Solar PV System Installation and Maintenance

Level-IV

Learning Guide-42

Unit of Competence	**Establish Quality Standards**
Module Title	**Establishing Quality Standards**
LG Code	**EIS PIM4 M012 LO1-LG-42**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO 1: Establish quality Specifications for product

ADRA Ethiopia

InstructionSheet-1	Learning Guide:-42

This Learning Guide is developed to provide you the necessary information regarding the following **content coverage** and topics

- Sourcing market specifications and identifying legislated requirements
- Developing and agreeing upon quality specifications
- Documenting and introducing quality specifications
- Updating quality specifications

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:-

- Source and legislate market specifications.
- Develop and agree quality specifications
- Document and introduce quality specifications
- Quality specifications are updated when necessary

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the Information Sheets
4. Accomplish the Self-checks

Information Sheet-1	Sourcing market specifications and identifying legislated requirements

1.1. Introduction

The purpose of this guide is to provide information and practical advice about developing written requirements (specifications) for procuring goods and services. What is quality? Quality management is about making organizations perform for their stakeholders – from improving products, services, systems and processes, to making sure that the whole organization is fit and effective.

1.2. Why is Quality Important?

- Waste is reduced
- Accidents and problems eliminated
- Productivity increases
- Operating costs reduced
- Profitability increases
- Competitiveness improves

1.3. Sourcing

Sourcing is defined as a technical activity with the purpose of identifying existing suitable products and services on the market and qualified suppliers available to provide those products and services. Sourcing also aims at collecting and analyzing information about capabilities within the market to satisfy the organization's requirements, such as obtaining updated cost information, determining the appropriate technology and alternative products, as well as identifying appropriate supplier qualification criteria.

Process

The flowchart below shows each of the stages in the sourcing process.

- **Market research**

Market research should identify relevant suppliers and products that could meet the needs of the organization. The amount of effort required for market research depends on the value/risk of the requirement. For small standard procurement activities research may be limited to searching existing rosters and previous contracts. For larger or more complex procurement, extensive market analysis is required.

- **Establishment and signature of short list**

Unless a rule prescribes or a decision is made to proceed with an open tender, or market research justifies a waiver of competitive bidding, a short list of suppliers to be invited should be prepared based on the market research findings. Many aspects should be taken into account when selecting the suppliers for the short list. The overall goal is to increase competition to a maximum, provide a fair chance to a vast number of serious companies in the market, and at the same time ensure economy and efficiency of the procurement process by limiting competition to the most relevant suppliers.

- **Supplier management**

UN organizations strive to continuously identify new suppliers which could broaden the market for products and services procured. Some organizations give particular attention during market research to suppliers from developing countries or rapidly growing new markets, not to favors these suppliers as such but in order to broaden the source range of suppliers.

1.4. What is a specification?

In a procurement context, a specification can be defined as a statement of needs. It defines what the procurer wants to buy and, consequently, what the supplier is required to provide. Specifications can be simple or complex depending on the need. The success of the procurement activity relies on the specification being a true and accurate statement of the buyer's requirements. Apart from being a means of identifying the goods or services required, a specification will form part of any future contract that might result from offers received.

- **A good specification**

  A good design specification should be clear, consistent and exact. Reasonable tolerances should be included and should be non-restrictive to encourage competition. A design specification provides explicit information about the requirements for a product and how the product is to be assembled.

- **Types of specifications**

  a. Functional specifications

  These are specifications that define the function, duty or role of the goods or services. It nominates what the goods or services are broadly required to do. Functional specifications define the task or desired result by focusing on what is to be achieved rather than how it is to be done. They do not describe the method of achieving the intended result. This enables suppliers to provide solutions to defined problems.

  b. Technical specifications

  These are specifications that define the technical and physical characteristics and/or measurements of a product, such as physical aspects (for example, dimensions, color, surface finish), design details, material properties, energy requirements, processes, maintenance requirements and operational requirements. They are used when functional and performance

  c. Performance specifications

  These are specifications that define the purpose of the goods or services in terms of how effectively it will perform, that is, in capability or performance terms. Performance is a logical extension of function. Performance specifications define the task or desired result by focusing on what is to be achieved. They do not describe the method of achieving the desired result. This enables suppliers to provide solutions to defined problems.

1.5. What is legislation?

Legislation (statute law) is written law enacted by a body or person authorized to do so by the Constitution or other legislation.

- Legislation entails enacted law-texts.
- Legislation must be distinguished from other types of law because the rules and principles of statutory interpretation only apply to legislation.

  Law means any law, proclamation, Ordinance, Act of parliament or other enactment having the force of the law.

1.5.1. Types of Legislative Documents

a. Committee Prints

Committee prints may also be compilations of laws under the committee's jurisdiction reprinted as they currently stand or even legislative histories of selected laws compiled by the House's Office of the Legislative Counsel or less often, by the committee staff.

b. Committee Reports

The committee report is a goldmine for legislative history research in that it often sets out in detail the purpose of a given bill, its prior history, and the reasons why the statutory language is worded in a particular way.

c. Floor Debate

Floor debate, especially the consideration of a conference report, is another good, often underutilized source of legislative history

d. Conference Reports

The conference report is an excellent starting point for legislative history research. Unlike committee reports, conference reports are always printed in the Congressional Record

Self-Check-1	Written Test

Instruction: Follow the below selected instruction

Choose the best option & circle the letter of your choice.

N°	Questions
1	_____is written law enacted by a body or person authorized to do so by the Constitution or other legislation. A. Functional specifications B. Technical specifications
2	_____Which One of the following is Types of specifications A. Committee Prints B. Market research C. Committee Reports D. Floor Debate
3	_____Which One of the following is not Types of Legislative Documents A. Committee Prints B. Market research C. Committee Reports D. Floor Debate

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below 2 points

Information Sheet-2	Developing and agreeing upon quality specifications

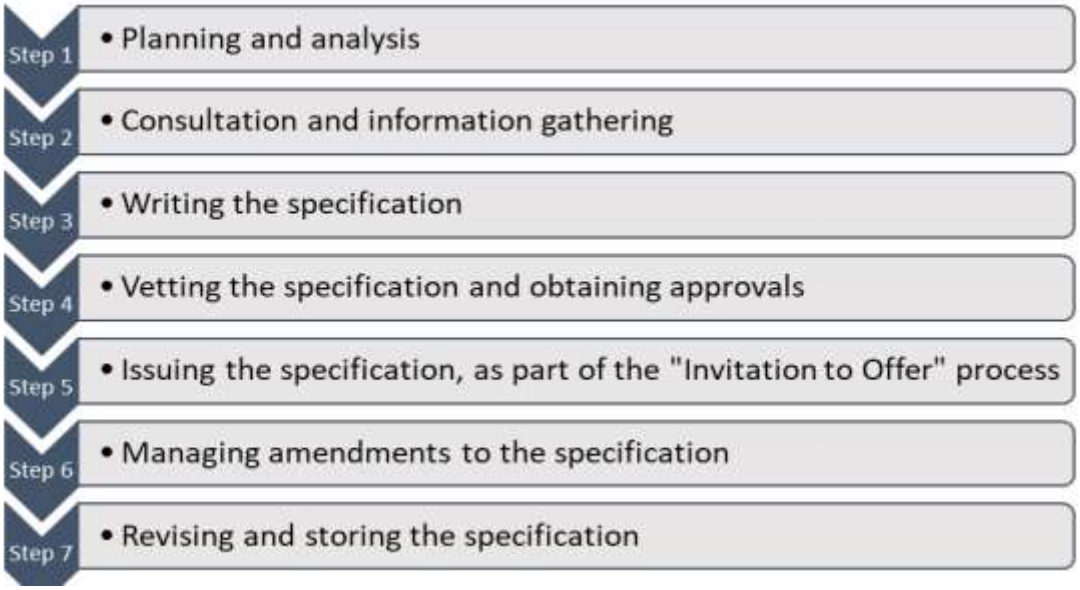
2.1. Introduction

The Quality Standards for Development Evaluation identify the key pillars needed for a quality development evaluation process and product. They are intended for use by evaluation managers and practitioners. The Standards are not mandatory, but provide a guide to good practice.

2.2. Who is involved in developing the specification?

Users of the procured goods or services should be involved in defining their requirements together with appropriate project officers, technical officers (for example, information technology or medical staff) and procurement officers.

Table 1: The process of developing the specification



Step 1: Planning and analysis

The foundation of a good specification is in the planning and analyses which are undertaken before writing begins. Key people who can help such as procurement staff, technical officers, project officers and managers, disability representatives and end users need to be involved. Planning and analysis will provide a better understanding of the requirement(s) and may reveal alternative solutions. Planning and analysis are particularly important when developing complex requirements. These may take some time to define, perhaps even years in the case of major

equipment. The accuracy and detail of the definition is likely to improve as information is gathered and assimilated. Define the requirement(s) and then approach industry to see what is available to meet the department's/agency's needs. If industry is approached too early in the development process, there is the risk of deciding the solution to the problem before the requirement(s) is fully defined.

Step 2: Consultation and information gathering

Developing specifications requires consultation and can be perceived as an evolutionary process involving close and continuous liaison between the end-user, technical officers, project officers/managers, procurement officers and the specification writer. Valuable information and advice relating to the requirement can be obtained by discussing it with procurement officers, technical officers and other users of similar goods or services within the department/agency. Procurement officers should be involved from the start of the process (that is, the information gathering and design stages). Other sources of information include:

- Other departments or agencies (including federal and local governments)
- Industry - either industry associations or particular companies (ensure that industry does not assume pre-offer negotiations)
- Educational institutions, for example, universities and TAFE Institutes
- Standards Australia
- Industry Capability Network Queensland which can assist in identifying and evaluating appropriate
- local industry capabilities
- Disability representatives on category council industry reference groups
- Other users of the goods or services.

Step 3: Writing the specification

Some writing tips:

- Use simple, clear language without jargon (to minimize misinterpretation)
- Define terms, symbols and acronyms (include a "Glossary of Terms")
- Be concise
- Do not explain the same requirement in more than one section

- Define each aspect of the requirement in one or two paragraphs where possible
- Adopt a user-friendly format
- Number the sections and paragraphs
- Seek feedback from someone unfamiliar with the requirement
- Discuss the draft and refine it

Step 4: Vetting the specification and obtaining approvals

After writing the specification, ask a colleague who is unfamiliar with the requirement to critique it from a potential supplier's view. Try to identify improvements by considering:

- Readability
- Simplicity of meaning
- Clarity
- Logic.

Seek approval from the appropriate financial or procurement delegates in the department/agency after vetting the specification but before issuing it.

Step 5: Issuing the specification

The specification should be included as part of the "Invitation to Offer" document.

Step 6: Managing amendments to the specification

Should a need arise to amend the specification during the "Invitation to Offer" process, the amendment should be authorized by the project manager. The amended specification should be noted in the project files and all offers or potential offers must be given a reasonable opportunity to offer to the new specification.

Step 7: Revising and storing the specification

The specification should be reviewed at the end of the procurement activity to ensure that it effectively defined the goods or services that were actually bought. If areas for improvement are identified, revise the specification with the benefit of hindsight.

Self-Check-2	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	Writing the specification do explain the same requirement in more than one section
2	The Quality Standards for Development Evaluation identify the key pillars needed for a quality development evaluation process and product…..T
3	Consultation and information gathering Other users of the goods or services.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet-3	Documenting and introducing quality specifications

3.1. Documenting quality specifications

Quality Documentation means the quality manuals, quality plans, quality procedures, calibration, sample, trial, inspection and test plans, work instructions or like documentation, as appropriate, which describe and define a quality management system under the quality management plan for the design, construction, operation and management of the Toll Road in accordance with the Concession Specification and include the health and safety management plan and the environmental management plan as set out in Schedule.

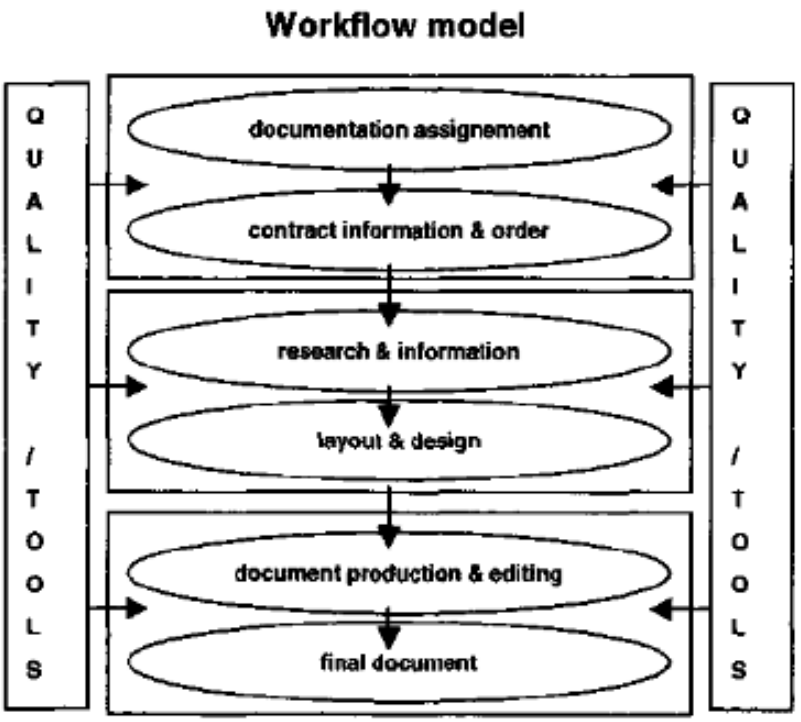
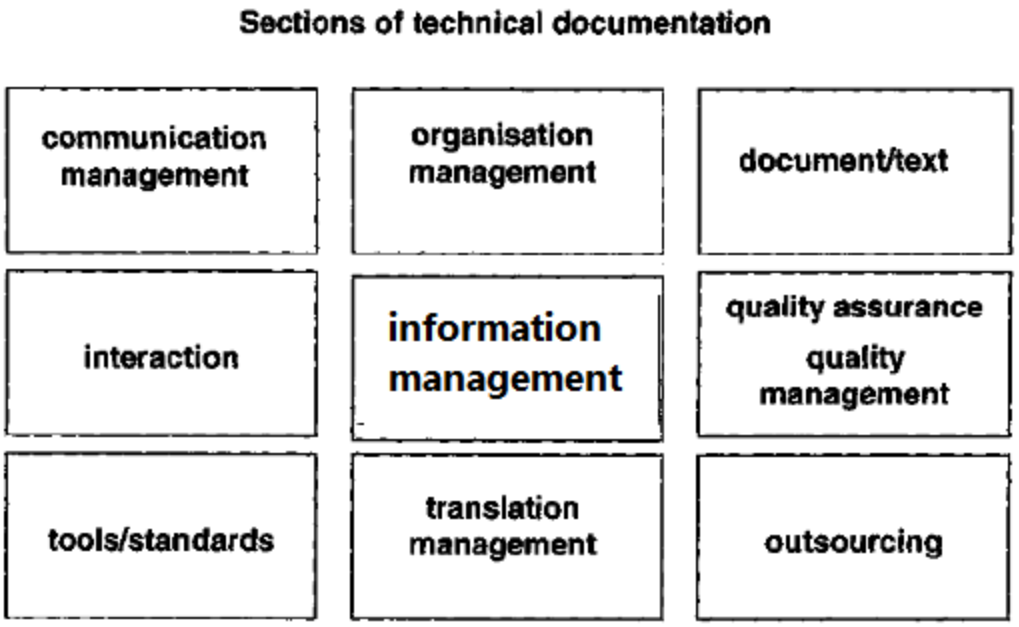


Figure 3: Workflow model

It was assumed that such a process would originate in a translation or documentation assignment by a customer (this includes in-house orders), and would ultimately culminate in contract information, research and information stages, document production, construction and layout stages, proof-reading, and final print and on-line document versions. Parallel to the workflow, the different workflow sections were grouped into the main components of research and development, as indicated in Figure 3, and data was collected for each of them. The information area contained in Figure 3 is purposely put at the center of attention. The information section and the

module information will be used as an example throughout the rest of this paper. This collection of sections was used to help classify and structure the bulk of the data, as well as theories available, and to group and regroup the variety of factors relevant to quality assurance in technical documentation.



Sections of technical documentation

Self-Check-3	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	Workflow sections mean the quality manuals, quality plans, quality procedures, calibration, sample, trial
2	Documentation assignment is Sections of technical documentation

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 4	Updating quality specifications

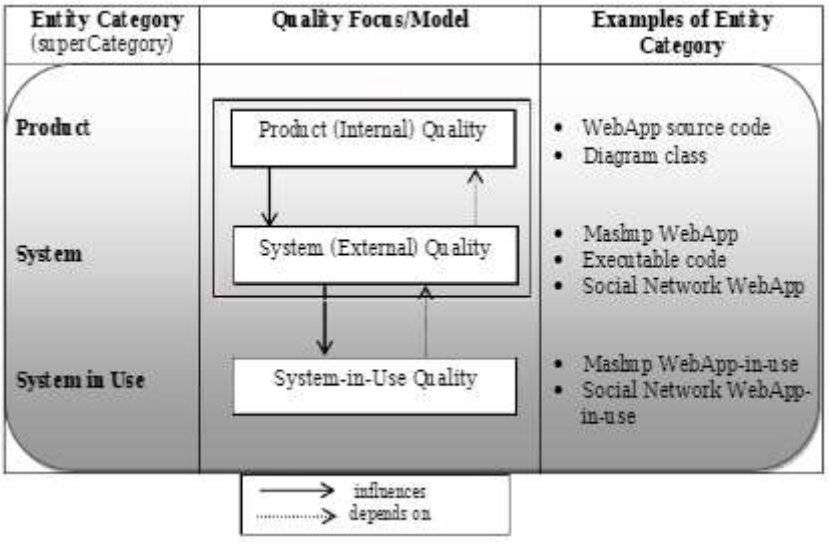
4.1 The importance of updating quality documentation

Updating quality documentation is crucial in more than one respect. First of all, it is a guarantee that the know-how and knowledge created and acquired by the company will not be lost. To achieve the goals set by the company, it pursues a knowledge management policy by ensuring the identification, analysis, organization, memorization and sharing of knowledge. The systematic updating of documentation, therefore, makes it possible to capitalize on this know-how and transmit it to employees, whether they are newcomers to the company or existing employees who are responsible for replacing others in the event of unavailability (hence greater versatility). New recruits and internal replacements can thus refer to valid documents, effectively guiding them in the performance of their tasks and reducing the risk of error. In addition, updating quality documents ensures that improvement actions are always in the right direction, that they are not affected by any flaws and that they do not force us to go back.

4.2 The different sources of the quality update

The actors involved in updating quality documentation, including the quality manager, of course, rely on different sources to ensure this approach. First, the updating of quality documents is carried out taking into account customer feedback. Any comments made by the latter after use of the product must be taken into account. They can lead to more or less significant changes in procedures in order to improve product quality and therefore customer satisfaction. Secondly, audits also make it possible to update quality documents based on observations made during these operations, whether internal or external. One of the first steps in evaluation is to define non-functional requirements, usually, by means of quality models and also by a quality framework that structure relationships among them. Quality models can be the focus for different entities categories such as product, system, system in use, among others as resource and process. The products are entities at early phases of a software/Web process life cycle (e.g., textual documents or graphical documents such as images, UML diagrams, source code, etc.); the information systems are executable products in a specified context (e.g. mobile or mashup Web Apps in a testing environment), which can include hardware and software together; and the

information systems in use are the aforementioned systems but operated by real users in real contexts of use, i.e. while users perform the daily application tasks in a real environment and infrastructure. Hence, new generation Web Apps can be considered as system or system in use from the evaluated entity categories standpoint.



Self-Check-4	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions and answers
1	Updating quality documentation is crucial in not more than one respect.
2	The actors involved in updating quality documentation, including the quality manager, of course, rely on different sources to ensure this approach

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Solar PV System Installation and Maintenance

Level-IV

Learning Guide-43

Unit of Competence	**Establish Quality Standards**
Module Title	**Establishing Quality Standards**
LG Code	**EIS PIM4 M012 LO2 LG-43**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO 2: Identify hazards and critical Control points

InstructionSheet-1	Learning Guide:-43

This Learning Guide is developed to provide you the necessary information regarding the following content coverage and topics

- Identifying critical control points
- Determining degree of risk for each hazard
- Accomplishing necessary documentation

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, up on completion of this Learning Guide, **you will be able to:-**

- Identify critical control points
- Determine degree of risk for each hazard
- Accomplish necessary documentation

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet- 1	Identifying critical control points

1.1. Introduction

Workers in the solar energy industry are potentially exposed to a variety of serious hazards, such as arc flashes (which include arc flash burn and blast hazards), electric shock, falls, and thermal burn hazards that can cause injury and death. Hazards in this stage are mainly chemical in nature. They include crystalline silicon, amorphous silicon thin film, cadmium telluride thin film, copper indium selenite, copper indium gallium selenite, and gallium arsenide. These are highly toxic and flammable; hazardous exposures can come via chemical burns, explosions, and inhalation of gaseous fumes. Other routes can include hand-to-mouth contact or accidental ingestion. Most solar cells start as quartz, which is later refined into elemental silicon, which risks lung disease silicos is amongst miners.

- **Installation/Operation**

Falls from heights are a significant risk for panel installers. Fatal falls from the installation phase have been reported from California and in France. Health effects associated with falls from roofs include, but are not limited to: skeletomuscular injuries, brain or spine injuries, concussions, lacerations, bruising, swelling, long-term disability, and/or mortality.

Figure 1: Installing solar panels

- **Other Hazards**

Many solar PV technologies use extremely toxic material that have unknown health and environmental consequences including new Nano-materials and processes. There is limited data on specific air emissions and liquid or solid effluents from PV cells and processing**.**

1.2. Hazard analysis and critical control points

HACCP is a systematic preventive approach to Solar PV System safety that identifies physical, module, charge controller and inverter hazards in production processes that can cause the finished product to be ADRA Ethiopia, and designs measurements to reduce these risks to a safe level. In this manner, HACCP is referred as the prevention of hazards rather than finished product inspection.

Figure 2: Solar PV installation System

1.3. The seven principles of System are-

A. Analyze hazards

Climate and weather risk: Risk of changes in electricity generation due to lack of sunshine or snow covering solar panels for long periods of time. Sabotage, terrorism and theft risk: Risk that all or parts of the solar park will be subject to sabotage, terrorism or theft and thus generate less electricity than planned.

B. Determine critical control points

station of a solar energy control system for an on grid energy critical case, it is common to use a real time operating system to keep the device is to locate and keep tracking the maximum power point even if the solar radiance or. The MPPT controller executing frequency can be analyzed and determined as well.

C. Establish limits for critical control points

Critical limits must be something that can be monitored by measurement or observation. They must be scientifically and/or regulatory based. Examples include: temperature, time, pH, water activity or available chlorine.

D. Establish monitoring procedures for critical control points

If monitoring indicates that the critical limits are not being met, then an action must be taken to bring the process back into control. The monitoring system should be easy to use and meet the needs of the food establishment, as well as the regulatory authority

E. Establish corrective actions

Establish corrective actions. Definition: Corrective Action: Procedures to be followed when a deviation occurs. The primary objective is to establish a HACCP program that permits rapid identification of deviations from a critical limit

F. Establish verification procedures

The process of verification involves taking sufficient steps to ensure that the procedures set out in the HACCP plan are working in practice and in particular that the critical limits are sufficient to ensure that the identified hazards are controlled at critical control points.

G. Establish a record system

- Review the records your company wants to store and your current records collections and storage practices. Form a small committee to work with you in outlining the materials you plan to organize. Create the categories you need to encompass all your records.

- Organize documents into recognizable categories that make sense to your personnel. The primary criterion for a category is that it not overlap any other category. If a major category is customers, then each customer, or compatible group of customers, should serve as a sub-category. Product or vendor records must be in different categories. Within each category and sub-category, individual records can be arranged alphabetically by title, by date initiated or completed, department or any other method that makes retrieval convenient, consistent and efficient.

- Prepare training materials that explain the system to employees. Conduct a training program to explain the procedures and benefits of record storage and retrieval. Give special attention to any record handlers, whose job is to collect, file and distribute records; and unit supervisors, who are likely to receive questions after the system is in place. Use the development team members to assist you in monitoring the system for changes that will correct problems or make it easier and more efficient to use

- A filing system without a back-up system is not complete or secure. Companies suffered large financial losses or went out of business when they lost their data. For critical records, it may pay to make duplicate records and file them in secure, fireproof off-site locations. Another alternative is to scan critical data electronically and transmit the files to off-site, online storage. If privacy of data is an issue, you can back the files up to your own drives, which you keep in a secure, off-site location

Self-Check-1	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions and answers
1	One of the following principles of examples include temperature, time, ph., water activity or available chlorine. Establish a record system Establish verification procedures Establish corrective actions Establish limits for critical control points
	_____is a systematic preventive approach to Solar PV System safety that identifies physical. A. HACCP B. Analyze hazards C. Determine critical control points D. Noun the above

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 2	Determining degree of risk for each hazard

2.1. Introduction

Determine appropriate ways to eliminate the hazard, or control the risk when the including “hazard assessment”, “hazard and risk assessment”, “all hazards risk has taken appropriate steps to determine the level of risk of these hazards.

2.2. Hazard

The meaning of the word hazard can be confusing. Often dictionaries do not give specific definitions or combine it with the term "risk". For example, one dictionary defines hazard as "a danger or risk" which helps explain why many people use the terms interchangeably. There are many definitions for hazard but the most common definition when talking about workplace health and safety is: A hazard is any source of potential damage, harm or adverse health effects on something or someone. Basically, a hazard is the potential for harm or an adverse effect (for example, to people as health effects, to organizations as property or equipment losses, or to the environment). Sometimes the resulting harm is referred to as the hazard instead of the actual source of the hazard. For example, the disease tuberculosis (TB) might be called a "hazard" by some but, in general, the TB-causing bacteria (Mycobacterium tuberculosis) would be considered the "hazard" or "hazardous biological agent"

2.3. Examples of a hazard

Workplace hazards can come from a wide range of sources. General examples include any substance, material, process, practice, etc. that has the ability to cause harm or adverse health effect to a person or property. See Table 1.

Table 1 Example of Hazards and Their Effects

Workplace Hazard	Example of Hazard	Example of Harm Caused
Thing	Knife	Cut
Substance	Benzene	Leukemia
Material	Mycobacterium tuberculosis	Tuberculosis
Source of Energy	Electricity	Shock, electrocution
Condition	Wet floor	Slips, falls

Process	Welding	Metal fume fever
Practice	Hard rock mining	Silicosis
Behavior	Bullying	Anxiety, fear, depression

- Workplace hazards also include practices or conditions that release uncontrolled energy like:
  - ✓ An object that could fall from a height (potential or gravitational energy),
  - ✓ A run-away chemical reaction (chemical energy),
  - ✓ The release of compressed gas or steam (pressure; high temperature),
  - ✓ Entanglement of hair or clothing in rotating equipment (kinetic energy), or
  - ✓ Contact with electrodes of a battery or capacitor (electrical energy).

2.4. Risk

Risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss, or harmful effects on the environment. For example: the risk of developing cancer from smoking cigarettes could be expressed as:

- "Cigarette smokers are 12 times (for example) more likely to die of lung cancer than non-smokers", or
- "The number per 100,000 smokers who will develop lung cancer" (actual number depends on factors such as their age and how many years they have been smoking).

  These risks are expressed as a probability or likelihood of developing a disease or getting injured, whereas hazard refers to the agent responsible (i.e. smoking).

  Factors that influence the degree or likelihood of risk are:
  - ✓ the nature of the exposure: how much a person is exposed to a hazardous thing or condition (e.g., several times a day or once a year),
  - ✓ How the person is exposed (e.g., breathing in a vapor, skin contact), and
  - ✓ The severity of the effect. For example, one substance may cause skin cancer, while another may cause skin irritation. Cancer is a much more serious effect than irritation.

Self-Check-2	Written Test

Instruction: Follow the below selected instruction

Match the components in column A to their respective power plants in column B

N°	Questions

A	B
1. Knife	**A.** Slips, falls
2. Benzene	**B.** Shock, electrocution
3. Mycobacterium	**C.** Tuberculosis
4. Electricity	**D.** Cut
5. Wet floor	**E.** Leukemia

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 3	Accomplishing necessary documentation

3.1. Document hierarchy

A good way to represent the relationship of policies, processes, and procedures is as a tree. The policies are represented by the roots, and they form the base for all the other parts. The processes can be viewed as the trunk of the tree, representing a series of steps or flow of actions through the laboratory. The leaves of the tree can be thought of as the procedures; there will be many procedures in the laboratory for accomplishing the activities or the work.

The quality manual is the overall guiding document that defines the quality system through policies established by the laboratory. Next in the hierarchy of documents are the processes, the sets of activities. Procedures either flow from processes, or make up a part of a process; these will generally be described as standard operating procedures (SOP). Work instructions or job aids are shortened versions of SOPs. Finally, forms are used to record results; when completed, they become records.

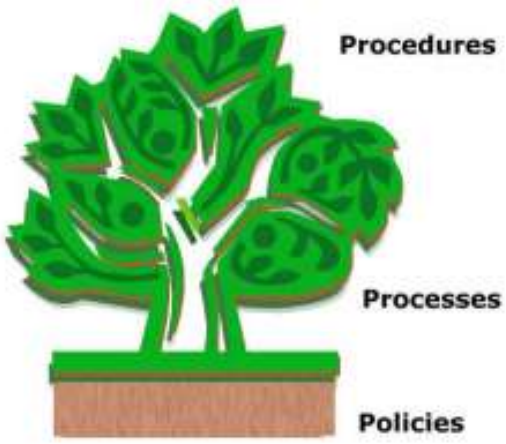


Figure 3: hierarchy

3.2. Why are documents important?

Documents are the essential guidelines for all of the laboratory operations. Some of the important documents that every laboratory should have include:

- **Quality Manual**- this is the overall guiding document for the quality system and provides the framework for its design and implementation.

- **Standard Operating Procedures** (SOP) contain step-by-step written instructions for each procedure performed in the laboratory. These instructions are essential to ensure that all procedures are performed consistently by everyone in the laboratory.
- **Reference materials**- Good reference materials are needed in order to find scientific and clinical information about diseases, laboratory methods, and procedures.

3.3. What makes a good document?

Documents communicate what is done in the laboratory. Good documents are:

- written clearly and concisely; it is better to avoid wordy, unnecessary explanations in the documents;
- Witten in a user-friendly style; it might be helpful to use a standard outline so the general structure will be familiar to staff and easily used by new personnel;
- Written so as to be explicit and accurate reflecting all implemented measures, responsibilities, and programs;
- Maintained to ensure that it is always up-to-date.

3.4. Accomplishment document

When the time comes as to when you have to create monthly, weekly, or yearly document based on the accomplishments you're going to have to include all of the necessary details. Understanding how to write such a report well can make a big difference in whether you are perceived as a success or someone that isn't exactly meeting the standards of the company.

Self-Check-3	Written Test

Instruction: Follow the below selected instruction

Match the components in column A to their respective power plants in column B

N°	Questions		
	A	**B**	
	1. Standard Operating Procedures		A. Maintained to ensure that it is always up-to-date
	2. Quality Manual	Maintained to ensure that it is	B. is the overall guiding document for quality system
	3. What makes a good document	. always up-to-date	C. obtain step-by-step

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Solar PV System Installation and Maintenance

Level-IV

Learning Guide-44

Unit of Competence	**Establish Quality Standards**
Module Title	**Establishing Quality Standards**
LG Code	**EIS PIM4 M012 LO3 LG-44**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO 3: Assist in planning of quality assurance procedures

InstructionSheet-1	Learning Guide:-44

This Learning Guide is developed to provide you the necessary information regarding the following content coverage and topics

- Developing procedures for identified control point
- Minimizing hazards and risks
- Developing processes

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, up on completion of this Learning Guide, **you will be able to:-**

- Develop procedures for identified control point
- Minimize hazards and risks
- Develop processes

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet- 1	Developing procedures for identified control point

1.1. Introduction

So far throughout this learning guide you have determined:

- Quality specifications for your product
- Potential hazards that may impact the quality of your product
- The risk rating of the hazard and whether it warrants the implementation
- of a control measure
- What the control measures are
- Which steps in the process are CCPs
- Monitoring and verification processes to ensure that control measures are working.

By this stage you have done a lot of research and planning, but now it is time to document these procedures and implement them. You may feel daunted at the prospect of introducing quality assurance (QA) procedures to your enterprise.

1.2. What is Quality Assurance?

Quality assurance is a program for the systematic monitoring and evaluation of the various aspects of a project, service, or facility to ensure that standards of quality are being met.

- **Standard can**
  - ✓ Set by accrediting agencies
  - ✓ Set by funders
  - ✓ Our own criteria for quality

1.3. Quality Assurance Components

A. **Quality Monitoring:** Quality monitoring is the planned, systematic, and ongoing collection of data (information).

B. **Quality Assessment:** Measurement of the level of quality at some point in time as compared to your standards.

C. **Quality Improvement:** Making your program better with the intent of meeting and exceeding customer expectations and outcomes

1.4. What is Quality Assurance Plan?

Quality Assurance Plan is a critical part of any project, as it enables to agree a set of quality targets with the customers. It then helps in monitoring and controlling the level of quality, which further indicates the level of adherence to the targets. The purpose of quality assurance plan is to direct and facilitate the establishment of quality assurance activities within processes used to deliver right products and services to the clients. This also makes sure of the quality of the goods delivered.

Quality Assurance Plan describes the principles, processes and procedures used to support the regular delivery of high quality products and competitive services. The quality assurance process is concerned with establishing the authority of the quality assurance function, standards, procedures and their monitoring and evaluation to determine quality in relation to established standards. Quality assurance activities concentrate on the prevention of problems through the continuous improvement of processes

1.5. Who is responsible to develop quality assurance plan?

Quality assurance plan is developed by a dedicated quality assurance team. Management is determined to protect the team's independence in dealing with the process quality – for both products and services. Management also helps the team to formulate the roles and responsibilities of each individual of the team.

1.6. Roles & Responsibilities

The main function of the quality assurance team is to guide the technical staff to gradually improve the standards relating to quality. Quality assurance team will initiate

the process and will take part in each and every phase of the process. The roles and responsibilities of quality assurance team are:

- To develop and maintains the quality assurance plan.
- To conduct the audits and reviews.
- To ensure the quality assurance processes and procedures adequately control processes.
- To review and approve specifies deliverables.
- To promptly report the results of audits to management.
- To implement task level quality control based on quality assurance standards.
- To manage defects, errors and corrections.

Self-Check-1	Written Test

Instruction: Follow the below selected instruction

Choose the best option & circle the letter of your choice.

N°	Questions and answers
1	----------Quality monitoring is the planned, systematic, and ongoing collection of data (information). A, Quality Assessment B, Quality Monitoring C, Quality Improvement D, all
2	---------- Making your program better with the intent of meeting and exceeding customer expectations and outcomes A, Quality Monitoring B, Quality Improvement C, Quality Assessment D, all
3	---------- Measurement of the level of quality at some point in time as compared to your standards. A , Quality Assessment B, Quality Improvement C, Quality Monitoring D, all

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

2.1. Solar construction safety

Solar construction safety, like general construction safety, requires more than knowledge of safety rules; it requires the ability to evaluate unique situations to actively create safe work practices. This manual presents many common conditions found in typical solar work – both electrical and plumbing. These examples should be used as initial steps toward developing safe work habits for employees and to assist employers in developing appropriate safety policies

Figure 4: Solar construction safety

This manual prescribes the following process to minimize workplace hazards:

a) Evaluate and identify hazards.
b) Eliminate or remove hazards.
c) Control hazards that cannot be eliminated.
d) Recover from accidents

The safety topics in this manual are presented in task-oriented modules (chapters) associated with the solar industry. Modules can be used independently or grouped together in any way and are not necessarily meant to be used in the order they are presented here.

The safety training needs of each individual should determine which modules are completed. Each module includes four main sections that cover specific areas associated with developing a proactive safety policy. Each section has a goal and associated symbol as described below. Notice how each section contributes to an overall understanding of safe work practices.

Section 1: Evaluate and identify potential safety hazards and injuries knowing how to identify potential safety hazards is critical to understanding potential injuries, preventing accidents, and recovering from accidents.

Section 2: Prevent accidents by using safe work practices knowing how to work in a safe manner is critical to preventing and recovering from accidents.

Section 3: Recover from accidents using preplanning you must be prepared to recover from accidents if they occur. When an accident occurs, it's difficult to think clearly – this is the wrong time to start planning how to recover from the situation.

Section 4: Section review quiz with questions the section review checks employees' understanding of the material and can be entered into the employee's safety training record to comply with Oregon OSHA training requirements. Review quiz answers are located at the end of the manual.

2.2. Safety planning checklist

While most construction jobs are within easy access to medical care, some construction jobs are in more remote areas. The following items should be considered when you develop procedures for responding to emergencies. Someone who is not on the jobsite should know the following:

- How many people are on the jobsite?
- Who knows they are on the jobsite?
- Are they expected to return at a specific time?
- Do they have access to phone service ?
- Are they expected to call in at a specific time?
- Do employees have the proper safety training they need for the work they are doing?
- Do employees have first-aid and CPR training?
- Do they carry a first-aid kit?
- Is there a nearby hospital or clinic?
- Do employees have proper safety gear in good working condition (such as fall protection and other personal protective equipment)?
- Is employee emergency-contact information such as phone number, person to contact, and any pertinent medical information up-to-date and accessible?

Self-Check-2	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions and answers
1	Solar construction not more safety on practical work.
2	Recover from accidents using preplanning you must be prepared to recover from accidents if they occur. 
3	Prevent accidents by using safe work practices knowing how to work in a safe manner is critical to preventing and recovering from accidents 

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 3	Developing processes

3.1. Develop and maintains the quality assurance plan

As with all change management projects, you need to tackle the implementation of a quality assurance (QA) program within the context of your business needs and values, and on an incremental rather than a „big bang" basis. You might go about this by deciding to prioritize procedures for immediate implementation. This might be done on the basis that:

- Significant (high, extreme) risks should be managed first. This may involve a range of simple to complex controls (e.g. reduced chemical use, repairs, disposal, guarding, re-design of infrastructure, providing personal protective equipment, re-design of work procedures, signage or training or a combination of controls).
- Controls that do not require significant resources, and can be implemented quickly and easily, can be done immediately.
- Controls that require long-term investment, might be staged.

When planning the implementation of a QA program, look at the „big picture" project and then break it down into a series of bite sized chunks or „stages". Make a plan that shows what the priorities for implementation are (e.g. stage 1, stage 2, stage 3) and then for each stage:

- ✓ Identify the tasks to be completed
- ✓ Who will train staff and then subsequently monitor procedures?
- ✓ What resources/equipment/manpower is required to implement each stage?
- ✓ Any dependencies between stages or tasks within stages?

  Once you have a plan, you are in control and can approach the implementation of a QA program in a logical and systematic way.

Table 2: Reference to documenting your QA implementation plan.

Stage 1	Task	**Person Responsible**	Resource	Duration	Start date	End date	**Dependencies**
Stage 2							
Stage 3							

3.2. Develop QA Procedures

So you are now in the driver's seat and are ready to develop QA procedures for implementation. Do you know how to approach this task?

What resources are available to help get you started? The best way to approach this is to develop.

- **Standard Operating Procedures (SOPs**). These explain how to do a particular task/process and will include all of the QA „rules" that you want to apply (e.g. control measures, monitoring and verifications tasks). If these „rules" are integrated into every day practices, the more likely they are to become the „norm" rather than the „exception".

Creating an SOP manual from scratch can be quite discouraging as most owner/operators start with the information in their heads. Each business will have its own way of doing things, partly because of the infrastructure and partly because of the management. Many QA programs will provide you with SOPs but no existing system will fit all circumstances. The essential skill is to refine the SOPs that you are provided with to specifically suit your production system and business, whilst still achieving compliance for the whole QA program.

Table 3: SOPs that are applicable to your business and will be used in your QA system.

Date	**Version No**
Approved By	
Action and Person Responsible ☐ **Owner** ☐ **Manager** ☐ **Staff** ☐ **Other** (specify)	**Record**
Facilities design and contingency planning	
Appropriate facilities and structures are provided and maintained to protect from damage	
Contingency arrangements are in place in case of power failures or failures of automated temperature and ventilation control equipment	Daily Checklists/Diary
including: outline arrangements in place, for example, a standby generator.	
Cleaning and maintenance	
Equipments are cleaned as necessary	Daily Checklists/Diary
plant and equipment are checked and maintained, as necessary.	Maintenance Record
Fire and electrical safety	
All buildings have fire prevention measures in place, in accordance with the requirements of the local controlling authority.	Fire safety advisor recommendations
Staffs are trained in the correct use of fire safety equipment and fire emergency procedures.	Staff Training/Competency Register
All such fittings are checked by staff in routine facility inspections and an electrician called in if any signs of obvious damage or malfunction are found.	Maintenance Record/
Annual electrical safety inspections are carried out by a registered electrician (or other suitably qualified person).	Maintenance Record/ Diary/ Electrical inspection report

Self-Check-3	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	Creating an SOP manual from scratch can be quite discouraging as most owner/operators start with the information in their heads.
2	Once you have a plan, you are in control and can approach the implementation of a QA program in a logical and systematic way.
3	Annual electrical safety inspection are carried out by a digested electrician are staff training.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Solar PV System Installation and Maintenance

Level-IV

Learning Guide-45

Unit of Competence	**Establish Quality Standards**
Module Title	**Establishing Quality Standards**
LG Code	**EIS PIM4 M012 LO4 LG- 45**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO 4: Implement quality assurance procedures

InstructionSheet-1	Learning Guide:-45

This Learning Guide is developed to provide you the necessary information regarding the following content coverage and topics

- Allocating responsibilities for carrying out procedures
- Preparing instructions
- Giving staff and contractors
- Safety procedures
- Giving Staff and contractors in-service training

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **youwillbeableto:-**

- Allocate responsibilities for carrying out procedures
- Prepare instructions
- Give staff and contractors
- Safe procedures
- Give Staff and contractors in-service training

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet- 1	Allocating responsibilities for carrying out procedures

1.1. Introduction

Now that you have developed your SOPs you can assign responsibilities for carrying out procedures to staff and contractors and provide induction/ in-service training relevant to these assigned procedures. It is not possible to successfully implement a QA system that involves significant procedural changes in the workplace without providing training to staff. In some cases the training may be legislated (e.g. related to chemical accreditation or licensing for machinery operation). In other cases the training will be specifically related to the required changes in the workplace to ensure accreditation is met. Successful training will involve the strategic use of techniques, tools, activities and actions to engender change in target groups (e.g. staff). The capacity of the business managers to achieve and practice change is determined by the knowledge and confidence gained by staff in the training process.

Identifying the training needs for your workplace to implement and maintain your QA outcomes.

Who requires training?	What training is required?	How will training be provided and who will provide it	How will staff competency be assessed following training?

1.2. Allocating Responsibilities

Team Leaders need to allocate roles to team members in such a way that the roles are coordinated to achieve the team's goals and that team members take responsibility for their individual roles. Allocating appropriate roles and coordinating these roles can lead to increased morale and motivation. There are a number of factors that Team Leaders

need to consider when allocating roles to ensure that the team is effectively meeting its goals. Team Leaders need to ensure that team members:

- Understand their roles
- Understand the roles of their team mates
- Understand how the roles interrelate in the achievement of the team's goals
- Have authority to coordinate activities with team mates

To ensure total quality control in each and every component of your business operation you should follow few important quality assurance procedures. By following these procedures, you will definitely be able to notice a substantial amount of improvement in your business processes, which will eventually produce a better turnover from your business endeavor. Here are few tips (guidelines) on the development or implementation part of the process.

a) The quality control policies must be documented and kept in storage properly, so that the understanding of the project can be shared by everyone, who is involved with the project. If it is not documented, then you cannot claim to be sharing the information with others, which might result to bring up many more disputes throughout the total process.

b) To implement the quality assurance procedures, you must ensure that the technical infrastructure is capable of executing the policies. A particular quality control policy might require some specific set of environment, which should be available at the time of the checking.

c) Also, you should have essential resources to implement the policies. If you do not arrange the necessary resources, then there is no use of that particular policy.

d) Time to time checking process is required to ensure that the policies are being properly implemented, in real life scenario.

e) One of the important quality assurance procedures is to maintain audit trails to record the outcomes of the checking processes. In case of any failure or dysfunction of any process, the information should be updated. This will help to rectify the faults, so that the process passes the quality control test next time, when it appears.

f) In addition to the developed policies, which are relevant to the context, you can search information from others, having experience with this background. This will give you more opportunities to full proof the system.

g) If you have already ensured total quality control in your organization, then share the effective policies and procedures with other organizations. Your effort to excellence might be an example to apply quality control, for a wider community.

h) While implementing the quality assurance procedures throughout your business processes, do not expect a perfect result at the beginning. Most of the time, you might find unsuccessful results. But, this should not break your heart. You must be giving enough chance to rectify the system and to settle down for giving correct results. Also, a totally perfect system is not at all feasible, by any means.

i) Whatever policies or procedures you might accept for your quality control project, always remember that you might have some limitation to employ all these policies. It is always advisable, to accept the limitation first to set out the scope of project and then decide on the policies.

j) At the time of implementing the quality assurance procedures, you will get better result if you take one component at a time rather than taking the overall scope of your business operations. This is a far more dependable procedure, as you can concentrate on a single field of issues at one time. This way, you can ensure the quality control to each component of the operation one at a time. Other than the above tips, if you are interested in more information on quality control topic, then you can search internet. Many of the authorities have standardized the quality in terms of the relevant field. All these websites carry important and useful information on successful quality control procedures.

Self-Check-1	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions and answers
1	Team Leaders need to ensure that team members understand their roles
2	QA system that involves significant procedural changes in the workplace without providing training to staff.
3	To implement the quality assurance procedures, you must ensure that the technical infrastructure is capable of executing the policies

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 2	Preparing instructions

2.1 Introduction

Here are eight steps to help you get started on building a QA program for your customer service support team from scratch.

a. Define standards and goals for your customer service

Visualize and think about what you want your team to achieve. Knowing which direction you want to go is the base of defining the next steps for building a QA program for your support team. Create the quality assurance plan with deference to the customer. Start by imagining what you want for your customers.

- What kinds of outcomes do you want them to have?
- How should they feel when they finish with the call?
- Is there anything you want them to do during or after the call?

b. Set policies and procedures for each department

Quality is a team effort and everyone in your company must be involved. Determine a set of procedures adapted to each department and level in order for all staff to participate and take action on this new change. The policies needed to spell out how a variety of situations are to be handled. They also need to set expectations about attendance, overtime, and conduct on the job. Procedures have to cover everything from how calls are to be conducted to how and when feedback is given.

c. Share the news

Once everything is planned out and has been carefully outlined, communicate the new procedures and changes that will take place with your staff. Before making a big announcement, discuss this with the head and managers of each department. Talking to your managers first, prepares them for the changes ahead and allows them to participate in prepping and handling front-line employees when questions arise.

d. Implement the procedures

Now the fun really begins. Collaborating with the different head of departments, work together to implement the new policies and procedures. This can be done through trainings, one-on-ones, and continuous feedback with employees. Initially, it is normal for doubts to come up. It is your job to address any questions and concerns for both managers and front-line employees and ensure adherence to the new procedures through regular tracking and reporting.

e. Get feedback

After a few weeks or a couple of months after implementation, organize discussion and feedback sessions among managers meet and their teams to hear their experience with the new QA program. By creating a 360° feedback, you'll empower the entire organization and reduce resistance.

f. Measure results

Right around the same time you are getting feedback, start to analyze the progress and changes the procedures have brought on and measure the adjustments that have happened within your customer service support team.

g. Communicate results

There is nothing more motivating to staff than knowing that their actions have led to a significant improvement for their organization. An increase in happy customers, sales, or a reduction in waiting time all have to do directly with actions that front line employees took.

h. Adjust as needed

Remember that when the procedures and policies were defined for your QA program, it was all in theory. Now that you have gathered both feedback and measurable results, it's time to analyze gaps and areas of improvement to tweak the procedures as necessary. This could be done by getting more feedback to spot areas of weaknesses, providing improved training and deeper VOC analysis.

Self-Check-2	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions	
		B
1. Get feedback 2. Implement the procedures 3. Measure results		A. the procedures have brought on and measure the adjustments B. Collaborating with the different head of departments, work together to implement C. Now the fun really begins. Collaborating with the different head of departments

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 3	Giving staff and contractors

3.1. Explore five ways measuring quality improves your employee engagement:

- Agents have control
- Agents' confidence increases
- Improved agent-leader relationships
- Prompt feedback powers up coaching opportunities
- Clearer onboarding process

a) Agents have control

As an individual contributor in a service environment, agents are often subject to measures of performance that are not entirely "fair". Customer Survey responses are not entirely in their control, and are prone to a host of influences that have no bearing on how well the agent is performing their role. Customer Satisfaction surveys usually don't reflect the single conversation or support interaction; customers use them to reflect their experience with the brand has a whole

Figure 5: Agents have control

b) Agents' confidence increases

A quality assurance rubric gives agents more confidence in when they are meeting, exceeding, or falling short of service expectations. It becomes clear where their skills lie, and, importantly, it can help them understand their exact remit, too. A good QA process can ensure procedural compliance, and other trust, safety, security or other industry or standard requirements.

c) Improved agent-leader relationships

Its common knowledge that people don't leave jobs, they leave bad bosses and cultures. Any manager worth their salt will tell you that clarity of expectations is king. In fact, when it comes to setting goals, even something as fundamental as trying to adhere to a smart goal model can prove elusive when tied to highly subjective cast measures.

Figure 6: Improved agent-leader relationships

d) Clearer onboarding process

New employees feel greater confidence in their value and effectiveness if your onboarding programmer is solid and comprehensive. Concentrate only on product knowledge, or organizational knowledge, and you potentially disengage your new hires from their early day-to-day expectations. It can also dissociate their role from those moments of greater depth.

Self-Check-3	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions and answers
1	Confidence increases are often subject to measures of performance that are not entirely “fair”.
	Get feedback is one of ways measuring quality improves your employee engagement
2	A good QA process can ensure procedural compliance, and other trust, safety, security or other industry or standard requirements.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 4	Safety procedures

4.1 Safety

Safety is the concern in all Grace Consulting, Inc. operations. It is our policy and goal to provide a healthy, safe working environment, to abide by federal, state, and local standards, and to follow safe work practices.

4.2 Safety Programs:

- Injury and Illness Prevention Program
- Code of Safe Work Practice
- Housekeeping
- Confined Spaces
- Electrical Safety
- Lockout/ Tag out
- Employee Emergency Action Plan
- Fire Protection/ Hot Work
- Hand & Power Tools
- Material Handling
- Hearing Conservation
- Personal Protective Equipment
- Respiratory Protection
- Employee Environmental Protection
- Ladder Safety
- Scaffolds/ Aerial Lifts
- Fall Protection
- Hazardous Waste Operations
- Spill Prevention
- Process Safety Management
- Asbestos/ Lead/ Mold Awareness
- Blood borne Pathogen
- Site Specific Safety Plan
- Drug-Free Workplace
- Self-Inspection Checklist

Self-Check-4	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions and answers
1	Fire Protection is to wind and cold
	Electrical Safety to protect electric pore

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 5	Giving Staff and contractors in-service training

5.1 Introduction

Customer service has evolved as one of the leading differentiators which consumers consider before making a purchase. Recent research suggests that providing excellent customer experiences will be even more important than cost by the year 2020. Many organizations are unaware that there are problems with their customer service. It was recently found that 80% of organizations think they provide superior customer service. The shocking part is that only 8% of their customers felt the same way

5.2 Crucial Customer Service Training Skills

Every employee needs a basic level of customer service training, irrespective of their working space. Although the depth of knowledge and training that they need varies depending on the role of each employee, there are 3 basic types of skills you need to include in your training plan.

i. Product Knowledge

It is essential that all employees have a deep working knowledge of the organization's offerings. Today's customers can look up basic information about products and services on their own. Employees need to not only know the details of the products but how they specifically fulfill different customers' needs. As customers are getting intelligent with every passing minute, product knowledge has become a critical element of the corporate training spectrum. Businesses have understood that they need to educate team members with full-proof product knowledge in order to create lasting Customer experiences.

ii. Soft Skills

Soft skills will help your employees better communicate with customers. For any customer service team, it is imperative to indulge in programs that only strengthen their technical skills, but also enhances their soft skills, especially communication. The better teams are able to communicate with the customer, the more satisfied is the client at the end of the process. Incorporating soft skills building programs in the training curriculum shows that the organization is not just focused on making sales but is willing to invest in giving great customer service. Some common soft skills you should consider including in your training are:

- Active listening
- Clear communication
- Positive
- e language
- Persuasion
- Empathy

73% of customers fall in love with a brand and remain loyal because of friendly customer service representatives. Ensuring that each employee has the skills necessary to communicate effectively will greatly improve customer relationships and help promote brand loyalty among your customers.

iii. Company Mission and Values

Every employee should have a deep understanding of the company's mission and values. It is important for a business to educate their employees on what it aims to achieve in the coming time. Not only does this give a direction to the mission, but it also makes the workforce feel valued, encouraging them to propel in the given direction with much passion. No different is the case with customer service teams. As they form the first level of interaction with customers, they need to embody the company’s mission and vision into their conversation so that the same information can be projected to your customers

Self-Check-5	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions and answers
1	Every employee should have a not deep understanding of the company's mission and values.
2.	Every employee needs a basic level of customer service training, irrespective of their working space.
3	Soft skills will help your employees better communicate with customers.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Solar PV System Installation and Maintenance

Level-IV

Learning Guide-46

Unit of Competence	**Establish Quality Standards**
Module Title	**Establishing Quality Standards**
LG Code	**EIS PIM4 M12 LO5 LG-46**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO 5: Monitor quality of work outcome

InstructionSheet-1	Learning Guide:-46

This Learning Guide is developed to provide you the necessary information regarding the following content coverage and topics

- Identifying quality requirements
- Inspecting inputs
- Conducting work to produce required outcomes
- Monitoring work processes
- Adjusting processes to maintain outputs

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:-

- Identify quality requirements
- Inspect inputs
- Conduct work to produce required outcomes
- Monitor work processes
- Adjust processes to maintain outputs

Information Sheet- 1	Identifying quality requirements

1.1. Identify Quality requirements

Whatever it takes to satisfy a customer; characteristics of a good or service that determine whether it meets the express and implied requirements of its customers.Also called quality requirements.

Quality requirements are typically much more important than functional requirements because it used to determine the success or failure of mission critical systems.

1.2. Quality Requirements Identification

a. Quality requirements been elicited from an appropriate sample of all legitimate stakeholders

b. Relevant laws, regulations, and standards been used as sources of quality requirements

1.3. Types of Quality Requirements

Quality Model: defines the meaning of quality for a system. Quality model been used as a basis for identifying the types of quality requirements. Specifically, each quality requirement specifies that the system under development shall achieve a minimum amount of some quality factor or sub factor defined by the quality model.

Standard: Standards can be an international standard, national standard, military standard, industry standard.

Quality Factors or Sub factors: the quality requirements only based on quality factors (e.g., performance) or quality sub factors (e.g., response time, schedule ability,) used to identify subtypes of quality requirements.

1.4. Quality of Quality Requirements

Like other requirements, quality requirements should have certain characteristics:

- **Mandatory:** Each quality requirement should be relevant.
- **Scalable:** clear just how much quality is required
- **Unambiguous:** all stakeholders and developers will interpret it the same way
- **Verifiable:** via testing, demonstration, inspection ?
- **Correct**: in that it meets some real need of the stakeholders?
- **Feasible**

1.5. Determine performance indicators for individual workers in line with quality management systems.

Any Quality Management System must have a method of measuring the performance of the system. If the system is not measured, it is difficult to determine the success of the system and achieve appropriate outcomes.

Whilst every industry, workplace or job is different, typical performance indicators used for measurement may include:

- Time parameters
- Quantity
- Productivity parameters
- Quality parameters
- Cost parameters
- Time targets for own work
- Criteria for evaluation of own work
- Measures to avoid wastage
- Criteria for measurement of internal and external customer satisfaction
- Processes to ensure „right first time" approach

Performance indicators must be measurable indicators that demonstrate the achievement of an outcome. They enable decision-makers to assess progress towards the achievement of intended outputs, outcomes, goals, and objectives, and are chosen to reflect the critical success factors of a project/workplace/industry

1.6. Five most common performance measures

If you're starting out with measurement but don't have a clearly articulated strategy – or any strategy at all – you're probably feeling stuck about what to measure to manage performance. With no goals, no objectives, and no clear priorities, everything seems important and it's too overwhelming to measure everything.

Measure 1:- Customer satisfaction

This is probably the most common and most important of the five. It is the only measure that will connect you with the relevance of the work you are doing. If customers are not happy, then everyone is wasting at least a portion of their time. Measure how your customer judges the outcome of your product or service, through surveys or at the end of each transaction with the customer. You can ask them directly, give them a survey form, or send them to a website form.

If you also collect data about what aspects of your product or service are most important to customers, it will give you clues about more specific things that might be important to measure also e.g. easy access to support staff or accuracy of bills.

Measure 2:- Product/service defects

Defects is a measure of quality, and a translation of what the customer expects your product or service to do, into something you can count to assess how often the product or service actually does what is expected.

Your customer satisfaction measure is a companion to this one. And the extra data collected about what is most important to customers about your product or service will help you define what constitutes a defect (e.g. something breaks, something doesn't operate correctly, a delivery deadline was missed, an invoice has errors).

Measure 3:- Production/delivery time

The time it takes to produce / deliver your product or service for your customer is a very useful thing to measure. It is not just about meeting the time commitments you made to your customer but focusing everyone on the full process that make the production / delivery

time what it is. This measurement will also show unnecessary time wastage which should result in greater efficiency.

Measure 4:- productivity

Productivity is a measure of your process efficiency, and is essentially the rate at which you can produce outputs, relative to the inputs it takes to do so. A great measure to focus on eliminating waste and rework, wasted time and wasted actions. Productivity can measure many things i.e.

- what is product output compared to time taken
- what is the product output versus cost

Measure 5:- Innovation (or improvement) ideas

This is about making active suggestions about how to improve performance. A good workplace will share and discuss the first 4 measures and their outcomes among the work team. This sharing will actively encourage improvement ideas and suggestions. This process encourages everyone to deepen their understanding about performance, and how they can influence it.

Self-Check-1	Written Test

Instruction: Follow the below selected instruction

Choose the best option & circle the letter of your choice.

.

N°	Questions
1	----------all stakeholders and developers will interpret it the same way A, Quality model B, standard C, Unambiguous D, all
2	----------meaning of quality for a system been used as a basis for identifying the types of quality requirements. A, Unambiguous B, Quality model C, standard D, all
3	----------can be an international standard, national standard, military standard, industry standard. A , standard B, Unambiguous C, Quality model D, all

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 2	Inspecting inputs

2.1. Introduction

An inspection is, most generally, an organized examination or formal evaluation exercise. In engineering activities inspection involves the measurements, tests, and gauges applied to certain characteristics in regard to an object or activity. The results are usually compared to specified requirements and standards for determining whether the item or activity is in line with these targets, often with a standard Inspection procedure in place to ensure consistent checking. Inspections are usually non-destructive.

Both, inspection and maintenance have an important role in production system. Understanding and highlighting their advantage independently suggest realizing the connection between quality inspection and equipment maintenance. Proceeding observations on various publications inspire us the meaningful of their relationship as such a way to achieve better quality assurance and establishing the performance of production system. Thus, the importance of quality assurance through equipment maintenance becomes increasingly indispensable. In this paper, we propose the interaction between product quality inspection and equipment maintenance served in a framework of interaction.

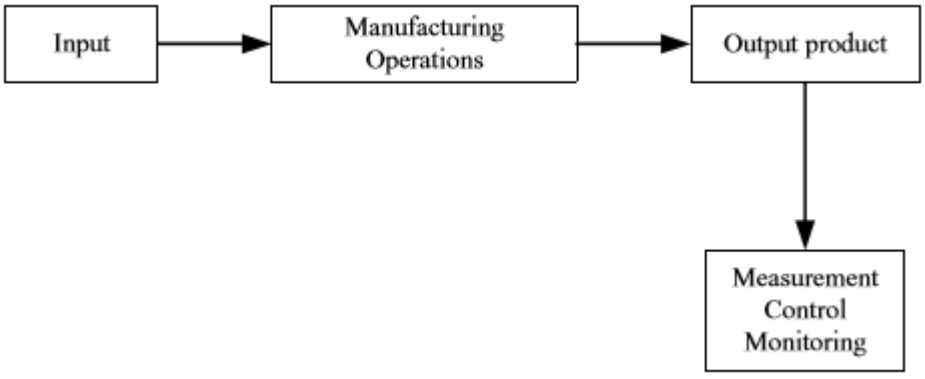


Figure 7: input in to measurement process

2.2. Quality and Inspection

There are two reasons for the necessity of quality control system. First, QC is an effective daily management process; and second, QC is a requirement for developing quality improvement program, it is imperative that the process is initially controlled. QC accomplishes its missions by doing an inspection. As a basic operational technique and one of the earliest aspects of QC, inspection plays an important role in a production system to gain the

- **Inspections techniques**

Inspections are performed at various times during the manufacturing process. Include inspection on raw materials and components from outside sources (incoming inspection), and final inspection on finished product to ensure the functional quality and the appearance of the product (outgoing inspection). The modern view of QC encompasses a broader scope of activities throughout the company. For instance, Total Quality Management (TQM) philosophy suggested the process control inspection along production line rather than final inspection only. This diversion keeps the inspection as an essential technique in quality assurance and doesn't reduce the necessity for inspection instead. Industrial experience shows that the manufacturer may monitor its process at every stage, the acceptance inspection for the final product and incoming raw materials inspections are still necessary. The acceptance inspection is kind of middle bridge between 100% inspection and zero inspection, which has a primary advantage of fewer resources needed including money, labor, and time.

- **Acceptance inspection**

A major classification of acceptance sampling is based on data type, include variables sampling plans and attributes sampling plans. Variables sampling plans (VSP) are preferred over attributes sampling plans, need smaller sample size than would be required for attributes sampling plans, in order to achieve the same operating characteristic curve. The significant savings even better when the destructive testing is applied or expensive items are involved. This phenomena reported by many publications.

2.3. Equipment maintenance

Whenever items or equipment failed to operate or perform its intended function, the option of maintenance may be carried out, including repairs or replaces. The purpose of maintenance is to keep the item's good condition, to rectify failures, and to restore the item to its operational state following failure or deterioration condition.

- **Maintenance and quality**

The role of maintenance in completing the production purpose has already been addressed in the literature. In most models, the problem statement is how to meet the production schedule under the limiting constraints on maintenance.

2.4. Interaction between quality inspection and maintenance

There are significant-vast literatures on inspection (i.e. acceptance sampling) and maintenance, however, their focus tends to be on each topic separately. Presently, there have been no research attempts to study the connection between quality inspection and maintenance. The rejected lot may trigger for examination on manufacturing process or machine, moreover, become a demand of equipment maintenance. Whenever proper maintenance policy apply, machine can be restored to its operational state following deterioration condition, then the product quality and process capability may improve.

2.5. Concluding Remark

Performance of equipment is substantial to preserve the performance of production process, as the increasing trend on mechanization and automation. Since the current market improved, customer demand high-quality product. The well-maintained equipment ensures the product quality will conform to requirements. Many literatures discussed the roles and advantages of quality inspection and equipment maintenance individually and separately. The investigations on these two aspects reveal their possible interactions. The proposed interaction framework between inspection and maintenance provides logical thinking that may interrelate these aspects to provide better quality assurance

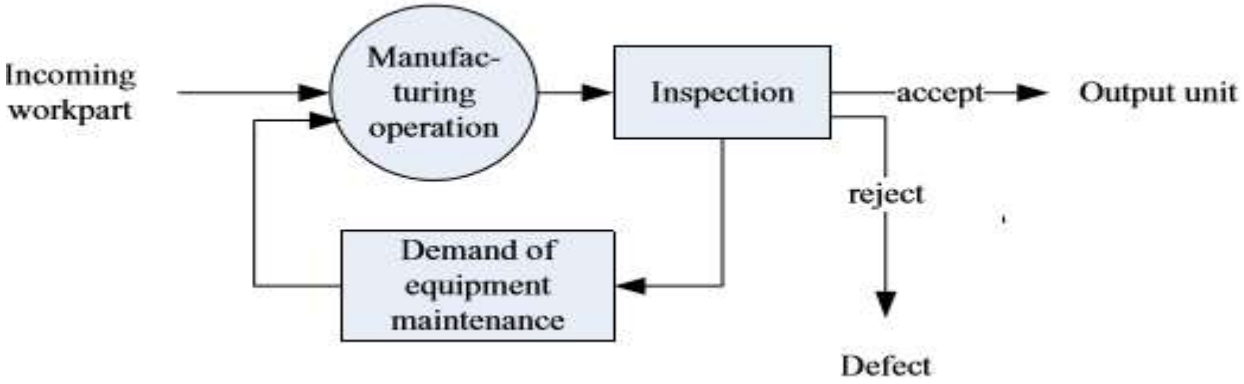


Figure 8: Concluding Remark

Self-Check-2	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	QC is a requirement for developing quality improvement program, it is imperative that the process is initially controlled.
2	Maintenance and quality is substantial to preserve the performance of production process,
3	acceptance sampling is based on data type, include variables sampling plans and attributes sampling plans.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 3	Conducting work to produce required outcomes

3.1. Introduction

Outputs, outcomes and impact are terms that are used to describe changes at different levels from the delivery of goods and services to long-term, sustainable change in people's lives. Whilst the terminology is in common use, there is great inconsistency in how the terms are interpreted.

Most organizations understand the key difference between the things they do (activities) and the ultimate changes they wish to help bring about (impact). But the distinction is not always helpful. In order to achieve desired long-term changes, there may be many steps between an organization's activities and the desired impact. The results chain (see below) attempts to categories these steps by breaking them down into manageable stages – inputs, activities, outputs, outcomes and impact.

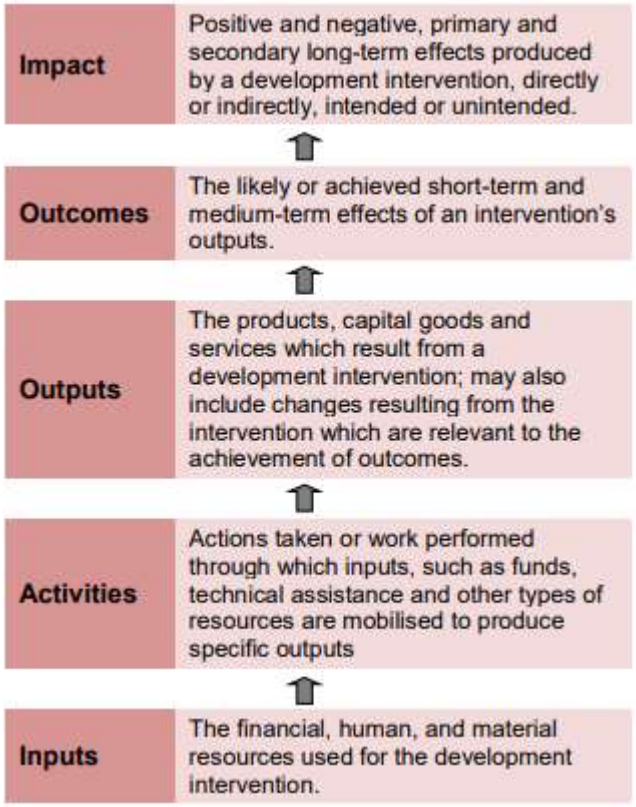


Figure 9: chain using a set of definitions originally developed

Include travelling to the field to deliver seeds and, possibly, conduct training with farmers. The outputs could be the seeds distributed and the people trained. The outcomes could be that the farmers plant the seeds, the seeds grow into crops and the crops are harvested, and then eaten or sold. This might contribute to the impact, which would be a better standard of living in the long-term for farmers and their families. A simplified diagram of how these different terms relate can be found in the diagram below.

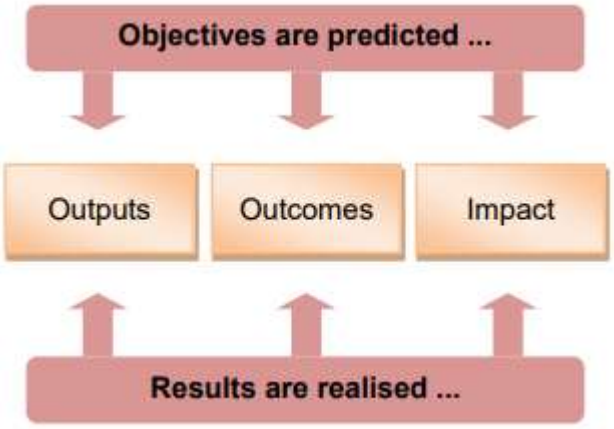


Figure 10: Simplified diagram

3.2. Working with outcomes

Case 1 in the example below, an organization might carry out eye operations in the field (outputs) in order to improve sight (outcomes/impact). But it might also train local partners to carry out the operations

Case 2 to a higher standard – in which case the training is the output and the carrying out of effective operations by partners an outcome. So what on first inspection seems to be a clear deliverable – the carrying out of effective eye operations – may be an outcome of an organization's work in different circumstances.

Case 1		Eye operations carried out to standard *(output)*	Improved eyesight for patients *(outcome)*	Improved quality of life *(impact)*
Case 2	Eye surgeons trained by partner *(output)*	Eye operations carried out to standard *(outcome)*	Improved eyesight for patients *(outcome)*	Improved quality of life *(impact)*

Figure 11: output' and 'outcome'

3.3. Level of focus for M&E systems

Almost any M&E system or approach would be expected to consider both outputs and outcomes, and some go further to look at impact. But in larger projects and programs the direction of M&E also needs to be considered. The table below shows three different choices.

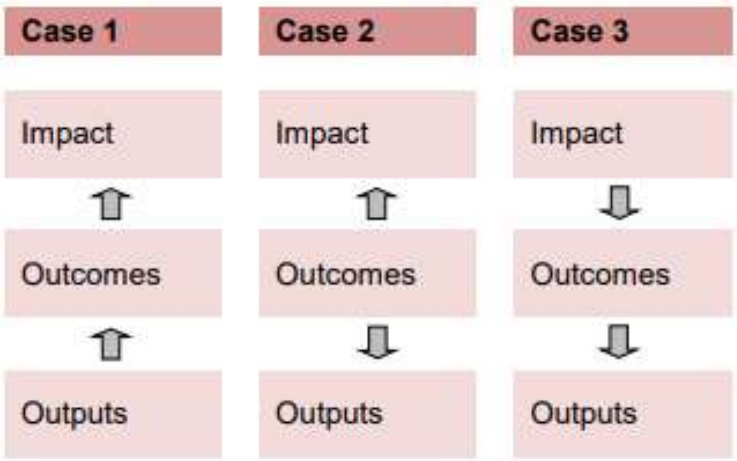


Fig 14 Level of focus for M&E systems

Self-Check-3	Written Test

Instruction: Follow the below selected instruction

Match the components in column A to their respective power plants in column B

	Questions	
	Inputs	The likely or achieved short-term and medium-term effects of an intervention output
	Out comes	The financial, human, and material resource used for the development intervention
	Impact	Positive and negative primary and secondary long-term effect produced by a development

Note: the satisfactory rating is as followed

factory	nts
tisfactory	w2points

Information Sheet- 4	Monitoring work processes

4.1. Introduction

A monitoring process is a special kind of integration process that you use as part of Business Activity Monitoring(BAM). You use a monitoring process to monitor the milestones in a business process. The business process can be distributed across multiple applications

4.2. Defining a Monitoring Process

A monitoring process is a special kind of integration process that you use as part of Business Activity Monitoring (BAM). You use a monitoring process to monitor the milestones in a business process. The business process can be distributed across multiple applications. When a milestone is reached, the applications each publish events, to which a central monitoring process is subscribed.

In monitoring processes you can define that alerts are triggered if particular events occur or deadlines are missed. Furthermore, you can define conditions for creating alerts. You can also include information shipped by Business Intelligence in the conditions, for example, whether a customer is an A customer ("Gold Customer").

Only use monitoring processes to monitor events from applications. Do not use a monitoring process to monitor events from other monitoring processes. These kinds of monitoring process hierarchies are not supported.

4.3. Typical Structure

A monitoring process usually comprises the following elements:

- One event message that starts the process
- Further event messages that the process subscribes to by means of correlations.
- Conditions that evaluate the events and create corresponding alerts

You can group together recurring sequences in step groups. Doing so makes it easier for you to define monitoring processes and improves the clarity of the monitoring processes.

4.4. Monitoring Deadlines and Triggering Alerts

You can define the following types of deadline monitoring with the following type of alerting:

- If the process does not receive a particular event message within a given period, it triggers an appropriate alert and continues to wait for the event message.
- If the process does not receive a particular event message within a given period, it triggers an appropriate alert and continues processing.

4.5. Process monitoring from various perspectives

The specific activities that form part of the monitoring process are aimed at generating information that is appropriate from the perspective of the consumer group, who the monitoring is for. Three key consumer groups are discussed below:

- **From an accountability perspective**

Due to outside funding, program managers need to provide regular information to funders and program sponsors about the implementation of the program, problems that have been encountered and how these were handled. Program managers are accountable for and how the program is run, which leads to either the success or failure of the program.

- **From a management perspective**

From a management perspective, process monitoring is not only aimed at finding out how the program is going, but it is also aimed at putting in place corrective measures to ensure that the program performs as it should. In this case, process monitoring can take place during the pilot testing of the program in order to find ways of dealing with unexpected problems. Management-oriented monitoring can also take place in already-developed programs in order to obtain information about the performance of the program and whether or not the target population is being reached by the planned intervention.

- **From an evaluators perspective**

In order to evaluate the outcomes of a program, the evaluator first needs to monitor the process in order to assess the implementation of the intervention. The reason for this is that many program failures are due to failures in the implementation of the program. Therefore, in order to determine whether or not the planned outcomes have been reached, the evaluator needs to assess how the intervention was implemented.

Self-Check-4	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	If the process does not receive a particular event message within a given period, it triggers an appropriate alert and continues processing. T
2	Typical Structures a special kind of integration process that you use as part of Business Activity Monitoring (BAM). F
3	Doing so makes it easier for you to define monitoring processes and improves the clarity of the monitoring processes. T

Note: the satisfactory rating is as followed

factory	2 points
tisfactory	Below2points

Information Sheet- 5	Adjusting processes to maintain outputs

5.1 Process adjustment in quality control

Process Adjustment for Quality Control fills the need for a comprehensive presentation of control theory at the elementary level, focusing on statistical methods used in process adjustment (Engineering Process Control Methods or EPC) and their relation to the classical methods of process monitoring

- **Control charts**

The data from measurements of variations at points on the process map is monitored using control charts. Control charts attempt to differentiate "assignable" ("special") sources of variation from "common" sources. "Common" sources, because they are an expected part of the process, are of much less concern to the manufacturer than "assignable" sources. Using control charts is a continuous activity, ongoing over time.

- **Stable process**

When the process does not trigger any of the control chart "detection rules" for the control chart, it is said to be "stable". A process capability analysis may be performed on a stable process to predict the ability of the process to produce "conforming product" in the future.
A stable process can be demonstrated by a process signature that is free of variances outside of the capability index. A process signature is the plotted points compared with the capability index.

- **Excessive variations**

When the process triggers any of the control chart "detection rules", (or alternatively, the process capability is low), other activities may be performed to identify the source of the excessive variation. The tools used in these extra activities include: Ishikawa diagram, designed experiments, and Pareto charts. Designed experiments are a means of objectively quantifying the relative importance (strength) of sources of variation. Once the sources of (special cause) variation are identified, they can be minimized or eliminated. Steps to eliminating a source of variation might include: development of standards, staff training, error-proofing, and changes to the process itself or its inputs.

- **Process stability metrics**

When monitoring many processes with control charts, it is sometimes useful to calculate quantitative measures of the stability of the processes. These metrics can then be used to identify/prioritize the processes that are most in need of corrective actions. These metrics can also be viewed as supplementing the traditional process capability metrics. Several metrics have been proposed, as described in Ramirez and Runger. They are

a. A Stability Ratio which compares the long-term variability to the short-term variability,

b. An ANOVA Test which compares the within-subgroup variation to the between-subgroup variation,

c. An Instability Ratio which compares the number of subgroups that have one or more violations of the Western Electric rules to the total number of subgroups

5.2 Ten ways to maintain consistent project quality

- **Define quality**

Quality is ambiguous, it can mean many things. For example, The Project Management Body of Knowledge (PMBOK) defines quality as, “conformance to requirements and fitness of use”, defines quality as, “the degree to which a set of inherent characteristics fulfill requirement".

- **Commit to quality**

A company's commitment to quality must come from the top and be reinforced repeatedly. Unless a Business views quality as its single, non-negotiable goal, workers will inevitably feel the need to make trade-offs and quality will slip.

- **Stick to the project requirements!**

Once you’ve defined the quality criteria and project requirements, stick to them! Balance continual project improvements with gold-plate requirements. Adding features the customer did not request increases the potential for delays, and higher cost. Project Managers drive improvements and project quality but beware of out-of-scope extras creeping in.

- **Manage quality**

Work with your project team to define a practical approach to managing quality, including applicable standards and quality processes. These are driven by your standards and quality processes contained in the project blueprint.

- **Perform quality assurance**

Execute your quality management plan using the standards and processes defined in the project blueprint. Perform a quality audit to evaluate how well the team is following the plan and meeting your customer's expectations

- **Control the quality**

Ensure the deliverables are correct and free of defects and focus on quality from the beginning to the end of the project. Perform inspections to identify defects. Start as early as possible; identifying and correcting defects close to the point of origin saves time and money

- **Focus on requirements**

Requirements management and quality management go hand in hand. Clear, well-defined requirements lead to less rework and schedule delays. Focus on improving the requirements process—eliciting, analyzing, documenting and validating them.

- **Follow the project processes**

Follow the processes and tasks contained in your project blueprint. If you identify a more efficient way to do something, add this into the blueprint to continually improve the processes

- **Lessons learned**

Document lessons learned after project phases and at the completion of the project to evaluate your processes and 'bake' all the improvements into the project blueprint and translate them to future projects. This forms part of your knowledge management strategy;

you build up a knowledge bank and use lessons learned in the last project for both existing and new projects

- **Project De-Brief**

The project de-brief is more than a casual conversation about what did and didn’t work; it digs into why things happened (or didn't happen). A de-brief can sometimes be as painful as the project itself, especially when your project has failed, and you need to investigate where things went wrong. Rather than rushing headlong into your next project take time for a thorough de-brief with both your team and your client so that over time you continuously improve the consistency of quality in your projects and deliver more of them successfully

Self-Check-5	Written Test

Instruction: Follow the below selected instruction

Choose the best option & circle the letter of your choice.

N°	Questions
1	The data from measurements of variations at points on the process map is monitored A. Excessive variations B. Control charts C. Stable process D. Process stability metrics
2	Work with your project team to define a practical approach to managing quality, including applicable standards A. Focus on requirements B. Commit to quality C. Manage quality D. Control the quality
3	Unless a Business views quality as its single, non-negotiable goal, A. Focus on requirements B. Commit to quality C. Manage quality D. Control the quality

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Solar PV System Installation and Maintenance

Level-IV

Learning Guide-47

Unit of Competence	**Establish Quality Standards**
Module Title	**Establishing Quality Standards**
LG Code	**EIS PIM4 M12 LO6 LG-47**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO 6: Participate in maintaining and improving quality at work

InstructionSheet-1	Learning Guide:-47

This Learning Guide is developed to provide you the necessary information regarding the following content coverage and topics

- Routinely monitoring work area, materials, processes and product
- Workplace reporting requirements
- Identifying and reporting non-conformance in
  - ✓ Inputs
  - ✓ Process
  - ✓ product and/or service
- Taking corrective actions
- Raising quality issues

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:-

- Routinely monitoring work area, materials, processes and product
- Workplace reporting requirements
- Identifying and reporting non-conformance in
  - ✓ Inputs
  - ✓ Process
  - ✓ product and/or service
- Taking corrective actions
- Raising quality issues

Information Sheet- 1	Routinely monitoring work area, materials, processes and product

1.1. Introduction

It is all well and good to have a Quality Management System in place applicable to an industry or broader business. However unless that total system is broken down into appropriate Quality Assurance and Quality Control for each sector or product in the workplace, the system will be seen as difficult, unwieldy and a waste of time by many workers. As a review, read the definitions of quality assurance and quality control again.

1.2. Participate in maintaining and improving quality

- 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) and “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.
- 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

Assuming your workplace has appropriate procedures related to quality assurance and quality control for your products/services, how do you get your work done so that it is completed efficiently, within the time required and still maintains the required quality of work?

The following points are used to maintaining and improving quality at work

a. Be a good organizer:

Good organizers are able to look at the big picture and arrange output requirements, equipment and the time frame to fit into the most orderly and productive working pattern. Good organizers plan ahead and follow the plan. With a plan they set specific goals so that they are able to measure their progress at regular intervals. They follow simple procedures so that work gets done smoothly, effectively and with the least problems.

b. Effective use of time:

When you are at work your time is limited. In order not to waste valuable time take note of the following points:

Plan ahead: When you plan ahead and allocate the workload well, your job gets done in the smoothest way and done right the first time. Proper planning and effective use of time go hand in hand.

Do first things first: Do the most important things first and do not be side-tracked by unimportant interruptions.

Delegate work appropriately: Ensure the most appropriate people are doing each job.

c. Setting schedules and meeting deadlines:

Without deadlines there is a natural tendency for people to slack off. Appropriate deadlines keep everyone busy and productive

d. Write it down:

Work procedures should be written down. This applies to general procedures that are applicable over a long period of time as well as “task or job” procedures that may be a simple list and appropriate for a short period of time only. Without procedures, how do workers know they are completing a task in the correct and most efficient way? A procedure should include

- the specific task to be done
- assign the people responsible to do it
- set realistic completion dates

e. Monitor routinely work area, materials, processes and product to ensure compliance with quality requirements

f. Identify and report non-conformance in inputs, process, product and/or service according to workplace reporting requirements

g. Take corrective action within level of responsibility, to maintain quality standards

h. Raise quality issues with designated personnel

1.3. Routinely monitoring work area

There are five ways to monitor the actions of employees:

1.3.1. Watch employees work.

One of the most effective ways to monitor an employee's performance is with your own eyes. Watching an employee interact with a customer for a few minutes will tell you more about that employee's customer service performance than a batch of customer feedback surveys. That's why so many route-sales organizations encourage their managers to do ride-along with salespeople. So the manager can actually watch the employee do his job. If you are having difficulties helping an employee succeed with a particular task, "shadow" that employee while he does the task. You'll find out exactly what he's doing and how he can do it better

1.3.2. Ask for an account.

In every one-on-one conversation with every employee, ask for an account of what that person has done since your last conversation: "What concrete actions did you take? Did you meet the clearly spelled-out expectations?" Then listen very carefully, make judgments, and ask more probing questions. Asking for an account is the number one method for holding a person accountable for his actions. Then move on to discuss next steps. As long as you are consistently carrying out your one-on-one management conversations with every person on a regular basis, this element of monitoring performance will become routine.

1.3.3. Help employees use self-monitoring tools.

You can also ask employees to help you keep track of their actions by using self-monitoring tools like project plans, checklists, and activity logs. Employees can monitor whether they are meeting goals and deadlines laid out in a project plan, make notations within checklists,

and report to the manager at regular intervals. Activity logs are diaries that employees can keep, noting contemporaneously exactly what they do all day, including breaks and interruptions. Each time the employee moves on to a new activity, he is asked to note the time and the new activity he is turning to

1.3.4. Review work in progress on a regular basis.

Check your employees' work carefully in process along the way. If an employee is not responsible for producing a tangible end product, then watching that employee work is the same thing as reviewing work in progress. If she is responsible for an end product, spot-check it while she is working on it. For example, if the employee manages a database, spot-check the records. If the employee writes reports, look at drafts. If the employee makes phone calls, record them and listen to a random sample. If the employee makes widgets, check some half-done widgets and see how they look. You can't actually keep track of everything every employee does, but you can check random samples on a regular basis

1.3.5. Ask around a little.

Gather intelligence. Ask customers, vendors, coworkers, and other managers about their interactions with specific employees. Always ask question about the employee's work, never about the person. Don't ask for evaluations, but ask for descriptions. Don't ask for impressions, but ask for details. And don't believe everything you hear; the unverified statements of third parties are simply hearsay. But the more you keep your ear to the ground, the more you know which sources can be trusted. So, ask around on a regular basis

Self -Check-1	Written Test

Instruction: Follow the below selected instruction

Choose the best option & circle the letter of your choice.

.

N°	Questions
1	Do the most important things first and do not be side-tracked by unimportant interruptions A. Plan ahead B. Delegate work appropriately C. Do first things first: D. Write it down
2	Ensure the most appropriate people are doing each job. A. Plan ahead B. Delegate work appropriately C. Do first things first: D. Write it down
3	Allocate the workload well, your job gets done in the smoothest way and done right the first time. A. Plan ahead B. Delegate work appropriately C. Do first things first: D. Write it down

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 2	Workplace reporting requirements

2.1 Workplace Gender Equality Act

Requires non-public sector employers with 100 or more employees ('relevant employers') to submit a report to the Workplace Gender Equality Agency. This includes:

- non-public sector employers with 100 or more employees
- corporate structures that employ 100 or more people across all entities

2.2 Recordkeeping Requirements

Many employers with more than 10 employees are required to keep a record of serious work-related injuries and illnesses. Minor injuries requiring first aid only do not need to be recorded.

- How does OSHA define a recordable injury or illness?
  - ✓ Any work-related fatality.
  - ✓ Any work-related injury or illness that results in loss of consciousness, days away from work, restricted work, or transfer to another job.
  - ✓ Any work-related injury or illness requiring medical treatment beyond first aid.
  - ✓ Any work-related diagnosed case of cancer, chronic irreversible diseases, fractured or cracked bones or teeth, and punctured eardrums.
  - ✓ There are also special recording criteria for work-related cases involving:

- How does OSHA define first aid?
  - ✓ Using a non-prescription medication at nonprescription strength (for medications available in both prescription and non-prescription form, a recommendation by a physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for recordkeeping purposes);
  - ✓ Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment); Cleaning, flushing or soaking wounds on the surface of the skin

- ✓ Using wound coverings such as bandages, Band-Aids, gauze pads, etc.; or using butterfly bandages or Steri-Strips (other wound closing devices such as sutures, staples, etc., are considered medical treatment);
- ✓ Using hot or cold therapy;
- ✓ Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for recordkeeping purposes);

2.3 Maintaining and Posting Records

The records must be maintained at the worksite for at least five years. Each February through April, employers must post a summary of the injuries and illnesses recorded the previous year. Also, if requested, copies of the records must be provided to current and former employees, or their representatives.

Figure 12: reporting

Self-Check-2	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts
2	Requires public sector employers with 100 or more employees (‘relevant employers’)
3	Any work-related injury or illness that results in loss of consciousness, days away from work, restricted work, or transfer to another job.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 3	Identifying and reporting non-conformance in Inputs

3.1. Introduction

Nonconformance (NC) is an audit designation indicating the quality management system or a portion of it does not meet the requirements established by ISO 9000. Non-conformance is a sign that something went wrong in a service, process, and product or in the system itself by not meeting a certain set of specifications. The existence of a nonconformance implies that some aspects of a company's standard operating procedures are not being followed or they need to be modified or even updated

These deviations can be identified through internal and external audits, customer complaints, material inspection or routine testing. A non-conformance report is then prepared. The purpose of the report is to document the details of a deviation from expectations. The report helps define the problem in a clear, logical and concise way so that management can take steps to implement changes. ISO 9001:2015 no longer requires a documented procedure, but one must still keep records of the nonconformity and what was done to correct it

Non-conformance could lead to rework, product recall, and decreased productivity. Corrective actions are reactive – the steps you take once the problem has occurred. Preventive actions are not only to prevent a particular instance of non-conformance from re-occurring, but also to prevent one from ever occurring.

3.2. Here are four ways to prevent or minimize non-conformance:

a. Management Review

Management review is akin to getting your car serviced every year even when there are no overt signs of problems. Management reviews are generally conducted once a year and present an opportunity to review the company's existing quality policy as well as set new objectives for the rest of the year. New objectives can be invaluable for minimizing nonconformance. Product changes, new requirements, new processes, change management etc. are all reviewed. The management review process can identify and correct any current or incipient deficiencies before they might be revealed by an audit or incident. Routinely reviewing the organization's process helps spur continuous

improvement. A system should be in place for implementing any resulting plans for improvement or corrective action and verifying their effectiveness.

b. Review

A review is usually a 'senior management' exercise. Keeping this in mind, it's important to conduct a similar exercise with the actual employees who are involved in the day-to-day process. These employees have an in-depth understanding of various processes and how they are related. They have vast knowledge about the product and more importantly about past non-conformance issues. They very well could have been first to respond to a crisis and would have played a crucial role in analyzing the situation and solving an issue. On the flip side, this discussion could reveal a knowledge gap crucial to fixing non- conformance. An end-to-end understanding is crucial in setting up new objectives to minimize non-conformance. Also, understanding the process followed by lower-level employees could highlight pain points and provide key insight into potential areas of non- conformance, those which cannot be identified in a management review or audit.

c. Internal Audit

An audit is simply another form of testing i.e. comparing things as they are to how they ought to be. Internal Audits need to be scheduled at regular intervals to check whether the quality system conforms to requirements and to ensure the system's efficacy. Unlike an external audit, all the processes need not be audited at the same. Internal audits can be conducted as a series of smaller audits, with different processes audited at different times. The frequency of audit can also be set depending on the process in question. With changing internal and external dynamics, the criteria for the audit can be decided prior to the audit rather than the planning stage. Any previous findings, past audit conclusions, and pre-defined questions all become valuable data. Observations raised during internal audits could be classed as preventive actions as they can suggest improvements within the system to prevent non-conformances from occurring in the future.

d. Feedback

While all customer complaints are recorded and must be actioned, customer feedback also plays a role in minimizing non-conformance. Feedback from customers helps to understand potential non-conformance issues and is an opportunity for improvement. Customer

suggestions may prevent any issues from being raised in the future. Negative as well as positive feedback is valuable data. Spending time to analyze could help spot trends and patterns. Feedbacks help to dig into the root cause of the issue which may not always be obvious (else it would have been picked up in audit testing). Understanding the root cause can help differentiate a temporary lapse from a process flaw.

3.3. Nonconformance process

Non conformances occur when a service, product or process does not meet defined specifications or industry regulation and standards. ... Improvements to product/service and resultant customer satisfaction. Efficient use of resources.

- Reduction in the occurrence and costly impact of nonconformance's in terms of reputation, cost and resources
- Improvements to product/service and resultant customer satisfaction
- Efficient use of resources.
- Reduction in number of Customer Complaints
- Improved QMS effectiveness

Figure 13: Its foundation is the Plan Do Check Act cycle.

3.4. Handling Nonconforming Products:

- Documented procedure should indicate the plan of action for controlling products.
- Nonconforming product is identified and separated from other conforming products.
- Nonconforming product must be reviewed and approved before release.
- Details of nonconformity must be documented.

Self-Check-3	Written Test

Instruction: Follow the below selected instruction

Choose the best option & circle the letter of your choice.

N°	Questions
1	_____is akin to getting your car serviced every year even when there are no overt signs of problems. A. Review B. Management Review C. Internal Audit D. Feedback
2	plays a role in minimizing non-conformance A. Review B. Management Review C. Internal Audit D. Feedback
3	Need to be scheduled at regular intervals to check whether the quality system conforms to requirements and to ensure the system's efficacy. A. Review B. Management Review C. Internal Audit D. Feedback

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 4	Taking corrective actions

4.1. Corrective actions

Corrective action is a process of communicating with the employee to improve attendance, unacceptable behavior or performance. No corrective action is required when the deviations are within acceptable limits. However, when the deviations go beyond the acceptable range, especially in the important areas, it demands immediate managerial attention so that deviations do not occur again and standards are accomplished.

Corrective action might involve training of employees if the production target could not be met. Similarly, if an important project is running behind schedule, corrective action might involve assigning additional workers and equipment to the project and permission for overtime work.

- Corrective action is a process of communicating with the employee to improve attendance, unacceptable behavior, or performance.
- Taking corrective action requires identifying the problem and implementing a potential solution.
- In any business, at some point employers such as HR managers, managers, or small business owners have to take corrective actions and/or discipline employees.

4.2. The basic control process includes the following steps:

a. Establishment of Standards:

Managers must translate plans into performance standards. Standards like employee morale, discipline, public relations, the image of the concern, etc. cannot be easily quantified, as they are intangible. These performance standards can be in the form of goals, such as revenue from sales over a period of time. A standard should be tangible, for better evaluation. Performance standards are expressed in terms of cost, quality, quantity, and time.

b. Measurement of Actual Performance

If performance is not measured, it cannot be ascertained whether standards have been met. Work, operations, and turnout should be observed, measured and facts collected. Statistical data, reports, opinions, accounting information, etc. will help in measuring the actual performance.

c. Comparison of Actual Performance with the Original Standards:

Accept or reject the product or outcome. The comparison may disclose either agreements or deviations from the standards established. But the manager has to be very clear about the concept of deviation: minor or negligible deviations may be ignored, but major and significant deviations should be correctly understood.

d. Taking Corrective Action:

Managers must determine why standards were not met. Corrective action should be taken immediately, without any loss of time. Corrective action may be improving the techniques, organizational structure, proper selection, training, and remuneration of workers. This step also involves determining whether more control is necessary or if the standard should be changed.

e. Feedback:

If the feedback is positive and reveals accomplishment, the manager must encourage and appreciate the subordinates. If the feedback brings negative results, the manager has to take corrective action and alter the operations accordingly. Feedback will help in getting information well in time about work performance, and it also motivates people

Self-Check-4	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	Corrective Action s positive and reveals accomplishment, the manager must encourage and appreciate the subordinates.
2	If performance is not measured, it cannot be ascertained whether standards have been met.
3	Corrective action is a process of communicating with the employee to improve attendance.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 5	Raising quality issues

5.1. Use the following general process to identify and resolve quality problems.

5.1.1. Identify the problem or symptom

You shouldn't assume that everyone knows the problem already. Take the time to document the problem in clear terms that everyone can understand. Make sure to also explain the impact of the quality problem to the project. The first rule of problem resolution is that if you can't define the problem, you can't resolve it.

5.1.2. Identify the root cause

Try to identify the root cause of the problem and explain how the root cause ultimately results in the problem that has arisen. If you can't track the root cause to the perceived problem, you haven't taken your investigation far enough. There are a number of problem-solving techniques you can utilize, including root cause analysis and Fishbone Diagrams.

5.1.3. Determine alternatives and impacts

Once the cause is identified, you should look at the alternatives and the impact of each alternative. Although it's best to try to solve the root cause of the problem, sometimes it's not possible and sometimes it's not cost effective. In these instances, you might need to look at alternatives that resolve the symptoms of the problem. Sometimes there's a very obvious solution that needs to be implemented. However, in many cases there are a number of potential alternatives. For each alternative, they should also address the impact to the project in terms of costs, benefits, and risks. It's worthwhile to make sure you look at the solutions as holistically as possible, so that you can make select the best alternative

5.1.4. Select the best alternative

Depending on the severity of the problem, the project team may be able to choose the best alternative to the problem. If the problem is large enough, your sponsor and management stakeholders may need to be involved as well.

5.1.5. Execute

A mini-plan is put into place to address the quality problem and implement the chosen alternative. These activities should be moved into the project workplan to ensure that they are performed

5.1.6. Monitor

The resolution plan needs to be monitored to ensure that the quality has improved as expected. If the quality has improved or is moving in that direction, you may allow the plan to continue. However, if the quality is not improving as expected, further corrective action may be required

Self-Check-5	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	Root cause of the problem and explain how the root cause ultimately results in the problem that has arisen.
2	Monitor these activities should be moved into the project workplan to ensure that they are performed.
3	The first rule of problem resolution is that if you can't define the problem, you can't resolve it.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Solar PV System Installation and Maintenance

Level-IV

Learning Guide-48

Unit of Competence	**Establish Quality Standards**
Module Title	**Establishing Quality Standards**
LG Code	**EIS PIM4 M12 LO7 LG-48**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO 7: Report problems that affect quality

InstructionSheet-1	Learning Guide:-48

This Learning Guide is developed to provide you the necessary information regarding the following content coverage and topics

- Recognizing potential or existing quality problems
- Identifying instances of variation in quality
- Reporting variation and potential problems

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:-

- Recognizing potential or existing quality problems
- Identifying instances of variation in quality
- Reporting variation and potential problems

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet- 1	Recognizing potential or existing quality problems

1.1. Management commitment

Effective risk management starts with a commitment to health and safety from those who operate and manage the business or undertaking. You also need the involvement and cooperation of your workers, and if you show your workers that you are serious about health and safety they are more likely to follow your lead.

To demonstrate your commitment, you should:

- Get involved in health and safety issues
- Invest time and money in health and safety
- Ensure health and safety responsibilities are clearly understood.

  A step-by-step process

A safe and healthy workplace does not happen by chance or guesswork. You have to think about what could go wrong at your workplace and what the consequences could be. Then you must do whatever you can (in other words, whatever is 'reasonably practicable') to eliminate or minimize health and safety risks arising from your business or undertaking. This process is known as risk management and involves the four steps set out in this Code

- Identify hazards- find out what could cause harm
- Assess risks if necessary - understand the nature of the harm that could be caused by the hazard, how serious the harm could be and the likelihood of it happening
- Control risks- implement the most effective control measure that is reasonablypracticable in the circumstances
- Review control measures to ensure they are working as planned.

1.2. Factors Affecting Quality

The factors affecting quality are:

A. Money:

Most important factor affecting the quality of a product is the money involved in the production itself. In the present day of tough and cut throat competition, companies are forced to invest a lot in maintaining the quality of products.

B. Materials:

To turn out a high quality product, the raw materials involved in production process must be of high quality.

C. Management:

Quality control and maintenance programmers should have the support from top management. If the management is quality conscious rather than merely quantity conscious, organization can maintain adequate quality of products.

D. People:

People employed in production, in designing the products must have knowledge and experience in their respective areas.

E. Market:

Market for the product must exist before quality of the product is emphasized by management. It is useless to talk about the quality when the market for the product is lacking. For example, there is no demand for woolen garments in the hot climates (e.g., Southern part of India).

F. Machines and Methods:

To maintain high standards of quality, companies are investing in new machines and following new procedures and methods these days.

1.3. Effective Problem Solving

The 7 step problem solving guide provided below has been created to help solve problems where the solution or in some cases the problem itself is not obvious

STEP 1: The Right Problem to Solve

Identifying the right problem to solve can be by far the most crucial element in the process and it can't be stressed enough that for this step to work to its full potential it is important to remember to focus on the problem and not just its symptoms or possible solutions, these parts will come shortly. If dealing with multiple problems the right problem is generally the one with the most important outcome, the greatest chance for solution and the nearest deadline.

STEP 2: Analyze the Problem

Analyzing the problem starts with collecting as much information as possible relating to all aspects of the problem. This is where you find out what you already know about the situation and what areas need further looking into. To help discover all the facts it is a good idea to create a number of lists relating to the problem where you in turn list as many points as possible.

When you ask "What?" you are asking for information specifying something -"What are we looking at?" or for things that are used in specifying something -"What we need is?" or even information specifying something -"What time is it?". Asking "What?" can also be used to find out to what extent -"What does it matter?".

STEP 3: Define the Problem

Only after the right problem has been identified and analyzed can one be sure of the correct definition of the problem. In most cases the definition will remain unchanged from STEP 1, but in some cases once other available information has been brought to light the problem, the opportunity or the desired outcome may have changed to accommodate either new information or a new perspective on the problem itself

The following definitions should be written down for future reference. If there is any hesitation with any of the definitions it can be a sign that you don't fully understand the problem at hand and that the previous step should be re-visited.

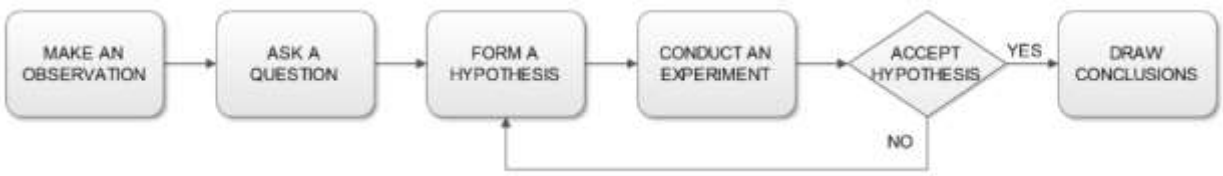
- Define exactly what the problem is.
- Define exactly what needs to be solved.
- Define your problem as an opportunity.
- Define the desired outcome.

STEP 4: Develop Opportunities (Possible Solutions)

There is always more than one way to solve a problem and in some cases simultaneous solutions may be required. As with the previous steps it is essential that time is taken to develop plenty of innovative and creative ideas. At the end of this step you can be certain you will have the best solution if you have explored all possible avenues and generated every conceivable option. To help you find the best solution the following methods can be used.

- **The Scientific Method**

A method for conducting an objective investigation which is a proven approach to solving problems in a way that is reliable, consistent and non-arbitrary. The scientific method can be seen to underlay the scientific revolution and has helped to create many of the great accomplishments of recent human history. A basic flow chart of the scientific method is shown below



STEP 5: Select the Best Solution

With a list of possible solutions developed in the previous step it is time to select the best individual or best combination of solutions to be put into action and to eliminate the problem at hand. The process of selecting the best solution is a matter of ranking all of the available solutions against one another and defining each option “pluses and minuses”. Some of the key areas that might need to be evaluated and prioritized have been listed below

- **Operational validity**: Can the solution actually be implemented or is it just an idea?
- **Economic validity:** Is the solution economical? Will the solution bring an economic result?
- **Degree of Complexity**: Is the solution simple to implement or are there complexities involved?
- **Ease of Implementation**: Is the solution ready to go and easy to install?
- **Stakeholder interest:** Does the solution satisfy everyone’s interests.
- **Potential Risk:** Does the solution bring any additional risk with it?
- **Personal commitment:** Is the solution something that reflects the ideals of all involved? Is the solution something you believe in?
- **End result:** Will the solution solve all parts of the problem or will the problem just be reduced or concealed?

Table 4: Select the Best Solution

CRITERIA / SOLUTIONS	Operational Validity	Economic Validity	Degree of Complexity	Ease of Implimentation	Stakeholder Interest	Potential Risk	Personal Commitment	End Result	TOTALS
Solution 1	8	3	2	5	9	3	9	10	**49**
Solution 2	6	7	3	6	3	7	9	10	**51**
Solution 3	5	9	3	7	3	8	9	9	**52**
Solution 4	5	9	8	7	5	7	7	9	**61**
Solution 5	5	9	7	6	7	8	9	9	**60**

STEP 6: Implement the Solution

The implementation plan is just as important as implementing the solution/s and monitoring the progress of this step is something that will need to be done also. Brief guides to some of the things that will need to be considered have been detailed below.

STEP 7: Evaluate and Learn

Hopefully everything went to plan and the problem is now solved and even if it wasn't, this step is still the same. It is vital that the whole process is evaluated from problem to solution and a good starting point is to document the 7 step procedure. This step is intended to not only provide a future reference but also a learning experience for future problem solving. At a very minimum the following questions should be answered

Self-Check-1	Written Test

Instruction: Follow the below selected instruction

Choose the best option & circle the letter of your choice.

N°	Questions
1	To turn out a high quality product, the involved in production process must be of high quality A. Management B. Money C. People D. Material
2	The product must exist before quality of the product is emphasized by management. A. Market B. Money C. People D. Material
3	One of the following is not demonstrate your commitment, you should: A. Get involved in health and safety issues B. Invest time and money in health and safety C. Evaluate and Learn D. Ensure health and safety responsibilities are clearly understood.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 2	Identifying instances of variation in quality

2.1. Introduction

A variation (sometimes referred to as a variation instruction, variation order (VO) or change order), is an alteration to the scope of works in a construction contract in the form of an addition, substitution or omission from the original scope of works. Almost all construction projects vary from the original design, scope and definition. Whether small or large, construction projects will inevitably depart from the original tender design, specifications and drawings prepared by the design team. This can be because of technological advancement, statutory changes or enforcement, change in conditions, geological anomalies, non-availability of specified materials, or simply because of the continued development of the design after the contract has been awarded. In large civil engineering projects variations can be very significant, whereas on small building contracts they may be relatively minor.

2.2. Variations may include:

- Alterations to the design
- Alterations to quantities
- Alterations to quality
- Alterations to working conditions
- Alterations to the sequence of work

Variations may also be deemed to occur if the contract documents do not properly describe the works actually required. Variations may not (without the contractors consent):

- Change the fundamental nature of the works.
- Omit work so that it can be carried out by another contractor.
- Be instructed after practical completion.
- Require the contractor to carry out work that was the subject of a prime cost sum

In legal terms, a variation is an agreement supported by consideration to alter some terms of the contract. No power to order variation is implied, and so there must be express terms in contracts which give the power instruct variations. In the absence of such express terms the contractor may reject instructions for variations without any legal consequences. Standard forms of contract generally make express provisions for the contract administrator (generally

the architect or engineer) to instruct variations. Such provisions enable the continued, smooth administration of the works without the need for another contract. Variation instructions must be clear as to what is and is not included, and may propose the method of valuation.

2.3. Valuation of variations

Variations may give rise to additions or deductions from the contract sum. The valuation of variations may include not just the work which the variation instruction describes, but other expenses that may result from the variation, such as the impact on other aspects of the works. Variations may also (but not necessarily) require adjustment of the completion date

2.4. Variations may be valued by:

- Agreement between the contractor and the client.
- The cost consultant.
- A variation quotation prepared by the contractor and accepted by the client.
- By some other method agreed by the contractor and the client.

Valuations of variations are often based on the rates and prices provided by the contractor in their tender, provided the work is of a similar nature and carried out in similar conditions. This is true, even if it becomes apparent that the rates provided by the contractor were higher or lower than otherwise available commercial rates. The contractor's rates do not become reasonable or unreasonable by the execution of variations, as stipulated by the ruling in the case of Henry Boot Construction Ltd v Alstom [1999]. If similar types of works to those instructed by a variation cannot be found in the drawings, specification or bills of quantities, then fair valuation of the contractor's direct costs, overheads and profit is necessary.

Self-Check-2	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	Variations may give rise to additions or deductions from the contract sum.
2	Valuation of variations agreement between the contractor and the client.
3	Variations may not without the contractors consent :Be instructed after practical completion

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

Information Sheet- 3	Reporting variation and potential problems

3.1. Introduction

A quality report is defined as are port conveying information about the quality of a statistical product or process. It contains text, one or more quality indicators or a combination of both and it can be recorded on paper, in a file or a database.

3.2. Report variation and potential problems to supervisor/manager according to enterprise guidelines

- Establish a Schedule for Regular Reporting
- Develop Report Formats To Communicate Clearly

The “best” methods to display monitoring data are the ones that work for your implementation team and other users. Some people find tables to be an effective way to communicate information; others prefer graphs.

You should report the same results to all users of the monitoring information, but each type of user will be interested in different aspects of the information

3.3. Problems of supervision

Following are the main problems of supervision

- **Not enough authority in supervision:**

A supervisor is expected to convert managerial ideas and goals into concrete operational results. But the problem is that he is not given enough authority to make operational decisions and also not accepted as a part of the management. His position is such that he is often in a dilemma as to whom to please. If he pleases managers, he is subjected to earn the displeasure of the workers and vice versa. Thus to be successful in his activity, supervisor should keep an equal distance between the two parties and balance their conflicting attitudes and goals.

- **Labor union pressures in Supervision:**

The supervisor has direct contact with the workers. He is often in a position to face the problem of, labor union pressures and interference in the 'normal functioning of his unit. He has only little control over their problem which makes his lob more difficult.

- **Supervision is prone to criticism:**

One of the notable problems of supervision is that it is prone to criticism. Frequently, the supervisor gets advice, suggestions, instructions and observations from several specialist staff units. At every stage of his functioning, he has to reflect on the likely implications of his activities on the thinking of such specialized staff units. Here, it is a problem for him to distinguish whether such specialists are suggesting, for helping or interfering and whether they are making their own observations or criticizing his working.

- **Inadequate time in supervision**

One of the problems of supervision is that much of the supervisors time is wasted on keeping records, filling in forms, submitting returns and memoranda for the benefit of top level management, etc. This leaves the supervisors in inadequacy of time to do the, real supervisory work.

- **Educational level of the supervisor**

In most of the cases, the educational level of the supervisor is modest. He lack the required intellectual sharpness to understand the dynamics of management and supervision. He also lacks enough authority and status. This renders him relatively unequal to the tasks attached to his position, Another important problem of supervision is that it may not always be easy for the supervisor to make his group members understand the expectations and requirements of the organization. This is because, his, work group mostly' include illiterate rank and file workers.

3.4. Solutions / Requirements of effective Supervision

For a supervision to be effective, the following requirements may be a solution:

a. For an effective supervision, a supervisor should be given complete control over his work unit. He should be given adequate authority, responsibility and status.

b. A supervisor should be supplied with full information and knowledge on all matters affecting the working of his work unit.

c. Supervisor should be provided with an adequate number of assistance to share his work load who also should work directly under his control.

d. For supervision to me more effective, a supervisor should have promotional opportunities to the higher managerial posts. This will encourage him and boost up his confidence level.

If all the above provisions are available in an organization, the problems of supervision can be eliminated.

Self-Check-3	Written Test

Instruction: Follow the below selected instruction

The following are true or false items, write true if the statement is true and write false if the statement is false.

N°	Questions
1	A supervisor should be supplied with full information and knowledge on all matters affecting the working of his work unit.
2	Supervision is that it is prone to criticism. Frequently, the supervisor gets advice
3	Reporting is expected to convert managerial ideas and goals into concrete operational result.

Note: the satisfactory rating is as followed

Satisfactory	2 points
Unsatisfactory	Below2points

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