Context-Awareness for Adequate Business Process Modelling

Oumaima Saidani* and **Selmin Nurcan*+**

* Centre de Recherche en Informatique
+ Sorbonne Graduate Business School (IAE de Paris)

Université Paris 1 – Panthéon - Sorbonne

Outline

1. Requirements for BP Adequacy

2. Requirements for Context Awareness

3. RBPM : Role-Based BP Modelling

4. CM4BPM : Context Model for BP Modelling

5. Conclusion and Future Work

Requirements for BP Adequacy

BP **adequacy** aims to provide capability to satisfy **customers' expectations** in every situation where a customer request is receivable.

Why is adequacy required ?

- Environment : **distributed companies**, **changing environment** and high **competition**

- Customers : requirements for **rapidity, reactivity** and **quality** of products and services

- Employees and actors of BPs : **autonomy, choice**

- Information and Communication Technology: **fast evolution**

Requirements for BP Adequacy

Organizations need flexible and adaptive processes whose enactment can evolve

❖ according to situations that cannot always be prescribed, and/or

❖ according to business changes (organizational, process improvement, strategic ...)

How is adequacy can be reached ?

➔ Enhancing BP models by the capability of being **flexible** and **context-aware**

➔ a**dapting** BPs to their enactment **context** (i.e. dealing with the variability)

Business Process Modelling (1)

❖ Six modeling perspectives: functional, organizational, process, informational, operational (Van de Aalst et al, 2003) and intentional (Daoudi and Nurcan, 2008).

❖ N modelling formalisms : activity driven, product driven, decision/intention/ goal driven, conversation driven, agent driven …

❖ BP modelling languages still provide concepts for activity-oriented and product-oriented representations.

❖ Using models to represent the enterprise allows us to produce a coherent and complete description. "The task is not so much to capture a process in order to automate it, as to comprehend a process" (Odeh et al, 2002).

Business Process Modelling (1)

❖ The intention driven process modelling approaches offer the capability to highlight the 'Why', provide basis for understanding alternative way-of-workings, and when required, the reasons of change and its impact on the business processes (and systems).

❖ Need for less detailed, more concise, more usage oriented representations (Saidani and Nurcan, 2006) taking into account social and organizational factors => **goal** and **role** orientation rather than activity one.

❖ Need for representing variability and context awareness (Saidani and Nurcan, 2007)

Outline

1. Requirements for BP Adequacy

2. **Requirements for Context Awareness**

3. RBPM : Role-Based BP Modelling

4. CM4BPM : Context Model for BP Modelling

5. Conclusion and Future Work

Requirements for Context-awareness (1)

What about existing BP modelling approaches ?

- They are often rigid, do not deal with flexibility requirements and thus are not able to provide representations which are adequate for a given situation
  - ❑ Focus on operational aspects : **who does what and how ?**
- Or focus on ways of adopting or modifying business processes after a need for process change arises.
  - ❑ They capture only the reactive part of process flexibility (a posteriori flexibility) and ignore the stimulus for change, *i.e.* the context.
- Lack of approaches that support adaptability according to the contextual requirements of BPs
- ➔ Lack of models which can represent the context of enactment of business processes

Requirements for Context-awareness (2)

The ability to integrate context knowledge in BP representations allows :

- Enacting a business process model according to the context

- Ensuring BPs variability and flexibility

➔ e.g. the assignation of an actor to a role may vary according to the context in which this process is executed: if the process is running out of time, a given role should be assigned to an expert actor instead of a novice one

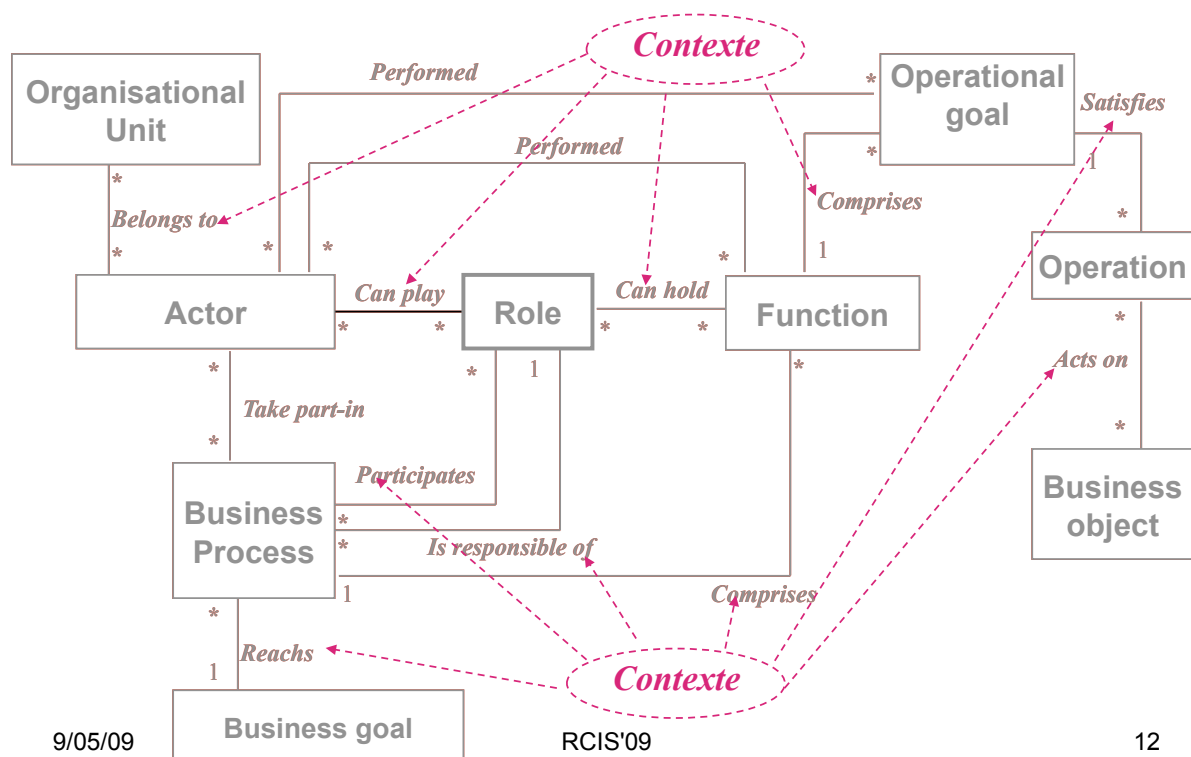# Requirements for Context-awareness (3)

Issues related to the context support provided by a modelling approach

- How the business process should behave in case of urgent situation ?

- What are the roles that can be played by an actor in a given situation and those that can not be played ?

- What are the activities that should compose a BP in a given situation ?

- Etc.

Outline

1. Requirements for BP Adequacy

2. Requirements for Context Awareness

3. RBPM : Role-Based BP Modelling

4. CM4BPM : Context Model for BP Modelling

5. Conclusion and Future Work

RBPM : Role-Based BP Modelling

Issues that need to be dealt with according to RBPM

- ❑ Which functions a business process should include in an urgent situation ?

- ❑ Which actors should be required to play a given role in a given situation ?

- ❑ What are the roles that could participate to the achievement of a process - and those that can be responsible of the process– in a given situation ?

- ❑ Etc.

Outline

1. Requirements for BP Adequacy

2. Requirements for Context Awareness

3. RBPM : Role-Based BP Modelling

4. CM4BPM : Context Model for BP Modelling

5. Conclusion and Future Work

CM4BPM : Context Model for BP Modelling
Issues to be discussed

1. What kind of context related knowledge (CRK) to take into account ?

2. How to structure the CRK ?

3. Which kind of contextual information is relevant for a specific BP ?

4. How the CRK can be used during the enactment of BPs ?

CM4BPM : Context Model for BP Modelling
1. What kind of context related knowledge to take into account ?

Context related knowledge is partly related to the application domain.

➔ *"any information reflecting changing circumstances during the modeling and the execution of a BP"* can be considered as contextual information

    ➔ To understand the organization

    ➔ To identify and to model business processes that are currently performed

    ➔ To identify the all kind of dependencies and potential impacts between elements of the organization (*e.g.* actors, BPs, information flows)

CM4BPM : Context Model for BP Modelling

2. How to structure the context related knowledge ?

Can we categorize contextual information ?

Who : actors (competency, experience, availability, age, gender, coordination ability, collaboration sensitivity, decision making capability, motivation, job involvement), **organization unit** (structure, cultural and social characteristics), **relationships between actors** (actors hierarchically closer, actors geographically closer, collaboration history)

What : resource properties (network connectivity, resource availability, cost of a 'BP chunk', time required by 'BP chunk')

How: process, activity and operation properties and requirements (security, confidentiality, repetitiveness, documentation need, duration)

When: all about the time (operation time, work duration, frequency, need of saving time)

Where: Location

Why: Link with the business goals

CM4BPM : Context Model for BP Modelling

2. How to structure the context related knowledge ?

Example of a context tree

CM4BPM : Context Model for BP Modelling

3. Which kind of contextual information is relevant for a specific BP ?

- That are a lot of information expressing the context

- In a given BP or focus, only a part of these information could present an interest for making useful assignments during the instantiation of the RBPM

→ The CT should be adapted so that, at a given time, it includes only contextual information which is relevant to a BP

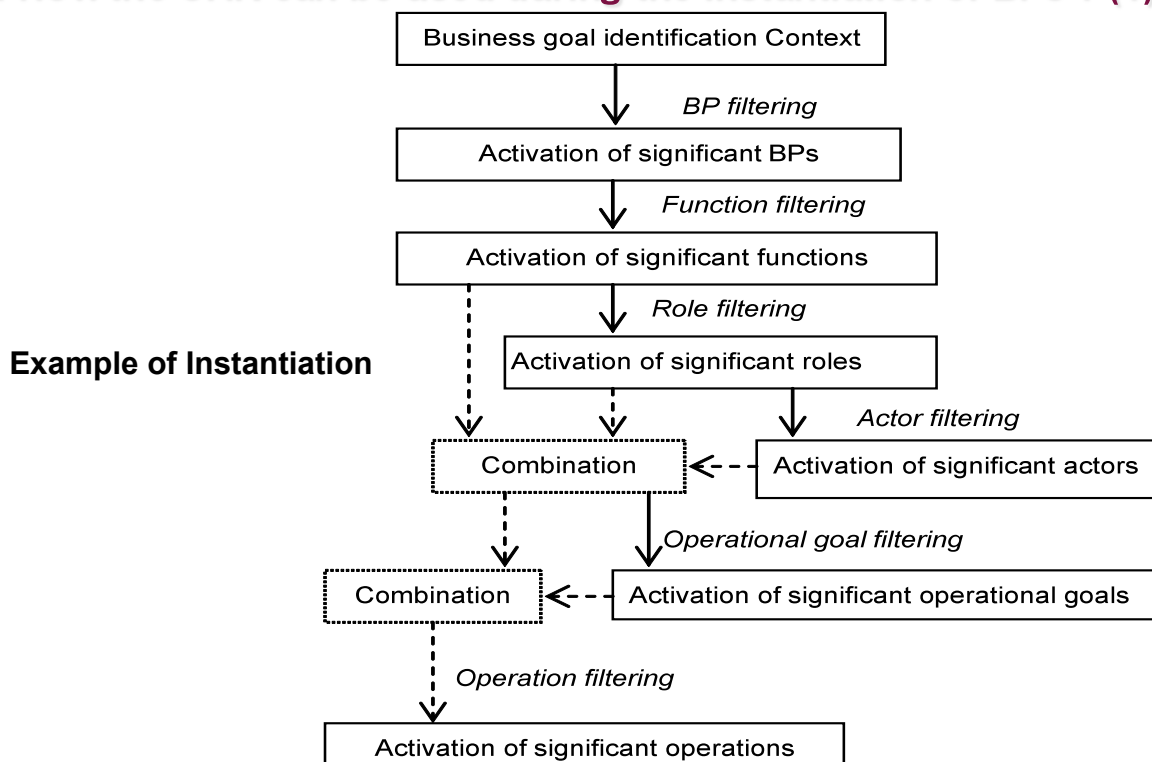→ The adapted context tree (ACT) will include only meaningful facets and attributes for the given BP

CM4BPM : Context Model for BP Modelling

4. How the *CRK* can be used during the instantiation of BPs ? (1)

Example of Instantiation

```
                    Business goal identification Context
                                  │
                                  │  BP filtering
                                  ▼
                        Activation of significant BPs
                                  │
                                  │  Function filtering
                                  ▼
                    Activation of significant functions
                          │                │
                          │                │  Role filtering
                          │                ▼
                          │      Activation of significant roles
                          │                │
                          │                │        Actor filtering
                          ▼                ▼                ▼
                        Combination  ◄- - -  Activation of significant actors
                          │
                          │                  Operational goal filtering
                          ▼                          ▼
                        Combination  ◄- - -  Activation of significant operational goals
                          │
                          │  Operation filtering
                          ▼
                    Activation of significant operations
```

CM4BPM : Context Model for BP Modelling

4. How the *CRK* can be used during the instantiation of BPs ? (2)

■ For reasoning with context, we propose using a first order predicate named *CRK*

■ A CRK can be atomic or compound. An atomic CRK has the following structure :
<Attribute, Subject, Link, Value>

■ Atomic CRK can be used in order to construct more complex CRK

■ *ATTRIBUTE* is the type of context defined by the predicate

■ *SUBJECT* refers to the thing with which the context is concerned (e.g. an actor, an activity)

■ *VALUE* is the value associated of attribute

■ LINK relates the attribute and the value. The link can be preposition (e.g. *In, At*), a comparison operator (e.g. =, >), an adverb (e.g. *near*)

CM4BPM : Context Model for BP Modelling

4. How the *CRK* can be used during the instantiation of BPs ? (3)

■ Examples for context predicate CRK :

   ❑ CRK (Experience, Georges, >, 5 years)

   ❑ CRK (Location, Georges, In, 90 rue Tolbiac – 75013 Paris) →
      CRK(Role, Georges, =, Trainee)

■ Possibility to apply Boolean operations and quantifications over CRK predicates for allowing expressing more complex predicates

■ E.g. $\exists x, x \in ACTORS, CRK(Experience, x, >, 5 years)$ is true if and only if $CRK(Experience, x, >, 5 years)$ is true for at least one value of x belonging to the set *ACTORS*

Conclusion and Future Work

- Relevance of the CRK for adequate BP modelling

- Approach using context related knowledge during BP modelling and enactment :
  - Elicitation
  - Categorization
  - Adaptation
  - BP instantiation

- Taxonomy of contextual information to capture most common CRK

- Context-awareness allows variability during the specification of process models and business rules and it allows adequacy during BP enactment

- Flexibility is brought by the concepts of **role, 'function'** and **context**.

- Changes in pieces of works of several granularities can be done at the BP type and instance level.

- Context sensitive BP models fit better variability requirements of the BPs.

Future work :
- Complete and validate the context definition
  - Provide guidelines for BP instantiation
  - Define context-based process variants
- Define metrics for qualifying and quantifying CRK
- Identify dependency relationships between elements of CRK

Thank you for your attention

Selmin.Nurcan@univ-paris1.fr

Oumaima.Saidani@univ-paris1.fr

... QUESTIONS **?**
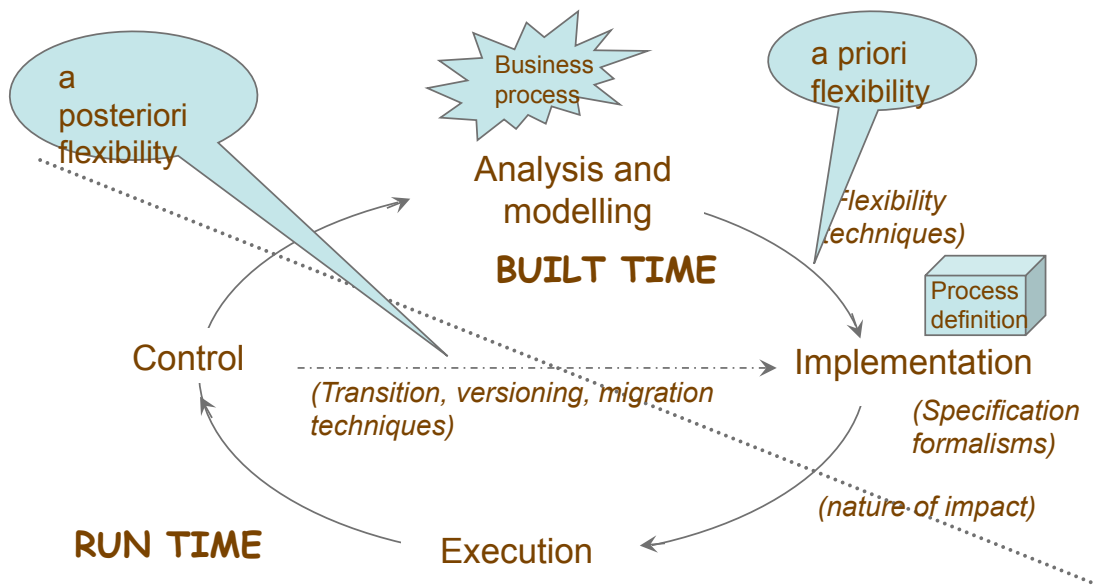
Nature of the flexibility

a posteriori flexibility

Business process

a priori flexibility

Analysis and modelling

BUILT TIME

Flexibility (techniques)

Process definition

Control

(Transition, versioning, migration techniques)

Implementation

(Specification formalisms)

(nature of impact)

RUN TIME

Execution

(HICCS 2008)