

Monitoring Employee Well-Being with Process Mining

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Abstract

Employee well-being is essential for organizational productivity and profitability, as it impacts health, job satisfaction, performance, and decision-making. Traditionally, self-report surveys have been used to measure well-being, but they may not fully capture the work environment as they rely on subjective experience and capture only a snapshot of the well-being at that time. Process mining can provide an objective and continuous view of the work environment by investigating the business processes. This Ph.D. project investigates the use of process mining to identify and measure work characteristics (using the Job Demands-Resources model) and patterns that are important predictors of employee well-being. Practically, this project will focus on identifying process improvements and how process mining can be used to (self-)monitor employee well-being. This research aims to enhance the understanding of well-being across various occupational sectors, combining process mining and traditional survey methods for a comprehensive assessment using qualitative and quantitative research methods. Initial results show promising correlations between process mining variables and well-being outcomes, suggesting the potential of process mining to identify improvements for work engagement. This Ph.D. project will contribute to both business process management and work and organizational psychology, offering practical and theoretical insights for monitoring and improving work-related well-being.

Keywords

process mining, employee well-being, work characteristics, work patterns, job demands-resources

1. Introduction

Employee well-being is a crucial part of organizational productivity and profitability [1]. Apart from an ethical argument to care for employees' health, upholding employees' well-being is essential from a business standpoint to achieve organizational success. Low employee well-being can cause illness, job dissatisfaction, lower performance, and poor decision-making [2, 3]. Monitoring well-being creates the opportunity for organizations to investigate how the work environment can be improved to support employee well-being.

Within work and organizational psychology, self-report surveys are commonly used to monitor well-being outcomes, such as work pressure, work stress, work engagement, and job satisfaction [4]. Self-report measures are valuable in evaluating employees' perceptions of various work characteristics [5, 6]. However, they rely on employees' subjective experiences and, thus, show a subjective view of the work environment [6, 7]. Additionally, the results of self-report surveys show a snapshot of the work environment at a specific moment in time and need to be repeated often to investigate changes over time.

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Process mining is a set of methods that could provide additional information and understanding of work-related well-being and work characteristics. It can be used to investigate the work environment by analyzing data collected from various information systems organizations use. This data will show the interaction between the employee and the information systems and, thus, part of the employee's behavior at work. Tang and Matzner [8] show conceptually how process mining can be used to measure aspects of work that influence employee well-being, such as workload and (un)fair distribution of work. The combination of process mining and self-report surveys can provide a more complete picture of the work environment by evaluating the employees' experience with surveys and evaluating the as-is situation and employees' behavior with process mining. In my PhD-project I want to answer the following questions:

- RQ1: *To what extent can process mining be used to identify work characteristics that influence employee well-being?*
- RQ2: *To what extent can process mining be used to measure work characteristics, and how does this compare to validated questionnaires?*
- RQ3: *To what extent can process mining be used to identify improvements to increase employee well-being?*
- RQ4: *How can process mining be used to continuously monitor employee well-being?*
- RQ5: *What are the similarities and differences between different occupational sectors regarding what work characteristics and patterns influence employee well-being?*

This research contributes to the business process management field by investigating how business processes influence employee well-being and how process mining can be used to assess and monitor employee well-being and its causes. Additionally, this research contributes to the work and organizational psychology field by combining traditional survey research with process mining creating a more comprehensive and objective view of employee well-being. The results of this research will have a practical contribution by extending our understanding of well-being and how it can be monitored and improved in different occupational sectors.

2. Related Work

2.1. Work-Related Well-Being and the Job Demands-Resources Model

Employee well-being is a broad concept that includes various well-being outcomes, such as work stress and work engagement. Within the work- and organizational psychology field, the Job Demands-Resources model (JD-R model) is often used to explain the causes of work stress and work engagement. The JD-R model suggests that the presence of job demands and job resources explain employee well-being. Job demands are aspects of someone's job that come with physical, psychological, and physiological costs [9]. Typical job demands are workload, time pressure, and role ambiguity. Job resources are aspects of someone's job that provide support to achieve one's goals and help cope with the existing job demands [9]. Job resources include supervisor and colleague support, autonomy, and development opportunities. Two pathways in the model explain how job demands and resources influence employee well-being. First, the health impairment process explains that job demands cause an increase in experienced

stress, which is related to lower well-being. Second, the motivational process explains that job resources are directly and indirectly related to employee well-being. Job resources directly influence employee well-being by increasing work engagement and indirectly by lessening the effect of job demands on work stress or burnout.

Previous research has shown that low job demands are not necessarily related to higher well-being. Low job demands, in combination with low job resources, are related to feelings of boredom [10]. Additionally, challenging demands, i.e., job demands that are appraised as something that can promote goal achievement and development, are related to an increased work engagement [11].

2.2. Business Processes, Process Mining, and Employee Well-Being

Business processes can be defined as the end-to-end work performed within an organization that creates customer value [12]. This work is performed by machines or employees, who are commonly referred to as process participants. The execution of processes or how employees work could affect their well-being, both positively and negatively. Indeed, Reif et al. [13] argue that processes are unhealthy not only when they do not create (enough) value but also if they negatively affect employees' well-being. Healthy processes, on the other hand, can foster employee well-being. Similar to the JD-R model, business processes (or parts of processes, e.g., work practices) may influence employee well-being as a job demand or a job resource.

One way to investigate the well-being of process participants may be through process mining. Process mining is a set of methods to analyze business processes through the use of an event log, which includes a case identifier, an activity, and a timestamp attribute [14]. Most process mining studies are focused on the order of activities in a process, i.e., the control-flow perspective [15]. The resource or organizational perspective focuses on the resource that executes the activities. This perspective provides more insight into the involvement of employees and how they work [16]. The framework by Pika et al. [17] shows how process mining can be used to analyse the resources' behavior. Recent work by Tang and Matzner [8] suggests the use of process mining to analyze work characteristics such as workload and job satisfaction. Burden et al. [18] show how event logs in health organizations can be used to measure different types of workload, by counting the number of times an employee opens patient charts, writes notes, and contacts colleagues.

The benefit of using process mining to evaluate employee well-being is the possible insight into day-to-day variations of work activities. The surveys commonly used in work and organizational psychology have set moments in time to measure the average presence of work characteristics at that moment. Process mining can continuously observe employee behavior and provide an evidence-based view of what the workday looks like for employees. Additionally, process mining can be used to observe any changes or deviations in processes that might be linked to employee well-being and monitor the implementation of improvements.

3. Method

This section describes the intended studies for this Ph.D. project. The project will make use of various research methods, including process mining, survey research, and interviews.

3.1. Study 1 (Accepted as workshop paper to BPM conference 2024, Krakau)

A pilot study was conducted to investigate how process mining can be used to evaluate work-related well-being in a small sample. Data in the form of event logs were collected from the main information system used in two IT departments. Additionally, a survey was used to measure the perceived presence of work characteristics and work-related well-being. The work characteristics measured as process mining and survey variables were monotonous work, time pressure, workload, social support, and autonomy. The work-related well-being was measured with three well-being outcomes: boredom, burnout, and work engagement. The process mining variables were statistically compared to the survey work characteristics and work-related well-being.

Although the study had a small sample size, it showed promising results. The process mining variables of social support, autonomy, and workload were found to strongly correlate to work engagement, while monotonous work was positively correlated to boredom. This indicates that these process mining metrics can partially explain work engagement. A moderate positive correlation was found between the process mining and survey variable of the work characteristic monotonous work.

3.2. Study 2 (In Progress)

Study 2 consists of two parts. First, interviews are used to identify the work characteristics and patterns present in academic personnel's work. We focus on which work characteristics and patterns are important for employees' experience of work engagement. The interviews will focus on the workday and work processes in the form of projects the employees execute. In the interviews, we will discuss active projects and two recent workdays in more detail to find concrete examples of work characteristics and patterns that influence their work engagement. For instance, we will ask about workload through questions related to the number of tasks and projects someone is working on and how long they have been working on them. Additionally, we are interested in knowing how long these tasks usually take, if there are instances where tasks would take longer or shorter than usual, and the possible reason why. We focus on high-level categories of the work's content, e.g., educational, research-related, or administrative tasks. Other than these task types, we focus on how the participants work rather than the content of the work.

The second part of Study 2 consists of analyzing event logs collected using active window tracking in a similar sample of academic personnel. An active window tracking tool records the app someone uses and the title of the active screen [19]. Using the interview results and a literature review, process mining variables of important work characteristics and patterns will be formulated. The correlations between the process mining variables and the work engagement measured in a survey will be investigated to identify which work characteristics and patterns are essential for the work engagement of academic personnel. The active window tracking and survey data were collected over the course of an academic year, creating the opportunity to investigate changes over time. Moreover, the data will be used to identify possible improvements that can be made to increase work engagement.

3.3. Study 3

Study 3 will be an intervention study. Based on the possible improvements identified in the second part of Study 2, one feasible improvement is chosen and implemented in the same sample. The same as in Study 2, data is collected using active window tracking and daily surveys after which the effect of work characteristics and patterns on work engagement is analyzed. Using the data from Study 2 and Study 3, we will investigate how effective the intervention was and how process mining can be used to monitor this change.

3.4. Further Studies

In studies 2 and 3, data are collected from academic personnel. In further research, we intend to investigate how process mining can be used to evaluate work-related well-being in other contexts. One of the intended work environments we would be interested in researching is health organizations. Health professionals cope with high work pressure and stress [20]. Finding improvements to decrease work pressure and stress and increase work engagement is crucial. We will investigate whether and how process mining can be used to find these improvements. Researching how well process mining variables can evaluate work-related well-being in more contexts will show the similarities and differences between work environments. This can broaden our understanding of how process mining can be used to identify improvements for business processes regarding employee well-being in multiple work environments.

Moreover, similar to Study 1, we intend to compare process mining variables with the more traditional survey measures of work characteristics. We will investigate how well they both explain work-related well-being and if process mining variables can be used to measure the same constructs.

4. Conclusion

To conclude, this Ph.D. project aims to investigate how process mining can be used to evaluate work-related well-being. By investigating work characteristics and patterns and their influence on employee well-being through process mining, we can gain a more comprehensive and objective view of the work environment. We suggest that the combination of process mining and survey research offers a promising approach to (self-)monitoring and improving employee well-being. This research can provide practical insights for organizations looking to foster a healthier workforce. Research in different work environments could provide broader applications and improvements in employee well-being across various sectors.

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