Modelling Method Conceptualization within OMiLAB: The 4EM Case

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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
OMiLAB: Core Development Environment

www.adoxx.org

Data Bases
Open Source
Commercial

MaxDB
Oracle
DB2
SQL Server

Linux, AIX, HP-UX, Solaris, Windows

Operating System Independence
(System Libraries)

Operating System
(Windows, Linux)

Distribution
Interfaces

Intranet
Firewall
Internet

Communication
Integration

Other Platforms

ADOxx® Platform

Modeling Methods

OMiLAB

OMiLAB, ADOxx, 4EM, PoEM'2017
Metamodelling in ADOxx

Modelling Method Implementation based on ADOxx®

MM-Specific Inheritance of ADOxx® Meta Model

Indirect support of procedure

MM-Specific Configuration & Scripting of ADOxx® + Add-Ons

Inheritance

Configuration & Scripting

GOAL: DEVELOPMENT OF MODELLING TOOLKITS
ADOxx USAGE PATHS

Proof of Concept Modelling Tool Conceptualization

Open-Use Development Environment

ADOxx Meta Modelling Platform

ADOxx Community Edition
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

http://www.omilab.org/psm/content/ep/globalnetworkservice?view=tilestools
General Representation Structure of the 4EM Tool

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

- Concept Model
- Goal Model
- Business Rule Model

- X D-construct (Metamodel)
- _4EM_Concept_Model_
  - _Concept_Model_Component_
    - Concept
    - Attribute
  - _4EM_Concept_Model_Gateways_
    - TOTAL-ISA
    - PARTIAL-ISA
    - PARTIAL-PartOF
    - TOTAL-PartOF

- X 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

- X 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 Conflicts
- CM Binary Relation
- CM Generic Relation
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

Autors & Resources Model

- _D-construct_ (Metamodel)
- _4EM_Actors_and_Resource_Model_
  - _Actors_and_Resources_Components_
    - **Individual**
    - **Role**
    - **Resource**
    - **Organizational Unit**
  - **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_
    - **TCIM AND**
    - **TCRM OR**
    - **TCRM OR AND**
    - **TCRM PARTIAL-PartOF**
  - Relation classes
    - TCRM Supports
    - TCRM Hinders
    - TCRM Has Goal
    - TCRM Has Requirement
    - TCRM Generic Relation
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

Diagram:
- Intra-model relationship
- Inter-model relationship

Diagram content:
- Goal 2: Increase sales by using promotional measures
- Goal 2.1: Develop both new products variants and versions
- Problem 8: The development of new products is cost-intensive as well as time-consuming
- Process 13: Create a standardized product
- Rule 5: Static Constraint Rule: Manufacturing processes have to be completed within 2 weeks
- Role 8: Blacksmith
- Organizational Unit 5: Product organization
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.

Diagram:
- Goal 4: Optimize manufacturing processes
  - Goal 4.1: Reduce manufacturing time
  - Goal 4.2: Reduce manufacturing costs
  - Goal 4.3: Reduce rejects
- Goal 6: Expand marketing activities
  - Goal 6.1: Create a more transparent marketing budget allocation
  - Goal 6.2: Use up to 10% of the last year's turnover for marketing operations
- Goal 5: Improve the acquisition of new customers
- Goal 2: Increase sales with the assistance of promotional measures

Example of a Goals Model

- **Goal 5(+)**: Increase acquisition of new customers
- **Goal 6(+)**: Expand marketing activities

**Goal 2**: Increase sales by using promotional measures

- **Goal 2.1**: Develop both new products variants and versions
- **Goal 2.2**: Decrease the time to market
- **Goal 2.3**: Extend the range of services

- **Goal 3(+)**: Reduce operating costs by 10%

**Problem 9**: The development of new products is cost-intensive as well as time consuming

- **Goal 10**: Investigate the acquisition of more efficient and higher quality machines

- **Goal 11**: Implement third party payment services

**Opportunity 9**: The implementation of PayPal
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

GM Elements

GM Decompositions

Auxiliary Components

GM Relations

Auxiliary Relation
4EM-Modeling-Tool: Example Model

Goal 3: Cut the costs by 10%

Goal 2: Increase the sales with the assistance of promotional measures

Goal 0.1: Create a more transparent marketing budget allocation

Goal 4: Optimize the manufacturing processes

Problem 3: Missing success monitoring of offline marketing operations

Hinders / Supports
4EM-Modeling-Tool: Problem Type

Goal 2 (1) Cut the costs by 10% (Supports)

Goal 2 (1) Increase the sales with the assistance of promotional measures (Hinders)

Goal 4 (+) Optimize the manufacturing processes (Hinders)

Goal 3.1 Create a more transparent marketing budget allocation (Supports)

Problem 3 (Problem/Threat/Weakness)

Name: Problem 3

Type:
- Problem
- Threat
- Weakness

Description:
Missing success monitoring of offline marketing operations
4EM-Modeling-Tool: Sub-Models

Goal 3: Cut the costs by 10%

Goal 2: Increase the sales with the assistance of promotional measures

Goal 4: Optimize the manufacturing processes

Goal 8.1: Create a more transparent marketing budget allocation

Problem 3: Missing success monitoring of offline marketing operations

Goal Submodel:
4EM-Modeling-Tool: Sub-Models
4EM-Modeling-Tool: Sub-Models

Goal 3
Reduce operational costs by 10%

Goal 3.1 (+)
Reduce maintenance costs

Goal 3.2 (+)
Set up long-term contracts with shipping service provider

Goal 3.3 (+)
Reduce employment of temporary employees to post...
Case Study A4Y: Exercise

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

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Additional reading...


http://austria.omilab.org/psm/content/4em/info?view=home