

Title	DXにおける機械学習応用システムの深化プロセスと人間・機械協働型マネジメント
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Abstract

This doctoral dissertation focuses on machine learning systems and human-machine collaborative management, elucidating digital transformation's (DX) classification and evolutionary processes and methods for enhancing DX implementation intention. Promoting DX within enterprises is essential for improving operational efficiency and creating new value, with machine learning systems playing an increasingly crucial role. However, significant challenges exist in how users can effectively utilize machine-generated outputs and exploit the system. This research aims to classify DX in enterprises, clarify its evolutionary processes, and investigate how machine learning systems, including human factors, interact, exploit, and collaborate.

This study proposes a new theoretical framework based on systematic analysis of qualitative data to address the challenges enterprises face with DX and machine learning application systems. The factors that enhance DX intention and the human-machine collaboration factors were validated through quantitative analysis.

The research results, which unveil three classifications of DX in enterprises (internal chain optimization DX, value chain optimization DX, and new business value creation DX) and their evolutionary patterns (operational excellence, self-sufficiency, and co-creation), are of significant importance. The findings shed light on the factors that influence DX intention, such as attitudes, interests, and confidence in skills and abilities related to DX. Moreover, the systematic enhancement of these factors can improve the intention.

The exploitation process of machine learning systems is a continuous sequence evolving from data visualization to system autonomy, with each stage characterized by specific features and challenges. These challenges include technical issues and human factors, where users must accept, adapt, and effectively utilize the system. The construction of trust in human-machine collaboration is crucial, with the dissertation analyzing the elements required for trust and the processes leading to it. Translators, who interpret and convey machine-generated predictions and analyses, are critical in optimizing system performance and fostering user trust by presenting the system's output efficiently.

The dissertation identifies characteristic user profiles (general users, AI users, AI translators) at each stage of the machine learning system's exploitation process. It highlights the factors influencing user trust in machines and aims to provide guidelines

for incrementally deepening machine learning systems in alignment with the evolution of DX. The study emphasizes the importance of human trust in machines within the knowledge-creation process, where machines function as active agents. This balanced relationship is crucial for the successful integration of humans and machines in promoting DX in enterprises.

By complementing and adapting to each other, humans and machines can offer significant insights into promoting DX in enterprises. Companies can overcome the complexities of technology and innovation management through this integrated approach, ensuring continuous improvement and competitive advantage in the digital era.

Keywords: Human-machine collaboration, Software Engineering for Machine Learning Applications, Digital Transformation, Business Model Innovation, Project Management, Technology and Innovation Management.