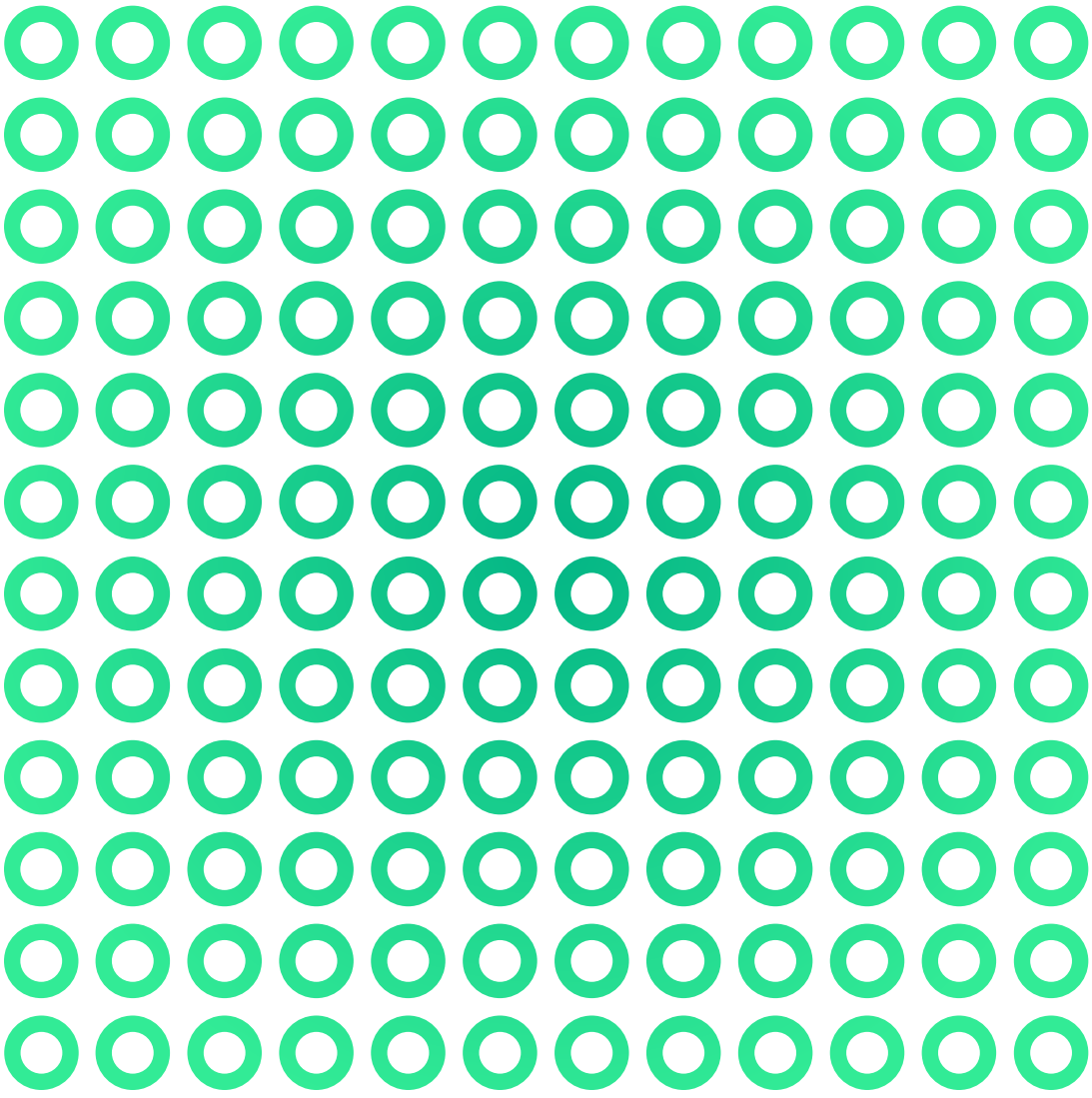
WHITE PAPER

Connecting the Product Development Lifecycle from Design to Test



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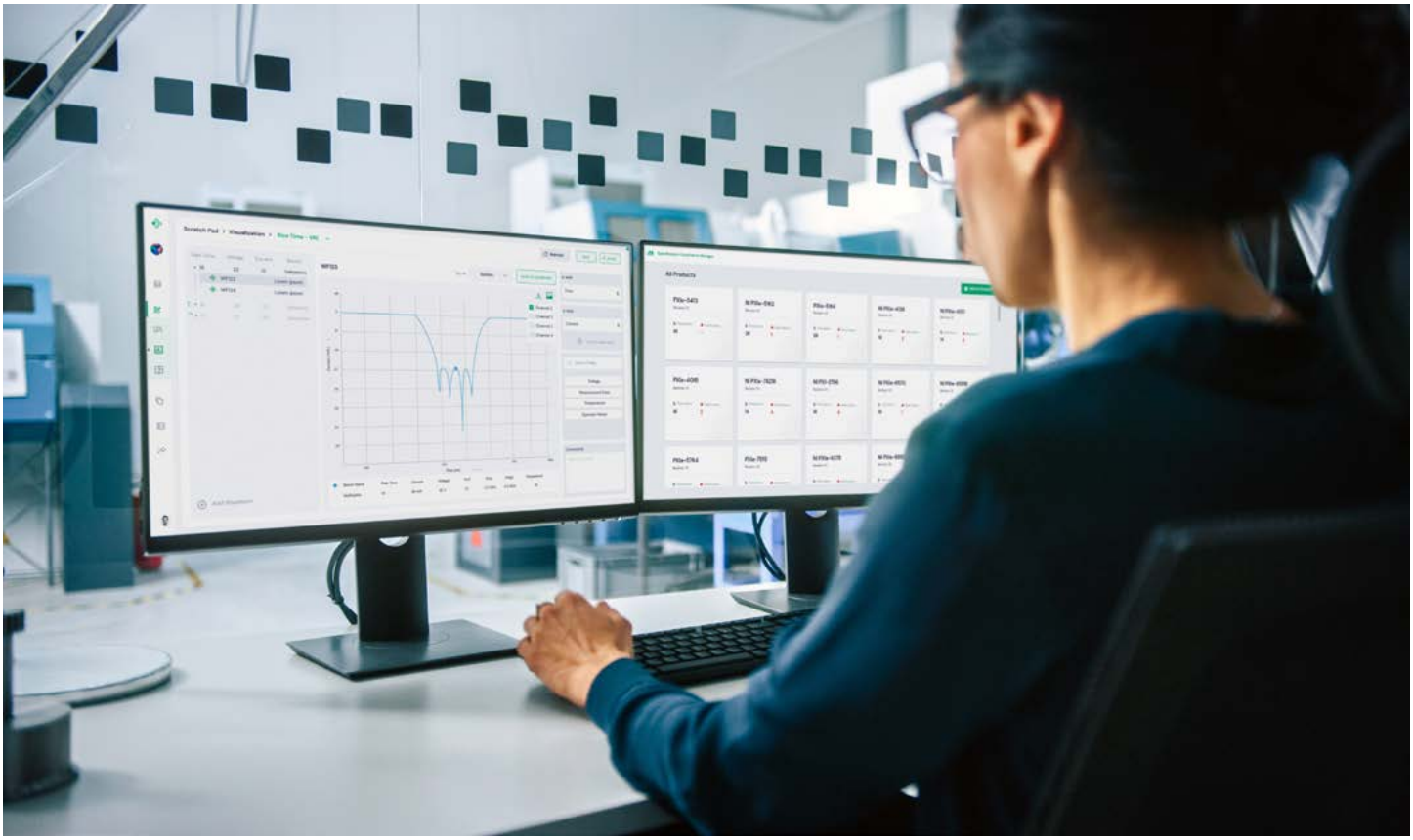


The Reality of Product Development: Reinventing the Wheel Time and Time Again

There are two things that are relevant in every phase of product development: how a product should work and how it actually works. In other words, its specifications and its data. These are among the most important pieces of information every stage of development has in common. Yet all the unique tools used have a unique way of conveying this vital information, and modern-day product development requires a variety of tools.

From pre-silicon simulation and verification to validation bench instruments and production automated test, each piece of equipment is designed for a specific purpose. All phases of the development and testing process for a device are highly specialized and have evolved to solve these unique challenges. This is why existing practices have worked so well for decades—but can also be why the overall design-to-test (D2T) workflow is very inefficient. By focusing on a narrow and deep

problem set in each distinct stage, it is tough to consolidate and integrate product phases together—even within the development process of the same device.

Illustrating Product Development Gaps in Semiconductor and Beyond

Historically, there have been three primary stages in product development: design, validation, and production. Regardless of the industry or application, there have been long-standing trends that impact how effectively organizations can iterate and progress through the design-to-test (D2T) lifecycle. For instance, developing a new product requires many resources and cross-functional team expertise, with each individual group working to ensure a product meets specifications to operate properly once it reaches its end customer.

While expertise in design, verification, validation, or production test is crucial for product performance and execution, time and time again we've observed that these teams have little exposure to the other stages in product development. They have advanced independently and thus have developed different best practices, using vastly different tools and processes suited for the nuance of their respective disciplines. This lack of visibility often leads to miscommunication, redundancy, and oversight as a product moves from one stage to the next.

In turn, companies that support the product development process have also run into a similar challenge, rarely accumulating the wide-ranging knowledge and skills required to connect all phases. This has resulted in different software, hardware, data formats, documentation styles, and best practices—not just at a product or company scale, but across entire industries.

Until recently, having disconnected processes has been inconvenient yet manageable. There have been inefficiencies present, but more pressing needs such as improving design simulation performance or increasing throughput and cost reduction of production test systems have been the focus of improvement. However, this is rapidly changing. As innovation drives increased complexity in product development, organizations are struggling to keep pace with longer design cycles, more extensive testing, and aggressive time-to-market schedules with the current state of disconnectedness. Being as efficient as possible is now a critical way to improve product development.

Reaching a Tipping Point for Product Development

As mentioned previously, two key components of breaking down these silos are understanding how a product should perform and how a product actually performs: the product's specifications and its data. Having isolated stages of development means one step does not start until another ends. For instance, simulation data is not shared with validation as designs progress, making it difficult to correlate results or judge the current state of a project. A lack of visibility and access to these things across distinct stages of development is a huge problem in product development today. It often means teams end up having to "throw the product over the wall" to the next group, who will not benefit from the knowledge gained previously.

The massive amounts of data that a new product generates during its development further complicates matters. Simply put, having data is only half the battle. Drawing meaning from the data is even more important and harder to accomplish. Data is often in different formats, labeled differently, and considerable effort is spent understanding what was already known at an earlier stage. This highly manual process leads to a long ramp up, with test systems being designed only after design or validation has finished, and results in inevitable delays in development. In general, this method of operating leads to a substantial amount of repeated effort, lost time, and inefficiencies on a global scale. One way this can be improved is by increasing visibility between distinct functions and connecting tools and processes in a way that allows for better data analysis.

The Opportunity of Connecting Design, Validation, and Production Data

Connecting data and specifications between design and validation teams means that requirements are known and understood ahead of time. This leads to test systems being designed in a way to properly characterize a device and rapidly begin validation as soon as the design is complete. This way, any issues identified in validation can be quickly visualized, communicated, and addressed appropriately. Simply taking workflows that exist today and placing them in an environment that encourages connectedness and consolidating differences in processes can significantly increase the productivity in the D2T lifecycle. Even the smallest changes can have a big impact because the challenges discussed are foundational and affect the connection of every team in an organization. However, this also means that a thorough and complete solution to address this has the opportunity to be scalable and far-reaching.

How Enterprise Software Solutions Can Help Solve Inefficiencies in Product Development

While the benefits of connecting an organization through data, specifications, and methodology are appealing in many ways, the biggest challenge is making it a reality. This is where enterprise software brings incredible value. An enterprise software solution is one that considers the vastly different functions and disciplines that are part of an organization and implements a common methodology that every group can use.

Within the D2T lifecycle, specification sharing and compliance is a great way to do this. With the right specifications shared and documented in a standardized way, all teams can gain visibility into where a product is in development and can understand what the data means. Validation teams can design and set up test plans before a design has been completed and communicate those results back much more quickly. Production teams can then integrate and ramp up production lines much earlier than before, while having time to plan the most efficient test cycle to ensure functionality.

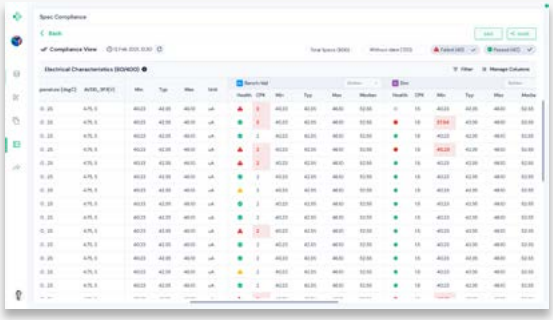
Another crucial step to increasing visibility is connected and open data sharing practices. How a product performs at various stages of development can dictate what steps need to be taken and when to complete development effectively.

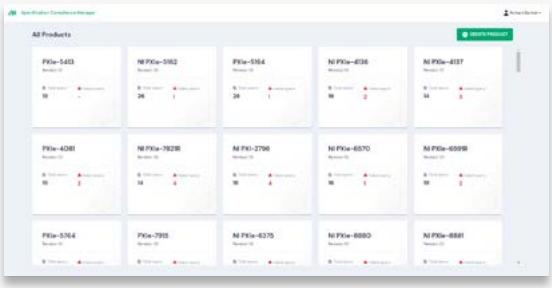
On top of this, sharing data is the first step in the bigger picture: understanding what that data means. Accessible data is important but making sense of that data and drawing meaningful insights from it is another step altogether. Data today is complex, with waveforms, comparisons, and parametric data under different conditions. It is no longer enough to simply have a repository of all data that has been collected. Being able to visualize, share, and connect data from design, validation, and production can provide a level of understanding and efficiency that means every team has the insights and information needed to iterate and engineer solutions to any problem they may encounter.

NI DataStudio: A Reimagined Approach to Data Analytics Solutions

With all of this in mind, NI developed DataStudio, a new product-centric data platform aimed at improving data management, analysis, and increasing workflow efficiency. With open, scalable, and integrated data sharing practices as its foundation, it is ideal for use throughout the entire product lifecycle from specifications to volume production. Open in nature, it has built-in connections to many common tools used in design, validation, and production, and can also integrate with existing data management platforms and requirements frameworks. DataStudio accommodates the huge variety of tools used throughout development, consolidates them, and enables in-depth, DUT-specific data analysis and specification compliance from design through validation and production.

With its Specification Compliance Manager (SCM) tool, users can compare validation results to their specifications. Additionally, they can compare distributions of their validation data to earlier products or to production data—or any other combination. By providing connections to the data sources, SCM provides an added level of engineering detail that elevates it from its generic competitors. The primary tool functionalities allow users to capture and document device specifications, connect to various data sources, and generate compliance reports.





Additionally, the Bench Data Connector (BDC) tool provides a standard method to capture validation data on the bench and format it in a way to automatically upload results. It also provides a standardized user interface for visualization on bench validation equipment.

The BDC allows users to easily capture and format validation data, interface with NI and third-party hardware for data, and provides a common methodology to prepare data for analysis and storage. Each of these applications is intended to solve the challenges faced by many product development teams around connected data, integrated tools/processes, and meaningful data analysis.

The Bottom Line: Meaningful Data Enables Smarter Product Lifecycle Management

The bottom line is that meaningful data enables smarter product lifecycle management. Organizations that can leverage the unique opportunity of connecting workflows will reach the next level of insight and collaboration. Elevating engineering teams with the tools to focus on innovative ideas helps accelerate product development while improving performance. As your trusted partner and expert connector, NI is here to help you Engineer Ambitiously. Contact a NI Technical Expert to learn more about how data analytics solutions like DataStudio can help you accelerate innovation.

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