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Knowledge management framework for complaint knowledge transfer to product development

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Abstract

The paper presents a methodological framework based on the analytical network process (ANP) approach for selecting knowledge management (KM) solutions for complaint knowledge transfer to product development. Existing approaches to technical complaint management (TCM) mostly neglect the necessity of knowledge transfer, and thus do not address quality or sustainability issues. The framework addresses this shortcoming by providing a systematic approach for selecting appropriate KM solutions in a given organizational environment. Based on extensive literature review competing objectives, diverse criteria as well as various organization specific factors have been identified and integrated into the framework. An expert study amongst 15 KM experts was conducted for parametrizing the model (i.e., to evaluate KM solutions with respect to the identified objectives and criteria). The framework enables long-term effects on failure-based learning and facilitates the design of a more sustainable TCM.

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Keywords: knowledge management; learning organization; technical complaint mangement; sustainable product development; ANP; MCDM

1. Introduction

These days, manufacturing companies are subject to a market environment that is characterized by constantly increasing customer requirements at shorter product life cycles [1]. In order to meet global competition with regard to these challenges, companies need to design and deliver products both providing significant value to their customers and being sustainable [2]. Herewith, the ability of customer-oriented product development at minimal time becomes a key success factor. Additionally, the consideration of sustainability aspects in the product development process is of

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increasing importance as customers' demands for sustainable products are rising [3]. Product development particularly allows addressing these aspects upfront the product life cycle [4]. In this context, technical complaint management (TCM) has repeatedly proposed to be a source of knowledge for identifying and addressing critical aspects to product quality and sustainability [5]. TCM comprehends all technical related efforts to solve criticized product failures underlying internal or external complaints. It aims at fast failure identification, immediate root cause clarification and long-term prevention of reoccurrence whilst considering the entire product life cycle. Although research indicates great potential, long-term effects of failure-based learning lag behind [6,7]. In order to address this shortcoming, a conceptual process model for complaint knowledge transfer was developed in former research by LINDER ET AL. [8] The focus of this paper is to consider this model in detail by integrating a framework of knowledge management (KM) solutions and a corresponding selection approach using the analytical network process (ANP).

The paper is organized as follows. First, the state of the art of knowledge management in TCM research is briefly reviewed. Afterwards, a literature-based framework of KM solutions is developed, which serves as methodological support for the above mentioned process model. Finally, an ANP model for the evaluation of the identified solutions is derived and parametrized based on the results of a study amongst 15 KM experts.

2. Knowledge management in technical complaint management research

This chapter provides an overview of relevant research works related to aspects of knowledge management within technical complaint management. Specific TCM reference models or processes can be found in different fields and vary greatly in terminology (e.g., CHIEW and WANG [9], GOLDSZMIDT ET. AL. [10], KLAMMA ET AL. [11], SCHMITT and PFEIFFER [12], BEAUJEAN [13], BOSCH and ENRIQUEZ [14]). Although, these models agree on similar process steps to guide failure correction, the necessity of transferring complaint and failure knowledge is neglected [8].

Instead, prior research mainly incorporates approaches for description and standardization of complaint information and knowledge. ORENDI [15] presents an approach for complaint and failure classification based on quantitative, qualitative and verbal descriptions. LASCHET [16] describes an alphanumeric and mainly cost-oriented concept for complaint classification. EBNER [17] proposes a concept that allows the use of field failure data as standardized descriptions in the phase of product development. FUNDIN and ELG [18] address the use of dissatisfaction feedback for continuous learning in product development. The expert-based method by PLACH [19] (research project FAMOS) allows a computer-aided failure management by using text-based descriptions of failures with exclusive syntax. Additionally, industry-specific approaches can be found in scientific literature. KIRATLI [20] developed a relative classification of failures at the example of cutting manufacturing facilities. HORNAUER [21] provides a catalog, which is used for classification of failure types and causes in the field of sheet metal forming. RUETTHARD [22] focuses on the feedback of experience in the stages of product planning at the example of complex sheet metal parts.

The presented approaches give an overview regarding the integration of KM aspects in TCM. However, theoretical prototypes that specify the long-term transfer of complaint information and knowledge are practically non-existent or have no application in practice. In order to extend the scope of existing models to a more sustainable TCM, it requires a specific approach to generate, distribute and use complaint knowledge in the long run. Hereof , the concept developed by LINDER ET AL. [8] serves as basis for further considerations in the following sections.

3. Long-term complaint knowledge transfer to product development

3.1. Conceptual process model

The conceptual process model for long-term knowledge transfer [8] builds on generic KM activities defined by PROBST ET AL. [23]: Identification, acquisition, development, distribution, usage and protection of knowledge. LINDER ET AL. [8] have applied these activities to the objective of long-term complaint knowledge transfer. They suggest to conduct knowledge identification, acquisition and development as well as distribution and usage with the inputs of the previous TCM phases (i.e. *data organization*, *failure identification* and *failure correction*). Hence, the model includes three modules, namely *acquisition*, *analysis* as well as *distribution and usage*.