Analyzing the feedback structure of failure management in manufacturing systems

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Abstract

Purpose

Despite manufacturing companies' intended zero-defects strategy, experience in dealing with complex systems shows that a comprehensive error and defect prevention is virtually impossible. Complex systems are characterized by diverse interacting components which are subject to intrinsic dynamics as well as circular, partially delayed cause-effect relationships. Due to these system properties, system performance is strongly affected by the internal emergence and external introduction of defects and disturbances. Serial production can be considered as such a complex system and, hence, requires adequate mechanisms for defect and nonconformity management.

Design/methodology/approach

The paper presents a system dynamics (SD) model for the analysis of manufacturing system's performance resulting from different defect management strategies. The model incorporates containment actions, root cause analyses, corrective actions as well as organizational learning effects resulting from the analysis of defects.

Findings

The model provides fundamental insights into how the system's feedback structure presents challenges to employees and management facing partially conflicting targets while resources are limited.

Originality/value

The optimum design of associated processes requires a systemic approach as defect management activities add even more complexity to the manufacturing system. Most existing approaches, however, neglect the strong interactions between short-term production targets and defect management activities. Both subsystems are traditionally optimized independently, provoking target conflicts.

Keywords: Defects, Nonconformity Management, Quality, Manufacturing System, Learning