Solar PV System Installation and Maintenance

Level-IV

Learning Guide -39

Unit of Competence	**Migrate to New Technology**
Module Title	**Migrating to New Technology**
LG Code	**EIS PIM4 M10 LO1 LG-39**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO1:- Apply existing knowledge and techniques to technology and transfer

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Instruction Sheet	Learning Guide:-39

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

- Identifying situations for existing knowledge
- Reacquiring and using new or upgraded technology skills
- Identifying, classifying and using new or upgraded equipment

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 situations for existing knowledge
- Reacquire and use new or upgraded technology skills
- Identify, classify and use new or upgraded equipment

Learning Instructions:

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

Information Sheet-1	Identifying situations for existing knowledge

1.1 The need to identify new technology:-

When a new technology emerges, IT professionals wait anxiously to see how thetechnology could be used to enhance the current business functions. There should be a good business case supporting any decision to integrate new technology into a business. When a technology is used to support a task that is not well suited for the functions and skill levels of the employees, it is likely to be a waste of time and fail. In the majority of cases, the lack of skills related to using and supporting new technology hinders the migration into the new technology, causing missed opportunities. Therefore, it is important for you as an IT professional to upgrade your skills in response to any new technologies that are emerging in the industry.

1.2 Sources for identifying new technology

As an IT professional, you need be aware of the trends of new technology emerging in the industry. The following are some sources amongst many others that will keep you up-to-date with these changes.

- **Trade magazines**

  Trade and business magazines such as Technology and Business constantly introduce IT professionals to new technologies.

- **The Internet**

  The Internet, giving access to World Wide Web, forums, newsgroups and mailing lists, is also a valuable source of information about new technologies.

- **Networking**

  Socializing with other IT professionals and joining professional associations is also a good source of identifying new technologies available.

- **Formal training**

  Attending formal training courses will certainly expose you to new technologies available by giving you an opportunity to identify new technologies

1.3 Identifying the impact of new technology

New technologies are emerging in the market every day. It is important that IT professionals are aware of how to identify new technologies that are appropriate for their organization. IT professionals need to follow a systematic procedure to identify the implications of the new technology for all the stakeholders. Implementing new technology means change. It is expected that the new technology will make life much easier for users by providing better mechanisms for performing and managing regular organizational tasks. However, if we are to be successful in migrating to new technology then we must anticipate how the new technology will impact all stakeholders. You should also be mindful of the magnitude of the impact the technology will have on the enterprise. Finally you must bear in mind that user (stakeholder) acceptance is the key to successful implementation

- **Assessing the impact of new technology on the business Gather information about the technology:**
  - ✓ Talk to vendors and other IT professionals to learn as much as possible about the new technology and other related technologies.
  - ✓ Use IT magazines and otherjournalsto learn about the technology including legal and political impacts.
  - ✓ How this technology compares with the existing technology to get an idea of the magnitude of the impact on the organizational functions.

- **Assess (review) the impact on stakeholders**

Assess not only the financial, educational and economic impact of new technology but also the social, legal and political impact that new technology will have on the stakeholders.

1.4 Skills for acquiring and implementing new technology

IT professionals must refresh their skills and use their existing knowledge when acquiring and implementing new technologies.

The following are the types of skills essential in acquiring and implementing new technologies.

- Technical skills
- Interpersonal and psychological skills
- Managerial skills

- **Technical skill**

Once a new technology is identified, it is fundamental that you gain the technical skills necessary before migrating to it. These technical skills may relate to:-

- ✓ Hardware,
- ✓ Software,
- ✓ Network,
- ✓ PC support or programming knowledge.

  Building technical skills is an ongoing and never-ending process for an IT professional

- **Interpersonal and psychological skills**
  - ✓ An IT professional must further develop interpersonal and psychological skills, so they can deliver the new technology in a user-friendly manner.
  - ✓ Psychological skills will give you the ability to create harmony in difficult situations and promote better acceptance of new technology.

- **Managerial skills**
  - ✓ It is important that the IT professional be conversant in managerial and design skills so that new technology is chosen and implemented in line with business objectives.

Self-Check -1	Written Test

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

I. Say true or false for the following questions stated below

1. Psychological skills will give you the ability to create harmony in difficult situations and promote better acceptance of new technology.
2. technical skills may relate only to Hardware & Software.
3. Attending formal training courses will certainly expose you to new technologies available.
4. New technology solutions should match the organization"s strategic direction.
5. Selection of new technology should be driven by a solution not a need.

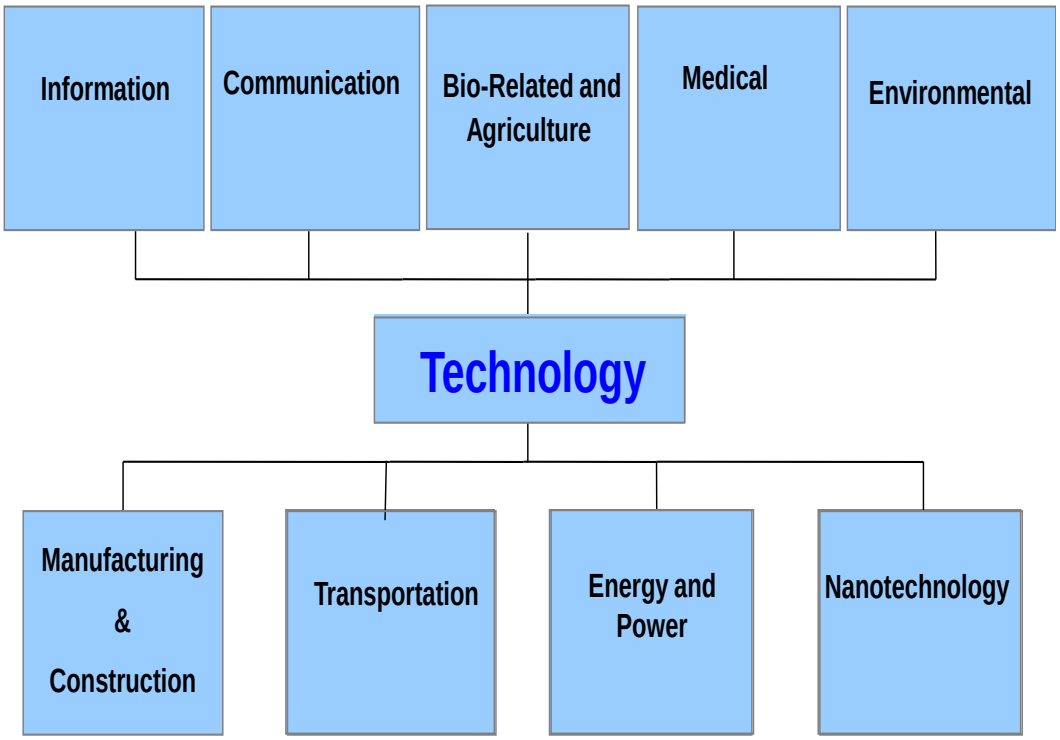
Note: Satisfactory rating - 4 points **Unsatisfactory - below 4 points**

Information Sheet-2	Reacquiring and using new or upgraded technology skills

2.1 Technology Transfer ;

- The technology transfer process helps a manufacturing company more effectively use its human, physical, and capital resources by providing knowledge, information, or assistance, which leads to improvements in its facility, equipment, manufacturing methods, management methods, or marketing methods.

- Technology Transfer is the transactions between changing technology and invention.
- Sectors of Technology that address Human Needs and Wants



- **Information Technology** allows us to send signals around the world**.**
  Examples: Television, Internet, satellite, GPS, cell phones
- **Communication Technology** is giving or exchanging information.
  Examples: Magazines, DVDs, photography, video games
- **Bio-related and Agricultural Technology**
  - ✓ **Biotechnology** transforms living things into products or new forms of life
    Examples: Genetic engineering, bionics

- ✓ **Agricultural Technology** produces plants and animals for food, fibre, and fuel.

  Examples: Irrigation, food preservation, weed and insect control

  Both deal with living things: Plants, animals, and people

- **Medical Technology** creates tools to treat disease and injury.

  Examples: Lasers, prostheses, ultrasound, medications

- **Environmental Technology** creates tools to minimize the effect of technology on the development of living things.

  Examples: Hybrid vehicles, conservation, waste management (recycling)

- **Production Technology** is the **manufacturing** of physical goods on an assembly line and the construction of structures on a job site.

  a) **Manufacturing** changes natural or synthetic materials into usable products. Examples: Clothing, vehicles, food

  b) **Construction Technology** builds structures that support loads and protect us from the environment. Examples: House, bridge, roads

- **Materials Technology:-**The development of materials with outstanding combinations of mechanical, chemical, and electrical properties that make other advances possible. Examples: Mosquito repellent clothing, artificial skin grafts for burn victims, advanced building materials.

- **Transportation Technology** provides a way for people, animals, products, and materials to be moved from one place to the next.

  Examples:

  - ✓ Flight – Airplane, rocket, space shuttle
  - ✓ Land – Train, subway, automobile, bicycle
  - ✓ Water – Commercial, cruise ships
  - ✓ Non-vehicle – Conveyor belts, pipelines

- **Energy and Power Technology**

  a) Energy is the ability or capacity to do work.

  Examples:

  - ✓ Chemical Energy → Gasoline
  - ✓ Mechanical Energy → Motion

- ✓ Thermal Energy → Steam
- ✓ Electrical Energy → Electricity
- ✓ Radiant Energy → Light
- ✓ **b) Power** is the rate at which energy is transformed from one form to another.

Examples:

- ✓ Electrical power – provides light and operates motors
- ✓ Mechanical power – moves automobiles, trains, and airplanes
- ✓ Fluid power – uses fluids to produce motion
- ✓ Hydraulic – uses a liquid
- ✓ Pneumatic – uses a gas

- .**Nanotechnology** is manipulating materials on an atomic or molecular level.
  Examples: Sensors, molecular manufacturing

- **Technology transfer Forms**

Technology transfer is one of the core issues of industry extension service where technology can be identified in the following terms:-

- ✓ **Techno ware**: includes materials, tools, etc.
- ✓ **Human ware**: includes the human knowledge, ability, experience, etc.
- ✓ **Info ware**: includes organized information, work processes, design and blueprints, etc.
- ✓ **Orga ware**: includes the organizational structures, setups, methods of doing things, etc. The term is now introduced to the different governmentally owned TVET institutions so that the different technologies copied by them could be further transferred to the nearby micro and small enterprises.

- **The process of Technology Transfer**

By the ministry of education, and further agreed by the regional TVET agencies and approved by TVET institutions, involves the following processes.

- ✓ selection of the priority sector (e.g. Agriculture or others)
- ✓ value chain mapping
- ✓ Identification of constraints in the value chain
- ✓ acquiring possible technological solution (can be free patented)
- ✓ Selecting the best technology

- ✓ Blueprinting the selected technology
- ✓ Prototyping, according to the blue print
- ✓ Testing the prototype in the actual condition
- ✓ Selection of appropriate MSEs
- ✓ Training the MSEs on the technology, and how to produce it.
- ✓ Transferring the technology through the MSEs, by making exact copy.

- **The Actors**

The above mentioned processes can be from

- ✓ TVET sectors
- ✓ Universities
- ✓ Research Sectors
- ✓ Companies and etc.

- **The priority sectors**

Are usually those earmarked by the government in the five year growth and transformation plan. This includes small scale industries:-

- ✓ Textile
- ✓ Agriculture
- ✓ Agro processing
- ✓ Leather
- ✓ Metal
- ✓ Construction
- ✓ Hotel and tourism, industries based on the realities of the region.

- **Value chain mapping and analysis :**

Helps identify the different chain of actions done on the product from the very first step to the last one, where the product is ready for marketing. By identifying where value is added, one can de-cide on the interference point.

- **The constraint to be identified** :

Can be in terms of technology, man power capacity, information, organizational structure, etc. so that if properly mitigated, it can solve the problem by increasing productivity. Once the problem/ constraint in the value chain is identified, the next step would be listing a possible solution (a technology) that can either minimize the problem or eradicate it, thus giving solution to the age old problem in the production process. But from where can one get the technology? Ideal would be from the internet where someone somewhere may have designed it, patented it and now it is a free patent to be used by anyone interested. Ideal would be listing at least six possible solutions, and then making a thorough investigation of one very important solution to the problem, a viable technology.

Viability of the technology, as agreed in Ethiopia, has the following characters:

- ✓ Does the selected technology increase productivity?
- ✓ Does it contribute to quality product, according to a specified standard?
- ✓ Does it promote labor intensive approach (thus raising employability)?
- ✓ Does it bring about change in price by lowering the production cost?

- **stages of technology Transfer involves**
  - ✓ Identification of multipliers, usually MSEs, where they can be identified based on their capacity like their man power, production capacity, and their financial status.
  - ✓ Capacitating the identified multipliers by the necessary skill and knowledge
  - ✓ Giving technical support while copying the prototype
  - ✓ Giving support on creating market linkage
  - ✓ Giving support by through training on entrepreneurship, productivity, and skill.

- **Barriers to Technology Transfer**
  - ✓ **Lack of awareness** – what technologies are available to them
  - ✓ **Lack of knowledge** – If staff of company is lacking technical knowledge, it may not be able to capitalize on the technology being offered in the transfer
  - ✓ **Lack of funds** – company may not be able to afford the development costs of the technology being transferred

- ✓ **Lack of common interests** – Individuals putting the interests of their own company ahead of the alliance
- ✓ **Conflict of interest** – Even in collaborations on the technical level or strong, it has been found that collaborations between competing companies don't work.
- ✓ **Poor communications** – Fail to keep each abreast on everything relevant to the collaboration, activities, thoughts, processes, goals, direction of venture
- ✓ **Lack of infrastructure** – company may lack equipment and facility in infrastructure to take on the transfer
- ✓ **Over-committed** – The Company may be over-committed on current projects and simply lacks the time needed for success.

2.2 Identifying appropriate new technologies

Suppose you came across a new technology that most IT managers are excited about. How would you evaluate whether you need to implement this technology in your organization? Remember that technology should be identified based on an organizational need and comply with the technical, commercial and economic criteria of the organization. Here are some approaches you can use when selecting a new technology for the benefit of the organization

Get together with a team of IT professionals in your organization and put your heads together to identify a suitable new technology that will help achieve your business goals.

- **Horizon scanning**

  talk to your circle of friends or other IT professionals. Browse through published reports. Read IT magazines and the World Wide Web to identify new technologies that are proven to be a success.
- **Collective scanning** — attends meetings of IT professionals such as the Systems Administrator"s Guild to discuss their findings.
- **Evaluating and selecting new technology**

  How do you evaluate whether the new technology is successfully aligned with the business requirements?

There are several tangible (e.g. cost savings) and intangible (e.g. user satisfaction) benefits of implementing new technologies. These benefits will give you an indication of how well the new technology is aligned with the business objectives. Therefore, before new technologies are introduced, an organization"s management must agree on the performance indicators that will help them calculate and measure benefits after implementation.

2.3 Assessing the appropriateness of a technology

This involves assessing the technical as well as economic features of the new technology in the organizational context. It is important to obtain reliable information about the new technology from various sources, such as the Internet,

a) consultants
b) colleagues and other IT professionals
c) IT supplements of newspapers
d) magazines and trade papers
e) demonstration versions of software
f) and vendor catalogues containing drawings, designs and
g) product specifications

- **Environmental impacts of New Technology**

Environmentally sound technologies protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes. Every energy generation and transmission method affects the environment. As it is obvious conventional generating options can damage air, climate, water, land and wildlife, landscape, as well as raise the levels of harmful radiation. Renewable technologies are substantially safer offering a solution to many environmental and social problems associated with fossil and nuclear fuels.

Therefore the new technology should positive implications such as;

a) Reduction of the emissions of the greenhouse gases (mainly CO2, NO x) and prevention of toxic gas emissions (SO2, particulates)
b) Does not affect the land;
c) Reduction in consumption of electricity

Self-Check -2	Written Test

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

II. Choose the best answer for the following questions below

1. Which of the following is not Benefits of new technology?

   A. increase profits B. Increase market share C. increase costs D. all

2. Allows us to send signal around the world is called_____

   A. Communication technology B. bio technology C. medical technology D. none

3. Which one of the following is miss-matched?

   A. Flight-rocket B. Land-train C. non-convey-vehicle D. Water-ships

4. The rate of energy transfer from one form to another form is called_____

   A. Energy B. work C. Force D. power

5. All except one is technology transfer Forms

   A. Techno ware B. Info ware C. Force ware D Human ware

6. Which one of the following are the actors of technology transfer

   A. TVET sectors B. Universities C. Research Sectors D. all

   B.

7. Which one of the following is the Barriers to Technology Transfer

   A. Lack of awareness B. Lack of knowledge C. Lack of funds D. Conflict of interest E. all

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

Information Sheet-3	Identifying, classifying and using new or upgraded equipment

3.1 Identifying, classifying and using new or upgraded equipment

We have grown to accept technological change. Unless businesses exploit the advantages of the new technology, they will find that they can"t compete with businesses that do. Consider the changes to our lives that have been brought about by such things as telephone banking, the Internet, e-business, email and so on, and the competitive advantages such changes have given the organizations that implement them.

Organizations need to be constantly aware of current or emerging technology trends and directions in information technology (IT). IT will continue to evolve and produce more and more new technology. Many IT managers are very keen to embrace new technology, anticipating better IT services for the organization. However, unless new technology is used appropriately, it may not bring the desired outcome for the organization.

- **Align (support) business and IT strategies**

In today"s competitive business environment, and IT manager should understand the link between business objective, business strategy andIT strategy. All IT managers should understand that IT exists to support the business objectives of the organization and not the other way around. IT must support the business goals in every service it provides. The IT department must develop a vision and strategyto ensure that this is the prime focus of its existence.

To ensure that IT is totally aligned with business objectives, IT managers need to:-

a) The IT leadership must be connected to business management
b) Think about the impact of tasks on business as a whole rather than provide solutions for
c) individual tasks
d) Concentrate more on end-user experience with new technologies rather than the technology
e) itself.
f) Focus on the business goals and let the technology follow.
g) Play a strategic role in the future of the organization.

3.2 The relationship between business objective, business strategy and IT strategy

- **Business objective**

A business objective is what the business wants to happen in broad terms. It is best if there is some way of measuring it. Some examples are:

- ✓ Reduce operating costs by 2.5% per year.
- ✓ Get BAS ready on time every 3 months.
- ✓ Improve customer satisfaction levels by 10%.
- ✓ Process orders within 3 working days

- **Business strategy**

A business strategy is how the business objective will be met. Some **examples are:**

- ✓ Automate a labor-intensive function.
- ✓ Implement an accounting package with BAS capabilities.
- ✓ Provide printed quotes over the counter.
- ✓ Implement an order tracking system

- **Information technology strategy**

IT strategy is about how IT will be used to support the business strategy. More than one strategy may be identified. Some examples are:

- ✓ Switch to barcode-scanner checkouts.
- ✓ Modify existing accounting package and retrain users
- ✓ Build extract report software. Provide networked PCs and printers to front counter staff and train them
- ✓ Purchase an order tracking module of the existing inventory software and train staff.

3.3 Types of business technologies

- **Production technologies include:**
  - ✓ Technologies that boost (improve) aid or enhance production/manufacture of goods
  - ✓ Technologies for the „production" of technical services such as a wide area network (WAN) and computer software development

- **Automation (computerization) technology** include:
  - ✓ technologies that automate services such as payroll
  - ✓ technologies that automate the tasks that are labor intensive or dangerous

- **Technologies that improve services**

Technologies that improve the quality of services will lead to increased profit by drawing clients back for more service, E.g. more accurate diagnostics in the medical field made possible by new technologies and automated patient monitoring in hospitals.

- **Technologies in design include:-**
  - ✓ technologies that are used to design or develop a newproduct or service such as :- Computer Aided Drafting (CAD) and Computer Aided Systems Design (CASD)
  - ✓ technologies that promote modernizationby introducing new, more efficient, cost effective and improved quality services or products to the consumer.

3.4 New technology and your business

New technology is used to enhance service, promote innovation, and improve communication and quality while reducing the costs, and increase productivity and profits. The appropriate business use of new technology should result in benefits such as:

- ✓ reduced costs
- ✓ improved quality of existing services
- ✓ existing resources being utilized to optimum capacity resulting in better products and better ways of conducting business
- ✓ Increased flexibility

- **Understanding your business**

To be utilized effectively, technology must fit with the users" goals. It is no good developing a database that manages stock when the requirement is for a system that manages contacts of potential customers. Documents produced by the organization such as mission statements, strategic plans and organizational charts are usually a good source of information for determiningthe organization"s core business.

Organization charts:-

can provide a graphical representation of the business in terms of how it is organized to fulfill its core business

- **Locating information**

Where can you find information such as mission statements and organization charts? Many organizations publish these documents and can provide them when requested to do so. A source is the company"s annual report which may be available on the company"s website. You can see examples of these documents on Global Platform website

- **Business planning and IT solutions**

To understand how the business planning process relates to the development of IT business solutions, we must first define the organizational needs and establish the business requirements

- **Defining organizational needs**

One definition of organizational need is a lack or problem that requires actions so that organizational goals or objectives can be achieved. Organizational needs are usually identified by the staff and/or the managers directly affected by them.

- **The product selection process**

The product selection process establishes a set of criteria that must be matched by new achievement. The product selection criteria are drawn from business requirements of an organization. Organization"s business requirements will state high-level outcomes of any new technology. Often, new business requirements arise when organizations experience problems. Problems are expressed in different ways by organizations, and, as we mentioned previously, they can be found in documents such as:

- ✓ Corporate mission or vision statements
- ✓ long-term goals stated in strategic plans
- ✓ Product specifications from project plans and designs.

From these high level outcomes stated in the business requirements, a set of criteria can be established for selecting any new technology that the organization will acquire.

For example, the high level outcomes of the business requirements could implicate all or any of the following criteria for selecting the new technology.

- ✓ **Compatibility** New technology will need to work with existing hardware, system and application software with minimum changes to both.
- ✓ **Interoperability** The new technology must be able to interoperate with the existing network.
- ✓ **Maintainability** The current IT staff should be able to maintain the system even after the introduction of the new technology.
- ✓ **Centralizations/accessibility** The new technology must be accessible by multiple users at various sites.
- ✓ **Security** The new technology must be accessed by authorized users only.
- ✓ **Ease of use**Existing users must be able to operate new technology with minimum re-training.
- ✓ **Scalability** The system introduced using the new technology should be able to cope with growth of the business, expansion of networks, and a growing number of employees, etc.

- **Matching solutions with strategic directions**

IT staff are expected to have expertise in a range of IT products. Each support section has standard products that it supports, but because of the diverse range of offerings from vendors, there are usually more products than is possible to fully understand and support.IT staff usually have the skills to locate and interpret information about new technologies. However, standard products cover most expected needs. This means that it should be relatively easy to match existing technology to organizational needs.

Self-Check -3	Written Test

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

I. Say true or false for the following questions which stated below

1. A business strategy is how the business objective will be met.
2. Bad technology is used to enhance service, promote innovation, and improve communication skills.
3. The product selection process establishes a set of criteria that must be matched by new achievement.
4. Compatibility is the new technology must be able to interoperate with the existing network.

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

Solar PV System Installation and Maintenance

Level-IV

Learning Guide -40

Unit of Competence	**Migrate to New Technology**
Module Title	**Migrating to New Technology**
LG Code	**EIS PIM4 M10 LO2 LG-40**
TTLM Code	**EIS PIM4TTLM 0920v1**

LO2:- Apply functions of technology to assist in solving organizational problems

Instruction Sheet	Learning Guide:-40

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

- Testing of new or upgraded equipment
- Applying features of new or upgraded equipment
- Using Features and functions of new or upgraded equipment
- Accessing and using Sources of information for new or upgraded equipment.

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:-**

- Test of new or upgraded equipment
- Apply features of new or upgraded equipment
- Use Features and functions of new or upgraded equipment
- Access and use Sources of information for new or upgraded equipment.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
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Information Sheet-1	Testing of new or upgraded equipment

1.1 Introduction

Once the new features of the technology are identified, you must build a variety of tests to ensure that these features continue to meet the business goals even after implementation. In order to test the effectiveness of the new technology you can use the following process:

- **Test case**— states clearly the features you are testing.
- **Test procedure**— identify the specific tasks that are involved in using each feature.

1.2 A test case

It is a document, which has a set of test data, preconditions, expected results and post conditions, developed for a particular test scenario in order to verify compliance against a specific requirement. Describes a specific idea that is to be tested, without detailing the exact steps to be taken or data to be used.

- **Why test cases are important**

Test cases define what must be done to test a system, including the steps executed in the system, the input data values that are entered into the system and the results that are expected throughout test case execution. Using test cases allows developers and testers to discover errors that may have occurred during development or defects that were missed during ad hoc tests.

- **The benefits of an effective test case include:**
  - ✓ Guaranteed good test coverage.
  - ✓ Reduced maintenance and software support costs.
  - ✓ Reusable test cases.
  - ✓ Confirmation that the software satisfies end-user requirements.
  - ✓ Improved quality of software and user experience.
  - ✓ Higher quality products lead to more satisfied customers.
  - ✓ More satisfied customers will increase company profits.

Overall, writing and using test cases will lead to business optimization. Clients are more satisfied, customer retention increases, the costs of customer service and fixing products decreases, and more reliable products are produced, which improves the company's reputation and brand image.

- **Example of test case format**

Test cases must be designed to fully reflect the software application features and functionality under evaluation. QA engineers should write test cases so only one thing is tested at a time. The language used to write a test case should be simple and easy to understand, active instead of passive, and exact and consistent when naming elements.

- **The components of a test case include:**
  - ✓ **Test name.** A title that describes the functionality or features that the test is verifying.
  - ✓ **Test ID.** Typically a numeric or alphanumeric identifier that QA engineers and testers use to group test cases into test suites.
  - ✓ **Objective.** Also called the description, this important component describes what the test intends to verify in one to two sentences.
  - ✓ **References.** Links to user stories, design specifications or requirements that the test is expected to verify.
  - ✓ **Prerequisites.** Any conditions that are necessary for the tester or QA engineer to perform the test.
  - ✓ **Test setup.** This component identifies what the test case needs to run correctly, such as app version, operation system, date and time requirements and security specifications.
  - ✓ **Test steps.** Detailed descriptions of the sequential actions that must be taken to complete the test.
  - ✓ **Expected results.** An outline of how the system should respond to each test step.

1.3 Test plan.

A Test Plan is a detailed document that describes the test strategy, objectives, schedule, estimation, deliverables and resources required to perform testing for a software product. Test Plan helps us determine the effort needed to validate the quality of the application under test.

The Test Plan is a document that lists all the activities in a QA project, schedules them, defines the scope of the project, roles & responsibilities, risks, entry & exit criteria, test objective, and anything else that you can think of. The Test Plan is as I like to call a 'super document' that lists everything there is to know and need. The Test Plan will be designed based on the requirements. While assigning work to the test engineers, due to some reasons one of the testers gets replaced by another one. Here, the Test Plan gets updated.

- **Test Plan Document**

Test Plan is a document that provides complete information about testing tasks related to a Software Project. It provides details like Scope of the testing, Types of testing, Objectives, Test Methodology, Testing Effort, Risks & Contingencies, Release Criteria, Test Deliverables, etc. It keeps track of possible tests that will be run on the system after coding. The test plan is obviously set to change. Initially, a draft test plan will be developed based on project clarity at that time. This initial plan will get modified as the project progresses. Test team Manager or Test Lead can prepare the test plan document. It describes the Specifications and is subject to change based on the same. What to test, when to test, who will test, and how to test will be defined in the test plan. Test Plan will sort out a list of issues, dependencies, and the underlying risks.

- **Types Of Test Plan**

Test Plans can be of different types based on the stage of testing. Initially, there will be a master test plan for the entire project execution. Separate test plans can be created for specific testing types like system testing, system integration testing, user acceptance testing, etc. Another approach is to have separate test plans for functional and non-functional testing. In this approach performance, testing will have a separate test plan.

1.4 Test equipment is a general term describing equipment used in many fields. Types of test equipment include:

- Electrical and electronic test equipment
  - ✓ Electrical test equipment
  - ✓ Electronic test equipment
- Mechanical test equipment

1.5 Electrical test equipment

- **Battery tester**, used to test the state of an electric battery
- **Continuity tester**, used to determine if an electrical path can be established between two points
  - ✓ **Cable tester,** used to verify the electrical connections in a signal cable or other wired assembly
  - ✓ **Receptacle tester,** used to verify that an AC wall outlet is wired properly
  - ✓ **Test ligh**t, used to determine the presence or absence of an electric voltage
- **Hipot tester,** used to verify electrical insulation in finished products carrying high electrical potential
- **Electronic test equipment**

Electronic test equipment is used to create signals and capture responses from electronic devices, to prove proper operation or trace faults. Types of electronic test equipment include:

- ✓ Automatic test equipment, any apparatus that performs tests using automation
- ✓ Built-in test equipment, passive fault management and diagnosis equipment built into airborne systems to support maintenance
- ✓ On-board diagnostics, test equipment for automobiles
- ✓ Transistor tester, used to test the electrical behavior of transistors and solid-state diodes

- **Mechanical test equipment**
  - ✓ Adhesion tester, used to determine if a paint or coating will adhere properly to a substrate
  - ✓ Brake tester, used to calculate the braking efforts and efficiencies of a motor vehicle
  - ✓ Deadweight tester, a calibration tool for pressure gauges.

1.6 Classifications of testing

Level 1 These tests are used to test the major functions of the equipment and usually this is done during the equipment selection process.

Level 2 These test the major as well as minor functions of the equipment and ensure that they can work together in a variety of situations. This type of testing is usually conducted in the **prototype**phase.

Level 3 These tests target the performance, stability and reliability under heavy loads, usability, error handling, recovery and compatibility. Level 3 tests could start very close to the implementation phase and a substantial period after the introduction of the new technology.

1.7 Strategies for testing

It is good practice to use two different groups of users and test various methods of doing the same task using the technology. This will enable you to identify the most productive method of performing a task and confirm the operation of advanced features and functions.

In most cases, as the technology is new to the organization, testing must be conducted with a few competent people, unless the purpose of the test is to identify problems for all users. Therefore, it would be a great help to identify one or two „power users" from each area being tested to eliminate incorrect use of software due to poor training.

When selecting participant for testing you must include:-

a) Users for whom the new technology is an integral part of their work
b) Representatives from IT personnel supporting the new/upgraded equipment
c) Individuals who understand the business objectives and the rationale behind the implementation of the new equipment.

- **Conclusion (ending) of tests**

Conclusions of tests should be able to indicate whether the organization"s business performance expectations are met with the measured performance of the new/upgraded equipment. Test results must be documented as part of the ongoing process of monitoring, implementing and aligning new technologies with business requirements.

Self-Check -1	Written Test

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

II. Say true or false for the following questions below

1. Test case is identify the specific tasks that are involved in using each feature.
2. Strategies for testing are good practice to use two different groups of users and test various methods of doing the same task using the technology.
3. Conclusions of tests are used to indicate the organization"s business performance expectations with the measured performance of the upgraded equipment.
4. A test case is a detailed document that describes the test strategy, objectives, schedule, estimation, deliverables and resources required to perform a task.
5. A Test Plan describes a specific idea that is to be tested, without detailing the exact steps to be taken or data to be used.

Note: Satisfactory rating - 4 points Unsatisfactory - below 4 points

Information Sheet-2	Applying features of new or upgraded equipment

2.1 Applying features of new or upgraded equipment

New technologies are expected to have a positive influence on the business performance. In is not realistic to have this expectation unless users are willing to use the features of new technology to improve the business performance. For new or upgraded equipment to be used to its optimum capacity to meet business objectives, we must continuously verify that advanced features and functions are used and that they are providing the promised performance. Some users might find the new technology overwhelming, and therefore only use the features of the new technology that they are comfortable with. Consider the following situation:

2.2 Integrating new equipment into the existing workflow

The existing infrastructure must be taken into consideration when implementing new technology. Measures must be adopted to ensure that the new equipment will integrate well with the current workflow.

Consider the following situation:

A local supermarket introduced a new computerized „Shift Management System" to keep track of the weekly hours of the full-time and casual shift workers in each department. Many department managers are very comfortable with the manual paper-based system and are not very keen to change their well-established system.

- **Phasing out old technologies**

Ensure that old processes and technology will lapse by a certain date so users will be more eager to learn and use the features of the new technology. If you continue to use the old systems, some users will feel very comfortable using these and IT professionals will end up dealing with platform and file compatibility problems. In the case of the supermarket example, unless the old manual system is phased out by stopping the acceptance of manual time sheets and departmental reports, the users will not have incentive to learn about the new system nor use it to improve the business processes.

- **Selling new features to users**

You must sell the new features to the existing users so that they will actively adopt these potentially profitable features to improve the business performance. It is worthwhile spending time „hyping up" users to use the new features of new technology.

- **Giving full conceptual perspective to users**

Make the business and IT strategies accessible to all users. This will enable them to understand the full picture of the new technology and how it improves the business processes to achieve the business objectives. In the example above, the supermarket department managers must be given the full picture of how the new system will improve the performance of the organization. The supermarket managers will filter this information to the workers in their departments.

- **Developing an organization-wide support strategy**

Introducing support strategies could substantially lower the barriers that users face when using new technology. The organization-wide support strategy should be flexible enough to adapt to varying needs of the different user groups. In the supermarket example, a support strategy to help with the department managers to migrate from the old technology to the new technology will ensure that you win them over.

- **Focusing on user-specific features**

Bring the users" attention to the essential and most common tasks that they"ll need in their everyday work life. To focus on specific features:-

- ✓ Create job specific cheat sheets and how-to guides.
- ✓ Provide help desk and other mechanisms for resolving problems and offering guidance,

  E.g. automated information systems and searchable **frequently-asked-questions** (FAQ) databases.
- ✓ Offer initial and ongoing training on upgraded/new equipment and software.
- ✓ Identify external resources, including websites, consultants, and volunteers as appropriate.

- **Establishing a use policy**

It is important to establish an acceptable use policy for all new and upgraded equipment. This policy should clearly state:

- ✓ User‟s rights and responsibilities
- ✓ Rights of the organization to monitor and control the use of equipment or software.

Self-Check -2	Written Test

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

I. Say true or false for the following questions below

1. New technologies are expected to have a negative influence on the business performance.
2. The existing infrastructure must be taken into consideration when implementing new technology.
3. Establishing a use policy is important to establish an acceptable use policy for all new and upgraded equipment.

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

Information Sheet-3	Using Features and functions of new or upgraded equipment

3.1 Using Features and functions of new or upgraded equipment

- **Organizational requirements**

You must carefully analyze and diagnose organizational requirements before introducing new equipment. With the integration of new equipment into any existing system, change is unavoidable and it is usually accepted in the expectation that it would bring about improvement. Therefore, the first rule in managing technology is to ensure that the desired outcomes are aligned with organizational requirements and achievable.

- **Identify organizational requirements**

The following questions will help you to identify the organizational requirements with regard to new technology:

- ✓ What are the current priorities of the organization?
- ✓ Is the organization expecting to grow in the near future? If so, what is the extent of the expected growth?
- ✓ Will the organizational needs change in the near future?
- ✓ Does the organization have any budgetary constraints?
- ✓ How capable are the end users with regard to adapting to the new technologies introduced?
- ✓ How much training would they need?

3.2 Strategic Planning

To ensure wise decision-making processes, it is important that strategies are in place to support the business functions and operations. It is important to an organization because it provides a sense of direction and outlines measurable goals. It is a tool that is useful for guiding day-to-day decisions and also for evaluating progress and changing approaches when moving forward. In order to make the most of strategic planning, your company should give careful thought to the strategic objectives it outlines, and then back up these goals with realistic, thoroughly re-searched, quantifiable benchmarks for evaluating results.

- **The Strategic Planning Process**

The process of strategic planning can be as important to an organization as the results. Strategic planning can be an especially valuable process when it includes employees in all departments and at all levels of responsibility thinking about how their activities and responsibilities fit into the larger picture, and about their potential contributions.

- **Attributes Of Successful Strategic Plans**
  - ✓ Objective situational and stakeholder analysis
  - ✓ Clarity of purpose and realistic goals
  - ✓ Sense of urgency
  - ✓ Strategies that underscore your values and play to your organizational strengths
  - ✓ Understanding your culture
  - ✓ Leadership
  - ✓ Unwavering discipline
  - ✓ Transparency
  - ✓ Monitoring, measurement and feedback
  - ✓ Anchoring the changes in company culture

- **Strategic planning for new technology**

Most new technology fails when it is implemented without proper assessment of the factors that caused the technology to be introduced in the first place. For successful technology implementation, you must first analyze the business requirement that alerted the need for new equipment in the first place. This is usually found in the IT strategic plan and business strategic plan.

- **Importance of strategies and planning**

Strategy is defined as an elaborate and systematic action to get something done. Once a company"s goals and objectives are established, each division must establish strategies to support the company goals and objectives. Strategic planning is essential for the successful running of any business in order to improve customer service and increase efficiency. Strategic planning gives direction to the acquisition and integration of new technology. All important equipment implementations must be carried out with thoughtful planning within the framework of these strategies.

Technology strategy

When int roducing new equipment into any existing system, you must conform to the technology strategy of the organization

because this will:

- ✓ Reduce completion time and accelerate the progress by providing a framework for integrating new technology into the existing system.
- ✓ Reduce total IT costs through appropriate technology selection as well as improve software development and package selection decisions.
- ✓ Enable increased return on your technology investments.
- ✓ Provide a competitive advantage through the strategic use of information technologies.

- **Integration and implementation strategies**

As discussed above, following a systematic procedure can ensure the successful integration of new equipment into an existing system. You can develop procedures appropriate to your organization by selecting from the following strategies.

- ✓ Identify all stakeholders and take their input into account when formulating a strategy for integration and implementation of new equipment.
- ✓ Map the organization"s business goals into the information technology requirements. Align the IT requirements to existing infrastructure to identify areas that need to be supported by the new equipment.
- ✓ Check the readiness of the IT infrastructure to accept the new equipment. This is critical for the success of your new technology implementation.
- ✓ Measure success. Strategies must be established to measure success of the new equipment at each stage of the implementation.
- ✓ Plan a rollout strategy that may be based on any one of these: department, job function, physical location and alphabetical order.
- ✓ Establish effective IT support strategies by reviewing and extending IT support policies and services to include the new equipment.

Self-Check -3	Written Test

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

I. Say true or false for the following question

1. You must carefully analyze and diagnose organizational requirements before introducing new equipment.
2. Strategy is defined as an elaborate and systematic action to get something done.
3. Strategic planning is not essential for the successful running of any business in order to improve customer service and increase efficiency.
4. Short term planning is important to an organization because it provides a sense of direction and outlines measurable goals.
5. The process of strategic planning can be as important to an organization as the results.

Note: Satisfactory rating - 4 points **Unsatisfactory - below 4 points**

Information Sheet-4	Accessing and using Sources of information for new or upgraded equipment.

4.1 Accessing and using Sources of information for new or upgraded equipment.

- **What are the characteristics of good Information?**
  - ✓ It has to be accurate
  - ✓ Must be relevant to basic purposes
  - ✓ Complete in respect to the key elements of the problem
  - ✓ It has to be Timely (should be communicated in time to be used)
  - ✓ It has to be consistent and reliable
  - ✓ It has to be Up-to-date
  - ✓ Easy to understand
  - ✓ It has to be tailored to the needs of managers and end users

- **What are the characteristics of Technology?**
  - ✓ Technology is human knowledge
  - ✓ Technology uses tools, materials and systems.
  - ✓ Its application will result into artifacts (human-made things)
  - ✓ Technology is developed by people to modify their environment.

4.2 Information technology has become a major driving force in many organizations. These organizations are seeking to get IT applications which can help them sell their products or services effectively. For example, by use of Internet, organizations or businesses are moving information faster and they also coordinate multiple activities to achieve efficiency. They also use the internet to sell their services or products. Information technology has changed businesses, education so many other sectors. In the business world it has helped in creating a ”networked economy” where businesses are linked with their suppliers, customers, manufacturers and business partners in real time. So in this case we look at Information Technology as an enabler and as an industry for the economic development.

- **Importance of information technology to users and organizations:**
  - ✓ IT helps in re-engineering of work practices
  - ✓ Speed
  - ✓ Consistency and accuracy
  - ✓ Reliability
  - ✓ Data capture
  - ✓ Data Processing
  - ✓ Generation of Information
  - ✓ Storage of information
  - ✓ Retrieval of Information

- **Advantages of Technology**

✓ Education: Students & trainers use computer technology for research and education. it does not only allow for the acquisition of knowledge but also makes studying more efficient as information and learning materials could be accessed on the internet and local networks.

- ✓ Business
- ✓ Globalization
- ✓ Job creation
- ✓ Entertainment

- **Disadvantages**
  - ✓ Privacy
  - ✓ Copyright
  - ✓ Privacy
  - ✓ Unemployment

- **Problem Solving in Organizations**

Effective managers and productive workers share one thing in common - they are good at solving problems! Problem-solving is the system of thoughts and actions that people take to fix an issue (or challenge) for themselves or others. Managers even have a term for problem-solving called 'putting out fires.'. This lesson will give you some skills, steps, and strategies to help you be a better problem-solver.

A. Skills

There are three main skills that good problem solvers have:

- ✓ Listening
- ✓ Evaluating
- ✓ Communicating

Listening is more than just sound waves hitting your eardrum; it is more about gaining a better understanding of a situation by discovering what the core of the problem is and how it is affecting others. You may have to listen to someone coming to you and telling you about a problem that needs to be solved or you may be listening to a supervisor to get advice on how to solve it.

Evaluating is a process where you take the information gathered from listening and make a determination about the source of the problem. At that point, you would evaluate your available options. Your options may be to take action, consult with others, pay someone to fix the problem, or do nothing.

Communicating is the skill needed to let others know about the decision that has been made. It does not do anyone else any good if you know the answer but keep it to yourself. Select the most appropriate form of communication that fits your message. For example, if your decision as a manager is to fire Billy, then it would not be fitting to communicate this through a text message

Self-Check -4	Written Test

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

a. Choose the best answer for the following questions below

1. All are advantages of technology except one

A. Unemployment B. Business C. Globalization D. Job creation

2. All are dis advantages of technology except one

A. Privacy B. Job creation C. Copyright D. Privacy

3. There are three main skills that good problem solvers have:

A. Listening B. Evaluating C. Communicating D. all

4. _____ is a process where you take the information gathered from listening and make a determination about the source of the problem

A. Listening B. Evaluating C. Communicating D. all

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

Solar PV System Installation and Maintenance

Level-IV

Learning Guide -41

Unit of Competence	**Migrate to New Technology**
Module Title	**Migrating to New Technology**
LG Code	**EIS PIM4 M10 LO3 LG-41**
TTLM Code	**EIS PIM4 TTLM 0920v1**

LO3:- Evaluate new or upgraded technology performance

Instruction Sheet	Learning Guide:-41

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

- Evaluating new or upgraded equipment for
  - ✓ Performance
  - ✓ Usability and against OHS standards
- Determining environmental considerations
- Seeking feedback

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:-**

- Evaluate new or upgraded equipment for
  - ✓ Performance
  - ✓ Usability and against OHS standards
- Determine environmental considerations
- Seek feedback

Learning Instructions:

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

Information Sheet-1	Evaluating new or upgraded equipment for Performance and Usability

1.1 The need for evaluation.

Evaluation needs to be conducted after the migration into the new technology to assess the project's success or failure. In this process, you must use the project success indicators to compare against the actual benefits and returns. During evaluation, data is collected, recorded and analyzed to identify the benefits of the new technology.

- **Evaluation is conducted after implementation of new technology to:-**
  - ✓ Identify any issues relating to the relevance, effectiveness and efficiency of the hardware and software systems installed
  - ✓ Identify changes that are necessary to address any pressing issues.
  - ✓ Ensure that the organizational process used for migrating to new technology is acceptable to stakeholders and identify any changes that are necessary.
  - ✓ Verify whether the system the system has delivered what was expected so as to benefit future projects.
  - ✓ Monitor long-term use of the system.

1.2 The process of evaluation

There are three steps in the evaluation process:-

- Collect, record and analyses feedback to track progress against the targets.
- Explain success and failures with respect to the performance indicators.
- Identify unintended positive or negative effects.
- Decide on necessary adjustments to the system to increase its usability and performance.
- Establish any lessons that could be learnt from this project so future information technology projects would be much more efficient

1.3 Planning evaluation

The evaluation plan should be flexible enough to accommodate new questions and information sources. Here are some strategies in planning evaluation:-

- Obtain a list of all stakeholders of the new technology.
- Identify stakeholders that must be consulted to evaluate the performance and usability of the system.
- Identify any other data sources to collect information such as documents, reports, performance logs, etc.
- Identify key performance indicators with regard to performance and usability of the software applications and hardware.
- Determine the resources that are needed to carry out the evaluation.
- Identify the methodologies that will be used to conduct the evaluation.
  - ✓ The possible methodologies are:
  - ✓ observations,
  - ✓ questionnaires,
  - ✓ walkthroughs,
  - ✓ Interviews focus groups, etc.
- Analyses the information collected and compares it against the targets of performance and usability.
- Recommend potential enhancements to the system and identify any shortcomings of the implementation for the benefit of future projects.

1.4 Key indicators of usability and performance

The overall objective of conducting usability and performance evaluation is to recommend changes that will contribute to increase user acceptance, increase productivity, decrease training and learning times, and increase business performance

- **Key indicators of usability**

Usability of the system measures hardware and software user interface with respect to attributes such as ease of learning, ease of use and satisfaction in meeting user needs. A usable system ensures that the user can access the required feature instantly through its well-planned user interface.

- ✓ Ease of use users find it easy to apply to their intended tasks.
- ✓ User satisfaction with the functional capabilities.
- ✓ Sufficient and easily accessible user support.
- ✓ Satisfactory initial experience.
- ✓ Integration with existing processes.
- ✓ Overall system capability.

What Are Key Performance Indicators (KPIs)?

Key performance indicators (KPIs) refer to a set of quantifiable measurements used to gauge a company's overall long-term performance. KPIs specifically help determine a company's strategic, financial, and operational achievements, especially compared to those of other businesses within the same sector.

Also referred to as key success indicators (KSIs), KPIs vary between companies and between industries, depending on performance criteria. For example, a software company striving to attain the fastest growth in its industry may consider year-over-year(YOY) revenue growth, as its chief performance indicator. Contrarily, a retail chain might place more value on same-store sales, as the best KPI metric in which to gauge its growth.

Making your KPIs actionable **is a five-step process:**

- **a)** Review business objectives
- **b)** Analyze your current performance
- **c)** Set short and long term KPI targets
- **d)** Review targets with your team
- **e)** Review progress and readjust

- **Update your KPI objectives as needed**

KPIs aren't static. They always need to evolve, update and change as needed. If you're setting and forgetting your KPIs, you risk chasing objectives that are no longer relevant to your business. Make a habit of regularly checking in not just to see how you are performing against your KPIs, but on which KPIs need to be changed or scrapped completely.

To someone who's never developed a KPI before, all of this might sound exhausting. But here's the good news: Once you've gone through this process a few times, it'll be that much easier to use it again in the future.

Key Performance Indicator Examples & Definitions

- ✓ **Profit**:

  This goes without saying, but it is still important to note, as this is one of the most important performance indicators out there. Don't forget to analyze both gross and net profit margin to better understand how successful your organization is at generating a high return.

- ✓ **Cost**:

  Measure cost effectiveness and find the best ways to reduce and manage your costs.

- ✓ **LOB Revenue Vs. Target**:

  This is a comparison between your actual revenue and your projected revenue. Charting and analyzing the discrepancies between these two numbers will help you identify how your department is performing.

- ✓ **Cost Of Goods Sold**:

  By tallying all production costs for the product your company is selling, you can get a better idea of both what your product markup should look like and your actual profit margin. This information is key in determining how to outsell your competition.

- ✓ **Day Sales Outstanding (DSO)**:

  Take your accounts receivable and divide them by the number of total credit sales. Take that number and multiply it by the number of days in the time frame you are examining. Congratulations—you've just come up with your DSO number! The lower the number, the better your organization is doing at collecting accounts receivable. Run this formula every month, quarter, or year to see how you are improving.

- ✓ **Sales By Region**:

  Through analyzing which regions are meeting sales objectives, you can provide better feedback for underperforming regions.

- ✓ **LOB Expenses Vs. Budget**:

  Compare your actual overhead with your forecasted budget. Understanding where you deviated from your plan can help you create a more effective departmental budget in the future.

- ✓ **Customer Acquisition Cost (CAC)**:

  Divide your total acquisition costs by the number of new customers in the time frame you're examining. Voila! You have found your CAC. This is considered one of the most important metrics in e-commerce because it can help you evaluate the cost effectiveness of your marketing campaigns.

- ✓ **Customer Satisfaction & Retention**:

  On the surface, this is simple: Make the customer happy and they will continue to be your customer. Many firms argue, however, that this is more for shareholder value than it is for the customers themselves. You can use multiple performance indicators to measure CSR, including customer satisfaction scores and percentage of customers repeating a purchase.

- ✓ **Net Promoter Score (NPS)**:

  Finding out your NPS is one of the best ways to indicate long-term company growth. To determine your NPS score, send out quarterly surveys to your customers to see how likely it is that they'll recommend your organization to someone they know. Establish a baseline with your first survey and put measures in place that will help those numbers grow quarter to quarter.

- ✓ **Number Of Customers**:

  Similar to profit, this performance indicator is fairly straightforward. By determining the number of customers you've gained and lost, you can further understand whether or not you are meeting your customers' needs.

- ✓ **Customer Support Tickets**:

  Analysis of the number of new tickets, the number of resolved tickets, and resolution time will help you create the best customer service department in your industry.

- ✓ **Percentage Of Product Defects**:

  Take the number of defective units and divide it by the total number of units produced in the time frame you're examining. This will give you the percentage of defective products. Clearly, the lower you can get this number, the better.

- ✓ **LOB Efficiency Measure**:

  Efficiency can be measured differently in every industry. Let's use the manufacturing industry as an example. You can measure your organization's efficiency by analyzing how many units you have produced every hour, and what percentage of time your plant was up and running.

- ✓ **Employee Turnover Rate (ETR):**

  To determine your ETR, take the number of employees who have departed the company and divide it by the average number of employees. If you have a high ETR, spend some time examining your workplace culture, employment packages, and work environment.

- ✓ **Percentage Of Response To Open Positions**:

  When you have a high percentage of qualified applicants apply for your open job positions, you know you are doing a good job maximizing exposure to the right job seekers. This will lead to an increase in interviewees, as well.

- ✓ **Employee Satisfaction**:

  Happy employees are going to work harder—it's as simple as that. Measuring your employee satisfaction through surveys and other metrics is vital to your departmental and organizational health.

Self-Check -1	Written Test

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

I. say true or false for the following question

1. Evaluation needs to be conducted after the migration into the new technology to assess the project's success or failure.
2. The evaluation plan should be fixed enough to accommodate new questions and information sources.
3. Performance of the system measures the reliability of the hardware and software.
4. Efficiency Measure cost effectiveness and find the best ways to reduce and manage your costs
5. Cost can be measured differently in every industry.

Note: Satisfactory rating -4 points Unsatisfactory – below4 points

Information Sheet-2	Determining environmental considerations

2.1 Environmental considerations

It is important to use a formal process to ensure that potential environment problems are foresee and addressed at early stages of the implementation of new hardware or software. However, a careful environmental impact assessment prior to implementation does not exempt you from re-visiting this topic during the evaluation stage. Environmental risk management begins with being aware of pollutants that can harm the environment and taking measures to reduce their impacts. Environment, Health & Safety (EH&S), Environmental Protection and Permitting Program (EP3) coordinates Phase I and Phase II Environmental Site Assessments(ESAs) to investigate site soil and groundwater quality for property the U-M is interested in purchasing or leasing and for U-M properties undergoing construction or renovation. If the assessment activities identify contaminants within the subsurface, the concentrations are compared to risk-based criteria for site-specific exposure pathways. If remediation is deemed necessary, cost effective and innovative solutions are implemented.

Awareness and action relating to environmental protection continues when University of Michigan (U-M) properties are undergoing construction or renovations. U-M construction workers, and contractors, must work with EH&S to prevent pollutants related to construction activities from entering the environment. In addition, construction workers, contractors, and EH &S must also ensure the health of the environment surrounding the construction site is not compromised.

- **Purpose of Environmental considerations**
  - ✓ Energy efficiency
  - ✓ Green materials**.**
  - ✓ Reduced waste
  - ✓ Better tools and equipment
  - ✓ Long-term: (sustainability)

- **Assessment** of the environmental impact of using the technology must be done against:
  - ✓ resources
  - ✓ labor
  - ✓ infrastructure
  - ✓ Supporting technologies required.

- **Factors that could bring favorable environmental outcomes are:**
  - ✓ reduction in wastage
  - ✓ replacement of old equipment that is not environmentally friendly
  - ✓ reduction in paper usage
  - ✓ Reduction in energy consumption.

- **Factors that could pose a challenge are:**
  - ✓ environmental issues relating to disposal of obsolete computer supplies, hardware and other equipment
  - ✓ environmental issues relating to communication devices, wireless communication devices in particular
  - ✓ The apparent need of many organizations to purchase large numbers of new computers

2.2 Occupational Health and Safety of a piece of equipment needs to be evaluated. It is unreasonable to make users operate unsafe equipment that could lead to illness or accident. Items to be considered include:

- Safety of cabling to equipment;
- Electrical testing of equipment (ensure is up to date);
- Equipment meets ergonomic equirements;
- Appropriate training is provided to users to ensure safe Operation of equipment;

Self-Check -2	Written Test

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

III. Choose the best answer for the following questions below

1. **Which one of the following is the purpose of Environmental considerations**

A. Energy efficiency B. Green materials C. Reduced waste D. all

2. **Assessment of the environmental impact of using the technology must be done against:**

A. Resources B. labor C. Infrastructure D. All

3. **All except one are Factors that could bring favorable environmental outcomes:**

A. reduction in wastage B. maximizing in economy C. reduction in paper usage

D. Reduction in energy consumption

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

Information Sheet-3	Seeking feedback

3.1 The value of feedback

Feedback is extremely valuable in the evaluation of hardware and software as it provides an effective balance for your own observations and walkthroughs on the system. This is an ongoing process of keeping IT professionals informed of the performance and usability of the system and should not be treated as merely an event.

- **Gathering feedback**

The goal of collecting feedback from users and gathering information from other sources is to enable the technology committee to assess how well the software and hardware implementation is satisfying the key usability and performance indicators.

- **Sources of information**

You can gather data from people, documents, performance data, observation of events or any other empirical method such as experiments and benchmarking.

3.2 Basic feedback gathering methods

The ideal form of feedback gathering is to use a combination of the following methods depending on time and organizational factors.

- **Observations, walk throughs and site visits**

These are conducted to get first hand information on performance and usability features of the system. The internal or external evaluators will observe all stakeholders using the technology and observe usability and performance indicators of the system. Walkthroughs are conducted where an evaluator walks through a certain feature to assess how the system performs that feature with respect to usability and performance indicators.

- **Interviews**

Here are some tips for conducting interviews:

- ✓ Choose stakeholders who would have greater or unique involvement with the new system.
- ✓ Communicate the purpose of the interview to the interviewee.
- ✓ Ask brief questions relevant to performance and usability of the system.
- ✓ Don"t interrupt.
- ✓ Be a good listener.
- ✓ Take notes.

- **Focus groups**

These are group interview situations where discussions can take place about the usability and the performance of the hardware and software. Here are some tips for conducting focus groups:

- ✓ Reward the attendees by providing refreshments as this could be a good motivator.
- ✓ Start and finish on time.
- ✓ Be prepared to hear positive and negative comments.
- ✓ Be prepared with prompting questions to start the discussions about usability and performance of the system.
- ✓ Let the participants communicate and listen carefully.
- ✓ Avoid being defensive.
- ✓ Listen to all comments.
- ✓ Engage a note-taker.

- **Surveys and questionnaires**

These are used to gather quantifiable data about the system from a large number of people. You should make allowances for the low response rate and the slow response time.

Here are some tips for conducting surveys:

a) State the objective of the survey as evaluating the performance and usability of the new technology.
b) Keep the survey to a manageable length.
c) Use both open-ended and closed questions.

- **Analyzing and processing feedback**

All data regardless of how and from where it was collected must be summarized against the performance and usability indicators so they are more manageable. In almost all case, both quantitative and qualitative data will be collected and used.

- ✓ The performance measurements such as error rates will be quantitative and will be easy to interpret.
- ✓ Performance measurements such as reliability could be a combination of qualitative and quantitative data.
- ✓ Usability indicators could be qualitative or quantitative.

- **Scoring (achieve) of usability and performance**

It is common practice to use a scoring system to identify how the system is performing with regards to usability and performance. An example of a scoring system is given below.

Table 1: Directions for scoring key indicators

Indicators	Poor	Satisfactory	Good	Excellent
Support				
Help desk services	Support mechanisms are non-existent or not	Support mechanisms exist. But fees	Support mechanisms exist. Fees for help	Excellent support mechanisms. Reasonable fees and acceptable
	adequate	associated with help desk calls are high and response times are slow.	desk calls are reasonable but response times are slow. Cheat sheets and how-to guides are available for some features	response times. Relevant cheat sheets and how-to guides are accessible through the web-based support system

Technical needs assessment				
Needs assessment conducted for implementation	Needs assessment was not conducted	Some groups of stakeholders were surveyed to identify computer hardware requirements.	Needs for all stakeholders identified however not all needs are accounted for in the final implementation	An elaborate and comprehensive needs assessment was conducted and it all stakeholders were well informed about the improvements that would be introduced.

Indicators	**Poor**	**Satisfactory**	**Good**	**Excellent**
Training				
Training prior to and during implementation	Training was not provided.	Training was provided in large groups.	More customize training for small groups	A comprehensive training plan was derived and all users were trained in groups for common skills and on a one-to-one basis for user specific tasks.
Customization				
User customization	All features are set and customization is not an option	Desktop attributes such as fonts and colors could be customized to suit the user"s needs	Power users can customize certain features. Ordinary uses cannot change any features	Power users can customize most features where as ordinary users can change a limited number of features.

Integration				
Compatibility	The new software is not compatible with any old packages that performed similar tasks.	New software is partially compatible with old technologies however the administrator has stopped making any reference to data in the previous system.	New software is backward compatible with the old software but does need some intervention with data conversions	New software is totally backward compatible with the old software

Poor	Indicators	Excellent	Good	Satisfactory
Performance				
Value for Money	The technology has not produced any cost advantages that was anticipated. In fact, the new technology	The new technology has not enforced any additional expenses (running costs) compared to the old	The technology has minimized costs	The technology is proving to be producing a profit
	costs more money to the	technologies used		
Speed (Throughput)	Output of new technology is slower compared to the previous technologies	New Technology is comparable with old other technologies.	New Technology is lot more efficient than all previous technologies	New Technology is producing more than three times faster than the previous system

Quality	The quality of output is not acceptable. Error rate is more than 5%.	The quality of output is comparable to older technologies and is acceptable. Less than 5% defects.	Produces good quality output. Less than 2% defects	The quality of output is rated as very high. Less than 0.5% defects.

Summary

We began with a discussion of the need for and process of evaluation when implementing new technology. Then we moved on to planning an evaluation, key indicators of usability and performance, and environmental considerations when purchasing new equipment. Then we explored using feedback, its value and how to gather analyses and process it. We finished with an example of a scoring system to identify how the new system is performing with regards to usability and performance

Self-Check -3	Written Test

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

I. Say true or false for the following questions

1. The ideal form of feedback gathering is to use a combination of the following methods depending on time and organizational factors.

2. All data regardless of how and from where it was collected must be summarized against the performance and usability indicators.

3. It is common practice to use a scoring system to identify how the system is performing with regards to usability and performance

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

List of references

1. **Jump up ^** Hargadon, Andrew. Harvard Business School Working Knowledge for Business Leaders, August 4, 2003.
2. **Jump up ^** EU Report on EU/global comparisons in the commercialization of new technologies
3. **Jump up ^** State of The Nation 2008 - Canada's Science, Technology and Innovation System
4. **Jump up ^** "Assessments of Selected Weapon Programs".