Utilizing Process Mining and What If Scenarios to Enhance and Optimize Production in a Drone Factory

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ABSTRACT

Due to the widespread need for increased production in a factory, the study of scenarios is becoming increasingly relevant. A production line consists of events that indicate activities performed by resources at a specific time. The Process Mining Simulation allows the verification of the actual behavior of the event, deviations from expected behavior, and evaluation of maximum production of the system. Simulations enable What If Scenarios to be tested in order to consider different states of a project, thus expediting implementation and improve the actual operation.

The application of What If Scenarios in Process Mining is used for profitability forecasting, risk analysis, and production planning. The ability of simulate behaviors of dynamic systems and systems based on differential equations, identifying stock and flow variables, helps to visualize the evolution of a system over time. Therefore it is necessary to identify relevant scenarios to improve production with minimal investment, constructing the system model based on Event Logs and identifying the relationship between activities and resources to validate the possibility of applying the What If Scenario.

The process utilizes the ”Process Of OnGoing Improvement”(POOGI) methodology, which aims to improve the current condition of a functioning factory by determining the best alternative. Thus, the project focus is to simulate a drone factory using SimPy Python, with 2 manufacturing

processes for producing parts (propellers and the drone body) and a production conformity verification machine. The objective is to identify the best alternative for improving production. Among the options analyzed are increasing the number of machines, varying the failure rate of the machines and maintenance time.

The project presents the first phase of factory simulation, where the flow of processes and machine production is structured and event logs are generated to have control over production and process flow, in this phase, the system maximum production are also identified. The second phase involves repeating the process with variations in the failure rate of the machines and maintenance time for each machine. The third phase involves adding new machines to the flow, restructuring the flow of processes and identifying the new bottlenecks, considering both the failure rate of the machines and maintenance time. In the fourth phase, data analysis is conducted by calculating the average production from multiple simulations considering that the probability of failure rate influences the final result.

Finally, the best improvement scenario for the factory is identified, demonstrating the correlation between machines in production line and proving which of the scenarios is most effective. By demonstrating the correlation between various factors such as the number of machines, failure rates and maintenance times, it offers decisionmakers a comprehensive understanding of the optimal strategies to mitigate bottlenecks and improve production.

KEYWORDS. Process Mining. What If Scenarios. POOGI.