ORIGINAL ARTICLE

Relationship between lean manufacturing tools and their sustainable economic benefits

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Abstract
Traditionally, the isolated relationship of total preventive maintenance (TPM), quick setup (QS), overall equipment effectiveness (OEE), and one-piece flow (OPF) with economic sustainability (ESU) has been investigated; however, these lean manufacturing (LM) tools are implemented together into production systems, and traditional research does not report their relationships and interactions. To contribute to this gap, this paper integrates all those variables in a structural equation model (SEM), which are related by seven hypotheses that are validated using the partial least squares (PLS) technique using information from 176 responses to a questionnaire applied to the Mexican maquiladora industry. Additionally, a sensitivity analysis has been carried out to determine the probability of occurrence at high and low implementation levels for all variables when they occur in isolation, jointly and conditionally. Findings indicate that TPM is a precursor of QS and OEE, while QS is a precursor of OEE and OPF, OEE is a precursor of OPF and ESU, but also OPF is a precursor of ESU. The sensitivity analysis indicates that low levels of TPM are a risk for reaching adequate levels of OEE and QC, while low levels in OEE and OPF are a risk for reaching adequate ESU levels.

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