IPC Electronics Midwest 2010

Reliability and Quality Planning in the Product Development Cycle

Santanu Roymoulik

PTC

Biography:

Santanu is a highly successful and accomplished product development professional with international and domestic experience of over 15 years in strategic planning, global product development, product and program management, product strategy and marketing, and business process improvement.

Santanu has held senior level positions in established companies and start-ups. His experience spans several industries, including high tech, biotechnology, pharmaceuticals, telecommunications, medical devices, automotive, industrial equipment, financial services, oil and gas and aerospace and defense.

EXPERTISE

- Operational Strategy Excellence focusing on Product Development and Supply Chain
- Strategic Marketing & Management
- Business Process Improvement through Best Practices implementation
- Value Identification and Planning

ROLE

- Responsible for developing core positioning and messaging reflecting company strategies and using competitive intelligence for Relex.
- Act as company spokesperson on Relex.
- Facilitate industry analyst discussion to position PTC as market leader in target market segments

Executive Summary

In globally competitive markets, managing product quality, reliability and risk is not an option. However, it also brings its own unique set of challenges to complex organizations:

- Product design teams need to gain early insight into product reliability
- A systematic process is needed to plan for quality, and to identify and mitigate risks
- The product design must be more closely aligned with customer requirements
- Reliability and quality must be balanced with lifecycle costs and profitability
- A centralized system is required to enable guided corrective actions and prevent repeat issues

Today, many companies struggle with these demands, creating fragmented tools and processes that delay analysis and prevent communication, the consequences of which range from undesirable to catastrophic, including: Escalated costs, undetected risks, product recalls, decreased consumer confidence, and loss of market share.

Customer demands and government oversight have never been greater, which is further amplified with 24 hour access to consumer blogs and media coverage. Every corporate boardroom is forced to consider the impacts of quality, reliability and risk on their business.

This presentation will present a comprehensive quality lifecycle management framework that focuses on addressing quality and reliability management challenges across the product lifecycle. Focus will be on ensuring quality and reliability are aligned with requirements and systematically tracked throughout the product's lifecycle and allowing all levels of management and engineering professionals to access critical information about product performance and safety dimensions in a collaborative environment, enabling quality and reliability best practices.

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AGENDA

Product Reliability Challenges

Quality and Reliability Value Proposition

Quality Lifecycle Management (QLM)

QLM Realization

QLM Benefits

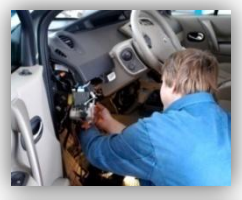
Q&A

The Quality / Reliability Opportunities

Best Practices

- ***Product Reliability Visibility***
- ***Quality Planning***
- ***Requirements Alignment***
- ***Service Planning Optimization***
- ***Closed loop Performance Feedback***

Benefits



Eighty percent of all quality issues are repeat issues.

- Quality Digest

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Current State: Quality initiatives are fragmented

Market Trends	Current State of Quality	Results
Increasing product complexity		Disparate systems with minimal data exchange
Multiple legacy systems to integrate		Little or no cross-functional collaboration
Globally dispersed development teams		No single source of truth for product quality
Diverse supply chain / contractor network		Management lacks critical quality information

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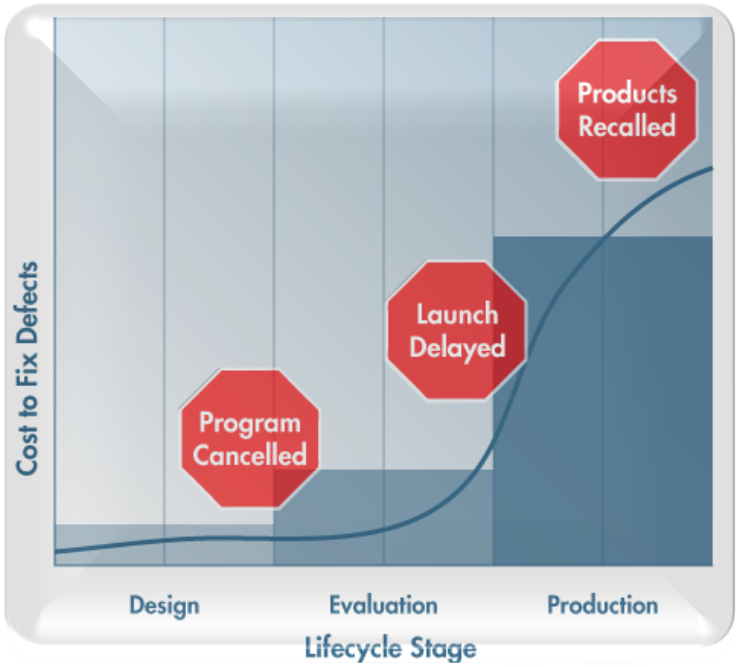
The Consequences of Managing Quality & Risk Too Late



Market Share Erosion

~ 0.5 – 1% of market share.

"Toyota recall will result in loss of market share in US by 1%."

- Deutsche Securities, UBS Auto Analysts

COPQ/ Warranty Costs

~ 5 – 20% of revenue, including 1 - 5% from warranty.

"Top 50 US manufacturers spend over $28 billion annually on warranty."

- Warranty Week

Liabilities/ Non-Compliances

~ 0.5 – 1% of revenue.

Liability / noncompliance causing vehicle rollovers cost Ford Motor Company & Bridgestone Tires $1.1B in claims in 2002.

- ASQ

Toyota Recall Will Exceed $2 Billion

- Businessweek

BP Oil Spill Clean-Up to Cost Nearly $5 Billion

- Reuters

Reliability Value Drivers

Quality Impact

- **Market Share Erosion**
- **Cost of Poor Quality (COPQ)**
- **Non Compliance Costs**

Business Initiatives

Design for Reliability
Design for Quality
Quality Lifecycle Management
Quality Planning
Product Integrity Enablement

Design for Reliability
Quality Lifecycle Management
Warranty Cost Reduction
Product Integrity Enablement

Quality Improvement
Corrective Action Support

Growth

Value

Profitability

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Business Process Impact

	Plan	Concept	Design	Validate	Production	Support
 Management	Portfolio Management					
	Program Management					
	Regulatory Compliance					
	Quality and Reliability Management					
	Change and Configuration Management					
 Sales & Marketing	Requirements Capture and Management					
	Product Marketing Publications					
 Engineering	Concept Development					
	System Design					
	Detailed Design					
	Verification and Validation					
	Variant Design & Generation					
	Design Outsourcing					
 Sourcing	Component and Supplier Management					
	Early Sourcing					
 Manufacturing	Manufacturing Process Management					
	Tooling Design and Manufacture					
	Manufacturing Outsourcing					
 Service	Technical Publications					
	Service Program Management					
	Equipment Management					
	Performance Analysis					

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Business Process Impact

Impacted process

Plan	Concept	Design	Validate	Production	Support

Management

- Portfolio Management
- Program Management
- Regulatory Compliance
- Quality and Reliability Management
- Change and Configuration Management

Sales & Marketing

- Requirements Capture and Management
- Product Marketing Publications

Engineering

- Concept Development
- System Design
- Detailed Design
- Verification and Validation
- Variant Design & Generation
- Design Outsourcing

Sourcing

- Component and Supplier Management
- Early Sourcing

Manufacturing

- Manufacturing Process Management
- Tooling Design and Manufacture
- Manufacturing Outsourcing

Service

- Technical Publications
- Service Program Management
- Equipment Management
- Performance Analysis

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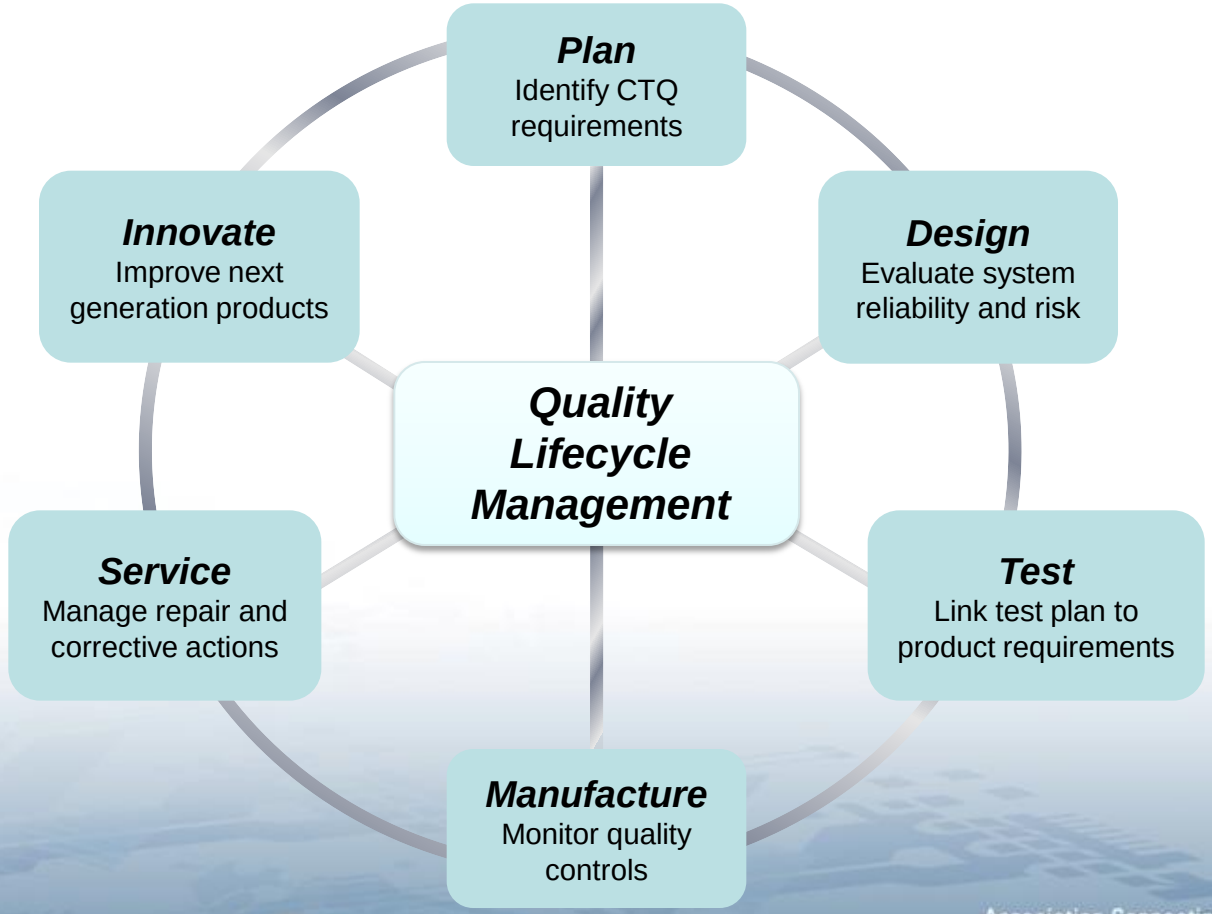
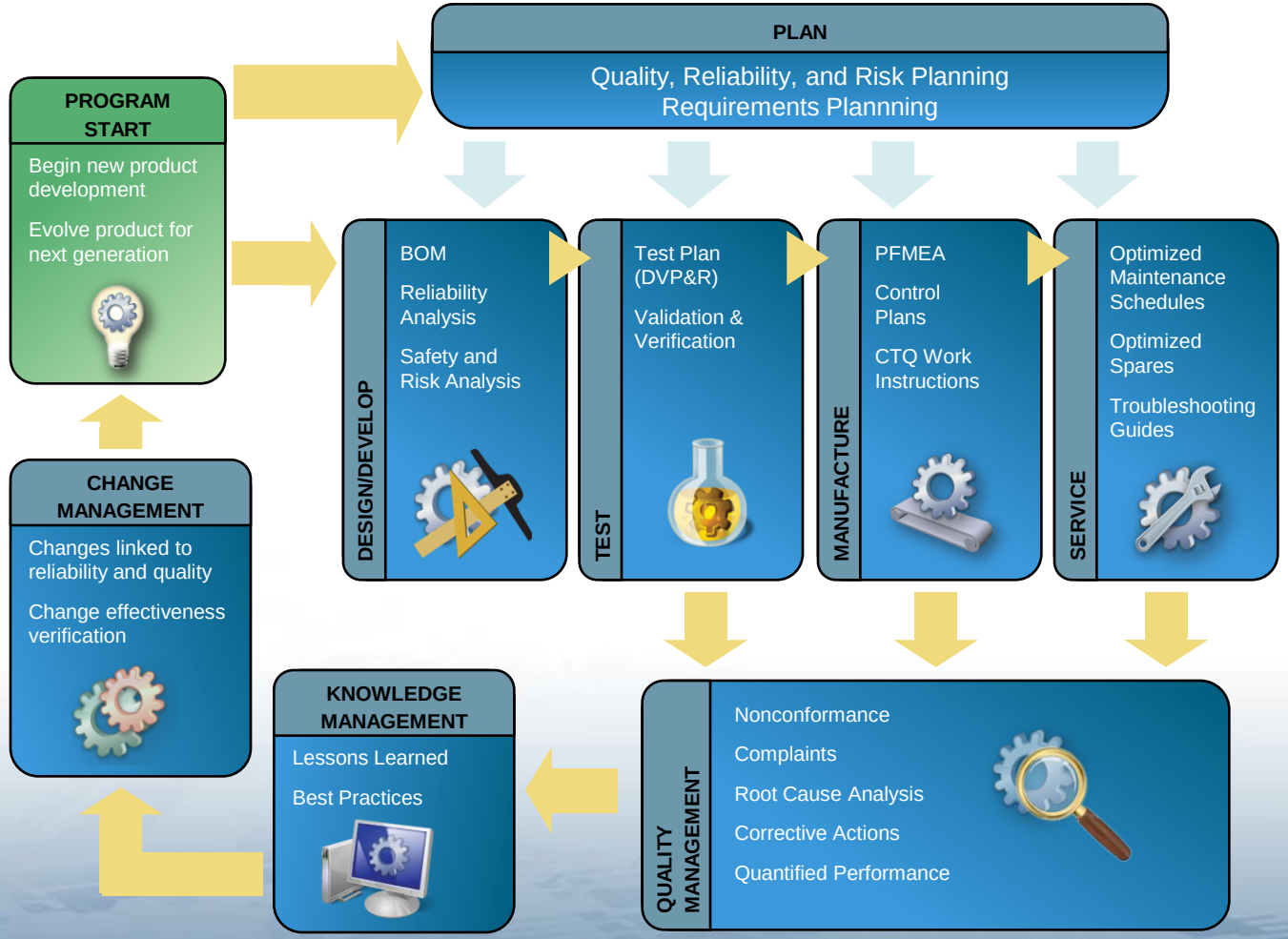
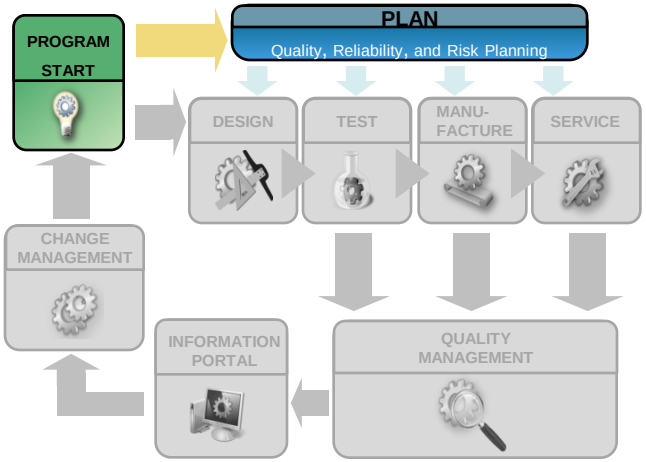
Quality Lifecycle Management (QLM)
PLM Solution focused on quality



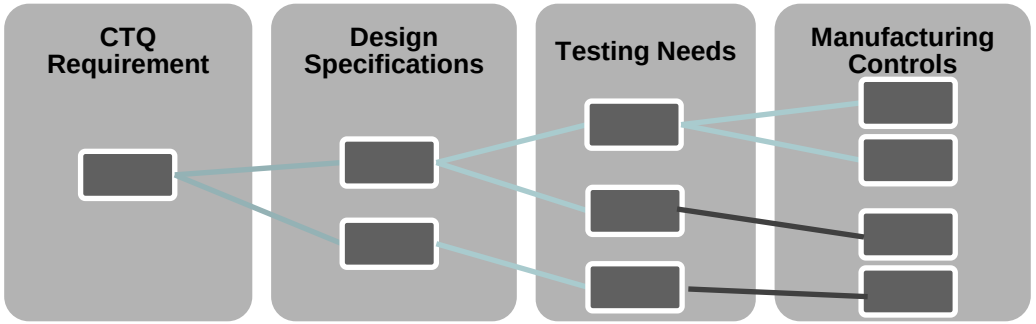
QLM enables quality, reliability, and risk planning across the product lifecycle



Plan: Identify Critical-To-Quality (CTQ) Requirements



- Compile requirements from multiple sources
- Define Critical-To-Quality (CTQ) characteristics related to each requirement



Quality planning drives lifecycle stages:

- Prioritizes reliability and risk analysis
- Determines necessary product tests
- Identifies changes based on test/analysis
- Guides manufacturing controls, service

FMEA - Functional Tree

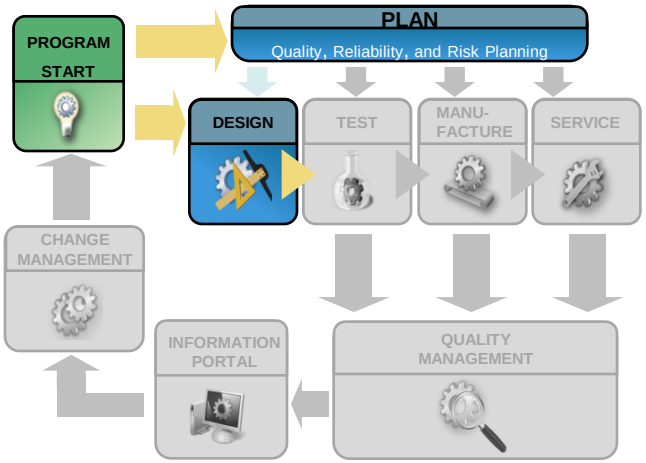
Name	Attachments
Product	0 Attachments
Product-specific Requirements	0 Attachments
Performance	0 Attachments
Operator Usability	0 Attachments
Standard Requirements	0 Attachments
Regulatory	0 Attachments
Safety	0 Attachments

BOM | Programs | FMEA Table | FMEA - Functional Tree

Performance Tree

	Need / Level 1 CTQ (Item)	Driver / Level 2 CTQ (Mode)	Investigate	Responsibility	Due Date	Start	Status	Actions Taken	Done?	Documentation	Requirement (Cause)	Send to Req Link	Test ID	Test Type
1													ID222	08 - Vibration
2	Quiet	Vibration	Identify maximum vibration level	Dan	3/1/2010	☑	Done	Benchmarked similar systems and identified maximum vibration during cycle is 0.35g RMS	☑	0 Attachments	Maximum cycle vibration shall be 0.35g RMS or less	☑	ID223	08 - Vibration
3		Sound Level	Benchmark competitive products to identify best in class dB	Dan	1/27/2010	☑	Done	Created Best in Class sound profile	☑	1 Attachment	Dishwasher shall adhere to Best in Class Sound Profile	☑	ID224	06 - Accoustic

Design: Evaluate System Reliability and Risk

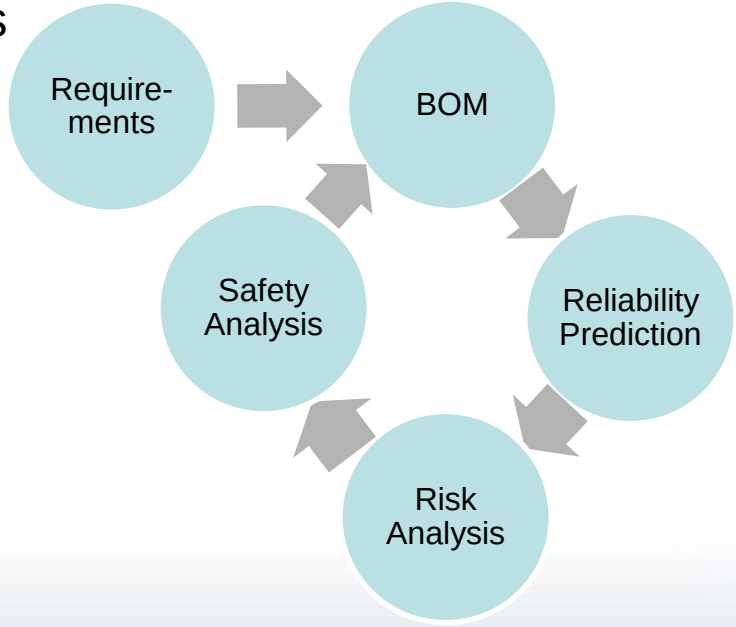


System design is informed by the quality plan and impacts other processes:

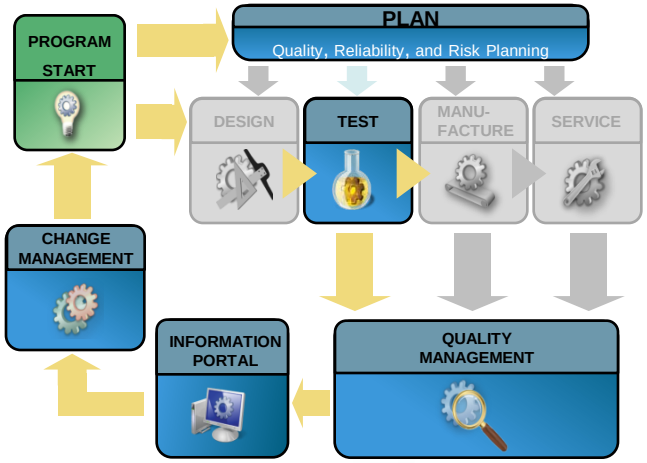
- Testing validates early risk and reliability analysis
- Manufacturing controls are identified by PFMEA
- Service planning begins in the design stage

An iterative process

- Create BOM
- Perform reliability and risk analysis
- Manage safety and performance risks
- Determine optimal system design



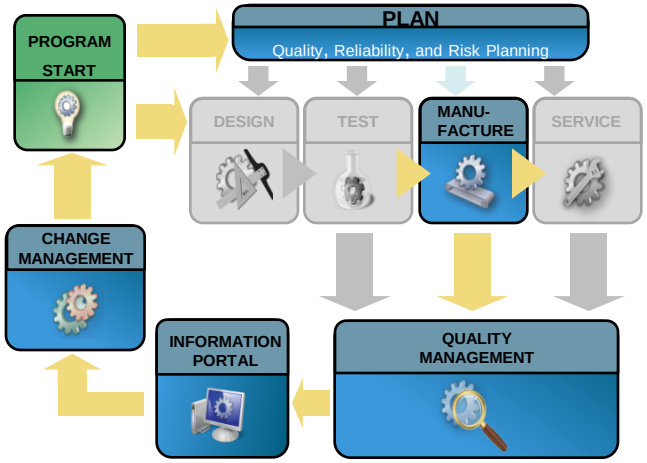
Test: Link Testing to Requirements, Design



- Driven by CTQ requirements defined during planning
- Verifies and validates reliability analysis and risk analysis activities performed during design

Planning & Design	Testing Resources	Test Results	Change Management
•Meet CTQ Requirements •Verify and Validate Risk and Reliability Analysis: DVP&R	• Lab Tests • Simulations • Field Tests • Testing Resources	• Verify results against: - Benchmarks -Tolerances - Performance Targets	• Identify corrective actions • Provide feedback to product design

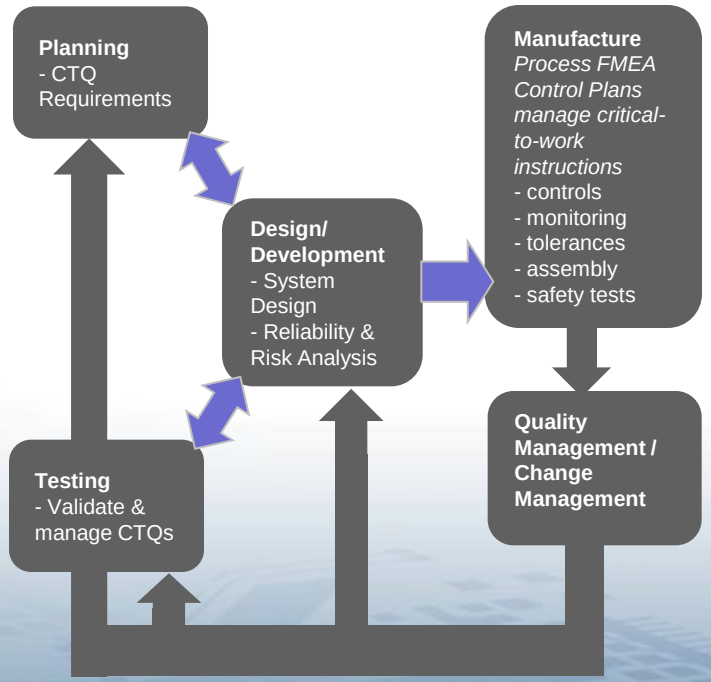
Manufacture: Implement and Monitor Quality Controls



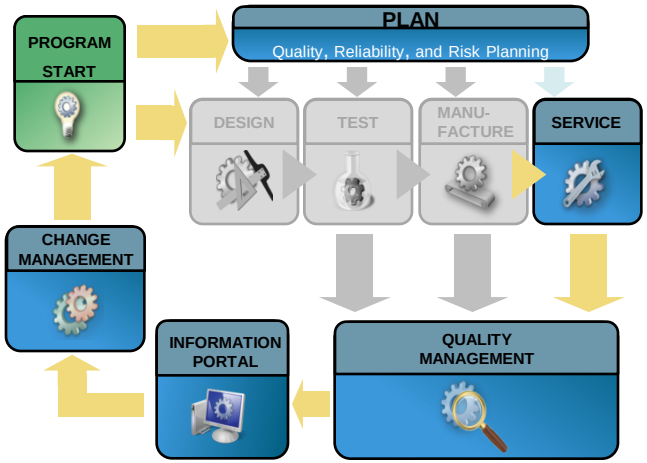
Feedback from manufacturing impacts other stages to improve product quality:

- Design changes required by manufacturing
- Supplier requirements or limitations
- Best practices inform next-generation products

- Feedback from manufacturing is directed back to earlier stages to improve quality

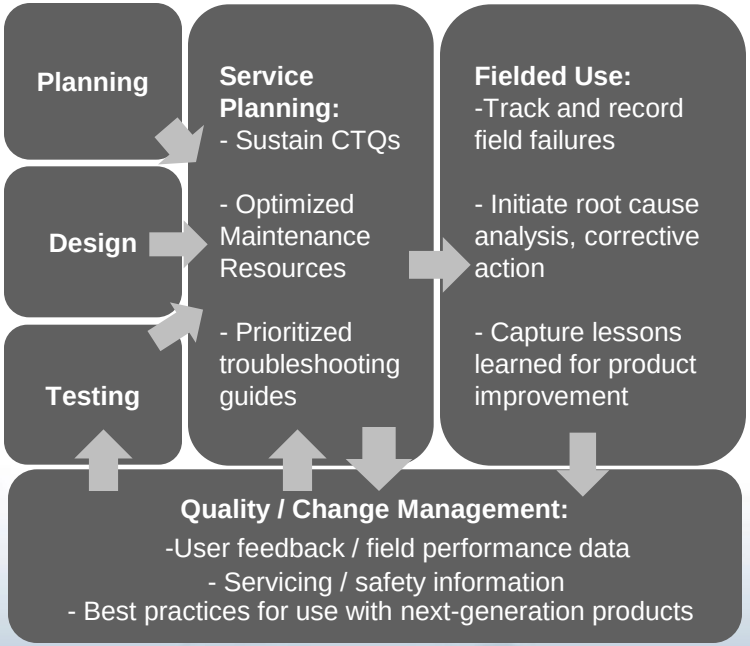


Service: Manage Maintenance and Corrective Actions

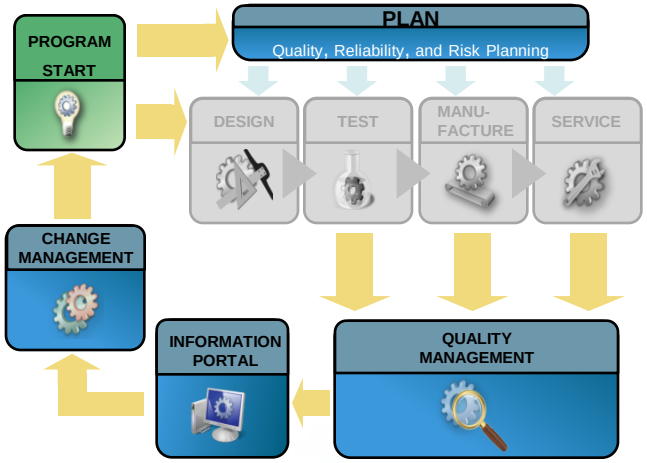


Feedback from service and use impacts other key areas of product development:

- Validate results from testing, analysis
- Identify previously unforeseen failures or risks
- Initiate root cause analysis, corrective actions
- Inform next-generation quality planning



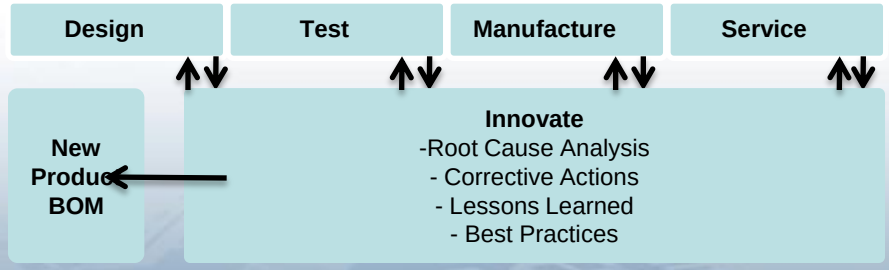
Innovate: Improve Next-Generation Products and Systems



QLM streamlines and advances innovation:

- Continuous product improvement throughout lifecycle stages
- More dramatic strides in innovation for next-generation products

- Compile lessons learned from all lifecycle stages into a best practices database
- Root cause analysis, corrective actions, lessons learned inform other relevant lifecycle stages
- Structured software methodologies “filter” any new product BOMs through lessons learned database



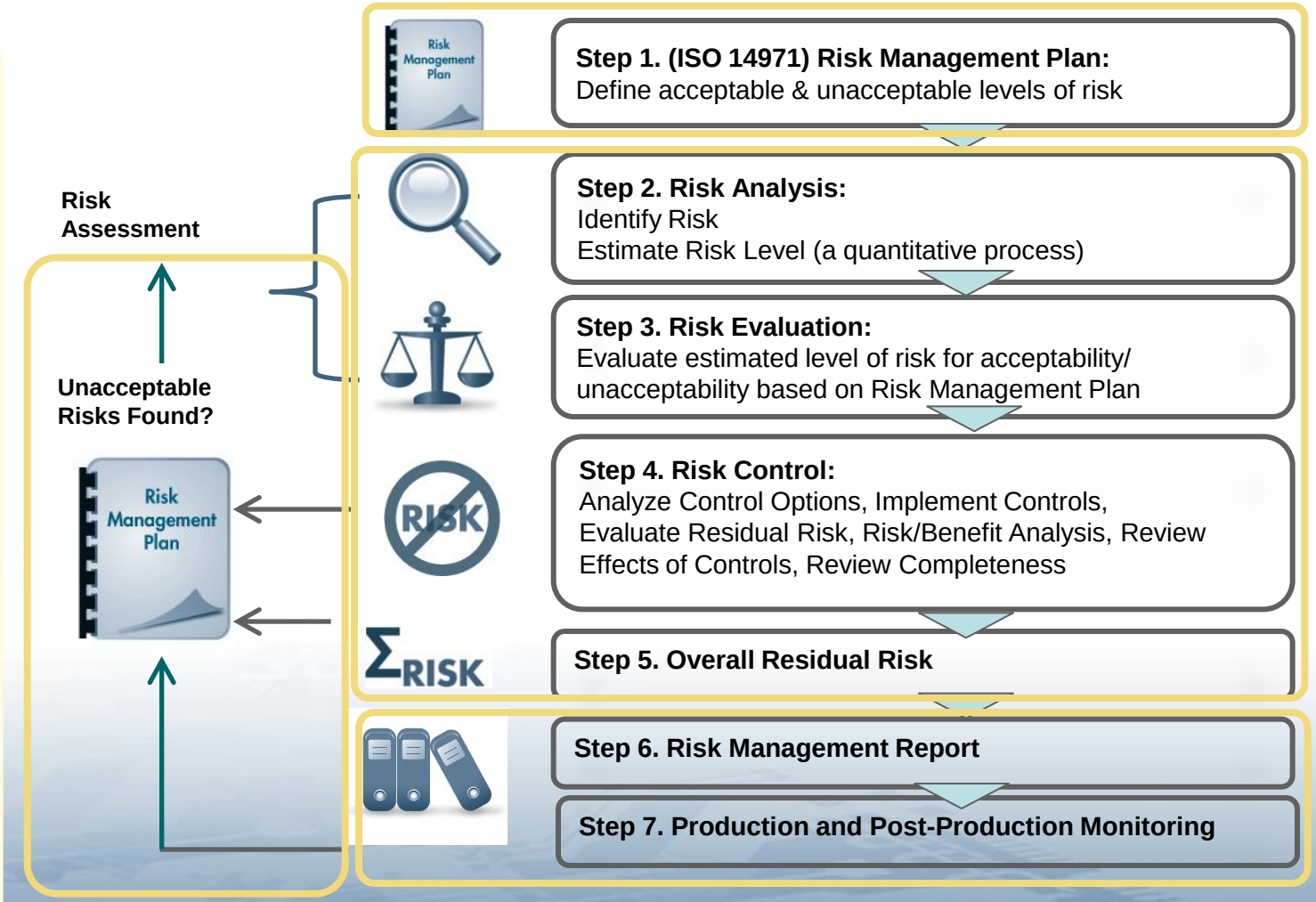
Models for QLM: Risk Analysis, Medical Devices

Plan

Design/ Develop/ Test

Build / Service

Innovate



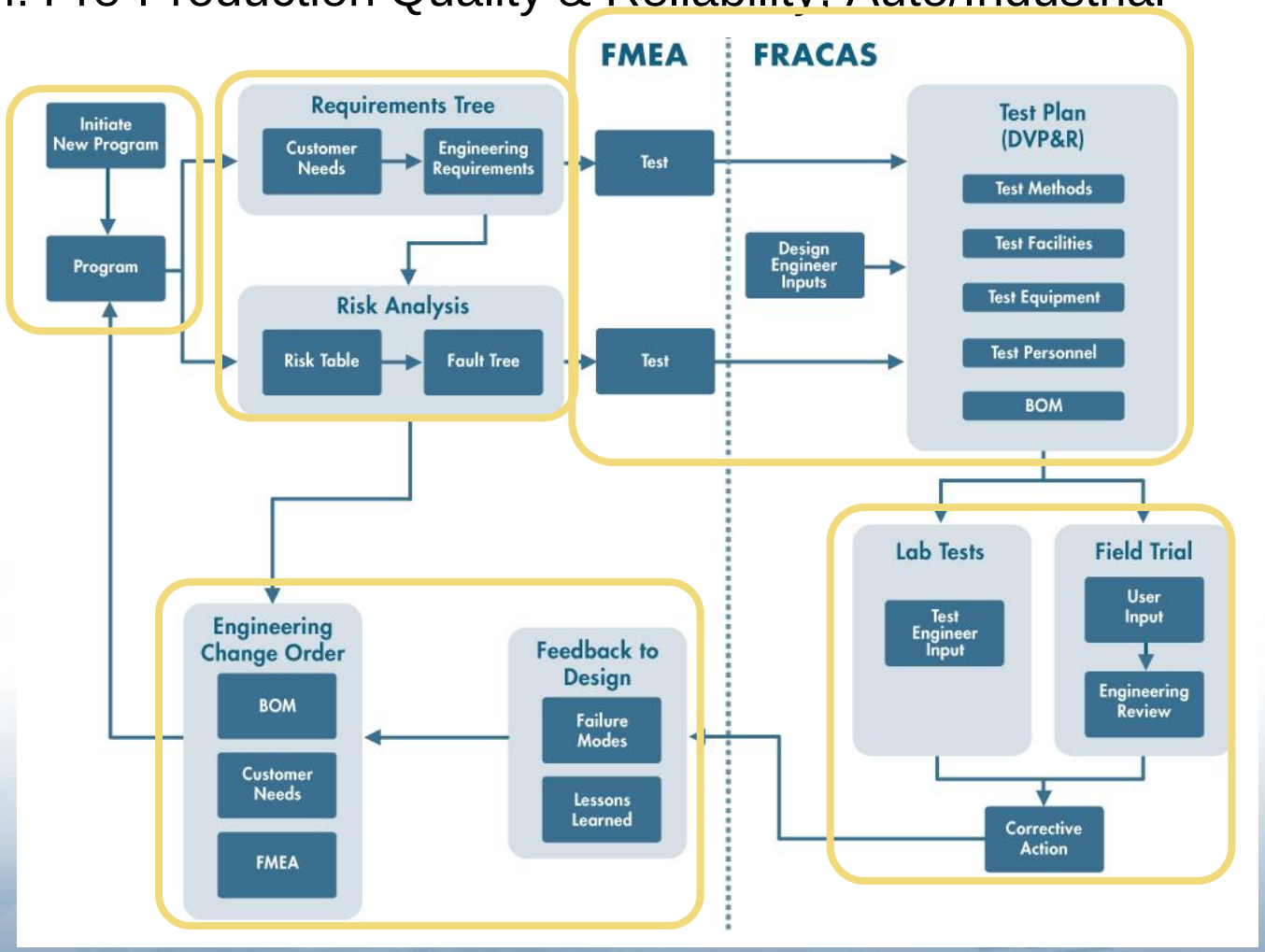
Models for QLM: Pre-Production Quality & Reliability, Auto/Industrial

Plan

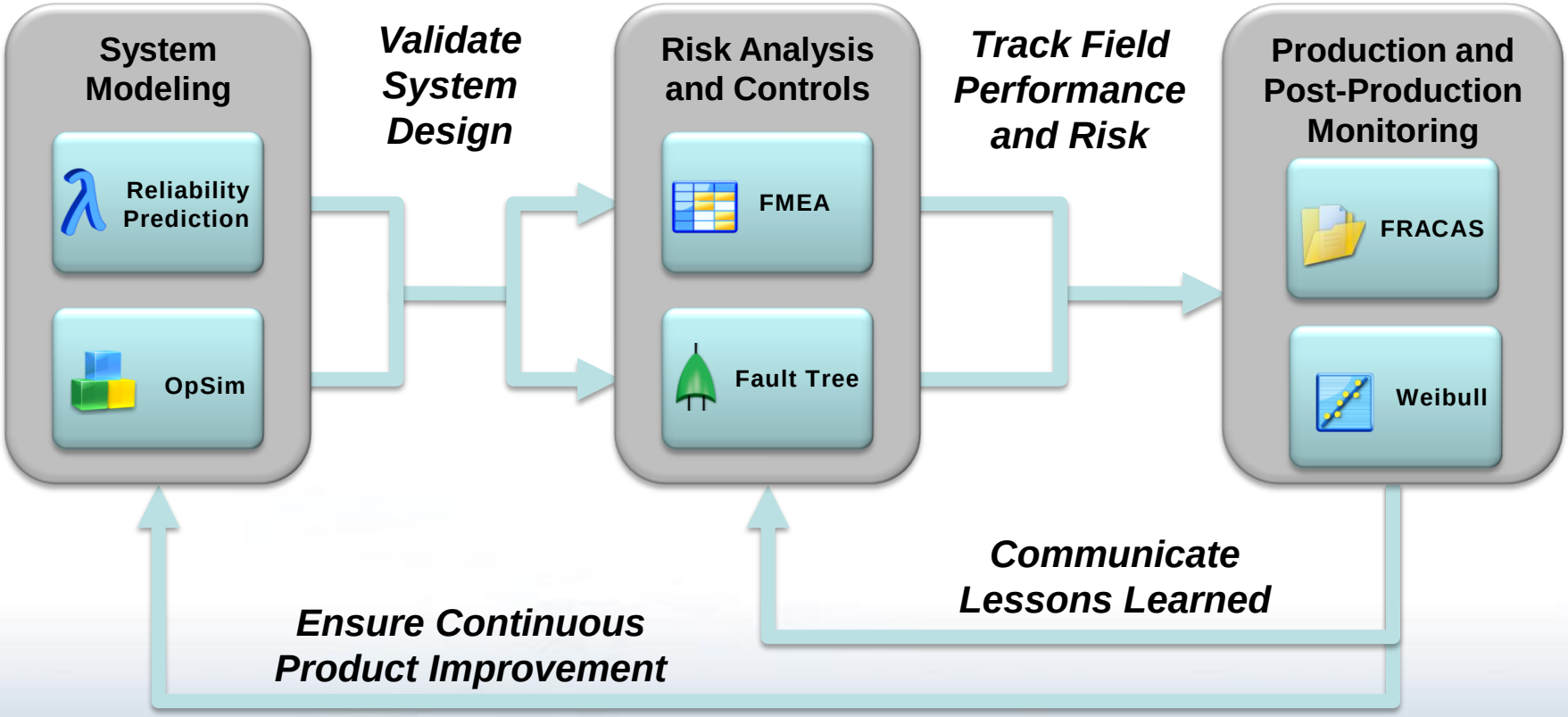
Design / Develop

Test

Innovate



Realizing QLM



Benefits – Improved Total Cost of Quality

- Reuse past experience to identify critical components and plan mitigation
- Build reusable cross-product Reliability Intelligence Database
- Share Lessons Learned across products
- Enable Design for Reliability
- Continuous Improvement and Quality

Benefits – Faster Issue Resolution and Time to Market

- Optimize the number of Engineering Builds
- Mitigate the number and impact of late engineering changes
- Improve the effectiveness of field performance feedback with a closed-loop system

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Questions?