Methods for the specification and verification of business processes

MPB (6 cfu, 295AA)

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03 - Lifecycle
Object

Overview the business process lifecycle

Sect.1.2 of Business Process Management: Concepts, Languages, Architectures
BP lifecycle

Five phases with logical dependencies, organized along a cyclic structure
BP lifecycle

Similar to the PDCA scheme (you may have heard of): a management method for the control and continuous improvement of products
Different, e.g., from the classical **waterfall model**: a sequential sw design process seen as flowing downwards (like a waterfall) through various phases but without feedback.
Better structured than, e.g., extreme programming methodology: intended to improve responsiveness to changing requirements and productivity, advocates frequent releases, avoiding features until needed and a flat management structure.
BP lifecycle

The logical dependencies between different phases do not imply a strict temporal ordering of their execution.

Incremental and evolutionary approaches involving concurrent activities in multiple phases are frequently used.
Business process lifecycle

Design & Analysis

Design:
- Business Process Identification and Modeling

Analysis:
- Validation
- Simulation
- Verification
Design and analysis phase

Require **surveys** on:
- the business processes
- their organizational environment
- their technical environment

Based on these surveys, business processes are:
- identified
- reviewed
- validated
- represented (by business process models)
Design and analysis phase

Context: matrix organizational structure
Modeling

Core technical sub-phase:

from informal descriptions to a particular business process modeling notation

Explicit business process models expressed in a graphical notation facilitate communication about these processes so that different stakeholders can:

communicate efficiently
refine them
improve them
Look, see, imagine, show
Validation

The initial design must be validated by checking that **all valid process instances are reflected** by the business process model.

Useful instrument: a **workshop** where the persons involved can discuss the business process model.
Validation

- desired instances
- undesired instances

proposed process
Validation

- desired instances
- undesired instances

proposed process

desired process
Simulation

Simulation techniques can support validation

Stakeholders can walk through the process in a step-by-step manner

Check whether processes expose all desired behaviour

Discover undesired execution sequences to show deficits in the process model
Verification

The business process model must be analyzed and improved to make sure:

- it actually includes all desired instances
- it does not contain any undesired properties (e.g., absence of deadlock)
- Error-prone activities, to be repeated several times, for which automatic tools are necessary
Business process lifecycle

Configuration

Configuration:
- System Selection
- Implementation
- Test and Deployment
Configuration phase

From (verified) business process models to **implementation** as

a set of policies, guidelines and procedures (to be followed by employees)

a dedicated software system (over a chosen implementation platform: a business process management system)
Enhanced models

Software systems usually require additional technical information

The model must be decorated with such data, to be exploited for configuring the system

Examples: interactions of the employees with the system, integration of existing systems, wrapping of legacy software
Testing

When the system is configured, it must be tested before deployment

Usual testing techniques from sw engineering
Integration tests
Performance tests

Other possible activities: training of personnel, migration of application data
Business process lifecycle

Enactment:
- Operation
- Monitoring
- Maintenance
Enactment phase

When the system is deployed, business process instances can be **enacted**

Typically, each process instance is initiated after an **event** occurs
(e.g., the receipt of an order)

The system must control and monitor the execution of all instances according to the model to guarantee a correct process **orchestration** (e.g., respecting dependencies)
Monitoring

At each moment in time, the current **status** of any instance must be **known** (and **logged**) by the system as accurately as possible

Both for process instances and activity instances

Fancy visualization techniques are usually provided by business process management systems (e.g., coloured activities)

Such information is highly valuable for customers (e.g., tracking of orders)
Business process lifecycle

Evaluation:
Process Mining
Business Activity Monitoring

Evaluation
Evaluation phase

Execution logs are of fundamental importance

The information collected during instances enactment can be used to evaluate and improve business process models

Business activity monitoring and process mining techniques aim at identifying the quality of the model and the adequacy of the environment
BA monitoring

Log files typically include information such as the start / end timestamps of activity instances

Activity monitoring serve to identify that certain activities take too long or need more resources

The same information can be also exploited in the simulation sub-phase of the design and analysis phase
Process mining has recently turned into an active field of research.

Thanks to mining techniques, execution logs can be used for the automatic generation of business process models in the design and analysis phase.

They can also be used to assess and compare different models to see which fits best the enacted instances.
Business process lifecycle

Administration and Stakeholders
Administration phase

Business process management involves numerous artifacts at different levels of abstraction.

Such artifacts need to be organized and managed (storage, retrieval, disposal).

A well-structured repository is needed, with powerful query mechanisms.
Stakeholders

Several types of stakeholders co-exist in the process domain

They have different kind of educational background, knowledge, expertise, experience

Roughly, they can be classified into a few roles

CPO  BE  PD  PP  KW  PR  SA  Dev
Chief process officer

Top level management
(CPO reports directly to CEO / board of directors)

Responsible for defining rules, policies and guidelines and establishing control mechanisms

Responsible for standardizing and harmonizing business processes in the enterprise

Responsible of business process evolution in the presence of changing market requirements
Business engineer

Business domain expert

Responsible for defining strategic goals of the company and organizational business processes

Often equipped with non-technical educational background (mostly economics)

It is preferred to communicate with these stakeholders by means of simple-to-use process modeling notation
Process designer

Responsible for modeling business processes by communicating with business domain experts and other stakeholders.

Must be equipped with good analytical capabilities and excellent communication skills.
Process participants

Conduct the actual operational work during the enactment of business process instances

They are knowledgeable about the activities conducted and thus play a fundamental role for the modeling phase

Their information must be assembled by the process designer to compose an overall picture and put it in the process model
Knowledge worker

Process participants who use software systems to perform activities in a business process, often autonomously
Each business process model is assigned an individual who is held responsible for the correct and efficient execution of all business process instances of this model.

Responsible for detecting inefficiencies and improving the process model.

Close collaboration with process participants and the process designer is needed.
System architect

Responsible for developing and configuring business process management systems on the information system infrastructure at hand
Developers

Information technology professionals

Responsible for creating the software artifacts required to implement business processes

Implementation of interfaces is a relevant part of the work done by developers