

**MANAGEMENT OF TECHNOLOGY:
A CASE STUDY OF COST DEDUCTION IN MULTI-SITE TESTING FOR THE
SEMICONDUCTOR INDUSTRY**

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ABSTRACT

With the increasing demand for high-complexity consumer Electronic products, the design of New Semiconductor chips needs to provide the required flexibility and speed. This trend shows that the functionality built into a single Semiconductor chip has continuously improved compared to the functionality 20 years ago. In contrast, Testing Costs in Semiconductor industries today can reach a substantial percent of the total Manufacturing Cost, thus affecting the Profit Margin.

Numerous approaches have been introduced to lessen Testing Costs; one of them is the Multi-site Testing. Two case studies were conducted to determine the effectiveness of Multi-site Testing in reducing Testing Costs. To achieve the research goal, a Multi-site test Cost Model and Profit Model was developed using the test Cost economic Model developed by Evan (1999) based on the economic theory of the firm, and by integrating important elements including economic Profit Margin and technology Multi-site efficiency. These models enabled the researcher to measure the capabilities of the Multi-site Testing for the Cost of Test Deduction and its effectiveness in relation to improving the Profit Margin.

The case studies were conducted on two types of Test-equipment, namely, Wafer-Ring and Pick-and-Place Test-equipment setup. Five Multi-site configurations were configured on both Test-equipment setups for comparison. Testing time, Indexing time, and Test yield-data were collected for the purpose of establishing the Testing Cost and calculating the Profit Margin. Four hypotheses were tendered to analyze the performance of the Test-equipment setup, including Multi-site versus Multi-site efficiency, Multi-site versus Testing throughput, Multi-site versus Testing Cost, and Multi-site versus Profit Margin improvement. The findings were analyzed using one-way ANOVA, Post-hoc test, and factorial ANOVA.

This research established that increasing the number of test sites is not sufficient to guarantee reduced Testing Cost while maintaining Profit Margin because, once the number of test sites increases correspondingly, the Testing time will increase as well. It is therefore proposed that future work be conducted on the Multi-site Testing Approach together with other Testing Approaches that can reduce Testing time, such as concurrent Testing.

APPROVAL PAGE

I certify that I have supervised/read this Study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in quality and scope, as a thesis for the fulfilment of the requirements for the degree of Master of Science (By Research) in Management.

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DECLARATION

I hereby declare that the thesis submitted in fulfilment of the Master of Science (By Research) in Management degree is my own work and that all contributions from any other persons or sources are properly and duly cited. I further declare that the material has not been submitted either in whole or in part, for a degree at this or any other university. In making this declaration, I understand and acknowledge any breaches in this declaration constitute academic misconduct, which may result in my expulsion from the programme and/or exclusion from the award of the degree.

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List of Abbreviations

ASP	Average Selling Price
ATE	Automated Testing Equipment
ATC	Average Total Cost
ANOVA	Analysis of Variance
AU%O	Actual Utilization Percentage for Production Output
BIST	Built-in Self-Test
BM	Bandwidth matching
C_{PKg}	Cost of Bad Parts
CPD	Cost per Device Model
CPU	Cost per Unit
Dep	Depreciation Cost
DL	Direct Labor Cost
DRAM	Dynamic Random Access Memory
DSP	Digital Signal Processor
DFT	Design for Testability
D	Demand Curve
EEPROM	Electrically Erasable Programmable Read-only Memory Chip
EPROM	Erasable Programmable Read-only Memory Chip
FC	Fixed Cost
FCC	Facility Cost
FPS	Floor space Cost
GPL	Graphic Processing Logic Chip