

SOLUTION  
BROCHURE

# Production Test Software Standardization

[ni.com](http://ni.com)



# Introduction to Software Standardization

---

## Benefits

Like all software, your test applications have a life cycle that gets harder to manage as the complexity and scale of tasks increase. And, like most companies, your test engineering team is most likely short on time and resources.

By adopting modern software development processes and standardizing your software development tools, test architectures, and proficiency programs, you not only mitigate but also overcome these challenges to a level where the output of your team becomes a competitive advantage.

Effective standardization initiatives have been shown to:

- Decrease new product introduction (NPI) development schedules, which shortens time to market
- Improve tester quality and stability, which minimizes errors and downtime, thus reducing product and manufacturing costs
- Reduce maintenance burden, which frees up resources and lowers sustaining cost

## Roadblocks

If standardization is this beneficial, why hasn't everyone done it? Because it's hard!

- Hard to conceive
- Hard to obtain up-front investment
- Hard to implement
- Hard to drive adoption
- Hard to measure success

Many test groups are stuck in a loop of perpetual siloed development that is inescapable without a vision for change that can be articulated clearly enough to obtain executive sponsorship.

## How NI Can Help

Tens of thousands of standardized testers using NI software are deployed around the globe. The engineers that own them trust NI not only for our tools but also for the hundreds of years of combined domain knowledge that we will use to support them throughout the life cycles of their test strategies.

Committed to meeting your engineering, operational, and business goals, NI is here to help you assess the need for, plan the execution of, and deliver a software standardization strategy optimized to your organization's needs.

# CONTENTS

1. 4 ELEMENTS OF SOFTWARE STANDARDIZATION	4
2. IMPLEMENTATION STEPS FOR STANDARDIZATION	5
3. NI SOLUTION FOR PROCESS STANDARDIZATION	6
4. NI SOLUTION FOR ARCHITECTURE STANDARDIZATION	8
5. NI SOLUTION FOR TECHNOLOGY STANDARDIZATION	10
6. NI SOLUTION FOR PROFICIENCY STANDARDIZATION	16
7. CASE STUDY: STANDARDIZATION SUCCESS AT PHILIPS	18

**Reuse is key to our software strategy.** Many of the required tests are common, needing only frequency range variation, but increasingly new DUTs require entirely new measurements, too. **To ensure efficient ongoing development and stable operation, we developed a scalable software architecture** leveraging COTS tools with which we could add and reuse measurements.

With **the correct mix of software tools abstracting common tasks and architectures**, our test team could focus on designing high-accuracy, highly repeatable tests using our specific knowledge of the DUT operation. We **reduced test development from months to weeks**, despite a 2.5X test coverage increase on new products, and made **test data accessible across our company and suppliers**.

CHRISTIAN WOLF

GLOBAL MANUFACTURING TEST MANAGER, GN AUDIO



## 4 Elements to Software Standardization

### 1. Process: How the Architecture and Tools Are Executed

The methodology used to plan, design, implement, test, release, and maintain software can affect your ability to deliver and maintain high-quality software within acceptable resource bounds. Defining a holistic process or set of processes that will govern the full life cycle of your test software allows you to make effective decisions around further investments

### 2. Architecture: A Framework for the Tools to Be Used

Standardizing on a single software architecture for a set of test stations can drastically improve NPI timelines (including certification if necessary), deployed code quality, and overall project cost. The remote deployment of systems, along with the growing expectation for data connectivity, is increasing the complexity of test infrastructure development and accelerating the adoption of standardized architectures that provide a higher return on investment.

### 3. Technology: The Tools in Use

Standardization of software technology allows for engineers across multiple projects or teams to effectively contribute high-quality development, share ideas and best practices, and maintain systems. This level of standardization often forms the foundation for wider standardization initiatives and consists of selecting a subset of software tools and agreeing to use them.

### 4. People and Proficiency: The Ability to Use Tools, Architecture, and Process

Developing skill sets, educational processes, and coaching practices ensures that all team members can use software tools and processes effectively and collaborate productively. Best-in-class test engineering teams consider proficiency not only at an individual level but at a team level or an organizational level. Standardizing onboarding schedules, coaching behavior, collaboration practices, and continuous improvement has shown to improve productivity, safeguard quality in the case of personnel churn, and more effectively develop individual careers by providing role flexibility.



Figure 1. To effectively standardize your software, you must consider these four elements.

# Implementation Steps for Standardization

No matter the element of standardization (technology, architecture, proficiency, process) or the breadth of software standardization (program, department, company) the process for implementation follows a similar path.

## Value Assessment

Best-in-class production test teams don't just build test stations and develop test software; they execute against a test strategy that actively supports their company's performance. Therefore, to build a proposal that delivers the highest return on investment (ROI), the first stage of any standardization initiative must involve evaluating the current state of the business as well as leadership needs and wants.

Effective proposals should be based on both internal best practice and external/industry benchmarking; they should include financial models, forecasting assumptions, and risk assessment.

This stage can be completed internally or in collaboration with external industry consultants. Incorrect or insufficient value assessment is a leading contributor to project failure.

## Execution Planning

Successful standardization initiatives do not happen overnight. Without proper planning and nurturing, they often falter and fail before they even get to deployment. You should transform your strategy into action with detailed plans that define clear roles and responsibilities, quantify project metrics, and allocate resources efficiently.

Successful planning should identify enterprise-wide gaps and inefficiencies across your siloed teams and functions. It should provide details of all internal and third-party resources needed and how they will be orchestrated. This stage can be completed internally or in collaboration with external industry consultants.

## Value Delivery

Execute your plan to provide (and measure) value to your company.

This stage—including onboarding and a technology refresh—can be completed internally or via supplemented professional test services to accelerate your project. When development capacity is critical, free up resources by leveraging the expertise and program management of professional test services to deliver a complete solution that meets your schedule.

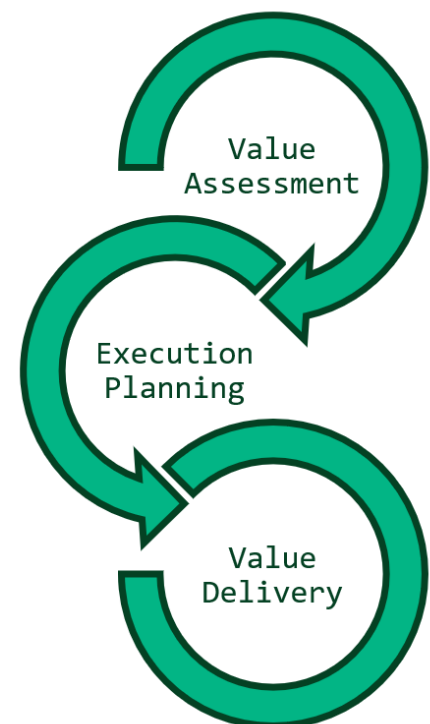


Figure 2. Follow these three steps to implement standardization

# NI Solution for Process Standardization

The process your team follows for developing new test software is separate from yet intertwined with the process for developing and deploying new test plans or test stations. By properly defining and optimizing the process at each stage of the software development life cycle, you can save significant time, money, and organizational stress.



Figure 3. Software Development Life Cycle

Processes should include milestones with defined gates and decision makers, mechanisms for quality control, and a methodology for change management. By collaborating with an external, data-focused group like NI Methodology Consulting Services (MCS), apolitical views can be elevated, industry best practice and rigor can be introduced, and, ultimately, change can be successfully adopted.

## Value Assessment

You can build a strong case for process definition based on the unique needs of your organization. NI MCS can support you with a formal report including the following:

- Business case for change
- ROI and/or metrics
- Process and skills assessment
- Benchmarking
- Metrics and dashboard design for tracking success
- Recommendation of higher ROI activities
- High-level process recommendation

Collaboration with the experienced experts from NI MCS has accelerated agreement on problem statement definition, created urgency in stakeholders' minds, and depoliticized solution approach recommendations.

[View](#) more information on NI consulting services.

## Execution Planning

Many well-conceived and well-funded standardization initiatives fail because the cross-functional resources are not in place to execute them. To secure these resources, you should develop a detailed solution implementation plan.

NI MCS can support you with a formal report including the following:

- Detailed process flow
- Process governance structure
- Rollout plan with phase timelines, training, and onboarding

By working with NI, you can be confident that your solution implementation plan is based on industry best practices with clear metrics to track progress and demonstrate value.

[View](#) more information on NI consulting services.

## Value Delivery

You can receive ongoing support to implement your test process and ensure you get the value you expect. NI and our global network of certified integration NI Partners are positioned to consult, support, and develop alongside you and your engineering team. We can help you optimize your plan as you learn from its rollout.

Delivery support options include:

- Training to assist with new process adoption
- Reference documentation and templates
- Pilot execution management

[View](#) more information on NI consulting services.

# NI Solution for Architecture Standardization

Defining and implementing a standardized test architecture can have a significant positive effect:

- Time to market—reduce test development time for NPIs
- Project cost—decrease the engineering resources needed per project
- Test quality—justify investment in well-written, fully tested code modules using code reuse
- Ease of regulatory compliance—reduce time and risk with code and documentation reuse

Up-front investment in a flexible and scalable software architecture that maximizes code reuse of both test steps/measurements and peripheral functionality (data connectivity, UI, station health monitoring, and so on) pays high dividends on large-scale deployments. Test architectures are usually developed in a standard toolset (for example, LabVIEW, TestStand, or C) by a core team of experienced engineers. Others may contribute or apply the architecture for individual tests and test stations using either the same language or simpler tools (for example, Python and XML).

With half a century in the test industry, NI has acted as a consultant for successful test deployments, from a single tester to large-scale global projects. By combining best practices from across the industry, NI can help you specify, plan, and execute your standardized architecture.

## Value Assessment

*Have you identified issues with quality, time to market, or operating expenses that a standardized software architecture could address, but you do not have organizational alignment or a financial model to justify the investment?*

*Do you have an NPI that would benefit from a standard software framework, but business and technical alignment with stakeholders such as product development and operations is not secured?*

NI MCS can support you with a formal report including the following:

- Business case for change
- ROI and/or total cost of ownership (TCO) metrics
- Skills and process assessment
- Benchmarking
- Metrics and dashboard design for tracking success
- Recommendation of higher ROI activities
- High-level solution architecture definition



As with process standardization, collaboration with the experienced external experts from NI MCS has been shown to accelerate agreement on problem statement definition, create urgency in stakeholders' minds, and depoliticize solution approach recommendations.

[View](#) more information on NI consulting services.

### Execution Planning

Many well-conceived and well-funded standardization initiatives fail because the cross-functional resources are not in place to execute them. To secure these resources, you should develop a detailed solution implementation plan.

NI MCS can support you with a formal report including the following:

- Detailed solution architecture
- Rollout plan with phase timelines, resourcing (internal development, third-party integrator, vendor), and training and onboarding
- New tester introduction process and workflows
- Standard governance and change management design

By working with NI, you can have the confidence that your solution implementation plan is based on industry best practices with clear metrics to track progress and demonstrate value.

[View](#) more information on NI consulting services.

### Value Delivery

You don't realize business benefits by having a well-defined business problem and a detailed implementation plan (developed either in house or with NI assistance). You reap these benefits by only through implementation and adoption of the new architecture. Outsourcing all or part of the development work can help you achieve the following:

- **Overall quality improvement**—leverage specialist architecture skills and industry experience
- **Risk-reduction schedule**—insulate projects from urgent day-to-day tasks
- **Load-balanced workload**—soften peak/trough staffing spikes for long-term team stability

NI and our global network of certified integration NI Partners are positioned to consult, support, and develop alongside you and your engineering team. Development specific to your architecture may include the following:

- Pilot implementations
- Hardware abstraction layers/measurement abstraction layers
- UI/OI customizations
- Integration with manufacturing infrastructure
- Plug-ins for tester maintenance, configuration, data reporting, and so on
- Custom interfaces to Python or other scripting languages

NI also offer development of individual testers including hardware integration.

[View](#) more information on NI integration services.

# NI Solutions for Technology Standardization

Standardization on a single set of software tools allows for engineers to easily transfer between programs or projects. Consider these common examples:

1. Test developers write test sequences in C++ (rather than their language of choice), which allows each to quickly understand the code written by the other for reuse or maintenance.
2. Test developers adopt an off-the-shelf sequencer or test management engine to effectively standardize on an externally maintained code base to use as a basis for development.

NI engineers have helped tens of thousands of people worldwide assess the software needs of their teams and select the right scale and licensing deployment options. Whether you are looking to optimize for new test coverage requirements, increase throughput, or plan for the future by lowering long-term sustaining costs, NI offers free consulting to talk through your needs and identify the correct mix of software products to meet them.

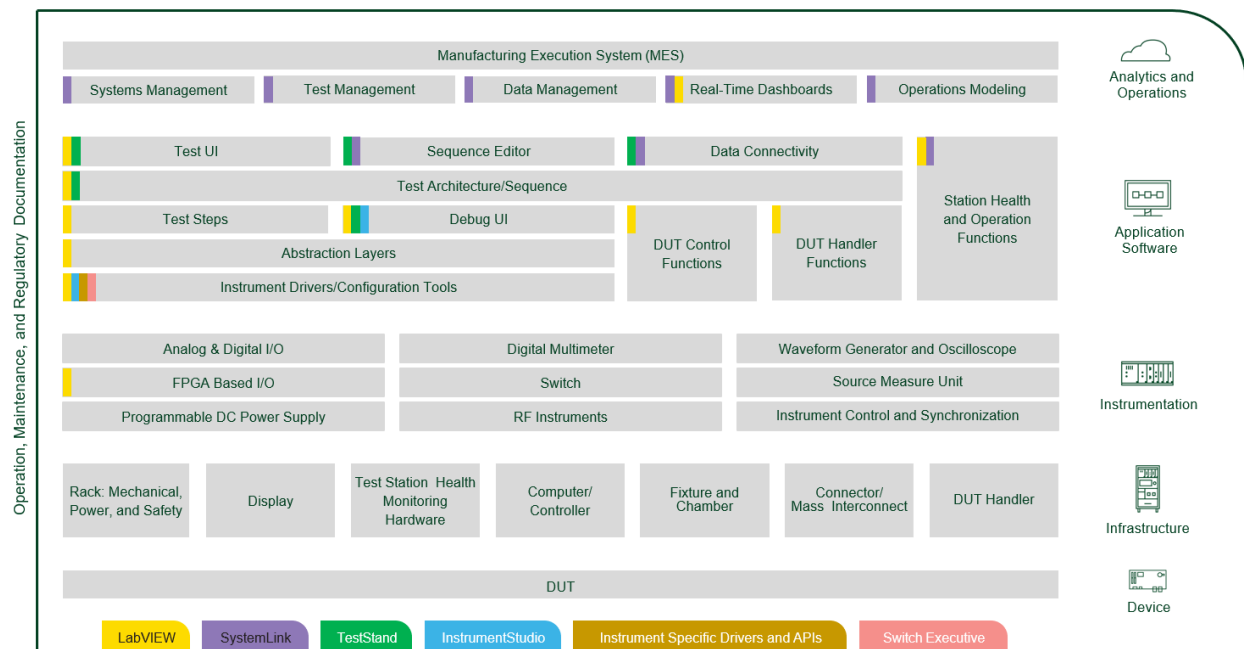


Figure 4. This depiction of a single test station shows the distribution of NI software tools throughout the station.

## Benefits of the NI Software Portfolio

By standardizing on NI software tools, teams can use a single, closely integrated toolchain for the vast majority of their test development work. This not only improves productivity because proficiency is transferable from task to task, but it creates flexibility and job security within the workforce because engineering talent can add value wherever needed rather than being siloed into a single function.

Standardization on NI software tools does not limit engineers with existing code bases or specialist needs because NI test software is open and compatible with most other development languages, including C, C#, and Python.

NI products such as LabVIEW and TestStand are tried and tested in the market after thousands of deployments over the decades. This reduces the risk of “unknown-unknowns” and low-level bugs in your software.

NI is committed to long-term investment in and sustainment of its software tools. By standardizing on a set of test software tools from NI, you will benefit from ongoing product investment funded by wide industry adoption that is orders of magnitude greater than most test teams can budget for. Improvements include the following:

- New functionality and productivity features
- Support for new measurements including hardware drivers, steps, and functions
- Support for new OS updates and patches
- Support for new data communications and networking
- IT and data security compliance with modern standards
- Analytics

*“The NI platform (especially LabVIEW and TestStand) has greatly increased our productivity and is a department standard. It probably saves us at least 40 hours on each project.”*

MAKENNA SHASKE,  
TEST DEVELOPMENT ENGINEER,  
BENCHMARK ELECTRONICS

## Software Standardization Licensing Programs

### Single-Seat License Program

If you have a small team or need custom installation flexibility, individual licenses provide a perpetual license option suited to capital expenditure budget processes.

- Purchase products individually or as a **suite of tools** designed for your application
- Receive a one-year membership to NI’s Standard Service Program (SSP)

### Volume License Program

The Volume License Program (VLP) maximizes your investment as your company expands its use of NI software. Designed for small groups, sites, or organizations with more than five licenses, VLP helps you manage and optimize the use of your software.

**Reduce Your Cost of Ownership:** Reduce your costs, ease your management, and increase your use of software when you enroll in VLP. Renewal is easier because all your licenses expire at the same time. You can also have concurrent licenses for simultaneous usage.

**License Tracking and Software Asset Management:** License administrators can use the NI Volume License Manager (VLM) tool to report, analyze, and optimize software usage within your company. You can easily track and reassign unused licenses, for example, to prevent loss as employee roles change.

**Support to Ensure Success:** VLP members receive all SSP entitlements and additional benefits to increase success.

### Enterprise License Program

Remove the barriers to software adoption with unlimited organization-wide access to NI software as well as live and virtual training, support, startup assistance, and consultation.

Enrolling your team in an Enterprise License Program is the best way to increase proficiency, promote team collaboration, and shorten development time.

*“The NI platform gave us the ability to significantly scale our production test throughput by 400% with an ROI of 185% while carefully maintaining the quality and performance standards that our military radios are known for.”*

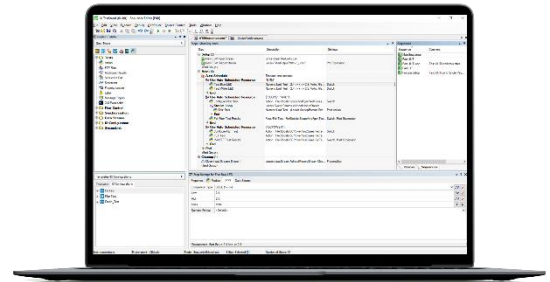
JOSEPH NAKOSKI

ENGINEERING DIRECTOR, HARRIS



# TestStand

TestStand is a test executive framework that reduces maintenance by up to 67% and automate tasks to standup test stations in a quarter of the time. It does this by enabling code reuse for common tasks like interface development, parallelization of test execution, and standardized reporting. Write once, deploy anywhere, across your fleet.



## TestStand Licensing Options

TestStand Development System	TestStand Debug Deployment Environment	TestStand Base Deployment Engine
Develop and debug test sequences using an interactive development environment	Deploy TestStand to validation or production test systems	Deploy TestStand to test systems
Call test code written in any programming language	Use advanced debugging tools to step into test code for immediate troubleshooting	Execute test sequences and perform simple debugging
Create deployable test system installers	Debug code written in LabVIEW, LabWindows™/CVI, or Measurement Studio	Upgrade deployed systems to the latest version of TestStand for free
Most feature rich—priced for development		Limited functionality—priced for deployment

- Perpetual licenses
- Volume licenses and enterprise access licenses (see page 11)
- Significant discount for high-volume debug/deployment licensing (tens, hundreds, thousands)
- Perpetual deployment licenses built into time-bound volume license contracts

Which TestStand License Is Right for My Project? [Compare versions.](#)

*“TestStand has helped to decrease the time spent testing products and gets them to the market faster.”*

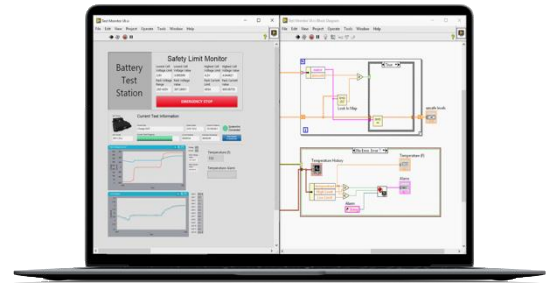
JARED SMITH

TEST ENGINEER, SCHNEIDER ELECTRIC



# LabVIEW

When it comes to developing test and measurement applications, no development software improves your productivity better than LabVIEW. With an intuitive graphical programming language, extensive libraries of IP, unparalleled hardware connectivity, and a large developer community, it ensures you can focus on solving your engineering challenges and less on developing software. LabVIEW, the industry-standard tool for production test engineering, is deployed on thousands of stations across the world.



## LabVIEW Licensing Options

LabVIEW Professional	LabVIEW Full	LabVIEW Base
Recommended for applications requiring code validation	Recommended for inline advanced mathematics and signal processing	Recommended for desktop measurement applications
Includes code and application deployment capabilities	Required for signal processing add-ons	Includes device drivers for NI hardware and third-party instruments
Includes multiple software engineering add-ons	Required for real-time and FPGA hardware	Includes basic mathematics and signal processing

- Subscription or perpetual licenses
- Volume licenses and enterprise access licenses (see page 11)

Which LabVIEW License Is Right for My Project? [Compare versions.](#)

*“We have developed a standard hardware platform based on NI’s offerings that allows us to rapidly deploy new equipment. We do the same with LabVIEW code, which allows us to deploy a system probably 50% quicker than in the past.”*

DAVE GILMORE

PROJECT ENGINEERING MANAGER, SUB ZERO GROUP, INC.

# SystemLink™ Software

When accelerating time to market is a priority, removing inefficiencies across your operational workflows is essential. From optimizing equipment utilization and maximizing system uptime to standardizing data practices and enabling real-time accessibility, you need a centralized intelligent systems and data management environment. Transform your validation and production processes to empower high-performing teams to keep pace with the increasing and evolving demands of a modern manufacturer.



## SystemLink Licensing Options

Manufacturing Test Operations Module	Lab Management Module	Data Management Module	Systems Management Module
Improve production testing performance through test optimization, yield monitoring, and trend analysis	Centrally manage and support test assets that are used for multiple product development projects	Access your test data, analyze it for insight, and automate it for speed	Centrally configure and manage all test stations; optimize utilization, remote systems deployment, and real-time monitoring
Standardization, root-cause analysis, defect identification/quality metrics, KPI tracking (for example, yield, throughput), proactive management	Fast new tester setup, software updates, easy asset finding and asset calibration status determination	Measurement data collection, processing, reporting, and real-time console	Test asset utilization, device-level traceability, remote software deployment, and configuration management

- Subscription and perpetual licenses
- User license that is required for web server access
- Node licenses that are required for each connected computer or controller
- Server license that is required for every implementation
- Built-in user and data access controls
- Volume-based pricing

How Do I Know Which SystemLink Capabilities I Need? [View options.](#)

*"I love SystemLink because it enables our production floor to step into the future of doing business. We keep approaching a 'new normal' every day, and SystemLink enables us to visualize what the new normal looks like for teams supporting development and production efforts all around the world. I spend less time managing deployments and post-processing data and more time using the built-in tools to attach low-hanging opportunities and improve efficiency for my team."*

IAN YEAGER  
TEST MANAGER, CREE LIGHTING

# NI Solution for Proficiency Standardization

Software standardization and success entail more than ensuring a team uses the same software tool. Your team should be implementing consistent and proven software practices. NI provides education services to help you standardize best practices across engineer teams including software engineering, community learning, and technical leadership.

- **Improve quality**—identify and fix knowledge gaps and bad habits
- **Build flexibility**—minimize dependency on individual and historical knowledge
- **Develop careers**—engage your workforce with clear goals and advancement opportunities

Engineers who took advantage of NI education services showed significant productivity improvement:

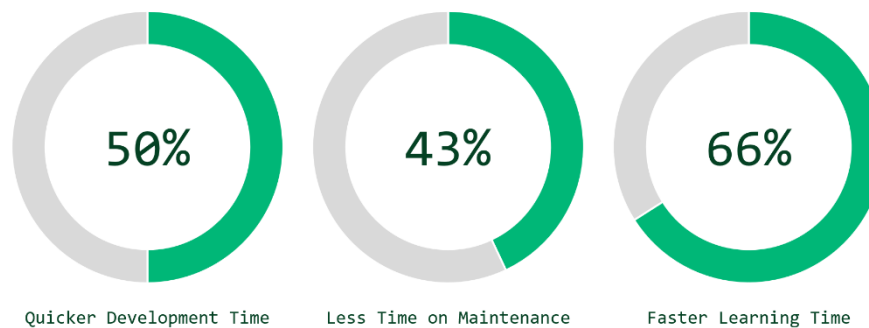


Figure 5. Save time and effort with NI products and services.

## Value Assessment

You can take advantage of NI's experience to help you assess the strengths and weaknesses of your organization's ability to implement and maintain consistent and proven software practices.

NI MCS can support you with a formal report including the following:

- Map-and-gap organizational needs relating to technical leadership, software engineering, developer competency, and community learning
- Creation of ROI models for stakeholder alignment

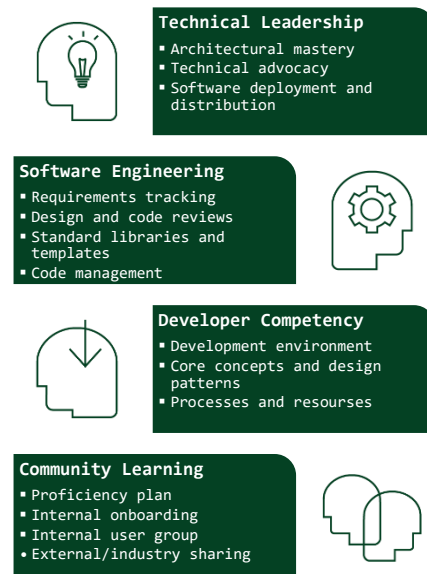


Figure 6. Important factors when assessing your team's proficiency

## Execution Planning

Knowing the proficiency gaps within an organization and proposing the ideal future state do not guarantee success without a procedural transition plan. Talent planning and team development cannot happen overnight, and effective change management is driven by effective project management.

NI MCS can support you with a formal report including the following:

- Identification of relevant project teams and investment in people and workflow
- Timeline development for standardized proficiency-based activity to develop technical leadership, software engineering, developer competency, and community learning

## Value Delivery

NI can help you deliver standardized programs for software proficiency.

**Training courses:** After attending on-location or virtual classes and labs ranging from the fundamentals to advanced specifics, you can become familiar with NI hardware and software. [Learn more.](#)

**Training entitlements:** You can gain unique and unlimited access to all NI training courses and certification programs using credits or a one- or two-year membership. [Learn more.](#)

**Individual certification:** With certifications from associate developer to architect for LabVIEW and TestStand software, you can join the ranks of the thousands of engineers with NI these professional accreditations. [Learn more.](#)

**Team certification:** By collaborating with NI experts to implement consistent and proven software practices and formally assess your team's progress, your team can be certified as a Center of Excellence for test. [Learn more.](#)

**Partner relationship:** You can partner with NI to introduce, strengthen, and support the relationships you have with critical outsourcing partners. Build strategic alignment, business relationships, and technical understanding to ensure you can quickly engage third-party developers when you need them.

*"I've worked with all kinds of companies, from semiconductor to consumer electronics. Most people get stage one correct: They standardize on a single tool, such as LabVIEW, and a single set of development guidelines. Where they fail is stage two: Implementing a process for every engineer to adhere to those guidelines and supporting initial success until it becomes a habit."*

CHRIS CILINO.

FOUNDER  
AND OWNER,  
PETRANWAY



## Case Study: PHILIPS ULTRASOUND

# Key Factors to Project Success

**\*Executive sponsorship—***The ability to articulate the business value that a test organization could deliver was critical. In this case, we could forecast the exponential development and sustaining costs in-line with increased product complexity. A vision of breaking the relationship between product complexity and test-system cost provided executive buy-in.*

**Engineering proficiency—***Because any plan is only as good as the people executing it, critical to the creation of this initiative was our recruitment and continual engagement of two leading software architects and one hardware designer who formed our core team. We attribute this project's success to these lead engineers' innovation and ongoing diligence as a collaborative team effort.*

**Technology adoption—***Moving to a COTS approach using PXI and LabVIEW was critical to this production test success at Philips. The combination of best-in-class modular hardware along with industry-standard software was pivotal to the millions of dollars and hundreds of hours saved in production-test engineering.*



**NEIL EVANS,**  
SENIOR MANAGER, PHILIPS

\*Excerpt taken from “Philips Rethinks Functional Test, Shortening Time to Market.”

# 80%

REDUCTION IN  
DEVELOPMENT  
EFFORT

# 10X

REDUCTION IN  
SUSTAINING  
EFFORT

# 10X

REDUCTION  
IN CYCLE TIME

# 60%

REDUCTION IN  
CERTIFICATION  
TIME





©2021 NATIONAL INSTRUMENTS. ALL RIGHTS RESERVED. NATIONAL INSTRUMENTS, NI, NI.COM, CVI, ENGINEER AMBITIOUSLY, LABVIEW, MEASUREMENT STUDIO, and NI TESTSTAND ARE TRADEMARKS OF NATIONAL INSTRUMENTS CORPORATION. OTHER PRODUCT AND COMPANY NAMES LISTED ARE TRADEMARKS OR TRADE NAMES OF THEIR RESPECTIVE COMPANIES.

THE MARK LABWINDOWS IS USED UNDER A LICENSE FROM MICROSOFT CORPORATION. WINDOWS IS A REGISTERED TRADEMARK OF MICROSOFT CORPORATION IN THE UNITED STATES AND OTHER COUNTRIES.

AN NI PARTNER IS A BUSINESS ENTITY INDEPENDENT FROM NI AND HAS NO AGENCY, PARTNERSHIP, OR JOINT-VENTURE RELATIONSHIP WITH NI.