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Optimization of Manufacturing Process Parameters: An Empirical Study from Taiwan's Tech Companies

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Abstract : The parameter design is crucial to improving the uniformity of a product or process. In the product design stage, parameter design aims to determine the optimal settings for the parameters of each element in the system, thereby minimizing the functional deviations of the product. In the process design stage, parameter design aims to determine the operating settings of the manufacturing processes so that non-uniformity in manufacturing processes can be minimized. The parameter design, trying to minimize the influence of noise on the manufacturing system, plays an important role in the high-tech companies. Taiwan has many well-known high-tech companies, which show key roles in the global economy. Quality remains the most important factor that enables these companies to sustain their competitive advantage. In Taiwan however, many high-tech companies face various quality problems. A common challenge is related to root causes and defect patterns. In the R&D stage, root causes are often unknown, and defect patterns are difficult to classify. Additionally, data collection is not easy. Even when high-volume data can be collected, data interpretation is difficult. To overcome these challenges, high-tech companies in Taiwan use more advanced quality improvement tools. In addition to traditional statistical methods and quality tools, the new trend is the application of powerful tools, such as neural network, fuzzy theory, data mining, industrial engineering, operations research, and innovation skills. In this study, several examples of optimizing the parameter settings for the manufacturing process in Taiwan’s tech companies will be presented to illustrate proposed approach’s effectiveness. Finally, a discussion of using traditional experimental design versus the proposed approach for process optimization will be made.

Keywords : quality engineering, parameter design, neural network, genetic algorithm, experimental design
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