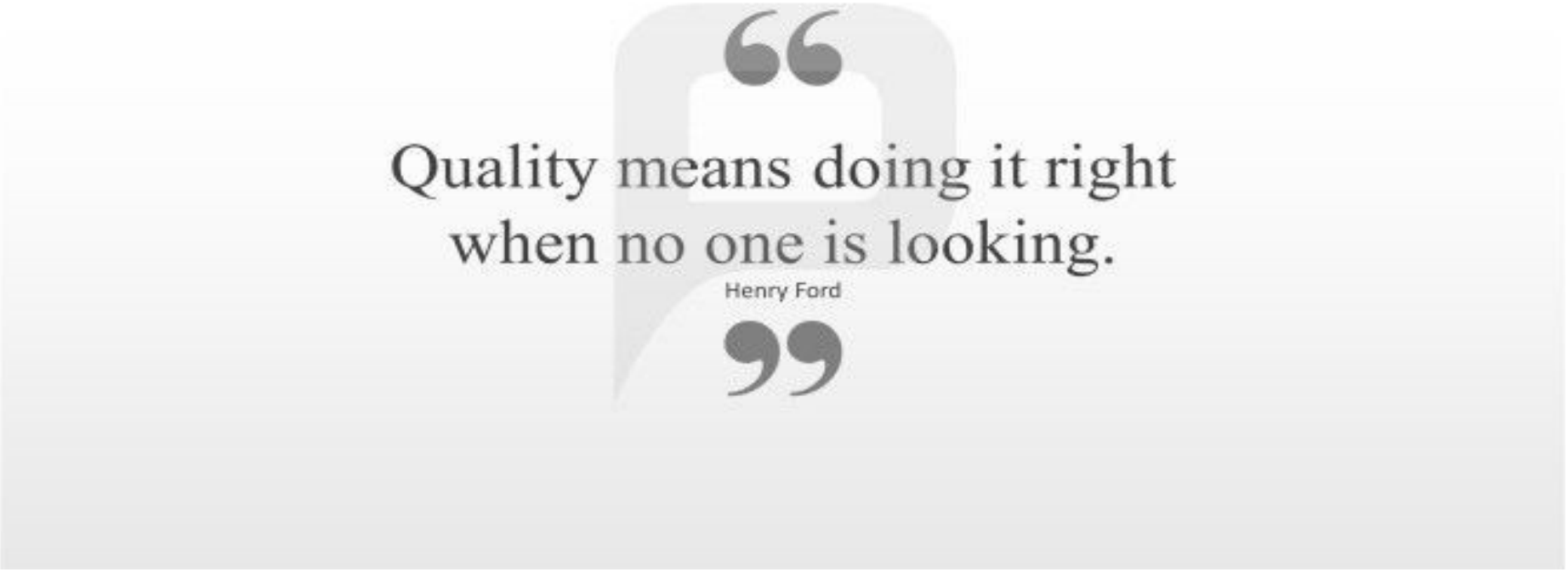
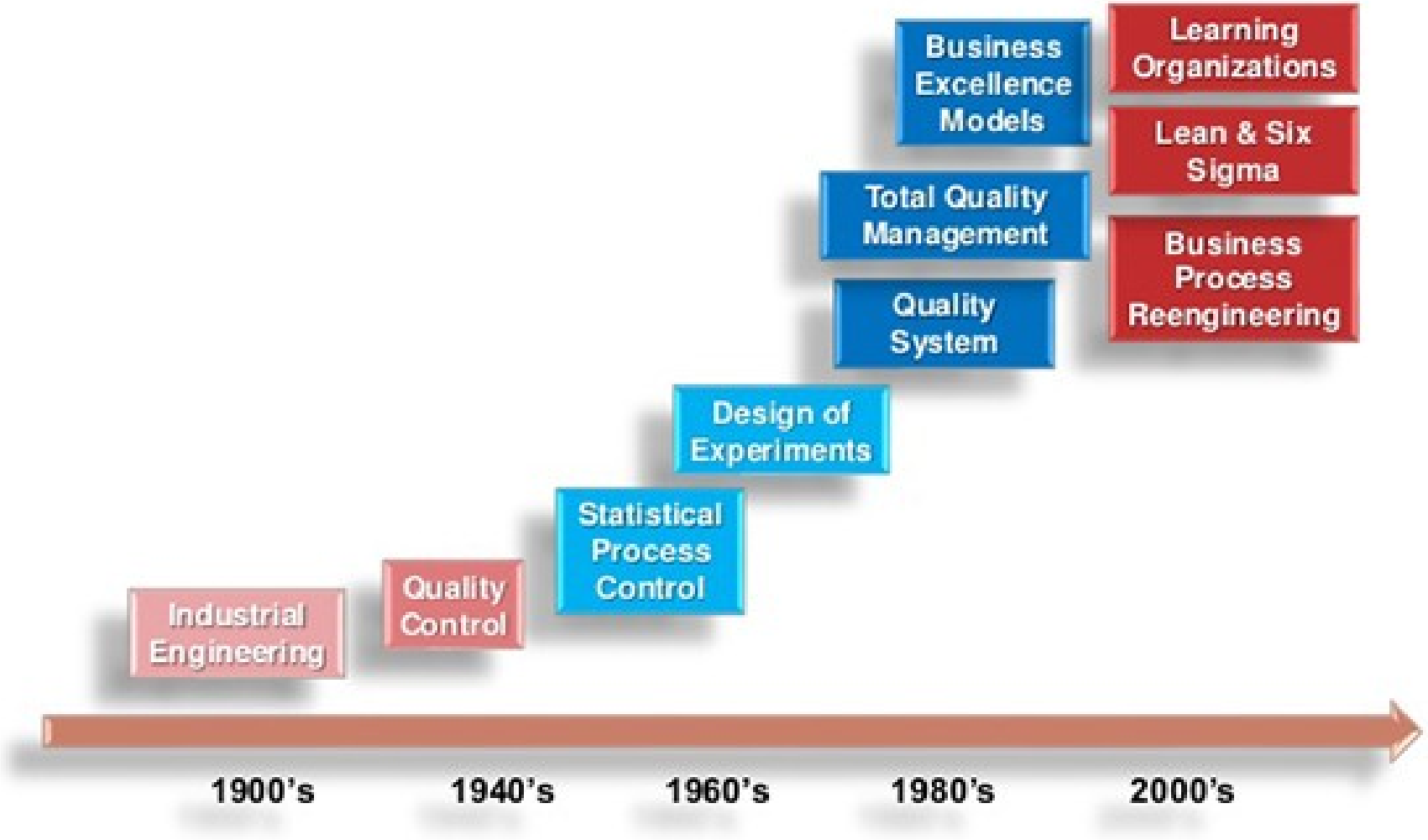
Production Planning and Management

Total Quality Management (TQM)



Evolution of Total Quality Management



Definition of quality:

- Fitness for Use
- Conformance to Specifications
- Producing the Very Best Products
- Excellence in Products and Services
- Total Customer Satisfaction
- Exceeding Customer Expectations

Definition 1 (General Definition)

Measure of excellence or state of being free from defects, deficiencies, and significant variations.

The totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs.

Definition 2 (Manufacturing Definition)

Strict and consistent adherence to measurable and verifiable standards to achieve uniformity of output that satisfies specific customer or user requirements.

Definition 3 (Objective Definition)

Measurable and verifiable aspect of a thing or phenomenon, expressed in numbers or quantities, such as lightness or heaviness, thickness or thinness, softness or hardness.

Definition 4 (Subjective Definition)

Attribute, characteristic, or property of a thing or phenomenon that can be observed and interpreted, and may be approximated (quantified) but cannot be measured, such as beauty, feel, flavor, taste.

Poor quality is responsible to increase scrap and production loss

Table 5.1 Quality Dimensions of Goods and Services

Product Quality Dimensions

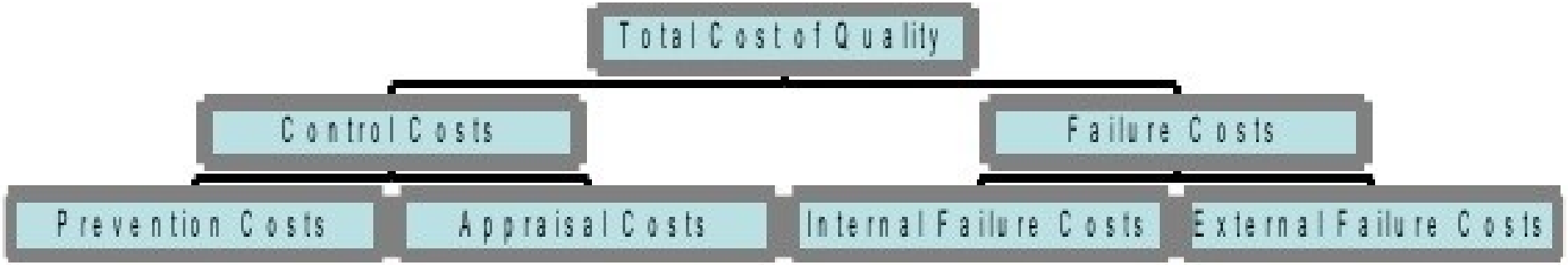
1. ***Performance***—Operating characteristics
2. ***Features***—Important special characteristics
3. ***Flexibility***—Meeting operating specifications over some period of time
4. ***Durability***—Amount of use before performance deteriorates
5. ***Conformance***—Match with preestablished standards
6. ***Serviceability***—Ease and speed of repair
7. ***Aesthetics***—How a product looks and feels
8. ***Perceived quality***—Subjective assessment of characteristics (product image)

SOURCES: Adapted from J.W. Dean, Jr., & J. R. Evans, 1994, *Total Quality: Management, Organization and Society,* St. Paul, MN:West Publishing Company; H.V. Roberts & B. F. Sergesketter, 1993, *Quality Is Personal,* New York:The Free Press; D. Garvin, 1988, *Managed Quality: The Strategic and Competitive Edge,* New York:The Free Press.

Service Quality Dimensions

Timeliness	Performed in promised period of time
Courtesy	Performed cheerfully
Consistency	Giving all customers similar experiences
Convenience	Accessibility to customers
Completeness	Fully serviced, as required
Accuracy	Performed correctly each time

Total Cost of Quality



The cost of planning and executing a project so it is error-free or within an acceptable error range

- Quality planning
- Training
- Process planning
- New product review
- QC procedures

The cost of evaluating processes and their outputs to ensure quality, including measurement and test equipment costs: capital cost of equipment

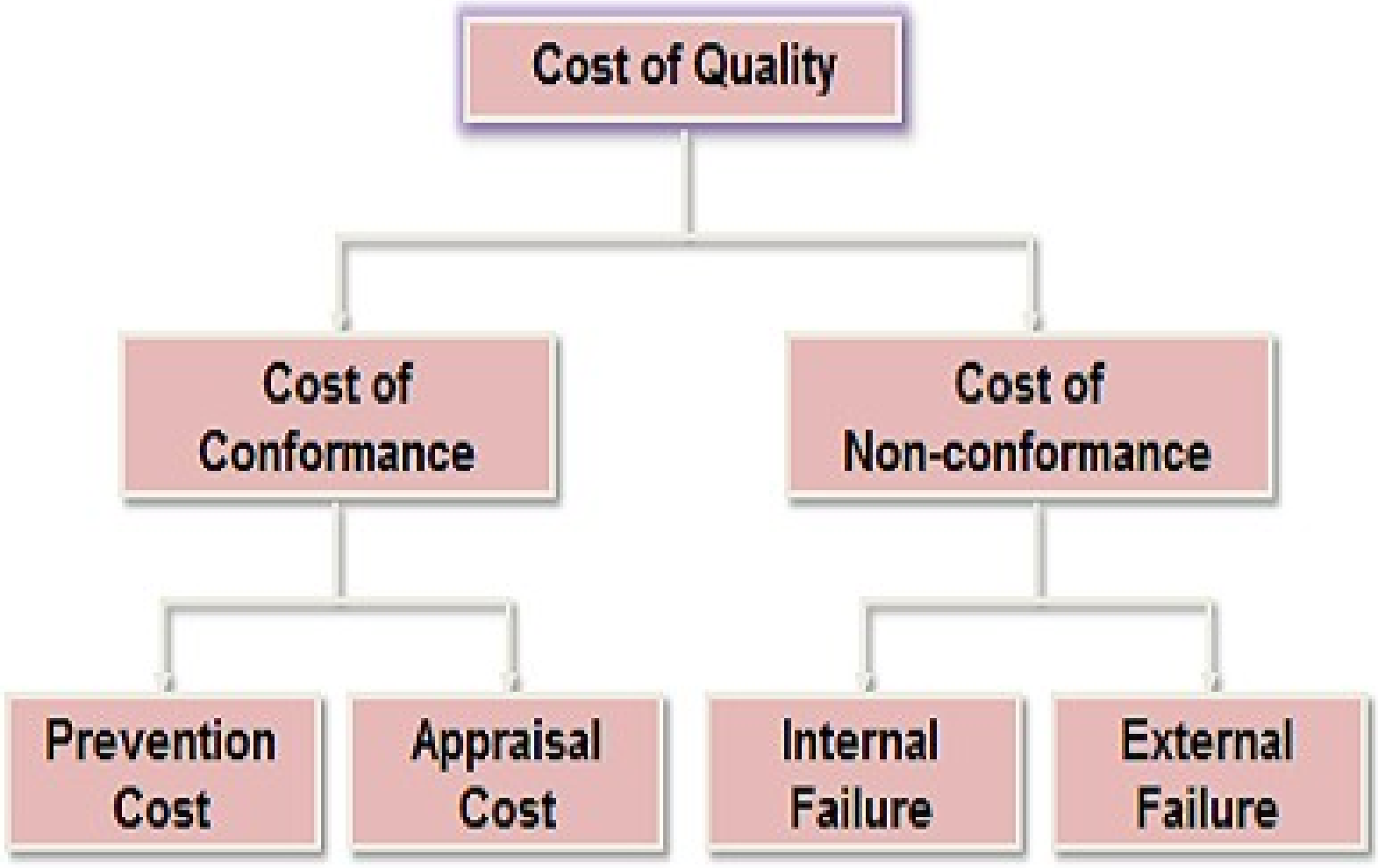
- Inspection
- Testing
- Equipment

The cost incurred to correct an identified defect before the customer receives the product

- Lost production
- Scrap
- Rework
- Employee injury

The cost that relates to all errors not detected and corrected before delivery to the customer

- Warranty work
- customer complaints
- Replacements
- Liabilities
- Loss of goodwill


Cost of Quality
Cost of Conformance
Cost of Non-conformance
Prevention Cost
Appraisal Cost
Internal Failure
External Failure

Cost of quality = Cost of conformance + Cost of non-conformance

- Cost of conformance is the cost of providing products or services as per the required standards. This can be termed as good amount spent. (Prevention & Appraisal costs)

- Cost of non-conformance is the failure cost associated with a process not being operated to the requirements. This can be termed as unnecessary amount spent.(Internal & External failure costs)

Table 1 Xerox Cost of Quality Definitions

Term	Definition	Example
Costs of Conformance	Necessary expenses associated with meeting customer requirements.	
• Prevention.	The costs to avoid failure.	Training, communications.
• Inspection/ appraisal.	The costs to check work.	Incoming inspection, preinstalls, auditing.
Costs of Nonconformance	Unnecessary expenses associated with failure to meet customer requirements.	
• Failure to meet customer requirements.	The costs of redoing work, waste, remakes.	Aborted installs, machine replacement, incomplete surveys.
• Exceeding customer requirements.	The costs of unnecessary "extras."	Response time in excess of customer requirements, overly elaborate presentations.

Prevention Costs include all activities intended to prevent poor quality in products or services.

- Process Planning
- Training and Education
- Process Controls, Validations, and Audits
- Quality Function Expenses
- Performance Reporting
- Marketing Research and Customer Surveys

Appraisal Costs include all activities associated with assuring a product or service conforms to performance requirements and standards.

- Inspections, Evaluations, Tests, and Review of Data
- Laboratory Support and Equipment
- Qualification of Supplier Product and Purchasing Appraisal
- Product or Service Quality Audits
- Measurement Equipment, Maintenance, and Calibration
- Outside Certifications

Internal Failure Costs include all activities associated with a product or service not meeting standards or customer requirements prior to delivery to the customer.

- Failure to Scale Up
- Poor Communication and Documentation
- Uncontrolled Material Losses
- Material Review, Disposition, and Corrective Action
- Rework, Repair, Retest, Reinspection, and Investigation Support
- Supplier Failure, Reject, and Replacement

External Failure Costs include all activities associated with a product or service not meeting standards or customer requirements at delivery or after delivery to the customer.

- Surgical Error or Incorrect Prescription
- Customer Goodwill
- Retrofit Costs and Warranty Claims
- Recall Costs and Returned Goods
- Liability Costs and Penalties
- Customer Compliant Investigation

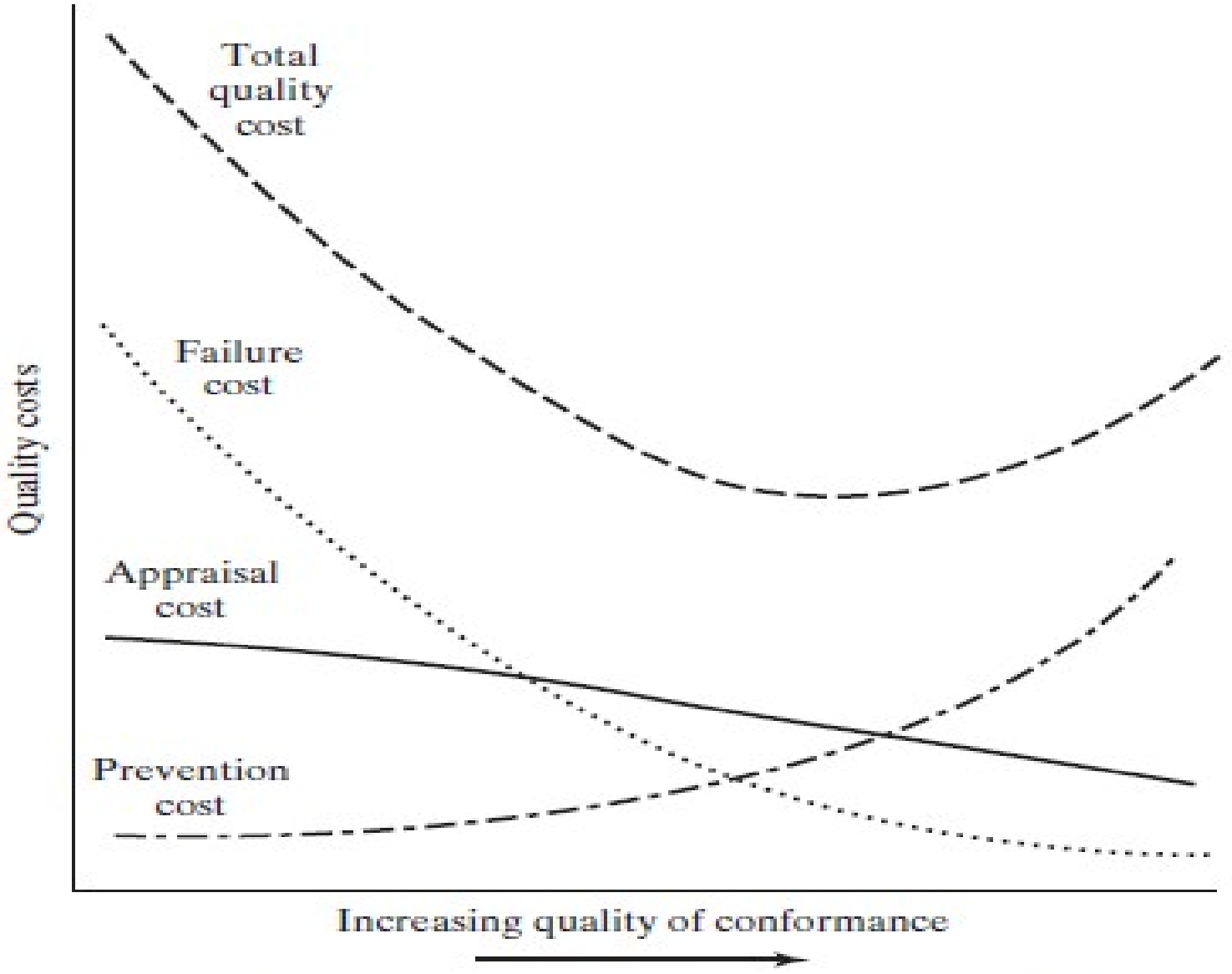
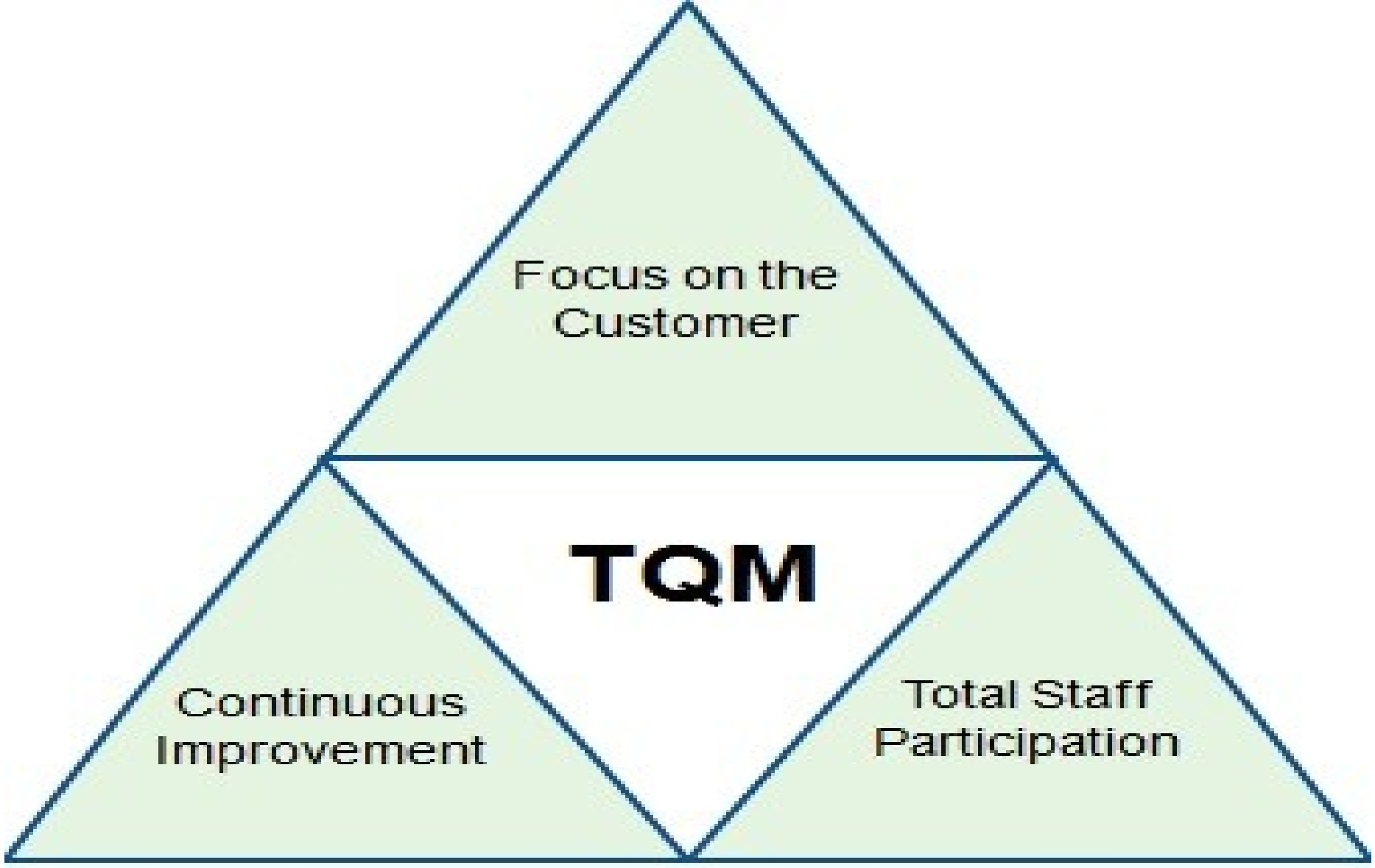


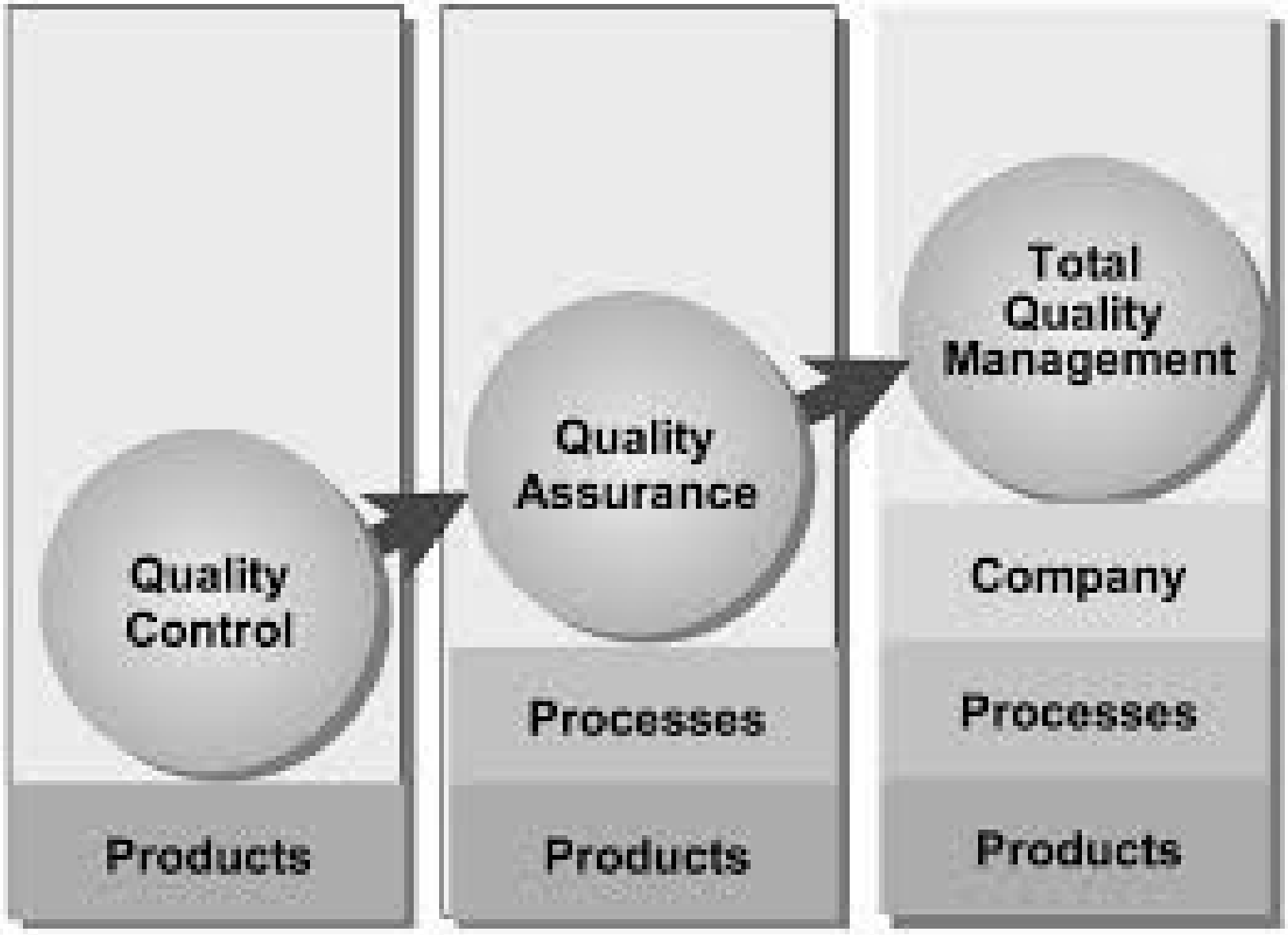
Figure 12-1 Effect of quality improvement on quality costs.

Total Quality Management

Quality element	Previous state	TQM
Definition	Product-oriented	Customer-oriented
Priorities	Second to service and cost	First among equals of service and cost
Decisions	Short-term	Long-term
Emphasis	Detection	Prevention
Errors	Operations	System
Responsibility	Quality Control	Everyone
Problem solving	Managers	Teams
Procurement	Price	Life-cycle costs
Manager's role	Plan, assign, control, and enforce	Delegate, coach, facilitate, and mentor



Total Quality Management


Quality Control
Products
Quality Assurance
Processes
Products
Total Quality Management
Company
Processes
Products

Obstacles to Implementing TQM

- Lack of a company-wide definition of quality.
- Lack of a formalized strategic plan for change.
- Lack of a customer focus.
- Poor inter-organizational communication.
- Lack of real employee empowerment.
- Lack of employee trust in senior management.
- View of the quality program as a quick fix.
- Drive for short-term financial results.
- Politics and turf issues.

International Organization of Standardization (ISO)

ISO 9000 is a family of quality improvement standards released by ISO.

- The 9000 series helps an organization define steps to create and maintain a quality management system.

Thoughtful work toward ISO 9001 certification (the most well-known standard issued by ISO) can increase efficiency and customer satisfaction for service and transactional businesses, as well as for manufacturing and real-goods organizations.

Although ISO standards provide a foundation for thinking about and working toward quality, however, certification does not guarantee immediate business growth and cost savings.

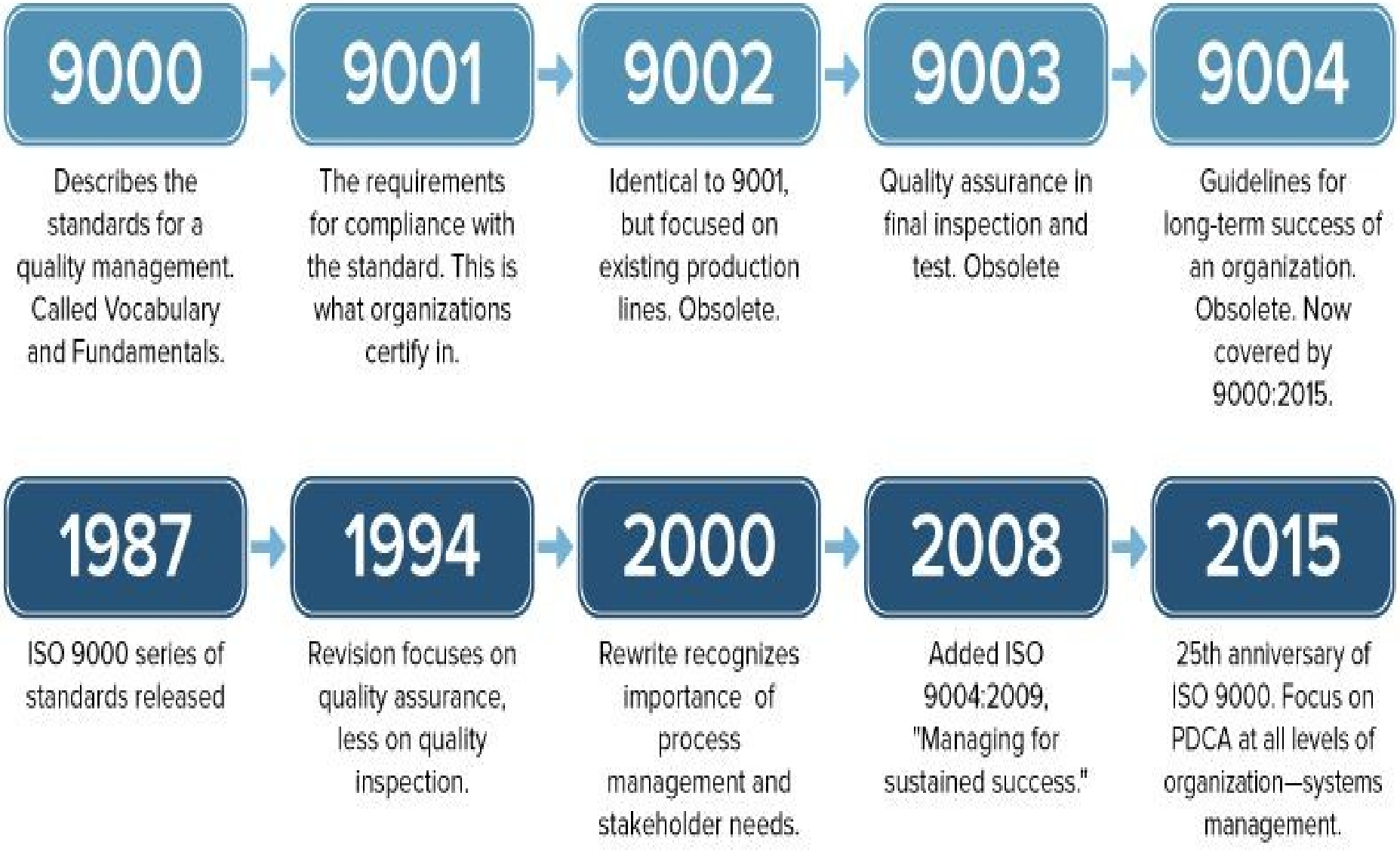
ISO 9000

The ISO 9000 and ISO 14000 families are among ISO's most widely known standards ever. ISO 9000 and ISO 14000 standards are implemented by some 760,900 organizations in 154 countries. ISO 9000 has become an international reference for quality management requirements in business-to-business dealings, and ISO 14000 is well on the way to achieving as much, if not more, in enabling organizations to meet their environmental challenges.

ISO 9000 vs. ISO 9001

ISO 9000 is a family of standards encompassing a handful of documents. ISO 9000 is also the name of the document that details the fundamentals and vocabulary of what constitutes a quality system.

ISO 9001 represents specific requirements to improve processes, and is considered the most essential certification of the ISO 9000 family.


9000
Describes the standards for a quality management. Called Vocabulary and Fundamentals.
9001
The requirements for compliance with the standard. This is what organizations certify in.
9002
Identical to 9001, but focused on existing production lines. Obsolete.
9003
Quality assurance in final inspection and test. Obsolete
9004
Guidelines for long-term success of an organization. Obsolete. Now covered by 9000:2015.
1987
ISO 9000 series of standards released
1994
Revision focuses on quality assurance, less on quality inspection.
2000
Rewrite recognizes importance of process management and stakeholder needs.
2008
Added ISO 9004:2009, "Managing for sustained success."
2015
25th anniversary of ISO 9000. Focus on PDCA at all levels of organization—systems management.

Quality Gurus

- U.S. Quality Innovators
- Walter Shewhart (1920s -1940s)
- W. Edwards Deming (post WWII through 1980s)
- Joseph M. Juran (consultant post WWII through 1980s)
- Philip Crosby (1980s)
- Japanese Quality Innovators:
- Kaoru Ishikawa (post WWII - 1980s)
- Genichi Taguchi (1960s - 1980s)

Quality Guru	Main Contribution
Walter A. Shewhart	– Contributed to understanding of process variability. – Developed concept of statistical control charts.
W. Edwards Deming	– Stressed management's responsibility for quality. – Developed "14 Points" to guide companies in quality improvement.
Joseph M. Juran	– Defined quality as "fitness for use." – Developed concept of cost of quality.
Armand V. Feigenbaum	– Introduced concept of total quality control.
Philip B. Crosby	– Coined phrase "quality is free." – Introduced concept of zero defects.
Kaoru Ishikawa	– Developed cause-and-effect diagrams. – Identified concept of "internal customer."
Genichi Taguchi	– Focused on product design quality. – Developed Taguchi loss function.

Guru	Definition of quality	Emphasis	Dominant factor
Deming	Customer-led	Process	Control of variation
Juran	Customer-led	People	Fitness for purpose/ use
Crosby	Supply-led	Performance	Conformance to requirements/ zero defects
Feigenbaum	Customer-led	Process	Total quality control
Ishikawa	Value-led	People	Company-wide quality control/ quality circles
Taguchi	Supply-led	Process/ design	Quality loss function/ value to society

	Deming	Juran	Crosby
Definition of quality	Continuous improvement	Fitness for use	Conformance to requirements
Emphasis	Tools/system	Measurement	Motivation (behaviour)
Types of tools	Statistical process control	Analytical, cost-of-quality	Minimal use
Use of goals and targets	Not used	Significant emphasis	Posted goals for workers

Table 2-2 Deming's 14 Points

1. Create constancy of purpose.
2. Adopt a new philosophy.
3. Cease mass inspection.
4. End awarding business on the basis of price tag.
5. Constantly improve the system.
6. Institute training on the job.
7. Improve leadership.
8. Drive out fear.
9. Break down barriers between departments.
10. Eliminate slogans.
11. Eliminate work standards.
12. Remove barriers to pride.
13. Institute education and self-improvement.
14. Put everybody to work.

Deming's 14 Points

1. **Create consistency of purpose toward the improvement of product and service, and communicate this goal to all employees.**
2. **Adopt the new philosophy of quality throughout all levels with the organization.**
3. **Cease dependence on inspection to achieve quality; understand that quality comes from improving processes.**
4. **No longer select suppliers based solely on price. Move towards developing a long-term relationship with a single supplier.**
5. **Processes, products, and services should be improved constantly; reducing waste.**
6. **Institute extensive on-the-job training.**
7. **Improve supervision.**
8. **Drive out fear of expressing ideas and concerns.**
9. **Break down barriers between departments. People should be encouraged to work together as a team.**
10. **Eliminate slogans and targets for the workforce.**
11. **Eliminate work quotas on the factory floor.**
12. **Remove barriers that rob workers of their right to pride of workmanship.**
13. **Institute a program of education and self-improvement.**
14. **Make sure to put everyone in the company to work to accomplish the transformation.**

Juran's Three Basic Steps to Progress

1. Achieve structured improvements on a continual basis combined with dedication and a sense of urgency.
2. Establish an extensive training program.
3. Establish commitment and leadership on the part of higher management.

Juran's Ten Steps to Quality Improvement

1. Build awareness of both the need for improvement and opportunities for improvement.
2. Set goals for improvement.
3. Organize to meet the goals that have been set.
4. Provide training.
5. Implement projects aimed at solving problems.
6. Report progress.
7. Give recognition.
8. Communicate results.
9. Keep score.
10. Maintain momentum by building improvement into the company's regular systems.

Philip B. Crosby

Quality is free. It's not a gift, but it is free.

"What costs money are the unquality things -- all the actions that involve not doing jobs right the first time."

"Quality is an achievable, measurable, profitable entity that can be installed once you have commitment and understanding and are prepared for hard work."

"What costs money are the unquality things -- all the actions that involve not doing jobs right the first time."

"Quality is an achievable, measurable, profitable entity that can be installed once you have commitment and understanding and are prepared for hard work."

7 Concepts of TQM

- Continuous Improvement
- Six Sigma
- Employee Empowerment
- Benchmarking
- Just-in-Time
- Taguchi Concept
- Knowledge of TQM Tools – 7 Tools of TQM

Continuous Improvement

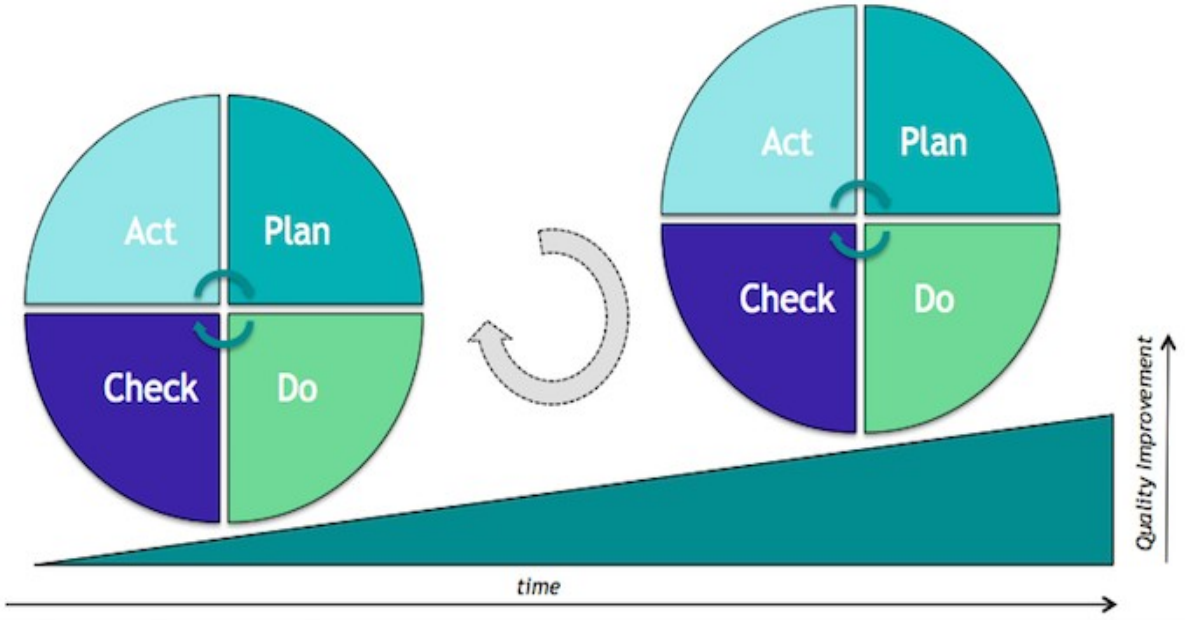
The PDCA Cycle is a framework for problem solving, continuous improvement and change. It is widely recognized as the basis of continually improving

the quality

of processes,

products,

and services.

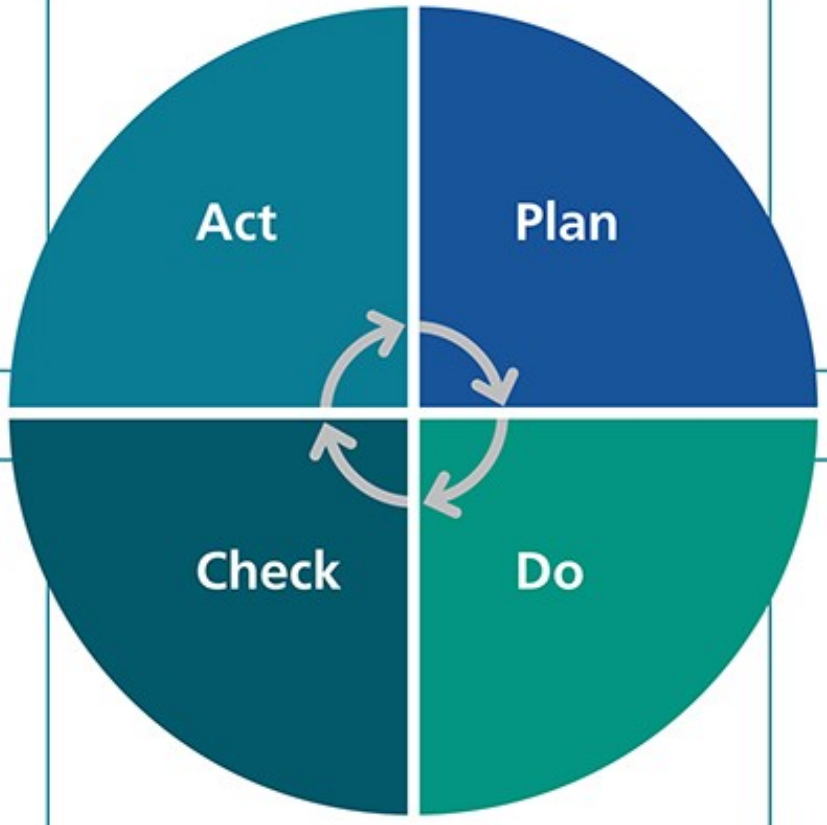


Sustaining

- Embed and maintain
- Spread improvement
- Increase impact

Identifying and Preparing

- Identify areas for improvement
- Would partners assist?
- Identify potential partners
- Agree to partner
- Develop a plan



Adapted from: KPMG International, 2015

Assessing and Revising

- Monitor and report
- Generate solutions
- Review the partnership
- Review your outcomes
- Check and repeat

Implementing

- Mobilise your partners
- Mobilise your people
- Implement plans
- Utilise Linkage Strategies
- Utilise ELDAC toolkits

Six Sigma

- A highly structured strategy for acquiring, assessing, and applying customer, competitor, and enterprise intelligence for the purposes of product, system or enterprise innovation and design.
- *"Six Sigma is a business improvement approach that seeks to find and eliminate causes of mistakes or defects in business processes by focusing on process outputs that are of critical importance to customers."* (Snee, 2004).
- *"Six Sigma is a useful management philosophy and problem-solving methodology but it is not a comprehensive management system. "* (McAdam & Evans, 2004)

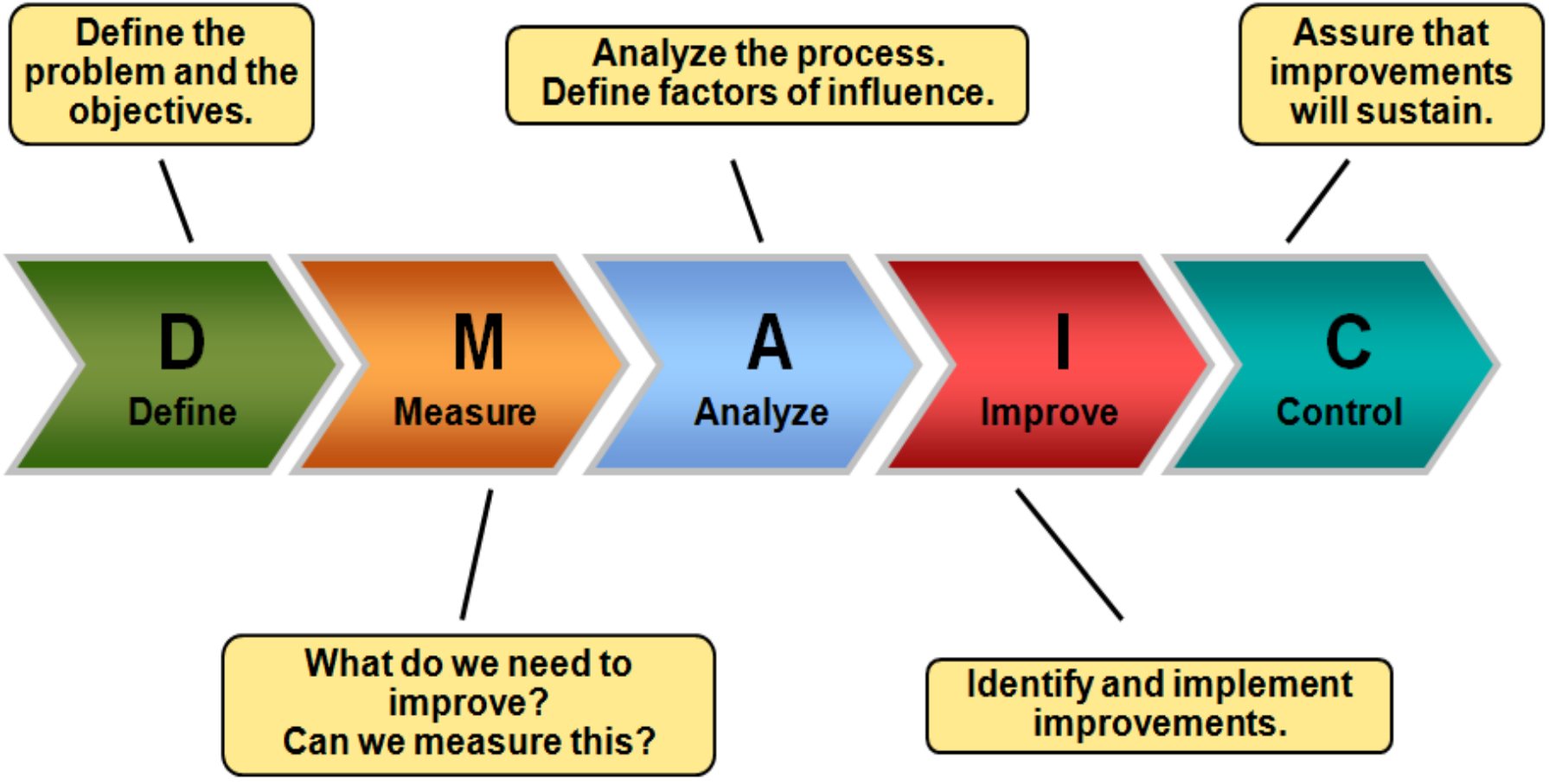
Alternative Definitions

- *"A Six Sigma initiative is designed to change the culture in an organisation by the way of breakthrough improvement in all aspects of the business."* (Breyfogle III et al., 2001)
- *"Six Sigma is a programme that combines the most effective statistical and non-statistical methods to make overall business."* (Pearson, 2001)

Sigma Level	DPMO Defects per Million Opportunities	Yield
6	3.4	99.99966%
5	230	99.977%
4	6,210	99.38%
3	66,800	93.32%
2	308,000	69.15%
1	690,000	30.85%


Improve
Analyze
Control
Measure
Define

DMAIC Roadmap



Employee Empowerment

By empowering employees, organizations can:

- Engage the expertise of employees
- Allow them to feel responsible for quality
- Allow managers to understand and communicate the TQM vision

Benchmarking

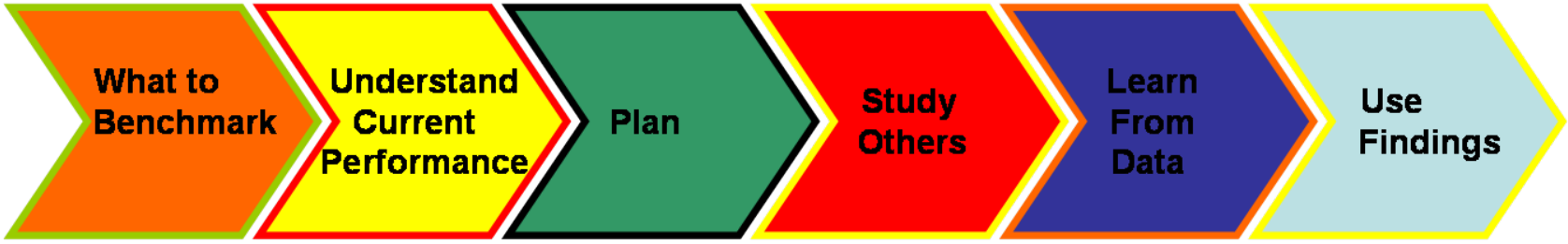
- Benchmarking is the process of continually searching for the best methods, practices and processes, and either adopting or adapting their good features and implementing them to become the "best of the best."
- Measuring your performance against that of the best-in-class companies, determining how the best-in-class achieve those performance levels, and using the information as a basis for your own company's targets, strategies, and implementation.
  - Compare performance of an existing process against other companies' best-in-class practices
  - Determine how those companies achieve their performance levels
  - Improve internal performance levels

Why Benchmark?

- To Obtain an External Perspective of What Is Possible
- To Assist in Setting Strategic Targets
- To Promote Improvements in Performance
- To Establish a Competitive Edge
- To Enhance Customer Satisfaction
- To Reduce Costs
- To Improve Employee Morale
- To Achieve Quality Awards
- To Survive

The Process of Benchmarking

Organizations that benchmark, adapt the process to best fit their own needs and culture. Although number of steps in the process may vary from organization to organization, the following six steps contain the core techniques:



Just-In-Time


Zero
inventory
Zero
failures
JIT
Just in Time
Zero
lead time
Zero
Delay

WHAT IT IS

- Management philosophy
- "Pull" system though the plant

WHAT IT DOES

- Attacks waste
- Exposes problems and bottlenecks
- Achieves streamlined production

WHAT IT REQUIRES

- Employee participation
- Industrial engineering/basics
- Continuing improvement
- Total quality control
- Small lot sizes

WHAT IT ASSUMES

- Stable environment

JIT is based on three principles:

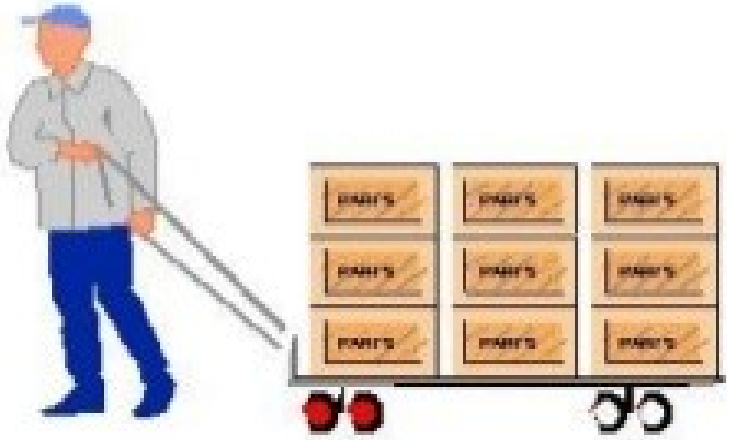
- The PULL system within the production process means requesting the parts that are needed, when they are needed and in the exact amount needed.
- The continuous flow implies the rapid and definitive elimination of the problems that stop the production lines.
- Takt Time is the time it should take to produce a vehicle or component. In synthesis, it is the constant and synchronized speed required between the production lines.

Push vs. Pull

Make all we can just in case.

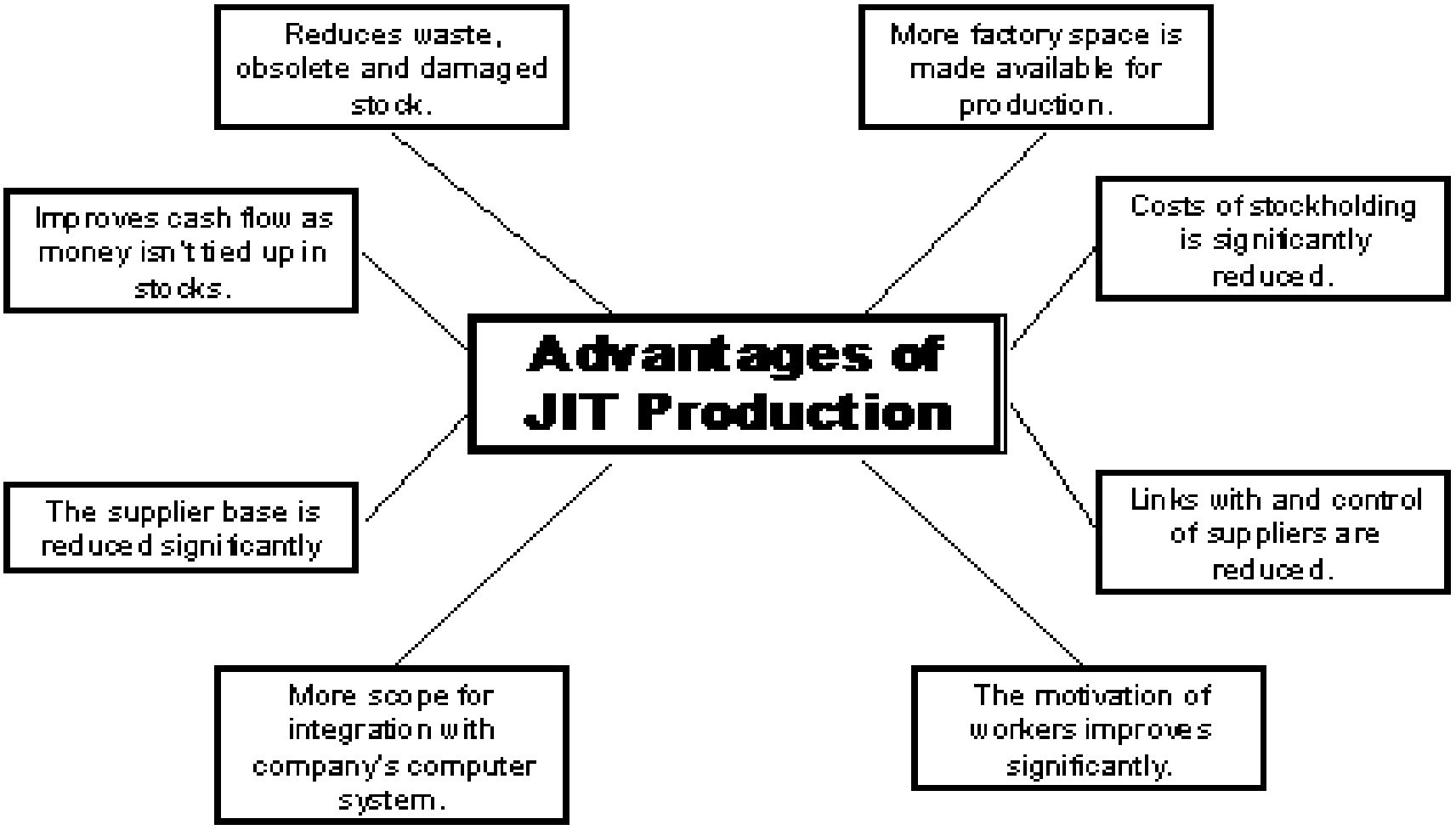
- Production Approximation
- Anticipated Usage's
- Large Lots
- High Inventories
- Waste
- Management by Firefighting
- Poor Communication

Make what's needed when we need it



- Production Precision
- Actual Consumption
- Small Lots
- Low Inventories
- Waste Reduction
- Management by Sight
- Better Communication

Factor	Traditional	JIT
Inventory	Much to offset forecast errors, late deliveries	Minimal necessary to operate
Deliveries	Few, large	Many, small
Lot sizes	Large	Small
Setup; runs	Few, long runs	Many, short runs
Vendors	Long-term relationships are unusual	Partners
Workers	Necessary to do the work	Assets


Advantages of JIT Production
Reduces waste, obsolete and damaged stock.
More factory space is made available for production.
Improves cash flow as money isn't tied up in stocks.
Costs of stockholding is significantly reduced.
The supplier base is reduced significantly
Links with and control of suppliers are reduced.
More scope for integration with company's computer system.
The motivation of workers improves significantly.

Taguchi Concept

- ☑ Engineering and experimental design methods to improve product and process design
  - ☑ Identify key component and process variables affecting product variation
- ☑ Taguchi Concepts
  - ☑ Quality robustness
  - ☑ Quality loss function
  - ☑ Target-oriented quality

- Taguchi Method is a new engineering design optimisation methodology that improves the quality of existing products and processes and simultaneously reduces their costs very rapidly, with minimum engineering resources and development man-hours

- The Taguchi Method achieves this by making the product or process performance "insensitive" to variations in factors such as materials, manufacturing equipment, workmanship and operating conditions. Taguchi method makes the product or process robust and therefore is also called as ROBUST DESIGN

- **The Taguchi definition of quality**
  - Ideal quality refers to a target value for determining the quality level
  - Ideal quality is delivered if a product or service tangible performs its intended function throughout its projected life under reasonable operating conditions without harmful side effects
  - Ideal quality is a function of customer perception and satisfaction
  - Service quality is measured in terms of loss to society

Taguchi defines robustness as:

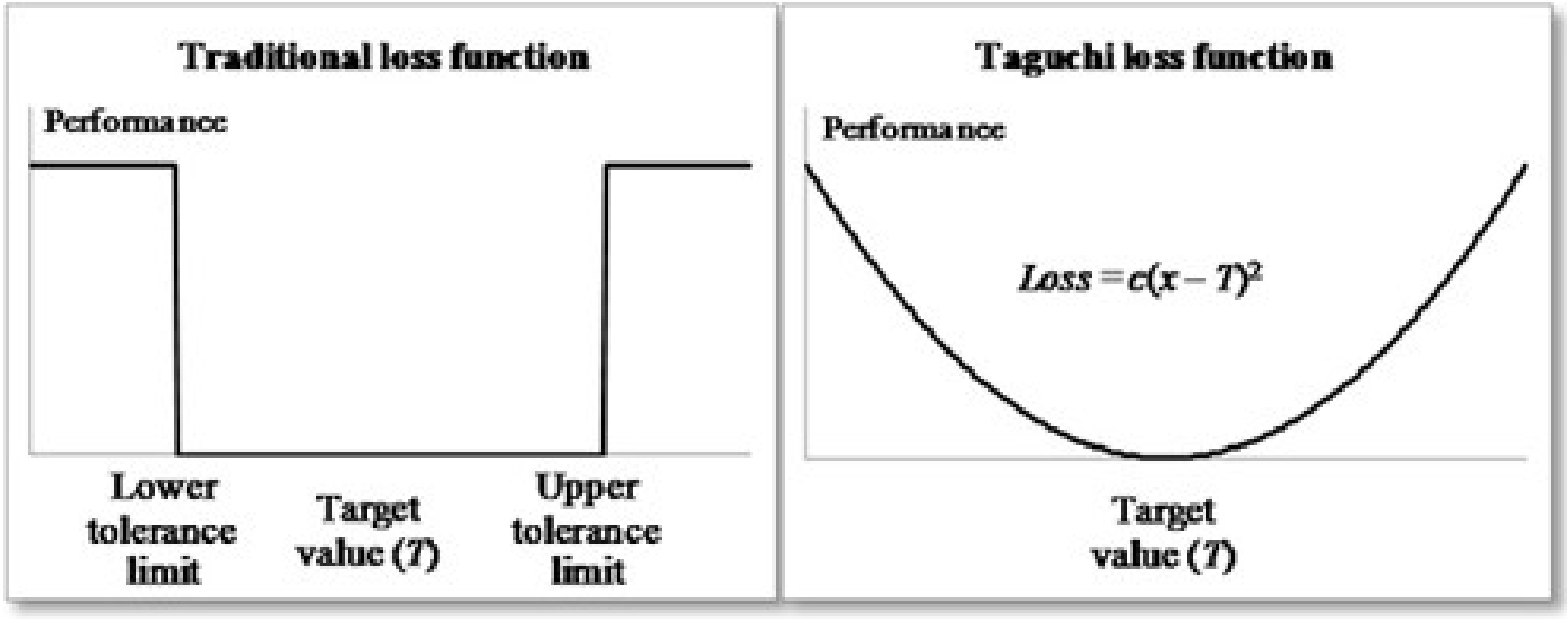
- the state where the technology, product, or process performance is minimally sensitive to factors causing variability (either in the manufacturing or user's environment) at the lowest cost.

Taguchi Loss Function

- Genichi Taguchi developed a **"loss function"** based on the idea that loss to society occurs whenever there is a deviation from the most desirable value
- Taguchi believes that the customer becomes increasingly dissatisfied as performance departs farther away from the target.

Dr. Genichi Taguchi developed a practical approach for designing quality into products and processes. His methodology recognized that quality should not be defined as simply within or not within specifications, so he created a simple **quadratic loss function** to measure quality.

The two figures below contrast the typical 0-1 loss function used in quality with the Taguchi quadratic loss function.

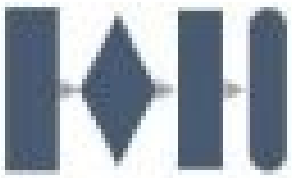


Seven Tools of TQM

- Tools for Generating Ideas
  - (1) Check Sheet
  - (2) Scatter Diagram
  - (3) Cause-and-Effect Diagram
- Tools to Organize the Data
  - (4) Pareto Chart
  - (5) Flowchart (Process Diagram)
- Tools for Identifying Problems
  - (6) Histogram
  - (7) Statistical Process Control Chart

The 7 Quality Tools For Process Improvement

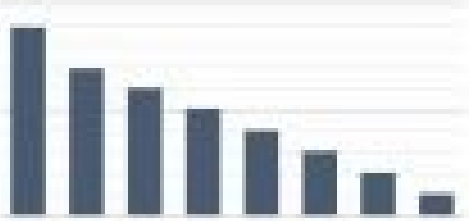
Flow Chart



Control Chart

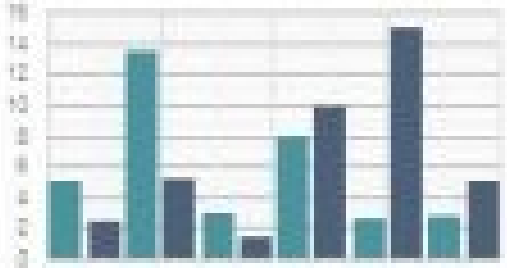
Cause - Effect Diagram

Pareto Chart

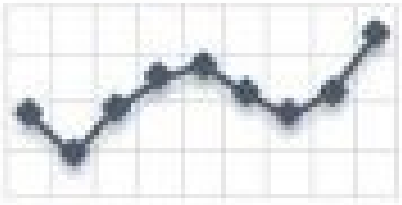


Check Sheet

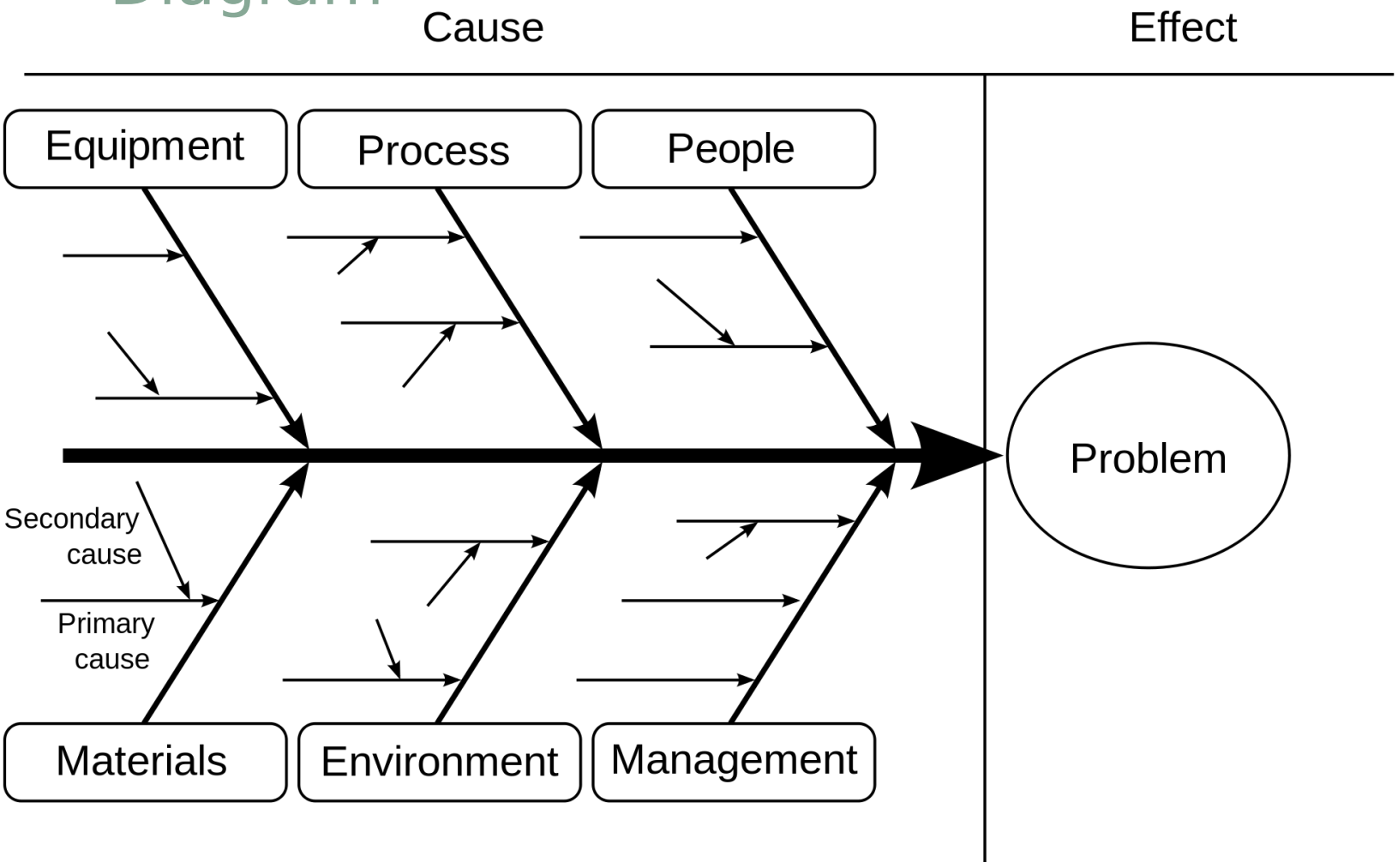
Histogram



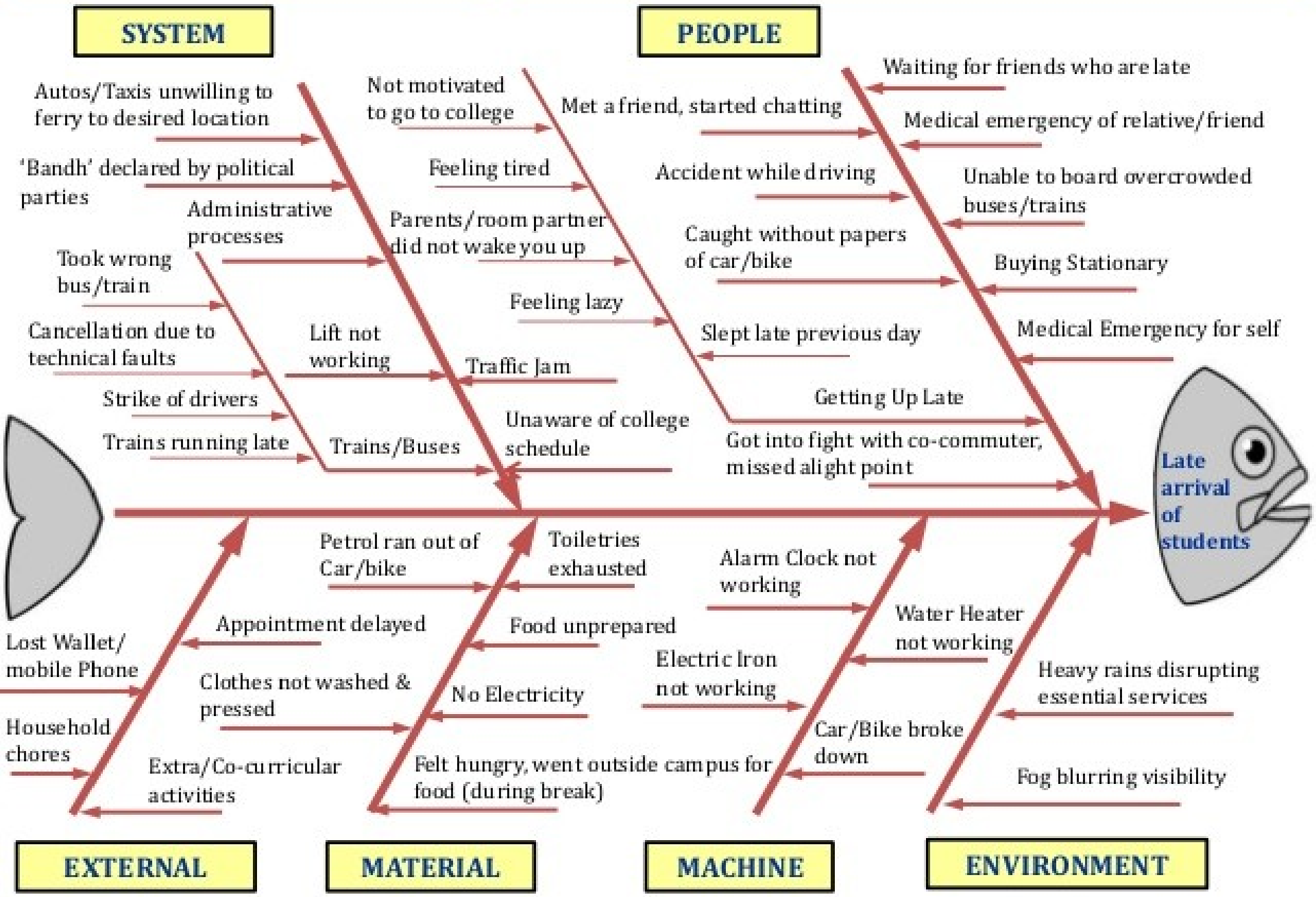
Scatter Plot



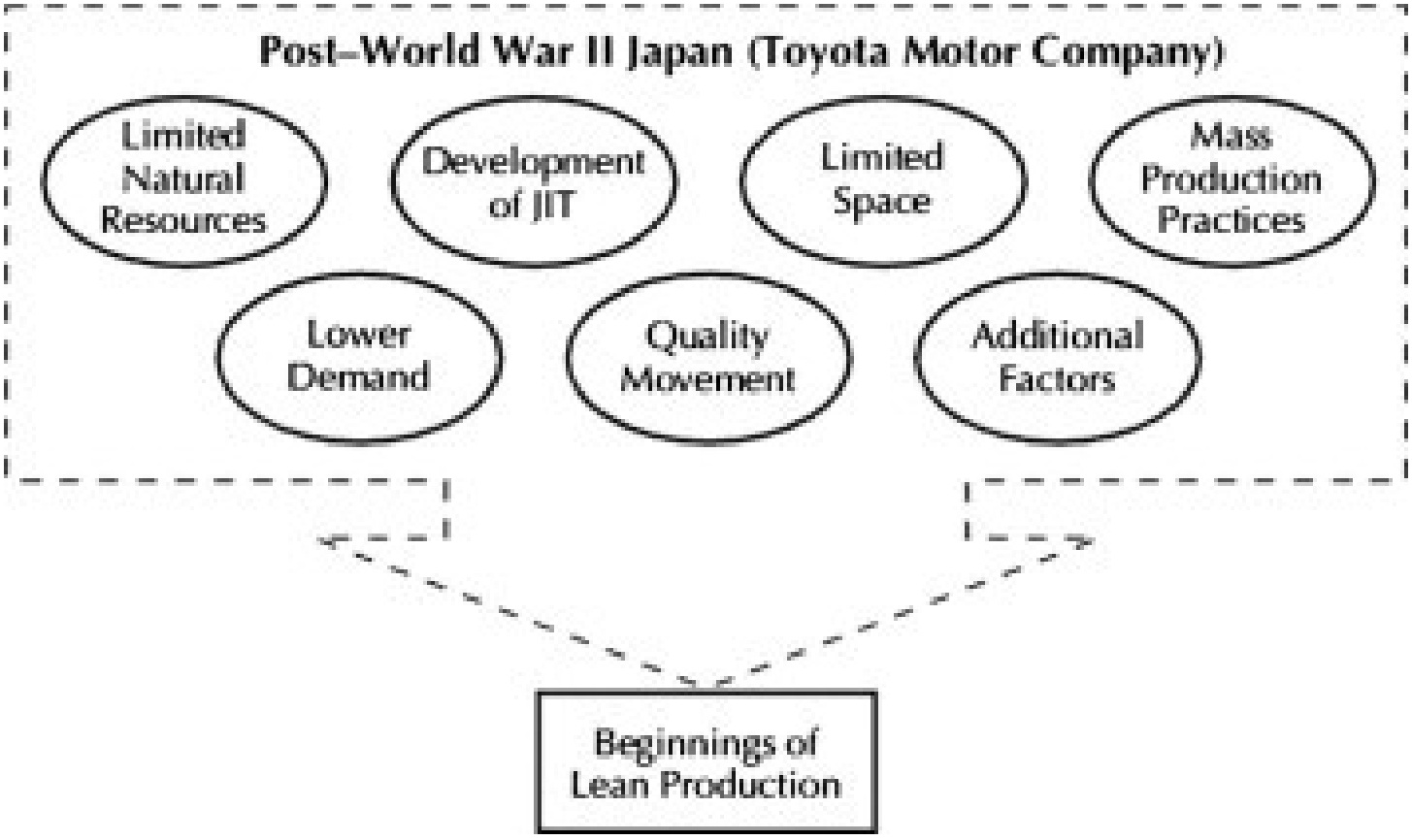
Ishikawa Cause and Effect (Fishbone) Diagram

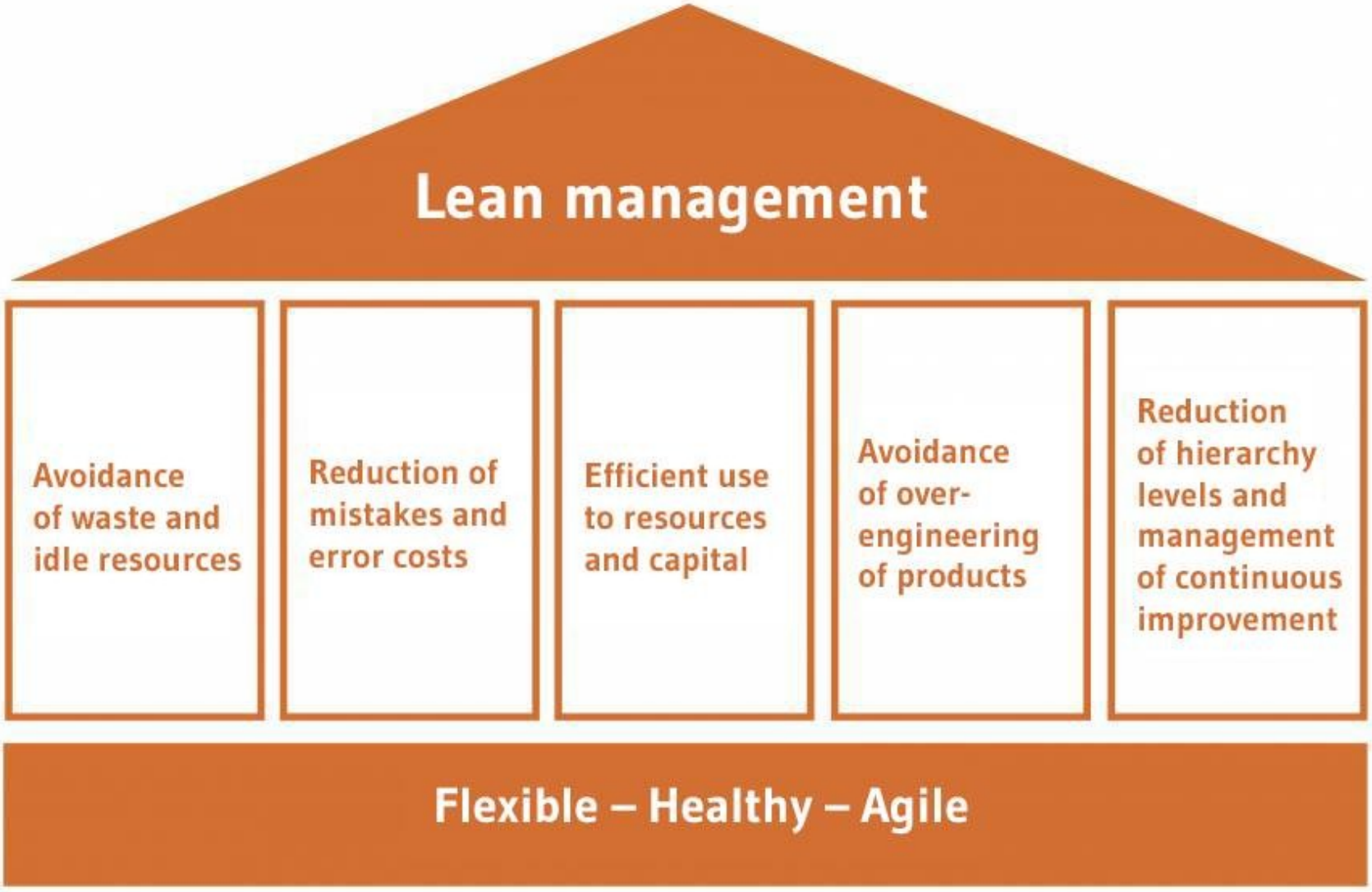


Cause effect diagram: "Late arrival of Students"



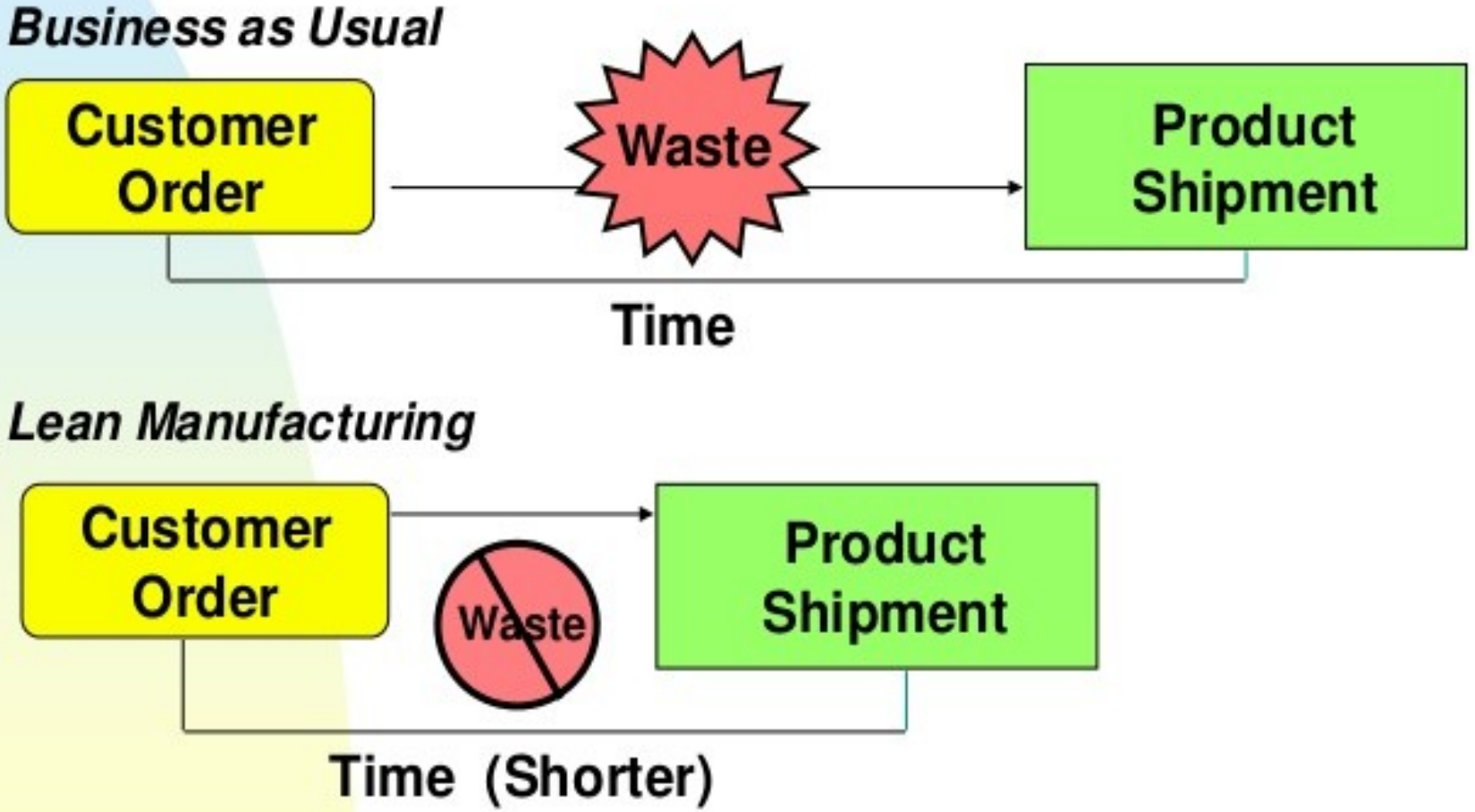
Lean Management Manufacturing/Production




Lean management
Avoidance of waste and idle resources
Reduction of mistakes and error costs
Efficient use to resources and capital
Avoidance of over-engineering of products
Reduction of hierarchy levels and management of continuous improvement
Flexible – Healthy – Agile

Lean Manufacturing

- is a manufacturing philosophy which shortens the time line between the customer order and the product shipment by eliminating waste.



Six Steps to Becoming Lean

7 WASTES OF LEAN

If you find your company is losing money, understanding the 7 Wastes of Lean may help a business get on the path to solving problems.

TRANSPORT

WAITING

MOTION OR MOVEMENT

DEFECTS

OVERPRODUCTION

EXTRA PROCESSING

INVENTORY

SIX SIGMA

LEAN MANAGEMENT

Different types of wastes

Overproduction

Production that is more than needed or before it is needed.

Waiting

Wasted time waiting for the next step in a process.

Non-Utilized Talent

Underutilizing people's talents.

Transportation

Unnecessary movements of products & materials.

Inventory

Excess products and materials not being processed.

Motion

Unnecessary movements by people (e.g., walking).

Extra-Processing

More work or higher quality than is required by the customer.

Defects

Efforts caused by rework, scrap, and incorrect information.

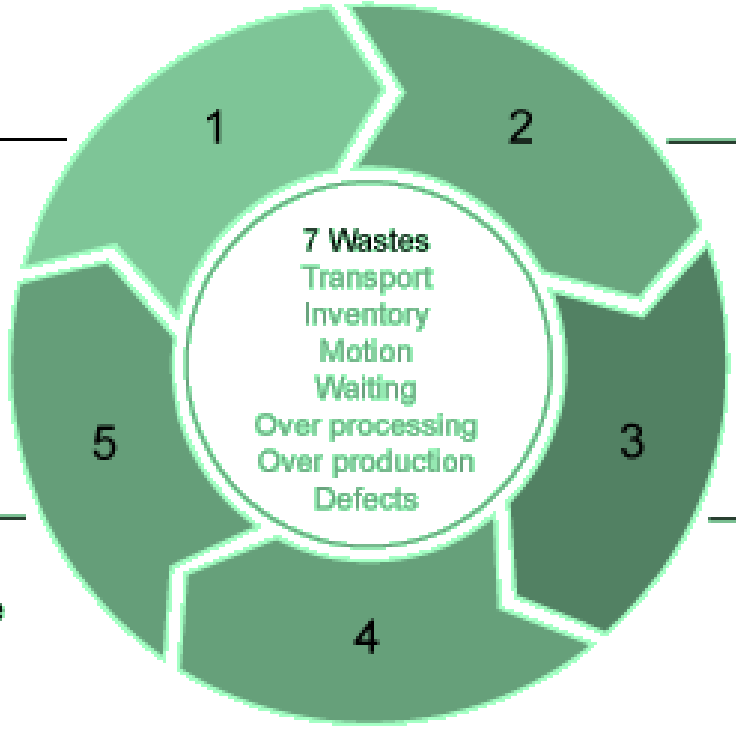
Lean Principles

Specify Value

Define **value** from the customers perspective and express value in terms of a specific product or service

Map the Value Stream

Map all of the steps...value added and non-value added...that bring a product or service to the customer



Work to Perfection

The complete elimination of waste so all activities create value for the customer by breakthrough and **continuous improvement** projects

Establish Flow

The continuous **flow** of products, services and information from end to end through the process

Implement Pull

Nothing is done by the upstream process until the downstream customer signals the need, actual demand **pulls** product/service through the value stream

The Five Principles of Lean

The role of lean leadership is to develop and deploy strategy across the whole organization in order to establish the philosophy and tools of lean in a coordinated manner to maximize effectiveness:

1. Focus on building Value for Customer
2. Organize by Value Stream. The Value Stream is the focus of lean management, measurement and improvement.
3. Flow and Pull. Value is created through flow and cost is directly related to flow – waste impedes flow and increases cost. Pull means only making what the customer wants.
4. Empower People by creating a lean culture where managers practice what they preach.
5. Pursue perfection through continuous improvement.

Lean Principles

	Lean Principle	Description
D	Deliver Fast	**Deliver value to the customer quickly**, rapid delivery; high quality; low cost **Queuing theory** to Limit Work in Process (WIP) and context switching **Managing workflow is easier than managing schedules**, using repeatable workflow
E	Eliminate Waste	Waste is anything that does not add value to the customer. The three biggest wastes in software development are: 1. **Building the wrong thing**: building features that aren't needed 2. **Failure to learn**: policies that interfere with our ability to learn 3. **Thrashing**: anything that interferes with smooth flow of value
L	Learn Constantly	**Predictable performance is driven by feedback**: rapidly respond to change **Maintain options**; keep code change tolerant, minimise irreversible decisions Defer commitment, schedule irreversible decisions to **Last responsible moment**
I	Build Quality In (Integrate Quality)	**Final Verification should not find defects!** Prevent with executable requirements **Mistake proof your process with test first development** to establish correctness **Break dependencies**: architecture should support addition of any feature at any time
V	Optimize the Whole (Value the Whole)	**Focus on the entire value stream** from customer request to deployed software **Deliver a complete product**, a complete team delivering not just the software **Think long term** rather than local optimization
E	Engage Everyone	**Autonomy**: Empowered self-organising feature teams with effective leadership **Mastery**: Provide challenge and environment which enables people to grow **Purpose**: Tie the work to value and a common vision
R	Keep Getting Better (Relentless Improvement)	**Failure is a learning opportunity**: investigate and correct them as they occur **Standards exist to be challenged and improved** **Use the scientific method** Plan-Do-Check-Act process

Source: Mary and Tom Poppendieck

EQUINOX IT

Lean

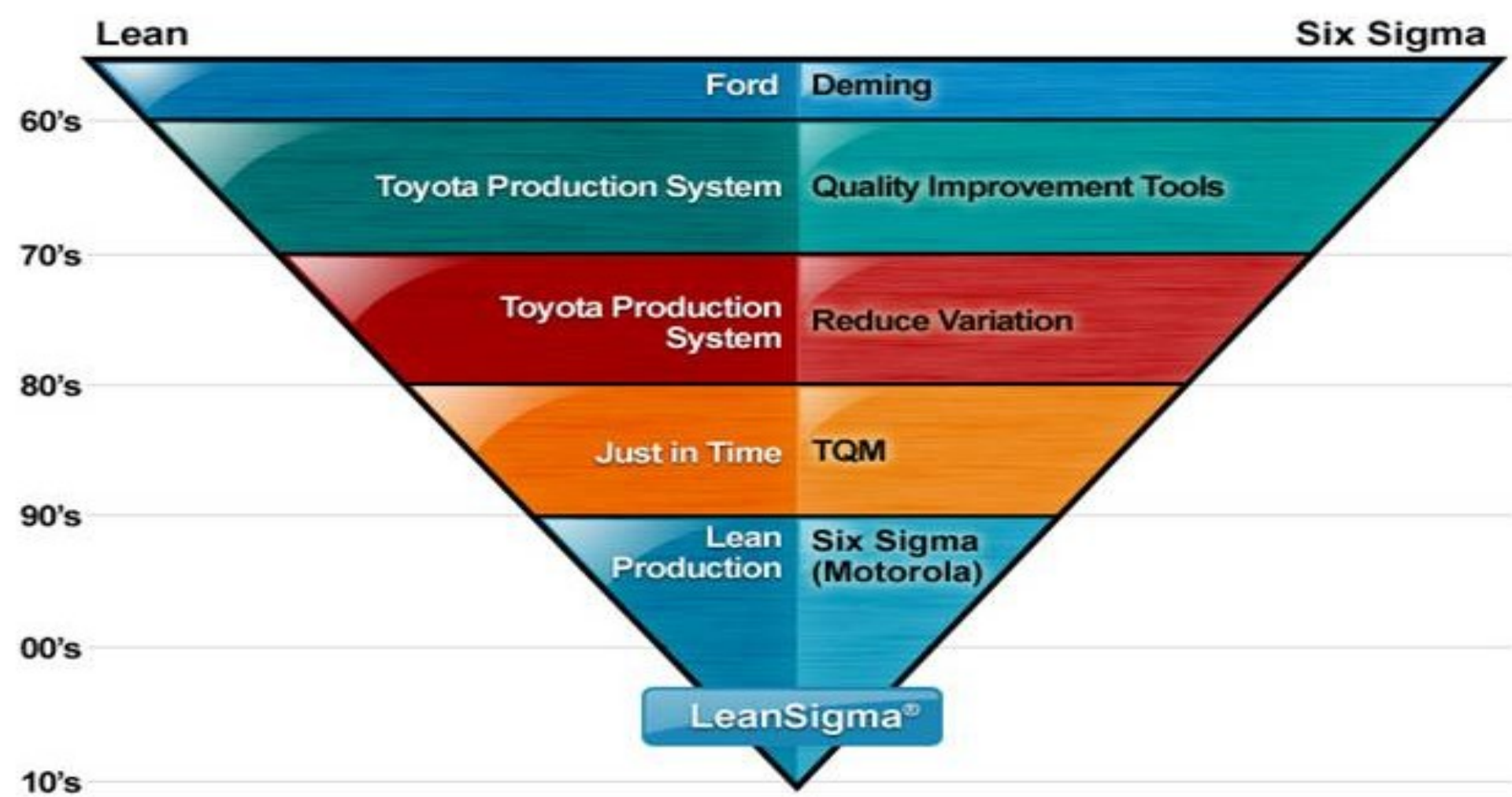
Focused on waste reduction by streamlining a process

Six Sigma

Focused on defects through problem solving

Lean Six Sigma

Lean strengthens Six Sigma: Reducing waste and solving problems to be faster and more efficient



Commonalities of Both Methodologies

- Focus on the customer - their needs / wants
- Improve processes by eliminating waste & delivering value
- Continuous effort to ensure improvements are sustained

When to use

- TQM
  - When your enterprise is looking to build strong products and relationships. When you are looking to develop smooth, elegant and timeless processes
- Lean
  - When you have defined processes and want to improve efficiencies by reducing waste elements from your processes. Typically in manufacturing scenarios.
- Six Sigma
  - When you have corporate support to focus on error reduction - and you want to empower your employees to take control of this reduction process
- BPR
  - When you are making a strategic shift and need to re-orient your process(es)
  - When you need to change fast


SIX SIGMA
TOTAL QUALITY MANAGEMENT
Executive ownership
Self-directed work teams
Business strategy execution system
Quality initiative
Truly cross-functional
Largely within a single function
Focused training with verifiable return on investment
No mass training in statistics and quality
Return on investment
Business results oriented
Quality oriented

TQM	Six Sigma
A product driven approach within the organization.	Stakeholders and capability driven. Focuses on cross-functional value delivery streams and not on functional division of labour.
Short term goals are emphasized	Specific short term and long term goals on sigma metric are emphasized.
Loosely monitors progress toward goals.	Ensures that the investment produces the expected return.
Team members are engaged in routine duties like Planning, improvement, and control.	Resources are created to change key business processes and the organization itself.
Emphasizes problem solving.	Emphasizes breakthrough rates of improvement.
Inspection centers & quality control departments are responsible for quality.	Responsibility of quality involves every member of organization & every stakeholder.
Provides a vast set of tools and techniques with no clear framework for using them effectively.	Provides a selected subset of tools and techniques and a clearly defined framework for using them to achieve results through DMAIC process.
Goals are developed by quality department based on quality criteria and the assumption that what is good for quality is good for the organization.	Goals flow down from customers and senior leadership's strategic objectives.

Quality Philosophies and Approaches

Guru	Contribution
Philip B. Crosby	Senior manager involvement 4 absolutes of quality management Quality cost measurements
W. Edwards Deming	Plan-do-study-act (wide American usage) Top management involvement Concentration on system improvement Constancy of purpose
Armand V. Feigenbaum	Total quality control/management Top management involvement
Kaoru Ishikawa	4M (5M) or cause-and-effect diagram Companywide quality control Next operation as customer

Joseph M. Juran	Top management involvement Quality Trilogy (project improvement) Quality cost measurement Pareto Analysis
Walter A. Shewhart	Assignable cause vs. chance cause Control charts and use of statistics Plan-do-check-act (in product design)
Genichi Taguchi	Loss function concepts Signal to noise ratio Concept of design robustness
Bill Smith	First introduced the term "six sigma"
Mikel Harry	The main architect of six sigma
Forrest Breyfogle III	Author of *Implementing Six Sigma*


PURCHASING
CUSTOMER WEB PORTAL
CRM & SALES
MANUFACTURING
ERP
ENTERPRISE RESOURCE PLANNING
DISTRIBUTION
FINANCE
DASHBOARDS
TIME & PROJECTS

TOP BENEFITS OF IMPLEMENTING ERP SOFTWARE

SECURITY & Regulatory Compliance

Keep data safe and regulated with built-in protections.

PRODUCTIVITY

Eliminate redundant processes and tasks through automation.

STREAMLINE Processes & Efficiency

Automate all business operations cross-departmentally.

FOSTERS GROWTH

Competition

Stay on top of technology solutions, ahead of your competition.

Mobility and Flexibility

Work from home, your office, or anywhere with a mobile-friendly solution.

SAVE MONEY!

INTEGRATED INFORMATION

All customer and financial data, housed in one location.

Collaboration

Centralized data will bolster interdepartmental collaboration.

CUSTOMER SERVICE

Faster, more accurate access to customers' information and history.

Forecasting & Reporting

www.workwisesoftware.com

Supply chain management

Supply Chain Management Flow

Shareholders

Sales and Product Development

Procurement

Consumers

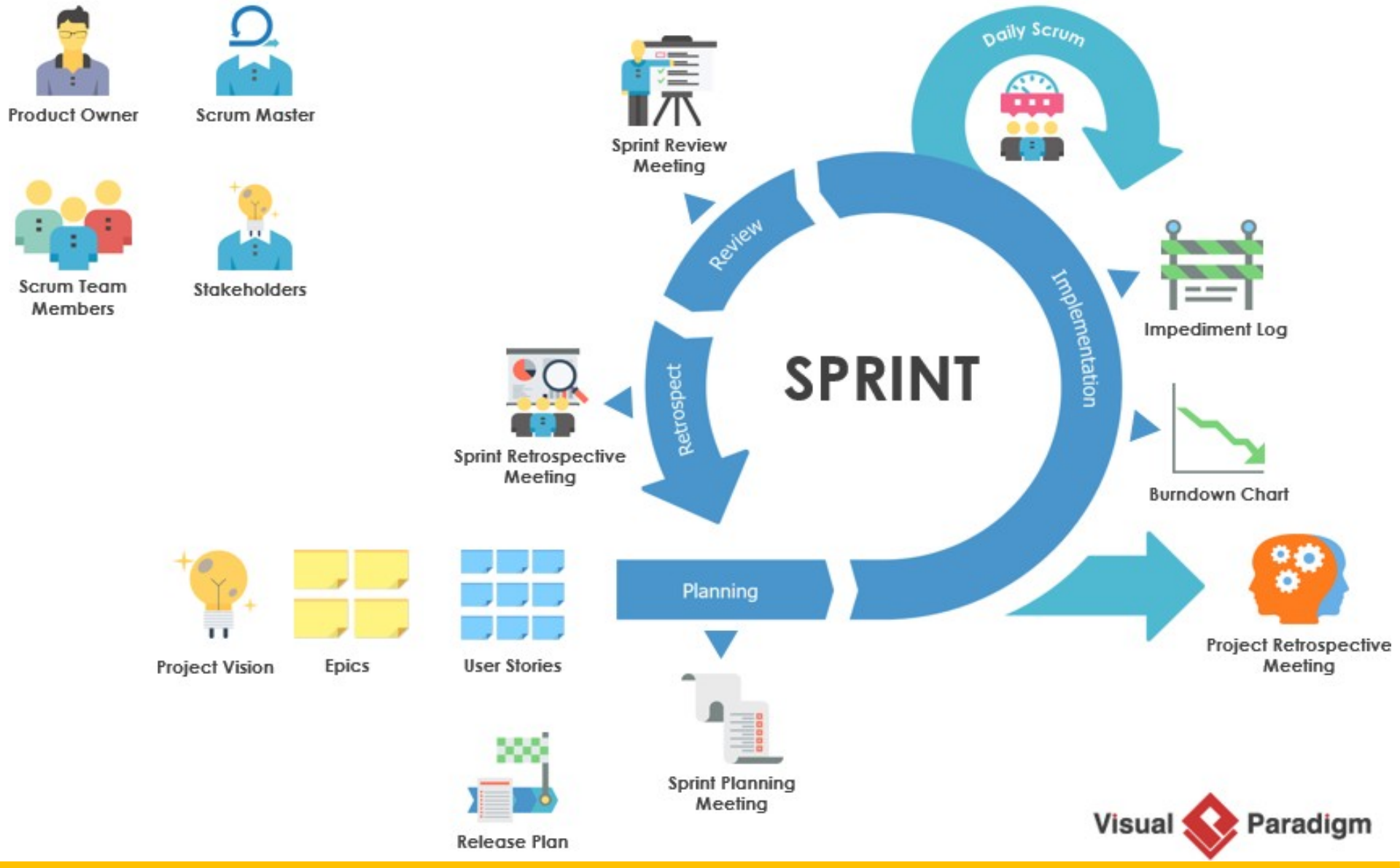
Logistics

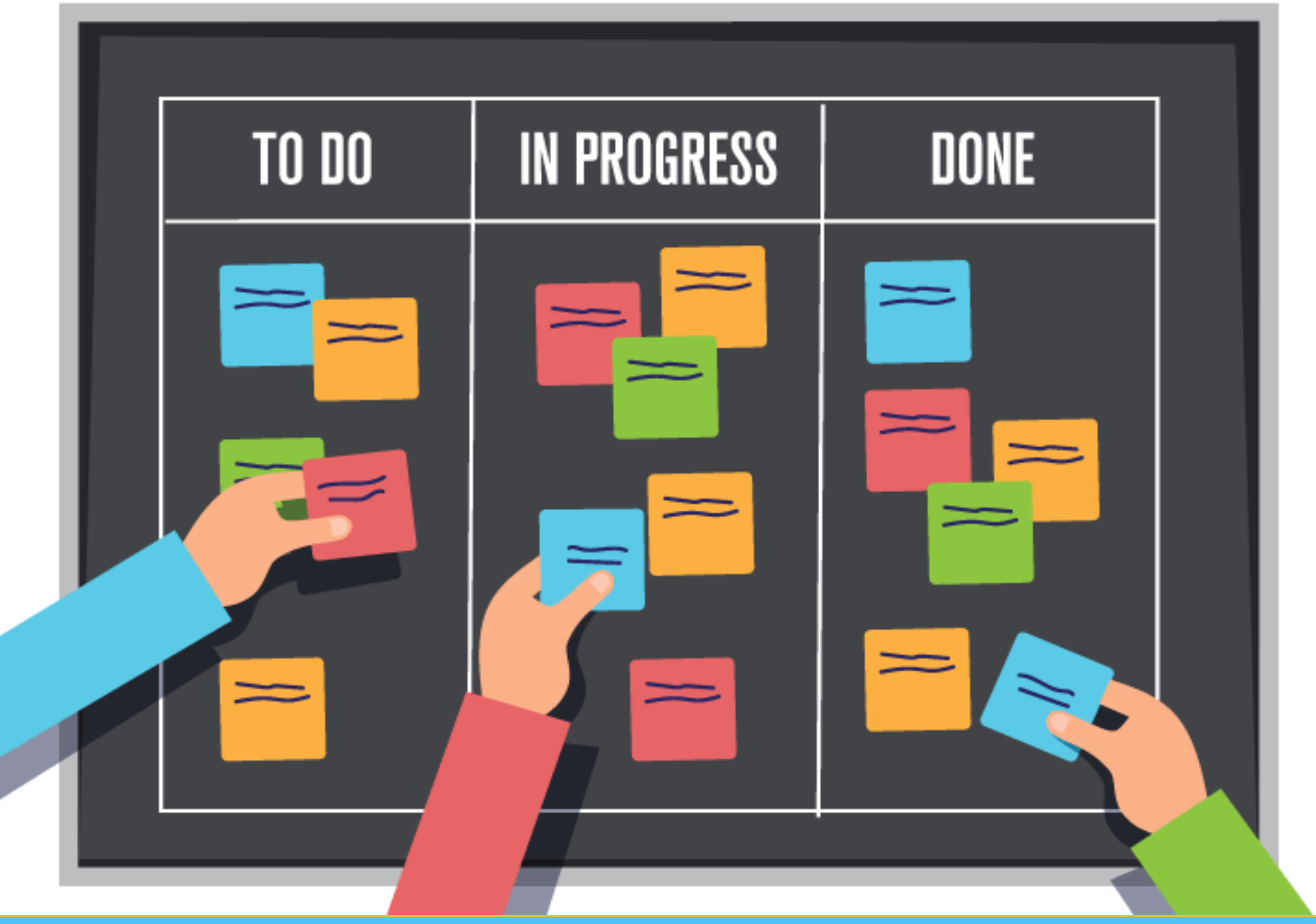
Suppliers

Manufacturing

Warehouse

The Agile – Scrum Framework




TO DO
IN PROGRESS
DONE