Flexibility and Compliance in Workflow Systems - The KitCom Prototype

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Abstract. Managing workflows is becoming increasingly flexible on both the conceptual and the technical level. However, workflow flexibility has to be accompanied by comprehensive access to information and the processing of it. Validating compliance is a still disregarded but crucial aspect though in flexible workflows where a lot of information is processed. In this contribution, a novel prototype named "KitCom" is presented, aiming at an automated adaptation of controls to realize flexible and compliant workflows.

1 Flexibility <u>and</u> Compliance – Precondition for Effective Workflow Management

A significant majority of companies use information and communication technology to support and execute their business processes (BP) and workflow management systems have been common practice for many years [1]. Increasing need for fast and efficient adaptation to changing demands from markets or customers' individual needs keeps flexibility of BP top on the agenda of many companies [2, 3]. However, a flexible adaptation of ongoing workflows to new demands is necessary and challenging [4, 5].

Apart from flexibility, a second important characteristic of workflow execution is the validation of compliance with given rules and laws [6]. While compliance and, in particular, controls can be seen as a contradiction to flexibility and therefore might be neglected, compliance is still a necessary condition for executing workflows [7]. Hence, the integration of controls into workflow schemes is used today to ensure that policy rules of companies are followed at the expense of gaining flexibility. As a novel approach, integrating controls individually into workflow instances and not into schemes also opens up new ways of providing flexibility [8].

In the following chapter, a method for flexible integration of controls into workflow instances, named "FlexCom", is briefly described. This method aims at both the need for restrictive controls and the required flexibility of business processes. In chapter

three, a novel prototype called "KitCom" is presented, which is an implementation of the summarized model-based method of chapter two. This contribution then ends with a short conclusion.

2   Flexibility and Compliance in Workflow Systems

The main challenge to satisfy both the need for flexibility and the compliance to policy rules is the integration of control activities into workflows during execution without disturbing them. The development of new methods and tools for changing workflows "on the fly" according to actual environmental conditions and without violating compliance requirements is an emerging field of research [7, 9-11]. The basic idea of our approach is to provide a methodic basis for identifying and adapting effective control activities on the level of individual instances of processes (For more details see [8, 12-14]).

The model-based "FlexCom" approach that is briefly presented in the following includes two main areas: firstly, the definition of reference controls that shows a way of how control activities can be executed. It basically separates workflows and controls at the construction time of the model. Secondly, an approach is presented for integrating control activities into workflows "on the fly" at run time.

2.1   Definition of Reference Controls

The generic starting point for a methodic integration of control activities into workflows is the definition of (formal) compliance requirements. For each compliance requirement, at least one or a set of general reference controls has to be defined. Such reference controls can be seen as a template where activities and objects involved as well as the general structure of the controls are already designed [14]. For instance, the "second set of eyes" principle (compliance requirement) can be performed in several ways: it can be realized as a sequential execution of control activities or with two control activities in parallel. Furthermore, it can be performed executing two control activities successively or with other workflow activities in between. This template has to be substantiated at the moment when the reference control is instantiated. Thus, reference controls are similar to the schema of workflows which can produce several instances if executed [15] and can be modeled with the same tools [16]. When all relevant reference controls are defined, the selection of appropriate controls and their integration into the workflow is the next consecutive step.

2.2   Integrating Controls into Workflows "on the fly"

A flexible integration of reference controls in the form of concrete control activities into workflow instances during their execution has a significant advantage: there is more information available than at design time. Such information can be used for adapting a workflow and control activities to the actual process context, for instance to implement control activities. Furthermore, the integration "on the fly" allows

control activities to be integrated only if they are actually needed in a specific instance and, consequently, can reduce the complexity of business process execution.

For realizing such an integration "on the fly", information such as inputs, outputs, or the timeframe, which define the setting for the control activities, have to be taken into account [14]: validity period, activities as precondition, and/or activities as postcondition have to be defined. This additional information is saved as part of the reference controls and called control parameters. Using all these pieces of information makes it possible to identify points for integrating concrete control activities into workflows by the help of automated search algorithms. Therefore, the control parameters saved for each reference control have to be checked against the workflow instance information. Since there might be many points in a workflow where integration is theoretically possible, a reduction to efficient control points can be achieved by known methods already used by companies for many years: for instance by path analytics calculating the so-called critical path [17]. In a first step, we integrate the controls as early as possible following a prudence principle, while identifying the optimal integration point is part of current research.

3 The KitCom Prototype

A prototype called KitCom was created to integrate reference controls "on the fly" into ongoing workflow instances. Following the FlexCom approach, the prototype requires two parts: first, reference controls, including the definition of situations in the workflow instance where an injection of reference controls is necessary, have to be modeled, e.g., by a compliance officer. Secondly, the execution engine of a workflow management system needs to be extended to automatically perform the modeled actions and integrate the modeled reference controls (see Fig. 1).
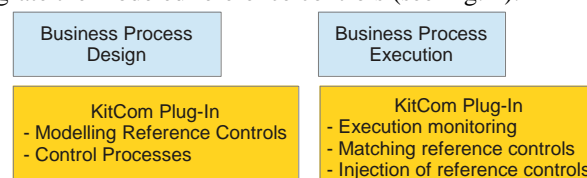
Business Process Design	Business Process Execution
KitCom Plug-In - Modelling Reference Controls - Control Processes	KitCom Plug-In - Execution monitoring - Matching reference controls - Injection of reference controls

Fig. 1. The two conceptual parts of KitCom

Therefore, we extend the Aristaflow BPM Platform [18, 19]: On the client side, the Process Template Editor is extended for modeling reference controls. On the server side, the so-called LogManager is extended for intercepting execution events.

To easily follow the working of KitCom, an exemplary workflow (activities if an invoice is received) will be presented and a control (orders above 5,000€ which are captured by the user "Meyer13" must be checked) will explain the working of the method. In a first step, a process designer has to create and develop the workflow in the Process Template Editor as shown in Fig. 2.
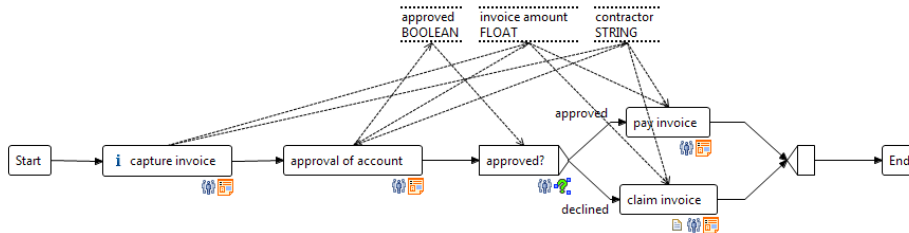
Fig. 2. Example Workflow created with the AristaFlow Process Template Editor

In a second step, a compliance officer has to create and define a reference control. In the simple example, only one control activity is defined: An accounts clerk has to compare the invoice amount with the condition of the contract (see Fig. 3). Since the AristaFlow Process Template Editor is implemented using Eclipse RCP, it can be easily extended with additional plug-ins (Reference Control Editor, Control Process Repository, Control Parameter). Therefore, a separate view in the AristaFlow Process Template Editor was created.
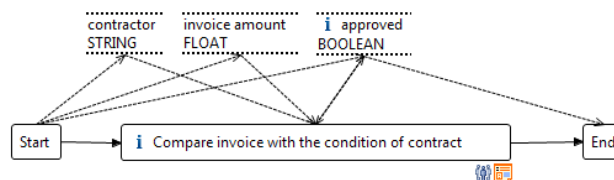

Fig. 3. Exemplary Reference Control in KitCom

Subsequently, the definitions of the control parameters have to be made in the extended Process Template Editor (see Fig. 4).
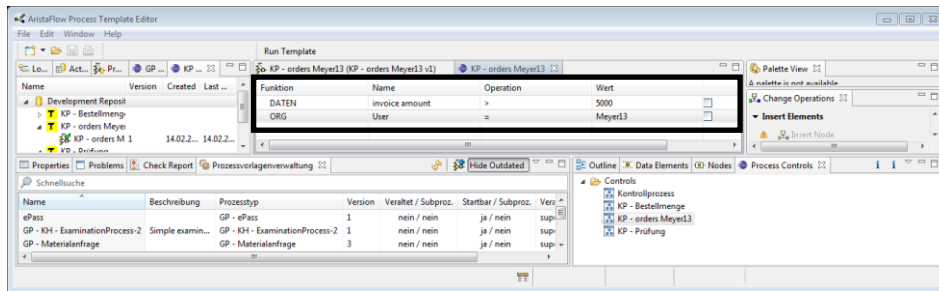

Fig. 4. Control Parameter Part in KitCom

Defining all three parts (Figs. 2, 3, and 4) then allows the execution of the workflow and should ensure compliance throughout its execution. Therefore, all events concerning the execution and adaptations of the ongoing workflow instance need to be monitored by KitCom. Within the AristaFlow Platform, all these events, e.g. start of a new workflow instance, finishing a workflow step, etc., are centrally logged in the Execution History, using the Log Manager Service of the platform. The Execution History is updated synchronously and the Log Manager Service is extensible. Therefore, the ideal place for KitCom is on the execution/server side. The information of

execution events in the extended Log Manager is used for identifying relevant reference controls. If the requirement of a control is detected, the execution of the workflow instance is suspended. Using the API for adhoc-deviations [20], the control is injected into the workflow instance. Fig. 5 shows an overview of the architecture of our KitCom prototype (white/blue fields are the original components of AristaFlow, grey/yellow fields are the extensions characterizing KitCom).
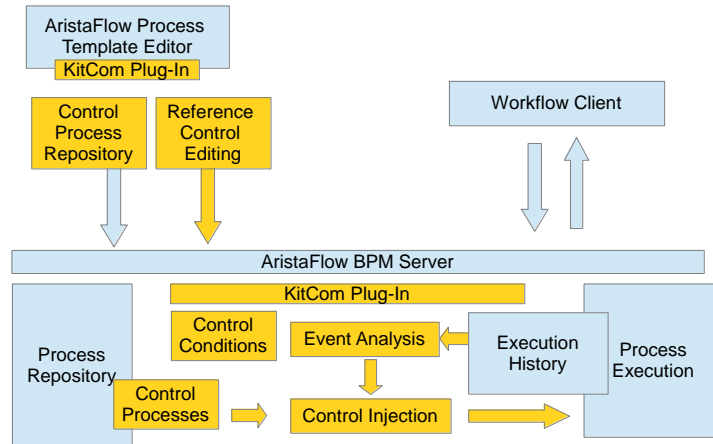

Fig. 5. KitCom: prototype architecture

After the injection of the control activities, the execution of the workflow instance is resumed. The prototype works as follows: Firstly, the workflow without control is started (see Fig. 5).
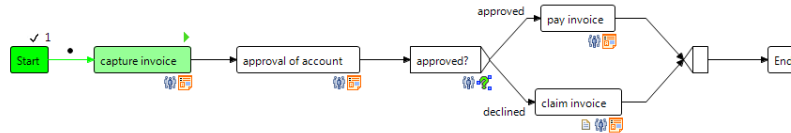

Fig. 6. Usual Workflow Execution with the Software AristaFlow

Secondly, if the user "Meyer13" captures an invoice with an amount above 5,000€, the reference control will automatically be integrated as a sub-process called "Kontrolle" shown in Fig. 6, following the definition of reference controls and control parameters (Figs. 3 and 4).
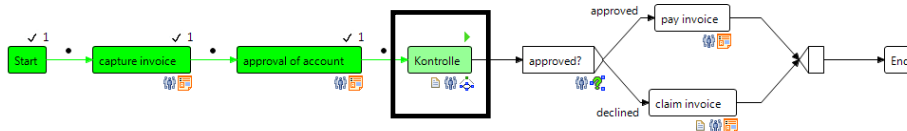

Fig. 7. Automatic Integration of the Reference Control
into the Workflow Instance through KitCom

While only one demonstration example is shown in this chapter, a lot of other information can already be integrated with KitCom. Known approaches on business process compliance provide several criteria for modeling controls, such as the COMPAS project [21], which identifies generic criteria on the basis of a comprehensive compliance legislation review. Other authors, such as [10, 22, 23] identify generic criteria, too. As aggregated in [14], all these control parameters can be defined as control parameters in KitCom.

Although the underlying control model of the approach presented is very general and obviously requires a more dedicated analysis, the prototype has the general functionality for integrating control activities into workflows during execution to satisfy both the need for flexibility and the compliance to policy rules.

4 Summary and Outlook

The aim of this contribution was to present the novel KitCom prototype, which is based on a method to flexibly integrate controls into workflows in an automatic manner. While the working of the prototype was only shown with one demonstration example in this contribution, KitCom is a promising application for integrating any kind of control activities into workflows during execution. The solution is independent of the implementation of a Workflow Client, since it integrates directly into the process engine. The screenshots show the AristaFlow Workflow Client. However, the prototype implementation also works for any custom Workflow Client implementation. Future research has obviously to be carried out with regard to a more dedicated control model, e.g. by adapting our approach to existing control taxonomies. Further extensions of the prototype are also required to meet more realistic and complex compliance goals, for instance by aiming to include control actions such as limitation of the users, who may execute a process step only in a special timeframe or when a process step may be delegated, etc. In conclusion, KitCom is seen as a promising next step in automating compliance that helps to react in an automatic manner – if business processes need to remain flexible.

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