Combining Flexibility and Data Handling in Business Process Models

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ABSTRACT

Flexibility and data handling are two hot topics in current research on business process models. However, these issues are tackled separately through declarative languages and artifact-centric approaches, respectively. It follows that the situations in which the choice of the task to perform is a human decision affected by the presence of suitable input entities are not adequately handled; unfortunately, these situations are common in several industrial processes such as build-to-order ones. An integrated approach able to combine flexibility and data handling is needed and to this end this paper presents a notation named ENTA (ENtities and TAsks): it makes both business entities and tasks first-class citizens in process models and it provides high-level descriptions of the tasks in terms of intended effects and constraints to be met. Some examples of order handling processes are used to explain the issues of entity selection and task selection: deciding which customer orders can be associated with the same supplier order is a case of entity selection while deciding whether to generate a new supplier order for the customer orders selected or to add them to an existing supplier order is a case of task selection.

Keywords: Business Entities, Business Processes, Entity Selection, Tasks, Task Selection

INTRODUCTION

The purpose of business processes is to organize work in a business context (Davenport & Short, 1990). They are defined with models which consist of several ingredients, i.e. activities, events and decisions points (Dumas, La Rosa, Mendling & Reijers, 2013), and may be observed from different perspectives (functional, control-flow and data-handling).

The functional perspective encompasses the activities (also called tasks) to be performed in the process; they can be divided into human tasks and automatic ones. The former are carried out by participants playing specific roles, and the latter by software units. The control-flow perspective and the data-handling one establish the precedence rules and the information flow among the tasks, respectively.

Over the years various approaches and notations have been proposed to define process models; they differ in the interpretation and importance given to the above-mentioned perspectives.

The industry standard BPMN (Business Process Model and Notation) (OMG-BPMN, 2014) is the champion of the activity-centric approach.

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approach, whose focus is on the tasks and the control flow.

The data flow is based on process variables, which may be graphically represented with data objects. Links, called data associations, are used to indicate the input and output data objects of the tasks.

The control flow is mainly based on the completion events of the tasks through the intermediation of control-flow elements called gateways; however, the activation of the tasks may also depend on the presence of data in their input data objects. The implementation of the tasks is outside the scope of BPMN; therefore, the process elements representing tasks have the purpose of sending the input parameters to the implementation as well as of receiving the results. Such interactions take place through services; the input parameters and the results may be represented by the input and output data objects of the tasks.

When processes are meant to operate on the business entities which form an information system, a tighter integration between business processes and business entities is needed and, for this reason, in recent research a shift of interest from the activity-centric approach to the artifact-centric one took place.

In the artifact-centric approach, the emphasis is placed on the identification of the key business entities (called artifacts) and of their life cycles, which consist of states and transitions. The major benefit is the right level of granularity, which facilitates communication among the stakeholders and helps them focus on the primary purposes of the business (Chao et al., 2009). The terms “business entity” and “artifact” will be used interchangeably in this paper.

The artifact types and their structures and relationships come from experience and may be represented through an information model. The artifact life cycles show how the actual entities evolve over time: the business activities, which are responsible for the state transitions, may be introduced in a subsequent step of analysis along with the business rules governing their execution. Business processes are not eliminated; they, instead, result from the combination of interrelated life cycles; however, how to synchronize the states of the life cycles in a simple yet effective way remains an open issue (Bruno, 2013).

The focus on business entities leads to the design of more flexible processes as demonstrated by the case-handling approach (van der Aalst, Weske & Grünbauer, 2005). A process is thought of as the recipe for handling cases of a given type, e.g., insurance claims, and the precedence relations between tasks are kept to a minimum so that the process evolution depends on the state of the case and not only on the tasks performed (Künzle & Reichert, 2009).

Flexibility (Schonenberg, Mans, Russell, Mulyar & van der Aalst, 2008) is at the heart of knowledge-intensive processes (Marjanovic & Freeze, 2011), i.e., processes calling for some degree of creativity and adaptation to specific circumstances (Alvesson, 2004). What distinguishes knowledge-intensive processes from routines is that the participants are not considered as mere resources needed to carry out tasks which are not automatable; on the contrary, their involvement is required at a higher level where they may make choices which affect the control flow.

Task selection is the distinctive feature of declarative approaches (Pesic & van der Aalst, 2006), whose basic principle is to permit the execution of any task as long as no constraint is violated. However, current declarative languages do not explicitly represent situations in which the performer of a task is in charge of selecting the appropriate input entities. This issue, which is referred to as entity selection in this paper, is common in several industrial processes such as build-to-order ones: it has been reported as a desired work practice that is not supported by the functionalities of typical workflow systems (Sadiq, Orlowska, Sadiq & Schulz, 2005).

Integrated approaches able to combine flexibility and data handling are then needed and to this end this paper presents a notation named ENTA (ENTities and TAsks), whose purposes are to make both business entities and