Context-Awareness for Adequate Business Process Modelling

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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
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
- adapting 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)
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 assignment 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.
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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.

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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?

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)
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
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
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:
  
  \[
  \text{<Attribute, Subject, Link, Value>}
  \]

- 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*)

Examples for context predicate CRK:

- \( \text{CRK (Experience, Georges, >, 5 years)} \)
- \( \text{CRK (Location, Georges, In, 90 rue Tolbiac – 75013 Paris)} \)
- \( \text{CRK (Role, Georges, =, Trainee)} \)

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

E.g. \( \exists x, x \in \text{ACTORS}, \text{CRK (Experience, x, >, 5 years)} \) is true if and only if \( \text{CRK (Experience, x, >, 5 years)} \) 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

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...QUESTIONS?
Nature of the flexibility

A posteriori flexibility

Analysis and modelling
BUILT TIME

Business process

a priori flexibility

Implementation

Process definition

(Control, versioning, migration techniques)

Nature of the flexibility (HICCS 2008)

Execution

Run time