BCIT: A Tool for Analyzing the Interactions between Business Process Compliance and Business Process Change

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Abstract. Business processes as well as their supporting information technology (IT) can be affected by compliance requirements. In the case of changing the business process, an IT component or a compliance requirement the interactions between business process compliance (BPC) and business process change must be determined to ensure BPC. However, there is a lack of tool-support that can analyze the interactions between BPC and business process change considering compliance requirements and supporting IT components. Therefore, we developed the prototype BCIT (Business Process Compliance and IT) which can analyze these interactions considering the change patterns "delete element" and "replace element".

Keywords: business process compliance, business process change, compliance process, information technology, software prototype

1 Introduction

Business process compliance (BPC) denotes the execution of business processes in adherence to applicable compliance requirements [1]. Not only business processes but also information technology (IT) components that can support certain business activities can be affected by so-called compliance requirements. In dynamic markets, the rapid detection of compliance violations and the adherence to the demands of compliance requirements to changed business processes and supporting IT components are necessary [2]. Thus, in the case of a business process change, which includes the change of a business activity, IT component, or compliance requirement, the effects on business process compliance must be automatically determined [3]. Although, there are numerous process modeling tools, such as ARIS Architect, Bizagi Studio, Camunda Modeler and Signavio Process Manager, to the best of our knowledge, there is a lack of a tool that automatically determines the interaction between BPC and business process change considering compliance requirements and supporting IT components. Therefore, the goal of our paper is to present the software prototype BCIT (Business Process

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Compliance and IT), which is able to determine those interaction between BPC and business process change.

The rest of the demo paper is structured as follows: Section 2 defines preliminaries and provides a motivation example that can be solved by our prototype. Section 3 shows the architecture and implementation of our prototype; and finally, Section 4 concludes the paper.

2 Business Process Compliance and Business Process Change

There are various approaches used to check for or ensure BPC. One possible solution to ensure BPC during the design time of the business process is the separate modeling of so-called compliance processes and their integration into the business process. In this context, a compliance process is defined as an independent process (part) consisting of at least one compliance-related activity that ensures BPC [4].

In the literature, many business process change patterns are discussed. In the following, we focus on the change patterns “replace element” and “delete element” (e.g. [5]) because they allow the determination of relationships between a changed element and compliance requirement or a compliance process in a user-provided model. The replace pattern replaces an existing element with a new one, while the delete pattern removes an existing element. Business process change patterns can also be applied to views other than a control flow perspective of a business process. In our case, they are applied to the perspectives compliance and IT architecture. Further, we define an interaction between BPC and business process change, if due to a change, an element is either affected by a compliance requirement or compliance process and a change affects a compliance requirement or compliance process.

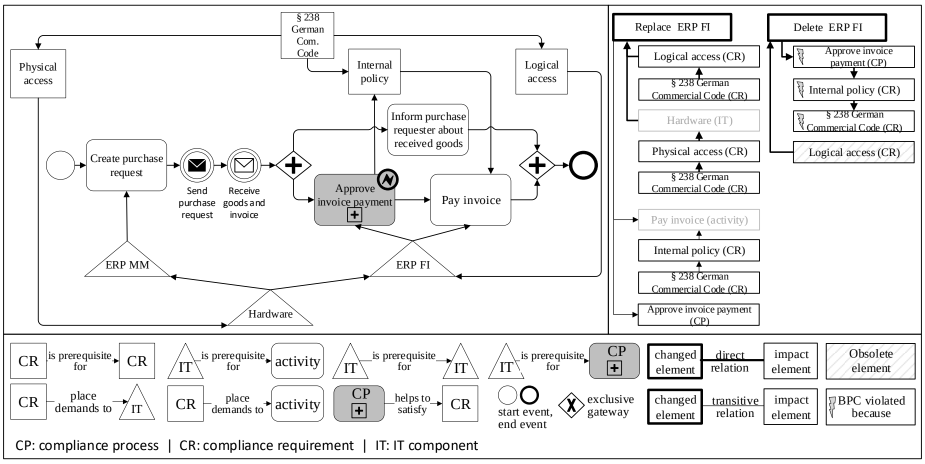

Fig. 1. Motivation example: purchase-to-pay process (based on [3])

The left side of Figure 1 shows a simplified purchase-to-pay process including IT components that support both business activities and the compliance process, which is based on our previous work [3]. Further, relevant compliance requirements (CR) of business activities and IT components (IT) are modeled in the process model. The compliance process (CP) “approve invoice payment” helps to satisfy the “internal policy”. In the event of a compliance violation, the compliance process aborts the business process instance. The right side of Figure 1 shows the interaction between BPC and business process change. In the event of replacing the IT component “ERP FI”, both compliance requirements “physical access” and “§ 238 German Commercial Code” must be directly considered because “ERP FI” must consider all compliance requirements of their prerequisite IT components. In addition, the “internal policy” must be considered as well because there is a transitive relation between “ERP FI” and this compliance requirement. “ERP FI” is necessary for the execution of the compliance process “approve invoice payment”, which is in turn necessary to satisfy the “internal policy”.

In the case of deleting the IT component “ERP FI” the compliance requirement “internal policy” and its prerequisite “§ 238 German Commercial Code” are violated. In this case, the compliance process “approve invoice payment” that helps to satisfy the “internal policy” cannot be executed since “ERP FI” is a prerequisite to execute this compliance process. Additionally, the “logical access” becomes obsolete.

3 Tool Architecture and Implementation

We developed the software prototype BCIT[1], which is available as a cross-platform desktop application, based on the software frameworks Node.js and Electron. Figure 2 describes the basic interaction between the components of BCIT to perform each user step. When starting BCIT, the component *app* each create an object of *process-view*, *IT-architecture-view* and *compliance-view*. According to [3], the user has to follow three steps to analyze the interaction between BPC and business process change. First, the necessary models business process, IT architecture and compliance requirements have to be imported. Second, the appropriate elements of the imported models have to be linked together, and third, the element that shall be changed has to be defined.

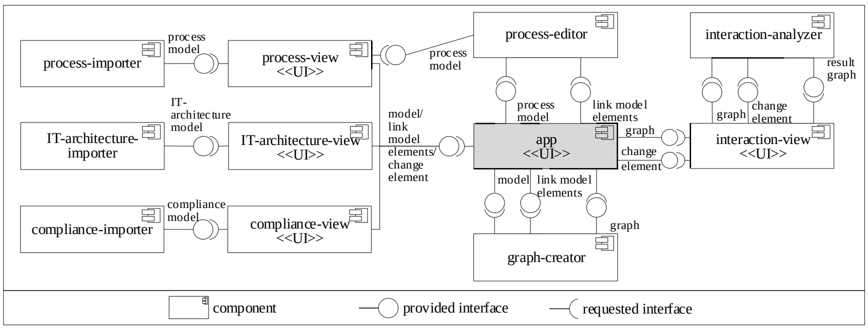

Fig. 2. BCIT architecture as a UML component diagram

1 Our prototype, the sourcecode, a screencast and further information can be found at: http://informationsmanagement.wiwi.uni-halle.de/projekte/bcit/

Import Models: Within the component *process-importer*, we use bpmn-js [6], a JavaScript library for parsing, visualizing and modifying BPMN process models to import process models. This library is also used for the visualization of process models in the component *process-view*. In addition, within the component *IT-architecture-importer,* we built a parser that can read The Open Group's ArchiMate XML exchange format to import IT architectures. The *IT-architecture-view* uses the graph library Cytoscape [7] to visualize the IT components and their interrelations. Finally, the component *compliance-importer* can import compliance requirements that are provided either as JSON files or as formal XML files by the German Federal Ministry of Justice.

Link Models: Next, the user must link the corresponding elements of the imported models together. Here, the following relationships are possible: process flow element and IT component, process flow element and compliance requirement, IT component and compliance requirement, and compliance requirement and compliance requirement. Technically, within the component *graph-creator* the imported models are transformed into a single graph $G = (V, E, F, H, I)$ with its elements $g_i \in G$. The graph is modelled using the graph library Cytoscape [7]. In this graph, V is a nonempty finite set of vertices, $e_l \in E$ is a directed edge between two vertices (v_i, v_j) and $f_i \in F$ is the unique identification (id) of the vertex v_i. In addition, $h_i \in H$ is the model type of the vertex v_i with $H = \{P, IT, CR\}$, which corresponds to the imported model types process (P), IT architecture (IT) or compliance requirement (CR). Finally, $i_l \in I$ contains the individual properties of vertex v_i. In case a process flow element is marked as a compliance process, this information is available in $i_l \in I$.

When linking two elements together, the *graph-creator* generates the corresponding edges between the vertices of the linked elements. In the case of linking an IT component or compliance requirement to the process, the *process-editor* (1) extends the respective extension element of the process flow element by the id of the added vertex and (2) adds a data storage symbol or rather a data symbol to the process flow element. Then, the *process-viewer* visualize the updated process model again.

Define the Element to be Changed: For analyzing the interactions between BPC and business process change, the user has to define the element to be changed. This element can be a compliance requirement, IT component, or a process flow element that includes a compliance process. The *interaction-analyzer* always performs the analysis when the *interaction-view* is opened. The analysis is based on the graph that was generated and adjusted in the previous step. Figure 3 shows the algorithm used to analyze the interactions between BPC and business process change by replacing an IT component.

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Input: Graph g, element to be replaced v ∈ g where h=it architecture
// get all direct related compliance requirements and compliance processes to v
Foreach k in (get all predecessor of v where h=compliance requirement) do
└ mark k as direct AND add k including all vertices between k und v to result
// get all transitive related compliance processes and compliance requirements to v
Foreach it in (get all leafs of v where h=it architecture) do
│ Foreach activity in (get all direct successor of it where h=business process) do
│ │ Foreach cr in (get all direct predecessor of activity where h=compliance requirement) do
│ │ │ k = get all predecessor of cr
│ └ └ mark it, activity, cr and k as transitiv AND add to result
│ Foreach complianceprocess in (get all direct successor of it where h=compliance process) do
│ │ Foreach cr in (get all direct successor of complianceprocess where h=compliance requirement) do
│ │ │ k = get all predecessor of cr
└ └ └ mark it, complianceprocess, cr and k as transitiv AND add to result
generate result_graph based on g and result
Output: Graph result_graph
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Fig. 3. Algorithm to analyze interactions by replacing an IT component (based on [3])

4 Conclusion, Maturity and Future Work

In this paper we presented BCIT, a software prototype that is able to analyze the interactions between BPC and business process change considering supporting IT components and compliance requirements. The interaction between BPC and business process change occurs in two cases. First, the changed element is affected by a compliance requirement or a compliance process. Second, the changed element affects a compliance requirement or a compliance process. More precisely, our software prototype considers the business process change patterns "delete element" and "replace element".

Currently, BCIT considers the user-provided links between elements of the three model types' compliance requirements, processes and IT architectures. Furthermore, only vertices of our single graph can be changed. As a consequent next step, we are planning to add the data and resource perspectives on a business process to our algorithm. Additionally, we are planning to extend BCIT by a function to add or remove edges between individual IT components or compliance requirements. As a result, it is possible to detect demands by compliance requirements and thus avoid compliance violations due to changed relations between individual IT components or compliance requirements.

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