Process Mining in a Public Procurement Process: A Case Study from University of Costa Rica

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Public procurement is a strategic function that ensures the acquisition of essential goods and services essential for institutional operations [1]. However, these processes require resource optimization to strengthen internal controls and enhance public management. Process Mining (PM) supports process analysis through the use of event logs from information systems [2], enabling the study and improvement of specific processes such as public procurement.

At the University of Costa Rica, the Procurement Office (OSUM) manages procurement activities under a defined legal framework. However, the need for a more comprehensive and systematic analysis of procurement processes at OSUM motivated the implementation of a case study using PM[1] for the first time. Data from 2023 and 2024 were extracted from the Sistema Integrado de Compras Públicas (SICOP) and UCR's internal GECO platform. The approach followed three key stages: an ETL process for data extraction and transformation, the definition of key performance indicators (KPIs), and the application of PM tools.

This case study highlights the following main contributions and challenges:

1. **Reality vs. design**: although the procedures follow standard guidelines, only 30% conform to the ideal process model. This project reveals structural inefficiencies caused by unplanned activities and shows that real execution often deviates from formal design. Improving these processes requires insights grounded in actual data.
2. **Quantifying time-based impact by procedure type**: this project identified bottlenecks associated with specific procurement categories such as minor and major tenders, with average delays reaching up to 156 days. These results support targeted interventions by procedure type, enabling more precise process optimization.

[1] This case is part of the results of the final graduation project titled *Aplicación de minería de procesos para los procesos de contratación ordinaria en la UCR* (Chacón, Herrera & Matarrita, 2025), developed within the Industrial Engineering program at the University of Costa Rica.

3. **Compliance diagnostics**: PM facilitated the evaluation of process conformance and the detection of frequent deviations from the ideal flow. Between 2023 and 2024, major tenders showed improvement (from 8% to 40%), while small purchases declined in compliance (from 61% to 51%), underscoring the need to adapt strategies based on procurement type.
4. **Data management as a core enabler**: although detailed logs were available, the project required an ETL procedure to address data quality and structural issues. This highlights the importance of strengthening data governance and internal standardization across institutional platforms.

As a contribution to this workshop, the project demonstrates how PM can quantify process conformance, identify procurement-specific bottlenecks, and reveal variations that affect efficiency. The case study provided OSUM staff actionable insights to improve operational planning, reinforce control mechanisms, and support evidence-based decision-making.

References

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2. Van Der Aalst, W. (2016). Data science in action. In *Process Mining: Data Science in Action* (pp. 3–23). Berlin, Heidelberg: Springer Berlin Heidelberg.