Organizations Under the Lens of Metamodeling: Towards Unfolding the Logics of Change

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Introduction

- **Organization:**
  - Structuring and arranging a set of related or connected concepts

- **Metamodeling:**
  - Constructing and relating a collection of concepts within a certain problem domain
    - Examples of metamodels in software, process, and requirements engineering: UML, SysML, SPEM, i*

- **What is the difference between organization and metamodeling?**
What is the problem?

Conceptualization of change at the level of metamodels is an open research issue

Rational:
Generally in the design space in which everything is planned ahead change is considered as an exceptional concept

Why is it a problem?

What about the flexibility of designs?
My Current Research Goals

- **Research Question:**
  How to conceptualize the notion of change at the level of metamodels?

- **Research Goal 1:**
  To investigate injecting the concept of change in the current metamodels

- **Research Goal 2:**
  To propose a new metamodel which conceptualizes the notion of change

- **Limiting research scope:**
  - Focusing on the context of organizations

- **Research Question:** How to conceptualize the notion of change in organizational and business processes metamodels?
My Current Research Method

- Am I the first researcher to address these questions??!!

- Investigation of conceptual frameworks in:
  - Organization Theory, and
  - Systems Theory

  , which directly address the concept of change in their analysis frameworks, such as:
  - Systems Dynamics
  - Ecosystems
System Dynamics

- **Dynamics:**
  - The branch of any science in which *forces* and *changes* are considered.

- **System Dynamics:**
  - An approach to understanding *the behavior of* the system *over the time* in complex systems.

- **Main concepts related to change and behavior over time:**
  - **Stocks**: accumulations in the system (e.g. bank balance)
  - **Flows**: (e.g. inflow: deposit interests, outflow: withdrawal)
  - **Valves**: actions controlling the rate of inflows and outflows to stock
  - **Information feedbacks**: information which affects the valves

- It supports simulation and prediction of the behavior of system over time
My first research step

- **A preliminary step in accordance with:**
  - **RG1:** To inject the concept of change in the current business process metamodels

- **Research Objective:**
  
  Integrating

  - i* models (strategic-rational, strategic-dependency relationships)
  - stock and flow models (stock and flow diagrams), and
  - process models (activity diagrams)

- **Research Outcomes (so far):**
  
  - A methodology for relating the dynamics of processes to their statics
  - A methodology for managing reconfiguration of statics of processes based on their dynamics
Problem Formulation

Interaction diagram of the organization

Reconfiguring the as-is architecture based on dynamic properties

As-Is Organization Architecture (T1)

To-Be Organization Architecture (T2)
Proposed Methodology – Step 1

- Identification of properties of interest which should be achieved and maintained over time and corresponding them to SD relationships
  - In the case study: cash level (a function of costs and time)
  - Desired behavior: Reaching cash level from 0 to 2100K$ in two years
Proposed Methodology – Step2

- Development of the relevant process models and identification of:
  1. Material flows
Proposed Methodology – Step 2

2. **Information flows:**
Proposed Methodology – Step 3 (1)

- Development of stock and flow diagrams based on process models
Proposed Methodology – Step 3

1. Produce and deliver W
   - Order for W from C
   - Production duration

2. W production and delivery rate

3. Total inventory of W
   - Time to adjust W inventory
   - Desired inventory of W
   - W order rate
   - C’s Inventory of W’s consumption rate of W

4. Produce and deliver Y
   - Production starts rate
   - Order for Y from C
   - C’s inventory of X
   - C’s consumption rate of X
   - Time to adjust W inventory
   - X consumption for each Y

5. Cost of Y
   - Cash outflow rate
   - Cash
   - Income from Y
   - C’s production cost
   - Y’s Price
   - Total production costs
   - Cost of X
   - Y’s production and delivery rate
   - Production cost For each Y
   - Price per X

6. Price per Y

7. Produce and deliver Z
   - C’s production duration
   - D’s Inventory of Y

8. Producer A
   - Produce and deliver X
   - Order for X production and delivery rate
   - Production duration

9. Producer B
   - Price per X
Proposed Methodology – Step 4

- Simulating the behavior of the organization’s architecture
  - In the case study: Over a two-year period

What is the current behavior of the as-is architecture over a two-year period?

**Cash level reaches to 850K$**

What is the desired behavior over a two-year period?

**Reaching the cash level to 2100K$**
Proposed Methodology – Step 5

a) Reducing level of abstraction of strategic-dependency diagram

b) Developing alternative reconfiguration solutions

c) Repeating step 2 to 4
The behavior of the system with the chosen solution
Final Step: Reconfiguring the as-is architecture

A. AS-Is Architecture
   Interaction diagram of the organization

B. Interaction diagram of producer c

C. To-Be Architecture
   Interaction diagram of producer c

D. To-Be Architecture
   Interaction diagram of the organization
Summary

- What have I done?
  - Developed a small case study
  - Proposed the first draft of a methodology for relating statics of the design space to its dynamics (relating i* and process models to stock and flow models)
  - Proposed the first draft of a methodology for moving to the new version of a design based on its dynamics

- What have not I done?
Summary

- The potential contributions to the bigger context:
  
  [i* models is a conceptual problem structuring method: other static design models can be mapped on it]

- Contribution to the evaluation of static designs models (responsibility assignment and re-assignment between entities) based on the dynamics of the design

- Contribution to the evolution of static design models
What I learnt

- I had no view of the path I want to travel throughout my research before this project.
  
  - **Now I have the straw-man version of a straw-man version. I am happy!**

- Have I moved towards the research goals I have set?
  
  - **To a very small extent. A good try!**

- Do I want to change my research goals?
  
  - **Definitely not! I will strongly continue!**