An Outloook On Semantic Business Process Mining and Monitoring

Semantic Business Process Management (SBPM) is an extension of BPM with Semantic Web and Semantic Web Services technologies in order to increase and enhance the level of automation that can be done within the BPM life-cycle. SBPM is also based on exhaustive conceptualisation of the BPM domain in the purpose to support reasoning during business processes.
To put it simply, there is a need for good analysis tools that can provide feedback information about how business process are actually being executed in companies (using information system to support the execution of their business processes such as ERC, CRM,…) based on the observed (or registered) behaviour in event logs.
The BPM systems are here to support the whole life-cycle (design, configuration, execution and analysis) necessary to deploy and maintain business process organisations. Basically, the general approaches of BPM suffer from a lack of automation that would be able to insure a transition between the business world and the IT world, this is due to the lack of machine processable semantics. In order to remedy to this, the SBPM systems were created combining systems of Semantic Web and SWS technologies. The use of ontologies is major advantage of SBPM.

Process monitoring involves the analysis of process instances at runtime by processing events propagated by the information system supporting business process. The goal is to track the enactment of processes as they are performed in order to have timely information about the evolution of business activities, supporting business practitioners in the identification of deviations and the eventual application of corrective measures and here, in process monitoring, all vendors in this sectors can provide their own solutions.
There are 2 type of process monitoring: active monitoring (« real-time » propagation of relevant data concerning enactment of business processes) and passive monitoring (delivers information about process instances upon request).

The Semantic Business process Monitoring is composed of 5 phases (in which knowledge-based techniques play a key role) structured around a large use of ontologies as the core means for defining formal conceptualisation and much more:

1. **Observe:** obtaining monitoring information and lifting it into a semantic form, ontologies are well-suited to support this task. Once in the ontological form, the monitoring information supports navigation, manipulation, and querying at the knowledge level (closer to human understanding and lead to important improvements in the user interface). Semantic monitoring data is amenable to automated reasoning thus enabling the application of knowledge-based technologies. A consistency checking can allow to detect anomalies in the monitoring data itself and thus reduce the noise for subsequent analysis and potentially enhance quality of the analysis result.
2. **Evaluate**: in charge of timely computation of process metrics like the execution time or the number of failures. To support business practitioners, a metrics ontology is used to perform metrics computation. For that, formalising the analysis results themselves is envisaged because an ontological definition of analysis results enhances the whole body of knowledge for supporting the further reasoning (over computationally expensive analysis results within runtime monitoring tasks and allowing the combination of those results in order to perform more complex evaluations). The use of SWS technologies is seen as the orchestration of different analysis techniques.
3. **Detect**: identifying or predicting deviations with respect to the expected behaviour of a process. This approach support the seamless application of knowledge-based algorithms (e.g: classification PSMs,). An extensive conceptualisation of the BPM domain can be beneficial to select the right algorithm, this can be done by performing a dynamic selection of SWS implementing some algorithms on the basis of the characteristics of the domain. Further more, if the relation between metrics and data domain, and the mining results are modelled are aligned: this can constituted advantages.
4. **Diagnose**: the origin of the deviation is diagnose, this depends on the actual interpretation of the data by the user and it's based on some structured approach that can be understood by humans. Knowledge-based methods have applied to diagnose automated systems, as well as diseases (very popular subject in AI).
5. **Resolve**: the design and application of resolution strategy for addressing some previously diagnosed process deviation: that's the most complex task. Not all approaches can cope with the wide range of deviation because they aren't realistic due to unforeseen situations affecting user-defined an process-specific conditions. This phase will be defined as orchestrations of SWS, allowing users to specify their own strategies by reusing and combining problem-solving expertise over their domain specific terms. This approach serves as a basis for defining general resolutions templates.