

Optimising Performance and Cost at the Early Design Stages

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Abstract

When designers start to design a product, deriving a useful cost estimate at the early design stage is challenging. This is because the available data is limited and designers need to deal with variation, especially for new products where product specifications are often expressed as a range of values. Despite this difficulty, cost estimation should be carried out as early as possible since, up to 80% of a product's cost is said to have been committed in the early design stages. One of the challenges faced is how one can optimise performance and cost. The research presented in this paper offers a solution to this challenge. The solution is used to reduce variation in the product specification in order to improve the quality of the cost estimate in the early design stages. The step-by-step process enables designers to undertake an informed optimisation between performance and cost to aid in the selection of the final concept. To achieve this, the research presented in this paper proposes the use of Taguchi's orthogonal array approach to reduce variation in the product specification. Within this paper, a critique of the literature and industrial context is offered, demonstrating the need for such an approach. From this critique, the research question 'How can we improve the quality of the average cost during the early design stages using the limited information available?' is defined and a novel process is described. Finally, a pilot and industrial case study are used to demonstrate how the process would be used. The outcome illustrates how designers can use this process to estimate the lowest possible average cost with the lowest variance.

Keywords: cost estimation, Taguchi's orthogonal array approach, concept development process

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