# Chapter XV
# Foundations of Business Process Modeling

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## ABSTRACT

*This chapter provides an overview of business process management and business process modeling. We approach business process management by giving a historical classification of seminal work, and define it by the help of the business process management life cycle. Business process models play an important role in this life cycle, in particular, if information systems are used for executing processes. We deduct a definition for business process modeling based on a discussion of modeling from a general information systems point of view. In the following, we detail business process modeling techniques, in particular, modeling languages and modeling procedures for business process modeling. Finally, we discuss some future trends with a focus on the business process execution language for Web services (BPEL), and conclude the chapter with a summary. The chapter aims to cover business process modeling in a comprehensive way such that academics and practitioners can use it as a reference for identifying more specialized works.*

## INTRODUCTION

This section provides an overview of business process management. The first part elaborates on the background of business process management by giving a historical classification of seminal work. The second part defines business process management and illustrates it by the help of the business process management life cycle. Business process models play an important role in this life cycle.

## HISTORY OF BUSINESS PROCESS MANAGEMENT

In the last couple of years, there has been a growing interest in business process management, from practice as well as from business administration and information systems research. In essence, business process management deals with the efficient coordination of business activities within and between companies. As such, it can be related to several seminal works on economics and business administration. Fayol (1966), as one of the found-

ers of modern organization theory recommended a subdivision of labor in order to increase productivity. Adam Smith (1776) illustrated its potential benefits by analyzing pin production. As a drawback, subdivision of labor requires coordination between the subtasks. Business process management is concerned with coordination mechanisms, in order to leverage the efficient creation of goods and services in a production system based on such subdivision of labor. In this context, the individual tasks and the coordination between them can be subject to optimization efforts. Frederick Taylor advocated the creation of an optimal work environment based on scientific methods to leverage the most efficient way of performing individual work steps. In the optimization of each step, he proposed to "select the quickest way," to "eliminate all false movements, slow movements, and useless movements," and to "collect into one series the quickest and best movements" (Taylor, 1911). The efficient coordination of business processes is addressed by the innovation of the assembly line system. Its inventor Ford (1926), proudly praised the production cycle of only 81 hours in his company "from the mine to the finished machine" to illustrate the efficiency of the concept.

In academia, Nordsieck was one of the first to distinguish structural and process organization (Nordsieck, 1932, 1934). He described several types of workflow diagrams, for example, for subdivision and distribution of labor, sequencing of activities, or task assignment (Nordsieck, 1932). In this context, he identifies the order of work steps and the temporal relationship of tasks as the subject of process analysis with the overall goal of integrating these steps. He distinguishes between five levels of automation: free course of work, concerning the contents bound course of work, concerning the order bound course of work, temporally bound course of work, and concerning the beat bound course of work (Nordsieck, 1934).

In the decades after World War II, operations research devoted more attention to structural organization than to process organization. In the early 1970s, it became apparent that information systems would become a new design dimension in an organizational setting (see Grochla & Szyperski, 1975). But the focus, even in this context, remained on the structure. At that time, the logic of business processes used to be hard-coded in applications such as production floor automation systems and was, therefore, difficult to change (Hsu & Kleissner, 1996; zur Muehlen, 2004). Office automation technology during the late 1970s was the starting point for a more explicit control over the flow of information and the coordination of tasks. The basic idea was to build electronic forms for clerical work that was originally handled via paper. In his doctoral thesis, Zisman (1978, 1977) used Petri nets (Petri, 1962a, 1962b) to specify the clerical work steps of an office agent and introduced a respective prototype system called SCOOP. A comparable approach was presented by Ellis (1979), who modelled office procedures as information control nets, a special kind of Petri nets consisting of activities, precedence constraints, and information repositories. An overview of further work on office automation is provided in Ellis and Nutt (1980).

Although the business importance of processes received some attention in the 1980s (see Porter, 1985) and new innovations were introduced in information system support of processes, for instance (e.g., system support for communication processes (Winograd, 1987-1988) based on speech act theory (Austin, 1962; Searle, 1969)), it was only in the early 1990s that workflow management prevailed as a new technology to support business processes. An increasing number of commercial vendors of workflow management systems benefited from new business administration concepts and ideas such as process innovation (Davenport, 1993) and business process reengineering (Hammer & Champy, 1993). On the other hand, these business programs heavily relied on information system technology, in particular workflow systems, in order to establish new and more efficient ways of doing business. In the 1990s, the application of workflow systems, in particular, those supporting information systems integration