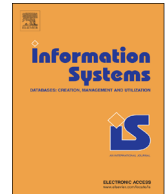




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Comparing textual descriptions to process models – The automatic detection of inconsistencies

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ABSTRACT

Many organizations maintain textual process descriptions alongside graphical process models. The purpose is to make process information accessible to various stakeholders, including those who are not familiar with reading and interpreting the complex execution logic of process models. Despite this merit, there is a clear risk that model and text become misaligned when changes are not applied to both descriptions consistently. For organizations with hundreds of different processes, the effort required to identify and clear up such conflicts is considerable. To support organizations in keeping their process descriptions consistent, we present an approach to automatically identify inconsistencies between a process model and a corresponding textual description. Our approach detects cases where the two process representations describe activities in different orders and detect process model activities not contained in the textual description. A quantitative evaluation with 53 real-life model-text pairs demonstrates that our approach accurately identifies inconsistencies between model and text.

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1. Introduction

The documentation of business operations using process models has become a quintessential activity for many organizations [1]. However, organizations typically do not solely rely on process models for documenting business operations. Realizing that some stakeholders have difficulties with reading and interpreting process models [1,2], organizations have recognized the value of maintaining text-based process descriptions alongside model-based ones [3]. While such textual descriptions may not be suitable to represent complex aspects of a process in a precise

manner [4], they can be created, maintained, and understood by virtually everyone [5].

Despite these benefits, the usage of two representation formats for the same process can lead to considerable difficulties [6]. Most notably, there is a high risk of having to deal with inconsistencies between the two representation formats, in particular when different stakeholders develop or maintain the two representation formats independently from each other [7]. As a result of such inconsistencies, readers of the different representations may develop different expectations about what the process aims to establish or how it should be executed. Against the background of the potentially disastrous implications of inconsistencies, it is an important task of organizations to keep their process descriptions consistent. However, the associated effort to identify and clear up conflicts for an entire process repository is hardly manageable in a manual way.

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To effectively deal with the problem of inconsistencies between model and text, we present a technique that automatically detects differences between textual and model-based process descriptions. Specifically, our technique identifies two types of inconsistencies.

First, it identifies process model activities that are not contained in the accompanying textual description. Second, the technique detects cases where a process model and a textual description describe the process steps in a conflicting order. Our technique can be used to quickly identify the process models in a collection that are likely to diverge from their accompanying textual descriptions. This allows organizations to focus their efforts on the descriptions that can be expected to contain such inconsistencies. A quantitative evaluation demonstrates that the proposed technique is indeed able to effectively identify inconsistencies in a collection of model-text pairs obtained from practice.

The remainder of this paper is structured as follows. Section 2 illustrates the problem tackled by our approach and discusses the research gap that follows from a review of related work. Section 3 describes the proposed approach to detect inconsistencies. In Section 4, we present a quantitative evaluation of the approach. Finally, we conclude the paper in Section 6.

2. Background

2.1. Problem illustration

To illustrate the challenges that are associated with the detection of inconsistencies between textual and model-based

process descriptions, consider the model-text pair shown in Fig. 1. It includes a textual and a model-based description of a bicycle manufacturing process. On the left-hand side, we observe a textual description, which comprises 11 sentences. On the right-hand side, a corresponding model-based description can be seen, expressed in the Business Process Model and Notation (BPMN). The model contains nine activities, which are depicted using boxes with rounded edges. The diamond shapes that contain a plus symbol indicate concurrent streams of action; the diamond shapes containing a cross represent decision points. The gray shades suggest correspondences between the sentences and the activities of the process model.

A closer look at the example reveals that many connections between the two artifacts are evident. For example, there is little doubt that sentence (7) describes the “reserve part” activity or that sentence (8) describes the “back-order part” activity. In some cases, however, there is clearly an inconsistency between the two process representations. For instance, there is no sentence that is related to the “ship bicycle to customer” activity, i.e. that activity is missing from the textual description. Likewise, we can observe that sentences (4) and (5) occur in a different order than the corresponding activities in the model.

In other cases it is less straightforward to decide on the consistency – or lack thereof – between the representations. For example, the text of sentence (9) simply indicates that a part of the process must be repeated. By contrast, the model includes an activity, “select unchecked part”, which associates an explicit action with this repetition. Whether or not sentence (9) actually describes an activity, and thus should be considered an inconsistency, seems to be open for debate. Ambiguous cases that are

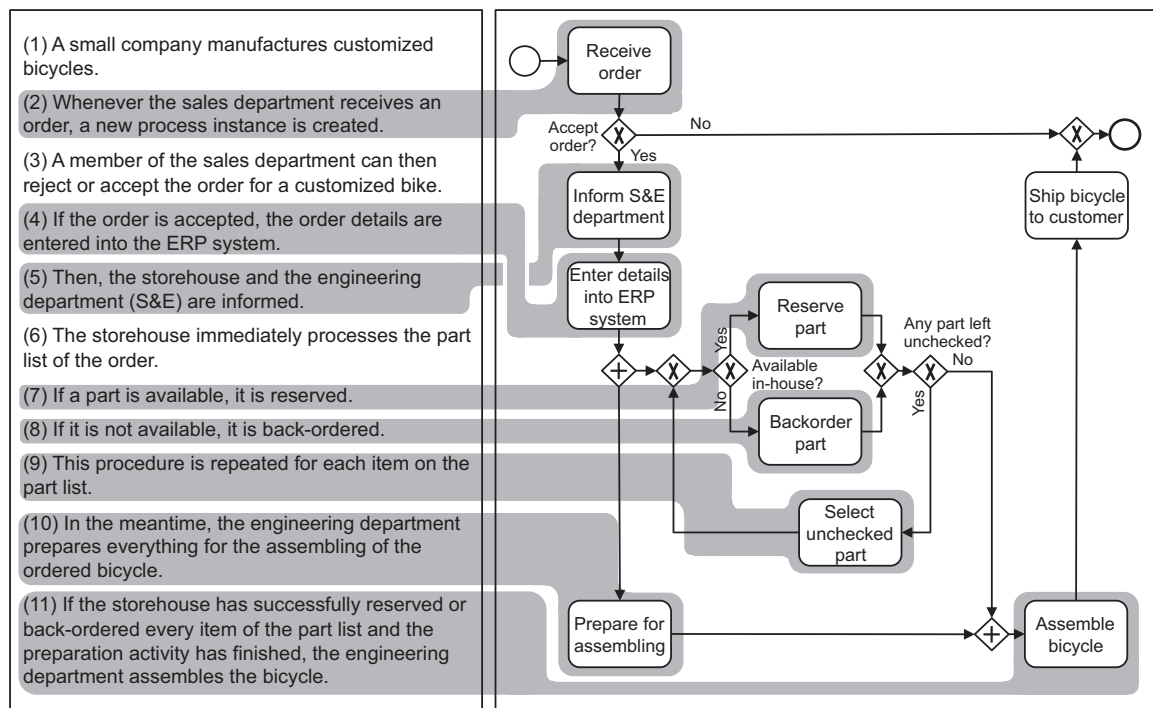


Fig. 1. A textual and a model-based description of a bicycle manufacturing process.

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