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# Application of Lean Six Sigma for product quality improvement and production process enhancement in micro-scale food manufacturing

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## Abstract

This paper aims to investigate the application of Lean Six Sigma (LSS) methodology to improve product quality and streamline production processes within micro-scale food manufacturing enterprises. A qualitative case study design was used to examine the business operations of a bakery shop. The study focuses on identifying and addressing the root causes of product defects using the DMAIC (Define, Measure, Analyze, Improve, and Control) approach to product quality and to the cheese tarts process. Over three months, data collection revealed that cracked tart shells and inconsistent cheese texture were the primary quality issues. The cheese tart production process was assessed at a Sigma level of 3.20. To improve product quality, the study uses a Taguchi method–based Design of Experiments (DOE) and recommends specific process parameters: a mixing speed of 80 rpm, a baking duration of 15 min, and an oven temperature of 180 °C. As a result, defect rates were reduced, leading to improved product quality and an enhanced production process with fewer defective products. This paper is based on a single case study, which limits the findings to other micro-scale food manufacturers or industries. The study's results show that micro-scale manufacturers can achieve significant improvements in product quality and operational efficiency by adopting a tailored LSS approach. The findings of this study can inform practitioners and researchers on effective strategies for leveraging LSS methodology in similar organizational contexts. © The Author(s), under exclusive licence to Springer Nature B.V. 2026.

## Author keywords

DMAIC; DOE; Lean Six Sigma; Micro-scale manufacturing; Taguchi method

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