Chapter 2
A Version and Context-Based Approach to Easily Model Flexible Collaborative Processes

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ABSTRACT

Process flexibility has been investigated for intra-organizational processes, but it is still an open issue for collaborative processes (CP), each of which is defined as a set of intra-organizational processes that interact together. In the literature, the version-based approach is largely used in the field of business process management (BPM) to cope with process flexibility. However, BPM practitioners can face difficulties in a multi-version environment. So, the following questions arise: How can we use the version-based approach to easily model flexible CP? Does an appropriate version exist for a given situation or is it necessary to create a new one? The chapter answers these questions recommending a solution for the modeling of CP versions and the retrieval of the adequate CP version for a given situation. This solution comprises (1) a meta-model to consider the modeling of the CP versions, (2) an ontology-based approach to model and query the context of use of CP versions, and (3) a framework to provide support for both the modeling of CP versions and the context querying.

INTRODUCTION

Process flexibility is an active research area in the field of Business Process Management (BPM). It is defined as the ability of processes to respond to both foreseen and unforeseen changes occurring in their operating environment. Change support is important for processes running within a single company (*i.e.*, intra-organizational processes), but also for Collaborative Processes (CP), which are processes crossing the boundaries of companies. More precisely, a CP is defined as a set of independent intra-organizational processes/partners interacting together (Aalst, 2000). BPM tools are convenient to manage CP that do not change over time. However, flexibility of CP, which corresponds to the ability of CP to change over time, has not been deeply investigated and it is still an open issue (Cognini, Corradini, Gnesi, Polini, & Re, 2018). This issue is very important as the strong competition between companies leads them to frequently change and adapt their CP to face new clients' requirements or to benefit from new collaboration opportunities.

In the literature, the version-based approach is largely used to cope with process flexibility, notably in the context of intra-organizational processes. Many research contributions have recommended the version-based approach to address process flexibility (*e.g.*, (Ben Said, Chaâbane, Bouaziz, & Andonoff, 2018; Chaâbane, Bouzguenda, & Bouaziz, 2011; Dadam & Reichert, 2009; Ellouze, Chaâbane, Bouaziz, & Andonoff, 2016; Ekanayake, La Rosa, ter Hofstede, & Fauvet, 2011; Kradolfer & Geppert, 1999; Zhao & Liu, 2013)) for the following reasons. On the one hand, it is the basic reality in companies: new technologies, governmental rules, organizational contexts or the adoption of new standards lead them to define several versions of their processes. On the other hand, it helps address four main needs of process flexibility (Reichert & Weber, 2012): (i) flexibility by variability, since it is possible to model alternative versions depending on the context of their execution, (ii) flexibility by evolution, since the different significant changes on processes are modeled within process versions, (iii) flexibility by looseness, since it is possible to model not completed versions, and (iv) flexibility by adaptation, since it is possible to model versions for occasional situations or anticipated exceptions.

However, BPM practitioners can face difficulties in a multi-version *environment*, mainly when modeling CP versions, due to the proliferation of versions. Therefore, the research question addressed in this paper is "how can we use the version-based approach to easily model flexible CP?" This question leads to another one, which is related to the reuse of (CP) versions, and, which can be summarized by the following question "Does an appropriate version exist for a given situation or is it necessary to create a new one?" This question is of utmost importance in a multi-version environment, where numerous versions co-exist. More precisely, in such an environment, BPM practitioners (*i.e.*, BPM end-users and designers) have to face the problem of selecting, among different versions, the most appropriate one to a given situation/context. This selection is required both at run-time, if BPM practitioners have to select the version of a CP to be executed, and at design-time, if they have to select an existing (CP) version to be used to make up a new (CP) version.

As each version is required in a specific context, it becomes crucial to consider the context to select an appropriate (CP) version. In the BPM area, the notion of context is defined as "the minimum of elements containing all relevant information that impact the design and the execution of a process" (Rosemann, Recker, & Flender, 2008). Actually, several taxonomies have been proposed to classify these context elements (*e.g.*, (Brocke, Zelt, & Schmiedel, 2016; Rosemann *et al.*, 2008; Saidani, Rolland, & Nurcan 2015; Wang, Zhang, Gu & Pung, 2004)). We outline the largest one, described in (Rosemann *et al.*, 2008), which distinguishes four types of context (i) immediate context, which covers elements

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