AI-Augmented Analytics Dashboards for Process Health

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Abstract

Ensuring proper asset-maintenance processes within an organization is critical for optimizing business continuity, reducing costs, and avoiding downtime. IBM Process Miner provides a data-driven analysis solution allowing to optimize asset-maintenance process health. We propose to augment IBM Process Miner analytic dashboards with AI methods to provide to non-business analyst users with an easy-to-use visually-guided investigation tool to analyze deviations from business key performance indicators and to perform root-cause analysis of such deviations.

Introduction

Critical asset events and asset downtime create potential risks not only to human life but also can lead to spiraling maintenance costs and regulatory fines. Achieving operational excellence in asset maintenance is critical for the business to stay competitive, to boost efficiency, and to reduce costs.

IBM Process Miner applies data-driven process insights to help businesses optimize their processes by providing transparency into how their processes are performing, finding process deviations and bottlenecks, and evaluating a set of possible solutions to find the optimal one.

One of the capabilities provided by IBM Process Miner is advanced analytic dashboards allowing investigation of the process inefficiencies and improvement opportunities. For each business process represented in the IBM Process Miner it is possible to create one or more such analytic dashboards. These are used to explore,filter, and analyse process data. They are created by the organization's business analyst from a set of predefined widgets to allow visual drill-down into the processes' data to test for a particular business key performance indicator (KPI) or a set of KPIs, to investigate reasons for process bottlenecks, and to explore identified opportunities.

We propose to employ AI methods to extend these dashboard capabilities for non business-analyst users.

Approach

Our proposed approach is to create an extended set of dashboards on top of IBM Process Miner, specifically designed for asset management non-business analyst users. The aim is to support a guided "breadcrumb-following" investigation path for bottlenecks in asset maintenance processes. The dashboards support business KPIs reflecting asset maintenance process health (e.g., work order duration, work order cost, first time fixed rate, and duplicate work orders) and utilize AI-based methods to support dashboard widget composition and AI-guided visual analysis to use the widgets. This allows asset-maintenance management team to easily analyze asset maintenance processes, compare sites performance, cluster assets by characteristics, and rapidly identify anomalies.

One such example of AI-based methods is the use of a predictive model for some of the business KPIs. As complementary method, a model explainer can be used to determine the most influential features which affect this KPI. The combination of these methods provide guidance regarding where to look for possible root causes of KPI deviations. These methods are already utilized in the IBM Process Miner for some KPIs, such as cost and duration. We demonstrate how to leverage these methods in a visually-guided dashboard built for non-business analyst users for the specific purpose of work-order duration analysis.

To demonstrate and validate our approach we have created an analytic dashboard for guided investigation of bottlenecks in the asset maintenance planned maintenance processes for facility management domain, focusing on the duration KPI (Figure 1). The widgets in the dashboard are interconnected, such as, filtering the data based on some parameter in one widget, will filter the data in all other widgets accordingly. This allows starting the investigation from high level view of all work order cases, and drilling down to interesting set of sub-cases.

As aforementioned, we created an analytic dashboard for the particular case of duration KPI analysis. For step one, outlier detection, we used a set of filter widgets to filter all cases to a particular subset of filtering on completion status and on asset types, which have longest case-handling duration. Afterwards, we continue to filter in only deviating cases from point of view of process representation. To this end, we utilize widgets to allow the user to analyze the process variants, to further filter in the relevant problematic cases focusing on those variants having the longest duration, and finding out the bottleneck activities in these case variants. As step two - feature investigation - we use the influencers widget
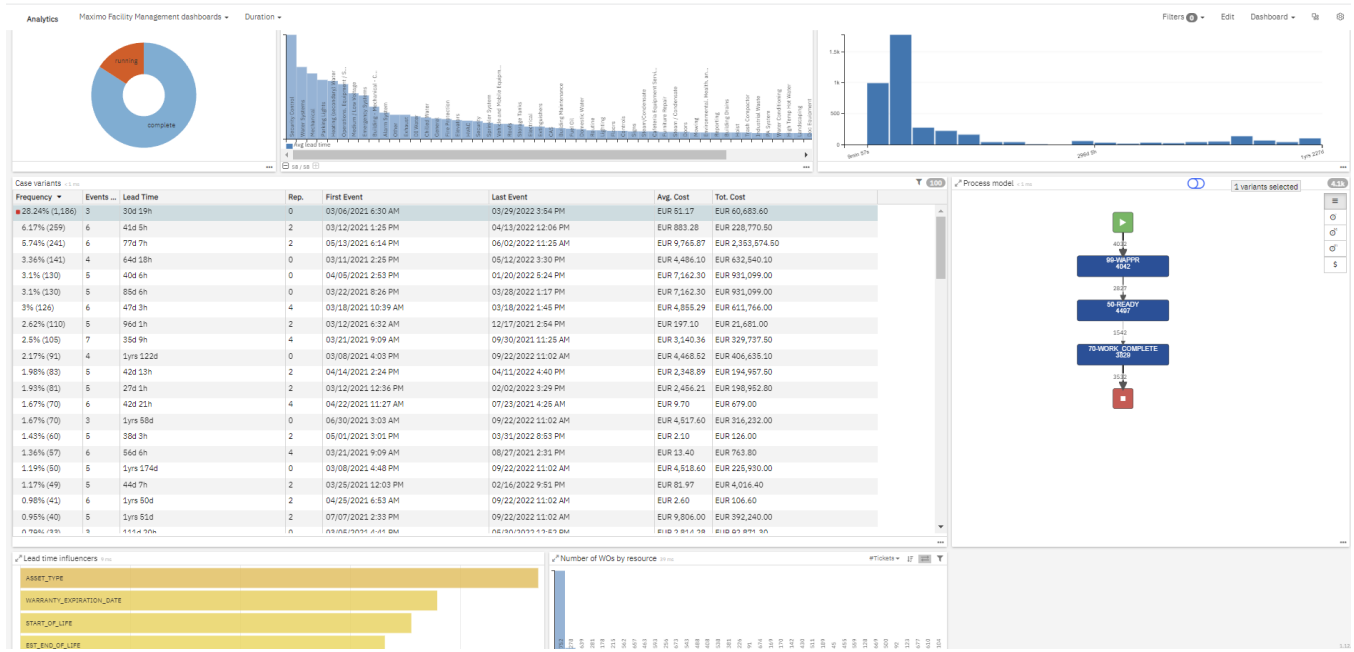
Figure 1: Analytics dashboard for duration KPI

to analyze the most problematic tasks to perform root-cause analyses and to find the features which influence the tasks the most from the point of view of duration. Finally, as step three - root cause analyses - we analyze the values of the features for the problematic cases and analyze the resources assigned to those cases. This provides us with a clear picture allowing to determine the specific reasons behind duration violation of the problematic tasks.

Summary and Future Work

In the near future, we plan on further enriching the existing functionalities of IBM Process Miner with more advanced AI capabilities, such as anomaly detection techniques for detecting suspicious cases, predictive models for KPIs not represented in the basic suite, and finally, enriching the explainer abilities for deeper understanding of the root-causes of cases detected as anomalous. Our current focus is on asset maintenance business KPIs which have the potential to create highest impact , such as analyses of rework in corrective maintenance processes and duplicate work orders. Our goal is to identify such business KPIs, to define a standard unified approach of bottleneck investigation that will dictate the dashboard structure, and to utilize AI capabilities described above in support of dashboards filtration and root-cause analyses widgets.

To sum up, our work is based around extending IBM Process Miner for non-business analyst user in the asset maintenance domain. We intend to create a set of pre-built AI-augmented analytic dashboards, which will allow guided investigation of asset maintenance processes from the point of view of main business KPIs, to find and explore process deviations and bottlenecks, and perform root-cause analyses of these deviations.