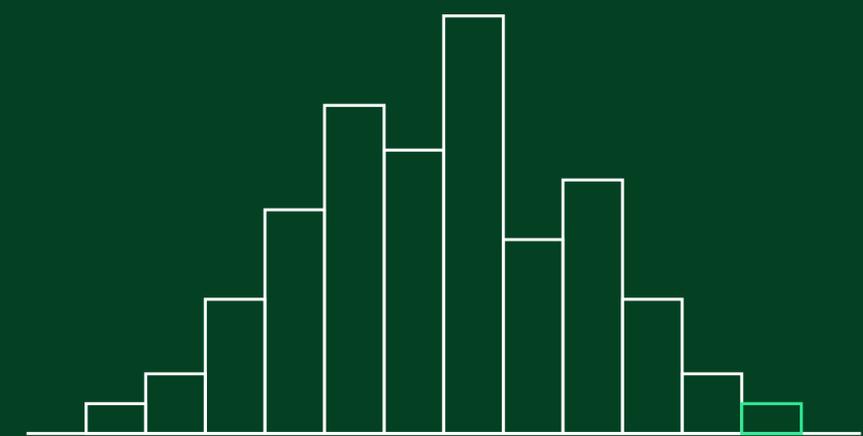
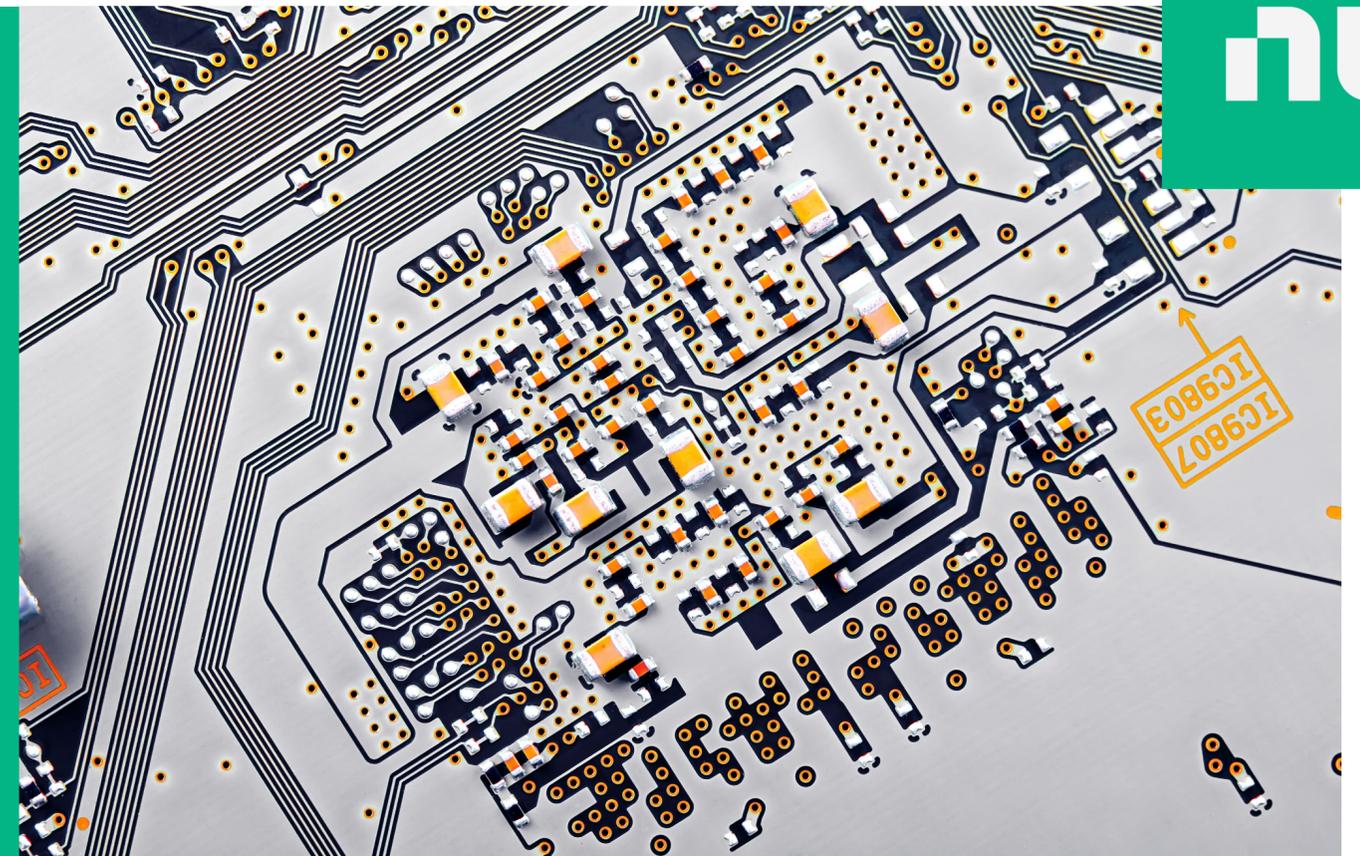




# How to Become an Engineering Powerhouse



## INTRO

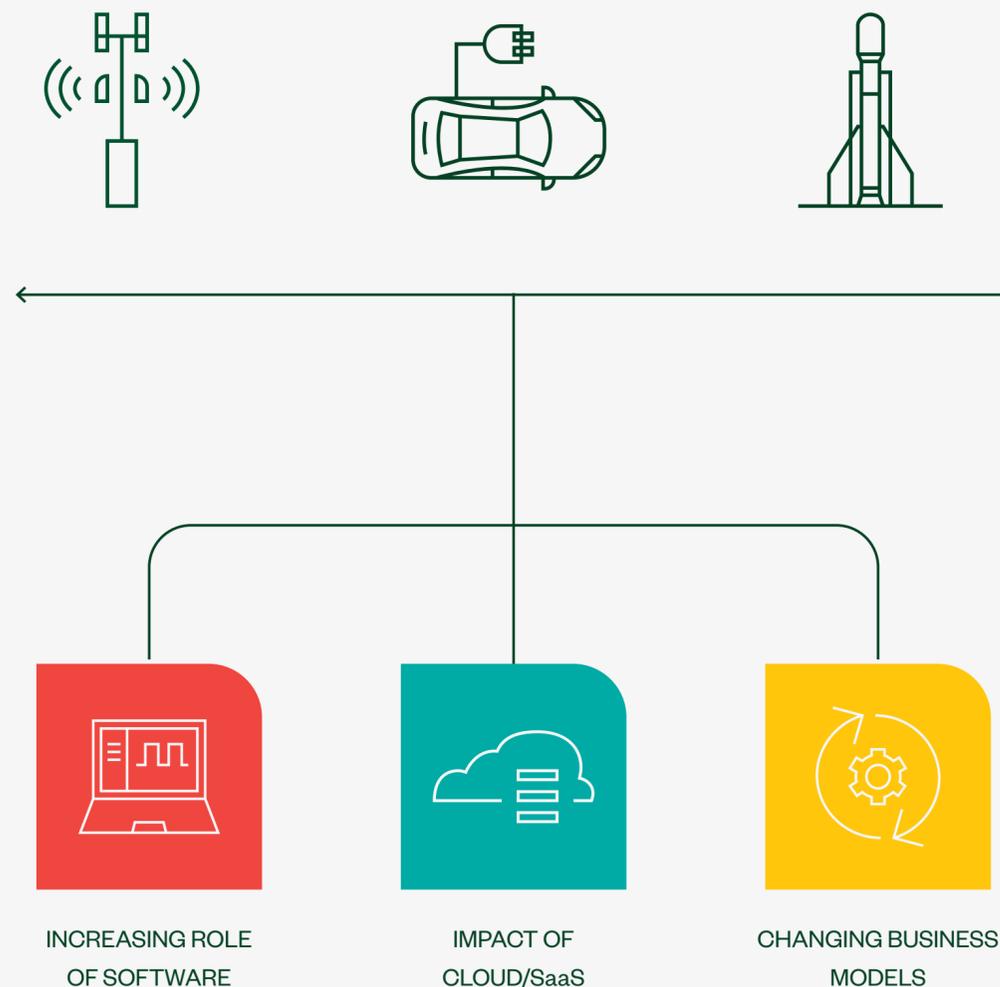
# The Pressures for Perfect Products Keep Mounting

The pace of technology development continues to grow faster than ever before. From the rapid expansion of autonomous vehicles to 5G and beyond, engineers play a pivotal role in making technological advancements a reality. And while the pressures associated with innovating at warp speed and meeting aggressive time-to-market demands aren't new, they are intensifying. Now engineers are expected to test new designs at multiple stages of development quickly—reducing costs—without sacrificing product quality. Although many organizations feel they have optimized test, they're still looking for opportunities to improve it.

“In the future, mobile will enable new applications for hyper-connected experiences like truly immersive extended reality, high-fidelity mobile holograms, and even digital replicas. These applications create new technical requirements for 6G. Examples include expanding peak data rates to 1 TB/s while doubling both energy and spectral efficiency.”

**Dr. Sunghyun Choi**  
President and Chief Executive Officer  
Samsung Electronics North America

## Industry Trends



## CHALLENGE

# Disjointed Design and Test Stages Create Inefficiencies at a Global Scale

In an ideal world, every organization would have endless resources and time to fine-tune complex designs, but that's rarely the case. High product complexity drives engineering teams to have vertical and functionalized sets of design expertise. That means that a new design must go through many different people and development phases before a product even reaches the market. Although organizations often intend to work across boundaries, teams are not usually set up for success. The issue is compounded by the fact that many semiconductor organizations have grown through mergers and acquisitions, which creates duplicate organizational structures. This in turn leads to multiple teams often working to solve the same challenges.

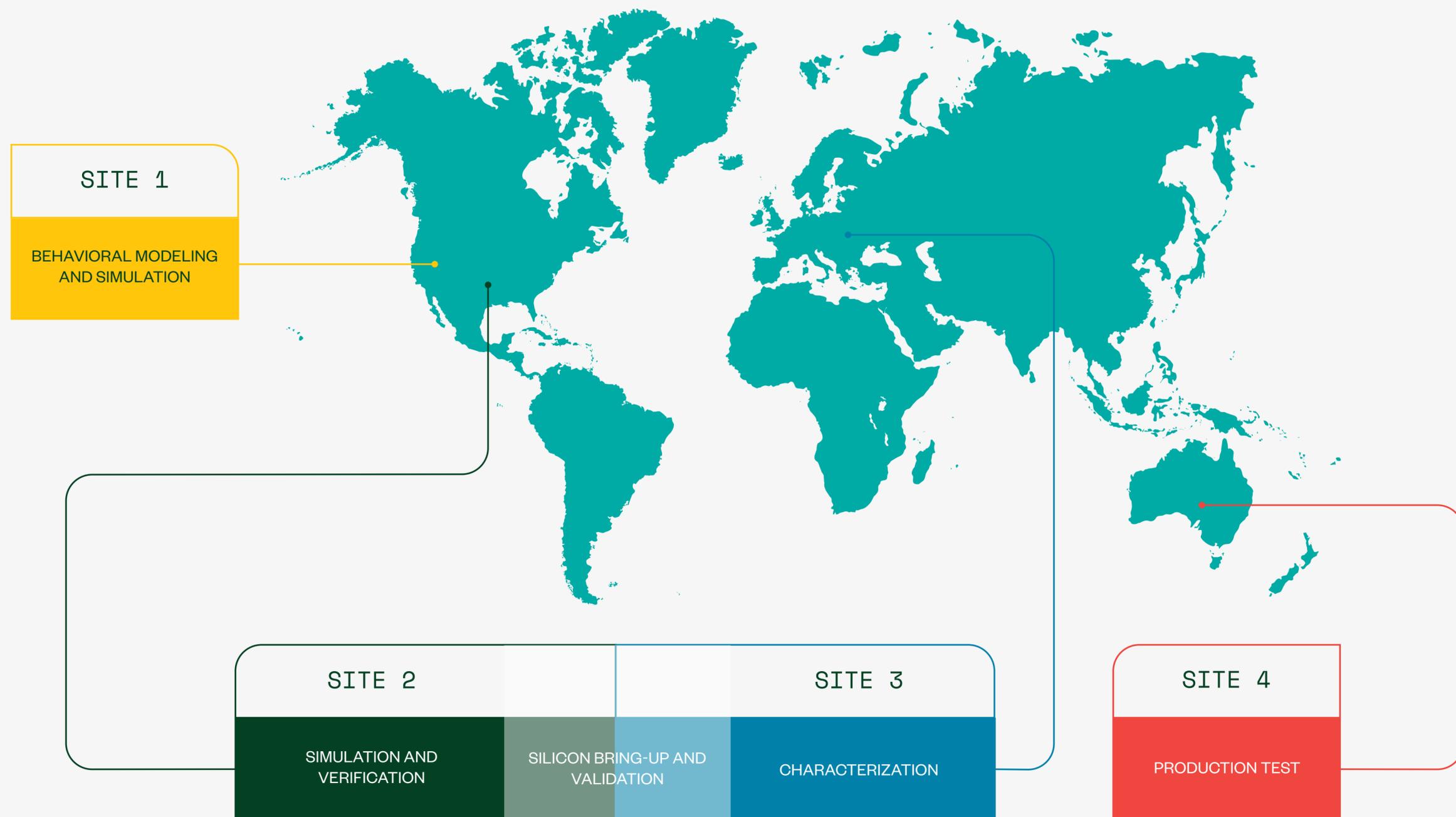
Time and again, we observe that teams lack the tools or processes to effectively communicate with one another and share best practices. This creates inefficiencies at a global scale and represents a significant missed opportunity. The complexity of characterization testing creates the need for those testing to have more specialized software and instrumentation knowledge. Even in organizations that are more functionalized, it's common for a design to get "thrown over the wall" to a test team because other teams lack the tools or processes to effectively communicate with one another. Thus, organizations can gain efficiency by centralizing those functions. In fact, some of the most successful organizations we work with have driven efficiency by standardizing test measurement software globally. While some degree of duplication is always going to happen, companies are increasingly benefitting from sharing both test software and test methodologies across sites.



# Disjointed Design and Test Stages Create Inefficiencies

“When designing and manufacturing a semiconductor device, we frequently see instances where either the finished goods or the engineering sample doesn’t perform at the same level expected from simulations. It leads to all types of questions like: Is it a particular part that’s defective? Was it something in the manufacturing process that didn’t go right? Is it a fundamental flaw in the design? To debug that, engineers must work against these different silos, using different tools from different vendors with different data sets.”

**Ritu Favre**  
Executive Vice President, NI



## OPPORTUNITIES

# Best-in-Class Organizations Share IP across Teams and Product Stages

In our recent ebook, [Keeping Up with the Pace of Change](#), we explored the idea of starting the journey to modernizing the validation lab with small steps. Even something seemingly modest like automating measurements can have a big impact. Although the idea of a complete organizational and process overhaul is often unrealistic, implementing test software in the lab is far less daunting yet highly effective.

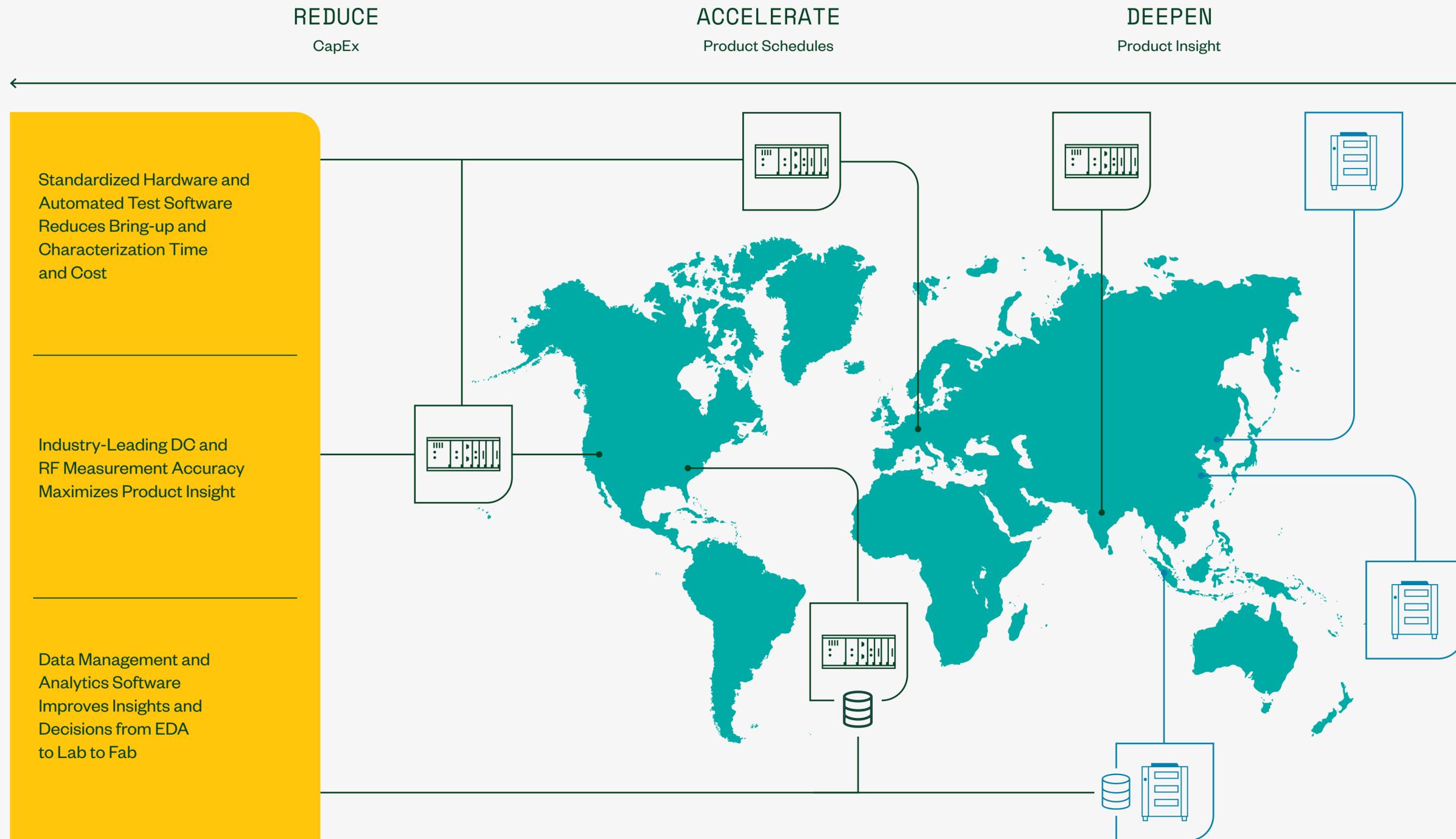
Having the ability to standardize and reuse test software with existing lab setups can significantly reduce characterization time, improve productivity, and lower costs. Standardizing test approaches across sites and creating code libraries can significantly decrease engineering time, especially in large multinational organizations with labs at various locations. For example, consider the scenario of “Site A” developing automated test code for a power management IC (PMIC). Assuming this code is reusable, engineers testing PMICs at other sites can save development time by leveraging existing setups, even if the new device has different performance requirements.

As more and more technology companies compete for the biggest market share, individual organizations must leverage their expertise to push the boundaries of innovation. To further streamline workflows, leading organizations are creating training and debugging communities within their broader structure to provide avenues for engineers to share ideas and ask questions. Instead of working in isolation, dedicated groups enable an open channel to facilitate discussion.

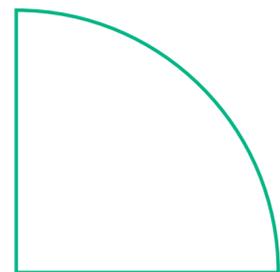


# Accelerate Time to Market by Scaling Global Labs

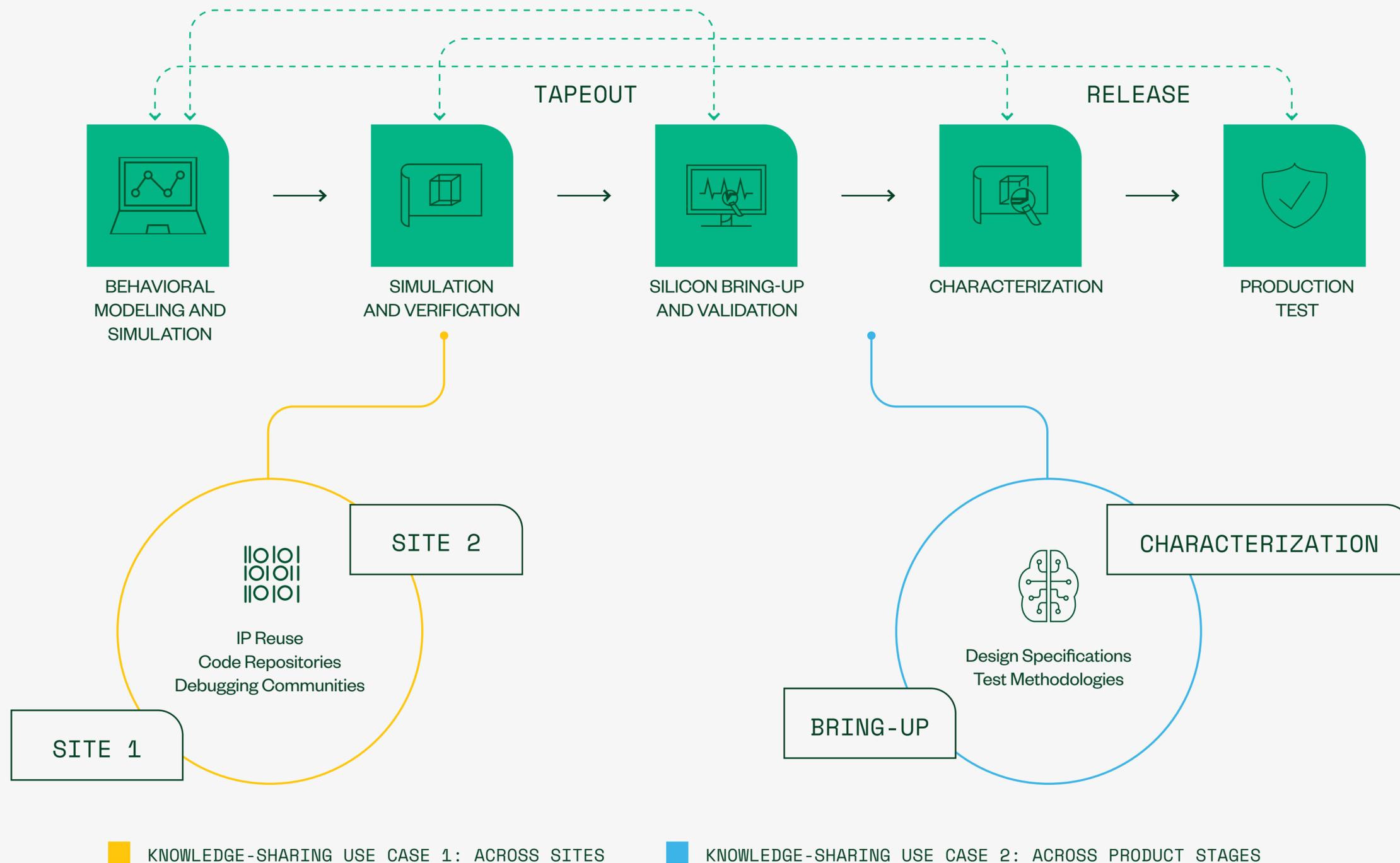
There's an opportunity to maximize resources beyond teams working to solve the same challenge. Leveraging IP across the different stages of product development is in itself a new frontier. One example is sharing design specifications and test methodologies across bring-up and characterization. In these cases, standardizing software helps lay the foundation for consistent data capturing, opening the door for seamless data correlation across product stages. This is the first step to enabling smart data analytics across the product lifecycle. Data is collected every second during the design, validation, and test processes. However, we continue to see how underutilized it is.



# Knowledge-Sharing across Teams



As design complexity continues to increase, developing new automated test code gets more challenging as well. Standardizing software allows engineering teams to “get started” more effectively and organizations to maximize IP globally. The higher complexity we see in ICs, the greater the benefit of reusing software across sites—which ultimately reduces engineering costs and time to market to achieve business objectives.



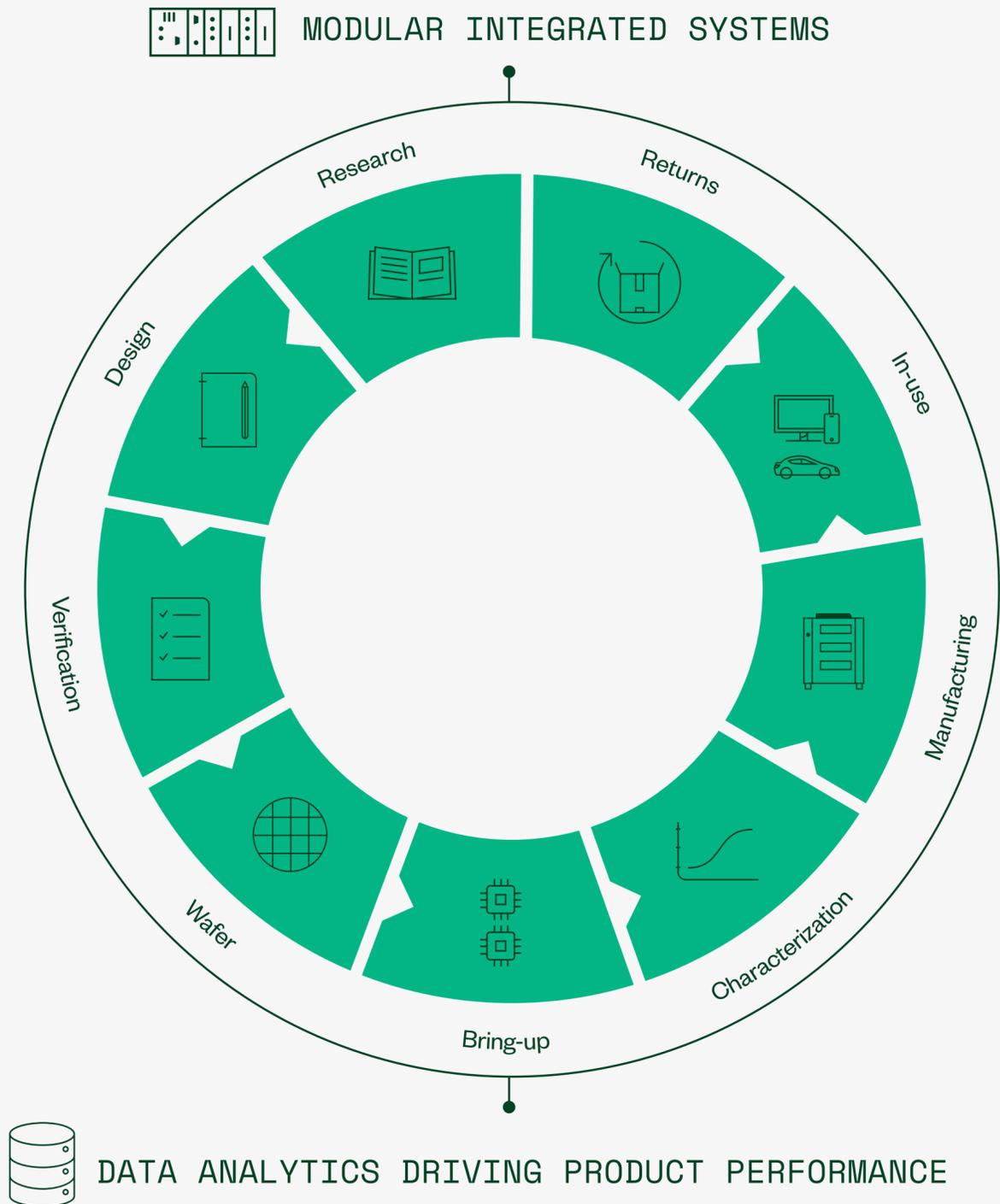
## IMPACT

# Enabling Data Analytics by Connecting the Product Lifecycle

Each phase in the product development process produces immense amounts of data, and engineers often struggle to harness the deep product insight that data can produce. This isn't due to a lack of effort or expertise. In many cases, each team collects data with different tools, in different formats, and often in isolation of one another. As a result, even when an engineer can get the data from upstream processes, correlating different data sources and interpreting it in a meaningful way is often extremely difficult and highly manual. Additionally, tracking whether data was generated using the same settings can be tricky, especially if a single product can produce thousands of data sets during characterization alone.

At NI, we see an opportunity to connect data not only across sites but across phases of the design process as well. For example, using this data, engineers can correlate design specifications with both simulation and validation results, accelerating the development cycle. When knowledge is carried through the whole process, test systems are designed in a way to properly characterize a device and are ready to begin validation as soon as a design is complete. Troubleshooting also becomes more efficient when, for example, a problem found in validation can be quickly visualized and communicated back to the design team(s).

## Leveraging Data Intelligently as the Next Step in Our Journey



The bottom line is that meaningful data enables smarter product lifecycle management. While we've observed customers effectively connect data between design and test with in-house solutions, maintaining software that can ingest data from different sources, correlate it, and manage it consumes a considerable number of resources. Creating do-it-yourself data platform solutions also detracts focus from engineering teams, pulling them away from what they do best—creating innovative products.

Off-the-shelf data management and analytics platforms can improve productivity and accelerate product development with open, scalable, and integrated data-sharing practices for use throughout the entire product lifecycle, from specifications to volume production. Easy to integrate with existing data management platforms and requirement frameworks, these solutions consolidate tools and allow for in-depth data analysis and specification compliance. Only teams that capitalize on the unique opportunity of connecting workflows will unlock the next level of insight and collaboration. Elevating engineering teams with the tools to focus on innovative ideas is the only surefire way to accelerate product development while improving performance.



## CONTACT US

# We are here to help.

As your trusted partner and expert connector, we're here to help you Engineer Ambitiously.™ Take advantage of our:

-  Products and Technology
-  Extensive Partner Network
-  Wide Range of Engineering Services
-  Deep Applications-Engineering Expertise

Get in touch to see which solution best suits your needs and start optimizing your lab.

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US Corporate Headquarters  
11500 N Mopac Expwy, Austin, TX 78759-3504  
T: 512 683 0100 F: 512 683 9300 [info@ni.com](mailto:info@ni.com)

## NI Services and Support

NI offers success services to ensure you get the results you are looking for. We complement your team with expertise in implementation, integration, and data management practices.

## Consultation and Integration

From start-up assistance to full solution implementation, leverage specialized expertise in configuration, integration and data ingestion, visualization, and analytics from NI engineers and our partners to ensure project success.

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From online training modules to custom on-site training, ensure your team has the skills needed to be successful.

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Troubleshoot any issue by contacting NI applications engineers who are ready to help via phone and email.

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