

## UNIT -3 (QUALITY MANAGEMENT)

Organization structure and design - Quality function, Decentralization - Designing and fitting - Organization for different type products and company - Economics of quality value and contribution - Quality cost - Optimizing quality cost - Reduction program

### HUMAN FACTOR QUALITY

Attitude of top management - Cooperation of groups - Operators attitude - Responsibility causes of apparatus error and corrective methods

### Introduction:

The term organization in the context of a quality management model is used to indicate the management and the supporting organizational structure of the laboratory. Organization is one of the essential elements of the quality system, and is intimately related to all the other elements in the model.

### Essential elements of Quality System

1) Organization 2) Personnel 3) Equipment 4) Purchasing & Inventory 5) Process Control 6) Information 7) Management 8) Documents & Records Occurrence 9) Management Assessment 10) Process Improvement 11) Customer Service 12) Facilities & Safety

### Key organizational components

The important organizational requirements for achieving a successful quality system include the following.

**Leadership:** Laboratory leaders must be fully committed to implementation of the system, and these leaders also will need vision, team-building and motivational skills, good communication techniques, and the ability to use resources responsibly.

**Organizational structure:** The structure of the organization should be clearly defined, and this should be reflected by a functional organizational chart with clear assignment of responsibility.

**Planning process:** Skills for planning are needed, and planning should address a time frame, responsibility for conducting the activities, the availability and use of human resources, management of workflow, and financial resources.

**Implementation:** Implementation requires that a number of issues must be addressed by the management staff. These include management of projects and activities, directing resources to accomplish plans, and assuring that timelines are met and goals achieved.

**Monitoring:** As components of the quality management system are put in place, processes for monitoring will be needed to assure that the system is working, that benchmarks and standards are being met. This element is essential to the primary goal of a quality system, which is continuous improvement.

## Quality Management

Quality Management System [ISO 9000]: The organizational structure, responsibilities, procedures, processes and resources for implementing quality management. Concerned with ensuring that the required level of quality is achieved in a software product. Involves defining appropriate quality standards and procedures and ensuring that these are followed. Should aim to develop a 'quality culture' where quality is seen as everyone's responsibility.

Organizing – arranging and structuring work to accomplish an organization's goals.

Organizational Structure – the formal arrangement of jobs within an organization.

## Organizational structure and design

### Designing Organizational Structure:

Organizational chart – the visual representation of an organization's structure.

Organizational Design – a process involving decisions about six key elements:

- Work specialization
- Departmentalization
- Chain of command
- Span of control
- Centralization and decentralization
- Formalization

**1. Work specialization:** Dividing work activities into separate job tasks.

- ✓ Early proponents of work specialization believed it could lead to great increases in productivity.
- ✓ Overspecialization can result in human diseconomies such as boredom, fatigue, stress, poor quality, increased absenteeism, and higher turnover.

**2. Departmentalization:** The basis by which jobs are grouped together.

- ✓ **Functional:** Grouping jobs by functions performed
- ✓ **Product:** Grouping jobs by product line
- ✓ **Geographical:** Grouping jobs on the basis of territory or geography
- ✓ **Process:** Grouping jobs on the basis of product or customer flow
- ✓ **Customer:** Grouping jobs by type of customer and needs

### Departmentalization trends

- Increasing use of customer departmentalization.
- **Cross-functional team:** A work team composed of individuals from various functional specialties.

**3. Chain of Command:** The continuous line of authority that extends from upper levels of an organization to the lowest levels of the organization clarifies who reports to whom.

- **Authority:** the rights inherent in a managerial position to tell people what to do and to expect them to do it.
- **Acceptance theory of authority** – the view that authority comes from the willingness of subordinates to accept it.
- **Line authority** – authority that entitles a manager to direct the work of an employee.
- **Staff authority** – positions with some authority that have been created to support, assist, and advise those holding line authority.

### **Responsibility and Unity of Command**

- ✓ **Responsibility:** The obligation or expectation to perform.
- ✓ **Unity of command:** The management principle that each person should report to only one manager.

**4. Span of Control:** Span of control – the number of employees who can be effectively and efficiently supervised by a manager.

### **5. Centralization and Decentralization:**

**Centralization:** The degree to which decision-making is concentrated at the upper levels of the organization.

**Decentralization:** The degree to which lower-level employees provide input or actually make decisions.

- ✓ **Employee empowerment:** Giving employees more authority (power) to make decisions.

**6. Formalization:** The degree to which jobs within the organization are standardized and the extent to which employee behavior is guided by rules and procedures.

- Highly formalized jobs offer little discretion over what is to be done.
- Low formalization means fewer constraints on how employees do their work.

### **Mechanistic and Organic structures:**

- **Mechanistic organization:** An organizational design that's rigid and tightly controlled.
- **Organic organization:** An organizational design that's highly adaptive and flexible.

### **Traditional Organizational designs:**

- **Simple structure** – an organizational design with low departmentalization, wide spans of control, centralized authority, and little formalization.
- **Functional structure** – an organizational design that groups together similar or related occupational specialties.

- **Divisional structure** – an organizational structure made up of separate, semiautonomous units or divisions.

## **Quality Function Deployment**

A key to improving quality through TQM is linking the design of products or services to the processes that produce them. Quality Function Deployment (QFD) is a means of translating customer requirements into appropriate technical requirements for each stage of product or service development and production.

Quality must be designed into the product, not inspected into it. Quality can be defined as meeting customer needs and providing superior value. This focus on satisfying the customer's needs places an emphasis on techniques such as Quality Function Deployment to help understand those needs and plan a product to provide superior value.

Quality Function Deployment (QFD) is a structured approach to defining customer needs or requirements and translating them into specific plans to produce products to meet those needs. The "voice of the customer" is the term to describe these stated and unstated customer needs or requirements. The voice of the customer is captured in a variety of ways: direct discussion or interviews, surveys, focus groups, customer specifications, observation, warranty data, field reports, etc. This understanding of the customer needs is then summarized in a product planning matrix or "house of quality". These matrices are used to translate higher level "what's" or needs into lower level "how's" - product requirements or technical characteristics to satisfy these needs.

- What are the qualities the customer desires?
- What functions must the product serve, and what functions must we use to provide the product or service?
- Based on our available resources, how can we best provide what our customer wants?

## **Benefits of QFD**

- Shorter development cycles
- Trade-offs are made in design, strategically, rather than in the market, tactically.
- Lower costs, increased productivity
- Documentation orientation
- Team involvement and commitment at the design stage

## **QFD: The Visual Planning Matrix**

The House of Quality links:

- Customer requirements
- Design requirements
- Target values
- Competitive performance

## QFD: An 8-step Process

1. Product planning: voice of the customer
2. Prioritize and weight: The voices of the customer
3. Competitive evaluation (Benchmarking)
4. Design process: What capabilities do we have?
5. Design: How do our capabilities match the customers' needs?
6. Design: What trade-offs do we make in design?
7. Process planning: Key processes identified from the planning matrix
8. Process control: Output from step 7 provides the basis for process control.

## The Customer's Voice

- Solicited information
- Unsolicited information
- Quantitative information
- Qualitative information
- Structured information
- Random information

## QFD Tools

- **Affinity diagram:** Creative tool used to organize a lot of qualitative data
- **Inter-relationship digraph:** Establishes relationships between and among causes
- **Tree diagram:** Classification tree of the ideas in the affinity diagram
- **Matrix diagram:** Maps the voice of the customer against the company capabilities required to meet the customer need.

## Decentralization

Decentralization is opposite to centralization where there is no concentration of authority instead diffusion is planned and executed. Decentralization emerges from the principles of delegation.

Delegation plays role of a peace-maker in decentralization, without it, might have been a distant possibility. Delegation makes the subordinate feel that he too is important for the organization. His ego is satisfied. He is encouraged to take more and more interest in his job and to maximize his efforts considering this as an important principal of delegation.

## Definition of Decentralization

1. In the words of Satya Saran Chatterjee "decentralization means pushing down of authority and power of decision making to lower levels of organization".

2. Henry Fayol define that “everything that goes to increase the importance of the subordinate’s role is decentralization” He obviously was referring to division of authority which certainly is the essence of decentralization.
3. E.F.L Breech has rightly put it as “the pattern of responsibilities resulting from delegation.”

### **Objectives of Decentralization**

The following are the main objectives which a decentralized system of organization seeks to achieve.

1. To relive the burden of work on the chief executive
2. To develop the managerial faculties
3. To satisfy the ego of lower level of workers and motivate them
4. To take quick and appropriate decision on the spot at the level which it is really required with a view of cash on the opportunity available and
5. To reduce the communication work and fill the gap in communication, if there has arisen any

### **Designing and Fitting:**

#### **Design Process:**

These are the four main phases of the design process. The content and scope vary depending on the task and complexity of the project.

#### **Phase 1: Conception and Design**

First ideas will be visualized fast and effective. Scribbles will give shape and are the basis for team communication and decision making.

#### **Good Design**

The internationally recognized design criteria for good design were used in the design process. These criteria are also applied in the analysis and evaluation of products.

- Degree of innovation
- Self-explanatory quality
- Functionality
- Formal quality
- Material and production-oriented design
- Ergonomics
- Safety
- Product environment relationship
- Durability
- Ecological compatibility

#### **Phase 2: Design Development**

In the second phase of the design process the favorite design is revised in accordance with meeting results. Details are worked out. A design model (mock-up) made of polyurethane foam gives a first impression of the tactile qualities and help to evaluate the future shape and size.

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## **Phase 3: Optimization**

After the design acceptance a further optimization step of all detailed solutions is conducted. Rapid-prototyping in detailed and finished design qualities provides valuable feedback on the later serial product quality. The user interface is programmed and simulated to test the functionality (usability) and the value of experience (User Experience).

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## **Phase 4: Design**

Evaluation of the rapid-prototype and detail optimization are implemented in the following 3D-data processing. After final acceptance the data are handed over to the customer for tooling, serial production and marketing purposes.

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### **Fitting:**

#### **1. Understand your customers' current needs and foresee future ones.**

Learning the needs of your customer takes time and experience. If you don't know your customer, you won't have much luck figuring out the product-market fit. To get a better understanding of your target demographic, you should spend time with your customers, write for industry news outlets, attend industry tradeshows, and find a mentor in the market to help you learn the ropes. Doing so allows you to gain invaluable connections and gain an inherent sense of the industry needs. Developing a deep understanding of the problems facing your customers enables you to relate to them better and ultimately helps build trust and credibility.

#### **2. Focus on one significant value proposition.**

Narrowing your feature set down to the one feature that is a game changer is difficult, but it is an absolute necessity. To determine which feature you should initially focus on, spend time with customers, analyze major emerging trends in the industry, and examine areas where competitors fail to solve problems. The ancillary features can come later as your customers will be willing to wait if your product solves one major pain point they are facing.

#### **3. Build credibility.**

The best way to build credibility is to offer up a story. Customers want to know how your product or service is going to make sense for them, and the easiest way to do this is to inject their needs into your brand's story.

### **Economics of quality in sales and services:**

Product quality is the understanding that the products offered by sellers have more selling points that are not owned by a competitor's product. Therefore, companies are trying to focus on quality products and compare them with the products offered by competitors. However, a product with the best view is not the highest quality product if the zoom is not needed and desired by the market.

Based on the above opinion, it can be concluded that product quality are the characteristics of products or services that depend on its ability to demonstrate its function, among others, the overall durability, reliability, accuracy, ease of operation and repair product attributes are also other products to satisfy consumer needs and wants.



## ❖ **Quality in sales:**

Quality sales is the foundation of a strong and lucrative relationship between a supplier and its customer. Inadequate sales technique is a sure ticket to a supplier closing its doors before it gets a chance to enjoy one full year in business. When everyone can identify a sales professional with a top-notch sales technique, then it is easier to weed out the scam artists and under-performers.

Customers want to work with professional sales representatives, those who have determination, understanding, and empathy, can solve their problems, and connect with them emotionally. These are the elements of a good sales technique.

### **1. Pestering**

Pestering simply means that you are contacting a client constantly with no new information and without the client asking to be called back.

### **2. Determination in Sales**

A quality sales professional is also determined to stay up to date on all product information and committed to learning new sales methodologies. You are intent to know everything there is to know about your product and the competitors' products as well. Information is always the best sales tool available.

### **3. Understanding**

Does your sales technique center around asking questions to find out what your customer wants, or are you the kind of sales professional who shoves information down a customer's throat until the customer buys or runs away? There are plenty of sales professionals who believe that the customer will listen to whatever the pitch is and then buy the product based on the pitch. Those are the sales professionals who are struggling to make ends meet and keep sales jobs.

### **4. Customer Empathy**

Empathy can help you to make more sales. Remember your past, put yourself in your customer's position, and use that standpoint to sell to the client in front of you.

Problem Solving

Sales people are problem solvers. Your customer has a problem and you use your product to solve that problem. That is the core of the sales process. Upselling and all of the other parts of revenue generation are only effective when you have solved the customer's problems.

### **5. Emotional Leverage**

The honest truth is that emotional leverage is extremely dangerous when used improperly. Emotional leverage is:

- Getting information from the customer that can be used to create an emotional desire for the product.
- Getting the customer to trust you.
- Using the information and your status as a trusted advisor to make the sale.

### **6. Perfect Your Technique**

There is no such thing as the perfect script or template you can use to create an ideal sales method. Your technique is the result of practice, refinement, and a comprehensive understanding of the five essential elements of a good sales approach. Take the five elements and use them to create a sales approach that makes you successful.

❖ **Service quality (SQ)**, in its contemporary conceptualization, is a comparison of perceived expectations (E) of a service with perceived performance (P), giving rise to the equation  $SQ=P-E$ .

A business with high service quality will meet or exceed customer expectations whilst remaining economically competitive. Evidence from empirical studies suggests that improved service quality increases profitability and long term economic competitiveness. Improvements to service quality may be achieved by improving operational processes; identifying problems quickly and systematically, establishing valid and reliable service performance measures and measuring customer satisfaction and other performance outcomes.

### **Optimizing cost:**

Finding an alternative with the most cost effective or higher achievable performance under the given constraints, by maximizing desired factors and minimizing undesired ones. In comparison, maximization means trying to attain the highest or maximum result or outcome without regard to cost or expense. Practice of optimization is restricted by the lack of full information, and the lack of time to evaluate what information is available (see bounded reality for details). In computer simulation (modelling) of business problems, optimizing is achieved usually by using linear programming techniques of operations research.

### **Seduction Program:**

Executives who produce peak performance in the face of extreme challenges succeed by recognizing and surviving specific dangers. Many manufacturing organizations we work with are still reeling from the impact of organizational change programs:

- **Wasted Time:** Several supervisors at an auto parts manufacturer complained, "We finally documented our processes for ISO certification then management went on an industry best-practices tour. They found out our processes weren't the best in the first place. All we did was waste our time certifying poor processes."
- **Increased Politics:** A power systems manufacturer's quality program failed as interdepartmental feedback data wasn't used to improve processes, but seen as an attack from being "written up." The ensuing write-up wars brought the organization to its knees.
- **Functional Distractions:** A hi-tech manufacturer development team was frustrated as they tried to figure out how to make their R&D meet the mandatory quality policies. How would they know which "idea" had enough quality?
- **Strategic Misdirection:** One plant manager complained about the overhead of six-sigma process. "Our bottle caps work great at 3-sigma. We've achieved no more market share or profit from the extra quality. I think management forgot to look at how the program would support our strategy."

### **Tool Seduction**

In manufacturing, managers typically look for tools to help. Tools like team training, continuous improvement, process engineering, quality programs, culture alignment, leadership development, or other methods.

Has tool seduction infected your organization? Be nervous if one or more of the following exist:

1. **Tool Tossing:** Are managers throwing tools at problems to solve organizational woes?
2. **Consultant Lure:** Are consultants hired to uncover what everyone already knows?
3. **Buzzwords:** Do managers use buzzwords to make themselves look good, or make someone else look stupid, in order to further their own personal agenda?
4. **Change Program of the Week:** Is your staff whiplashed from frequent change programs?

5. **Concrete Plans:** Are managers seduced with the illusion that the plan is progress itself? Do plans take on a life of their own which become set in concrete so that no one adapts when:
- ✓ The competitive landscape suddenly changes, or assumptions fail to materialize.
  - ✓ Market conditions or customer demands change.
  - ✓ Regulatory or economic winds shift.
  - ✓ Resources become constrained

### **How to Avoid Tool Seduction**

Before initiating another change program, we have clients do the following:

- **Assess Transferability:** It worked in the manufacturing company referenced in the bestselling books, but will it transfer to us? Different cultures, strategies, leadership styles, customers, and other elements thwart the best intentions.
- **Ensure Commitment:** How much discomfort is everyone willing to endure to make this happen? Change can be painful.
- **Expect to Adapt:** No plan survives impact with reality. As the saying goes, "Men plan, God laughs." What is our adaptation strategy? How will we know if we have to adapt the change program?
- **Analyze Strategic Impact:** Will this change measurably drive our success, or is it just an industry fashion trend? Assess what the direct strategic impact will be on market share and profits.
- **Analyze Organizational Impact:** Will this change allow us to act more decisively, or just clog our shelves with interesting but irrelevant information? Will it fuel our team's passion for the challenge ahead, or derail production with useless meetings, lingo and processes?
- **Pilot Test:** Validate the above assumptions with a limited and measurable pilot program before inflicting it on the whole organization. This also enables a great "learning laboratory" for your culture.

### **Human Factor in Quality:**

Quality management is not just a strategy. It must be a new style of working, even a new style of thinking. A dedication to quality and excellence is more than good business. It is a way of life, giving something back to society, offering your best to others" (George Bush 1991). From this statement it becomes immediately clear that the human factor plays an eminent role in quality management. Therefore, some important relevant aspects of quality management are high.

### **CONSTRUCTS OF TOP MANAGEMENT COMMITMENT**

It aims to identify the constructs adopted by researchers and the definition in the dictionary. The commitment towards quality management is summarized into six constructs. These are:

#### **1. Quality goals**

The most basic criteria for management commitment towards quality management should be the having of goals for quality. A goal is an objective to achieve or a direction to move forward.

#### **2. Priority**

Management commitment on quality management can also be perceived from the extent they place the importance of quality in relation to other considerations such as time and cost.

### **3. Efforts**

Effort for quality is another aspect to judge management commitment on quality management. A person who puts an effort to enhance quality for product or services can be seen as being serious and committed to quality.

### **4. Involvement**

In terms of directness, the involvement of management in quality management can be direct (personally involved) or indirect (through delegation). From the angle of activeness, the involvement can be active or passive. To what level the management is involved in quality management indicates its commitment in the quality management implementation.

### **5. Resources allocation**

To implement quality management, sufficient resources are necessary. Basically, they are human resources and financial resources. The management of an organization plays the role of distributing resources for various needs. A committed management in quality management should try its best to allocate sufficient resources for the purpose.

### **6. Attitude to change**

Human beings normally resist change once they get used to certain habits, procedures, or methods. Such phenomena are even more severe if the practices have become part of their culture. A strong commitment might be required to get these practices changed even if such change is known for the good of themselves. With regard to the known difficulties in getting a person to change, management of an organization which is willing to change its practices for the purpose of quality management can be perceived as being committed about quality management.

## **Attitude of Top Management:**

Organizational learning in an alliance-based context. An interaction effect of environmental turbulence on the relationship between top management attitude towards learning and organizational learning is proposed

### **Design/methodology/approach:**

The paper begins with the notion that alliances provide an opportunity for organizations to learn from one another. The paper describes three basic tenets of organizational learning. It then proposes how top management attitude will affect these. It also proposes that these relationships will be affected by the environment in which the organizations are operating.

### **Findings:**

The proposed framework makes clear that, for organizational learning to take place, both top management attitude toward learning and environmental turbulence will affect the way organizational learning takes place.

### **Practical implications:**

The paper proposes an important relationship between top management attitude, environmental turbulence, and organizational learning. In highly turbulent environments, even a positive top management attitude will not always help to improve organizational learning.

### **Originality/value:**

The paper fills a gap in the alliance and organizational learning literature by proposing environmental effects on the relationship between top management attitude and organizational learning.

### **Cooperation of Groups:**

Empowerment means giving people authority to make decisions based on what they feel is right, have control over their work, take risks and learn from mistakes, and promote change (Evans and Lindsay, 2008). Empowerment is the process of enabling or authorizing an individual to think, behaves, take action, and control work and decision making in autonomous ways.

### **The role of employee empowerment in total quality management:**

The basic philosophy of total quality management is to involve every employee in the organization along with its suppliers and distributors to improve quality and thus enhance customer satisfaction.

### **Benefits of employee empowerment:**

Some of the benefits of empowering employees include;

- **Improved morale**

Involving employees in decisions and policy changes that directly affect their job while also empowering employees to be more autonomous greatly improves company morale at large.

- **Increased productivity**

Quality management practices also translate into increased productivity

- **Team cohesion**

Employee empowerment fosters better relationships between employees and with their managers, as employees that are given more independence tend to form better working relationships.

- **Innovation**

Employee empowerment cultivates innovation as employees that have a stake in company growth and sustainability will offer more ideas and problem solving solutions when solutions arise.

### **Definition of a team**

A team is defined as a group of people with a common, collective goal. This goal aspect is very critical in the team.

### **The Need for Teams**

The team's ability was more than the sum of the abilities of individual members. This is the major reason for advocating teamwork. The rationale for teamwork therefore is:

- Teams satisfy the human social need to belong
- It promotes better communication
- It multiplies the potential of individual members
- It produces positive peer pressure

## **Team excellence and performance**

Teamwork is not a magic cure -all. Poorly run teams can do more damage to an organizations performance and corresponding competitiveness than having no teams at all. Thus, excellence is an overriding goal for the organization.

### **Building teams and making them work**

Part of building a successful team is choosing team members wisely. It involves strategies for selecting team members, naming officers, creating a mission statement and developing collegial relations among team members.

### **Choosing team members**

When putting together a team, the first step is to identify all potential team members.

### **Developing Collegial Relationships**

A team works most effectively when individual team members form positive, mutually supportive peer relationships. These are collegial relationships, and they can be the difference between a high-performance team and a mediocre one.

### **Promoting Diversity in Teams**

The workplace today is dominated by women and minorities coming from different cultures and backgrounds. Consequently, they are likely to have different values and outlooks.

### **Character building is part of a team building program**

Participants in each group contribute to team success or failure. There is a strong correlation between composite data of a successful group and an unsuccessful group.

### **Mentoring**

Good coaches are mentors. This means they establish a helping, caring, nurturing, relationship, with team members. Developing capabilities of team members, improving the contribution individuals make to the team and helping team members advance their career.

### **Mutual Respect**

It is important for team members to respect their coach, for the coach to respect his or her team members, and for the team members to respect each other.

## **Operators Attitude:**

Quality management plays a vital role for manufacturing sites to ensure readiness plan establish to produce the superior quality products. Therefore, the attitude towards quality management of operators who produced high quality material is essential for the success of the firms.

### **Attitude component models:**

Multicomponent model is the most influential model of attitude. Where attitudes are evaluations of an object that have cognitive, affective, and behavioural components. These components are also known as taxi CAB that will get you where you want to go.

- **Cognitive component:** The cognitive component of attitudes refer to the beliefs, thoughts, and attributes that we would associate with an object. Many times a person's attitude might be based on the negative and positive attributes they associate with an object.

- **Affective component:** The affective component of attitudes refer to your feelings or emotions linked to an attitude object. Affective responses influence attitudes in a number of ways. For example, many people are afraid/scared of spiders. So this negative affective response is likely to cause you to have a negative attitude towards spiders.
- **Behavioural component:** The behavioural component of attitudes refer to past behaviours or experiences regarding an attitude object. The idea that people might infer their attitudes from their previous actions.

Daniel Katz classified attitudes into four different groups based on their functions:

1. **Utilitarian:** provides us with general approach or avoidance tendencies
2. **Knowledge:** help people organize and interpret new information
3. **Ego-defensive:** attitudes can help people protect their self-esteem
4. **Value-expressive:** used to express central values or beliefs

### **Responsibility:**

The Quality Manager is responsible for overall development, implementation, and maintenance of the organization's Quality Management System (QMS).

### **Quality manager essential duties and responsibilities:**

- Ensure that the organization's Quality Management System conforms to customer, internal, ISO 9001, and regulatory/legal requirements.
- Ensure evaluation of, and reporting on, vendor quality systems.
- Oversee inspection (examination) of incoming materials, ensuring that they meet requirements.
- Manage the monitoring, measurement, and review of internal processes, especially those that affect the quality of the organization's products.
- Lead a team of Quality engineers, inspectors, auditors, analysts, and technicians
- Work with customers, employees, contractors, and outsourcing firms to develop product requirements.
- Report to top management on the performance of the QMS (e.g., results of quality audits, corrective actions), including the need for improvement.
- Conduct periodic management review meetings.
- Oversee product recalls.
- Responsible for accuracy and timely inspection/calibration of monitoring and measuring devices.
- Keep up on standards, regulations/laws, issues, and news with respect to product (service) quality.

### **Quality Roles and Responsibilities**

Our quality team is a worldwide organization that leads customer-critical functions within NXP. Their responsibilities include:

**Customer Quality:**

- ✓ Finding the root cause of quality issues
- ✓ Working on product quality improvements through preventive and corrective actions

**External Quality:**

- ✓ Working with final manufacturing subcontractors and foundries on quality-related tasks, audits and incidents
- ✓ Being the main quality point of contact for outsourced products

**Failure Analysis Lab:**

- ✓ Electrical and physical product analysis for new product development, customer issue resolution and manufacturing effectiveness improvements
- ✓ Providing an expert voice in new product development teams

**Field Quality:**

- ✓ Working with customers for quality-related tasks, audits and incidents
- ✓ Collecting and reporting customer quality data to drive improvement within NXP

**Manufacturing Quality:**

- ✓ Acting as customer advocate for internal manufacturing sites regarding change management, discrepant material and product qualifications
- ✓ Overseeing and performing quality audit activities
- ✓ Giving expert knowledge, with the help of quality tools and methods, to help ensure quality of manufactured products

**New Product Introduction (NPI) Quality:**

- ✓ Driving quality into product development activities
- ✓ Helping ensure that new product releases meet customer and standards requirements
- ✓ Quality Standards and Bodies:
- ✓ Voicing Our position and interests within industry standard bodies such as AEC, IEC and JEDEC
- ✓ Communicating internally, industry standard trends and changes (planned or actual)

**Quality Systems:**

- ✓ Managing our quality rules, process structure and documents
- ✓ Coordinating internal and certification audits
- ✓ Leading continuous improvement activities
- ✓ Making sure that customer-specific requirements are available and understood

**Reliability Lab:**

- ✓ Operating life and environmental stress labs to validate long-term reliability of our products
- ✓ Software Quality:
- ✓ Driving quality into software development activities
- ✓ Making sure new software releases meet customer and standards requirements



### **Supplier Quality:**

- ✓ Working with suppliers on quality related tasks, audits and incidents
- ✓ Driving supplier quality improvements
- ✓ Handling supplier audits, data collection and analysis and quality related items, including issues and changes

### **Sustainability Office:**

- ✓ **Environmental Health and Safety**
  - Conduct business activities in a responsible manner
  - Provide a safe work environment for our employees
  - Reduce our environmental impact
  - Work to meet the EHS expectations of our customers, suppliers, partners and the community
- ✓ **Business Continuity Management**
  - Identify critical processes that may interrupt business operations and implement strategies to minimize the impact
- ✓ **Social Responsibility**
  - Ensuring a workplace that is safe, secure, and in which every employee is treated humanely, with respect and dignity
- ✓ **Eco-Products**
  - Drive NXP products toward environmental compliance with reduced environmental impact from hazardous substances and conflict minerals
- ✓ Additional information can be found at: Corporate Responsibility

### **Causes of Apparatus error and corrective methods:**

The purpose of a failure/deviation system is to assure that each failure/deviation does not adversely impact product quality and that effective corrective action is taken to reduce the probability of such failure in the future.

### **Contributors to Failure:**

- Materials
- Facilities
- Equipment
- Instrumentation
- People
- Processes
- Procedures

### **Failure:**

Product does not meet specification. Failure may be detected in/by Production Laboratory.

### **Deviation:**

Change in procedures, equipment, materials, personnel related to product manufacture having an impact on product quality.

### **Definitions:**

**1) Immediate Cause:** Situation directly causing the problem

**2) Root Cause:** Basic Causal Factor, which if corrected or removed prevents a repeat of the problem

**3) Intermediate Cause** Reason for problem at more fundamental level than the 7 immediate cause, but not the root cause [why-2, why-3]

**4) Root Cause Analysis** Structured questioning process enabling identification of underlying beliefs and practices that result in poor quality.

### **Analysis**

Failure analysis is the process that determines the root cause of the failure. Each failure should be verified and then analyzed to the extent that you can identify the cause of the failure and any contributing factors. The methods used can range from a simple investigation of the circumstances surrounding the failure to a sophisticated laboratory analysis of all failed parts.

#### **The analysis process is:**

1. Review, in detail, the field service reports.
2. Capture historical data from the database of any related or similar failures.
3. Assign owners for action items.
4. Do a root cause analysis (RCA).
5. Develop corrective actions.
6. Obtain the failed items for RCA (as needed).
7. Write a problem analysis report (PAR) and, if needed, a material disposition report (MDR).

### **Root Cause Analysis**

In failure analysis, reported failures are evaluated and analyzed to determine the root cause. In RCA, the causes themselves are analyzed and the results and conclusions are documented. Any investigative or analytical method can be used, including the following:

- **Brainstorming**

Brainstorming is a group creativity technique by which efforts are made to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by its members.

- **Histogram**

A histogram is an accurate representation of the distribution of numerical data. It is an estimate of the probability distribution of a continuous variable and was first introduced by Karl Pearson. It is a kind of bar graph.

- **Flow chart**

A flowchart is a type of diagram that represents an algorithm, workflow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows.

- **Force field analysis**

helps you to think about the pressures for and against a decision or a change. It was developed by Kurt Lewin. To carry out a **Force Field Analysis**, describe your plan or proposal in the middle of a piece of paper or whiteboard.

- **Pareto analysis**

Pareto Analysis is a statistical technique in decision-making used for the selection of a limited number of tasks that produce significant overall effect. It uses the Pareto Principle (also known as the 80/20 rule) the idea that by doing 20% of the work you can generate 80% of the benefit of doing the entire job.

- **Nominal group technique**

It is a group process involving problem identification, solution generation, and decision making. ... For example, it can identify strengths versus areas in need of development, rather than be used as a decision-making voting alternative.

- **FMEA**

Failure modes and effects analysis (FMEA) is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service. "Failure modes" means the ways, or modes, in which something might fail.

- **Trend analysis**

A trend analysis is an aspect of technical analysis that tries to predict the future movement of a stock based on past data. Trend analysis is based on the idea that what has happened in the past gives traders an idea of what will happen in the future.

- **Fault tree analysis**

Fault tree analysis is a top down, deductive failure analysis in which an undesired state of a system is analyzed using Boolean logic to combine a series of lower-level events.

- **Cause and effect diagram (fishbone)**

A fishbone diagram, also called a cause and effect diagram or Ishikawa diagram, is a visualization tool for categorizing the potential causes of a problem in order to identify its root causes.

### **Corrective Action:**

When the cause of a failure has been determined, a corrective action plan should be developed, documented, and implemented to eliminate or reduce recurrences of the failure. The implementation plan should be approved by a user representative, and appropriate change control procedures should be followed.

