Meta-Modelling as a Means for Improved Communication and Interoperability – The Case of Frisco

Petia Wohed & Birger Andersson
Background of our work

- There is **terminological fuzziness** in IS engineering
- To **address** this frameworks has been developed
  - Frisco (Framework for information systems concepts)
  - BWW (Bunge Wand & Weber) model
- The goal: To provide a coherent system of concepts
  - Support communication between stakeholders
  - Facilitate interoperability among systems
  - Be beneficial for RE, reusability and reliability within the IS development process
Assumptions and approaches

- Basic assumption:
  - graphical representation considerably facilitates the comprehension of a framework (for people non skilled in formal notations).

- Rosemann and Green have developed a graphical meta-model for BWW models

- We propose a graphical meta-model for Frisco
**Frisco**

- **Concept Set Definition Description**
  - **Concept**
    - **Set**
    - **Definition**
    - **Description**

  - **Relation** $\mathcal{R}$
    - $\mathcal{R} = \{ r \in \mathcal{Z}^{2} / \mathcal{U} \cup \mathcal{U} = \{ (q,p) | q,p \in \mathcal{Z} \} \land \exists r < 0 \}$
    - A thing composed of several predicted things, each one associated with one.

  - **Transition** $T$
    - $T = \{ (r_{i}, r_{0}, u_{0}, z_{0}) \in \mathcal{Z}^{2} | \exists t_{i} = \{ \langle u_{i} \rangle \text{ before}, \langle z_{i} \rangle \text{ after} \} \land r_{0} \}$
    - A binary relationship between two different composite things, called pre-state and post-state of the transition.

  - **State** $S$
    - $S = \{ (s_{i}, T_{i}) \land \exists t \}$
    - A composite thing involved as a pre-state or post-state in a transition.

  - **Action** $A$
    - $A = \{ (t_{i}, q_{i}, \mathcal{Q}) \land \exists r \}$
    - A transition involving a non-empty set of actions.

- **Fundamental layer**
- **Actor, action and actands layer**
- **System concepts layer**
- **Organisational and IS concepts layer**

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Frisco - basic concepts

Diagram showing relationships between concepts such as Thing, Composite Thing, Elementary Thing, Predicator, Predicated Thing, Entity, Pair, Relationship, and Set Membership.
Frisco – Fundamental layer
Frisco – Actor, Action & Actands layer

Diagram showing the relationships between various components:
- Goal
- Actors
- Actions
- Composite Actions
- State
- Transition
- Composite Transition
- Rule
- States
- Transition Occurrence
- Choice
- Sequence
- Concurrency
- Output
- Input
- Resource
Examples of suggested changes

**Def 8** An action $n: s_1 \rightarrow s_2$ is enabled to be performed by an actor $a$ in state $s$ if $s_1 \subseteq s$ and $a \in \text{Actorof}(n)$. If an action $n:s_1 \rightarrow s_2$ is performed in state $s$, then $s$ is changed to the new state $s' = (s \backslash s_1) \cup s_2$.

The performance of an action $n:s_1 \Rightarrow s_2$ by actor $a$ in state $s$ leading to state $s'$ at time unit $tu$ is denoted as $\text{occ}(n,a,tu):s \rightarrow s'$.

**Def 6** Let $ET = 2^E$ denote the set of entity types.

**Def adj 7** Let $N$ denote the set of all actions. $N = \{ t \in T \mid \exists q \in ET, \exists r \in R [r = \{ \langle q, \text{performing} \rangle, \langle t, \text{performed_by} \rangle \} \land q \in \text{Prestateof}(t)] \}$. 

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Benefits of the work

- Increase communication, understanding and use
- **Support analysis and further development**
- Further facilitate cross analysis between approaches e.g., Frisco, BWW, TOVE, EO, etc.
- Used as reference framework through which modeling languages can be analyzed and compared
Further work

- To use the proposed meta-model for analysing Frisco against other alternative attempts in the area:
  - Top-down and well formalised frameworks such as BWW, EO, TOVE
  - Pragmatic, bottom-up developed attempts like UEML and Söderström.