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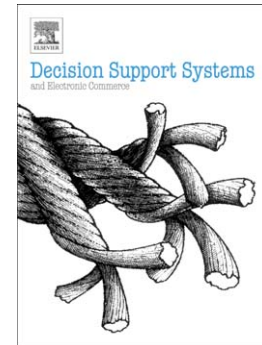
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# Process Querying: Enabling Business Intelligence through Query-Based Process Analytics

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## Abstract

The volume of process-related data is growing rapidly: more and more business operations are being supported and monitored by information systems. Industry 4.0 and the corresponding industrial Internet of Things are about to generate new waves of process-related data, next to the abundance of event data already present in enterprise systems. However, organizations often fail to convert such data into strategic and tactical intelligence. This is due to the lack of dedicated technologies that are tailored to effectively manage the information on processes encoded in process models and process execution records. Process-related information is a core organizational asset which requires dedicated analytics to unlock its full potential. This paper proposes a framework for devising process querying methods, i.e., techniques for the (automated) management of repositories of designed and executed processes, as well as models that describe relationships between processes. The framework is composed of generic components that can be configured to create a range of process querying methods. The motivation for the framework stems from use cases in the field of Business Process Management. The design of the framework is informed by and validated via a systematic literature review. The framework structures the state of the art and points to gaps in existing research. Process querying methods need to address these gaps to better support strategic decision-making and provide the next generation of Business Intelligence platforms.

*Keywords:* Process querying, process management, process analytics, process intelligence, process science, business intelligence

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## 1. Introduction

Business Process Management (BPM) is the discipline that combines approaches for the design, execution, control, measurement, and optimization of business processes. Most of the larger organizations adopted BPM principles (e.g., designing processes explicitly). A growing, but still limited, number of organizations uses explicit BPM systems, i.e., information systems directly driven and controlled by explicit process models. Business Intelligence (BI) systems focus on the dissemination of business-related data without considering process models. Hence, one can easily witness the gap between data-driven BI approaches and process-centric BPM approaches. Process mining approaches aim to bridge this gap [1]. Like other BPM approaches, process mining is process-centric. However, unlike most BPM approaches, it is driven by factual event data rather than hand-made models.

Process mining is closely related to the term *process analytics* [2, 3] which refers to approaches, techniques, and tools to provide process participants, decision makers, and other stakeholders with insights about the efficiency and effectiveness of operational processes. The search, correlation, aggregation, analysis and visualization of process events can support insights and improvements in performance, quality,

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