

**Innovation<sup>TM</sup>  
Through  
Creation**



**LEARDON<sup>TM</sup>**  
SOLUTIONS

**Product Development  
and Commercialization  
Lifecycle**



**Innovation  
Through  
Creation™**



# Product Development Life Cycle

# Definition Phase

1. Product Alignment with Company Strategy and Roadmap
2. Competitive Analysis
  - Lessons/feedback from existing products in market
  - Analysis of competitor's product functional performance and features
  - Intellectual Property (IP) Landscape Search and Protection
3. Product Data Sheet/Product Requirements
  - Desired performance, functional, and interface requirements
  - Industrial design requirements
  - Human factors requirements
  - Installation, support, service, and maintenance requirements
  - Qualification, regulatory, safety, and standards compliance requirements
  - Compatibility requirements
  - Packaging, shipping, and labeling requirements
4. Engineering Data Sheet/Product Specifications
  - Translation of the product requirements into engineering specifications
5. Program Management/Product Development Plans
  - Program schedule
  - Program budget
  - Program risk assessment
  - Quality system implementation plans
  - Program priorities: scope, cost, schedule

# Definition Readiness Checkpoint

1. Product Development Plan Document
  - Preliminary schedule and budget approved
  - Program priorities approved
  - Strategy, cost, schedule, risks, quality expectations, and product goals aligned
2. Product Data Sheet/Product Requirements Document
  - Document approved and under revision control
3. Engineering Data Sheet/Product Specifications Document
  - Document approved and under revision control

# Feasibility Phase

1. Product Architecture
  - Identify functional subsystems in architecture
  - Define interface between functional subsystems
  - Define critical functional parameters of functional subsystems
  - Define interface protocols between all functional engineering disciplines
  - Develop proof-of-concept testbeds based on functional subsystems
  - Refine industrial design and human factors
2. Qualification, Verification, and Regulatory
  - Verification of subsystem functional performance parameters
  - Product qualification, regulatory, and compliance testing requirements
  - County ship-to list impact on qualification
3. Program Management/Product Development Plans
  - Preliminary bill of materials
  - Cost of goods sold analysis
  - Nonrecurring costs (engineering, prototyping, qualification)
  - Prototyping strategy (methods, quantities, packaging, regulatory requirements)
  - Feasibility issue tracking list management
  - Updated program schedule
4. Design Review
  - Review of designs relative to Engineering Data Sheet/Product Specs

# Product Feasibility Checkpoint

1. Product Architecture Document
  - Industrial design and human factors documents approved
  - Product architecture and interface document approved
  - Proof-of-concept testbed designs documented
2. Qualification, Verification, and Regulatory Document
  - Plan documented, approved, and under revision control
  - Proof-of-concept testbed performance documented and approved
3. Product Development Plan Document
  - Updated schedule approval based on product feasibility results
  - Program financials and budget reviewed and approved
  - No outstanding issues on feasibility issue tracking list
  - Prototyping plan reviewed and approved
4. Design Review Documentation
  - All design review sessions documented

# Prototype Design Phase

1. Detailed Design and Prototype
  - Product design that meets form, fit, and functional requirements
  - Develop packaging design
  - Product design reviews with cross-discipline team
  - Design margin and tolerance analysis for critical parts and assemblies
  - Generate all required design documentation
  - Fabricate quick-turn prototypes to validate integrated functionality
2. Qualification, Verification, and Regulatory Testing of Design Prototypes
  - Develop qualification plan that validates and verifies integrated functionality
  - Execute first phase of hardware, software, and firmware qualification plan
  - Test product under regulatory and compliance testing conditions
3. Supply Chain Strategy
  - Capacity, ramp plan, and product volume forecast
  - Develop production tooling strategy and schedule
  - Assurance of supply analysis for each component and vendor
  - Identify key suppliers and technologies
  - Initiate supplier contracts
  - Develop a distribution strategy
  - Develop a reverse logistics (service and support) strategy
4. Program Management/Product Development Plans
  - Align Engineering Disciplines to Overall Product Schedule
  - Review Intellectual Property and File any New IP
  - Implement a Defect Tracking System

# Product Design Checkpoint

1. Product Design Documentation
  - Integrated product design documentation
  - Design reviews sessions documented
2. Qualification, Verification, and Regulatory Document
  - Demonstrated functionality of quick-turn integrated prototypes
  - Updated qualification document
3. Supply Chain Strategy
  - Tooling strategy, assurance of supply, and supplier plan
  - Product forecast and capacity
  - Distribution and reverse logistics plan
  - Key supplier contracts
4. Product Development Plan Document
  - Program schedule, financials, and expenses approved
  - Documented release criteria for ship/no-ship

# Production Prototype Phase

1. Production-Ready Design
  - Product design incorporates design-for-manufacturability
  - Production tooling released
  - Production prototypes built using production processes
2. Qualification, Verification, and Regulatory Certification of Production Prototypes
  - Qualify production prototypes using qualification plan
  - Verify product performance meets product specifications
  - Complete regulatory and certification testing and submission to agencies
  - Qualify final package design with in-box materials
3. Production and Manufacturing
  - Production line assembly and test processes designed and implemented
  - Assembly jigs and fixtures designed and fabricated
  - Production processes qualified for volume production
4. Supply Chain
  - Finalize all supplier contracts
  - All vendors qualified and capable of producing expected volumes
  - Distribution and reverse logistics operational plan generated
5. Program Management/Product Development Plans
  - Formal change management and revision control of designs
  - Defect tracking system linked with change management
  - Learning products draft complete and under revision control
  - Costed bill of materials under revision control and cost of goods sold approved
  - Expense budget and schedule details managed to plan

# Production Prototype Checkpoint

1. Product Design Documentation
  - Design files updated for volume production design
2. Qualification, Verification, and Regulatory Document
  - Production prototypes meet product specifications (zero no-ship issues)
  - Regulatory approvals and country certifications received
3. Supply Chain and Manufacturing
  - Production able to meet ramp, capacity, and product forecast
  - Production processes documented and approved
  - Supply chain able to meet ramp, capacity, and product forecast
4. Product Development Plan Document
  - Product financials meet profit and revenue goals
  - Product introduction date announced

# Production Ramp Phase

1. Production Design
  - Build production products to fill the outbound supply chain
  - Resolve issues and defects that arise during ramp to steady-state volume
2. Qualification, Verification, and Regulatory Compliance
  - Develop on-going qualification and verification plan
  - Execute on-going quality plan with production samples
  - Develop regulatory and certification plans for new regions of distribution
3. Supply Chain and Manufacturing
  - Implementation of distribution strategy
  - Develop contingency plans for supply chain and manufacturing issues
4. Program Management
  - Cost of goods sold under revision control
  - Learning products and product labeling complete

# Production Release Checkpoint

1. Production meets demand fulfillment requirements
2. Products shipped with zero “no-ship” issues
3. On-going product qualification yield acceptable product performance
4. All financial product goals are met

# Stable Production Phase

1. Stable Production Performance
  - Production line yield and productivity is monitored and stabilized
  - Production line output has reached expected volumes
  - In-factory product issues are resolved quickly
  - Flawless execution of demand fulfillment plans
2. Design Improvements
  - Design improvements fed forward to future products
  - Resolve critical field and customer issues and roll into current production
3. Program Management
  - Product development and management learnings rolled into future programs
  - Hand-off of design ownership to production team

# Discontinuance Phase

1. Develop Discontinuance/Rollover Plans
  - Engineering support, technical support, and reverse logistics plan
  - Inventory requirements for repair and support
  - Plan to use parts in follow-on products
2. Discontinue Manufacturing and Sales
3. Disposition Inventory
4. Determine Support Requirements