BUILDING A KNOWING MAINTENANCE ORGANIZATION

by enhancing the predictive maintenance process at the Royal Netherlands Navy

Predictive maintenance has garnered increasing attention in both industry and academia as an effective maintenance strategy. In order to implement predictive maintenance successfully, the creation and enhancement of knowledge play a vital role. In this study, the maintenance department of the Royal Netherlands Navy (RNLN) serves as the case organization. In order to foster knowledge creation, a predictive maintenance process was developed, wherein a proposed Predictive Maintenance Knowledge Improvement Process (PdM KIP) was implemented and demonstrated using the "Combat Support Ship" case. Through the examination and evaluation of the case study, this research demonstrates a positive impact of the PdM KIP on knowledge creation. Furthermore, it recommends the establishment of a contextual environment (ba) to solidify and integrate knowledge within the organization's knowledge system.

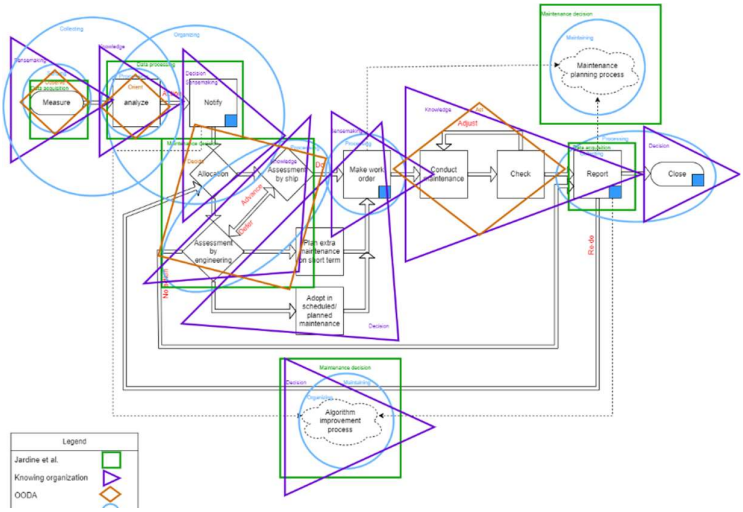

Figure 1: Visualization of the applicability of information management and decision making frameworks on the designed PdM process

Introduction

Predictive maintenance is a maintenance strategy which is gaining more and more interest in the industry and education. To do this predictive maintenance it is importance to create and improve knowledge. This knowledge can be used to improve processes and decisions. Knowledge creation should have a space or context (*ba* by *Nonka et al. (2006)*) to be executed, and thus also to improve. In the current maintenance processes at the Royal Netherlands Navy there is limited space to generate knowledge creation or improvement. The biggest challenge for knowledge creation is the entry and quality of data on for example repairs, feedback and performance information. The purpose of this research is to create a space where knowledge can be created and improved for predictive maintenance, which is done by creating a Predictive Maintenance Knowledge Improvement Process (PdM KIP).

Methods and approach

The design of the PdM KIP was developed using the Design Science Research Methodology (DSRM) of *Peffers et al. (2007).* By following this methodology the current maintenance strategies were brought to light at the RNLN and at four companies in the industry, combined with their CBM maturity based on *van de Kerkhof et al. (2019)*. A predictive maintenance process for the RNLN was designed to which four information

management and decision making frameworks were applied, shown in Figure 1. This figure includes the visualization of areas of knowledge creation, where a knowledge improvement process can be applied.

Proposed solution

To improve knowledge in the maintenance organization of the RNLN, and specifically in the PdM process a Predictive Maintenance Knowledge Improvement Process (PdM KIP) is proposed. The knowledge improvement process is described in Figure 2. This process aims to improve knowledge in the decision making, maintenance execution and data analysis. The design of the PdM KIP was refined using multiple design iterations that followed of *Peffers' et al. (2007)* DSRM.

Results and observations

The PdM Kip was demonstrated using the Navy's Combat Support Ship, that will be introduced in 2024. This demonstration showed how knowledge can be created and improved within the designed PdM process (Figure 2. Improvements are expected in seven areas of the predictive maintenance process at the RNLN, which generally entail: analysis of data, decision making and assessment, the execution of maintenance, the functionality check of equipment and the reporting of maintenance tasks.

Discussion and implication

This study observed that with the use of the PdM KIP, based on the demonstration and evaluation of the Combat Support Ship case study, the predictive maintenance process can be enhanced by adopting fundamental conditions for knowledge creation. Knowledge is created by giving meaning and context to data from assets and information from decision making and executed maintenance tasks. This information and data is used in the PdM KIP to improve and amplify the knowledge in the predictive maintenance process and connecting knowledge by crystallizing it in the organizational structure. Although the results of this study cannot be generalized, the recommendation of this study is to introduce a *ba* where knowledge can be created, shared and improved to support the adoption of predictive maintenance.

References

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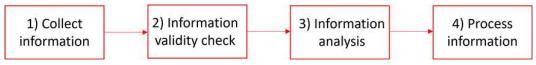

Figure 2: The PdM KIP activities

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