

# Chapter 1

## Preliminaries

### ABSTRACT

*This chapter looks at the relevant tools and technologies that are related/ applicable to the process mining and semantic modelling techniques. Theoretically, the chapter describes some of the interrelated tools and area of topics covered by this book. In other words, the chapter introduces the background information that is essential for understanding the context and proposed method of this book. It starts by looking at the process mining term and the different types of its application when applied to solve real-time problems. Consequently, the chapter discusses the wider scope of the different semantic-aware methods that trails to provide valuable information or insights that can be utilized to support the real-time processing or decision-making purposes.*

### INTRODUCTION

Contextually, the chapter is structured as follows: Firstly, the idea of embracing the process mining technique and applying its methods for the purpose of this book is discussed. We start by looking at the process mining term and the different types of its application when solving real-time process-related problems. Accordingly, the chapter continues by describing the different components and practice that supports the real-time application of the process mining. We also make use of the example of the educational process mining (EPM) domain to illustrate how this is done. To this effect, this chapter describes the EPM and the other associated modelling approaches e.g.

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educational data mining (EDM) devoted to improving process analysis by acquiring and representing non-trivial knowledge about the actual processes in reality. Essentially, the review is done in order to highlight the main benefits of using the process mining techniques to analyse data extracted from any given process domain (e.g. case study of the educational domain or learning process described in this book). Consequently, the chapter looks at the wider scope of the several semantic-aware methods that trails to provide valuable information or insights which can be used to support the real-time processing or decision-making. Therefore, the chapter discusses the broader term of Business Intelligence (BI) and other overlapping terms, such as the Business Process Management (BPM), Business Activity Monitoring (BAM), Process-Aware Information Systems (PAIS) etc. that combines tools or methodologies that are aimed at offering useful information and insights that can be utilized to support the process mining technique. Consequently, the chapter discusses the Semantic Web Search technologies, and the various associated methods or mechanisms such as the Data integration and linking, Semantic annotation and data labelling, and Ontology-based Information Extraction (OBIE) systems which are all seen as very useful methods used to support the extraction, mining and analysis of processes by influencing the level of real world (semantic) knowledge that can be derived from the readily available datasets and input models. Finally, the chapter also takes into account the Process Querying (PQ) method that is concerned with automatic management of repositories of models (of observed or unseen processes) with the goal of transforming the process-related information into decision-making capabilities. To end the chapter, the book provides a comprehensive review of the relevant works that have been conducted in context of this book – particularly focusing on the areas which covers the process discovery and pattern mining, to information retrieval and extraction, semantic-based process modelling and ontologies, and the interrelated data mining techniques such as the classifications method and the fuzzy logic. Conclusively, the work provides a systematic representation and summary of the existing methods in terms of the design approach/tools used in conducting the different studies, their findings and relevance to this book. To this effect, this chapter provides a thematic table outlining the main relevant work in this area of topic or scientific research, and are grouped in terms of their various application domains which are most closely related to the process mining and semantic modelling techniques described in this book.

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