Chapter 8
Interoperable Process Engineering System for Collaborative Optimization of Product Life-Cycle

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ABSTRACT
Most of the industrial organizations, including SMEs, need to quickly react and adapt to the changing market conditions imposed by globalization, such as new sustainability directives or new type of customers. The fulfillment of these requirements on time is a must so as to remain competitive in the global markets. Since data management information systems are already present in almost all the corpus of industrial enterprises as custom developments or standard PLM solutions, the natural technical evolution that aims to provide an effective answer to these changing market conditions comprises the shifting from a data management perspective towards a process management view. Hence, the challenge is how to manage business processes that build upon existing information systems so as to encourage business agility, efficiency, and interoperability. The proposed approach roots on the Business Process Management (BPM) discipline and leverages process optimization through the systematic modeling and reengineering of business processes accompanied by supporting interoperable and configurable eco-services, which are conceived as sustainability-aware services designed to optimize some aspects of the product life-cycle through eco-constraints management.

DOI: 10.4018/978-1-4666-5142-5.ch008
INTRODUCTION

Thirty years ago, organizations’ main goal focused on managing their business data, the “what,” with the help of informatics systems, which were conceived following a Structured Analysis (Senn, 1992) approach. The use of tools such as data flows, data models, structure charts and state models was considered appropriate enough to document and develop those monolithic systems integrated with normalized databases. As a result, the business logic of those IT systems was centered in data management.

Nowadays, data and functions that manage data are still equally important, but the focus is more centered on how to work more efficiently with data through process management. The main difference with respect to the previous scenario resides in the fact that information systems are already present in almost all the corpus of organizations as custom developments or standard software solutions. This technical capability allows an evolutionary shift of paradigm in the sense that organizations are able to react to the continuous market changes imposed by globalization, such as new types of customers or incoming sustainability regulations. The challenge is how to evolve from the “what” or data perspective to the “how” perspective more focused on processes, that is to say, how to manage business processes that build upon existing data management so as to leverage interoperability among processes. In this regard, Business Process Management (BPM) (ABPM, 2009) is a “disciplined approach to identify, design, execute, document, measure, monitor, and control both automated and non-automated business processes to achieve consistent, targeted results aligned with an organization’s strategic goals. BPM involves the deliberate, collaborative and increasingly technology-aided definition, improvement, innovation, and management of end-to-end business processes that drive business results, create value, and enable an organization to meet its business objectives with more agility.”

Consequently, BPM is regarded as a discipline that allows the integration of manual processes with automated processes that involve the support of IT. It leads to the overall efficacy through the definition of control flows that enable the orchestration and choreography of the modeled processes that take place either within a specific area in an organization, across different areas or even between organizations, such as suppliers’ and customers’ processes.

The BPM discipline roots on three major business process traditions (Harmon, 2010) i.e. the Quality Control tradition, the Business Management tradition and the Information Technologies (IT) tradition. The Quality Control tradition, whose practitioners have been engineers and quality control specialists, focuses on the continuous improvement of the isolated productive process by means of process analysis, measurements and statistical quality control techniques application. This tradition was reinforced with quality control and quality assurance methodologies such as Total Quality Management (TQM), Lean and Six Sigma. On the other hand, the Business Management tradition extends the Quality Control tradition and incorporates business people’s (executives) worries about the improvement of the whole operation of the companies, in addition to the traditional economic and financial concerns. Thus, not only the productive processes are taken into account, but also the supporting processes, including those involving clients’ satisfaction. The main emphasis is on aligning the processes of the company with the business strategy by means of the implementation of the company operations under a process perspective that enables the measurement of process performance towards a continuous improvement. In this sense, the Balanced Scorecard methodology provides a systematic so as to determine if the modeled and implemented operations are aligned towards the business strategy. In order to identify and model enterprise operations, several Business Process Frameworks (also called Operation Reference
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