

Standardizing Platforms From Characterization to Production

In 1983, the first commercial mobile phone retailed for \$3995, almost \$10,000 in today's economy. It supported a single band, weighed almost a kilogram, and was about the size of a brick.

Two decades later, a quad-band "world phone" costs a few hundred dollars. Even a basic mobile phone that supports over 20 cellular bands, in addition to Bluetooth, Wireless LAN, and GPS technology, retails for under \$100 today.

While this dramatic drop in price has significantly benefited consumers, it has created substantial challenges for those supplying the RF components inside. According to a recent Databeans analyst forecast, the cost of radio frequency integrated circuits (RFICs) for

"...greater effort is being placed on decreasing IC design, development, and fabrication expenditures in order for the industry to maintain its continuous reduction in the cost per function."

—The McClean Report 2015, IC Insights

mobile devices has dropped by more than 40 percent since 2007. This price decrease is coupled with the challenge of rising device complexity. Ten years ago, a single-function GSM power amplifier was the norm. Today, many RFICs are significantly more complex. They support multiple radio standards and multiple bands with more advanced technologies such as dynamic power supplies, MIPI digital interfaces, and more.

To maintain margins while the average sales price shrinks, companies must reduce the cost of semiconductor design and test. Given that test cost is often nearly half of the cost of goods sold, according to IC Insights, RFIC suppliers have a renewed focus on decreasing the cost of manufacturing test.

Over the past decade, this intense focus has produced a significant shift from using turnkey ATE solutions to building in-house and cost-optimized testers based on off-the-shelf instrumentation. The ability to specify a tester for a specific IC device—along with improvements in instrumentation technology—can significantly reduce test cost. This shift to a custom tester approach has been a large factor in the success of modular instrumentation platforms like PXI in manufacturing particularly because modular instruments have shown excellent value per performance.

Competition and Innovation Increase Pressure on Cost

As intense market competition and an ever-accelerating pace of wireless innovation complicate the desire for lower costs, recognizing that these forces require shorter product release cycles for companies to stay competitive is important. With much of their manufacturing test costs already reduced through the use of modular instruments, organizations must find new ways to improve the efficiency of product development.

Once considered the holy grail of product development, one increasingly important practice is to shorten the product design cycle with standardized design and test tools. In the past, product development teams often used different design and test practices and equipment in each phase of product development. With this approach, the engineer validating silicon and the engineer designing the manufacturing test plan were often left to design their own tester from the ground up.

To be profitable, companies must improve efficiency between each phase of the product development cycle. As a result, many companies are adopting integrated

platform approaches to help reduce total test costs as well as shorten time to market. As the 2015 McClean Report says, organizations must place greater effort into "decreasing IC design, development, and fabrication expenditures in order for the industry to maintain its continuous reduction in cost per function."

Although the desire to use a common test platform from design to test is not new, innovations in test equipment are now making that possible. A decade ago, the test equipment engineers might have used in their characterization labs was simply not fast enough for high-volume manufacturing test, and using different tools throughout the product life cycle was a necessity.

Today, PXI instruments offer the measurement accuracy required for R&D and the speed required for manufacturing test. As a result, organizations are increasingly standardizing on modular instrument platforms throughout the entire design cycle, which directly reduces the cost associated with correlating measurement results. In addition to the improved speed and measurement quality of PXI, application-specific systems, such as the NI Semiconductor Test System, build on the PXI platform by adding a rugged enclosure, fixturing, DUT control, and the turnkey software required for the semiconductor manufacturing environment.

Mergers and Acquisitions Drive Standardization

Other factors driving the need to standardize on common design and test platforms are mergers and acquisitions within the semiconductor industry. Although the consolidation of suppliers enables companies to address a larger set of components in a particular mobile device,

it uniquely impacts the engineering teams responsible for delivering products to market.

This impact is usually caused by merging geographically distributed engineering teams that have their own preferences in programming languages, test strategy, and tool investments. Product development inefficiency often emerges when distributed teams do not share common best practices.

As a result, many organizations are in the midst of standardization. One critical focus is using a single codebase from automated measurements in R&D to automated measurements in manufacturing test. By sharing a common codebase of test software, along with using the same core measurement technology throughout the design cycle, organizations have reduced test software development cost and ultimately decreased time to market.

Status Quo Leaves Money on the Table

Just as the digital age commoditized digital IC, the information age is commoditizing analog IC. Commoditization comes with lower cost, and it requires a dramatically new approach to test. In an era where test strategy is considered a competitive advantage, organizations are using standardization on a common platform as a method to reduce test costs. However, if an organization is not considering a common platform approach for test, it might be in trouble. Although the old way is sometimes easier, the additional cost and inefficiency leave company profits on the table.

ACCELERATED PRODUCT DEVELOPMENT THROUGH STANDARDIZATION

