

# Behavioral Maintenance Management

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**Bas van Oudenhoven is a PhD student at the Eindhoven University of Technology. He is active in the field of behavioral operations management, where he focuses on the interaction between human decision-makers and advanced decision-support systems for predictive maintenance. In his research he investigates why people often reject these systems, and how these systems can be (re-)designed for acceptance by and efficient cooperation with decision-makers. He combines theoretical and empirical work in order to advance academia and support industry.**

## Introduction

Within PrimaVera, Bas van Oudenhoven participates in Work Package 5: *Organizational Behavior and Human Decision Making*. In his research efforts, Bas is supervised by his daily supervisor dr. Philippe Van de Calseyde, and his promoters dr. ir. Rob Basten and prof. dr. Eva Demerouti. As the research is part of a PhD project, we demonstrate the application of various research techniques. The project includes a literature review, multiple interview-based investigations, and several behavioral experiments. Combined, these researches aim to increase the frequency and quality of decision-makers' planning and prognostic decisions made with predictive maintenance (PdM) systems.

## Framework Development

First, to obtain and examine relevant literature for the research project, we performed a literature review. This review covers research in work- and organizational psychology, human behavior, forecasting, and predictive maintenance. The review aims to identify factors that promote acceptance of PdM in the workplace. We use a framework called *the Smith-Carayon model of the Work System*, which posits that humans are the center of the work system and that the workplace should be designed around them to facilitate acceptance of new technologies. We adjust this model

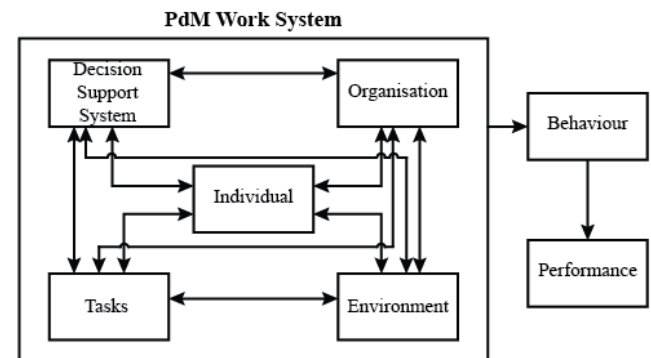


Figure 1: PdM Work System from the literature review, based on the Smith – Carayon Work System model.

(see Figure 1) to investigate how implementation of PdM affects the workplace and to develop propositions about the impact on the maintenance decision-makers that will use it. Based on the review, we formulate ten propositions about human acceptance of PdM. Next, we verify the relevance of these propositions through interviews with experts from academia and industry. From the interviews, we distilled four factors that enhance PdM adoption: trust between decision-maker and model (maker), control in the decision-making process, availability of sufficient cognitive resources,

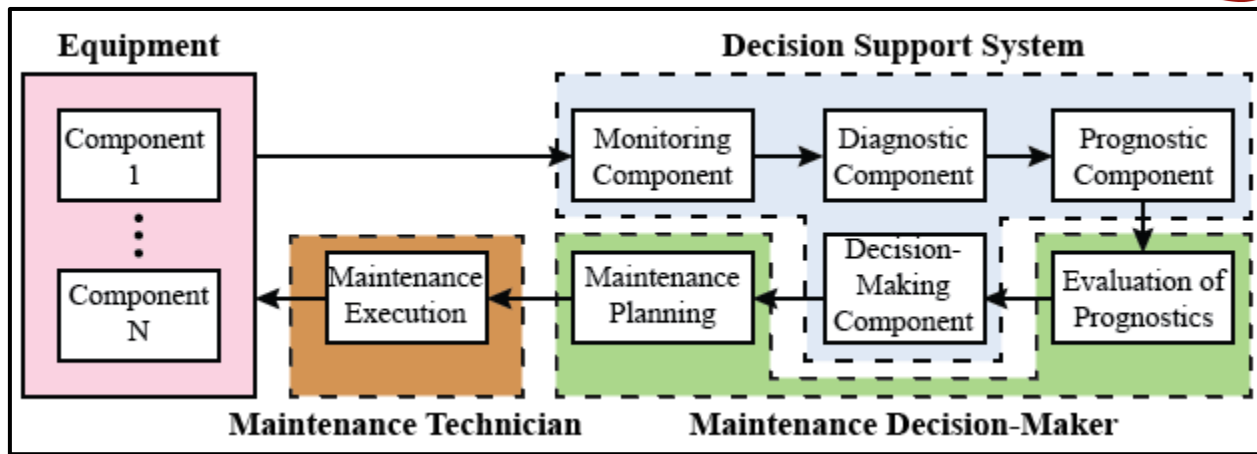


Figure 2: The PdM Decision-Making Process from our Literature Review

and proper organisational allocation of decision-making.

The paper is called ‘Predictive maintenance for industry 5.0: behavioral inquiries from a work system perspective’ and has been published in the *International Journal of Production Research*, see: [doi.org/10.1080/00207543.2022.2154403](https://doi.org/10.1080/00207543.2022.2154403).

## Empirical Extensions

The support factors from the first paper provide guidance for the remainder of the research project. We are most interested in investigating the control decision-makers have and want in the maintenance process. Figure 2 illustrates where we believe maintenance decision-makers will be asserting most control. As such, our empirical work assesses what these decisions will look like.

## Interviewing Decision-Makers

The interview study aims to uncover when and why maintenance decision-makers reject or accept advanced decision-support models and based on what motivations maintenance decision-makers come to a final decision. We conduct interviews with maintenance decision-

makers to describe their current decision-support system (DSS) application in practice and to ask them how they would respond to the implementation of more advanced PdM DSSs. We interview decision-makers at two companies: a private company where only planners perform ‘Maintenance Planning’ (see Figure 2) and a public company where both planners and maintenance technicians can make these decisions. From the interviews, we derive the decision-makers’ motives to reject and accept PdM systems.

## Behavioral Experiments

In our experimental work, we will test some of the system characteristics that our review suggests improve the acceptance of a PdM DSS (advice). These experiments address how to organize human control to increase decision-making performance and how to phrase and frame advice to increase acceptance of PdM systems. That is, we manipulate the amount of human control and the format of advice across various experimental conditions to examine which characteristics have the largest impact on acceptance of PdM and decision-making quality. Our first series of

experiments will be performed online. For our second series of experiments, we hope to replicate earlier experiments or perform new ones with industry partners (i.e., perform field experiments). By conducting experiments in a real-world setting, researchers can be confident that their results accurately reflect how people will behave when using a PdM DSS in their everyday work.

## Facts

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