A PRODUCT REALIZATION GROUP White Paper

Hardware New Product Introduction (NPI): Seven Best Practices

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New Product Introduction consists of people, processes and technology, which together provide a formal methodology for a product's transition from engineering to manufacturing. A subset of the product lifecycle process, which spans concept to end of life, NPI's focus is on a product's beta, pilot, and general availability (GA) stages.

Hardware New Product Introduction

Focusing on the Transition from Engineering to Manufacturing

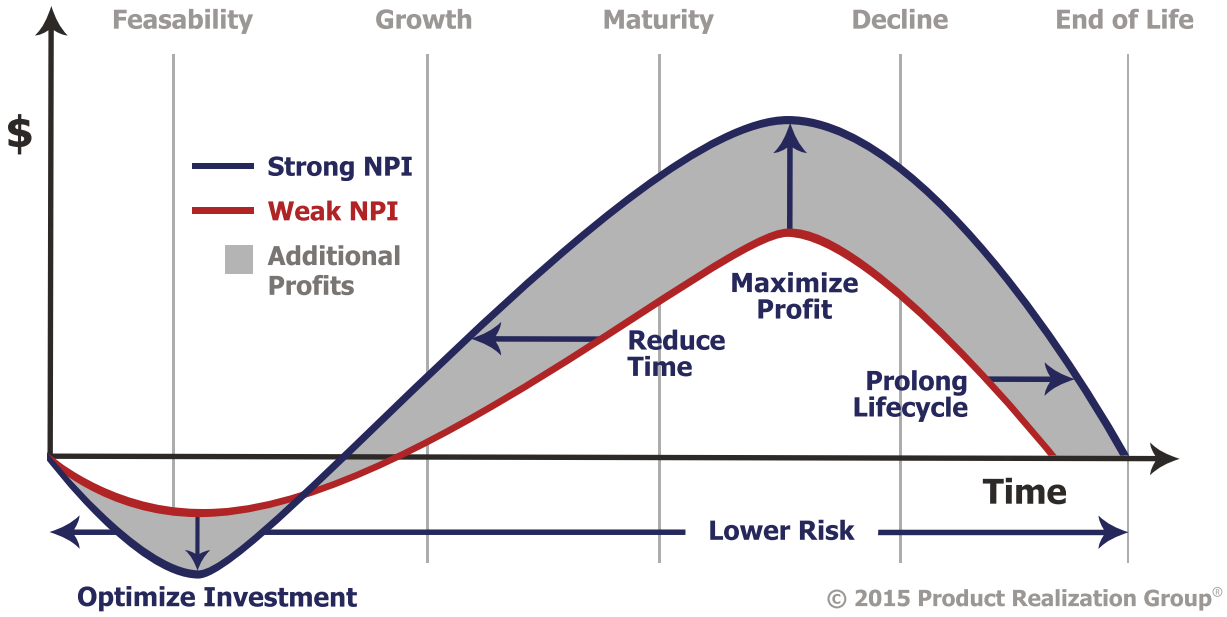
In today's global marketplace, a strong hardware NPI process is critical to successfully launching the next innovative new product, enabling growth, and meeting cost, quality, and time-to market goals. Regrettably, many new products never make it to market because key steps in the NPI process are missed, or executed in ways that prevent a successful launch.

What are typical symptoms of a weak NPI process?

- Lack of capital.
- Unrealistic schedules.
- Deficient designs.
- Unavailable resources and expertise.
- Insufficient test and reliability.
- Risky materials management.
- Manual and inefficient processes.
- Inadequate tooling and fixturing.
- Poor communications.

A strong hardware NPI process helps companies gain additional profits by enabling them to minimize investment (using selective resources and optimal capital expenditure), reduce time-to-market (through agile product development and deployment), maximize profits (by lowering product and total costs), lower risks (through quality design and efficient supply chain and manufacturing processes), and prolong a product's availability in the marketplace. See below for a comparison of strong vs. weak NPI processes, and the impact they have on a product's lifecycle.

Impact of New Product Introduction in the Product Lifecycle



Here are seven best practices for deploying a strong NPI strategy:

1. **Use Concurrent Engineering**
   Concurrent engineering ensures that a high quality product is built at the lowest possible cost.
   a. **Assign an experienced NPI project manager** who owns driving the project. This individual defines the NPI schedule including deliverables, task linkage, due dates, and owners. The project manager also tracks decisions and impacts.
   b. **Assemble the NPI team.** NPI is comprised of cross-functional resources from marketing, engineering, operations, finance, and service. All functions should be involved early on in the product development process.
      - **Marketing** - ensures there is demand for the product and that it meets market needs.
      - **Engineering** - mechanical, electrical, and software engineers ensure the product's technical feasibility. Reliability, quality and compliance engineers support parts selection and testing that verifies the product will perform throughout its lifecycle.
      - **Operations** - responsible for Quality, Cost and Delivery (QCD). Ensures that the product can be cost-effectively built, shipped and supported through the lifecycle.
      - **Finance** - responsible for budgeting, and ensures projects meet financial targets.
      - **Service and support** - responsible for installation, training, support, field service, and reverse logistics - Return Materials Authorization (RMA) replacement and repair.
   c. **Follow an agile hardware development process**, leveraging project management software and agile hardware sprints, to help keep the project on track and ensure key decision points. Typical phases include:
      - **Definition and planning** includes marketing and product requirements, preliminary roadmap, regulatory and cost definitions.
      - **Development** focuses on functional design specifications, feasibility analysis, alpha and beta development, design verification testing, design for excellence (DFX), preliminary documentation (product, assembly, training), and cost of goods sold (COGS).
      - **Production** incorporates marketing and sales plans, volume manufacturing and test processes, final documentation (product, assembly, training), ordering and fulfillment systems, business compliance, production yield analysis, production tooling and fixtures, sustaining engineering, warranty and returns.

2. **Mitigate Risks**
   a. **Focus on basic product requirements/features** to mitigate risk. Risk can take many forms: market, technological, cost, component, supply chain, regulatory, and processes. With the cross-functional NPI team involved early on, risks can be identified and mitigated.
   b. **Choices made in engineering affect a product for a long time.** A solid hardware NPI program makes sure manufacturing and service can live with those choices, especially if needing to adhere to agency, regulatory, and the fabrication and assembly requirements of outside electronic manufacturing services (EMS) providers.
   c. **Perform feasibility studies early** and set realistic timelines to ensure success.

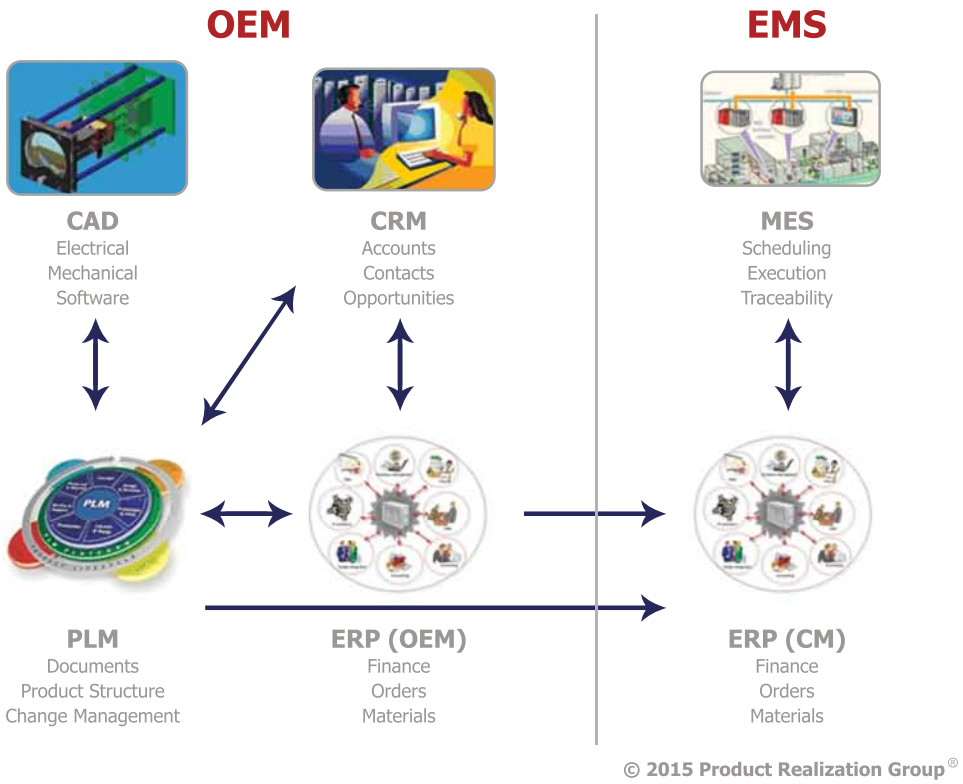
3. **Employ Design for Excellence (DFX)**
   a. DFX is the umbrella term for designing high quality products that can be cost-effectively built, tested, shipped and supported. DFX typically includes Design for Cost, Design for Reliability, Design for Procurement, Design for Assembly, Design for Manufacturing, Design for Test, Design for Logistics, and Design for Service. Leverage DFX methodologies during key development transitions points:
      - Concept **(DFX)** Engineering Verification Test
      - Engineering Verification Test **(DFX)** Design Verification Test
      - Design Verification Test **(DFX)** Process Verification Test
      - Process Verification Test **(DFX)** Volume Manufacturing

4. **Leverage Rapid Prototyping and Accelerated Life Testing**
   a. **Additive manufacturing techniques** allow objects to be made in layers from 3D computer-aided design (CAD) models, allowing you to quickly and cost-effectively see what the product will look like or how it functions. The cost and lead times for this process are so favorable that you have the ability make new designs rapidly to evaluate development progress/options. Here are just a few ways you can leverage this amazing method:
      - Shape analysis for fit, ergonomics, appearance
      - "Disposable" assembly tooling (when they wear out, just grow more)
      - Component fitting for both internal and external enclosure designs
      - Air flow testing for cooling or other functional aspects
      - Mechanism concept testing (normally a very time consuming process)
   b. **Highly Accelerated Life Tests (HALT)** provide insights into design reliability (i.e. which parts fail first) that allow improvements to the design before release to production, and extend product life.

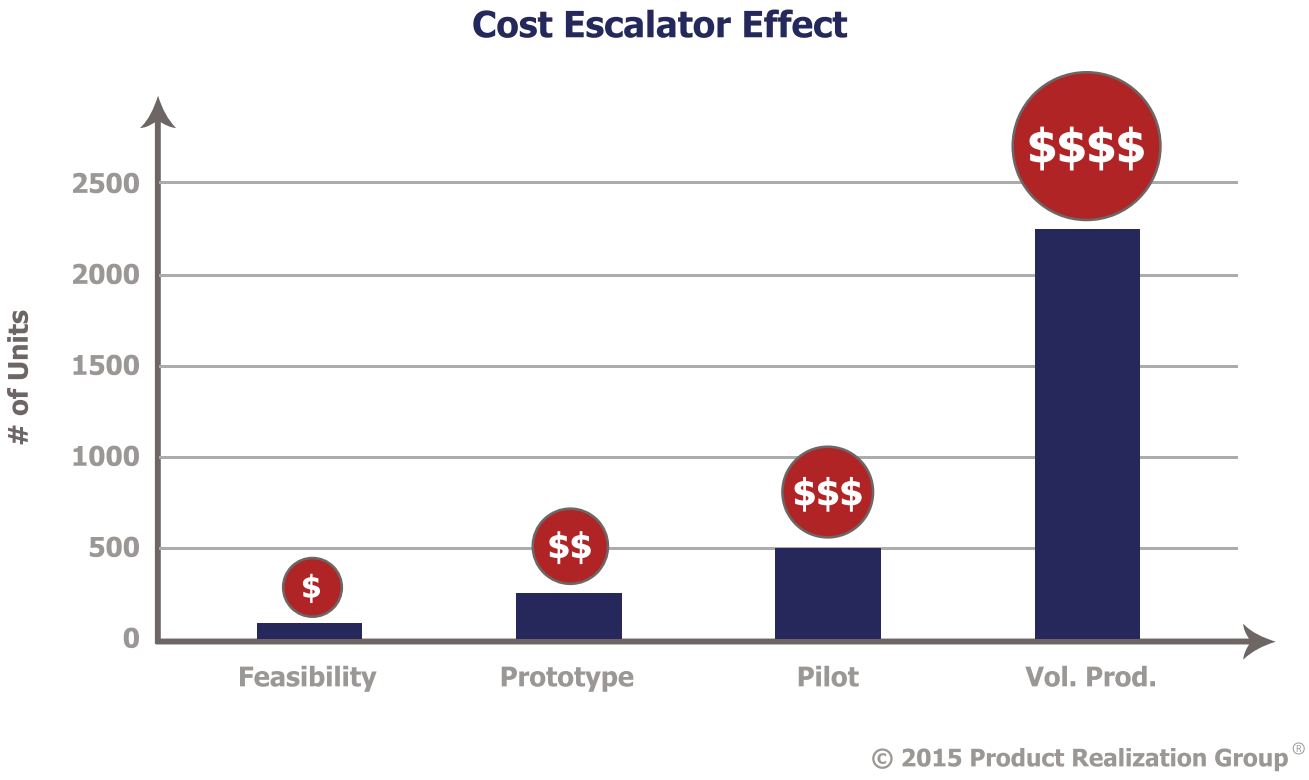
5. **Adhere to Agency and Environmental Compliance Requirements**
   a. **Agency Compliance:** define your strategy for compliance based on your industry and incorporate compliance requirements early in the design phase. Typical requirements include:
      - Federal Drug Administration (FDA)
      - Underwriters Laboratory (UL)
      - European Conformity (CE)
      - Federal Communications Commission (FCC)
      - International Electrotechnical Commission (IEC)
      - International Standards Organization (ISO)
      - Military Standards (MIL)
   b. **Environmental Compliance:** define your strategy for environmental compliance with directives based on your industry. Common environmental compliance for high-tech electronics include:
      - Evaluation, Authorization and Restriction of Chemical substances (REACH)
      - Restriction of Hazardous Substances (RoHS)
      - Waste Electrical and Electronic Equipment (WEEE)
      - Conflict Free Minerals disclosure

6. **Deploy Scalable Business Systems**
   a. Purchase and deploy systems early to support rapid development of the product, customer relationships, orders, materials management, financials, quality management, and smooth data flows between Original Equipment Manufacturer (OEM) and outside partners such as Original Design and Manufacturers (ODM's), EMS providers, and Component Suppliers.
   b. Systems may include but are not limited to CAD (electrical, mechanical, software), Customer Relationship Management (CRM), Product Lifecycle Management (PLM), Enterprise Resource Planning (ERP), Manufacturing Execution Systems (MES), and Quality Management Systems (QMS). The following practices should be followed to mitigate risks:
      - Develop an end-to-end systems strategy that includes outsourced partners
      - Plan time (and budget) for process definition before systems implementation
      - Plan time (and budget) for user training after implementation
      - Automate data exchange between systems, where possible
      - Allocate resources for ongoing support
      - Get management support, clear Statements of Work (SOWs), service level agreements (SLAs), training, a systems integration manager/owner, vendor support (apps engineers, portals, user groups and a plan for validating system updates.

Typical Business Systems and Data Flows



7. **Learn from Prototype and Pilot Builds**
   a. Costs for mistakes escalate rapidly when moving from prototype to pilot into full production. By implementing best practices, and actively reviewing and mitigating issues found as a result of feasibility, prototype and pilot builds, design issues can be eliminated and manufacturing processes optimized for volume production.



Do it right from the start - the leverage is HUGE!

These best practices will help you to deliver a strong NPI process in your organization, accelerating time-to-market, raising product quality and reliability, complying with standards and regulations, gaining extra profits and extending product life to deliver products that exceed customer performance expectations. If you do not have available internal resources to fill out the expertise needed on your NPI team, consider using experienced outsourced service providers.

ABOUT PRODUCT REALIZATION GROUP, INC.

Product Realization Group is a consortium of Silicon Valley companies that can take your hardware product from idea to scale. One source for prototype design and build, cost-reducing insights, and scalable manufacturing. Go to market faster, for less money than do-it-yourself. Get a smoother launch and lower costs by 20%. Our 500 clients include medical device, consumer electronic, and high-technology start ups, SMBs, and large companies such as GoPro, EMC, and Intuitive Surgical.

PRG delivers services that support all aspects of NPI. For more information on NPI best practices or PRG, visit **productrealizationgroup.com**.