

TQM - Introduction

1. There are some Quality Management Software

https://www.bmqualitymaster.com/qms-software/?gad_source=1&gclid=CjwKCAjw5Ky1BhAgEiwA5jGujnUNxdddIiwg69qrXAuUK1ri0sQsOTLSPOI5XjJxILhTeyPeqoLeyBoCB5wQAvD_BwE

https://www.testrail.com/qa-management-tool/?utm_term=qa%20management%20system&utm_campaign=gg_dg_geo6_search_non_branded&utm_source=google&utm_medium=cpc&utm_content=medium_intent_qa_management&hsa_acc=9739162558&hsa_cam=18929403020&hsa_grp=146518110427&hsa_ad=635046738220&hsa_src=g&hsa_tgt=kwd-305468719868&hsa_kw=qa%20management%20system&hsa_mt=e&hsa_net=adwords&hsa_ver=3&gad_source=1&gclid=CjwKCAjw5Ky1BhAgEiwA5jGujoeLfMHq_yDvuaHDb7aasqDpH4Bq57gZnD2jnOzNrforO3G4NNaM4xoCb64QAvD_BwE

2. Part of the business process software such as - ERP

https://www.ramco.com/products/erp-software/?utm_source=paid_search&utm_campaign=erp_search_middleeast&utm_term=mes%20software&utm_campaign=ERP++Search++India&utm_source=adwords&utm_medium=ppc&hsa_tgt=kwd-339143778191&hsa_grp=158173900706&hsa_src=g&hsa_net=adwords&hsa_mt=b&hsa_ve=r=3&hsa_ad=690063914544&hsa_acc=6390741559&hsa_kw=mes%20software&hsa_cam=17411842306&gad_source=1&gclid=CjwKCAjw5Ky1BhAgEiwA5jGujvtrEe-Kf8N0YkvVG4YNxW5c4lE7EaVNk1Kz_ND07y7cEoizL0vJkxoCduoQAvD_BwE



MANAGEMENT

DEFINITIONS:

● “Management is the art of getting things done through and with people in formally organized groups”

--- Koontz

● “Management is the art of getting things done through and with people”

--- Mary Parker

● “Management is the art of knowing what you want to do and then seeing that it is done in the best and cheapest way”

-- F.W. Taylor

● “Management is the accomplishment of results through the efforts of other people”

--- Lawrence

● “Management is to manage is to forecast and plan, to organize, to command, to coordinate and control”.

-- Henry Fayol (1916)





Forecasting

Definition

Forecasting is a technique that uses historical data as inputs to make informed estimates that are predictive in determining the direction of future trends. Businesses utilize **forecasting** to determine how to allocate their budgets or plan for anticipated expenses for an upcoming period of time.





Planning

Planning is the process of deciding the objectives to be achieved and selecting the ways and means of achieving the pre-decided objectives.



Organizing

Definition



Organizing is the function of management, which involves the assignment of tasks, the grouping of tasks into departments, and the allocation of resources to departments.

fppt.com



Staffing

Staffing is the process of hiring eligible candidates in the organization or company for specific positions. In management, the meaning of staffing is an operation of recruiting the employees by evaluating their skills, knowledge and then offering them specific job roles accordingly.

Directing

DIRECTING is said to be a process in which the managers instruct, guide and oversee the performance of the workers to achieve predetermined goals.



Leadership

Leadership is the art of motivating a group of people to act toward achieving a common goal. In a business setting, this can mean directing workers and colleagues with a strategy to meet the company's needs.



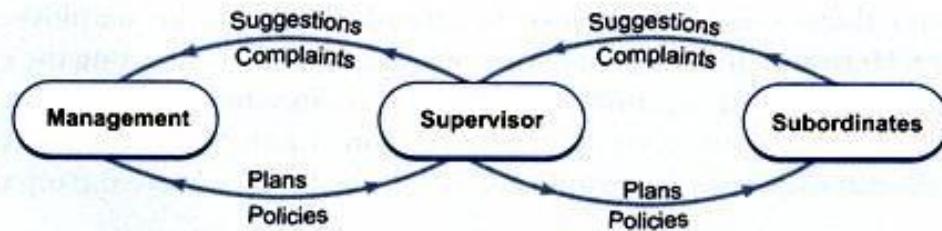
Communication

It is the systematic planning, implementing, monitoring, and revision of all the channels of communication within an organization, and between organizations

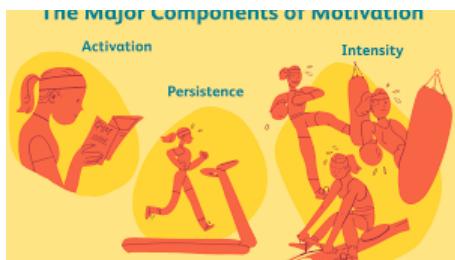


Management Communication

Supervision



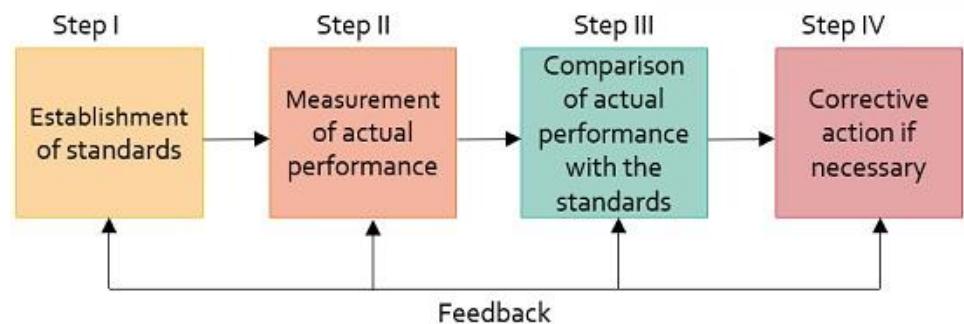
Motivation



Coordination

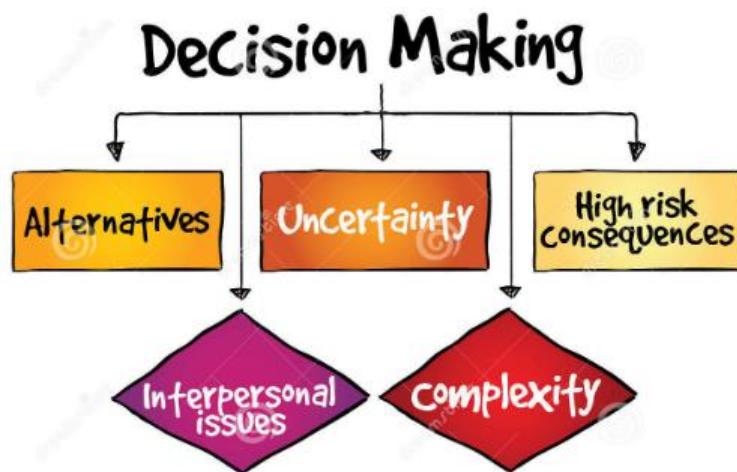


Controlling



Decision making

- Decision-making is the process by which a course of action is selected as the way to deal with a specific problem.

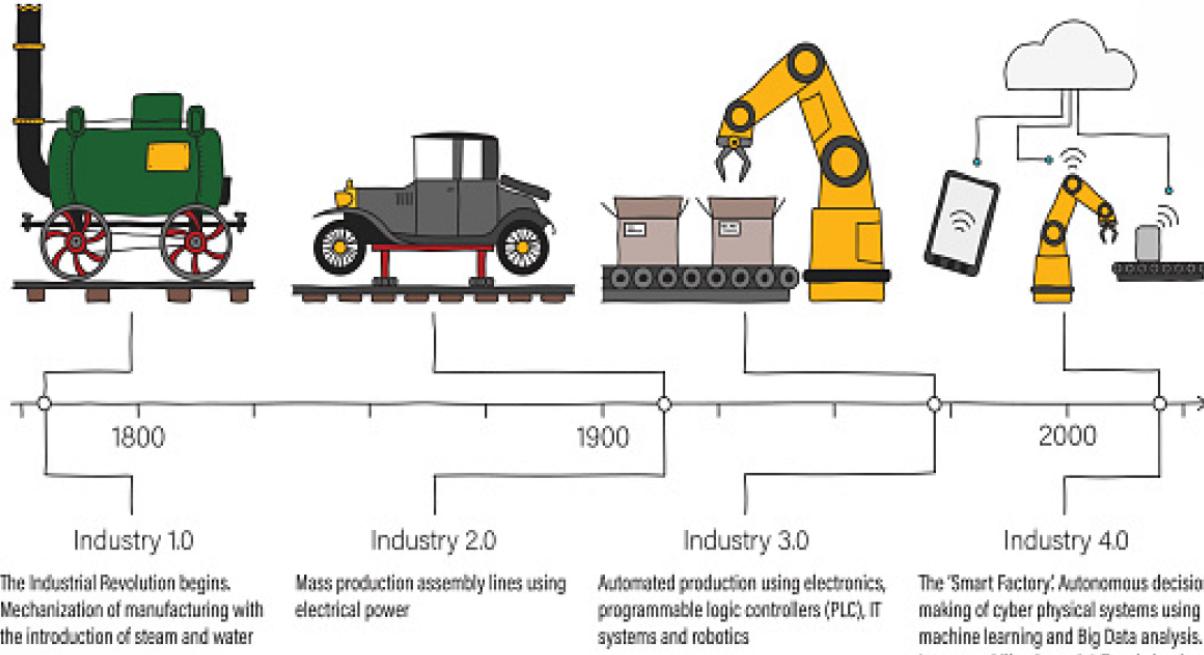


References:

<https://www.managementstudyhq.com/what-is-management.html>

https://www.managementstudyguide.com/management_functions.htm

<https://www.managementstudyhq.com/functions-of-management.html>

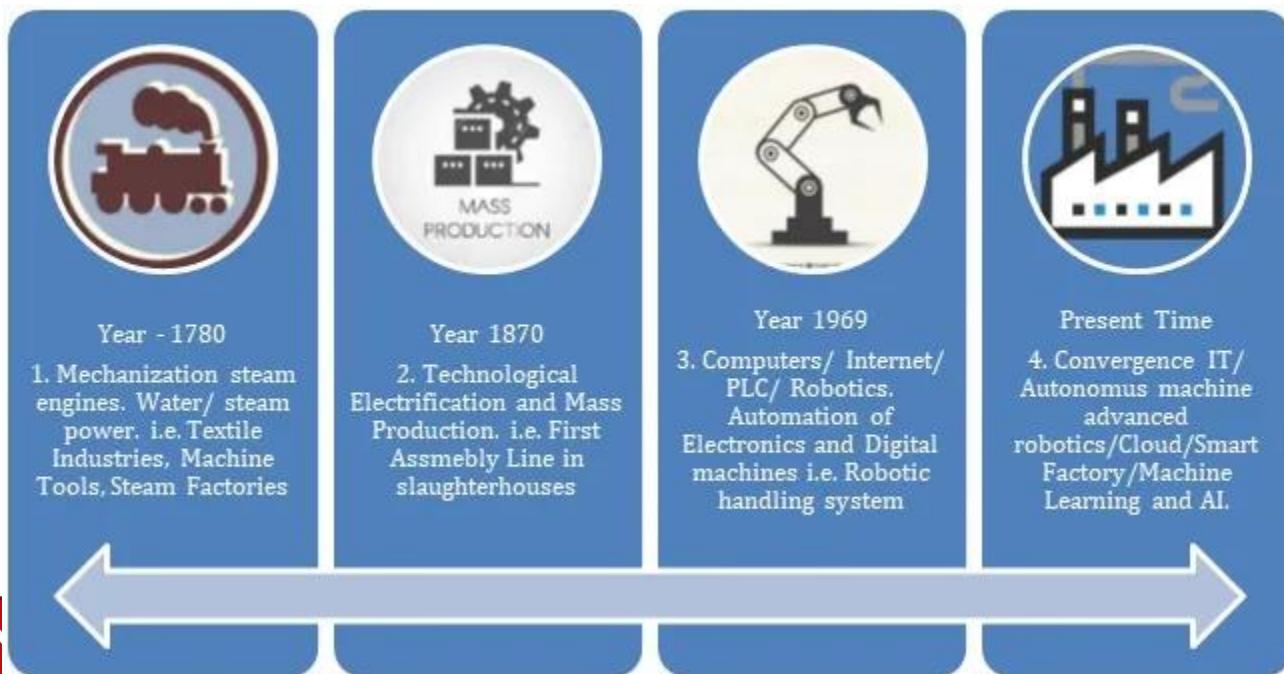


The Industrial Revolution begins.
Mechanization of manufacturing with
the introduction of steam and water
power

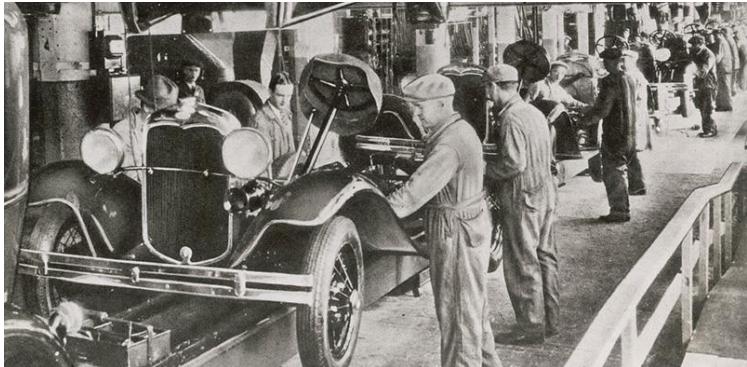
Mass production assembly lines using
electrical power

Automated production using electronics,
programmable logic controllers (PLC), IT
systems and robotics

The 'Smart Factory'. Autonomous decision
making of cyber physical systems using
machine learning and Big Data analysis.
Interoperability through IoT and cloud
technology.



Evolution/History of Quality Management

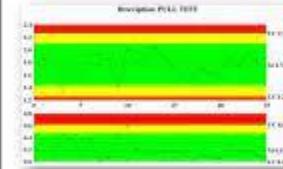


- Early days of manufacturing : inspection and decision making – **accept or reject**
- Separate inspection department with a “**chief inspector**”
- Evolution of quality control department with “**quality control manager**”
- **1920's** the birth of statistical quality control
- **1924** Modern control chart by Shewhart; later developed by Deming



- Shewhart, Deming, Dodge and Romig introduced the theory of **statistical process control (SPC)** and it was used until late 1940s.
- **1940s** – Japan's industrial system was virtually destroyed and had a reputation for cheap imitation products and illiterate workforce.
- Japan solved these problems with the help of Juran, Deming and Feigenbaum.

What is SPC?



01

A dynamic tool used to monitor the process. It provides real time information on the performance of a process.

02

SPC is real time and provides data that allows users to make decisions about the process.

03

SPC is a disciplined approach to data and normal distribution. It is a scientific approach to managing processes.



- **1950s** Quality management practices developed rapidly in Japan and became their management philosophy.
- **1960s-1970s** Japan's imports into the USA and Europe increased significantly due to its cheaper, higher quality products, compared to the Western counterparts.

- 1969 First International conference on quality control, sponsored by Japan, America and Europe.
- On Feigenbaum paper, the term “**total quality**” was used for the first time. This constitutes wider issues such as **planning, organization, and management responsibility**.

- Ishikawa introduced new meaning for “**total quality control**” which means “**company wide quality control**”. He described how all employees, from top management to the workers must participate in quality control.
- Late **1970s** Company wide quality management became common in Japanese companies.



- Quality revolution in the West was slow and did not begin until early 1980s.
 - **Total quality management (TQM)** became the centre in most cases.
 - **1979** - The **British Standard (BS) 5750** for quality systems was published.



- ④ 1983 - The National Quality Campaign was launched using **BS5750** main theme. The aim was to popularize to the industry the importance of quality for competitiveness and survival in the world market. Since then the **International Standardisation Organization (ISO) 9000** became the internationally recognised standard for quality management systems.

ISO

What is quality



Quality - Definition

Juran: Fitness for intended use

Crosby : Conformance to requirements or specifications

Garvin

► Divides the definition of quality into 5 categories

- Transcendent (always improving or uplifting)
- Product-based
- User-based
- Manufacturing-based
- Value-based

► 8 attributes can be used to define quality

- | | | |
|---------------|-------------------|----------------|
| ► Performance | Features | Reliability |
| ► Conformance | Durability | Serviceability |
| ► Aesthetics | Perceived Quality | |

Mitra

► Is the fitness of the product or service for meeting or exceeding its intended use as required by customer



Top 10 definitions of quality / TABLE 1

1.	Efficiently providing products and services that meet or exceed customer expectations.
2.	Adding customer value.
3.	Continuously measuring the improvement of processes and services for customers.
4.	Acting as promised and reporting failures.
5.	Doing the right thing at the right time in the right way with the right people.
6.	Ensuring customers come back and products do not.
7.	Providing the best value to customers by improving everyday activities and processes.
8.	Beyond delivering what the customer wants, anticipating what the customer will want when he or she knows the possibilities.
9.	Delivering customer value across the organization through best-in-class products, services and support.
10.	Meeting and exceeding the expectations of clients, employees and relevant constituencies in the community.

Source: ASQ, "Discoveries," ASQ Global State of Quality Study, 2013, <http://asq.org/global-state-of-quality/reports.aspx>.



ISO definition (ISO 8402:1994)

- “The totality of features and characteristics of a product, process or service that bears on its ability to satisfy stated and implied needs.”

How to define quality?

Defined using Quality Characteristics

Quality characteristics

- Are the elements that define the intended quality level of the product or service

How to define quality? – contd..



Diameter

Length

Pressure

Wall Thickness

How to define quality? – contd.



Taste, Smell

Price, Way of serving etc.

How to define quality? – contd.



Place B

Place A

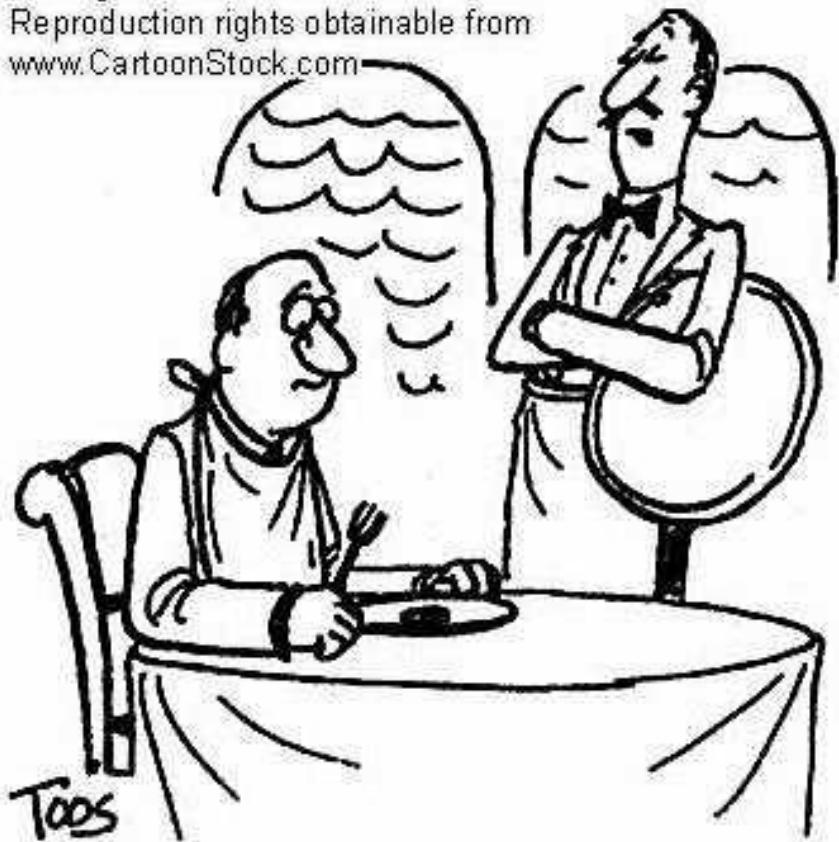
Time

Reliability

How to define quality? – contd.

© Original Artist

Reproduction rights obtainable from
www.CartoonStock.com

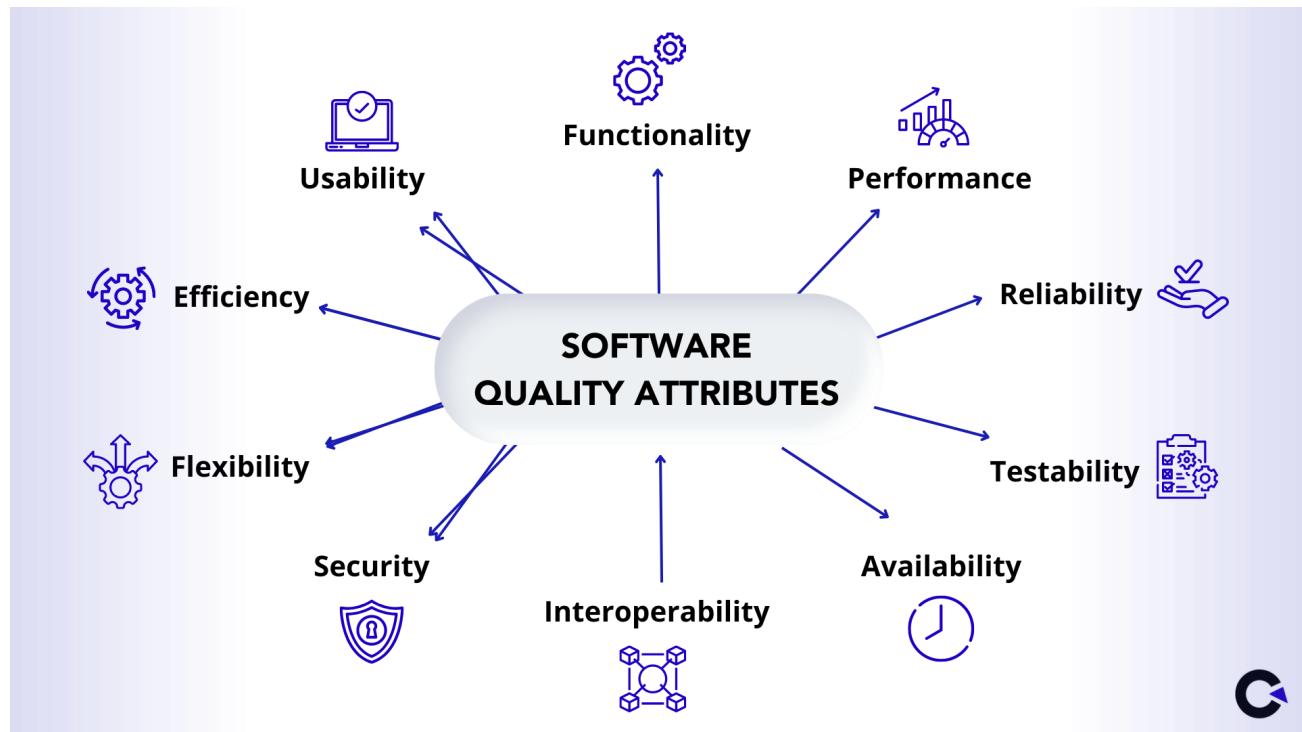


"As you requested, we trimmed the fat."

Honesty
Courtesy

The Consortium for IT Software Quality (CISQ) has defined five major desirable structural characteristics needed for a piece of software to provide business value:

- ✓ Reliability,
- ✓ Efficiency,
- ✓ Security,
- ✓ Maintainability,
- ✓ (adequate) Size.



<https://codoid.com/software-testing/the-basics-of-software-quality-attributes/>

Functionality

The first from the list of software quality attributes we will be focusing on is functionality. This attribute determines the **conformity of a software-driven system with the defined requirements and specifications.**

Most Software Testing professionals view this attribute as the most important one as an application fails on the most basic level if it doesn't function as expected. That is why we always advocate performing tests that assess the desired functionality of a system during the early stages of software testing.

Performance

Performance is on our list of the most important software quality attributes as it is a very important trait for every software to have in this fast-paced world. It can be understood as the **ability of a software-driven system to conform to timing requirements.**

From a testing point of view, it implies that QA testers must check whether the **system responds to various events within defined time limits.** These events may occur in the form of *clock events, process interruptions, messages, requests from different users,* and so on.

Reliability

Now that we have seen the functionality & performance software quality attributes, let's shift our focus to reliability. Reliability **is to check if the application or the testing product with different combinations to see if it withstands its nature and produces the expected results.** By different combinations, we mean testing it in **different browsers, operating systems, environments, and so on.**

Testability

It indicates **how well the application allows software testers to perform tests in line with the predefined criteria.** In addition to that, this software quality attribute also assesses the ease with which QA engineers can develop test criteria for a said system and its various components.

QA professionals can assess the testability of a system by using various techniques such as encapsulation, interfaces, patterns, low coupling, and more.

Availability

As the name suggests, this software quality attribute indicates whether an application will execute the tasks when they are assigned. It can be defined as a ratio of the system's available time to the required time it is expected to perform. Top-notch availability indicates that a software-driven system will recover from operational failures or scheduled maintenance periods without exceeding a specific time value. Availability also includes certain concepts that relate to software security, performance, integrity, reliability, dependability, and confidentiality.

Interoperability

Software-driven systems could be required to communicate and act in tandem with different systems to perform certain tasks. Interoperability is the ability of the system to interact with other systems to exchange the required information via certain interfaces. So, Software Quality Assurance engineers must examine the interoperability of a system in terms of both syntactic and semantic interoperability.

Security

We have added security to our list of the most important software quality attributes as it has lately been the need of the hour. The number of cyber-attacks has been on the rise and users have started prioritizing a product's safety. So the security attribute measures the **ability of a system to protect and block malicious or unauthorized actions that could negatively impact** the user or destroy the system. Security also **includes authorization and authentication techniques, protection against network attacks, data encryption, and other risks**. It is imperative for Software Testing Companies and professionals to regularly conduct updated security checks on systems.

Flexibility

If keeping up with the security threats is a key aspect, so is the **system's ability to keep up with the upcoming trends and requirements**. And for that, the system should be flexible enough or should be able to modify accordingly.

For example, let's say you're working on a web application that was developed when **Windows 8** was launched. As the OS gets upgraded, the application should be flexible enough to support **future versions such as Windows 10 & 11**.

Efficiency

Though mentioned at the bottom, it is still one of the most important software quality attributes. Why? Because an inefficient application might work well only when it consumes excessive resources that slow down other applications or the system on the whole. In addition to **checking how long it takes to complete a process, it is also important to check the level of system resource usage.**

For example, if the system uses the entire CPU power and memory for a single application. It can be considered to be inefficient as it pulls down the performance of the entire system from the user's perspective.

Usability

Though all software-driven systems are designed with **ease of use** in mind, not all achieve this goal. And the software quality attribute of usability denotes the ease with which users are able to execute tasks on the system. It also indicates the **level of user support provided by the system.**

In addition to general usability, Software Quality Assurance engineers must also **test if the software is accessible to people with different types of abilities.** Usability plays a critical role in a product's success.

Three aspects associated with Quality



Downloaded from [QualityTree.com](http://www.QualityTree.com)



➤ Quality of Design

- Quality of design is said to be good if it **conforms to product needs**.
- It is the quality which the producer or supplier is intending to offer to the customer
- take into consideration the customer's requirements
- completeness and correctness of specifications, drawings, catalogues
- measured with fitness for use
- Thus, the product or service must be designed to **meet the needs** of the intended customers.
- A good design **is simple yet meets specific customer requirements**.
- It should meet
 - profit considerations.
 - manufacturing considerations.
 - environmental considerations as well.

➤ Quality of Conformance

- Is said to be good when the manufactured product conforms to design specifications

➤ Quality of Performance

Quality Of Conformance

- Ensuring product or service produced according to design
- Depends on
 - design of production process
 - performance of machinery
 - materials
 - training

Deals with

- ✓ defect finding
- ✓ defect analysis
- ✓ rectification

Quality of conformance is the level of the quality of product actually produced and delivered through the production or service process of the organization as per the specifications or design. When the quality of a product entirely conforms to the specification (design), the quality of conformance is said to be good.

Quality Management Principles

Principles of Total Quality Management (TQM)



<https://www.qualitiso.com/en/the-7-principles-of-quality-management/>



Quality characteristics

Are of two types

Variables

- Measurable and expressed on numerical scale,
- Eg., Diameter, Resistance etc.

Attributes

- If a characteristic is said to be conforming or non conforming or that can't be measured
- Variable can be attribute, but attribute cannot be variable
- Eg. Go-No Go gauges. It results in economical measurement and time saving

50,000 → 2 Days → TVs

50,000 → 2 Days → TVs

50,000 → 2 Days → TVs



Quality characteristics or The dimensions of quality

by Garvin

Eight Dimensions of Quality



Dimension	Meaning
Performance	Primary product characteristics
Features	Secondary characteristics added features
Conformance	Meet specifications or industry standards, workmanship
Reliability	Consistency of performance overtime
Durability	Useful life
Service	Resolution of problems and complaints, ease of repair
Response	Human-to-human interface
Aesthetics	Sensory characteristics
Reputation	Past performance, ranking first

- Quality dimensions are independent
- focus on a few dimensions (e.g. Japanese cars – reliability, conformance, and aesthetics)

1. Performance

- basic operating characteristics

2. Features

- “extra” items added to basic features

3. Reliability

- probability product will operate over time

4. Conformance

- meeting pre-established standards

5. Durability

- life span before replacement

6. Serviceability

- ease of getting repairs, speed & competence of repairs

7. Aesthetics

- look, feel, sound, smell or taste

8. Safety

- freedom from injury or harm

9. Other perceptions

- subjective perceptions based on brand name, advertising, etc

Evolution of Quality Management

Inspection



Quality Control



Quality Assurance



TQM

Salvage, sorting, grading, blending, corrective actions, identify sources of non-conformance

Develop quality manual, process performance data, self-inspection, product testing, basic quality planning, use of basic statistics, paperwork control.

Quality systems development, advanced quality planning, comprehensive quality manuals, use of quality costs, involvement of non-production operations, failure mode and effects analysis, SPC.

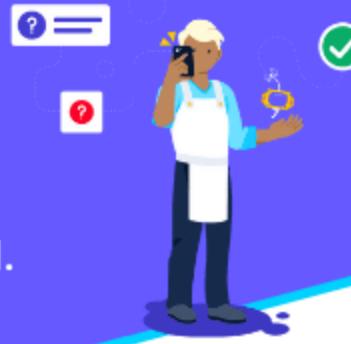
Policy deployment, involve supplier & customers, involve all operations, process management, performance measurement, teamwork, employee involvement.

Quality Control & Quality Assurance



Quality Assurance

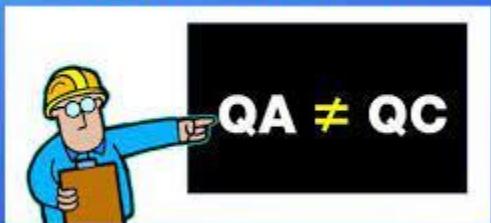
Quality Assurance (QA) is the proactive approach of quality which focuses on preventing the defects at the process level.



Quality Control

Quality Control (QC) is the reactive approach of quality which works by finding the defects of the product itself.

DIFFERENCE BETWEEN QUALITY ASSURANCE AND QUALITY CONTROL



Quality Assurance Vs Quality Control

QUALITY ASSURANCE

Focus on the prevention of defects

Proactive process

Process-based approach

Manages Quality

QUALITY CONTROL

Focus on the identification of defects

Reactive process

Product-based approach

Verify the Quality



Process Oriented

Product Oriented

Defect Prevention

Defect Identification

Proactive Approach

Reactive Approach

Managerial Tool

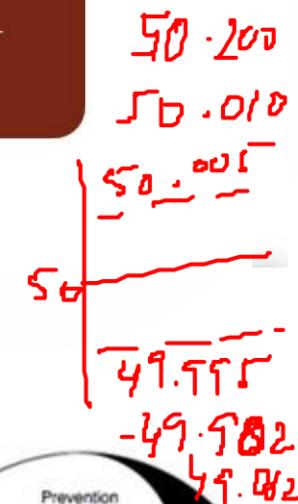
Corrective Tool

Everyone's Responsibility

Specific Team's Responsibility

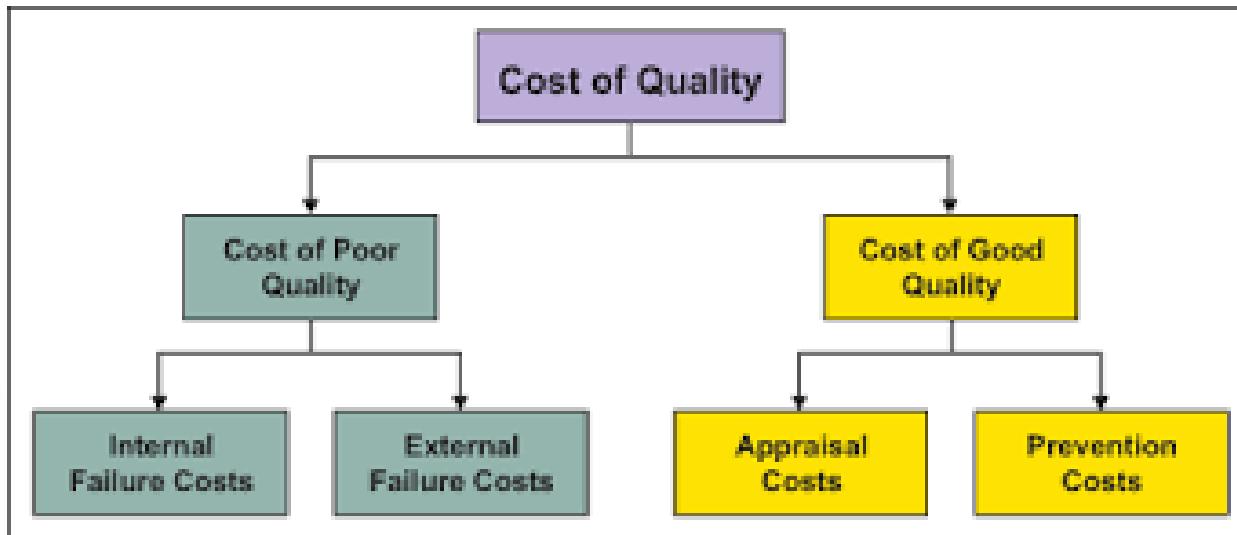
Causes of Variation

Common ↗ ↘ Special
causes causes causes
or
chance assignable
causes causes



	Quality Assurance	Quality Control
Definition	QA is a set of activities for ensuring quality in the processes by which products are developed.	QC is a set of activities for ensuring quality in products , focused on identifying defects in the products produced.
Focus	QA is a proactive quality process which aims to prevent defects in the process used to make the product.	QC is a reactive process to identify (and correct) defects in the finished product.
Goal	To improve development and test processes to reduce defects when the product is being developed.	To identify defects in a developed product before it's released.
How	QA establishes good quality management systems and the assessment of its adequacy and conformance audits of the system.	QC find & eliminates sources of quality problems through tools & equipment so that customer's requirements are continually met.
What	Prevention of quality problems through planned and systematic activities including documentation.	The activities or techniques used to achieve and maintain the product quality, process and service.
Responsibility	Everyone on the team involved in developing the product is responsible for quality assurance.	Quality control is usually the responsibility of a specific team that tests the product for defects.
Example	Verification is an example of QA	Validation/Software Testing is an example of QC
Techniques	Statistical Tools & Techniques can be applied in both QA & QC. When they are applied to processes (process inputs & operational parameters), they are called Statistical Process Control (SPC); & it becomes the part of QA.	When statistical tools & techniques are applied to finished products (process outputs), they are called as Statistical Quality Control (SQC) & comes under QC
As a Tool	QA is a managerial tool	QC is a corrective tool
Orientation	QA is process oriented	QC is product oriented

Quality Costs



Prevention Costs	Appraisal Costs	Internal Failure Costs	External Failure Costs
<ul style="list-style-type: none"> - Planning - Process Control - Quality Audits - Supplier Evaluation - Training - Design Review - Risk assessment - FMEA 	<ul style="list-style-type: none"> - Inspection - FAT - Document Review - Quality Audits - Calibration - Test materials - Test product 	<ul style="list-style-type: none"> - Scrap - Rework - Missing Docs - Problem Solving - 100% Sorting - Retest - Redesign - Downgrading - Variation - Unplanned downtime 	<ul style="list-style-type: none"> - Warranty charges - Complaints - Returned Material - Late delivery penalties - Rework after installation - Lost Opportunities

Cost of Poor Quality (COPQ)

Visible Costs

Hidden Costs

RMA

Warranty

Rejects/scraps

Inspection

Field services

Yield

Gross Margin Erosion

Rework/Re-grade

Engineering
change orders

Time value of
money

More set-ups

Working
capital
allocations

Lost customer
loyalty

Lost sales/
opportunities

Late delivery
Expediting costs

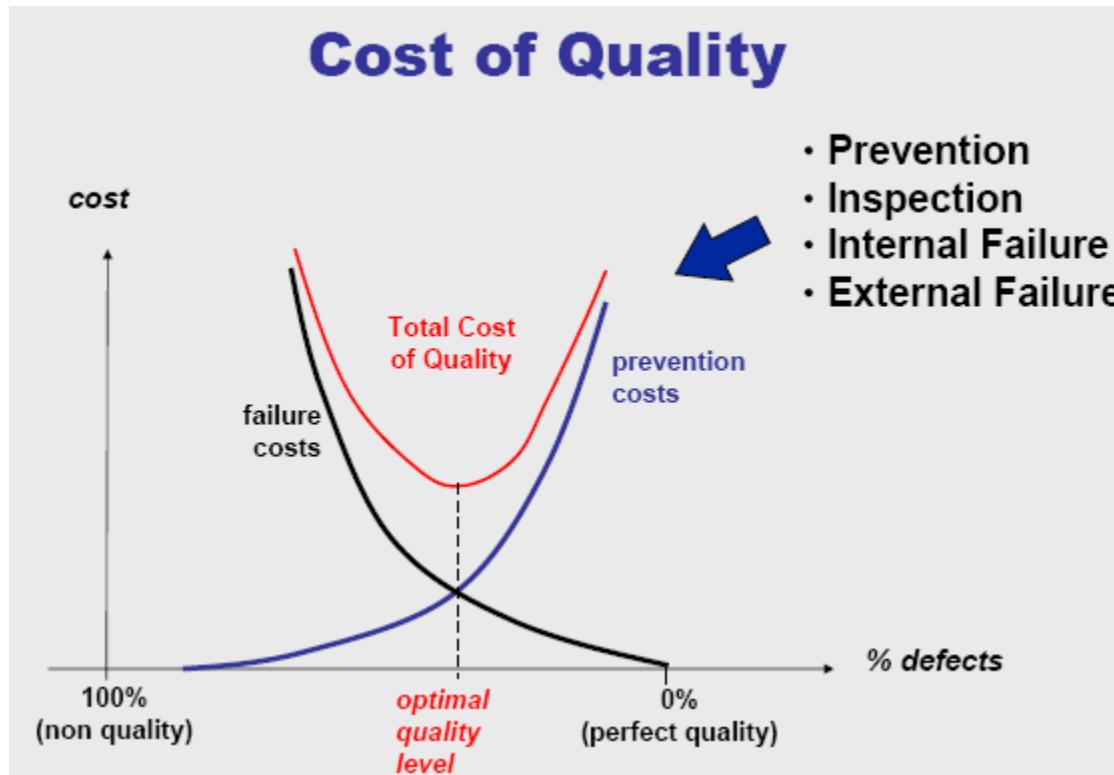
Excess inventory

Long cycle times

Excessive material
orders/planing

Degraded brand
image

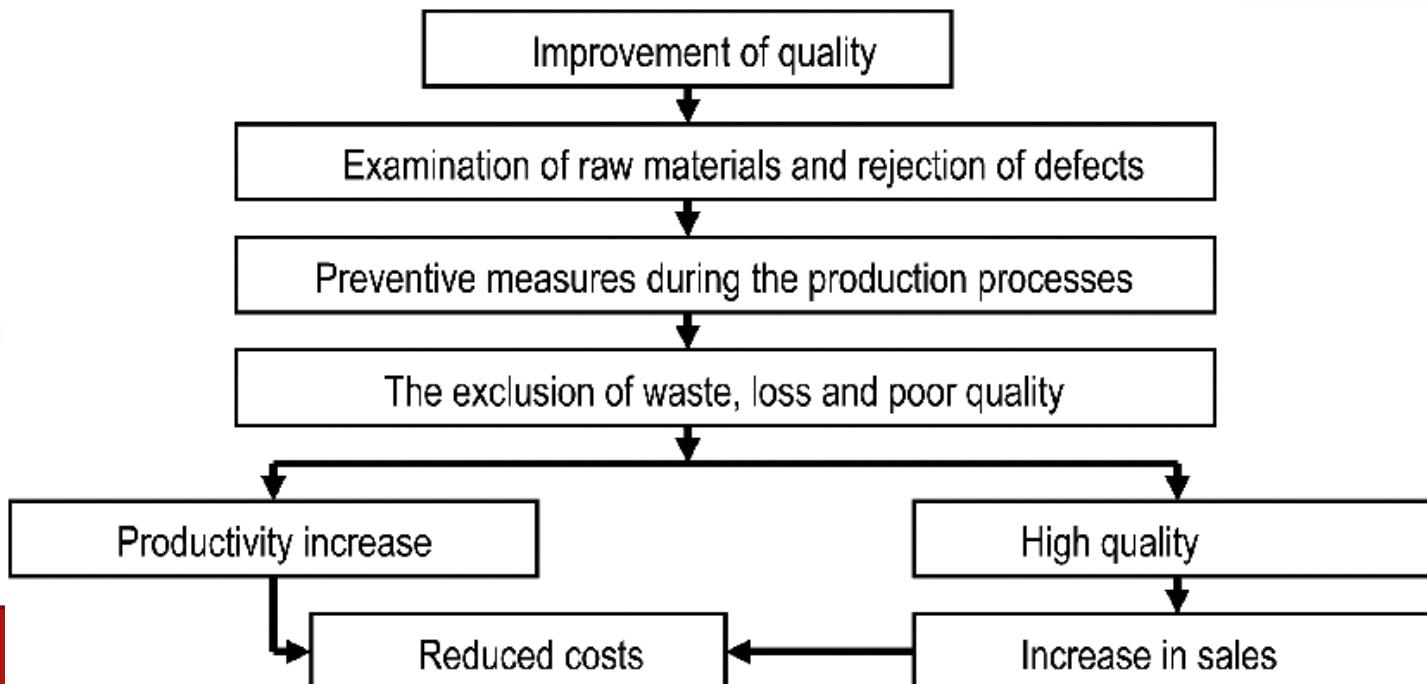
COPQ ranges 15-20% of total cost. Hidden costs can be up to 4 times the visible costs.



Quality vs Productivity



- Quality means; inspection, quality control, quality assurance and total quality management.
- Low quality will cause redoing work.
- Redoing work affects the production rate and decrease the output.
- When output decreases, productivity decreases.





Productivity versus quality

Productivity and quality are always in conflict.

Lasting productivity gains are made only as a result of quality improvements.

How quality is defined

Meeting customer specifications.

Satisfying customer needs and exceeding customer expectations.

How quality is measured

Establishing an acceptable level of nonconformance and measuring against the benchmark.

Establishing high-performance benchmarks for customer satisfaction and then continually improving performance.





NEW AND OLD CULTURES

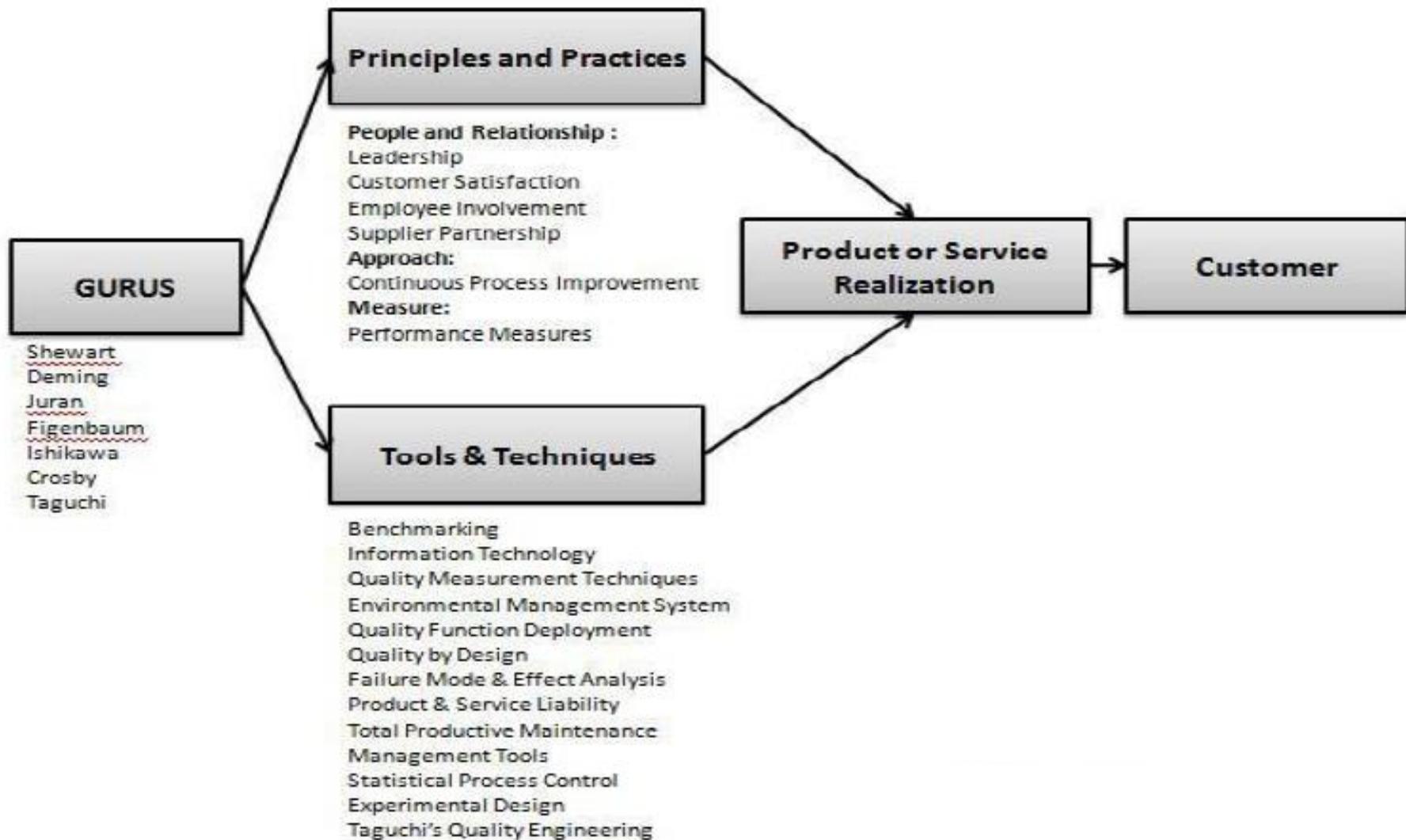
SL NO	QUALITY ELEMENT	PREVIOUS STATE	TQM
1	Definition	Product-oriented	Customer-oriented
2	Priorities	Second to service and cost	First among equals of service and cost
3	Decisions	Short-term	Long-term
4	Emphasis	Detection	Prevention
5	Errors	Operations	System
6	Responsibility	Quality control	Everyone
7	Problem solving	Managers	Teams
8	Procurement	Price	Life-cycle costs, partnership
9	Manager's role	Plan, assign, control and enforce	Delegate, coach, facilitate and monitor

Basic approach to TQM

- 1 Customer focus
- 2 Management commitment
- 3 Continuous improvement
- 4 Fast response
- 5 Action based on facts
- 6 Employee participation
- 7 TQM Culture
- 8 Supplier partnership
- 9 Performance measurement



TQM Implementation



TQM Implementation steps

How to Implement Total Quality Management?

1. Commitment from Employees
2. Quality Improvement Culture
3. Continuous Improvement in Process
4. Co-operation from Employees
5. Focus on Customer Requirements
6. Effective Control shall be laid down

Step 1

- Gain commitment to the change made by the organization's top team.

Step 2

- Develop a shared mission or vision of the business or where change is required.

Step 3

- Define the measurable objectives.

Step 4

- Develop the mission into its critical success factors (CSFs) to coerce and move it forward.

Step 5

- Break down the critical success factors into the key or critical processes and gain process ownership.

Step 6

- Break down the critical processes into sub-processes, activities, and tasks.

Step 7

- Monitor and settle the process alignment in response to difficulties of the change process.

Poor Practices

- Leaders not giving clear direction
- Not understanding, or ignoring competitive positioning
- Each department working only for itself
- Trying to control people through systems
- Confusing quality with grade
- Accepting that a level of defects or errors is inevitable
- Firefighting, reactive behavior
- The “*It's not my problem*” attitude

Benefits of TQM

- 1 Strengthened competitive position.
- 2 Adaptability to changing or emerging market conditions and to environmental and other government regulations.
- 3 Higher productivity.
- 4 Enhanced market image.
- 5 Elimination of defects and waste.
- 6 Reduced costs and better cost management.
- 7 Higher profitability.

TQM at Motorola

99000 workers

53 major facilities worldwide

Products- semiconductors and equipment for defence, aerospace, data communication, automotive and other industrial uses.



1. Launched an ambitious project for 10 fold rise in quality of its products and services
2. Zero defect in every thing
3. Regular visits to customer sites.
4. Customer feedback collected regularly through survey
5. Six-sigma (DMAIC)(at most 3.4 defects per million products)
6. Reducing total cycle time
7. PMP (Participative Management Program), composed of employees who work in same area
8. PMP (Participative Management Program) teams meet regularly
 - * Identify new initiatives
 - * Work on problems
 - * Reward high quality work
 - * Training on quality tools and techniques

Vision, Mission & Quality Policy

An example of a more elaborate vision statement is

L&T shall be a professionally-managed Indian multinational, committed to total customer satisfaction and enhancing shareholder value.

L&T shall be an innovative, entrepreneurial and empowered team constantly creating value and attaining global benchmarks.

L&T shall foster culture of caring, trust and continuous learning while meeting expectations of employees, stakeholders and society.¹⁵

LARSEN & TOUBRO

Ford Motor Company is a worldwide leader in automatic and automotive-related products and services as well as the newer industries such as aerospace, communications, and financial services. Our mission is to improve continually our products and services to meet our customers' needs, allowing us to prosper as a business and to provide a reasonable return to our shareholders, the owners of our business.

FORD MOTOR COMPANY

A simpler mission statement is

Our mission is to help our customers achieve their business goals through excellence in global product realization. We will enable this through solutions based on innovative technologies, efficient processes and world-class competencies in our people.

GEOMETRIC SOFTWARE

Vision

- To be a globally respected corporation that provides best-in-class business solutions using technology

Mission

- To achieve objectives with fairness, honesty, and courtesy towards clients, employees, and society

Values

- Commitment, integrity, personal development, leadership, teamwork, and work life balance

Quality Policy

Infosys is an ISO certified company with robust focus on process quality. Our quality framework focuses on quality control (call monitoring, transaction monitoring, etc.) quality assurance (process audits, process control, etc.) and quality improvement (Six sigma, BPR, etc.).

Xerox is a quality company. Quality is the basic business principle for Xerox. Quality means providing our external and internal customers with innovative products and services that fully satisfy their requirements. Quality is the job of every employee.

XEROX CORPORATION

A more elaborate quality policy statement is

Tata Motors is committed to maximizing customer satisfaction and strives to achieve the goal of excellence, by continual improvement, through ongoing design and development, manufacture and sale of reliable, safe, cost-effective,

quality products and services of international standards, using environmentally sustainable technologies, for improving levels of efficiency and productivity within its plants and ancillaries.

Tata Motors also has commitment towards improving the quality of life of its employees, both within and outside its plants and offices, through improved work practices and social welfare schemes.

RATAN N. TATA, CHAIRMAN

Thermax India

Vision:

To be a respected and preferred provider of advanced thermal power generation solutions in India.

Mission:

Deliver innovative, reliable and cost effective solutions in advanced thermal power generation

Develop strategic relationships with customers, suppliers and partners

Provide a challenging, rewarding and safe working environment

Build a reputable enterprise and create value for our stakeholders

Ensure customer satisfaction through assured quality and after sales service

Thermax India cont.

Quality Policy:

Build mutually beneficial relationships with our customers by understanding their needs and providing solutions to exceed their expectations.

Establish effective processes and systems, designed to meet all safety, quality, cost and delivery objectives of the business.

Promote a culture of Continual Improvement in our business practices, led by Top Management.

Maintain a skilled, knowledgeable and accountable workforce through individual competency development, effective communications and employee engagement.

Thank you, for your time and attention!



The LNMIIT: Where young dreams take shape



Quality management gurus and their quality philosophies

Quality Management Gurus

W. Edwards Deming,

Joseph M Juran,

Philip B Crosby,

Armand V Feigenbaum,

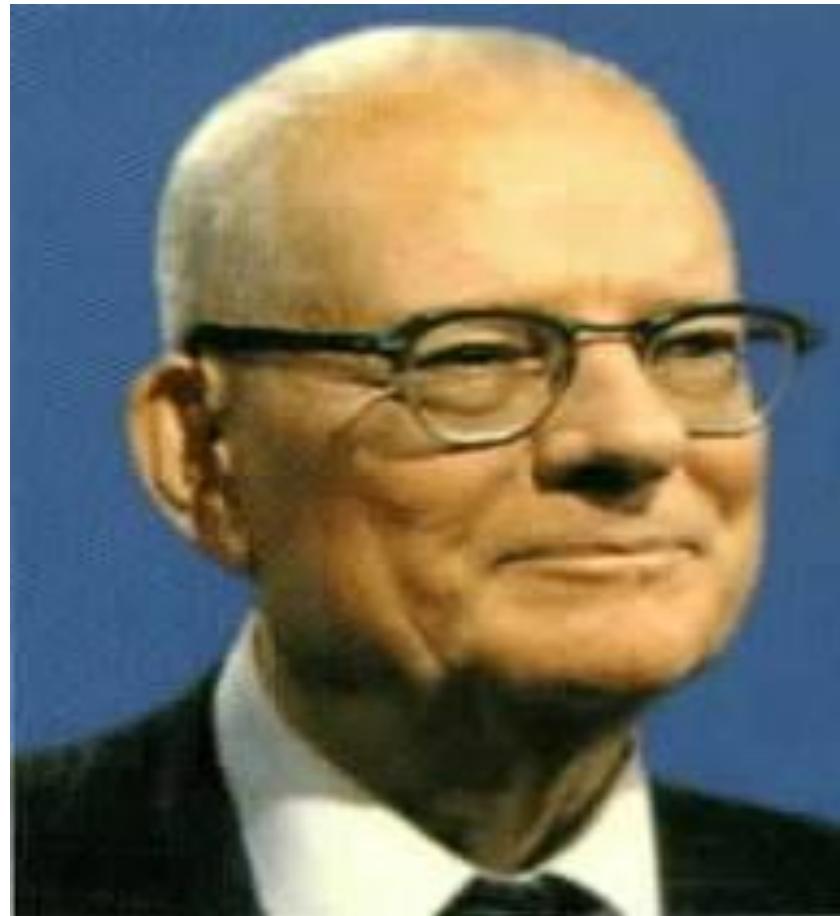
Kaoru Ishikawa,

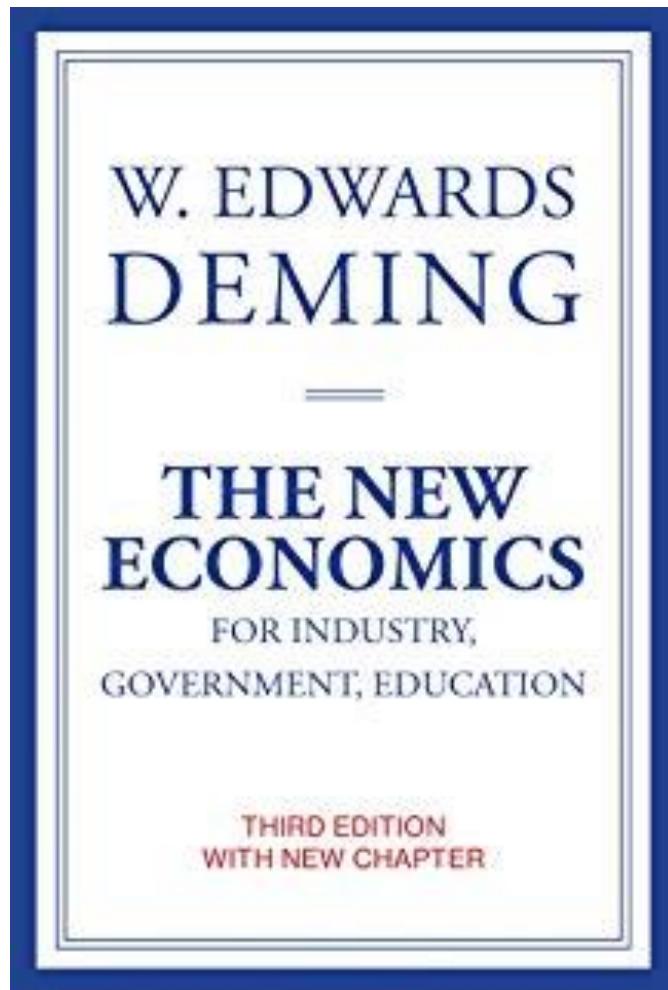
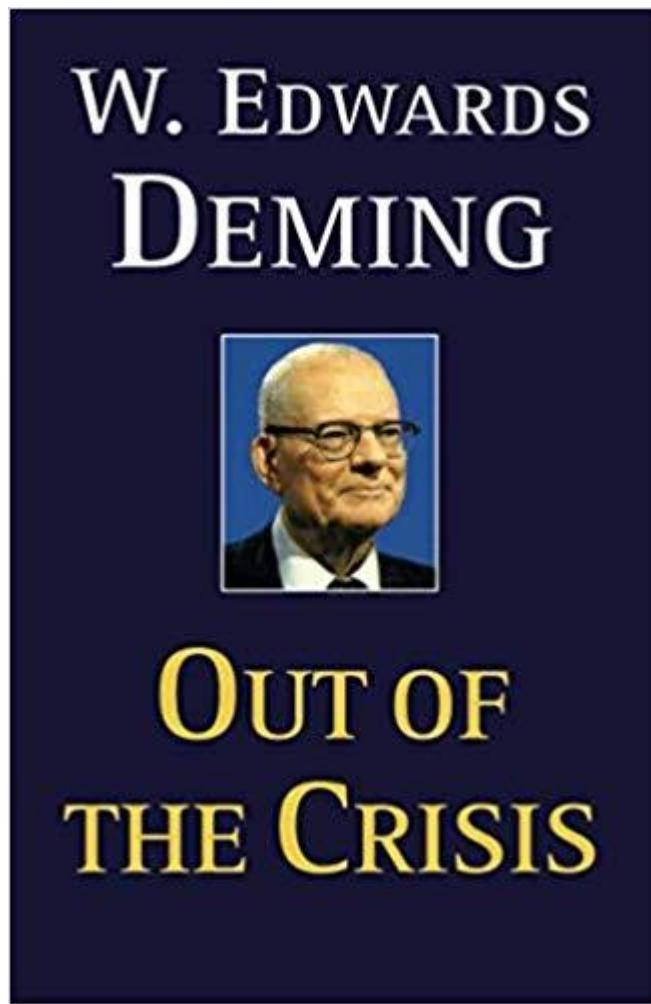
Shigeo Shingo.

Dr. William. Edwards Deming

(October 14, 1900 – December 20, 1993)

- American engineer
- Management consultant
- Father of the quality movement
- Influential in post-WWII Japan.





Deming's 14 Points

1. Create constancy of purpose for improvement of product & service.
2. Adopt the new philosophy.
3. Cease dependency on mass inspection.
4. End the practice of awarding business on price tag alone.
5. Improve constantly and forever the system of production & service.
6. Institute training.
7. Institute leadership.
8. Drive out fear .
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations, and targets for the workforce.
11. Eliminate numerical quotas.
12. Remove barriers to pride of workmanship.
13. Institute a vigorous program of education & retraining.
14. Take action to accomplish the transformation.

1. Create a Constant Purpose Toward Improvement

- Plan for quality in the **long term**.
- Resist reacting with short-term solutions.
- Don't just do the same things better – **find better things to do**.
- Predict and **prepare for future challenges**, and always have the goal of getting better.

2. Adopt the New Philosophy

- Embrace **quality throughout the organization**.
- Put your **customers' needs first**, rather than react to competitive pressure – and design products and services to meet those needs.
- Be **prepared for a major change** in the way business is done. It's about leading, not simply managing.
- Create your **quality vision**, and implement it.

3. Stop Depending on Inspections

- **Inspections are costly and unreliable** – and they don't improve quality, they merely find a lack of quality.
- Build **quality into the process** from start to finish.
- Don't just find what you did wrong – eliminate the "wrongs" altogether.
- Use **statistical control** methods – not physical inspections alone – to prove that the process is working.

4. Use a Single Supplier for Any One Item

- Quality relies on **consistency** – the less variation you have in the input, the less variation you'll have in the output.
- Look at suppliers as your partners in quality. Encourage them to spend time improving their own quality – they shouldn't compete for your business based on price alone.
- Analyze the **total cost** to you, **not just the initial cost** of the product.
- **Use quality statistics** to ensure that suppliers meet your quality standards.

5. Improve Constantly and Forever

- Continuously improve your systems and processes. Deming promoted the **Plan-Do-Check-Act** approach to process analysis and improvement.
- Emphasize **training and education** so everyone can do their jobs better.
- Use **kaizen** as a model to reduce waste and to improve productivity, effectiveness, and safety.

6. Use Training on the Job

- **Train for consistency** to help reduce variation.
- Build a foundation of common knowledge.
- Allow workers to understand their roles in the "big picture."
- Encourage staff **to learn from one another**, and provide a culture and environment for effective **teamwork**.

7. Implement Leadership

- Expect your supervisors and managers to **understand their workers and the processes** they use.
- Don't simply supervise – **provide support and resources** so that each staff member can do their best. **Be a coach not a policeman.**
- Figure out what each person actually needs to do their best. For example, hardware, software, other tools, and training.
- Emphasize the importance of **participative management** and transformational leadership.
- Find ways to **reach full potential**, and don't just focus on meeting targets and quotas.

8. Eliminate Fear

- Allow people to perform at their best by ensuring that they're **not afraid to express ideas or concerns.**
 - Let everyone know that the goal is to achieve high quality by doing more things right – and that **you're not interested in blaming people when mistakes happen.**
 - Make workers **feel valued**, and encourage them to look for better ways to do things.
- Ensure that **leaders are approachable** and that they work with teams to act in the company's best interests.
- Use open and honest communication to remove fear from the organization.

9. Break Down Barriers Between Departments

- Build the "**internal customer**" concept – recognize that each department or function serves other departments that use their output.
- Build a **shared vision**.
- Use **cross-functional teamwork** to build understanding and reduce adversarial relationships.
- Focus on **collaboration and consensus** instead of compromise.

10. Get Rid of Unclear Slogans

- Let people know exactly what you want – don't make them guess. "**Excellence in service**" is short and memorable, but what does it mean? How is it achieved? The message is clearer in a slogan like "**Always be striving to be better.**"
- However, don't let words and nice-sounding phrases replace effective leadership. **Outline your expectations**, and then **praise people** face-to-face for doing good work.

11. Eliminate Management by Objectives

- Look at how processes are carried out, not just numerical targets. Deming said that production targets can encourage high output but result in low quality.
- **Provide support and resources** so that both production levels **and** quality are high and achievable.
- **Measure the process rather than the people** behind the process.

12. Remove Barriers to Pride of Workmanship

- Allow everyone to take pride in their work **without being rated or compared**.
- **Treat workers equally**, and **don't make them compete with colleagues for monetary or other rewards**. Over time, the quality system will naturally raise the level of everyone's work to an equally high level.

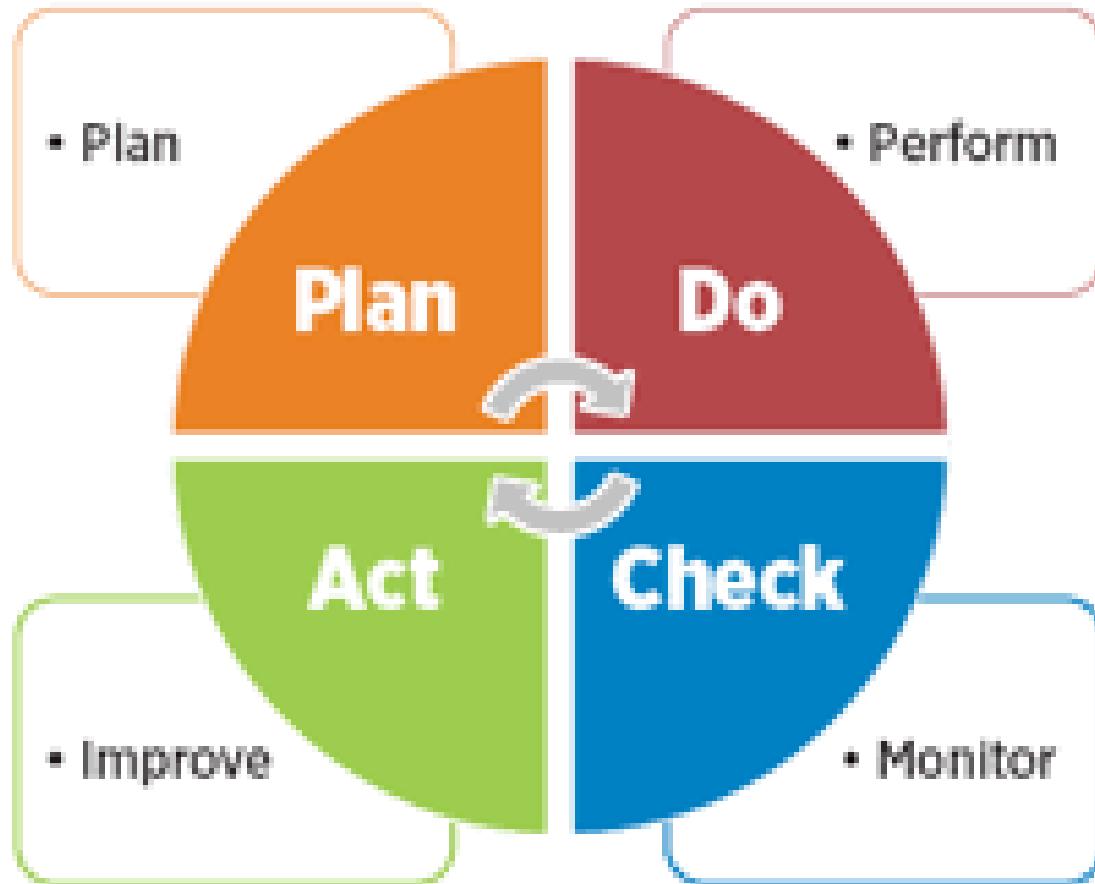
13. Implement Education and Self-Improvement

- Improve the current **skills** of workers.
- Encourage people to learn new skills to prepare for future changes and challenges.
- Build skills to make your **workforce more adaptable to change**, and better able to find and achieve improvements.

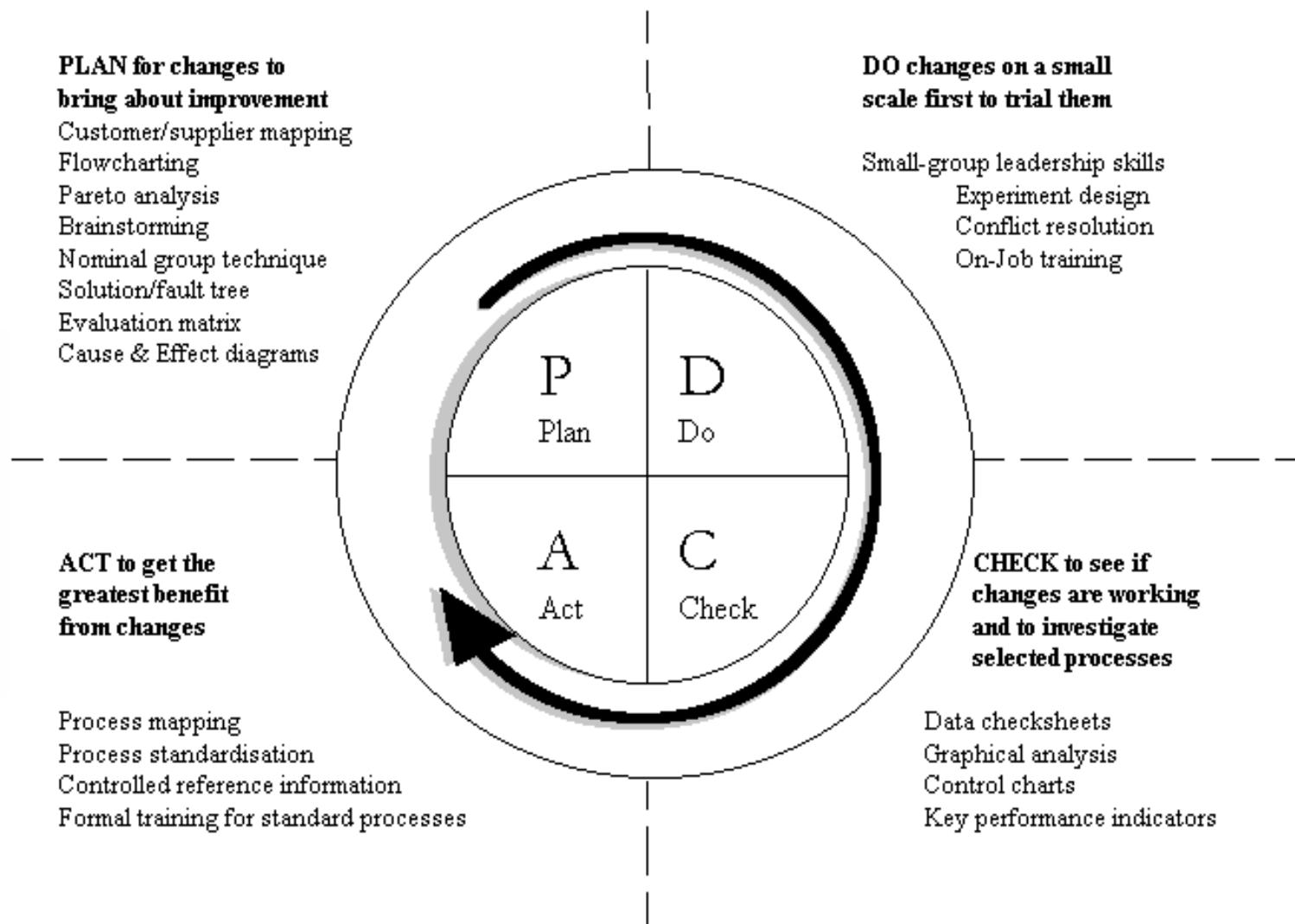
14. Make "Transformation" Everyone's Job

- Improve your overall organization by having **each person** take a step toward quality.
- **Analyze each small step**, and ask yourself how it fits into the bigger picture.
- Use effective change management principles to introduce the new philosophy and ideas in Deming's 14 points.

Deming's PDCA Cycle



How to define quality?





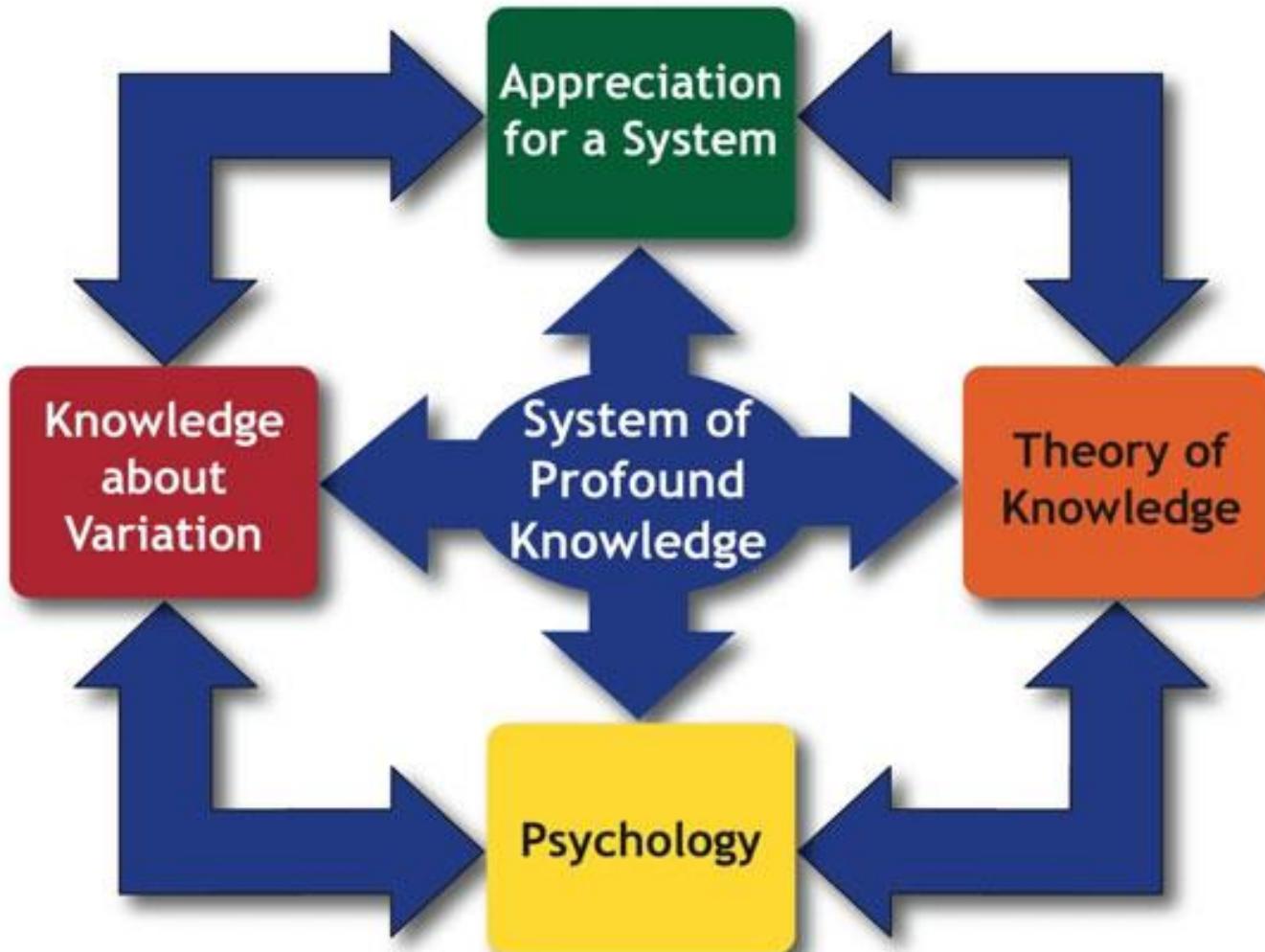
Deming's 7 Deadly Sins

- Lack of constancy of purpose
- Emphasis on short term results
- Evaluation-- merit rating, annual review
- Mobility of management
- Relying on visible figures alone
- Excessive medical cost
- Excessive legal costs

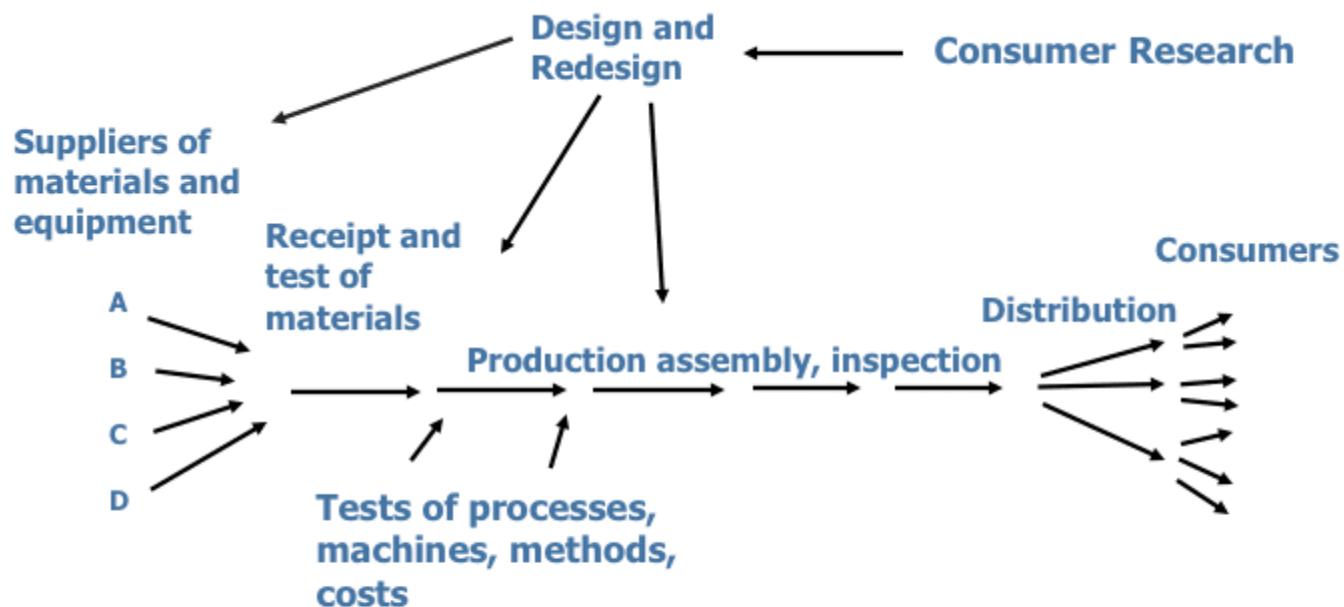
24

<http://www.jimleonardpi.com/blog/management-s-seven-deadly-diseases/>

Dr W. Edwards Deming's – System of Profound Knowledge



Appreciation for a system



Out of the Crisis, page 4

The view of an organization as a system by W. Edwards Deming from Japan lectures in the 1950's and also found in Out of the Crisis.

1.Appreciation of a System:

- ❖ A business is a system.
- ❖ Action in one part of the system will have effects in the other parts. We often call these “unintended consequences.”
- ❖ By learning about systems we can better avoid these unintended consequences and optimize the whole system.

2.Knowledge of Variation:

- ❖ One goal of quality is to reduce variation. Managers who do not understand variation frequently increase variation by their actions.
- ❖ Critical to this is understanding the two types of variation — **Common cause** which is variation from the system and **Special cause** which variation from outside the system

3.Theory of Knowledge:

- ❖ There is no knowledge without theory. Understanding the difference between **theory** and **experience** prevents shallow change.
- ❖ Theory requires prediction, not just explanation. While you can never prove that a theory is right, there must exist the possibility of proving it wrong by testing its predictions.

4.Understanding of Psychology:

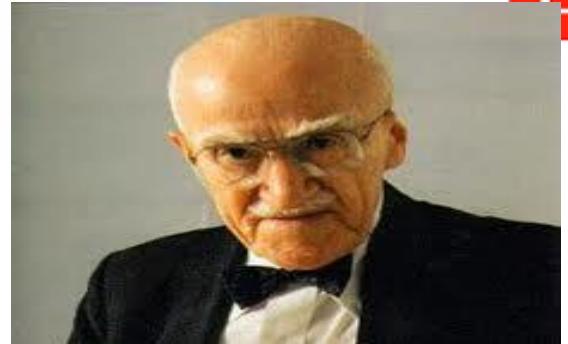
To understand the interaction between work systems and people, leaders must seek to answer questions such as: How do people learn? How do people relate to change? What motivates people?

- ❖ A system view of the organization views the flow of the processes to create products and services. The interactions between various processes is respected.
- ❖ Taking a systems approach results in management viewing the organization in terms of many internal and external interrelated connections and interactions, as opposed to discrete and independent departments or processes governed by various chains of command.
- ❖ When all the connections and interactions are working together to accomplish a shared aim, a business can achieve tremendous results—from improving the quality of its products and services, to raising the entire esprit de corps of a company.
- ❖ A system view helps create a long term focus. Rather than seeing incidents as isolated (and often looking for the person to blame for a bad result) a system view allows managers to focus on the systemic drivers of results.
- ❖ *The aim proposed here for any organization is for everybody to gain – stockholders, employees, suppliers, customers, community, the environment – over the long term.*
- ❖ Dr. Deming continually increased the percentage of problems attributable to the system instead of to special causes (outside of the system) such as blaming a person for a mistake. Obviously that doesn't mean those problems are inevitable, it just means that the most effective way to improve and avoid those issues in the future is to improve the system.

Dr Joseph M Juran



- Following his high school graduation in 1920, in 1924 Dr. Juran graduated with a degree in **electrical** engineering and was hired by Western Electric's Hawthorne Works
- began working on **statistical sampling** and quality **control techniques** – and this early introduction to quality analysis and management
- After WWII, Juran became a **professor** of industrial engineering at **New York University**, teaching quality control.
- Dr. Juran's work in the field of **quality management** drew particular interest in **Japan**, and in **1954** he went there to discuss his theories at the invitation of the Japanese Union of Scientists and Engineers.



American engineer
and management
consultant

(Dec. 24, 1904 – Feb. 28, 2008)

Juran's Quality Trilogy



Juran's Quality Trilogy Cont.

It consists of the three processes that together make up the overall quality management journey

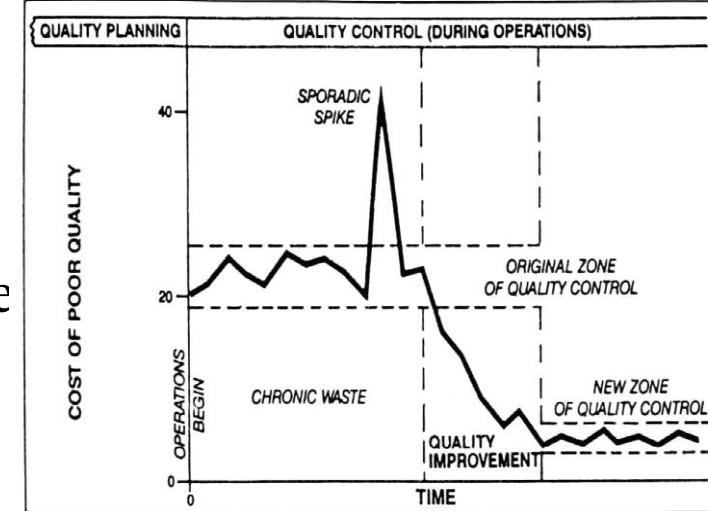
They are :

Quality planning – This is effectively the

design stage during which an organization establishes an understanding of its target **customer's needs**, defines the features and specifications of the product or service, and devises the processes that will deliver on those needs.

Quality control – Ongoing quality control involves periodic **checks and inspections, and tracking metrics** to ensure the process is in control and meeting specifications. Where defects are identified, **root causes** need to be identified to enable corrective and preventative action.

Quality improvement – While organizations may expect to achieve incremental improvements by day-to-day means, breakthrough quality improvement involves the identification of areas where processes can be optimized, and the organized creation of beneficial change in order to attain measurably improved performance.



(Ref: <https://www.juran.com/blog/the-juran-trilogy-quality-planning/>)

The Pareto Principle

The Pareto Principle – also widely known as the **80/20 rule** – follows the observations of economist Vilfredo Pareto, whose studies showed that 80% of the **land in Italy** was owned by 20% of the population. Juran realized that this same 80/20 rule could also be applied to quality issues; he coined the phrase “**the vital few and the trivial many**” to convey that a small percentage of root causes can result in a high percentage of problems or defects.

The principle applies in other contexts making it a universal principle. For example, 20% of an organization’s products may account for 80% of its profits, or 20% of team members may contribute to 80% of successful results in a given project. In terms of quality control, Pareto analysis can help identify which factors account for the greatest effects in terms of scrap, repairs or cost, and this information can in turn be used to drive improvement in processes.

Quality by Design

- ❖ It is a fundamental principle of the quality planning stage
- ❖ By making the planning of quality an integral part of the design process, an organization can ensure that its new product or service is created around features that will produce customer satisfaction.
- ❖ Dr. Juran established the universal methods that created breakthroughs in Quality Improvement.
- ❖ These methods were the precursor to Six Sigma. It was Dr. Juran who put the Define in DMAIC.

Juran's 10 Steps to Quality Improvement

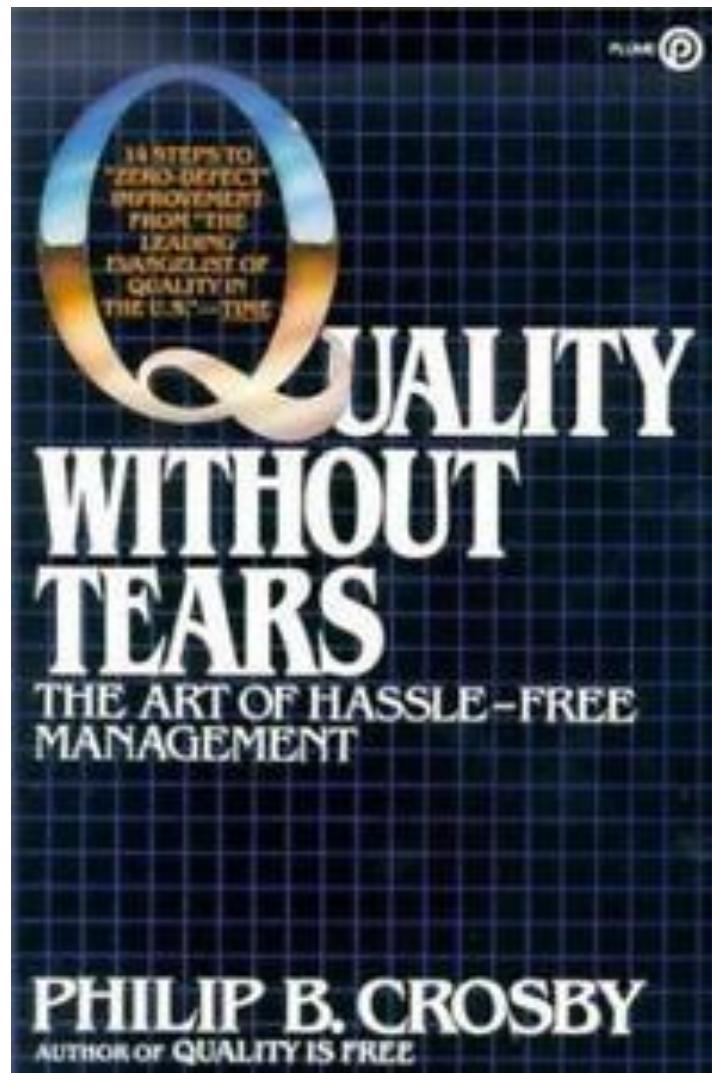
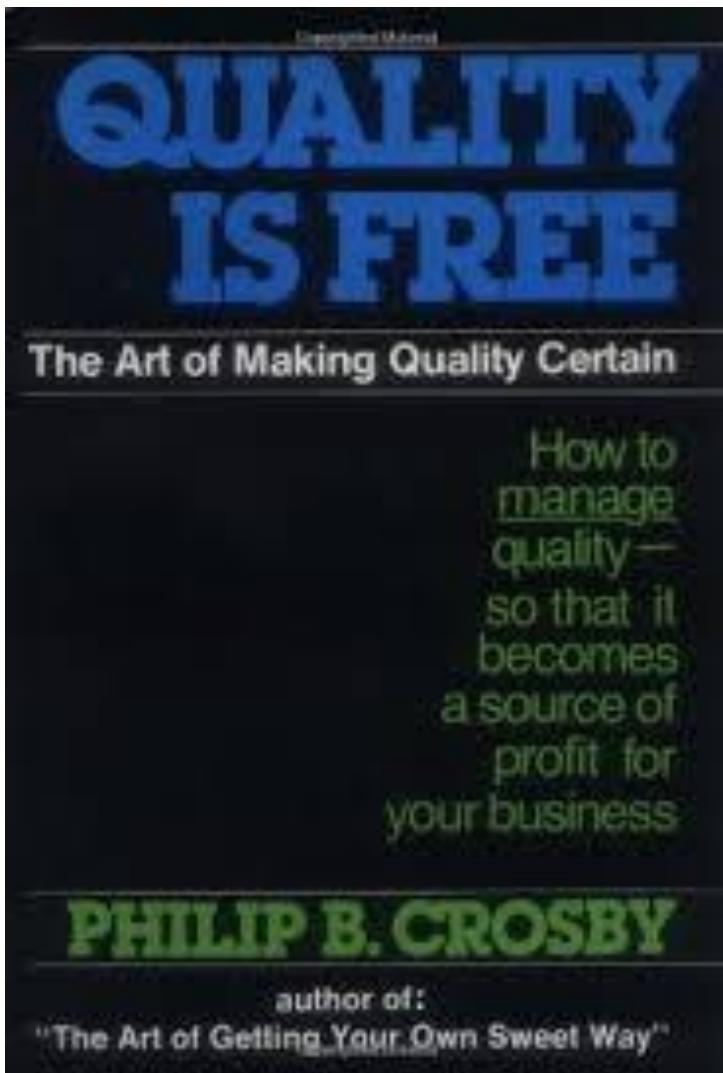
- Build awareness of the need and opportunity for improvement
- Set goals for improvement
- Organise to reach the goals
- Provide training
- Carry out projects to solve problems
- Report progress
- Give recognition
- Communicate results
- Keep score of improvements achieved
- Maintain momentum

Philip B Crosby



- **Philip Bayard "Phil" Crosby**, (June 18, 1926 – August 18, 2001) was an American businessman and author who contributed to management theory and quality management practices.
- Crosby initiated the **Zero Defects** program at the Martin Company. As the quality control manager of the Pershing missile program, Crosby **was credited with a 25 percent reduction in the overall rejection rate and a 30 percent reduction in scrap costs**.

Books by Crosby



Crosby's Four absolutes of quality

Absolute of Quality	Description
Definition	Quality is conformance to requirements, nothing more or less and certainly not goodness or elegance.
System	Prevention not appraisal.
Performance standard	“Zero defects” not something close to it.
Quality measurement	Price of non-conformance (how much the defects cost the company).

1. Absolutes of Quality definition of quality is conformance to requirements, not goodness.

- This is a simple way but a specific one to define quality for each and everyone. thus, It puts onus on management to take the process of setting requirements seriously.
- Quality is not about goodness, but it's about meeting requirements.
- The management needs to respond according to it.
- They need to decide what it needs. If they don't, the operator should do. In addition, management has to provide enough tools and techniques to achieve the requirements. It requires continuous support and encouragement .

2. The system of quality is prevention.

- As we know, prevention is better than correction. also, In the whole process, you need to analyze what goes wrong and what is the preventive action required. So, we can reduce the extent of damage.
- In business, the primary method for ensuring quality is inspection, as it is a simple but effective way to ensure that doing it right the first time happens every time.

3. The performance standard is zero defects.

- Here, Crosby is stating that nothing less than perfect quality has to be the aim, setting targets below 100% is sort of downward.
- As we know, when we are dealing with human behavior, perfection is not always realistic thing.
- But we still want to expect perfection and be confident . It doesn't mean the work would have zero defect, but it means that there should be no known defects.
- It means that if a defect is discovered, then it should be fixed. There should be no known defect.

4. The measurement of quality is the price of non-conformance , not indices.

- This measure looks for the cost of failure when something is done incorrectly and does not meet their requirements.
- Most failure costs are caused when the management does not set achievable requirements and does not insist that all employees take requirements seriously.

Summary-Four Principles of Zero Defects By Crosby

1. Quality is conformance to requirements
2. Defect prevention is preferable to quality inspection and correction
3. Zero Defects is the quality standard
4. Quality is measured in monetary terms – the Price of Nonconformance

- ✓ To support his Four Absolutes of Quality Management, Crosby developed the **Quality Management Maturity Grid** and **Fourteen Steps of Quality Improvement**.
- ✓ Crosby sees the Quality Management Maturity Grid as a first step in moving an organization towards quality management.
- ✓ After a company has located its position on the grid, it implements a quality improvement system based on Crosby's Fourteen Steps of Quality Improvement.

Quality Management Maturity Grid (Crosby)			Assessor:	Department:	
Measurement Categories	Stage 1: <i>Uncertainty</i>	Stage 2: <i>Awakening</i>	Stage 3: <i>Enlightenment</i>	Stage 4: <i>Wisdom</i>	Stage 5: <i>Certainty</i>
Management understanding and attitude	No comprehension of quality as a management tool. Tend to blame quality department for "quality problems".	Recognising that quality management may be of value but not willing to provide money or time to make it all happen.	While going through quality improvement programme learn more about quality management; becoming supportive and helpful.	Participating. Understand absolutes of quality management. Recognise their personal role in continuing emphasis.	Consider quality management as an essential part of company system.
Quality organisation status	Quality is hidden in manufacturing or engineering departments. Inspection probably not part of organisation. Emphasis on appraisal and sorting.	A stronger quality leader is appointed but main emphasis is still on appraisal and moving the product. Still part of manufacturing or other.	Quality department reports to top management, all appraisal is incorporated and manager has role in management of company.	Quality manager is an officer of company; effective status reporting and preventive action. Involved with customer affairs and special assignments.	Quality manager on board of directors. Prevention is main concern. Quality is a thought leader.
Problem handling	Problems are fought as they occur; no resolution; inadequate definition; lots of yelling and accusations.	Teams are set up to attack major problems. Long-range solutions are not solicited.	Corrective action communication established. Problems are faced openly and resolved in an orderly way.	Problems are identified early in their development. All functions are open to suggestion and improvement.	Except in the most usual cases, problems are prevented.
Cost of quality as % of sales	Reported: Unknown Actual: 20%	Reported: 3% Actual: 18%	Reported: 8% Actual: 12%	Reported: 6.5% Actual: 8%	Reported: 2.5% Actual: 2.5%
Quality improvement actions	No organised activities. No understanding of such activities	Trying obvious "motivational" short-range efforts.	Implementation of a multi-step programme (e.g. Crosby's 14-step) with thorough understanding and establishment of each step.	Continuing the multi-step programme and starting other pro-active / preventive product quality initiatives.	Quality improvement is a normal and continued activity.
Summary of company quality posture	"We don't know why we have problems with quality".	"Is it absolutely necessary to always have problems with quality?"	"Through management commitment and quality improvement we are identifying and resolving our problems."	"Defect prevention is a routine part of our operation."	"We know why we do not have problems with quality."

Figure 4.1: Crosby's Quality Management Maturity Grid (Crosby, 1979)



Crosby: 14 Steps to Quality Improvement

- Management commitment
- Quality improvement teams
- Quality measurement
- Cost of Quality evaluation
- Quality awareness
- Corrective action
- Zero defects program
- Supervisor training
- Zero Defects day
- Goal setting
- Error cause removal
- Recognition
- Quality councils
- Do it all over again

Crosby's Cost of Quality

- In his book Quality Is Free, Crosby makes the point that **it costs money to achieve quality, but it costs more money when quality is not achieved.**
- If an organization **designs and builds an item right the first time** (or provides a service without errors), **quality is free.**
- It does not cost anything above what would have already been spent. When an organization has to **rework or scrap an item because of poor quality**, **it costs more.**
- Crosby discusses the **Cost of Quality** and **Cost of Nonconformance** or **Cost of No-quality.**
- The **intention** is to spend more money on **preventing defects** and less on inspection and rework.

Armand V Feigenbaum



- American quality control expert and businessman.
- He devised the concept of **Total Quality Control** which inspired Total Quality Management.

Total quality control is an effective system for integrating the quality development, quality maintenance and quality improvement efforts of the various groups in an organization so as to enable production and service at the most economical levels which allow full customer satisfaction."

- Armand V. Feigenbaum

Feigenbaum's three steps to quality

Feigenbaum's 3 Step Process

- **Quality Leadership**-motivating force for quality improvement
- **Quality Technology** -statistics and machinery used to improve technology
- **Organizational Commitment** -includes everyone in the quality struggle

The Three Steps to Quality

As well as developing the concept of TQM, Feigenbaum developed the idea of the three steps to quality. He defined it as: leadership, modern quality technology, and an organisational commitment to quality. These are:

1. Quality Leadership:

Management should take the lead in enforcing quality efforts. It should be based on sound planning.

2. Management Quality Technology:

The traditional quality programmes should be replaced by the latest quality technology for satisfying the customers in future.

3. Organisational Commitment:

Motivation and continuous training of the total work force tells about the organisational commitment towards the improvement of the quality of the product and the services.

It was here that his approach to quality slightly differed to those of another improvement hero, Deming. He felt that **EVERYONE** should be responsible of quality, not just the management alone. He approached quality 'as a strategic business tool that requires awareness by everyone in the company'.

TOTAL QUALITY CONTROL

THIRD EDITION, REVISED



Armand V.
Feigenbaum

Quality of products and services is
directly influenced by 'Nine Ms'-

- Markets
- Money
- Management
- Men
- Motivation
- Materials
- Machines and Mechanization
- Modern information methods
- Mounting product requirements



Here are Dr Feigenbaum's elements of total quality to lead to a total customer focus:

- ❖ Quality is the customers perception of what quality is, not what a company thinks it is.
- ❖ Quality and cost are the same - not different.
- ❖ Quality is an individual and team commitment.
- ❖ Quality and innovation are interrelated and mutually beneficial.
- ❖ Managing Quality is managing the business.
- ❖ Quality is a principal.
- ❖ Quality is not a temporary or quick fix but a continuous process of improvement.
- ❖ Productivity gained by cost effective demonstrably beneficial Quality investment.
- ❖ Implement Quality by encompassing suppliers and customers in the system.

Dr Kaoru Ishikawa



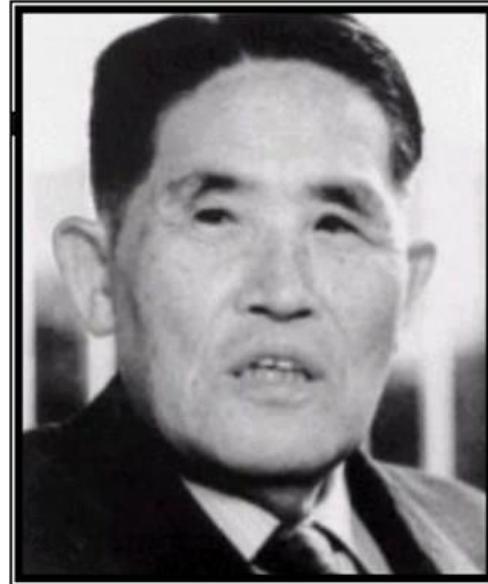
- a Japanese
- a professor in the engineering faculty at the University of Tokyo
- noted for his quality management innovations.

Ishikawa's seven basic tools of quality

Pareto analysis	<i>which are the big problems?</i>
Cause and effect diagrams	<i>what causes the problems?</i>
Stratification	<i>how is the data made up?</i>
Check sheets	<i>how often it occurs or is done?</i>
Histograms	<i>what do overall variations look like?</i>
Scatter charts	<i>what are the relationships between factors?</i>
Process control charts	<i>which variations to control and how?</i>

Shigeo Shingo

- Shigeo Shingo was born in 1909 at Saga City, Japan.
- The Shingo Prize is awarded for excellence in manufacturing as a tribute to Dr. Shingo and his lifelong work .
- He died in 1990.



Shigeo Shingo was associated with:

1. Just-in-Time manufacturing
2. Single minute exchange of die (SMED)
3. Poka-Yoke (Mistake proofing)

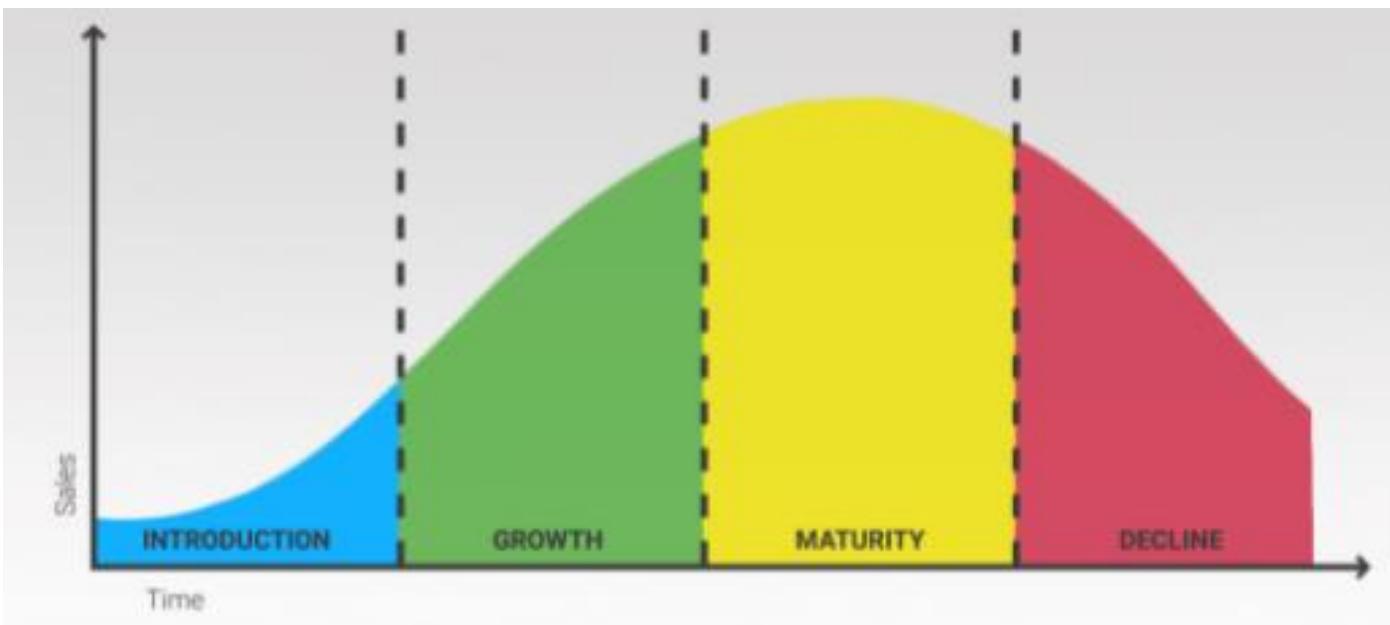
Thank you, for your time and attention!



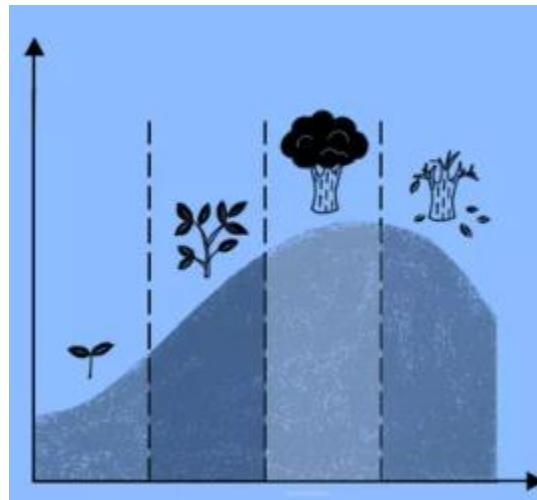
The LNMIIT: Where young dreams take shape



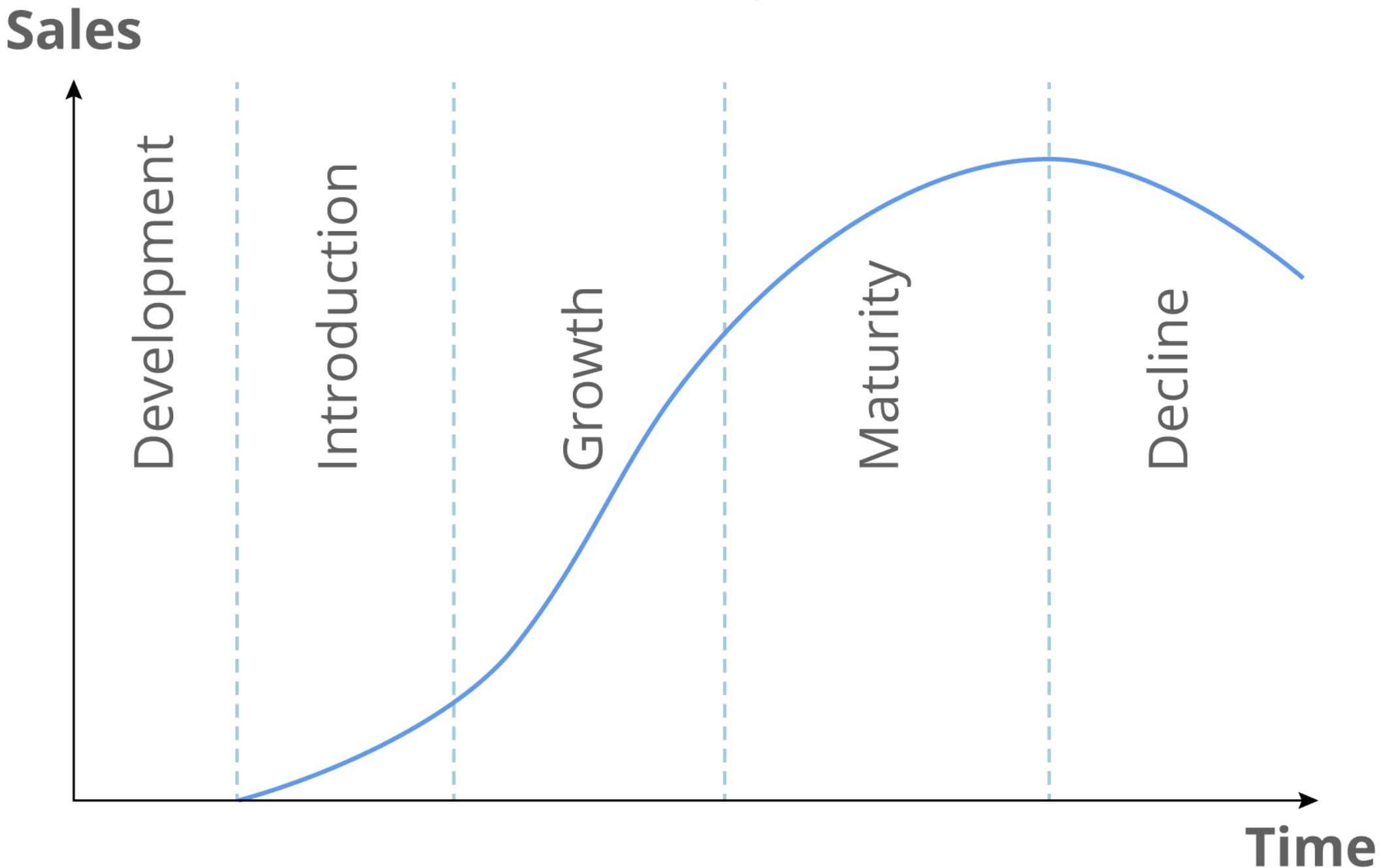
Product life cycle



The product life cycle is the process a product goes through from when it is first introduced into the market until it declines or is removed from the market. The life cycle has four stages - introduction, growth, maturity and decline.

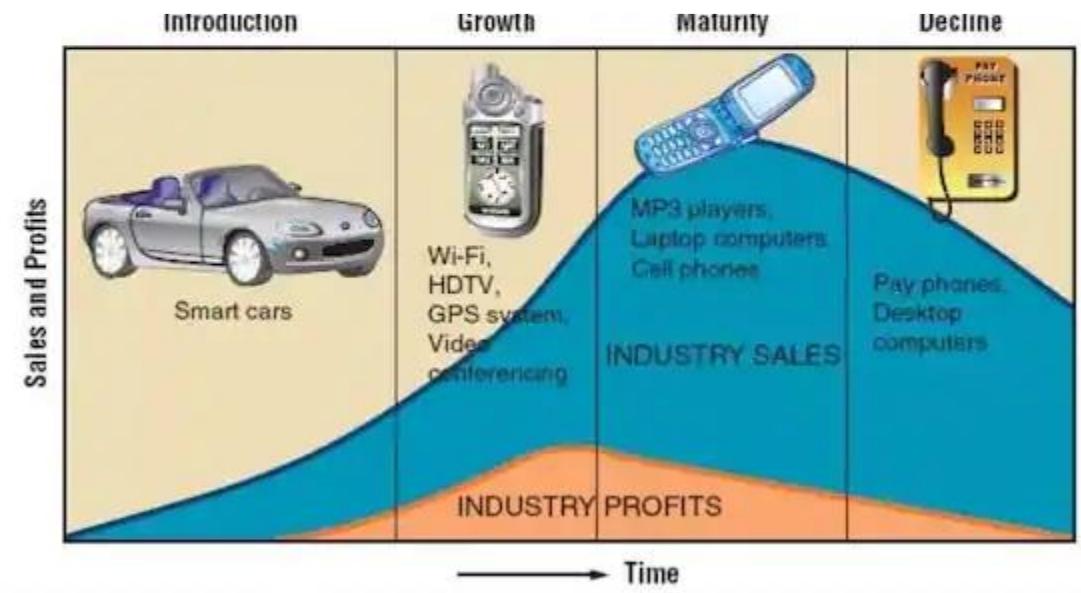


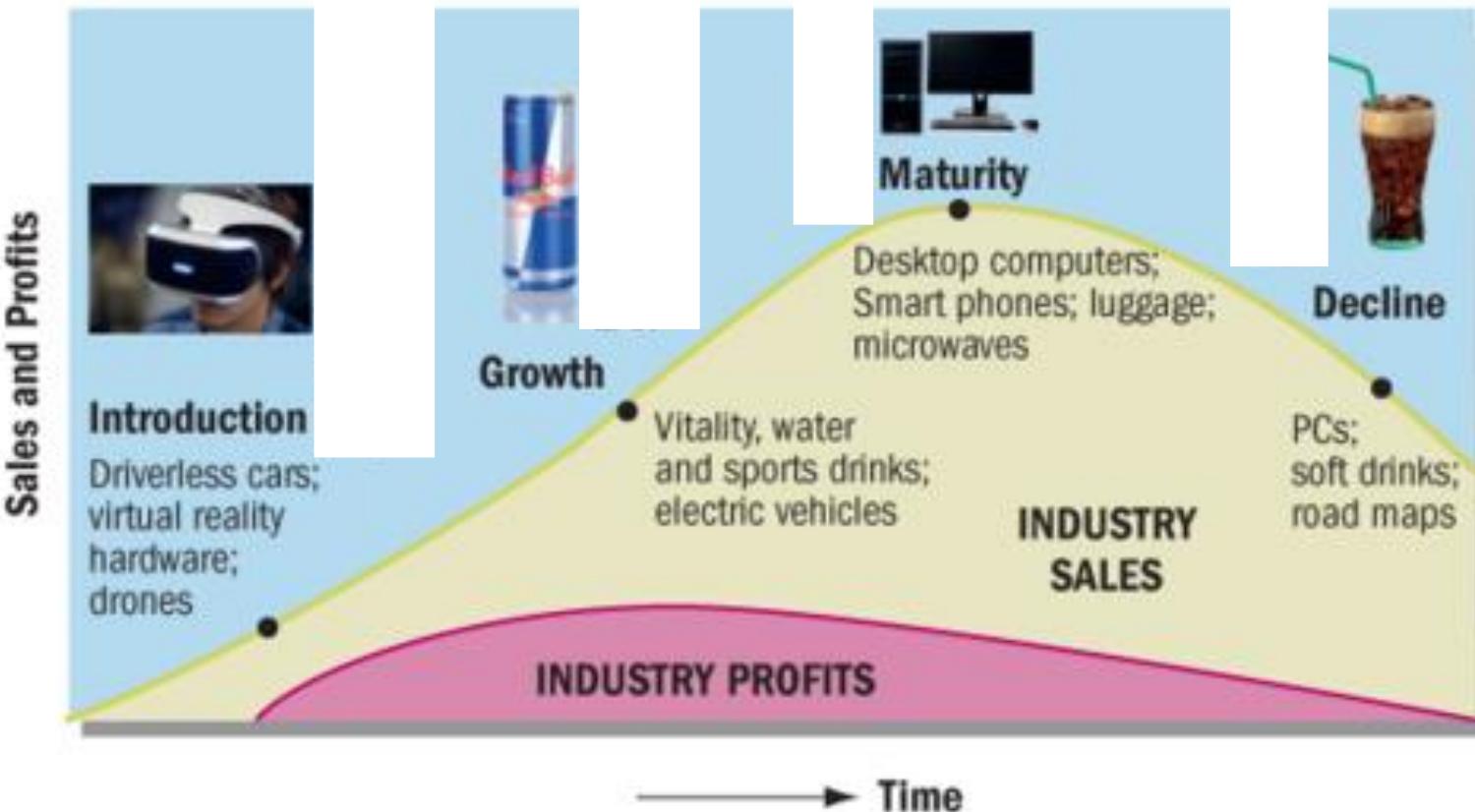
Product life cycle



Examples

Examples





References:

<https://www.investopedia.com/terms/p/product-life-cycle.asp>

<https://quizlet.com/516176572/122-product-life-cycle-flash-cards/>

Supplier partnership

Procurement procedure

Steps:

Purchase request

Selection of potential suppliers for calling quotations

Call of quotations from suppliers

Submission of quotations

Negotiations

Contract conclusion

Delivery and inspection

Payment

TQM related expectations from Suppliers

- 1. Strict Compliance**
- 2. Assurance of Quality**
- 3. Fair Price**
- 4. Observance of Delivery Date**
- 5. Environmental Considerations**
- 6. Assurance of Safety**
- 7. Maintenance and After-Sale Services**

Parameters for evaluation of suppliers

1 Company profile

Ownership

Global ability

Dependency

2 Management

Operations Management

Customer satisfaction

Quality Work procedures

Risk management

Parameters for evaluation of suppliers cont.

3 Environment

4 Quality

Quality Planning and Part quality assurance

Quality performance of deliveries.

Reliability

Problem solving

5 Logistics

6 After-market support

Co-operation and after market support

Warranty

Parameters for evaluation of suppliers cont.

7 Competence

Product and industrial technology

Industrial engineering

Customer support and communication

Electronic communication

8 Product Development

Product development process and project support

Engineering experience

Product engineering technology

Prototypes

Research & development

Design changes

Parameters for evaluation of suppliers cont.

9 Economy

Financial Evaluation

Payment Terms

10 Productivity

Process of internal cost reduction

Cost targets

11 Purchasing

Sourcing process

Subcontractor performance

CAPACITY VERIFICATION

Points to be considered:

- 1. MANUFACTURING PLANT & MACHINCERY**
- 2. MANUFACTURING PROCESS**
- 3. TESTING**
- 4. IN – HOUSE QUALITY CONTROL**
- 5. MANPOWER RESOURCES**
- 6. ADEQUACY OF INFRASTRCUTURE FACILITIES**
- 7. GENERAL**

Development of Sources of Production

Bajaj Auto's case of Supplier management

Supply chain of a company includes not only its immediate vendors but also secondary vendors to their immediate vendors.

- Today, Business strategy drives sourcing and supplier management; **build partnerships with suppliers**, in short and long run.
- The focus has shifted on **reducing total cost** rather than cost of individual components.
- The companies are vigorously **reducing supply base** and entering into strategic partnership with its key suppliers.

- Bajaj auto, disclosed about its plans to rationalize, company's supply base.
- Company's efforts in this direction took 5 to 6 years.
- Initially they had over 1000 suppliers.
- The disadvantage was that they could not get economies of scale; neither the company could ask its suppliers to invest in technology, as economies of scale were not there.
- This propelled them to reduce the number of suppliers.
- Now they have less than 200 suppliers.
- Most of these suppliers have developed very good design and manufacturing capabilities and many of them have world-class foreign collaborations.
- Now all of them have huge economies of scale and many of them even export their products.

- When the company grows, the core suppliers are again passed on the benefits of volume that in turn also boosts confidence among suppliers that they are **interdependent**.
- The company in turn gets **better pricing** from its suppliers.
- Bajaj Auto is taking its core group of suppliers to its new plants in Utranchal, Jharkhand and Indonesia. In fact the company has also purchased land for 16 of its suppliers while setting up its new plant in Uttranchal.
- These cluster suppliers will meet 75% of the component requirement of the new Plant.

Outsourcing at Bajaj Auto

- Outsourcing subassemblies or components through a multi tiered supplier base.
- This system has evolved because of need for super specialization in different areas.
- Tier 1 suppliers provide a subassembly or a complete system such as engine subassembly, steering subassembly, transmission, wheel assemblies, car seats, door modules etc rather than discrete parts.
- In such arrangement, first tier supplier is responsible for coordinating with and managing second tier supplier and delivering the complete subassembly or module.
- The second tier supplier is responsible for managing third tier supplier and so on.
- Such approach increases productivity and improves economies of scale.
- Tier 1 has emerged most crucial as it is closest to the vehicle manufacturer.
- For the vehicle manufacturer, benefits include:
 - fast response for new product development,
 - reduced inventory,
 - simplified transactions and
 - focused core competencies.
- Also, it helps in a large reduction in vendors that the firms deal with as also making manufacturing process less complicated with smaller number of parts entering the factory.

- Bajaj Auto has developed clearly defined **communication channels**, order rules, inventory objectives, quality expectations and continuous development framework.
- **Supplier training and development** in the field of design, quality, delivery, cost, administration and technology is an important step taken by Bajaj Auto.
- **Vendor rating** on the basis of quality achievements, on time delivery, price, cooperation in design, flexibility, good communication and efficient paper work is an exercise undertaken regularly.
- Bajaj has set specific criteria for its vendors to qualify for **awards** (which consists of gold, silver and bronze categories). For example, to qualify for gold level awards, 24 months should pass without single complaint being recorded.

Thank you, for your time and attention!



The LNMIIT: Where young dreams take shape



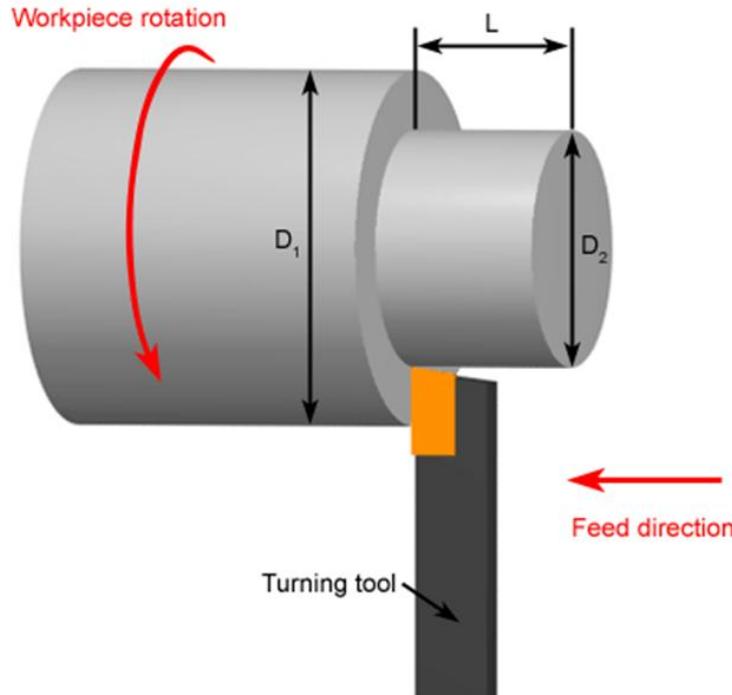
Manufacturing and inspection methods

Manufacturing method	Brief overview
<u>Metal Casting</u>	Expendable mold and permanent mold .
<u>Machining</u>	Turning, boring, drilling, milling, planing, shaping, broaching, grinding, ultrasonic machining, chemical, electrical, and electrochemical machining and high-energy beam machining .
<u>Metal Forming & shaping</u>	Rolling, forging, extrusion, drawing, sheet forming, powder metallurgy, and molding .
<u>Finishing Operations</u>	Honing, lapping, polishing, burnishing, deburring, surface treating, coating and plating processes.
<u>Joining</u>	Welding, brazing, soldering, diffusion bonding, adhesive bonding, and mechanical joining.
<u>Plastics Molding & Forming</u>	Blow Molding, CNC Machining, Centrifugal Casting, Continuous Strip Molding, Compression Molding, Profile Extrusion, Continuous Lamination, Injection Molding, Filament Winding, Thermoforming, Vacuum Forming, Pressure Bag Molding, Pressure Forming, Twin Sheet Forming, Pultrusion, Liquid Resin Molding,
<u>Rapid Prototyping</u>	Stereolithography - SLA or SL, 3D Printing - 3DP, Selective Laser Sintering - SLS, Fused-Deposition Modeling - FDM, Solid-Ground Curing - SGC, Laminated Object Manufacturing - LOM,

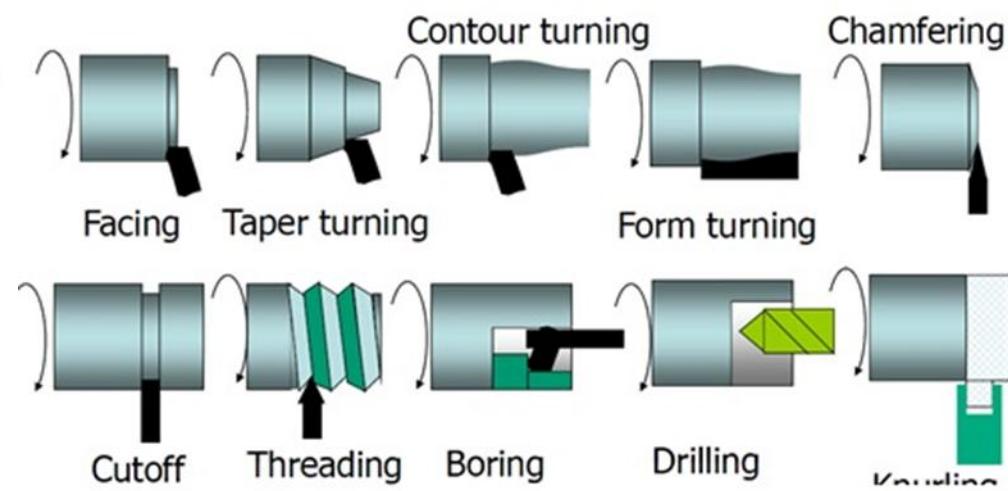
Metal Casting

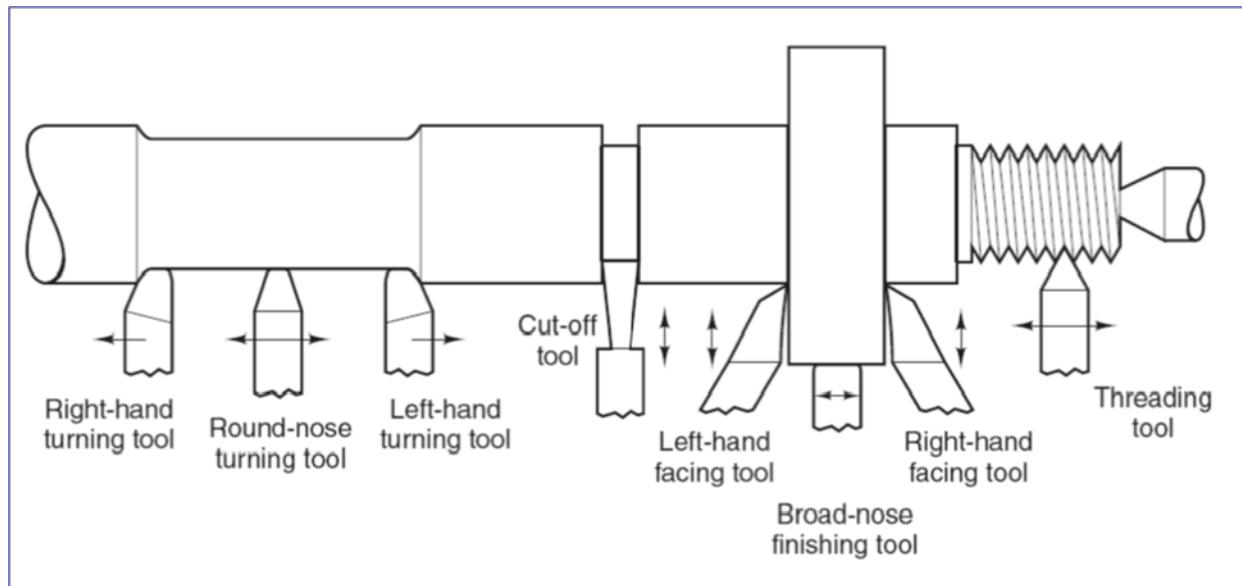


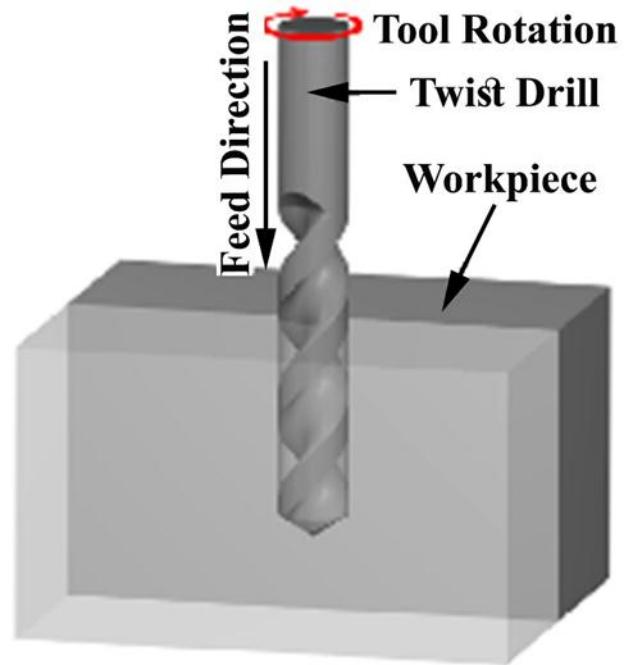
Turning



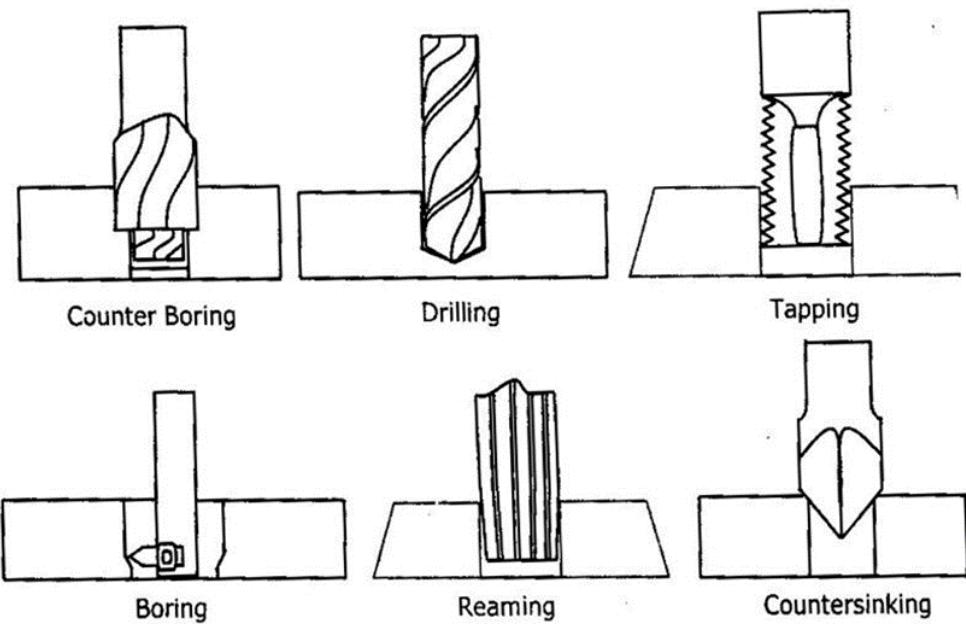
Copyright © 2007 CustomPartNet



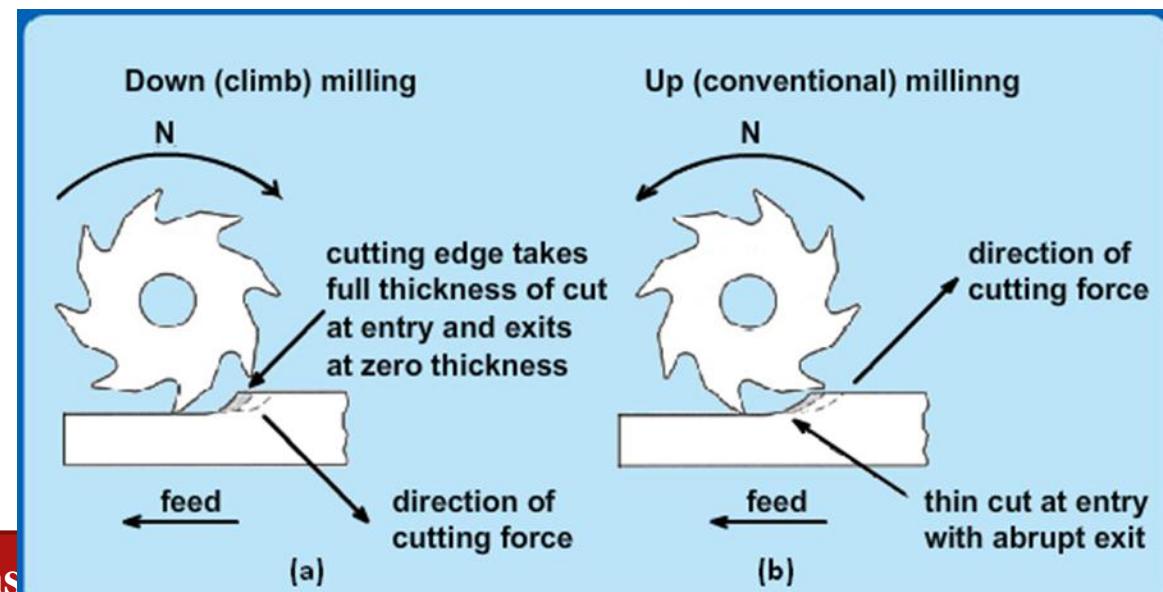
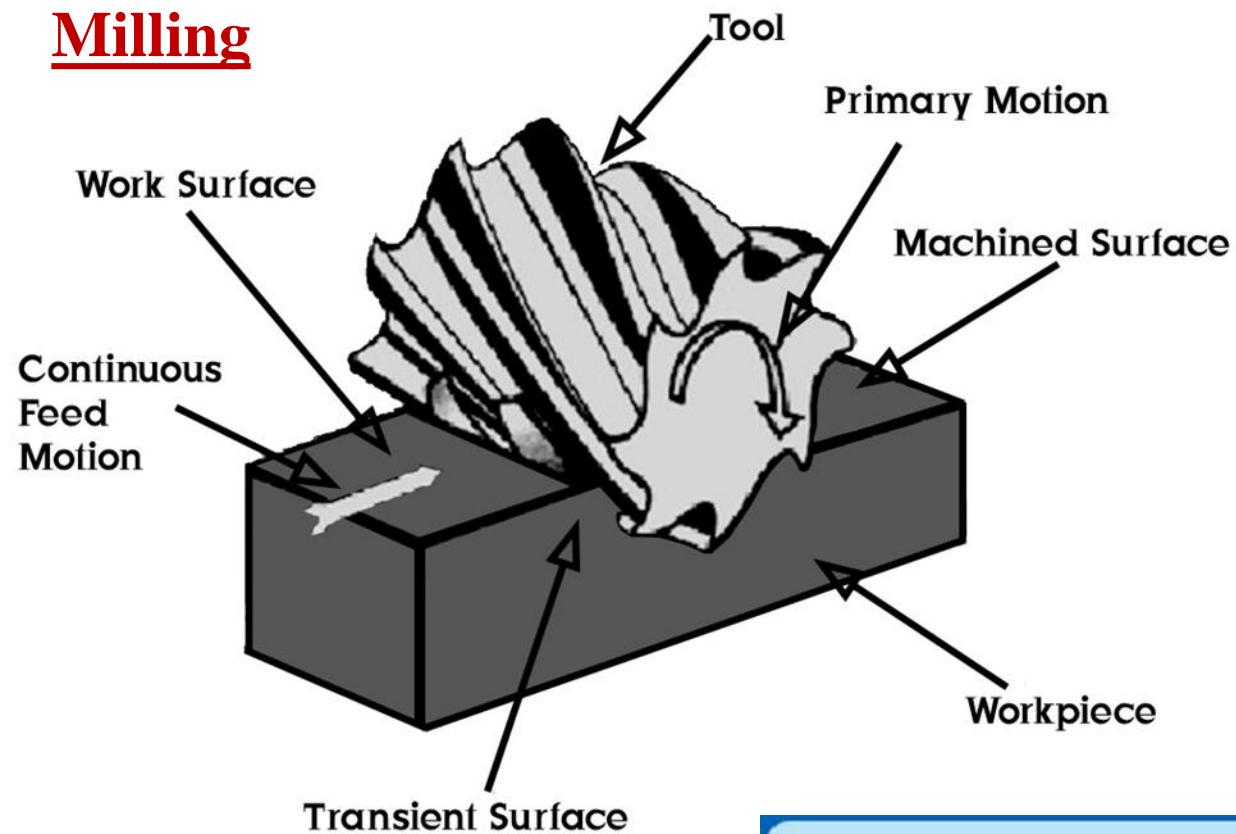




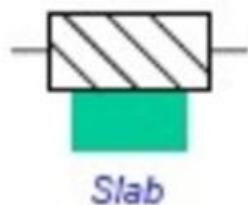
Drilling Operations



Milling



Milling Operations



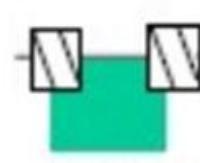
Slab



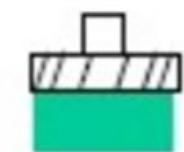
slotting



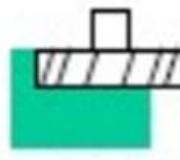
side



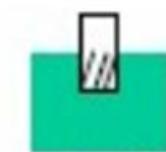
straddle



conventional
face milling



Partial face
milling



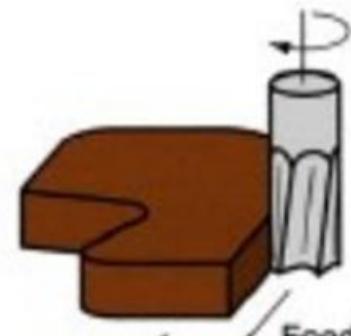
end milling



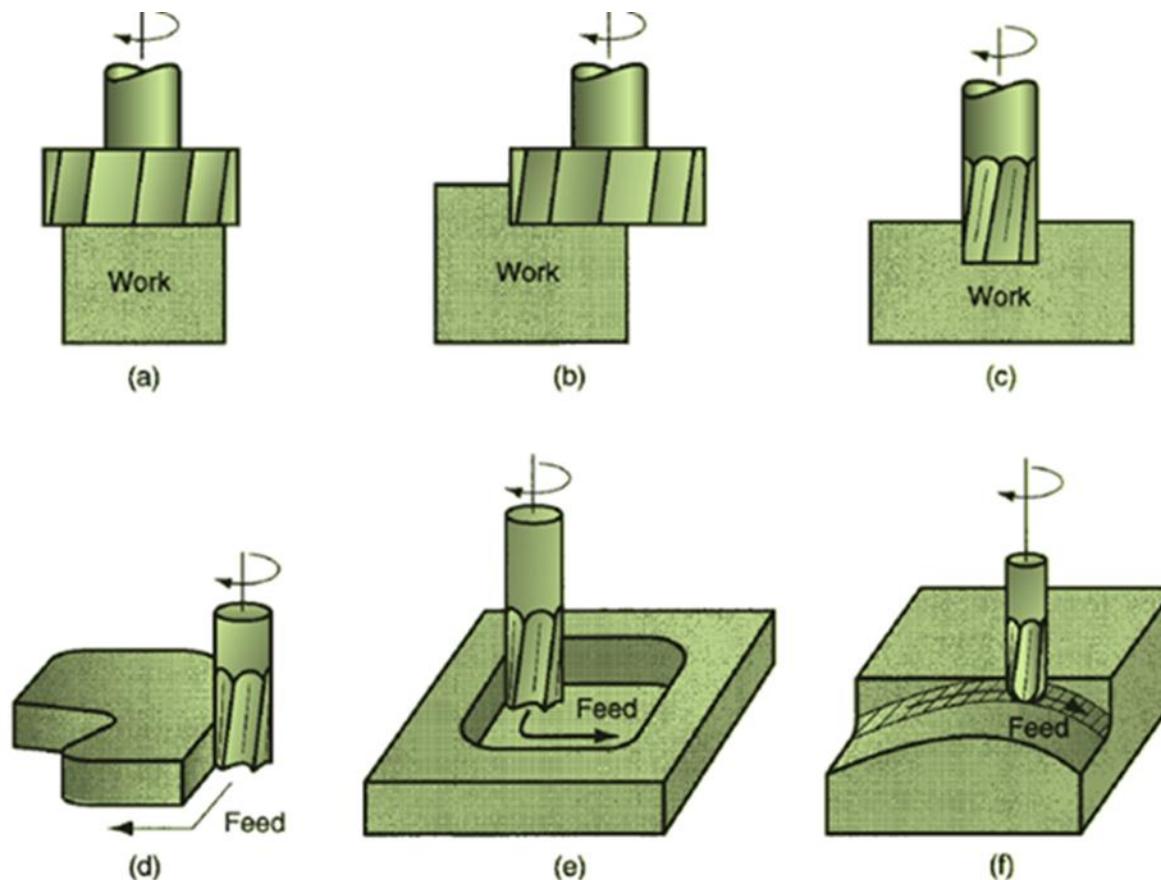
pocket milling



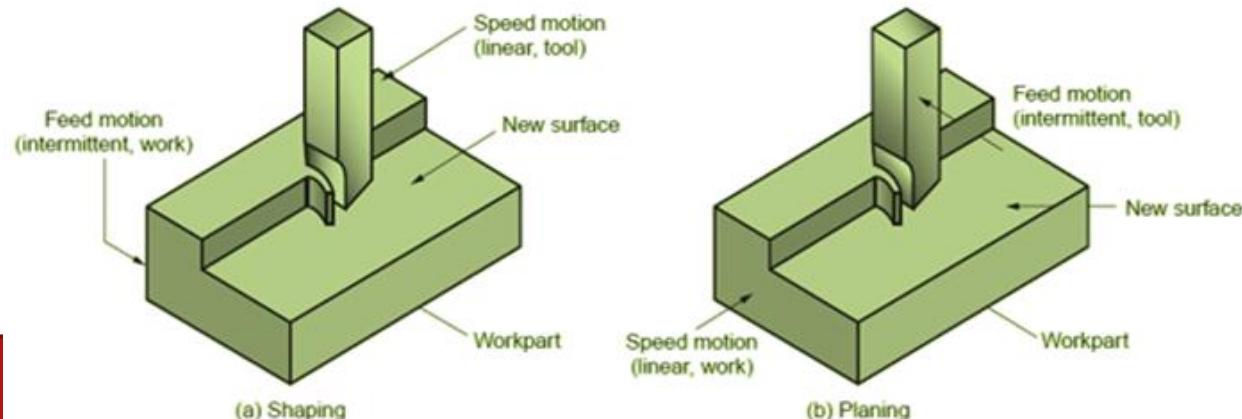
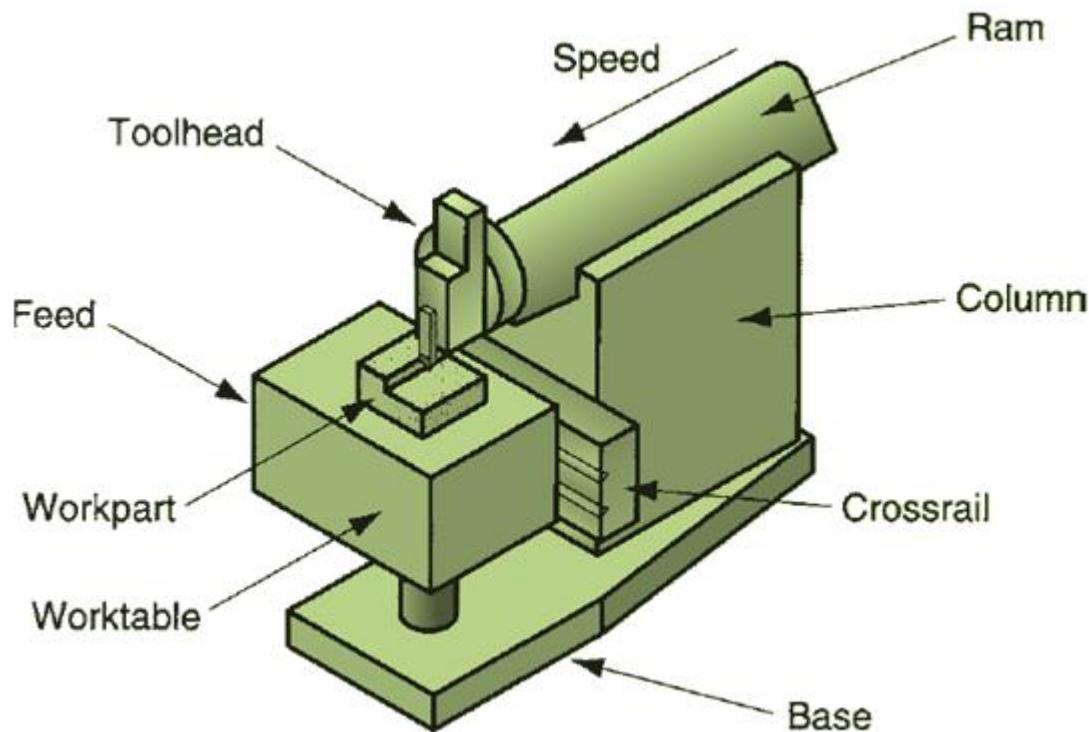
Surface contouring



profile milling

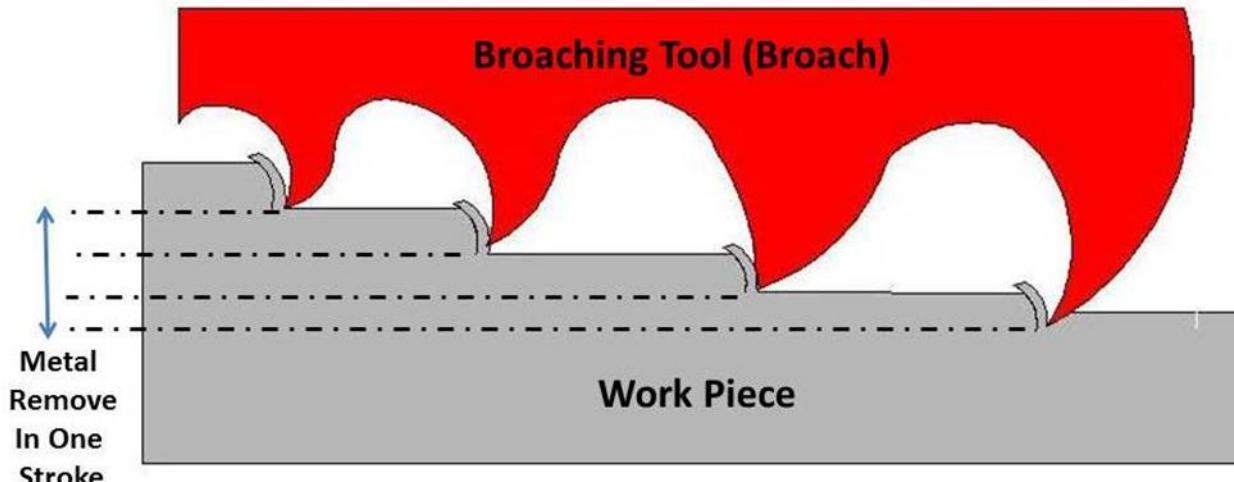


Shaping and Planning



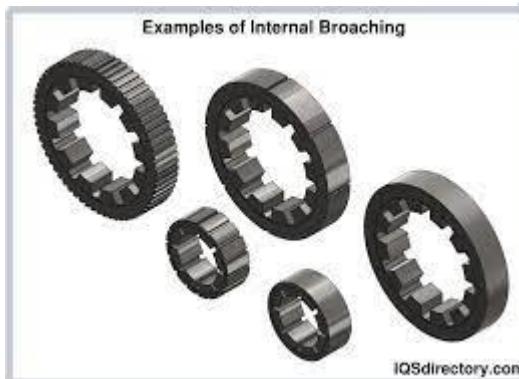


Broaching

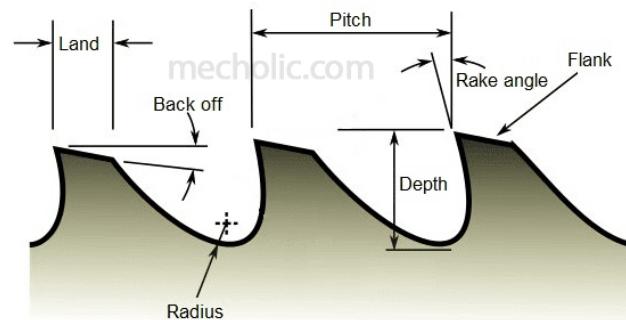
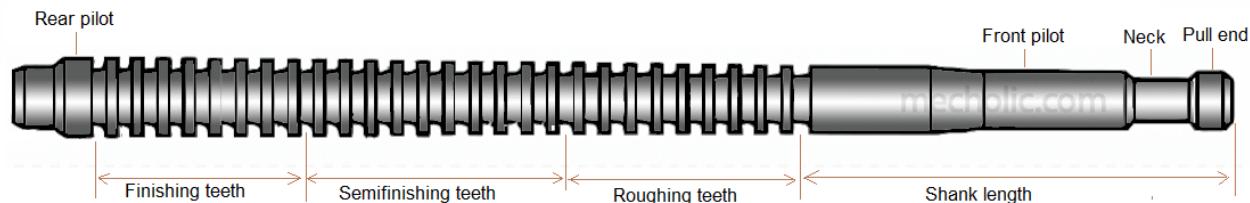


Broaching Operation

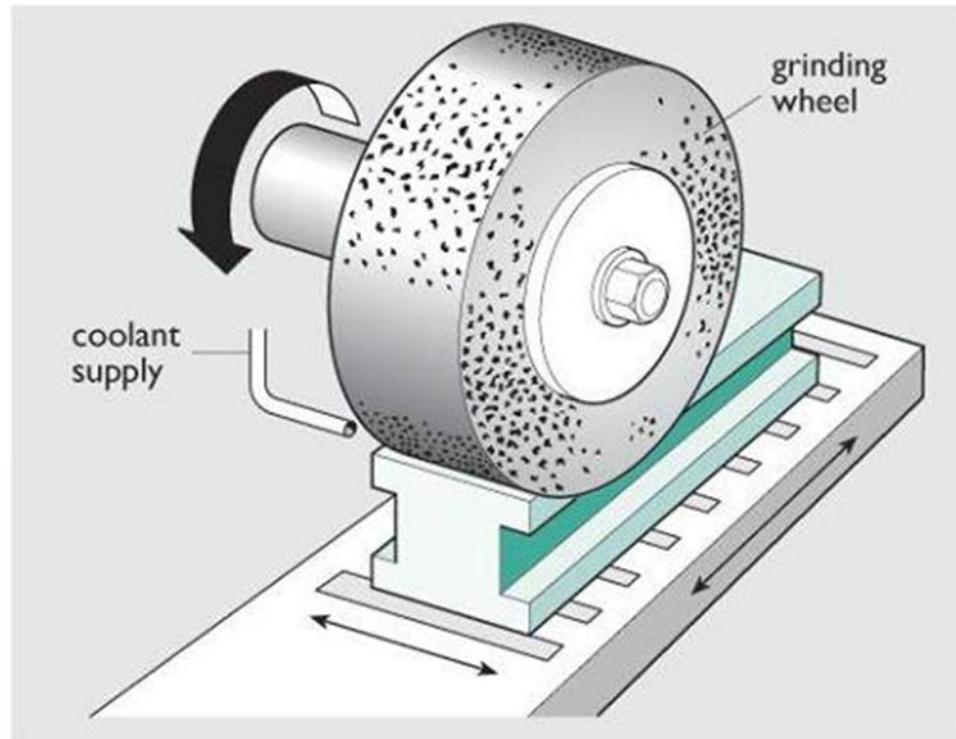




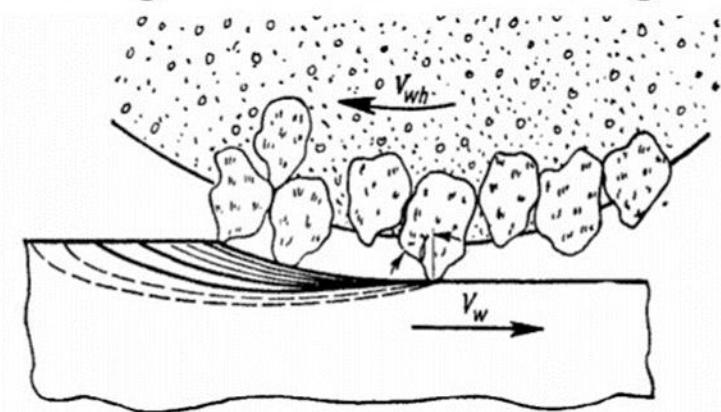
Broaching splines in internal gears



Grinding

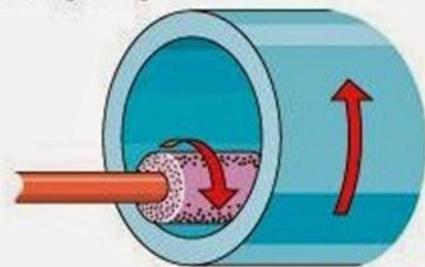


Cutting action of abrasive grains

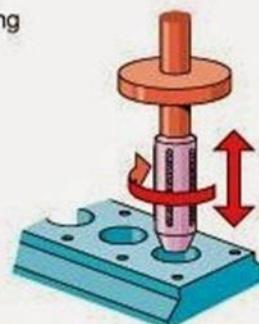


Common grinding operations

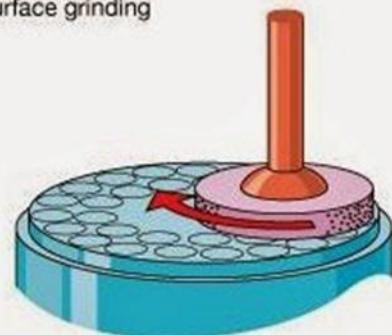
internal grinding



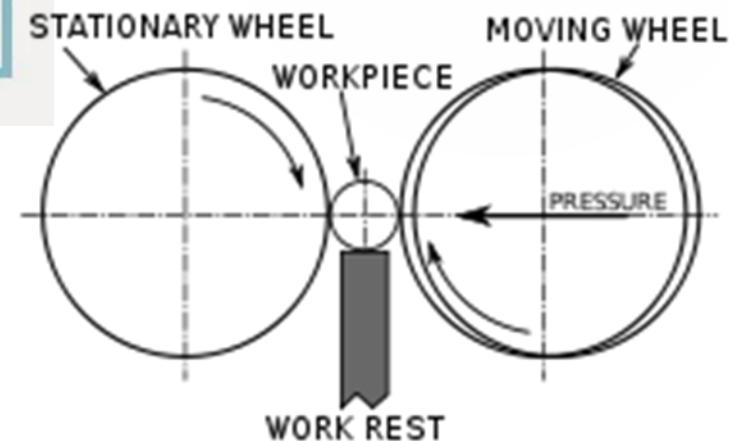
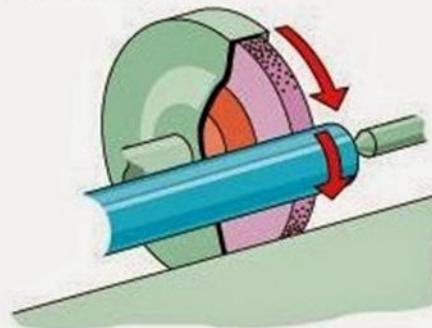
honing



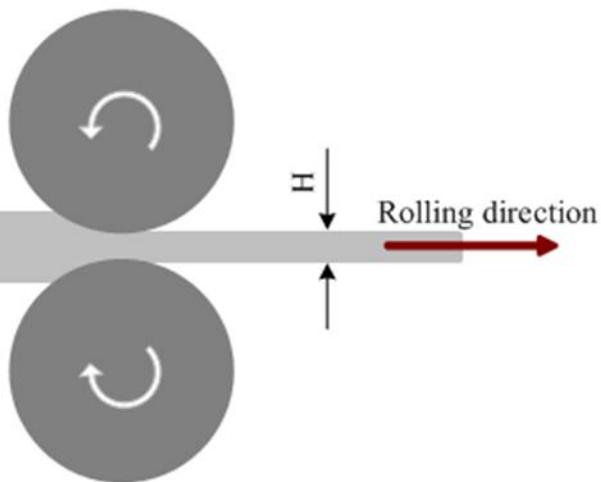
surface grinding



cylindrical grinding



Centreless grinding



Two high rolling mill

Cold Rolling

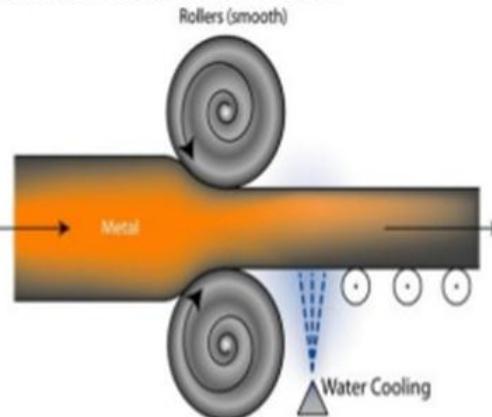
➤ Cold rolling is the most rapid method of forming metal into desired shapes by plastic deformation through compressive stresses using two or more than two rolls with or without spraying water.

➤ Cold rolling metals impart smooth bright surface finish and good physical and mechanical properties to cold rolled parts.

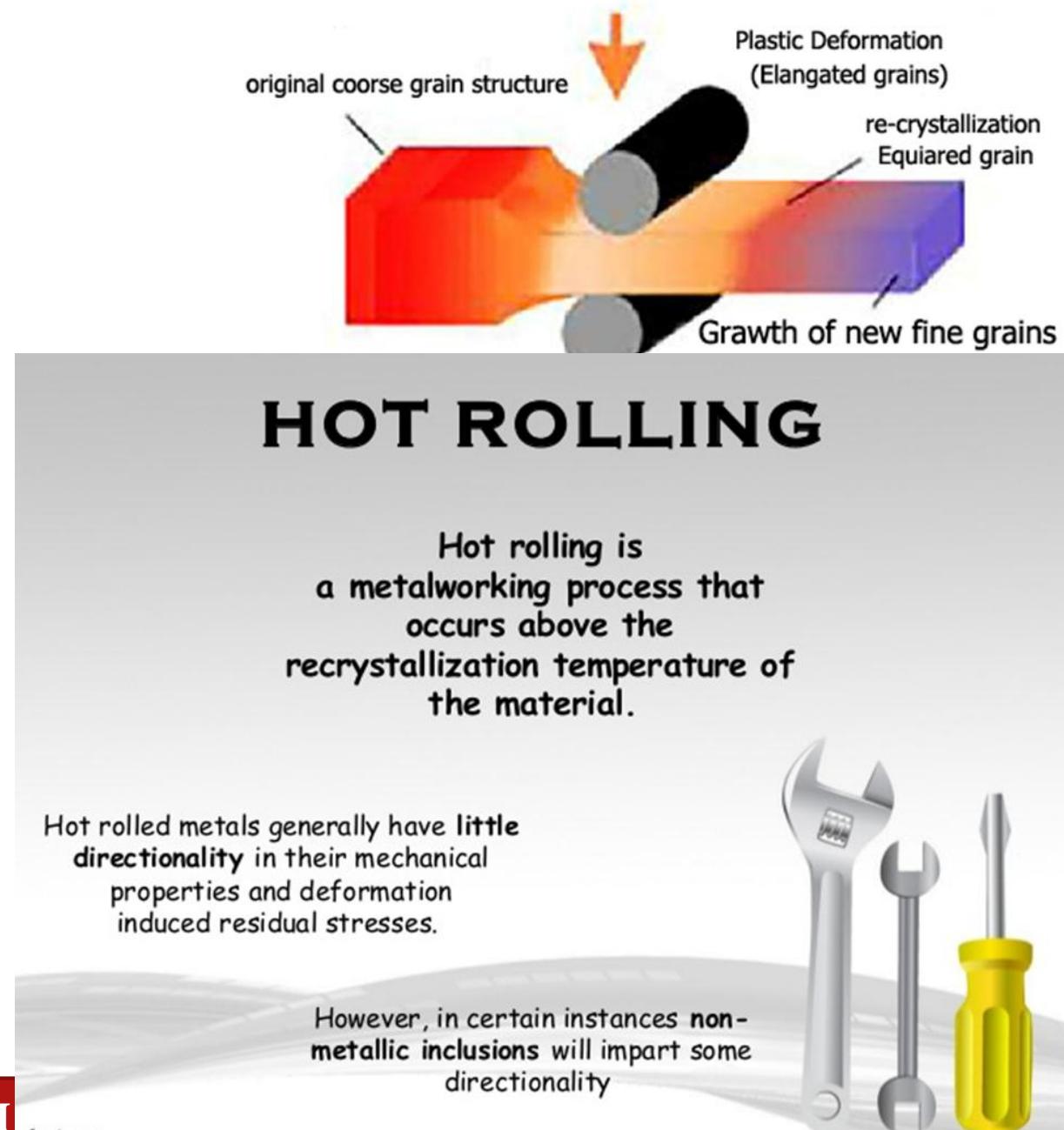
➤ The preliminary step to the cold-rolling operation, the sheets of pre hot-rolled steel are immersed in an acid solution to remove the scale and then dried.

➤ The cleaned steel is passed through a set of rolls of cold rolling process thereby producing a slight reduction in each pass until the required thickness is obtained.

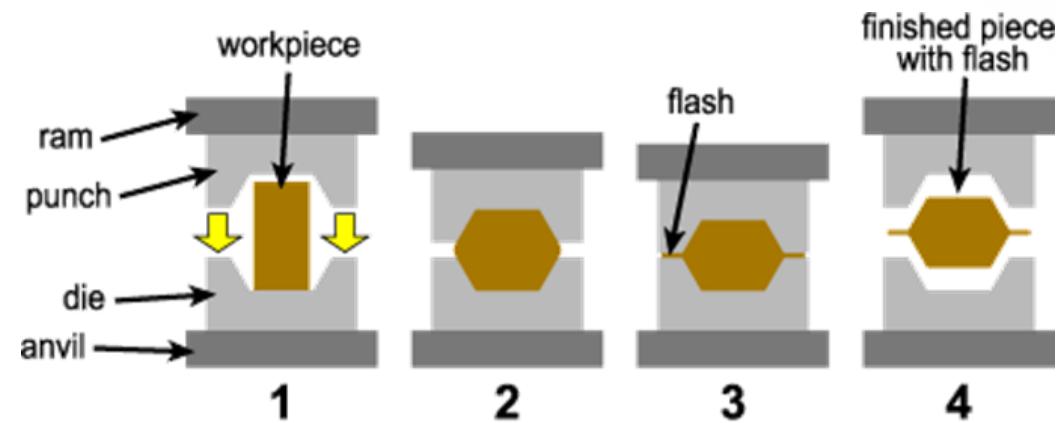
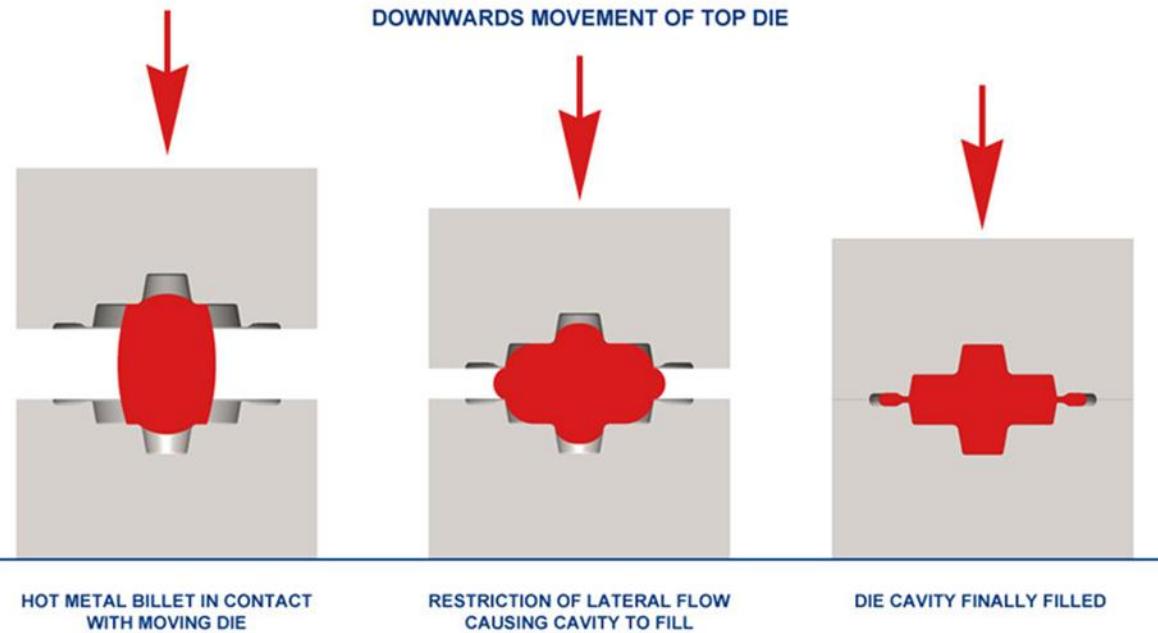
➤ Cold rolling process is being widely used in the production of large number of useful products such as rails, sheets, structural sections, plates etc.



Recrystallization is a process by which deformed grains are replaced by a new set of defect-free grains that nucleate and grow until the original grains have been entirely consumed. Recrystallization is usually accompanied by a reduction in the strength and hardness of a material and a simultaneous increase in the ductility. Thus, the process may be introduced as a deliberate step in metals processing or may be an undesirable byproduct of another processing step. The most important industrial uses are softening of metals previously hardened or rendered brittle by cold work, and control of the grain structure in the final product.

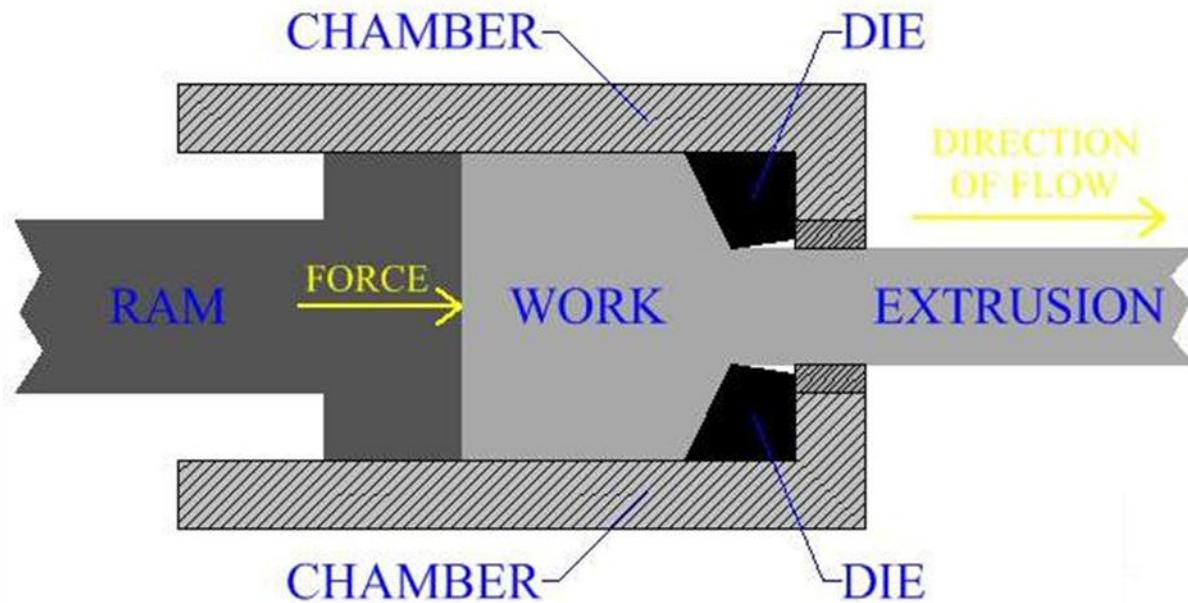


Forging

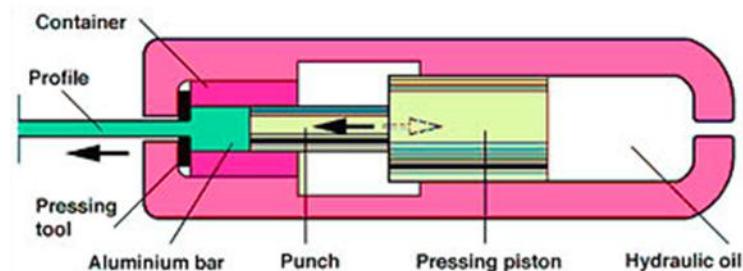


Machine Forging

DIRECT EXTRUSION



The Extrusion Process



Tube Drawing Operations

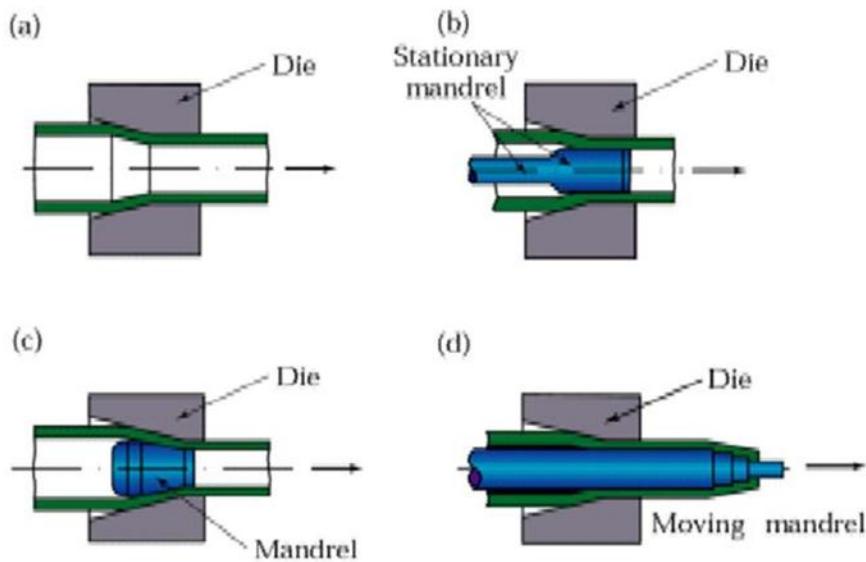


Fig : Examples of tube-drawing operations, with and without internal mandrel. Note that a variety of diameters and wall thickness can be produced from the same initial tube stock (which had been made by other processes).

Reaming

Drilling, Boring & Reaming

Drill bit

Boring bar

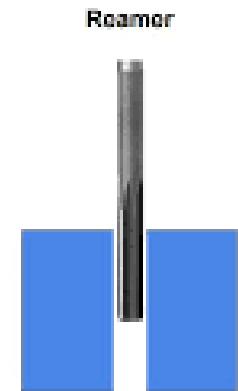
Reamer



Drilling New Hole



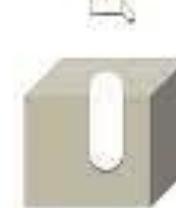
Enlarging Existing Hole



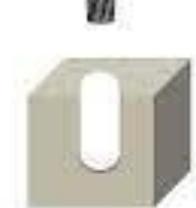
Finishing Existing Hole



Drilling for making cylindrical hole



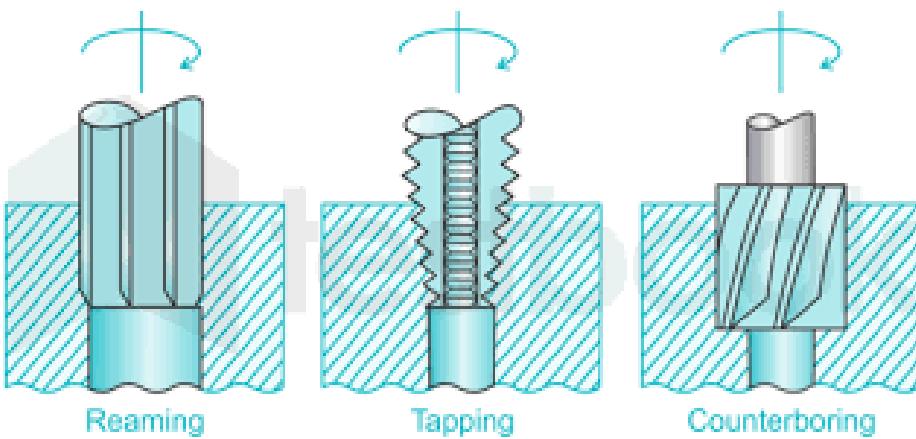
Boring for enlarge Drilling hole



Reaming for finishing holes Or slightly remove Material from the hole



Types Of Reamers



Drilling Operations

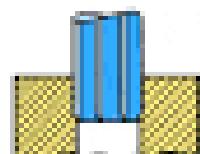
Drilling



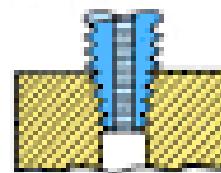
Boring



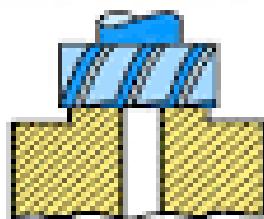
Reaming



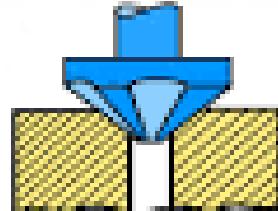
Tapping



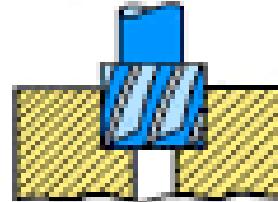
Spot Facing



Counter Sinking

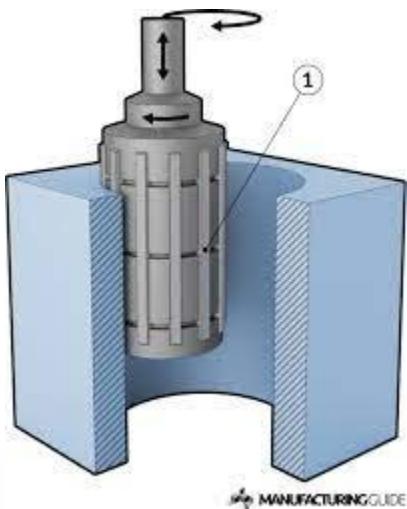


Counter Boring

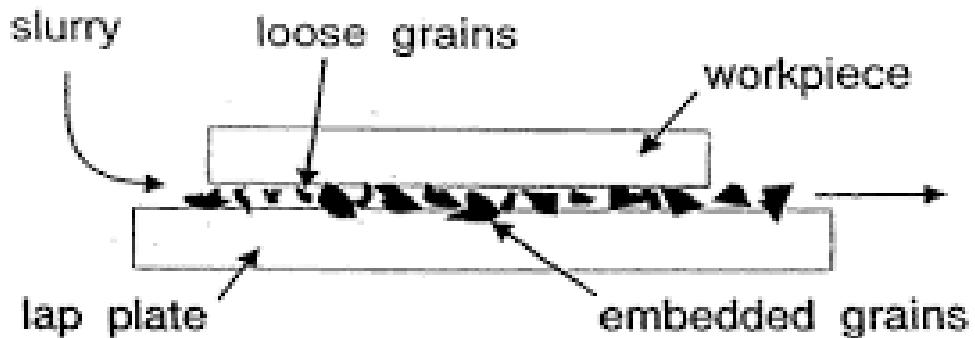


 YouTube/MindTech

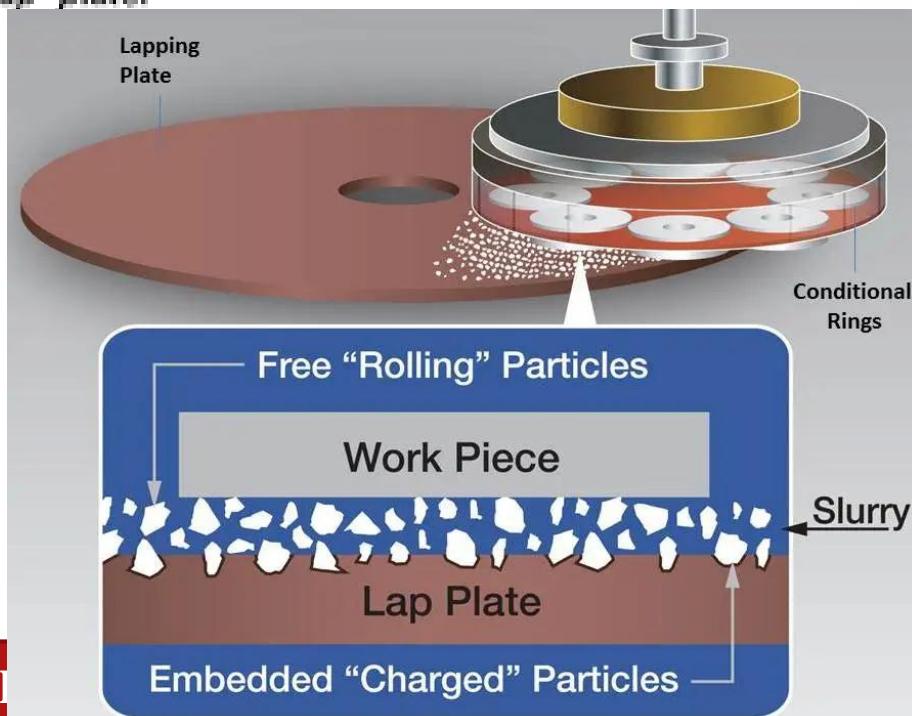
Honing



Lapping



Lapping involves the cutting and shearing action of loose abrasive particles and the fine grinding of abrasive particles embedded in the lap plate.



Polishing and buffing,



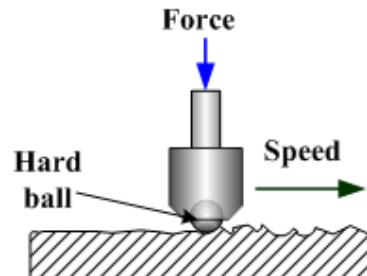
shutterstock.com · 1703968147



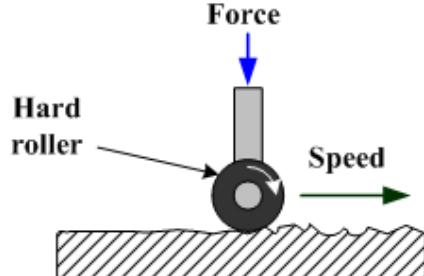
Polishing is the process of creating a smooth and shiny surface by rubbing it or by applying a chemical treatment, leaving a clean surface with a significant specular reflection. Finishing processes that utilize abrasive belts are referred to as polishing, and processes that use cloth wheels with compound applied is buffing. Polishing generates a brushed or lined finish, where buffing removes the lines and creates a bright luster finish.

Burnishing

Burnishing

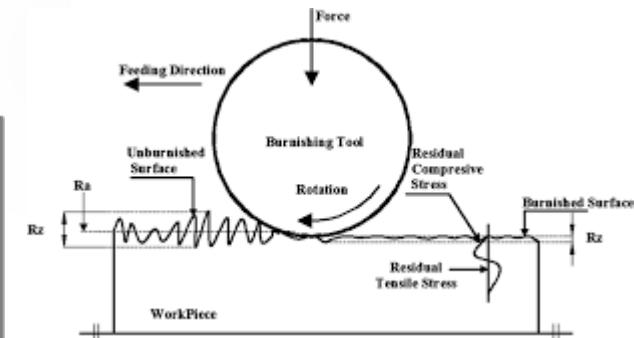


Ball burnishing



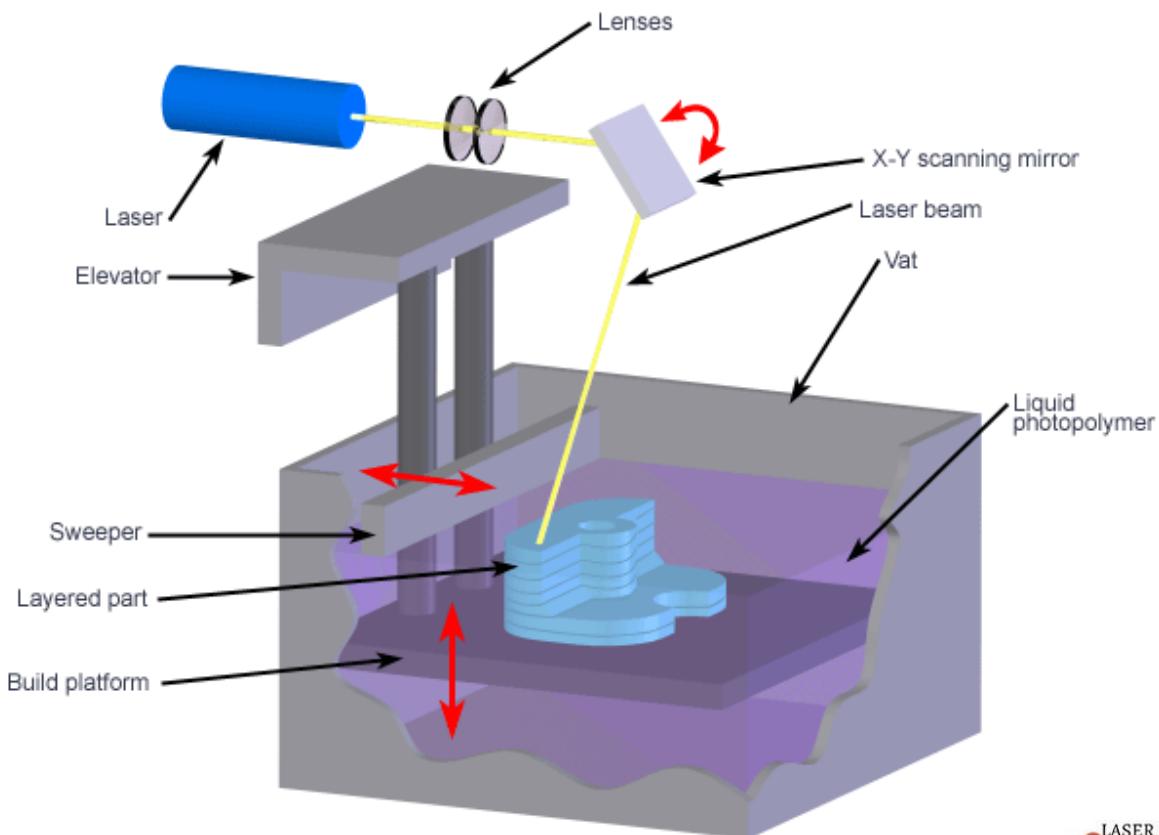
Roller burnishing

www.substech.com

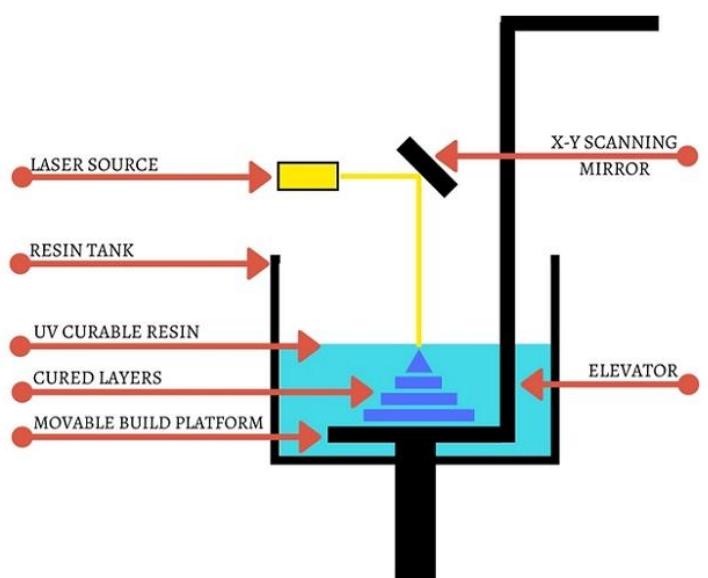


Burnishing is the plastic deformation of a surface due to sliding contact with another object. It smooths the surface and makes it shinier. Burnishing may occur on any sliding surface if the contact stress locally exceeds the yield strength of the material.

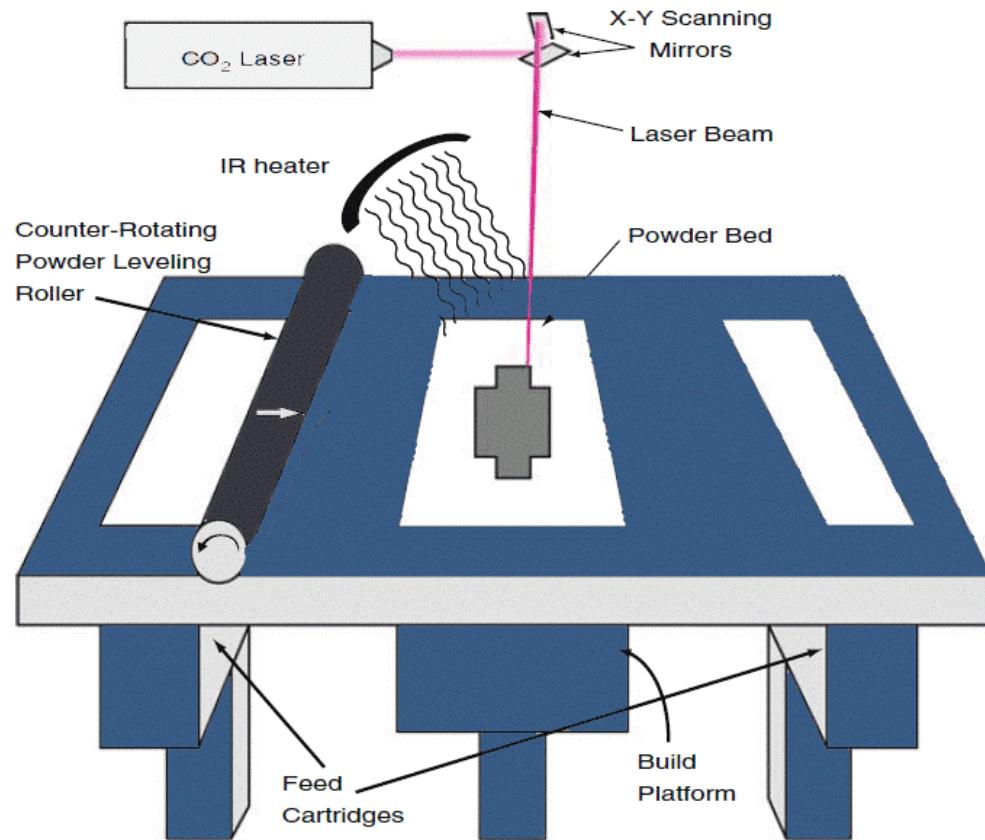
Stereolithography - SLA or SL

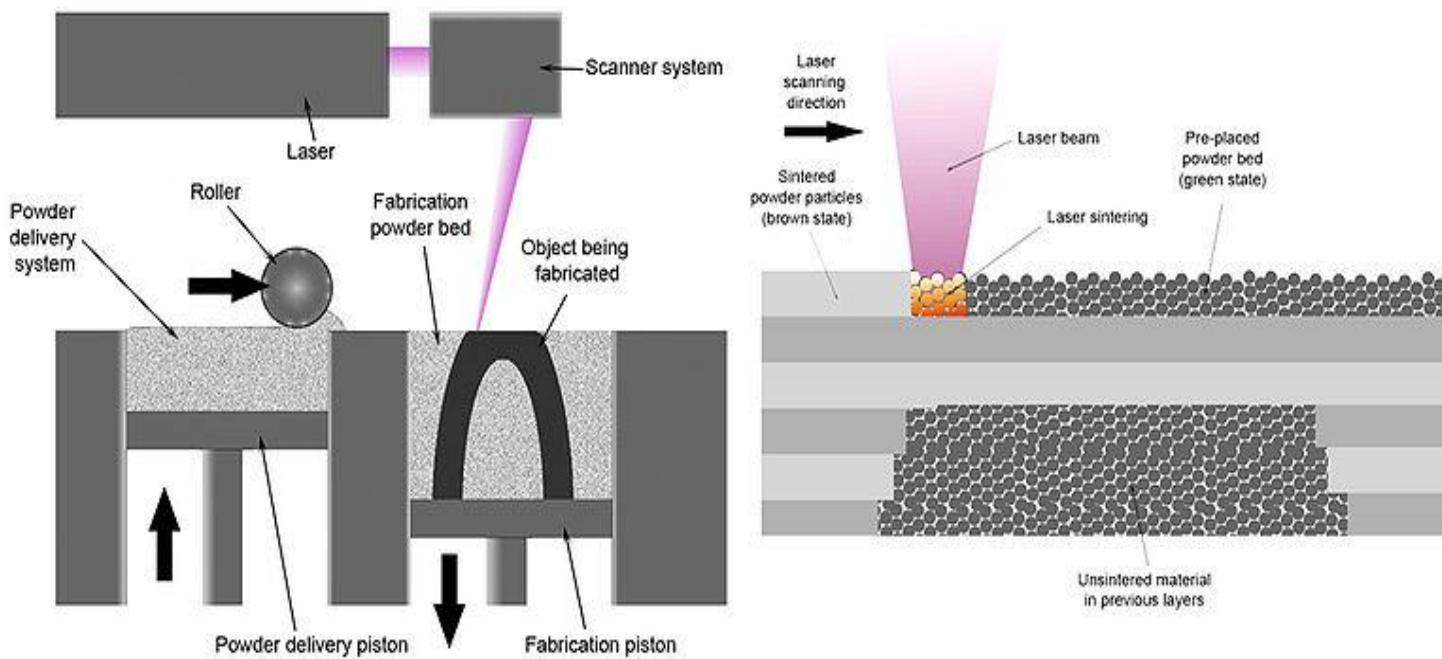


Copyright © 2008

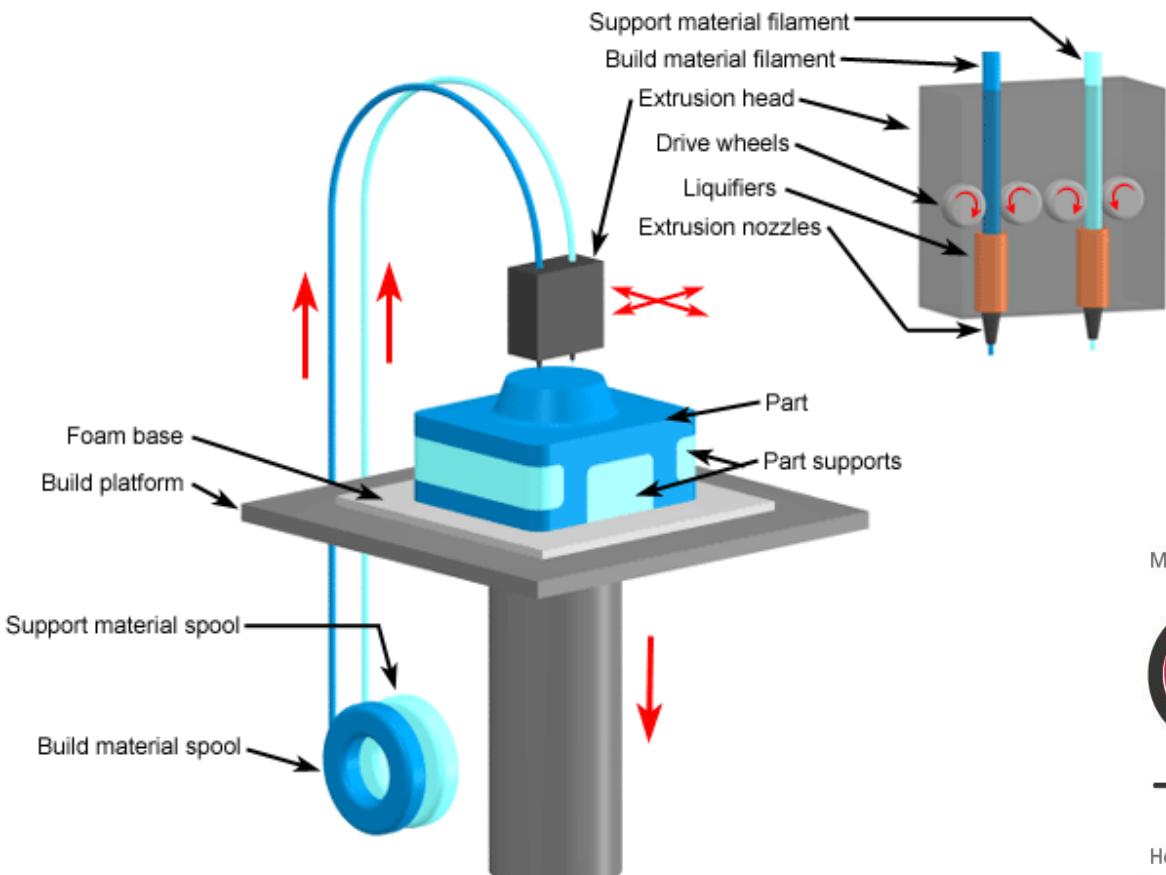


Selective Laser Sintering

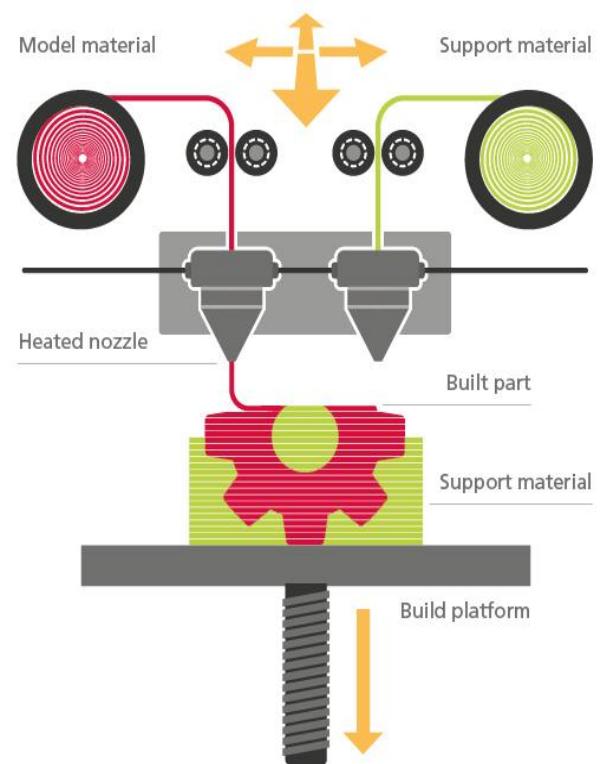




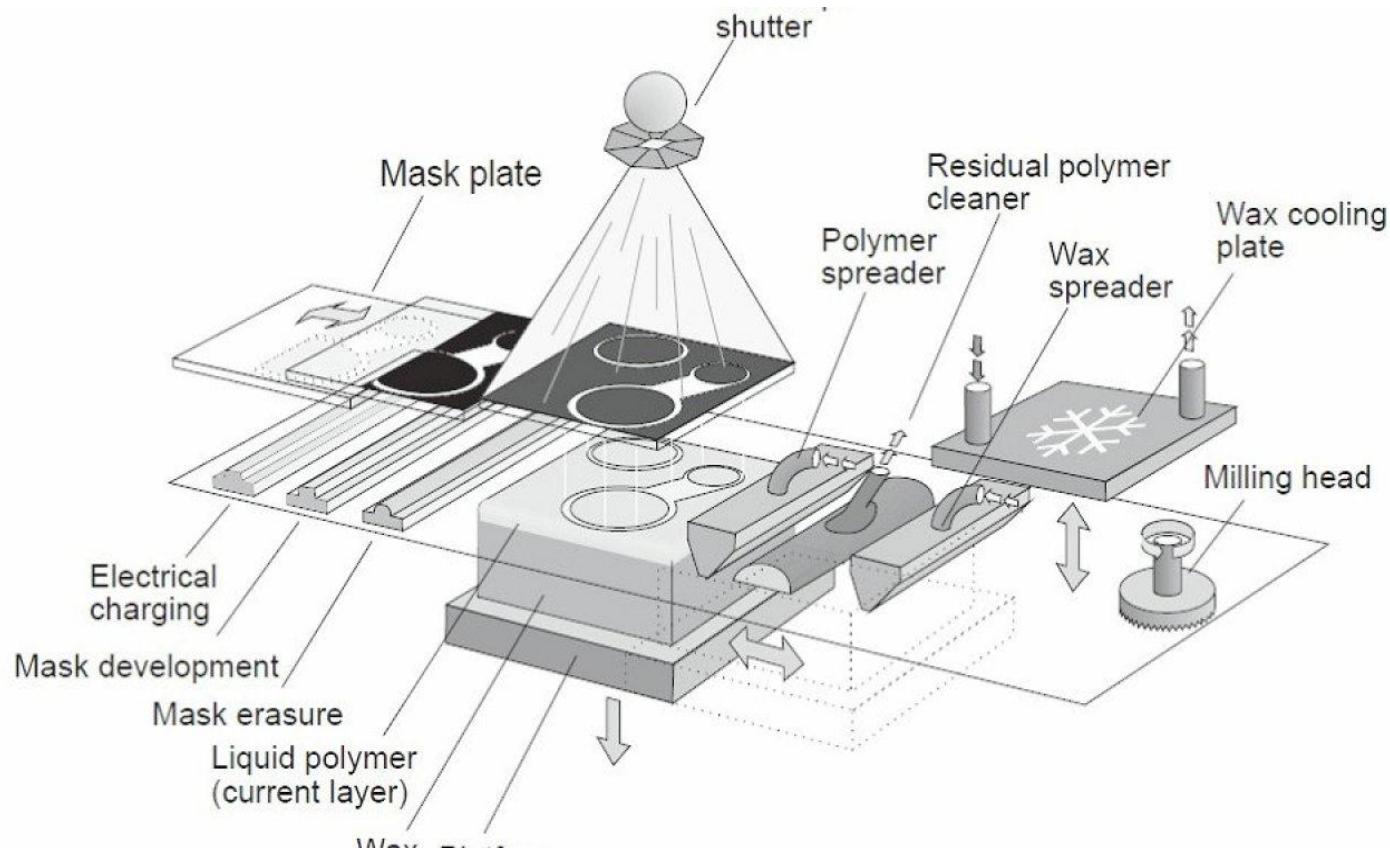
Fused-Deposition Modeling



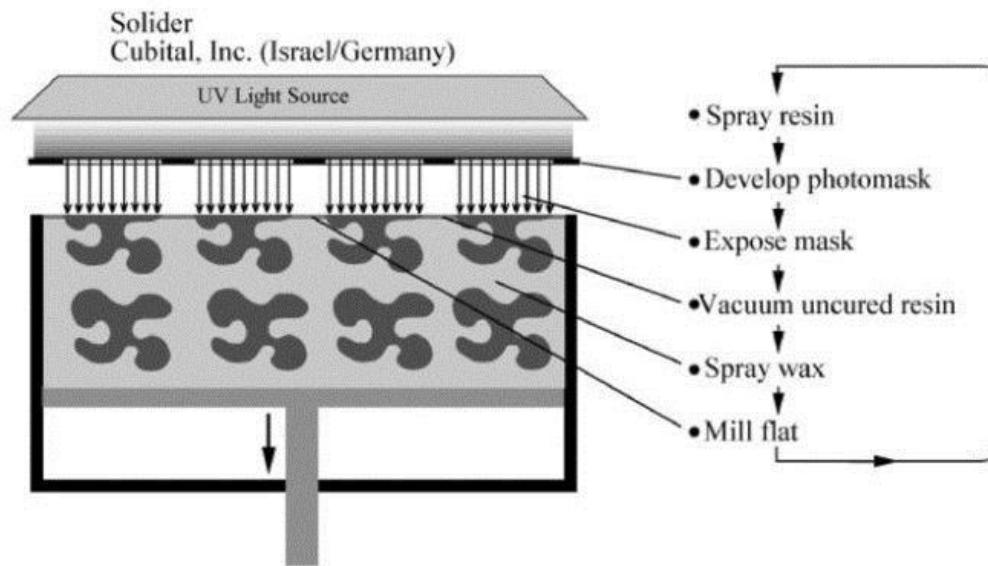
Copyright © 2008 C



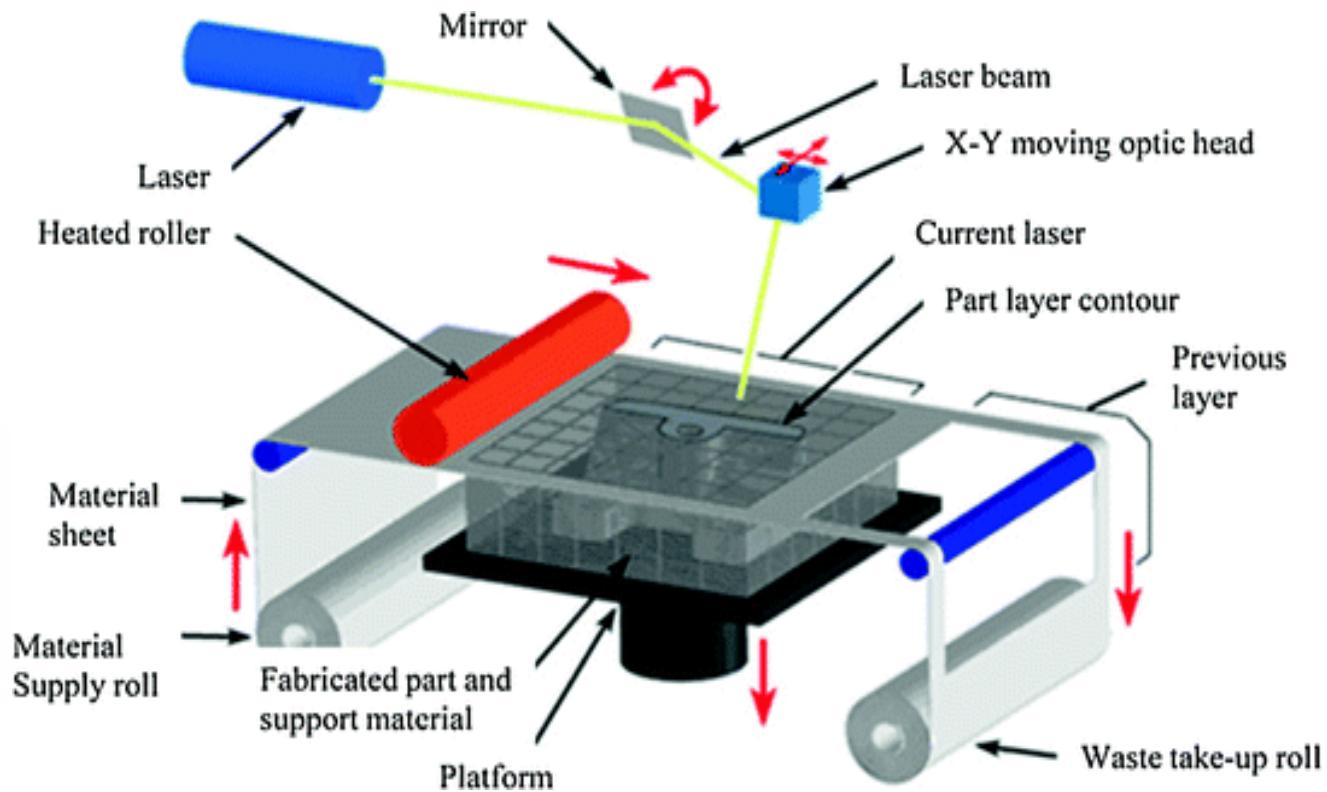
Solid-Ground Curing



Solid Ground Curing (SGC)



Laminated Object Manufacturing



Methods for inspection

1 Production line inspection

2 Inspection by workers

Techniques of inspection

1. 100 percent inspection

2. Acceptance sampling

Type I Error (or α error, producer's risk)

Type II Error (or β error, consumer's risk)

Types of Sample Plans

- 1 Single Sampling plan**
- 2 Double Sampling plan**
- 3 Multiple Sampling plan**
- 4 Sequential Sampling plan**

Single Sampling plan

sampling plan procedure

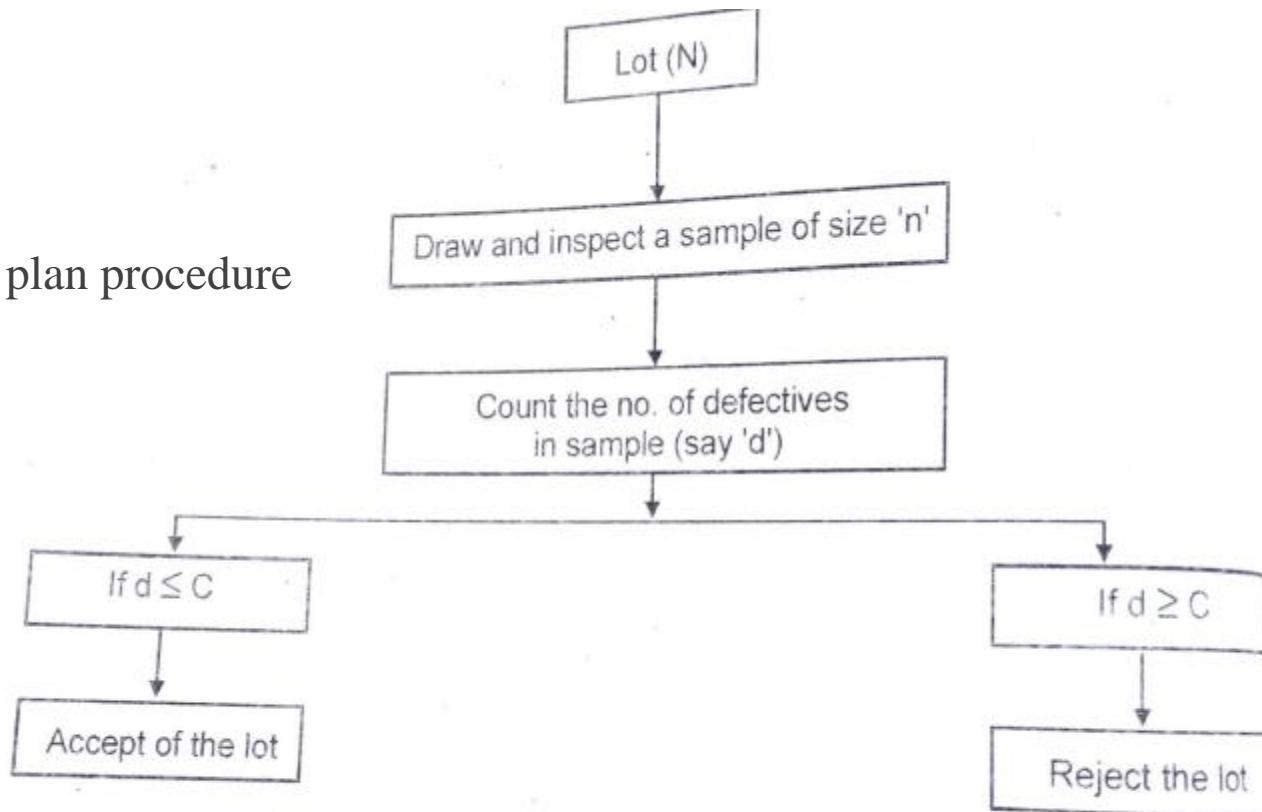


Figure : Single sampling plan

In case the lot is rejected, inspect each and every piece of the lot and replace the defective parts or salvage and correct the defective parts.

TABLE

Lot size	Sample size	<i>Allowable percent defective</i>				
		1	2	3	4	5
		C	C	C	C	C
up to 499	75	1	2	3	4	5
500–799	115	2	3	4	6	8
800–1299	150	3	4	5	8	10
1300–3199	225	4	5	8	11	14
3200–7999	300	5	7	10	14	18
8000–21999	450	6	9	14	20	26

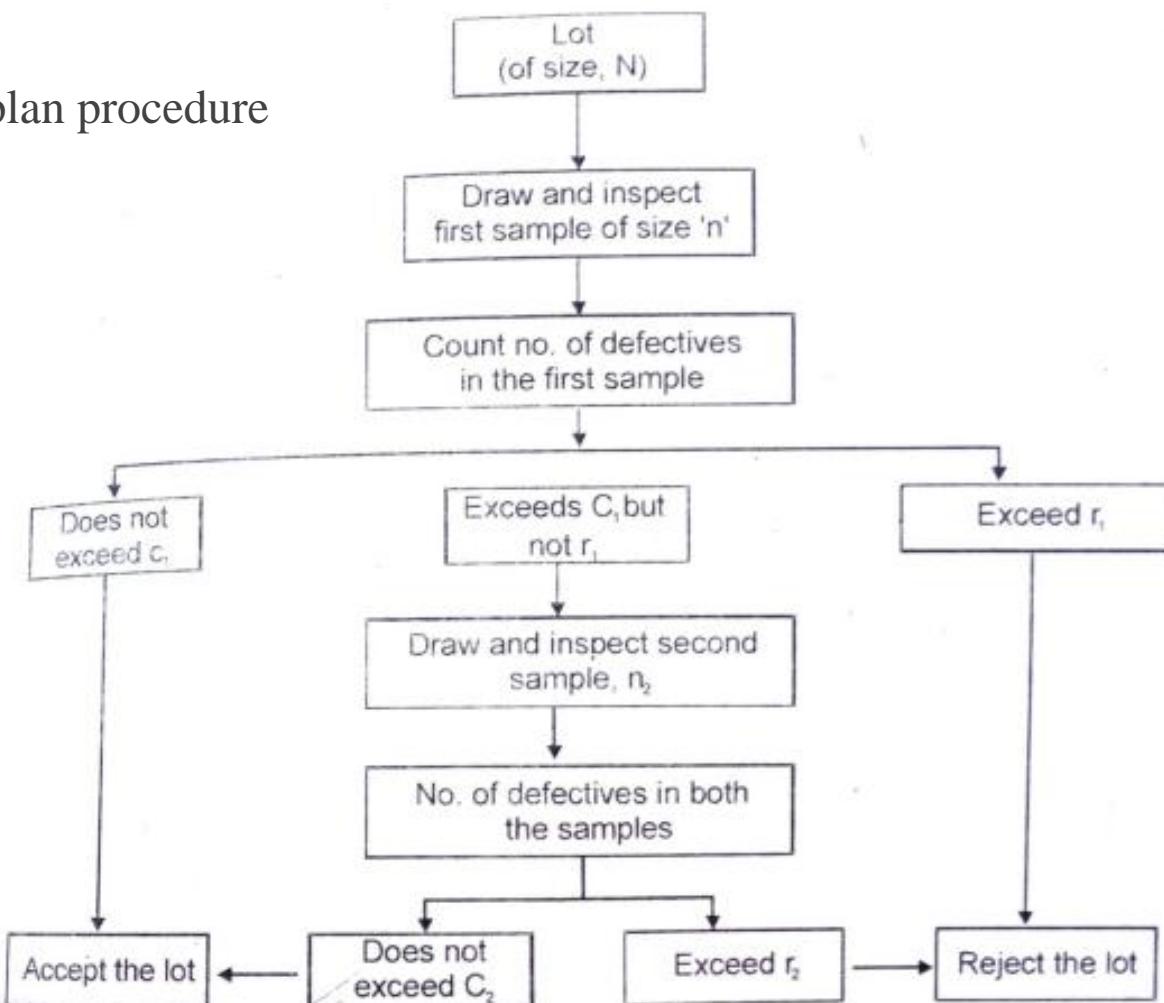
For a lot size of 850 and allowable percent defective 3%. Table gives a sample size of 150 and acceptance number, c as 5. This means from the lot containing 850 parts, at random pick up 150 parts, inspect them and find out the number of defective pieces. If defective pieces are up to 5, accept the lot; if their number is 6, 7, 8 or more, reject the lot.

Characteristics of Single Sampling Plan:

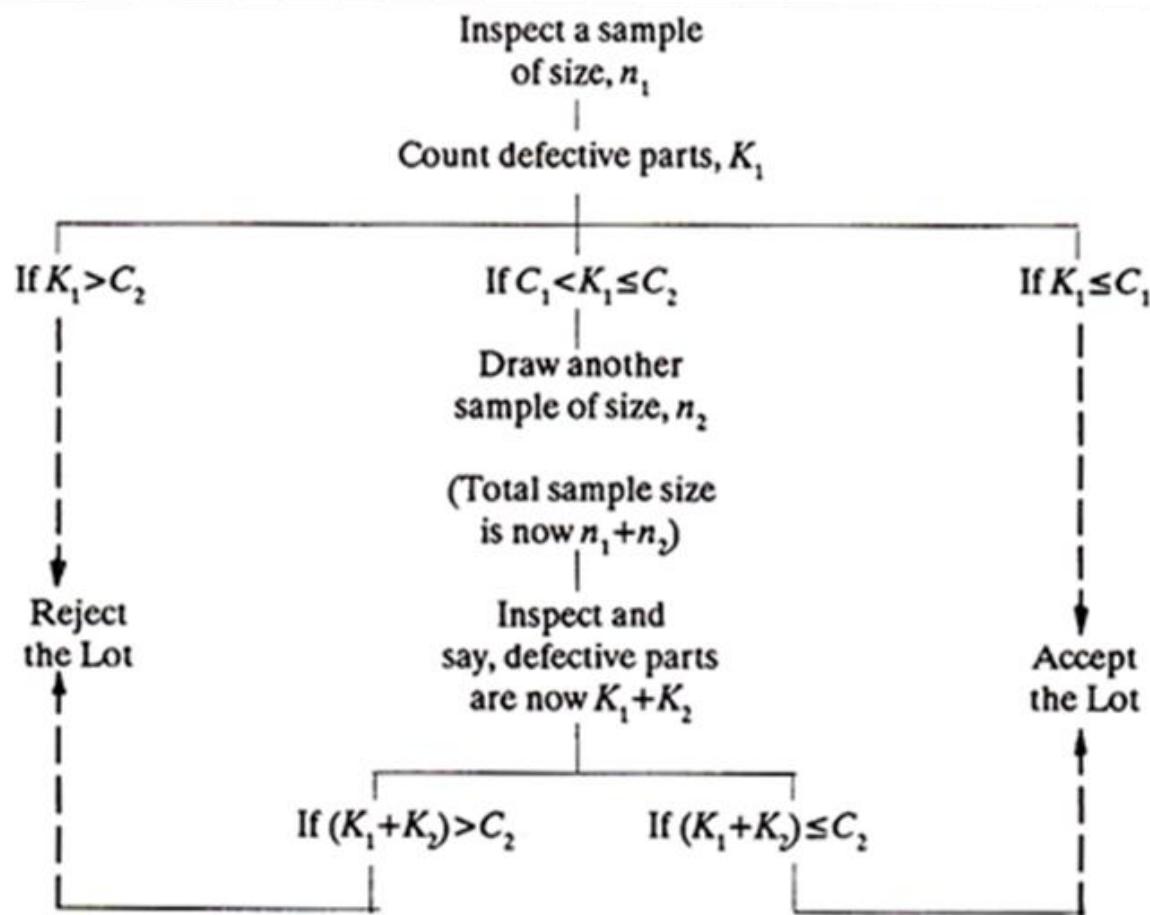
- (i) A single sampling plan is easy to design, explain and administer.
- (ii) It is the only practical type of sampling plan under conveyorized production conditions when only one sample can be selected.
- (iii) It involves a lower cost of training and supervising employees, transporting and sorting samples, etc.
- (iv) It very accurately estimates lot quality.
- (v) It is more economical than double sampling plan when lots have their % defectives close to the AQL.
- (vi) It involves a bigger sample size than the double sampling plan.
- (vii) It involves record keeping less than that of double and multiple sampling plans.
- (viii) A single sampling plan provides maximum information concerning the lot quality because each sample can be plotted on the control chart.

Double Sampling plan

sampling plan procedure



If it is not possible to decide the fate of the lot on the basis of the first sample, a second sample is drawn out of the same lot and the decision whether to accept or reject the lot is taken on the basis of the combined results of first and second samples.



sampling plan procedure

Characteristics of double sampling plan:

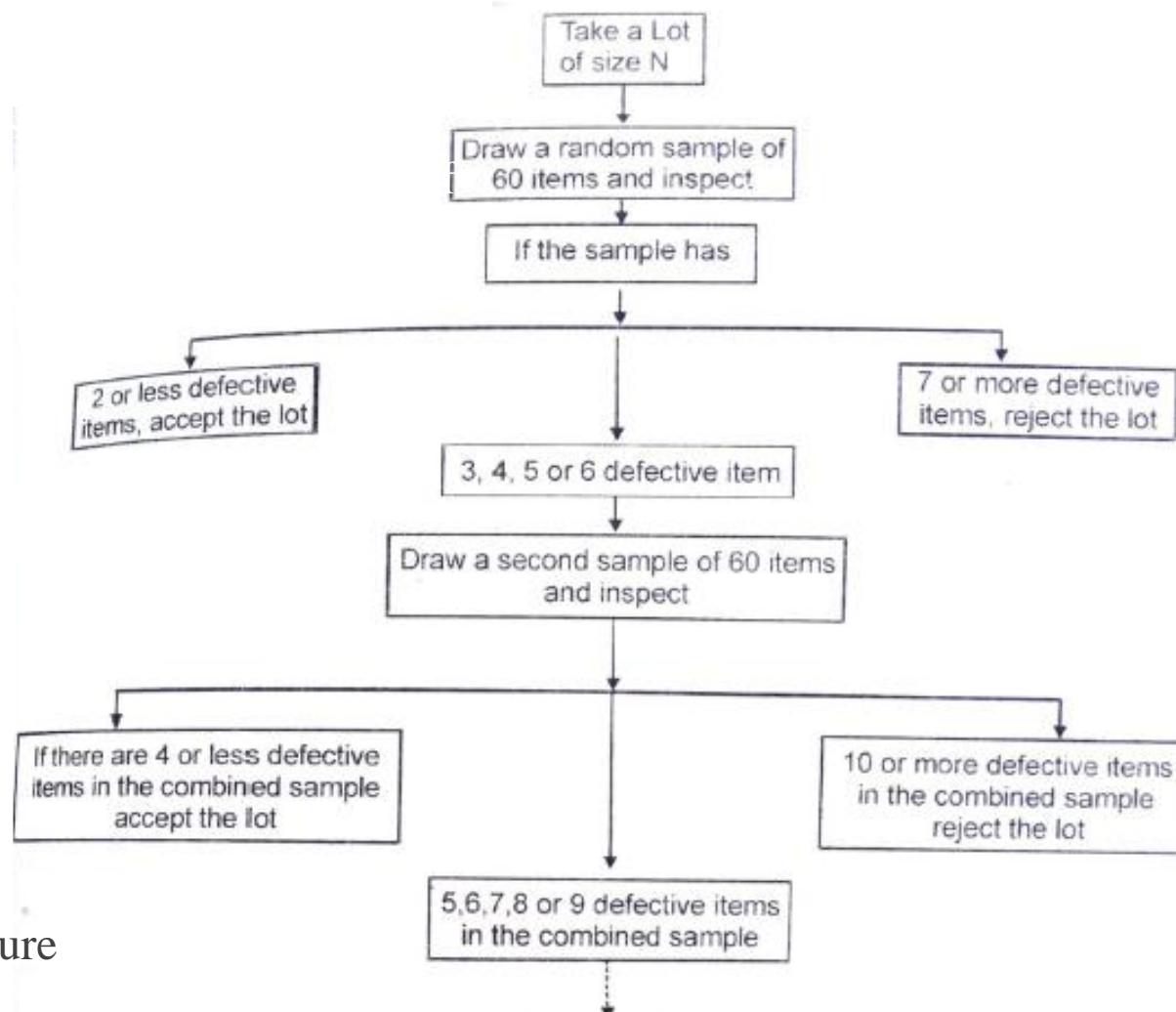
- (i) A double sampling plan is more expensive to administer than a comparable single sampling plan.
- (ii) It involves less inspection than that required for a single sampling plan.
- (iii) Double sampling plan is easier to sell to the personnel because psychologically the idea of giving a second chance to a lot before rejecting it exercises popular appeal.
- (iv) It permits a smaller first sample than the sample size of the corresponding single sampling plan.
- (v) A double sampling plan involves more overheads than a single sampling plan.
- (vi) It involves more record keeping than a single sampling plan.

Multiple Sampling

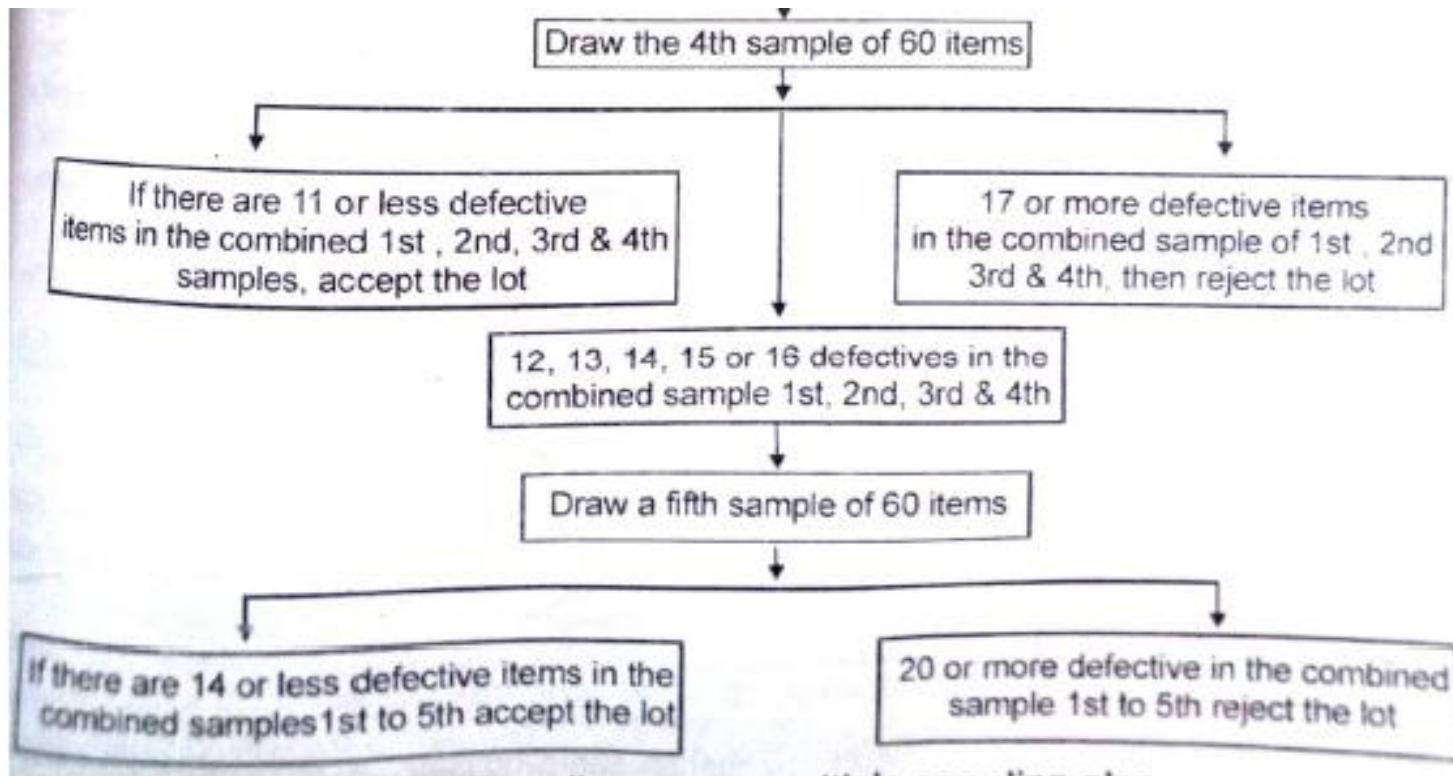
Sample No.	Sample size	Cumulative Acceptance No.	Cumulative Rejection No.
First	32	0	4
Second	32	1	6
Third	32	3	8
Fourth	32	5	10
Fifth	32	7	11
Sixth	32	10	12
Seventh	32	13	14

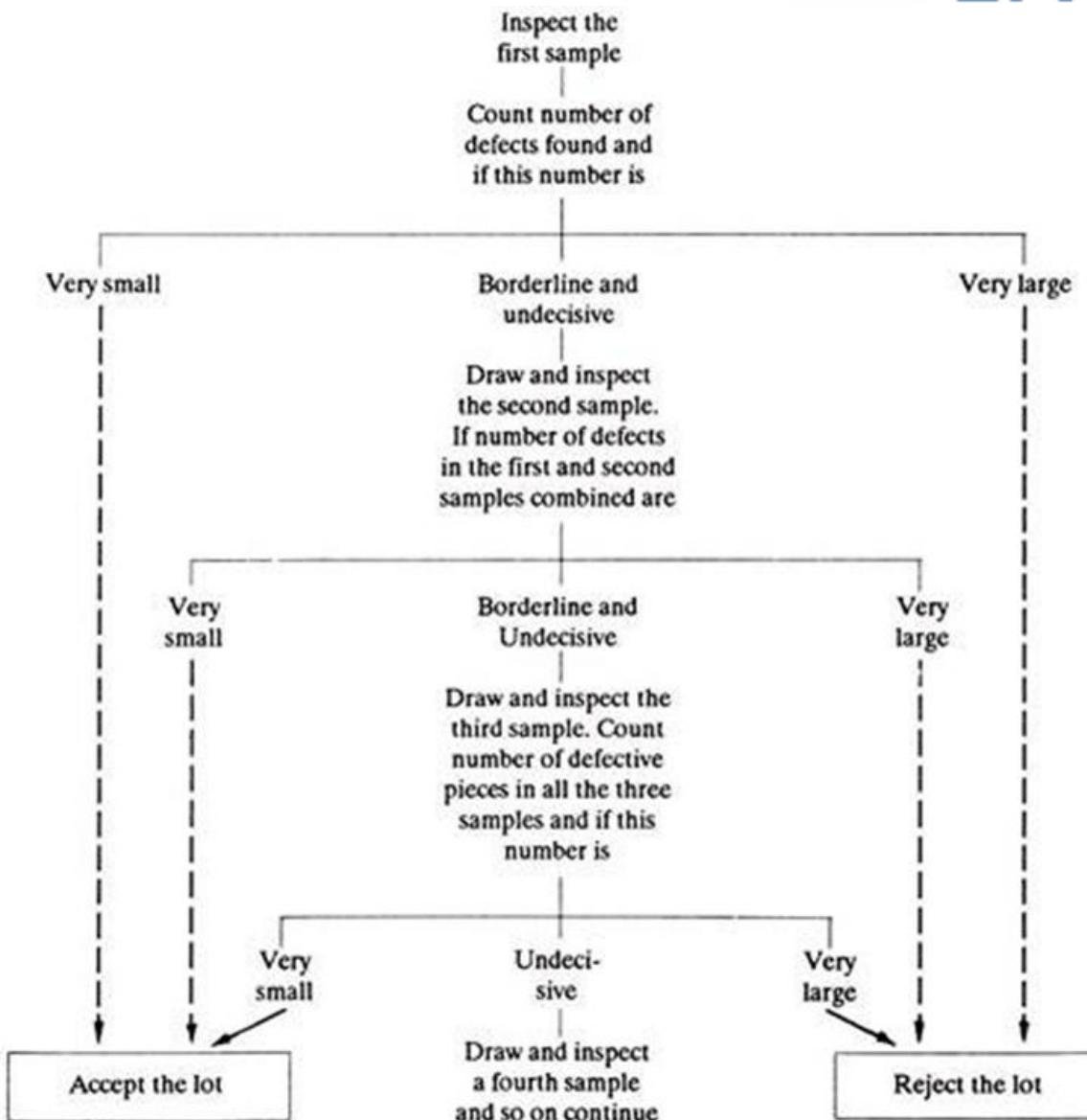
Multiple Sampling plan

A lot is accepted or rejected based upon the results obtained from several samples (of parts) drawn from the lot.



sampling plan procedure





Characteristics of multiple sampling plan:

- (i) A multiple sampling plan involves smaller first samples than single or double sampling plans.
- (ii) A multiple sampling plan is comparatively difficult to design and explain, and expensive to administer.
- (iii) It involves a higher overhead cost as compared to single and double sampling plans.
- (iv) It involves more record keeping.
- (v) In theory, multiple sampling may often permit lower total inspection than double sampling for a given degree of protection because of smaller sample sizes required.
- (vi) New methods, which simplify multiple sampling, such as automatic sampling boxes may result in greatly improved efficiency in administering multiple sampling plans.

Sequential Sampling

Item	Quality	Score		
		Initial Score H	=	15 e of nology
1st	Good	15 + 1	=	16
2nd	"	16 + 1	=	17
3rd	Bad	17 - 5	=	12
4th	Good	12 + 1	=	13
5th	"	13 + 1	=	14
6th	"	14 + 1	=	15
7th	"	15 + 1	=	16
8th	"	16 + 1	=	17
9th	"	17 + 1	=	18
10th	"	18 + 1	=	19
11th	"	19 + 1	=	20
12th	"	20 + 1	=	21
13th	"	21 + 1	=	22
14th	"	22 + 1	=	23
15th	"	23 + 1	=	24
16th	"	24 + 1	=	25
17th	"	25 + 1	=	26
18th	"	26 + 1	=	27
19th	"	27 + 1	=	28
20th	"	28 + 1	=	29
21st	"	29 + 1	=	30
22nd	"	30 + 1	=	31
23rd	"	31 + 1	=	32

sampling plan procedure

Sequential sampling involves increasing the sample size by one part at a time till the sample becomes large enough and contains sufficient number of defectives to decide intelligently whether to accept or reject the lot.

It is a plan in which sample size is increased by one piece (or part) at a time till the sample becomes large enough and contains sufficient number of defective pieces to decide intelligently whether to accept the lot or to reject it.

It is easy to design, but more expensive to administer than a comparable multisampling plan, since more steps are needed to take a decision. Since sample size is increased by one at a time, sample results are analysed much faster than in a single or double sampling plan. Sampling costs are least. Overhead cost is maximum. It is seldom used in lot acceptance control but is important because multiple sampling is based on it.

Operating Characteristic Curve (OC curve)

TABLE

Lot size	Sample size	<i>Allowable percent defective</i>				
		1	2	3	4	5
		C	C	C	C	C
up to 499	75	1	2	3	4	5
500–799	115	2	3	4	6	8
800–1299	150	3	4	5	8	10
1300–3199	225	4	5	8	11	14
3200–7999	300	5	7	10	14	18
8000–21999	450	6	9	14	20	26

Example: For a lot size of 850 and allowable percent defective 3%.
 Table gives a sample size of 150 and acceptance number, c as 5.

DODGE-ROMIG PLANS

TABLE 19.3 EXAMPLE OF DODGE-ROMIG SINGLE SAMPLING AOQL TABLES
(Average outgoing quality limit = 2.0%)

Lot size	Process average, %																	
	0-0.04			0.05-0.40			0.41-0.80			0.81-1.20			1.21-1.60			1.61-2.00		
	n	c	100 _{p_{0.10}}	n	c	100 _{p_{0.10}}	n	c	100 _{p_{0.10}}	n	c	100 _{p_{0.10}}	n	c	100 _{p_{0.10}}	n	c	100 _{p_{0.10}}
1-15	All	0	—	All	0	—	All	0	—	All	0	—	All	0	—	All	0	—
16-50	14	0	13.6	14	0	13.6	14	0	13.6	14	0	13.6	14	0	13.6	14	0	13.6
51-100	16	0	12.4	16	0	12.4	16	0	12.4	16	0	12.4	16	0	12.4	16	0	12.4
101-200	17	0	12.2	17	0	12.2	17	0	12.2	17	0	12.2	35	1	10.5	35	1	10.5
201-300	17	0	12.3	17	0	12.3	17	0	12.3	37	1	10.2	37	1	10.2	37	1	10.2
301-400	18	0	11.8	18	0	11.8	38	1	10.0	38	1	10.0	38	1	10.0	60	2	8.5
401-500	18	0	11.9	18	0	11.9	39	1	9.8	39	1	9.8	60	2	8.6	60	2	8.6
501-600	18	0	11.9	18	0	11.9	39	1	9.8	39	1	9.8	60	2	8.6	60	2	8.6
601-800	18	0	11.9	40	1	9.6	40	1	9.6	65	2	8.0	65	2	8.0	85	3	7.5
801-1000	18	0	12.0	40	1	9.6	40	1	9.6	65	2	8.1	65	2	8.1	90	3	7.4
1001-2000	18	0	12.0	41	1	9.4	65	2	8.2	65	2	8.2	95	3	7.0	120	4	6.5
2001-3000	18	0	12.0	41	1	9.4	65	2	8.2	95	3	7.0	120	4	6.5	180	6	5.8
3001-4000	18	0	12.0	42	1	9.3	65	2	8.2	95	3	7.0	155	5	6.0	210	7	5.5
4001-5000	18	0	12.0	42	1	9.3	70	2	7.5	125	4	6.4	155	5	6.0	245	8	5.3
5001-7000	18	0	12.0	42	1	9.3	95	3	7.0	125	4	6.4	185	6	5.6	280	9	5.1
7001-10,000	42	1	9.3	70	2	7.5	95	3	7.0	155	5	6.0	220	7	5.4	350	11	4.8
10,001-20,000	42	1	9.3	70	2	7.6	95	3	7.0	190	6	5.6	290	9	4.9	460	14	4.4
20,001-50,000	42	1	9.3	70	2	7.6	125	4	6.4	220	7	5.4	395	12	4.5	720	21	3.9
50,001-100,000	42	1	9.3	95	3	7.0	160	5	5.9	290	9	4.9	505	15	4.2	955	27	3.7

Source: Reprinted by permission from H. F. Dodge and H. G. Romig, *Sampling Inspection Tables—Single and Double Sampling*, 2d ed., New York, NY: Wiley, page 201, 1959.

MIL-STD-105E III

Lot or Batch Size	Special Inspection Levels				General Inspection Levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1200	C	C	E	F	G	J	K
1201 to 3200	C	D	E	G	H	K	L
3201 to 10000	C	D	F	G	J	L	M
10001 to 35000	C	D	F	H	K	M	N
35001 to 150000	D	E	G	J	L	N	P
150001 to 500000	D	E	G	J	M	P	Q
500000 and over	D	E	H	K	N	Q	R

Table 3.3 ISO 2859-1 Single sampling plans for normal inspection

Sample size code letter	Sample size	Acceptable quality levels (normal inspection)																											
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000		
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re		
A	2																												3031
B	3																												4445
C	5																												
D	8																												
E	13																												
F	20																												
G	32																												
H	50																												
J	80																												
K	125																												
L	200																												
M	315																												
N	500																												
P	800																												
Q	1250																												
R	2000																												

 = Use first sampling plan below arrow. If sample size equals or exceeds the lot or batch size, perform 100% inspection.

 = Use first sampling plan above arrow.

Ac = Acceptance number.

Re = Rejection number.

Source: ISO

SINGLE SAMPLING PLANS FOR NORMAL INSPECTION

Sample Size Code Letter	Sample Size	Acceptable Quality Levels (Normal Inspection)											
		0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	
A	2											0 1	
B	3										0 1		
C	5									0 1			
D	8								0 1			1 2	
E	13							0 1			1 2	2 3	
F	20						0 1			1 2	2 3	3 4	
G	32					0 1			1 2	2 3	3 4	5 6	
H	50					0 1		1 2	2 3	3 4	5 6	7 8	
J	80			0 1		0 1		1 2	2 3	3 4	5 6	7 8	10 11
K	125		0 1		0 1		1 2	2 3	3 4	5 6	7 8	10 11	14 15
L	200	0 1			1 2		1 2	2 3	3 4	5 6	7 8	10 11	14 15
M	315				1 2		2 3	3 4	5 6	7 8	10 11	14 15	21 22
N	500			1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22		
P	800	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22				
Q	1250	2 3	3 4	5 6	7 8	10 11	14 15	21 22					
R	2000	3 4	5 6	7 8	10 11	14 15	21 22						

↑ Use first sampling plan above arrow, if sample size equals or exceeds lot or batch size, do 100 percent inspection.

↓ Use first sampling plan below arrow

AC : Acceptance number Re : Rejection number

Code Letter	Sample Size	1.0	1.5	2.5	4.0	6.5
A	2	≤ 0				
B	3	≤ 0				
C	5	≤ 0	≤ 0	≤ 0	≤ 0	≤ 1
D	8	≤ 0	≤ 0	≤ 0	≤ 1	≤ 1
E	13	≤ 0	≤ 0	≤ 1	≤ 1	≤ 2
F	20	≤ 0	≤ 1	≤ 1	≤ 2	≤ 3
G	32	≤ 1	≤ 1	≤ 2	≤ 3	≤ 5
H	50	≤ 1	≤ 2	≤ 3	≤ 5	≤ 7
J	80	≤ 2	≤ 3	≤ 5	≤ 7	≤ 10
K	125	≤ 3	≤ 5	≤ 7	≤ 10	≤ 14
L	200	≤ 5	≤ 7	≤ 10	≤ 14	≤ 21
M	315	≤ 7	≤ 10	≤ 14	≤ 21	≤ 21
N	500	≤ 10	≤ 14	≤ 21	≤ 21	≤ 21
P	800	≤ 14	≤ 21	≤ 21	≤ 21	≤ 21
Q	1,250	≤ 21				
R	2,000	≤ 21				

Adjust table row

Table II - B. Single Sampling Plans for Tightened Inspection (Master Table).

Sample size code letter	Sample size	Acceptable Quality Levels (Tightened inspection)																																				
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000											
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re												
A	2																				1	2	2	3	3	4	5	6	8	9	12	13	15	16	19	27	28	
B	3																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	27	41	42		
C	5																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	27	41	42		
D	8																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	27	41	42		
E	13																			1	2	2	3	3	4	5	6	8	9	12	15	18	19	27	41	42		
F	20																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	27	41	42		
G	32																			8	9	12	13	18	19	18	19	18	19	18	19	18	19	27	41	42		
H	50																			8	9	12	13	18	19	18	19	18	19	18	19	18	19	27	41	42		
J	80																			8	9	12	13	18	19	18	19	18	19	18	19	18	19	27	41	42		
K	125																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42
L	200																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42
M	315																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42
N	500																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42
P	800																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42
O	1250																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42
R	2000	0	1																	1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42
S	3150																			1	2	2	3	3	4	5	6	8	9	12	13	18	19	18	19	27	41	42

↓ = Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.
↑ = Use first sampling plan above arrow.

Ac = Acceptance number.

Re = Rejection number.

MASTER TABLE FOR REDUCED INSPECTION—SINGLE SAMPLING
 (Mil. Std. 105D, Table II-C)

Sample size code letter	Sample size	Acceptable Quality Levels (reduced inspection)†																										
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000	
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
A	2																											
B	2																											
C	2																											
D	3																											
E	5																											
F	8																											
G	13																											
H	20																											
J	32																											
K	50																											
L	80																											
M	125																											
N	200																											
P	315																											
Q	500	0 1																										
R	800	↑																										



= Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.



= Use first sampling plan above arrow.



= Acceptance number.



= Rejection number.



† = If the acceptance number has been exceeded, but the rejection number has not been reached, accept the lot, but reinstate normal inspection (see 10.1.4).

Table IV - B. Multiple Sampling Plans for Tightened Inspection (Master Table).

 Use first sampling plan below unless (refer to continuation of table on following pages, when relevant). If sample size equals or exceeds lot or batch size, do 100 percent inspection.

* Use corresponding single sampling plan for pattern intervals. Use double sampling plan besides when available.

++ Use `concurrent_pending_doubleSamplingPlan` for all environments. Use `multipleSamplingPlan` below, otherwise avoidable.

For stockists lot or batch size, do 100 percent inspection.

Ac = Acaplanth number.

* Acceptance not permitted at this sample site.

 Use first sampling plan above arrow

R₀ = Reproduction number.



Random Sampling Numbers

3502	7917	0413	3519	0452	6846	2273	2666	6076	9139
4731	6400	8494	3125	2159	3845	8686	2433	0425	8646
3645	2366	4959	8056	1027	0145	4512	3884	9967	4152
0972	7392	9152	4878	2812	5239	4348	2393	5698	7591
6731	0826	0569	7684	8345	5746	4716	4496	7273	6584
2090	7773	5140	4479	0620	9475	2548	5139	7407	5418
1240	6879	0932	0475	8720	2538	1192	6895	6318	3744
9881	4092	0941	9385	9224	4721	5697	4634	9924	9627
0385	7008	3748	4631	6793	4287	4197	2981	9157	5425
6749	0478	2800	3673	8972	2986	0440	3496	6187	3493
1182	7202	8139	7904	9002	2959	3971	0095	2533	0063
4844	4064	8417	8030	5932	7360	9764	4294	7998	8889
0539	8431	0548	0449	0767	4673	7987	5911	8097	9887
3586	6609	5875	3433	7734	5172	2704	5903	4945	8648
1181	5165	9210	7996	6767	2216	1643	2564	4119	1359
5387	1346	1018	1127	6931	3195	7673	8264	6450	0085
5989	3156	6067	6107	0632	5242	7278	6766	3396	2620
8464	3570	1408	3983	8630	5263	1555	3965	7899	1845
9076	3642	6516	8357	5246	4722	9570	2285	1734	6897
4546	7733	2972	4218	4454	0543	9362	7150	0114	5499
4681	4643	9668	4848	5122	8853	7859	0547	1308	7074
7133	0918	9972	8534	7739	7413	1293	2421	9498	2120
4032	7763	0223	5684	6649	7409	0287	6966	2577	6749
7577	6685	9597	6599	5015	8760	8358	5822	7608	8624
7082	2564	2973	8099	9440	2427	0870	2865	1468	5345

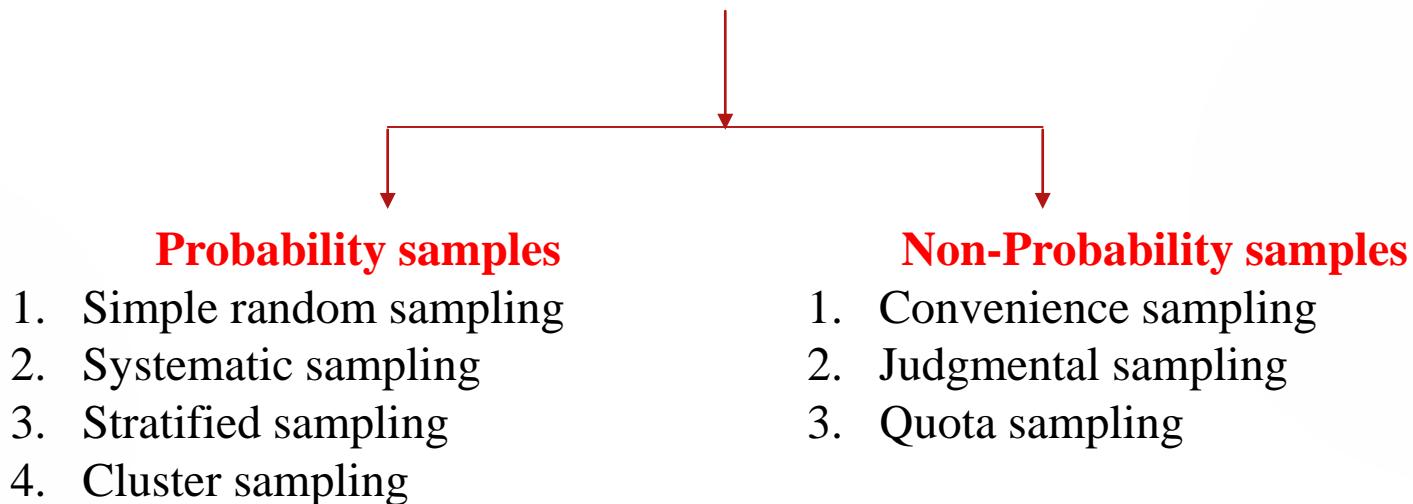
Random Sampling Numbers



9370	5856	3462	3271	4712	4496	4514	0982	3346	5644
8765	6645	6118	4057	6475	3134	2262	1318	3405	2087
0066	0120	4235	9529	7757	0785	1369	2905	1598	6727
4903	8158	1828	6462	5312	5894	9069	7328	3964	4503
2355	7680	2724	2753	8139	5941	4074	8218	0102	6213
8381	9616	9113	5150	0277	7013	3436	4365	9597	5359
5866	1501	7193	8308	6299	5673	1559	3218	4843	5222
1975	3597	8887	8198	0271	3747	8049	0928	5526	5775
3217	7211	1160	5324	8708	4195	6299	5615	6022	3763
5777	6920	4474	6719	7697	0450	1313	7118	8765	4599
0930	3390	2166	8359	5053	0428	9089	5903	3810	7577
6793	4878	5303	2016	8037	1727	4877	3842	4341	0361
5992	3943	6409	8104	3309	9195	1830	0989	2667	1363
1623	8860	4642	3088	4349	8772	1695	6300	5967	0594
2978	2995	2849	4874	0193	3506	2201	6117	3409	0049
7982	9672	4167	2972	2462	1421	2570	0850	2307	4363
8176	9154	0789	7354	6935	8714	4937	3820	9785	9181
0116	7350	7072	8774	4007	2068	7608	4901	8729	9047
2459	9070	5872	0533	2588	2137	2677	7694	6841	2465
8896	8536	0914	1278	2945	0008	1957	0590	6640	1122
4917	2534	7520	1517	5120	3609	1374	5914	2566	7043
9258	8548	3209	6117	7776	0181	4454	9281	0969	3689
9089	8521	5191	5532	3277	6227	9094	3000	8110	0272
4129	9337	6469	6713	7864	8935	5794	9113	1782	5832
1406	9641	8954	8229	3745	0674	9825	1638	4291	0400

Sample Design

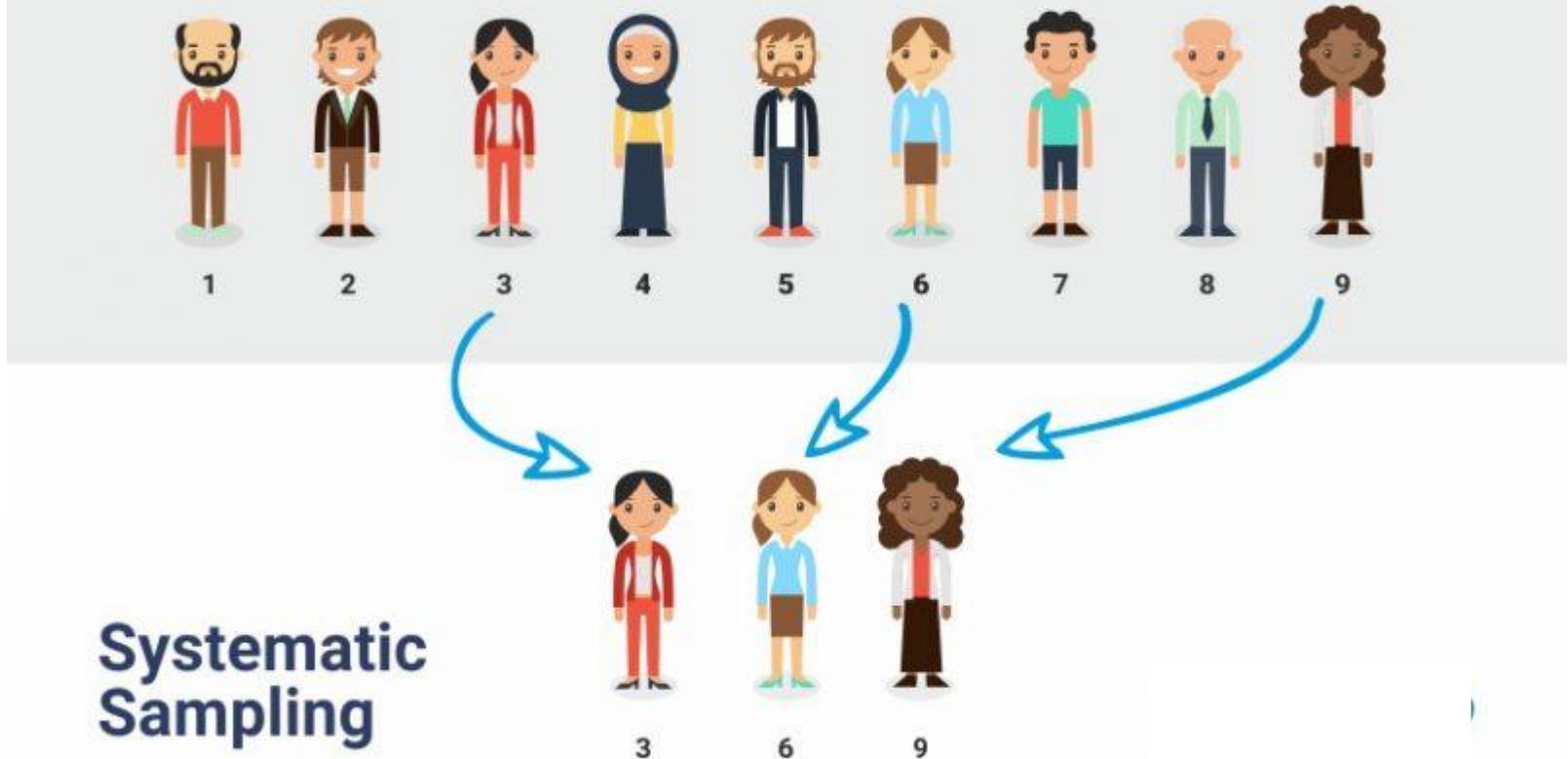
(Drawing of samples)





Simple Random Sampling

Simple random sampling is a sampling technique where every item in the population has an even chance and likelihood of being selected in the sample. Here the selection of items completely depends on chance or by probability and therefore this sampling technique is also sometimes known as a **method of chances**.



Systematic sampling is a probability sampling method where the elements are chosen from a target population by selecting a random starting point and selecting other members after a fixed 'sampling interval'. Sampling interval is calculated by dividing the entire population size by the desired sample size.



Stratified Random Sampling

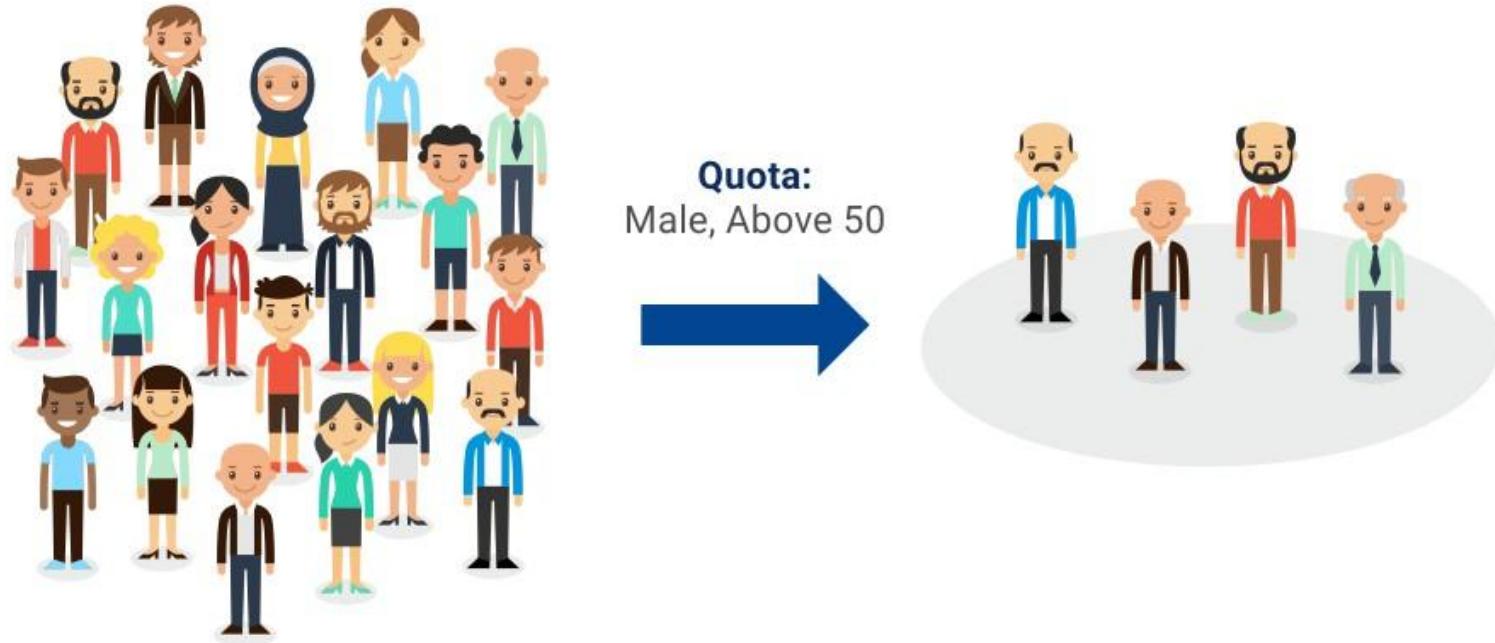
Stratified random sampling is a type of probability sampling using which an organization can branch off the entire population into multiple non-overlapping, homogeneous groups (strata) and randomly choose final members from the various strata which reduces cost and improves efficiency. Members in each of these groups should be distinct so that every member of all groups get equal opportunity to be selected using simple probability.



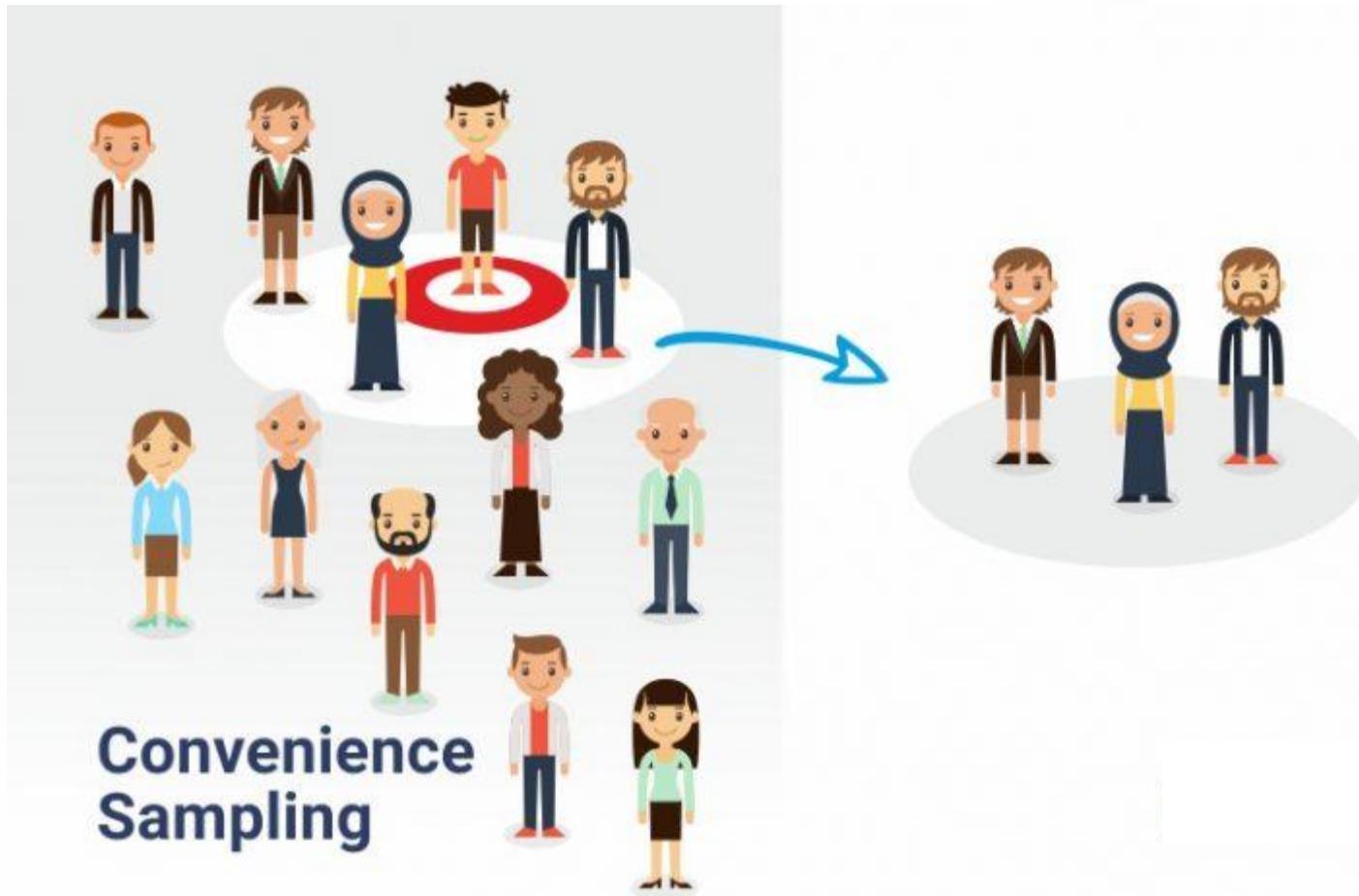
Cluster Sampling

Cluster sampling is defined as a sampling method where multiple clusters are created from a population where they are indicative of homogeneous characteristics and have an equal chance of being a part of the sample. In this sampling method, a simple random sample is created from the different clusters in the population.

Quota Sampling

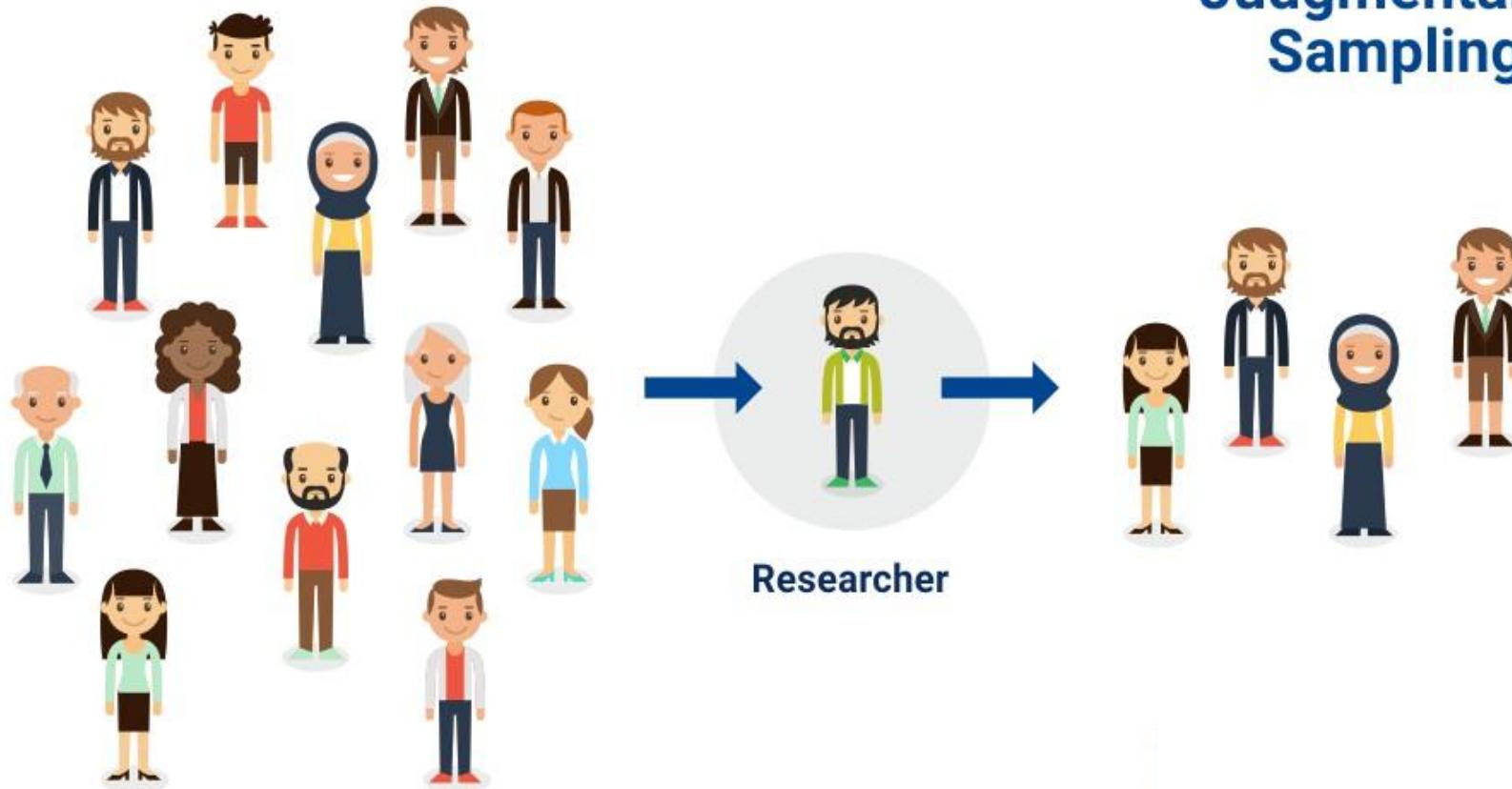


Quota Sampling is a non-probability sampling method in which organizations can form a sample involving individuals that represent a population and are chosen according to traits or qualities. Organizations can decide the trait as per which the sample subset selection will be conducted so that the sample can be effective in collecting data that can be generalized to the entire population. The final subset will be decided only according to the interviewer or researcher's knowledge of the population.



Convenience Sampling (also called availability sampling) is a non-probability/non-random sampling technique used to create sample as per ease of access, readiness to be a part of the sample, availability at a given time slot or any other practical specifications of a particular element.

Judgmental Sampling



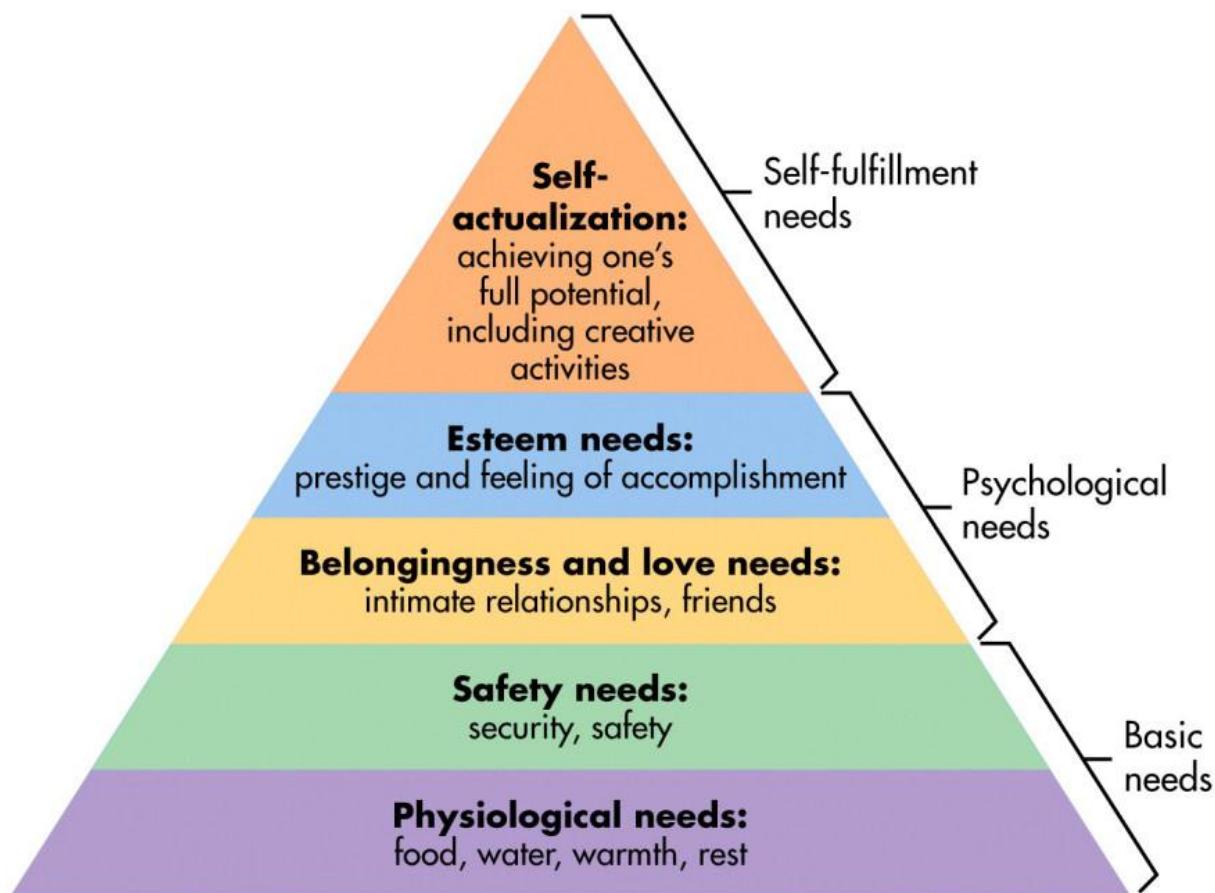
Judgmental sampling, also called purposive sampling or authoritative sampling, is a non-probability sampling technique in which the sample members are chosen only on the basis of the engineer's knowledge and judgment. As the engineer's knowledge is instrumental in creating a sample in this sampling technique, there are chances that the results obtained will be highly accurate with a minimum margin of error.

Quality and Sales

- **After sales service**
- **Sales and product quality**
- **Guarantee**
- **Analysis of Claims**

Motivation

Maslow's Hierarchy of Needs



Maslow stated that people are motivated to achieve certain needs and that some needs take precedence over others. Our most basic need is for physical survival, and this will be the first thing that motivates our behavior. Once that level is fulfilled the next level up is what motivates us, and so on.

1. **Physiological needs** - these are biological requirements for human survival, e.g. air, food, drink, shelter, clothing, warmth, sleep.

If these needs are not satisfied the human body cannot function optimally. Maslow considered physiological needs the most important as all the other needs become secondary until these needs are met.

2. **Safety needs** - protection from elements, security, order, law, stability, freedom from fear.

3. Love and belongingness needs - after physiological and safety needs have been fulfilled, the third level of human needs is social and involves feelings of belongingness. The need for interpersonal relationships motivates behavior

Examples include friendship, intimacy, trust, and acceptance, receiving and giving affection and love. Affiliating, being part of a group (family, friends, work).

4. Esteem needs - which Maslow classified into two categories: (i) esteem for oneself (dignity, achievement, mastery, independence) and (ii) the desire for reputation or respect from others (e.g., status, prestige).

Maslow indicated that the need for respect or reputation is most important for children and adolescents and precedes real self-esteem or dignity.

5. Self-actualization needs - realizing personal potential, self-fulfillment, seeking personal growth and peak experiences. A desire “to become everything one is capable of becoming”

Deficiency Needs vs. Growth Needs

Maslow believed that these needs are similar to instincts and play a major role in motivating behavior. Physiological, security, social, and esteem needs are deficiency needs, which arise due to deprivation. Satisfying these lower-level needs is important in order to avoid unpleasant feelings or consequences.

Maslow termed the highest level of the pyramid as growth needs. These needs don't stem from a lack of something, but rather from a desire to grow as a person.

While the theory is generally portrayed as a fairly rigid hierarchy, Maslow noted that the order in which these needs are fulfilled does not always follow this standard progression. For example, he noted that for some individuals, the need for self-esteem is more important than the need for love. For others, the need for creative fulfillment may supersede even the most basic needs.

Two Factor Theory by Frederick Herzberg

This theory, also called the **Motivation-Hygiene Theory** or the **dual-factor theory**, was penned by Frederick Herzberg , American psychologist, who was very interested in people's motivation and job satisfaction, came up with the theory. He conducted his research by asking a group of people about their **good and bad**

experiences at work. He was surprised that the group answered questions about their good experiences very differently from the ones about their bad experiences.

Based on this, he developed the theory that people's job satisfaction depends on two kinds of factors.

Factors for **satisfaction** (motivators/satisfiers) and

factors for **dissatisfaction** (hygiene factors/ dissatisfiers).

Performance, recognition, job status, responsibility and opportunities for growth all fall under **motivators/ satisfiers**.

Hygiene factors/dissatisfiers are about salary, secondary working conditions, the relationship with colleagues, physical work place and the relationship between supervisor and employee.

In his theory, Herzberg claims these factors function on the same plane. In other words, satisfaction and dissatisfaction aren't polar opposites. Taking away an employee's dissatisfaction – for example by offering a higher salary – doesn't necessarily mean the employee will then be satisfied. The employee is just no longer dissatisfied.

4 different combinations can exist at work:

1: High hygiene and high motivation. This is the ideal situation. Employees are very motivated and barely have any complaints.

2: High hygiene and low motivation. Employees have few complaints, but they're not really motivated, they see their work simply as a pay check.

3: Low hygiene and high motivation. Employees are motivated, their job is challenging, but they have complaints about salary or work conditions.

4: Low hygiene and low motivation. This is the worst possible situation, employees are not motivated and have a lot of complaints.

Employee Empowerment

Employee empowerment is giving employees a certain degree of autonomy and responsibility for decision-making regarding their specific organizational tasks. It allows decisions to be made at the lower levels of an organization where employees have a unique view of the issues and problems facing the organization at a certain level. Employee empowerment entails giving employees the authority to make critical business decisions on their own with little to no supervision. When done right, having empowered employees can be great. However, when done wrong, it can be devastating for both the business and its workforce. Before making the decision to empower employees, businesses should first weigh the advantages and disadvantages.

Three theoretical approaches have been used to study empowerment: socio-structural perspective, psychological approach, and the critical perspective. The **socio-structural perspective** focuses its attention on developing or redesigning organizational policies, practices, and structures to give employees power, authority, and influence over their work. The **psychological approach** focuses on enhancing and enabling personal effectiveness by helping employees develop their sense of meaning, competency, self-determination, and impact. The **critical perspective** challenges the notion of employee empowerment and argues that efforts to create empowerment may actually lead to more, albeit less-obvious, controls over employees. Employee empowerment provides some distinct advantages. Employee empowerment should lead to increased organizational responsiveness to issues and problems. Another advantage of employee empowerment should be an increase in productivity. It should also lead to a greater degree of employee commitment to organizational goals since employees can take some degree of ownership in the decisions made toward goal achievement.

A benefit of having empowered employees is that they take on more responsibility within the company. As they take on more responsibility, they begin working independently with little to no supervision. Businesses like this because it saves them money by decreasing their managerial workforce. However, unlike managers and supervisors who are educated and trained in making sound decisions, empowered employees often lack this type of experience. This lack of experience lends to an increase in mistakes and unnecessary company risks.

One way that employers empower their employees is by sharing important information with them. This free exchange of ideas and information makes the employees feel appreciated and important, which ends up empowering them. However, when information is freely exchanged with people throughout the company, there is an increased risk of confidential and security-related data being leaked to parties that shouldn't have access to that type of information. For competitive businesses, these potential leaks could prove devastating to their operations.

When employees are empowered, their confidence levels tend to increase. This additional confidence is a good thing because it creates happier workers and productivity levels soar. However, in some situations, confidence levels can be taken too far and end up crossing the line into arrogance. Arrogant employees are difficult to deal with, don't take direction well and can become insubordinate. Working in this type of work environment takes its toll on employees and they once again become dissatisfied with their job and productivity levels decrease.

Employee surveys

Employee surveys are tools used by organizational leadership to gain feedback on and measure employee engagement, employee morale, and performance. Usually answered anonymously, surveys are also used to gain a holistic picture of employees' feelings on such areas as working conditions, supervisory impact, and motivation that regular channels of communication may not.

Surveys are still great predictors of behavior. We learn a lot from surveys even when people don't participate. People who don't fill out either of our two annual

surveys are 2.6 times more likely to leave in the next six months. **Surveys give employees the chance to feel heard.** Not having a regular survey sends a clear message: you don't care about people's opinions. The act of filling out a survey gives them a specific channel for expressing voice. **Surveys are a vehicle for changing behavior.** When you ask people for their input and insights, you aren't just learning from them. You're also influencing them. Psychologists find that asking questions can change behavior.

Employee satisfaction survey questions

01. On a scale of 1 to 10, how happy are you at work?

To get employee engagement right, you must start with this question and ask it regularly. It's undoubtedly the most direct of questions to ask employees regarding workplace satisfaction. Regularly finding out where your company's morale falls on the 10-point scale allows you to track morale over time. The key, however, is consistency.

02. Would you refer someone to work here?

How likely an employee would refer someone is a reflection on how satisfied this person is at their job. If they're unhappy with their job, you can bet they don't have much good to say to their friends about the company.

03. Do you have a clear understanding of your career or promotion path?

Another poll by Gallup found that employees who get the opportunity to continually develop are twice as likely to say they will spend their career with their company. Find out if your workers have a clear understanding of what lies ahead of them. If their answers are negative, you'll need to start offering developmental opportunities to prevent people from quitting in rapid succession.

04. On a scale of 1 to 10, how would you rate your work-life balance?

Employees need to balance work and their personal life in order to be productive and engaged. If employees are feeling lopsided, then that's a red flag that signals burnout is right around the corner.

05. Hypothetically, if you were to quit tomorrow, what would your reason be?

Bad communication, lack of transparency, feeling unvalued — these can all be uncovered by asking this question. Responses to this ultra-insightful of engagement questions will inform you if your employees feel like they're there to stay or if there are underlying issues that are driving them to look elsewhere for work.

Questions to ask employees about their manager

06. Do you feel valued at work?

Our research has revealed that only 21% of employees feel strongly valued at work. Use this question to gauge how valued workers in your organization are feeling.

07. How frequently do you receive recognition from your manager?

Find out how the leadership team is doing with recognizing their employees. If the majority of workers have said they've gone more than two weeks without recognition, there's a good chance morale is dropping. And that can lead to disengagement, loss of productivity, and attrition.

08. The last time you accomplished a big project, did you receive any recognition?

Feeling valued at work is a huge motivator. This question will help uncover if leaders (or peers) have missed the mark when it comes to recognition. If employees don't feel their hard work is properly recognized, you can work together to find a solution to this problem.

Employee Retention

09. Do you believe you'll be able to reach your full potential here?

Employees want to work at a place that will nurture their desire for growth. The more opportunities for growth your organization can offer, the longer employees will stick around.

10. If you were given the chance, would you reapply to your current job?

This is a tricky question — the happier an employee is at their current job, the more likely they would be to reapply to that very same position. So if an employee rates on the lower end of the spectrum then they're most likely unhappy and won't be at the job for long.

11. Do you foresee yourself working here one year from now?

A question like this is pretty self-explanatory. However, it can say a lot about your retention rate. If a majority of your employees are saying they don't see themselves working here in one year, you've got some changes to make.

12. Do you believe the leadership team takes your feedback seriously?

No one wants to work at a place that ignores their employees. When leaders don't take feedback or suggestions seriously, it shows that they're not committed to making improvements. And frankly, it makes employees feel unvalued.

13. Do you feel like the management team here is transparent?

Transparency is the number one factor that contributes to workplace happiness. Only 25% of workers believe management is very transparent — despite that nearly twice as many managers consider themselves transparent.

Find out how well your leaders are doing with providing information to their employees.

14. With eyes closed, can you recite our organization's values?

Our previous research has also uncovered the fact that only 42% of employees know their organization's vision, mission, and cultural values. A low number is unsettling because it's saying that employees are doing their work without any real understanding of how they're contributing to the company or that everyone isn't working on the same page.

15. What three words would you use to describe our culture?

Fun, suppressive, supportive — find out what your employees think about your culture. Use the results to find ways to strengthen and improve your culture to suit your employees' needs.

16. On a scale of 1 to 10, how comfortable do you feel giving upwards feedback to your supervisor?

A workplace should never be a hostile environment. Nor should it be one that's suppressive. Employees should feel comfortable providing feedback to their supervisors so that they can continue to offer suggestions for improvements.

17. Do you feel like coworkers give each other respect here?

You want to build a culture where people respect one another — not one where heads clash. Dig under the surface to find out how employees truly feel about each other. If they're not supporting one another, it's time to start doing team-building activities.

18. Do you believe we live authentically by our organizational values?

Do your employees feel like the organization's values are just meaningless words on the walls? Or maybe they believe leaders aren't living out the values. Either way, an organization's values are there are guidelines for behaviors and decisions.

19. Does our executive team contribute to a positive work culture?

Are the top leaders in your organization fostering a positive work environment or a negative one? With this survey question, you'll be able to go behind the scenes and find out how well leaders are upholding the organization's culture.

20. Do you have fun at work?

Employees spend so many hours at work. Find out if your employees think your organization's culture is worth waking up every day for.

Anonymous employee surveys are an important tool for fighting disengagement and attrition. But you'll need to act on this feedback by sharing it with your employees and working with them to find solutions to improve the workplace in order to truly foster an engaging environment.

TEAMS

"A team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable.". 90 percent of corporate leaders feel today's

problems are so complex they require teams to provide effective solutions. These leaders believe collaboration can fuel creative thinking and problem solving critical to positive business outcomes.

1. Department teams: Departmental teams have been around for quite some time. As a department team, individuals relate to specialty or focus he or she has mastered, with everyone working toward achieving goals outlined in the company's mission statement. Some examples include developer teams at a tech start up or the sales team at a marketing agency.

Departmental teams are permanent and typically work on ongoing projects or goals.

2. Problem-solving teams: These types of teams are usually temporary and focus on solving a specific issue. For example, after the 2008 financial crisis, several organizational task force teams and governmental committees were created to come up with solutions to help the country climb out of a steep recession. Once guidelines were set in place and plans were formed, the task forces and committees were disbanded.

3. Virtual teams: A virtual team can be any type of team that communicates digitally rather than in person. Easier communication tools allow managers to build teams based on strengths and weaknesses rather than geography. It's important for us to master virtual skills early on, as conference calls and WebEx presentations have become ubiquitous in the workplace. Virtual Team is thus a team which is not sitting together, which do not have a face-to-face interaction. Here we have people who were sitting in different time zones. These are people from different cultures, different language and they are working towards a common goal using the help of technology.

4. Cross-functional teams: In most business settings, permanent team members are going to collaborate with other departments to tackle certain events for the company – such a new product launch. In these situations communication between internal departments is crucial in order to address the project goals.

5. Self-managed teams/Self-directed team: The self-directed team comes together on their own. These are not formally assigned to a particular project. The members of the self-directed team come together on their own with the minimum input from management. For example, they see a problem; they come together to form an informal team and work together towards that goal.

These types of teams are the most empowered, as they have to power to make decisions. Each team member brings a certain skill set to the table to make informed

decisions, complete assignments or deliver services for customers. Companies that implement self-managed teams say their employees tend to feel more ownership of the project.

6. Natural work teams are workgroups that are built around around common product, process or service. It involves groups of people working in same workspace and performing related or similar job e.g. Customer service team, finance team

7. A project team consists of members of multiple company departments. Also known as a special purpose or task force team, this type of team has a “charter”; they are called together to plan an event, such as the annual holiday party, or solve a looming workplace issue, such as the rising cost of health care benefits. Project teams are usually temporary in nature; once they accomplish their objective, team members disband, although they can reprise their role at a later date if and when the need arises. Since a project team is interdisciplinary, the challenge for the small-business owner is to appoint the “right” representatives who will make worthy contributions without ruffling the feathers of the rest of the flock.

8. A management team consists of department leaders. Lower-level employees may refer to them as “the big guns,” but not necessarily in a pejorative manner. Presumably, these are the people you count on most. And presumably, they can rise to the occasion by bringing their different and valuable perspectives to a vexing workplace problem or dilemma.

Effective team meetings

How to run effective team meetings:

1. Have a meeting agenda with clear objectives

Meetings often stray from their initial purpose. Getting off topic is easy when there are multiple people trying to communicate with one another — especially with a remote team and video conferencing software. It’s recommended to set goals, write an agenda, collaborate ahead of time, and assign roles before the meeting even starts. Before every meeting, create an agenda outlining the points to be discussed. Taking a few minutes to do this for each meeting makes a big difference in the outcome of your meetings. It helps you stay on track and constantly reminds you throughout the meeting about what the objective is.

2. Set an end time and stick to it

Creating a meeting agenda beforehand will help you determine the amount of time to allot for it. When you set a staff meeting with no end time, it's easy to get off topic even when you have an agenda and objective. The meeting leader (see below) should solicit the help of meeting participants to keep an eye on the time. If you're a participant, don't be afraid to speak up and remind everyone of the time.

3. Designate a meeting leader

Without a meeting leader, chaos will ensue every time. Your meetings must have a point person — typically the person who called the meeting — to lead a meeting and to keep things on track throughout the session. The primary roles of the meeting leader include:

- Scheduling the meeting and sending a calendar invite
- Creating and disseminating the agenda
- Assigning talking points or time slots to each attendee
- Assigning tasks upon the conclusion of the meeting

4. Cut down on meetings

Many people call meetings without a true purpose. Before calling a meeting, ask yourself if the information can be shared just as effectively in a different way. Some communication channels include Slack groups, email, internal memos, and project management tools. A way to cut down on meetings is to merge similar meetings together. This is a good move if you're a manager and talking about similar topics with different team members.

5. Cut down on attendees

While merging meetings can be a good idea, having too many people in a meeting can dilute the quality of information exchanged. When meetings have too many participants, you can end up with endless discussions, unclear direction, and too many opinions guiding the decision-making process.

Think of people best suited to attend the meeting, then send out meeting notes or highlights to the entire team if it's relevant.

6. Create action items and accountability

Use the ideas and decisions developed during the meeting to create action items. And when these action items are created, assign them to members of your team. Log them in your project management system and link to the meeting notes so people can refresh their memory about the meeting's details. (Typically, a project manager will follow up by assigning tasks and deadlines after the meeting, but it's on everyone in attendance to take their own notes).

7. Bring solutions to the meeting

Team meetings are more effective when attendees come up with solutions ahead of time. People should come up with solutions on their own and then discuss them. This way you get more options to choose from and generally save time. If you have a problem, ask team members to come up with 5-6 solutions. At the time of the meeting people will present their solutions with a brief description of the solution and its main advantages and disadvantages. Depending on the number of solutions, we can either discuss it or maybe use a poll for everyone to vote.”

Meeting Evaluation Checklist

A feedback should be taken from attendees as follows:

The meeting was well planned **YES** **SOMEWHAT** **NO**

- Members were notified in advance
- There was a pre-arranged agenda
- Officers and committees were ready to report
- The meeting room was pre-arranged

The meeting was well organized **YES** **SOMEWHAT** **NO**

- The meeting started on time
- Guests were introduced and welcomed
- Agendas were available for all members
- The purposes for the meeting were made clear
- There was a transition from the last meeting
- One topic was discussed at a time
- One person has the floor at a time
- Discussion was relevant
- The chairperson summarized the main points of the discussion
- The meeting moved along at a workable pace
- Committee assignments were complete and clear

- Plans for the next meeting were announced
- All that was planned for the meeting was covered

Participation in the meeting **YES** **SOMEWHAT** **NO**

- Members participated in discussion and voting
- The chairperson made good use of questions
- The pros and cons of all issues were considered
- Members gave suggestions to committees
- Responsibilities were evenly distributed
- Members participated in planning the agenda for the next meeting

The value of the meeting **YES** **SOMEWHAT** **NO**

- Progress was made toward goals
- Something was learned

Attitude of the meeting **YES** **SOMEWHAT** **NO**

- Attendance was good
- Everyone present was on time
- Members knew one another
- There was a "warm up" period before the meeting
- There was some humor during the meeting
- Members and officers helped one another when needed
- There was an atmosphere of free expression

Stages of team development

Psychologist Bruce Tuckman first came up with the memorable phrase "forming, storming, norming, and performing" in his article, "**Developmental Sequence in Small Groups.**" He used it to describe the path that most teams follow on their way to high performance. Later, he added a fifth stage, "adjourning" (which is sometimes known as "mourning"). Let's look at each stage in more detail.

1. Forming

In this stage, most team members are positive and polite. Some are anxious, as they haven't fully understood what work the team will do. Others are simply excited about the task ahead. As leader, you play a dominant role at this stage, because team members' roles and responsibilities aren't clear. This stage can last for some time, as people start to work together, and as they make an effort to get to know their new colleagues.

In this stage the leader Directs the team, and establish clear objectives, both for the team as a whole and for individual team members.

2. Storming

Next, the team moves into the storming phase, where people start to push against the boundaries established in the forming stage. This is the stage where many teams fail. Storming often starts where there is a conflict between team members' natural working styles. People may work in different ways for all sorts of reasons but, if differing working styles cause unforeseen problems, they may become frustrated. Storming can also happen in other situations. For example, team members may challenge your authority, or jockey for position as their roles are clarified. Or, if you haven't defined clearly how the team will work, people may feel overwhelmed by their workload, or they could be uncomfortable with the approach you're using. Some may question the worth of the team's goal, and they may resist taking on tasks. Team members who stick with the task at hand may experience stress, particularly as they don't have the support of established processes or strong relationships with their colleagues.

In this stage the leader needs to Establishes processes and structures, Build trust and good relationships between team members, Resolve conflicts swiftly if they occur, Provide support, especially to those team members who are less secure. Remain positive and firm in the face of challenges to your leadership, or to the team's goal. Explain the "forming, storming, norming, and performing" idea, so that people understand why problems are occurring, and so that they see that things will get better in the future. Coach team members in.

3. Norming

Gradually, the team moves into the norming stage. This is when people start to resolve their differences, appreciate colleagues' strengths, and respect your authority as a leader. Now that your team members know one another better, they may socialize together, and they are able to ask one another for help and provide constructive feedback. People develop a stronger commitment to the team goal, and you start to see good progress towards it. There is often a prolonged overlap between storming and norming, because, as new tasks come up, the team may lapse back into behavior from the storming stage.

In this stage the leader Steps back and help team members take responsibility for progress towards the goal. (This is a good time to arrange a team-building event.)

4. Performing

The team reaches the performing stage, when hard work leads, without friction, to the achievement of the team's goal. The structures and processes that you have set up support this well. As leader, you can delegate much of your work, and you can concentrate on developing team members. It feels easy to be part of the team at this stage, and people who join or leave won't disrupt performance.

The leader needs to delegate tasks and projects as far as one can. Once the team is achieving well, you should aim to have as light a touch as possible. You will now be able to start focusing on other goals and areas of work.

5. Adjourning

Many teams will reach this stage eventually. For example, project teams exist for only a fixed period, and even permanent teams may be disbanded through organizational restructuring. Team members who like routine, or who have developed close working relationships with colleagues, may find this stage difficult, particularly if their future now looks uncertain.

In this stage the leader should take the time to celebrate the team's achievements – you may work with some of your people again, and this will be much easier if people view past experiences positively.

Ten common team problems and their solutions

Teams are complicated, complex structures because they are comprised of individuals with different personalities, biases, strengths, and weaknesses. Before people can form into an effective team, they must first learn to work together. Participants must work through personal differences, find strengths to build on, and balance collective commitments against the demands of individual job requirements. Leaders must deal with team needs that arise from the pressures of personal differences and the demands of the individual jobs apart from the team. Addressing these issues is as important as the team's task of making organizational improvements. Often both leaders and team members underestimate the need to develop themselves into a cohesive group.

The busyness of a project manager's day-to-day business means problems are often brushed aside with the hope that they will just disappear – which they rarely do.

Be proactive instead. Address any issues and create a successful project team. Here is a list some of the most common problems that teams face. By confronting these – and therefore improving project outcomes – you can boost your own career, while working better together benefits everyone on the team.

1. Lack of trust

Trust is crucial to teamwork, and it starts with people knowing each other. Team members absolutely need to be acquainted, both professionally and personally, particularly in projects where tensions will run high at some point. Otherwise members won't understand each other, they won't want to engage because they haven't made that human connection and they won't fully trust each other.

2. Conflict and tension

Conflict or a difference of opinion can be healthy and, if carefully managed, can trigger useful debates. It can make people think differently, expanding knowledge and insight; innovation can happen and results flourish. Different opinions are not a bad thing. It's how we handle the conflict that makes a difference.

3. Not sharing information

Knowledge is not power – unless it's shared. Project team members all bring a unique set of skills, knowledge, experience and wisdom to the table. Effective project teams fearlessly share regularly and generously for the benefit of everyone and for the benefit of the project's success. This makes the capability of the whole team grow and gives the team more power.

4. Low engagement

Team engagement is crucial to business success. If engaged, team members on a given project will be interested in what they do, committed to the project mission and willing to go the extra mile. They are there in body as well as mentally and emotionally. The key to engagement is involvement – by involving others you make it impossible to stay detached.

5. Lack of transparency

Without transparency, trust will suffer – both within the project team and with the end client. Transparency is becoming the presumed norm in project and programme management and expectations are growing. It starts at the top: the more senior you are, the more responsibility you have to be a role model for this. Employees will follow the leader's behaviors, good or bad. When this is done well it can have a positive cascade effect throughout the organization.

6. No long-term thinking

Managers have to get beyond day-to-day urgencies, see the big picture and consider how all parts of the project fit together. For a project team, this means being able to think beyond your own area, about how you fit into the wider change programme or project and how you impact the end client's experience. This is about business sustainability and long-term success. Everyone is busy, but just being busy is not enough. Long-term project success requires long-term thinking.

7. Badly perceived, not delivering

A project team has a brand, an image and a reputation created by the actions and behaviors of the team members. A large part of the perception is driven by how well the team delivers on expectations and promises made. As a project team, you need to make sure that everyone understands and takes responsibility for their roles in creating the perception of the team. This includes both what is delivered on the project and how it is delivered.

8. Poor change management

Change is constant and unless carefully managed, it can be detrimental to teamwork and results. Change starts and ends with communication. Whenever you think you've communicated enough, you need to communicate some more – and it needs to be interactive: listen, talk and involve. Be aware of the change curve, or the four predictable stages of change: denial/resistance, emotional, hopeful, commitment. Each stage is needed, but how long someone stays at each stage can be managed and kept to a minimum.

9. Working in silos

Silo working is a reality for many project teams. Team members may sit side by side but not really work together. A great project team can be like the three musketeers – all for one and one for all. So if you are in a team, you may as well really be in it. Working together in earnest is about making the most of the fact that you are a team. Honor your time and efforts by seeing yourself as a full-time member of the team, not just an individual contributor. Imagine how great it would feel to be part of a team where everyone is thinking of the team and not just themselves – make that project a success by working together.

10. Not going in the same direction

To walk in the same direction, a team needs to know where it is going or what it is contributing to (vision) and why (purpose). Spend time on this with your team. This clarity provides a framework and ‘reason to be’ that can rally any given

project team to work together. Keep in mind that visions need to be compelling and purposes meaningful. People respond to the importance of both.

Some more points for teams not being able to work:

- The project manager / team leader & team are unclear on the purpose of the teams work – the '*What are we here? + What am I doing here?*'
- The project manager / team leader & team are unclear of their specific goals + what they are responsible for completing.
- The teams' purpose is lacking in either the '**What**' *quality & quantity of the goal* or the '**by-when**' *time frame required & resources to complete the work*.
- The direct managers of the project team members (*who are usually NOT the project manager/leader and are generally different for each member of the cross-functional team*) don't support the team members' participation on the team.
- The project manager / team leader is lacking the authority to be effective with the team.
- Lack of skilled-knowledge & management capability in the the team leader.
- The team members lack the skilled-knowledge and / or technical skills needed to complete their tasks.

Ten Common People Problems and Their Solutions³¹

One way to deal with group problems is to talk about them as soon as they occur. Most problems require a more structured approach. Common team problems and their solutions are given below.

1. *Floundering* occurs when the team has trouble starting or ending a project or different stages of the project. Solutions to this state are to look critically at the improvement plan, review the mission statement, determine the cause of the holdup, and have each member write down reasons and discuss them at the next meeting.

2. *Overbearing participants* have an unusual amount of influence in the team. They usually have a position of authority or a particular expertise. Teams need these abilities; however, it becomes detrimental when they discourage discussion on their expertise and discount other members' ideas. Solutions are to reinforce the ground rules, talk to the person off-line and ask for cooperation, and enforce the importance of data and the problem-solving method.

3. *Dominating participants* like to hear themselves talk, use overlong anecdotes, and dominate the meeting. Members get discouraged and find excuses for missing meetings. Solutions are to structure discussion on key issues for equal participation, talk to the offending person off-line, and have the team agree on the need for limits and a balanced participation. In addition, the leader may act as a gatekeeper by asking questions such as "Gupta, we heard from you; what do the others think?"

4. *Reluctant participants* feel shy or unsure of themselves and must be encouraged to contribute. Problems develop when there are no built-in activities that encourage introverts to participate and extroverts to listen. In addition to structured activities, solutions include dividing the task into individual assignments and acting as a gatekeeper by asking questions such as, "Sanjeev, what is your experience in this area?"

5. *Unquestioned acceptance of opinions as facts* occurs when members assert personal beliefs with such confidence that other members think they are facts. Solutions are to request data and to follow the problem-solving method.

6. *Rush to accomplish* is common to teams being pushed by one or more members who are impatient for results. Teams must realize that improvements do not come easily and rarely overnight. Solutions are to remind members that the ground rules call for the problem-solving method or to confront the rusher off-line and explain the effects of impatience.

7. *Attribution* is the activity of guessing at a person's motives when we disagree or don't understand his or her opinion or behavior. Solutions are to reaffirm the importance of the problem-solving method, question whether this opinion is based on data, and find out the real meaning of the problem.

8. *Discounts and "plops"* arise when members fail to give credit to another's opinions or no one responds to a statement that "plops." Every member deserves the respect and attention from the team. Solutions are to reinforce active listening as a team behavior, support the discounted member, or talk off-line with members who frequently discount, put down, or ignore.

9. *Wanderlust: digression and tangents* happen when members lose track of the meeting's purpose or want to avoid a sensitive topic. Discussions then wander off in many directions at once. Solutions are to use a written agenda with time estimates, write meeting topics on flip charts, or redirect the conversation back to the agenda.

10. *Feuding team members* can disrupt an entire team with their disagreements. Usually these feuds predate the team and are best dealt with outside the team meetings. Solutions are to get the adversaries to discuss the issues off-line, offer to facilitate the discussion, and encourage them to form some contract about their behavior.

Common barriers to team progress

- **Insufficient training.** Teams cannot be expected to perform unless they are trained in problem-solving techniques, group dynamics, and communication skills.
- **Incompatible rewards and compensation.** In general, organizations make little effort to reward team performance. Because of a strong focus on individual rewards it is difficult for individuals to buy into the team concept. Similarly, performance appraisals do not accept input from peers or team members.
- **First-line supervisor resistance.** Supervisors are reluctant to give up power, confident that they can do the work better and faster, are concerned about job security, and are ultimately held responsible.
- **Lack of planning.** A lack of common direction or alignment on the use of collaborative efforts, internal competition, redundancy, and fragmented work processes all prevent team progress.
- **Lack of management support.** Management must provide the resources and “buy into” the quality council/sponsor system.
- **Access to information systems.** Teams need access to organizational information such as business performance, competitive performance, financial data, and so forth.
- **Lack of union support.** Organizations need union support for the team to be successful.
- **Project scope too large.** The team and organization are not clear on what is reasonable, or management is abdicating its responsibility to guide the team.
- **Project objectives are not significant.** Management has not defined what role the team will play in the organization.
- **No clear measures of success.** The team is not clear about its charter and goals.
- **No time to do improvement work.** Values and beliefs of the organization are not compatible with the team’s work. Individual departmental politics interfere with the team’s progress. Management has not given the team proper resources.
- **Team is too large.** The organization lacks methods for involving people in ways other than team membership.
- **Trapped in groupthink.** Team members all have a mind-set that no actions are taken until everyone agrees with every decision.
- **Bad Leadership** A team without an effective leader is not going to be a productive team. Leaders need to establish the policies that govern the team and help the team achieve its goals. When a leader lacks vision or the ability to effectively manage the team, then the group loses the motivation and confidence necessary to come together as a unit.

- **Poor Goal Planning** For a team to feel effective and relevant, it needs to have well-defined goals to accomplish. Long-term team goals need to be broken down into smaller milestones so that the team is able to chart its success or failure and make any necessary changes to its procedures. When there are no clearly defined goals for the team to achieve, the team members do not have a way of utilizing their individual talents and they have no way of pooling those talents toward achieving a common result.
- **Poor Communication** An effective team has developed an efficient method of communication that processes incoming information and distributes it to the proper parties. Good team communication also means that each of the team members feels comfortable and confident when addressing other members of the group. The group is able to communicate without egos or personal agendas getting in the way. A team with a poor communication structure, or no communication structure at all, has no way of getting information to the team members that need it. A lack of internal communication does not allow the group members to bond and find ways of solving the issues that face the team.
- **Personality Clashes** People who have their own agenda that they are unwilling to compromise for the good of the group will be some of the biggest barriers to developing an efficient team. A lack of respect for other members of the team can lead to conflict within the team and cause people who have personal issues with each other to disrupt the constructive nature of the group.
 - **Individual agendas** If a team is to prosper, all members need to sign up to and be committed to the team goals first foremost. For many this is particularly challenging as in business, we are used to being concerned about our own individual situation. Creating a reward system that relies on the group can be a useful stepping stone to encouraging teams to focus on the team agenda.
 - **Playing it safe** Making a step change in performance or turning things round requires teams and team members to take some risk and step out of their comfort zone. This will only happen if the culture within the organisation supports and rewards this type of innovative and balanced risk taking approach. For example, if the culture is to look for scapegoats when things go wrong, people will keep within the safety boundaries rather than taking a chance.
 - **Unproductive conflict** All successful teams need to have challenge and conflict otherwise it all becomes too cosy. On the other hand, it is important to ensure that conflict is productive rather than destructive or unproductive. Lively and heated debate that actually results in a better

outcome or solution is an example of productive conflict. Challenge that focuses on all of the negatives without offering any alternatives is unproductive.

- **Fuzzy outcomes** If a team is to prosper and deliver results, it needs to be crystal clear about the results or outcomes that are expected to be delivered by the team. Too often teams are set outcomes that are fuzzy and vague which unsurprisingly leads to little in terms of results. Make the outcomes specific and measurable. For example, reduce waste from product X by 10% by 31 December 2008 is both specific and measurable.

Training

Dale S. Beach defines training as ‘the organized procedure by which people learn knowledge and/or skill for a definite purpose’. Training refers to the teaching and learning activities carried on for the primary purpose of helping members of an organization acquire and apply the knowledge, skills, abilities, and attitudes needed by a particular job and organization.

Reasons for Training:

- Improve Turnover
- New technology
- Cost control
- Role & career flexibility
- Orientation
- New appraisal techniques
- Skill & labor shortage
- Globalization & speed of change
- Product & service quality

The benefits of training in an ongoing basis also includes the maintenance of team cohesion, the creation of a common mindset and a shared vocabulary. As with learning, in general, the benefits of training your team are a challenge to enumerate. There are, however, several clear benefits.

Ongoing training will:

- Enable your team to respond to technological changes which can affect their job requirements.
- Help workers respond to the changes that come from organizational restructuring.
- Give them the ability to adapt to changes resulting from increased diversity in the workforce.
- Work to facilitate career development.
- Help to meet your employee's need for continued growth

Training is important to understand the difference between training and development. These are two of the most critical areas of Human resource management. They are concerned with the ways your workforce self-organizes-indeed whether or not it can. Training and Development are the primary ways through which the performance of groups and individuals are improved within an organization.

The Goals of Training & Development

- Improve efficiency
- Improve team morale
- Improve human relations
- Reduce supervisory needs
- Improve organizational flexibility and viability

The Training & Development Process

- Determine your company's T&D needs
- Decide what are your desired results.
- Set out clear Training objectives
- List clear summaries of your objectives.
- Choose optimal T&D methods
- Know your training options and select the right ones.
- Implement programs

- Set up and execute your training programs.
- Evaluate programs
- Have adequate evaluation methods in place and execute them.

It is important to understand what is involved in the implementation of any employee training and development program. Understand that workforce T&D means change. Be sure that your organization is ready for the improvements that your workforce will want to execute after their training is complete. They must have the authority and resources to use their new skills. Qualified trainers must be available to perform the required training. And these trainers need to understand what your company's objectives are.

Importance/benefits of training:

- ❖ **Improved employee performance** – the employee who receives the necessary training is more able to perform in their job. The training will give the employee a greater understanding of their responsibilities within their role, and in turn build their confidence. This confidence will enhance their overall performance and this can only benefit the company. Employees who are competent and on top of changing industry standards help your company hold a position as a leader and strong competitor within the industry.
- ❖ **Improved employee satisfaction and morale** – the investment in training that a company makes shows employees that they are valued. The training creates a supportive workplace. Employees may gain access to training they wouldn't have otherwise known about or sought out themselves. Employees who feel appreciated and challenged through training opportunities may feel more satisfaction toward their jobs.
- ❖ **Addressing weaknesses** – Most employees will have some weaknesses in their workplace skills. A training program allows you to strengthen those skills that each employee needs to improve. A development program brings all employees to a higher level so they all have similar skills and knowledge. This helps reduce any weak links within the company who rely heavily on others to complete basic work tasks. Providing the necessary training creates an overall knowledgeable staff with employees who can take over for one another as needed, work on teams or work independently without constant help and supervision from others.

- ❖ **Consistency** – A robust training and development program ensures that employees have a consistent experience and background knowledge. The consistency is particularly relevant for the company's basic policies and procedures. All employees need to be aware of the expectations and procedures within the company. Increased efficiencies in processes results in financial gain for the company.
- ❖ **Increased productivity and adherence to quality standards** – Productivity usually increases when a company implements training courses. Increased efficiency in processes will ensure project success which in turn will improve the company turnover and potential market share.
- ❖ **Increased innovation in new strategies and products** – Ongoing training and upskilling of the workforce can encourage creativity. New ideas can be formed as a direct result of training and development.
- ❖ **Reduced employee turnover** – staff are more likely to feel valued if they are invested in and therefore, less likely to change employers. Training and development is seen as an additional company benefit. Recruitment costs therefore go down due to staff retention.

Types of Training:

Various types of training can be given to the employees such as induction training, refresher training, on the job training, vestibule training, and training for promotions.

Some of the commonly used training programs are listed below:

1. Induction training:

Also known as orientation training given for the new recruits in order to make them familiarize with the internal environment of an organization. It helps the employees to understand the procedures, code of conduct, policies existing in that organization.

2. Job instruction training:

This training provides an overview about the job and experienced trainers demonstrates the entire job. Addition training is offered to employees after evaluating their performance if necessary.

3. Vestibule training:

It is the training on actual work to be done by an employee but conducted away from the work place.

4. Refresher training:

This type of training is offered in order to incorporate the latest development in a particular field. This training is imparted to upgrade the skills of employees. This training can also be used for promoting an employee.

5. Apprenticeship training:

Apprentice is a worker who spends a prescribed period of time under a supervisor.

Suggestion system

Suggestion systems are a form of employee-to-management communication that benefit employees as well as employers. They provide a two-way channel of communication between employees and management, with management accepting or rejecting employee suggestions and in some cases commenting on them. Suggestion systems give employees a voice and a role in determining company policies and operating procedures.

Employee suggestions can help increase efficiency, eliminate waste, improve safety, and improve the quality of a company's products and services. The company benefits not only in terms of cost savings realized as a result of employee suggestions, but also in terms of better employee morale. In many cases suggestion systems can help develop teamwork among employees. While the goal of a suggestion system is for cost savings to exceed expenses associated with the program, there are also intangible benefits to be realized from suggestion systems.

One of the first suggestion systems was started at General Electric in 1906. It consisted of a suggestion box in each department with a pad of blank paper on which employees were instructed to write practical suggestions for improving the company's manufacturing and other operations. The system was put into place only after an employee was fired for developing and proposing an idea for improving a manufacturing operation. Today, suggestion systems are common not only in manufacturing companies, but in businesses of all sizes and types.

A successful suggestion system must be promoted to the company's employees.
There are 5 ground rules for a suggestion system:

1. Be progressive by regularly asking your employees for suggestions system
2. Remove fear by focusing on process and not on person
3. Simplify process so that its easy to participate.
4. Respond quickly to suggestions and within specific time period
5. Reward the idea with published recognition so that everyone knows the value of the contribution

Benefits of a Suggestion System

- Improves one's own work and the working environment
- Engages and empowers employees
- Creates ownership and trust
- Improves motivation and morale
- Improves customer satisfaction
- Improves profitability

The Suggestions Cycle



Key Considerations for Designing a Successful Suggestions System

Many organizations have made the mistake of putting up suggestion boxes and expect employees to participate and contribute good quality ideas to improve the products, services and the working environment without creating a supporting infrastructure to manage the flow of suggestions. More often than not, these suggestion boxes are either empty or become collectors of trash. For a suggestions system to be successful and effective, the following factors have to be considered:

- Formation of a suggestions committee to plan and manage the suggestions system
- Defining the suggestions process, including a feedback system
- Promoting the suggestions system
- Evaluation system
- Award system
- Sustaining the suggestions system

Recognition and reward system for employees

Rewards

Following are the common methods of rewards that can be found in modern business organizations. Although not all these reward methods are used by the same company, the companies can adopt the best reward methods that suit the company culture and other company goals. As an example, some companies do like to give all the benefits to the employees as financials, while other companies like giving the employees the other benefits such as insurance, better working environment, etc.

Basic Pay Pay is an essential factor, which is closely related to job satisfaction and motivation. Although pay may not be a reward as this is a static amount, which an employee will be paid every month, it will be considered as a reward if similar work is paid less.

Additional Hour's Rewards This is similar to that of overtime. However, it is paid to employees if they put in an extra hour of work for working at unsocial hours or for working long hours on top of overtime hours.

Commission Many organizations pay commission to sales staff based on the sales that they have generated. The commission is based on the number of successful sales and the total business revenue that they have made. This is a popular method of incentive.

Bonuses Bonuses will be paid to employees, who meet their targets and objectives. This is aimed at employees to improve their performance and to work harder.

Performance Related Pay This is typically paid to employees, who have met or exceeded their targets and objectives. This method of reward can be measured at either team or department level.

Profits Related Pay Profits related pay is associated with if an organization is incurring a profit situation. If the organization is getting more than the expected profits, then employees receive an additional amount of money that has been defined as a variable component of the salary.

Payment by Results This is very similar to that of profit related pay. This reward is based on the number of sales and total revenue generated by the organization.

Piece Rate Reward Piece rate reward is directly related to output. The employees get paid on the number of 'pieces' that they have produced. These pieces will be closely inspected to make sure that quality standards are being met.

Recognition

Employees will not always be motivated by monetary value alone. They do require recognition to be motivated and to perform well in their work.

Job Enrichment This is a common type of recognition that is aimed at employees to get motivated. Job enrichment allows more challenging tasks to be included in the day-to-day tasks performed by the employee. Working the same way everyday may prove to be monotonous to the employees. Therefore, there will be a lack of interest and the performance drops.

Job Rotation Unlike job enrichment, job rotation refers to shifting employees between different functions. This will give them more experience and a sense of achievement.

Teamwork Teamwork is also considered as recognition. Creating teamwork between team members will improve performance at work. Social relationships at work are essential for any organization.

Empowerment Empowerment refers to when employees are given authority to make certain decisions. This decision making authority is restricted only to the day-to-day tasks. By giving employees authority and power can lead to wrong decisions to be made which will cost the company. Empowerment will not relate to day-to-day functioning authority. This will make employees more responsible, vigilant and increase their performance.

Training Many organizations place a greater emphasis on training. This is considered as recognition for employees. Training could vary from on the job training to personal development training.

Training workshops such as *train the trainer* or *how to become a manager* will give employees a chance to switch job roles and this will increase their motivation levels.

Awards This again is an important type of recognition that is given to employees, who perform better. Organizations have introduced award systems such as *best performer of the month*, etc., and all these will lead employees to perform better.

Difference between reward and recognition

1. **Rewards are tangible. Recognition is intangible.** Whether tangible or monetary, rewards are always something you can touch and of a specific amount. Recognition is often invisible in nature and yet priceless in value. You can give recognition without giving a reward. You should never give a reward without giving recognition.
2. **Rewards will always be transactional. Recognition should always be relational.** Rewards are always if you do "X" then you'll get "Y" in return. Recognition is so much more of a relational exchange between people. Rewards are great for attracting people to an organization, and recognition is perfect for keeping them.
3. **Rewards are simply consumed. Recognition is mostly experienced.** When you receive money or a gift it is usually spent, used up or somehow consumed until it ends. In contrast, recognition is a total immersion experience and a personal encounter of the best kind which can last forever. Carefully using both will help address the unique differences within all of us.
4. **Rewards are transferable. Recognition is non-transferable.** Rewards can be passed off from one person to another and are temporary in nature. Recognition cannot be removed from the person given to or exchanged and is quite permanent. Focus on achieving that kind of permanence through recognition while using the momentary impact possible through a tangible reward.

5. Rewards are certainly conditional. Recognition happens to be unconditional. Rewards are very dependent consequences based on certain terms or conditions. Recognition, however, tends to be more independent and not part of a fixed result derived from specific actions. It is about blending rigidity with flexibility or at least knowing when to use one over the other.

6. Rewards are expected. Recognition is a surprise. It seems that, with rewards, we go into a situation knowing that if we perform well we deserve the reward. With recognition, on the other hand, you have no idea until you unexpectedly receive it. Never let anyone down by not giving them a merited reward and learn to be spontaneous with appreciating and celebrating people every day.

7. Rewards are economical. Recognition is emotional. Rewards are a prudent use of resources in the whole economy of production, distribution and income. Recognition contrasts as a psychological and emotional event, a felt phenomenon. Remember that performance may reign but feelings rule!

8. Rewards are outcome driven. Recognition is focused on behaviors. Rewards are used to reinforce the occurrence of achieved results. Recognition can happen anytime someone notices positive behaviors of another. People want to know how they are doing before the end result is achieved.

9. Rewards are fixed. Recognition is flowing. Rewards are fixed and determined based on desired performance and the expected returns. Recognition is free flowing from one person to another and expanded upon as shared by others. Know when each has their place and use each one wisely.

10. Rewards are impersonal. Recognition is personal. Rewards have little human dimension based on their tangible, contractual arrangement, even when given to someone. Recognition differs because it's purely human connection celebrating people for who they are and what they do. This is where the giving of rewards can be made much more personable by giving recognition too.

Gainsharing

Gainsharing is best described as a system of management in which an organization seeks higher levels of performance through the involvement and participation of its people. As performance improves, employees share financially in the gain. It is a team approach; generally all the employees at a site or operation are included. The typical Gainsharing organization measures performance and through a pre-determined formula shares the savings with all employees. The organization's actual performance is compared to baseline performance (often a historical standard) to determine the amount of the gain. Employees have an opportunity to earn a Gainsharing bonus (if there is a gain) generally on a monthly or quarterly basis.

Gainsharing measures are typically based on operational measures (productivity, spending, quality, customer service) which are more controllable by employees rather than organization-wide profits. Gainsharing applies to all types of business that require employee collaboration and is found in manufacturing, health care, distribution, and service, as well as the public sector and non-profit organizations. Typical elements of a Gainsharing plan include the following:

- Gains and resulting payouts are self-funded based on savings generated by improved performance.
- Gainsharing commonly applies to a single site, or stand-alone organization.
- Many plans often have a year-end reserve fund to account for deficit periods.
- Employees often are involved with the design process.
- A supporting employee involvement system is part of the plan in order to drive improvement initiatives.

Advantages	Disadvantages
<ul style="list-style-type: none">• Helps companies achieve sustained improvement in key performance measures• Rewards only performance improvement• Payouts are self-funded from savings generated by the plan• Aligns employees to organization goals• Fosters a culture of continuous improvement• Enhances employee focus and awareness• Increases the feeling of ownership and accountability• Enhances the level of involvement, teamwork and cooperation	<ul style="list-style-type: none">• Measures are narrower than organization-wide profit and therefore gains may be paid even though profits may be down.• Requires a participative management style• Requires that management openly shares information related to performance measures• Employees may question or challenge management decisions that may adversely impact a gain.• Increases the level of organizational stress since everyone has more of a financial stake in the organization's success• Applies best to and a work environment that requires

- Supports other performance improvement efforts and helps promote positive change
- Promotes morale, pride, and more positive attitudes toward the organization

- teamwork and collaboration rather than individual entrepreneurship
- Paid on the basis of group performance rather than individual merit

Gainsharing works best when company performance levels can be easily quantified and in a work environment that is based on openness and trust. A supporting system of employee involvement will significantly enhance the long term effectiveness of the plan. Requires management commitment, training and frequent and ongoing communications.

Executives and managers must be educated in order to develop a clear understanding of the Gainsharing philosophy and the management style required for success. If an organization moves forward with a plan, it is best to form a team of employees to work on various elements of the project. The team is involved in preparing many of the rules of the plan and final approval for the plan details from top management. The team is then responsible for presenting and communicating the plan details. Supervisors and managers are trained in the relationship of their role toward the plan. Teams are formed and trained in order to work on performance enhancement initiatives. It's best to have an expert on Gainsharing to guide and facilitate the process in order to work through the pitfalls and to avoid payout out of false gains.

Difference between Gainsharing & Profit Sharing

In a profit-sharing program, employees receive bonuses tied directly to the company's overall profitability. The more money the company makes, the bigger the bonuses. Employees in a gainsharing program earn bonuses, too, but those bonuses require specific improvements in performance, such as increased productivity, higher sales or reduced expenses. Both types of programs aim to give employees a

stake in the success of the company, but with gainsharing, bonuses are more closely tied to the performance of specific employees or groups of employees.

Because profit-sharing programs depend on the success of the company as a whole, they are typically administered company wide: If the whole company does well, everyone benefits -- even those who are dragging their feet. If the whole company does poorly, no one benefits -- even those who are performing at a high level. Gainsharing programs can be applied company wide, but more often they're targeted toward specific facilities or units of a business. If a company has, say, five production plants, the workers at each individual plant might earn gainsharing bonuses based on the performance improvements at their particular facility. This allows employers to judge and reward employees based on parameters that the employee can actually control.

Performance Appraisal

Performance Appraisal is defined as a process, in which the personality and performance of an employee is assessed by the supervisor or manager, against predefined standards, such as knowledge of the job, quality and quantity of output, leadership abilities, attitude towards work, attendance, cooperation, judgment, versatility, health, initiative and so forth. Thus, it is the systematic evaluation of the performance of employees and to understand the abilities of a person for further growth and development. Performance appraisal is generally done in systematic ways which are as follows:

- The supervisors measure the pay of employees and compare it with targets and plans.
- The supervisor analyses the factors behind work performances of employees.
- The employers are in position to guide the employees for a better performance.

It is also known as performance rating, performance evaluation, employee assessment, performance review, merit rating, etc. Performance Appraisal is carried out to identify the abilities and competencies of an employee for future growth and development. It is aimed at ascertaining the worth of the employee to the organization, in which he/she works. Performance Appraisal can be done with following objectives in mind:

- To maintain records in order to determine compensation packages, wage structure, salaries raises, etc.
- To identify the strengths and weaknesses of employees to place right men on right job.
- To maintain and assess the potential present in a person for further growth and development.
- To provide a feedback to employees regarding their performance and related status.
- To review and retain the training programmes.

Performance appraisal methods Some of the methods are:

Paired Comparison Method

This method bears more relevance and importance in startups/SMBs, which have small teams. It compares each employee with every individual present in the same team and depending on their comparative performance to the employee who has performed the best, appraisals are given. It is considered reliable because it follows a systematic method of comparative evaluation. This technique is most apt when, the organisation plans on giving appraisal only to the best employee in the team.

Rating Scale

This performance appraisal method can be used by startups and small businesses that are scaling and are trying to set up processes in place. It is process-based and involves the organisation to set pre-determined objectives that employees are expected to meet. Individuals are then rated by their supervisors or managers. It is similar to the grading system that is usually followed in schools, but is effective and systematic. Employees are evaluated for their skills, teamwork, communication skills, precision, etc. And they are expected to meet a basic score. If they do not meet the score then they are sent for performance improvement training which would help them cope up with their shortcomings.

Trait Focused Appraisals

This technique is useful for reinforcing positive work ethics and culture in the organisation. It considers attributes like helpfulness, dependability, punctuality, etc for being appraised by the organisation. It motivates employees to be competitive in a fair manner and yet be available for helping out colleagues if need be.

360 Degree Feedback

This method involves getting a feedback about the employee from every individual who interacts with him during his working hours. They can be his peers, his subordinates, his superiors, customers who have interacted with him and even he himself would be interviewed about his perception of himself and his duties at the workplace. This performance appraisal method would be very useful for startups, because the best way to review an employee's overall performance and get an insight about his behaviour, personality and attitude this is the best method to follow. Although it is a little time consuming, but it is cost effective and precise. It keeps biases out of play due to multiple opinions, so that the review isn't affected by biases of one person.

720 degree performance appraisal is an integrated method of performance **appraisal** where, the performance of an employee is evaluated from **360degrees** (Management, Colleagues, Self and also customers) and timely feedback is given and performance is evaluated again based on the targets that are set.

720 degree as the name suggests is 360 degree twice - doing the appraisal once, where the performance of the employee is analyzed and having a good feedback mechanism where the boss sits down with the employee another time and gives him feedback and tips on achieving the targets set. Too often, employees complain that they never receive feedback until the next performance appraisal. They say that, by then it is too late. 720 degree appraisal seeks to address these concerns by giving the employees feedback on their performance and help to attain the goals set for them.

Organizational Structure

The typically hierarchical arrangement of lines of authority, communications, rights and duties of an organization. Organizational structure determines how the roles, power and responsibilities are assigned, controlled, and coordinated, and how information flows between the different levels of management. A structure depends on the organization's objectives and strategy. In a centralized structure, the top layer of management has most of the decision making power and has tight control over departments and divisions. In a decentralized structure, the decision making power is distributed and the departments and divisions may have different degrees of independence.

An organizational structure is a system that outlines how certain activities are directed in order to achieve the goals of an organization. These activities can include rules, roles and responsibilities. The organizational structure also determines how

information flows from level to level within the company. For example, in a centralized structure, decisions flow from the top down, while in a decentralized structure, the decisions are made at various levels.

BREAKING DOWN Of Organizational Structure

Organizational structure defines a specific hierarchy within an organization, and businesses of all shapes and sizes use it heavily. A successful organizational structure defines each employee's job and how it fits within the overall system. This structuring provides a company with a visual representation of how it is shaped and how it can best move forward in achieving its goals. Organizational structures are normally illustrated in some sort of chart or diagram.

Why Have an Organizational Structure?

Not having a formal structure in place may prove difficult for certain organizations. For instance, employees may have difficulty knowing to whom they should report. That can lead to uncertainty as to who is responsible for what in the organization. Having a structure in place can help improve efficiency and provide clarity for everyone at every level. That also means that each and every department can be more productive, as they are likely to be more focused on energy and time.

Centralized vs. Decentralized Organizational Structures

At its highest level, an organizational structure is either centralized or decentralized. Traditionally, organizations have been structured with centralized leadership and a defined chain of command. The military, for example, is an organization famous for its highly centralized structure, with a long and specific hierarchy of superiors and subordinates. However, there has been a rise in decentralized organizations, as is the case with many technology startups. This allows the companies to remain fast, agile and adaptable, with almost every employee receiving a high level of personal agency.

Types of Organizational Structures

1 Functional organization

This is also referred to as a bureaucratic organizational structure and breaks up a company based on the specialization of its workforce. Most small-to-medium sized businesses implement a functional structure. Dividing the firm into departments consisting of marketing, sales and operations is the act of using a bureaucratic organizational structure.

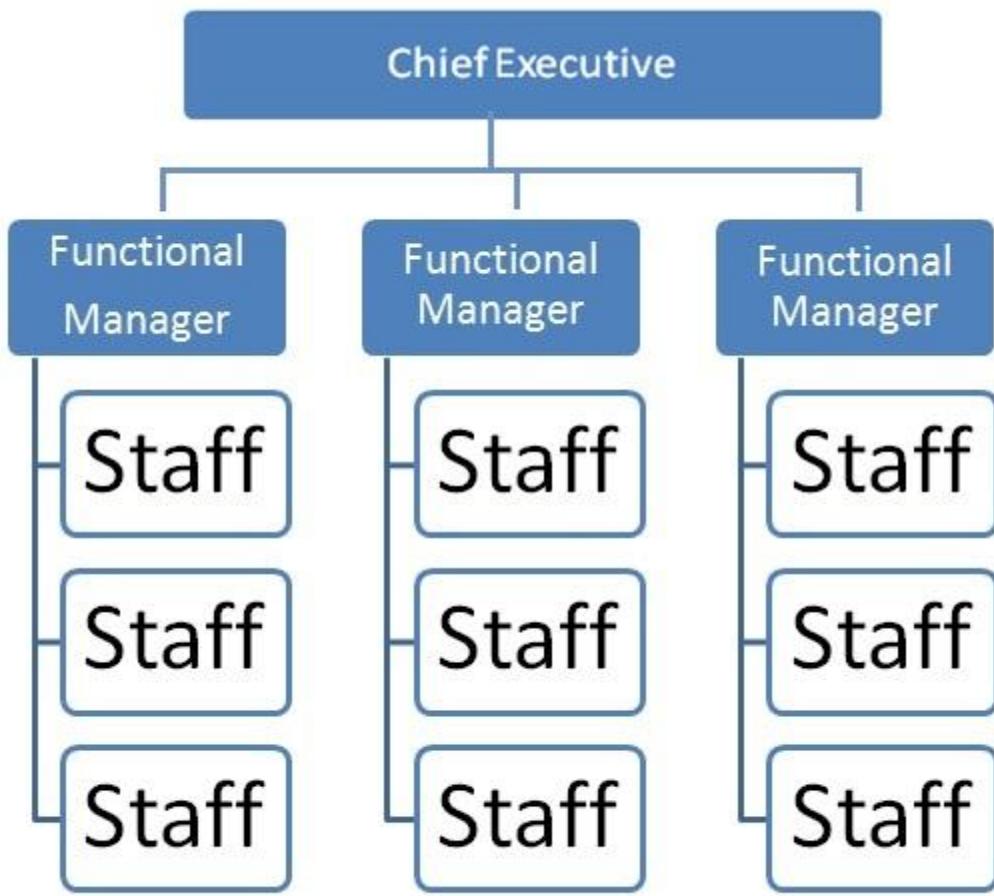
If you've had a job, you likely worked in a functional organizational structure.

The functional structure is based on an organization being divided up into smaller groups with specific tasks or roles. For example, a company could have a group working in information technology, another in marketing and another in finance.

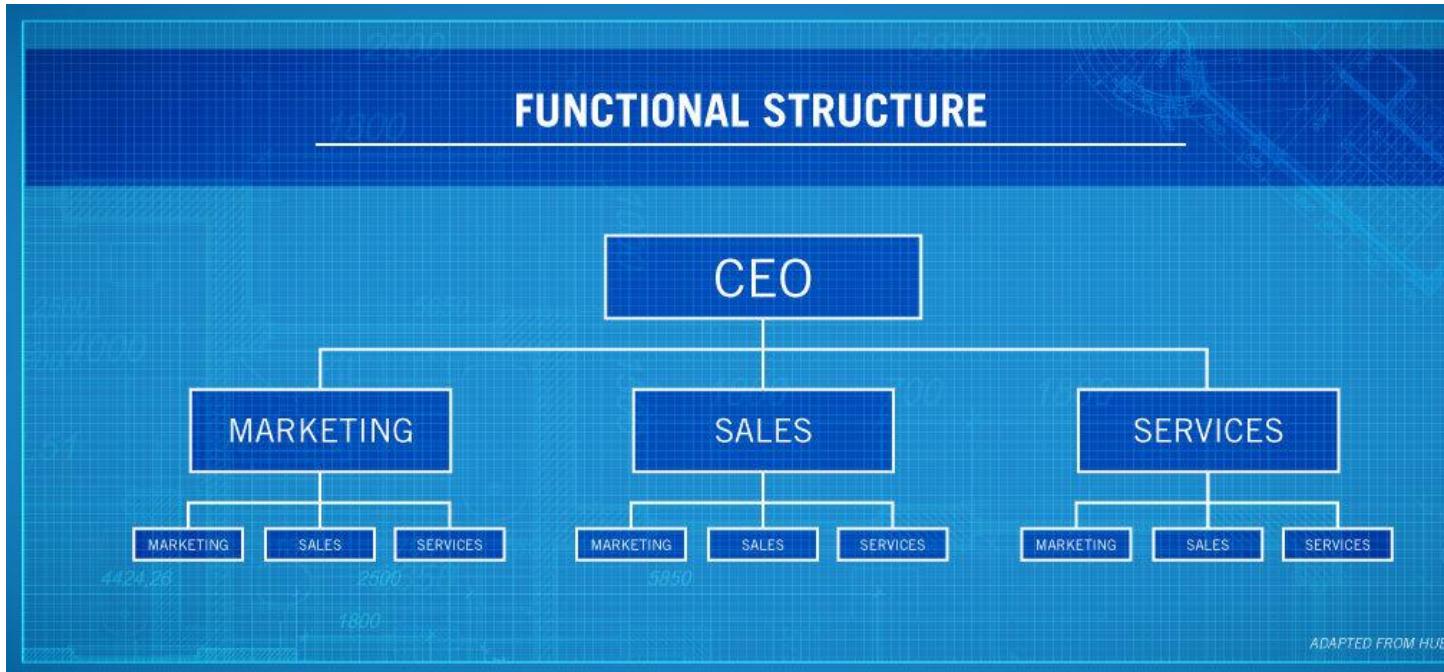
Each department has a manager or director who answers to an executive a level up in the hierarchy who may oversee multiple departments. One such example is a director of marketing who supervises the marketing department and answers to a vice president who is in charge of the marketing, finance and IT divisions.

An advantage of this structure is employees are grouped by skill set and function, allowing them to focus their collective energies on executing their roles as a department.

One of the challenges this structure presents is a lack of inter-departmental communication, with most issues and discussions taking place at the managerial level among individual departments. For example, one department working with another on a project may have different expectations or details for its specific job, which could lead to issues down the road. In addition, with groups paired by job function, there's the possibility employees can develop "tunnel vision" — seeing the company solely through the lens of the employee's job function.



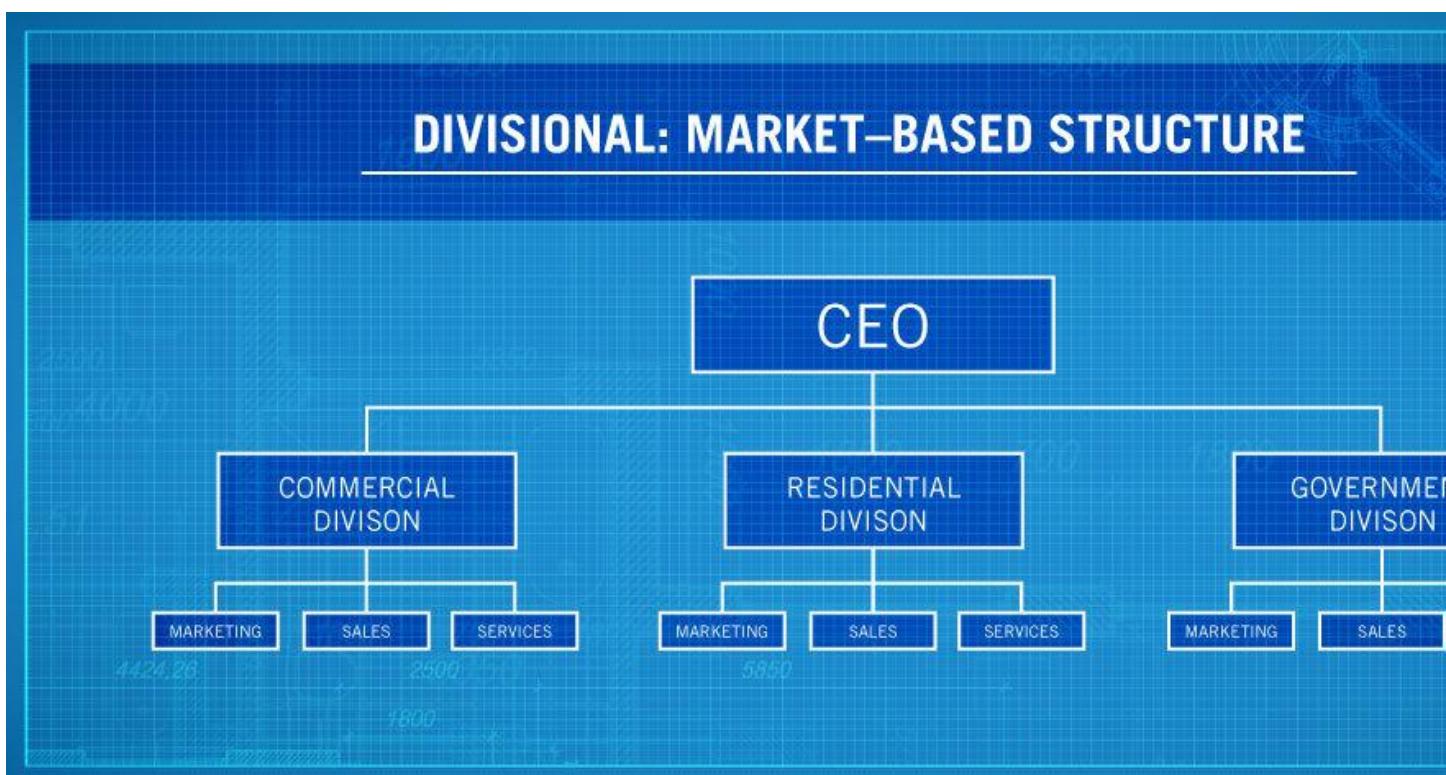
FUNCTIONAL STRUCTURE



2 Divisional organization

The second type is common among large companies with many business units. Called the divisional or multidivisional structure, a company that uses this method structures its leadership team based on the products, projects or subsidiaries they operate. A good example of this structure is Godrej. With so many products and lines of business, the company structures itself so each business unit operates as its own company with its own president.

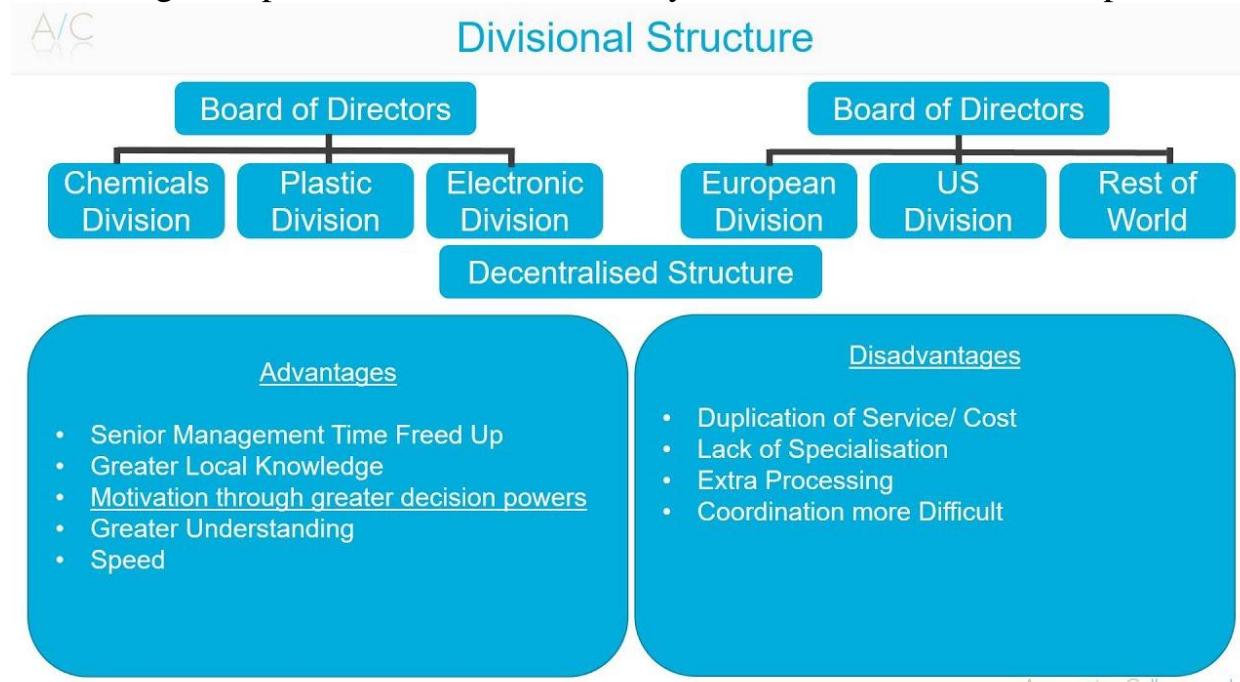
Larger companies that operate across several horizontal objectives use a divisional organizational structure. This structure allows for much more autonomy among groups within the organization. One more example of this is a company like TATA Group. TATA has many different divisions including automobile, aviation, transportation, software, projects and renewable energy, among others. Under this structure, each division essentially operates as its own company, controlling its own resources and how much money it spends on certain projects or aspects of the division.



Additionally, within this structure, divisions could also be created geographically, with a company having divisions in North America, Europe, East Asia, etc.

This type of structure offers greater flexibility to a large company with many divisions, allowing each one to operate as its own company with one or two people reporting to the parent company's chief executive officer or upper management staff. Instead of having all programs approved at the very top levels, those questions can be answered at the divisional level.

A downside to this type of organizational structure is that by focusing on divisions, employees working in the same function in different divisions may be unable to communicate well between divisions. This structure also raises issues with accounting practices and may have tax implications.



DIVISIONAL: GEOGRAPHICAL STRUCTURE



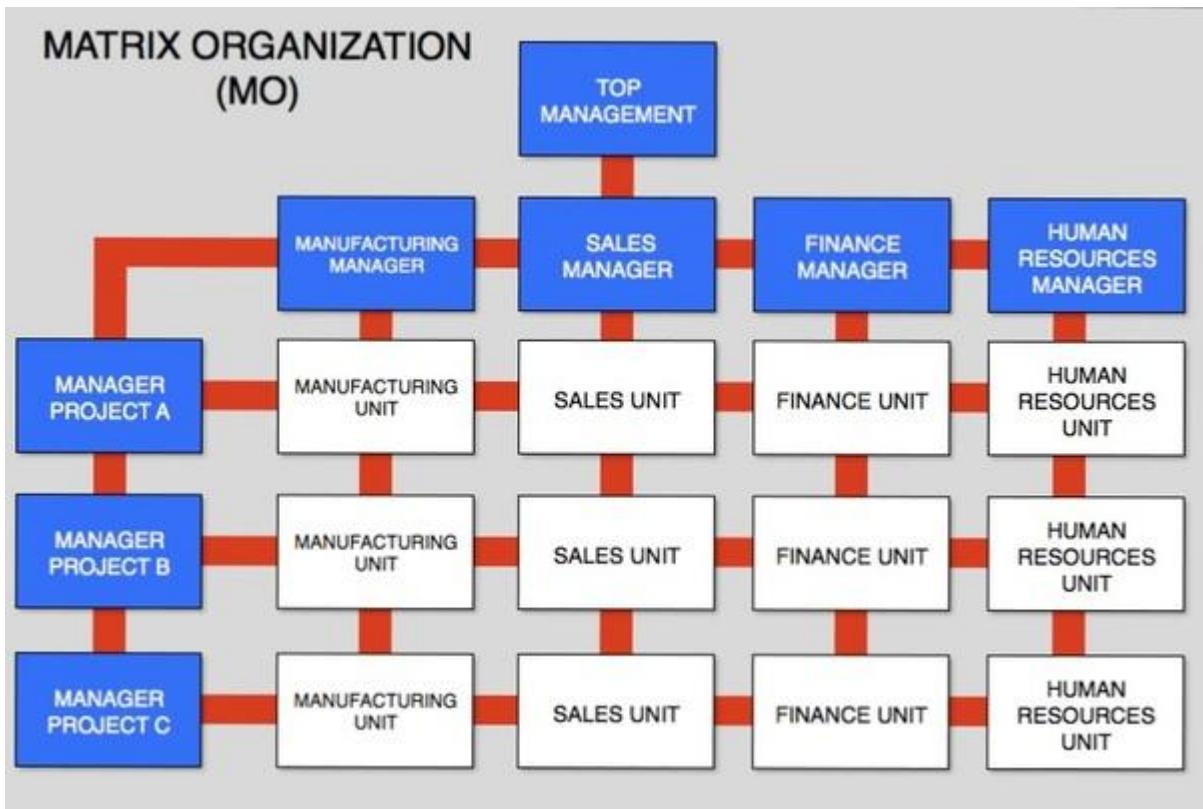
3. Matrix organization

A hybrid organizational structure, the matrix structure is a blend of the functional organizational structure and the projectized organizational structure. It is also the most confusing and the least used. This structure matrixes employees across different superiors, divisions or departments. An employee working for a matrixed company, for example, may have duties in both sales and customer service.

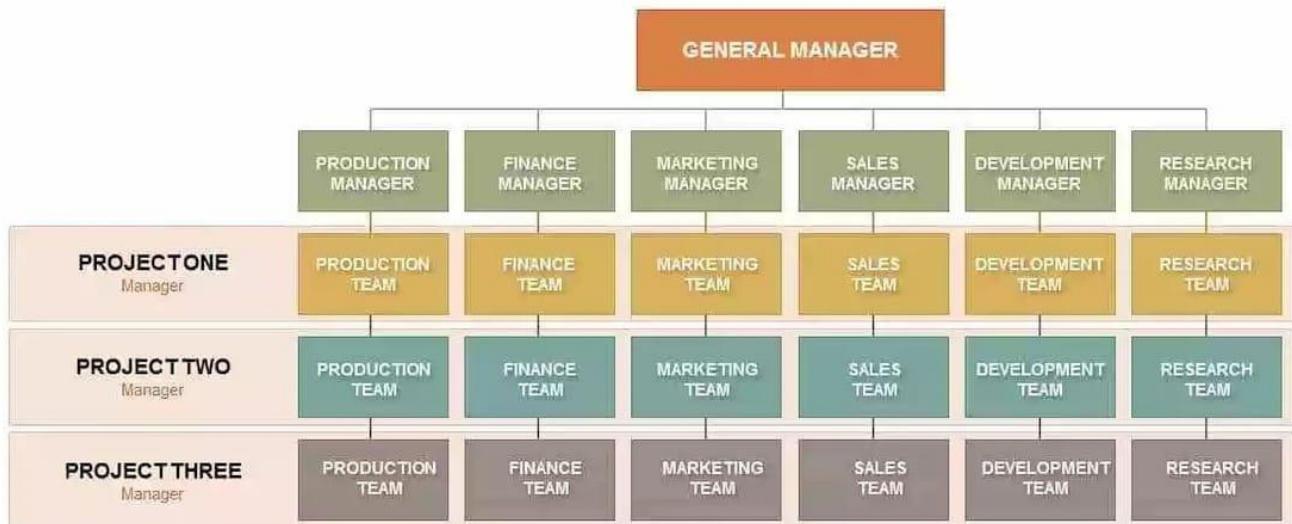
In the matrix structure, employees may report to two or more bosses depending on the situation or project. For example, under normal functional circumstances, an engineer at a large engineering firm could work for one boss, but a new project may arise where that engineer's expertise is needed. For the duration of that project, the employee would also report to that project's manager, as well as his or her boss for all other daily tasks.

The matrix structure is challenging because it can be tough reporting to multiple bosses and knowing what to communicate to them. Reporting to multiple managers may add confusion and conflict between managers over what should be reported. And if priorities are not clearly defined, employees, too, may get confused about their roles. That's why it's very important for the employees to know their roles, responsibilities and work priorities. Advantages of this structure is that employees can share their knowledge across the different functional divisions, allowing for better communication and understanding of each function's role. And by working

across functions, employees can broaden their skills and knowledge, leading to professional growth within the company.



MATRIX ORGANIZATION STRUCTURE



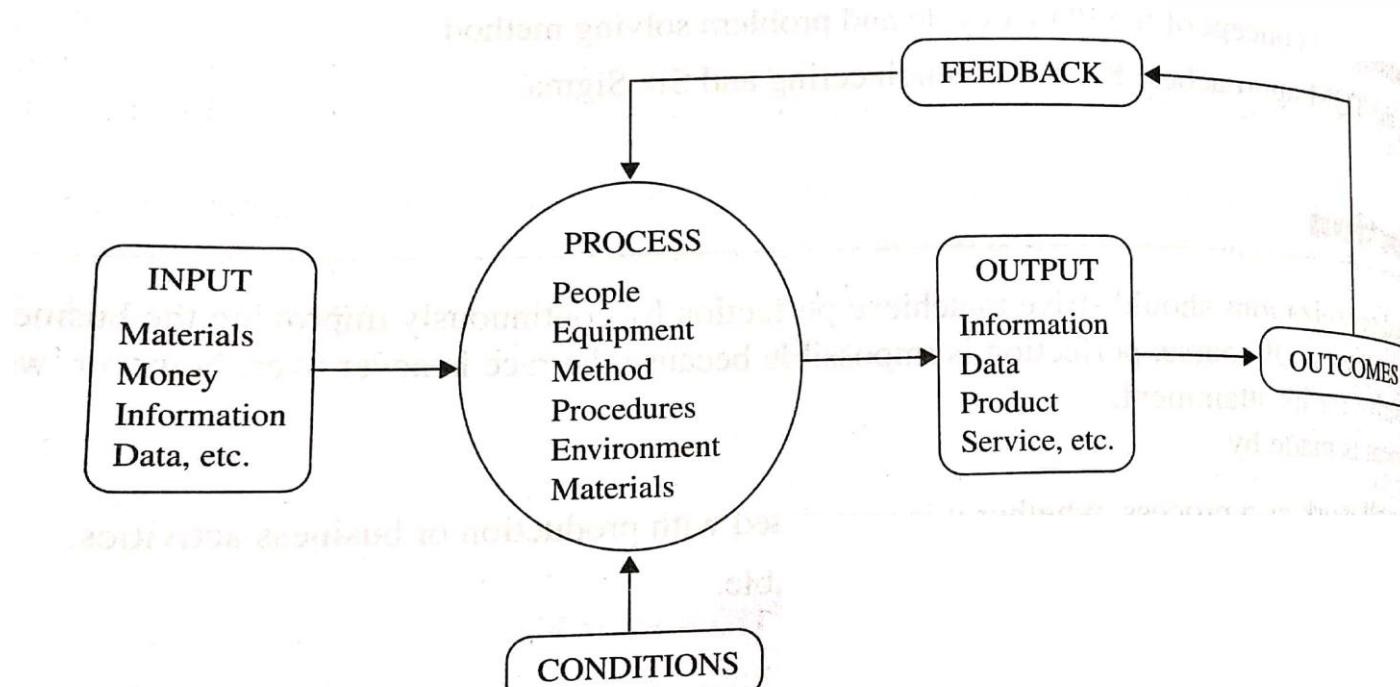
4 Flatarchy

Flatarchy, a newer structure, is the third type and is used among many startups. As the name alludes, it flattens the hierarchy and chain of command and gives its employees a lot of autonomy. Companies that use this type of structure have a high speed of implementation.

While the previous three types of organizational structures may work for some organizations, another hybrid organizational structure may be better for startups or small companies. Blending a functional structure and a flat structure results in a flatarchy organizational structure, which allows for more decision making among the levels of an organization and, overall, flattens out the vertical appearance of a hierarchy. The best example of this structure within a company is if the organization has an internal incubator or innovation program. Within this system, the company can operate in an existing structure, but employees at any level are encouraged to suggest ideas and run with them, potentially creating new flat teams.

Continuous Process Improvement

Process



I-1 Input/Output Process Model

Five basic ways to improve:

1. Reduce resources
2. Reduce errors
3. Meet or exceed downstream customer expectations
4. Make the process safer
5. Make the process more satisfying to the person doing it

The Juran Trilogy

- Planning
- Control (expense measurement)
- Improvement (Cost reduction)

Improvement Strategies- 4R

- Repair
- Refinement
- Renovation
- Reinvention

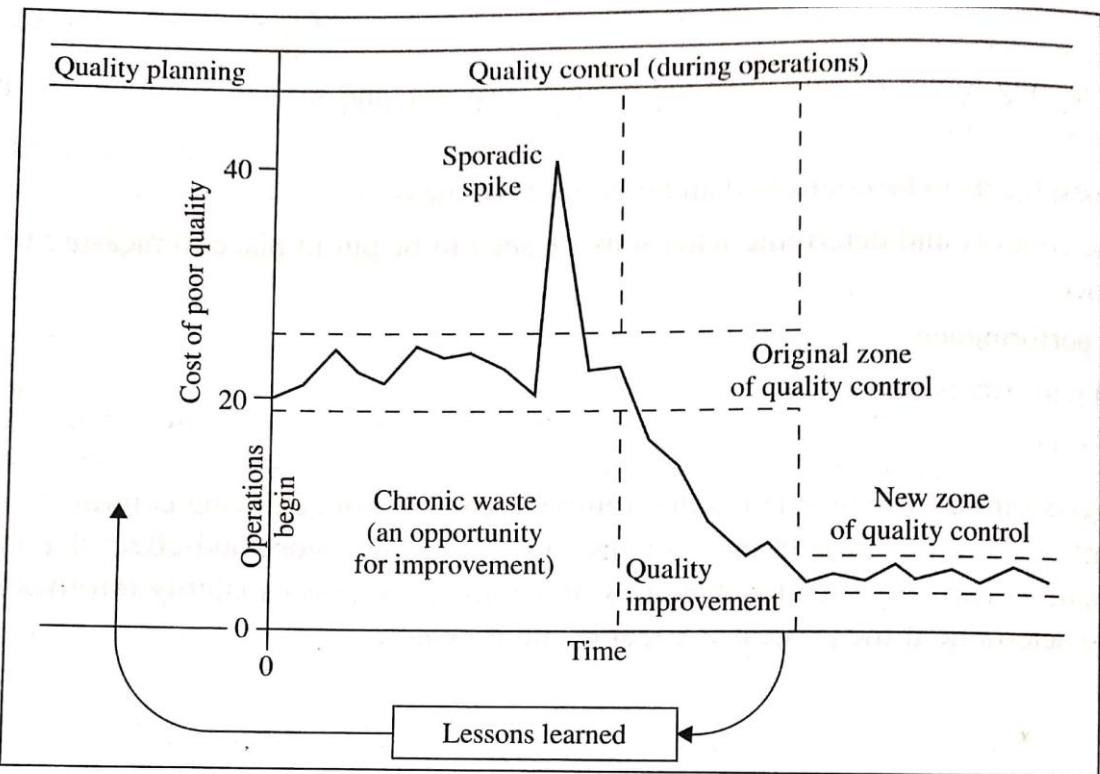


Figure 5-2 The Juran Trilogy Diagram

Adapted, with permission, from J. M. Juran, ed., *Quality Control Handbook*, 4th ed. (New York: McGraw-Hill, 1988).

Quality Problem Types

1. Conformance problems
2. Unstructured performance problems
3. Efficiency problems
4. Product design problems
5. Process design problems

Problem type	Defining characteristics	Key problem solving tasks	Strategies and techniques
Conformance problems	Unsatisfactory performance by a well-specified system; users not happy with system outputs.	Diagnosis; determining why the system is not performing as intended.	Use statistical process control to identify problems, cause and effect diagrams to diagnose causes.
Unstructured performance problems	Unsatisfactory performance by a poorly specified system.	Setting performance goals; diagnosis; generating viable solution alternatives.	Diagnostic methods; Use incentives to inspire improvement; develop expertise; add structure appropriately.
Efficiency problems	Unsatisfactory performance from the standpoint of system owners and operators.	Setting performance goals; localizing inefficiencies; devising cost effective solution alternatives.	Use employees to identify problems; eliminate unnecessary activities; reduce input costs, errors and variety.
Product design problems	Devising new products that satisfy user needs.	Determining user requirements; generating new product concepts and elaborating them into viable artifacts.	Quality function deployment translates user needs into product characteristics. Value analysis and "design for" methods support design activity.
Process design problems	Devising new processes or substantially revising existing processes.	Problem definition, including requirements determination; generating and elaborating new process alternatives.	Use flowcharts to represent processes, process analysis to improve existing processes, reengineering to devise new processes and benchmarking to adapt processes from others.

Phase 1: Identify the Opportunity

- Pareto analysis of external failures
- Pareto analysis of internal failures
- Proposals from insiders
- Proposals from suggestion schemes
- Field study of users' needs
- Data on performance of competitors
- Comments from people from outside organization
- Comments from Government regulators and labs
- Customer surveys
- Employee surveys

Phase 2: Analyze the current process

- Establish performance measures with respect to customer requirements
- Determine the data needed to manage the process
- Use Feedback from customers and suppliers
- Establish measures for quality/cost/timelines of inputs and outputs

Phase 3: Develop the optimal solution(s)

Phase 4: Implement change(s)

- Why, how, when, who, where

Phase 5: Study the result(s)

Phase 6: Standardize the solution(s)

Phase 7: Plan for the future

**TABLE 5-1
Combination Map of Dimensions for Process Control**

What's Inspected	Type of Data	Timing	By Whom?	Type of Record	Action	By Whom?
Process variable: continuous	Variable	During run: on-line	Device	Electronic control chart	Process Improved	Automated equipment
Process variable: sample				Paper control chart		
Product Sample	Attribute	During run: off-line	Process Operator	Electronic trend chart	Process adjusted	Operator
100% of product				Paper trend chart	Lot sorted	
	After lot: complete		Inspector	Electronic list	Sample repaired or discarded	Inspector or mechanic
				Paper list		
				None		

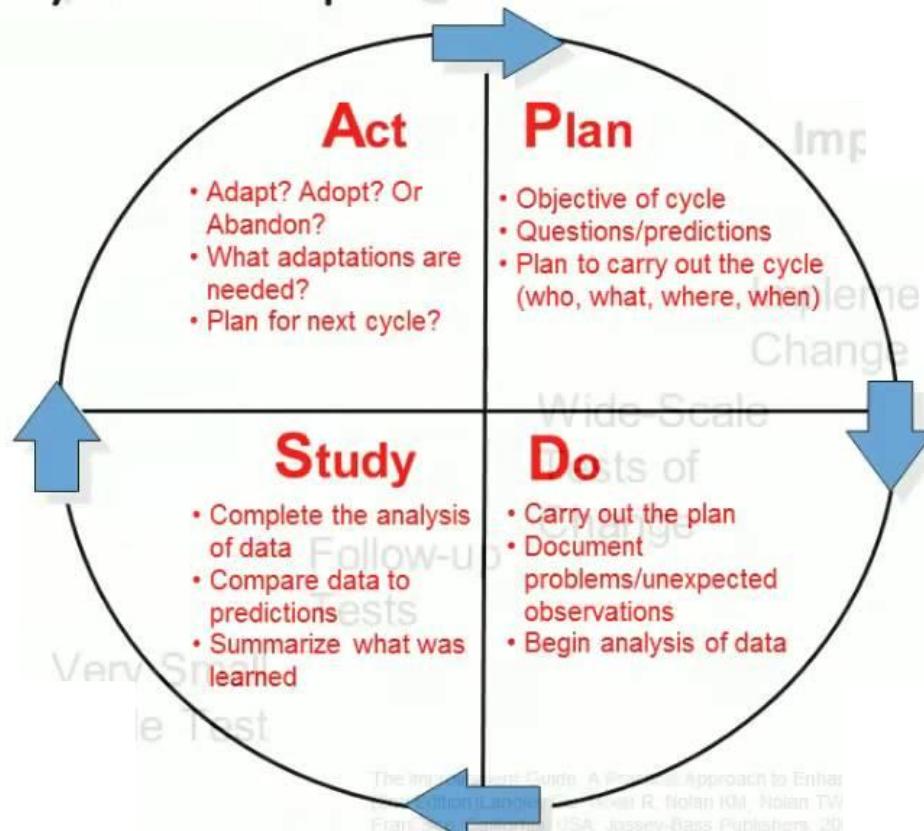
Reproduced, with permission, from Peter E. Pylipow, "Understanding the Hierarchy of Process Control: Using a Combination Map to Formulate an Action Plan," *Quality Progress* (October 2000): 63–66.

**TABLE 5-2
Positrol of a Wave Soldering Process**

What	Specs.	Who	How	Where	When
An 880 flux	0.864 g ± 0.008	Lab technician	Sp. gravity meter	Lab	Daily
Belt speed	ft/min ± 10%	Process technician	Counter	Board feed	Each change
Preheat temperature	220° ± 5°	Automatic	Thermocouple	Chamber entrance	Continuous

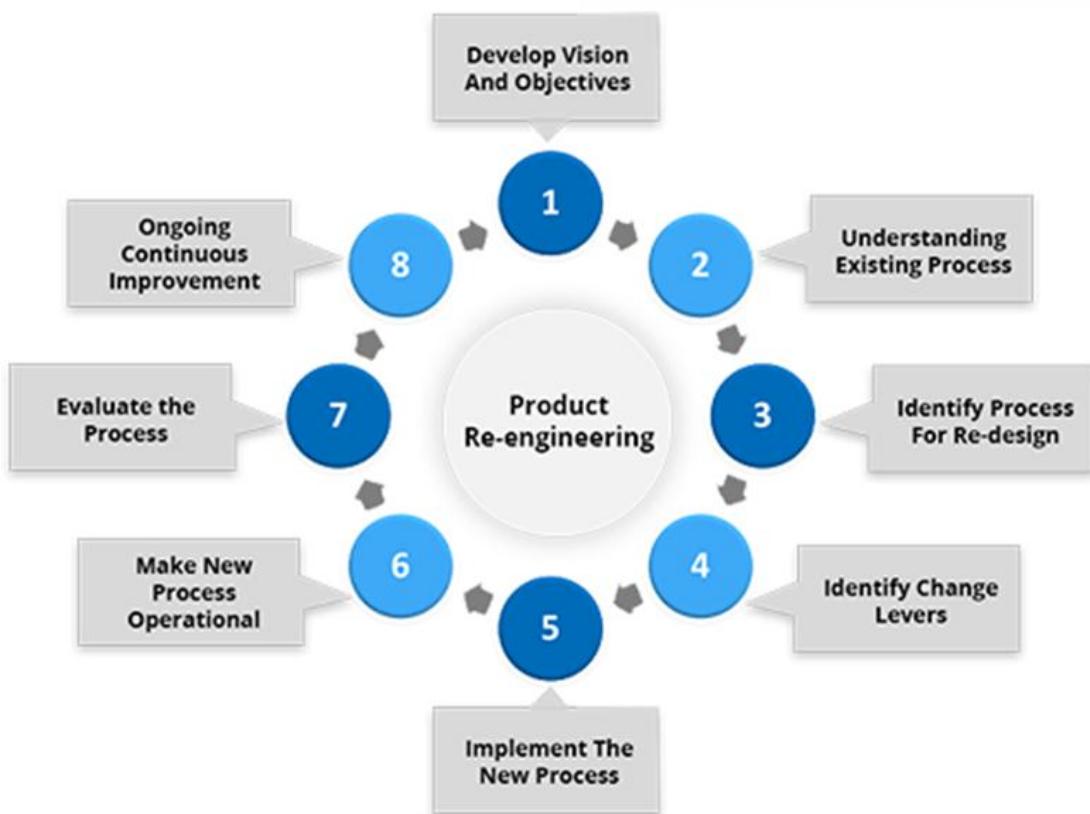
Develop a plan to test the change (Plan), carrying out the test (Do), observing and learning from the consequences (Study), and determining what modifications should be made to the test (Act).

PDSA Cycle Components

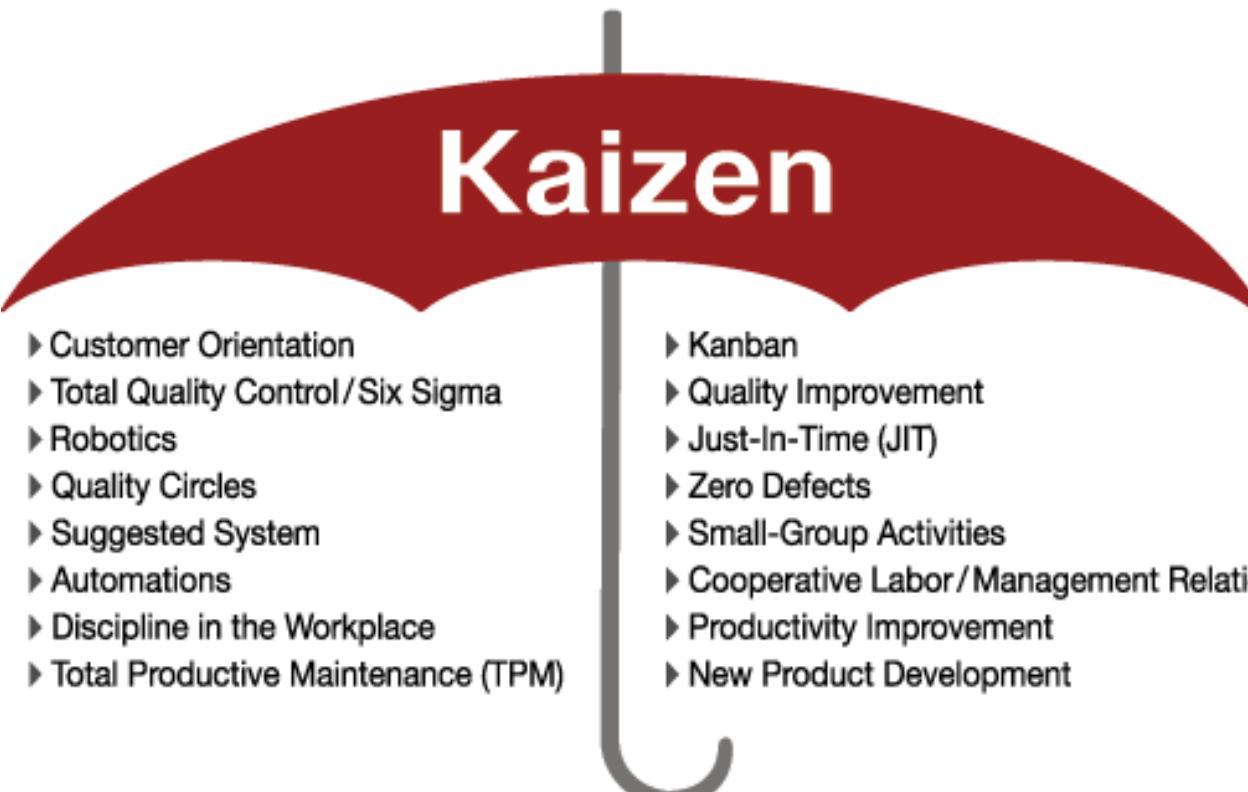


Reengineering

Defined by M. Hammer and J. Champy (in their book 'Reengineering The Corporation') as "Fundamental rethinking and radical redesign of business process to achieve dramatic improvements in critical measures of performance such as cost, quality, service, and speed".



Kaizen

- 
- ▶ Customer Orientation
 - ▶ Total Quality Control/Six Sigma
 - ▶ Robotics
 - ▶ Quality Circles
 - ▶ Suggested System
 - ▶ Automations
 - ▶ Discipline in the Workplace
 - ▶ Total Productive Maintenance (TPM)
 - ▶ Kanban
 - ▶ Quality Improvement
 - ▶ Just-In-Time (JIT)
 - ▶ Zero Defects
 - ▶ Small-Group Activities
 - ▶ Cooperative Labor/Management Relations
 - ▶ Productivity Improvement
 - ▶ New Product Development

10 Principles of Kaizen

The Kaizen method follows ten specific principles, which are described below:

1. Improve everything continuously.
2. Abolish old, traditional concepts.
3. Accept no excuses and make things happen.
4. Say no to the status quo of implementing new methods and assuming they will work.
5. If something is wrong, correct it.
6. Empower everyone to take part in problem solving.
7. Get information and opinions from multiple people.
8. Before making decisions, ask “why” five times to get to the root cause. (5 Why Method)
9. Be economical. Save money through small improvements and spend the saved money on further improvements.
10. Remember that improvement has no limits. Never stop trying to improve.

The 5 W and 1 H of Kaizen

Who?	What?	Where?
1. Who does it? 2. Who is doing it? 3. Who should be doing it? 4. Who else can do it? 5. Who else should do it?	1. What to do? 2. What is being done? 3. What should be done? 4. What else can be done? 5. What else should be done?	1. Where to do it? 2. Where is it done? 3. Where should it be done? 4. Where else can it be done? 5. Where else should it be done?
When?	Why?	How?
1. When to do it? 2. When is it done? 3. When should it be done? 4. What other time can it be done? 5. What other time should it be done?	1. Why does he do it? 2. Why do it? 3. Why do it there? 4. Why do it then? 5. Why do it that way?	1. How to do it? 2. How is it done? 3. How should it be done? 4. Can this method be used in other areas? 5. Is there any other way to do it?

MUDA : Elements of Production that Add Time, Effort, Cost, but no value

Intellect

Any failure to fully utilize the time and talents of people

Motion

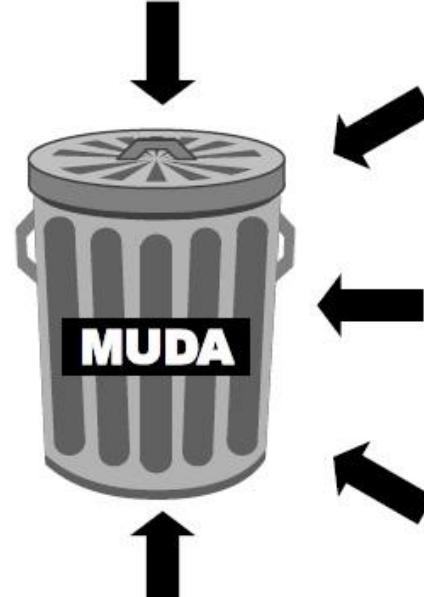
Any motion that does not add value

Rework
Any rework

Overproduction
Producing too much, or producing too soon

Transportation
Any nonessential transport is waste

Inventory
Any more than the minimum to get the job done



Processing
Over-processing
Process Variability

Waiting
Waiting on parts, waiting for a machine to finish cycle

The Seven Wastes (Muda)

1. Delay, waiting or time spent in a queue with no value being added.

large part of an individual product's life is spent waiting to be worked on.

2. Producing more than you need. Overproduction usually hides and/or generates all the others. It leads to excess inventory, which then requires the expenditure of resources on storage space and preservation. These activities do not benefit the customer.

3. Over processing or undertaking non-value added activity. Over processing occurs when more work is performed on a piece than what is required by the customer.

4. Transportation. Each time a product is moved, it stands the risk of being damaged, lost, delayed, etc. as well as being a cost for no added value.

5. Unnecessary movement or motion. Motion refers to the damage that the production process inflicts on the entity that creates the product. This may be either over time (wear and tear for equipment and repetitive strain injuries for workers) or during discrete events (accidents that damage equipment and/or injure workers).

6. Inventory. Whether it is in the form of raw materials, work-in-progress, or finished goods, represents a capital outlay that has not yet produced an income, either by the producer or for the consumer.

7. Production of Defects. Defects cause extra costs for reworking the part and can sometimes result in doubling the cost of one single product.

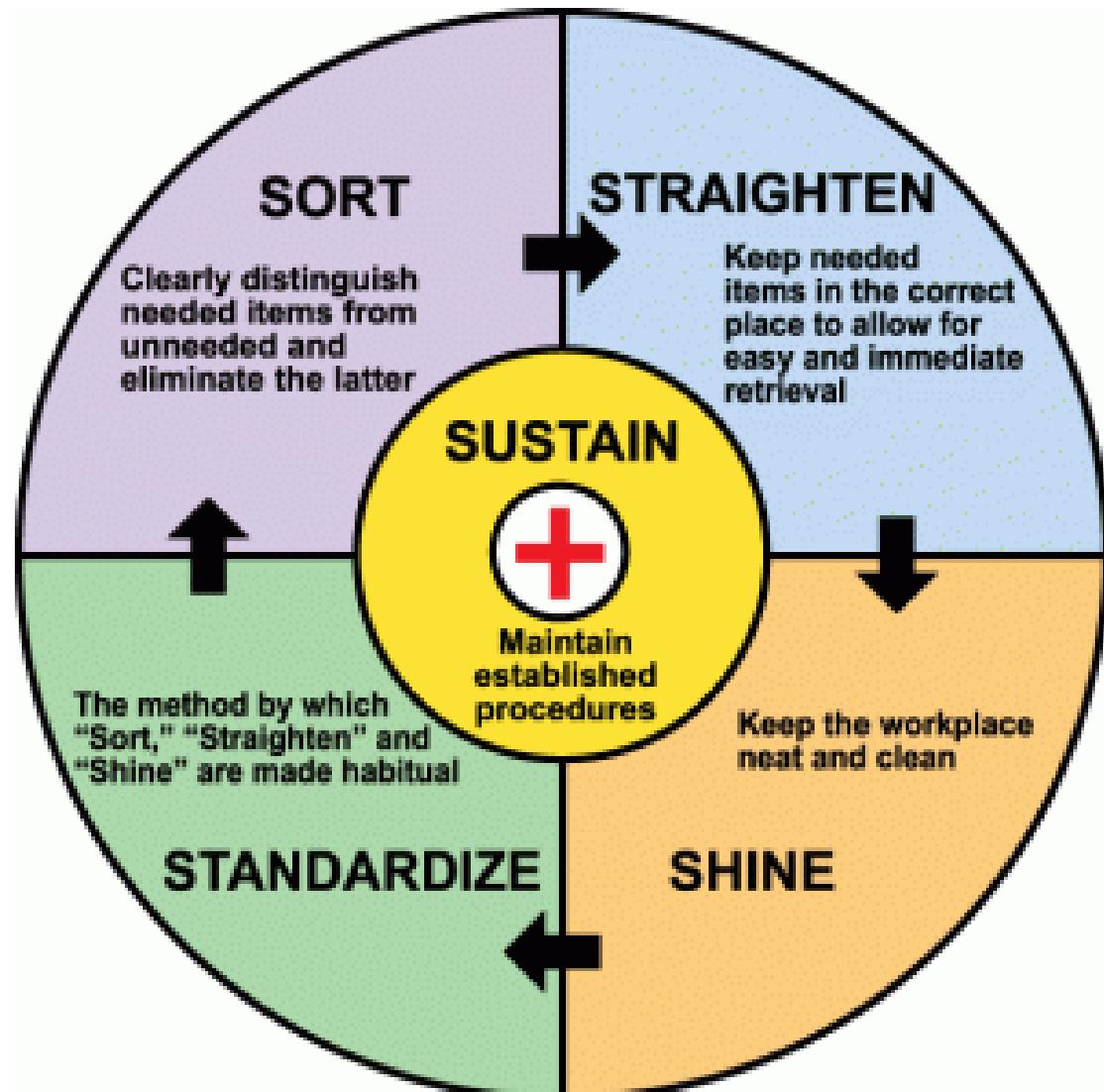
5S

The term 5S comes from five Japanese words:

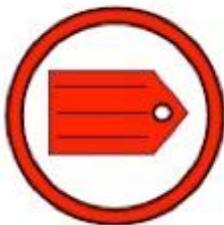
- Seiri
- Seiton
- Seiso
- Seiketsu
- Shitsuke

In English, these words are often translated to:

- Sort
- Set in Order
- Shine
- Standardize
- Sustain



5S Explanation



Sort



Set in Order



Shine



Standardize



Sustain

When in doubt,
move it out –
Red Tag
technique

A place
for
everything
and
everything
in its
place

Clean and
inspect
or
Inspect
through
cleaning

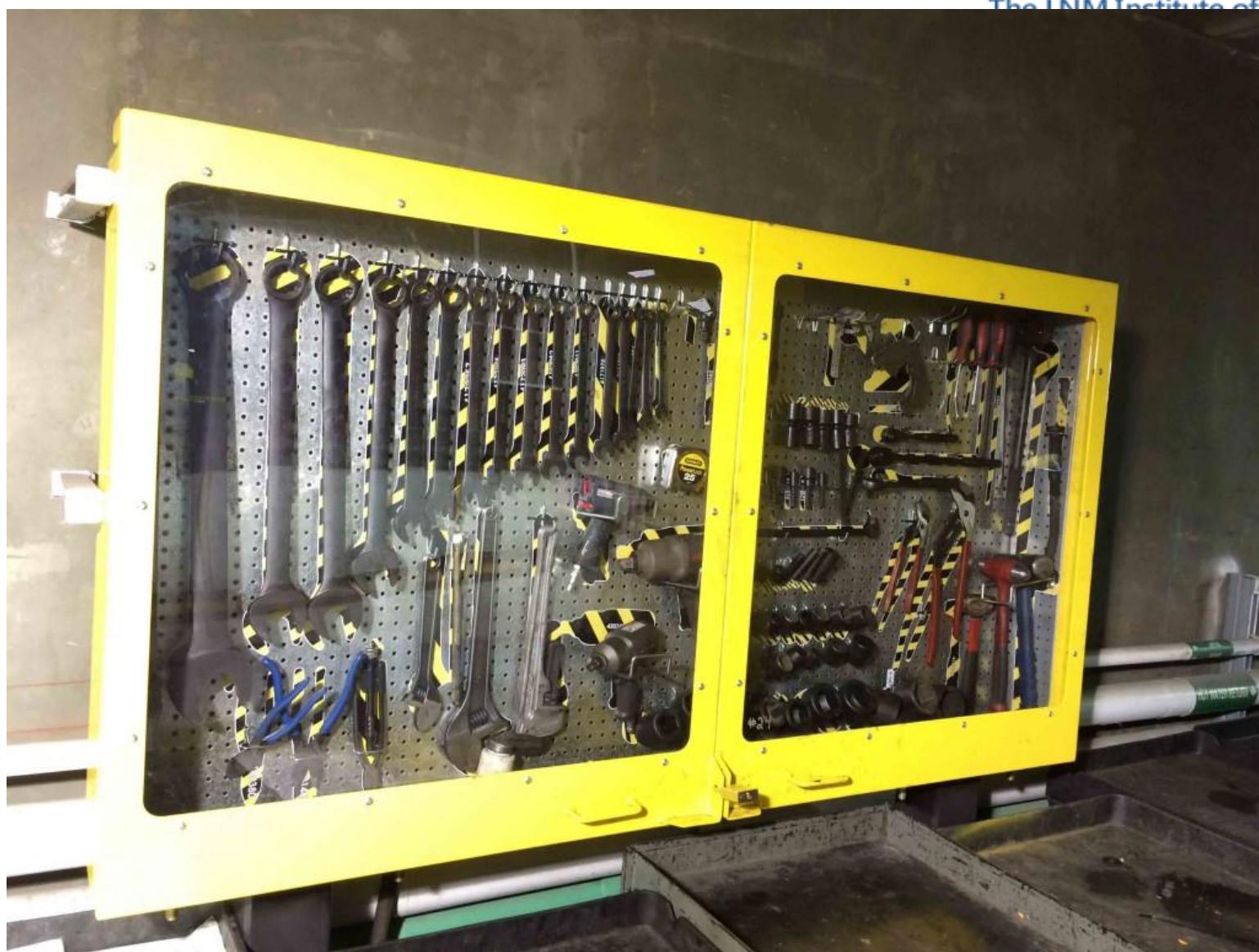
Make up
the rules,
follow and
enforce
them

Part of
daily work
and it
becomes
a habit



**Set in
order
example**







Benefits of 5S

- Improves organizational efficiency
- Reduces waste in all forms
- Cuts down employee frustration when the system doesn't work
- Improves speed and quality of work performance
- Improves safety
- Creates a visually attractive environment
- Punctuality, commitment & discipline



QUALITY CIRCLE DEFINITION



QUALITY CIRCLE

Quality circle is a volunteer group composed of workers, usually under the leadership of their supervisor, who are trained to identify , analyze and solve work related problems and present their solutions to management in order to improve the performance of the organization, and motivate and enrich the work of employees.

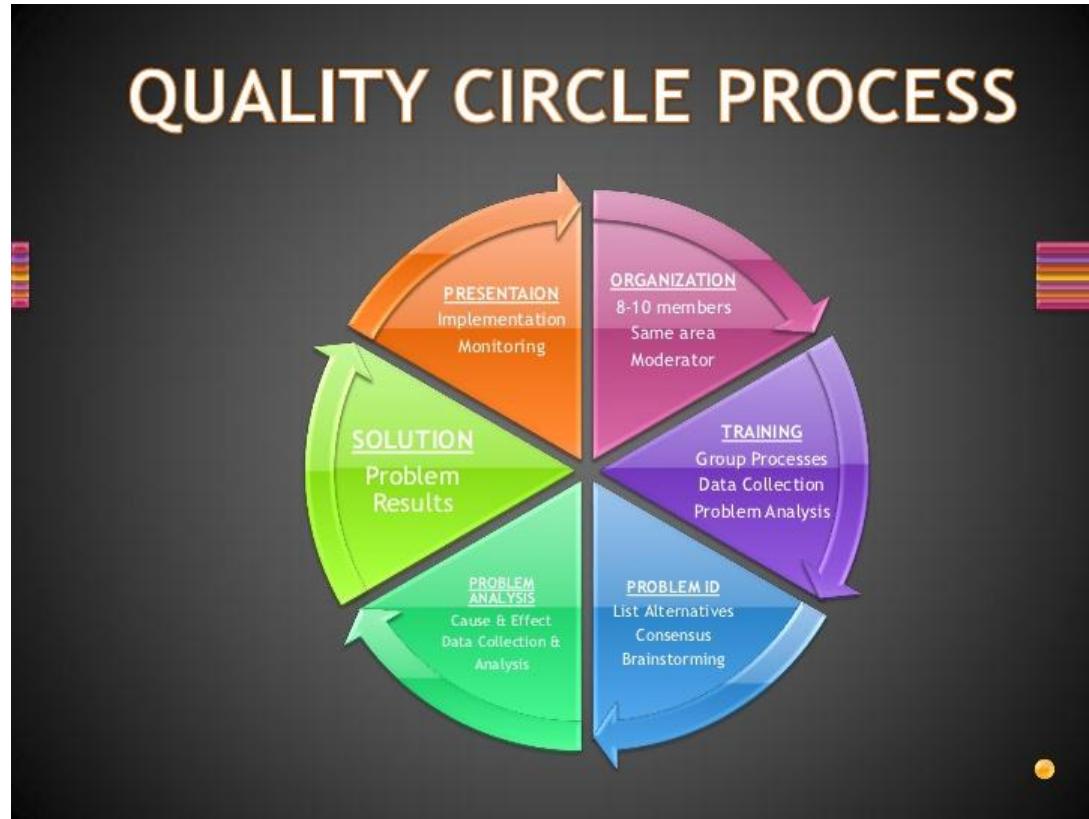
Basic Principle

“ Employee participation in decision making and problem - solving improves the quality of work ”

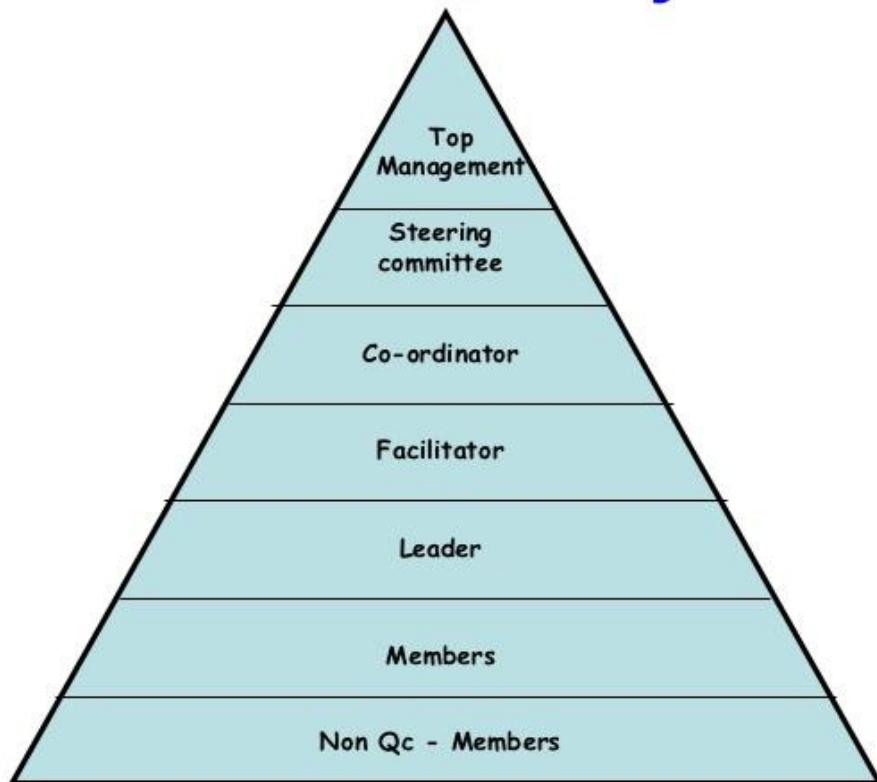
Quality Circle is

- ❖ Group of employees
- ❖ Work on similar area
- ❖ Solve problems related to work
- ❖ Improve production techniques
- ❖ Improve quality





Structure of Quality Circle



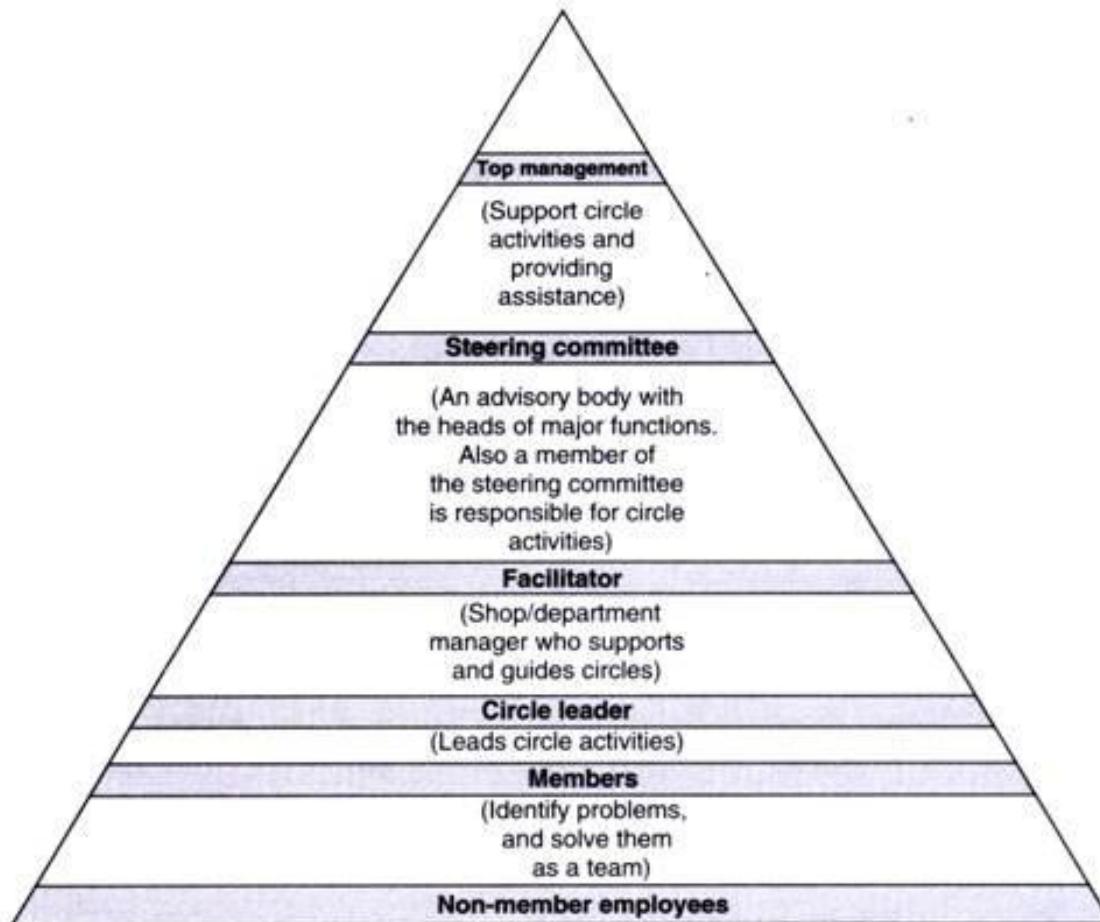


Figure Structure of quality circle

LAUNCHING QUALITY CIRCLE IN AN ORGANISATION

Arrange training of co-ordinators, facilitators in basics of Quality Circle approach, implementation, techniques and operation.
Later facilitator may provide training to Circle leaders and Circle members.

A meeting should be fixed preferably one hour a week for the Quality Circle to meet.

Formally inaugurate the Quality Circle

Arrange the necessary facilities for the Quality Circle meeting and its operation.

Objectives of Quality Circle

The **objective of QCC** is to improve and upgrade quality of work through:

- (a) The problem solving capability of the workers;
- (b) Team work;
- (c) The cultivation and assimilation of positive values and work ethics;
- (d) Involvement and interest in work;
- (e) High motivation for work; and
- (f) Awareness of responsibility towards oneself, the group, the department / office and the nation.

OBJECTIVE

The objectives of Quality Circles are multi-faced.

a) Change in Attitude

From "I don't care" to "I do care"

Continuous improvement in quality of work life through humanisation of work.

b) Self Development

Bring out 'Hidden Potential' of people

People get to learn additional skills.

QUALITY AUDIT





QUALITY AUDIT:DEFINITION

- It is a Periodic, independent, and documented examination and verification of activities, records, processes, and other elements of a quality system to determine their conformity with the requirements of a quality standard such as ISO 9000.

Any failure in their proper implementation may be published publicly and may lead to a revocation of quality certification.

Also called conformity assessment or quality system audit.



Types of Audits



Internal Audit

- First Party

Auditing your own organization using a planned schedule and trained internal auditors.



External Audit

- Second Party

Audit is initiated by client i.e. your purchaser

- Third Party

Audit performed by independent organization or regulatory body, e.g. ISO 9001:2000 registrar.

Example SGS, URS, Moody Int. etc.

The Audit Process



Why Audit?

- To determine whether the quality system conforms to specified requirements
- To determine the effectiveness of the implemented system
- To initiate improvements in the system
- To compare practice with procedure
- To provide objective evidence that the system is in compliance with the standard (i.e for certification purpose) intake per set criteria

Quality Audit ensures:

Identification of where best practices are implemented

Areas NOT using best practices are identified

Best practices proven in similar projects are shared

Project team implement best practices

Sponsor is reassured project progress is in line with the plan

The essential qualities of a good auditor

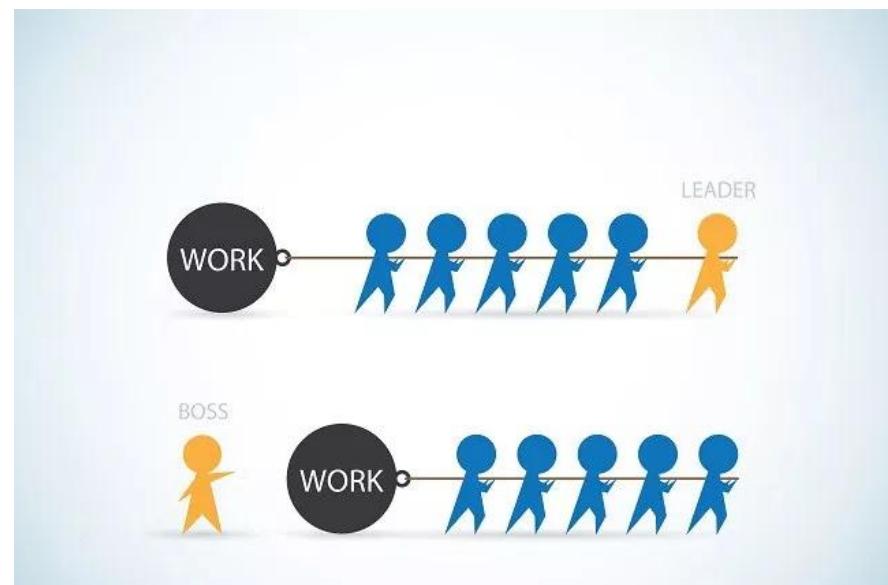
- The auditor's task is to communicate. To do this well requires that there are no blocks to communication. This may be done by:
- Looking the part and fitting in to the working environment
- Being calm and polite under all circumstances
- Being punctual, neither early nor late.
- Being prepared, determined, direct, decisive and precise.
- Getting on with the job.
- Having good judgement, a sense of proportion and being prepared to make some allowances.
- Being aware of personnel interrelationships and of potential union problems.
- Being independent in thought, and neutral in attitude, in the event of any dispute.

[Home](#)

Quality Leadership

A Leader

- Is the one who instills purpose
- Does not try to control by force
- Strengthens and inspires the followers to accomplish shared goals
- Shares promotes protects organizational values
- Has vision and implements it meticulously



Characteristics of a quality leader

1. Pays high attention to external and internal customer and there needs
2. Empowers rather than controls subordinates
3. Emphasizes improvement rather than maintenance
4. Emphasizes prevention rather than cure
5. Emphasizes collaboration rather than competition
6. Train and coach rather than direct and supervise
7. Learn from problems
8. Try to improve communication/ disseminate information on TQM
9. Demonstrate their commitment to quality
10. Choose suppliers on the basis of their quality not price
11. Establish organizational system to support the quality effort
12. Encourage and recognize team effort
13. Are proactive,
 - ❖ begin with end in mind,
 - ❖ Put first things first,
 - ❖ Seek first to understand, then to be understood,
 - ❖ Synergy,
 - ❖ Sharpen the saw- physical, spiritual, mental, social



6 Ways to Succeed as a Leader



Inspiring Commitment

- Recognize others' achievements
- Motivate employees



Leading Employees

- Delegate effectively
- Act with fairness



Strategic Planning

- Translate vision into reality
- Plan for the long-term



Change Management

- Facilitate organizational adaptation
- Manage resistance to change



Employee Development

- Coach to improve performance
- Provide guidance and encouragement



Self-Awareness

- Recognize personal limits
- Learn from mistakes

DMAIC

DMAIC is a five-step method for improving existing process problems with unknown causes.





Phase 1: Define

Define the problem. The Define Phase is the first phase of the Lean Six Sigma improvement process. In this phase, the leaders of the project create a Project Charter, create a high-level view of the process, and begin to understand the needs of the customers of the process.

!! Steps

Define the problem by developing a "Problem Statement"

Define the goal by developing a "Goal Statement"

Define process by developing maps of the process

Identify your customer and define their requirements

X Tools

Project Charter

SIPOC

Swimlane Process Map

VOC Translation Matrix

Tree Diagram



Phase 2: Measure

Map out the current problem. In the Measure phase, the focus is on determining the start point or baseline of the process. The team must carefully select the right measures and create a robust data collection plan to get good data.

!! Steps

- Select Measures
- Create a plan to collect the data
- Ensure your data is reliable
- Gather the baseline data
- Update your project charter

Tools

- Data Collection Plan
- Checklists
- Measurement Definitions
- Value Stream Map



Phase 3: Analyze

Identify the cause of the problem. In the Analyze Phase, the team reviews the data collected during the Measure Phase. They analyze both the data and the process in an effort to narrow down and verify the root causes of waste and defects.

!! Steps

- Closely examine the process
- Visually display the data
- Brainstorm potential cause(s) of the problem
- Verify the cause(s) of the problem
- Update your Project Charter

Tools

- Process Analysis
- Data Analysis
- Cause & Effect Diagram
- Value Stream Map



Phase 4: Improve

Implement and verify the solution. In the Improve Phase, the team moves on to solution development. A structured improvement effort can lead to innovative and elegant solutions.

!! Steps

- Brainstorm solutions that might fix the problem
- Filter solutions
- Design a future state process map
- Select the best solution(s)
- Implement the solution(s)
- Measure improvement

Tools

- Brainstorming
- Impact Effort Matrix
- Weighted Criteria Matrix
- To-Be Process Maps
- FMEA



Phase 5: Control

Maintain the solution. In the Control Phase, the team begins to document exactly how they want to sustain improvements by passing process improvement infrastructure on to the employees who work within the process.

!! Steps

Continuously improve the process using Lean principles

Ensure the process is being managed and monitored properly

Expand the improved process throughout organization

Apply new knowledge to other processes in your organization

Share and celebrate your success!

Tools

Control Plan

Response Plan

Control Charts

Documentation

Thank you, for your time and attention!



The LNMIIT: Where young dreams take shape



Kaizen or Continuous improvement

Kaizen is a Japanese concept that means continuous improvement. Kaizen was created in Japan following World War II. It comes from the Japanese words 改 ("kai") which means "change" or "to correct" and 善 ("zen") which means "good". Today, Kaizen is a popular word in industry, worldwide. It aims at improvements without spending much money, involving everyone from managers to workers, and using much common sense. The Japanese way encourages **small** improvements day after day, **continuously**. The key aspect of KAIZEN is that it is an on-going, never-ending improvement process. It's a **soft and gradual** method opposed to more usual western habits to scrap everything and start with new.

Kaizen is a system that involves every employee - from upper management to the machinist and the cleaning crew. Everyone is encouraged to come up with small improvement suggestions on a regular basis. This is not a once a month or once a year activity. It is continuous. In Japanese companies, such as Toyota and Canon, a total of 60 to 70 suggestions per employee per year are written down, shared and implemented. Kaizen activities can be conducted in several ways. First and most common is to change worker's operations to make his job more productive, less tiring, more efficient or safer. To get his buy-in as well as significant improvement, worker is invited to cooperate, to reengineer by himself and with help of team mates or a Kaizen support group. The second way is to improve equipment, like installing foolproof devices and/or changing the machine layout. Third way is to improve procedures. All these alternatives can be combined in a broad improvement plan.

In most cases these are not ideas for dramatic changes. Kaizen is based on making little changes on a regular basis: always improving productivity, safety and effectiveness while reducing waste. Anyway, the first stage is reviewing the current work standards to check the current performance and than estimate how and how much performance can still be improved. When new leap is done, upgrade the standards.

Suggestions are not limited to a specific area such as production or marketing. Kaizen is based on making changes anywhere that improvements can be made. Kaizen in Japan is a system of improvement that includes both home and business life. Kaizen even includes social activities. It is a concept that is applied in every aspect of a person's life.

In business, Kaizen encompasses many of the components of Japanese businesses that have been seen as a part of their success. Quality circles, automation, suggestion systems, just-in-time delivery, Kanban and 5S are all included within the Kaizen system of running a business. Some examples of Kaizen are: setting up a new U shape machine layout in a workshop allows to downsize from a 5 machines/ 3 operators system to a 5 machines/ 2 operators system, addition of a positioning fixture on a machining center to quickly load and unload a component.

Quality Circle - A way to continuous quality Improvement

Quality Circles are (informal) groups of employees who voluntarily meet together on a regular basis to identify, define, analyze and solve work related problems. Usually the members of a particular team (quality circle) should be from the same work area or who do similar work so that the problems they select will be familiar to all of them. In addition, interdepartmental or cross functional quality circles may also be formed. An ideal size of quality circle is seven to eight members. But the number of members in a quality circle can vary. It is a way of capturing the creative and innovative power that lies within the work force.

Regular meetings are important part of quality circle's working. Meetings are attended by all the members of the quality circle. In general, meetings take place once a week or once in a fortnight. Thus, quality circle represents a philosophy of involving employees specially those at the grass root level, in decisions, concerning their work life, and in environments where peoples' capabilities are looked upon as assets to solve work-area problems. The concept of Quality Circle is primarily based upon recognition of the value of the worker as a human being, his wisdom, intelligence, experience, attitude and feelings. It is based upon the human resource management considered as one of the key factors in the improvement of product quality & productivity. Quality Circle concept has three major attributes:

- Quality Circle is a form of participation management.
- Quality Circle is a human resource development technique.
- Quality Circle is a problem solving technique.

Objectives of Quality Circles are:

- a) To change the attitude from "I don't care" to "I do care", continuous improvement in quality of work life through humanization of work.

- b) Encourage self development; bring out hidden potential of people. They get to learn additional skills.
- c) Development of team spirit, to eliminate inter-departmental conflicts.
- d) Improved organizational culture, positive working environment, total involvement of people at all levels, higher motivational level, participate management process.

A Quality Circle has an appropriate organizational structure for its effective and efficient performance. It varies from industry to industry, organization to organization. But it is useful to have a basic framework as a model. The structure of a Quality Circle consists of the following elements.

- i. A steering committee: This is at the top of the structure. It is headed by a senior executive and includes representatives from the top management personnel and human resources development people. It establishes policy, plans and directs the program and meets usually once in a month.
- ii. Coordinator: He may be a Personnel or Administrative officer who co-ordinates and supervises the work of the facilitators and administers the program.
- iii. Facilitator: He may be a senior supervisory officer. He co-ordinates the works of several quality circles through the Circle leaders.
- iv. Circle leader: Leaders may be from lowest level workers or Supervisors. A Circle leader organizes and conducts Circle activities.
- v. Circle members: They may be staff workers. Without circle members the program cannot exist. They are the lifeblood of quality circles. They should attend all meetings as far as possible, offer suggestions and ideas, participate actively in group process, take training seriously with a receptive attitude. The roles of Steering Committee, coordinator, Facilitator, Circle leader and Circle members are well defined.

The launching of Quality Circles involves the following steps:

1. Expose middle level executives to the concept.
2. Explain the concept to the employees and invite them to volunteer as members of Quality Circles.
3. Nominate senior officers as facilitators.
4. Form a steering committee.

5. Arrange training of coordinators, facilitators in basics of Quality Circle approach, implementation, techniques and operation. Later facilitator may provide training to Circle leaders and Circle members.
6. A meeting should be fixed preferably one hour a week for the Quality Circle to meet.
7. Formally inaugurate the Quality Circle.
8. Arrange the necessary facilities for the Quality Circle meeting and its operation.

Problem solving tools and techniques used by quality circles are brainstorming, pareto analysis, cause and effect diagram (or fish bone diagram or Ishikawa diagram), histogram, scatter diagram, stratification, check sheet, control charts and graphs, relations diagram, affinity diagram, systematic diagram or tree diagram, matrix diagram, matrix data analysis diagram, PDPC (Process Decision Program Chart) and arrow diagram.

The 5S

The 5S Program defines the steps that are used to make all work spaces efficient and productive, help people share work stations, reduce time looking for needed tools and improve the work quality. The Five Ss refer to the five dimensions of workplace optimization:

- Seiri (Sort),
- Seiton (Set in order),
- Seiso (Shine),
- Seiketsu (Standardize),
- Shitsuke (Sustain)

Sorting (Seiri) the first S focuses on eliminating unnecessary items from the workplace. It eliminates all unnecessary tools, parts, instructions. Go through all tools, materials, etc., in the plant and work area. Keep only essential items. Everything else is stored or discarded.

Straightening or Setting in Order (Seiton) is the second and focuses on efficient and effective storage methods. means there should be a place for everything and everything should be in its place. The place for each item should be clearly labeled or demarcated. Items should be arranged in a manner that promotes efficient work flow. Workers should not have to repetitively bend to access materials. Each tool, part, supply, piece of equipment, etc. should be kept close to where it will be used (i.e. straighten the flow path). Seiton is one of the features that distinguishes 5S from "standardized cleanup".

Shining or Sweeping or Cleanliness / Systematic Cleaning (Seiso) Once you have eliminated the clutter and junk that has been clogging your work areas and identified and located the necessary items, the next step is to thoroughly clean the work area. So the third S aims to keep the workplace tidy and organized. At the end of each shift, clean the work area and be sure everything is restored to its place. This makes it easy to know what goes where and ensures that everything is where it belongs. A key point is that maintaining cleanliness should be part of the daily work – not an occasional activity initiated when things get too messy.

Standardizing (Seiketsu) Once the first three 5S's have been implemented, you should concentrate on standardizing best practice in your work area. So, the forth S indicates that work practices should be consistent and standardized. Everyone should know exactly what his or her responsibilities are for adhering to the first 3 S's. Allow your employees to participate in the development of such standards. They are a valuable but often overlooked source of information regarding their work.

Sustaining the discipline (Shitsuke) refers to maintaining and review of standards. Once the previous 4 S's have been established, they become the new way to operate. Maintain focus on this new way and do not allow a gradual decline back to the old ways. The fifth S by far the most difficult S to implement and achieve. Human nature is to resist change and more than a few organizations have found themselves with a dirty cluttered shop a few months following their attempt to implement 5S. The tendency is to return to the status quo and the comfort zone of the "old way" of doing things. Sustain focuses on defining a new status quo and standard of work place organization.

Benefits of 5 S system: The 5S process can increase morale, create positive impressions on customers, and increase efficiency and organization. Not only will employees feel better about where they work, the effect on continuous improvement can lead to less waste, better quality and shorter lead times.

Quality audit

Also called conformity assessment or quality system audit, quality audit refers to a systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives. It is the periodic, independent, and documented examination and verification of activities, records, processes, and other elements of a quality system to determine their conformity with the requirements of a quality standard such as ISO 9000. Quality audits are used mainly by

the company to evaluate its own quality activities or the quality activities of vendors, licensees, etc.

In general, the purpose of a quality examination is to determine whether the company is complying with its quality program or whether it needs to make changes to its business practices. A company may also perform a quality audit in order to determine whether it is complying with certain quality standards, like those set by the International Organization for Standardization (ISO) 9000. During the quality audit, an auditor analyzes and verifies various records and processes relating to a company's quality program. An auditor is a professional who is responsible for evaluating various aspects of quality processes.

A quality audit may fall in one of the two categories:

- Internal audit
- External audit

A quality audit is an external audit, if it is conducted by an independent auditor or team of auditors who have expertise in the area but the auditors are not the employee of the company being audited. A company may also choose to perform an internal audit of its quality control systems on a periodic basis where the employees of the company are the auditors. Members of the audit team are typically professionals who have extensive knowledge about auditing, procedures, and principles. In addition, auditors should have hands-on experience with examining, evaluating, and reporting on whether each aspect of a quality system is deficient or satisfactory.

In a typical quality audit, the auditor first formulates a system audit plan. This plan gives details on the timeline, scope, and location of the audit. The plan also lists out any written documentation that will need to be reviewed as well as any interviews that will need to be conducted. For example, an auditor usually needs to review any of the company's written quality management policies, procedures, and manuals. When the plan has been prepared, the auditor submits it to the company for approval. Once the audit plan has been approved, the auditor generally meets with any individuals at the company who are responsible for the company's quality program. The auditor also examines any applicable records and investigates whether the company's business practices align with its written quality program. If data suggests that the company is not complying with its quality program, the auditor will investigate and document this information. Additionally, the auditor will note any areas in which the company is complying.

At the end of the quality audit, the auditor prepares and submits a report, which details the overall findings from the audit. This report contains a summary of all of the evidence that was reviewed. It also gives a description of any areas in which the company is or is not conforming to its quality program. Usually, the report also details the auditor's overall conclusion and rating of the company's quality program. In addition, most reports provide the company with detailed recommendations for improving its quality program and operations. With the upgrade of the ISO9000 series of standards from the 1994 to 2008 series, the focus of the audits has shifted from evaluating purely procedural adherence towards measurement of the actual effectiveness of the Quality Management System (QMS) and the results that have been achieved through the implementation of a QMS.