

# **A data-driven systematic approach to characterize job complexity and predict the optimal resource requirement and performance targets via data envelopment analysis**

**Pamela Lin, Nicolas Delagneau and John Kuan**

Infineon Technologies Asia Pacific Pte Ltd

8 Kallang Sector, Singapore 349282, Singapore

[yanlingpamela.lin@infineon.com](mailto:yanlingpamela.lin@infineon.com), [nicolas.delagneau@infineon.com](mailto:nicolas.delagneau@infineon.com), [kuan.john@infineon.com](mailto:kuan.john@infineon.com)

## **Abstract**

In the dynamically changing manufacturing environment, human resource management has always been a complex process as it is challenging to quantify and relate the job complexity to the required work effort. This is mainly because indirect labor deals with technical project oriented tasks and the driving force behind its requirement is not directly related to unit output. In this study, a data-driven systematic approach is developed to characterize the job complexity of indirect workforce and predict the optimal workforce requirement and performance targets via data envelopment analysis (DEA). Firstly, the job complexity is defined by its attributes and quantifying them in the form of an index. Subsequently, together with other key performance measurable, they serve as the outputs and number of engineers as the input for the non-parametric frontier modelling. The model is validated by evaluating the past relative efficiency performance of the different teams which will then be used as benchmark for the study. The effects of varying the output measurable on the optimal workforce requirement are illustrated via three real case scenarios. The approach provides a clear understanding of the team performance based on different performance measurable, and also serves as a decision-making tool for the managers to allocate their workforce in the light of changing manufacturing environment so that their shortages and excesses can be addressed more efficiently and effectively, thereby boosting productivity.

## **Keywords**

Job complexity; indirect workforce requirement; data envelopment analysis

## **Biographies**

**Pamela Lin** is an engineer in the Industrial Engineering in Infineon Technologies Asia Pacific. She holds a Bachelor of Engineering degree in Mechanical Engineering and also PhD in Mechanical Engineering from Nanyang Technological University, Singapore. She has published journal and conference papers. Her research interests include manufacturing analytics and simulation.

**Nicolas Delagneau** is Senior Manager Product and Test Engineering at Infineon Technologies. He manages several teams of Product Engineering, Yield Management, New Product Introduction and Engineering Samples. All responsibilities and priorities of these different teams have to be balanced to achieve short cycle time of productive lots, high yield and Time to Market. Headcount Efficiency is key in order to reach higher performance with fixed indirect human resources.

**John Kuan** is the Head of Department for Industrial Engineering, Test Singapore, Infineon Technologies Asia Pacific. He graduated with Degree in Mechanical Engineering from Nanyang Technological University, Singapore. He has more than 20 years' experience in the semiconductor, consumer electronics and solar industry in the field of Industrial Engineering and Manufacturing.