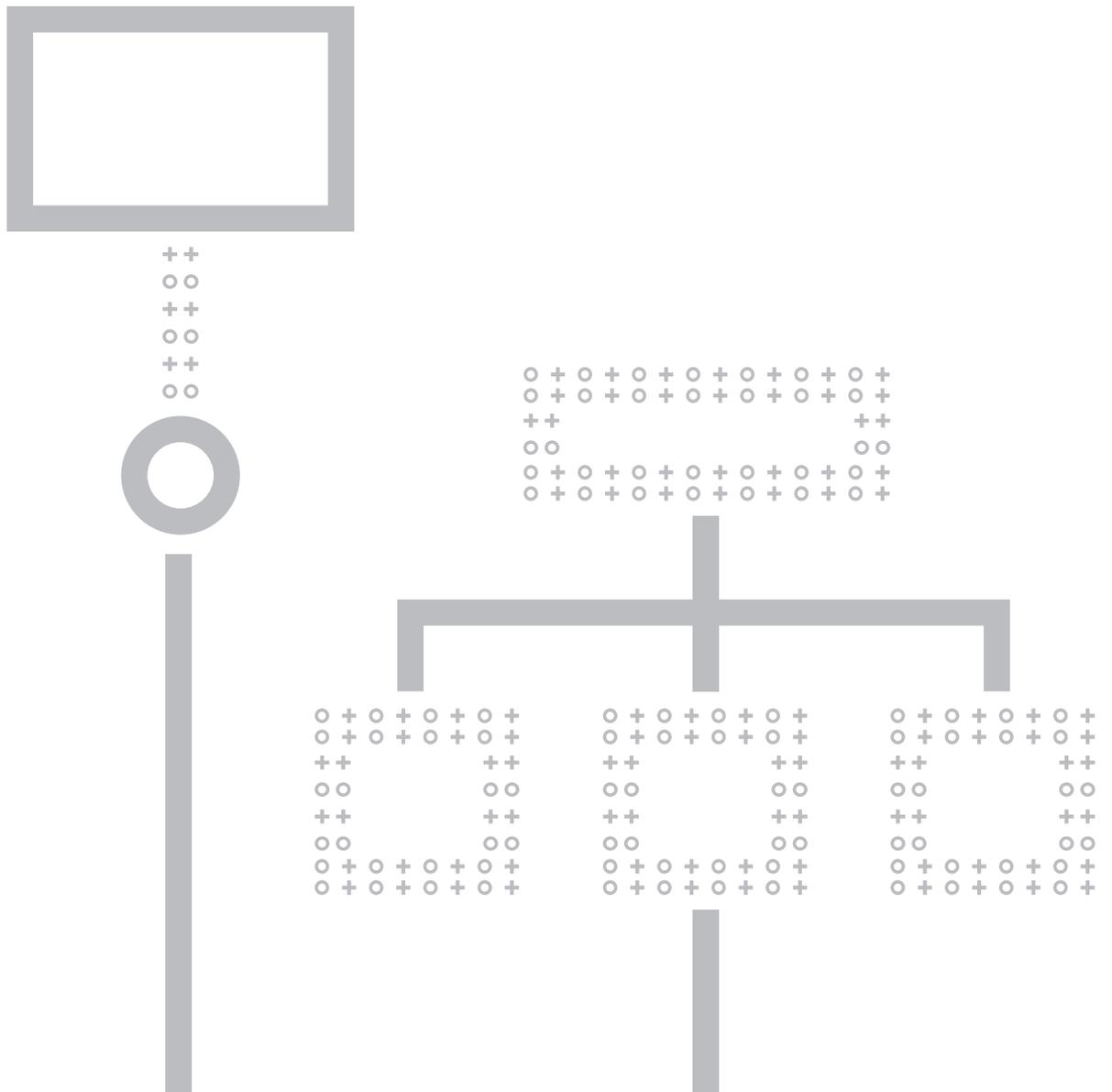# Test Data Analysis as a Service

Article | January 2019

Introduction

The semiconductor industry is under a lot of pressure from their customers nowadays. They're expected to keep up with consumer expectations for shorter electronic product life cycles, without compromising on the reliability and quality of the components and products coming off the line. A recent article from McKinsey & Company, however, describes how quality procedures have become a bottleneck in the drive to reduce time-to-market:

> " **Lead times for bringing integrated circuits to market have been gradually rising with each node. New design and manufacturing techniques account for some of the increase, but more complex inspection, testing and validation procedures also create delays.**

The McKinsey piece also goes on to discuss how advanced analytics and machine learning are critical to streamlining and optimizing manufacturing and testing processes in the semiconductor industry. In this blog, we focus on the challenges of test data analytics in the semiconductor industry, and we introduce OptimalPlus' new test data analysis service that can empower in-house teams.

Test data analytics: The challenges

Inspection, testing, and validation procedures in the semiconductor industry have become more complex because they have to meet the ever-increasing requirements and complexities of the products being delivered. In order to open up design and manufacturing bottlenecks, foundries and IDMs as well as fabless companies are all seeking to automate these procedures to the greatest extent possible.

Semiconductor manufacturers invest in equipment and platforms to collect data at scale and at velocity across the production, test and assembly floors. However, analyzing this big data in order to extract value in terms of improved yield, efficiency, and quality involves a number of challenges:

Data veracity	Data variety	Data management & analytics support	Personnel
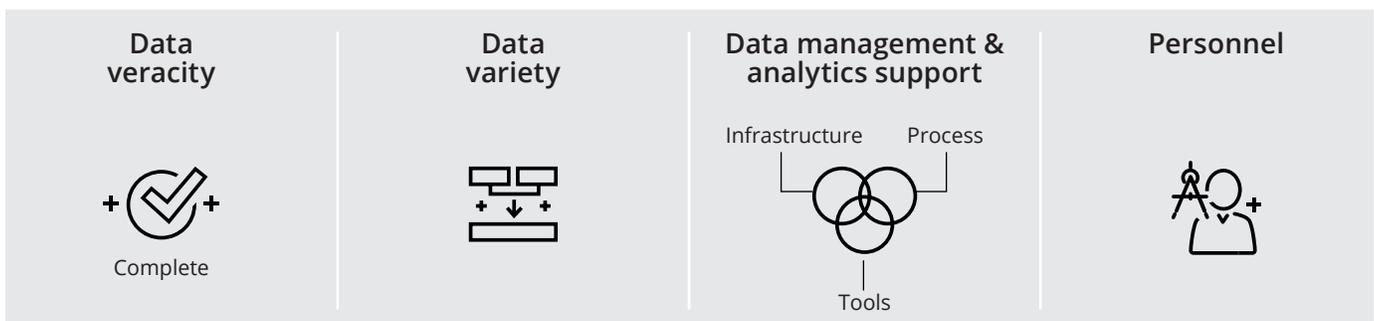
- **Veracity:** Ensuring that the test data being fed into the analytics stack is complete, accurate and in sync across operations.

- **Variety:** The wide range of sophisticated test and assembly equipment means that there are often several proprietary data formats that have to be merged into a unified data model in order to optimize it for analytics and machine learning.

- **Infrastructure:** Specialized infrastructures, processes, and tools are necessary to manage the test data sets and support the analytics efforts. Even when cloud-based, the infrastructure and tools for test data analytics can be costly to scale.

- **Personnel:** There is a great deal of competition for the highly skilled and experienced data scientists and engineers who have mastered the analytics platforms.

Data analytics & machine learning: Their critical role in semiconductor manufacturing & testing

Minimize production and test equipment downtime via predictive and adaptive maintenance.

Optimize yields: Track, capture, detect user-defined statistical changes in manufacturing, test, assembly processes for earlier, cost-effective corrective measures.

Higher equipment utilization and enhanced throughput with greater levels of efficiency; optimized test fleet and global operations, improved testing processes and products.

Reduce cost without compromising quality: Use upstream data to predict downstream failures, significantly reducing test time and skip test operations.
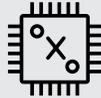
Fine-tune quality screenings: Catch "bad" dies before shipping, reduce waste from incorrectly categorizing dies as faulty or by discarding outlier chips that could be assigned to a lower level of functionality.

Extending your in-house teams

OptimalPlus now offers its test data analytics capabilities as a service that can augment and extend its customers' in-house quality, product engineering, and data science teams. The service leverages the unique OptimalPlus platform as well as the methodologies and best practices learned from extensive hands-on experience.

The customer uploads test data into a secured folder and over a period of several weeks, the OptimalPlus team analyzes the test data for a specific product and produces a detailed report identifying areas of potential improvement in yield, efficiency, and quality. The report also provides practical recommendations for addressing the issues identified, including:

- **Yield:** Detection of multiple yield issues and how to improve them, such as setting optimal test limits, using wafer sort data to predict edge fallout at Final Test results, and optimizing retest policies.

- **Efficiency:** Analysis of test equipment performance (pause time, site-to-site, tester-to-tester, etc.) and overall throughput across test fleet and global operations, with suggestions of how to streamline and improve testing processes and products.

- **Quality:** Leveraging a powerful combination of deterministic and statistical analytic methods developed through running analytics for 70+ billion devices each year, the Test Data Analysis service identifies quality issues such as tester freeze, test escapes, over-probing and outliers and suggest ways to improve them.

We at OptimalPlus are excited about our new Test Data Analysis service. Fabless and IDM companies that do not have dedicated tools or are using a variety of tools can benefit from the knowledge and expertise we have built over the years. We believe this service is a natural extension of our industry-leading manufacturing intelligence solution and will multiply the value that OptimalPlus already brings to the semiconductor industry. To learn more, visit our Test Data Analysis as a Service page or contact us at one of our US, European, or Asian locations.

Why OptimalPlus

OptimalPlus is a leader in product lifecycle analytics for the electronics industry, including chip manufacturers and the sector's entire supply chain. With its unique combination of data science excellence and semiconductor knowledge and expertise, OptimalPlus has earned the trust of the most prominent players in the global electronics market, including Qualcomm, Nvidia, AMD, NXP, Xilinx, STM, ON Semiconductor, Renesas, and many more.

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