The Basis and Core Knowledge of Business Process Management

M

Vitus S. W. Lam
The University of Hong Kong, Hong Kong

INTRODUCTION

In the era of globalization, there are intense competitions among organizations at an international level. To increase adaptability, efficiency and competitiveness in a global market, enterprises widely recognize that business processes play a pivotal role in their success. The criticality and complexity of operational business processes necessitate the development of methodical approaches for a wide range of practitioners and professionals. In response, theories and methodologies have been developed in the domain of business process management.

Business process management (BPM) is the study of the design, analysis, verification, simulation, visualization, metrics and workflow patterns of business processes. BPM is cross-disciplinary by nature that integrates business management with information technology (IT). The main notions, techniques and theoretical foundations of BPM build upon some well-established methods and formalisms that often stem from other domains in computer science. These include software engineering, formal methods, temporal logics and design patterns.

The aim for this article is to provide an overview of various concepts, approaches and foundational theories pertaining to BPM from the IT perspective. A wide spectrum of topics is covered in order to exhibit the different facets of BPM. Specifically, the emphases are on their positions within the BPM arena and their interrelationships.

BACKGROUND

In the BPM community, an activity is considered as a unit of work performed in a real business scenario. A business process is composed of a group of interrelated activities that is carried out in order to accomplish a stated business objective. Business process models serve as a basis for the conduction of static analysis, modelling error detection and formal reasoning. Providing a structured way to construct business process models is the primary focus of business process modelling.

The traditional method for business process modelling is based on an imperative approach, which activities are executed in a prescribed sequence. The three principal means that complement the design of business process models are the utilization of workflow patterns, equivalence checking and verification methodologies during the specification of workflows. Another prevailing technique to building a business process model is a declarative approach, which is characterized by a collection of constraints. This article is an exposition of these five key elements as vehicles for BPM.

The rest of the article is organized as follows. The third section is dedicated to imperative process modelling that is classified into two categories: process orchestration modelling and process choreography modelling. The discussion is complemented by presenting some business process modelling languages. The last part of the third section seeks to provide a brief overview of the Business Process Model and Notation. The fourth section offers a discussion of workflow patterns in the literature. The fifth section examines prior contributions that are devoted to the equivalence checking of business process models. The sixth section explores an alternative way for modelling workflows through the utilization of a declarative approach. The seventh section reviews a number of methods that is capable of verifying the correctness of BPMN models. The two final sections outline some advanced topics in the BPM field and conclude the article.

DOI: 10.4018/978-1-4666-5888-2.ch524

IMPERATIVE PROCESS MODELLING

There are two kinds of business process modelling approaches: imperative process modelling and declarative process modelling. Imperative process modelling, which states explicitly the order and alternative ways of execution for a business process model, is categorized into process orchestration modelling and process choreography modelling. Process orchestrations define business process models confined to an organization. In contrast, process choreographies specify cross-organizational workflows that involve collaborations and interactions among multiple business partners. As opposed to imperative process modelling, declarative process modelling states implicitly the order and alternative ways of execution for a workflow by means of constraints.

The two distinct types of business process modelling languages are text-based modelling languages and graphical modelling languages. Both Web Services Business Process Execution Language (WS-BPEL) (OASIS, 2007) and Web Services Choreography Description Language (WS-CDL) (W3C, 2005) are text-based modelling languages. WS-BPEL, which is also known as BPEL, is an orchestration language based on a centralized control. The former name of WS-BPEL is Business Process Execution Language for Web Services (BPEL4WS). WS-CDL, unlike WS-BPEL, is a choreography language in which there is not a centralized control mechanism.

In the context of BPM, there are several graphical modelling languages encompassing Unified Modelling Language (UML) activity diagrams (OMG, 2011a) and Business Process Model and Notation (BPMN) (OMG, 2011b). UML activity diagrams are a visual specification language that centres on the dynamic aspects of a system. They are regarded as a type of behaviour diagram that depicts the design of business process models.

BPMN, defined by the Object Management Group, is widely accepted as a lingua franca for imperative process modelling. It is a non-executable diagrammatic language that supports the modelling of both process orchestrations and process choreographies. Prior to BPMN 2.0, BPMN is an acronym of Business Process Modelling Notation rather than Business Process Model and Notation. Additionally, a more precise execution semantics is given in BPMN 2.0 when compared with the earlier versions. In what follows, a concise introduction to some of the core notational elements of the BPMN 2.0 is provided.

Process orchestrations are expressed as private (internal) business processes in the BPMN 2.0 standard. The three main graphical constructs of private business processes are events, activities and gateways (Figure 1). A start event and an end event signify, respectively, the commencement and completion of a workflow. An activity is a unit of work that is carried out within a business process. A data-based exclusive decision gateway has multiple alternative outgoing sequence flows in which each of them is associated with a condition. Multiple alternative incoming sequence flows are joined by a data-based exclusive merge gateway. A parallel fork gateway diverges a single-threaded execution into multiple concurrent threads of control. A parallel join gateway merges multiple concurrent execution threads into a single-threaded control. A sequence flow is a notational element for connecting events, activities and gateways.

An example of a private business process is depicted in Figure 2. The workflow begins with the receipt of a credit card application. A reject letter is sent whenever an application is disapproved. The approval of an application results in the preparation of credit card and determination of credit limit simultaneously. As soon as these two activities are complete, the credit card is sent to the customer and the process ends.

Figure 1. BPMN graphical elements