INTRODUCTION

This notes relates to the application of quality standards in the workplace and is appropriate to people employed in a range of workplaces in the rural, regional and remote sectors of a country. Activities and information will cover the maintenance and monitoring of work, production and site quality standards in industries related to people working in an assistant capacity in:-

- Civil construction/building
- Resources/Infrastructure
- Agribusiness/food production

Topics include planning and preparing for quality work outcomes, applying quality systems to individual work activities, and monitoring and reporting quality standards on a worksite. Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and industry sectors. Skills and knowledge developed will ensure ability to follow quality standards and procedures appropriate to workplace and industry sector. Resources and activities provided are designed to develop skills and provide formative assessments to monitor progress. The outcomes need to be applicable to quality work habits across all industry sectors but will also relate to skills specific to current workplace/industry sector. Completion of appropriate summative assessments provided by Registered Training Organization (RTO) will enable to achieve competency in the unit applicable to sector.

These learning materials discuss issues related to quality standards in the workplace including:-

- Plan and prepare for quality work outcomes.
- Access, interpret and apply documentation including quality standards to work activities

What is quality?

If a product fulfils the customer's expectations, the customer will be pleased and consider that the product is of acceptable or even high quality. If his or her expectations are not fulfilled, the customer will consider that the product is of low quality.This means that the quality of a product may be defined as "its ability to fulfill the customer's needs and expectations".

Quality needs to be defined firstly in terms of parameters or characteristics, which vary from product to product. For example, for a mechanical or electronic product these are performance, reliability, safety and appearance. For pharmaceutical products, parameters such as physical and chemical characteristics, medicinal effect, toxicity, taste and shelf life may be important. For a food product they will include taste, nutritional properties, texture, and shelf life and so on.

What value would be added by applying quality standards?

Establishing quality standards is it achievable? Changes are coming rapidly in this area. Standards developed may not be relevant now. It was felt that moving forward, any standards needed to be consensual; they needed to help shorten the process, improve communication and help in sharing understanding.

Guidelines and checklists would be useful to the commissioning manager and to aid evaluation however, it was felt that to provide pedagogical standards would be a minefield, as there is so little agreement.**What should standards address?**

There are at least three aspects to the issue of standards:-

(1) Providing best practice guidelines to support design and development
(2) Providing a gateway to content being published a form of quality assurance and
(3) Tracking effectiveness.

What should be considered in establishing standards?

- Have learner needs been adequately identified? Is learning the right method? What has worked and what hasn't?
- You could map materials to pedagogical models as a form of tagging.
- It is more important to see how learners apply the learning. How do you measure application?
- It is difficult to set the standard through objective measures, although the subjective experience is useful feedback.
- It is important to see learning as only a part of the overall learning process – not necessarily an end in itself. Learning may be only part of a blend, so some aspects of the standards must extend beyond learning to the overall intervention, which might include informal elements.

A concern with the setting of standards - who is to say what will work for the learners?

Quality Indicators

1. Program Planning Quality Indicator

A quality program has a planning process that is ongoing and participatory. It is student-centered and guided by evaluation. It is based on a written plan that considers community demographics, needs, resources, and economic and technological trends. It is implemented to its fullest extent.

2. Administration Quality Indicator

Program has a management system that ensures accurate accounting of personnel, budgets, inventory, and student records.

3. Curriculum and Instruction Quality Indicator

The program has appropriate curricula and a variety of methods to meet diverse student learning needs.

4. Educational Gains Quality Indicator

Students advance in the instructional program or complete program educational requirements that allow them to meet their goals, continue their education or training, or become employed.

5. Staffing and Staff Development Quality Indicator

The program has an ongoing process to select, develop, and retain staff members who consider the specific needs of their students, offer training in the skills necessary to provide quality instruction, and include opportunities for practice and systematic follow-up.

6. Student Support Services Quality Indicator

The program identifies student needs for support services, and makes services available to students directly or through referral to other educational and service agencies.

7. Recruitment Quality Indicator

The program successfully recruits the population in the community identified in the Adult Education and Family Literacy Act (AEFLA) as needing services.

8. Retention Quality Indicator: - Students remain in the program long enough to meet their educational and follow up-goals.

HUMAN FACTORS IN PRODUCT QUALITY

It is commonly believed that most quality problems are caused primarily by lack of interest or care on the part of the worker in the production department. However, it is usually not the worker who can be blamed for this, since the conditions necessary to carry out the work correctly often do not exist. For example, instructions may be inadequate, the incoming material may be defective, the machines may not be capable of producing goods of the required quality, and proper conditions for conducting inspection of the product are not given to the workers and so on.

In Japan, it is generally believed that 40% of quality problems are caused by poor product design, 30% of quality problems are caused by wrong or defective materials being purchased from suppliers and the remaining 30% are due to errors made during the manufacturing process.

Both design and purchase problems can be solved only by intervention of the management and workers have no control over them. One could argue that the remaining quality problems in manufacturing are caused in equal proportion by managers (by not providing adequate training for workers) and by workers (e.g. by not paying adequate attention to machine settings).

Thus 85% of problems come under management control, whereas 15% are under worker control. Here too the worker can only be held responsible for the defects if:

- He or she knows what he or she is supposed to do
- He or she knows the result of his or her own work
- He or she has the means to influence the result.

There is another method that product quality can be improved through propaganda andother motivational activities. This is based on the false assumption that human errorsare primarily the result of lack of interest or care on the part of the people involved.Experience shows that considerably better results can be achieved if instead it is ensuredthat the proper conditions exist for doing good work or getting things right the firsttime, for example:

- The product specification must be clear and unambiguous
- The technical conditions must be such as to enable the quality requirements to bemet, for example, the materials must be appropriate for the work and the machinesmust be capable of producing the required quality. Everyone must know what to do to prevent poor work.
- Everyone must know the consequences of poor work for the organization.For an organization to reach an adequate standard of quality, the people at all levelsmust cooperate actively. This means continuous staff development. The Japanese “revolutionin quality” is largely the result of comprehensive education and training aimedat all functions and levels, from the top management to the worker level.

SIMPLE TOOLS FOR QUALITY CONTROL

Seven quality control tools

The seven quality control tools were developed by Kaoru Ishikawa, known as the “father of quality control circles”. It has been the Japanese experience that 95% of problems in the workshop can be solved by using the following seven simple quality control tools and by the effective working of quality circles:

- Process flow charts

- Check sheets
- Graphs
- Pareto analysis
- Cause and effect diagrams
- Scatter diagrams
- Control charts

Process flow charts

Process flow charts record a series of events and activities, stages and decisions in a form that can be easily understood and communicated to all. Figure below give an example of a flow chart. Flow charts can also be used as a problem-solving tool. For this, first a flow chart is drawn up by a team of persons in order to reflect the way the process actually works. Then the members of the group are asked to draw up a flow chart on how the process should work ideally. The difference between the two represents the problems to be solved. It thus helps first to understand the process and then to make improvements.

Check sheets

Check sheets, or tally charts, are a simple device on which data is collected by putting a mark against predetermined items of measurement. The purpose for which the data is collected should always be clear. For example, check sheets can be used totrack events by factors such as timeliness (in time, one day late, two days late, etc.), reasons for failure during inspection (defects like blow holes, cracks, etc.) or number of customer complaints per day. An example check sheet for the final inspection of bracket casting in a foundry shop is shown in figure II.

Figure I. Flow chart for obtaining spare parts for maintenance activity

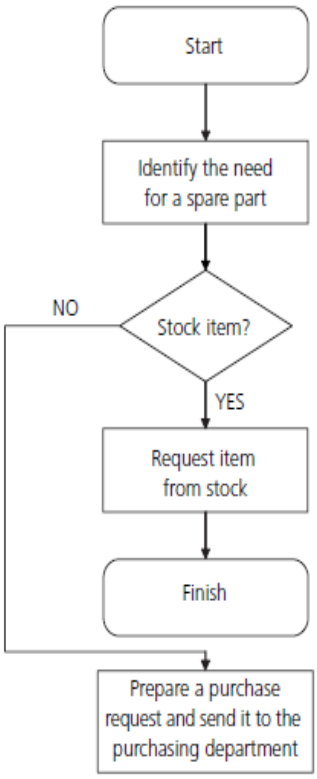


Figure II. Check sheet for final inspection of bracket casting

Check sheet

Product: Bracket casting — Date: 24 November 2004
Stage: Final inspection — Shop: Foundry
Total number inspected: 800 — Inspector: _____

Defect type	*Check*	*Subtotal*
Cracks	𝍸|	7
Blow holes	𝍸 | | 𝍸 | | —	18
Out of shape	𝍸 | | 𝍸 —	12
Others	𝍸 | | 𝍸	14
	Total	**51**

Graphs

There are numerous types of graphs, ranging from simple plotting points to a graphicpresentation of complex and interrelated data. Graphs are a good way to organize,summarize and display data for subsequent analysis. The most common examples ofgraphs are histograms (figure III) line graphs, pie charts (figures IV and V).

Figure III. Histogram of weights of bars

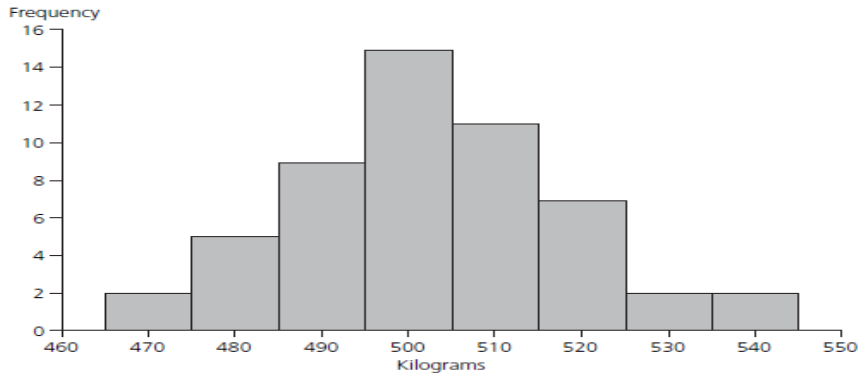


Figure IV. Radar chart of monthly temperatures in three cities

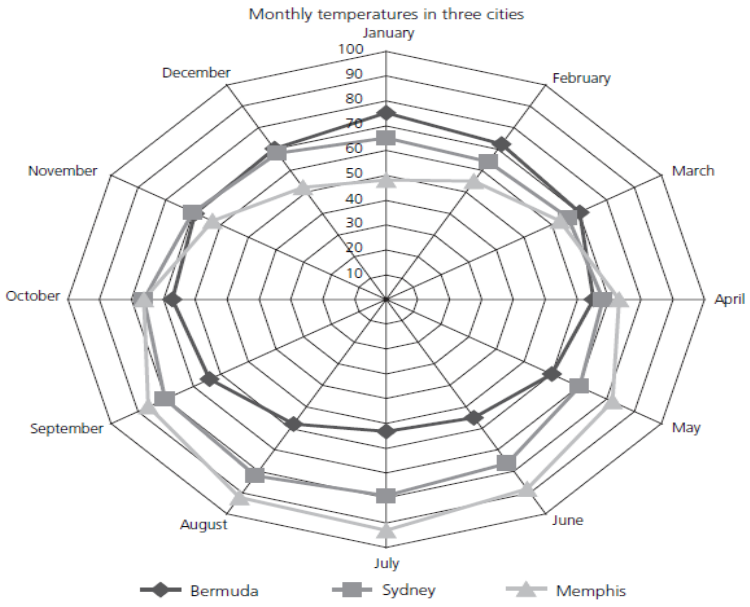
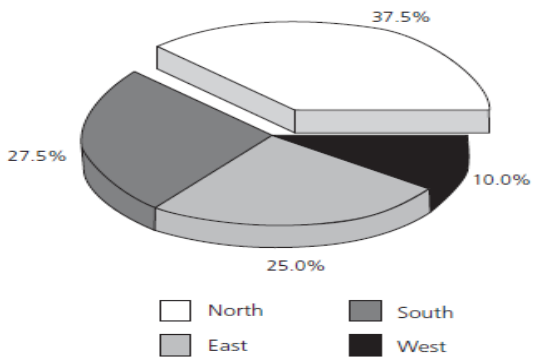


Figure V. Pie chart of customer complaints, by zone



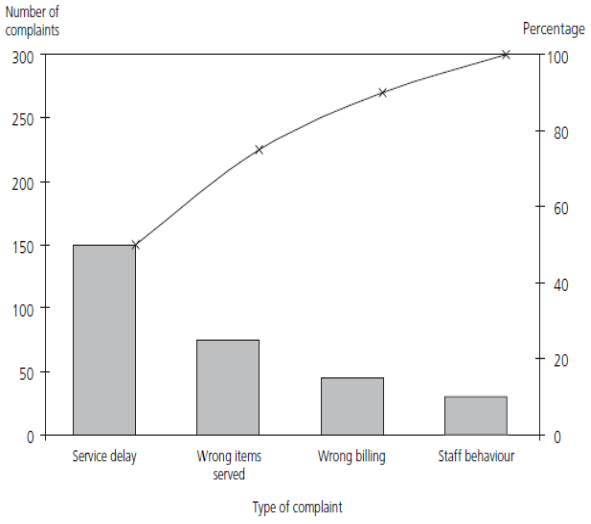
Pareto analysis

Pareto analysis is based on a bar graph and a line chart. The bar graph lists in descending order the problems affecting a process. The line chart accumulates the percentage of the total number of occurrences for each problem area. The other name of this tool is the 80-20 rule, indicating that 80% of the problems stem from 20% of the causes. It helps to identify the most important area to work to solve the problem. Joseph M. Juran, an expert on quality control, has said that one should concentrate on the "vital few" rather than the "trivial many" in tackling quality problems.

The complaint data is shown in the table below. The Pareto diagram of this data is shown in figure VI.

Type of complaints	*Number*	*Percentage*	*Cumulative percentage*
Service delay	150	50	50
Wrong items served	75	25	75
Wrong billing	45	15	90
Staff behaviour	30	10	100
Total	**300**	**100**	

Figure VI. Pareto analysis of complaints received in a restaurant

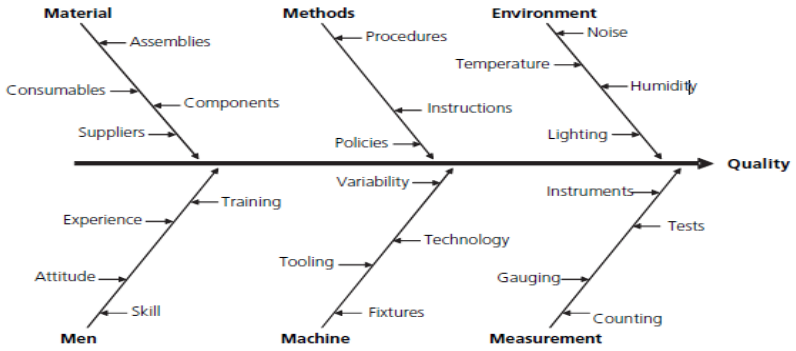


The above analysis shows that 75% of customer complaints are related to service delays and wrong items being served. Based on this finding, the above example can use cause and effect diagrams to determine the root cause of these two major problems.

Cause and effect diagrams

Cause and effect diagrams represent the relationship between a problem and its potential causes. They are also known as fishbone, or Ishikawa, diagrams. These diagrams deal only with factors, not quantities. To prepare a fishbone diagram, all the causes relating to a problem (effect) are collated through brainstorming among the people concerned. The problem is indicated on the horizontal arrow (see figure VII). All the causes listed from the brainstorming are classified by theme. Each theme represents a diagonal attached to the spine of the diagram. Individual causes are listed along the diagonal. Figure VII shows a cause and effect diagram of factors affecting quality.

Figure VII. Factors affecting quality



Scatter diagrams

Scatter diagrams are used to study the possible relationship between one variable and another. This can be used to test the possible cause and effect relationship. It does not prove that one variable causes the other, but it does make it clear whether a relationship exists between them and determines the strength of the relationship.

Usually the horizontal axis in the diagram is the one over which there is control. Each data point as observed is plotted. The more closely the dots group along an axis, the stronger the correlation. The more scattered they are, the weaker the correlation. Figure VIII shows an example scatter diagram showing a positive relationship and figure IX shows a negative relationship.

Figure VIII. Scatter diagram: positive relationship

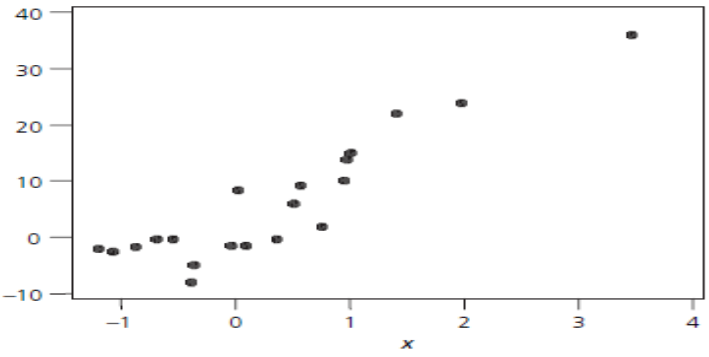
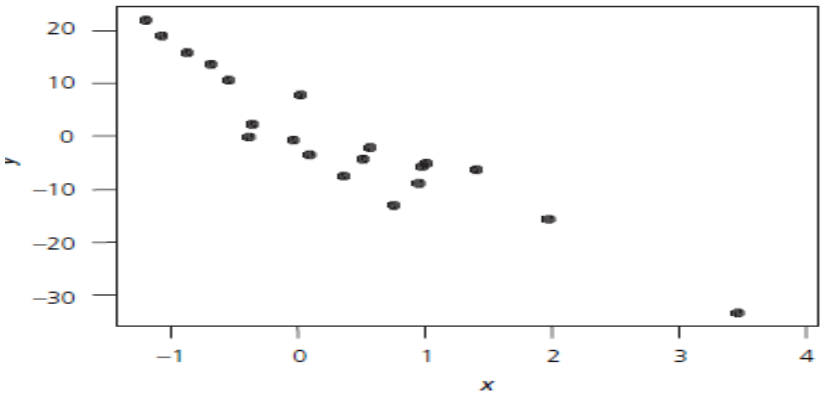


Figure IX. Scatter diagram: negative relationship



Control charts

Control charts are pictures of variations found in a process. The data of measurement or observations is plotted on graphs against time. These charts consist of two lines, called upper control limit (UCL) and lower control limit (LCL). These are not the same as specification tolerances; rather they are the values within which a process is expected to operate and if the results of measurements exceed these limits then the cause must be investigated and action taken on the process immediately.

In order to reduce variations in the process, fundamental changes may need to be made in methods, machines and/or materials. Control charts help to monitor and control quality by acting as a set of process "traffic lights" and are valuable in all types of activity.

Control charts can be plotted for variable or continuous data (such as weight of a bag, temperature of cold storage, and time of baking, dimension of a rod or speed of a conveyor).

Control charts for variables consist of mean and range charts (see figure X).

Control charts can also be plotted for attribute or discrete data such as the number of defects found in a lot, the number of cracks in a piece, the number of missing stitches in a garment, percentage delays in shipments or percentage delays in responding to customer complaints. As regards attribute data, the two most popular charts are control charts for the number of defective items in a lot, known as an "np-chart" (figure XI) and the proportion of defective items, known as a "p-chart" (figure XII).

Figure X. Mean (Xbar) and range (R) charts

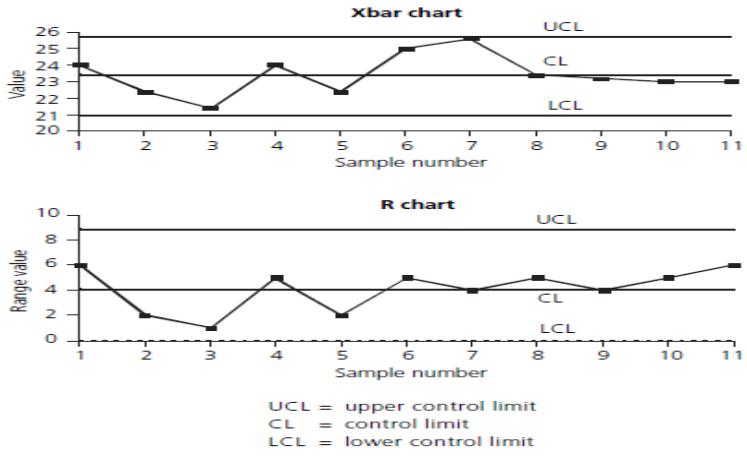
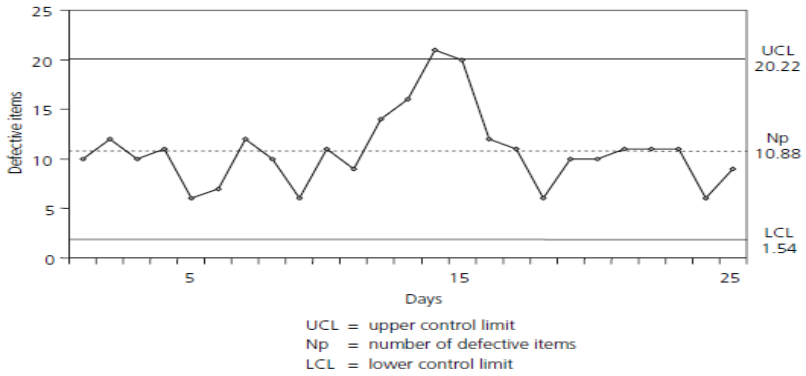
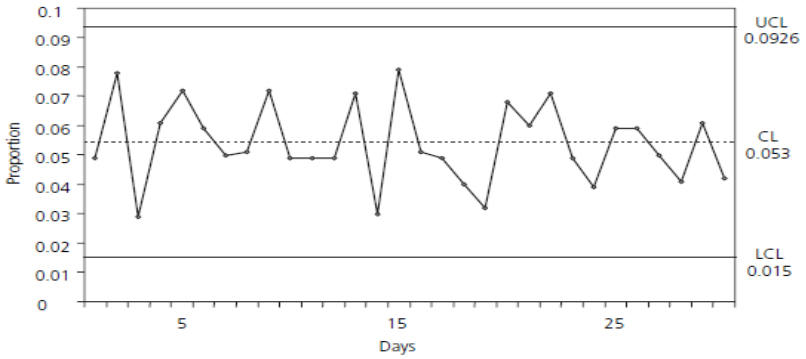


Figure XI. Number of defective items (np-chart)



UCL = upper control limit
Np = number of defective items
LCL = lower control limit

Figure XII. Proportion of defective items (p-chart)



UCL = upper control limit
CL = control limit
LCL = lower control limit

Other good practices

While the above seven quality control tools can help operators and supervisors to monitor their processes and find the causes of variations, there are other simple practices that have been very successfully practiced in Japanese industry. They are:

- Japanese 5S
- Quality circle
- Kaizen

Japanese 5S

Japanese factories are reputed for their cleanliness and orderliness. They follow thewell-known "5S" practice, which refers to the following five Japanese words:

- Seiri (Structurize: organize well)
- Seiton (Systemize: neatness in all areas)
- Seiso (Sanitize: cleanliness)
- Seiketsu (Standardize)
- Shitsuke (Self-discipline: do 5S daily)

Seiri (Organization):- This means separating things that are necessary for the job from those which are not, or keeping the number (inventory) of necessary ones as low as possible and at a convenient location. In other words, unnecessary items in the workplace should be sorted out and discarded.

Seiton (Neatness):- The necessary items should be arranged in good order so that they can be easily picked out for use.In other words, a place for everything and everything in its place.

Seiso (Cleanliness):- The workplace should be completely cleaned so that there is no dust on the floor or on any machines or equipment. Cleaning should be done by everyone in the organization, from the managing director to the worker level.

Seiketsu (Standardization):- The above standards of neatness and cleanliness should be maintained on a regular basis as a system. In other words, company standards or work instructions should be set for such practices to be followed by all.

Shitsuke (Discipline):- A workplace with good habits should be created. Training should be given to everyone who needs it and everyone should put their training into practice.

Quality circles

A quality circle is a small group of staff working together to contribute to the improvement of the enterprise, to respect humanity and build a cheerful work group through the development of the staff's infinite potential. A quality circle team usually comes from the same work area. Quality circle teams meet voluntarily on a regular basis to identify, investigate, analyze and solve their work-related problems. It has been the experience of Japanese industries that 95% of problems at the workplace can be solved by using the above seven quality circle tools and by the effective work of quality circles.

Kaizen

Kaizen is a Japanese word, which means "continuing improvement". A company will fail if the people working in it have attitudes such as "we have done enough", "let's stop here", and "we will hold our performance at this level" and so on. The fact is that every company works under two external pressures, one from its customers and the marketplace, which are demanding better and better products and services, and secondly from improvements made by competitors. It is therefore necessary to build awareness of kaizen as a continuous process throughout the organization. Kaizen recognizes the following principles:

- Maintaining standards is the responsibility of the workers, while the management's role is to raise standards
- Small and gradual improvements in work standards should be made
- Problem-solving tools (the seven quality circle tools) should be used
- Not a day should go by without some kind of improvement being made somewhere in the company.

The introduction and direction of kaizen should be top-down, but the suggestion has also been made that it should be bottom-up, as specific suggestions for improvement usually come from the people who are closest to the problem. The kaizen strategy therefore calls for both a top-down and a bottom-up approach.

Quality Management System (QMS):- Quality management can be defined as the total of activities and decisions performed in an organization to produce and maintain a product with desired quality levels against minimal costs. A QMS can therefore be defined as 'management of a system to ensure quality product'.

Quality Assurance: - Quality Assurance, or QA for short, refers to a procedure for the systematic monitoring and evaluation of individual aspects of a production line, process, service, or facility to ensure that standards of quality are being met.

• Two key principles characterize QA: – "fit for purpose" (the product should be suitable for the intended purpose) – "right first time" (mistakes should be eliminated). QA includes regulation of the quality of raw materials, assemblies, products and components, services related to production, and management, production and inspection processes.

It is important to realize also that quality is determined by the intended users, clients or customers, not by society in general; it is not the same as 'expensive' or 'high quality'. Even goods with low prices can be considered quality items if they meet a market need. QA is more than just testing the quality of aspects of a product, service or facility, it analyses the quality to make sure it conforms to specific predetermined standard.

Quality Control: - Quality control is the testing of completed products to uncover defects, and reporting to management who make the decision to allow or deny the release of the product within the broader Quality Management System

Fixing product specifications

A specification is the minimum requirement according to which a producer or service provider makes and delivers the product and service to the customer. In setting specification limits, the following should be considered:-

- ❖ The user's and/or customer's needs
- ❖ Requirements relating to product safety and health hazards provided for in the statutory and regulatory requirements
- ❖ Requirements provided for in national and/or international standards
- ❖ The competitor's product specifications, in order to gain marketing advantages

In designing the product, the capacity of processes and machines should be kept in mind. It is also necessary to maintain a balance between cost and value realization. The clearer the specification, the better the possibility of creating and delivering quality products.

Preparing product design

The specifications and drawings produced by the designer should show the quality standard demanded by the customer or marketplace in clear and precise terms. Every dimension should have realistic tolerances and other performance requirements should have precise limits of acceptability so that the production team can manufacture the product strictly according to specification and drawings.

To achieve the above, those responsible for design, production and quality should be consulted from the sales negotiation stage onwards. The overall design of any product is made up of many individual characteristics. For example these may be:-

- ❖ Dimensions, such as length, diameter, thickness or area
- ❖ Physical properties, such as weight, volume or strength
- ❖ Electrical properties, such as resistance, voltage or current
- ❖ Appearance, such as finish, colour or texture
- ❖ Functional qualities, such as output or kilometer per liter

- ❖ Effects on service, such as taste, feel or noise level.

Manufacturing drawings and specifications are prepared by the designers and these should indicate to the production team precisely what quality is required and what raw materials should be used.

Preparation for manufacture

After the design, including the manufacturing drawings, has been reviewed and finalized, it is time to plan for manufacture. This will include the following steps:

(a) Deciding on the method of manufacture. Methods must be devised that permit the operators and processes to make the product in the quickest, easiest and most foolproof way, including preparation of manufacturing instructions, setting up procedures, listing various operations and so on;

(b) Providing the necessary machines, plant, tooling and other equipment. Everything that is required for manufacture must be selected, taking care that all the elements are capable of achieving the standard of quality demanded;

(c) Obtaining satisfactory raw materials. No one can make a good product from unsatisfactory raw materials, so every material must have a precise written buying specification so that the purchasing department can buy exactly what is required. Often purchasers are expected to buy from suppliers who have been assessed and approved by them and when supplies arrive the goods should be checked before acceptance into stores.

(d) Obtaining and training suitable operators. Operators who are willing and able to do the work in a satisfactory manner must be chosen and given whatever training they need;

(e) Planning inspection and shop floor quality control. Plans for inspection activities should be prepared, proper workplaces provided for inspection staff, written inspection procedures prepared, inspection equipment provided, checking and calibration of inspection equipment planned for, inspection personnel selected and trained runs carried out. One should never attempt to solve a quality problem by carrying out more inspections.

Manufacture

Once the design and planning for manufacture have been completed, the manufacturing can begin. If the planning has been well done, there should not be too many problems. During manufacture the following are the most common factors that can affect quality:

(a) Set-up. Some processes, such as punching, cutting, printing and labeling, are so consistent that, if the initial set-up is correct, the whole lot will conform to the specifications. However, the initial set-up has to be checked by carrying out first-piece inspection;

(b) Machines and tools. From time to time changes can occur in machine or tool settings, which can then lead to defects. Processes of this type include machining, resistance welding and filling.

(c) Operator. There are some processes where the result depends on the skill and attention of the operator, such as welding, hand soldering and painting processes. For such processes it is necessary at the manufacture planning stage for the operator's working methods to be decided upon;

(d) Materials and components. It is important to ensure the quality of raw materials and components by undertaking regular checks on the suppliers' processes and also where necessary by carrying out incoming inspection.

Correction of quality deficiencies

In spite of all the efforts made, the required quality will sometimes not be attained and one may be faced with a scrap and rework. This means that something has gone wrong during the quality planning and maybe also during the manufacturing process. The reason for the trouble must be located and permanently corrected so that it cannot happen again. The following are obvious possibilities:

- The shop-floor operators had no clear idea what standard of quality was required
- The method was such that it was very difficult to get the job right, but very easy to get it wrong
- The machine and equipment were incapable of achieving the tolerances required
- The incoming materials and components were unsatisfactory
- The operators were untrained and not up to the job
- Shop-floor quality control was either not properly planned or not properly executed, or both.

Coordination

It is obvious from the above steps that everybody in the company, that is the salesmen, designers, purchasing, stores and methods staff, plant engineers, jigs and tool personnel, production planning and production staff, operators, inspection and testing staff, packaging, and dispatch and so on, are responsible for product quality. Indeed, quality is everybody's business. Unfortunately, if care is not taken, it ends up being nobody's business. It is therefore important to ensure that everyone is quality-conscious and that they all work together on matters related to quality

The National Quality Framework includes:

Anational legislative framework that consists of:

- The Education and Care Services National Law ('National Law')
- the Education and Care Services National Regulations ('National Regulations')

ANational Quality Standard consisting of seven Quality Areas:

- Educational program and practice
- Children's health and safety
- Physical environment
- Staffing arrangements
- Relationships with children
- Collaborative partnerships with families and communities
- Leadership and service management.

A national quality rating and assessment- process through which services are assessed againstthe National Quality Standard by regulatory authorities and provided with a quality rating.

A regulatory authority in each state and territory has primary responsibility for the approval,monitoring and quality assessment of services in their jurisdiction in accordance with thenational legislative framework and in relation to the National Quality Standard

A national bodywhich oversees the new system and guides its implementationin a nationally consistent way.The National Law, the National Regulations and the National Quality Standard (which is locatedin a schedule to the National Regulations) are the key legislative documents that establish theNational Quality Framework.

To assist services to meet the requirements of the National Quality Framework, a rangeof supporting guides and resources are available.

The National Quality Standard

The National Quality Standard is a schedule to the National Regulations.The National Quality Standard sets a new national benchmark for the quality of education andcare services. It also gives services and families a better understanding of a quality service.

The National Quality Standard brings together seven key Quality Areas that are importantto outcomes. These are:

QA1 Educational program and practice
QA2 Children's health and safety
QA3 Physical environment
QA4 Staffing arrangements
QA5 Relationships with children
QA6 Collaborative partnerships with families and communities
QA7 Leadership and service management

The National Quality Standard allows each service to adopt approaches that are mostappropriate to the training being educated and cared for at that service.

QUALITATIVE STANDARDS

A. Quality Control:-Team members should work cooperatively with each otherand their supervisors to understand not only what work they are to do and howthey are to proceed, but why the work is to be done and what it is expected toaccomplish.

B. Planning The second qualitative standard for investigative organizations is: **Investigative work is to be adequately planned**.Effective planning provides the basis toclearly identify the investigative issues to be addressed prior to initiating theinvestigation and includes preparing a written investigative plan spelling out theobjectives of the investigation and specific investigative steps to be performed.

C. Data Collection and Analysis

The third qualitative standard for investigative organizations is:**Information and data gathered during an investigation should becarefully documented and organized relative to case objectives.**

Appropriate investigative techniques should be chosen and employed toensure that the data gathered are sufficiently reliable for making judgmentsregarding the matters being investigated.Sources of investigative information should be documented in sufficient detailto provide a basis for assessing its reliability.

D. Evidence:-The fourth qualitative standard for investigative organizations is:**Sufficient, competent, and relevant evidence is to be obtained to afford a reasonable basis for the investigative findings and conclusions.**

E. Timeliness: -The fifth qualitative standard for investigative organizations is:**Investigationsshould be conducted in a timely manner.**

Timeliness increases the value of investigations. The nature of investigationsalso requires that schedules be flexible in order to respond to changingpriorities or unforeseen circumstances, such as the need to expand the scopeof an investigation or respond to an emergent need caused by other events.

F. Reporting:-The sixth qualitative standard for investigative organizations is:**Where appropriate, investigative activity should result in a timelyreferral for criminal prosecution or written report. All reportsshall present factual data accurately, fairly, and objectively, andpresent the results of investigation in a persuasive manner.**

G. Confidentiality:-The seventh qualitative standard for investigative organizations is:**They should establish and follow procedures for safeguardingthe identity of confidential sources and for protecting privilegedand confidential information.**

H .Follow-Up:-The eighth qualitative standard for investigative organizations is:Appropriate follow-up to administrative or systemic issuesidentified by investigators should be performed to assure that anyrecommendations made to appropriate officials are adequatelyconsidered and properly addressed.

Quality standards for inspections, evaluations, and reviewsgeneral standards

A. Staff Qualifications

The first general standard for inspections, evaluations, and reviews is:Individuals assigned to conduct inspection, evaluation, and review activities should collectively possess the knowledge, skills, and experience required for the work.

B. Independence

The second general standard for inspections, evaluations, and reviews is:The Inspector General and staff involved in performing or supervising any assignment should be free from personal or external impairments to independence and should constantly maintain an independent attitude and appearance.

C. Due Professional Care

The third standard for inspections, evaluations, and reviewsis:Due professional care should be used in conducting inspections, evaluations, and reviews and in preparing accompanying reports.

Due professional care requires:

Standards: -In conducting an inspection, evaluation, or review, staff should employ the methods of inquiry most appropriate for the object of study. They may rely on the work of others to the extent feasible once they satisfy themselves of the quality of the work by appropriate tests or by other acceptable means.

Thoroughness - Inspections, evaluations, and reviews should be conducted in a diligent and complete manner, and reasonable steps should be taken to ensure pertinent issues are sufficiently resolved and to ensure that all appropriate criminal, civil, contractual, or administrative remedies are considered.

Legal Requirements - Inspections, evaluations, and reviews should be initiated, conducted, and reported in accordance with all applicable laws, rules, and regulations.

Appropriate Techniques - Methods and techniques used in each inspection, evaluation, and review should be appropriate for the circumstances and objectives.

Objectivity - Evidence should be gathered and reported in a fair, unbiased, and independent manner to convince the report user of the validity of the inspection, evaluation, or review.

Ethics -At all times the actions of staff should conform to the highstandards of conduct expected from staff.

Timeliness - Work should be conducted and reported with due diligenceand in a timely manner while recognizing the individual complexities of eachcase or project situation.

Accurate and Complete Documentation - Report findings, conclusions, and recommendations should be supported by adequate documentation.

Coordination - Appropriate staff should coordinate the results of the inspections, evaluations, and reviews with appropriate officials.

Why inspection?

By "inspection" it is usually meant that, at certain stages in the course of production, a comparison is made between what has actually been produced and what should have been produced. The standard of reference may be a specification, drawing or a visual quality standard. The check made must be appropriate to the job and must be made with suitable measuring instruments. Inspectors should not waste time checking things that do not matter or fail to do a check that is important. Things that are unlikely to go wrong need little checking and those which are difficult to hold within limits will need a considerable amount of attention.It is a misconception that the inspector alone is responsible for quality. Quality results from a combination of quality of the original designs, the methods, equipment and materials used and the skill and care of the operator. In spite of these, if the job is still wrong, no amount of inspection will put it right.

Different forms of inspection

According to production flow, the inspection may be divided into:

- Incoming inspection
- In-process inspection
- Final inspection

Incoming inspection

Incoming inspection concerns goods upon delivery from vendors and/or suppliers. It consists of inspection of raw materials, components, sub-assemblies and so on. The aim of incoming inspection is to prevent goods that do not fulfill the quality requirements from entering the production process. Incoming inspection is one of the following steps in the control of the quality of supplies:

- A buying specification is prepared, setting out exactly what quality of material has to be obtained;
- Possible suppliers are checked for their ability and willingness to provide this quality. This is called "vendor appraisal" or "supplier evaluation";
- If the results of the vendor appraisal are satisfactory, then the supplier is placed on an approved list and purchase orders are placed when goods are required;
- When goods are received, they are subjected to some form of goods inward inspection;
- The results of the inspection are used to give each supplier a numerical rating, showing how satisfactory or otherwise his suppliers are. This is called "vendor rating";
- The results at every stage are monitored and steps taken to improve or discontinue unsatisfactory suppliers.

In-process inspection

In-process inspection aims to prevent products of unacceptable quality from being manufactured. It provides data for making decisions on the product (accept or rework or reject), as well as on the process (run or stop). In-process inspection can take the form of:

- First-piece inspection
- Patrol inspection
- Operator inspection
- Last-piece inspection
- Stage inspection

While first-off inspection ensures that the job starts correctly, the purpose of patrol inspection is to help the operator to make the whole run correctly. From time to time, the patrol inspector visits the machine or operator and if the quality of the sample checked during the visit is wrong on any point, then this must be corrected as quickly as possible. Operator inspection means that instead of the inspector, the operator carries out the inspection at a predetermined time during manufacturing.

Last-piece inspection is carried out on the last item manufactured in the lot. This allows action to be taken to rectify faults in the machine and/or tools before beginningthe next lot. If these faults are only detected when the next lot has started, there will be a risk of production delays.

Stage inspection involves inspection of products after every operation or group of operations. Stage inspection points are located on the shop floor itself, where components are tendered for inspection. Jobs found to be unacceptable are returned for rectification if they are rectifiable, otherwise they are scrapped.

Final inspection

Final inspection and/or testing is done after manufacture has been completed, with the object of making sure that the goods concerned are satisfactory for dispatch to the customer or maybe to another department for the next operation.

Based on the product specifications, inspection instructions are prepared that lay down the details of the tests to be carried out, the measuring instruments or test equipment to be used and the criteria for deciding acceptance of the product with respect to each characteristic. Measuring instruments or test equipment used for inspection should be calibrated periodically to verify their accuracy.

It is necessary to exercise suitable control over the movement of the product through the inspection area in order to avoid a mix-up of accepted and rejected products. Ways to exercise such control include:

- Provision of clear labels (preferably of different colours) for products awaitinginspection, accepted products, rejected products, products on hold awaiting theresults of tests and/or inspection and so on;
- Separation of accepted and rejected products;
- Review of rejected products for rectification or repair or for sale as seconds;
- The accepted product should only be released to the next process or to the customerby a person who is authorized to do so.