

# Dynamic business process: comparative models and workflow patterns

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**Abstract:** Business is rapidly changing nowadays to meet the requirements of a changing environment and to fulfil the customers' needs. All those changes of a business have to be implemented in business processes (BP) and their maintaining information systems (IS). Therefore, a necessity of new approaches for the dynamic business process (DBP) for their modelling, dynamic execution, simulation and management, This gap triggered significant research efforts and a number of approaches to solve DBP modelling problems and ensures the processes dynamicity. In this paper, we present the foundation design of DBP workflow management system (WFMS). We give special emphasis to the investigation of modelling BP, we investigate some fundamental concepts in this domain related with hypergraphs which concepts is strongly supported in Modeling of the BP.

**Keywords:** DBP, BP modelling, workflow, dynamic environment, hypergraph

## Introduction

Modeling of BP [17] is a very active topic in recent years. Because processes are a dominant factor in workflow management, it is important to use an established framework for modeling and analyzing workflow processes [10, 11.12], Modern enterprises and organizations operate in a dynamic environment [4] that is constantly evolving. Organizational theories emphasise that organisation must adapt their environment.

Workflow specifications can be understood, in a broad sense, from several different perspectives [2, 1]. The control-flow perspective (or process) describes activities and their execution ordering through different constructors, The data perspective layers business and processing data on the control perspective. Business documents and other objects which flow between activities, and local variables of the work-flow, The problem will be presented in this research is that the scope of our patterns is limited to static control flow, i.e., we do not consider patterns for resource allocation , case handling , exception handling and transaction management [18]

The organization of this paper is as follows. First, we will start with an introduction to the topic followed by the corresponding literature review, Then we will give workflow definition and various patterns a, then the different tools and languages are defined and the impact of environment when DBP represented , that follows with a simple approach of representation which proposed to mapped DBP in correct way .Finally, we conclude the paper and identify issues for further research.

## Literature review

The concept of DBP and DBP modeling [7] is widely differing. Generally, the definitions refer to changes within the external and internal environment[19], and the consequences can be traced through adding, deleting, replacing components representing activities [8]. Optimization algorithm that capable to of continuously adapting a solution to changing environment for each change a different optimization approach required [4]. The combination of internal and external factors that influence a company's operating situation the business environment can include factors such as: clients and suppliers; its competition and owners; improvements in technology; laws and government activities; and social and economic trends,the changes can be accomplished at operational level on the structure of the workflow and instance of a single process, however the modifications of content and business logic included in the activities are not analyzed. Jain et al. [10] examine the impact of internal changes on BPs and the capability of the processes to adapt themselves to the changing environment Hermosillo et al. [18] postulate that processes should be capable for dynamic adaptation to different scenarios, although the method for adaptation cannot be exhibited in detail. Mejia et al. [16] outlines an approach for dynamic adaptation based on Even-Condition-Action.

## Workflow

Workflows are a well-established concept to formalize BP and support their execution by a workflow management system. Workflows are “the automation of a BP, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules” [7]. In this section we will present various patterns of which define the basic modeling patterns of BP:

- Sequence: is an ordered series of activities, one activity starting after a previous activity has completed.
- Exclusive choice: defined as check point allows to make a choice of the execution path, the process path is chosen using a decision or condition
- Parallel split: is defined that two or more activities will start at the same time and it is a point in the process where a simple control link is split into multiple control links running in parallel.
- Multiple choice: is differs from exclusive choice pattern in that the multiple-choice pattern allows from one to all the alternative paths may be chosen at performance time
- Multiple merge: is a location in the process where multiple paths merging, but without any control and is a point in the process in which one or more branches of the control thread join without the need for synchronization
- Cycle: is a mechanism repeat the same instructions multiple times with conditions. In next section we will introduce BP modelling tools, their benefits and various kinds and languages .

## BP modeling tools

A BP is defined as “a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer” [3]. BP modeling tools allow you to represent your process in a digital way that can then be transferred to a live automated process. There are many benefits to BP modeling:

- Gives a clear understanding of how the process works
- Provides consistency and controls the process
- Identifies and eliminates redundancies and inefficiencies
- Sets a clear starting and ending to the process

There are two kinds of models: Dynamic and Static, most of currently used enterprise modeling technologies can be considered as static. In real life scenarios BPs are not static. That’s why demand for non-static models appears. The reference [6,5] contains comparison between static modeling and dynamic modeling: Dynamic model facilitates the display of activities and flow of events within a process. The advantage of using dynamic modeling is that it enables the outcome of a changed process to be evaluated prior to it being implemented into the physical environment. Static models have deterministic nature and are independent of process sequence, it may depend on the data collection and documents that are processed during the flow of information. Currently, most workflow languages support the basic constructs of sequence, iteration, splits (AND and OR) and joins (AND and OR). However, the interpretation of even these basic constructs is not uniform and it is often unclear how more complex requirements could be supported. Indeed, vendors are afforded the opportunity to recommend implementation level “such as database triggers and application event handling. The result is that neither the current capabilities of workflow languages nor insight into more complex requirements of BP is advanced. Process models are only useful if they actually help to improve processes. For example, verifying the absence of deadlocks in models is a prerequisite for process automation. However, models that are sound but at the same time not used to configure a BPM system do not improve performance. BP need to be managed in environments where processes are only partly documented, and a range of information systems is used. These systems are often “unaware” of the processes in which they are used [9] .

## Proposal approach

In this section we will explain main idea of this research, we investigate the opportunities for integration of document-centric approaches for information systems modelling and genre of BP modelling. We have a look at the dynamic aspects of BP, i.e the requirement for changes during operation and the necessary interactions with models of the information system.

We analyse the possibilities for representing the significant artifacts of information systems modelling as processes, the underlying documents and data structures in a unified mathematics representations, namely in hypergraphs which is strongly supported in Modeling of BP . The proposed research gives special emphasis to the investigation of modeling BP, we investigate some fundamental concepts in this domain. The first refers to BP [13] and then BP management [14] Hypergraph is a structure describe complex relationships can be explored among models during analysis and design of IS, it is a generalized graph theory plays a very important role in discrete mathematics [15]

The mappings with hypergraph presented, assigning a formal semantics to workflow languages, together with the *“notion of equivalence, then allow an in-depth investigation into expressiveness properties of various properties and activities of DBP.”*

## Conclusion

In this paper, we just propose and present the main idea and describing hypergraph as representation for a DBP, the suggested method takes advantages of the basic properties of generalized hypergraphs. there are some distinguished features: • The structure of the hypergraph can be interpreted as an ontology, thereby it opens the way for DBP representation and reasoning. And considers the time constraints and can be used to analyze the system • It would be a typical specification for a coded solution where we assume that during the coding we find an implementation. • Explain in details in full paper our proposal about DBP modelling and document-centric modelling using the hypergraphs This approach can also be considered as a background to analyse and design another complexes BP or DBP models or complexes IS and shows the hypergraph-based approach offers the chance to apply further mathematical tools for assistance in design.

## References

- [1] S. Jablonski and C. Bussler. Workflow Management: Modelin]g Concepts, Architecture, and Implementation. International Thomson Computer Press, 1996.
- [2] W.M.P.vanderAalstandK.M.vanHee. Workflow Management: Models, Methods, and Systems. MIT press, Cambridge, MA, 2002
- [3] Hammer, M., Champy, J.: Reengineering the corporation: A manifesto for business revolution. Harper Collins (2009)
- [4] Evolutionary optimization in dynamic environments 3 editio book J Branke - 2012 volume 8672 of LNCS, pages 24–39. Springer
- [5] Rosenberg. A. (2010) Dynamic versus static modeling types, SAP Modeling Handbook - Modeling Standards, <https://wiki.scn.sap.com/wiki/display/ModHandbook/SAP+Modeling+Handbook++Modeling+Standards> ( accessed: April 27, 2017).
- [6] Billington, J., et al. & Weber, M. (2003). The Petri net markup language: concepts, technology, and tools. In International Conference on Application and Theory of Petri Nets (pp. 483-505). Springer Berlin Heidelberg.
- [7] Mirjam Minor and Ralph Bergmann and Sebastian Görg.: Case-based adaptation of workflows. Information Systems. 40, 142 – 152. (2014).
- [8] Adams M.(2010). Dynamic Workflow, Hofstede et al. Modern BP Automation, Springer-Verlag Berlin Heidelberg, 123145
- [9] Dumas M (2015) From models to data and back: the journey of the BPM discipline and the tangled road to BPM 2020. In: Proceedings of the 13th International conference on BP management. Springer, Heidelberg
- [10] K. Hayes and K. Lavery. Workflow management software: the business opportunity. Technical report, Ovum Ltd, London, 1991.

- [11] T.M. Koulopoulos. *The Workflow Imperative*. Van Nostrand Reinhold New York, 1995.
- [12] P. Lawrence, editor. *Workflow Handbook 1997*, Workflow Management Coalition. John Wiley and Sons, New York, 1997
- [13] Camille Salinesi and Laure-Hélène Thevenet. *architecture Enterprise, From practical problems to innovation*. *Information Systems Engineering*, 13(1) :75105, 2008.
- [14] *Business Process Management: Models, Techniques, and Empirical Studies* publié par Wil, van der Aalst, Jörg Desel, Andreas Springer -31 juil 2003
- [15] Cui, K, Yang W, Gou, H: Experimental research and finite element analysis on the dynamic characteristics of concrete steel bridges with multi-cracks 19(6).4198-4209 (2017)
- [16] Mejía, O., F. Pérez-Miranda, Y. León-Romero, E. Soto-Galera & E. Luna. 2015. Morphometric variation of the *Herichthys bartoni* (Bean, 1892) species group (Teleostei: Cichlidae): how many species comprise *H. labridens* (Pellegrin, 1903)? *Neotropical Ichthyology*, 13: 61-76.
- [17] ARIS, *Business Process Modeling* August-Wilhelm Scheer Springer Science & Business Media, 27 nov. 2013 - 220
- [18] W.M.P. van der Aalst, A.H.M. ter Hofstede, B. Kiepuszewski , and A.P. Barros. *Workflow Patterns*, February 2016, Volume 58(1). 1–6
- [19] Bouafia, K, Molnár, B.: Adaptive Case Management and Dynamic BP Modeling A proposal for document-centric and formal approach. In: 12th AIS 2017. (2017).