

Automotive Manufacturing Quality Management

Best Practice and Management
Excellence

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SSCG is global management consulting and professional firm. We provide advisory, consulting and operation support across the public sector, private, business services, automotive , oil and gas, and manufacturing sectors.

Our solutions are designed to help our clients make distinctive transformations , drive sustainable growth with increased trust, confidence and greater collaboration. We provide informed perspective on the issues faced by our clients. The insights and quality solutions delivered to support our clients unlock new investment opportunities and drive consumer values and build confidence in the markets and economies..

Our Innovation offerings help clients develop a wide array of capabilities to achieve market-leading revenue and profitability growth. We have successfully helped many businesses develop new innovative businesses, products and services. We also help our clients build lasting internal capabilities that enable sustained, consistent results. Our unrivalled experience in delivering Innovation capabilities is underpinned by deep knowledge on how to move businesses to both optimise core product/service innovation and development levers and find new paths to growth..

Further, we help our clients define winning innovations and product strategies, optimize portfolios and balance roadmaps.



What is Quality Management

Quality is defined by customers' requirements.

The act of overseeing all activities and tasks needed to maintain a desired level of excellence.

Discipline for ensuring that outputs, benefits, and the processes by which they are delivered, meet customer requirements and are fit for purpose.

Top management has direct responsibility for quality improvement.

Increased quality comes from systematic analysis and improvement of work processes.

Ensures that a company, product or service is consistent.

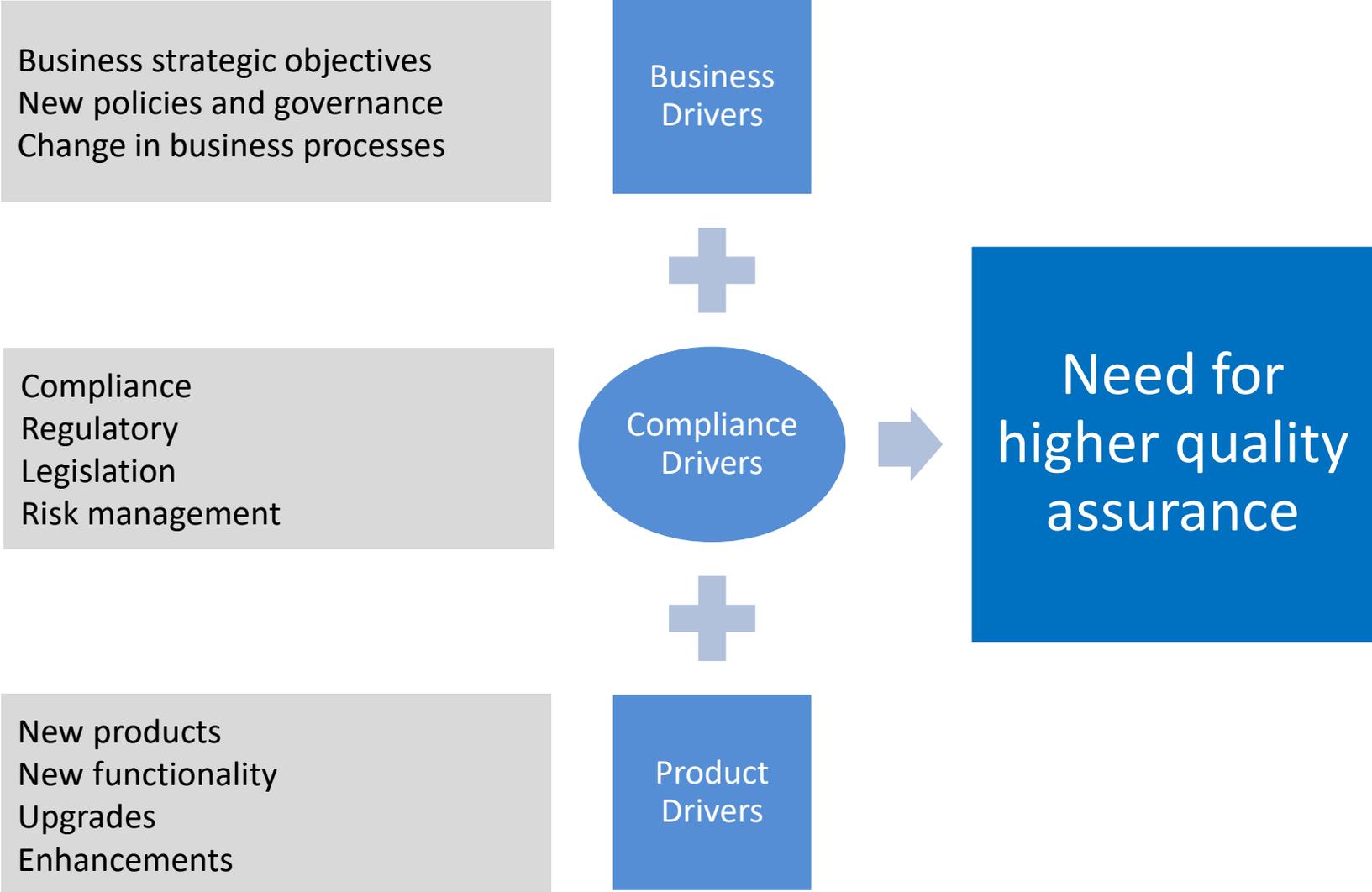
Quality improvement is a continuous effort and conducted throughout the company.

Focused not only on product and service quality, but also on the means to achieve it.

Main components:

- Planning
- Assurance
- Control
- Improvement

Quality Management: Business Challenges



Cost of Poor Quality (COPQ)

The Iceberg Analogy

External costs:

- Warranty claims
- Recalls
- Customer complaints
- Reputational damage
- Penalties/fines

Internal costs:

- Rejects
- Rework
- Scrap
- Additional labour hours
- Cycle Time

- Opportunity cost if sales greater plant capacity
- Improvement programme costs
- Lost customer loyalty
- Process control
- Supplier control
- Inspection/test
- Cost to customer
- Expediting
- Excess inventory
- Quality engineering and administration
- Quality audits
- Longer life times

The Evolution of Quality Management in the Automotive Industry



The automotive industry is one of the fastest advancing sectors in the world. The diversity of vehicle lines, product range and manufacturing technological advances over the last 5 decades are a testament to that. The automotive industry has always been an example in the field of Quality Management and Leadership as far as quality is concerned. The industry has established methodologies and techniques deployed across product development lifecycle.

Increasing global competition over the past decade has forced automotive companies to improve quality and efficiency. Application of industry wide management tools that are relevant to the company's needs has become a strategic issue for companies in today's competitive environment. By applying the best practices and industry wide methodologies, companies can improve performances, increase customer satisfaction and gain market shares.

Quality management has become a term associated with a holistic management approach to business processes with the aim of obtaining efficiency and customer satisfaction. Today the automotive industry faces the challenges of globalisation which necessitates a strong focus on quality and productivity achievement.

Today's automobiles incorporate increasingly complex technology to meet the demands of global customers. Automotive OEMs, Tier 1, Tier 2, and other suppliers face:

- Continuous pressure to reduce cost and keep price low
- Increasingly complex global supply chains
- Increasing demand for innovations with reduced time to market

As a result of these challenges, quality management in the Automotive industry requires real-time visibility within plants and across the globe to proactively:

- Drive down costs
- Increase quality through continuous improvements
- Ensure certification compliance

With a more diverse range of vehicles and offerings to customers, it is likely that support services such as quality control and auditing will change. Manufacturers are heavily reliant on a new sets of systems, management methodologies, techniques and quality controllers to adapt to an advancing industry. As well as assessing physical parts, quality controllers will be required to test digital services and software.

Customer focus

Leadership

Engagement of
people

Process/system
approach

Continuous
improvement

Evidence based
decision making

Relationship
management

Quality Management Functionalities

Non-Conformances,
Corrective and
Preventive Action

Compliance and
Audit Management

Supplier Quality
Management

Risk Management

Statistical Process
Control

Failure Mode and
Effects Analysis

Complaint Handling

Advanced Product
Quality Planning

Environment,
Health, and Safety

Hazard Analysis &
Critical Control
Points

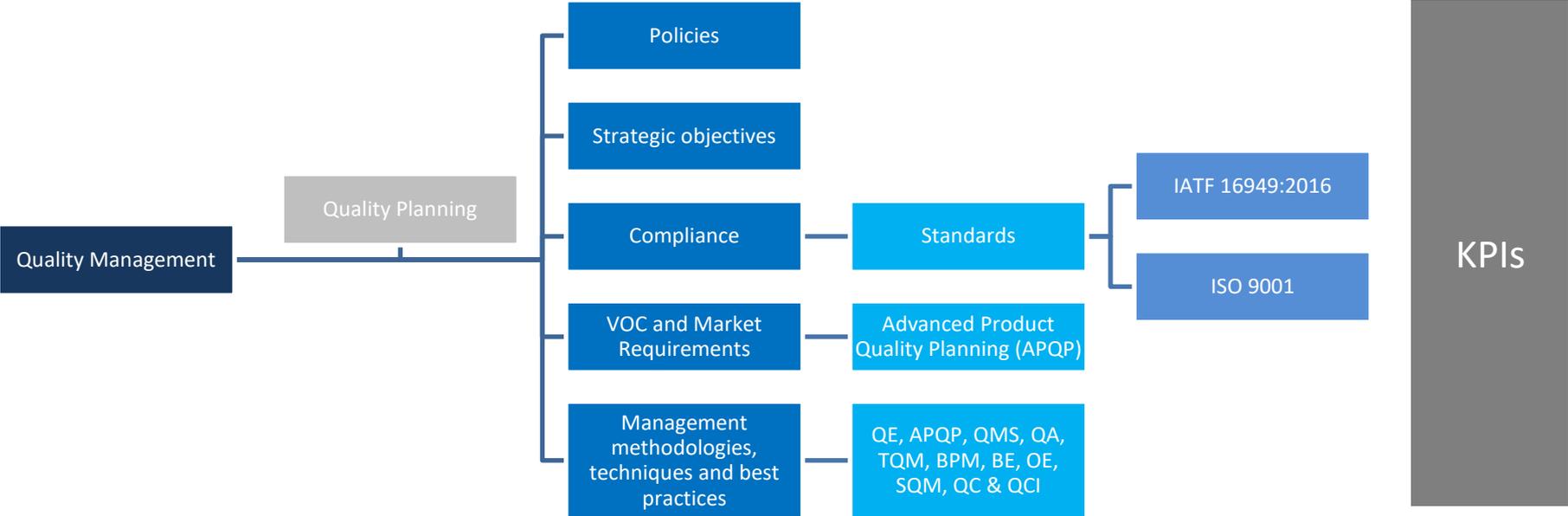
Production Part
Approval Process

Quality Management Framework



A systematic process that translates quality policy into measurable objectives and requirements, and lays down a sequence of steps for realizing them within a specified timeframe

:



Producing with “quality” is the philosophy of any company in the automotive industry. The industry has an extensive experience in quality management and this materializes in the form of quality assurance standards that have arisen throughout the years.

The industry has its own specifications, such as the IATF 16949 standard, based on the ISO 9001 model, with specific requirements of the automotive industry, raising the level of requirements and quality of this standard.

Common European and US Standards:

- ISO 9000 standards
- IATF 16949:2016
- VDA: Organisation developed for the German automobile industry VDA
- AVSQ: Organisation developed for the Italian automobile industry AVSQ
- EAQF: Organisation developed for the French automobile industry EAQF
- QS-9000: Standard developed for the US automobile industry QS9000
- ISO 19011 Standard developed for auditing a management system

:



IATF 16949:2016

Automotive Quality Management

IATF 16949:2016 is the global technical specification and quality management standard for the automotive industry. Based on ISO 9001:2015, it was published in October 2016 and replaces ISO/TS 16949.

It is designed to be used in conjunction with ISO 9001:2015 and contains supplemental requirements specific to the automotive industry rather than being a standalone QMS.

One of the automotive industry's most widely used International Standards for quality management, ISO/TS 16949, is set to evolve with the publication of a new global industry standard by the International Automotive Task Force (IATF).

It brings together standards from across Europe and the US. IATF 16949:2016 outlines everything you need to know about achieving best practice when designing, developing, manufacturing, installing or servicing automotive products.

The benefits of IATF 16949:2016:

- Get recognized as a world-class automotive OEM and supplier
- Integrate with other management system standards
- Bring quality and continual improvement to the heart of the organization
- Increase involvement of your leadership team
- Mitigate risk and improve opportunity management with a greater application of risk-based thinking



Advanced Product Quality Planning (APQP)



a structured approach to product and process design.
a standardized set of quality requirements that enable suppliers to design a product that satisfies the customer.

a structured process aimed at ensuring customer satisfaction with new products or processes.

ensures the Voice of the Customer (VOC) is clearly understood, translated into requirements, technical specifications and special characteristics. The product or process benefits are designed in through prevention.

used by progressive companies to assure quality and performance through planning.

Help suppliers to develop appropriate prevention and detection controls for new products supporting the corporate quality effort.

intended to aggregate the common planning activities all automotive OEM's require into one process.

Core Tools

Failure Mode and Effects Analysis (FMEA)

Measurement Systems Analysis (MSA)

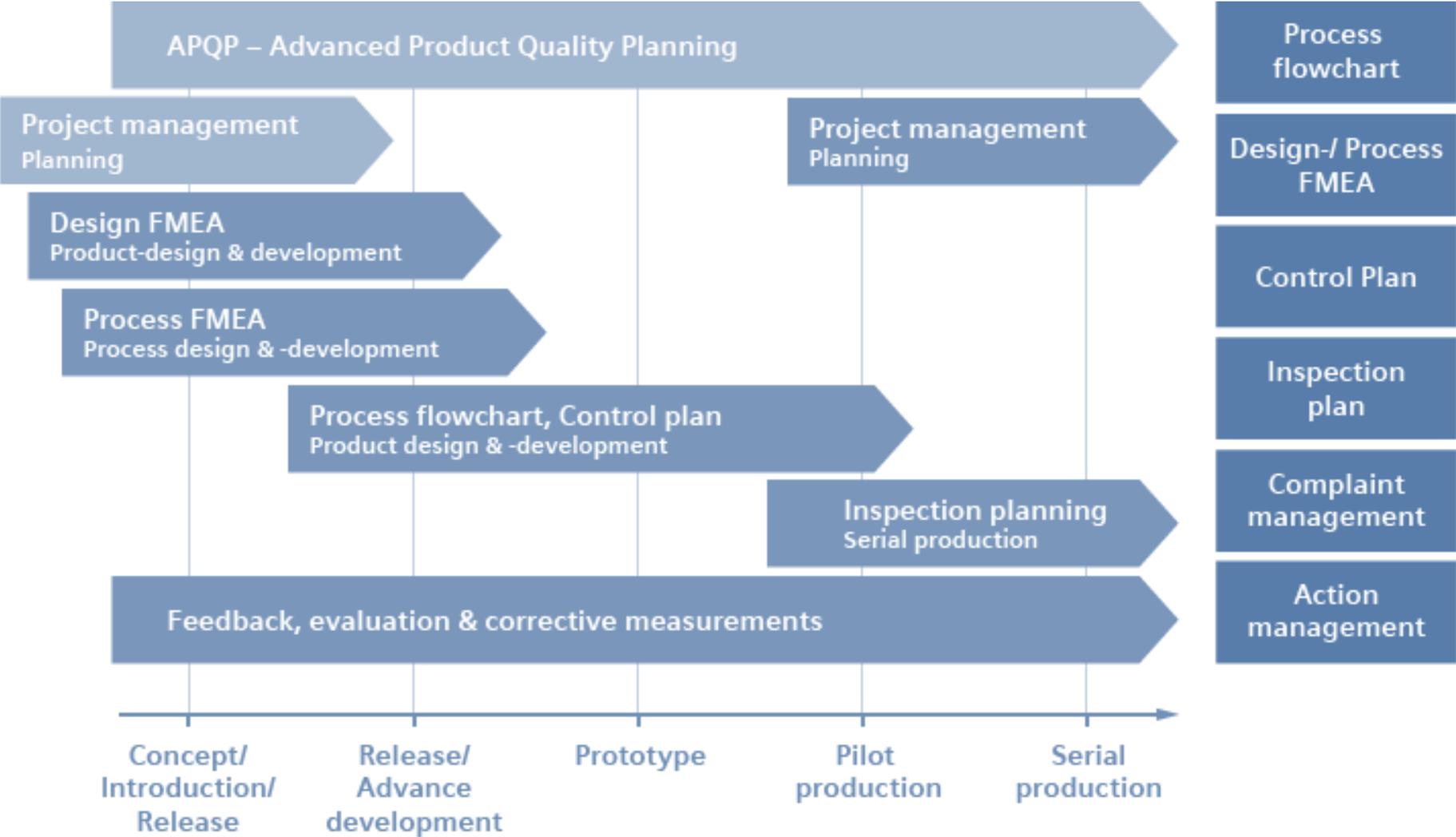
Statistical Process Control (SPC)

Production Part Approval Process (PPAP)

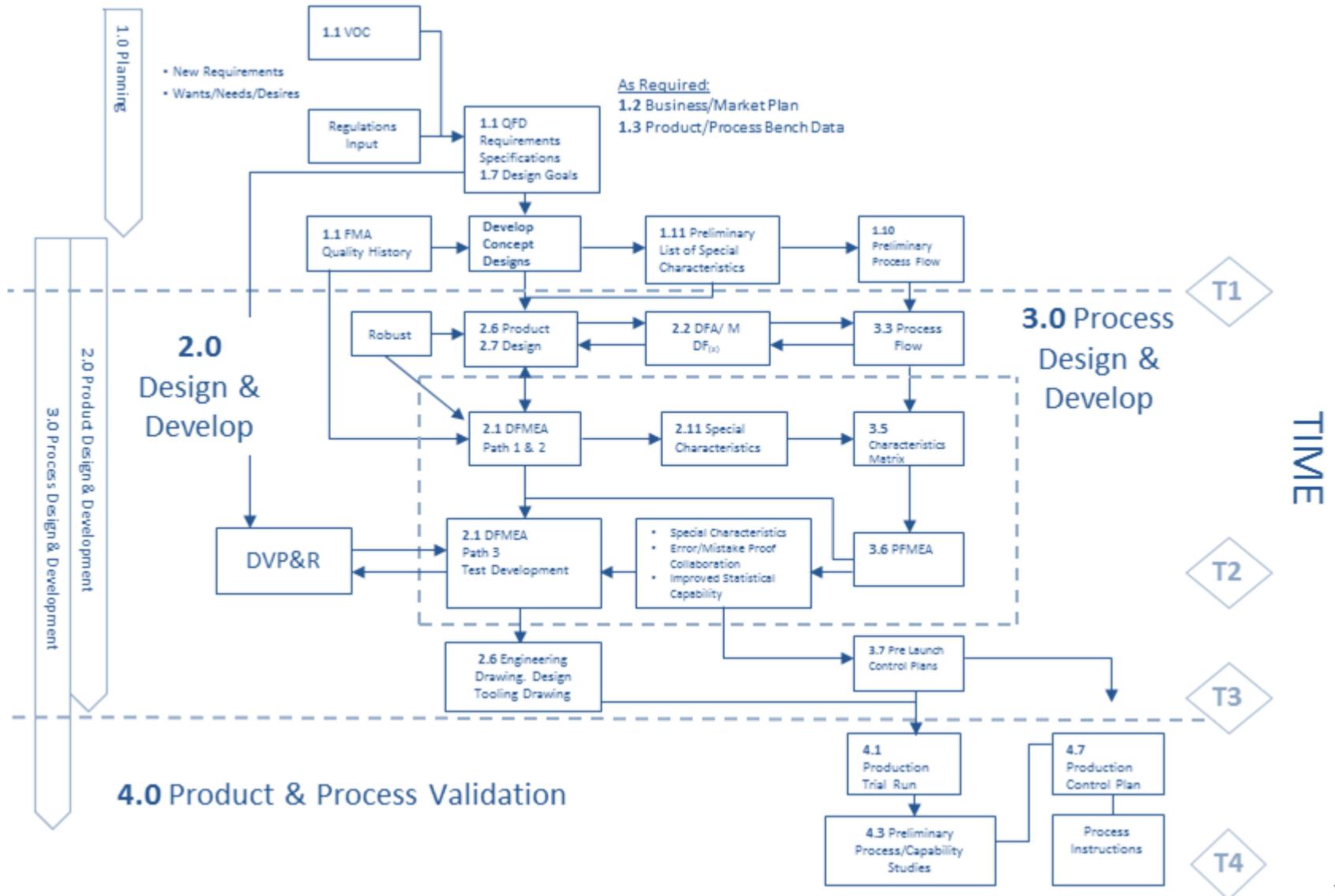
APQP deployment benefits:

- Effective resources allocation to vital area
- Promote early identification of change
- Avoid late changes (post release) by anticipating failure and preventing it
- Fewer design and process changes later in the product development process
- On-time quality product at lowest cost
- Multiple options for mitigating the risk when found earlier
- Higher capability of verification and validation of a change
- Improved collaboration between Design of the Product and Process
- Improved Design for Manufacturing and Assembly (DFM/A)
- Lower cost solutions selected earlier in the process
- Legacy capture and reuse, advancement of Tribal Knowledge and standard work creation and utilization

Product Quality Planning Framework



APQP: Product Quality Plan Flow Diagram



Quality Management Methodology, Techniques and Best Practice

Quality management techniques and tools are instruments and methods that help to solve specific problems at different company levels.

There is a wealth of literature above all professional, on the specific tools related to quality management Quality management techniques and tools are instruments and methods that help to solve specific problems at different company levels.

Management methodologies, techniques and best practices

Quality Engineering (QE)

Advanced Product Quality Planning (APQP)

Quality Management System (QMS)

Quality Assurance (QA)

Total Quality Management (TQM)

Business Process Management (BPM)

Business Excellence (BE)

Operational Excellence (OE)

Supplier Quality Management (SQM)

Quality Control (QC)

Continuous Quality Improvement (CQI)

Quality Management System (QMS)

Quality Management System (QMS) is a set of policies, processes and procedures required for planning and execution in the core business area of a company. A collection of business processes focused on consistently meeting customer requirements and enhancing their satisfaction.

ISO 9001:2015 sets out the criteria for a QMS and is the only standard in the family that can be certified to.

A company seeking compliance or certification must define the processes which form the QMS and the sequence and interaction of these processes.

Elements:

- Quality policy
- Quality objectives
- Quality manual
- Organisational structure and responsibilities
- Data management
- Processes
- Product quality and customer satisfaction
- Continuous improvement
- Quality instruments
- Document control

7 essential subsystems of a quality system:

- Management controls
- Design controls
- Production and process controls
- Corrective and preventative actions
- Material controls
- Records, documents, and change controls
- Facilities and equipment controls

ISO 9001 Quality Management System (QMS) SSCG

INPUTS

Company and Context

Customer Requirements

Stakeholders needs and expectations



OUTPUTS

Customer satisfaction

QMS Results/KPIs

Products and Services

Quality Assurance (QA)

Quality Assurance is a way of preventing mistakes or defects in manufactured products and avoiding problems when delivering solutions or services to customers; which ISO 9000 defines as "part of quality management focused on providing confidence that quality requirements will be fulfilled.

Quality assurance comprises administrative and procedural activities implemented in a quality system so that requirements and goals for a product, service or activity will be fulfilled.[3] It is the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention.

QA Principles:

- "Fit for purpose" (the product should be suitable for the intended purpose)
- "right first time" (mistakes should be eliminated)

Approaches:

- Failure testing
- Statistical control
- Total quality management
- Models and standards
- Company quality

:



Quality Engineering (QE)

QE - management principles and application of engineering integration to develop, improve and sustain the quality and performance of products, services and processes and of its outputs.

The management, development, operation and maintenance of systems and enterprise architectures with a high quality standard.

Analysis of a manufacturing system at all stages, to improve the quality of the production process and of its output.

Usually focused on the areas of process control tools in production and improvement tools used to improve existing production processes

Can be introduced into an organization to minimize product development cost, reduce time to market (TTM) and increase product quality QE implementation is classified into two sections, management strategy and engineering tool.



Total Quality Management (TQM)

TQM - a company wide efforts to install and make a permanent climate in which a company continuously improves its ability to deliver high-quality products and services to customers.

TQM is a philosophy for managing a company in a way which enables it to meet stakeholder needs and expectations efficiently and effectively, without compromising ethical values a strategy for continuously improving performance at every level, and in all areas of responsibility. It combines fundamental management techniques, existing improvement efforts, and specialized technical tools under a disciplined structure focused on continuously improving all processes.

A management philosophy and company practices that aim to harness the human and material resources of a company in the most effective way to achieve the objectives of the organization.

A management approach of a company centred on quality, based on the participation of all its members and aiming at long term success through customer satisfaction and benefits to all members of the organisation and society.

TQM Principles

- Quality oriented management
- Satisfy the customer
- Satisfy the supplier
- Continuous improvement



BPM focuses on improving corporate performance by managing business end-to-end enterprise processes in order to achieve three outcomes crucial to a performance-based, customer-driven firm:

- clarity on strategic direction
- alignment of the firm's resources
- increased discipline in daily operations.

BPM sees processes as an important assets of a company that must be understood, managed, and developed to announce and deliver value-added products and services to clients or customers.

BPM suites

- human-centric BPM
- integration-centric BPM (Enterprise Service Bus)
- document-centric BPM (Dynamic Case Management)

BPM Life-cycle:

- Design
- modelling
- Deployment
- monitoring
- optimization
- Re-engineering

Critical components of a BPM Suite:

- Process engine – a robust platform for modelling and executing process-based applications, including business rules
- Business analytics – enable managers to identify business issues, trends, and opportunities with reports and dashboards and react accordingly
- Content management – provides a system for storing and securing electronic documents, images, and other files
- Collaboration tools – remove intra- and interdepartmental communication barriers through discussion forums, dynamic workspaces, and message boards
- Managing end-to-end, customer-facing processes
- Consolidating data and increasing visibility into and access to associated data and information
- Increasing the flexibility and functionality of current infrastructure and data
- Integrating with existing systems and leveraging Service Oriented Architecture (SOA)
- Establishing a common language for business alignment

Global competitive businesses are focusing on processes for quality improvement, cost reduction and delivery-time reduction. Maturity models offers a prospering approach to improving a company's processes and business process management (BPM) capabilities.

The model emphasizes on the service level agreement (SLA) and metric definition for each business process. Which means , companies needs to focus on improving the maturity level of key business processes.

Process maturity - an indication of how close a developing process is to being complete and capable of continual improvement through qualitative measures and feedback. Thus, for a process to be mature, it has to be complete in its usefulness, automated, reliable in information and continuously improving.

Importance of Business Processes:

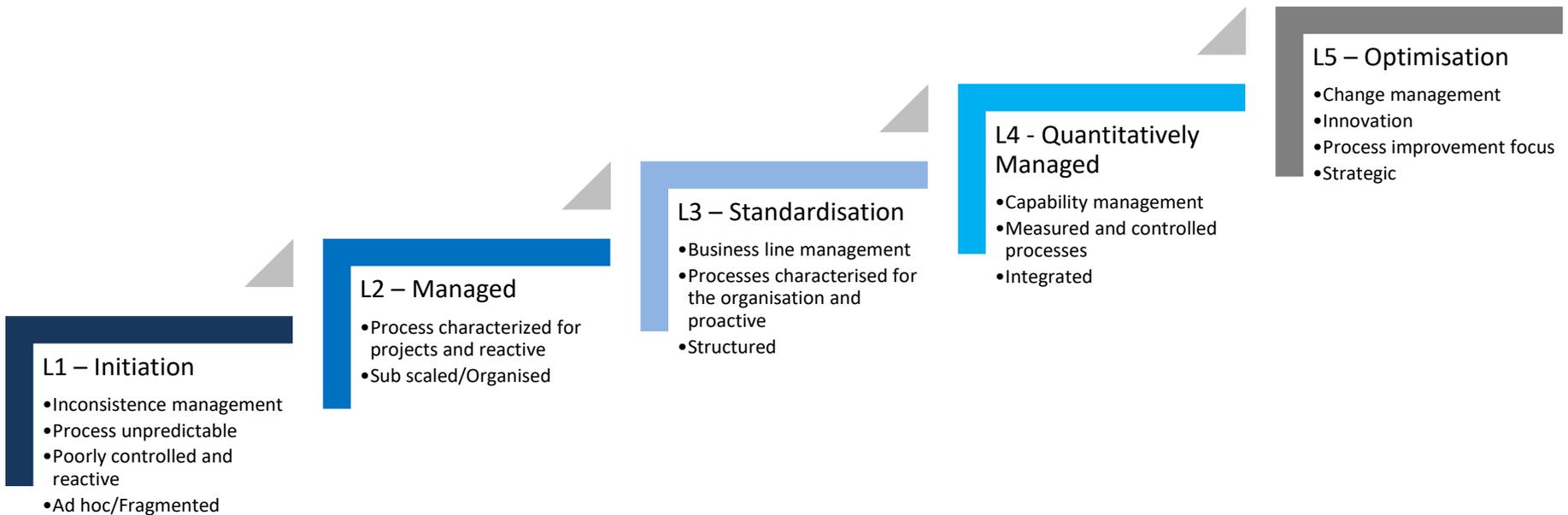
- Link Between Functions
- Cost of Transactions
- Consistency of Actions
- Reliability of Information
- Assurance to Top Management

CMMI (Capability Maturity Model Integration)

CMMI - Process level improvement and appraisal program. Has three constellations:

- Product and service development — CMMI for Development (CMMI-DEV),
- Service establishment, management, — CMMI for Services (CMMI-SVC), and
- Product and service acquisition — CMMI for Acquisition (CMMI-ACQ).

Business Process Maturity Model – 5 Growth Dimensions



Business Excellence (BE) - Assuring sustained and stable business growth

Business Excellence (BE) - the outstanding practices in managing a company and achieving results, all based on a set of fundamental concepts or values.

A models for how a world class organisation should operate.

BE Models

A frameworks that when applied within an organisation can help to focus thought and action in a more systematic and structured way that should lead to increased performance. The models are holistic in that they focus upon all areas and dimensions of an organisation, and in particular, factors that drive performance. Several models exist world-wide.

Common models:

- Baldrige (MBNQA)
- European Foundation for Quality Management (EFQM)
Singapore Quality Award Model
- Japan Quality Award Model
- Canadian Business Excellence Model
- Australian Business Excellence Framework (ABEF) – Australia

The fundamental concepts include:

1. Results orientation
2. Customer focus
3. Leadership and constancy of purpose
4. Management by processes and facts
5. People development and involvement
6. Continuous learning, innovation and improvement
7. Partnership development
8. Public responsibility

BE Models Comparative Analysis

Baldrige	EFQM	SPRING	Canadian Framework	Australian Framework
Leadership	Leadership	Leadership	Leadership	Leadership
Strategic Planning	Policy and Strategy	Planning	Planning	Strategy and Planning
Customer and Market Focus	Partnership and Resources	Customers	Customer Focus Supplier Partner Focus	Customer and Market Focus
Measurement, Analysis, and Knowledge Management	Customer Results	Information		Information and Knowledge
	People Results			
	Society Results			
Workforce Focus	People	People	People Focus	People
Process Management	Processes	Processes	Process Management	Process Management Improvement Innovation
Business Results	Key Performance Results	Results	Business Performance	Success and Sustainability

Operational excellence (OE) - the execution of the business strategy more consistently and reliably than the competition.

OE helps companies to improve decision-making and discover what customers really want. Having the best employees and solving critical strategic problems the minute they arise can give businesses a real competitive edge.

OE also offers business leaders a framework to operationalise business strategy, implement improvement and change in their organisation's processes, systems and people, as well as to maximise the value over the life of an asset or organisation.

Key components

- integrated Management system (IMS)
- culture of Operational Discipline.

OE includes:

- Environmental scanning & Strategic Context
- People, Performance and Culture
- Process Optimisation
- Supply Chain and Sourcing
- Asset Care
- Asset and Resource Optimisation
- Continuous Improvement
- Management Control Systems
- Organisational Redesign and Simplification
- System Capacity and Capability
- Social Labour Plan Commitments

To achieve scalable change, operational executives have to alter their way of doing business by adopting OE programmes that will allow operations to attain:

- lower operational risk.
- lower operating costs.
- increased revenues relative to competitors.
- create value for customers and shareholders.
- cost containment and improved efficiencies.

Driving and achieving best performance

Quality of a product starts at the supplier selection process as the supplier play a vital role in bringing the product to market.

Supplier Quality Management (SQM) is confidence in a supplier's ability to deliver a good or service that will satisfy the customer's needs. Achievable through interactive relationship between the customer and the supplier, it aims at ensuring the product's 'fit' to the customer's requirements with little or no adjustment or inspection.

Any company that relies on suppliers and vendors to provide services or products must also bear the responsibility for managing their supply chains adequately. Meticulous supplier quality management is particularly essential for regulated companies. Companies must establish and maintain procedures to ensure that all purchased or otherwise received product and services conform to specified requirements”

For complex manufacturers, their definition of quality is predicated on how well they stay aligned with the demanding, diverse and unique requirements of their customers while staying in compliance with regulatory requirements. Keeping the entire value chain of a business well-orchestrated and focused on supplier quality needs to start with a clear, consistent strategic plan about suppliers as co-creators of a series of product generations, not just selectively sourced from based on cost alone.

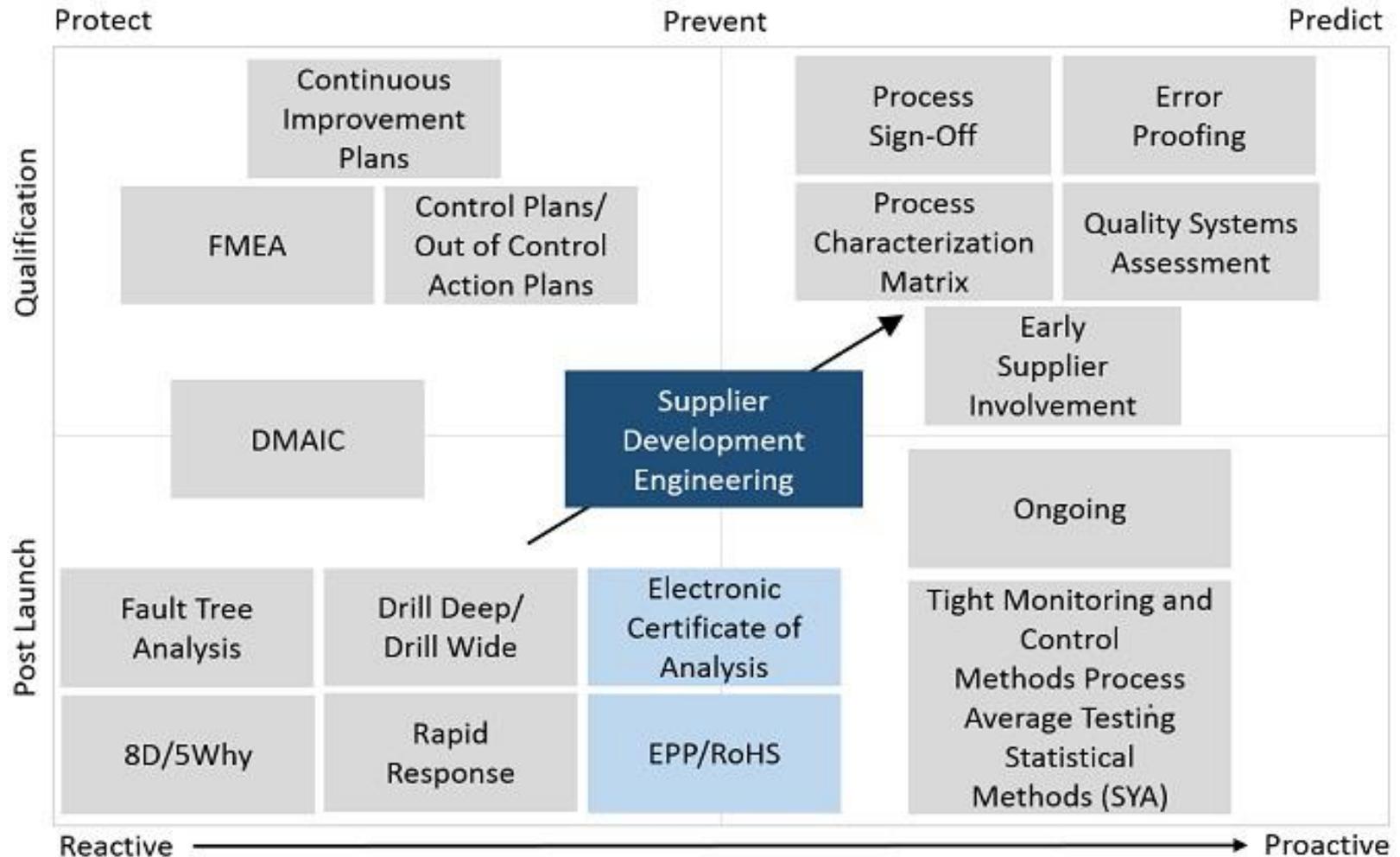
In today's world of globalised supply and demand networks, companies need to efficiently optimise the supply base given a broad set of requirements that go well beyond cost. To effectively do this, companies should begin to use a risk based approach and strategies that looks at both the criticality of a supplier and the likelihood of failure of a supplier. By applying standardised risk and audit tools through an enterprise system, the long term successes of initiatives around supplier quality are much more likely to succeed.

Strategies and best practice for Improving Supplier Quality Management:

- Align Supplier Risk Management with Quality Audits.
- Measure and Track the Cost of Poor Supplier Quality.
- Rationalise Suppliers for Better Quality Control.
- Standardise Supplier Quality and Performance Metrics.
- Enable a Collaborative Approach to Corrective Action.
- Gain Better Visibility into Supplier Quality with Technology.
- Manage suppliers to consistent, high quality standards on a global basis.
- Implement efficient and robust SQM processes.
- Implement a Non-Compliance/Corrective Action (NC/CA) program to evaluate supplier's inbound orders.

Supplier Quality Management Model

Supplier Quality Support Model



Production Part Approval Process (PPAP) - Establishing confidence in suppliers and production processes

PPAP aim:

- to ensure that a supplier meet the manufacturability and quality requirements of the parts supplied to the customer
- to provide evidence that the customer engineering design record and specification requirements are clearly understood and fulfilled by the supplier
- to demonstrate that the established manufacturing process has the potential to produce the part that consistently meets all requirements during the actual production run at the quoted production rate



Quality Control (QC)

Quality control (QC) is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer. QC is similar to, but not identical with, quality assurance (QA).

A process that consists of activities employed in detection and measurement of the variability in the characteristics of output attributable to the production system, and includes corrective responses.

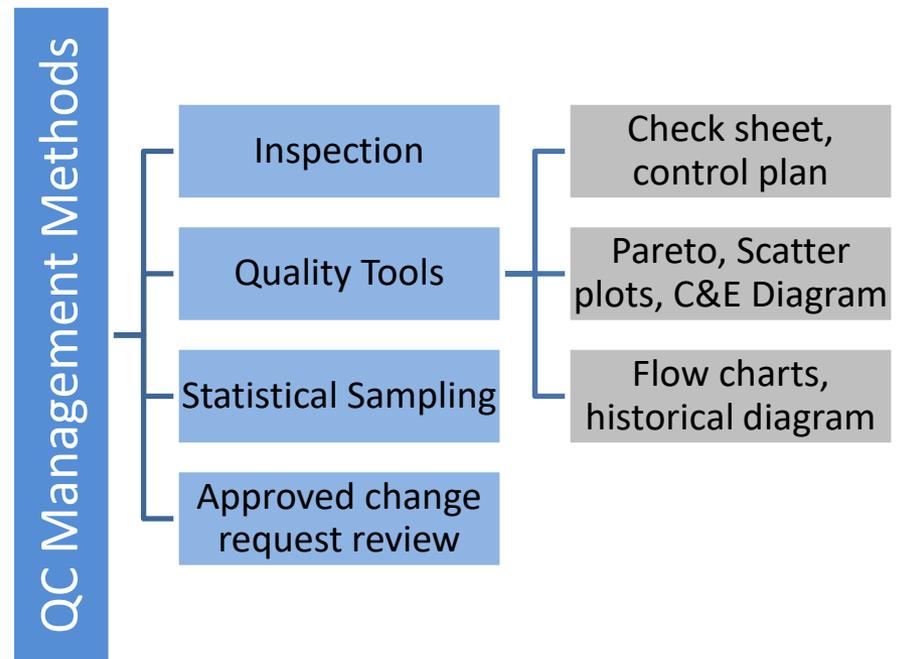
A process that ensures customers receive products free from defects and meet their needs. When done the wrong way, it can put consumers at risk.

A process through which a business seeks to ensure that product quality is maintained or improved and manufacturing errors are reduced or eliminated.

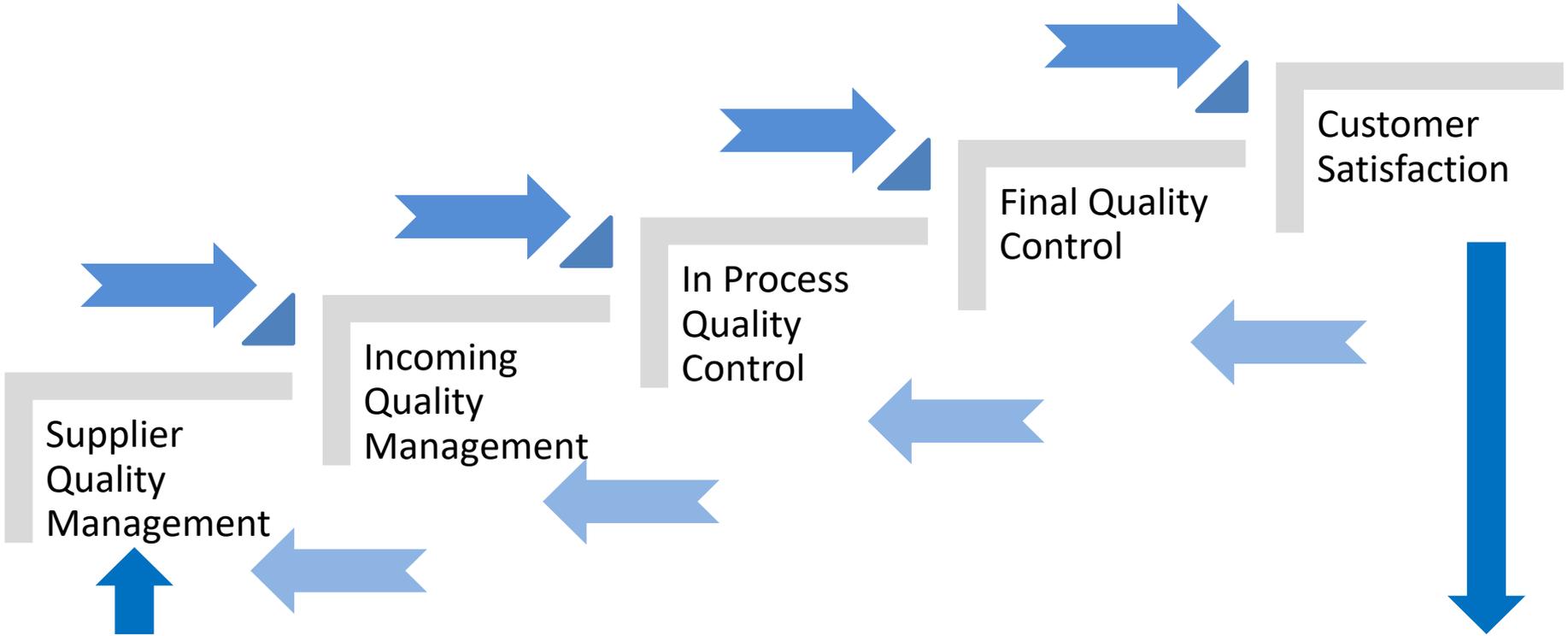
Benefits of Using QC in Manufacturing

When customers receive quality products company will:

- Increase customer loyalty
- Gain repeat business
- Gain new customers from referrals
- Maintain or improve your position in the market
- Improve safety
- Reduce liability risks
- Contribute to overall positive branding of your product



Quality Control Process



- SPC
- Training
- Calibration
- Preventative Maintenance
- Document and data control
- Reliability test
- Reject analysis
- Corrective Actions and Preventative Actions (CAPA)
- Engineering changes

Common quality methods and techniques focused on product improvement, process improvement and people based improvement:

ISO 9004:2008 - Guidelines for performance improvement.

ISO 9001:2015 - Quality Management System (QMS) certification

QFD - Quality Function Deployment

Kaizen - Japanese for continuous improvement.

Zero Defect - based upon statistical process control and one of the inputs of Six Sigma.

Lean manufacturing (The Toyota Production System)

Six Sigma

PDCA - plan, do, check, act cycle for quality control purposes

Taguchi - statistical oriented methods including quality robustness, quality loss function, and target specifications.

Kansei Engineering Approach that focuses on capturing customer emotional feedback about products to drive improvement.

TQM - management strategy aimed at embedding awareness of quality in all organizational processes

TRIZ - Theory of inventive problem solving

Business Process Reengineering (BPR) - management approach aiming at optimizing the workflows and processes within an organisation.

OQRM — Object-oriented Quality and Risk Management, a model for quality and risk management.

Top Down & Bottom Up Approaches leadership approaches to change

Quick response manufacturing

Total productive maintenance

Reliability centred maintenance

How SSCG Can Help



We help clients to:

- Optimise processes for excellence
- Develop and transform business management process
- Deploy robust operational transformation, excellence and programme management
- Implement and manage operational excellence programmes
- Manage continuous process improvement initiatives
- Manage complex quality investigations
- Adopt Lean six sigma methodologies and programmes management
- Manage and control product quality
- Improve QMS processes and functions
- Translate VOC into product inputs and strategy
- Re align market and VOC requirement with product design
- Improve compliance programmes and standardisation
- Deploy effective supplier management programmes and processes.
- Plan product quality and transformation
- Sustain growth through operation excellence and best practices

Contact Us

SSCG team are here to help. For more information and to submit RFP, contact:



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We provide informed perspective on the issues faced by our clients. The insights and quality solutions delivered to support our clients to build trust and confidence in the markets and in economies. We combines our multi-disciplinary approach with deep, practical industry knowledge to support our clients meet market dynamic challenges and respond to opportunities.

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