

SUSTAINING COMPETITIVE AND RESPONSIBLE ENTERPRISES

Module 2

Quality

Managing continuous improvement

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1.0 Introduction to quality principles

What is Quality?

The International Organization for Standardization (ISO) defines quality as *the totality of features and characteristics of a product or service that bears its ability to satisfy the needs of the company, the market and the customer on a consistent basis*. In practice, the term quality can have a multiplicity of meanings, depending on the product or service and the stage of the production process as well as customers' perceived level of value associated with the features and characteristics.

For many years, the prevailing view of quality was what might be called a **product-based** view. Quality was seen in terms of differences in the quantity or characteristics of various features or "ingredients". According to this view, a product is of higher quality if it has more of some desirable ingredients. However, it often neglects to take into account the needs of the customer who might value different features or ingredients. The example of the cell phone comes into mind. Over the past years, developers have added more and more sophisticated technological features to the cell phone which was perceived as producing high quality. However, most customers stick to the basic applications and would prefer different characteristics such as longer battery life.

Therefore, the current view of quality has changed to one that can be called **user or customer based**. In this view, quality is defined by what customers want and what will satisfy them. What would satisfy your customer may contain different dimensions of quality that could range from product performance, luxury, price, durability, and service to even convenience. Thus, it is important to know what dimensions of quality are of value to your customers. For example, if your customer value product durability, their willingness to pay for it will depend on how long they perceive the product will last. As a producer, such information about your customer is used during product planning to ensure the quality of the product is consistent with customer needs and wants.

Quality begins on the inside...and then works its way out.

Anonymous

Why is quality important?

In today's competitive markets, businesses recognize the increasing linkage between quality and customer satisfaction and identify **quality as a significant aspect that separates a business from their competitors**. Many firms make quality a strategic concern to remain competitive. Focusing on quality enables a business to meet customers' requirements and gain their loyalty, which is an essential ingredient for creating sustainable businesses.

Quality keeps your customers satisfied with the service or product you are providing and helps attract new customers, presenting greater opportunities for business growth. Conversely, customers will not order products from a supplier that cannot perform as expected. This is understandable since it is not plausible to jeopardize their own business interest out of loyalty to a supplier whose



products and services fail to perform in the expected manner. Hence, to remain in business, you have to perform to become your customers' choice supplier.

Most businesses underestimate the costs of quality or lack of it. When it comes to product quality, traditionally the basic assumption was that increasing quality always led to higher costs. But in fact, **increasing quality actually reduces costs**.

On the one hand, focusing on quality in the production process will improve your efficiency by developing better workmanship, detecting irregularities early, preventing defects, and minimizing repairs. This will significantly reduce your production costs since the production and inspection of defective goods requires just as much material and labour as the production of first quality goods; but the value of the finished product is less. Informed businesses recognize the cost associated with the production of defective products and work on improving quality at all levels to increase consistency, reducing overall costs as more desired products are produced and sold at the regular price.

On the other hand, focusing on quality will enable you to avoid the high cost of unsatisfactory product quality and poor service, which translate into the loss of your customers, reputation and ultimately your market share. By attracting more customers through quality products, you can increase your economies of scale, thus, bring about higher productivity that will result in lower production cost, and increase your company's competitiveness and profitability.

Costs related to producing low quality	
Tangible costs	Intangible costs
Scrap materials	Delays caused by defective products
Direct and indirect labour costs	Probable loss of goodwill
Repairs and salvage	Reduction in worker morale
Additional materials handling	Reduced customer confidence
Replacement costs involved	Loss of sales
Discounts on the sale of defective products	

From quality control to quality assurance

From the producer point of view, the level of quality the business aims to achieve in order to satisfy its customers and its business is a three-stage process involving product design, process design, and process control.

- ❑ **Product design** means assessing customer needs, designing a product to meet those needs at the least cost and involving customers, suppliers and manufacturing personnel.



- ❑ The second stage is **process design**. A process is a series of related activities that add value to a product or service. Product and process design are linked as products consume processes, which consume activities, which consume resources, such as money, manpower, material, machine, and require information, in the form of specifications, instructions and schedules. Quality in the product is impossible without quality in the process.
- ❑ The third stage is **process control** to ensure the process actually produces a product that meets quality specifications, which will happen if the process is designed correctly and if it is kept in control.

Traditionally, there were no great efforts put into building quality into design and processes. Therefore, considerable effort went into process control or inspection (quality control). This was very expensive and, in fact, often also largely ineffective. Not only is inspection difficult and costly, but it also leads to an attitude of “it does not matter if the product is faulty, because the inspector will find it and stop it from going to the customer”. Thus, paradoxically, the greater the level of inspection, the greater the likelihood of scrap products being made.

Quality control refers to the **detection** of defects, most commonly associated with testing which takes place within a quality management system typically referred to as verification and validation.

Quality assurance is the **prevention** of defects, such as by the deployment of a quality management system. Quality control is usually part of a quality assurance system.

This insight led to the introduction of **quality assurance** (QA) programmes. The central premise of quality assurance is that quality products and services result from an enterprise-wide, total approach to quality. It starts from a corporate or business philosophy and culture that is customer-focused. This focus on the customer is reflected in top-level policies and strategies and embedded in the performance goals, systems and processes of all the departments and units of the enterprise. This ensures that quality considerations are built into product and process design.

Quality is not just the responsibility of the quality control department or unit, but it is everyone’s responsibility. Everyone in the enterprise is involved, from the members of the Board, to the CEO down to the rank and file workers in production floors and offices. Quality products and services are produced in a quality environment where workers and management work together as a team towards a common objective. Quality assurance demands a clear focus on making each employee at all levels responsible for quality.

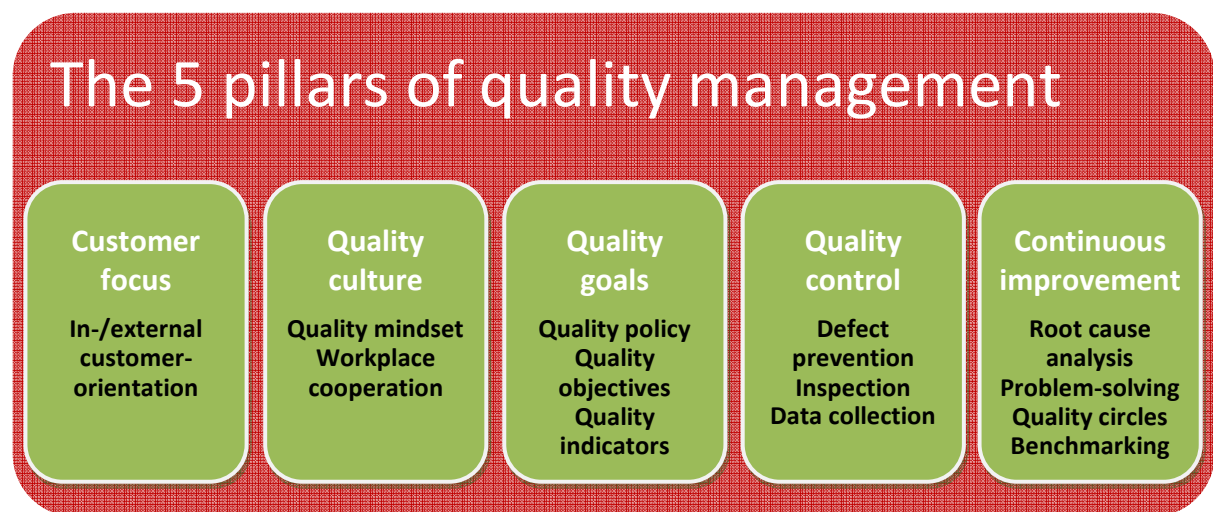
Revisit SCORE Module 1: Workplace cooperation – A foundation of business success to refresh your knowledge about successful cooperation of employees and managers alike to create products and services that meet the expectations of the customer.

Another key concept of QA programmes is the concept of the **internal customer**. Contrary to the external customers such as distributors, retailers and end users outside the enterprise, the internal customer is an individual or



department within your organization. For every step during production of goods and services, the next person or process that uses one's outputs as inputs to his or her own processes is an internal customer. The concept of the internal customer involves a shift in thinking where businesses learn to view everything that happens within the organization as a series of flows from an internal supplier to an internal customer. A business that internalizes the concept of the internal customer can continually improve the quality levels of product and service it provides.

The quest for quality extends even beyond the gates of the enterprise, ensuring that the enterprise's **supply-chain** and **distribution-chain** contribute to meeting the customers' needs and expectations.



2.0 Matching quality to customer needs

As mentioned earlier, taking the customer's perspective is the cornerstone of quality. Delivering quality requires understanding of customer needs and expectations and taking conscious and deliberate actions to meet them accordingly. Active efforts must therefore be undertaken to clearly identify and define who the enterprise's customers are and determine their needs, preferences and expectations. The following are basic approaches that will help formulate your quality assurance programs.



Exercise 1: Identifying customer expectations

Complete the following questions to help you identify your customers and their expectations. Remember to think of all possible customers including internal and external.

1. Who are your customers?



2. What is important to your customers?

3. Who could be your customer but is not?

Review your answers and make sure you did not overlook your **internal** customers.

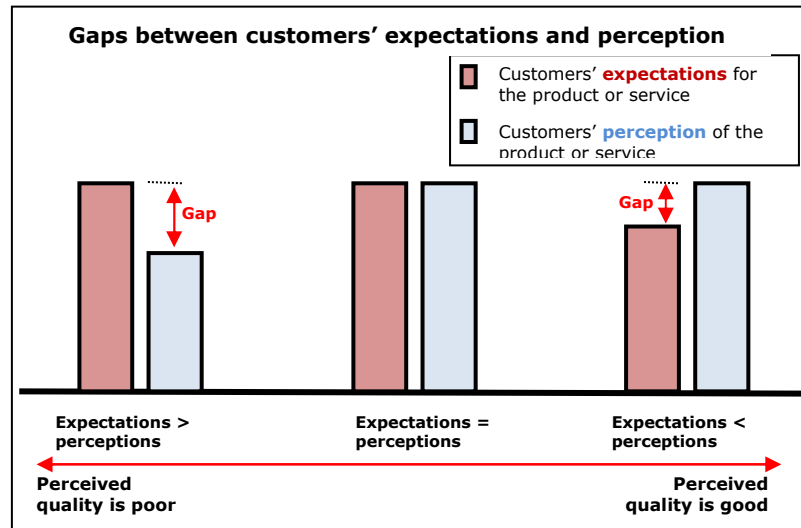
2.1 Understand your customers' needs

The customer-based approach to quality emphasizes the requirements of the people who use the product or service. This requires a thorough understanding of who your customers are, and what their expectations are in relation to product and services.

*"The consumer is the most important part of the production line. Quality should be aimed at the needs of the consumer, present and future."
(W.Edwards Deming)*



There are important implications here. The “customer” builds up a long-term relationship with the supplier, and is therefore accustomed to dealing with the business supplying that particular product or service. This is more than merely filling an order; it goes a step further and involves striving for maintaining this relationship. This is particularly important to a business that wants its customers to continue to use its products and services. The question is:



How does a business learn what its customers' needs are?

Fortunately, the greatest sources of information for a business are the customers. There are several ways of collecting information on what your customers needs are and here are some suggestions:

- ☐ Communicating with customers via suggestion boxes, surveys, focus group discussions, listening to complaints and other customer-initiated feedback
- ☐ One-to-one meeting with your customers to find out their level of satisfaction with your product and services
- ☐ Through examination of returned products to identify reasons for product failure and return
- ☐ Observing customer behaviour
- ☐ Visiting customer store locations

The information collected from your customers is then analyzed and translated into specific benefits they expect to receive from your products and services. In order to do so, it is important the customer needs analysis process asks, “What is important to our customer?”. Keep in mind that the dimensions of quality a customer desires may vary, but some examples of criteria that are often regularly quoted by customers include:

- ☐ Cost of product or service
- ☐ Reliability
- ☐ Expected delivery terms of the product or service
- ☐ Innovative design
- ☐ Flexibility
- ☐ Safety of the product or service
- ☐ Company reputation
- ☐ Other requirements such as social practices, environmental policies and compliance with code of conduct

When analysing what is important to your customer, remember to think of all possible current and future customers as well as internal customers. You can then determine the gap between what the customer expects and the level of



service they receive now. This will help you determine the level of "satisfaction" with specific attributes.

Once you have clearly identified the needs, you will then be able to prioritize them according to different circumstances or attributes the customer expects. Customer needs should be seen in a dynamic context that will be monitored and updated on a regular basis. The main objective for identifying your customer and their need is to position the business ahead of the competition. The benefits of thoroughly understanding your customer are many and will allow you to:

- ☐ Anticipate customer needs
- ☐ Determine gap between customer needs and product performance
- ☐ Provide a plan for action
- ☐ Communicate plan with the rest of the organization

Note that each customer will have different quality requirements that are not necessarily based on industry standards. However, in all cases they must be mutually beneficial and be:

- ☐ Agreed upon between customer and producer
- ☐ Achievable in terms of available skills, cost, price, equipment, production capacity and delivery time etc.
- ☐ In line with your business objectives for quality

Market Assessment Tips

To enhance your product or increase your market base, you need to analyze your current position in the market and try to capture data on what your customers want. There are many ways to gather this type of information. If possible, it is best to conduct surveys with customers to get first-hand information and to confirm if your ideas are appropriate. You should also look at other products on the market to make sure that your enhancement will be unique and will set your product apart from its competitors.

Survey your customers:

- ☐ Develop a standard set of questions. Questions should be a mix of yes/no or multiple choice and open answer type. Topics can vary from rating the current product in terms of price, quality, ease of use and availability to open-ended questions on what enhancements customers would like to see
- ☐ Make your written survey easy to read. Use broad, white margins on the top, bottom and sides of the document. Keep it simple by sticking with black ink on white paper
- ☐ Send your survey to known customers, buyers or distributors where possible. Try to follow up by telephone with individuals to get personal feedback

Tips:

- ☐ Make sure that your questions are brief and clear. Test your questions on colleagues before you write up the survey. Make sure they completely



understand the questions

- ☐ Introduce only one issue per question. Divide complex issues into individual questions. For example, instead of asking "Where do you buy computer equipment and software?" which may result in two different locations, ask "Where do you buy computer equipment?" and "Where do you buy software?"
- ☐ Follow up yes/no answers with a "why?" question to gather further insight into the responses
- ☐ Try to send your survey to as wide an audience as possible. The larger your 'sample' the more information you will gather on potential markets for the programme
- ☐ You may also want to conduct one-on-one interviews with the same set of questions rather than sending out the survey. If possible do both!



Exercise 2: How well do you meet customer expectations?

1. Fill out the table below. Add other criteria that are important to your customers. (You can also ask customers to fill out this table to see what their perception is.)

(1=very unsatisfactory, 2=fairly satisfactory, 3= satisfactory, 4= very good, 5= excellent)		R A T I N G				
		1	2	3	4	5
1	Price					
2	Reliable product quality					
3	Response time (from order to delivery)					
4	Punctual delivery					
5	Flexibility (coping with small orders or changes in orders)					
6	Innovative design capability					
7						
8						

Overall rating:

2. What can you do to better meet your customer expectations?



2.2 Analyze your business ability for quality

The role of the producer is to meet customer expectations and now you have the tools to help you gather information about your customer. The next step is to develop the right product or service that will match your customer's needs. To achieve this, you need to evaluate your abilities to meet these needs. To identify your business abilities, it is essential to gather inputs from customers, suppliers and workers on how you can improve product and service quality.

It is important to understand that knowing your customer and your business abilities are interlinked and as such highly essential in determining actions that will be taken in your quality improvement objectives. The benefits of thoroughly understanding your business abilities will allow you to:

- ☐ Set effective business objectives to meet customer needs
- ☐ Improve business competitiveness
- ☐ Recruit and maintain qualified workforce to meet your business needs
- ☐ Increase flexibility to respond to changing customer needs

In order to identify your business abilities for quality, it is also vital to involve everyone in the organization including workers and managers to provide input on both the positive and negative aspects of the business abilities. The aim here is to collect enough information that will help you improve your performance to meet your customers' quality expectations. You can apply similar data collection methods used to identify customer needs.

Remember that understanding your business abilities will allow you to bridge the gap between customer expectations and business capabilities. To do this, you will need to start with some basic questions such as:

- ☐ What is the current level of quality awareness in the organization?
- ☐ What are the needs of the costumers (present and future)?
- ☐ What areas offer opportunities for improvement?
- ☐ Do you have the right resources to meet the needs of your customers?
- ☐ Do you have qualified work force to meet the needs of your customers?

Once you answer the above basic questions, then you can prepare to invest on time and resources necessary to bridge the gaps that exist. This may require you to upgrade workers skills, upgrade equipment, put in place a quality assurance program, or in some cases develop new products at a competitive price level and in accordance to your customer expectations.

Where are you now?

Complete the following questionnaire by checking yes or no for each question.



Question	Response
1. Does your company have the necessary equipments to meet quality specifications?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2. Does your company have the skills needed to produce products according to customer specifications?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3. Do you monitor the product and service quality of other companies offering similar products?	Yes <input type="checkbox"/> No <input type="checkbox"/>
4. Do you assess the product and service quality gap that exist between what you and your competitors offer?	Yes <input type="checkbox"/> No <input type="checkbox"/>
5. Do you regularly monitor customer needs?	Yes <input type="checkbox"/> No <input type="checkbox"/>
6. Do you plan your products and services in line with customer needs?	Yes <input type="checkbox"/> No <input type="checkbox"/>
7. Is the quality of your products/services consistent?	Yes <input type="checkbox"/> No <input type="checkbox"/>
8. Do you deliver your product and services on time?	Yes <input type="checkbox"/> No <input type="checkbox"/>
9. Are workers aware of their role in creating quality products?	Yes <input type="checkbox"/> No <input type="checkbox"/>
10. Are workers trained on assessing product quality?	Yes <input type="checkbox"/> No <input type="checkbox"/>
11. Do you think quality improvements can be made?	Yes <input type="checkbox"/> No <input type="checkbox"/>



Exercise 3: Where are you now?

1. Complete the questionnaire on the previous page (Where are you now) to help you assess your current state and determine the actions you need to take to improve quality.



2. What actions do you need to take?

3.0 Develop your quality assurance culture

Quality assurance requires you to expand your business perspective of quality beyond standards and processes. Implementing quality objectives requires the commitment to provide employees with the skills and means to participate in the company's improvement. Once the appropriate working environment is in place, then the culture of quality will begin to take root in the organization creating an environment where everyone works towards the good of the company, improving its performance and simultaneously enhancing job satisfaction of employees.

The implementation and achievement of quality objectives as mentioned above is a team effort and requires careful planning of ways to involve employees, keep them motivated and empowered to take initiatives for improving product and service quality objectives. The aim is to gain full cooperation of employees to contribute at all levels of the quality improvement process.

3.1 Benefits of quality assurance culture

A quality assurance culture promotes reliance on everyone to take ownership of the quality of work they produce. It is more efficient to bring together the production and quality functions so that a worker who is performing a function is also responsible for checking that it is done correctly. This also helps in the identification and resolving of possible problems before the final inspection stage is reached. The benefits of a quality assurance culture are based on increased worker involvement and typically lead to:

- ☐ Improved workplace relationships and communication
- ☐ Improved output and quality
- ☐ Reduced rejects
- ☐ Improved overall skills of production workers
- ☐ Team based working environment with shared goals and objectives
- ☐ Empowered teams with decision-making responsibility related to quality

A quality assurance culture also emphasizes that problems with quality are usually not the worker's fault. It is believed processes, procedures or the environment generally causes the majority of quality problems. Most problems caused by employee error can be fixed through proper training.



3.2 How to support a quality assurance culture

To develop a quality assurance culture, you need to first define what the term 'culture' actually means for your business. A definition of culture could be that it is the shared beliefs, values, attitudes, institutions, and behaviour patterns that characterize the members of a community or organization. So, what's good for the business and/or customers comes together and becomes the driving force behind what you and everyone does.

Development of a quality culture therefore encourages people to constantly think about how to improve the quality of products and services while they work. Although there are many ways to achieve this, developing a quality culture must first be rooted in management commitment. Many quality programmes formed among workers did not work because supervisors did not take workers recommendations seriously or questioned their motives.

Appropriate measures must also be put in place, such as a reduction in bureaucratic procedures and appropriate incentive systems. In addition, training on quality is needed to provide employees with the skills to identify solve and prevent problems. Mechanisms for empowering employees are provided through quality teams or quality circles (see section 7.2) that involve workers in the improvement efforts of the company. The objective is to make quality a value that workers and management consciously strive for.

Differences between a traditional organization and a quality oriented company	
Traditional company	Quality oriented company
Defines quality as it is seen	Focuses on the customer and defines quality from the customer's point of view
Views the end user as the customer	Views everyone involved in producing the product/service as the customer
Is focused on maintaining the status quo	Is focused on daily improvements, no matter how small, involving everyone
Is results-oriented	Is process-oriented, believes that good results come from good processes
Awards contracts to suppliers on the basis of cost and places responsibility of quality on the supplier	Awards contract on the basis of quality and assumes joint responsibility for quality
Thinks that the quality control department is responsible for quality	Thinks that all departments are responsible for quality

The main function of quality assurance culture is to promote teamwork and joint problem solving approach to quality. A team-based approach will create an environment where quality is a shared goal and responsibility. This approach is successful only when equal opportunities are given to all employees to express an opinion and each voice is heard and given the same respect.



The ability to promote a quality culture also requires a workplace that is free from discrimination and allows for basic human rights such as freedom of association. The core element of a quality assurance culture is the respect for fundamental labour standards and ensures every worker whether be it a man or women have equal opportunities in the workplace and function in a safe and healthy work environment.

There are many ways to promote quality assurance culture and move towards greater employee responsibility for quality. A few common approaches that have proven to be practical include:

- ☐ Implement feedback mechanisms to involve workers such as employee suggestion boxes, in conjunction with meetings to discuss improvement issues
- ☐ Use fault record sheets to improve point of production quality where workers fill in a form when they experience problems and document what happened so that appropriate solutions can be found. This will involve workers in the process of quality assurance and since they are performing the same tasks every day, they will be the best source to find better ways to do the work, which is beneficial for them and the factory
- ☐ Create measurement systems to understand quality problems and share analysis and results with workers
- ☐ Ensure that QA is tied to continuous improvement, so that you are constantly striving to improve performance and competitiveness through quality work
- ☐ Use incentives such as individual and team recognition, awards, gifts or promotions. You may also want to consider possible financial rewards
- ☐ Make sure you offer ongoing training that supports a quality culture. (Start with induction, then continuous development, retraining and job rotation. Training can be on-the-job or off-site.)
- ☐ Finally, encourage open communications with workers and managers on various quality issues and communicate any progress that is made in quality improvement. You can also use simple techniques such as before and after photographs to demonstrate quality improvement

Once the basic foundations mentioned above are in place, quality management is then established as an ongoing part of the organization that provides the necessary tools including equipment, supplies, personnel, and budget to support its existence. This requires the following:

- ☐ Commitment and participation from all levels including workers and managers throughout the planning, pre-production, production, and distribution cycle
- ☐ Clear procedures and communication instructions to all workers
- ☐ An environment in which workers and management meet for idea generation, problem solving, and sharing results of improvements
- ☐ Healthy and safe work environment
- ☐ Involvement of all parties to continuous improvement by way of measuring performance

DEMING'S 14 POINTS

Dr. W. Edwards Deming is widely regarded as a management expert who wrote



extensively on quality and quality management throughout the course of his life. Deming's philosophy focuses on improving productivity and service quality by reducing uncertainty and variability in the design and manufacturing process.

1. Create and communicate to all employees a statement of the aims and purposes of the company
2. Adapt to the new philosophy of the day; industries and economics are always changing
3. Build quality into a product throughout production
4. End the practice of awarding business on the basis of price tag alone; instead, try a long-term relationship based on established loyalty and trust
5. Work to constantly improve quality and productivity
6. Institute on-the-job training
7. Teach and institute leadership to improve all job functions.
8. Drive out fear; create trust
9. Strive to reduce intradepartmental conflicts
10. Eliminate exhortations for the work force; instead, focus on the system and morale
11. (a) Eliminate work standard quotas for production. Substitute leadership methods for improvement. (b) Eliminate management by objectives. Avoid numerical goals. Alternatively, learn the capabilities of processes, and how to improve them
12. Remove barriers that rob people of pride of workmanship
13. Educate with self-improvement programs
14. Include everyone in the company to accomplish the transformation

In order to accomplish these goals, a company must develop a consistent and active plan that involves its entire labour force in the drive toward total quality.

Values that can drive the development of a quality culture and a quality work environment in your own business

Value 1: We're all in this together: company, suppliers and customers

- Everybody should define the company as more than the buildings, assets, and employees. The company also includes customers and suppliers as part of the definition. It captures the point that the company's welfare is directly tied to that of its suppliers, employees, and customers.
- Encourage the development of teams and teamwork when collaboration is appropriate to execute work. In this kind of organization, people examine the tasks that need to be done.
- Managers do not just react to problems. Instead, they proactively search for ways to improve all the time to reduce the possibility of problems occurring in the first place.
- Loyalty reduces the costs involved in recruiting, hiring, and training replacements. Employees recognize that it's hard to find an employer who



really understands that we're all in this together and what that means. When you care about them, they will care about you and the company.

Value 2: No subordinates or superiors allowed

- When a company culture eliminates the mentality behind superior-subordinate relationships, people more freely express what's on their minds. Of course, as with Value 1, this can only happen when you and everyone really believe that cooperation is what's most important. People have to experience this sense of cooperation. And that comes when everyone feels like a colleague and not just a cog in a machine controlled by someone else. It becomes a conscious driving force of behaviour.

Value 3: Open, honest communication is vital

- Empathy has to do with proactively seeing the world from the perspective of others, i.e. other members of the company, customers, suppliers, and the community. It is having a sense and appreciation of their problems, their abilities, and their behaviours. It incorporates a reluctance to judge too quickly the behaviour of others based on your own perspective to the exclusion of theirs.
- By actively listening and suspending judgement you create a situation where others do the same, as they naturally imitate your behaviour. This is an important way that you, as a manager, can encourage open and honest communication. The way you suspend judgement is by putting yourself in the other person's place. Then appreciate that the only way to find out what's on the mind of a colleague or a customer is to listen to him or her.

Value 4: Everyone has access to all the information they need

- Limited information means that decisions will be more speculative and thus more likely to introduce additional uncertainty into the company and its processes. Just think about when you or one of your employees made a poor decision. It probably happened because you did not have enough information. As a cultural value, everyone understands that full access to information is just the way things are at your company. Remember: You can never eliminate uncertainty in your business. However, you don't have to foster it by limiting access to information.

Value 5: Focus on processes

- Since organizations are systems that have processes for turning inputs into outputs, focus on processes is an important value. Industrial culture is however heavily oriented toward recognizing individual achievement and individual mistakes. Since about 80 to 95 percent of all production problems are due to variation in processes, it just does not make a lot of sense to blame individuals for all problems. Support this value by setting up teams and providing training and the tools needed to continuously improve these processes to everyone's benefit.

Value 6: There are no successes or failures, just learning experiences

- Failure and success are always value judgments we render after the fact. We can never predict with certainty whether what we do will end up as a success or a failure. It keeps company employees and managers from taking themselves too seriously. In other words, it keeps people open, humble, and



focused on what they should care about - figuring out how to do better and better for their customers. Further, it emphasizes a fundamental reality of our lives: we are always learning something. So it might as well as be something that is for the mutual good of our customers and us.



Exercise 4: Deming's 14 points

Study Deming's 14 points.

1. Pick the three points which you think are most important to you.

2. What is the point you agree to least? Why?

3.3 Worker and manager responsibilities

Many quality assurance cultures fail because of lack of commitment and support from management. To prevent this from happening, managers need to plan and develop quality policies and objectives that encourage a QA culture at all levels. They need to demonstrate a commitment to quality in their own work and clearly communicate challenges/issues they face so workers understand the context they are working in. Since communication is only effective when it is a two-way system, managers also have to listen to workers to understand their perspective even when they don't agree.



Workers' responsibility is to demonstrate a commitment to quality by participating in feedback/problem-solving activities, complying with policies and procedures and taking initiative to prevent any new problems/defects from occurring.

As you can see, quality assurance culture needs to promote responsibility in both workers and management to be successful in the long run.

MANAGEMENT'S COMMITMENT TO QUALITY

Quality assurance depends on commitment from all levels of an organization. Here are some specific approaches that will help managers demonstrate commitment to quality. Please remember that it is important to involve workers as much as possible in developing these tools and that once the tools are created they must be communicated across the organization and periodically reviewed for continuing suitability.

Quality Policy:

Every organization that is committed to quality has a specific policy that outlines what quality means in their context and how quality is assured throughout the production process. This policy can be developed with the help of workers to ensure that the information is relevant and appropriate to all employees. In addition, the policy should be appropriate for the organization with important information that relates to your business. Finally, a policy should provide a framework for establishing and reviewing quality objectives so that quality is continually measured and becomes part of the continuous improvement of an organization.

Example:

The future destiny of XYZ Company Ltd. is dependent on its ability to provide sound products and services to its customers through acceptable price, delivery and quality. The company has established and will continue to maintain and improve a quality system.

The Chief Executive Officer is ultimately responsible for the quality of the company's products and services and requires that all employees throughout the company take responsibility for the quality of all tasks for which they are accountable and act in accordance with the requirements of the quality system.

It is the policy of XYZ Company Ltd. To supply products and services of consistent quality to our customers. The achievement of high quality and consistency calls for a systematic and disciplined approach by all employees in their day-to-day work.

Benefits:

The advantages of a written policy on quality include:

- ☐ Providing a level of measurement (to what degree is the policy being followed?).
- ☐ Communicating to all workers and managers the importance of quality.



- ☐ Outlining the primary objectives relating to quality.



Exercise 5: Your quality culture

What can you do to create and maintain a quality assurance culture?

4.0 Set your quality goals

Once you have identified your customer needs and your abilities to meet those needs, the next significant step in the quality improvement process is formulating quality objectives. Quality objectives are quality oriented goals you aim to achieve and they are determined by everyone in the organization to demonstrate the implementation and improvement of a businesses' quality management system. Quality objectives are usually formulated at each relevant function and level within the business to ensure the plan filters through the entire organization.

The manner in which quality objectives are established and managed will have significant impact on the performance of your business. It is recommended to:

- ☐ Establish quality objectives at relevant functions and levels
- ☐ Include objectives needed to meet product/process requirements
- ☐ Ensure they are measurable
- ☐ Communicate to all personnel the meaning of the objectives and how each person helps to achieve them
- ☐ Maintain flexibility as quality objectives are not static and need to be updated in the light of the current business climate and the quest for continual improvement

Quality objectives are intended to be specific, measurable goals that you keep track of on a regular basis, and keep records of how you are doing. When setting quality objectives it is helpful to begin with establishing the groundwork for the objectives you plan to achieve. Understanding your customer needs and your business abilities was the beginning and the information you collected can now



be taken to the next step to formulate your objectives by answering some basic questions such as:

- ☐ What aspects about quality are most important to our customers and therefore to our success?
- ☐ What areas of quality need improvement?
- ☐ Who will benefit from our efforts?
- ☐ What needs are/are not being met by our efforts, and why?

This process will formulate the groundwork for your quality objectives by linking your customer needs and their importance in relation to what you are trying to accomplish. This is essential because it will help you focus and get a general sense of where you are moving compared to where your business is today. Once the foundation has been clearly defined, plans are formulated to enable the achievement of the quality objectives, that is, to define the specific steps necessary to fulfil the objectives. Remember that in order for an objective to be fully implemented, it has to be fully understood throughout the organization.

A significant part of this process also involves assembling the right people to participate and share information and ideas freely. This is a great opportunity to get management and workers in the same room to discuss ideas and actions they expect will **positively** or **negatively** affect the objectives needing improvement. The actions that come out of these sessions are then prioritized and actions taken accordingly. You can use tools such as brainstorming to help you facilitate this process.

See Annex 8.1 for detailed explanation of brainstorming sessions

Setting quality measures provides the mechanisms that will enable your business to translate objectives into a set of activities that can be quantified and compared to the current levels of performance. Selected quality measures are linked to defined quality objectives and can be selected for objectives such as:

- ☐ Promote quality assurance culture
- ☐ Improve product and process quality
- ☐ Reduce product defects
- ☐ Reduce material waste
- ☐ Reduce rate of product reworks

Regardless of the areas being addressed, measurement should allow for tracking of performance over time using qualitative or quantitative data. In addition, data collected must be analyzed and managed to confirm progress towards quality objectives. To do so,

- ☐ Identify expected results
- ☐ Prepare to collect the necessary data to measure progress and assign responsibility to collect data
- ☐ Monitor progress towards reaching each objectives
- ☐ Revise the activities as needed to reach your objectives

There is an adage that says, "if you cannot measure it, you can not improve it". Facts help confirm effectiveness of processes and any attempts to improve it. A major requirement therefore in performance improvement and change management is the selection and use of performance measures.



Performance measures quantify how well activities within a process achieve a specific goal or performance level. Activities and processes that consistently do not meet the specified performance goal-either the current performance goal or a revised higher goal-are obvious targets of improvement efforts. Once the improved process is installed it is necessary to monitor its performance to see whether it is performing at the expected level. If not, further improvements are required.

Performance measurement is therefore essential to continuous quality improvement efforts. Such measurements should provide critical data and information about key processes, outputs, and results. Ideally, their collection should be part of the enterprise's processes, systems and procedures.

Sample quality objectives	
Quality Objective	Key performance indicator
Improve on time product delivery rate	Decrease in number late deliveries per month and per customer
Promote a quality assurance culture	Percent increase in employees level of involvement in joint problem solving approaches to quality
Reduce product defects	Percent reduction in defect rate per month
Reduce reworks	Percent reduction in reworks per month



Exercise 6: Set quality objectives for your business

Based on the previous exercises, formulate the quality objectives for your business and identify key performance indicators for each objective.

5.0 Quality control

Quality control refers to the detection of defects, most commonly associated with testing which takes place within a quality management system typically referred to as verification and validation. A major part of quality control is the identification and reduced production of defective products.

But remember, quality control is not just about separating the defective from the non-defective products. The purpose of quality control is quality assurance – to **systematically eliminate quality problems**.

5.1 What are defects?

Defects are variations from specifications, allowed minimums or tolerances. The term “defectives” refers to products evaluated as seconds, thirds, irregulars or scraps depending on the:

- ☐ Characteristics of the defect
- ☐ Size and shape of the defect
- ☐ Number and types of defects

However, as we have learned earlier, the definition of quality depends on your customers. What is considered a defective product is therefore largely defined by your customer and will be different for each customer. Regardless of this, there has to be a clear definition and classification standards for:

- ☐ What constitute a product as defective
- ☐ What methods are used to identify defects e.g. testing materials, visual inspection etc. based on a set of criteria
- ☐ How defects are measured and classified
- ☐ How defects are managed

The fundamental purpose of having a clear definition and standard is to provide **consistency** between products and product lines.

Typical defects occur because of problems with:

- ☐ **Raw materials:** This could be a defective material delivered from a supplier and missed during inspection or lower quality material that malfunctions during production
- ☐ **Machinery/equipment/tools:** Defects in this situation is mostly introduced due to improper maintenance or use of incompatible use of material and machinery
- ☐ **Work conditions:** This includes improper lighting, messy/dirty work environment
- ☐ **Knowledge or skill level:** This is due to lack of information/training or lack of standardized procedures and clear instructions
- ☐ **Improper storage:** of product that would contribute to spoilage or distortion of material



5.2 Preventing defects

The aim of quality assurance programmes is to prevent errors so that products that meet standards are made right the first time. The best way to reduce defects is to minimize opportunities for defects to occur. This means before looking at specific lines or workers producing a high number of defects, it is useful to assess the work processes and standard operating procedures of the factory to see if that is causing or contributing to the number of defects.

In order to do so, a combination of methods such as visual inspection, measurements, and tests may be used to evaluate conformance to standards. These practices can be implemented at various stages of the production process including:

- ☐ Preproduction – Inspection of materials before production
- ☐ Production – Inspection of products during production (In line evaluation)
- ☐ Postproduction – Inspection of finished products prior to shipping to customers. (End of line evaluation)

Appropriate documentation of inspection and testing results is important to analyze and report on sources of defects so that steps can be taken to reduce defects. Documentation can be prepared for the entire production cycle as illustrated below.



It is very difficult to measure quality, detect defects or enhance the product without establishing **standard operating procedures** for receiving, storing, producing and shipping, and without a **product specification** for all products that outline all relevant details relating to the finished products.

Standard operation procedures

Standard operating procedures (SOPs) are written documents that describe in detail the routine procedures to be followed for a specific operation, analysis, or action. Consistent use of SOPs ensures that individual tasks as well as overall processes conform to best practices and quality standards. SOPs also help to reduce work effort and errors and can be used for training and induction activities.

SOPs should include methods for inspection, testing and acceptance procedures for:

- ☐ Receiving
- ☐ Pre-production
- ☐ In process
- ☐ Finished goods
- ☐ Distribution centers
- ☐ Measuring instructions
- ☐ Identification of non-first-quality goods



SOPs must be readily available for all workers and should be updated whenever a process or procedure changes as well as periodically reviewed for effectiveness.

Product Specifications

Specifications (also known as spec sheets) define how a product is to be made and the level of quality that must be present for the product to be acceptable to the buyer or customer. Because they help to produce accurate samples, spec sheets improve turnaround time and make expectations clear during all stages of production and quality control.

There are several different types of spec sheets that vary depending on the target audience. For example, there are customer specific spec sheets that outline what the customer wants in the final product and the product details that must be present to be deemed acceptable. Then, there are product specifications used by buyers to determine if the product meets their needs. There are also specifications for each main stage of the development process so that each production line understands to do their work according to the correct level of detail and quality. Specification sheets can come in a variety of formats and contain accurate and concise information.

For example if you are an apparel manufacturer, the following information would be included to complete the specification package.

- ☐ Detailed technical diagrams: Showing front and back of the garment and any special detail required to develop a pattern
- ☐ Detailed product description or code: Including name and style number assigned to the product. The style number will be used to track the product throughout the production process and shipping.
- ☐ Material name and description: Name, content, color and weight.
- ☐ Operation breakdown: number of pieces and materials to make up the garment, types of stitches and seams used to construct the garment.
- ☐ Measurements: Detailed measurement for each size being produced and allowed tolerances for acceptance or rejection of the product during inspection
- ☐ Garment packaging/Presentation: All Labelling to be attached on the garment and hanging/display device.

5.3 How to identify defects

Product specifications and SOPs do not only provide guidance on what the final product should be and how a process should be handled. They are also used to compare work processes, work in progress or final products against these guidelines to identify deviations from standards and defects. The actual inspection of a product however varies according to product type, time available and cost of inspection.

Regardless of this, the method selected must ensure that quality is everyone's responsibility. Each defect should be uniquely identified to determine where the defect first manifested itself, and whether multiple incidents are related to that specific defect (or a single defect). The most common inspection method is the systematic approach of **self-examination** and **random sampling** to verify quality standards.



Self-examination

Self-examination is an approach used in a 'team' or 'line' setting where workers are trained to inspect their items from a prior operation before proceeding. Each operation performs both production and quality inspection. In this way, quality feedback can be given on a timely basis and by monitoring where most problems occur in a production line. A quality manager or team can pinpoint causes whether it is lack of skill set or defective equipment. It is vital that all operators examine their work to prevent passing defective product onto the next operator, who should be treated as the internal customer. Quality can only be achieved if the products received from the previous operation meet quality standards. The simplest form of self-examination is to compare one's work against a template attached to the workstation or an approved prototype.

Having each worker check their work helps reduce time-consuming repair that may be required on the finished product.

If a defect is detected, it is flagged as potential irregular so successive operation is informed that the problem has been identified. If rejected for poor quality, it goes back to the workstation that produced the defect to be fixed. Defects caused by faulty machines or materials may be sent to a repair station for correction.

To perform self-examination effectively the worker needs to use a practical workstation, which incorporates sufficient working space to perform the operation and then examine the results of the work done in a safe manner. The benefits of self-examination are:

- ☐ Workers are responsible for their own work
- ☐ Rejects and defects rates are low
- ☐ Quality levels are consistent

Random Sampling

Most manufacturers carry out random sampling by removing a segment of work from an operator and selecting at random one piece that has just been finished. If that piece conforms to the quality standard the work is returned to the operator. If the piece is outside the quality standard, a second piece is selected and examined. If the second one is also incorrect the whole segment is carefully examined and the operator is stopped from producing anymore work until the fault is fixed.

For each segment of work and number of units examined the following are recorded:

- ☐ Time of examination
- ☐ Number of pieces examined
- ☐ Faults found
- ☐ Actions take

At the end of the working day, an analysis is made of all faults and categorized as critical, major or minor for the whole line or section.

Samplings are necessary to ensure:

- ☐ Operations correspond to the customer requirements
- ☐ Finished goods are of a consistent quality standard



- ☐ Self-examination is carried out according to standards

5.4 Measuring and classifying defects

Defects can and should be classified into a variety of types or classes depending upon the nature of the defect. The priority assigned to a defect is an indication of the urgency with which it must be rectified. In general, defects of the greatest severity will be assigned the highest priority.

Defects are usually measured by type and size and may be classified into three categories as follow:

Class	Level	Description of defect
A	Critical	Are classified as any defects that prevent usability or performance of the products.
B	Major	Are classified as any defect that renders the product unacceptable; affecting the appearance, durability, functionality and usability. One major defect will cause the product to be rejected.
C	Minor	Are classified as any defects that do not render the product to be unacceptable in the area of justifying a customer return. But it indicates faulty workmanship and areas requiring improvement. Usually several (or specified number of) minor defects will result in the product being rejected.

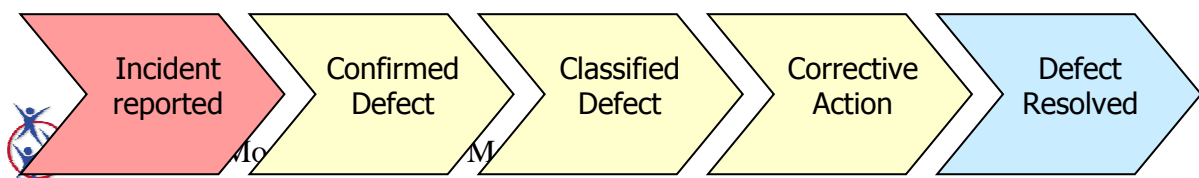
Defect identification and measuring is used to capture variation from specifications and categorize defects by type, level and take corrective action. Defects are measured using tangible methods such as measuring equipments or intangible methods as questionnaires and visual inspections to evaluate conformance to standards and specifications. You have to determine the appropriate methods for your products and service. Whatever methods you choose to use, your measurement process should ensure that:

- ☐ The right measurement tools are used
- ☐ The use of appropriate measuring procedures
- ☐ Ensure conformity to specifications
- ☐ Measurements are documented

Analysis of the defects examined using either process can be further sorted by:

- ☐ Defect type
- ☐ Defect category
- ☐ Source stage

Once defects are identified and categorized accordingly, then decisions can be made whether to rework or reissue the product, which is most likely to occur in case of critical defect. The process for recording and analyzing of defect below illustrates a set of statuses through which a defect goes.





Exercise 7: Your quality control process

Write down the quality inspection process/SOP in a section of your production floor. Include:

1. What is inspected?

2. When is it inspected?

3. How is it inspected?

5.5 How to collect defect data

Defect data throughout the production cycle needs to be collected on a continuous basis to locate where problems are occurring and determine why



they are occurring. Data can be collected during inspection in which a group of samples are selected and compared to specification to determine variation and sources of the problem. For example, if inspection is conducted to check for sewing defect information on stitch quality, seam strength, and measurement, can be collected. The information collected is then used to take corrective action to minimize or eliminate the problem from reoccurring.

Methods of collecting data include reviewing logbooks, observing production, and product inspection.

Product specifications and check sheets and other components of the quality control system are used to verify that deliverables are of acceptable quality and that they are complete and correct. But they need to be part of a system. Many companies use check sheets but don't link their use to systematic improvements in the production practices, so that defects are eliminated.

Check sheets

Using check sheets is a quick method to gather important data for improvement initiatives. Observations can be recorded in a tally sheet as shown below or on a graphic representation of the product or in whatever manner makes it easiest for workers to record their observations.

- ☐ List the problem or issue that needs to be examined (ex: damaged items below)
- ☐ Decide on the time frame required for recording the observations. Choose a time frame that realistically represents the frequency of occurrences
- ☐ Design the form for recording the observations. Workers should be able to collect data easily.
 - Label the columns and rows
 - The time frame is always indicated in the horizontal column at the top
 - The factors are listed in the vertical columns on the right side
 - The columns to accumulate the total should also be included
- ☐ Begin the recording of occurrences. Ensure all workers are involved in collecting the data. Each worker should record the occurrences on their own.
- ☐ Gather all the check sheets from the workers and collate the observations. Draw up the final check sheet that shows the totals for each factor.
- ☐ Analyze the results and draw conclusions
- ☐ Discuss with the team what changes/actions will be implemented and how the team will continue to monitor their progress

Check sheet to identify the major problems of electronic equipment

Date/ Damaged items	Nov 3	Nov 4	Nov 5	Nov 6	Total
Handset	###	////	### /	### ///	23
Cable connector	///	### ////	### ###	###	27
Antennae mounting	### ### ###	### ////	### ### //	### ### ### ###	56
Dial switch	### ###	### //	### ### ###	### ###	42
Battery casing	////	###	### ///	### ###	27



Remote control	//	///	////	/// /	17
Others	///	///	/// //	//	17
Total	44	42	62	61	209

After collecting the necessary data, you need to make conclusions about the problems that exist and determine ways to solve them. Analysis tools such as the **fishbone diagram** discussed later can help you look at possible causes to the problem.



Exercise 8: Design quality check sheets for your products

1. Design a quality check sheet for one of your products.

Time Defect						Total

2. Make a list of products for which you need to develop check sheets.



6.0 Continuous quality improvement

Continuous Quality Improvement (CQI) is a systematic, organization-wide approach for continually improving all processes to deliver valuable products and services. Continuous improvement seeks continuous improvement of machinery, materials, labour and production methods through the application of suggestions and ideas of team members. Employee involvement and team efforts are the key ingredients to continuous improvement.

Also central to the efforts of continuous quality improvement is the **problem-solving or improvement process**. It is applied by task forces doing a specific improvement assignment and by small group activities of systems such as quality control circles (QCC) discussed below. It is a systematic approach and uses various statistical and analytical tools in a series of stages: identification of a process or product needing improvement, gathering data on current quality performance level, analyzing the data to determine root causes of the problem, developing solutions and new ways of doing things, test implementation of the improved process, monitoring the performance of the new process, and then standardization and continuous monitoring of improved product, process or procedure.

CQI relies upon the following principles, all of which are important criteria for Performance Excellence:

- ☐ Customer focus: meeting or exceeding customer expectations while maintaining or improving costs
- ☐ A culture that expects continual improvements throughout the organization
- ☐ Employee and partner or supplier involvement
- ☐ Use of data and facts to make decisions

Benefits of Continuous Quality Improvement

CQI promotes a collaborative effort that enables workers and management to work together in order to improve shared quality improvement values. It is also vital in ensuring quality implementation is an integral part of your business philosophy. The benefits of CQI include:

- ☐ Higher customer satisfaction and loyalty as a result of improved quality and service delivery process
- ☐ Higher employee satisfaction and retention through better employee participation and sense of ownership of enterprise success
- ☐ Higher revenue as a result of improved product quality, process, and productivity
- ☐ Fewer errors and less re-works due to improved process

6.1 Solving your quality problems

Achieving your long-term quality objectives requires continuous analysis and solving of problems to prevent them from reoccurring. Otherwise, problems will continue to surface taking valuable time and energy away from regular



production time to fix the problem. The following sections introduce tools that can help you to analyze your problems and tackle the underlying causes of problems.

Analyzing defects data

Collected data needs to be analyzed to determine where problems exist to provide feedback to workers, managers and suppliers. However, data needs to be interpreted accurately to solve the problem.

The following are tools that can be used for collecting and analyzing quality problems. These basic quality tools are simple yet very powerful. They are explained in detail in the Annex.

- ☐ **Pareto chart (Annex 8.2)**
- ☐ **Histogram (Annex 8.3)**
- ☐ **Scatter diagram (Annex 8.4)**

Most of these tools can be used in different ways, each of which will be important in improving quality by helping you:

- ☐ Understand what is going on in a process or system
- ☐ Decide what to do next, where to place priority
- ☐ Make presentations, reports and so on, in order to make a case for investing resources, time, effort in tackling a quality improvement project
- ☐ Describe plans for tackling quality improvement
- ☐ Illustrate the results of tackling quality improvement

Utilize these tools to manage defects in a way that will allow you to measure and evaluate how, when and why defects are occurring. This information should be continually gathered and compared against established quality standards to see how you are doing, what you can improve and where you can fix problems. This involves

- ☐ monitoring production;
- ☐ feeding back information;
- ☐ responding to that information;
- ☐ and getting defects removed at source.



Exercise 9: Draw a Pareto chart

Draw a Pareto chart using your own data or data from the electronics check sheet in the previous chapter.





Root cause analysis of quality problems

The first step to solve a problem such as defects is to truly understand it. It is easy to see a symptom and think that you know what is causing it. But surprisingly often, if you take the time to explore more deeply, you will find that what you thought was the cause is in fact just another symptom, and that the problem lies much deeper within.

Solving your quality problems will require you find out and eliminate all the causes contributing to your problems. Tools such as the 5 Whys and the fishbone diagram help you to define and display the root causes of problems.

"The root cause of any problem is the key to a lasting solution."

Taiichi Ohno, Former Vice President of Toyota

The 5 Whys

The 5 Whys is a question-asking method used to explore the cause/effect relationships underlying a particular problem. Ultimately, the goal of applying the 5 Whys method is to determine a root cause of a defect or problem.

Example: Why did the machine stop?

1. *"Why did the machine stop?"*
⇒ The circuit has overloaded, causing a fuse to blow.
2. *"Why is the circuit overloaded?"*
⇒ There was insufficient lubrication on the bearings, so they locked up.
3. *"Why was there insufficient lubrication on the bearings?"*
⇒ The oil pump on the machine is not circulating sufficient oil.
4. *"Why is the pump not circulating sufficient oil?"*
⇒ The pump intake is clogged with metal shavings.
5. *"Why is the intake clogged with metal shavings?"*
⇒ Because there is no filter on the pump



Solution: Install filter

Fishbone diagram

The 'fishbone diagram', also known as the Ishikawa diagram, is a common tool used to help organizations solve problems by conducting a cause and effect analysis of a situation in a diagram that looks like a fishbone.

This is a joint problem-solving technique, as you need to involve others to find the root cause of a problem.

Through the fishbone diagram it is also possible to identify solutions that help solve more than one problem. While carrying out this analysis, you may make further discoveries that will also help you remove other blocks.

The fishbone diagram is used:

- ☐ To study a problem/issue to determine the root cause
- ☐ To develop a common understanding of the factors potentially influencing or causing quality problem
- ☐ As a road map for collecting data to verify the causal relationship of various factors
- ☐ To study why a process is not performing properly or producing the desired results

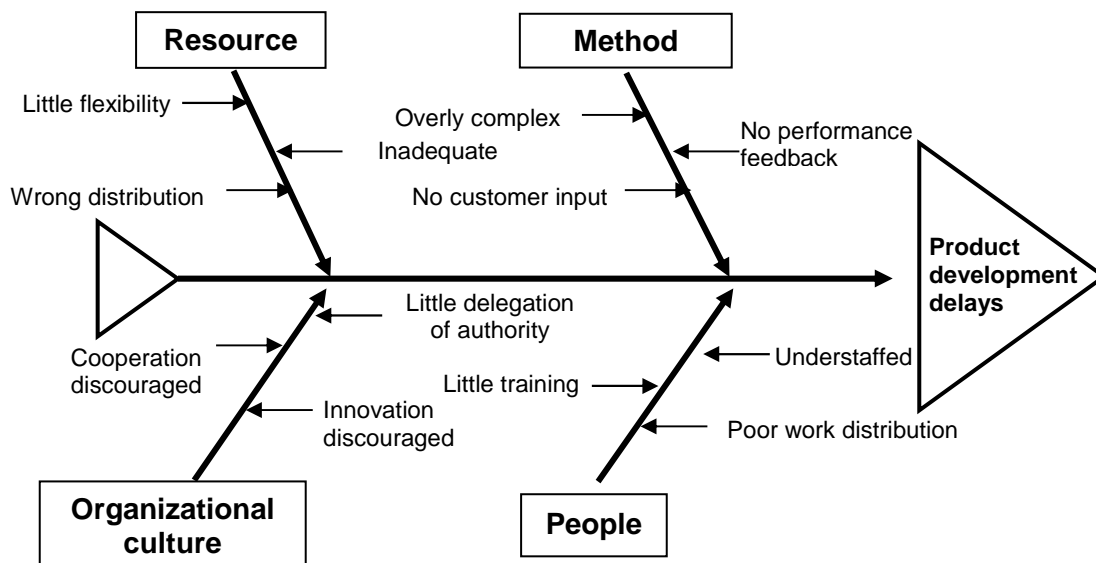
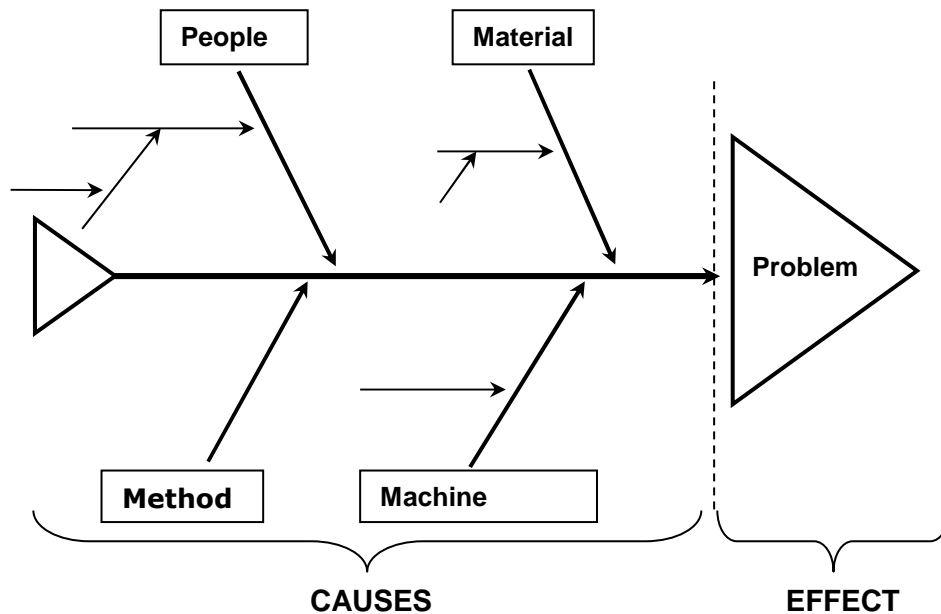
Fishbone Diagram – Basic steps

1. Write down your problem. Try to be as specific and precise as possible
2. Define the characteristics of the problem and make it the "backbone" of the fish
3. Decide on the main causes of the problem. In manufacturing for example, main causes of problems are often divided into:
 - ☐ People
 - ☐ Machine (technology)
 - ☐ Material (raw, consumables)
 - ☐ Method (process/inspection)
4. Assign one "large bone" coming off the backbone of the fish to each category
5. For each main cause, think of an area that contributes to the problem e.g. lack of training might be a main cause in the staff category. Write these on the horizontal lines the "middle bones" that run out from the large bones.
6. Analyze and define secondary causes and add them as "small bones".

The following is an example of a fishbone diagram illustrating the above explanation.



FISHBONE DIAGRAM



Look at each cause. Why does this happen? If there is another reason, include it on a branch of the horizontal line for that cause: e.g. why is there lack of training? The answer may be lack of funding. This should be added to the diagram.





Exercise 10: Draw a fishbone diagram

Use a fishbone diagram to analyze the causes for one of your major quality problems.

6.2 Quality Control Circles (QCC)

A QCC is a small group of workers (6-10 persons) from the same work unit who meet regularly to identify, select and analyze work-related problems. The group then puts forward suggested solutions to management for consideration and decision. Subsequently, they implement the decisions of management.

The philosophy of QCC is based on the concepts of participatory and humanistic management. Humanistic management refers to management that gives importance to people and their feelings recognizing that people are the most valuable asset of an enterprise. Participative management means that every worker regardless of status in the enterprise is given the opportunity to make meaningful contribution to the enterprise. Thus, QCC is a mechanism whereby workers are able to participate in the problem-solving process leading to improvement of quality and productivity in their area of work.

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

- ☐ The problem solving capability of the workers
- ☐ Team work
- ☐ The cultivation and assimilation of positive values and work ethics
- ☐ Involvement and interest in work
- ☐ High motivation for work; and
- ☐ Awareness of responsibility towards oneself, the group, and the enterprise

QCC is based on the following basic principles:

- ☐ Workers are recognized as the most valuable resource along with other management resources
- ☐ Development of workers as useful members of the enterprise
- ☐ Participation and support from all levels
- ☐ Constant encouragement of creativity



Numerous benefits can be obtained through the implementation of QCC. Among these are:

- ☐ Closer relationship between the workers and management
- ☐ Cultivation of cooperation among workers
- ☐ Job satisfaction
- ☐ Increased motivation to work
- ☐ Building of self-confidence
- ☐ Development of leadership among workers
- ☐ Encouragement of creativity among workers and
- ☐ Improvement of systems and work procedures

The success of the quality circles depends solely on the attitude of top management and plays an important role to ensure the success of implementation of quality circles in the enterprise. The QCC is made up of a steering committee called middle management consisting of heads of different divisions or a coordinator. Meetings are conveyed at least once in one to two months interval. The coordinator also acts as facilitator who is responsible for coordinating and directing the quality circles activities within the enterprise. The facilitator further acts as a catalyst, innovator, promoter and teacher and is nominated by the management. The leader of a quality circle is chosen by the members among themselves and they may decide to have a leader by rotation.

The following basic elements constitute the structure of the quality circle:

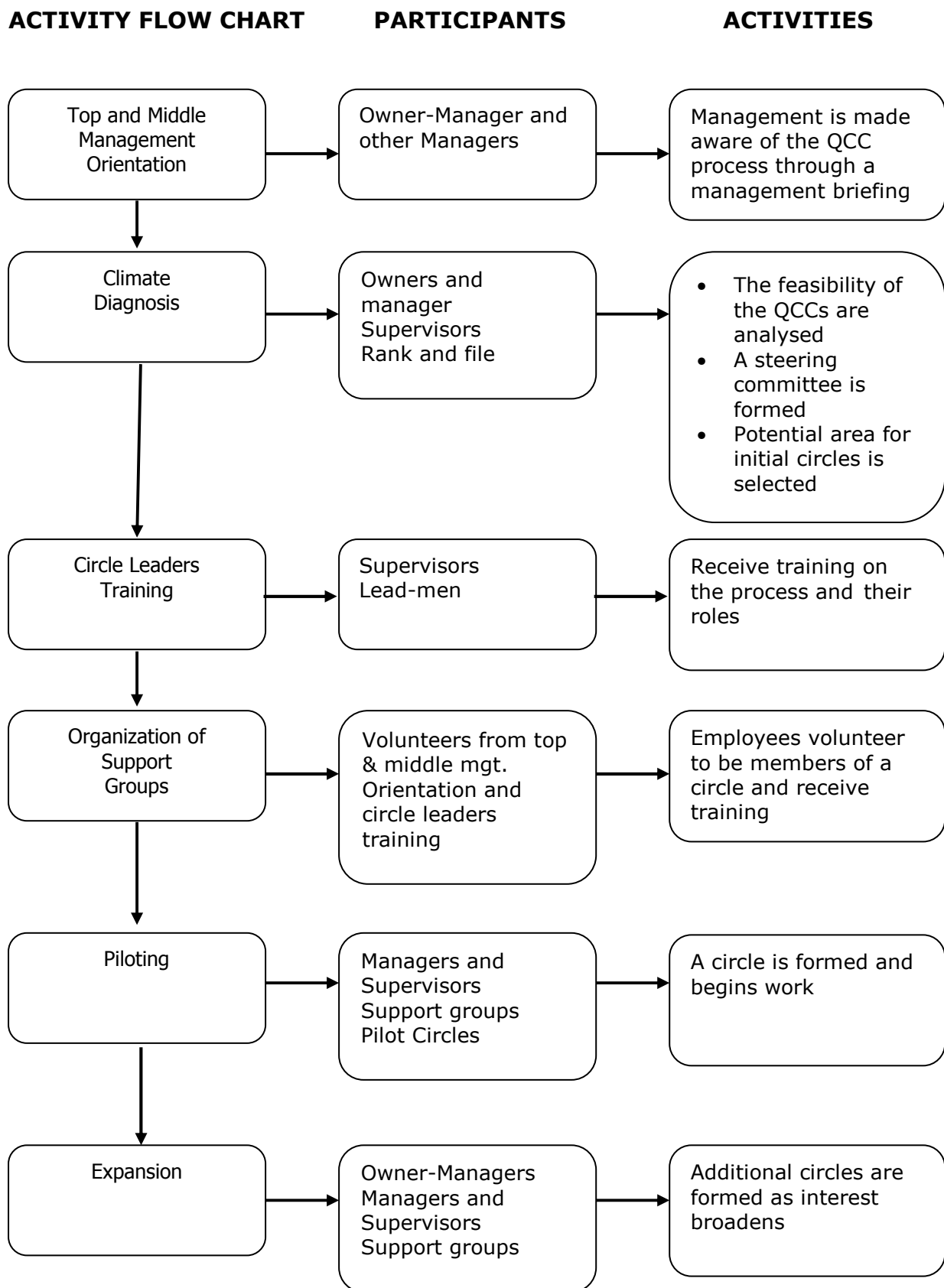
- ☐ QCC Steering Committee: Formulates policies for the implementation of QCC. It also deliberates as well as decides on the suggestions forwarded by QCC for solving problems
- ☐ Facilitators: They are chosen from among Heads of Divisions or workers selected by the Management. These facilitators are responsible for one or more QCC. The roles of the facilitators are as follows:
 - Communicating with all levels of management and obtaining their support and assistance
 - Providing training to QCC leaders and assisting in training of QCC members where required
 - Maintaining an open and supportive environment
 - Ensuring QCC members direct their activities to work-related problems
 - As a mediator in problem-solving
 - As a resource person to the Circle and
 - Evaluating the costs and benefits of the QCC programme and reporting to the Management.

Quality circles commonly use the following basic techniques to identify and to analyze problems.

- ☐ Team work (Brainstorming)
- ☐ Pareto analysis
- ☐ Ishikawa diagram (Fishbone diagram)

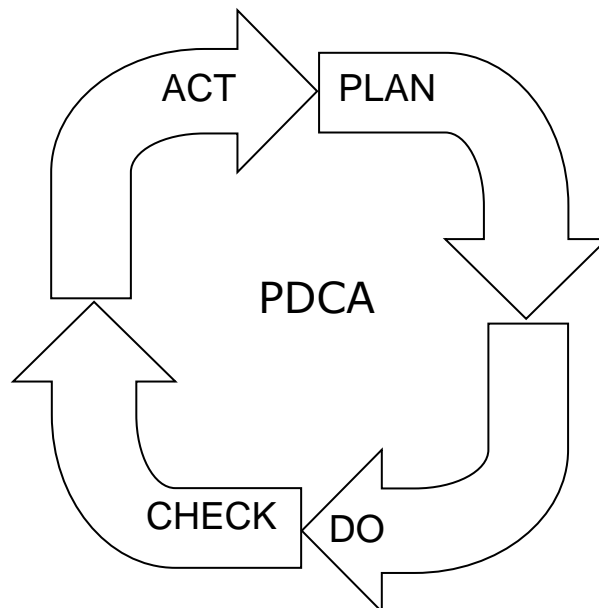


How to install QCC Programs in SMEs



6.3 The PDCA (Plan-Do-Check-Act) cycle

The most popular tool used by QCC in for continuous improvement is the **Plan, Do, Check, and Act** cycle, developed by Dr. W. Edwards Deming. These steps are commonly abbreviated as PDCA.



The four quality assurance steps within the PDCA model stand for:

Plan: Establish objectives and processes required to deliver the desired results

At the planning stage, QCC members

- ☐ select a project/problem
- ☐ set target
- ☐ analyze current situation (using quality tools)
- ☐ determine solution/s
- ☐ Consider suggestions and decision by the management
- ☐ Prepare implementation schedule

Do: Implement the process and solutions developed

Check: Monitor/measure the performance of the implemented process by testing the results against the predetermined objectives. Get feedback from the customer i.e. people who are affected by the new process.

At this stage, QCC members should carry out an evaluation of the proposed solution being undertaken to determine whether the objective of the project has been attained or otherwise. Once evaluation has been completed, the QCC members can decide whether to implement the proposed solution or otherwise.

Act: Apply actions necessary for improvement if the results require changes.

Act involves the standardization of the corrective action. As a result of the evaluation/check, QCC members will be able to identify the improvements arising out of the corrective action taken. If there are improvements, then QCC members can standardize the action implemented and make it a part of the procedure or operations of the enterprise. A briefing on the new procedure should be given to all workers.



PDCA is an effective method for monitoring quality assurance because it analyzes existing conditions and methods used to provide the product or service customers. It is well suited for addressing quality improvement and developing a quality assurance culture as it provides a continuous process of identifying and working on improvement projects. Applying PDCA continuously to your day-to-day work enables you to continuously improve your business situation.

6.4 Benchmark your processes against top performers

Benchmarking is a systematic way to identify best practices and understand the root causes of why one organization's performance is better than that of another. The benchmarking approach uses this knowledge to implement changes to processes so as to improve performance, and monitor those changes and measures their effect on performance. The basic objective is to find best practices that lead to superior performance and see how you can apply them in your enterprise. Benchmarking also allows you to set realistic targets and examine how to meet them. Although benchmarking involves making comparisons of performance, it is not:

Benchmarking is not	Benchmarking is
Merely competitor analysis	Benchmarking is best undertaken in a collaborative way
Comparison of association tables	The aim is to learn about the circumstances and processes that underpin superior performance
A quick fix done once and for all	Benchmarking projects may extend over a long period and it is vital to repeat them periodically as the background environment changes
Copying or catching up	In rapidly changing circumstances, good practices become dated very quickly. Also, the fact that others are doing things differently does not necessarily mean they are better
Spying or espionage	Openness and honesty are vital for successful benchmarking

In practice, benchmarking usually encompasses:

- ☐ Regularly comparing aspects of performance (function or processes) with best practitioners
- ☐ Identifying gaps in performance
- ☐ Seeking fresh approaches to improve performance
- ☐ Follow through with implementing improvements and



- ❑ Follow up by monitoring progress and reviewing the benefits

The Benchmarking Process

There are several benchmarking process models that have been used. Most of these models are based on the same concept, the concept of Plan-Do-Check-Action. Regardless of the model used, benchmarking as an on-going process consists of steps, as follow:

- ❑ Initiative for benchmarking project
- ❑ Selecting the subject of benchmarking
- ❑ Selecting benchmarking partners
- ❑ Preparing data collection and analysis
- ❑ Data collection, site visits and investigation
- ❑ Analysis
- ❑ Reporting, and
- ❑ Action

Each stage of benchmarking has its specific characteristics:

Initiative for benchmarking project

A benchmarking process is initiated by businesses, partners, professional groups, and others, who are determined to improve performance, achieve competitive edge and strategic advantage, solve some problem, etc.

Like other change methodologies, benchmarking must be conducted as a team effort activity. Roles and responsibilities for each team member must be specified. Possible candidates for the benchmarking team can be identified early on; the structure of benchmarking team can be defined usually after determining the subject of benchmarking.

Selecting the subject of benchmarking

There are several subjects of possible benchmarking such as products, services or processes that improve quality and performance and solve other strategic issues for example, equipment redesign, and technology modification. The purpose of this step is to define what the organization wants to benchmark. After the organization defines it, it will allocate the resources required to conduct benchmarking.

Selecting benchmarking partners

Deciding with whom to benchmark needs selection oriented towards organizations or successful projects with best results and solutions of certain issues. The purpose of this step is to identify the information sources that the company will use to collect the benchmarking information and pick the industry with the best practices. The focus of this stage is on information. There are five steps toward identify benchmarking partner as follows:

- ❑ **Develop a benchmarking information network.** While collected information concerning enterprise performance is usually quickly outdated, benchmarking information should be considered a potential long-term resource. Developing a benchmarking information network



reduces the time to find information, and the process of collecting and storing information for benchmarking will be easier.

- ❑ **Identify information resources.** This step can be easily implemented by asking three questions
 - Who produces the information you want?
 - Who else uses the information you want?
 - Who accumulates the data you want?

Answering these three questions will help you to discover the resources that are available to support the benchmarking process. The challenge at this stage is to identify benchmarking partners that will provide useful information to your benchmarking process.

- ❑ **Design list of benchmarking partner criteria.** The list of criteria should express the requirements an ideal benchmarking partner should satisfy. Requirements could include geographical location, size, structure and organization, products and technology. You should assure that all criteria set forward are relevant to your goal.
- ❑ **Identify potential benchmarking partners.** Potential benchmarking partners do not have to be best-in-class or world class. They can be only “best-in-the local area” when the enterprise draw the line to benchmark with companies located in the same area. Benchmarking with these companies can be as good as benchmarking with world class companies, thus one can also save the company resources.
- ❑ **Selecting benchmarking partner(s).** This step is to collect background information about the potential partners and decide which of these potential partners one will select as benchmarking partner(s).

PLAN OF SELECTION OF BENCHMARKING PARTNERS		
POTENTIAL BENCHMARKING PARTNER	ACTIVITY	LOCATION
Internal benchmarking units		
Competitors		
Other benchmarking partners		



Data collection and analysis

At this stage, the enterprise collects and analyzes the information for benchmarking. Information can be collected in many ways such as telephone interviews, personal meetings, site visits, surveys, publications, media and archival research. The information collected is then organized for example by first writing an outline, adding information in a matrix to compare companies, and summarizing the data.

After the information has been collected and summarized, the next step is data analysis. Analysis of data gathered is oriented towards determining the performance gap. Analysis should include checking for misinformation, identifying omissions, identifying patterns in the data and drawing conclusions.

The results of the analysis should be the basis for measures towards:

- ☐ Minimizing differences among benchmarking partners
- ☐ Keeping useful current practice
- ☐ Replacing adverse, non-efficient practice
- ☐ Obtaining specific standard quality standard, certificate or award
- ☐ Other goals

In this phase the possibility of informal learning is actually initiated and it continues in the phases that follow. Informal learning in this phase of the benchmarking process can be performed also through brainstorming where different ideas and arguments are presented and exchanged within the benchmarking team.

INFORMATION COLLECTION PLAN		
Internal sources	Who is responsible	Deadline
External sources		

Take action

Producing a benchmarking report and presenting the findings is one of the major tasks of the benchmarking team. Reporting practice should enable insight into benchmarking process and its findings. This stage should contribute to the knowledge accumulation and it is vital for decisions made upon changes and



improvements. The benchmarking report should include detailed recommendations for actions to be implemented.

Benchmarking like other changing methodologies requires time. Therefore, once the process begins, the enterprise has to make sure it is carried out through the time period that has been planned for successful application of the benchmarking process. Overall, benchmarking is not a one-time change methodology but rather a continuous process. Therefore, an organization would have to be aware of what is out there, and be able to improve their process in order to be able to compete with others.

Benchmarking benefits

There are several benefits gained by benchmarking your practice against best performers, which present at the same time, challenges to benchmark:

- ☐ Being familiar with conditions, characteristics (especially of specialties, advantages, potentials), events and results within an enterprise
- ☐ Defining the best practice
- ☐ Setting the basis for internal standards
- ☐ Strengthening of negotiating position
- ☐ Discovering knowledge and improving knowledge sharing
- ☐ Encouraging innovations
- ☐ Supporting team spirit
- ☐ Increasing of learning culture
- ☐ Increasing of social capital
- ☐ Rethinking the sense, efficiency and effectiveness of business activities and transactions,
- ☐ Developing and refining decision criteria (e. g. about business relationships, investments, and other strategic decisions), etc.

In this way benchmarking can prevent a company from too early conclusions and decisions, even from illusive self-assessment, and subjectivity. It can strengthen the trust both within and outside enterprise, and support information and communication flows.



7.0 ANNEX

7.1 Brainstorming

What it is

Brainstorming is a technique generally used in a group setting to quickly generate a large number of ideas about a specific problem or topic. It can help you:

- ☐ Encourage creative thinking and generate enthusiasm
- ☐ Encourage participation and building on the ideas of others

These may be ideas about:

- ☐ Things that need improving
- ☐ Possible cause of faults or problems
- ☐ Possible ways of solving problems or bringing about improvements

It is important to realize that the output of brainstorming is no more and no less than a list of possibilities. What happens next will depend on the nature of the topic being discussed.

The rules of brainstorming are quite simple.

- ☐ As already stated, brainstorming is a group technique
- ☐ The question or issue being brainstormed should be clearly stated. This is usually best done using a "why", "how" or "what" question. For example:
 - What needs to be changed to make the production floor safe for everyone to work in?
 - How can we reduce the number of faulty pieces of equipment that are shipped to customer?
 - Why are people not contributing to our suggestions scheme?
 - What do we want senior management to do differently so that we will feel more committed to working for this organization?

Check that all group members understand the question. Write it on a chart or board so that it can be seen during the brainstorming session.

Points to remember

- ☐ Never judge ideas as they are generated
- ☐ Try to write down all of the ideas exactly as they were presented
- ☐ Ensure diverse group of people are involved

7.2 Pareto diagram

What it is?

A bar chart based on the *Pareto* principle, which states that when several factors affect a situation, a few factors will account for most of the impact. The Pareto principle describes a phenomenon in which 80 percent of variation observed in



everyday processes can be explained by a mere 20 percent of the causes of that variation. A Pareto chart provides facts needed for setting priorities. It organizes and displays information to show the relative importance of various problems or causes of problems. It is essentially a special form of a vertical bar chart that puts items in order (from the highest to the lowest) relative to some measurable effect of interest: frequency, cost, time.

Placing the items in descending order of frequency makes it easy to discern those problems that are of greatest importance or those causes that appear to account for most of the variation. Thus, a Pareto chart helps teams to focus their efforts where they can have the greatest potential impact.

A Pareto chart can help you:

- ☐ Separate the few **major** problems from the many possible problems so you can focus your improvement efforts
- ☐ Arrange data according to priority or importance
- ☐ Determine which problems are most important, using data, not perception

When to Use It

Pareto charts help teams focus on the small number of really important problems or causes of problems. Pareto charts are useful in establishing priorities by showing which are the most critical problems to be tackled or causes to be addressed. Comparing Pareto charts of a given situation over time can also determine whether an implemented solution reduced the relative frequency or cost of that problem or cause.

How to Use It

- ☐ Develop a list of problems, items, or causes to be compared
 - Develop a standard measure for comparing the items
 - How often it occurs: frequency (e.g., utilization, complications, errors)
 - How long it takes: time
 - How many resources it uses: cost
- ☐ Choose a time frame for collecting the data
- ☐ Tally, for each item, how often it occurred (or cost or total time it took). Then add these amounts to determine the grand total for all items. Find the percent of each item in the grand total by taking the sum of the item, dividing it by the grand total, and multiplying by 100

Tallying Items in a Compilation Table

Causes for Late Delivery	Number of Occasions	Percentage
Problem with raw material	8	11
Late production start	20	27
Machine breakdowns	4	6
High defect rate in production	32	44
Workers absenteeism	6	8
Incorrect paper work for shipping	3	4



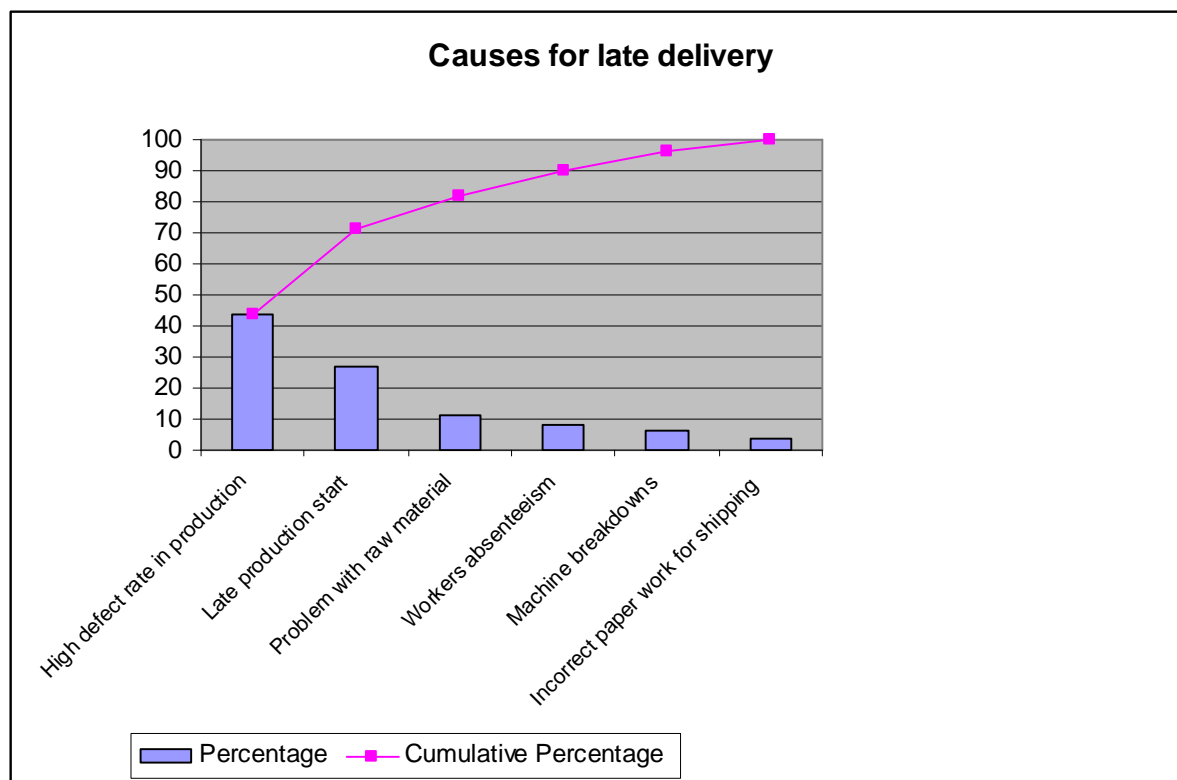
Total	73	100
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- ❑ List the items being compared in decreasing order of the measure of comparison: e.g., the most frequent to the least frequent. The cumulative percent for an item is the sum of that item's percent of the total and that of all the other items that come before it in the ordering by rank

Causes for Late Delivery (Decreasing Order)	Number of Occasions	Percentage	Cumulative Percentage
High defect rate in production	32	44	44
Late production start	20	27	71
Problem with raw material	8	11	82
Workers absenteeism	6	8	90
Machine breakdowns	4	6	96
Incorrect paper work for shipping	3	4	100

- ❑ List the items on the horizontal axis of a graph from highest to lowest. Label the left vertical axis with the numbers (frequency, time, or cost), then label the right vertical axis with the cumulative percentages (the cumulative total should equal 100 percent). Draw in the bars for each item
- ❑ Draw a line graph of the cumulative percentages. The first point on the line graph should line up with the top of the first bar
- ❑ Analyze the diagram by identifying those items that appear to account for most of the difficulty. Do this by looking for a clear breakpoint in the line graph, where it starts to level off quickly. If there is not a breakpoint, identify those items that account for 50 percent or more of the effect. If there appears to be no pattern (the bars are essentially all of the same height), think of some factors that may affect the outcome, such as day of week, shift. Then, subdivide the data and draw separate Pareto charts for each subgroup to see if a pattern emerges





7.3 Histogram

What it is?

A histogram is a bar graph that shows the central tendency and variability of a dataset. Histograms are sometimes referred to as frequency distributions.

A histogram can help you to:

- ☐ Understand the variability of a process
- ☐ Quickly and easily determine the underlying distribution of a process

How to use it:

Determine the type of data you want to collect. Be sure that the data is measurable, (for example, time, defect, etc.).

- ☐ **Collect the data.** Collect as many measurable data points as possible
- ☐ Collect data on one parameter at a time
- ☐ **Count the total number of points you have collected**
- ☐ **Determine the number of intervals required.** Use this table to determine how many intervals (or bars) the graph should have

If you have this many data points...	Then use this number of intervals
Less than 50	5–7
50–99	6–10
100–249	7–12
More than 250	10–20

- ☐ **Determine the range.** Subtract the smallest value in the dataset from the largest. This value is the range of your dataset
- ☐ **Determine the interval width.** Divide the range by the number of intervals. Round your answers up to a convenient value. For example, if the range of the data is 17 and you have decided to use 9 intervals, then your interval width is 1.88. You can round this to 1.9 or 2.0. It is helpful to have intervals defined to one more decimal place than the data collected

Example:

A small metal works company looked at ways to reuse scrap metal bars. It counted how many scrap pieces were produced of a certain length on one day.

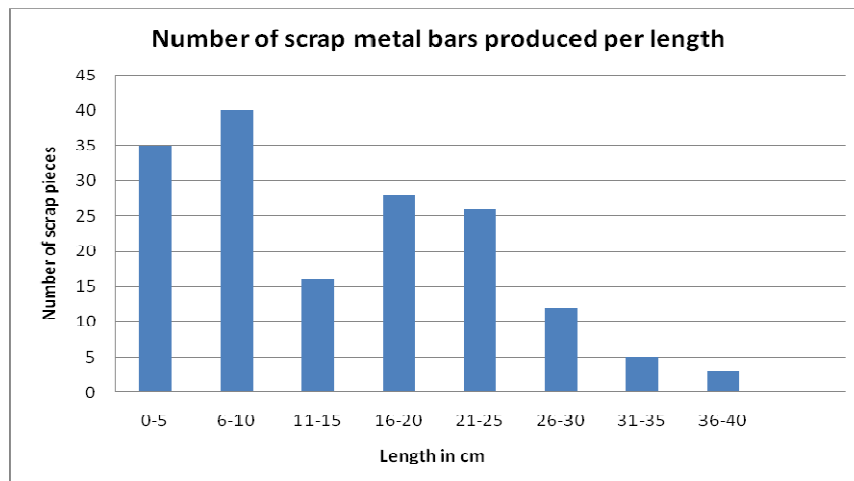
Number of scrap metal bars produced per length

Length (in cm)	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40
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Number of scrap pieces	35	40	16	28	26	12	5	3
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The business chose a histogram to visualize the data (see below). After analyzing the graph, the company started to produce two new products from the waste: The first used the short 6-10cm bars as inputs and the second product used the 16-25cm bars.



7.4 Scatter diagram

What it is?

The scatter diagram is a graphical technique used to analyze the relationship between two variables. It shows whether or not there is correlation between two variables. Correlation refers to the measure of the relationship between two sets of numbers or variables. Two sets of data are plotted on a graph, with the y-axis being used for the variable to be predicted and the x-axis being used for the variable to make the prediction. The graph will show possible relationships (although two variables might appear to be related, they might not be: Those who know most about the variables must make that evaluation). However, correlation does not necessarily mean a direct cause and effect relationship. If it appears that values for one of the variables can be predicted based on the value of the other variable, then there is correlation.

When to use it:

Use a scatter diagram to examine theories about cause-and-effect relationships and to search for root causes of an identified problem. Use a scatter diagram to design a control system to ensure that gains from quality improvement efforts are maintained.

How to use it:

- ☐ Decide which paired factors you want to examine. Both factors must be measurable on some incremental linear scale.



- ❑ Collect 30 to 100 paired data points. This might mean measuring both factors at the same, or measuring a starting condition or an in-process factor and the end result, but the data points all should be related in the same way. While you are at it, note any important differences such as equipment or machines used, time of day, variation in materials or people involved for each data point as you collect them. These differences might help you stratify the data later if the results are not clear.
- ❑ Find the highest and lowest value for both variables. This will help you determine the length of the scales and the intervals on your diagram.
- ❑ Draw the vertical (y) and the horizontal (x) axis of a graph. If the relationship of the data is caused to effect, place the cause values on the horizontal (x) scale and the effect values on the vertical (y) scale. Make the physical length of the scales about equal. Divided both scales individually into increments so that the high and low values of both variables fit on their respective scales.
- ❑ Plot the data. (Follow along the x scale until you find the x value of your pair. Trace up to where the y value would intersect with that value on the y scale. Make a dot at the intersection.) if two or more data points fall on the same intersection, either place the additional dots close to or touching the first one, or draw a small circle around the first dot for each additional data point.
- ❑ Title the diagram. Show the time during which the data were collected and the total number of data pairs. Title each axis and indicate the units of measure used on it.

The shape that the cluster of dots takes will tell you something about the relationship between the two variables that you tested. If the variables are correlated, when one changes the other probably also changes. The strength of the correlation is a measure of the confidence you can have in that probability. Dots that look like they are trying to form a line are strongly correlated.

- ❑ If one variable goes up when the other goes up, they are said to be positively correlated. If one variable goes down when the other goes up, they are said to be negatively correlated.
- ❑ If the variables have a cause and effect relationship, a strong positive correlation would indicate that raising the x value would cause the y value to go up and lowering it would cause the y value to go down. If the variables are not directly related as cause and effect, a strong positive correlation could indicate that some other factor or factors are affecting both of the measured variables similarly. One way to determine if a significant correlation exists is to use the sign test table.

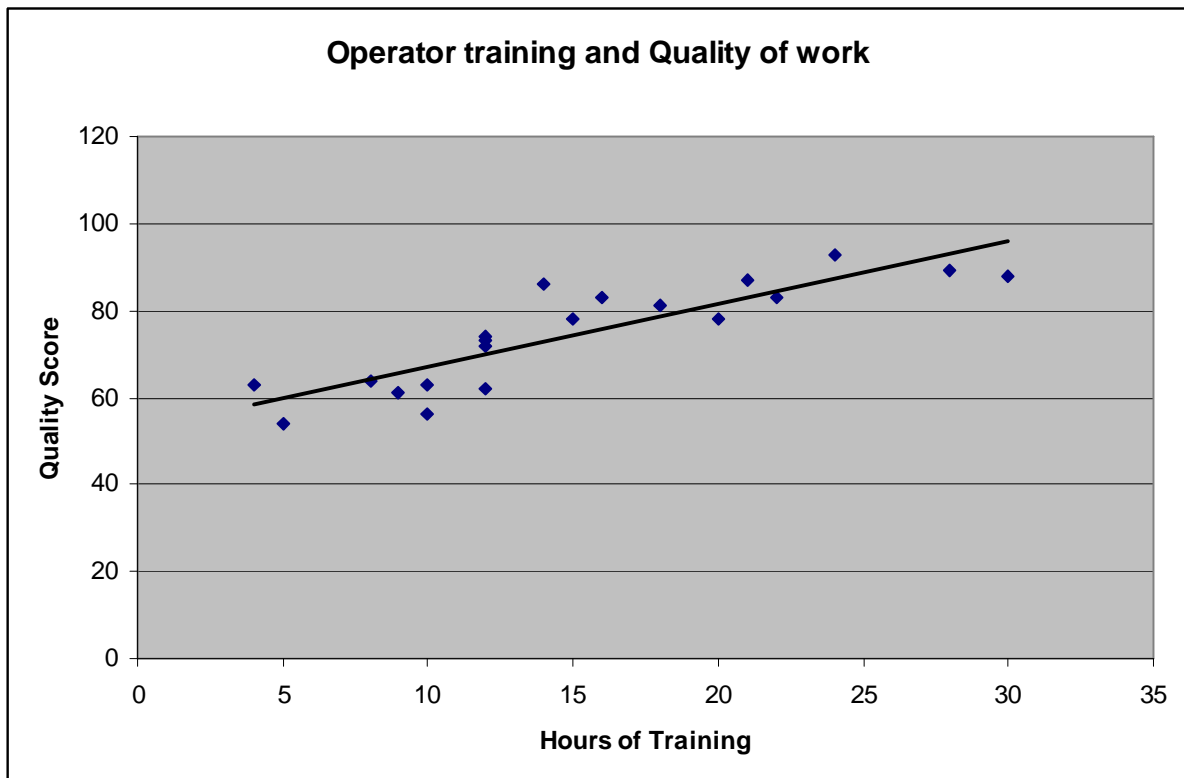
Scatter diagrams can be used to prove that a suspected cause-and-effect relationship exist between two process variables. With the results from these diagrams, you will be able to design experiments or make adjustments to help centre your processes and control variation.

The example below illustrates the relation between hours of training provided to operators and the quality of work they produced.

Operator	Hours of training	Score for production of high quality product
1	5	54



2	10	56
3	4	63
4	8	64
5	12	62
6	9	61
7	10	63
8	12	73
9	15	78
10	12	72
11	12	74
12	20	78
13	16	83
14	14	86
15	22	83
16	18	81
17	30	88
18	21	87
19	28	89
20	24	93



7.5 Action plan

Action Plan

Area:				
Goal/Objective	Proposed action (what & how)	Evidence of progress	Point person/ title	Expected completion date

Signature: _____

Date: _____

