Information Technology Support Service

Level II

Learning Guide-33

Unit of Competence:	**Implement Maintenance Procedure**
Module Title:	**Implementing Maintenance Procedure**
LG Code:	**ICT ITS2 LO1-LG-33**
TTLM Code:	**ICT ITS2 MO2 TTLM 1019v1**

LO 1: Determine best practices for equipment and software maintenance

Instruction Sheet	Learning Guide # 33

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

- Identifying Equipment and software to be maintained and implemented
- Identifying Vendor documentation, peer organizations or research information
- Obtaining user Requirements
- Documenting maintenance procedure

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 Equipment and software to be maintained and implemented processes to ensure future acquisitions of equipment and software.
- Identify Vendor documentation, peer organizations or research information detailing best practices in equipment and software maintenance to improve system performance and reliability.
- Obtain Requirements from user in the area of equipment maintenance and reliability.
- Document Procedures for maintenance based upon best practices.

Learning Activities

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 4.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4,” **in page -1-14,16-19,21-24 and 26-28** respectively.
4. Accomplish the “Self-check 1, Self-check 2, and Self-check- 3, Self-check and Self-check-4 **in page 15,20, 25 and 29** respectively

Information Sheet 1	Identifying Equipment and software to be maintained and implemented

1.1. Identifying computer hard ware to be maintained

There are several ways to identify the normal operation of a personal computer. Most people use diagnostic software packages like PC Tools, Norton Utilities and/or Check It to test a computer. Those diagnostic packages provide user-friendly operations to perform testing of a computer.

However, you can initially make measurable observations using your senses, that is, the sights and sounds to identify the normal operation of the computer. The table below suggests where to look and what you might hear to get an indication of normal behaviour of a PC.

Table 1.1: Reference points for indications of normal behaviour of a PC

Device	Sights	Sounds
System unit	Floppy disk drive activity indicator (light) Front panel indicators such as: •Power on LED (light emitting diode) •Hard disk drive activity LED	Floppy disk drive mechanisms Speaker (beep) Fan Hard disk drive
Display unit (monitor)	Power on indicator Text displayed on screen	
Keyboard	**Num lock** indicator **Caps lock** indicator **Scroll lock** indicator	
Printer	Power on indicator	Tractor feed

	Online/ready indicator Busy indicator Message display indicator	Printer head Laser printer mechanisms
Mouse	When software is loaded, mouse pointer appears on a screen that reflects a correct positioning of a pointer, or other operations of a mouse	

- **Potential sources of damage to computer hardware and software**

There are a number of common causes of damage to a computer or its components. These are:

- Temperature variations
- Power cycling
- Static electricity
- Power line noise
- Radio frequency interference
- Phosphor burn on a monitor
- Dust and pollutants
- Water

✓ **Temperature variations**

Cause

Temperature variations (expansion and contraction of components from temperature change) can lead to serious problems.

Damages

- Chip creep : where the heating and cooling of components can cause movement, usually out of the socket that holds the component.
- Signal traces on circuit boards can be cracked and separated.
- Solder joints can be broken.
- Contacts undergo accelerated corrosion.
- Solid-state components can be damaged.
- Read and write problems on hard disk drive (due to expansion and contraction of the platter of hard disk the data may be written at a different location relative to the track centre).

Advice

- Ensure a computer operates in correct ambient temperature Refer to the computer User's Manual for this information.
- Ensure the ambient temperature when the:
  - system is **on** it is in the range of **15-32 °C**
  - system is **off** it is in the range of **10-40 °C**.

✓ **Power cycling**

Cause

Turning on a cold computer subjects it to the greatest possible internal temperature variation.

Damages

Same as for temperature variation

Advice

Power on a computer only once daily. Don't turn a computer on and off several times every day.

✓ **Static electricity**

Cause

This problem usually appears during winter months when humidity is low, or in extremely dry climates where the humidity is low year-round.

Some static-sensitivity problems are caused by improper grounding of computer power.

Damages

Electronic components

Advice

- Always use a three-prong, grounded power cord plugged into a properly grounded outlet. You could use an outlet tester to check that it is properly grounded, but today, OH&S requires that all power equipment be properly tested and certified. This includes the outlets, cables and connectors.
- Use a grounded static mat underneath a computer, or an antistatic wrist-strap, before touching internal components of the computer.

✓ **Power line noise**

Cause

This problem is caused by poor quality power being supplied to a computer system, which creates some spikes and transients (short transient signals of sometimes 1000 volts or more).

It can also be caused by sharing a power source with other higher power consuming equipment, such as coffee makers, copy machines or a laser printer.

The wire size and length will affect the resistance of a power circuit.

Damages

All system components

Advice

- A computer system should be on its own circuit with its own circuit breaker.
- A three-wire circuit is a necessity.
- To decrease resistance, avoid extension cords unless absolutely necessary and then use only heavy-duty extension cords.
- Avoid using too many items on a single outlet.
- Add an Uninterruptible Power Supply (UPS) as a power conditioner.

✓ **Radio frequency interference**

Cause

Mobile phones, cordless phones, fax machines and any radio transmission equipment

Effects

- Sporadic random keystrokes will appear, as though an invisible entity were typing on the keyboard

- White spots and lines appear on the screen
- **Advice**
- Install specially shielded cables (built-in toroid core cables) outside a system unit.

✓ **Phosphor burn on a monitor**

Cause

The phosphor on a cathode ray tube can be burned if a stationary image is left on a screen continuously for long time.

Damages

Reduces the life of monitor (cathode ray tube)

Advice

- Turn both brightness and contrast levels to the minimum.
- Use a screensaver that displays different patterns on a screen.

✓ **Dust and pollutants**

Cause

A power supply fan carries airborne particles through a computer.

Food crumbs are attracted by magnetic media, while cigarette ash and smoke are drawn toward disk drives.

Damages

- Floppy disk heads and media
- Electronic components (dust on the surface of components prevents necessary heat loss)

Advice

- Use power supply unit with air filter (the filter must be cleaned and changed periodically).
- Don’t operate an unprotected computer in a dusty environment, eg an industrial workshop.

✓ **Water**

Cause

On a desktop, coffee or tea spills over a keyboard or into a monitor.

Damages

- Keyboard malfunction
- Monitor explosion (if a monitor is on)

Advice

Never eat, drink or smoke inside a computer room.

The first steps towards troubleshooting

Reflect

Here is a typical scenario reported to the help desk.

A client phones the help desk and reports that the computer hangs each time they try to run a particular application.

- What might be the source of the problem?
- What steps will you take to find out?

This is the trouble shooter's challenge!

Feedback

In all cases where you are trying to troubleshoot a problem, you need to use a **logical step-by-step approach**. For example, two questions that you would always ask in this situation are:

- When did the problem begin?
- Has any new hardware or software been added between the time that the problem appeared and when the system was last working correctly?

Here is a list of reasons why a computer might hang each time a specific software application is run. It could indicate:

- a corrupted file
- an incorrect installation
- hard disk failure
- a virus
- a new application causing conflict
- new hardware causing conflict
- new device drivers causing a conflict with older software.

General troubleshooting guide

Here's a general troubleshooting guide that you can use when a computer develops a fault.

- ✓ Don't panic.

- ✓ Observe:
  - What are the symptoms?
  - What conditions existed at the time of failure?
  - What actions were in progress?
  - What program was running?
  - What was displayed on the screen?
  - Was there an error message?
  - What functions are still working?
- ✓ Use your senses (sight, hearing, smell and touch).
  - Is there any odour present?
  - Does any part of the system feel hot?
- ✓ Check power supply:
  - Is the plug inserted snugly into the computer?
  - Is the power cord plugged into an appropriate wall power outlet?
  - Is the wall power outlet working?
- ✓ Documentation (fill in a pre-designed check list):
  - What is the computer doing?
  - What is the computer not doing?
  - What is being displayed on the screen?
  - Is there any error message?
  - What is still operating with everything connected?
  - Is power still operating on each part of a computer?
- ✓ Assume one problem:
  - Use correct data and resources
  - Use relevant technical manuals and information
- ✓ Use proper test equipment.
- ✓ Isolate units one-by-one:

- If a system worked when all peripherals were disconnected, turn power off and reconnect one of the peripherals. Power on and test. If that unit works, turn the power off and reconnect another peripheral. Again, power up and test. Follow this procedure until a unit fails.

✓ Consult your index of symptoms:

- Using your logbook, help desk database, or any relevant flow charts in reference books and manuals.

✓ Localise to a stage.

✓ Isolate to the failed part.

✓ Test and verify proper operation.

After diagnosing and rectifying the fault, you need to document it in the log book or help desk database for future reference.

A hardware fault-finding checklist

Here's a useful checklist that you can use to help you diagnose faults in hardware.

✓ First, consult any service level agreements (SLA) to ascertain if or clarify response time obligations and internal/external responsibilities. Determine also if there are there any other organisational guidelines you need to follow.

✓ Consult documentation logged from previous related or similar situations. Determine a set of questions can you ask the user, your colleagues and your supervisor that might assist you in finding a solution.

✓ Remember to keep safety as your highest priority by observing OH&S precautions, that is, ensure your own safety first, and then consider other precautions such as static discharge, etc.

✓ Check the power supply. Ensure it is working and that it is powering the motherboard.

✓ If no video is displayed try swapping the monitor with a known good one.

✓ If the video controller is built in, disable it and try another known working video card. To disable the built in video controller you will need to access the system CMOS or BIOS

setup. On some systems, simply inserting a new video card will automatically disable the built in video.

- ✓ Remove all expansion cards. If the machine boots, replace the cards one by one until the problem reappears.
- ✓ Check the CPU fan is operating.
- ✓ Check the RAM chips by swapping them with known good ones.
- ✓ Check the motherboard for signs of blown components.
- ✓ If still no success, you might swap the entire motherboard and CPU.

Remember to document everything you do according to organisational guidelines.

Is the problem with the hardware or the software?

A computer system consists of a hardware sub-system and a software sub-system. However, when looking for the cause of the fault, sometimes it can be difficult to determine if the fault is hardware or software. Once you have determined that the fault is confined to one of these two sub-systems, you can then isolate it, focus on the fault-finding process, and rectify the fault.

The easiest way to determine whether a problem is hardware or software is to **test the hardware with software packages** that are known to be good and that have successfully run on the system before. If the system boots and operates correctly, then the fault can be put down to software. If the system does not boot or operate correctly then the fault can be put down to hardware.

Configuration problems

Configuration problems are problems that arise when a computer system is set up for the first time or when new peripherals/components are added to the system. When the component is first added, the system is not ready to receive the hardware, until the system is prepared to support the device. This mismatch can be rectified by:

- ✓ installing the appropriate software device drivers
- ✓ configuring CMOS/BIOS
- ✓ configuring the operating system.

The POST

The Power On Self Test (POST) operates whenever a computer is switched on.

Whenever you start up the computer system, the computer automatically runs a series of tests. These test the basic functionality of vital components such as the CPU, RAM, video card, motherboard, and input and output devices.

POST tests are not particularly thorough, but they represent the first line of defence, especially in handling severe motherboard problems. If the POST test finds a problem which is severe enough to keep the system from operating properly, it halts boot up of the system and produces **audio beeps** and/or **error messages.** You can find the meanings of these error signs in documentation from the system manufacturer — this is often required for an accurate understanding of audio beeps and messages. But if the POST fails, then at least you know the problem is hardware-related.

The boot up process

Carefully watching the steps in the boot process can reveal a lot about the nature of problems in a system. By doing this you can include or exclude various possible causes of faults. The absence of one or more of the following during booting can indicate a fault:

- ✓ When power is applied, the power supply fan should work.
- ✓ The keyboard lights should flash as the rest of the system components are reset.
- ✓ A POST memory count and test should be seen.
- ✓ A BIOS message should be visible on the monitor.
- ✓ The floppy drive access light should come on briefly.
- ✓ The hard disk access light should come on briefly.
- ✓ An audible short beep should be heard.
- ✓ The floppy disk access light should come briefly before a check of the hard drive starts.
- ✓ An operating system prompt, message, or logo should be visible.

By observing the above sequence you should be able to work out where the problem might be, that is, isolate the fault. For instance, if any of the above steps (except the last one) fails in some regard, then you know the problem is hardware-related.

Hardware toolkit

What equipment are you likely to need when carrying out the fault-finding? The most useful tool, that you should never leave home without, is a good quality Philips-head screwdriver. However, other tools in your hardware toolkit may include:

- ✓ screwdrivers — a full set and range of sizes
- ✓ anti-static strap
- ✓ pointy-nose pliers
- ✓ multimeter
- ✓ known good components such as video card, cables, mouse, hard-disk drive, network interface card (NIC), CD-ROM drive
- ✓ serial and parallel loop-back connectors
- ✓ boot disks
- ✓ a range of testing software for the loop-back plugs and NIC
- ✓ a POST card.

POST cards

A **POST card** is a device that plugs into an empty slot in the motherboard. When the system boots up, the card runs a series of diagnostics. In some cases these cards replace the normal functions of the BIOS. The great advantage of using these cards is that you do not have to resort to software running off the hard drive or a floppy disk.

POST cards are normally used when systems are ‘dead’, or when the system cannot read from the hard drive or the floppy drive. Typically, a normal BIOS chip stops when there’s a severe error condition. POST cards can actually continue and go through a full testing cycle. Some POST cards also come with a series of light emitting diodes **(LEDs)** that produce coded error signals that you could interpret together with a manual. Other cards produce audio beep signals.

Diagnostic software

There is a wide range of diagnostic tools available that can help you identify all sorts of computer problems. Generally, the diagnostic software used for testing system components and/or performance falls into two categories:

- ✓ generic

✓ proprietary.

Generic diagnostic software

The generic tools available are usually sold as software packages and are very limited. To evaluate the usefulness of generic software you have to assume that the software supplier has tested their software with all original equipment manufacturer (OEM) hardware and software you may want to test. This is hardly possible, so you should not be surprised when the results of such packages fail to live up to expectations.

This is not to say the providers of these packages are supplying a defective product — just that **they can really only test the functionality of devices and systems functions known to the program writers** and this will exclude many proprietary devices. A good example of this would be network interface cards (NICs).

Most of the generic diagnostic packages will probably be able to determine that the NIC is installed in the system, however, if the exact functionality instructions of the NIC are not built into the diagnostic software, an accurate result will probably not be achieved.

This is better understood when considering that the same NIC OEM may provide a different diagnostics utility with each of many similar NICs. If the wrong version of the diagnostics utility is tried with the wrong NIC, even the most basic loop-back test will often fail. This highlights the need to pay close attention to the software provided by OEMs.

Another factor to consider is that general diagnostic software uses information gained from the underlying operating system, which gains its information from the BIOS. This means that the operating system (using its device driver) may not be able to accurately provide information on the device. If the information provided to the diagnostic software is not extremely accurate, then valid test results are not a reasonable expectation. For truly accurate testing of a device you should use the software provided by the manufacturer or use specialised diagnostic software that can bypass the operating system all together.

1.2. Software tools

- **Propriety diagnostic software**

If diagnostic software is operated on its own specially designed operating system, then direct access (via the BIOS) to the hardware will likely yield accurate and thorough details. Having unimpeded access to the low-level functions of the hardware means the diagnostic software

is able to run rigorous testing and reporting. After all, it's unlikely that rigorous memory testing could be performed while there are several other programs currently running in memory.

Two examples of good diagnostic software are:

- ✓ *Micro-Scope Diagnostic Suite* from Micro2000 (http://www.micro2000.com/)
- ✓ *PC Certify Lite* from Pro Tech Diagnostics (http://www.protechdiagnostics.com/)

Common diagnostic tools

All operating systems come with utilities that are used for general checking, repair and reporting of faults. Each operating system is different but they do have some tools in common such as hard disk scanning tools, eg:

- ✓ *Scandisk* for Microsoft
- ✓ *fsck* (file system check) for Unix clones like Linux
- ✓ *Disk First Aid* for Apple MacIntosh systems.

If your operating system supports it, then checking the device interrupts and input/output addresses can locate problems associated with hardware conflicts, or apparent inoperative hardware. For instance, you may have a sound card installed in a system but have difficulty in getting the device to produce any sound, when you know the device is not faulty. You would know the device operates correctly if you install it in another computer and can play audio.

When using any of the diagnostic tools, especially the disk checking utilities, the operator and other system users must be considered. As hard drives have become larger in size, the time taken to check them has also increased, to the point where it can take hours to fully complete some of the diagnostics. These checks do need to be carried out regularly but should be programmed to be done at a time outside usual working hours or by arrangement with the clients/users.

Leave a trail to follow

Apart from the use of diagnostic software (and a little trial and error) examining documentation on past faults and their solutions can reveal a lot. To give two examples:

- ✓ The introduction of a new device (say a different brand of NIC) may bring with it some configuration problems. If there is documented evidence of previous problems, together with information on how the problem was solved, you can more efficiently remedy similar problems. The remedy may come in the form of an automated configuration file (script), or a decision to purchase less trouble-prone devices.
- ✓ The reports generated by some help desk software may indicate that a particular user consistently experiences problems with certain devices, or software applications. This information could then be used to reduce future incidents of support calls by providing

or recommending targeted training for that user. The term currently in use for this is 'just in time training' (JIT).

For this approach to work, you must leave a documented trail to follow. The main consideration is to **record** and/or **document** all problems, changes made, and when they happened. The job is not finished until the documentation is done. Documentation needs to be done in accordance with standard organisational guidelines.

Finding more information

Experience, a logical approach and reviewing previously documented problems and solutions, can form the backbone of being able to analyse and determine the cause of system faults. However, there is always something new and no single person or group can form the only valid source of good information. There will always be a need to perform some research as a result of some fault or problem caused by hardware or software. The Internet provides other sources of information that can be relied upon.

When you do research on the Internet, you should check the source of the information, and bookmark (add to favourites) those that you consider valid and useful.

In the **Research** section of this Learning Pack you'll find many websites to carry out further research of the topics discussed here, including hardware-related and software-related websites.

Summary

To be able to analyse and determine system faults you need to:

- ✓ have a general knowledge of how computers and individual components should work
- ✓ use your senses to take in all the factors involved, eg sights, smell and sounds
- ✓ take a logical approach using questioning, flow charts, checklists and general guidelines
- ✓ have a good toolkit of both hardware and software tools
- ✓ use documentation on previous problems or faults generated by help desk software.

You should also:

- ✓ know the factors that can adversely affect computers and components, in order to prevent further problems occurring
- ✓ know where to find troubleshooting information at short notice

- ✓ document the fault and the resolution before the job can be considered as finished
- ✓ keep calm while everything fails around you!

Ref.

http://www.micro2000.com/

http://www.protechdiagnostics.com

Self-Check 1	**Written Test**

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

Please ask your trainer the answer key for this Self-Check.

I. Choose the correct answer from the given alternatives

1. Reasons why a computer might hang each time a specific software application is run
   A. corrupted file C. hard disk failure
   B. an incorrect installation D. All
2. During Power supply checking which question is correct?:
   A. Is the plug inserted snugly into the computer?
   B. Is the power cord plugged into an appropriate wall power outlet?
   C. Is the wall power outlet working?
   D. All
3. Among the following which one is diagnostic tool?
   A. Scandisk for Microsoft
   B. fsck (file system check) for Unix clones like Linux
   C. Disk First Aid for Apple MacIntosh systems
   D. All
4. which one is not hard ware toolkit
   A. Screwdrivers C. Anti static strap
   B. Anti virus D. All
5. when a computer develops a fault observe
   A. What are the symptoms? C. What actions were in progress?

B. What conditions existed at the time of failure? D. All

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

You can ask you teacher for the answer key

2.1. Assessing Vendor documentation during maintaining equipment and soft wares Regarding to ISO Standards

Manufacturers should be able to demonstrate that they have a commitment to environmental good practice, and that their equipment has been designed with environmental impacts in mind. Most ICT equipment available in the world is manufactured overseas, so there is limited opportunity to influence the design of the equipment.

However, maintaining ICT equipment should require suppliers to provide information on the steps being taken by the manufacturer to reduce the environmental impact of their products. In some regions of the world, such as Europe and North America, governments are increasingly regulating the manufacturing process to reduce waste.

Manufacturers are also starting to adopt Corporate Social Responsibility (CSR), which recognizes an obligation to consider the interests of customers, employees, shareholders, communities, and ecological considerations in all aspects of their operations. This obligation is seen to extend beyond their statutory obligation to comply with legislation.

The Eco-Management and Audit Scheme (EMAS) is the EU voluntary instrument which acknowledges organizations that improve their environmental performance on a continuous basis. EMAS registered organizations are legally compliant, run an environment management system and report on their environmental performance through the publication of an independently verified environmental statement. They are recognized by the EMAS logo, which guarantees the reliability of the information provided.

Fewer toxic components In January 2003 the European Parliament and the Council of the European Union issued an RoHS (Restriction of Hazardous Substances) Directive

2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment, and Directive 2002/96/EC on waste electrical and electronic equipment.

The two directives were designed to tackle the fast-increasing waste stream of electrical and electronic equipment. Directive 2002/96/EC requires increased recycling of electrical and electronic equipment to limit the total quantity of waste going to final disposal.
It also requires producers to take responsibility for taking back and recycling electrical and electronic equipment. This is intended to provide incentives for manufacturers to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account. Consumers should be able to return their equipment free of charge.

In order to prevent the generation of hazardous waste, Directive 2002/95/EC requires the substitution of various heavy metals (lead, mercury, cadmium and hexavalent chromium) and brominated flame retardants (polybrominated biphenyls [PBB] or polybrominated diphenyl ethers [PBDE]) in new electrical and electronic equipment put on the market from 1 July 2006.

The directive does, however, provide for some exemptions, including lead in the glass of CRTs and mercury in lamps for flat-panel displays. Although RoHS compliance has not been legislated in New Zealand, many other countries are following the European Union's lead, some with their own variations (as in China), and it is widely expected that RoHS will become a world-wide standard. There is no recognised logo for RoHS but manufacturers have chosen their own way to display compliance with the EU RoHS Directive.

- **Using recycled content**

In 1999 a computer supplier announced the world's first desktop PC using 100 per cent recycled plastic in all the plastic parts. However, it appears this was not commercially sustainable, and the company's 2006 Corporate Responsibility Report states that 28 per cent (by weight) of all plastic resins contain recycled plastic content, with a net recycled plastic content weight representing 8.1 per cent of total purchases (against a corporate goal of 5 per

cent).10 The EU RoHS Directive precludes the use of some recycled materials because of the use of substances such as flame-retardant bromides.

- **Some Examples of hard wares include:**

✓ **LCD display screens**

Liquid crystal displays (LCDs) consume about half the power of an equivalent-sized cathode ray tube (CRT) screen. LCDs also have direct user benefits in terms of saving desk space, and they are better for your health.

CRT monitors radiate three electron beams that are continually refreshing the entire screen 60 to 85 times each second. Although your brain doesn't register the constant refreshing, your eyes do, and they have to work harder to absorb the information. LCD monitors don't refresh in this way: pixels are constantly on or off, which greatly reduces eye fatigue and strain. An LCD monitor also generates less heat than a CRT, lessening the air conditioning loads in an office.

✓ **Desktop printers**

Desktop printers, while convenient for users, can be costly to maintain and operate. On the other hand, when printers are networked and shared among groups of users (the most common scenario), no one is responsible for turning them off at night. Current good practice is to consolidate printing functions into networked MFDs that are deployed on the basis of one per floor.

As noted above, MFDs have good power management tools and duplex printing (both sides) can be set as a default. Desktop printers typically have less functionality than MFDs and only more recent models have started to provide duplex printing as a default option. The Ministry for the Environment provides sustainability guidelines for office consumables such as paper and ink cartridges.

2.2. Impact of ISO on ICT

In the 1980s ISO began the work of devising "process" standards, specifically the ISO 9000 Quality Management System standards. Firms in the ICT industry want to become ISO certified in order to

improve their business practices and retain business with certain customers. More than 90% of ICT companies worldwide work within the needs of standardization. The term standardization is used in ICT companies to measure the quality of their services.

Applying ISO in ICT companies is considered to be significant in that it allows these companies to implement the total quality management (TQM) strategy to improve their organizational performance (Magd, 2006).

ICT practices have used many ISO standards such as ISO 9001 QMS, ISO 20000 ITSM, ISO 27001 ISMS and other standards. For example, ISO 9001 QMS helps bring out the best in organizations by enabling people to understand the processes of delivering products/services to customers.

- **ISO's Quality Management System**

is a model for continual improvement and customer satisfaction, and any organization looking to improve how it functions or does business can use it, regardless of size or sector. ISO 20000 ITSM promotes the adoption of an integrated process approach for effectively delivered managed services to meet business and customer requirements. To take another example, ISO 27001 ISMS provides information to responsible parties for establishing, implementing, operating, monitoring, reviewing, maintaining and improving a documented Information Security Management Systems (ISMS). It also designed to ensure adequate security controls that protect information assets, document ISMS and give confidence to customers and interested parties.

Ref.

IBM Launches World's First Desktop PC with 100% Recycled Plastic Resin, 1 March 1999. http://www.ibm.com/ibm/environment/news/epro.shtml. 10 IBM Corporate Responsibility Report 2006. http://www.ibm.com/ibm/responsibility/pdfs/IBM_CorpResp_2006.pdf.

Self-Check 2	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

Please ask your trainer the answer key for this Self-Check.

I. Write True if the statement is Correct and False if the statement is Incorrect

1. The Eco-Management and Audit Scheme (EMAS) is the EU voluntary instrument which acknowledges organizations that improve their environmental performance on a continuous basis
2. Liquid crystal displays (LCDs) consume about half the power of an equivalent-sized cathode ray tube (CRT) screen.
3. CRT monitors radiate three electron beams that are continually refreshing the entire screen 60 to
   85 times each second.
4. CRT monitor generates less heat than a LCD, lessening the air conditioning loads in an office.

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

You can ask you teacher for the answer key

Information Sheet -3	Obtaining User Requirements

3.1 User Requirements

The User Requirement document is a specification of requirements from the user point of view, and its contents are thus essentially non-technical.

It is not mandatory for the specification to include any technical elements. However, the users often do have technical requirements, and when they do such requirements have to be included in the User Requirement document. But even then they must be presented so as to be capable of being understood by the non-technical reader. The users will usually rely upon the services of appropriate technical advisors to help in the specification of such requirements.

- ✓ **Hardware requirements**

If hardware is to be supplied, it warrants its own detailed requirements section. This should specify requirements in a little or as much detail as the users care about the matter. A minimal specification might be concerned just with the general nature, capacity and performance of the equipment to be provided. But the defined requirements might even, for reasons of compatibility or standardisation, go so far as to specify particular makes and models of equipment, if that is what the user community wants.

3.2.Business requirements

Business requirements, also known as stakeholder requirements specifications (StRS), describe the characteristics of a proposed system from the viewpoint of the system's end user. Products, systems, software, and processes are ways of *how* to deliver, satisfy, or meet business requirements

- **Confusion arises for three main reasons**.
- ✓ A common practice is to refer to objectives, or expected benefits, as 'business requirements.'
- ✓ People commonly use the term 'requirements' to describe the features of the product, system, software expected to be created.
- ✓ A widely held model claims that these two types of requirements differ only in their level of detail or abstraction — wherein 'business requirements' are high-level, frequently vague, and decompose into the detailed product, system, or software requirements.

Such confusion can be avoided by recognizing that business requirements are not objectives, but rather meet objectives (i.e., provide value) when satisfied. Business requirements *whats* do not decompose into product/system/software requirement *hows*. Rather, products and their requirements represent a response to business requirements — presumably, *how* to satisfy *what*. Business requirements exist within the business environment and must be discovered, whereas product requirements are human-defined (specified). Business requirements are not limited to high-level existence, but need to be driven down to detail. Regardless of their level of detail, however, business requirements are always business deliverable *whats* that provide value when satisfied; driving them down to detail never turns business requirements into product requirements.[2]

In system or software development projects, business requirements usually require authority from stakeholders. This typically leads to the creation or updating of a product, system, or software. The product/system/software requirements usually consist of both functional requirements and non-functional requirements. Although typically defined in conjunction with the product/system/software functionality (features and usage), non-functional requirements often actually reflect a form of business requirements which are sometimes considered constraints. These could include necessary performance, security, or safety aspects that apply at a business level.

Business requirements are often listed in a Business Requirements Document or BRD. The emphasis in a BRD is on process or activity of accurately accessing planning and development of the requirements, rather than on how to achieve it; this is usually delegated to a Systems Requirements Specification or Document (SRS or SRD), or other variation such as a Functional Specification Document. Confusion can arise between a BRD and a SRD when the distinction between business requirements and system requirements is disregarded. Consequently, many BRDs actually describe requirements of a product, system, or software.

- **Benefits of Business Requirements**

Description	
Reduce Project failure	Structured explanation of a business process or method defined early in the life cycle helps reduce project failures that occur due to misaligned or misrepresented requirements leading to failure of user expectations.
Connects to broader business goals	Well-defined business requirements help lay out a project charter, a critical step in executing business strategy or business goals, and to take it to the next logical step of developing it into an IT system. This helps monitoring overall project health and provides for positive traction with key project stakeholders including sponsors.
Consensus creation and collaboration	The benefit of a structured format typical of business requirements documentation helps create positive consensus and better collaboration where the business stakeholder group might be a large cross-functional team, distributed geographically.
Saves costs	Good quality of business requirements when captured early on not only improves success of a project but also save overall costs associated with change requests, and related investments in training, infrastructure, etc.

- **Difficulties of Business requirement**

Business requirements are often prematurely hardened due to the large stakeholder base involved in defining the requirements, where there is a potential for conflict in interests. The process of managing and building consensus can be delicate and even political by nature. A lesser challenge, though common, is that of distributed teams with stakeholders in multiple geographical locations. It is natural that sales staff is closer to their customers, while production staff is closer to manufacturing units; finance and HR, including senior management are closer to the registered headquarters. A system for example that involves sales and production users may see conflict of purpose – one side may be interested in offering maximum features, while the other may focus on lowest cost of production. These sorts of situations often end in a consensus with maximum features for a reasonable, profitable cost of production and distribution.

- **Identifying business needs**

Includes the following steps:

1. Business definition
2. Understand business domain(s)
3. Organization goals
4. Core competence

References

1. Beal, 2012.
2. Goldsmith, 2004.
3. https://it.toolbox.com/question/brd-template-to-document-functional-customer-requirements-040208
4. .http://www.techiesbyte.com/2013/04/how-to-write-good-business-requirement.html

Self-Check 3	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

Please ask your trainer the answer key for this Self-Check.

I. Write True if the statement is Correct and False if the statement is Incorrect

1. When we identify business needs we should consider
   A. Business definition
   B. Understand business domain(s)
   C. Organizational goals
   D. All
2. _____document is a specification of requirements from the user point of view, and its contents are thus essentially non-technical
   A. Business Requirement
   B. The User Requirement
   C. System Requirement
   D. All
3. In system or software development projects, business requirements usually require authority from
   A. Developer
   B. User
   C. Stakeholder
   D. All
4. ____ is also known as stakeholder requirements specifications
   A. Hard ware requirements
   B. Business Requirements
   C. User Requirements
   D. All

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

You can ask you teacher for the answer key

Information Sheet -4	Documenting Maintenance Procedures

4.1. Introduction to Documenting maintenance procedures

A maintenance procedure is only as good as its measurement data. Poor data may be worse than no data at all because poor data may lead to the wrong analysis, resulting in working on the wrong thing.

One of the best ways to help ensure good data collection is to have well-written procedures. Plants often fail to see the importance of having well-written procedures for most tasks and especially for tasks seemingly as simple as data collection.

- **Why are Standard Maintenance Procedures Necessary?**

✓ To protect the health and safety of employees.

✓ To help ensure that everyone performs a task to the same degree of precision.

✓ To save time when performing a task.

✓ To help ensure that standards and regulations are met.

✓ To minimize the effects of personnel turnover.

✓ To increase equipment reliability.

✓ To serve as a training document.

✓ To help document the equipment management procedure.

✓ To help protect the environment.

✓ To provide a basis for accident investigation

- **What Information Should be Contained in a Standard Maintenance Procedure?**

✓ Formal title and document number.

✓ A statement reading: "Read all of the steps in this standard maintenance procedure before beginning work."

✓ Personal protective equipment (PPE) required to do the job.

✓ All safety and environmental hazards to be aware of while doing the job.

- ✓ A detailed list of steps for performing the job or task.
- ✓ A complete list of tools and materials for doing the job.
- ✓ References to other documents needed to perform the job.
- ✓ Photos and diagrams where needed to explain job steps.
- ✓ Measurements, standards and tolerances in the standard maintenance procedure steps.
- ✓ Any other important information that may help the worker complete the task in a satisfactory manner.
- ✓ A definition of skills required for performing the job.
- ✓ Hours required to perform the job.
- ✓ Number of people required to perform the job.
- ✓ Required frequency of performing the job.
- ✓ Preparation and revision dates.
- ✓ Approval and review signatures.
- ✓ Space to provide feedback as to the accuracy and effectiveness of the standard maintenance procedure.

Feedback is critical to the success of SMPs. In order for SMPs to be effective and accurate, a formal feedback mechanism should be supplied to the job performer. The SMP should be updated when feedback reveals mistakes or more effective ways to perform the job. Poorly written SMPs are unsafe and largely ineffective.

- **Who should write standard maintenance procedures?**

- ✓ A person who has some training in writing SMPs and who knows his or her company's SMP writing procedure. (Yes, there should be a procedure for writing procedures.)
- ✓ A person knowledgeable about the safety and environmental hazards involved.
- ✓ The writer should seek input from the trained job performer or subject matter experts who will be using the SMPs. It is a good idea to get the job performer to write the rough draft because you will get buy-in from the SMP users. A person is much more

likely to use something that they helped to develop as opposed to something that was developed without his or her input.

- **What are the rules for writing standard maintenance procedures?**

✓ The burden of written communication is on the writer, not the reader. The goal is to serve the user.

✓ The first writing is a rough draft and will need to be reviewed and tried before being published.

✓ Use numbered line items and avoid paragraphs (one item per step).

✓ Keep wording short and precise.

✓ List steps in proper sequence. The job should flow in natural order.

✓ Use step check-offs where useful.

✓ Have the job performer enter quantitative values; it is even better than check-offs.

✓ Target elementary-grade reading level (fourth or fifth grade) if possible, given the nature of the procedure being written. A reading skill commensurate to the minimum qualifications for performing the job itself is assumed.

✓ Use graphics where needed to clarify meanings. A picture really is worth a thousand words.

✓ Keep verbiage consistent. Don't change equipment names from step to step.

✓ Begin each step with a verb if possible. For example: Step 13 - Remove coupling guard.

✓ If jobs involve too many steps, break the job into sections such as Motor Removal Section and Gear Unit Removal Section

Ref.

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Self-Check 4	**Written Test**

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

Please ask your trainer the answer key for this Self-Check.

I. Write True if the statement is Correct and False if the statement is Incorrect

1. Standard Maintenance Procedures Necessary because of
   A. protect the health and safety of employees.
   B. help ensure that everyone performs a task to the same degree of precision.
   C. save time when performing a task.
   D. All
2. Which rules is used for writing standard maintenance procedures?
   A. Keep wording short and precise.
   B. List steps in proper sequence. The job should flow in natural order.
   C. Use step check-offs where useful.
   D. All
3. One of the best ways to help ensure good data collection is to have poor-written procedures.
   A. True B. False
4. Who should write standard maintenance procedures?
   A. A person who has some training in writing SMPsA
   B. Person who is not knowledgeable about the safety and environmental hazards involved.
   C. A person who is not skill full on the area

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

You can ask you teacher for the answer key