

Bringing Healthcare Professionals to the Forefront in Process Mining

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Abstract

The information systems of healthcare organizations are rich in data, yet much of this data remains underused for improving care delivery in general and healthcare processes in particular. Process mining, a technique that uses process execution data to visualize and analyze how processes actually occur, offers valuable opportunities for healthcare process improvement. However, many applications of process mining in healthcare have been driven by data scientists, with limited involvement from healthcare professionals who understand the real complexities of care. This dissertation aims at bringing healthcare professionals to the forefront in process mining. By giving more consideration to the input of healthcare professionals in process mining projects and research, the gap between process mining research and healthcare practice can be bridged.

To achieve this aim, the research was conducted in several phases. Firstly, a systematic review of process mining in healthcare studies was conducted, presenting a new perspective on the state of the art of process mining in healthcare. We provide a structured overview of the literature on process mining in healthcare with a focus on (i) the considered process mining project stages, (ii) the involvement of healthcare professionals, and (iii) the Key Performance Indicators (KPI) considered during the analysis. It became clear that the involvement of healthcare professionals was limited and there was too little attention for the real-world problems of these healthcare professionals. Therefore, secondly, a Delphi study involving 18 doctors and 7 nurses from 4 different countries explored the most urgent and real-world process-related problems in hospitals. The result was a list of 44 process-related problems in hospitals, categorized into 7 different categories. Thirdly, a method was developed to systematically identify the specific information needs of healthcare professionals in the context of process mining. The result is an iterative 11-step plan called MINI-PM, in which healthcare professionals are closely involved. This approach was also applied in the emergency department of the University Hospital in Brussels. Lastly, building upon the information needs of the emergency department of the University Hospital in Brussels, a case study was performed. In particular, the case study focuses on patient satisfaction. Satisfaction combined with process mining has not been widely studied and the conducted pilot study shows that it certainly is an interesting avenue for further exploration.

Overall, the findings of the dissertation show that healthcare professionals are confronted with a variety of process-related problems and have various context-specific information needs. The contributions of this dissertation enable both researchers and healthcare organizations to design algorithms and analyses that are more relevant, interpretable, and actionable. By enabling process mining to align better with the needs of healthcare professionals, this research contributes to empowering healthcare professionals to leverage the power of process mining to support the meaningful improvement of care processes in a data-driven way.