

Interrelationships between Utilization, Engineering Changes, Productivity and Quality in the Automobile Industry

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Abstract

We study the complex interplay between plant utilization and engineering change orders, and their influence on productivity and product quality with the help of a proprietary assembled dataset from the automobile industry. Specifically, we first observe that plant productivity has a significant positive association with final product quality. Second, we find a concave relationship between capacity utilization and productivity such that the rate of increase of productivity decreases with increased utilization. Third, we find that while utilization has a positive indirect effect on quality via productivity, it has a negative direct effect on quality. Overall, our analysis reveals that the net effect of utilization on quality is insignificant. Fourth, while we find that customer initiated changes in the product improve quality, surprisingly; manufacturing related changes are detrimental for quality. Furthermore, the economic impact of customer (manufacturing) change orders on quality is in reducing (increasing) the cost of a vehicle by about \$2.35 (\$1.53). These findings suggest that better management of ECO's can result in substantial savings overall by not only reducing warranty claims and associated costs, but also by improving customer loyalty through reduced warranty claims. Finally, we find a significant moderation effect of quality engineering changes on the relationship between utilization and productivity such that they impede productivity gains associated with increased utilization. Our findings shed new light on critical operational decisions in plants and their immediate (i.e., plant productivity) and distant (i.e., final product quality) performance implications for manufacturing firms.

Speaker Profile

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