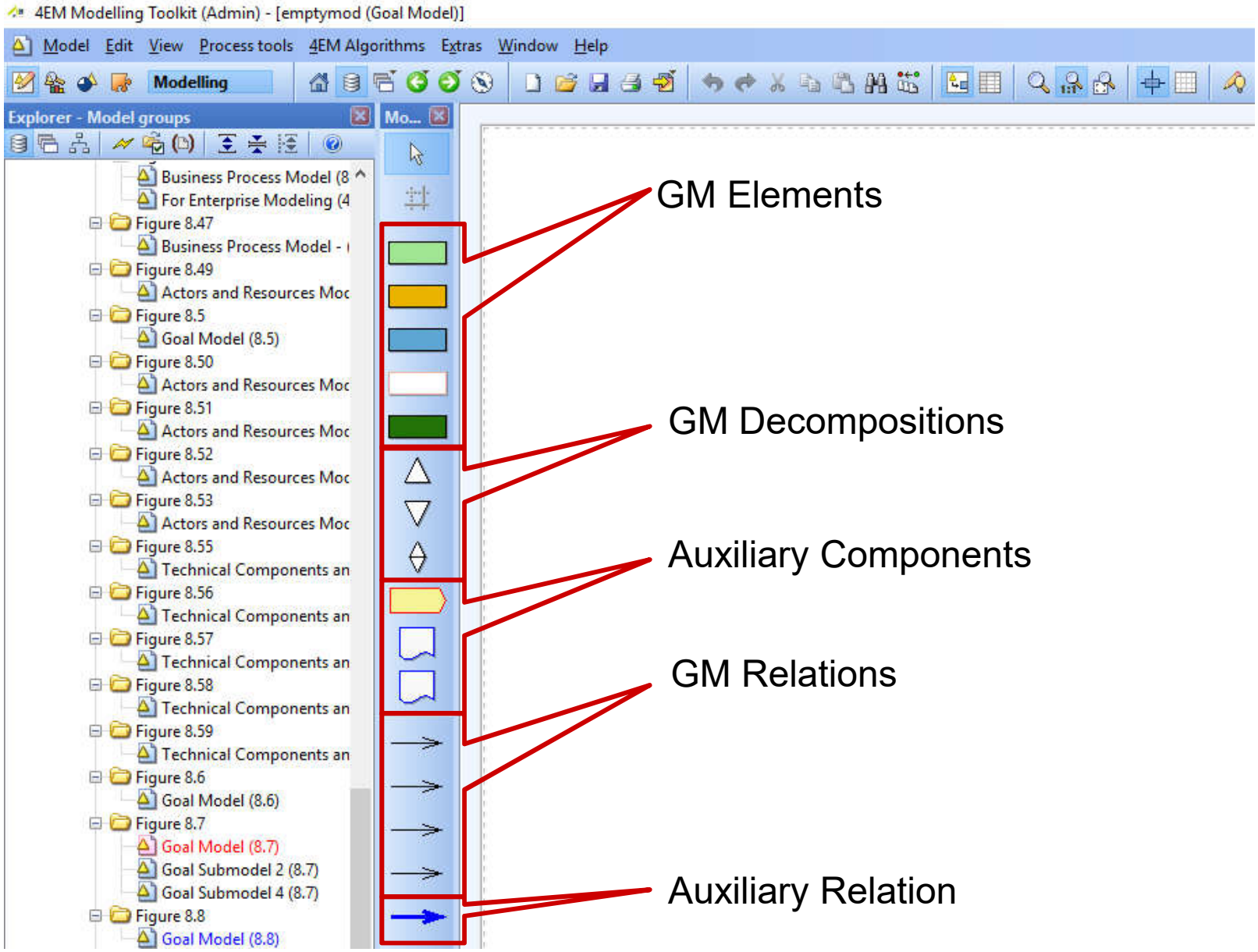


CASE STUDY: GOAL MODELING WITH ADOxx

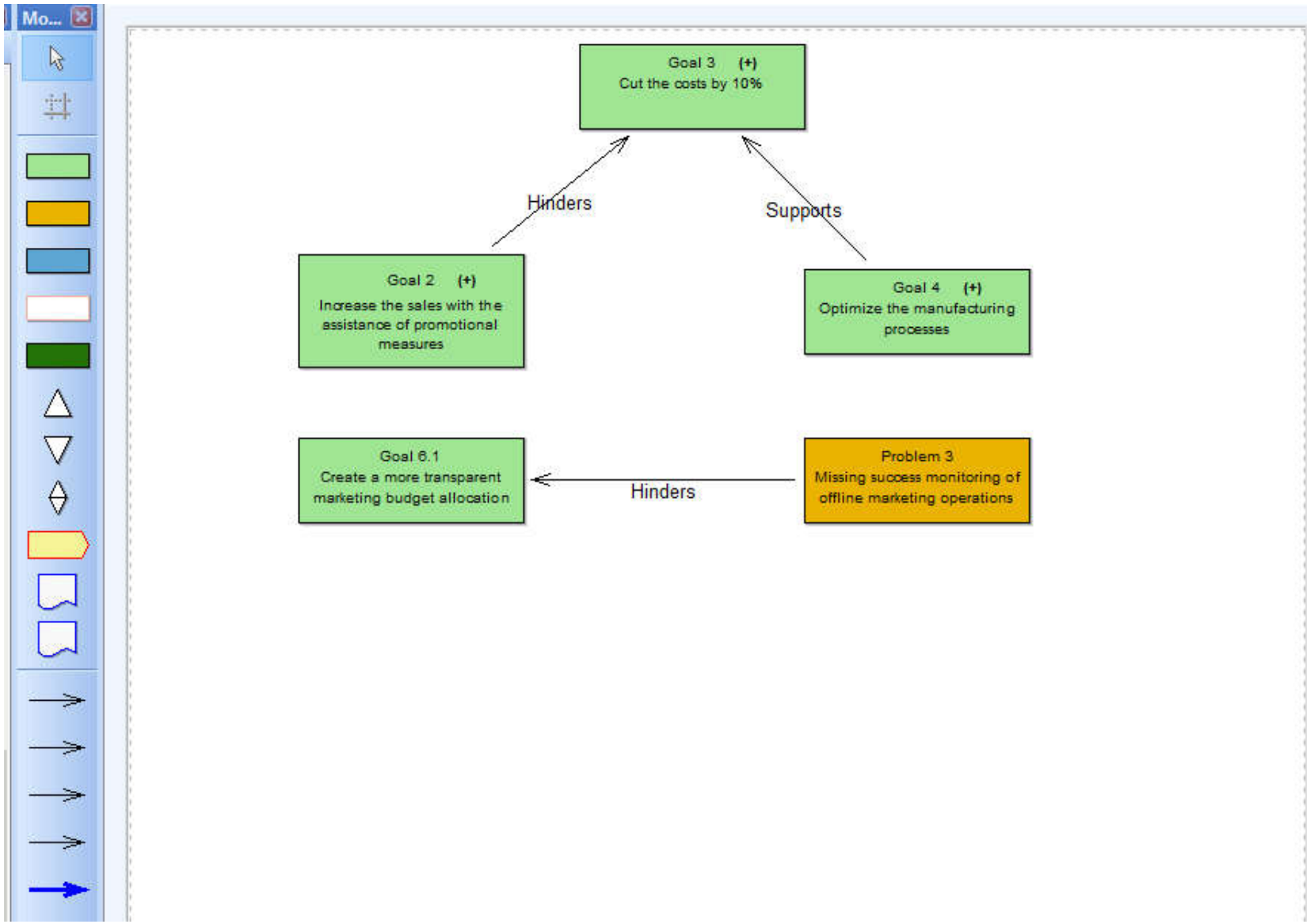
4EM-Modeling-Tool: Case Study A4Y

- E-Commerce Company specializing in sales of accessories and jewelry with individual engravings.
- Main turnover via E-Shop but also a conventional shop
- Manufacturing on site, additionally personal engravings
- Main Goals:
  - Goal 1: Increase Profits by 15%
  - Goal 2: Increase Sales
  - Goal 3: Reduce Operating Costs by 10%
- Several Problems:
  - Insufficient Monitoring Capabilities for Offline Marketing
  - Missing Resources for Product Innovation
  - …
- Possible Constraints:
  - Minimum wages
  - Work time regulations

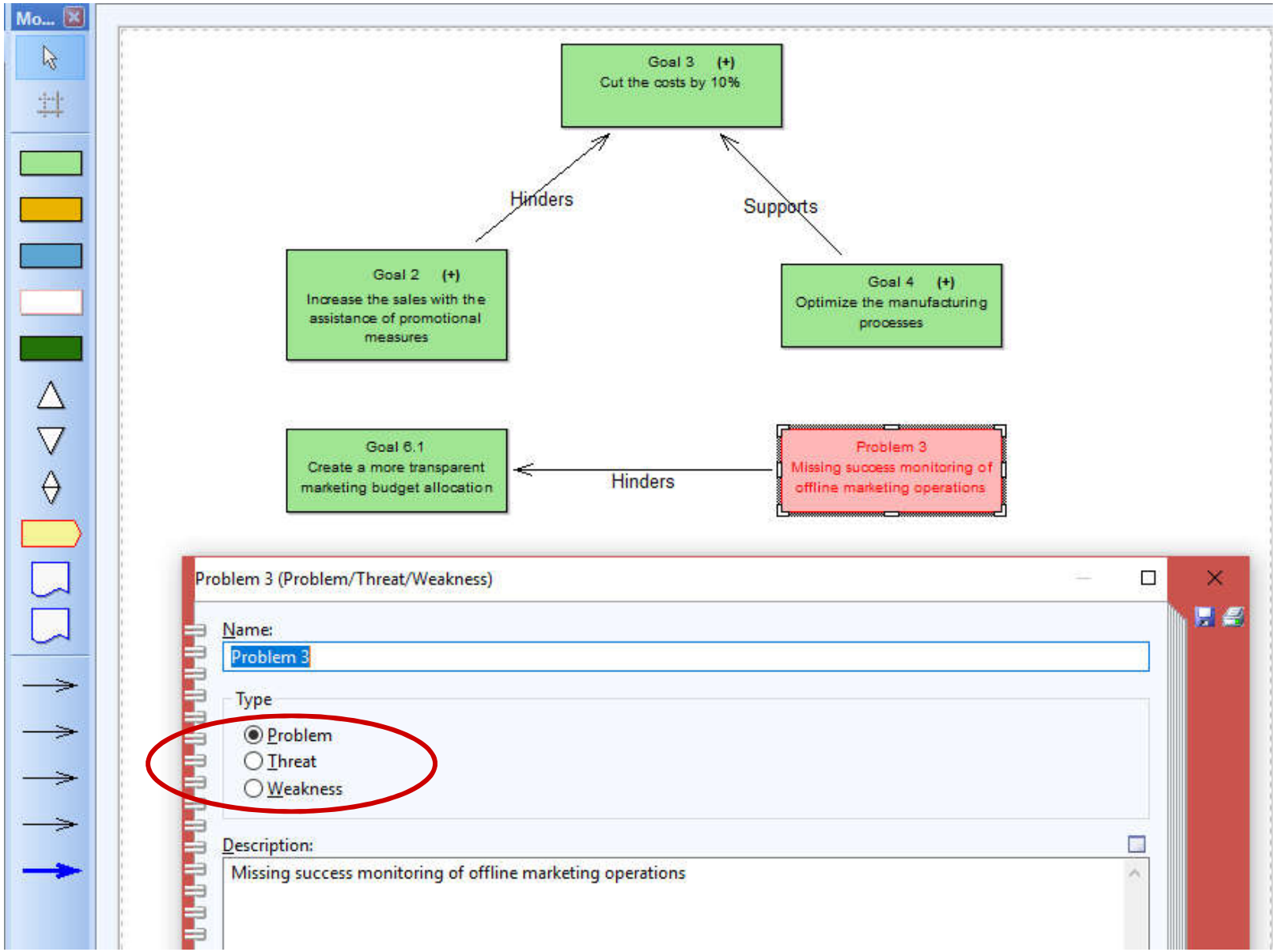
4EM-Modeling-Tool: Goal Modeling



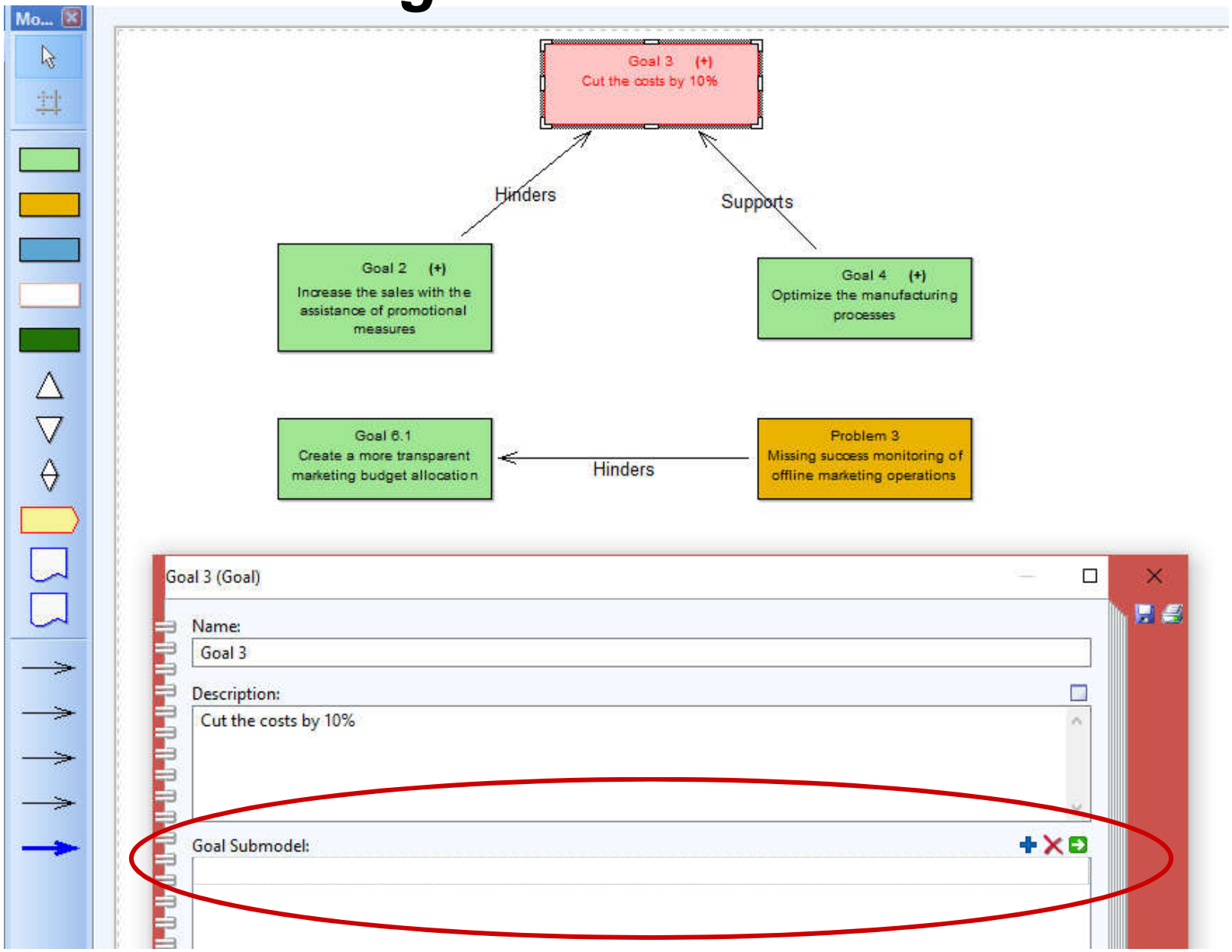
4EM-Modeling-Tool: Example Model



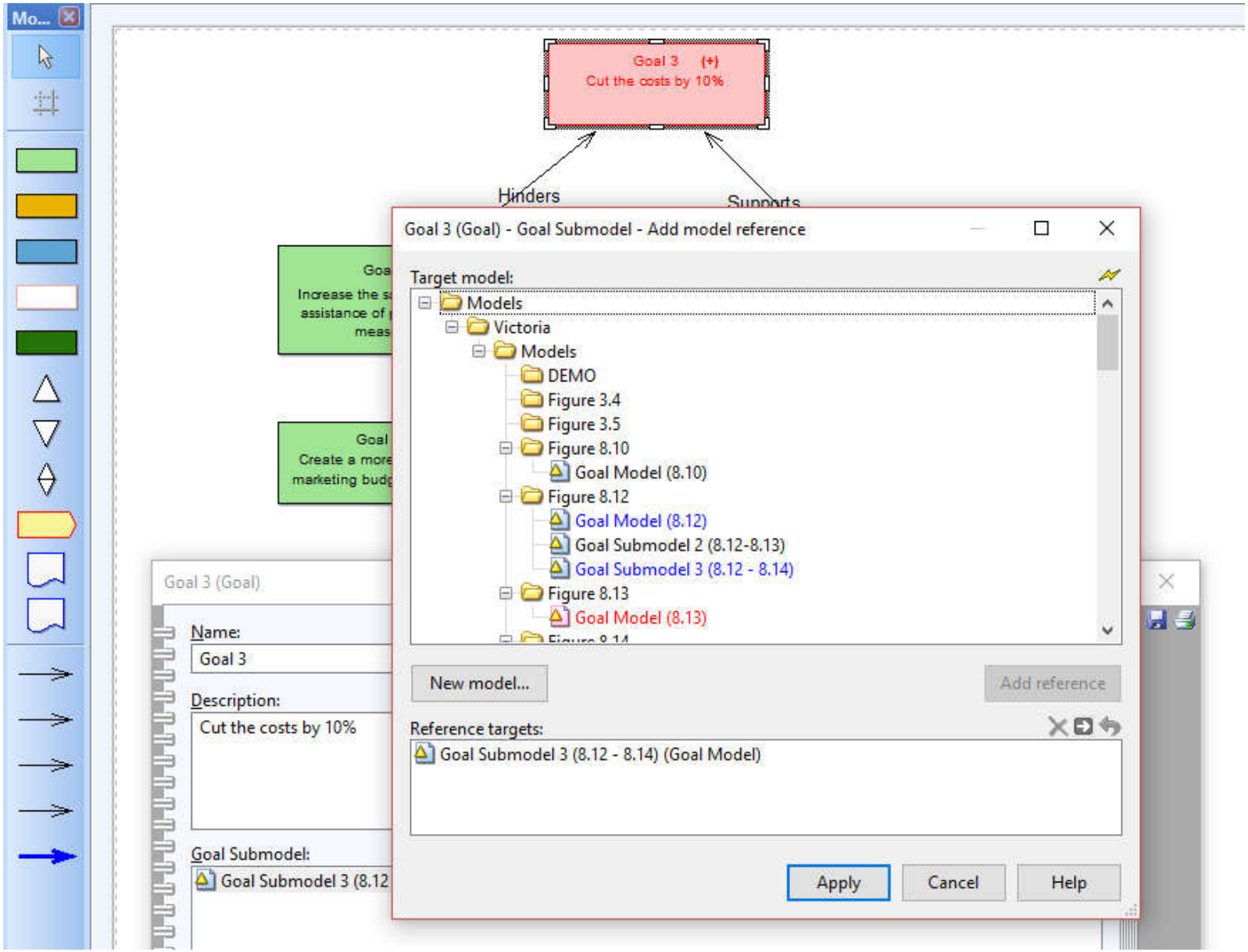
4EM-Modeling-Tool: Problem Type



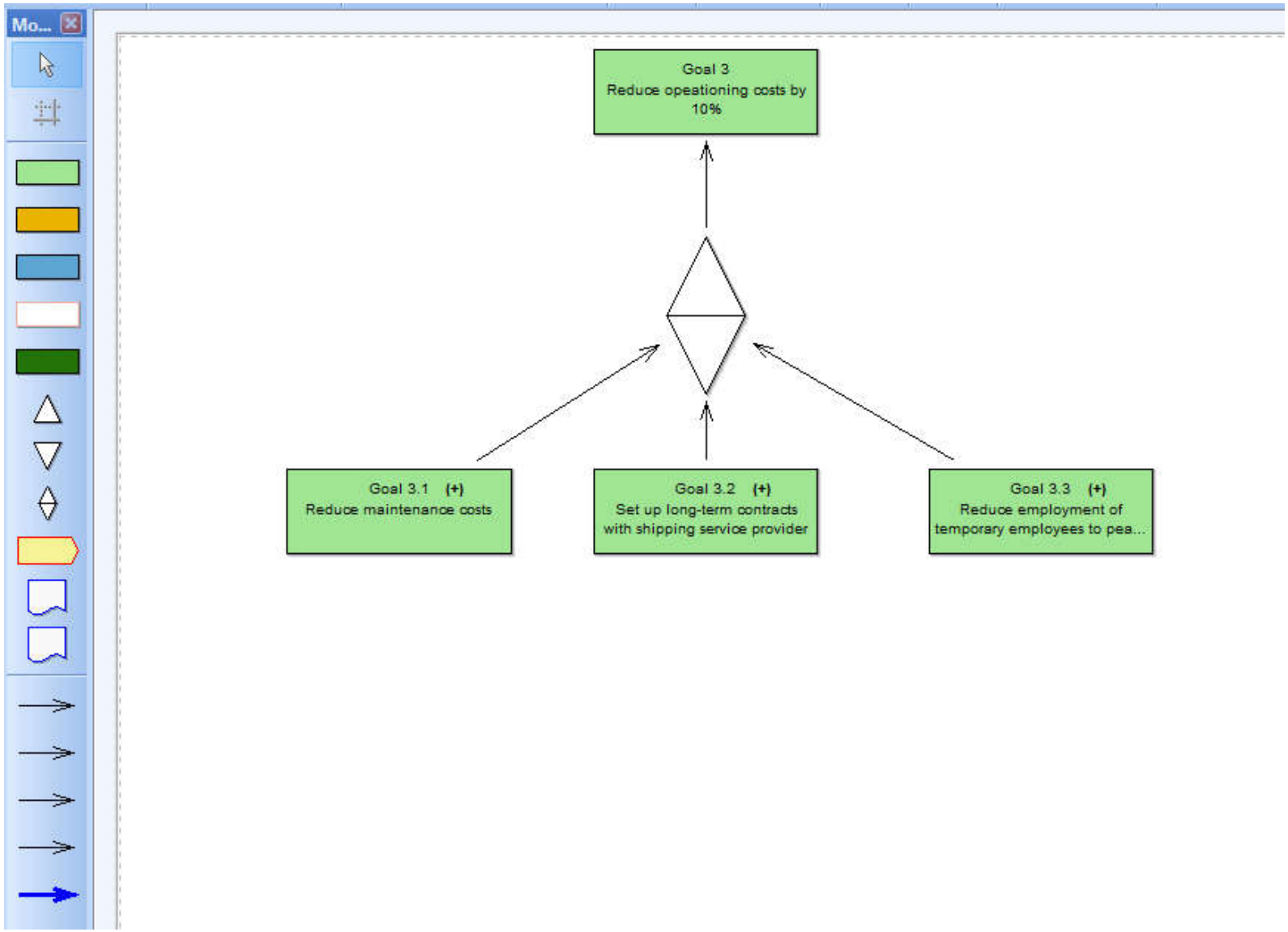
4EM-Modeling-Tool: Sub-Models



4EM-Modeling-Tool: Sub-Models



4EM-Modeling-Tool: Sub-Models



Case Study A4Y: Excercise

Create a Goal Model/ a set of linked Goal Models that fit to the situation of A4Y.

Already known …

- Main Goals: Goal 1: Increase Profits by 15%, Goal 2: Increase Sales, Goal 3: Reduce Operating Costs by 10%
- Several Problems: Insufficient Monitoring Capabilities for Offline Marketing, Missing Resources for Product Innovation, …
- Possible Constraints: Minimum wages, Work time regulations, ..

Some more information about A4Y you should know …

- *In order to increase sales, an expansion of the marketing activities is planned.*
- *New products could be developed in order to attract new customers.*
- *A main driver for production costs is the workforce.*
- *The workers union of the shipping service provider is going to fight for higher salaries next year.*
- *So far, A4Y provides limited payment options. However, PayPal offers an easy integration of additional payment options.*

SUMMARY AND DISCUSSION

4EM-Modeling-Tool: Further Development

Feature	Remark
Relationship Assistant	Prototype GM Implementation
Model Management Functionality	Ongoing Student Project
Advanced / Simple Modelling Mode	Long Term
View Concept	Long Term
Meta Model Extension	Long Term

Additional reading...

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