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Meta-model tailoring for Situation aware BP Modelling

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Outline

1. BP modelling
2. Requirements on BP flexibility
3. Situational method engineering
4. The proposed approach
5. Conclusion and future work

Definitions

- **BP** is a set of one or more linked procedures or activities that collectively realise a business objective or policy goal, normally within the context of an organisational structure defining functional roles and relationships. [Workflow Management Coalition,95]

- **BP modelling** consists on capturing the organisational knowledge according to various perspectives with respect to the modeling purpose and the situation

Modelling Perspectives [BPMDS'06 workshop], [Daoudi et al., 07], [Nurcan, 08], [van der Aalst, 03]

- Functional: «what» process must do?
- Organisational: «where», «by whom» and «under the responsibility of whom » the activities are realised?
- Behavioral: «when» the activities are realised and how they are controlled by constraints
- Informational: the business objects used by the process, their structure and the relationships established between them
- Operational: the operations and the activities performed during the process
- Intentional: « why » the process is performed?
- Decisional: «how» the decisions are made? the rationality of the decisions

Process nature

- The a priori knowledge of the execution
  - Definition of the procedural rules in advance
  - In the literature, two types of processes are distinguished
    - Well structured processes (eg. Production processes)
    - Ill structured / unstructured processes (eg. ad-hoc processes)
- Stability / evolution of the process
    - Stable processes
    - Evolutive processes

Modelling formalisms

- **Activity-oriented and product-oriented formalisms**
  - Focus on executability and translatability into executable languages (e.g. BPEL4WS or ebXML)
  - Are suitable for representing situations in which execution conditions are well known in advance
  - Describe who performs WHAT and HOW in details
  - Provide a rigid scheduling of activities
  - Examples : role-activity diagrams [Ould, 1995], state-transition diagrams [MOF,02]

Modelling formalisms

- **Role / Actor oriented formalisms**
  - Highlight the responsibilities of actors in the organisation
    - Responsibility, right, obligation, …
  - Reflect the organisational structure
    - Communication, dependency, action, interaction between actors, responsibility distribution
  - Etc.
  - Examples : I* [Yu, Mylopoulous, 94], role interaction networks [Singh et al., 1992]

1. Process modelling

Modelling formalisms

- **Goal, decision, strategy, intention oriented formalisms**
  - Focus on the objectives of the organisation, the decision making, the actors' points of views, etc.
  - WHY ?

  Exemples :
    - I* [Yu, Mylopoulous, 94]
    - KAOS [Heaven, Finkelstein, 04]
    - Nature [Rolland, 95]
    - MAP [Rolland et al., 99]

  + / - Providing guidance for satisfying goals
  + / - Dealing with different levels of granularity

2. Requirements of flexibility

These modelling formalisms

- Allow to capture different perspectives of the process knowledge
- Are complementary and can be combined in order to satisfy various modelling purposes
  - Combination of activity-oriented and product-oriented formalisms in order to determine which activity acts on which product
  - Combination of goal-oriented and activity-oriented formalisms in order to specify the operationalisation of goals

➔ **A unique modelling formalism can not be adequate for all situations**

2. Requirements of flexibility

There is a need for mechanisms allowing :

- the adaptation and
- the configuration

of existing formalisms according to the context

- **Internal context**
  - Process nature
  - Modelling purposes
  - Points of views, and/or preferences of actors
  - Etc.
- **External context**
  - Execution environment (instances performance)

- A process model can be flexible only if the formalism (meta-model) used to represent it integrates the capability to represent flexibility

➔ Creation of formalisms which are adapted to the current modelling needs (context)

3. Situational Method Engineering

- Method engineering is the discipline of developing, customising, and/or configuring a situation-specific method from parts of existing methods [Brinkkemper, 96], [Leppanen, 2006]

- **Principles of ME** : *meta modelling*, *flexibility*, *reuse* and *modularity* [Rolland, 2007]

- SME promotes the construction of a method by assembling reusable method fragments stored in some method base [Brinkkemper, 98], [Ralyte et al., 2001]

SME :

- Construction of new methods or adaptation of existing ones in order to satisfy the requirements of a given ISD project
- Dealing with flexibility and adaptability needs

➔ **Thus, we will base our reasoning for situation aware BP modelling on SME techniques**

3. Situational Method Engineering

Strategies of methods composition

♣ **Emphasis on composition strategies*** (classification by Ralyté & Rolland)

❑ **Assembly based**

❑ **Extension based**

❑ **Paradigm based**

*Motoshi Saeki talk in EMISE

Source : Colette Rolland talk in ME'07

4. The proposed approach

Motivations

- One formalism is not sufficient even for a unique perspective
- The is a need for adaptation and configuration mechanisms
- A BP can be analysed according to multiple perspectives depending on the engineering and the execution contexts

➔ Construction of modelling formalisms which are adapted to the context

4. The proposed approach

- **Formalism**
  - Consists on a set of reusable components named chunks
- **Chunks**
  - Rather than defining a complete set of concepts in one meta model, a taxonomy of concepts will be defined
  - Grouping concepts according to various configurations in order to construct specific chunks
  - Reuse of chunks in the construction of new chunks
    - Extension
    - Assembly
    - Etc..
  - A chunk base supporting research and extraction operations
  - ➔ Thus, the process engineer can select or construct a meta-model which better fits with the project situation and the underlying modelling purpose

Construction operators

- **ADD (Element, link, property)**
- **DELETE (Element, link, property)**
- **GENERALISE / SPECIALISE (Element)**
- **UNIFY (Element, link, property)**
- **MERGE (Element, link, property)**
- Etc.

(element, link, property)

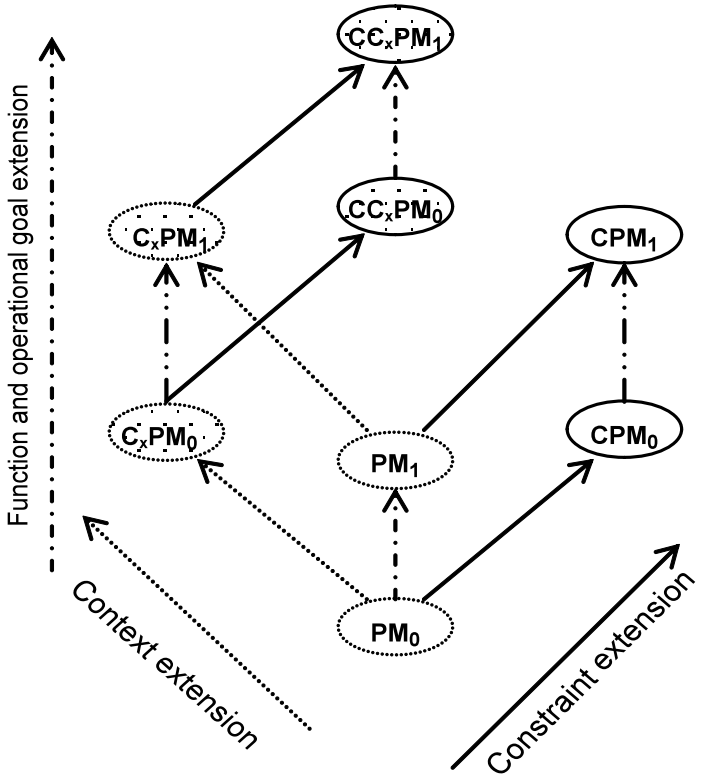
Example 1

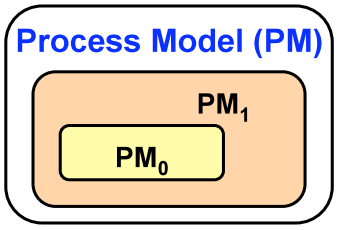
Extension-based strategy

4. The proposed approach

Example 1

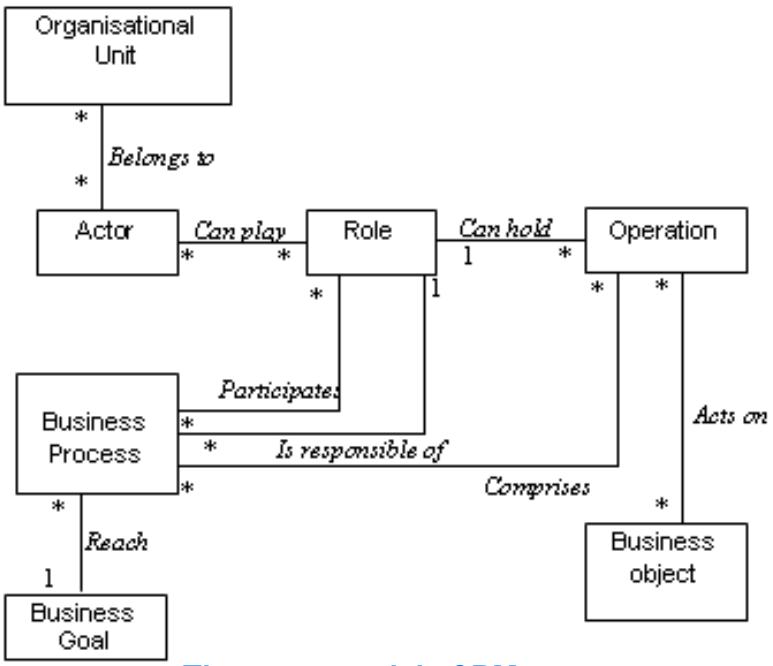
Extension-based strategy





4. The proposed approach

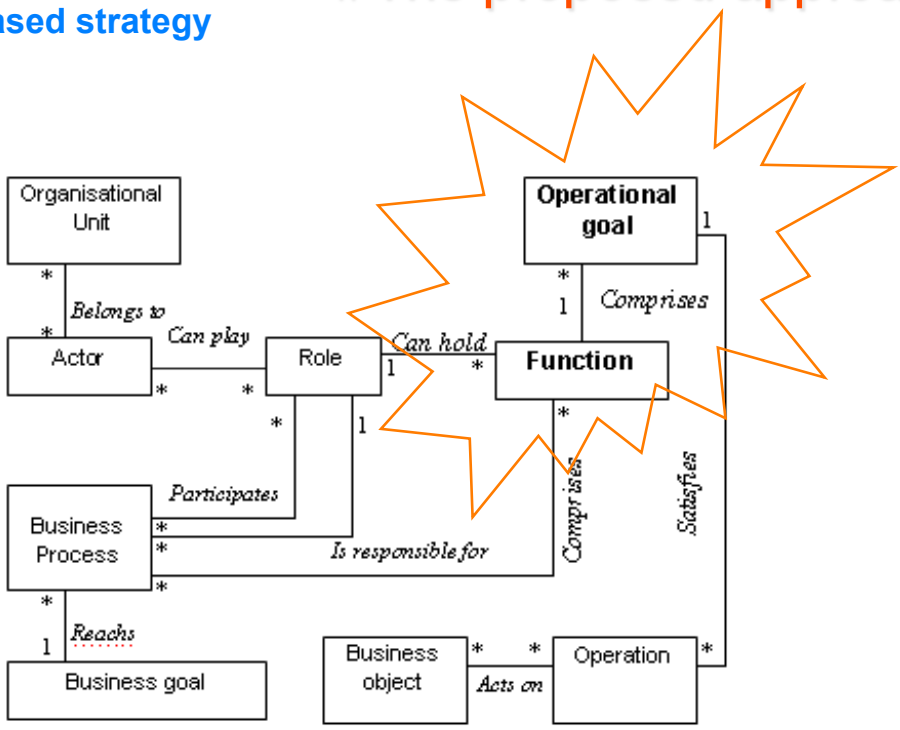
Example 1



The meta-model of PM_0

4. The proposed approach

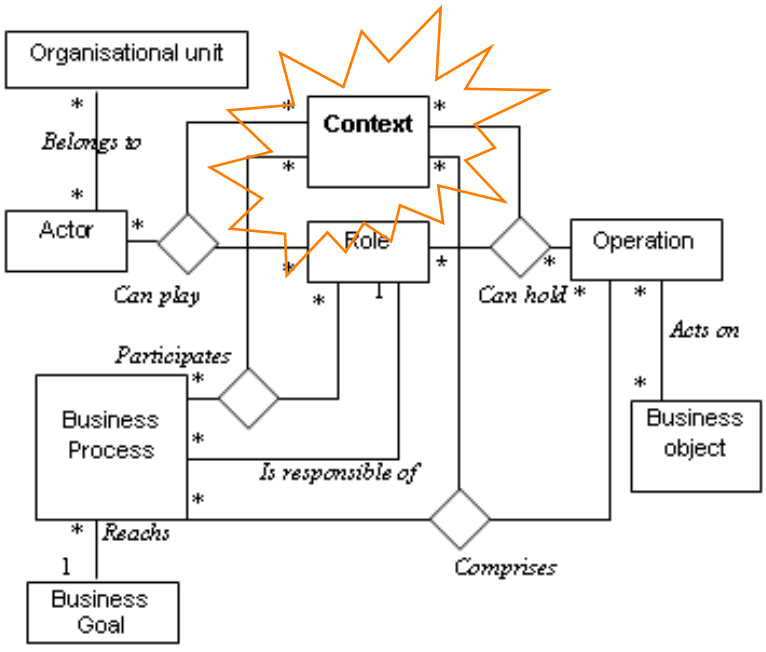
Extension-based strategy



The meta-model of PM_1

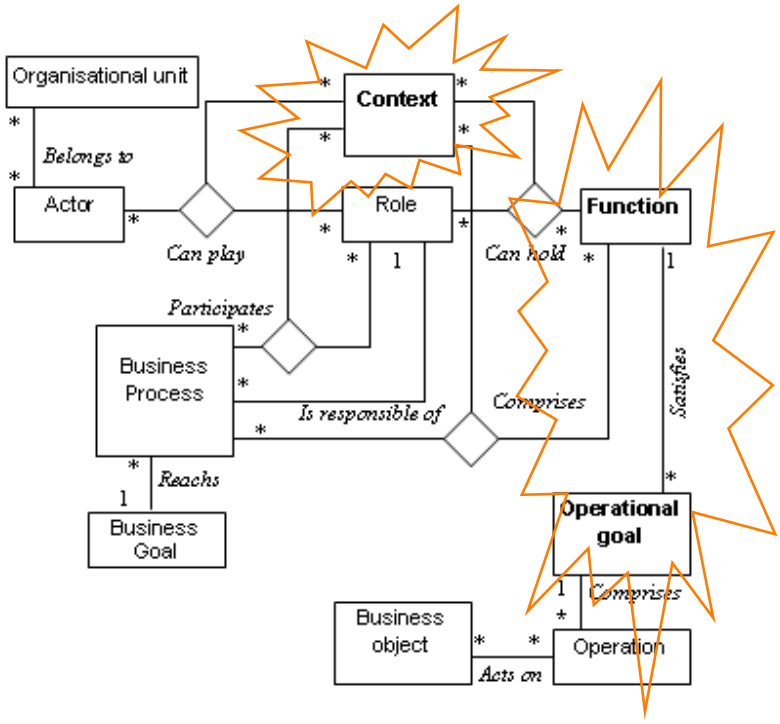
4. The proposed approach

Extension-based strategy



The meta-model of $CxPM_0$

4. The proposed approach



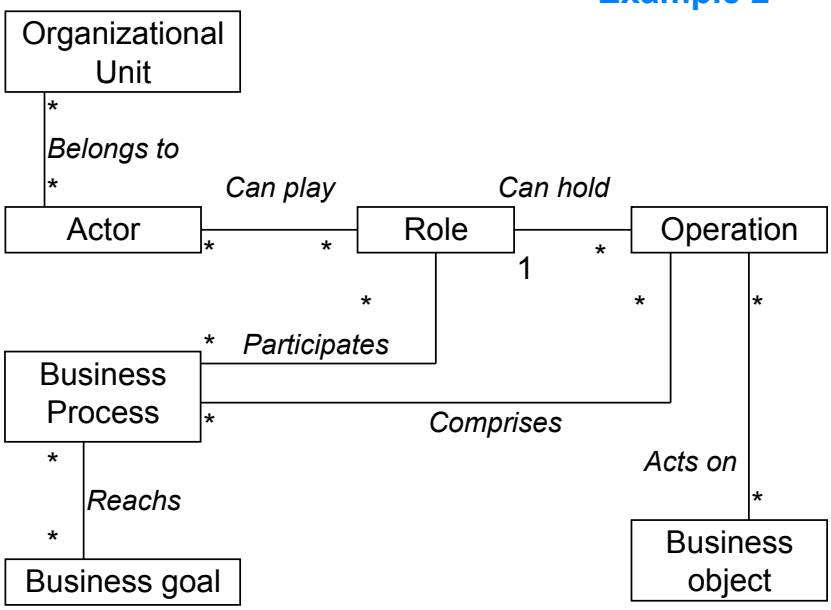
The meta-model of $CxPM_1$

Example 2

Assembly-based strategy

4. The proposed approach

Example 2

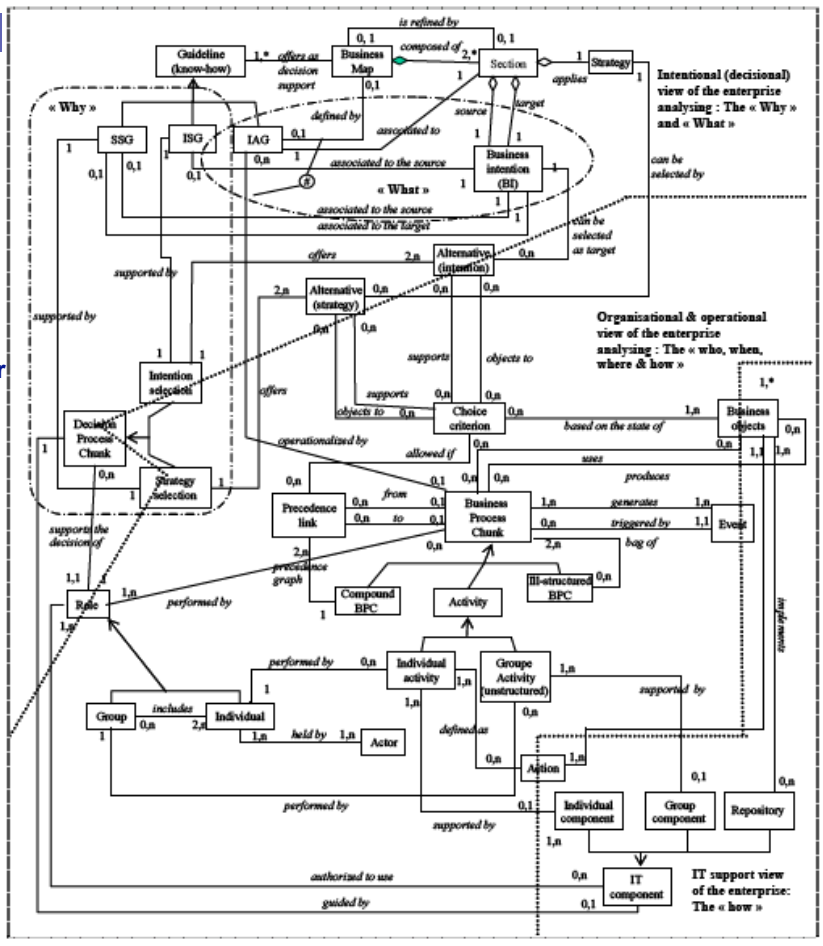


4. The proposed approach

Example 2

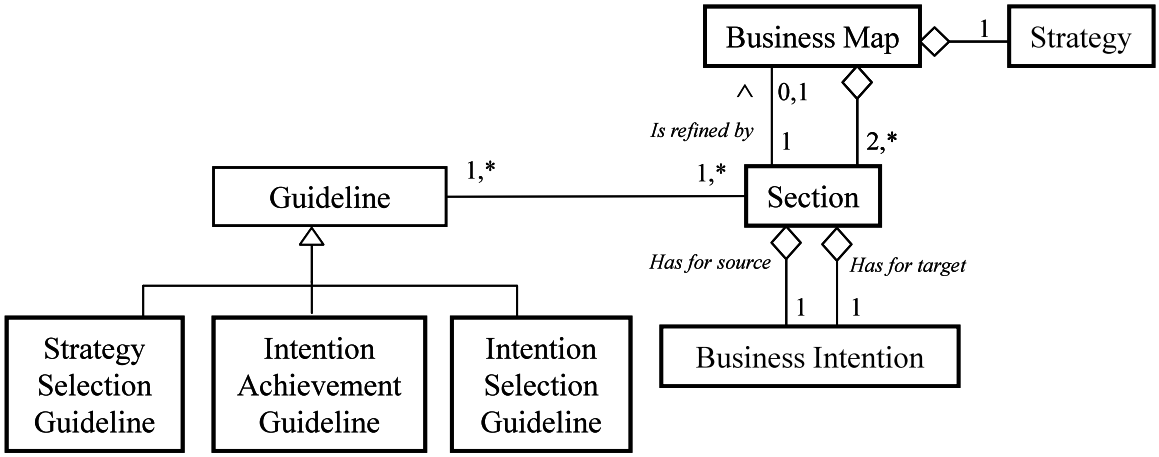
Cadre conceptuel pour la modélisation des processus métier et de leur système de support

- Intentional view
- Operational and Organisational view
- Support system view



4. The proposed approach

Example

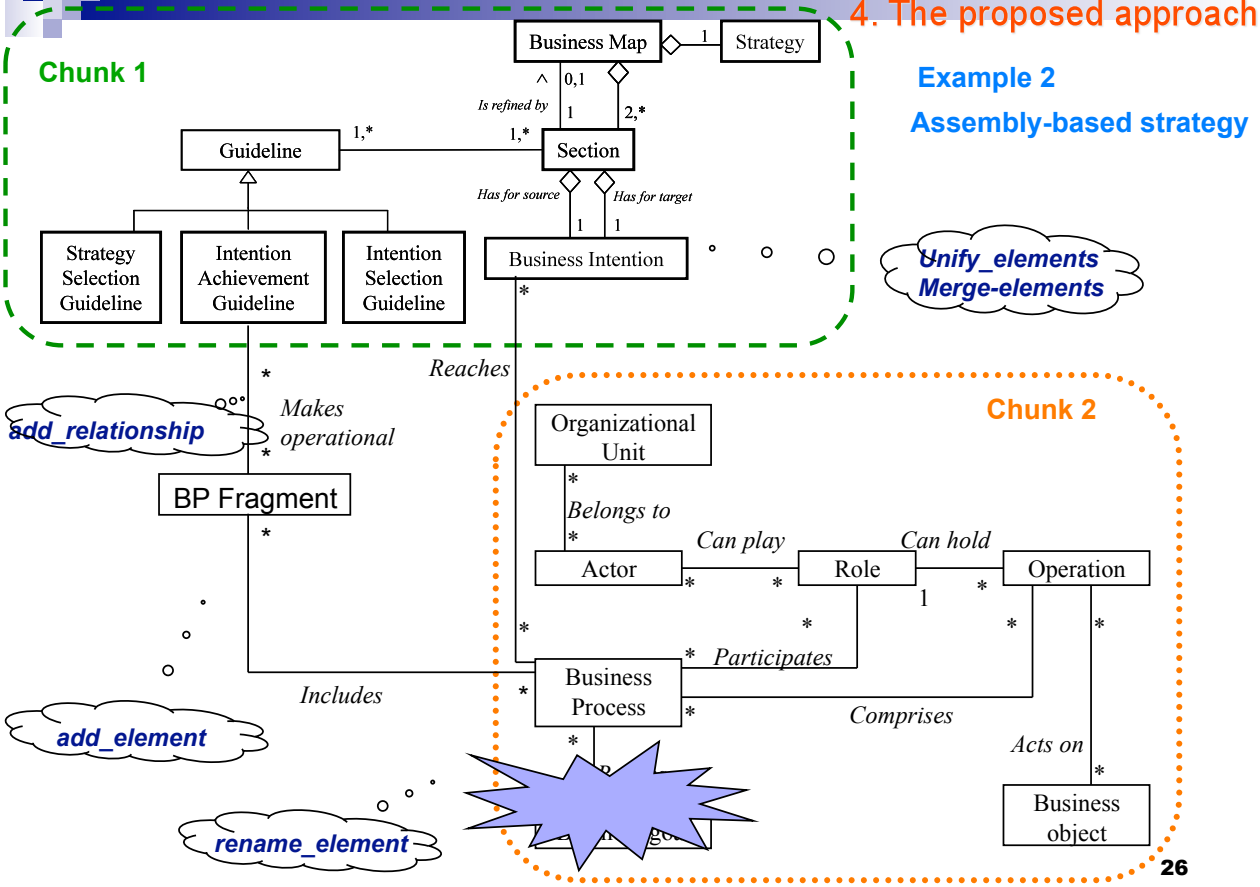


Intentional view

4. The proposed approach

Example 2

Assembly-based strategy



5. Conclusion and future work

- A starting point for defining an approach of configuration and adaptation of meta-models for BP modelling taking into consideration the purpose and the context of modelling
- Applying techniques and principles of SME
  - Proposing the concept of *chunk* in the definition of a meta-model (formalism)
  - Capturing different needs of representation in terms of method chunks
  - Constructing the resulting meta-model based on the set of chunks in order to fit with the context and the purpose of modelling

  ➔ Allowing the meta-models to be configurable
- Future work
  - Capturing the context knowledge which impact the selection of the adequate chunk / meta-model
  - A complete taxonomy of operators of assembly, adaptation and extension
  - The process of construction of meta-models

Thank you for your attention

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