CHAPTER 7: COORDINATING INFORMATION COMMUNICATIONS

Unit of learning code: BUS/BM/CR/06/5

Related Unit of Competency in Occupational Standard:

7.1 Introduction to the unit of learning

This unit specifies the competencies required to coordinate ICT functions. It involves developing organizations ICT policy, procuring ICT services, supervising ICT installation and maintenance, integrating ICT in operations, conducting ICT user training, promoting ICT innovation, coordinating virtual platforms and analyzing and interpreting user reports and prepare ICT report

7.2 Summary of Learning Outcomes

1. Develop organizations ICT policy
2. Procure ICT services
3. Supervise ICT installation and maintenance
4. Integrate ICT in operations
5. Conduct ICT user training
6. Promote ICT innovation
7. Coordinate virtual platforms
8. Analyze and interpret user reports
9. Prepare ICT report

7.2.1 Learning Outcome 1: Develop Organizations ICT Policy

Introduction to the learning outcome

This learning outcome is on developing organization ICT policy. It involves the following activities: Carrying out ICT needs assessment, forming technical team, developing ICT draft policy, reviewing and generating ICT draft policy, undertaking amendments on draft ICT policy, developing ICT policy and sharing ICT policy

Performance Standard

1. ICT needs assessment is carried out according to organizations business operations
2. Technical team is formed in accordance with organization policy
3. ICT draft policy is developed in accordance with the strategic plan
4. ICT draft policy is reviewed and a report generated according to organization standard operating procedures
5. Amendments on the draft ICT policy is undertaken based on review report
6. ICT policy is developed in accordance with the ICT objectives in the strategic plan
7. ICT policy is shared among organization departments according to organization policy

Information sheet

Definition of terms

Information

This refers to facts provided or earned about something or someone. It is what is conveyed or represented by a particular arrangement or sequence of things.

Information technology

It is the use of computers to store, retrieve, transmit and manipulate data or information.

Policy

It is a deliberate system of principles to guide decisions and achieve rational outcomes. It is a statement of intent, and is implemented as a procedure or protocol.

Strategic plan

It is a written document that points the way forward for a business. It lays out the company's goals and explains why they are important.

Objectives

These are specific, actionable targets that need to be achieved within a smaller time frame. They describe the actions or activities involved in achieving a goal.

An ICT policy

It is a road map with specific actions and best practices towards adoption, use and maintenance and value extraction at reasonable cost from ICT resources.

Need assessment

It is a systematic process for determining and addressing needs or gaps between current conditions and desired conditions.

ICT needs assessment is carried out according to organizations business operations

Without an ICT policy, in an organization, there will be no roadmap on how and why an organization should adopt ICTs. At the bare minimum, an ICT policy document for an organization should include the below:

1. Scope and objectives of the policy document: This defines the reason why the document exists, its target audience and what the document covers.
2. Technology adoption roadmap: This gives a clear definition of where the organization is and where it wants to go in the short and long term as far as ICT is concerned. For example; is the organization moving from an in-house data center to the cloud? It must be in the ICT policy. Is the organization trying to change the ICT department from being a cost center into a revenue generator? It must be in the ICT policy.
3. ICT best practices in relation to the organizations objectives: These define the dos and don'ts for the organization as a whole (and not the individual ICT user in that organization). For example; is the organization outsourcing its sensitive data analysis to a third party? This must be specified in the ICT policy. Is the organization allowing personal devices such as phones (BYOD) to connect to the office Wi-Fi? This must be specified in the ICT policy.

4. Precautions and disciplinary measures: This section details the rights and obligations of ICT users with punitive or damage preventive measures for failure to follow the laid down ICT policies by a member of staff. The severity of the punishment should commensurate with the risk or exposure the company suffers as a result of the failure to follow the laid down

Needs assessment

Needs assessment is defined as a powerful tool for addressing the needs between current as well as desired wants in ICT. It is used by organizations for strategic planning to allocate resources, make improvements, and determine priorities. A needs assessment is described as a process to collect information about an implied or expressed need that can be easily met by conducting training.

It is a desire to rectify a deficiency or improve current performance by developing a plan of action. You have to measure the discrepancy between both current and desired conditions to do so.

The aim of conducting a needs assessment is

- To gather the necessary information for minimizing the difference between desired and current wants
- Streamlining to improve the performance of a company about established goals
- Setting up the necessary criteria for training
- Identifying an apt solution for a complex issue

The characteristics that define a good needs assessment process are as follows-

- Focus is on obtaining the results and not on means to acquire them
- Helps in decision making
- Offers viable contribution towards common goals
- Establishes priorities by involving every stakeholder
- The main characteristic that defines needs assessment is that it integrates within the strategic planning efficiently

The perspectives on need in a need assessment are as follows-

- Perceived needs – These are defined in terms of what a person thinks about his needs
- Relative needs – It is related to equity and has to take into account differences in social pathology and population.
- Expressed needs – It is expressed by the number of people who seeks help. It has put its onus on circumstances and assumes that people with needs seek help.

Steps in conducting a needs assessment

i. Identification. The needs of the organization need to be identified first.
ii. Analysis. Needs between the current and desired results are analyzed

iii. Utilization. The analyzed data is used for creating an action plan
iv. Evaluation. An evaluation plan helps an organization to inch successfully towards its goal.

Benefits of needs assessment

The numerous advantages of the needs assessment are-

1. Needs assessment helps to enhance the performance of an organization
2. It enables the gathering of important information and data that you can analyze and utilize for your benefit
3. Helps to find business needs that should be addressed for better results
4. Develops training strategies to ensure the success of a project
5. Builds credibility with the stakeholders for the development process
6. A needs assessment is all about expert assistance and innovative approach
7. Implements viable solutions for the benefit of the organization
8. Identifies needs and wants and tries to offer solutions for existing discrepancies
9. Evaluates current performance to enhance the future ones
10. Is useful for complex issues
11. Is able to explore unexpected problems and find solutions for them

Limitations of needs assessment

A needs assessment is considered a time-consuming process

Sometimes it becomes very difficult to analyse because of complex issues

- It is only effective if it offers concrete evidence to determine which solution is the best for achieving the desired results.

Technical team is formed in accordance with organization policy

Information and communications technology (ICT) professionals conduct research, plan, design, write, test, provide advice and improve information technology systems, hardware, software and related concepts for specific applications. Therefore they play a key role in policy development.

The function of a technical working group is to ensure the proposed updates to the policy are usable and align with the policies in the Master Plan of an organization. The group serves to identify issues in draft documents and to brainstorm **t**echnical solutions.

How to set up a technical team

1. Define the problem.
2. Identify existing groups and networks.
3. Identify members.
4. Define roles and processes.
5. Define the scope.

6. Invite people to join.
7. Revisit the draft roles, processes and scope.
8. Develop an actionable agenda for every meeting.
9. Empower the leadership.
10. Document and communicate progress.

The role of the technical team is designed to bring together individuals possessing the relevant knowledge and skills who will act either individually or collectively to undertake assigned tasks and activities in order to achieve the set objectives of preparing an ICT policy document.

ICT draft policy is developed in accordance with the strategic plan

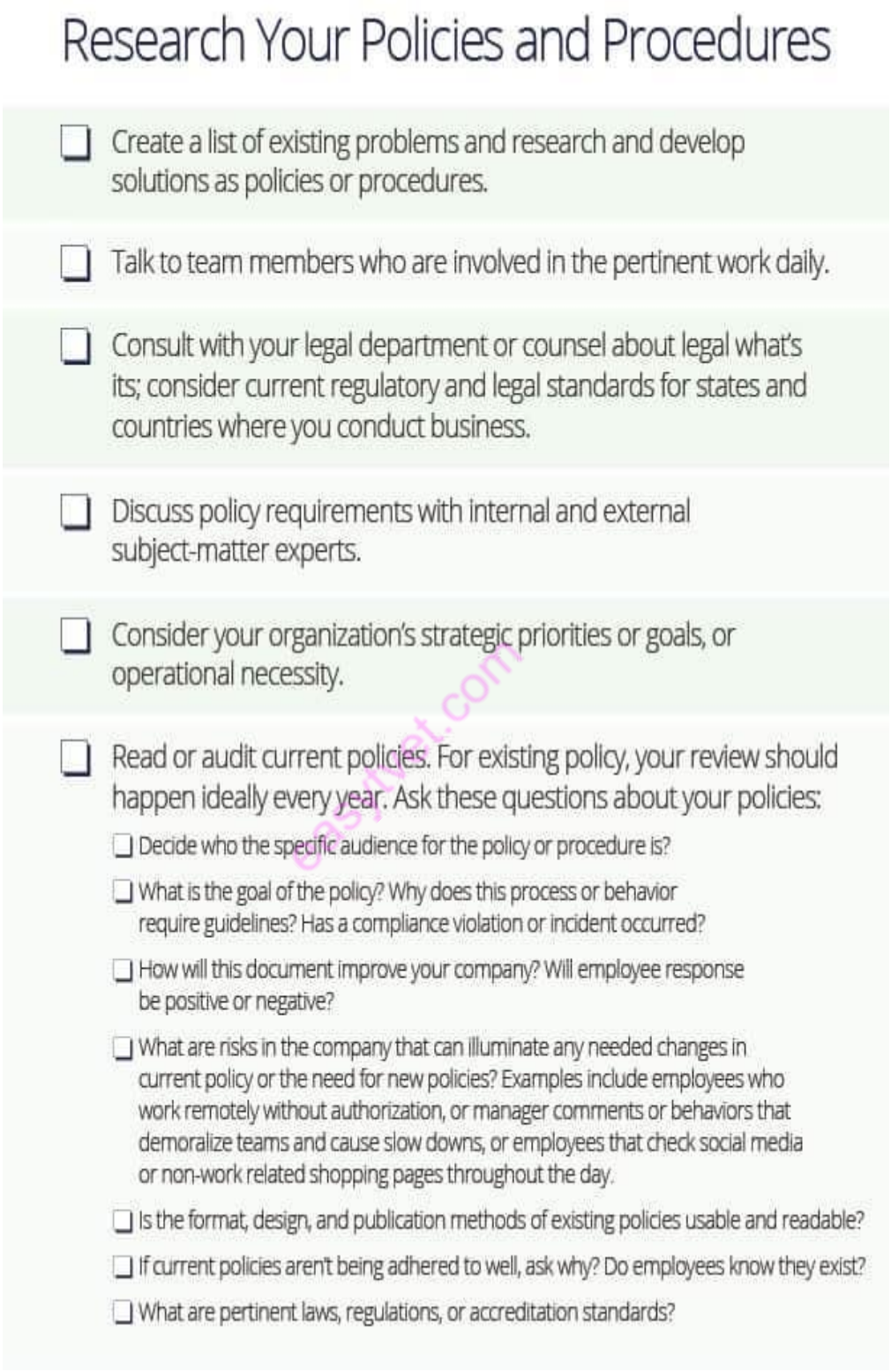
Policies and procedures guide daily workplace activities by promoting compliance with laws and regulations, providing strategic perspective for decision making, and simplifying processes

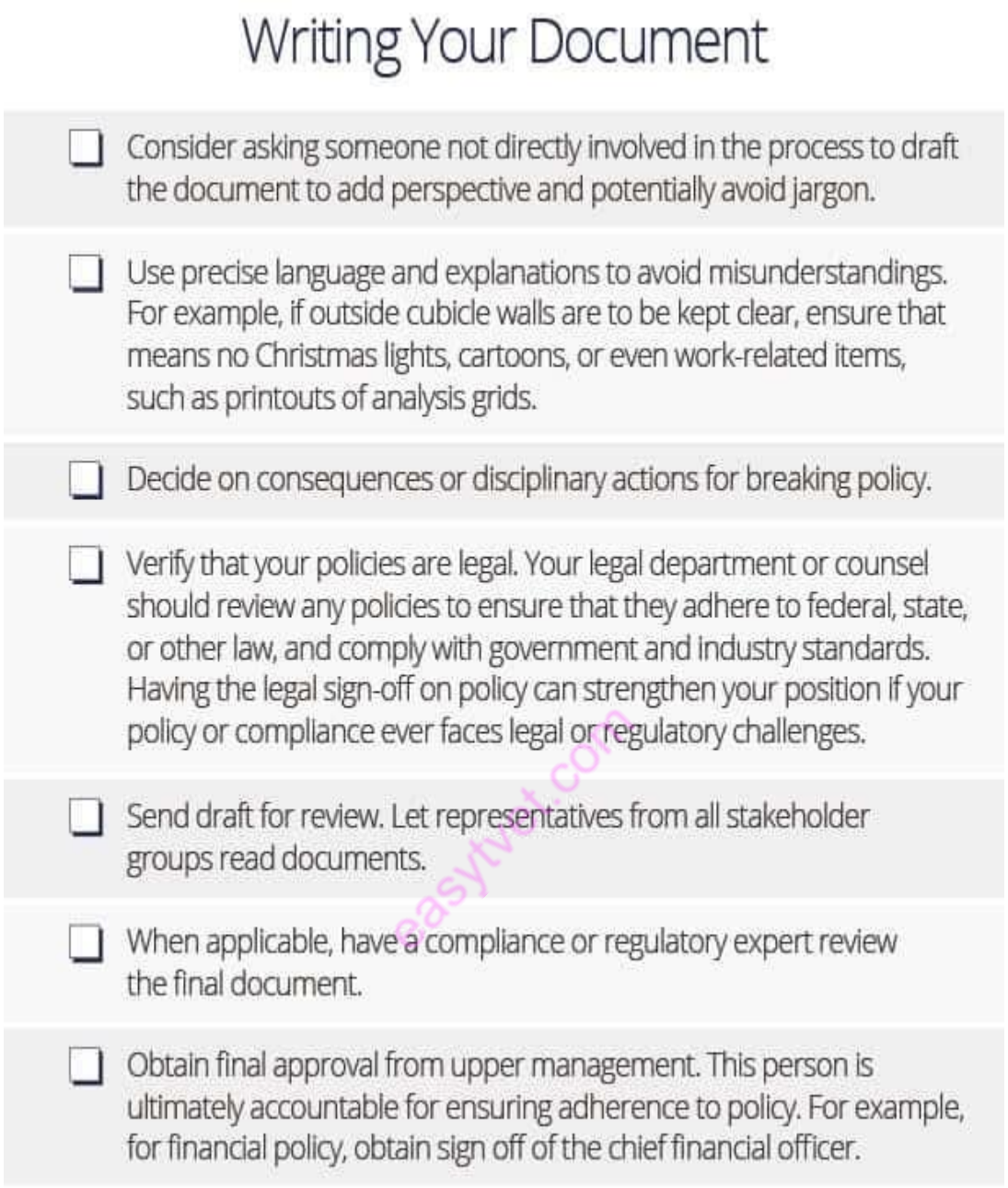
Figure 62: Policy creation workflow

Figure 62: Policy creation workflow

Figure 63: Policy and procedure pre-writing checklist

Figure 64: researching policy procedure





- Figure 65: writing a policy document

- Figure 66: reviewing policies and procedures

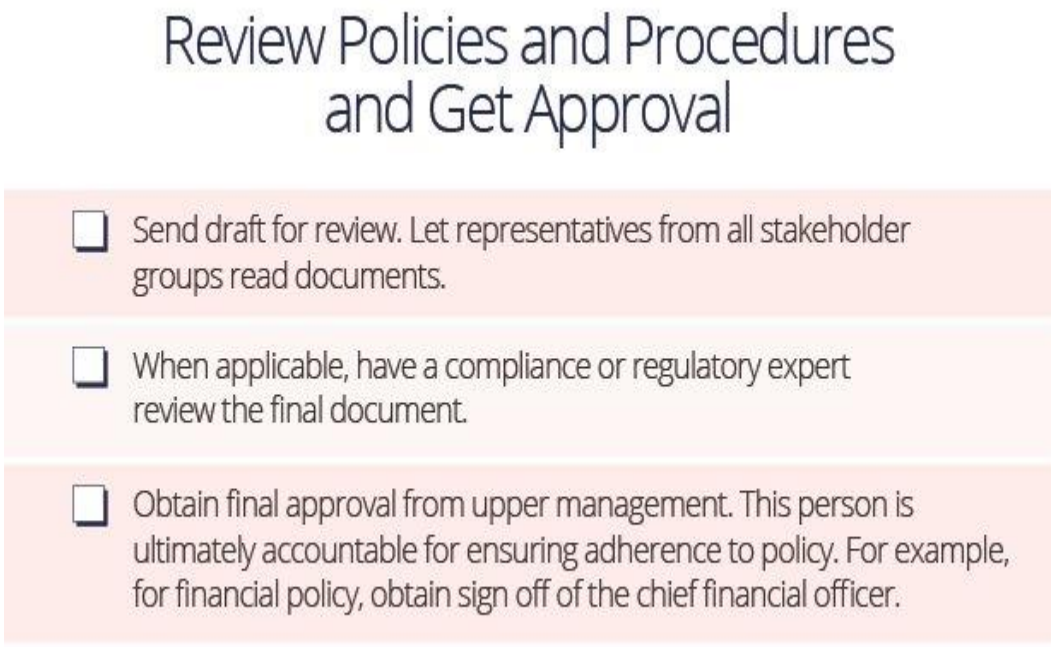


Figure 67: implementing policies and procedures

Here is why policies and procedures are crucial to your organization:

- Policies and procedures help employees maintain compliance and mitigate or even eliminate risks.
- In a regulated industry, they demonstrate legal and regulatory compliance.
- Policies provide a means to change your company culture.
- Creating policies and procedures requires spending in dollars and work hours, but what is the cost of a process failure, an injury, or damaged property?

Good policy documents provide the following:

- Ensure compliance:
- Increase accountability, training, and responsibility.
- Streamline internal processes

- Help organizations avoid errors and maneuver through incidents and problems

Common Elements of Policies and Procedures

Although it is important to customize any documents for a particular situation, policy documents tend to include core elements that help identify the document and provide the information necessary:

- **Clear Title:** Use as few words as possible and ensure that users at any reading level can understand.
- **Brief Description of the Policy:** A description or introduction orients users to the scope and purpose of the policy.
- **A Filing Number:** A filing or tracking number may be unique to your organization. No matter what your numbering system, ensure that your title describes the content of the document.
- **Key Dates:** Dates include the approval date of the original document, the annual review date, and the latest version date. Dates are important for tracking versions around legislative and other updates.
- **Policy Purpose:** The purpose describes why the policy exists. This includes such concerns as legal and regulatory needs and problems or conflicts a policy aims to avoid.
- **Policy Statement:** The core of the document and usually the lengthiest part. The policy statements specify the main audience for the policy, conditions and restrictions for applying the policy, expectations, and exclusions.
- **Scope:** This concerns which roles or departments the policy covers.
- **Responsibilities or Responsible Party:** Indicate what role, department, or group must maintain the policy. Alternatively, for some policies governed by regulations, this section lists roles responsible for executing the policy.
- **Definitions:** Describe key terms, jargon, or ambiguous terms. Always explain key terms in a separate definitions section or at first mention in the text of your policy or procedure to ensure that everyone has the same understanding of terms. Definitions are particularly important for terms that may have multiple meanings.
- **History:** Knowing the history is useful for understanding changes.
- **Related Documents:** Attach other policies, procedures, regulatory documents, forms, and guidelines for reference.
- **Search Functionality:** For web-based documents, this is a policy search feature.
- **Keywords:** For online documents, choose keywords that relate to how a user might search for your policy.

Policy Language and Tone Tips

Review these tips before you begin to write. Then, when you have finished your document, compare your work to the checklist.

- Write to the reading level of the document users. If necessary, use only numbers, graphics, and photographs.
- Use short sentences with familiar English words and with one thought or concept per sentence. Use must or will if something is mandatory.

- Avoid ambiguous words such as may or shall.
- Use plain words that are commonly understood rather than jargon. If you must use specialist terms, explain them in the text and in your glossary section.
- Use terms consistently throughout your documents. Write the full name for acronyms when you first use them.
- Remove extra words. For example, use to instead of in order to.
- Use positive and inclusive language. Their, not he or she (gender-neutral), worker not workman (gender-inclusive).
- Use active voice rather than passive voice. For example, you must wash the dishes. (Active). The dishes must be washed. (Passive) Use present tense. When you finish your shift, you lock the cabinets.
- Use headings that clearly identify the content of each section.

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ICT draft policy is reviewed and a report generated according to organization standard operating procedures

"Drafting" refers to any process of generating preliminary versions of a written work.

Writers can be doing any or all of the following during phases of drafting:

- developing cohesion
- organizing their thinking in relation to text produced so far
- experimenting with phrasing
- explaining or linking examples/ideas
- generating transitions
- discovering a central argument/point
- elaborating on key ideas

Reviewing a draft policy ensures that the wording and length or complexity of the policy are appropriate to those who will be expected to implement it.

Amendments on the draft ICT policy is undertaken based on review report

Consult with appropriate stakeholders

Policies are most effective if those affected are consulted are supportive and have the opportunity to consider and discuss the potential implications of the policy. Depending on whether you are developing policies to govern the internal working of the organization or external policy positions, you may wish to consult, for example:

- Supporters;
- Staff and volunteers;

- Management Committee members; and
- Service users or beneficiaries

ICT policy is developed in accordance with the ICT objectives in the strategic plan

Who will approve the policy? Is this a strategic issue that should be approved by the Management Committee or is the Committee confident that this can be dealt with effectively by staff? Bear in mind that, ultimately, the Management Committee is responsible for all policies and procedures within the organization.

ICT policy is shared among organization departments according to organization

It is important to answer some questions which will give guidance on how policies will be shared: How will the policy be communicated and to whom? Is training required to support the implementation among staff and volunteers? Should the organization produce a press release (for external policy positions)?

How policies are shared depends on what and to which audience, but the following are methods that may be used to share policies:

- ✓ Organization's Intranet
- ✓ Newsletters (organizational or departmental)
- ✓ Emails from the CEO
- ✓ Posters or displays in public areas
- ✓ Senior management information cascade
- ✓ Departmental communication relays (key points from management meetings are relayed to the departmental teams and the key points from team meetings are relayed back to management)
- ✓ Global meetings or directorate/departmental conferences
- ✓ Open days or "cafe chats" (open house drop-in forums)

Nothing really out of the ordinary there; the key is in the "who?" and the "why?" and then selecting the best mix of the above to achieve your aims.

Monitor, review and revise

As an organization it is important to answer the following questions: What monitoring and reporting systems are in place to ensure that the policy is implemented and to assess usage and responses? On what basis and when will the policy be reviewed and revised (if necessary)?

Learning Activities

Knowledge	Learning activity	Special instructions
• Carrying out ICT Needs assessment • Reviewing and generating ICT draft policy	• Carry out an ICT needs assessment in the institution	Prepare the necessary tools to collect the information, analyze the information and prepare a report

• Undertaking amendments on draft ICT policy • Developing ICT policy is developed • Sharing ICT policy is shared		
• Forming Technical team • Developing ICT draft policy	Role play by forming a technical team	Prepare their job description

- Practical activities related to the Performance Criteria statements
- Knowledge in relation to Performance Criteria given as content in the curriculum
- Special instructions related to learning activities

1.2.1.1 Self-Assessment

1. Which are the optimal benefits of ICT integration in an organization?
2. Which are the technological challenges an organization is likely to face from the adoption of technology in its operations
3. What are the characteristics of good ICT policies
4. How would an organization avoid information overload in systems design
5. Why would an organization upgrade its computer system

1.2.1.2 Tools, Equipment, Supplies and Materials

Computer
Internet connectivity
Stationery
Phones
Remotes
Software
Tablets
Network cables
Printers

References

1 Saleemi N A, Systems Theory and Management Information Systems Simplified, 2nd Edition, Nairobi Savanis Book centre (2000)
2 Nagpal D P, Computer Fundamentals, S Chand publishing (1999)
3 Luehrmann arthur, Computer Literacy, McGraw-Hill, (1983)

4 Stallings William, Data and Computer Communications, 10th Edition, Pearsons, (2013)

Responses answers

1 The optimal benefits of ICT integration in an organization.

- ✓ Flexibility in business activities to meet the clients' needs
- ✓ Strengthen the relationship with suppliers/distributors
- ✓ Allows for cost competitiveness of a business in the market
- ✓ Shorter order cycles
- ✓ Flexibility of response to clients

2 The technological challenges an organization is likely to face from the adoption of technology in its operations

- ✓ Lack of appropriate hardware.
- ✓ Costly to implement and maintain
- ✓ Technology gets outdated very quickly, which makes it very expensive for the organization to keep on adapting to the latest
- ✓ Power outages/low voltage of power supply affect utilization of technology
- ✓ Delayed or lack of maintenance affects the efficiency of the machines
- ✓ Requires constant training of employees which is expensive

3 Characteristics of good ICT policies

- ✓ Should be flexible
- ✓ Should be clear and simple
- ✓ Should have clear objectives
- ✓ Should be based on reliable information
- ✓ Should be fair
- ✓ Should be reasonable
- ✓ Should be consistent
- ✓ Should be reliable

4 Ways an organization would avoid information overload in systems design

- ✓ Keep things simple
- ✓ Keep it relevant
- ✓ Keep it clear
- ✓ Provide supporting information
- ✓ Provide balanced information
- ✓ Make it clear what is to be done with the information
- ✓ Make it easy for users to take action

5 Reasons why would an organization upgrade its computer system

- ✓ To prevent latest security vulnerabilities

- ✓ To improve stability
- ✓ To make the software more trustworthy
- ✓ To fully utilize latest functional tools
- ✓ To enjoy new features
- ✓ Benefits of pricing
- ✓ To keep the hardware healthy
- ✓ Enhanced user interface
- ✓ Go speed
- ✓ Support

7.2.2 LEARNING OUTCOME 2: PROCURE ICT SERVICES

Introduction to the learning outcome

This learning outcome is on the procurement of ICT services. The following activities are undertaken when carrying out these services. They include: receiving requisitions from user departments, undertaking invitation to tender or quotation, sourcing of ICT services, undertaking verification of procured ICT services and distributing procured ICT services

Performance Standard

1. Requisitions are received from user departments according to ICT policy
2. Invitation to tender or quotation is undertaken according to the budget and the mode according to the procurement procedure and regulations
3. Sourcing of ICT services is done in accordance with the procurement procedure and regulations.
4. Verification of procured ICT services is undertaken according to the procurement policy
5. Procured ICT services are distributed to respective departments based on organization policy

Information Sheet

Definitions of terms

Procurement

It refers to techniques, structured methods and means used to streamline an organization's procurement process and achieve desired goals while saving cost, reducing time and building win-win supplier relationship.

Purchasing

It is the act of buying the goods and services that a company needs to operate and/or manufacture products.

Purchasing procedures

These are "the series of activities designed to obtain products of the right quality and quantity at the right price and time and from the right source.

Tendering

Tendering is the process of making an offer, bid or proposal, or expressing interest in response to an invitation or request for tender.

Sourcing

It is the process of selecting suppliers to provide the goods and services needed to run a business

Requisitions are received from user departments according to ICT policy

Purchasing procedures and policies vary widely from one organization to another. The stages that almost any purchasing transaction will have to progress through are:-

1. Recognition of the need
2. Description of the need

3. Investigation and selection of potential suppliers
4. Preparation and issue of the purchase order
5. Follow-up of the order
6. Processing discrepancies and rejections
7. Auditing the transaction
8. Closing the transaction
9. Maintenance of files and records

Recognition and Description of the need

Before any purchasing transaction occurs, someone must notice that something is needed. E.g. user department or storekeeper. At this stage, the concerned department issues a requisition. Requisition is forwarded to stores or purchasing as appropriate the requisition/bill of materials issued must contain details/specification of the required material. Purchasing does not act on the description without inquiry of past purchases and without involvement of user department for clarification if unclear or to suggest alternatives that offer better quality/lower price (neither should purchasing accept requisition without question)

Invitation to tender or quotation is undertaken according to the budget and the mode according to the procurement procedure and regulations
The purchaser narrows down suppliers from the large list following appropriate procedure. If the item is standard/routine, the procedure is simple. For a non-standard item, proper investigation is required to establish price & availability. They then solicit for quotations and engage in negotiations.

Tendering is the process of making an offer, bid or proposal, or expressing interest in response to an invitation or request for tender. Organizations will seek other businesses to respond to a particular need, such as the supply of goods and services, and will select an offer or tender that meets their needs and provides the best value for money. Tender request documents; also referred to as invitations to tender, Requests for Tender (RTF), Requests for Proposal (RFP) etc outline what is required, that is, what the requesting organization's needs are. These documents also outline the particular requirements, criteria, and instructions that are to be followed. Future tenders are generally widely advertised to offer opportunities to a number of suppliers encourage competition and provide a greater pool of offers to select from

Interested suppliers will then prepare a tender; the documents that outline

- The offer that they are making, and
- Will include pricing,
- Schedules as well as
- Their eligibility for the procurement.
- Advantage over competitors;
- Provide information on qualifications, competencies and experience.
- Demonstrate how their bid offers the best value for money.

The submitted tenders are then evaluated with regard to defined criteria. In a normal tendering situation, this process should be conducted fairly and honestly, and in a

manner that is free from bias or favour. The offer that best meets all of the requirements outlined in the request, and provides value for money should win the contract. The tendering process is generally utilised for procurements or contracts involving substantial amounts of money.

The core principle in business tendering and procurement is achieving value for money. This does not just refer to offering the lowest price or best offer. Value for money can also be assessed by looking at factors including:

- The relative risk of the proposal
- Fitness for purpose
- The performance history of the supplier
- All direct and indirect financial costs and benefits over the life of the procurement
- The flexibility of the proposal to adapt to possible change
- The anticipated price that could be obtained, or cost incurred, at the time of disposal.
- maximizing competition,
- providing an opportunity for a much larger pool of suppliers to make an offer
- having a greater choice in selecting a supplier that offers value for money

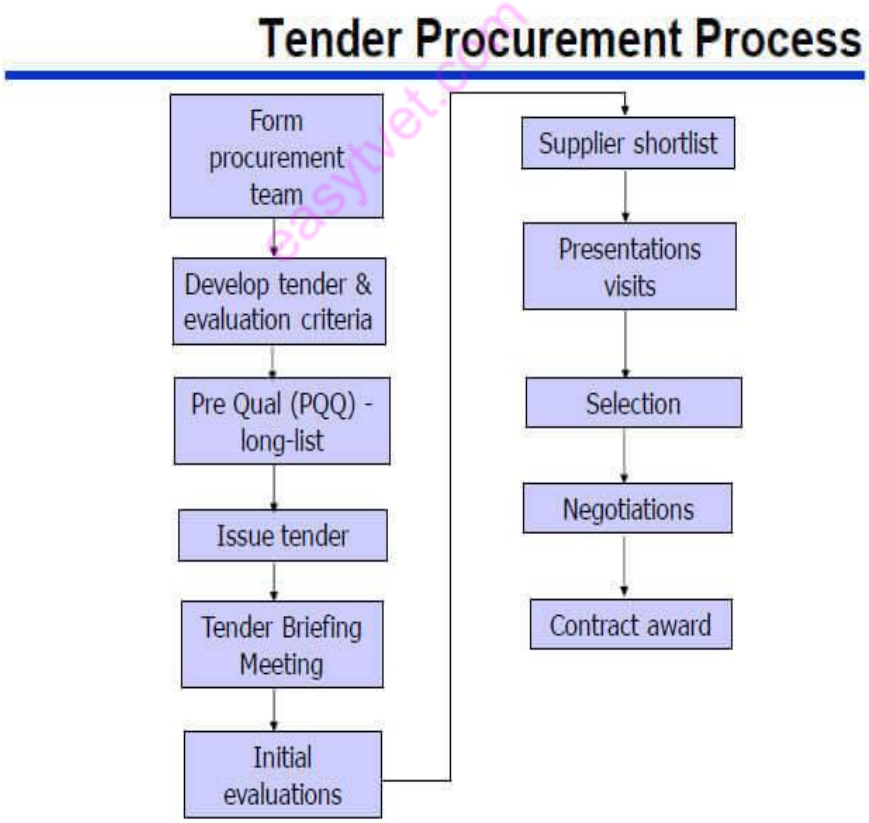

Figure 68: tender procurement process

The procurement team will typically involve:

- Procurement
- The budget holder
- Others involved in managing the contract
- Possibly representatives from health and safety, human resources, quality management and ICT.

The procurement team then agrees what the tender will involve:

- Specification or general requirement
- Supplier requirements and mandatory requirements (eg ISO standards)
- Questions
- Tender rules or instructions
- Evaluation criteria (how it will be scored e.g. 60% quality / 40% price)
- Contract (e.g. one-off, term or framework)
- The tender procurement process (e.g. PQQ or not)

Pre-Qualification Questionnaire (PQQ) or Tender Long-List

This is an initial selection process to help sift potential suppliers for suitability. It is used to draw a long-list of bidders to be invited to tender. This stage of the tender process might be by invitation or open to everyone.

The qualification stage might take the form of an approved supplier list, an initial screening interview or a formal PQQ (questionnaire to assess against minimum requirements). Some tenders incorporate aspects of the PQQ within the tender therefore eliminating this stage.

The invitation to tender (ITT) is issued to the long-list of selected bidders. The ITT can involve a set of questions to answer along with a pricing matrix. Alternatively it could be less formal – simply asking the bidder to submit a proposal and a price.

E-tenders are now the most common way of tendering.

Tender Briefing Meeting: It is not uncommon for the tender procurement panel to Hold supplier briefing meetings (pre-tender meetings). They help clarify the tender and answer any bidders' questions.

Initial Evaluation: The tender panel marks each bid against the agreed evaluation matrix. This results in a league table of the highest and lowest bidders' scores.

Tender Short-list: The evaluation is used to select a short-list of potential suppliers. The number of bidders in a short-list will depend on the nature of the contract. For example, a framework agreement has several suppliers. Another tender might only have one winner.

Presentations, Interviews & Visits: Short-listed bidders are sometimes subject to further evaluation. This can be a tender short-list presentation or a question and

answer session, and possibly a visit to supplier's premises and/or meeting some of their customers.

Again, the tender panel will assess this against their pre-determined evaluation criteria.

Selection: Whatever the tender procurement process, the tender panel will arrive at its final scores. These are used to select the best performers and award contract(s).

Negotiations: The limit of tender negotiations depends on the nature of each individual tender procurement process. A formal tender may not offer any scope for negotiation. Others will allow small negotiations. This can include: (a) Some aspects of price (e.g. additional items) (b) Contract wording and specification (e.g. items that don't affect the overall service). It is unlikely that there will be opportunity for any major negotiation and certainly not on the overall price.

There are five different types of procurement. These include open tendering, restricted tendering, direct procurement, request for proposals and request for quotations. Open tendering offers a fair and competitive type of procurement and is the most preferred method.

Sourcing of ICT services is done in accordance with the procurement procedure and regulations

Scope and Development of ICT specifications

The specifications need to be prepared in a clear and unambiguous manner covering hardware, software and/or services as the case may be. They should also cover supporting services such as delivery, installation, testing, commissioning, training and service responsiveness required of a supplier where necessary. These specifications need to take into account the most appropriate and latest technology

For PEs with ICT Departments a cross-functional team should be constituted to develop the specifications for ICT needs. The team should consist of the Procurement Unit, user departments and ICT Department which should coordinate the exercise. For complex ICT purchases, the team may consult the Government Information Technology Services department (GITS) located in Treasury, Nairobi, E-Government Secretariat (www.e-government.go.ke) located in the Office of the President, Nairobi and/ or the ICT Board (www.ict.go.ke) as appropriate.

For a PE that may not have an in-house ICT sections or where these sections are remotely located, advice may be obtained from other PEs through benchmarking, other organizations that have in-house ICT capacity or recognized ICT experts or consultants and service providers in their region.

It is not advisable for PEs to procure ICT needs without proper specifications and support services developed by a competent person as this may lead to purchase of inappropriate equipment and services which may not be supported.

It is the responsibility of the PU to ensure that the specifications developed are clear and complete to enable a competitive response from potential bidders.

Technical specifications

Technical specifications will generally include a combination of the following:

a) Physical characteristics (processor size, speed, Random Access Memory etc);

b) Scalability – Able to grow with the enterprise through: i) Establishing volume of data transactions in the short, medium and long term and ensure that the equipment, software and services procured would suffice; 24 ii) Considering the number of users requiring the ICT services during the projected duration of live of the ICT system or services and ensuring licenses required are sufficient; iii) Giving consideration for value data fields which are dynamic as the business/ economy grows by using variable field lengths as opposed to fixed lengths; and iv) Considering in-build features that allow for future expansion e.g. additional unused disk expansion slots where disks can be plugged in, and allowing for hardware or spare data fields which can be used to define customized data elements.

c) Upgradeability – Capable of being upgraded with change in technology: i) Establish that the supplier has proactive arrangements in place for future upgrades e.g. in-house research and development centre; and ii) Consider any additional costs for upgrades e.g. licenses, disks, memory etc. iii) Problem of reading old data which may be on old media or in old formats must be considered when upgrading hardware or systems and appropriate provisions made to transfer the data to new formats or media.

d) Portability – Capable of running on separate platforms: i) In the case of software, establish the number of operating systems that it supports; ii) In case of hardware, consider the location and its mode of use as this will determine the required physical size. Mobile users may require laptops while office users may require desktops.

e) Capacity/ Storage Requirements;

f) Compatibility – with existing hardware or software;

g) Interoperability – provide interface feature with other ICT products by considering any existing ICT products that would need to interface with the new products and ensure that features are available for this.

h) Support and Maintenance requirements:

i) Assess the after sales support available for the products purchased; ii) Establish contractual obligations of the supplier and the client. Develop service level agreements

clearly indicating penalties for failure to meet obligations; iii) Plan to sign a support and maintenance contract once procurement is complete. 25 i) Skill Requirements; i) Consider the availability of internal and external skills required to implement and use the ICT equipment, software or services; ii) Consider the training required for the effective and efficient use of the ICT equipment, software or service; iii) Assess the supplier's training and development capability.

j) Carry out cost benefit analysis i) Develop a business case that shows the cost benefit analysis; ii) Ensure that the benefits of the hardware/ software are more that the costs.

k) Cost Performance Effectiveness; i) Compare the features provided by the solution offered with the features required by the enterprise; ii) If the solution provided meets most of the requirements, then find out if the missing features can be easily customized.

l) Business Fitness – provides real solutions to the running of the enterprise; i) For hardware ensure that the technology is current and support for it is available into the foreseeable future; ii) Obtain references from other enterprises using similar hardware; iii) Wherever possible talk to the hardware manufacturers or read their brochures; iv) For software, ensure it can run on current state of art hardware.

m) Technology Fitness – Provides and supports current state of art technology;

n) User Friendliness – easy to learn and use;

o) Cost of Migration;

p) Operational requirements

Physical, virtual characteristics

These types of specifications are often used to design site and disaster recovery requirements. Examples include space, capacity and backup requirements.

Service specifications

Service level Agreements must be specified with corresponding penalties for failure to meet set service levels. Example: The time taken to respond and resolve to a service request e.g. when an ICT equipment or system fails.

Specifying testing and inspection

In addition to specifying performance it may be in some cases prudent to specify testing and inspection requirements in order to derive confidence in the delivered product

The following options of testing and inspection approaches can be used:

a) Review and or approval at the design stage including quality assurance documentation

b) In-process inspection
c) Pre-shipment inspection
d) d) Acceptance testing at the time of receipt, installation and /or commissioning.

In each case the procuring entity must specify the testing method and procedures to be used. The specific criteria with which to evaluate the result of the test and the party responsible for the costs of testing should be stated too

Standardization of hardware may be resorted to by a PE where it is established that it would be cost effective to do so without restricting competition.

Specifying Software

Pre-loaded Software: The PEs should specify pre-loaded software instead of leaving it to for the supplier to decide.

Load software via a disk image For large purchases and subject to a cost benefit analysis done, it may be beneficial to purchase "bare hardware" and load software via a disk image.

Sourcing involves the following:

- Finding quality sources of goods and services
- Negotiating contracts
- Establishing payment terms
- Market research
- Testing for quality
- Considering outsourcing for goods
- Establishing standards

Different Types of Sourcing

Depending on the goods you are trying to procure, you may choose to work directly with manufacturers, source from distributors, or use wholesalers. Here are sourcing examples of how these relationships might work:

- Working directly with manufacturers cuts out the middleman and may allow you to get products at the most affordable price. Not every manufacturer will work with every vendor directly, however, or they may have MOQs that exceed your abilities.
- Working with a wholesaler may allow you to get products from multiple vendors. That way in case a particular manufacturer is unable to provide you with what you need, they can still fulfill your order switching to another vendor. You will pay a mark-up on goods to work through a wholesaler, but you'll also get better pricing than through the open market – unless you can buy direct.
- Some manufacturers only sell through distributors. If that's the case, ask the manufacturer for a list of recommended distributors to make sure you can trust the

Qualification of the Suppliers

For a supplier to qualify for selection to provide specified goods or services the following evidence should be provided:

i. Evidence that the supplier has substantial involvement and experience of ICT;
ii. Experience in provision of the ICT goods or services of similar nature and value and brief information about such contracts, contracts underway or contractually committed; and names and addresses of clients who may be contacted for further information on those contracts
iii. Reports on financial standing of the bidder, such as profit and loss statements and auditor's report for the past three years' performance
v. Evidence of adequacy of working capital for the contract (access to credit and availability of other financial resources)
vi. Authority to the Procuring Entity to seek references from the bidder's banks
vii. Information regarding litigation history, in which the bidder is involved in, the parties concerned and the nature of the disputes at hand
viii. Any proposal for sub-contracting components of the services and the percentage of the value of the contract (where the scope if the procurement may warrant engagement of subcontractors)
ix. The value of other contracts currently being managed.

Verification of procured ICT services is undertaken according to the procurement policy

Procured ICT services include: data processing, telecommunication, office systems technology, professional services, hosting services, software licensing, hardware, training, maintenance

The essence of verification is to confirm that the hardware, software and the associated services are delivered by the ICT suppliers in accordance with the specifications and all the other terms and conditions of the contract. It is important to ensure that the Inspection and Acceptance Committee has members who have adequate knowledge and experience to comprehend and check the conformance and suitability of the products delivered. If such experts are not within the organization, they should be contracted from elsewhere similarly to those to assist in defining ICT needs specifications.

Procured ICT services are distributed to respective departments based on organization policy

Once services have been procured, they are distributed to the departments based on the needs assessment and the organization policy.

Disposal of ICT Equipment

Disposal of stores and equipment that have been rendered unserviceable, obsolete and surplus is to be carried out in accordance with the provisions of 44 Part X of the Public Procurement and Disposal Act 2005 and the Regulation 92 and 93 of the Public Procurement and Disposal Regulations 2006.

b) An employee in charge of unserviceable, obsolete or surplus ICT equipment shall bring the matter to attention of the Disposal Committee as stipulated in section 129 (1) of the PPD Act. Reasons for disposal may arise from multiplicity of reasons such as change in technology, lack of scalability to cater for expanded usage or being uneconomical to maintain or any other justifiable technical reasons.

c) Computers have components such as the battery and parts of the monitor which can be hazardous if not properly and safely disposed. The disposal methods used must therefore be in accordance with the NEMA guidelines for disposal of obsolete ICT equipment so as not to harm the environment. The PE should visit the NEMA website for more details (www.nema.go.ke). d) Where ICT equipment is transferred to other users, care should be taken to remove any sensitive information. Software licenses may not be transferred to other users.

- Provides additional information sources related to the learning outcome e.g. books, web links

1.2.2.1 Learning Activities

Knowledge	Learning activity	Special instructions
• Receiving requisitions from user departments • Undertaking invitation to tender or quotation	Attend a tender committee meeting in the institution	Prepare a questionnaire
• Sourcing of ICT services	Visit a supplier in the locality	Prepare an observation checklist
• Undertaking verification of procured ICT services	Visit the ICT department/lab to familiarize with these services	**P**repare a checklist
• Distributing procured ICT services	Visit the institutions stores when receiving procured items	Wear appropriate PPEs

Self-Assessment

1. In what areas would purchasing interface with ICT services design
2. How does the ICT department service other departments in an organization
3. How would an organization benefit from single sourcing while procuring ICT services

4. Purchased items are inspected on delivery according to a specified accepted quality level. In what ways would rejected items be dealt with

Tools, Equipment, Supplies and Materials

Computer
Internet connectivity
Stationery
Phones
Remotes
Software
Tablets
Network cables
Printers

References

1. Saleemi N A, Systems Theory and Management Information Systems Simplified, 2nd Edition, Nairobi Savanis Book centre (2000)
2. Nagpal D P, Computer Fundamentals, S Chand publishing (1999)
3. Luehrmann arthur, Computer Literacy, McGraw-Hill, (1983)
4. Stallings William, Data and Computer Communications, 10th Edition, Pearsons, (2013)
5. The Chartered Institute of Purchasing and Supply, Purchasing and Supply Chain Management, Pearson Education.

Sample answers for self-assessment items

1. Areas that purchasing would interface with ICT services design
   - ✓ Preparation of specifications for purchased materials and components
   - ✓ Quality assurance
   - ✓ Value engineering and value analysis
   - ✓ Information to design departments regarding availability of materials, suppliers and costs
   - ✓ Agreement of alternative when specified materials are not available
   - ✓ Issues arising from the increasing importance of buying rather than making
   - ✓ Importance of buying complete systems rather than individual components
   - ✓ Evaluation of cheaper alternative materials
   - ✓ Building co-makership
   - ✓ Creation of library of books, catalogues, journals and specifications for joint use by the design and purchasing department

2. Ways in which ICT department services other departments
   - ✓ Function of communication
   - ✓ Function of data management
   - ✓ Function of marketing

- ✓ Function of process improvement
- ✓ Function of enterprise resource planning

3. How would an organization benefit from single sourcing while procuring ICT services
   - ✓ Lower pricing due to consolidation of all requirements with one supplier
   - ✓ More consistent quality
   - ✓ Lower purchasing workload due to communication with fewer suppliers
   - ✓ Easier to manage supplier performance because of tracking fewer suppliers
   - ✓ Easier to track source of problem
4. Purchased items are inspected on delivery according to a specified accepted quality level. In what ways would rejected items be dealt with
   - ✓ Returned to the supplier at their expense for correction or replacement
   - ✓ Parts may be corrected by the purchaser and the supplier charged with the cost
   - ✓ Where rejected items are usable, although not strictly in accordance with the specification, the buyer may negotiate a price reduction

7.2.3 LEARNING OUTCOME 3: SUPERVISE ICT INSTALLATION AND MAINTENANCE

Introduction to the learning outcome

This learning outcome is to equip a trainee with skills to supervise ICT installation and maintenance. The activities include: Providing requirements of the **ICT system** installation, conducting installation process of ICT services, maintaining ICT system and reviewing ICT system.

Performance Standard

1. Requirements of the ICT system installation are provided in accordance with the nature of the service and service providers policy guidelines
2. Installation process are conducted in accordance with the ICT service provider policy and contract between the organization and the service provider
3. ICT system is maintained as per the ICT policy requirements
4. The ICT system is reviewed in accordance with the feedback gathered from the users

Information Sheet

Definition of terms

System

It is a set of organized components which interact in a given environment and within a specified boundary to achieve collective goals and objectives that are emergent.

Information system

It is an arrangement of people, data processes and information that work together to support and improve the day-to-day operations in a business and the decision making process

Requirements of the ICT system installation are provided in accordance with the nature of the service and service provider's policy guidelines

A system can be describes as being either soft or hard

Characteristics of a system

All systems have some common characteristics which include:

1. Holistic thinking
2. Subsystems
3. Boundary and environment
4. Purpose
5. Process
6. System entropy
7. Inputs and outputs

A system can either be open or closed.

The main purposes of an information system in an organization are:

- Supporting information processing by enhancing tasks such as data collection, processing and communication.
- Helping in decision making by collecting operational data, analyzing it and generating reports.
- Enable sharing of information.

The need for developing information systems is brought about by the following circumstances:

i. New opportunities
ii. Problems
iii. Directives

Stages of system development

1. Problem recognition and definition
2. Information gathering
3. Requirements specification
4. System design
5. System construction (coding)
6. System implementation
7. System review and maintenance

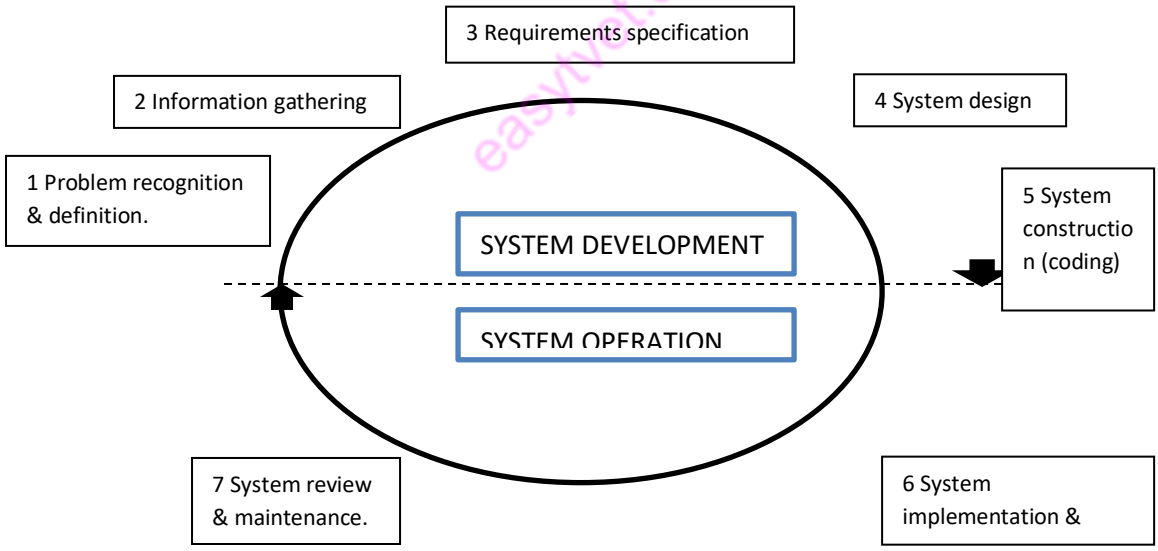

Figure 69: The system development lifecycle

Requirements specification

The system analyst must come up with the detailed requirements for a new system. The hardware and software used to develop the system mainly depends on input, output and file requirements. The following requirement specifications are considered:

1.2 Output specification: the target audience, the frequency of report generation, quality and format.

1.3 Input specification: input needed to obtain the relevant information from the system. The user interface is designed by designing data entry forms or screens.

1.4 File/data stores: number and structure of files, attributes of the records in a file. The following factors should be considered when designing a file: key attribute, type of data, length of each field and backup and recovery strategies

1.5 Hardware and software requirements. Consider factors like: price and acquisition methods, reliability, upgradability, compatibility, and user friendliness.

Installation process are conducted in accordance with the ICT service provider policy and contract between the organization and the service provider

System implantation is the process of delivering the system for use in day to day operating environment for users to start using it. The areas to be addressed during system implementation include file conversion, staff training and changeover strategies.

1. File conversion. A new system may require a change in file format for example from manual to computerize. The factors to consider are
    - Whether the new system requires a new operating system and hardware
    - Whether there is need to install new application software
    - Whether there is need to create new database files for the new system.
2. Staff training. Availability of appropriate user manuals goes a long way to make staff training easy, quick and effective.
3. Changeover strategies. Some of the changeover strategies include:
    - Straight changeover
    - Parallel changeover
    - Phased changeover

Security control measures

A lot of careful planning has to be done in order to have an inbuilt security system. This is because information is under constant threat of being illegally accessed or disclosed to unauthorized parties. System implementers must make sure that the security features built in the system are properly configured during the implementation stage.

ICT system is maintained as per the ICT policy requirements

System maintenance is the adjustment and enhancement of requirements or correction of errors after the system has been implemented. Regardless of how well the system is constructed and tested, errors may be detected when the system is in use.

System review is a formal process of going through the specifications and testing the system after implementation to find out whether it still meets the original objectives. This is also called review and audit. If the system does not meet the stated objectives, system development might start all over again.

The ICT system is reviewed in accordance with the feedback gathered from the users

MIS AUDITS An **MIS audit** is an examination of the controls within an Information technology (IT) infrastructure. The evaluation of obtained evidence determines if the information systems are safeguarding assets, maintaining data integrity, and operating effectively to achieve the organization's goals or objectives

lso known as an information systems audit, a system audit is the thorough and careful evaluation and review of the information systems present in an organization. The main aim of the audit is to check for vulnerabilities and loopholes in the system and how the productivity, efficiency, and efficacy of the system can be improved.

System audits are carried out by IT professionals who are well-versed with different information systems of a firm and how they can be used to prevent the abuse of organizational resources. IT systems play a direct role in the value of an organization's business; therefore, improving them is a must. It involves evaluating the hardware, software, data, and the users. Here are the vital steps of performing a system audit.

1. **Review**

In this phase, the system auditor tries to comprehend the management practices and various functions used at multiple levels of the IT hierarchy. This step determines whether or not the auditor will proceed with the rest of the rest.

Tasks such as observing installation procedures, interviewing installation staff, and going through installation documentation take place. Additional reviewing is carried out for the management and application controls; crucial weaknesses are identified in the management controls. Auditors also try to determine if the measures implemented in the installation controls are sufficient to bring down losses to an acceptable level.

2. **System Vulnerability is assessed**

In the next step of the audit, different applications are individually assessed to find out the most vulnerable ones. Computer systems and applications that are the most vulnerable are also the ones used for abuse. Hence, the type of application and the control of quality protocols are reviewed.

3. **Threats are identified**

Information systems are threatened by external and internal users such as programmers, system analysts, regular users, cyber security specialists, data entry operators, software services, data vendors, etc. All such people are identified by system auditors.

In the same way, events, points, and occasions are found out when the IT infrastructure was breached earlier. It can be when a transaction was carried out that might have been deleted, added or altered. There's also the possibility of risky behavior when data or programs are edited or when their operation is at fault.

4. **Internal Controls are analysed**

In this step, system auditors determine the efficacy of the information system's internal controls and whether or not they are working the way they should. They also check any missing internal controls within the system.

5. **Final Evaluation**

In the last step of the system audit, different tests are carried out for the various components of the internal control systems of the organization. The main purpose of this phase is to calculate the probability of any future losses in assets. These tests

include identifying erroneous processing, assessing the data quality, finding out inaccurate data, comparing physical counts of data, and confirming data with external sources.

How to conduct a system audit [ctrl+click] to follow link.

1.2.3.1 Learning Activities

Knowledge	Learning activity	Special instructions
• Providing requirements of the **ICT system** installation • Conducting installation process of ICT services • Maintaining ICT system	Carry out a field trip to a large manufacturing firm and analyse the firm's ICT system, installation process and maintenance	• Seek proper authorisation • Prepare a checklist
Reviewing ICT system	Visit a learning institution and carry out a review of their information system in meeting the needs of the institution	• Seek proper authorisation • Prepare a checklist • Prepare a report on the findings

Self-Assessment

1. Why is preventive maintenance a better alternative to reactive maintenance
2. What are the components of an ICT system
3. There are a number of programming techniques that can be used to construct a designed system. Which ones are these

Tools, Equipment, Supplies and Materials

- Computer
- Internet connectivity
- Stationery
- Phones
- Remotes
- Software
- Tablets
- Network cables
- Printers

References

1. Saleemi N A, Systems Theory and Management Information Systems Simplified, 2nd Edition, Nairobi Savanis Book centre (2000)
2. Nagpal D P, Computer Fundamentals, S Chand publishing (1999)
3. Luehrmann arthur, Computer Literacy, McGraw-Hill, (1983)
4. Stallings William, Data and Computer Communications, 10th Edition, Pearsons, (2013)

Sample answers for self-assessment items

1 Why preventive maintenance a better alternative to reactive maintenance
- ✓ Cost saving on the repairs
- ✓ Improved safety in the use of equipment
- ✓ Increased equipment efficiency
- ✓ Decreased downtime of machines in case of breakdown
- ✓ Improved reliability
- ✓ Conservation of assets

2 Components of an ICT system
- ✓ people
- ✓ data
- ✓ information
- ✓ hardware
- ✓ software
- ✓ procedures

3 Programming techniques that can be used to construct a designed system
- ✓ Using the high-level structured language such as Pascal COBOL
- ✓ Using fourth generation languages
- ✓ Customizing the standard packages
- ✓

7.2.4 LEARNING OUTCOME 4: INTEGRATE ICT IN OPERATIONS

Introduction to the learning outcome

The learning outcome on integrating ICT operations involves the following activities: undertaking systems networking, developing Systems of sharing

information, establishing enterprise resource planning (ERP), reporting challenges in the system and upgrading or downgrading ICT system

Performance Standard

1. Systems networking in the organization is undertaken according organization structure
2. Systems of sharing information is developed and implemented in accordance with the organization requirements
3. Enterprise resource planning (ERP) is established according to organization policy
4. Challenges in the system are reported according to the standard operating procedures
5. ICT system is upgraded or downgraded in accordance with the ICT policy

Information Sheet

Definition of terms

Computer networking

This refers to linking multiple devices so that they can readily share information and software resources.

Data communication

It is the process of transmitting data signal from one point to another through the network

Data signal

It is a voltage level in the circuit which represents the flow of data.

Signal modulation and demodulation

This is the process of converting data signals to and from a form that is suitable for transmission over a transmission medium.

Multiplexing

It is the process of sending multiple data signals over the same medium, for example, a wire conductor can be made to carry several data signals either simultaneously or at different times.

Bandwidth

It is the maximum amount of data that a transmission medium can carry at any one time.

Baseband signal

It is a digital signal that is generated and applied to the transmission medium directly without modulation.

Broadband transmission

In broadband transmission, an analog signal is sent over the transmission medium using a particular frequency.

Attenuation

This is the decrease in magnitude and energy as a signal progressively moves along a transmission medium.

Protocols

These are rules and technical procedures that govern communication between different computers.

Modes of data communication: are three, namely, simplex, half duplex and full duplex.

Types of computer networks

1. Local area network (LAN)
2. Metropolitan area network (MAN)
3. Wide area network (WAN)

Benefits of networking:

- Resource sharing
- Remote communication
- Distributed processing facilities
- Saving of organizations costs through efficient use scarce resources
- Allows reliability in communication

Limitations of networking

- Security issues
- High initial cost
- Moral and cultural effects
- Spread of terrorism and drug/child trafficking
- Over-reliance on networks

Elements of networking

1. Data communication media: bounded media and unbound media.
    (a) Bounded media: Two wire open lines cable, twisted pair cables, coaxial cable and fibre optic cables
    (b) Unbound media: Microwaves, satellite, radio waves, blue tooth technology, and infrared transmission.
2. Communication devices
    (a) Network interface cards
    (b) Modems and codes
    (c) Hubs
    (d) Bridges
    (e) Repeaters
    (f) Routers
    (g) Gateways
    (h) Switches
    (i) Wireless communication devices include: Access points, wireless antennae and personal computer memory card international association (PCMCIA)cards

3. Network software: Network operating systems and Network protocols
    (a) Network operating systems
        - Provides access to network resources

- Enables nodes on the network to communicate with each other more efficiently
- Supports inter-process communication
- Responds to requests from application programs running on the network
- Supporting network services like network and drivers and protocols
- Implementing network security features

  In most cases they are designed as multiuser operating systems that run the network server program. Once installed on the right hardware platform and configures as a server, the operating system will provide network management tools to network administrators who can use the tool to do the following

✓ Secure the network against unauthorized access.
✓ Track network usage and keep log of all the people who have used the network.
✓ Ensure inter-operatability between various systems on the network.
✓ Perform monitoring to ensure maximum output on the network.

(b) Protocols. The data transmission process over the network has to be broken down into discrete systematic steps. At each step, certain action takes place. Each step has its own rules and procedures as defined by the network protocols. Protocols are coordinated through layering to avoid conflict or incomplete operations. Network protocols are designed after the open systems interconnection (OSI) model.

	Layer	Function
7	Application layer	User applications run here and generate reuses for data transmission or open received information
6	Presentation layer	Adds formatting, displays and encryption information to the data being sent
5	Session layer	Sets up data transmission sessions between two communicating devices
4	Transport layer	Manages data transfer over the network to ensure reliability
3	Network layer	Address information is added to the packet and routing to destination
2	Data link layer	Adds error checking information and prepares data for going onto the physical connection
1	Physical layer	The data packets are finally transmitted via the network card through the transmission media in form of bits

Table 25: OSI Model

Application protocols work at the highest layer of the OSI model. Examples of application protocols include: e-mail program, simple mail transfer protocol, file transfer protocol, apple talk and apple share.

Transport protocols ensure data is passed between computers more reliably and include: transmission control protocol, sequential packet exchange, NetBEUI, Apple transaction protocol

Network protocols provide link services. They handle addressing and routing information, error checking and retransmission of requests. They include: Internet protocol, Internetwork packets exchange and NerBEUI.

4. Data signal: All messages that are sent and received through the network must be represented using a data signal. Metallic media would require an electrical signal; wireless media need electromagnetic signals while fiber optic cables need light signals. A signal can either be analog or digital.

Network topologies

This is the way in which computers and other devices have been arranged or how data is passed from one computer to another in the network. It can be viewed in two ways i.e. logical and physical topology.

(a) Logical topology: include Ethernet and token ring

(b) Physical topology: include star, bus, ring, mesh and tree/hierarchical topology.

- Definitions of terms, Methods, Processes/ procedures/ guidelines, Illustrations (photographs, pictures, videos, charts, plans, digital content links, simulations links) and case studies
- Provides additional information sources related to the learning outcome e.g. books, web links

<u>Systems of sharing information is developed and implemented in accordance with the organization requirements</u>

- An information system (IS) can be defined technically as a set of interrelated components that collect, process, store, and distribute information to support decision making and control in an organization.
- Information systems are combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings.

- Information systems are interrelated components working together to collect, process, store, and disseminate information to support decision making, coordination, control, analysis, and visualization in an organization.

Information systems can be viewed as having five major components: hardware, software, data, people, and processes.

These components collect, store, organize, and distribute data throughout the organization.

Information should be accurate, complete, cost effective, user-focused, relevant, authoritative and timely.

Systems development is systematic process which includes phases such as planning, analysis, design, deployment, and maintenance.

System Analysis and Design - Overview

Systems development is systematic process which includes phases such as planning, analysis, design, deployment, and maintenance. In systems development the primarily focus is on −

- Systems analysis
- Systems design

Systems Analysis

It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components.

System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose.

Analysis specifies *what the system should do*.

Systems Design

It is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Before planning, you need to understand the old system thoroughly and determine how computers can best be used in order to operate efficiently.

System Design focuses on *how to accomplish the objective of the system.*

System Analysis and Design (SAD) mainly focuses on −

- Systems
- Processes
- Technology

What is a System?

The word System is derived from Greek word Systema, which means an organized relationship between any set of components to achieve some common cause or objective.

A system is "an orderly grouping of interdependent components linked together according to a plan to achieve a specific goal."

Constraints of a System

A system must have three basic constraints −

- A system must have some structure and behavior which is designed to achieve a predefined objective.

- Interconnectivity and interdependence must exist among the system components.
- The objectives of the organization have a higher priority than the objectives of its subsystems.

For example, traffic management system, payroll system, automatic library system, human resources information system.

Properties of a System

A system has the following properties −

Organization

Organization implies structure and order. It is the arrangement of components that helps to achieve predetermined objectives.

Interaction

It is defined by the manner in which the components operate with each other.

For example, in an organization, purchasing department must interact with production department and payroll with personnel department.

Interdependence

Interdependence means how the components of a system depend on one another. For proper functioning, the components are coordinated and linked together according to a specified plan. The output of one subsystem is the required by other subsystem as input.

Integration

Integration is concerned with how system components are connected together. It means that the parts of the system work together within the system even if each part performs a unique function.

Central Objective

The objective of system must be central. It may be real or stated. It is not uncommon for an organization to state an objective and operate to achieve another.

The users must know the main objective of a computer application early in the analysis for a successful design and conversion.

Elements of a System

The following diagram shows the elements of a system −

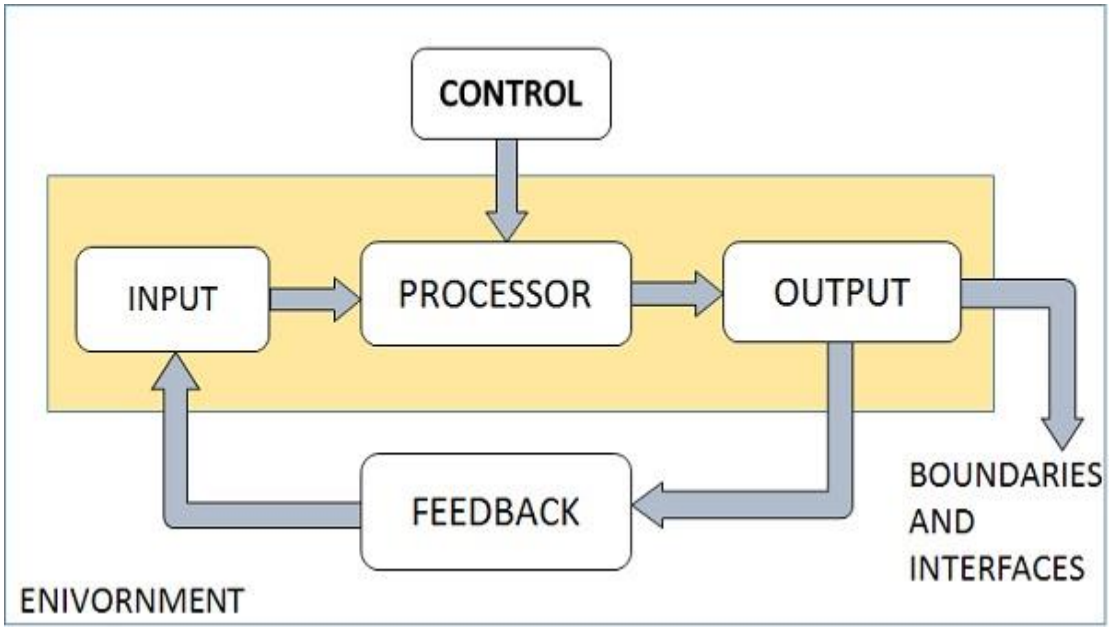

Figure 70: Elements of a system

Outputs and Inputs

- The main aim of a system is to produce an output which is useful for its user.
- Inputs are the information that enters into the system for processing.
- Output is the outcome of processing.

Processor(s)

- The processor is the element of a system that involves the actual transformation of input into output.
- It is the operational component of a system. Processors may modify the input either totally or partially, depending on the output specification.
- As the output specifications change, so does the processing. In some cases, input is also modified to enable the processor for handling the transformation.

Control

- The control element guides the system.
- It is the decision–making subsystem that controls the pattern of activities governing input, processing, and output.
- The behavior of a computer System is controlled by the Operating System and software. In order to keep system in balance, what and how much input is needed is determined by Output Specifications.

Feedback

- Feedback provides the control in a dynamic system.
- Positive feedback is routine in nature that encourages the performance of the system.

- Negative feedback is informational in nature that provides the controller with information for action.

Environment

- The environment is the "supersystem" within which an organization operates.
- It is the source of external elements that strike on the system.
- It determines how a system must function. For example, vendors and competitors of organization's environment may provide constraints that affect the actual performance of the business.

Boundaries and Interface

- A system should be defined by its boundaries. Boundaries are the limits that identify its components, processes, and interrelationship when it interfaces with another system.
- Each system has boundaries that determine its sphere of influence and control.
- The knowledge of the boundaries of a given system is crucial in determining the nature of its interface with other systems for successful design.

Types of Systems

The systems can be divided into the following types −

Physical or Abstract Systems

- Physical systems are tangible entities. We can touch and feel them.
- Physical System may be static or dynamic in nature. For example, desks and chairs are the physical parts of computer center which are static. A programmed computer is a dynamic system in which programs, data, and applications can change according to the user's needs.
- Abstract systems are non-physical entities or conceptual that may be formulas, representation or model of a real system.

Open or Closed Systems

- An open system must interact with its environment. It receives inputs from and delivers outputs to the outside of the system. For example, an information system which must adapt to the changing environmental conditions.
- A closed system does not interact with its environment. It is isolated from environmental influences. A completely closed system is rare in reality.

Adaptive and Non Adaptive System

- Adaptive System responds to the change in the environment in a way to improve their performance and to survive. For example, human beings, animals.
- Non Adaptive System is the system which does not respond to the environment. For example, machines.

Permanent or Temporary System

- Permanent System persists for long time. For example, business policies.
- Temporary System is made for specified time and after that they are demolished. For example, A DJ system is set up for a program and it is dissembled after the program.

Natural and Manufactured System

- Natural systems are created by the nature. For example, Solar system, seasonal system.
- Manufactured System is the man-made system. For example, Rockets, dams, trains.

Deterministic or Probabilistic System

- Deterministic system operates in a predictable manner and the interaction between system components is known with certainty. For example, two molecules of hydrogen and one molecule of oxygen make water.
- Probabilistic System shows uncertain behavior. The exact output is not known. For example, Weather forecasting, mail delivery.

Social, Human-Machine, Machine System

- Social System is made up of people. For example, social clubs, societies.
- In Human-Machine System, both human and machines are involved to perform a particular task. For example, Computer programming.
- Machine System is where human interference is neglected. All the tasks are performed by the machine. For example, an autonomous robot.

Man–Made Information Systems

- It is an interconnected set of information resources to manage data for particular organization, under Direct Management Control (DMC).
- This system includes hardware, software, communication, data, and application for producing information according to the need of an organization.

  Man-made information systems are divided into three types −

  a) Formal Information System − It is based on the flow of information in the form of memos, instructions, etc., from top level to lower levels of management.

  b) Informal Information System − this is employee based system which solves the day to day work related problems.

  c) Computer Based System − this system is directly dependent on the computer for managing business applications. For example, automatic library system, railway reservation system, a banking system, etc.

Systems Models

Schematic Models

- A schematic model is a 2-D chart that shows system elements and their linkages.
- Different arrows are used to show information flow, material flow, and information feedback.

Flow System Models

- A flow system model shows the orderly flow of the material, energy, and information that hold the system together.
- Program Evaluation and Review Technique (PERT), for example, is used to abstract a real world system in model form.

Static System Models

- They represent one pair of relationships such as *activity–time* or *cost–quantity*.
- The Gantt chart, for example, gives a static picture of an activity-time relationship.

Dynamic System Models

- Business organizations are dynamic systems. A dynamic model approximates the type of organization or application that analysts deal with.
- It shows an ongoing, constantly changing status of the system. It consists of −
    - Inputs that enter the system
    - The processor through which transformation takes place
    - The program(s) required for processing
    - The output(s) that result from processing.

Categories of Information

There are three categories of information related to managerial levels and the decision managers make.

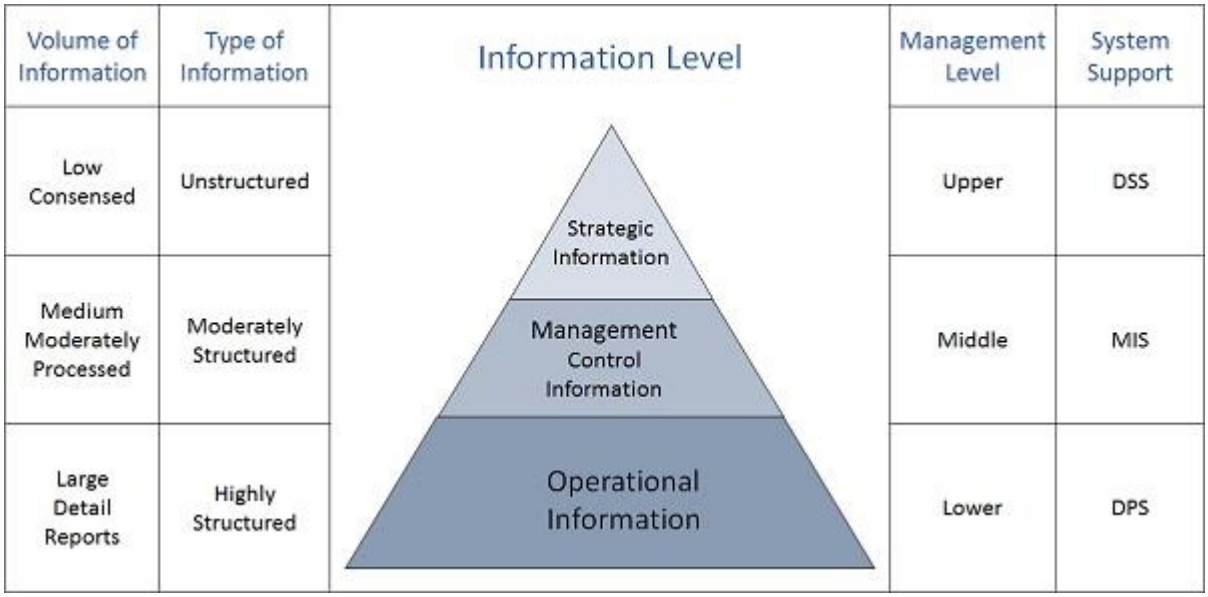

Figure 71: Categories of information in a system

Strategic information

This information is required by topmost management for long range planning policies for next few years. For example, trends in revenues, financial investment, and human resources, and population growth**.**

This type of information is achieved with the aid of decision support system (DSS).

Managerial information

This type of information is required by middle management for short and intermediate range planning which is in terms of months. For example, sales analysis, cash flow projection, and annual financial statements.

It is achieved with the aid of management information systems **(MIS).**

Operational information

- This type of information is required by low management for daily and short term planning to enforce day-to-day operational activities. For example, keeping employee attendance records, overdue purchase orders, and current stocks available.
- It is achieved with the aid of Data Processing Systems (DPS).

Enterprise resource planning (ERP) is established according to organization policy

Enterprise resource planning (**ERP**) is the integrated management of main business processes, often in real time and mediated by software and technology.

ERP is usually referred to as a category of business management software typically a suite of integrated applications—that an organization can use to collect, store, manage, and interpret data from many business activities.

ERP provides an integrated and continuously updated view of core business processes using common databases maintained by a database management system. ERP systems track business resources—cash, raw materials, production capacity—and the status of business commitments: orders, purchase orders, and payroll. The applications that make up the system share data across various departments (manufacturing, purchasing, sales, accounting, etc.) that provide the data. ERP facilitates information flow between all business functions and manages connections to outside stakeholders.

Characteristics

ERP systems typically include the following characteristics:

- An integrated system
- Operates in (or near) real time
- A common database that supports all the applications
- A consistent look and feel across modules
- Installation of the system with elaborate application/data integration by the Information Technology (IT) department, provided the implementation is not done in small steps
- Deployment options include: on-premises, cloud hosted, or SaaS

Functional areas

An ERP system covers the following common functional areas. In many ERP systems, these are called and grouped together as ERP modules:

- Financial accounting:
- Management accounting
- Human resources
- Manufacturing:
- Order processing:
- Supply chain management:
- Project management
- Customer relationship management (CRM)
- Data services:

Connectivity

ERP systems connect to real–time data and transaction data in a variety of ways. These systems are typically configured by systems integrators, who bring unique knowledge on process, equipment, and vendor solutions.

Direct integration—ERP systems have connectivity (communications to plant floor equipment) as part of their product offering. This requires that the vendors offer specific support for the plant floor equipment their customers operate.

Database integration—ERP systems connect to plant floor data sources through staging tables in a database. Plant floor systems deposit the necessary information into the database. The ERP system reads the information in the table. The benefit of staging is that ERP vendors do not need to master the complexities of equipment integration. Connectivity becomes the responsibility of the systems integrator.

Enterprise appliance transaction modules (EATM)—these devices communicate directly with plant floor equipment and with the ERP system via methods supported by the ERP system. EATM can employ a staging table, web services, or system–specific program interfaces (APIs). An EATM offers the benefit of being an off–the–shelf solution.

Custom–integration solutions—many system integrators offer custom solutions. These systems tend to have the highest level of initial integration cost, and can have a higher long term maintenance and reliability costs. Long term costs can be minimized through careful system testing and thorough documentation. Custom–integrated solutions typically run on workstation or server-class computers.

Implementation

ERP's scope usually implies significant changes to staff work processes and practices. Generally, three types of services are available to help implement such changes—consulting, customization, and support.[1] Implementation time depends on business size, number of modules, customization, the scope of process changes, and the readiness of the customer to take ownership for the project. Modular ERP systems can be implemented in stages. Customization can substantially increase implementation times.

Process preparation

Implementing ERP typically requires changes in existing business processes. Poor understanding of needed process changes prior to starting implementation is a main reason for project failure. The difficulties could be related to the system, business process, infrastructure, training, or lack of motivation.

It is therefore crucial that organizations thoroughly analyze business processes before they implement ERP software. Analysis can identify opportunities for process modernization. It also enables an assessment of the alignment of current processes with those provided by the ERP system. Research indicates that risk of business process mismatch is decreased by:

- Linking current processes to the organization's strategy
- Analyzing the effectiveness of each process
- Understanding existing automated solutions

ERP implementation is considerably more difficult (and politically charged) in decentralized organizations, because they often have different processes, business rules, data semantics, authorization hierarchies, and decision centers. This may require migrating some business units before others, delaying implementation to work through the necessary changes for each unit, possibly reducing integration (e.g., linking via Master Data management) or customizing the system to meet specific needs.

A potential disadvantage is that adopting "standard" processes can lead to a loss of competitive advantage. While this has happened, losses in one area are often offset by gains in other areas, increasing overall competitive advantage.

Configuration

Configuring an ERP system is largely a matter of balancing the way the organization wants the system to work with the way it was designed to work. ERP systems typically

include many settings that modify system operations. For example, an organization can select the type of inventory accounting—FIFO or LIFO—to use; whether to recognize revenue by geographical unit, product line, or distribution channel; and whether to pay for shipping costs on customer returns.

Two-tier enterprise resource planning

Two-tier ERP software and hardware lets companies run the equivalent of two ERP systems at once: one at the corporate level and one at the division or subsidiary level. For example, a manufacturing company could use an ERP system to manage across the organization using independent global or regional distribution, production or sales centers, and service providers to support the main company's customers. Each independent center (or) subsidiary may have its own business models, workflows, and business processes.

Given the realities of globalization, enterprises continuously evaluate how to optimize their regional, divisional, and product or manufacturing strategies to support strategic goals and reduce time-to-market while increasing profitability and delivering value. With two-tier ERP, the regional distribution, production, or sales centers and service providers continue operating under their own business model—separate from the main company, using their own ERP systems. Since these smaller companies' processes and workflows are not tied to main company's processes and workflows, they can respond to local business requirements in multiple locations.

Factors that affect enterprises' adoption of two-tier ERP systems include:

- Manufacturing globalization, the economics of sourcing in emerging economies
- Potential for quicker, less costly ERP implementations at subsidiaries, based on selecting software more suited to smaller companies
- Extra effort, (often involving the use of Enterprise application integration) is required where data must pass between two ERP systems Two-tier ERP strategies give enterprises agility in responding to market demands and in aligning IT systems at a corporate level while inevitably resulting in more systems as compared to one ERP system used throughout the organization.

Customization

ERP systems are theoretically based on industry best practices, and their makers intend that organizations deploy them "as is". ERP vendors do offer customers configuration options that let organizations incorporate their own business rules, but gaps in features often remain even after configuration is complete.

ERP customers have several options to reconcile feature gaps, each with their own pros/cons. Technical solutions include rewriting part of the delivered software, writing a homegrown module to work within the ERP system, or interfacing to an external system. These three options constitute varying degrees of system customization—with the first being the most invasive and costly to maintain. Alternatively, there are non-technical options such as changing business practices or organizational policies to better match the delivered ERP feature set. Key differences between customization and configuration include:

- Customization is always optional, whereas the software must always be configured before use (e.g., setting up cost/profit center structures, organizational trees, purchase approval rules, etc.).
- The software is designed to handle various configurations and behaves predictably in any allowed configuration.
- The effect of configuration changes on system behavior and performance is predictable and is the responsibility of the ERP vendor. The effect of customization is less predictable. It is the customer's responsibility, and increases testing activities.
- Configuration changes survive upgrades to new software versions. Some customizations (e.g., code that uses pre–defined "hooks" that are called before/after displaying data screens) survive upgrades, though they require retesting. Other customizations (e.g., those involving changes to fundamental data structures) are overwritten during upgrades and must be re-implemented.

Customization advantages include that it:

- Improves user acceptance
- Offers the potential to obtain competitive advantage vis-à-vis companies using only standard features

Customization disadvantages include that it may:

- Increase time and resources required to implement and maintain
- Hinder seamless interfacing/integration between suppliers and customers due to the differences between systems
- Limit the company's ability to upgrade the ERP software in the future
- Create overreliance on customization, undermining the principles of ERP as a standardizing software platform

Extensions

ERP systems can be extended with third–party software, often via vendor-supplied interfaces. Extensions offer features such as:

- product data management
- product life cycle management
- customer relations management
- data mining
- e-procurement

Data migration

Data migration is the process of moving, copying, and restructuring data from an existing system to the ERP system. Migration is critical to implementation success and requires significant planning. Unfortunately, since migration is one of the final activities before the production phase, it often receives insufficient attention. The following steps can structure migration planning:

- Identify the data to be migrated.
- Determine the migration timing.
- Generate data migration templates for key data components
- Freeze the toolset.

- Decide on the migration-related setup of key business accounts.
- Define data archiving policies and procedures.

Often, data migration is incomplete because some of the data in the existing system is either incompatible or not needed in the new system. As such, the existing system may need to be kept as an archived database to refer back to once the new ERP system is in place.

Benefits

- ERP creates a more agile company that adapts better to change. It also makes a company more flexible and less rigidly structured so organization components operate more cohesively, enhancing the business—internally and externally.
- ERP can improve data security in a closed environment. A common control system, such as the kind offered by ERP systems, allows organizations the ability to more easily ensure key company data is not compromised. This changes, however, with a more open environment, requiring further scrutiny of ERP security features and internal company policies regarding security.
- ERP provides increased opportunities for collaboration. Data takes many forms in the modern enterprise, including documents, files, forms, audio and video, and emails. Often, each data medium has its own mechanism for allowing collaboration. ERP provides a collaborative platform that lets employees spend more time collaborating on content rather than mastering the learning curve of communicating in various formats across distributed systems.
- ERP offers many benefits such as standardization of common processes, one integrated system, standardized reporting, improved key performance indicators (KPI), and access to common data. One of the key benefits of ERP; the concept of integrated system, is often misinterpreted by the business. ERP is a centralized system that provides tight integration with all major enterprise functions be it HR, planning, procurement, sales, customer relations, finance or analytics, as well to other connected application functions. In that sense ERP could be described as "Centralized Integrated Enterprise System (CIES)

Disadvantages

- Customization can be problematic. Compared to the best-of-breed approach, ERP can be seen as meeting an organization's lowest common denominator needs, forcing the organization to find workarounds to meet unique demands.
- Re-engineering business processes to fit the ERP system may damage competitiveness or divert focus from other critical activities.
- ERP can cost more than less integrated or less comprehensive solutions.
- High ERP switching costs can increase the ERP vendor's negotiating power, which can increase support, maintenance, and upgrade expenses.
- Overcoming resistance to sharing sensitive information between departments can divert management attention.
- Integration of truly independent businesses can create unnecessary dependencies.
- Extensive training requirements take resources from daily operations.
- Harmonization of ERP systems can be a mammoth task (especially for big companies) and requires a lot of time, planning, and money.
- Critical challenges include disbanding the project team very quickly after implementation, interface issues, lack of proper testing, time zone limitations,

stress, offshoring, people's resistance to change, a short hyper-care period, and data cleansing.

Challenges in the system are reported according to the standard operating procedures

MIS - The factors of Success and Failure

Many organizations use MIS successfully, others do not. Though the hardware and the software is the latest and has appropriate technology, its use is more for the collection and storage of data and its elementary processing. There are some factors which make the MIS a success and some others, which make it a failure. These factors can be summarized as follows:

Factors Contributing to Success

If a MIS is to be success then it should have all the features listed as follows

i. The MIS is integrated into the managerial functions. It sets clear objectives to ensure that the MIS focuses on the major issues of the business
ii. An appropriate information processing technology required to meet the data processing and analysis needs of the users of the MIS is selected.
iii. The MIS is oriented, defined and designed in terms of the user's requirements and its operational viability is ensured
iv. The MIS is kept under continuous surveillance, so that its open system design is modified according to the changing information needs
v. MIS focuses on the results and goals, and highlights the factors and reasons for non-achievement
vi. MIS is not allowed to end up into an information generation mill avoiding the noise in the information and the communication system.
vii. The MIS recognizes that a manager is a human being and therefore, the systems must consider all the human behavioral factors in the process of the management.
viii. The MIS recognizes that the different information needs for different objectives must be met with. The globalization of information in isolation from the different objectives leads to too much information and information and its non-use.
ix. The MIS is easy to operate and, therefore, the design of the MIS has such features which make up a user-friendly design.
x. MIS recognizes that the information needs become obsolete and new needs emerge. The MIS design, therefore, has a basic potential capability to quickly meet new needs of information.
xi. The MIS concentrates on developing the information support to manager critical success factors. It concentrates on the mission critical applications serving the needs of the top management.

Factors Contributing to Failures

Many a times MIS is a failures. The common factors which are responsible for this are listed as follows:

i. The MIS is conceived as a data processing and not as an information processing system.
ii. The MIS does not provide that information which is needed by the managers but it tends to provide the information generally the function calls for. The MIS then becomes an impersonal system.
iii. Underestimating the complexity in the business systems and not recognizing it in the MIS design leads to problems in the successful implementation.
iv. Adequate attention is not given to the quality control aspects of the inputs, the process and the outputs leading to insufficient checks and controls in the MIS.
v. The MIS is developed without streamlining the transaction processing systems in the organization.
vi. Lack of training and appreciation that the users of the information and the generators of the data are different, and they have to play an important responsible role in the MIS.
vii. The MIS does not meet certain critical and key factors of its users such as a response to the query on the database, an inability to get the processing done in a particular manner, lack of user-friendly system and the dependence on the system personnel.
viii. A belief that the computerized MIS can solve all the management problems of planning and control of the business.
ix. Lack of administrative discipline in following the standardized systems and procedures, wrong coding and deviating from the system specifications result in incomplete and incorrect information.
x. The MIS does not give perfect information to all the users in the organization.

Every report should have the following sections:

- ✓ Title page
- ✓ Table of content
- ✓ Executive summary
- ✓ Introduction
- ✓ Discussion
- ✓ Conclusion
- ✓ Recommendations
- ✓ References
- ✓ Appendices

<u>ICT system is upgraded or downgraded in accordance with the ICT policy</u>

In computing, downgrading refers to reverting software (or hardware) back to an older version; downgrade is the opposite of upgrade. Often, complex programs may need to be downgraded to remove unused or bugged features, and to increase speed and/or ease of use. The same can occur with machinery.

Users wanting to return to, or downgrade to (with some even calling it an "upgrade") because performance and familiarity issues.

Another reason could be that the user's applications do not support their new OS and they want to revert to an older version.

Upgrading is the process of replacing a product with a newer version of the same product. In computing and consumer electronics an upgrade is generally a replacement of hardware, software or firmware with a newer or better version, in order to bring the system up to date or to improve its characteristics.

Examples of common hardware upgrades include installing additional memory (RAM), adding larger hard disks, replacing microprocessor cards or graphics cards, and installing new versions of software. Many other upgrades are possible as well.

Common software upgrades include changing the version of an operating system, of an office suite, of an anti-virus program, or of various other tools.

Common firmware upgrades include the updating of the iPod control menus, the Xbox 360 dashboard, or the non-volatile flash memory that contains the embedded operating system for a consumer electronics device.

Users can often download software and firmware upgrades from the Internet. Often the download is a patch—it does not contain the new version of the software in its entirety, just the changes that need to be made. Software patches usually aim to improve functionality or solve problems with security. Rushed patches can cause more harm than good and are therefore sometimes regarded with skepticism for a short time after release. Patches are generally free.

A software or firmware upgrade can be major or minor and the release version code-number increases accordingly. A major upgrade will change the version number, whereas a minor update will often append a ".01", ".02", ".03", etc. For example, "version 10.03" might designate the third minor upgrade of version 10. In commercial software, the minor upgrades (or updates) are generally free, but the major versions must be purchased.

Companies usually make software upgrades for the following reasons:

1.) To support industry regulatory requirements

2.) To access emerging technologies with new features, and tools

3.) To meet the demands of changing markets

4.) To continue to receive comprehensive product sup

Learning Activities

Knowledge	Learning activity	Special instructions

• Undertaking systems networking • Developing Systems of sharing information • Reporting challenges in the system Upgrading or downgrade	1. Undertake a field trip to a business organization and assess the systems networks, information sharing system, upgrade and down grade 2. Assess and report on the challenges being experienced	○ Seek proper authorization ○ Prepare assessment tools ○ Prepare a checklist
Establishing enterprise resource planning (ERP	Role play on preparing a presentation on establishing an enterprise resource planning and make a power point presentation to the management	○ Gather the necessary information ○ Follow the right procedures used ○ Good power point slides, logical, good use of grammar and neat presentation

Self-Assessment

1. Distinguish between system software and application software.
2. Which are the factors that would determine the type of network topology a firm is to adopt?
3. Which are the benefits of using fibre optic cables
4. What are the characteristics of a system
5. How can validation checks be carried out on data during data input
6. What factors would be considered before purchasing any DTP software

Tools, Equipment, Supplies and Materials

- Computer
- Internet connectivity
- Stationery
- Phones
- Remotes
- Software
- Tablets
- Network cables

- Printers

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Sample answers to the self-assessment questions

1 Distinctions between a system software and an application software

- ✓ System software are designed to manage the operations of a compute and avail computer resources to the user. Application software are designed to enable the user accomplish a specific task.
- ✓ Examples of system software are Operating systems, Firmware, Networking software and Utility software
- ✓ Examples of application software are Word processor, Spreadsheets, Desktop Publishing (DTP), Databases and Computer Aided Design (CAD)
- factors that would determine the type of network topology a firm is to adopt

2 Factors that would determine the type of network topology a firm is to adopt

- ✓ Installation cost
- ✓ Number of terminals to be connected
- ✓ Expandability of the topology
- ✓ Cabling

3. Benefits of using fibre optic cables

- ✓ It is more economical choice when transmitting data over long distances
- ✓ Secure
- ✓ It is immune to electromagnetic and electrical interference which introduces noise to the signal
- ✓ Suffers low attenuation
- ✓ It has a larger band width
- ✓ Enables fast transmission of data

- ✓ They use light signal in data transmission and hence they do not emit electrical signals and hence can be used in highly flammable areas

4. Characteristics of a system
   - ✓ Holistic thinking
   - ✓ Subsystems
   - ✓ Process
   - ✓ Open and closed system
   - ✓ System entropy
   - ✓ Purpose
   - ✓ Inputs and outputs
   - ✓ control
5. How validation checks be carried out on data during data input
   - ✓ Range check
   - ✓ Type check
   - ✓ Length check
   - ✓ Spelling/grammar check
   - ✓ Data consistency
   - ✓ Presence check
   - ✓ Reasonableness
6. Factors that would be considered before purchasing any DTP software
   - ✓ Cost of the software
   - ✓ The available features
   - ✓ User-friendliness
   - ✓ Availability in the market
   - ✓ After sales support
   - ✓ Compatibility with the existing software
   - ✓ Memory capacity it occupies on the machine

7.2.5 LEARNING OUTCOME 5: CONDUCT ICT USER TRAINING

Introduction to the learning outcome

This learning outcome is conducting ICT user training. The activities involved include: Carrying out training needs assessment, setting training objectives, preparing training programmes preparing training budget, obtaining training resources, carrying out ICT training, carrying out evaluation of training, preparing and sharing training report

Performance Standard

1. Training needs assessment is carried out in accordance with HR training procedures
2. Training objectives are set based on training needs
3. ICT Training programmes is prepared as per HR procedures
4. ICT Training budget is prepared according to organization finance procedures and policy
5. ICT Training resources are obtained in accordance with budget
6. ICT training is carried out as per training programme and budget
7. Evaluation of training is carried out as per training needs and objectives set
8. Training report is prepared and shared according to organization procedures

Information Sheet

Definition of terms

Training

It is the act of increasing the knowledge and skills of an employee for performing the job assigned to him. Training has been defined by different scholars of management. Some important definitions of training are as under.

Introduction

Training is an activity leading to skilled behavior, the process of teaching employees the basic skills they need to perform their jobs. The heart of a continuous effort designed to improve employee competency and organizational performance.

Training typically focuses on providing employees with specific skills or helping those correct deficiencies in their performance.

It is a short-term learning process that involves the acquisition of knowledge, sharpening of skills, concepts, rules, or changing of attitudes and behaviors to enhance the performance of employees.

So, Training is a social and continuous process of increasing skills, knowledge, attitudes and efficiency of employees for getting better performance in the

Definition of Training

According to Garry Dessler, “Training is the process of teaching new employees the basic skills they need to perform their jobs”.

According to Jack Halloran, “Training is the process of transmitting and receiving information related to problem-solving”.

Objectives of Training program

The chief aim of formal education for the manager is to increase his ability to learn from experience. The second aim is to increase his ability to help his subordinates to learn from experience.

According to McGregor, there are three different purposes for training.

1. Acquiring Intellectual Knowledge.
2. Acquiring Manual Skills.
3. Acquiring Problem Solving Skills.

Steps in Training Process/Phases of Training

1. Decide If Training is needed.
2. Determine What Type of Training is needed.
3. Identifying Goals and Objectives.
4. Implementing Training.
5. Evaluation of the Training Program.

Step 1: Decide If Training is needed

In order to compete effectively, firms must keep their employees well trained. The first step in the training process is a basic one, to determine whether a problem can be solved by training.

The first step in the Training process is to determine Training needs. The overall purpose of the assessment phase is to determine if training is needed and, if so, to provide the information required designing the training program.

Training is conducted for one or more of these reasons:

- Required legally or by order or regulation,
- To improve job skills or move into a different position,

- To make an organization to remain competitive and profitable.

  If employees are not performing their jobs properly, it is often assumed that training will bring them up to standard. This may not always be the case. Ideally, training should be provided before problems or accidents occur and should be maintained as part of quality control.

  The assessment consists of three levels of analysis: organizational, task, and person.

  1. **Organizational Analysis:** It is an examination of the kinds of problems that an organization is experiencing and where they are located within an organization.

  2. Organizational Analysis**:** It is an examination of the kinds of problems that an organization is experiencing and where they are located within an organization.

  3. Task/Operational Analysis: An operational analysis identifies the kinds of the skills and behaviors required of the incumbents for a given job and the standards of performance that must be met.

  4. Personnel Analysis**:** The objective of the personnel analysis is to examine how well individual employees are performing their jobs. Training should be given to those who need it. Assigning all employees to a training program, regardless of their skill levels, is a waste of organizational resources and create an unpleasant situation for employees who do not need training. The objectives of training must be clarified, related to the areas identified in the task analysis, and should be challenging, precise, achievable, and understood by all.

Step 2: Determine What Type of Training is needed

The employees themselves can provide valuable information on the training they need. They know what they need/want to make them better at their jobs. Just ask them!

Also, regulatory considerations may require certain training in certain industries and/or job classifications.

Once the kind of training that is needed has been determined, it is equally important to determine what kind of training is not needed.

Training should focus on those steps on which improved performance is needed. This avoids unnecessary time lost and focuses the training to meet the needs of the employees.

Step 3: Identifying Goals and Objectives

Once the employees' training needs have been identified, employers can then prepare for the training.

Clearly stated training objectives will help employers communicate what they want their employees to do, to do better, or to stop doing!

Learning objectives do not necessarily have to be written, but in order for the training to be as successful as possible, they should be clear and thought-out before the training begins.

Step 4: Implementing Training

Training should be conducted by professionals with knowledge and experts.

Training should be conducted by professionals with knowledge and expertise in the given subject area.

Nothing is worse than being in a classroom with an instructor who has no knowledge of what they are supposed to be teaching! Use in-house, experienced talent or an outside professional best option.

The training should be presented so that its organization and meaning are clear to employees. An effective training program allows employees to participate in the training process and to practice their skills and/or knowledge.

Employees should be encouraged to become involved in the training process by participating in discussions, asking questions, contributing their knowledge and expertise, learning through hands-on experiences, and even through role-playing exercises.

Actually for making the training program effective the targeted group employee and the using of methods such as On-the-job or Off-the-job training should select first. The capacity and knowledge of trainers and their acceptance by the participants are of secondary importance.

1. **On the job:** Training is administered at the actual work site using the actual work equipment

2. **Off the job:** Training is administered away from the actual work site. It may be any prominent hall room or auditorium but the required training environment equipment and materials should be available or arranged there.

The training program that results from the assessment should be a direct response to an organizational problem or need. Approaches vary by location, presentation, and type.

Step 5: Evaluation of the Training Program

One way to make sure that the training program is accomplishing its goals is by using an evaluation of the training by both the trainees and the instructors Training should have, as one of its critical components, a method of measuring the effectiveness of the training.

*Evaluations of the training program will help employers or supervisor***s** determine the amount of learning achieved and whether or not an employee's performance has improved on the job as a result.

Assess the program's success or failures. The credibility of training is greatly enhanced when it can be shown that the organization has benefited tangibly from such programs.

Organizations have taken several approaches in attempting to determine the worth of specific programs.

In this phase, the effectiveness of the training is assessed.

Effectiveness can be measured in monetary or non-monetary terms. It is important that the training is assessed on how well it addresses the needs it was designed to address.

- **Participants Opinions:** Evaluating a training program by asking the participants' opinions of it is an inexpensive approach that provides immediate response and suggestions for improvements. The basic problem with this type of evaluation is that it is based on opinion rather than fact. In reality, the trainee may have learned nothing, but perceived that learning experiences have occurred.

- **The extent of Learning:** Some organizations administer tests to determine what the participants in the training program have learned. The pretest, posttest, control group design is one evaluation procedure that may be used.

- **Behavioral Change:** Tests may indicate fairly accurately what has been learned, but they give little insight into desired behavioral changes.

- **The accomplishment of Training Objectives:** Still another approach to evaluating training programs involves determining the extent to which stated objectives have been achieved.

- **Benchmarking:** Benchmarking utilizes exemplary practices of other organizations to evaluate and improve training programs. It is estimated that up to 70 percent of American and recently European and Indian firms engage in some sort of benchmarking.

- **A Case for Simplicity:** Value is the measure of impact and positive change elicited by the training.

Advantages of Training Program

Training brings about benefit/ advantages both to the organization and employees. Let us have a look at these:

Advantages to the Organization

Goldstein and Gilliam also outlined six reasons why companies believe that investments in training can help them gain a competitive advantage.

1. **Increased efficiency of employees:** An effective training program can make the employees of the company work in an effective manner. With training, people gain confidence and this confidence is seen in the output and results.

2. **Reduced supervision:** An employee needs to be supervised when he works. When the employee has got sufficient training the amount of supervision required is less as mistakes are less. This reduces the workload of the supervisor.

3. **Less amount of wastage:** The amount of wastage by an employee reduces a lot due to training and therefore if we take an account of the amount of wastage we find that the company has saved a lot of money.

4. **Reduced turnover:** Proper training improves the chances of obtaining promotions and employees are happy because they have better opportunities. This will be lowering employee turnover intention and hence labor turnover in the company

5. **Helps in better functioning of the organization:** Training always benefits employees, whether old or new. In the case of new employees, training helps them a lot. This is because new employees may not be aware of the functioning of the organization and training helps them to gain knowledge and insight into the working of the company.

6. **Better labor-management relations:** Labor-management relations are very essential for any organization. When companies introduce training programs and prepare employees for future jobs and promotions they send out a message to the unions that they are interested in employee welfare. Due to this the unions also adopt a positive attitude and labor-management relations improve.

Advantages to the Employee

Contributing to the debate on the general benefits of employee training and development, McNamara (2008) stated numerous benefits.

A training program has the following advantages. Advantages to the Organization are:

1. **Self-confidence:** Training leads to an increase in employee self-confidence. The person is able to adjust to his work environment and doesn't feel humiliated in front of his seniors. This confidence leads to chances of better efforts in the future of the employees.

2. **Increased motivation levels:** Training brings a positive attitude among employees and increases the motivation levels of the employees in the organization, thereby improving the results of the organization.

3. **High rewards:** An effective training program helps an employee to take the benefit of the reward systems and incentives available in the company. Thus the employee is able to get these rewards, which in turn increases his motivation levels.

4. **Group efforts:** An effective training program not only teaches an employee how to do his work but also trains him to work as a part of the group. Thus training program improves group efforts.

5. **Promotion:** Effective training program increase performance and increase the chances of obtaining promotions. Many employees even opt for a certain program so that they can help the employee improve his chances of promotions and obtaining higher positions in the organization.

Principles of Training

The training must be a continuous process; must be planned systematically in order to accomplish the desired results efficiently; must result in benefits both to the organization as well as employee

According to Littlefield, C. I. and Rachel, R., in order for the training program to be effective, the following principles must form the basis for training programs:

1. Training is most effective when the learning experience occurs under conditions that are identical to the actual conditions that occur on the job.

2. Training is most effective if the supervisor, who is training the employees, is made responsible for the progress of the candidate and overall results of the training program.

3. Training is most effective if the learner is given helpful, friendly and personal attention and instruction. This would create self-confidence in the employee and the desire to do better.

Identifying the Training Needs

Training needs analysis seeks to answer the questions, who if any, need training?

And what training do they need?

The questions may be very simple ones, but getting good answers to these questions constitute one of the most difficult steps in the total training process.

A training need exists when an individual lacks the knowledge or skills required for the execution of an assigned task satisfactorily.

The purpose of a training needs identification exercise, therefore, is to identify the gap between required and the actual competencies so as to determine the kinds of training that would help bridge the gap.

It is important to assess whether there is a need for training.

Two elements need consideration in carrying out a training needs analysis such as the job requirements and the person requirements.

At the same time, Robbins and Decenzo suggest that management can determine the training needs of an employee by answering four questions:

1. What are the organization's goals?

2. What tasks must be completed to achieve these goals?

3. What behaviors are necessary for each job incumbent to complete his assigned tasks?

4. What deficiencies, if any, do incumbents have in the skills, knowledge or attitudes needed to perform the necessary behaviors?

These questions demonstrate the close link between human resources planning and determination of training needs. Based on the determination of the organization's needs, the type of work that is to be done, and the type of skills and knowledge necessary to complete the work, a training program should be followed naturally.

Need for Training Policy

To ensure consistency in training and development function, the HR department of each organization develops a suitable training policy, defining the scope, objective, philosophy, and techniques. Such a training policy serves the following purposes:

1. It defines what the organization intends to accomplish through training;

2. It indicates the type of persons to be responsible for training functions;

3. It identifies the formal and informal nature of training;

4. It spells out the duration, time and place of training;

5. It indicates the need for engaging outside institutions for training;

6. It embraces and includes training in relation to the labor policies of the organization.

Methods for Determining Training Needs

HRM experts have identified the different methods for the identification of training needs.

These methods are briefly discussed below:

1. Observation and analysis of job performance;
2. Management recommendations;
3. Staff conferences and recommendations;
4. Analysis of job requirements;
5. Consideration of current and projected changes;
6. Surveys, reports, and inventories;

Once it has been determined that training is necessary, training goals must be established. Management should state what changes or results are sought for each employee.

These goals should be tangible, measurable and verifiable. Goals should be clear to both, management and employee. Both should know what is expected from the training effort.

What is a Training Budget

There is no real need to go into lengthy explanations about the training budget definition, but it's good to have a general idea of what it is and what it isn't**.** Think of it as all direct and indirect costs associated with courses and materials needed to analyze, design, develop, implement, evaluate, and maintain employee training or retraining.
In some sectors, there is an ongoing requirement for maintaining certifications to adhere to local, state and professional regulations related to their jobs. This can create substantial expense for small and medium companies.

Creating a training budget plan is not just necessary from a regulatory point of view, but it does make sense financially**.** It is one way to ensure your personnel has the skills and competencies required to complete tasks up to the required standard of quality.
The question becomes how to prepare training budgets without breaking the bank? Let's look at a few ways to maximize the return on your training cost.

How much do companies spend on training

Many medium and large organizations invest anywhere from 2 to 5% of salary budgets back into training**.** While that may not be realistic for a small business, it's important to find a training budget per employee your company can absorb. For this purpose, you can go on a 'needs' basis. For example, outside trainers can seem attractive, but they are not absolutely necessary.

Sometimes, senior employees under management supervision can do just as good a job as external training providers, and they'll cost you next to nothing. Of course, it all depends on the type of training you're interested in, as some professional and industry-specific subjects can't be handled internally.

Before you begin planning your budget, start by assessing the training needs of your business**.** You may need to focus on researching which skill deficit is affecting productivity and performanc**e**. This way, your program can identify and focus on the real issues and actual needs of the business and its employees, and your training budget can be put to good use.

How to manage training expenses

Budgeting for your company's training needs does not mean using surplus money when you have it. Ideally, you need to build a separate line item for training into your annual budget. A training budget should factor in the following costs:

· Initial briefing about the training program
· Training delivery (e.g. classes, video tutorials, eLearning, course fees)
· Training materials (workbooks, videos)
· Staff time (including replacement time)
· Instructor fee (if applicable)
· Travel, lodging or meal expenses required to participate (if applicable)
· Ongoing training (upkeep)
· Contingencies

Upon approval, your training budget needs to be carefully managed if you want to stay on track**.** This responsibility lies with the HR department. Naturally, every now and then there will be extra costs due to unforeseen events, such as employees quitting or temporarily leaving the company (maternity leave, sick days, vacations, etc.).

Bear in mind that training costs increase if you need to rely on external resources. As your company and staff grow, your training cost per employee will increase as well.

Keep in mind that the most important item in effective cost management is to understand the cost-revenue structure of your business**.** When you take a strategic view of your training program, you can accurately determine what your company needs and how to go about delivery in the most cost-efficient way possible.

Prioritize and develop a clear understanding of how the learning and development activities can be factored into your organization's strategy**.** This will allow you to achieve the desired results without going over the budget.

Optimizing training structure and minimizing costs

Once you have prioritized the training needs of your employees and drafted an initial training budget, you can look at ways to maximize its cost efficiency. Once you look at the cumulative expenses of training cost per employee, you can consider several ways of reducing them:

Internally

There are a lot of options for employers who can't afford to bring outside help and they can produce adequate results in training your employees. These include:

- Group training**:** earn volume discounts by training multiple employees at once.
- Find Trainers within your company**:** focus on training one employee with strong communication and interaction skills and have them train the rest. You can expand their job description to include training their colleagues.
- Hosting Weekly or Monthly events**:** These don't have to be formal and are a great way for team members to get involved, educated and motivated. Select a topic of discussion in advance and cover all questions and concerns they may have. Listen to the information they're sharing and synthesize it in follow-up e-mails or memos for quick access.
- Cross-training employees**:** This is common practice in businesses that rely on an agile workforce. Give your employees new roles or responsibilities and have them sit with someone who is comfortable performing the tasks you want them to learn. Change roles frequently to keep your employees motivated and continuously learning.
- Starting a Mentorship Program**:** Expanding on cross-training employees, a mentorship program benefits new and inexperienced workers without having you actually pay for their training. Have a senior worker act as a mentor and ease their transition into your corporate environment. The added benefit of a mentorship program is increased accountability.

Externally

External training resources don't have to break the bank and throw your training budget out of order**.** If you're smart about how you distribute resources and take advantage of industry-specific offers, there are ways to optimize your training costs:

- Re-using materials**:** most training materials such as videos have a long shelf life and may be used repeatedly. A lot of offices don't want to have anything lying around that's not constantly in use, but text books, CDs, and DVDs can be stored and used for new employees, so don't be quick to throw them away just yet.
- ELearnin**g:** electronic options are more affordable than traditional training. ELearning is usually associated with decreased material costs as all or most of the training information is available online. It allows for flexibility and reduces travel costs too, as employees can access courses remotely. The eLearning model supports the learner's development in real-time and offers a certain degree of personalizatio**n** and synchronization.
- Associations or Trade Groups**:** some industry associations offer discounted or free training program**s** for members at annual events, online, and through seminars.
- Turning to your Vendors and Clients**:** you can negotiate free or reduced-cost training from your vendors for specific projects or products. Clients are motivated to invest in training if it means they will receive better service.

You can use these techniques individually or try a combination based on your business needs. Ultimately, having the right training program in place will save you money in the long run.

Supporting Company Goals through Efficient Training Budgets

Ultimately, efficient training cost management comes down to employee commitment**.** If you want to be successful you need to factor in this component. This means setting specific goals for employees that you expect them to achieve.

Of course, they shouldn't feel pressured that their jobs depend on it, but holding them accountable is part of the dynamic of your working relationship.

Many employers use training courses as part of employee annual performance reviews to address competency gaps, as well as employees' desired areas of improvement. This includes setting specific training goals for each employee and letting them know they are monitored.
It's a good idea to assess the impact training has had on their overall skills and performance on a monthly and annual basis as well.

If you are paying for outside classes to improve their knowledge on a specific subject, get employees to commit to working for you for a specified period of time after completing the training**.** You can have your HR department include a reimbursement clause in their employment contract if they aren't able to fulfill the agreement.
Ultimately, you want to have the full support for training efforts from your senior staff and HR employees**.** If they understand the long-term value of employee development and training budget allocation, they will be able to assist you in every way possible.

What is a Training Report?

Generally, a training report will evaluate the positive and negative aspects of a training program after the event has occurred. As such, you'll start by defining the training program with a cover page that includes the name, location and date of the training. Include the date of the report, the author's name and contact information in a second block of information on the cover page. Depending on the duration of the training, some reports are necessarily longer than others. An annual review of a multi-city weekly training program is longer than a report concerning a two-hour training program, for example. Long reports incorporate a table of contents so readers can easily navigate the data.

Describe the Background and Objectives

Depending on the length of the report, training program background and objectives might be written as separate sections. Short reports often combine these components. The background component describes a training summary and how information for the report was gathered. Reports might include feedback from trainers and attendee reviews or surveys. Define why the training occurred and what leadership sought to accomplish by appropriating resources for the program. If the program doesn't define why the training occurred, it isn't possible to properly evaluate whether the objectives were met.

Describe the Training Methods and Activities

Include an explanation for how the training was conducted. Describe the presentation content as well as participant workshop exercises and the duration of each. Detail how learning aids were used in the course of the training program. Also, discuss any field trips that occurred in the course of the training.

Break this section into subsections if the training was extensive, conducted over extended periods of time and across geographic areas, or had many different types of activities. For example, a three-day sales-training workshop could have guest speakers, a sales manager breakout session and a ropes course for team building. Each of the speakers, sessions and the ropes course are explained in different subsections.

List Your Key Findings and Recommendations

Since the objectives and methods were previously defined, this section highlights the key takeaways. Review key feedback common in surveys. Be specific but don't get bogged down in too many details. The conclusions discuss potential implications to the organization based on the key findings. Make recommendations a separate section. Avoid combining recommendations with conclusions. There may be some overlap with the ideas discussed in key findings. However, keeping recommendations separate allows readers to succinctly find information to help the organization move forward productively.

Attach Supporting Documentation

Include supporting documents such as copies of training materials, slide presentations or agendas. This information is supplemental but helps future training program planner's review exactly where new changes can be implemented during training.

Parts of a Training report

- Introduction and background
- Rationale for the **t**raining.
- Broad and specific objective of the training
- Training method(s)
- List of materials distributed
- Planning activities
- Participant's evaluation and feedback.

Conclusion

In the age of globalization, knowledge is becoming a reliable source of sustained competitive advantage. It is becoming a basic capital and the trigger of development.

Modern organizations therefore use their non-HR resources (money, time, energy, information, etc.) for permanent training and development of their human resources.

Since the organizational knowledge is largely located inside the human mind, i.e. the head of employees, as carriers of knowledge and activities, human resources are becoming the key factor of business success.

Organizational development is always conditioned by human knowledge and skills. This is why; contemporary organizations pay more and more attention to the development of their employees.

Thus, employee education and training are becoming an optimal answer to complex business challenges, and the management of the human resource is taking a central role in modern management.

Employees are hired based on their current knowledge. New employees may not be able to perform their assigned job satisfactorily. As time goes on knowledge becomes obsolete.

Often they must be trained to the duties they are expected to do. Even the experienced employees in a new job need the training to improve their performance.

Through the process of employee training and development, the management of human resources provides constant knowledge innovation, creates conditions for mutual knowledge and experience exchange, and proactive behavior- in this way contributing to competitive advantage and satisfaction of all participants in business procedures.

Training is not a luxury; it is a necessity if companies are to participate in the global electronic marketplaces by offering high- quality products and services.

Training is the process of providing required skills to the employee for doing the job effectively, skillfully and qualitatively. Training of employees is not continuous, but it is periodical and given in specified time. Generally, training is given by an expert or professional in the related field or job.

Thus, training is a process that tries to improve skills or add to the existing level of knowledge so that the employee is better equipped to do his present job or to mold him to be fit for a higher job involving higher responsibilities. It bridges the gap between what the employee has'& what the job demands.

Training is required at every stage of work and for every person at work. To keep one updated with the fast-changing technologies, concepts, values, and environment, training plays a vital role.

Training programs are also necessary for any organization for improving the quality of the work of the employees at all levels. It is also required when a person is moved from one assignment to another of a different nature.

Taking into account this context, this chapter aims at providing insight into the concept, need and methods of training, also areas of evaluation of training, retraining, and dimensions of organizational learning.

Learning Activities

Knowledge	Learning activity	Special instructions
• Carrying out training needs assessment • Setting training objectives • Preparing training programs	Visit a large organization within your locality and carry out an ICT	• Wear appropriate PPEs • Seek proper authorization

• Preparing training budget • Obtaining training resources	training needs assessment, set the objectives, prepare a budget and identify the resources required	• Prepare a checklist
• Carrying out ICT training	Role play on conducting the ICT training	Role play with appropriate participants, materials, venue.
• Carrying out evaluation of training Preparing and sharing training report	Prepare a power point presentation how you would carry out the evaluation and a training report	Properly prepared slides

Self-Assessment

1. How does an organization benefit from training its employees
2. Which are the ways of evaluating a training program
3. Which are the on job training methods that can be used in an organization
4. How would the training needs of employees be identified
5. Why is it important to set training objectives

Tools, Equipment, Supplies and Materials

- Compuer
- Internet connectivity
- Stationery
- Phones
- Remotes
- Software
- Tablets
- Network cables
- Printers

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Sample answers for self-assessment items

1 How an organization benefits from training its employees

- ✓ Employees learn standard methods of performance

- ✓ Helps to reduce staff turnover
- ✓ Helps reduce production cost
- ✓ Gives employees fresh interest in work
- ✓ To keep abreast with changing technology

2 Ways of evaluating the effectiveness of a training program
- ✓ Self-assessment questionnaires
- ✓ Informal feedback from peers and managers
- ✓ Focus groups
- ✓ On-the-job observation
- ✓ Actual job performance key performance indicators

3 On job training methods that can be used in an organization
- ✓ Coaching
- ✓ Delegation
- ✓ Secondment
- ✓ Guided projects

4 How the training needs of employees would be identified
- ✓ Views of line managers
- ✓ Performance appraisal
- ✓ Company and departmental plans
- ✓ Quality and quantity of employees out put

5 Why it is important to set training objectives
- ✓ Spell out the employees targeted
- ✓ Defines the content of learning
- ✓ Helps determine the methods to be used
- ✓ Aids in determining financial allocations
- ✓ Helps in carrying out evaluation

7.2.6 LEARNING OUTCOME 6: PROMOTE ICT INNOVATION

Introduction to the learning outcome

This learning outcome is on promoting ICT innovation. The activities involved include: evaluating current technologies in ICT, identifying and conducting training needs on ICT, adopting and managing ICT new technologies and conducting impact assessment on new ICT technology uptake

Making recommendation on ICT uptake

Performance Standard

1. Current technologies in ICT are identified and evaluated according to the organizational needs
2. Training needs on ICT are identified and conducted according to the needs and approved budget
3. ICT new technologies are adopted and managed as per ICT guidelines
4. Impact assessment on new ICT technology uptake is conducted according to the organization policy
5. Recommendation on ICT uptake is made

Information Sheet

Definition of terms

Current technologies in ICT are identified and evaluated according to the organizational needs

Steps to determine if technology is right for you

1. Define the business need and goal
2. Determine if the goal could be achieved without technology
3. Conduct a simple return on investment (ROI) analysis
4. Cost
5. Return
6. Compare at least three vendors.

Evaluation criteria

Once you have heard or read about a great new technology promising a better development experience, cost-saving potential or any other benefit. Before adopting new technology it is important to consider different evaluation criteria and questions before making any investment decision.

For effective technology management, the factors to consider are:

i. **Development Cost:** Estimate the cost of integrating this technology into the organization. Development time costs money. Think of it this way: What is the cost of hiring the developers who know this technology compared to the cost of current developers.

ii. **Threat:** Estimate the risk of implementing the new technology in terms of security, financial aspect, and business viability. If you don't know what the technology will look like in the future, chances are you'll suffer from it.
iii. **Capability:** Evaluate new capabilities that this technology brings compared to what there is now. Unless the technology opens up important capabilities, chances are it isn't worth it.
iv. **Usability:** Assess if usability improves to address user's problems, for example with an app design. Do you think this new technology will address the existing usability problems?
v. **Interoperability:** Measure the level of interoperability between the technologies that support this trend and existing technologies and systems.
vi. **Integration**: Measure the ease of integration of the technology into the existing IT systems. If the integration into the existing systems is quick and easy, it gives an opportunity to realize make value using the technology faster.
vii. **Application:** Analyze the existing pilot projects or proof of concepts leveraging the technology. Try to analyze if the technology's ecosystem is expanding or shrinking.
viii. **Legal Compliance:** Scan the regulatory and compliance requirements linked to this technology implementation.
ix. **Security and Privacy:** Measure the security risks and privacy concerns coming from this technology. If the technology isn't secure, it is better not to be used for anything that needs secure technologies.
x. **Social and Cultural:** Forecast the response of the society in regard to this technology adoption.

Investing in new technology is usually a long-term decision causing wide-ranging consequences. Make sure to dedicate enough time to specify and prioritize the factors for evaluation to end up with robust decisions.

Training needs on ICT are identified and conducted according to the needs and approved budget

How to Conduct an Effective Training Needs Analysis

1. Step 1: Determine the Desired Business Outcomes. The information can be gathered from:

    - Conversations with managers and team leads
    - Company documentation (manuals, job aids, lists of job duties, etc.)
    - Evaluations of high performers currently performing the task

2. Step 2: Link Desired Business Outcomes with Employee Behavior. This will be determined by the gaps in the employees which can be identified from:

        - Observing learners on the job
        - Interviewing supervisors and managers
        - Analyzing company metrics
        - Analyzing performance reports

3. Step 3: Identify Trainable Competencies

   Determine the Cause of the Performance Gap, and Offer Solutions

   Now that you know the specific performance gap, you'll need to identify the cause, before you can identify the right solution. To do so, you should investigate all the possible factors that could affect performance, including:

   - Feedback
   - Knowledge and skills (past training)
   - Motivation
   - Capacity
   - Tools and equipment

4. Step 4: Evaluate Competencies

5. Step 5: Determine Performance Gaps
6. Step 6: Prioritize Training Needs
7. Step 7: Determine How to Train
8. Step 8: Conduct a Cost Benefit Analysis

ICT new technologies are adopted and managed as per ICT guidelines

a list of useful change management tools that you can use to adapt to new changes in your organization seamlessly.

- Flowcharts/ Process Maps
- ADKAR Analysis
- Culture Mapping
- Force Field Analysis
- Stakeholder Analysis
- Kotter's 8 Step Change Model
- Lewin's Change Model
- Gantt Charts

Essential steps to ensure change initiative are successful.

1. Identify what will be improved: Since most change occurs to improve a process, a product, or an outcome, it is critical to identify the focus and to clarify goals. This also involves identifying the resources and individuals that will facilitate the process and lead the endeavor. Most change systems acknowledge that knowing what to improve creates a solid foundation for clarity, ease, and successful implementation.

2. Present a Solid Business Case to Stakeholders: There are several layers of stakeholders that include upper management who both direct and finance the endeavor, champions of the process, and those who are directly charged with instituting the new normal. All have different expectations and experiences and

there must be a high level of "buy-in" from across the spectrum. The process of onboarding the different constituents vary with each change framework, but all provide plans that call for the time, patience, and communication.

3. Plan for the Change: This is the "roadmap" that identifies the beginning, the route to be taken, and the destination. You will also integrate resources to be leveraged, the scope or objective, and costs into the plan. A critical element of planning is providing a multi-step process rather than sudden, unplanned "sweeping" changes. This involves outlining the project with clear steps with measurable targets, incentives, measurements, and analysis. For example, a well-planed and controlled change management process for IT services will dramatically reduce the impact of IT infrastructure changes on the business. There is also a universal caution to practice patience throughout this process and avoid shortcuts.

4. Provide Resources and Use Data for Evaluation: As part of the planning process, resource identification and funding are crucial elements. These can include infrastructure, equipment, and software systems. Also consider the tools needed for re-education, retraining, and rethinking priorities and practices. Many models identify data gathering and analysis as an underutilized element. The clarity of clear reporting on progress allows for better communication, proper and timely distribution of incentives, and measuring successes and milestones.

5. Communication: This is the "golden thread" that runs through the entire practice of change management. Identifying, planning, onboarding, and executing a good change management plan is dependent on good communication. There are psychological and sociological realities inherent in group cultures. Those already involved have established skill sets, knowledge, and experiences. But they also have pecking orders, territory, and corporate customs that need to be addressed. Providing clear and open lines of communication throughout the process is a critical element in all change modalities. The methods advocate transparency and two-way communication structures that provide avenues to vent frustrations applaud what is working, and seamlessly change what doesn't work.

6. Monitor and Manage Resistance, Dependencies, and Budgeting Risks: Resistance is a very normal part of change management, but it can threaten the success of a project. Most resistance occurs due to a fear of the unknown. It also occurs because there is a fair amount of risk associated with change – the risk of impacting dependencies, return on investment risks, and risks associated with allocating budget to something new. Anticipating and preparing for resistance by arming leadership with tools to manage it will aid in a smooth change lifecycle.

7. Celebrate Success: Recognizing milestone achievements is an essential part of any project. When managing a change through its lifecycle, it’s important to recognize the success of teams and individuals involved. This will help in the adoption of both your change management process as well as adoption of the change itself.

8. Review, Revise and Continuously Improve: As much as change is difficult and even painful, it is also an ongoing process. Even change management strategies are commonly adjusted throughout a project. Like communication, this should be woven through all steps to identify and remove roadblocks. And, like the need for resources and data, this process is only as good as the commitment to measurement and analysis.

Impact assessment on new ICT technology uptake is conducted according to the organization policy

Technological Impact Assessment

Technology Assessment is the systematic identification, analysis and evaluation of the potential secondary consequences (whether beneficial or detrimental) of technology in terms of its impacts on social, cultural, political, economic and environmental systems and processes. The following steps maybe followed:

1. Planning of the IA
2. Carrying out the impact analysis
3. Consultation of affected stakeholders and the general public
4. Coordination with affected departments
5. Summary and presentation of findings in a report
6. Forwarding findings to decision makers
7. Publication of the IA report

Throughout the impact assessment process, methods can be used for support. Depending on usage, impact assessment methods can be classified as methods for:

1. Scoping (e.g., checklists)
2. For qualitative analysis (e.g. focus groups)
3. For quantitative analysis (e.g., life-cycle assessment, material flow accounting, modelling)
4. Aggregation and comparison of options (e.g., cost–benefit analysis)
5. Analyzing coherence (e.g., Gender IA)
6. Supporting participation and involvement (e.g., internet consultation)
7. Data presentation and involvement (e.g., GIS)
8. Monitoring and evaluation (e.g., indicators)

In carrying out the impact assessment it is important to:

- Define the extent of the change proposed
- Determine key differences in the changed state (proposed) from a point of reference or the original state
- Focus on the possible effects of the key differences from 2 above
- Sort and prioritize the possible effects from 3 above, from the key differences based on risk and possibility
- Make a decision using the results

Adelle, Camilla; Weiland, Sabine (2012). "Policy assessment: the state of the art". *Impact Assessment and Project Appraisal*. **30** (1): 25–33.

Recommendation on ICT uptake is made

Impact evaluation and recommendations will be on:

A. Relevance
B. Effectiveness
C. Efficiency
D. Impact
E. Sustainability

Characteristics of effective recommendations:

- Constructive. Try to offer solutions, not just identify problems.
- Specific. Include examples of what you recommend.
- Measurable. Suggest ways that the instructor will know a recommendation has been implemented
- Sensitive
- Balanced

Learning Activities

Knowledge	Learning activity	Special instructions
• Evaluating current technologies in ICT • Identifying and conducting training needs on ICT • Adopting and managing ICT new technologies • Conducting impact assessment on new ICT technology uptake Making recommendation on ICT uptake	Carry out a project in an organization of your choice: where you • Evaluating current technologies in ICT • Identifying and conducting training needs on ICT • Adopting and managing ICT new technologies • Conducting impact assessment on new ICT technology uptake Making recommendation on ICT	○ Seek proper authorization ○ Prepare assessment tools ○ Prepare a checklist ○ Follow the proper guidelines

Self-Assessment

1. What are the advantages of digital over analog data
2. Which are the ways in which ICT has improved communication
3. Which are the factors that determine the cost of a computer
4. What are the factors to consider when choosing an Internet Service Provider (ISP)

5. How does an organization benefit from conducting a training needs assessment
6. How do you conduct an impact change assessment

Tools, Equipment, Supplies and Materials

- Computer
- Internet connectivity
- Stationery
- Phones
- Remotes
- Software
- Tablets
- Network cables
- Printers

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Sample answers to self-assessment questions

1 Advantages of digital over analog data

- ✓ Digital data occupy less storage space than analog
- ✓ Digital data has higher accuracy than analog
- ✓ Digital data is transmitted faster than analog
- ✓ Digital data produces clearer output than analog

2 Ways in which ICT has improved communication

- ✓ Introduced mobile phones enabling people even in remote areas to enjoy telephone facilities
- ✓ Enable people to communicate through the internet and telephoning services
- ✓ Enable people to send and receive facsimile messages using a fax machine
- ✓ People can communicate through email
- ✓ It is possible to have real time chats through chat rooms and social web sites
- ✓ People are able to regularly receive current news items

3 Factors that determine the cost of a computer
- ✓ Processor speed and type
- ✓ Random Access Memory capacity
- ✓ Hard disk capacity
- ✓ If it is a branded computer or a clone
- ✓ Whether it is a laptop or a desktop
- ✓ Technology used to make the monitor and size

4 Factors to consider when choosing an Internet Service Provider (ISP)
- ✓ Initial connection cost
- ✓ Cost of running the service
- ✓ The after-connection support available
- ✓ The bandwidth available
- ✓ Experience in the field
- ✓ Authenticity
- ✓ Additional value services for example, free email account, web hosting and firewalls
- ✓ Existence of trial
- ✓ The ISPs privacy policies

5 Ways in which an organization benefits from conducting a training needs assessment
- ✓ Identifying knowledge gaps before they become a problem
- ✓ Helps in planning
- ✓ Highlights training that may not have been considered
- ✓ Ensures training is focusing on the right areas
- ✓ Helps decide who should attend which training sessions

6 How to conduct an impact change assessment
- ✓ Define the extent of proposed change
- ✓ Evaluate the difference between current and proposed future states
- ✓ Determine transition requirements
- ✓ Sort transition requirements based on impact and priority ratings
- ✓ Make design decisions based on requirements specified

7.2.7 LEARNING OUTCOME 7: COORDINATE VIRTUAL PLATFORMS

Introduction to the learning outcome

Coordinating virtue platforms involves the following activities: identifying virtual platforms, training personnel on the use of virtual platforms, customizing virtual platforms, developing online services for the business, monitoring and reviewing system feedback and providing systems security.

Performance Standard

1. Virtual platforms are identified according to organization needs
2. Personnel are trained on virtual platforms according to organizational policy
3. Virtual platform is customized in accordance with organizations needs
4. Online services for the business are developed in accordance with ICT Policy
5. System feedback is monitored and reviewed as per ICT policy
6. Systems security is provided in accordance with ICT policy

- **Information Sheet**

Virtual platforms are identified according to organization needs

Virtual Platform is a software based system that can fully mirror the functionality of a target System-on-Chip or board. A Virtual Platform provides full visibility: at any time, a user can get information regarding any part of the system (processor core, buses, peripherals, or environment models).

Here is how teams collaborate

1. Use Regular Meetings
2. Share Documents
3. Work "Side By Side"
4. Message Away

Every business has its own needs and abilities. Still, there are a few general characteristics that can be utilized by any organization that wants to work with other organizations and clients remotely. These include:

- **General collaboration**. Working together through virtual sharing tools is a must for partners who can't be physically together. Finding an easy way to share data, files, and project information is a community decision that should be made early on in the collaboration process.

- **Virtual partners**. Although a team may not be able to meet in person, each member must be able to provide input while being an active part of the project. For many companies with remote workers and international offices, this can only get accomplished by using highly reliable web-based tools.

Although in-person meetings might be the preferred method of collaboration, especially for more established organizations, successful companies that are adept at working in today's technological society know the best employees might not be geographically close to the main office.

Using online collaboration tools enables your organization to cast a broader net when it comes to finding the best employees for a project since you'll be able to provide a stable virtual environment where all employees can work together.

- Tech-based. None of the tools we mention below will be useful if you don't have reliable information technology (IT) staff to help you implement them. Any modern corporation that's looking to make their mark on today's international audience needs to have a trustworthy and knowledgeable team that can help bridge technological divides in an easy-to-understand manner.

Anyone can install or upgrade software, but having a patient and forward-thinking staff can be the difference between just squeaking by on standard technology and setting the pace for the future of your corporation. It's also crucial that your staff feels comfortable and trusts your IT staff's capabilities. Team members must be able to reach tech support at any time, and they must have confidence that their tech needs will be addressed promptly.

Types of Virtual Collaboration

A sampling of the different kinds of online collaboration tools includes:

- **Computer-mediated**. This type of communication is defined as the ability to use text and data to work on projects remotely through the use of email, text messaging, online project management software and linked databases. Most organizations use this system even if all of their employees are in one office.

- **Asynchronous collaboration**. This work environment allows staff members to react to, and collaborate with, each other's projects, even when these responses can't be instantaneous. Discussion groups or bulletin board-style software programs accomplish this, while also keeping a detailed record of recent changes and feedback. The downside is that this feedback can pile up, and there's often no easy-to-use mechanism for sorting through the messages. This can make collaboration difficult for the project manager.

- **Synchronous collaboration**. Working together from multiple remote job sites in a real-time environment is the goal of synchronous collaboration. Using apps and software that help team members see what the other people in their group are currently working on is one method, while scheduling meetings in an audio conference or a web-based conference room is another.

Tools and apps that make virtual collaboration possible and easy for most corporations include:

Microsoft teams, Slack, Yammer, Zoom, Jira, Microsoft office, Proof hub, WebEx, Google suite, Dropbox, Asana, Basecamp, Trello

Best Virtual Meeting Platforms

Skype, Slack, Google Hangouts, Zoom meeting, GoToMeeting, Microsoft Teams, Facetime, Google Meet, Free Conference Call, Intermedia, Adobe Connect, Amazon

Chime, Join. Me, Lifesize, RingCentral Meetings, HighFive, ON24, BigBlueButton, Zoho meeting, Intrado, Pexip, Cisco WebEx Meeting Center, Digitell, Infinite Conferencing, ezTalks, Cloud Meeting, LiveWebinar.

Personnel are trained on virtual platforms according to organizational policy

Types of Training

- Technical or Technology Training. Depending on the type of job, technical training will be required
- Quality Training. In a production-focused business, quality training is extremely important. ...
- Skills Training
- Soft Skills Training
- Professional Training and Legal Training
- Team Training
- Managerial Training
- Safety Training

The best types of employee training methods for your workforce may include:

1. Instructor-led training
2. eLearning
3. Simulation employee training
4. Hands-on training
5. Coaching or mentoring
6. Lectures
7. Group discussion and activities
8. Role-playing
9. Management-specific activities
10. Case studies or other required reading

Virtual platform is customized in accordance with organizations needs

Steps for Preparing for Virtualization

Assess Your Current Environment: While certain automation systems can scan and determine what you have in your environment, here are some questions you should ask as you take on a full server room clean-up.

- Do you truly know what's there?
- Do you have a full network inventory?
- Do you have a full server inventory?
- Do you know exactly what role/function each server plays?
- Do you have servers that have been decommissioned but are still either online, powered on, or powered off but just taking up space?
- Do you know the utilizations of each server? (OS, CPU, Memory, HDD/Storage)
- Do you have centralized storage or is it all local to each server?

- Do you have a team of resources or are you a one-man shop?
- Do you currently utilize any virtualization software/technologies?

It will help when determining if you have equipment you can reuse, what can be migrated, what can be removed and how equipment could be used in the future.

When you are collecting your data, here are a few tips to help make the process go more smoothly.

- ✓ Make sure that you have 100% full backups of any critical servers.
- ✓ Record what you have using Excel, Asset Tracking Software, or a Word document list.
- ✓ Document each server make, model, serial number, hardware specs, software specs, version numbers for Windows and Apps, purpose/roles, as well as technical roles specifically (DHCP server, Application Servicer – CRM XYZ Company, etc.).
- ✓ Have someone else audit your work (a second set of eyes is crucial) or use an automated network scanning tool.

Plan for Virtualization

1. **Select Virtualization Hypervisor Platform**
2. **Determine Server Environment Needs**
3. **Identify Reasons for Virtualizing**

Map Out and Create Timelines

1. Address Concerns about Virtualization
2. Combat Arguments that Virtualization is too costly
3. Roll out Virtualization without Disruptions

Online services for the business are developed in accordance with ICT Policy

Developing an Internet Strategy and Plan

- Define Your Goals and Objectives
- Define Your Target Online Market
- Define Your Online Competitive Market
- Define your Value Proposition
- Develop an Incentive
- Define Benefits
- Develop an Internet Strategy
- Develop an Internet Plan

How to create an online service

1. Find a need and fill it.
2. Write copy that sells.
3. Design and build an easy-to-use website.
4. Use search engines to drive traffic to your site.
5. Establish an expert reputation for yourself.

6. Follow up with your customers and subscribers with email.
7. Increase your income through back-end sales and upselling.

System feedback is monitored and reviewed as per ICT policy

Tips to improve effective customer feedback analysis and drive online sales:

1. Analyze all feedback
2. Categorize (and sub-categorize) feedback
3. Use negative and positive feedback
4. Look at root causes
5. Understand the value of the customer
6. Look for trends
7. Don't compare unrelated data
8. Consolidate results and determine a plan of action
9. Alert the right teams and individuals within your organization
10. Use automated tools to reduce your workload

Systems security is provided in accordance with ICT policy

System's security. The objective of system security is the protection of information and property from theft, corruption and other types of damage, while allowing the information and property to remain accessible and productive. System security includes the development and implementation of security countermeasures. There are a number of different approaches to computer system security, including the use of a firewall, data encryption, passwords and biometrics.

1. The security precautions related to computer information and access address four major threats: (1) theft of data, such as that of military secrets from government computers;
2. Vandalism, including the destruction of data by a computer virus;
3. Fraud, such as employees at a bank channelling funds into their own accounts; and
4. Invasion of privacy, such as the illegal accessing of protected personal financial or medical data from a large database

Physical security

The security precautions related to computer information and access address four major threats: (1) theft of data, such as that of military secrets from government computers;
(2) Vandalism, including the destruction of data by a computer virus;

(3) Fraud, such as employees at a bank channeling funds into their own accounts;
(4) Invasion of privacy, such as the illegal accessing of protected personal financial or medical data from a large database

1.2.1.6 Learning Activities

Knowledge	Learning activity	Special instructions
• Identifying virtual platforms • Training personnel on the use of virtual platforms • Customizing virtual platforms • Monitoring and reviewing system feedback • Providing systems security	i. Visit a business organization within your locality, carry a needs assessment of the appropriate virtual platforms to use, assess the training needs of the employees ii. Advise on how to customize the virtual platforms	○ Seek proper authorization ○ Wear appropriate PPEs ○ Prepare a checklist ○
• Developing online services for the business	Develop an online service for mama mboga in your locality , monitor and review the system and install security measures	

1.2.1.4 Self-Assessment

1. How can data be input into a computer system
2. Which are the components needed for internet connection
3. Which are the activities that can be carried out on an active webpage
4. What are the benefits of training staff using multimedia training packages instead of face-to-face
5. Why do businesses use virtual meetings
6. How can a business build a better social media presence

1.2.1.5 Tools, Equipment, Supplies and Materials

Computer
Internet connectivity
Stationery
Phones
Remotes
Software
Tablets
Network cables

Printers

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Sample answers to the self-assessment questions

1 How data can be input into a computer system

- ✓ Using a keying-in device such as a keyboard
- ✓ Using pointing devices such as a mouse
- ✓ Using data capture devices such as scanners, digital camera
- ✓ Using voice recognition/speech input devices such as a microphone

2. Components needed for internet connection
   - ✓ Data Terminal Equipment (DTE)
   - ✓ ISP (Internet Service Provider)
   - ✓ Internet software
   - ✓ Transmission media such as satellites
3. Activities that can be carried out on an active webpage
   - ✓ View the content
   - ✓ Refresh the page
   - ✓ Print the page
   - ✓ Download the items
   - ✓ Select an item
   - ✓ Copy and paste items
   - ✓ Navigate the page
   - ✓ Close the page
   - ✓ Follow links to other pages

4. Benefits of training staff using multimedia training packages instead of face-to-face
    - ✓ Multimedia presentations are more consistent than a human trainer
    - ✓ They have more impact because they simulate the real situation
    - ✓ They can involve many professionals to prepare and therefore will be of high standards
    - ✓ They can be delivered anywhere with no need for a trainer to travel

5. Why businesses use virtual meetings
    - ✓ Convenience
    - ✓ Reduced expense
    - ✓ Inclusivity
6. How a business build a better social media presence
    - ✓ Set SMART goals
    - ✓ Identify the audience
    - ✓ Be human
    - ✓ Seek relationships not just followers
    - ✓ Create an editorial calendar
    - ✓ Automate the right way
    - ✓ Focus on helping over selling
    - ✓ Optimize the accounts for engagement
    - ✓ When in doubt, get visual
    - ✓ Make your presence known
    - ✓ Stay active
    - ✓ Piggyback in what is trending
    - ✓ Do not be afraid to pay
    - ✓ Use tools to monitor the activities

Learning Outcome 8: Analyze and Interpret Reports

Introduction to the learning outcome

The learning outcome on analyzing and interpreting reports involves the following activities: developing information analysis system, obtaining departmental user reports, conducting analysis and interpretation of reports, disseminating analysed departmental reports and undertaking periodic review of ICT system

Performance Standard

1. Information analysis system is developed as per the organization policy
2. Departmental user reports are obtained according to the organization policy
3. Analysis and interpretation of reports is conducted according to the ICT policy.
4. Analyzed departmental user reports are disseminated according to organization procedure
5. Periodic review of ICT system is undertaken in accordance with ICT policy and procedures/SOPs

Information Sheet

Definition of terms

System analysis

It is the process of studying a procedure or business in order to identify its goals and purposes and create systems and procedures that will achieve them in an efficient way.

Analysis

It is the process of breaking a complex topic or substance into smaller parts in order to gain a better understanding of it.

Information

Knowledge obtained from investigation, study or instruction.

Information analysis system is developed as per the organization policy

An information system is an arrangement of people, data, processes and information that work together to support and improve the day to day operations in a business and decision making process.

Systems Analysis

It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose.

Objective of System Analysis are:

- It helps to design systems where subsystems may have conflicting objectives.
- System analysis helps to achieve inter compatibility and unity of the sub systems
- It helps in understanding of complex structures.
- System analysis gives an advantage of understanding and comparing the subsystems functions with complete system.

Some benefits of System Analysis are as below:

- Reduced costs
- Efficiency & Flexibility
- Risks
- Better Management
- Better Quality
- Reduced Costs
- Proper system analysis makes the clear path for web application development by minimizing the future IT requirements.

- Gathering of a clear set of requirement for any system will give an advantage of the precise planning of the resources for development, this will bring the final product at low cost.
- Efficiency & Flexibility
- System analysis will not only reduce the costs, and also helps to gain flexibility & flexibility in the system development. Also, it gives clear development targets for each version by defining the set of requirements
- The greater flexibility of SA is to cater almost every future requirements of business by mitigating the IT requirement

Tools and techniques are as below:

- Grid Charts
- System flow chart
- Decision Tree

Systems Analysis Activities

- Gather Detailed Information
- Define Requirements
- Prioritize Requirements
- Develop User-Interface Dialogs
- Evaluate Requirements with Users

Definition of 'Systems Design'

Definition: Systems design is the process of defining elements of a system like modules, architecture, components and their interfaces and data for a system based on the specified requirements. It is the process of defining, developing and designing systems which satisfies the specific needs and requirements of a business or organization.

Description**:** A systemic approach is required for a coherent and well-running system. Bottom-Up or Top-Down approach is required to take into account all related variables of the system. A designer uses the modelling languages to express the information and knowledge in a structure of system that is defined by a consistent set of rules and definitions. The designs can be defined in graphical or textual modelling languages.

Some of the examples of graphical modelling languages are

a. Unified Modelling Language (UML): To describe software both structurally and behaviourally with graphical notation.

b. Flowchart : A schematic or stepwise representation of an algorithm.

c. Business Process Modelling Notation (BPMN): Used for Process Modelling language.

d. Systems Modelling Language (SysML): Used for systems engineering.

Design methods:

1) Architectural design: To describes the views, models, behaviour, and structure of the system.

2) Logical design: To represent the data flow, inputs and outputs of the system. Example: ER Diagrams (Entity Relationship Diagrams).

3) Physical design: Defined as a) How users add information to the system and how the system represents information back to the user. b) How the data is modelled and stored within the system. c) How data moves through the system, how data is validated, secured and/or transformed as it flows through and out of the system.

Departmental user reports are obtained according to the organization policy

Why needs Data Collection?

Data collection takes place constantly throughout the systems development process. The selection committee gathers facts on which to base its decision regarding whether or not to pursue suggestions further. The feasibility team gathers data in determining a workable solution to a business problem. The system analyst needs data to design the system outlined in the feasibility study. Data associated with system studies usually are obtained in answer to these questions: What is the problem? What is the company currently doing about it? What tools are available to help solve the problem? What other areas in the company are affected by the problem? What opinions is available concerning a solution to the problem?

Data Collection Methods:

Interviews

A purpose of the interview is to find out what is in the person's mind that may not have been written down. The higher the person is in the organization, the more important this activity becomes because we get more into philosophy and policy. The interviewer must take care in handling disagreements; apply proper humility, postponement of an interview, appreciation of the other's opinion, proper stimulation of questions, definition of the cause and termination of the interview.

There are a number of alternative methods available for systems analyst. Those include observation, work measurement, sampling, and questionnaires.

Analysis and interpretation of reports is conducted according to the ICT policy.

Why needs Data Analysis?

Data analysis naturally follows data collection in a system development. In most systems studies, more data are gathered than can be handled conveniently. Moreover, the systems analyst usually is under time pressure to complete the data analysis phase of system development and begin designing the new system. This type of pressure must be resisted. Defining problems precisely requires patience. Analyzing what is wrong and determining the best solution is a unique skill which requires coordinated effort. When analysis is done properly, the actual detailed systems design follows easily.

Data analysis begins with a review of the facts gathered concerning a project. It is important not to look for solutions until all the facts have been gathered and the problems accurately defined. Data analysis also consists of asking questions until the problem is understood, then developing alternative solutions until the best one is obvious. Typical analysis questions are:

How important is this system? What must it really accomplish? What type of people does it require? How does it relate to other systems in the organization? What are the system's goals?

Systems analysts have a variety of techniques available for data analysis. These techniques, however, are no substitute for an analytical mind that can see through symptoms and address significant problems.

Creative Thinking

It is difficult for systems analysts people to develop creative solutions to problems, in many environments, because companies place many restrictions on what systems analysts can do. The people with whom systems analysts work often inhibit creative thought, and systems analysts frequently narrow their own thinking with self-imposed constraints. Systems analyst are often on the track of a truly creative solution to a problem only to be set back with a statement like "It has never been tried before," "Management will not like it," or "What we are doing now is good enough." It is difficult of deal with these types of thinking.

Brainstorming

Brainstorming is one technique for increasing creativity in problem solving. Brainstorming is a free exchange of ideas among people. In a brainstorming session, people offer solutions to problems as if there were no restrictions. Ideas are presented as they come to mind. This allows a person's imagination to develop ideas often suggest other ideas. One person builds on the other's suggestion and may come upon a solution that otherwise would not have surfaced.

After the session is completed, the proposed solutions must be evaluated realistically. Frequently, a solution that never would have been proposed in routine analytical sessions meets the real world tests and provides a feasible solution to a problem.

One area in which systems people are often restricted in their thinking is in determining a starting point for analyzing a problem. Most systems analysts examine the existing system trying to determine what is wrong and what can be done to improve matters. This immediately imposes constraints, as the systems analyst is strongly influenced by the way things were done previously.

One way to free a systems analyst's thinking is to begin analyzing a problem by totally disregarding what is currently being done, and concentrating on the objectives for the proposed system. The analyst's thoughts are centered on what the organization needs, and what is the best way it can be accomplished. The analyst brainstorms on ways to meet the objectives, temporarily disregarding all the reasons why the ideas will not work. Only when the best alternatives to meet the systems objectives have been formulated will the systems analyst start to consider the limitations of the working environment. With more clear thinking and planning, the best proposed plan will survive the test.

Structured Approach: Top-Down Approaches

One of the most significant advances in systems analysis during the last decade has been the introduction and growing use of so-called **structured top-down approaches** to analyzing and designing information systems. Although, these approaches were initially introduced as computer program design and coding aids, they have increasingly been adapted for use in systems analysis and design. These approaches are based on the ideology of:

- It is important to identify a system's structure before attempting to define or describe the system's processes.
- One should first describe the system's structure in a very general or overview fashion and then break its structural components into smaller, more detailed components *(hence the name top-down)*.
- Upon completing a structural taxonomy of the system, one should describe the system's processes, again employing a top-down approach.

The top-down, that is, from the general to the specific approaches, has improved the orderliness and quality of systems development. These approaches have also improved the quality of documentation and thus facilitated communications among project team members and communications with others. Finally, as result of a module can be added, deleted, or changed without disturbing the rest of the program, these approached have been an effective means for dividing or modularizing very large systems into smaller, more manageable subsystems without sacrificing future opportunities for integrating subsystem components into a single, comprehensive entity.

However, what structured analysis does best is to allow people to see problems more easily. This not only aids the analytical process, but leads to clearer communication among analyst, users, and management.

Top-down approach VS other structured methods of data analysing

Several new charting techniques have been developed specifically to support the goals of the structured approach: the HIPO techniques, data flow diagrams, N-S charts, flowcharts, and decision tables

The HIPO technique

The hierarchy plus input-process-output (HIPO) technique is a structured tool with broad applicability throughout the systems development life cycle. This technique uses two different types of charts. The first type, called a *VTOC diagrams*, is used to develop a top-down hierarchical structure through which systems functions and their relationships can be observed, discussed, and better understood. The second type is frequently called an *IPO diagram*, because it describes the input, output, and process components for a given function.

The VTOC diagram can be of major utility of the analyst. First, it is extremely easy to draw and thus can be used experimentally and accurately. Second, the diagram lends itself to group construction and thus is a valuable aid when several people must participate as a team.

Third, the diagram is also important in structuring and documenting that participation. Even when the "group" is composed of only the analyst and one other person, the analyst may want to use the diagram to structure the interview. Fourth, the diagram is potentially useful for making presentations at various levels of detail, depending on the intended audience because it can clearly illustrate the hierarchical relationships among various functions and subfunctions. Finally, the VTOC diagram can provide a basis for continuous and evolving documentation and contribute greatly to overall project control.

The advantage of IPO is that it permits a more extended description of processes in ordinary English than a VTOC diagram does. Thus, the processing steps may be briefly described in the process box and more fully explained in the extended description notes at the bottom of the HIPO form. The symbols that describe inputs and outputs resemble standard flowcharting symbols. There are, however, potential disadvantages in this reliance on verbal description and flowchart-like drawings; in particular, the documentation time required to describe all the functions may be very high. This drawback has led some analysts to employ a mix of diagramming techniques together with the VTOC aspect of HIPO. These analysts use IPO diagramming only when its extended-description advantages are judged to be worth the added documentation effort.

The data flow diagram

The data flow diagram is also an alternative of structured technique. Data flow diagrams are easy to draw and require the knowledge of only a few symbols. However, care must be taken to avoid making them overly detailed. Because data flow diagrams are not linear (straight line), analysts must take care not to describe too much detail on a single diagram, or it may become overly difficult to follow. Beginning with an overview and working to individual, more detailed levels of data flow is strongly recommended.

Nassi-Shneiderman charts

The N-S charts have been primarily used to design structured programs. However, they should prove helpful to the analyst in clearly describing complex problems in systems logic. Although N-S charts are not extensively used in all aspects of systems analysis

today, expanded uses will probably be found for them in the future - particularly when the analyst is looking for a better way of clearly describing to others some of the more complex logical problems involved in analysis and design.

Systems flowcharts

Systems flowcharts provide a concise diagram of a complete system or process. Thus, they can be useful in problem organization, problem solving, problem presentation, and problem review. There are two major kinds of standard flowcharts; *the system flowchart and the program flowchart*. In most instances the real difference between them is the level of detail being illustrated. However, both kinds of flowcharts are systems tools. It is simply a question of determining which level of detail is required and for which audience. To construct a lengthily and detailed program flowchart for presentation to corporate top management would probably obscure rather than clarify the problem for them. On the other hand, a general systems flowchart, by itself, does not contain the level of detail required for computer programming.

Decision tables

Decision tables represent human or machine decision alternatives in tabular form. They are most effective when the problem is a complex decision with many different conditions and possible results. In a sense, decision tables are most effective when the problem is one of selecting a single decision alternative or set of alternatives out of many possibilities.

As a systems analysis tool, decision tables work best in those instances which are both specific and detailed. Similarity, the systems analyst can provide decision tables to computer programmers as a basis from which coded routines can be developed. Such an approach eliminates much of the guess work from programming and can particularly assist the less accomplished programmer to do better programming work. Moreover, decision tables are also a beneficial to systems documentation. By including decision tables in the formal documentation, the analyst can quickly review some of the complex decision making processes without wading through computer program listings or lengthy, written statements and procedures.

<u>Analyzed departmental user reports are disseminated according to organization procedure</u>

MIS stands for Management Information system. In the simplest terms, an MIS report can be described as a system that provides important information for the management of your company. MIS collaborates with people, technology, and business processes within an organization. It also describes how the relationship with other organizations and people affect your company.

An MIS report is used to highlight the day to day business activities, which enables you to monitor your organization’s progress. These reports provide critical insights during decision making. It serves as a reference point to monitor your business and

communication. In this new era of emerging technologies, management information systems have become a vital part of successfully running a company.

How do MIS Reports Work

MIS reports is prepared periodically (which is either monthly or quarterly in most cases). These reports are prepared by various departments in your organization and presented to the company's management team.

MIS reports focusing on raw data, trends, patterns in that data and comparisons with relevant past data. MIS reports are also an effective tool for managers to track business operations across various departments. Furthermore, they provide clarity and enhance communication. They also help the company managers and the management team to make informed decisions, pinpoints and avoid problems, and capitalize on the current market trends.

For Example, if a decision about a new product launch has to be made, the MIS report will have current market trends and employee information. The data points in the MIS reports will help you make better decisions and improve the company's performance in both the short-term and long-term.

Importance of MIS Reports

MIS reports are crucial for the smooth functioning and growth of a company.

MIS reports are used to collect data from various sources. These include employees, management, documents, executives as well as the raw numbers for business sales. All of these are beneficial for identifying and solving problems within a company. They can help in making important decisions.

The data collected from the above-mentioned sources is then visualized. This includes presenting the data in the form of bars, graphs, and charts. This provides ease of analysis and helps to gain faster insights from the available data.

An MIS report also helps to track a company's financial growth and financial health. It is often used to track, analyze, and report business income.

An MIS report also serves as an effective tool for communication between employees and their employers, or between employees.

Types of MIS Reports

There are different types of MIS reports in every company. These reports range from company to company. Management Information system reports process data in its raw form. This raw data is generated by the people, business processes, and transactions that are collided to create understandable data points.

Different types of MIS reports aggregate different data points and present them in a format that provides clear insights and conclusions. The various departments in an organization present MIS reports which outline their department's specific functions. There can be different types of MIS reports based on which data is being analyzed and what it is being used for. The following is a summary of the most common types of MIS reports which you will find in an organization.

Figure 72: examples of MIS reports

Components of MIS Reports

An MIS report is not a stand-alone entity. It includes several components, which interact with each other in a meaningful way. The major components on an MIS report are as follows:

1. People

These include the people (a.k.a the users) of an information management system. Users of an MIS system include the company employees, managers, executives, and people who indirectly interact with your organization (for example, people who supply raw materials for your manufacturing process).

2. Data

This includes data collected from varied sources within an organization. This data is used for making critical business decisions, marketing analysis and target predictions.

3. Business Procedures

Business procedures specify how the data is collected, analyzed and stored within your organization. These procedures are used to outline the implementation of your company policies in a step-by-step manner. Examples include your company's hiring and onboarding process, manufacturing procedures, and procedures for day-to-day operations.

4. Hardware

These include all the hardware components that are used within your organization. Examples include the servers and workstations which store data, network routers and equipment, printers, Xerox machines etc.

5. Software

The software components include the programs which are used to process and handle the data in your organization. These may include spreadsheets, database management systems (eg. SQL and NoSQL), and data visualization tools (**example**. Tableau and Power BI). The software usage may vary in your organization, depending upon the tasks to be achieved.

Conclusion

A management information system provides data to identify non-performing areas and leverage trends and patterns. Not having an effective, functional MIS system can leave managers guessing in the dark. A management information system will help your company reach a higher level of efficiency, enable you to make more rational business decisions, improve communication between people in your company, and leverage your strengths.

An MIS system is essential for any business owner who is serious about improving their company's performance.

Without an MIS system, managers have to make decisions based on trial-and-error, rather than relying on data. Most companies have leveraged the power of an MIS system. Various types' software are also available to help companies speed up the process of data collection and visualization in the MIS reports.

Periodic review of ICT system is undertaken in accordance with ICT policy and procedures/SOPs

OBJECTIVE

The focus of the review is to analyze and improve the ICT function in the organization. The recommendations will propose improvements, which meet the needs of the organization and ensure that best value is provided to save money and increase productivity.

The review is a diagnostic tool - it is expected to identify strengths, problems/weaknesses and make practical recommendations including recommending alternative systems if required.

The review will critically examine the current ICT environment and ICT service provision to ensure that ICT systems and services are efficient, effective and aligned to the needs of the business. The review should result in a roadmap, detailing the necessary steps for improvement

SPECIFIC OBJECTIVES

The specific objectives include;

- Carry out a high-level technology and information systems review to assess fitness for purpose.
- Carry out a review of existing procedures and identify gaps and capacity weaknesses
- Reviewing compliance with administrative regulations and policies
- Identify areas where ICT Unit can add value and recommend innovative ways of operations to achieve Efficiency, Effectiveness and Turn-around Times.
- Provide recommendation on ICT equipment backup requirements
- Analyzing existing systems and identify areas of software improvement
- Drawing up specific proposals for modified or replacement systems with limited resources.
- Check whether current network connectivity and bandwidth meets the requirement or need changes.
- Review the reasons for existing problems and advise on how to address them.
- Review the measures against security threats such as hackers' attacks.
- Identify current costs and recommend ways for reducing the operational cost.
- Review the configuration of router & firewall to ensure security of the internal networks & comparison with ICT standards.
- Review the configuration of Servers & compare it with ICT standards.

- Review of incident handling, procedure and records.
- Assess the capacity/IT skills of users and IT staff and identify gaps as well as make recommendations for appropriate capacity building.
- Advice on the extent and number Internet service providers required, to continually support the organization, in the event of limited connections.
- Review existing system and assess whether they are under-used, miss-used or advise on how they can be put to better use (Internal organization staff compliance)
-

METHODOLOGY

- Interview with staff to assess the level of internal customer satisfaction with the existing service compared to the quality and level of service expected.
- Consult internal IT Officer and MIS Officer for their views on how ICT services could be made more effective.
- Compare current processes and methods against ICT industry and best practice standards
- Review of hardware, software, server room operations, internal networks (intranet) and back up arrangements etc.

Learning Activities

Knowledge	Learning activity	Special instructions
• Developing information analysis system • Obtaining departmental user reports • Conducting analysis and interpretation of reports • Disseminating analysed departmental reports Undertaking periodic review of ICT system	Conduct a project in an organization of your choice. Where by you undertake the following activities: develop an information analysis system, obtain departmental user reports, conduct analysis and interpretation of reports, disseminate analysed reports and undertake periodic review of the system e.g. once a month	• Seek proper authorization • Prepare a checklist • Prepare a report and share it

Self-Assessment

1. Which are the items that should come with an authentic software
2. Which are the functions of an operating system
3. What are the application areas of spreadsheets
4. How can a primary field be used in a database
5. Why is it important to carry out an audit trail in an information system

6. Which are the causes of data loss or program corruption in a computer system

Tools, Equipment, Supplies and Materials

- Computer
- Internet connectivity
- Stationery
- Phones
- Remotes
- Software
- Tablets
- Network cables
- Printers

References

1. Saleemi N A, Systems Theory and Management Information Systems Simplified, 2nd Edition, (2000), Nairobi Savanis Book centre
2. Nagpal D P, Computer Fundamentals, (1999), S Chand publishing
3. Luehrmann Arthur, Computer Literacy, (1983) McGraw-Hill,
4. Stallings William, Data and Computer Communications, 10th Edition, (2013) Pearsons,

Self-assessment sample answers

1 Items that should come with authentic software

- ✓ Installation guide
- ✓ User manual
- ✓ Reference guide
- ✓ License
- ✓ Quick reference guide

2 Functions of an operating system

- ✓ Job scheduling
- ✓ Resource control and management
- ✓ Memory management
- ✓ Error handling
- ✓ Interrupt handling
- ✓ Input/output handling

3 Application areas of spreadsheets

- ✓ Statistics analysis
- ✓ Accounting
- ✓ Data management
- ✓ Forecasting
- ✓ Scientific application

4 How a primary field be used in a database

- ✓ Maintain data integrity

- ✓ Index records in a database
- ✓ Control redundancy
- ✓ Sort records in a database

5 Why it is important to carry out an audit trail in an information system

- ✓ For detection of illegal alteration
- ✓ For detection of illegal access to the system
- ✓ To monitor the usage of the system
- ✓ Enable recovery of lost information
- ✓ Identify weak access points in the system

6 Causes of data loss or program corruption in a computer system

- ✓ Computer virus
- ✓ Unauthorized access
- ✓ Computer errors
- ✓ Accidental erasures
- ✓ Vandalism
- ✓ Crashing of hard disk
- ✓ Power failure

7.2.9 LEARNING OUTCOME 9: PREPARE ICT REPORT

Introduction to the learning outcome

This learning outcome covers the competency on preparing ICT reports. The activities involved include: preparing and sharing organization ICT report, identifying ICT areas of concern and implementing ICT recommendations

Performance Standard

1. Organization ICT report is prepared and shared in accordance with SOPs
2. ICT Areas of concern are identified based on targets and ICT procedures
3. ICT recommendations are implemented as per ICT policy

Information Sheet

Control in a dynamic system is achieved by feedback. Feedback measures output against a standard in some form of cybernetic procedure that includes communication and control. Output information is fed back to the input and / or to management (Controller) for deliberation. After the output is compared against performance standards, changes can result in the input or processing and consequently, the output. Feedback may be positive or negative, routing or informational. Positive feedback reinforces the performance of the system. It is routine in nature. Negative feedback generally provides the controller with information for action. In systems analysis, feedback is important in different ways. During analysis, the user may be told that the problems in a given application verify the initial concerns and justify the need for change. Another form of feedback comes after the system is implemented. The user informs the analyst about the performance of the new installation. This feedback often results in enhancements to meet the user's requirements.

A compute**r** performance evaluation is defined as the process by which a computer system's resources and outputs are assessed to determine whether the **s**ystem is performing at an optimal level. It is similar to a voltmeter that a handyman may use to check the voltage across a circuit.

Once the new system has been implemented and is in full use, the system should be evaluated (this means that we take a long, critical look at it).

The purpose of an evaluation is to assess the system to see if it does what it was supposed to do, that it is working well, and that everyone is happy with it.

Evaluation

What Does an Evaluation Look For?

When the systems analyst evaluates the new system, the following questions will be asked:

- Is the system efficient?
- Does it operate quickly, smoothly and with minimal waste?
- Is the system saving time, and resources?
- Easy to use?

- Are all of the system's users able to use the system easily and effectively?
- Can new staff understand and use the system with minimal training?
- Appropriate
- Is the system suitable for the particular business / organization?
- Does the system actually meet the needs of the business / organization?

But how can we find the answers to these questions?
How is a System Evaluated?
The systems analyst will use a number of techniques to evaluate the system...

- Check against the Requirements Specification

This list was called the Requirements Specification.

The systems analyst will use this document to check the new system. Going through the requirements one-by-one the analyst will check if they have been met.

- Check the Users' Responses

It is essential to get feedback from the users of the system...
Do they like it?
Does it make their work easier?
What, if anything, could be improved?
The systems analyst can get this feedback in the same way they collected information about the original system...
Questionnaires
Interviews
Observations

What Happens Next?
The outcome of the evaluation will be to identify any limitations or problems with the new system.

The system analyst will then need to begin the task of system analysis from the beginning, but this time analysing the new system, and then designing, testing and implementing improvements.

Thus the whole process repeats...
The fact that the process of Systems Analysis is often repeated over and over (constantly building upon and improving systems) means that it is often referred to as a cyclic (repeating) process.
After evaluation has been carried out, a report is prepared with recommendations.
Every report should have the following sections:

- ✓ Title page

- ✓ Table of content
- ✓ Executive summary
- ✓ Introduction
- ✓ Discussion
- ✓ Conclusion
- ✓ Recommendations
- ✓ References
- ✓ Appendices

Learning Activities

Knowledge	Learning activity	Special instructions
preparing and sharing organization ICT report, identifying ICT areas of concern and implementing ICT recommendations	Visit a learning institution within your locality and prepare a report on areas of concern in ICT after carrying out an evaluation	• Seek authorisation • Prepare a checklist • Prepare a report

Self-Assessment

1. What are the functions of an antivirus software
2. Which are the errors that can occur during data collection stage
3. What methods can be used to gather data during system development
4. What is the role of computer system auditor
5. How does the function of report preparation and sharing benefit an organization

Tools, Equipment, Supplies and Materials

- Computer
- Internet connectivity
- Stationery
- Phones
- Remotes
- Software
- Tablets
- Network cables
- Printers

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3. Luehrmann Arthur, Computer Literacy, McGraw-Hill, (1983)
4. Stallings William, Data and Computer Communications, 10th Edition, Pearsons, (2013)
5. Dessler Gary, Human Resource Management, 12th Edition (2011), Pearson
6. Dessler Gary, The Strategic Human Resource Management, 10th edition (2005) Prentice Hall Inc.
7. Goldstein Irwin, Human Resource Management, volume 5 (2015), Wiley Encyclopedia of Management

Sample answers for self-assessment items

1 Functions of antivirus software
- ✓ Provide real-time protection against viruses
- ✓ Identify viruses
- ✓ Provide tools for eliminating viruses
- ✓ Alert the user when a program behaves like a virus
- ✓ Quarantine files with viruses that cannot be removed

2 Errors that can occur during data collection stage
- ✓ Transcription error
- ✓ Machine hardware faults
- ✓ Program faults
- ✓ Inappropriate data on the source document
- ✓ Transposition error

3 Methods can be used to gather data during system development
- ✓ Interview
- ✓ Questionnaire
- ✓ Observation
- ✓ Automation method

4 The role of computer system auditor
- ✓ Analyses the information processing systems to assess their completeness, accuracy, validity and efficiency
- ✓ Participates in new system design to ensure efficient, effective and well controlled systems
- ✓ Checks and reports on the usage of computing facilities

5 How does the function of report preparation and sharing benefit an organization
- ✓ Reports help in tracking progress
- ✓ Helps in decision making and planning
- ✓ Keep a record for future reference

- ✓ Fulfil legal obligations
- ✓ Analyse and solve problems
- ✓ Monitor and control activities