Ethiopian TVET-System

ELECTRONIC COMMUNICATION AND MULTIMEDIA EQUIPMENT SERVICING Level II

Based on May 2011 Occupational Standards

October, 2019

Module Title: Applying Routine Problem Solving Techniques

TTLM Code: EEL CMS2TTLM 1019 v1

This module includes the following Learning Guides

LG32: Analyze the problem
            LG Code: EELICS2M09LO1LG32
LG33: Identify possible solutions

            LG Code: EEL ICS2 M09 LO2-LG33
LG34: Recommend solution to higher management
             LG Code: EEL ICS2 M09 LO3-LG34
LG35: Implement solution
            LG Code: EEL ICS2 M09 LO4-LG35
LG36: Install additional/ enhancement features
            LG Code: EEL ICS2 M09 LO5-LG36

Instruction Sheet	LG32: Analyze the problem

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Evaluate issues or concerns based on data gathered
- Identifying possible causes of problem within the **area of responsibility** using, experience or problem solving tools
- Developing possible cause statements based on findings

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**:

- Evaluating Issues/concerns based on data gathered
- Identifying possible causes of problem within the area of responsibility as based on experience and the use of problem solving tools/analytical techniques
- Developed possible cause of statements are developed based on findings

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3 and Sheet 4".
4. Accomplish the "Self-check 1, Self-check t 2, and Self-check 3" **in page -21, 29, and 31** respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1 " **in page -22.**
6. Do the "LAP test" **in page – 32** (if you are ready).

Information Sheet-1	Evaluate issues or concerns based on data gathered

Introduction

Problem solving is the act of defining a problem; determining the cause of the problem; identifying, prioritizing, and selecting alternatives for a solution; and implementing a solution.

Good problem solving skills empower students in their educational, professional, and personal lives. Nationally and internationally, there is growing recognition that if education is to produce skilled thinkers and innovators in a fast-changing global economy, then problem solving skills are more important than ever. The ability to solve problems in a range of learning contexts is essential for the development of knowledge understanding and performance. Requiring students to engage with complex, authentic problem solving encourages them to use content knowledge in innovative and creative ways and promotes deep understanding.

1.1 Basic Steps of the Problem-Solving Process

In order to effectively manage and run a successful organization, leadership must guide their employees and develop problem-solving techniques. Finding a suitable solution for issues can be accomplished by following the four-step problem-solving process and methodology outlined below.

1. 1.1 Define the problem

Diagnose the situation so that your focus is on the problem, not just its symptoms. Helpful problem-solving techniques include using *flowcharts* to identify the expected steps of a

Process and *cause-and-effect diagrams* to define and analyze *root causes*.

The sections below help explain key problem-solving steps. These steps support the involvement of interested parties, the use of factual information, comparison of expectations to reality, and a focus on root causes of a problem. You should begin by:

- Reviewing and documenting how processes currently work (i.e., who does what, with what information, using what tools, communicating with what organizations and individuals, in what time frame, using what format).
- Evaluating the possible impact of new tools and revised policies in the development of your "what should be" model.

1.1.2 Generate alternative solutions

Postpone the selection of one solution until several problem-solving alternatives have been proposed. Considering multiple alternatives can significantly enhance the value of your ideal solution. Once you have decided on the "what should be" model, this target standard becomes the basis for developing a road map for investigating alternatives. Brainstorming and team problem-solving techniques are both useful tools in this stage of problem solving. Many alternative solutions to the problem should be generated before final evaluation. A common mistake in problem solving is that alternatives are evaluated as they are proposed, so the first acceptable solution is chosen, even if it's not the best fit. If we focus on trying to get the results we want, we miss the potential for learning something new that will allow for real improvement in the problem-solving process.

1.1.3 Evaluate and select an alternative

Skilled problem solvers use a series of considerations when selecting the best alternative. They consider the extent to which:

- A particular alternative will solve the problem without causing other unanticipated problems.
- All the individuals involved will accept the alternative.
- Implementation of the alternative is likely.
- The alternative fits within the organizational constraints.

1.1.4 Implement and follow up on the solution

Leaders may be called upon to direct others to implement the solution, "sell" the solution, or facilitate the implementation with the help of others. Involving others in the implementation is an effective way to gain buy-in and support and minimize resistance to subsequent changes. Regardless of how the solution is rolled out, feedback channels should be built into the implementation. This allows for continuous monitoring and testing of actual events against expectations. Problem solving, and the techniques used to gain clarity, are most effective if the solution remains in place and is updated to respond to future changes.

Fig1.1 Problem Solving Chart

1.2 A Systematic Approach to Problem solving

That it will be 24 to 48 hours before it can restore power. You immediately think of two major problems: getting your morning coffee and the freezer full of food! How would you solve both of these problems? Think about it and be prepared to share your solution.

What is your solution to getting your morning coffee? O.K. – you may not drink coffee, but if you did, what would you do?

What is your solution to taking care of that freezer full of food?

What was the process that you used in solving these two problems?

Did you first determine the seriousness of the problem? For example, did you ask questions like these?

    a. Can I live without my coffee for a day?

    b. Will the food thaw out in 24 hours if I just leave the door closed? Do I want to chance it?

    c. What is the value of all of the food in the freezer? Can I afford to lose it all?

Would you consult with someone else to help solve the problems?

Would you decide on an action plan and then implement it (hypothetically) for each of these problems?

Do you think your action plans would work (hypothetically)?

If this is the process that you followed, then you just applied a systematic approach to solving a problem. It is something that a lot of us instinctively on daily, personal problems. In industry this same system is applied, but in many cases you are working with a team and the problems you are solving are bigger and harder to solve.

1.2.1 Types of Problem That Need to Be Solved

On a personal level, I'm sure that you solve problems all of the time. Here are a few practical problems you may have had to solve recently.

- You have a lot of work to do, and not enough time to do it; however, you manage to get it all done anyway.
- All of your clothes are dirty, but you still find something to wear.
- You were really low on cash last month, so you budgeted wisely to make what you have last to the next pay check

In industry, problems occur all of the time; therefore, problem solving tasks are common place.

- Technicians determine the cause of equipment failure and eliminate the cause. At the same time, they fix any problems created when the equipment failed.
- When the product being manufactured is defective, technicians, operators and engineers work together to find the cause of the defects and then prevent them from happening again.
- Computer technicians identify and correct problems with their customers' computers.

- Mechanical assemblers work with supervisors and engineers to find ways to assemble the product faster and more efficiently.
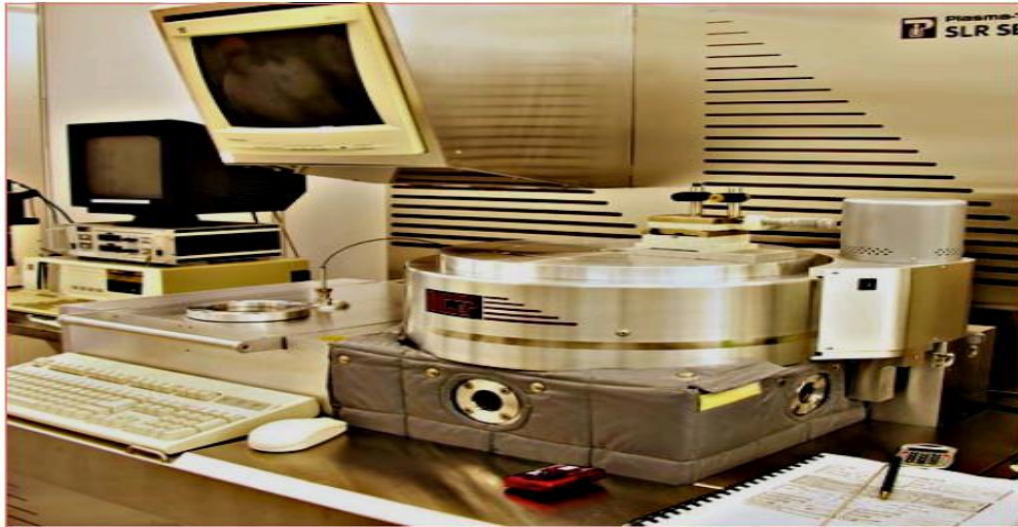

[Image of Plasma Etcher courtesy of the Manufacturing Technology Training Center (MTTC), University of New Mexico]

In all of these problem-solving tasks, people use a variety of tools to get the problem solved. Employers want all of their employees to have these tools and know how to use them. Employers also need new employees to bring skills such as problem-solving, teamwork, and communication with them when they get hired. Therefore, your chances of getting hired and being successful in a manufacturing field improve by developing these skills now. That is what this learning module will help you do.

Creativity
How creative are you? Let's see.
Connect the following set of nine dots with four straight lines without taking your pen or pencil up off of the paper.
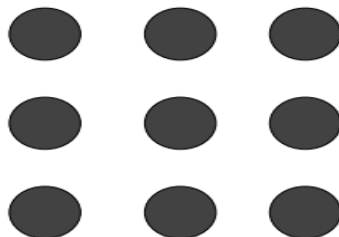
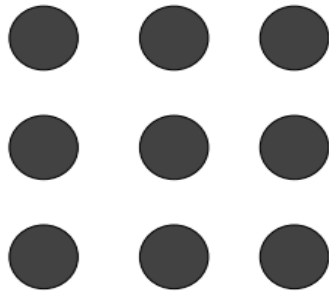Did you do it? Are your lines straight lines? Did you have to pick your pen up at any point?

If you weren't able to do it, work with another person to see if together you can solve this puzzle.

Let's try it again, but with only three straight lines.

Again, do not lift your pen or pencil off of the paper and connect these nine dots with THREE STRAIGHT lines

Did you do it? If not, maybe you aren't "thinking outside the box". Try again and this time, remember that there are only 2 rules – three straight lines and don't pick up your pen from the paper.

If you had difficulty solving these puzzles, what were some of your constraints?

Creative problem-solving encourages new ways of thinking, new ways of getting the problem solved. Your own creativity can be enhanced when working with others, because we tend to impose unnecessary limitations on ourselves when solving problem. We need to learn how to identify "real" limitations and let the other ones go. For example, if you tried to solve the nine dots problems by staying within the perimeter formed by the dots, then you were working with a limitation imposed by you, and only you. That was not a limitation of the problem itself.

If you still haven't been able to solve the nine dots problems, try again. This time, "think outside of the box", outside of the perimeter defined by the nine dots.

1.2.1.1 SIX STEPS TO PROBLEM SOLVING

Creativity and being open-minded to solutions are two things that everyone needs to bring to a problem-solving table. Using these tools along with a systematic approach to solving problems can speed up the process and get the job done more efficiently and more effectively.

This module uses a Six Step Problem Solving process. Below are the six steps:

- Recognize that a problem exists
- Analyze the problem - Collect information
- Identify possible causes (solutions) to the problem
- Evaluate the possible causes (solutions)
- Develop an action plan to correct the problem and take action
- Verify that the problem has been corrected.

Each of these steps requires an open-mind and a creative mind. In addition, in the workplace especially, each step requires teamwork and effective communication between team

members as well as those outside of the problem-solving team. Let's look at each step in detail.

Step 1: RECOGNIZE THAT A PROBLEM EXISTS

In order to recognize that a problem exists, you must have some "knowledge" of the situation, the job, the equipment, the product. It is possible to know so little, that you do not know that there is a problem to begin with. Gaining knowledge about your job helps you to "recognize" –

"Hey, we have a PROBLEM!"

Become an information addict. Ask questions. Learn everything you can. When you are put into a situation that you don't understand ASK QUESTIONS. Get enough information to work safely and correctly.

Here's what can happen when you don't have enough information.

Jake and Junior like to hunt. Hearing about the moose up north, they went to the wilds of Canada to hunt. They had hunted for a week, and each had bagged a huge moose. When their pilot landed on the lake to take them out of the wilderness, he saw their gear and the two moose. He said, "I can't fly out of here with you, your gear and both moose."

"Why not?" Jake asked.

"Because the load will be too heavy. The plane won't be able to take off."

They argued for a few minutes, and then Junior said, "I don't understand.

Last year, each of us had a moose, and the pilot loaded everything."

"Well," said the pilot, "I guess if you did it last year, I can do it, too."

So they loaded the plane. It moved slowly across the lake and rose toward the mountain ahead. Alas, it was too heavy and crashed into the mountain side.

No one was hurt, and as they crawled out of the wreckage, Jake asked, "Where are we?"

Junior surveyed the scene and answered, "Oh, about a mile farther than we got last year

--from a speech by Carl Wayne Hensley, Professor of Speech Communication, Bethel College.

Do you think the pilot should have gotten "a little" more information before taking off?

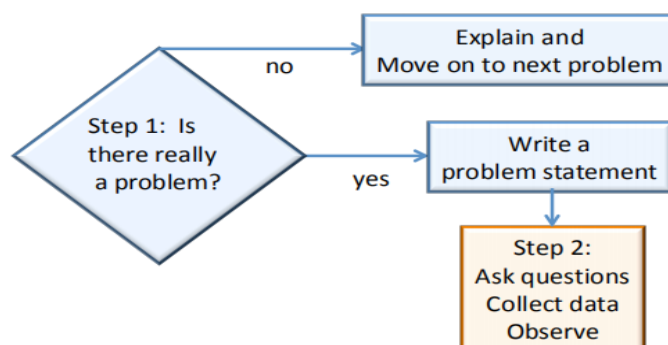## Step 1: Recognize that a problem exists

Fig step to recognize that a problem exists

A problem exists when there is a deviation from the standard for which the cause is not known. Examples:

a. My car is making a noise that I've never heard before.

b. An unacceptable amount of finished product is defective.

c. The uniformity of photoresist on the process wafer is "out of control", beyond the acceptable control limits.

2. To recognize a problem, ask,
   a. "Is it doing what it should be doing?"
   b. "Is the outcome the correct outcome?"

In order to answer these questions, people who work in a manufacturing environment should know the equipment, the product, and the process - what it sounds like, looks like, smells like, and feels like. The more one knows, the better problem solver one becomes.

3. Once it is recognized that a problem exists, write a problem statement that states exactly what is affected, what is wrong, and the extent of the problem (the degree of deviation from accepted performance levels.)

4. If working with others, everyone must agree on what the problem is and agree with the problem statement.

Examples of Problem Statements:

a. My electricity will be out for at least 24 hours and I have at least $600 worth of food in the freezer that could thaw out. I need to keep the food from thawing.

b. (Microtechnology processing example) The photoresist uniformity data on the last batch of wafers is outside acceptable limits; therefore, the process needs to be halted and the uniformity problem corrected.

c. (Microtechnology processing example) Product yield (the per cent of good die) has dropped from 78% to 58% over the past month. Our lowest acceptable yield is 66%.

Step 2: ANALYZE THE PROBLEM

Situation: You go out one morning to leave for work and your car won't start. What is your immediately response / action? Do you start pulling out tools or calling a tow truck or do you start thinking about "why" it won't start?

Responses:

a. **Time waster:** If you start pulling out tools to start working on your car before you know the cause of the problem, you'll end of wasting a lot of time and could end up breaking something else. The cause of the problem could just be that you're out of gas and didn't know it.

b. **Non-thinker:** If you called a tow truck, then you're asking someone else to solve your problem. Again, you may just be out of gas and you're going to end up paying a mechanic a lot of money to tell you that. And don't forget the cost of the tow truck!

c. **Problem-solver**: If you immediately started thinking about "why" it won't start, then you have already started to "analyze the problem". You instinctively started the question and answer game with yourself.

- How old is the battery?
- Have I been having problems with the car starting or has it been starting easily each time?
- Has any maintenance been done recently?
- Do I have gas in the car? When did I fill up last?
- Has someone else been driving my car and let it run out gas?
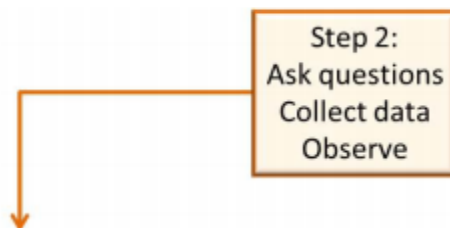
Steps to Analyzing the Problem

Fig Steps to Analyzing the Problem

1. Determine the "degree of deviation" from the standard.

   a. How bad is it? (e.g., Is the uniformity problem with the photoresist bad enough that the wafers can't be processed?)

   b. What is the urgency of the problem? (e.g., Do I need to stop processing wafers altogether until the problem is fixed?)

2. Will the problem get worse if left unattended?

3. Is the problem worth the time and effort?

4. Are you 100% sure that you know the cause of the problem?

a. If so, then start thinking about "how" to fix it.

b. If not, continue to analyze the problem.

5. Gather as many facts about the situation as possible.

a. Take your time gathering information. This will save you time in the long run.

b. Talk to anyone associated with the problem that can provide you with information.

c. Collect any data associated with the problem (e.g., Statistical Process Control (SPC)charts, quality assurance data, maintenance records, shift passdowns)

d. Re-enact the situation if possible. For example, if a piece of equipment is not working correctly, run the equipment yourself if possible.

e. Location

I. Where was the problem identified? Who identified the problem – the operator, quality assurance, the customer?

II. Where is the problem on the defective part? Determine exactly what the defect is and where it is on the defective part?

III. Where is the problem on the equipment? Locate the exact location of the problem if possible.

f. Timing

I. When did the problem start or when was it first noticed?

II. Is the problem continuous, sporadic or intermittent?

III. How often does the problem occur?

IV. Is there a pattern?

g. Degree

I. What is the degree of deviation from the standard?

II. Are there any trends?

III. Is the problem static? (Can it get worse?)

IV. How severe can the problem become?.

V. How fast can the problem worsen from its current state?

VI. . Are there more than one "units" having the same problem?

VII. Is there more than one machine producing the same defects?

VIII. How many defects are there?

h. Trouble Specifics

A. Analyze the problem for what IS happening and, for every what "IS", determine what "IS NOT".

1. WHAT IS wrong with it? WHAT IS NOT wrong with it, but could be?

2. WHERE IS the defect on the part? WHERE could the defect be, but IS NOT?

3. WHEN the problem was first noticed? WHEN could the problem have been noticed but wasn't?

4. HOW MANY defective parts have been produced? HOW MANY defective parts COULD have been produced, but haven't?

5. HOW BIG is the problem? HOW BIG could the problem be, but isn't?

6. WHAT IS happening? WHAT could be happening, but isn't? What is NOT happening?

ii. Look for CHANGE

1. Problems occur when something has changed.

- A previous maintenance procedure

- A new part installed

- New materials being used

- New employee

2. Where did the change take place?

3. When did the change take place?

4. What is there about the change that could have caused the problem?

Take a moment and relate some of these questions to the two problem statements below. Be sure to read the information provided about "uniformity" and "product yield" so you can understand the problem better. Determine which of the "analyze the problem" questions you would ask and what kind of data you need to collect?

a. The photoresist uniformity data on the last batch of wafers is outside acceptable limits;
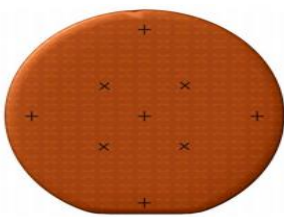

therefore, the process needs to be halted and the uniformity problem corrected.

A photoresist uniformity test involves measuring the photoresist thickness at several points on the wafer, as shown in the left image with an "x" and "+". The range (thickest point – thinnest point) and the mean (sum of all measurements / # of measurements) are calculated. This data is then compared to what is acceptable to determine if the thickness is correct and uniform.

Product yield has dropped from 78% to 58% over the past month. Our lowest acceptable yield is 66%.
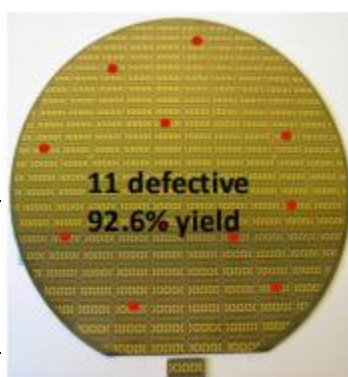
To determine product yield the percent yield is calculated for each batch of end product wafers. Using the wafer on the left as an example, there are 150 die, 11 of which are defective. Therefore, the yield for this wafer is 92.6% or (150-11)/150 *100.

11 defective
92.6% yield

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For the batch yield, the mean yield of the batch is calculated. Can you see for manufacturing problems such as these, the more you know, the easier and faster it would be to solve these problem? If you aren't familiar with the photolithography process you are probably scratching your head right now saying "What?"

Step 3: IDENTIFY POSSIBLE CAUSES (SOLUTIONS)

By the time you reach step 3, you should know what the problem is and what the problem looks like. Now it's time to think about what may be causing the problem. Here's where being a creative thinker helps.
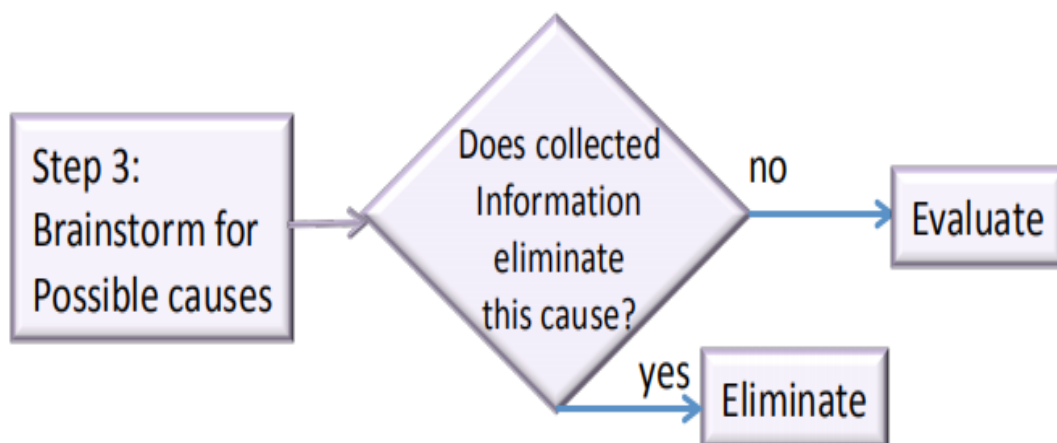
Many times the cause is obvious.

- The motor won't run. Cause: WHOOPS, it's not plugged in!

- The car won't start. Cause: OH NO, I'm out of gas.

- We lost vacuum to the equipment. Cause: The vacuum pump is off. (Of course, now you need to figure you why the vacuum pump is off.)

- The sale of Kleenex has suddenly dropped off. Cause: The allergy and cold seasons are over.

Then there are times when the cause it not so obvious.

- Employee absenteeism has steadily increased during the past 12 months.

- The car won't start and I know it has plenty of gas and the battery is only 6 months old.

- Photoresist uniformity has gradually been decreasing over the last six batches of wafers.

- Final product yield has dropped to unacceptable levels in just one month!

When the problem is not obvious, then BRAINSTORM and develop some possible causes (solutions) to the problem

Brainstorming

Brainstorming: is a method used by a two or more people to generate ideas and possibilities. The goal is to come up with as many ideas as possible, focusing on quantity, not quality. As a person throws out an idea, others can build on it. Group brainstorming sessions lead to more good ideas than an individual working alone. People piggyback off the ideas of others and ideas evolve as the group works its way through the process.

Once a list is created, the group evaluates it using everyone's combined knowledge and the collected data to identify the probable cause(s) of the problem. During the evaluation process, the team discusses the ideas and determines which ones are worth further investigation.

At this time, let's break away and practice brainstorming a couple of problems.

Complete the Brainstorming Activity.

Brainstorming is a great way to "identify possible causes" to a problem and, depending on the type of problem, possible solutions. As you saw in the activity, when working as a team you are able to come up with some causes that you, alone probably would not have thought of. Standard practice for a systematic approach to problem solving is to list ALL of the possible alternatives (causes) BEFORE making decisions.

In the second brainstorming activity, you developed a list of possible causes for "poor resist uniformity". Now it's time to EVALUATE your list using the information you could have gathered in Step 2: Analyze the Problem.
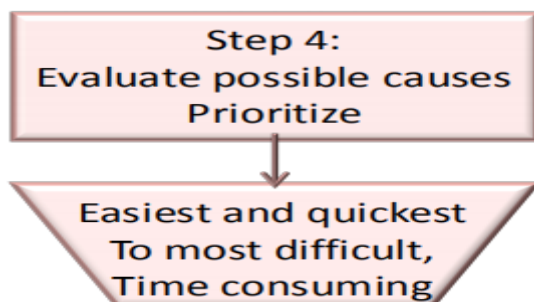
Step 4: EVALUATE THE POSSIBLE CAUSES
Before discussing this step of problem-solving, we're going to do another short activity.
Questions:
1. Did you get them all?
2. How did you go about solving this puzzle?
3. Did you eliminate duplicates first?
4. Did you go through and solve the easiest ones first, then go back and solve the harder ones?
If you saved the hardest ones for last, then you already have a good evaluation method going for you. Now you just need to apply this method to solving a problem.

Step 4:
Evaluate possible causes
Prioritize

Easiest and quickest
To most difficult,
Time consuming

When evaluating possible causes, you are developing probable solutions. Take the results of the

second brainstorming session (Poor Resist Uniformity) and evaluate the items in your list.

1. Eliminate duplication.
2. Eliminate those causes that have already been checked out or that you know couldn't cause he problem because of your knowledge of the process and equipment. (In a real situation, you would also use the data that you collected in Step 2 to eliminate some of the possible causes as well as using the data to support an item on the list as a probable cause.)
3. Once you have eliminated as much as you can, prioritize the possible causes from the easier and quickest to eliminate to the most difficult (just like you probably did when you unscrambled the cities).
4. Determine the methods and the processes to verify each of the remaining causes. A checklist can work well for this step. You'll also find that you problem need more data or more information.
5. Begin eliminating additional possible causes if you can.
6. The elimination of a cause requires asking more questions:

   - How could this have caused the problem?
   - Would it account for everything that IS and IS NOT happening?
   - Would this have caused the full extent of the problem?
   - Does this correlate to the discovery of the problem?
   - Would this explain everything that is happening?

Step 5: Develop An Action Plan To Correct The Problem And Take Action

At this point in the problem solving process, there should be only 2 – 3 possible causes that stand out as the most probable solutions to the problem. Go for the solution that gets the most done with the fewest adverse consequences – the Most Probable Cause. Ask some more questions:

- How much time is required?
- How much money is needed?
- How much manpower is needed?
- Do we need additional information?
- Do we need to involve others and if so, who?
- Is there an easier way?
- Do we need to step back to see if something else is "causing" the "cause" of our problem?

- Which solution will "fix" the problem?

- Will the "fix" be permanent or temporary?

If possible, divide up the tasks necessary to test out the probable causes.

Step 5:
Develop an Action

↓

Implement the Action Plan
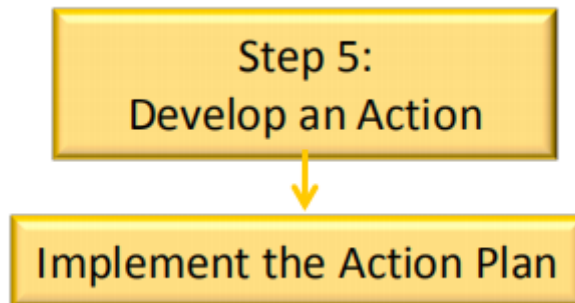
Develop an action plan. A good action plan serves you in much the same way a road map serves traveler - it's your game plan. A good action plan includes the following:

a. The steps or actions required

b. The sequence in which these should be carried out

c. The responsibilities of the various people involved

d. Time requirements

e. Tools and equipment needed

f. The provisions for follow-up and control

g. Methods for communicating the plan and the results

Before taking action you need to show the action plan to those directly and indirectly affected. Be ready to answer questions from your supervisor in order to support your plan. Here are some

examples of questions a supervisor might ask:

- What is the reason for the decision?

- Whom will it affect and how?

- What benefits are expected for individuals, for departments and for the company?

- Specifically, what is each person's role?

- What adjustments will be required in terms of how the work will be done?

- When does the action go into effect?

By answering such questions, you can head off many problems that could slow down implementation of your plan. By letting people know what is happening, you are less likely to get resistance and more likely to get assistance.

Step 6: VERIFY THAT THE PROBLEM HAS BEEN CORRECTED

1. Once the solution has been implemented, the results should be evaluated for the effectiveness of the most probable cause. This evaluation should take place several times to ensure that the problem doesn't return.

2. Problems have been corrected if they do not reoccur.

3. If the problem reoccurs, then it did not get fixed. Evaluate WHY and attack the problem again.
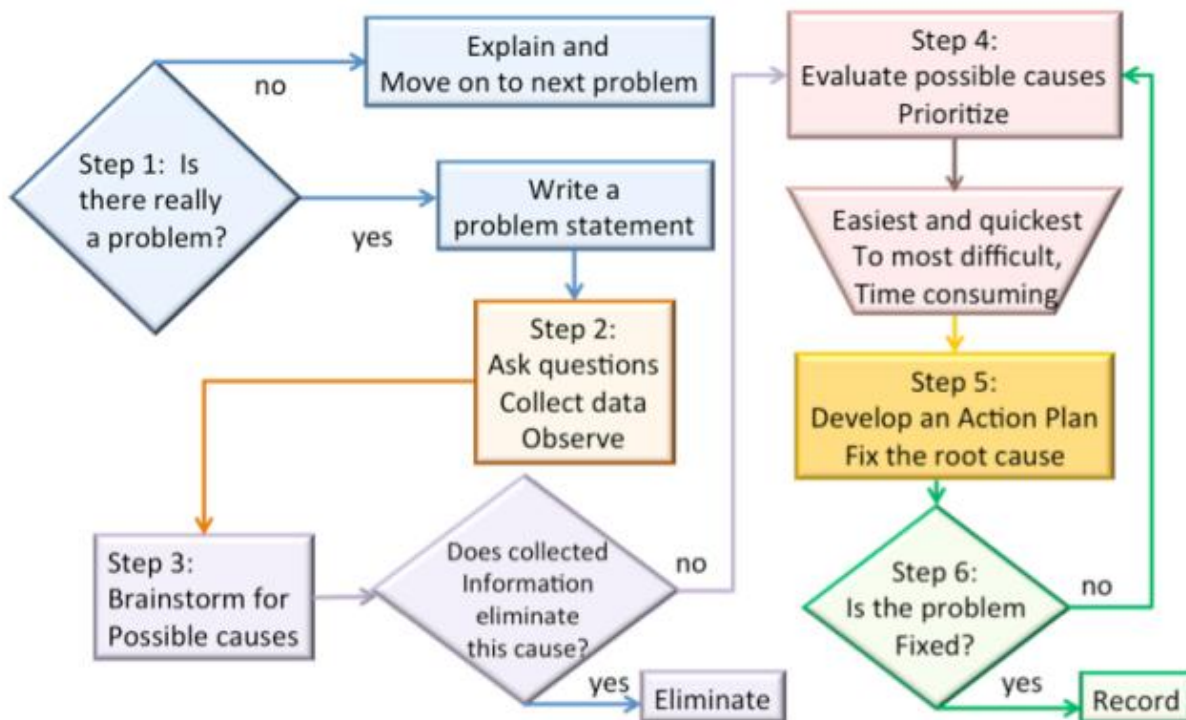
1.2.2 Types of Problems

Problems can be classified into two types, **well-structured** and **ill-structured**.

Well-structured problems: are problems that have a simple and well-defined solution. In most cases, there is only one solution and the problem can be solved quickly and easily. An example of a well-structured problem is when your car won't start and the best possible causes are that your battery is dead or that you ran out of gas. If your car won't start and the cause is neither, then you have to look into your problem further. Perhaps your starter is shot, but that will take some more investigation, now making your problem less simple and more difficult to solve. This leads us into ill-structured problems.

Ill-structured problems: are problems that cannot be solved quickly and easily, and do not have an obvious cause. Ill-structured problems can also be problems that have more than one root cause or two things contributing to the problem. In either case, there are usually numerous possible causes to an ill-structured problem thus requiring a systemic approach to solving the problem.

Well-Structured Problems

Let's look into well-structured problems a little further, looking at some problems that are relevant to micro systems. To the wafer right is a spin coat chamber for applying photoresist to the surface of a wafer. The sits on a wafer chuck through which a vacuum is applied. The vacuum holds the wafer on the surface of the chuck keeping it from flying off during the spin coat process. Our problem: There has been a loss of vacuum to the wafer chuck in a spin coat chamber.

Fig

There are two things that an experienced technician would quickly check to see if one could be the cause of the problem.

- Is the vacuum pump on?
- Is there a kink in the vacuum hose to the chamber?

These are obvious possible causes to the problem and fairly simple to solve if one proves to be true. In many cases an experienced technician can identify the cause of a well-structured problem pretty quickly because it has been seen before, it has happened before, or something very similar has happened on another machine. If a problem can be solved quickly and easily, it is a well-structured.

Ill-Structured Problems

Ill-structured problems are problems that can't be solved quickly and easily and do not have an obvious cause or in some cases, only one cause. Here are some examples of an ill-structured problem.

- The yield or number of good die per wafer has been steadily decreasing over the past two weeks.
- The gas mileage on your car has been steadily decreasing over the past year.
- During the past year our on-time delivery rate has gone from 98% to a 65%.
- Particle counts on the wafers have slowly been increasing over the past 4 weeks.

Notice the difference between well-structured and ill-structured problems? Well-structured problems usually happen suddenly. Things are working fine, then they aren't. In the particle count example, if the particle count increased suddenly rather than over a 4 week period, then it was probably due a recent "event" that could be quickly identified and corrected. This is wellstructured. In the example where the particle count gradually increases over a 4 week period, the cause of the problem is not easily seen, and thus we have an ill-structured problem. Ill-structured problems appear over time and are not identified until the problem is already out of control.

Problem Solving vs. Troubleshooting

At this point, you may have asked the question "what is the difference is between problem solving and troubleshooting?" Well, not a whole lot. Sometimes these terms are even interchangeable, but the difference comes with the type of problem you are solving, a wellstructured, or an ill-structured.

Troubleshooting is normally what a technician does with well-structured problems. If the cause is an obvious one, then it can be fixed and you can move on. Trouble shooting requires critical thinking and quite a bit of knowledge and experience on the job. Such skills are developed over time through the experiences of doing your job and solving problems as they occur.

Problem solving is engaged when troubleshooting or the quick-fix doesn't work. Problem solving is used when the cause of the problem isn't obvious or there may be many possible causes. Problem solving is used to solve ill-structured problems and requires critical and creative thinking because there is no quick fix to ill-structured problems.

Summary

The six-step process described in this learning module may seem cumbersome to you right now, but in a manufacturing environment, when a problem like "Poor Resist Uniformity" comes up, you'll find that it works! With enough practice, you'll start applying these steps out of habit because you have found that, in the long run, they save time and money. Also, the information you gather helps to justify any actions that may require a complete shutdown of the equipment or the line, or the purchase of new equipment.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. _____ is a method used by a two or more people to generate ideas and possibilities.(1 points)

   A. Problem Identification   C. Decision Making

   B. **Brainstorming**   D. Monitoring/Seeking Feedback

2. List out Basic Steps of the Problem-Solving Process. (4 points)

   a) _____

   b) _____

   c) _____

   d) _____

Note: **Satisfactory rating - 3 and 5 points**   **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Operation Sheet 1	Evaluate issues or concerns based on data gathered

1.1.   Evaluate issues or concerns based on data gathered**;**

Step 1- Identify six steps of problem solving process/techniques
Step 2- Develop a problem to recognize problem exists
Step 3- Analyze the problem already you exist
Step 4- Identify possible causes (solution) from your analyzed problem
Step 5- Evaluate the possible causes
Step 6- Develop an action plan to correct the problem that you developed
Step 7- Finally verify the problem

Information Sheet- 2	Identifying possible causes of problem within the *area of responsibility* using, experience or problem solving tools

2.1 Identifying possible cause of problem in *area of responsibility*

2.1.1. Work environment

When you have multiple people working together, you're bound to have some conflict. But sometimes problems in the workplace become severe enough to affect productivity and create a toxic work environment. Common workplace issues range from mildly disruptive to completely toxic and unhealthy. Figuring out the specific cause of workplace tension can make it easier to get help with work issues.

Poor Communication

Think about a time when you felt out of the loop due to lack of communication. You might feel insecure about the situation or not have enough information to make good decisions. The same thing happens in the workplace.

When upper management acts secretive, it can create worry among the staff. Employees start to wonder what the boss is hiding. Is the company about to fold? Are layoffs on the horizon? Lack of communication can also make employees feel like their managers don't trust them with information. At the very least, it makes the organization look disorganized and inefficient. Lack of information also creates a prime environment for assumptions and gossip, which adds to the confusion.

Colleagues may also be bad about communicating. It's often not intentional. Some people are just better at communicating information than others. Some people think if they know important information others should know it, too. But failure to share key details about projects, work policies and other work-related topics can disrupt the flow of work. Say the boss moves up the deadline for your project by a week but forgets to tell everyone on the team. You'll likely miss the deadline or have to scramble at the end when you finally find out about the deadline change.

Poor communication often slows down progress. If you don't have the information you need easily, you have to seek it out, which wastes time. Or you may not even realize you're missing information and make decisions or complete work without being fully informed, which can lead to mistakes or the need to redo the work.

Bad Management

Bad managers run the gamut from micromanagers who make it feel like you can't breathe without permission to "buddies" who want to be everyone's friend and provide no real leadership. Unprofessional, overbearing or inappropriate bosses cause a trickle-down effect that creates lots of problems that may eventually turn into HR issues.

Incompetency at the leadership level can hurt morale and productivity. It's tough to take direction from someone who is a poor example of a leader, no matter what the reason. Some boss behaviors can cause friction between employees. A boss who plays favorites can create resentment between co-workers, for example. If a manager fails to address poor

Performance, employees may continue to slack or get progressively worse, which decreases the overall quality of what the company produces.

Conflicting Styles

You probably have at least one person in your life with which you butt heads. You just have two completely different styles of handling life. Conflicting personalities and working styles can cause major workplace issues for those involved. One example is a highly competitive type A personality who likes to control everything working with someone who's very laid back with little regard to deadlines or urgency. If those two people have to work on projects together frequently, there's a good chance of conflict because their styles are so different and incompatible.

Even if you're not involved in a tension-filled colleague relationship, you may feel the effects of people who are. When two co-workers butt heads frequently, it can cast a negative feeling on everyone in the office. People might start to take sides or withdraw from the relationship. Conflicting personalities can make it difficult to create a teamwork-based environment.

Bullying Behaviors

Bullying in the workplace goes beyond conflicting personalities or people you don't like. A workplace bully uses intimidation to undermine a colleague. The behavior can cause emotional harm to the person on the receiving end of the behavior. Examples of bullying include creating malicious rumors, belittling someone, screaming or using profanities toward a co-worker, tampering with a person's belongings, and physically threatening someone.

A similar and related behavior is harassment. Workplace harassment can take different forms. Making inappropriate and offensive comments or jokes is one example. Physical harassment is another issue in some workplaces. This can include any type of touch that someone doesn't want, including pushing and groping. Unwanted sexual advances also fall into this category. All of these harassment issues make the victim feel unsafe at work.

Discrimination Workplace Issues

Another major cause of workplace issues is that of discrimination. Not only do these types of behavior create a negative work environment, they are also illegal. Discrimination laws are in place to protect everybody in the workplace. But that doesn't mean that all workplaces are free of discrimination. .

Discrimination is not only harmful to the person being discriminated against.; it also may have a negative impact on every one. Discriminating behaviors should be reported immediately, so that they can be stopped, which will also minimize the damaging effects.

2.1.1   Problem solution processes
What is a root cause of problem?

- The causal or contributing factors that, if corrected, would prevent recurrence of the identified problem
- The "factor" that caused a problem or defect and should be permanently eliminated through process improvement
- The factor that sets in motion the cause and effect chain that creates a problem

- The "true" reason that contributed to the creation of a problem, defect or nonconformance

What is root cause analysis?
- A standard process of:
    - ✓ identifying a problem
    - ✓ containing and analyzing the problem
    - ✓ defining the root cause
    - ✓ defining and implementing the actions required to eliminate the root cause
    - ✓ validating that the corrective action prevented recurrence of problem

Benefits of root cause analysis

- By eliminating the root cause

    - ✓ You save time and money!

- Problems are not repeated

    - ✓ Reduce rework, retest, re-inspect poor quality costs, etc…

- Problems are prevented in other areas

- Communication improves between groups and

- Process cycle times improve (no rework loops)

- Secure long term company performance and profits

When should root cause analysis be performed?

- When Problems Occur

- Supplier Defects

- Out of Control Process

- Human Error

- Machine Defects

- workmanship Defects

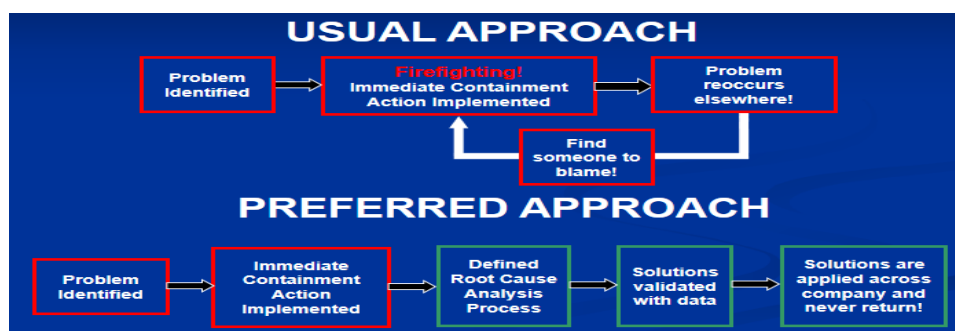- Safety Issues   etc

How does it differ from what we do now?

Fig 2.1 comparison of usual approach & preferred approach
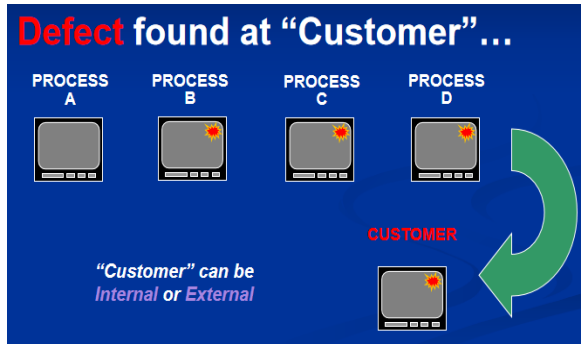
How does it work?
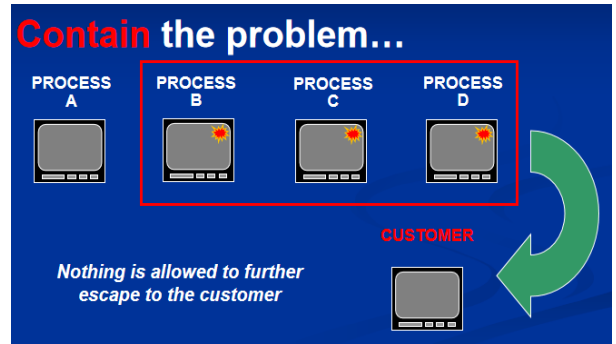

Fig2.2 a) defect found at customer

Fig2.2 b) defect contain the problem
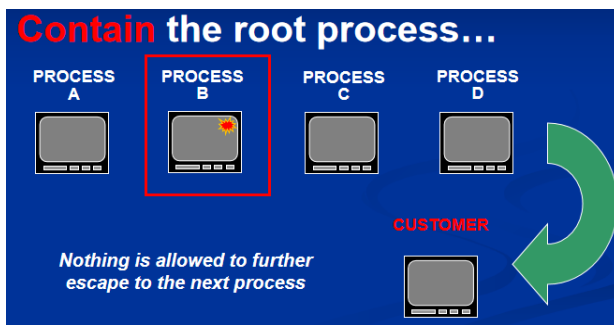
Fig 2.2 c) defect contain the root process
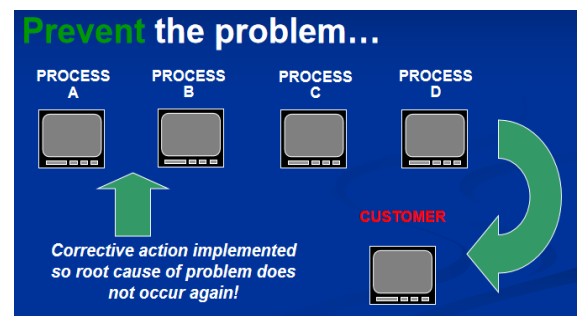
Fig 2.2 d) preventive the problem

2.1.2 Preventative maintenance and diagnostic policy
Preventive/Predictive Maintenance

The guiding principle of PPM is the regular and systematic application of engineering knowledge and maintenance attention to equipment and facilities to ensure their proper functionality and to reduce their rate of deterioration. In addition to dedicated engineering, PPM encompasses regular examination, inspection, lubrication, testing and adjustments of equipment without prior knowledge of equipment failure. PPM also provides the framework for all planned maintenance activity, including the generation of planned work orders to correct potential problems identified by inspection. The result is a proactive (rather than a reactive) environment, optimizing equipment performance and life.

Corrective Actions

➢ **types of Corrective Action:**

- **Immediate action**: - the action taken to quickly fix the impact of the problem so the "Customer" is not further impacted

- **Permanent root cause corrective action: -** the action taken to eliminate the error on the affected process or product
- **Preventive (Systemic) root cause corrective action: -** the action taken to prevent the error from recurring on any process or product

The Difference between Permanent and Preventive Corrective Actions

Permanent Corrective Actions	Preventive Corrective Actions
trained employee on proper machine use	Made training a requirement to new employees working in that area
Changed product design to make parts easier to assemble manually	Changed design guidelines to not allow for use of part in full scale production
Specific customer document critical to project is identified with red folder	All documents that are critical to project are identified with red folders
Update all customers with latest software revision to fix problem	check for those software bugs added to checklist and performed prior to release of software
Fallen patient given full-time assistant to provide help moving around hospital	Process developed to identify "at risk" patients for falls who require assistant
Employee fired for ethical violation	Ethics training developed and provided to all employees

2.1.3 Roles and technical responsibilities
- Provide technical support to the technician team in executive projects.
- Investigate technical aspects and root cause of problems.
- Initiate corrective actions to rectify problems.
- Develop preventative measures to prevent recurrence of problems.
- Assess the impact of deviation on product quality.
- Ensure meeting of key timing commitments.
- With technicians in developing engineering designs.
- Determine product disposition and various technical issues relating to a product.
- Ensure collaborative relationship with manufacturing floor personnel.
- Implement best practices in developing technical solutions.

Electronics Technician Duties and Responsibilities

An electronics technician's main work is to conduct, maintain, test and repair electrical and electronic, mechanical, hydraulic and pneumatic systems and components. To work as an electronic technician, it is important to possess deep knowledge of electronic and mechanical systems so that one can understand equipment malfunctions, and provide viable solutions to counter them.

To be considered eligible to work as an electronics technician, one has to possess an associate's degree in electronics at the very least. Some exposure to working in the same capacity (even if it is an apprenticeship) will go a long way in helping hiring managers decide if they want to hire you – an experienced individual is almost always a great choice to work at a technical position such as this. In order for your candidature to be truly inspiring, you have to show the hiring manager that you have an analytic mind, and that you can effectively work with technology. Other competencies that you will need in order to work as a successful electronic technician include technical capacity, problem solving skills, sound decision making capabilities and learning orientation. Since working at this position means that you will essentially be exposed to adversaries such as fumes and moving mechanical parts, your knowledge of safety procedures and precautions must be hands-on.

Some of the main duties and responsibilities of an individual working as an electronics technician include:

Technician Duties and Responsibilities in electrical

- Lay out, build, test and troubleshoot electronic and electrical components, equipment and units
- Discuss layouts and assembly procedures with electronics engineers to create a solid plan of action
- Perform inspections on electronic equipment and components to determine problems and need for troubleshooting
- Troubleshoot and repair mechanical, hydraulic, pneumatic and electrical systems including controls, power supplies and test equipment
- Install, start up and shut down equipment and units to test their functionality according to company protocols
- Assemble electronic systems based on established technical specifications and ensure that correlating repair and maintenance needs are fulfilled
- Create cable and wiring connections in a safe and accurate manner, and perform regular inspections to identify defects and replacements
- Provide recommendations for upgrades and modifications to improve system performance
- Develop prototypes to provide feasibility analysis and conduct correlating product presentations
- Create and maintain inventory of tools and equipment required for testing and repairing purposes
- Perform tests on electronic equipment and analyze and interpret test data, creating reports for review
- Provide support in adjusting, calibrating and aligning components and units and record performance metrics

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is root cause analysis in a standard process .(1 points)
   A. Problems identifying a problem   C. Human Error
   B. Machine Defects   D. Services

2. _____types of Corrective Action .(1 points)
   A. Implement best practices   C. Immediate action
   B. Assess the impact   D. Reduce rework

3. List out the Roles and responsibilities of technician .(4 points)
   a). _____
   b). _____
   c). _____
   d). _____

Note: **Satisfactory rating - 3 and 6 points   Unsatisfactory - below 3 and 6 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Developing the Problem Statement

A problem is merely the difference between the way things are and the way things need to be. The difficulty in writing a good problem statement often stems from knowing too much. When we know too much about the problem, this hampers our ability to write a clear and concise problem statement.

Often, by the time we write the problem statement, we know a lot about the cause of the problem. We also know consequences of the problem, the customer/coworkers reaction to the problem, the need to resolve it promptly. We have probably also given thought as to a few viable solutions to the problem. When these thoughts about how the problem occurred or how we can solve the problem seep in to the problem statement, it skews our description of the problem. When one writes skewed or cloudy problem statements, the reader struggles to understand the problem. When the reader struggles to understand the problem, it is difficult to convince them to take appropriate action.

Consider these two problem statements below. There are real reports of problems that need attention. Neither example, however, states the problem directly. Both examples beg the question and infer a solution. This approach handicaps our problem-solving efforts.

"Workers are making mistakes because there is no work instruction."

"We need to perform 5S at the production work cells."

Let's take the first example above. Let us assume that the problem statement author observed a product yield problem at final test. Also evident was that assemblers were not using work instructions. The problem solving team goes out to gemba walk to research the problem. With a little digging, they find that indeed there is a work instruction. However, no one uses it. The team reports back, "There is no problem, we found a work instruction, and told everyone to use it."

Not so fast. In this example, the better problem statement would be "Excessive fallout at final test causes excess rework and late shipments". This is a better problem statement. But it requires focus on the problem itself, a gemba walk, and communication with the team to understand the problem. No matter what potential remedies the team discovers as they dig for root cause, this problem statement remains objective and unchanged.

A good problem statement has these features:

- It describes the difference between the actual conditions and the desired conditions.
- It does not offer commentary on a proposed solution.
- It does not attempt to diagnose the problem, nor assign blame.
- It is objective and factual.

A *great* problem statement goes even further:
- It ties to company goals.
- It is measureable, not qualitative.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. A great problem statement goes even further **(1 points)**

    A. Perform inspections   C. It ties to company goals

    B. Troubleshoot and repair   D. Perform tests

2. List out a good problem statements (4 points)

    a). _____

    b). _____

    c). _____

    d). _____

Note: **Satisfactory rating - 3 points**   **Unsatisfactory – 3 below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

LAP Test	Practical Demonstration

Name: _____   Date: _____

Time started: _____   Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task 1. Develop a systematic approach to problem solving techniques

Instruction Sheet	**LG33: Identify possible solutions**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Considering all possible options for resolution of the problem
- Considering strengths and weaknesses of possible options
- Determining corrective action to resolve the problem and its possible future causes

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**:

- Consider all possible options for resolution of the problem
- Consider strengths and weaknesses of possible options
- Determine corrective action to resolve the problem and its possible future causes

Learning Instructions:

7. Read the specific objectives of this Learning Guide.
8. Follow the instructions described below 3 to 6.
9. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3 and Sheet 4".
10. Accomplish the "Self-check 1, Self-check t 2 and Self-check 3" **in page -40 and 49** respectively.
11. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 " **in page -50.**
12. Do the "LAP test" **in page – 51** (if you are ready).

2.1 Considering all possible options for resolution of the problem in accordance with *safety* and operating procedures

2.1.1 INTRODUCTION

The use of any electrical appliances introduces a potential risk of electric shock.

The occupation has established and implemented a range of risk controls to eliminate or reduce so far as is practicable the risk of electric shock from the use of electrical appliances, including programs, procedures and processes for:

- Installation, maintenance and testing of residual current devices;
- In-service electrical inspection and testing of portable electrical appliances (refer to
- Removal from service damaged and unsafe equipment (refer to •

Additional guidance material including this document provides guidance when completing standard operating procedures (SOPs) for the safe use of electrical equipment.

2.1.2. INSPECTION

Experience has shown that greater than 90% of defects are detectable by visual inspection.

Large numbers of electrical appliances are use throughout the collages workplaces.

Additionally there are significant variations in the characteristics of these electrical appliances, including:

- Age of the appliance;
- Size of the appliance;
- Frequency of use; and
- Environmental conditions in which the electrical appliances are used.

Taking into account the variation in the characteristics and the importance of visual inspection **all** electrical appliances must be inspected by the operator prior to use to confirm that:

- The appliance has not been tagged out of service;
- The plug and lead is free of obvious damage (eg damaged lead, damaged plug. burn marks, damaged casing); and
- The socket-outlet is free of obvious damage (eg broken casing, socket-outlet not fixed to the wall, cable to suspended socket-outlets not damaged).
    - ➢ Confirm the appliance is within current inspection and test period (i.e. check tag).
    - ➢ Visually inspect the pins on the appliance plug to confirm it is insulated.
    - ➢ Where the pins on the appliance plug are not insulated (typically older appliances):
        a. assess the risks associated with continued use of the appliance to determine if any short term actions action are required; and
        b. Plan and priorities the replacement of uninsulated plugs based on level of risk and the variation in characteristics outlined above.
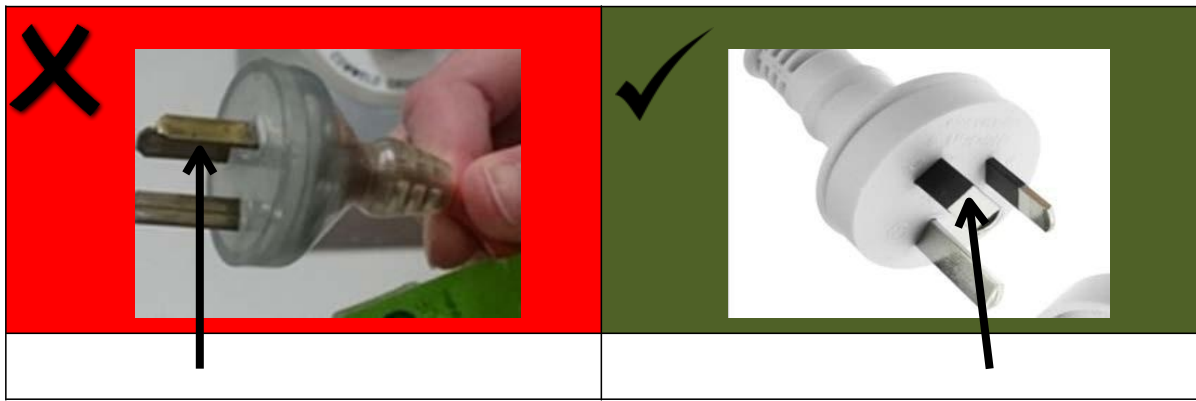
Fig 2.1 Uninsulated and insulated appliance plugs

2.1.3 SWITCH OFF

Prior to connecting an appliance to a socket-outlet, so far as is reasonably practicable:

1. Confirm electrical appliance is switched off.
2. Confirm socket-outlet is switched off (Figure 2).

Socket-outlet switched on   Socket-outlet switched off
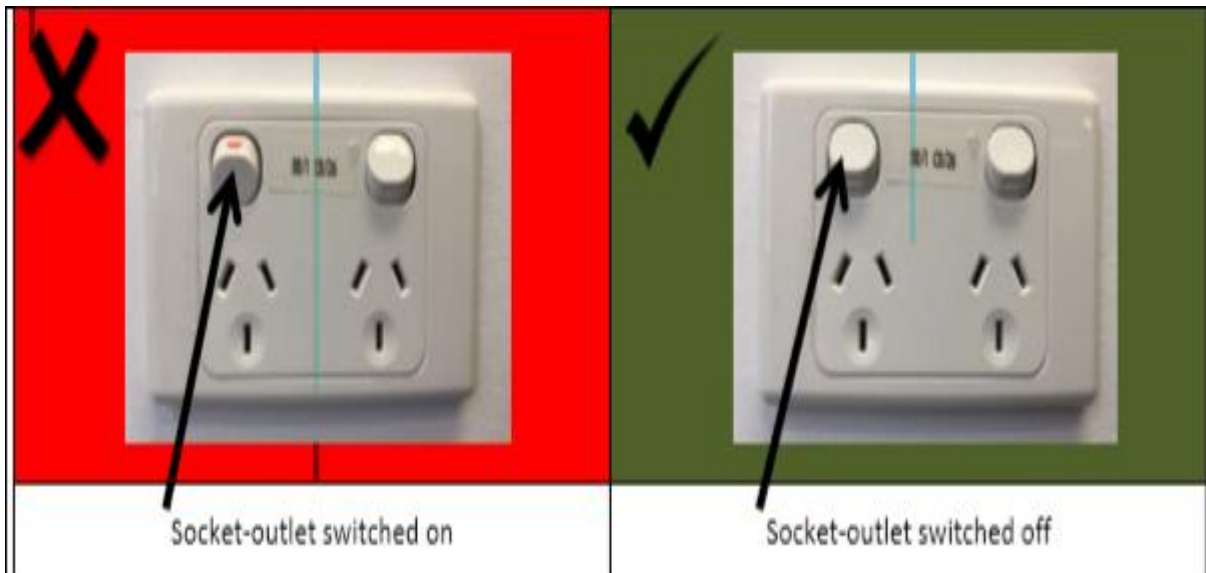
Figure 2.2: Confirm socket-outlet is switched off

2.1.4 TECHNIQUE

1. Ensure the plug is fully engaged in the socket-outlet.
2. Hold the plug with fingers on the outside of the plug and away from the pins (Figure 3).
3. Ensure the appliance/extension lead is not subjected to environmental damage (eg mechanical, chemical) whilst in use.
4. Ensure the appliance lead will not introduce other hazards eg trip hazards.

5. Where a screw cap fitting is installed on the plug and the socket-outlet (water/dust resistant plugs and socket-outlets)ensure the screw cap is screwed firm closed

Figure 2.3: Hold the plug with fingers on the outside of the plug and away from the pins

2.1.5 DAMAGED OR UNSAFE ELECTRICAL APPLIANCES OR INSTALLATIONS

If an electrical appliance, plug, socket-outlet or other part of an electrical installation is damaged or identified as unsafe to use (see Figure 4), remove the item from service with an out-of-service tag (see Figure 4) in accordance with the *Health & Safety: Unsafe plant and equipment requirements*.

Figure 2.4 Damaged electrical socket-outlet and plug
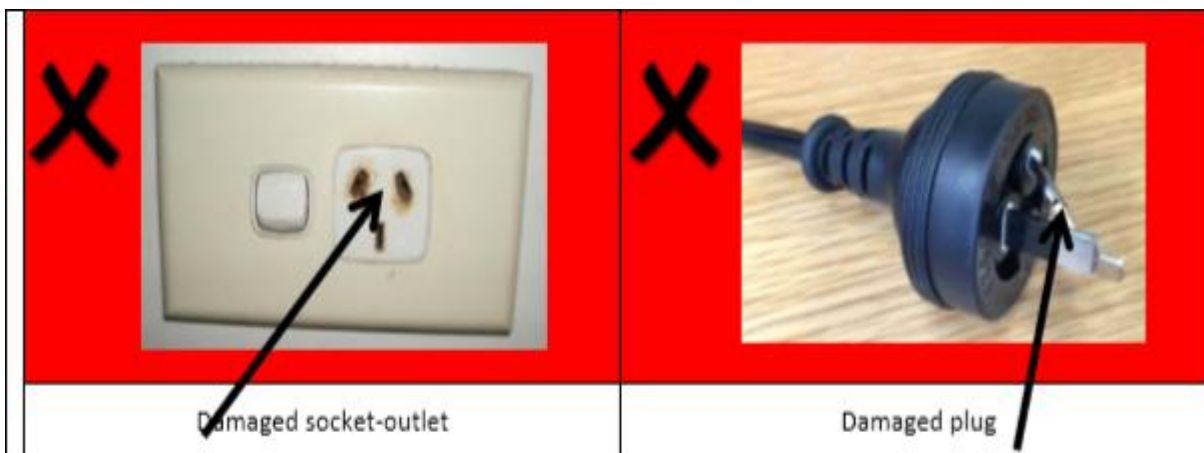
In the previous examples of a damaged socket-outlet and a damaged plug an out-of service tag (Figure 5) can be attached by:

- Taping the tag across the front of the socket-outlet; or
- Tying the tag around the electrical lead close to the plug end.

Figure 5: Out-of-service tag

2.1.5 Uninsulated electrical pins

The Occupational Health and Safety requires trainees to, so far as reasonably practicable, to provide a safe workplace; including providing or maintaining plant or systems of work that are, so far as is reasonably practicable, safe and without risks to health.

The Electricity Safety (Equipment) Regulations 2009 (Vic) prescribes minimum standards of safety for electrical equipment, including the requirement to comply with:

- Essential safety requirements for electrical equipment; and
- Approval and test specification – Plugs and socket-outlets.

This includes a requirement that electrical appliance plug pins are insulated to prevent live parts of insulated pins being exposed when the plug is partially or fully engaged with the associated socket-outlet.

From April 2005 suppliers of 240 volt 10-15 amp single phase electrical appliances are required to ensure the pins on the electrical appliance plug are insulated in accordance with AS3112. However, prior to this date most electrical appliances were supplied with un-insulated plug pins

Under certain conditions the use of electrical appliances with un-insulated plug pins may increase the risk of electric shock. Therefore it is appropriate to:

- Provide information and instruction on safe use of electrical appliances;
- Assess the risks associated with continued use of electrical appliances with un-insulated plug pins to determine if any short term actions action are required; and
- Plan and priorities the eventual replacement of uninsulated plugs based on level of risk.

2.1.6 HIGHER RISK ENVIRONMENTS

Some environmental conditions or exposure to specific users can increase the risk of electric shock when connecting, operating and disconnecting electrical appliances. These include:

1. wet or dusty environments;
2. where the user does not have direct vision of the socket-outlet;
3. where electrical appliances are easily accessible to young children
4. where the electrical appliance is frequently connected and disconnected to a socket-outlet
5. where mechanical forces may be applied to the plug or socket-outlet; and
6. Where residual current devices (safety switches) are not in use.

Where risk of electric shock associated with un insulated plug pins is low to moderate, then the risk should controlled with the implementation of an SOP (as described in this section) or other similar control measures.

Where risk of electric shock associated with un insulated plug pins is high to very high then, the item should be removed

from service in accordance with the Health & Safety: Unsafe plant and equipment requirements until such time that the plug can be replaced with a plug with insulated pins or the risk can be suitably controlled so far as reasonably practicable.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Safety for electrical equipment, including the requirement to comply with. (**1 points**)

    C. wet or dusty environments   C. Data

    D. Approval and test specification   D. Gathering information

2. List out Some environmental conditions or exposure to specific users can increase the risk of electric shock when connecting, operating and disconnecting electrical appliances.(**4 points**)

    a). _____

    b). _____

    c). _____

    d). _____

Note: **Satisfactory rating – 3 and 5 points**   **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

2.2 Considering strengths and weaknesses of possible options

2.2.1 Strengths and Weaknesses Analysis

The Strengths and Weaknesses Analysis is a job model that analyses strengths, weaknesses, opportunities and threats in the environment. Subsequently, the strategy is determined based on this analysis. The English version uses the term SWOT which is also often used and it comprises the four elements:

Strengths, Weaknesses, Opportunities & Threats- However, this term does not cover quite cover the meaning of the term as the objective is to formulate a strategy for the future and not just an analysis of the current state of affairs. These matters form an important part of the model as they create a link between the internal and external analyses.

The Strengths and Weaknesses Analysis can be used to make decisions and to scrutinize an organization's position, course and strategy. The Strengths and Weaknesses Analysis is also used for planning, marketing, assessment of the competition, organizational and product development, research and team building. Individuals' use the Strengths and Weaknesses Analysis as a tool to obtain a better self-image, for instance when preparing for a job interview or for the drawing up of a personal development plan (PDP). The Strengths and Weaknesses Analysis can also be part of a business plan.

- Based on this survey a concept model was developed named SOFT:
- Satisfactory: what is good in the present is Satisfactory.
- Opportunity: what is good in the future is an Opportunity.
- Fault: what is bad in the present is a Fault.
- Threat: what is bad in the future is a Threat.

2.2.2 Community Engagement Considerations

- What level of participation are we seeking?
- Who are my primary stakeholders?
- Communications / materials
- Resources
- Time limitations
- Timely feedback & next steps
- Methods

2.2.3 Why Identify Strengths & Weaknesses?

- Develop a shared understanding of the problem(s) you're trying to deal with •
- Raise the level of awareness about root causes of identified problem(s) •
- Identify root causes

Fig 2.2 considering strength and weaknesses

Question-and-Answer Approach

• What is the main problem that concerns our community?

 • Why is that a problem? – Repeat until root causes become apparent

 • Who/what causes the problems?

Clarify choices

 • Let everyone know what happens next
• Avoid or anticipate difficulties
• Provide inspiration
• Know what paths you did NOT choose and why
• Consider various different ideas and solutions
• Build a foundation for commitment
• This keeps individuals plugging away
• Provides basis for teamwork
• Be sure to include timelines & guidelines for implementation

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why Identify Strengths & Weaknesses. (1 points)

      A. Identify root causes   C. Provide inspiration

      B. Time limitations   D. Provides basis for teamwork

2. List out Community Engagement Considerations.(**4 points**)

      a). _____

      b). _____

      c). _____

      d). _____

Note: **Satisfactory rating – 5 points   Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

2.3 Determining corrective action to resolve the problem and its possible future

Introduction

Supplier Corrective Action Request (SCAR) is a systematic approach to request investigation of a problem that already happened and request root cause analysis and resolution from supplier to prevent recurrence.

Step 1: Problem Verification

Step 2: Containment Action

Step 3: Failure Analysis

SCAR

Step 4: Root Cause

Step 5: Corrective Action

Step 6: Preventive Action

Step 7: Effectiveness Verification
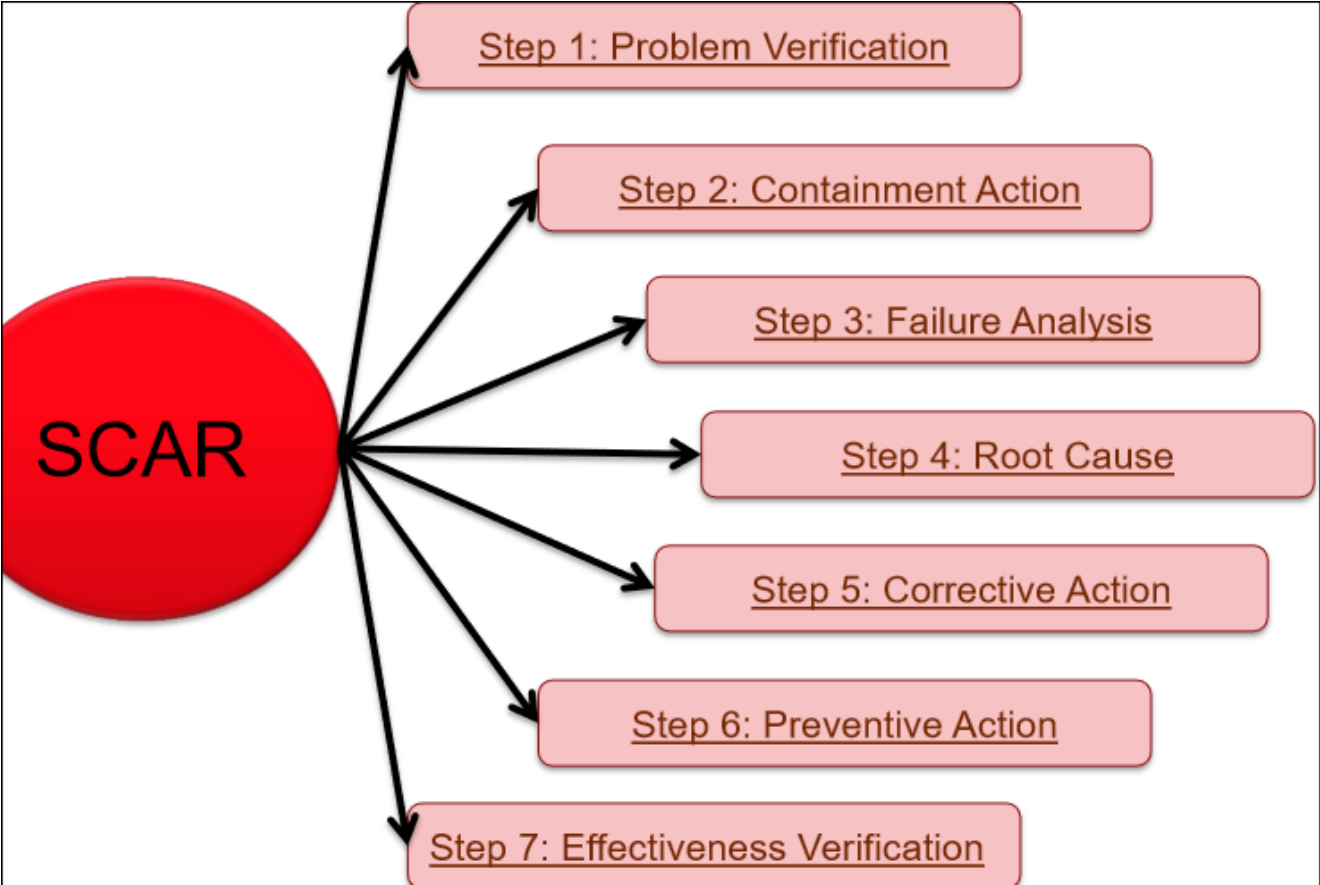
Fig 2.3.1 SCAR Key Elements

Step 1: Problem Verification

Problem verification is the first step of problem investigation. There are 3 main activities:

a) Verify the problem

b) Collect information

c) Describe the problem

To describe the problem specifically, (5W2H) terms (who, what, where, when, why, how, and how many) would help. Examples please refer to next slide.

Example:

What? | What happen? | Where? | When? | How much?

Probe **(Part No.)** is found out of specification at Keysight on **date X**. **Total quantity** X pcs

What type of problem?

The output current is X when the frequency is X KHz. (specification is ±X)

What? | How often?

The defective part **date code** is X. This is the first case reported from customer.

5W2H	Questions to ask	Answer should be provided
Who	Who first observed? Who is affected?	- Location of defect found
What	What type of problem? What has the problem? What is happening?	- Failure reported - Part No./ Model - Detail description of failure
Why	Why it is a problem?	- Detail description on the failure and **verification done**
Where	Where was the problem observed/ occur?	
When	When the problem first noticed?	- **Date code** of defective part
How much/many	How much/ many involved?	- Quantity affected
How often	What is the trend? Has the problem occurred previously?	- **Failure history**

Table 2.3.1 Problem Verification table

Step 2: Containment Action

Containment action is to limit a problem extent while continue normal operation until the root cause is defined and permanent corrective action is implemented
The containment area should cover:
- ➢ Production
- ➢ Finished goods
- ➢ Customer (Key sight)
- ➢ Incoming material
- ➢ Warehouse Storage

Notes: Affected date code/ serial number should be clearly identified and stated.
Step 2: Containment Action
Activities:
- Stoppage of production or shipment
- Segregation goods on pass or fail
- Additional visual control
- Informing customer about the problem
- Informing operators about the problem
- Check on similar product or processes if there is similar risk

Example: 100% screening is done for below area: Supplier's production (xx pcs), warehouse inventory (xx pcs) Key sight inventory including production (xx pcs), warehouse (xx pcs),

Results: xx pcs out of total xx pcs is found with similar reject. The reject rate is xx%.
Confirmed the affected date code is x. Rejected part is sent back for further FA

Step 3: Failure Analysis

Failure analysis (FA) is the process of collecting and analyzing data to determine the cause of a failure.
Failure Analysis can be carry out by various methods including visual inspection, electrical testing and physical testing.

Examples:

Visual Inspection

- Bare eye inspection
- Optical microscope
- X-ray microscope

Electrical Testing

- Voltage measurement data
- Resistance measurement

Physical Testing

- Drop test
- Bending test
- Pull test

Step 4: Root Cause

Root cause identification is the most important step. The problem will be solved only if the corrective action implemented is addressing the real root cause accurately.

Root Cause Analysis (RCA) is a systematic approach to identify the actual root causes of a problem. Below are the tools frequently used in RCA.

This is a continuous question-asking technique used to explore the cause-and effect relationships underlying a particular problem.

General Flow

   I. Define the problem.
  II. Ask Why the problem happen and write down the answer
 III. Validate the answer is it the real root cause
 IV. If no, Repeat step 3 until problem's root cause is identified.

A fishbone diagram is a visualization tool for categorizing the potential causes of a problem in order to identify its root causes.

General Flow:

   i.   Define the problem
  ii.   Identify the key causes
 iii.   Brainstorm the causes
 iv.   Validate the identified root cause causes.
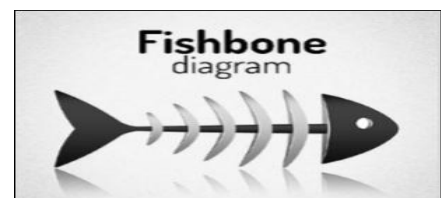
Table 2.3.2 fish bone diagram

Example of Fishbone Diagram (Cause and Effect Diagram)

1. Identify potential root cause
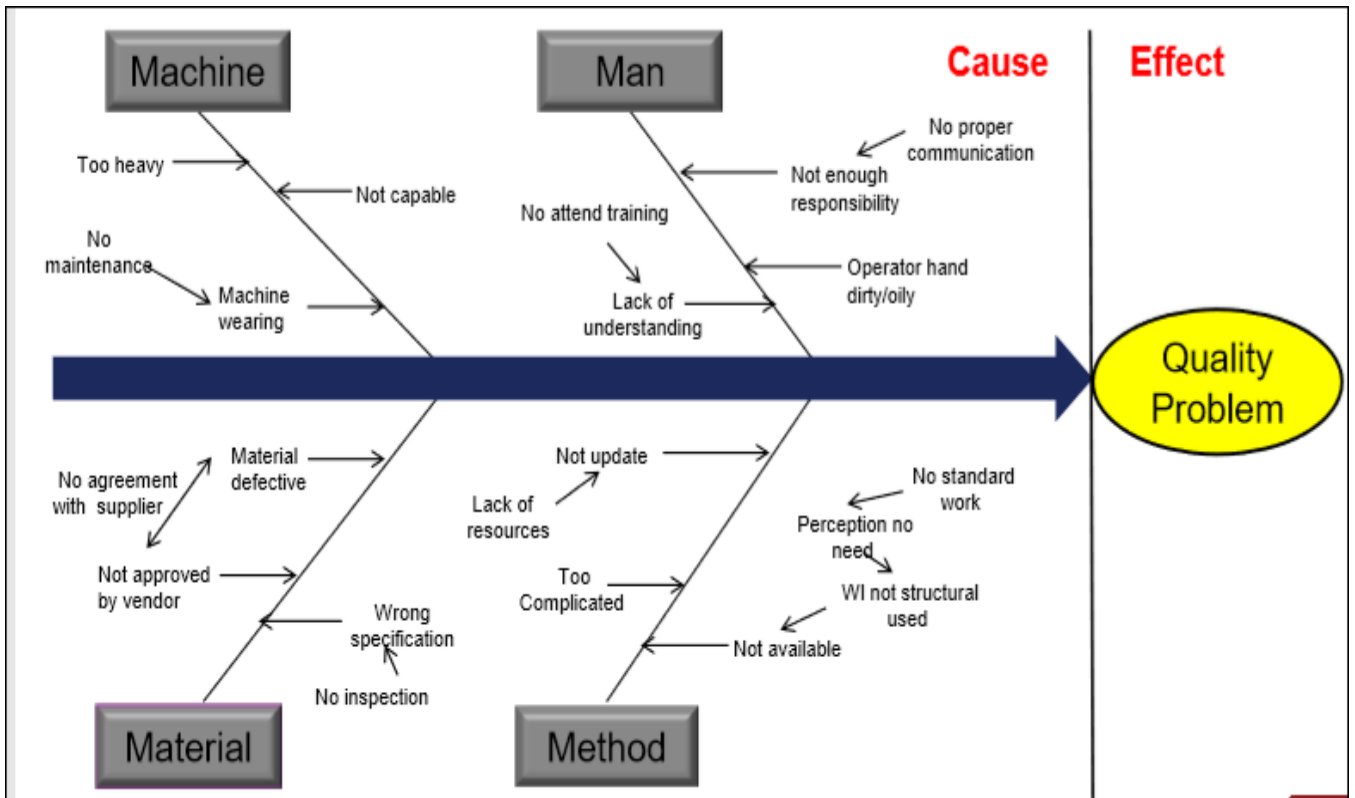
Fig2.3.3 Identify potential root cause Fishbone Diagram

2. Validate identified root cause

Category	Root cause	Validation / investigations	Findings	True / false
Man	Hand dirty /oily	Operator's hand are dirty.	Parts found with finger print mark on surface during process	TRUE

Table 2.3.3 Identify potential root cause Fishbone Diagram

Step 5: Corrective Action

Corrective action (CA) is to remove the root cause and prevent a problem from ever happening again.

The corrective action should correspond to the root cause identified earlier in order to eliminate the real root cause and prevent recurrence of the problem.

Method such as brainstorming is recommended as it can help to select appropriate corrective action for identified root cause.

Examples:

For root cause of "Why problem occur?"

- Introduce additional process control
- Introduce new process

For root cause of "Why not detected?"

- Introduce new testing gate
- Enhance previous testing coverage

Step 6: Preventive Action

Preventive Action is proactive and focused on a potential problem in the future.
Corrective actions is only a temporary solution that keeps the system running, but a permanent solution is needed to avoid similar problems from occurring into the system again

Examples:

- Changing the process parameter
- Changing procedure
- Changing documentation or specification
- Changing of process or tools
- Modified or make proper jig

Step 7: Effectiveness Verification

After the corrective and preventive actions are implemented, the effectiveness should be validating.

The key to verification is evidence. This evidence usually takes the form of data, records or first-hand observations.

It is recommended the verification made by monitoring the quality of next deliveries.

Examples:

- Product acceptance rate
- Test or control results showing improvement
- Engineering measurement (Dimension and appearance) according to specification and tolerance
- Suppliers deliver goods of better quality

Summary

In conclusion, proper RCA should be conducted in a systematic approach in order to obtain the real root cause. Besides, effective containment, corrective and preventive actions correspond to identified root cause should be provided. Below shows the difference between containment, corrective and preventive actions.

Containment Action A "first aid" that limit a problem's extent and establish normal operations until the root cause is defined and permanent corrective actions is implemented

Corrective Action Actions to remove the root cause and prevent a problem from ever happening again. The actions are directed to an event that happened in the past.

Preventive Action is proactive and oriented towards a potential problem in the future. They improve a process or a product to remove causes for a potential problem and prevent it and related problems from ever happening

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. _____ is to limit a problem extent while continue normal operation until the root cause is defined and permanent corrective action. (1 points)

    A. Changing procedure   C. Define the problem

    B. Interpreting information   D. Containment action

2. List out the step Supplier Corrective Action Request (SCAR) systematic approach.(**4 points**)

    a). _____

    b). _____

    c). _____

    d). _____

Note: **Satisfactory rating – 3 points**   **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Operation Sheet 2	Determining corrective action to resolve the problem and its possible future

2.3 Determining corrective action to resolve the problem and its possible future;

Step 1- Identify SCAR Problem investigation techniques

Step 2- Select the first steep of Problem verification techniques

Step 3- verify problem, collect information and describe the problem specifically using (5W2H) terms (who, what, where, when, why, how, and how many) would help.

LAP Test	**Practical Demonstration**

Name: _____ Date: _____

Time started: _____   Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task1. Develop Supplier Corrective Action Request (SCAR) is a systematic approach to request investigation of a problem using Problem Verification.

Instruction Sheet	**LG34: Recommend solution to higher management**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Preparing report or documentation for communication
- Presenting recommendations to appropriate personnel
- Following-up recommendations, if required
- Examining or experiment the proposed solutions

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:

- Prepare report or documentation for communication
- Present recommendations to appropriate personnel
- Follow-up recommendations, if required
- Examine or experiment the proposed solutions

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5".
4. Accomplish the "Self-check 1, Self-check t 2, Self-check 3 and Self-check 4" **in page -64, 67, 69 and 73** respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 " **in page -70.**
6. Do the "LAP test" **in page – 74** (if you are ready).

2.1 Preparing report or documentation for communication

2.1.1 Types of Documentation

Audit trails The Internal Revenue Service's defines an audit trail as a chronological sequence of records that contain evidence about a business process. Each record includes information about who created the record, with what system, on what date and at what time. A data log captures the records that make up an audit trail, and audit trail reports assemble these records so analysts can scrutinize them. These reports serve business purposes as varied as lost transaction recovery, fraud detection, disaster recovery and regulatory compliance.

- **Finding Lost Transactions**: If you know nothing about a transaction except the day that someone entered it, an audit trail report can help you find the transaction. By reviewing the audit logs for that day and matching them to the transactions you already know about, you can eliminate the known transactions and find the lost one. The type of accounting software you use determines the steps you take to find lost transactions. Some applications let you search by amount, by transaction number or by the user who entered the transaction.
- **Fraud Detection:** An audit trail is a useful aid in uncovering fraud in an organization. In addition to recording the metadata behind each individual transaction at the time it was created, an audit trail also records data about transactions that users have edited. Thus, the audit trail report exposes an individual who accesses the system to alter transactions after other users entered them accurately. Audit logs provide objective evidence to support the action an organization takes when it uncovers fraud, such as an employee termination, civil litigation or a criminal complaint to law enforcement.

Version control

A component of software configuration management, version control, also known as revision control or source control is the management of changes to documents, computer programs, large web sites, and other collections of information. Changes are usually identified by a number or letter code, termed the "revision number", "revision level", or simply "revision". For example, an initial set of files is "revision 1". When the first change is made, the resulting set is "revision 2", and so on. Each revision is associated with a timestamp and the person making the change. Revisions can be compared, restored, and with some types of files, merged.

The need for a logical way to organize and control revisions has existed for almost as long as writing has existed, but revision control became much more important, and complicated when the era of computing began. The numbering of book editions and of specification revisions are examples that date back to the print-only era. Today, the most capable (as well as complex) revision control systems are those used in software development, where a team of people may concurrently make changes to the same files.

Version control systems (VCS) most commonly run as stand-alone applications, but revision control is also embedded in various types of software such as word processors and spreadsheets, collaborative web docs and in various content management systems, e.g., Wikipedia's page history. Revision control allows for the ability to revert a document to a previous revision, which is critical for allowing to track each other's edits, correct mistakes, and defend against vandalism and spamming in wikis.

1.2.2 Way of Communication

Handwriting: is the writing done with a writing instrument, such as a pen or pencil, in the hand. Handwriting includes both printing and cursive styles and is separate from formal calligraphy or typeface. Because each person's handwriting is unique and different, it can be used to verify a document's writer. The deterioration of a person's handwriting is also a symptom or result of certain diseases. The inability to produce clear and coherent handwriting is also known as dysgraphia.

Report: In modern business situation, reports play a major role in the progress of business. Reports are the backbone to the thinking process of the establishment and they are responsible, to a great extent, in evolving an efficient or inefficient work environment.

The significance of the reports includes:

- Reports present adequate information on various aspects of the business.
- All the skills and the knowledge of the professionals are communicated through reports.
- Reports help the top line in decision making.
- A rule and balanced report also helps in problem solving.
- Reports communicate the planning, policies and other matters regarding an organization to the masses.

What is Report Writing?

A report can be defined as a testimonial or account of some happening. It is purely based on observation and analysis. A report gives an explanation of any circumstance. In today's corporate world, reports play a crucial role. They are a strong base for planning and control in an organization, i.e., reports give information which can be utilized by the management team in an organization for making plans and for solving complex issues in the organization.

A report discusses a particular problem in detail. It brings significant and reliable information to the limelight of top management in an organization. Hence, on the basis of such information, the management can make strong decisions. Reports are required for judging the performances of various departments in an organization.

An effective report can be written going through the following steps-

1. Determine the objective of the report, i.e., identify the problem.
2. Collect the required material (facts) for the report.
3. Study and examine the facts gathered.
4. Plan the facts for the report.

5. Prepare an outline for the report, i.e., draft the report.
6. Edit the drafted report.
7. Distribute the draft report to the advisory team and ask for feedback and recommendations.

The essentials of good/effective report writing are as follows-

1. Know your objective, i.e., be focused.
2. Analyze the niche audience, i.e., make an analysis of the target audience, the purpose for which audience requires the report, kind of data audience is looking for in the report, the implications of report reading, etc.
3. Decide the length of report.
4. Disclose correct and true information in a report.
5. Discuss all sides of the problem reasonably and impartially. Include all relevant facts in a report.
6. Concentrate on the report structure and matter. Pre-decide the report writing style. Use vivid structure of sentences.
7. The report should be neatly presented and should be carefully documented.
8. Highlight and recap the main message in a report.
9. Encourage feedback on the report from the critics. The feedback, if negative, might be useful if properly supported with reasons by the critics. The report can be modified based on such feedback.
10. Use graphs, pie-charts, etc to show the numerical data records over years.
11. Decide on the margins on a report. Ideally, the top and the side margins should be the same (minimum 1 inch broad), but the lower/bottom margins can be one and a half times as broad as others.
12. Attempt to generate reader's interest by making appropriate paragraphs, giving bold headings for each paragraph, using bullets wherever required, etc.

Internal Memorandum

A memo is a note to a group of people telling them to do something, or informing them of a new policy.

A memorandum, more commonly known as a *memo*, is a short message or record used for internal communication in a business. Once the primary form of internal written communication, memorandums have declined in use since the introduction of email and other forms of electronic messaging; however, being able to write clear memos certainly can serve you well in writing internal business emails, as they often serve the same purpose.

Purpose of Memos

Memos can be used to quickly communicate with a wide audience something brief but important, such as procedural changes, price increases, policy additions, meeting schedules, reminders for teams, or summaries of agreement terms, for example.

How To Write a Good and Clear Memorandum

It is good to know how to come up with the best memo so that whatever you are trying to pass across to your audience is clear. In most cases, a memo is usually used to address very critical matters and therefore it has to come out clear so that the content of the

information being passed is not distorted. Below are some of the tips that you need to pay attention to while writing your memo:

- Make it a s short as possible- the memo should not be lengthy because it will be tiresome to read. Most people would want to go through it with the shortest time possible but acquire all the information. You need to summarize as much as you can. The shorter your memo will be, the more the readers because most people are prone to be ignorant to lengthy notices.
- Use simple English- you should not use complex language while writing your memo because the readers may end up missing up important points and your memorandum will not have served its purpose. Avoid too much use of vocabularies in your work.
- Use a captivating heading- the heading of your memo should attract readers- you should be very selective in the words that you use for your heading because that is the first impression that your readers would come across. Others would just read the heading and leave, so it is your responsibility to make them curious to read the rest of the document. There are different ways that you can use to captivate the readers:

1. Use bolding on emphasize- you should use bold letters in the action that expect your readers to take so that it can attract their attention and they will have gotten the message.
2. Use a different color for the heading- you can decide to use a different color for your heading so that it can attract readers from a distance.

- Avoid simple grammar and spelling errors- you should be very cautious in memo writing because a simple spelling mistake may confuse the intended information that you needed to pass and that would be chaos especially if it is a critical matter that affects an organization. You should go through your memo after writing to ensure that everything reads as required.

A memorandum writing format.

The format of your memo should adhere to the required rubric because one can be able to identify a memo from its format. In the notice board you may find several notices of which others are usually, meant for motivations purposes, so it is the format that will distinguish your memo from other notices.

The header

At the top of the page, you should indicate that it is a memo in capital letters. This helps to give identity to your document.

The recipient addresses

Immediately after the header, you should write the recipient address. Be official in writing the name of the recipient whether it is one person or a group of people. The address helps the readers to know whom the memo is being addressed to. You should also include other recipients if you wish your memo to address a different group of people. When you have more than one recipient, you can use the following format:

Memorandum

To:

Cc:

From:

Date

Subject

In this format, the cc will serve to address another recipient that you wish to address apart from your main.

The sender

After the recipient's address, you should indicate where the memo is coming from, write your name and your position if you have one so that the readers can be able to know you.

The date

After writing the senders name you should write the date in the right format so that the readers can be able to know when was the memo sent. The date is important because it distinguishes the old and new memos in the notice board.

The title

After the date, you should write the title of the memo. In the title, you should indicate what the memo is all about clearly. The title carries a heavy weight in your memo because it should tell the reader what the memo is all about in the shortest words.

On the formatting of the heading and the addresses you should:

- Ensure that the content is double spaced. This helps to improve the clarity of your document.
- Align all the content to the left side of your page- you should align the date and the addresses to the left side of the page.
- You should write the start of the address with capital letters. For example, when writing to your staff and you are the It director of a certain company you will proceed on as follows:

To: All staff

From: The IT Director.

Date: 9/07/2018.

Subject: Promotions in Different Departments.

The body

The second part of the memo format is the body. You should keep your memo as short as possible by avoiding more stories in the body paragraphs. Below are some of the tips on how to come up with the best body for your memo:

- Consider your readers- your readers, in this case, are the audience that you are writing to. You should use the right tone depending on what you are writing on. You should be able to note the needs of your audience because for instance if you are requesting something from your staff as the manager, you have to use polite language so that your staff can consider your request. You should ask yourself any question that your readers are likely to come up with after reading your memo and address them accordingly. You should also use a language that will suit the class of people you are addressing.
- Go directly to the point- after deciding on what you are going to write on, you should avoid the salutations available in other letter writing formats. The thesis for your memo should be your major issue.
- Give a small background of the problem- after addressing the change that you need you should proceed and give reasons for the implementation of that policyor rule. Explain to your audience the sole reason that led to coming up with that decision or what motivate you to that step. You can also mention the merits and the demerits of the change.
- Support your issue- after mentioning what you wanted of the readers, you can go on and give illustrations just to be clear on what you mean or improve their understanding. There are several ways in which you can support your points.
- Use of lists- you can use a list to indicate what you need to be done if there are several points.
- Use of short subheadings- you can use a short subheading just to clarify to your reader on the points you are addressing.
- Give the actions that you need the readers to do- after explaining what you need you should state the role of the readers in the implementation of your policies. You can also give the conditions that should apply to your reader. you can, for example, give a deadline to whatever you need to be done.
- End your memo with a summary. You need to summarize your points and state the cause of action needed by your readers. Try and be positive as much as you can while closing your memo.
- The last thing is signing- you can decide to sign at the end of the memo just to make it official. Signing of the memo makes it official.

Types of memos

There are different types of memos that you can be asked to write. It is good to get familiar with each type so that you can be able to classify and know where it falls. Below are some of the memo types that you can come across:

- Request memo- in this type of memo you will be trying to get a favor from a certain person or group of people. You are supposed to use persuasive language to win the heart of your recipients.
- Confirmation memo- this document is written after a certain agreement between two parties. You will be writing just to confirm that you agree to a certain demand. In this type of memo, you should state the terms of the agreement and encourage the recipient to ask for clarification where they did not understand.

- Suggestive memo- this type of writing is written in the case where the management is requesting views from the employees on how to solve a certain problem. You will need to request your readers to give their say about a certain issue and specify how they should forward the suggestions.
- Report memo- this is a memo written after a certain period of time to give an account of the progress.it takes the report format. In this memo, the body is mainly consistent of values and charts to indicate the progress.
- Informal results memo- this is where you are required to give the results of a certain action. It can be research that was done and people would wish to know the outcome, or it can be even application results for various seats in a department.

Memo examples

A good writer would always have the passion of going through different samples to improve their proficiency. A memo template will help you to understand how you are supposed to orient your work to look appealing in the eyes of the reader. Below is a memo sample that should act to guide you on how to plan your work and keep to the right format.

MEMORANDUM

To: All students taking IT course at the university.

From: The department chair.

Date: July 7, 2018.

Subject: Submission of your final project.

It has come to our notice that some of you have not submitted their final year projects which is very crucial at this moment because it determines whether you will graduate or not. In the previous years, we have had the same incidents and students usually come back to me crying when they find out that their name is not on the graduation list.

The project will account for forty percent of your final grade and that is why it should be taken seriously. On that note the department has given out a deadline of 3rd august 2018, if you do not have submitted your project by then, you will have to wait 1 academic year to graduate. You are all advised to submit your project before the due date as we do not want you to suffer when it comes to graduation. Thanks in advance.

Yours sincerely,

Sign……..

Department   chair.

Technical communication in an **electronic**

Electronic   technologies
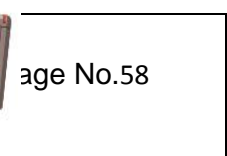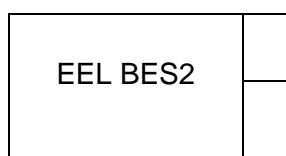

EEL BES2   age No.58

allow far more communication today than ever before. Long before people had a telephone, voice mail, email, Web access, a pager, or a cell phone, they communicated by speaking and writing. We still do this: We live in an age of information overload.

Figure 1.1Electronic communication devices.

Effective technical communication can help people manage and sort through this information. have meetings or go down the hall to speak with a colleague, and we still send letters, print newspapers, and read books. But now we send and receive information through an even greater number of channels. And while we may enjoy the efficiency of email, the convenience of voice mail, and the cost savings of teleconferences, it is also apparent that many professionals are suddenly struggling with information overload (Figure 1.1). And the more information people receive on a daily basis, the more urgent the need to make sure this information is accessible, usable, and relevant. In short, our information-saturated society cries out for effective technical communication.

Bulletin Board

A **bulletin board** (**pinboard**, **pin board**, **noticeboard**, or **notice board** in British English) is a surface intended for the posting of public messages, for example, to advertise items wanted or for sale, announce events, or provide information. Bulletin boards are often made of a material such as cork to facilitate addition and removal of messages, as well as a writing surface such as blackboard or whiteboard. A bulletin board which combines a pin board (corkboard) and writing surface is known as a combination bulletin board. Bulletin boards can also be entirely in the digital domain and placed on computer networks so people can leave and erase messages for other people to read and see, as in a bulletin board system.

Bulletin boards are particularly prevalent at universities. They are used by many sports groups and extracurricular groups and anything from local shops to official notices. For example Dormitory corridors, well-trafficked hallways, lobbies, and freestanding kiosks often have cork boards attached to facilitate the posting of notices. At some universities, lampposts, bollards, trees, and walls often become impromptu posting sites in areas where official boards are sparse in number.

Internet forums are a replacement for traditional bulletin boards. Online bulletin boards are sometimes referred to as message boards. The terms bulletin board, message board and even Internet forum are interchangeable, although often one bulletin board or message board can contain a number of Internet forums or discussion groups. An online board can serve the same purpose as a physical bulletin board.

Magnet boards, or magnetic bulletin boards, are a popular substitute for cork boards because they lack the problem of board deterioration from the insertion and removal of pins over time.

Fig 1.2 Bulletin board

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List out the Way of Communication.(**4 points**)

   a). _____

   b). _____

   c). _____

   d). _____

2. An effective report can be written going through the following steps. (**6 points**)

   a). _____

   b). _____

   c). _____

   d). _____

   e). _____

   f). _____

   g). _____

Note: **Satisfactory rating - 10 points   Unsatisfactory - 5 below 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Information Sheet-2	Presenting recommendations to appropriate personnel

INTRODUCTION

2.1.THESE RECOMMENDED PRACTICES provide responsible employers, workers, and worker representatives with a sound, flexible framework for addressing safety and health issues on diverse electrical /construction job sites. They may be used by any electrical/Construction Company or job site, but they will be particularly helpful to small and medium-sized contractors. They also include guidance specifically aimed at general contractor employment, staffing agency employment, and multiemployer work situations. These recommended practices have been developed solely for the electrical/construction industry. Separate recommended practices are available for all other industries.

The recommended practices emphasize a proactive approach to managing occupational safety and health. Traditional approaches are often reactive—that is, actions are taken only after a worker is injured or becomes sick, a new standard or regulation is published, or an outside inspection finds a problem that must be fixed. Finding and fixing hazards before they cause injury or illness is a far more effective approach. Doing so avoids the direct and indirect costs of worker injuries and illnesses, and promotes a positive work environment.

2.2 Organizational recommendations

2.2.1 Inspection / maintenance

In order to guarantee reliable functioning of all security-related and operational equipment, functional inspections and maintenance operations should be defined and conducted either on a regular basis or as required by events but at least once a year. Every such operation should be documented.

Fig 2.1 maintenance

2.2.2 Regular instruction / further training of employees

The implementation of these security requirements can only be ensured if all employees are familiar with them, have been made aware of the underlying corporate philosophy and are thoroughly immersed in this. Security is only possible if founded on broad-based acceptance.

It is therefore necessary to train the personnel appropriately, provide them with further instruction or as required by events and to integrate them in the security measures.

Employees should be made aware that one of the aims of the security measures is to ensure their own personal safety.

Adherence to the security requirements should be verified and documented on a regular basis or as required by events, but at least once a year. Any required improvements identified during these verifications should be implemented without delay.

2.2.1.1 Employees' equipment

It is necessary to ensure that the facilities, equipment or accessories required by the personnel are in a proper condition and that the personnel are instructed in their use.

Uniform, clearly identifiable working clothing assists the personnel in the fulfillment of their tasks and contributes to the avoidance of disputes in areas of potential confrontation.

2.2.1.2 Personal safety

Whenever conducting security-related activities, control personnel must pay attention to their own personal safety. Hazardous activities jeopardize not only the security objectives but also the life or physical wellbeing of the personnel involved. Etc….

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List out Regular instruction / further training of employees.(**3 points**)

   a). _____

   b). _____

Note: **Satisfactory rating - 3 points**   **Unsatisfactory – 2 below 3 points**

You can ask you teacher for the copy of the correct answers.

<div align="center">

Answer Sheet

</div>

Score = _____
Rating: _____

Name: _____   Date: _____

Short Answer Questions

3.1 Best practices for following up after a problem solving session

Too often when we are done with a problem solving session and have begun to implement our solution (action plan) to the problem, we forget to follow up and check in. One of the first things we like to do after the session has ended (usually within a day) is to send around a brief survey to ask how participants felt about the meeting and the process overall. Asking 3 simple questions:

- What worked well?
- What needs improvement to be more effective next time?
- What else would you like to share?

Consider these best practice steps for following up on a problem solving session with your team: Schedule a brief telephone call or face-to-face follow up meeting to do the following:

- Thank participants again for their participation in the session.
- Provide a summary of the results of the online survey.
- Check in on progress toward the action plan.
- Answer any questions that have arisen since the meeting ended and work has begun on the action plan.
- Be prepared to address any issues that may have arisen in applying the solution to the problem and/or to get the right people together off line to resolve any other issues.

Always enable for some time prior to getting started for the group to "catch up" with each other through personal conversations. These follow up sessions enable for continued progress toward the action plan to resolve the issue. If necessary, and especially for complex problems,

In summary, carefully planning for, facilitating (leading) and following up after problem solving sessions enables for increased success in ensuring the session was productive and that action plans put in place are being acted upon.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Describe consider these best practice steps for follow-up on a problem solving session with your team Schedule a brief telephone call or face-to-face follow up meeting to do the following? (**5 points**)

a). _____

b). _____

c). _____

d). _____

e). _____

Note: **Satisfactory rating – 5 points**   **Unsatisfactory -3 below 5 points**

You can ask you teacher for the copy of the correct answers.

<div align="center">

Answer Sheet

</div>

Score = _____
Rating: _____

Name: _____   Date: _____

Short Answer Questions

Operation sheet -3	**internal memorandum**

1. Writing of internal memo random procedures **;**

Step 1- The recipient address
Step 2- Sender
Step 3- Date
Step 4- The title
Step 5- The body

- Using the procedure write internal memo random

Information Sheet-4	Examining or experiment the proposed solutions

What Is a Controlled Experiment?

A controlled experiment is one in which everything is held constant except for one variable. Usually, a set of data is taken for a control group, which is commonly the normal or usual state, and one or more other groups are examined, where all conditions are identical to the control group and each other except this one variable. Sometimes it's necessary to change more than one variable, but all of the experimental conditions will be *controlled* so that only the variables being examined change and the amount or way they change is measured.

Key Takeaways: Controlled Experiment

- A controlled experiment is simply an experiment in which all factors are held constant except for one: the independent variable.
- A common type of controlled experiment compares a control group against an experimental group. All variables are identical between the two groups except the factor being tested.
- The advantage of a controlled experiment is that it makes it easier to eliminate uncertainty about significant of the results.

Example of a Controlled Experiment

Let's say you want to know if the type of soil affects how long it takes a seed to germinate. You decide to set up a controlled experiment to answer the question. You might take five identical pots, fill each with a different type of soil, plant bean seeds in each pot, place the pots in a sunny window, water them, and measure how long it takes for the seeds in each pot to sprout. This is a controlled experiment because your goal is to keep every variable constant except the type of soil you use. You *control* these things!

Why Controlled Experiments Are Important

The big advantage of a controlled experiment is you can eliminate much of the uncertainty about your results. If you couldn't control each variable, you might end up with a confusing outcome. For example, if you planted different types of seeds in each of the pots, trying to determine if soil type affected germination, you might find some types of seeds germinate faster than others. You wouldn't be able to say, with any degree of certainty, that the rate of germination was due to the type of soil! Or, if you had placed some pots in a sunny window and some in the shade or watered some pots more than others, you could get mixed results. The value of a controlled experiment is that it yields a high degree of confidence in the outcome.

Are All Experiments Controlled?

No, they are not. It's still possible to obtain useful data from uncontrolled experiments, but it's harder to draw conclusions based on the data. An example of an area where controlled experiments are difficult is human testing. Say you want to know if a new diet pill helps with weight loss. You can collect a sample of people, give each of them the pill, and measure their weight. You can try to control as many variables as possible, such as how much exercise they get or how many calories they eat. However, you will have several uncontrolled variables, which may include age, gender, genetic predisposition toward a high or low metabolism, how overweight they were before starting the test, whether they inadvertently eat something that interacts with the drug, etc. Scientists try to record as much data as

possible when conducting uncontrolled experiments so they can see additional factors that may be affecting their results. Although it is harder to draw conclusions from uncontrolled experiments, new patterns often emerge that would not have been observable in a controlled experiment.

For example, you may notice the diet drug seems to work for female subjects, but not for male subjects. This may lead to further experimentation and a possible breakthrough. If you had been able to perform a controlled experiment, perhaps only on male clones, you would have missed this connection.

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

2. List out Controlled Experiment. (3 points)

a). _____

b). _____

Note: **Satisfactory rating – 3 points**   **Unsatisfactory - 2 below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task1. Develop /write internal memo random Using correct procedure.

Instruction Sheet	**LG35: Implement solution**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Identifying measurable objectives
- Identifying resource needs
- Identifying timelines in accordance with plan

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**:

- Identified measurable objectives
- Identified needs
- Identified timelines in accordance with plan

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3 and Sheet 4".
13. Accomplish the "Self-check 1, Self-check t 2and Self-check 3" **in page -82, 87, and 89**respectively.
14. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet

Information Sheet 1	Identifying measurable objectives

Why are measurable objectives important?

Measurable objectives play a critical role in evaluating performance, reducing uncertainty, and improving MSP over time. Because management objectives are used to guide decisions in managing human activities in electrical/electronic areas, they should be more specific than broad brush statements or overall management purposes. For example, generic statements such as "maintain good workplace" or "improve safety quality" are general statements (goals) about why management has been undertaken, not measurable objectives that can help guide decision-making.

Objectives are derived from goals. Goals can have more than one objective

Task 1: Identify Measurable Objectives in the Spatial Management Plan

What are the characteristics of SMART objectives?

Some of the characteristics of SMART objectives include:

- **Specific:** objectives should be concrete, detailed, focused, and well defined in terms of defining desirable outcomes of the MSP process (have you specified what you want to achieve?);
- **Measurable:** objectives should allow measurement of the outcomes and progress toward their achievement—preferably in quantitative terms (can you measure what you want to achieve?);
- **Achievable:** objectives should be attainable within a reasonable amount of effort and resources (are the resources required to achieve the objective available?);
- **Relevant or Realistic:** objectives should lead to a desired goal, either on its own or in combination with other objectives; and,
- **Time-bound:** objectives should indicate a start and finish date in relation to what is to be accomplished (when do you want to achieve the specific objective or objectives?)

No single way exists to write a SMART objective. It will depend on the nature of the objective and its intended use. The real test is to compare the objective statement against the SMART criteria you have chosen to use and answer the simple question: Does the objective statement check most if not all of the criteria?

SMART Objectives in Problem Solving

We need goals to define required results and what success is, to set direction and focus our efforts. Specific, measurable goals motivate by defining the enabling us to measure our progress and our achievements.

Constructing a clear objective assists the execution of change, the delivery and the communication and engagement of the people involved.

Objectives should be **SMART:**

- S - Specific
- M - Measurable
- A - Achievable
- R - Relevant
- T - Timely

The team needs to go through the problems that have been identified and evaluate them for each of these items. If all the goals that have been set are S.M.A.R.T. goals, great -- you are ready to move on to Monitoring Progress. Otherwise, work with the team to make the necessary adjustments to make the goals S.M.A.R.T.

S – Specific

Specific goals are clear and focused, not broad, ambiguous, or general. Specific goals provide specific information on the behaviors that are associated with the goal. These goals indicate who will do what, when and how.

- Example of a goal that is not specific - "The advisory team will improve Pleasant view Dairy's profitability."
- Example of a specific goal - "Employees of Pleasant view Dairy will lower feed costs by producing high-quality forages (RFV>125), having forage equipment in top working order by May 1, storing the first crop of hay silage by May 25, and continuing to harvest at 31-day intervals throughout the growing season."

M - Measurable

Measurable goals provide a measurable indicator of success, so that it becomes easy to monitor progress and determine when success has been attained. Measurements of success may be quantified with numbers or a simple yes/no determination.

- Example of a goal that is not measurable - "Employees of Pleasantview Dairy will improve feed quality."
- Example of a measurable goal - "Employees of Pleasantview Dairy will increase the average relative feed value from 100 to greater than 140 for all hay silage stored this summer" or "All ingredients in the TMR will be weighed using the electronic scales and delivered to the feed bunk by 10:00 a.m."

A – Achievable

Achievable goals are realistic, and well within the abilities, responsibilities and resources of the management and staff. This does not mean that goals must be easy to achieve. Every effort should be made to reach a higher level of performance. Sometimes "stretch" goals can encourage someone to step out of their comfort zone and tackle tasks in a new, challenging, yet achievable way that results in overall improvement for the operation.

- Example of a goal that is not achievable - "Milk yields will exceed x amount," where x is beyond the limitations for the breed of cattle, facilities and management of the operation.

- Example of an achievable goal - "Farm employee x will mix feed ingredients accurately (wet feed less than 5 percent and dry feed less than 1 percent error) and deliver it to the cows by 10:00 a.m."

R – Relevant

A relevant goal is appropriate to a person who will be attempting to achieve it and to the overall goals and objectives of the farm.

- Example of a goal that is not relevant - "All feed will be delivered to the cows by 10:00 a.m." This goal is easy enough to measure and achieve, but doesn't do anything to ensure the quality of the feed.
- Example of a relevant goal - "Farm staff will improve milk production and lower feed waste by assuring that the computed ration is fed to the cows accurately, in the proper amounts and by 10:00 a.m. each morning."

T – Timely

The attainment of a goal should not be open-ended, but set for a specific time. As much as possible, the exact date the goal is to be achieved should be determined. When a goal has a deadline, it provides a measurable point and speeds progress toward critical goals. Employees will generally put more emphasis on goals that have specific deadlines than on those for which no time for measurement has been established.

- Example of a goal that is not timely - "We will increase milk sold per worker to 1.2 million pounds."
- Example of a timely goal - "We will increase milk sold per worker to 1.2 million pounds by July 1 of next year."

Now, back to our example - an appropriate S.M.A.R.T. goal for this situation would be to write a standard operating procedure (SOP) by tomorrow evening's feeding so that everyone that is assigned to feed the cows unexpectedly can easily follow the steps and assure that the cows are fed correctly twice daily, at 6 a.m. and 6 p.m.

Step 5: Implement Solutions - The Action Plan

Step five is to write an action plan that addresses the problems. An action plan is written so that any employee can do the task successfully alone and is followed much like a recipe. It converts the goal or plan into a people process. It has three essential parts:

1. Based on the goal the action plans answers five questions - What? When? How? Where? Who?
2. Lists Resources
3. Lists Potential Barriers

The example below applies these steps to our sample problem. Some of the steps in the action plan are obvious.

- What? - Feed the cows correctly twice a day.
- When? - By tomorrow night.

- How? - The written SOP.

Some questions still need answers in the action plan:

- Where? - Feed is to be mixed in the feed wagon using the green tractor on the concrete pad by the commodity bins next to the silos. The feed is then to be fed to the cows in lots 2, 3, and 4 twice daily, at 6AM and 6 PM.
- Who? - To be assigned by the herdsman until a new feeder is hired and trained.

Resource List:

- Ask the herdsman for help if any questions arise.
- The feeds are in the feed storage area and will be replaced as they are used.
- The tractor and mixing wagon are in the shed by the feed storage.
- The feeder is authorized to order feed or ask the office to do so.
- The feeder can spend up to $300 to correct problems when the office is closed and should get parts on account at Dickerson's Equipment.

Potential Barriers:

- Depleted feeds in silos or bins.
- Tractor is in use somewhere else.
- Broken equipment.
- Sick employees.
- Cows in the wrong lot.
- Scales broken.

Problem Solving: Set Goals for your Employees. Here are some examples:

- To be accommodative of other people's ideas and views and to be willing to take them on board.
- Research well enough to gather factual information before setting out to solve a problem.
- Look at things in different perspectives and angles and to develop alternative options.
- Be willing enough to collaborate with other when it comes to problem-solving issues.
- Learn to articulate or communicate in a proper manner that can be well understood by people.
- Get first to understand what the problem really is before starting to solve it.
- Show great confidence and poise when making decisions and not afraid to make mistakes and learn from them.
- Keep a cool head when dealing with more pressing and exhausting issues.
- Try to ask the right questions that will act as a guide to coming up with proper solutions.
- Be more flexible to change and adapt to new tact and ways of finding new solutions.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Objectives should be **SMART** (5 points)
    a). _____
    b). _____
    c). _____
    d). _____
    e). _____

Note: **Satisfactory rating – 5 points**   **Unsatisfactory - 3 below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Information Sheet-2	Identifying resource needs

Five General Categories of Resources

Creative Intelligence

You are intelligent, and you are creative. That is, you can use your intelligence in novel (creative) ways to solve problems. In this module, we will use the term creative intelligence to represent the combination of creativity and intelligence.

It is possible to differentiate between intelligence and creativity. Thus, a person may score really well on a standard measure of intelligence (an intelligence quotient test) yet have a relatively low level of creativity. [[The opposite is also true. Some highly creative people perform quite poorly on IQ tests. They may do poorly in school, because their talents do not align well with school curriculum and assessment.]] There has been a lot of research on creativity and how to increase creativity. Courses on creative problem solving are offered at many universities. Workshops on creative problem solving are readily available. They tend to be particularly popular in business and industry. When you work to solve a problem, you bring your creative intelligence to the task. This intelligence is used: to understand the problem; to help reformulate a problem situation so it is a clearly defined problem; to modify the problem (pose a modified problem) based on information gained during the solution process; and to provide guidance in making effective use of other resources.

Tools

We divide tools into two categories--physical artifacts (tools to supplement physical resources of a person) and cognitive artifacts (tools to supplement mental resources of a person). Some tools, such as computerized machinery, fall into both categories. A modern car contains a large number of microprocessors. An electron microscope can be thought of as a computerized microscope that makes use of a beam of electrons instead of light to illuminate the object being viewed.

It is evident that tools contribute to cumulative progress in helping people get better at problem solving. Once a useful tool is invented, it is relatively easy for other people to learn to use the tool. For example, you probably have made use of a microscope and a telescope. These tools have contributed greatly to a number of different fields of scientific knowledge.

We remember Alexander Graham Bell for his invention of the telephone. This invention has greatly changed the societies of the world.

The telephone represents a very important idea in human tool-making progress. It took the genius of just one person (Bell) to create a tool that has spread to the entire world. However, often an invention occurs when the underlying technology needed has developed to a level that readily supports the invention. Thus, a second inventor simultaneously developed the telephone, but arrived at the US Patent Office a few minutes later that did Alexander Graham Bell.]]

Some tools are general purpose, while others are designed to help solve a very narrow range of problems. As part of a general education, you learn to use a number of general-purpose cognitive and physical artifacts. These become so commonplace to you that you don't even think about them. Thus, you may not even think of reading, writing, and arithmetic as cognitive artifacts--useful across every area of human intellectual endeavor.

A person who is working to develop a high level of expertise in a narrow area of specialization is apt to be learning to use some tools that are specific to that area. For example, the tools of a professional welder are quite a bit different than the tools of an eye surgeon.

Accumulated Knowledge

The amount of accumulated knowledge of the human race is huge and is continuing to grow rapidly. Various people have made estimates on how rapidly the accumulated knowledge is growing.

However, it is not clear what people mean when they say that the amount of accumulated knowledge is doubling every few years. Some people like to talk about a continuum that runs from data to information to knowledge.
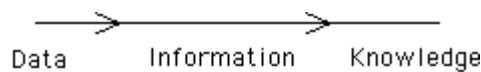
Data   Information   Knowledge

Figure 2.1 the knowledge continuum.

It is clear that the amount of accumulated data, information, and knowledge is all growing rapidly. It is increasing so rapidly that even experts in narrow specialization areas are hard pressed to remain at the forefront of their specialty areas. This information explosion contributes both to the number and nature of problems that people want to solve and to their ability to solve the problems that they pose.

There are many ways to store data, information, and knowledge. People carry a lot of it around in their heads. It may be in written form and stored on stone or clay tablets, or on paper. It may be stored on audio- and videotapes. It may be in photographs, paintings, or drawings.

And, of course, data, information, and knowledge can be stored in a computer. Computers are a key tool of the Information Age. A computer is both storage and a processing device. It is the combination of storage and processing that make computers such powerful aids to problem solving.

Perhaps the key idea is that there are various ways to represent data, information, and knowledge. Knowledge stored or represented in a person's head is certainly in a different form than knowledge stored in a book, knowledge integrated into the design and workings of a piece of machinery, or knowledge stored in a computer. If one insists on a definition that "knowledge" is something that can only be stored and represented in a person's head, than that certainly precludes the idea of storing knowledge in a computer system. However, most people use a broader definition of the term.

Education and Training

Education and training are needed to learn to make use of tools. Some education and training is quite general, cutting across many disciplines. Other education and training is highly specific to a narrow area.

The basics of education that are emphasized in the early grades of school, such as reading, writing, arithmetic, speaking, and listening, tend to be quite general purpose. These basics of education are useful in addressing a wide range of problems. As one progresses further along in school, education and training begin to become more specialized. Through formal education, extending even to the postdoctoral level and through apprenticeship training that may take many years, one can gain a great deal of expertise in a specialized area.

The human mind is always learning. Information flows into the mind from the senses. It is processed--mostly at a subconscious level. Thus, it is appropriate to say that we are all lifelong learners. Much of this lifelong learning is informal, incidental, and non-directed. However, some of this learning is consciously directed. This consciously directed learning may occur at work, play, or school. Conscious, directed learning is essential to developing expertise and to increasing one's overall abilities as a problem solver. We will discuss this in more detail in later chapters.

Time

We have now listed four major types of resources that can be used in problem solving. Figure 2.2 shows each of these resources inside a circle. The diagram is designed to suggest the interaction of the various resources that are available to support a person doing problem solving. You might visualize yourself sitting at the top of a pyramid of resources that are available to support you in problem solving.
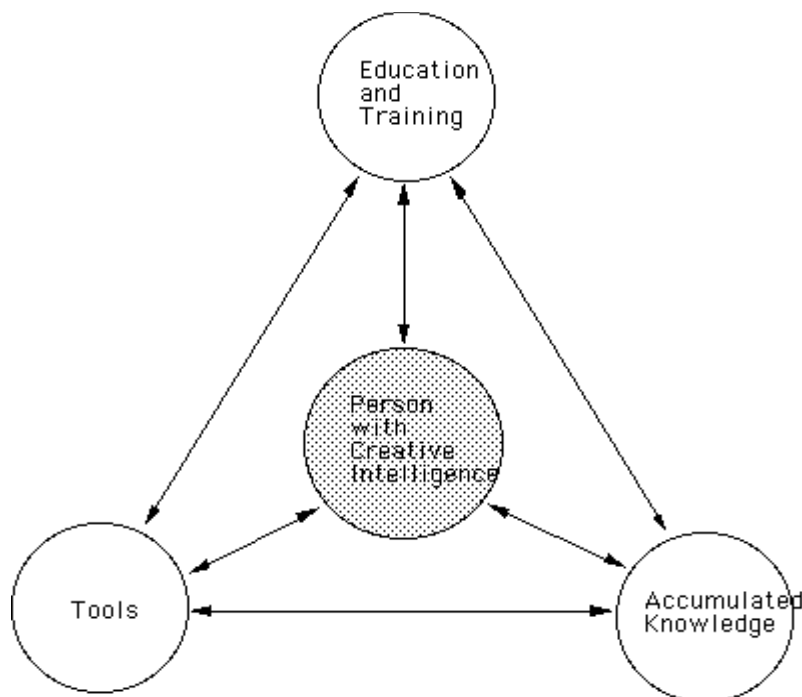

Figure 2.2 Four major resources in problem solving.

Finally, it is time to talk about time. The ownership component in the definition of a problem indicates that you are willing to devote some of your personal resources to accomplishing the goal. This may include putting in time thinking about the problem and time actually carrying out steps to solve the problem.

It is useful to think about two different uses of time. First, there is the time spent before the problem is encountered. This time is spent in gaining general and specific knowledge and skills. It is time spent developing your mind and body. It is time spent honing an essential resource--namely, you!

Then there is the time actually devoted to solving a particular problem or accomplishing a particular task. This may be a few seconds, or it may be many years. It is important to remember that time spent solving a problem contributes to your overall knowledge, skills, and experience. It helps prepare you for the next time you encounter a somewhat similar problem.

Both the preparation time and the problem-solving time vary with the problem to be solved or task to be accomplished. However, the time needed can be decreased through using appropriate tools, education and training, access to accumulated knowledge, and so on. There are ways to save time when preparing yourself to solve problems and when actually solving problems.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the

next page:

1. Five General Categories of a resources (5 points)

a). _____

b). _____

c). _____

d). _____

e). _____

Note: **Satisfactory rating - 5 points   Unsatisfactory -3 below 5 points**

You can ask you teacher for the copy of the correct answers.

<div align="center">

Answer Sheet

</div>

Score = _____
Rating: _____

Name: _____   Date: _____

Short Answer Questions

Information Sheet-3	Identifying timelines in accordance with plan

Introduction

A timeline is a display of a list of events in chronological order. It is typically a graphic design showing a long bar labelled with dates paralleling it, and usually contemporaneous events; a Gantt chart is a form of timeline used in project management.

Timelines can use any suitable scale representing time, suiting the subject and data; many use a linear scale, in which a unit of distance is equal to a set amount of time. This timescale is dependent on the events in the timeline.

Building project **plans** is a critical and key first step when beginning any project. ... A well-illustrated project **plan** can be used for more than laying out a project **timeline**. It can also be reused throughout the life of the project to communicate progress at status meetings, **planning** reviews and on project scorecards.

Building project plans is a critical and key first step when beginning any project. This project plan template can help you do that. It was designed for professionals who need to create project plans for clients, execs and other project stakeholders. The template is a quick and simple alternative to complex project management tools and your project plan slide will serve as the starting point for any project.

Project plans should illustrate the key objectives to be achieved and those objectives should be displayed as milestones and tasks on a timeline. Using a PowerPoint slide to communicate a project plan is the easiest way to launch projects. Your plans can be manually entered into this project plan template's placeholders or you can instantly update it with Office Timeline, a free project planning add-in for PowerPoint.

A well-illustrated project plan can be used for more than laying out a project timeline. It can also be reused throughout the life of the project to communicate progress at status meetings, planning reviews and on project scorecards. This free template was designed so show progress and includes a Today's Date marker that also shows elapsed time on the time band.

Office Timeline's PowerPoint add-in can add more project visuals to this project plan template in just a few clicks. It can turn on features such as such as showing the duration of each task and their percent complete, or changing the shapes of milestone markers or task bands. Additionally, Office Timeline plus Edition can make your project plan instantly by importing data directly from Microsoft Project or Excel. This makes it simple to create project plan timeline slides quickly by using existing data from your primary project management tools.

Whether it's for sharing plans with important audiences or having an illustration for your own reference, building easy-to-follow project plans is simple with the project plan template for PowerPoint.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Describe about timeline?

_____
_____
_____
_____.

Note: **Satisfactory rating - 10 points   Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Instruction Sheet	**LG36: Install additional/ enhancement features**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Identifying processes and improvements based on evaluative assessment of problem
- Preparing and submitting recommendations to superiors or instructor.

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 processes and improvements based on evaluative assessment of problem
- Prepare and submit recommendations to superiors/supervisors.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1 and Sheet 2".
4. Accomplish the "Self-check 1 and Self-check 2" **in page -96 and 98** respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 " **in page .**
6. Do the "LAP test" **in page –** (if you are ready).

Information Sheet-1	Identifying processes and improvements based on evaluative assessment of problem

Introduction

Evaluation is not simply about assessing whether an initiative was a success or failure. Instead, evaluation is about creating the information and data about the initiative's success and why. Evaluation findings can lead to more effective and efficient program delivery.

Evaluation as the systematic collection and analysis of information on the performance of a policy, program or initiative to make judgments about relevance, progress or success and cost-effectiveness and or to inform future programming decisions about design and implementation.

Benefits of Evaluation
Some of the benefits of evaluation include:
- Enhancing the chance that the initiative's goals and objectives are being achieved
- Determining value for money (i.e., allocated resources are yielding the greatest benefit for clients and stakeholders)
- Identifying what components of an initiative work/do not work and why
- Identifying areas that need improvement in order to provide the best service possible

While most people think about evaluation in the context of assessing programs and policies, building evaluation into operational processes can lead to better procurement decisions.

Types of Evaluation
There are several different types of evaluations depending on what is being evaluated and the purpose of the evaluation. All types of evaluation can be generally classified into the broad categories of formative and summative evaluations.

Formative: evaluations are used primarily to provide information for initiative improvement by examining the delivery of the initiative, its implementation, procedures, personnel, etc. **Summative:** evaluations, in contrast, examine the initiative's outcomes and are used to provide information that will assist in making decisions regarding the initiative's adoption, continuation or expansion and can assist in judgments of the initiative's overall merit based on certain criteria. Some more **Comprehensive** evaluations combine both process and outcome questions.

Evaluability Assessment

Before a proper evaluation can take place it is often necessary to perform an evaluability assessment in order to assess the extent to which the initiative is ready to be evaluated and what type of evaluation would be most appropriate. The assessment aims to ascertain the needs, goals and objectives of the initiative and determine if a formal evaluation is warranted at this point in time or even whether the initiative is ready to be evaluated.

There are often several factors that prevent an initiative from being ready to be evaluated. These can include a failure to agree on goals, objectives and performance criteria, the goals and objectives are found to be unrealistic given the resources available, relevant information/data regarding performance is not available, or there is an unwillingness to

change the initiative on the basis of evaluation information. An evaluability assessment will help bring these issues to light. The proper steps can then be taken so that a future evaluation becomes feasible. A more in-depth explanation and guide to completing an evaluability assessment can be found in the resource section at the end of this document.

The Policy on Evaluation requires that departments prepare annual or multi-year Departmental Evaluation Plans to identify priority evaluations and evaluation-related activities. A specific type of evaluability assessment process used to support departmental risk-based assessment of evaluation priorities is contained in the Guide to Developing a Risk-based Departmental Evaluation Plan.

Needs Assessment

A Needs Assessment can be useful for determining whether a problem or need exists within a community, organization or target group and then describing that problem. Recommendations can then be made for ways to reduce that problem. This process typically involves interviews and consultations with stakeholders as well as document reviews and research of relevant information. The Needs Assessment is an ongoing process and is helpful for assessing whether a new policy/program/intervention may be necessary. A more in depth explanation and guide to completing a needs assessment can be found in the resource section at the end of this document.

The existence of reliable data supporting a needs assessment is an important factor to justify major policy or program changes in departmental Cabinet submissions.

Implementation/Process/Formative Evaluation

Every initiative has a strategy or plan that dictates how it is intended to work. The initiative's theory states that if its plan is followed and implemented faithfully, then the intended outcomes will be achieved. A process evaluation can be conducted at any point in the initiative's lifecycle and is used to assess whether and to what degree this plan was followed and the extent to which early outcomes are achieved.

A process / formative evaluation involve collecting relevant information regarding the initiative's implementation on an ongoing basis and identifying any barriers that need to be overcome. Accurate and detailed information about the initiative and its activities and goals are a necessity in order to make the linkages between its various components and the achievement of outcomes. The results of a process evaluation can be used to make improvements to the initiative. If monitoring reports indicate material variances that cannot be explained, a process / formative evaluation may assist to determine the reasons and allow for mitigation strategies to be put in place to improve future performance.

Impact/Outcome/Summative Evaluation

An outcome / summative evaluation is useful for focusing on the results of an initiative, whether they are short-term, intermediate or long-term. This type of evaluation determines what changes, if any, occurred and if they are in line with the initiative's theory. An important aspect of this assessment is determining whether those outcomes occurred due to the initiative itself (impact or attribution), whether some change may have occurred without the program intervention (deadweight) or may have been achieved by other external factors (? Displacement). The findings from this type of evaluation can be used not only for making improvements to the initiative, but for summative decision making as well, that is will the program continue as is, expand, reduce or be eliminated.

The document "Developing an Accountability Framework Resource and Reference Guide" contains a section requiring departments to identify if and when formative or summative evaluations of new programs and major new policies will take place.

Program Review

A Program Review is a systematic overall assessment of an initiative's operations, processes and systems for the purpose of finding efficiencies, cost savings, opportunities for possible realignment with another level of government and/ or other delivery options. It is needed when there is an overriding concern with the initiative's relevance, operations and/or a need to find savings. Such a review process often involves a comprehensive review of an entire department or organization often with a budget reduction target assigned.

Efficiency Assessment (Cost/Benefit Analysis or Cost Effectiveness Analysis)

An efficiency assessment is used to determine the value or benefit of an initiative in relation to its cost. Whether the evaluation focuses on cost-benefit, cost-effectiveness or both depends on the evaluation's scope. A cost-benefit analysis seeks to compare the total costs of implementing an initiative to the total net benefits, while cost-effectiveness analyses assess the value-for-money of an initiative based on the costs required to produce various outcomes. Typically, this type of evaluation is recommended after the initiative has been in place for a period of time so that actual outcome data is available. A more in-depth explanation and guide to completing an efficiency assessment can be found in the resource section at the end of this document.

Common Barriers to Evaluation

It is common for people to have some reservations regarding evaluation of their programs or initiatives since there are several things that can disrupt the evaluation process or impact on the results. Some of the most commonly encountered barriers to an effective evaluation are:

- *Lack of Management Support*

  If not initiated or supported by the Minister, Deputy Minister and other senior officials, evaluations will often not receive the support and resources necessary to conduct a proper evaluation. Personnel associated with the initiative are often expected to collect additional data and perform the analyses in addition to their original duties. The result is often a poorly constructed and conducted evaluation with unreliable information on which to base decisions.

- *Lack of Skills and Resources*

  Lack of skills and resources in the collection, analysis, and interpretation of data fosters incomplete or inaccurate evaluation results. Many organizations simply do not have the necessary time, systems or personnel with the skills to construct interview or data collection instruments, or analyze and interpret the data. This could result in false assumptions and conclusions from inaccurate, missing or irrelevant data.

- *Lack of Relevant Data*

Lack of relevant data can render the evaluation useless. Unless data collection instruments and methods are carefully planned from the beginning of the evaluation period, missing, inconsistent, and untimely data will result in an incomplete evaluation. Certain evaluation questions will not be answered and the inaccurate data can render the results meaningless.

- *Fear of Consequences*

  Fear that the results of the evaluation will suggest or recommend elimination of or significant changes to the initiative will often become a detriment to the process. More realistically, an evaluation, even when negative, will usually lead to the improvement or refinement of the existing program.

- *Promoting Proper Evaluation*

  A culture of effective evaluation can be fostered by encouraging the participation of employees and primary stakeholders in the development process, making the scope and purpose of the evaluation clear from the start and providing sufficient support from managers and supervisors. The creation of proper and easy to use evaluation tools will also ensure the process goes much more smoothly.

Self-Check -1	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. A Common Barriers to Evaluation (1 points)

      A. Lack of Skills and Resources   C. Evaluability Assessment
      B. Program Review   D. Data collection

2. List out Types of Evaluation (2 points)

    a). _____

    b). _____

Note: **Satisfactory rating - 5 points**   **Unsatisfactory -2 below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Information Sheet-2	Preparing and submitting recommendations to superiors or instructor

How to Recommend a Professional supervisor/instructor

If an executive-level colleague asks you to write a recommendation or serve as a reference, it's a task that requires more than an average recommendation letter. Chances are that the person is applying for a prestigious award, a high-level position, or is seeking tenure, a grant or some other type of career advancement. As such, the wording you use can make or break what could be a very important opportunity.

Writing an Effective Letter

Executive-level professionals don't usually ask friends, co-workers or mid-level managers to put their impressions down in a letter, outlining that they arrive on time and contribute well in groups sessions. This type of high-level correspondence is specific, and the best way to support someone with a recommendation, is to ask them pointedly what they want covered. If no such direction is provided, emphasize the following points:

- Your relationship with the person
- Your views on the person's skills, professionalism, integrity and work ethic
- Why you are making the recommendation and why the person should be given serious consideration

In many instances, the person making the request will actually ask or volunteer to draft the letter himself, or will have a marketing or PR person draft the correspondence, which you can then review for accuracy, affix to letterhead, sign and return.

Making a Virtual Introduction

A top-level employee may ask for a recommendation or referral to someone you know, be it a connection to a job lead, a new staffer or a prospective client. One way to do this is via email, in which all parties are copied, and in which the basis for the introduction or referral is made clear.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. When writing an Effective Letter emphasize the following points

   a). _____

   b). _____

   c). _____

Note: **Satisfactory rating - 3 points   Unsatisfactory -2 below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

Reference

- Types of evaluation https://www.policynl.ca/policydevelopment/pages/information-on-benefits-types-evaluation.html
- https://work.chron.com/recommend-professional-boss-7126.html
- https://www.nap.edu/read/2102/chapter/7
- Hand writing   https://en.wikipedia.org/wiki/Handwriting
- Version control   https://en.wikipedia.org/wiki/Version_control
- Resume writing https://www.managementstudyguide.com/resume-writing.htm
- Bulletin board   https://en.wikipedia.org/wiki/Bulletin_board
- http://www.tisgdv.de/tise/bedingungen/parken/parkplatzgesichert/inhalt05.htm
- Follow up after a problem solving session https://www.ginaabudi.com/best-practices-for-following-up-after-a-problem-solving-session-part-iii/
- control experiment https://www.thoughtco.com/controlled-experiment-609091

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