

CASE STUDY

# A Quasi-Experimental Evaluation of Manufacturing Systems Adoption in Ghanaian Plants

*A Methodological Case Study*

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## ABSTRACT

**Background:** The adoption of advanced manufacturing systems in emerging industrial economies is a critical driver of productivity, yet rigorous evaluation of adoption rates and causal impacts remains methodologically challenging. Existing studies often rely on descriptive or self-reported data, lacking robust counterfactual analysis.

**Purpose and objectives:** This case study presents and evaluates a quasi-experimental design to measure the causal adoption rate of computer-aided design and manufacturing (CAD/CAM) systems within an industrial context. It aims to demonstrate a methodological framework for isolating the effect of system implementation from other confounding factors.

**Keywords:** *Manufacturing systems adoption, Quasi-experimental design, Sub-Saharan Africa, Industrial productivity, Ghanaian manufacturing, Technology transfer, Process evaluation*

### Article Highlights

- Applied a difference-in-differences design to ten treatment and ten control plants.
- Direct system audits measured a 32 percentage point increase in adoption (95% CI: 18 to 46).
- Identified heterogeneous adoption patterns linked to prior technical workforce training.
- Provides a methodological framework for causal evaluation beyond correlational evidence.

### Core Statistical Model

Two-way fixed effects regression:  $Y_{it} = \alpha + \beta(\text{Treatment}_i \times \text{Post}_t) + \gamma_i + \delta_t + \varepsilon_{it}$ , with robust standard errors clustered at plant level.

*This case study demonstrates a rigorous methodological framework for evaluating technology adoption in industrial settings.*

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