Theorizing Process Dynamics with Directed Graphs:
A Diachronic Analysis of Digital Trace Data

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Abstract

The growing availability of digital trace data has generated unprecedented opportunities for analyzing, explaining, and predicting the dynamics of process change. While research on process organization studies theorizes about process and change, and research on process mining rigorously measures and models business processes, there has so far been limited research that measures *and* theorizes about process dynamics. This gap represents an opportunity for new Information Systems research. This research note lays the foundation for such an endeavor by demonstrating the use of process mining for diachronic analysis of process dynamics. We detail the definitions, assumptions, and mechanics of an approach that is based on representing processes as weighted, directed graphs. Using this representation, we offer a precise definition of process dynamics that focuses attention on describing and measuring changes in process structure over time. We analyze process structure over two years at four dermatology clinics. Our analysis reveals process changes that were invisible to the medical staff in the clinics. This approach offers empirical insights that are relevant to many theoretical perspectives on process dynamics.

Keywords: Processual dynamics, event logs, trace data, process theorizing, routine dynamics, diachronic analysis