Evolution of Goal-driven Pattern Families for Business Process Modeling

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Motivation

- Difficulties in modeling requirements with goals
- Difficulties in creating business processes that realize goals
- Relationships between these two views are not well defined

There is a need to:

- Facilitate creating business goal models with business process models that realize them
- Reuse recurring solutions for recurring problems in a given domain
- Evolve captured recurring problems and solutions
Motivation

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Objectives

- Facilitate creating business goal models with business process models that realize them
- Evolve recurring solutions and recurring problems captured as patterns
Proposed Solution

Goal-oriented Pattern Family framework (GoPF)

Goal-driven Method (GDM)
- Organization-driven Customization and Extraction Method (OCEM)
- Family Development Method (FDM)
  - Family Creation
  - Family Evolution

Family Metamodel (FMM)

User Requirements Notation

Goal-driven Pattern Family (GPF)

Profile of uses notation of

Manages

Adapts

Instance of
User Requirements Notation (URN)

- **Goal-oriented Requirement Language (GRL)** enables:
  - Modeling of stakeholders, goals, requirements, alternatives and rationales
  - Understanding the problems that ought to be solved

- **Use Case Map (UCM)** enables:
  - Modeling of causal scenarios
  - Organizing complex models in hierarchical structures
Adverse events are undesirable patient outcomes caused by medical care rather than the underlying disease.

Focusing on hospital patients, Canadian studies estimate that one in twelve patients experiences an adverse event.

9250 to 23750 deaths from adverse events in 2000 could have been prevented in Canada.
Scenarios of Proposed Solution

- Creating a GPF
- Evolving a GPF
- Customizing and Extracting for an organization
Establishing Framework – Steps

- Observe and analyze goals that define the problem
- Create **Goal Templates** that capture recurring excerpts of goal graphs
- Observe and analyze process models that realize goals
- Identify a set of strategies to address the problem
- Create **Business Process Templates** that capture the behavioral and structural details of strategies
- Create **Patterns**, each composed of a Goal Template and corresponding Business Process Templates
Family Creation - Establishing a GPF

Goal Template

- Increase Patient Safety «main»
  - Collect Data
  - Generate Informative Outcome Information
  - Make Safety Decision
  - Adopt Decision

- Increase Quality of Care in Long Term «external»
- Decrease Costs «external»
- Deploy Advanced Infrastructure «external»

Business Process Template

A

1. Collecting Data
2. Generating Informative Outcome Information
3. Making Safety Decision
4. Adopting Decision

B

1. Collecting Data
2. Generating Informative Outcome Information
3. Making Safety Decision
4. Adopting Decision
Organization-driven Customization and Extraction Method (OCEM)

- Algorithm that helps adapting instances of solutions for particular organizations within the domain
- Assesses the impact of alternative solutions for achieving the high-level goals of a given organization in a systematic, top-down approach
- Inputs: GPF and an incomplete business goal model of an organization
- Output: more complete goal model combined with business processes aligned with the identified goals
Organization-driven Customization and Extraction Method (OCEM)

Goal Template
- Increase Patient Safety «main»
- Collect Data
- Make Safety Decision
- Generate Informative Outcome Information
- Adopt Decision
- Deploy Advanced Infrastructure «external»
- Decrease Costs «external»
- Increase Quality of Care in Long Term «external»

Business Process Template
- Collecting Data
- Making Safety Decision
- Generating Informative Outcome Information
- Adopting Decision

Organizational Goal Model
- Healthcare Institute A
- Increase Patient Safety (100)
- Implement Advanced Infrastructure
- Decrease Costs (25)
- Support Research on Adverse Events (20)

Increase Patient Safety
«realization link»
Family Development Method – Family Evolution

- Requirements in any domain are dynamic and constantly changing
  - Caused by changes within the domain and outside of the domain
  - Leads to new problems
- A GPF can remain useful only if it can evolve to comply with changes
Family Development Method – Family Evolution

- Used when new observed patterns are related to a particular GPF
- Extension, modification, elimination, and combination
- Maintain the usefulness of a GPF by increasing the quality and accuracy of its patterns and their interrelationships
Family Evolution

Evolved Patient Safety GPF
Conclusion

- The framework proposes a solution to address the mentioned gap between goals and business processes by:
  - Capturing the knowledge in the domain
  - Designing business processes that better satisfy the goals and requirements of stakeholders
  - Increasing the reusability of recurring solutions
- Improving the framework by evolution mechanisms when changes happen in the domain
Future Work

- Complete the patient safety GPF and better report on its content and structure
- Develop another pattern family
- Support partial automation for the algorithms that formalize the framework methods
- Completion of:
  - Metamodel (with OCL constraints)
  - Elimination and combination algorithms
- Explore whether the method activities can be made more systematic
- Partial tool support based on jUCMNav
- Update of related work where necessary
Questions
Framework Metamodel

- The Framework Metamodel lays down the structure for frameworks.
- The concepts in the framework are formalized with a URN profile.
- URN already includes all necessary concepts for the suggested framework.
Family Metamodel (FMM)