MACHINING

Level- IV

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Acronym.

BOM	Bill of material
BOQ	Bill of Quantities
Cm	machining cost
KPIs	key performance indicators
MSDS	Material Safety Data Sheet
ORR	overhead recovery rate
POR	predetermined overhead rate
PHC	productive hour cost
Ri	unit time cost
SPC	statistical process control
Ti	machine time
WBS	Work Breakdown Structure

Introduction to the Module

Managing product cost estimation and bill of materials is an essential aspect of product development and manufacturing. It involves determining the cost of producing a product and creating a comprehensive list of components and materials required for its assembly.

This modules cover the unite

- Plan and prepare for work
- Develop estimated product / project costs
- Analyze customer benefits and determine waste
- Analyze production performance variance
- Measure and check correct quantities of work
- Maintain administrative control over resource acquisition process
- Supervise the provision and withdrawal of resources

Learning objectives of the modules

- Pprepare Plan and work
- Identify estimated product / project costs
- Understand customer benefits and determine waste
- Analyze production performance variance
- Measure and check correct quantities of work
- Maintain administrative control over resource acquisition process
- Supervise the provision and withdrawal of resources
- Assure quality and verify all data

Modules learning instruction

For effective use these modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” giver at the end of each unit and
5. Read the identified reference book for Examples and exercise

Unit One. Plan preparation and work

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

- Work and Tender
- Time Scheduling, Sequences of Work and Labors
- Format (Take Off Sheet) And Materials Bill of Quantities.
- Cost Centers of All Required Resources.
- Suppling Information Regarding Remarks.

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

- Managing The Work and Tender
- Essential Time Scheduling, Sequences of Work and Labors
- Identify the Format (Take Off Sheet) And Materials Bill of Quantities.
- Understand Cost Centers of All Required Resources.
- Supply the Information of Regarding Remarks.

1.1. Tender and Work requirements

"Work and tender" typically refer to the process of bidding for and securing contracts or projects through a competitive tendering process. In this context, "work" refers to the actual project or contract that needs to be executed, while "tender" refers to the formal bidding process to win that work.

Here's how the work and tender process generally works:

Project Identification: Potential projects or contracts are identified, either through public procurement announcements, private invitations, or other sources.

Tender Documentation: The organization or entity seeking to award the project (referred to as the "client" or "project owner") prepares and issues tender documentation. This typically includes the scope of work, technical specifications, contract terms and conditions, evaluation criteria, and submission requirements.

Tender Preparation: Interested parties (referred to as "tenderers" or "bidders") review the tender documentation, assess the project requirements, and determine if they are capable of delivering the work. They may seek clarifications from the client if needed.

Cost Estimation: Tenderers prepare a comprehensive cost estimation for the project, considering various factors such as labor, materials, equipment, subcontracting, overheads, and profit margin. The cost estimation is typically part of the tender submission.

Tender Submission: Tenderers submit their proposals in response to the tender documentation within the specified deadline. The submission may include technical proposals, project plans, financial bids, and supporting documents like company profiles, references, and qualifications.

Tender Evaluation: The client evaluates the submitted tenders based on predetermined criteria. This may include technical competence, experience, financial viability, compliance with specifications, and price. The evaluation process may involve a review panel or committee.

Tender Award: After the evaluation, the client selects the winning tenderer based on the evaluation criteria and awards the contract or project to them. The selected tenderer is notified, and negotiations may take place to finalize the contract terms and conditions.

Project Execution: Once the contract is awarded, the winning tenderer proceeds with the execution of the work. This involves mobilizing resources, managing the project according to the agreed-upon plan, meeting milestones, and delivering the project as per the contract requirements.

public bidding statutes (laws)

Public bidding statutes are designed to protect the public interest, not that of the contractor. Their essential purpose is to protect public funds; prevent fraud, collusion, and bias; and obtain quality construction at reasonable and fair prices. The decision to bid by the contractor depends on the bidding climate.

The bidding climate is affected by:

1. Bidding capacity considerations
2. Location of project
3. Severity of contractual terms (contractor responsibilities and liabilities)
4. Owner and their financial status
5. Who is the architect/engineer
6. Nature and size of project as it relates to company experience and equipment
7. Labor conditions and supply
8. Completion date

The Bidding Period

1. An accurate bid requires adequate time
2. Too little time to bid results in contractors either not bidding or bidding too high
3. Result of “rushed” or “quick” bids is NOT a lower price
4. When unsure, contractors add Contingency and to their bid

Preparing a Bid

- Preliminary Considerations
- Become familiar with
  - Instruction to bidders
  - Proposal form

- Alternates
- General and supplementary/special conditions
- Drawing and specifications (addenda)
- Form of the contract

Prebid meeting (in-house)

Prebid meeting (with owner)

A. Jobsite visit
   - Observe job site specific conditions that must be covered in the bid (site access, logistics…)
   - Bid invitations

B. Quantity surveys (take-offs)
   - Unit-price project (AE's #'s vs contractors)
   - Experience needed to do quantity surveys?
   - General contractor's cost estimate of own work

C. Bid Components
   - Material Costs – anything that becomes a part of the finished structure
   - Material Allowance – What is it? Example?
   - Direct Labor costs

The Difference between Bidding and Estimating

Bidding and estimating are related but different concepts and processes.

Bidding is a procurement process, whereas estimating is a predictive process.

General contractors prepare an initial estimate as part of the bidding process, but with the exception of the direct work actually conducted by the general contractor, they rely on quotes from subcontractors and suppliers to finalize their bid.

The process of preparing detailed cost estimates starts with establishing clear definitions of the scope of the estimating tasks and the physical nature of the project being estimated.

The next step is to follow an organized and consistent work plan for preparing and reviewing the estimate.

The final step is to present the estimate and, if necessary, reconcile it with estimates prepared by others.

For most industrial companies, cost estimation methods mostly determine the performances of two strategic functions: **product design** and **pricing** (or quotation).

Tendering

Types tendering

- Open tendering
- Selective tendering
- Two-stage tendering

Traditional Methods of Procurement

- Open Competition
- Selective Competition
- Two-stage Selective Tendering
- Competition and Negotiation
- Continuity Contractual Arrangements and Procurement
- Cost Reimbursement Contracts

Measured Term Contracts

Requirement of Tender Documents

- Invitation to bid
- Instruction to bidders
- Information to bidders & bid data
- Biding Forms
- General conditions of contract
- Specific condition of contract
- Specification
- BOQ
- Drawings
- Contract forms

1,2, Essential Time Scheduling, Sequences of Work and Labors

Effective time scheduling, sequencing of work, and labor management are crucial for ensuring efficient project execution. Here are some key considerations for each aspect:

Time Scheduling:

1. **Define Project Milestones:** Identify the major milestones of the project, such as the start and end dates, key deliverables, and critical deadlines. This provides a clear timeline for the project.
2. **Develop a Work Breakdown Structure (WBS):** Break down the project into smaller, manageable tasks or activities. Arrange these activities in a hierarchical structure to understand the project's sequence and dependencies.
3. **Estimate Activity Durations:** Determine the time required to complete each activity in the WBS. Consider factors like resource availability, skill levels, and historical data to make realistic estimates.
4. **Identify Critical Path:** Determine the critical path, which is the sequence of activities that determines the project's overall duration. It represents the longest path of dependent activities that must be completed on time to avoid project delays.
5. **Develop a Project Schedule:** Use project management software or tools to create a detailed project schedule. Assign start and end dates to activities, considering their dependencies and critical path. Visualize the schedule using Gantt charts or other suitable formats.

Sequences of Work:

1. **Analyze Activity Dependencies:** Identify the dependencies between activities. Some activities can be performed concurrently, while others must be completed sequentially. Understanding these dependencies helps determine the most efficient sequence of work.
2. **Optimize Workflow:** Determine the most logical and efficient order of performing activities. Consider factors like resource availability, skill requirements, equipment utilization, and minimizing rework or rehandling.

3. **Consider Trade Coordination:** If the project involves multiple trades or disciplines, coordinate their activities to minimize conflicts and ensure smooth workflow. Align the sequencing of work across trades to avoid delays or disruptions.
4. **Plan for Critical Activities:** Pay special attention to critical activities on the project's critical path. Ensure they are scheduled and executed with precision to prevent delays in the overall project timeline.

Labors Management:

1. **Determine Labor Requirements:** Assess the labor requirements for each activity, considering the required skill sets, qualifications, and experience levels. Determine the number of workers needed and allocate resources accordingly.
2. **Resource Availability and Allocation:** Identify the availability of labor resources, including both internal and external workers. Consider factors like shift schedules, holidays, and any other constraints that may impact resource allocation.
3. **Resource Leveling:** Optimize resource allocation to balance workloads and avoid overburdening or underutilizing labor resources. Smooth out peaks and valleys in resource demand by adjusting schedules and activities.
4. **Communication and Coordination:** Establish effective communication channels to ensure clear instructions, task assignments, and progress updates. Foster collaboration and coordination among labor teams to streamline work processes and avoid conflicts.
5. **Monitor and Adjust:** Regularly monitor labor performance and productivity. Track actual labor hours, progress, and any deviations from the planned schedule. Analyze the data to identify areas for improvement and make necessary adjustments to optimize labor management.

By giving due attention to time scheduling, sequencing of work, and labor management, you can enhance project efficiency, reduce delays, and improve overall project outcomes. It's important to regularly review and update schedules, sequences, and labor plans as the project progresses to adapt to changing circumstances and optimize project execution.

1.3. Format (Take Off Sheet) And Materials Bill of Quantities.

A takeoff sheet, also known as a quantity takeoff sheet or material takeoff sheet, is a document used in construction and estimating to itemize and quantify the materials required for a project. While there are different formats and variations, here's a general outline of a takeoff sheet format:

Table: 3. Take off sheet Format Example

Title----------							
Timesing	Dimension	Squaring	Description	Timesing	Dimension	Squaring	Description

1. **Project Information:**
    - Project Name: Name or description of the project.
    - Project Location: Location or address of the project site.
    - Project Number: Unique identification number for the project.
    - Date: Date when the takeoff sheet is prepared.
2. **Itemized List of Materials:**
    - Item/Description: A detailed description of each material item.
    - Quantity: The quantity or amount required for each material item.
    - Unit: The unit of measurement for each material item (e.g., square feet, cubic yards, pieces).
    - Unit Cost: The cost per unit of each material item.
    - Total Cost: The total cost for each material item (quantity multiplied by unit cost).

3. **Subtotals and Summary:**
    - Subtotals: Subtotals for different sections or categories of materials, if applicable (e.g., by trade, area, or phase of work).
    - Grand Total: The total cost of all materials combined.
4. **Notes and Comments:**
    - Any additional notes or comments related to the takeoff, such as specific assumptions made, special considerations, or explanations.
5. **References**:
    - Drawing References: References to project drawings, plans, specifications, or other documents that support the takeoff quantities.
    - Specification References: References to project specifications or other relevant documents.

Any additional notes or comments related to the takeoff, such as specific assumptions made, special considerations, or explanations.

A Bill of Quantities (BOQ) is a detailed document prepared by quantity surveyors or estimators in construction projects. It provides a comprehensive list of all the items, quantities, and costs required to complete a construction project or specific parts of it.

The purpose of a Bill of Quantities is to provide a clear and unambiguous description of the materials, components, and workmanship required for a project. It enables accurate cost estimation, tendering, and contract administration. The BOQ serves as a basis for comparing and evaluating bids from contractors and suppliers, as well as for assessing progress and making payments during the construction phase.

Typically, a Bill of Quantities is organized into various sections and sub-sections, each corresponding to a specific trade or element of the project (e.g., civil works, electrical works, plumbing works, etc.). The document includes detailed descriptions of the items, their quantities,

units of measurement, and rates or prices. It may also include specifications, drawings, and other relevant information to clarify the requirements.

A typical BOQ may include the following information for each item:

Item number: A unique identifier for each item.

Description: A detailed description of the item, including specifications if necessary.

Quantity: The quantity of the item required for the project, usually specified in standard units of measurement.

Unit: The unit of measurement for the item (e.g., meters, kilograms, pieces, etc.).

Rate: The unit rate or price for the item, which can be obtained from market rates or based on specific agreements.

Amount: The calculated amount for each item, obtained by multiplying the quantity by the rate.

The Bill of Quantities is an important document in the construction industry as it forms the basis for accurate cost estimation, tendering, and contract administration. It helps ensure transparency, fairness, and consistency in the procurement process and provides a clear understanding of the project requirements for all stakeholders involved.

The bill of quantities (sometimes referred to as 'BoQ' or 'BQ') is a document prepared by the cost consultant (often a quantity surveyor) that provides project specific measured quantities of the items of work identified by the drawings and specifications in the tender documentation.

The quantities may be measured in number, length, area, volume, weight or time. Preparing a bill of quantities requires that the design is complete and a specification has been prepared.

The bill of quantities is issued to tenderers for them to prepare a price for carrying out the works. The bill of quantities assists tenderers in the calculation of construction costs for their tender, and, as it means all tendering contractors will be pricing the same quantities (rather than taking off quantities from the drawings and specifications themselves), it also provides a fair and accurate system for tendering.

The contractor tenders against the bill of quantities, stating their price for each item. This priced bill of quantities constitutes the tenderer's offer. As the offer is built up of prescribed items, it is

possible to compare both the overall price and individual items directly with other tenderers' offers, allowing a detailed assessment of which aspects of a tender may offer good or poor value. This information can assist with tender negotiations.

The priced bill of quantities will also:

- Assist with the agreement of the contract sum with the successful tenderer.
- Provide a schedule of rates assisting with the valuation of variations.
- Provide a basis for the valuation of interim payments.

Provide a basis for the preparation of the final account

Table: 1. Bill of Quantities format

Project----------					
item	Description	Unit	Quantity	Unit price	Total price

1.4. Cost Centers of All Required Resources operational specifications

To provide a comprehensive list of cost centers for all required resources in operational specifications, I would need more specific information about the industry or operational context you are referring to. However, I can provide you with a general overview of common cost centers that are typically found in operational specifications across various industries. Please note that the specific cost centers may vary depending on the nature of the business or project. Here are some common examples:

Labor Costs: This includes the cost of direct and indirect labor required to perform the specified operations. It may involve different categories of labor, such as skilled workers, supervisors, and administrative staff.

Material Costs: This includes the cost of all materials and supplies needed for the operations. It encompasses raw materials, components, consumables, and any other tangible items required.

Equipment Costs: This includes the cost of using or renting equipment necessary for the operations. It may involve machinery, tools, vehicles, or any other specialized equipment required for production or service delivery.

Overhead Costs: This includes indirect costs associated with the operations. It typically covers expenses such as utilities, facility maintenance, insurance, taxes, and other general administrative costs.

Subcontracting Costs: This includes the cost of outsourcing certain operations or tasks to external contractors or service providers. It may involve hiring specialized subcontractors for specific activities.

Administrative Costs: This includes the cost of administrative functions that support the operations, such as management, finance, human resources, and other related overhead expenses.

Quality Control Costs: This includes the cost of quality assurance and quality control measures to ensure compliance with operational specifications. It may involve testing, inspections, audits, and any other quality-related activities.

Training and Development Costs: This includes the cost of training programs and employee development initiatives necessary to maintain the required skills and knowledge for the operations.

Marketing and Sales Costs: This includes the cost of marketing activities, advertising, sales promotions, and other expenses related to promoting and selling the products or services resulting from the operations.

Research and Development Costs: This includes the cost of research and development activities aimed at improving products, processes, or technologies related to the operations.

1.5. Suppling Information Regarding Remarks and operational procedures

1.5.1. Written Information

Reports

Prior to construction, the condition report, soil report and engineer's drawings will need to be prepared as they contain:

- Information on the existing site such as the location of services
- Instructions for building complex structures
- An assessment on the bearing capacity of the soil

Condition report

The condition report for the site is a record of details about the existing site, the buildings on adjacent boundaries and the setbacks of structures on adjacent properties. It contains information about the condition of fences, any significant vegetation on the site on the boundaries and location of services. Services include water, gas, electricity and telephone lines. It may contain photos as evidence of existing conditions on the site if disputes arise (e.g. if the footpath is cracked prior to work commencing and the council tries to charge you for the repair of the footpath).

To provide information regarding remarks and operational procedures, I would need more specific details about the industry or operational context you are referring to. However, I can offer a general overview of what remarks and operational procedures entail.

Remarks:

Remarks are additional notes or comments included in operational specifications to provide clarification, instructions, or specific information about certain aspects of the operations. These remarks can serve various purposes, such as highlighting important considerations, specifying special requirements, addressing potential challenges, or providing additional guidance to ensure the smooth execution of the specified operations. The content and nature of remarks will

depend on the specific operational context.

Operational Procedures:

Operational procedures outline the step-by-step instructions or guidelines that need to be followed to carry out the specified operations effectively and efficiently. These procedures provide a structured approach to ensure consistency, safety, and desired outcomes. Operational procedures typically include the following elements:

Preparatory Steps: This section outlines the necessary preparations that need to be made before initiating the operation. It may involve tasks such as gathering materials, equipment setup, safety checks, and ensuring compliance with any regulatory requirements.

Sequence of Operations: This section provides a detailed description of the chronological order in which the different tasks or activities should be performed. It outlines the specific actions, methods, and techniques to be used at each stage of the operation.

Safety Guidelines: This section emphasizes the importance of safety during the operations and provides specific safety instructions and precautions to be followed. It may include guidelines for personal protective equipment (PPE), handling hazardous materials, emergency procedures, and any other safety considerations.

Quality Control Measures: This section specifies the quality control measures and inspections to be carried out during the operations. It may include checkpoints, testing requirements, documentation procedures, and any other quality-related instructions.

Troubleshooting and Contingency Plans: This section addresses potential challenges or problems that may arise during the operations and provides instructions on how to handle them. It may include troubleshooting steps, alternative approaches, and contingency plans to ensure continuity and minimize disruptions.

Completion and Post-Operation Tasks: This section outlines the tasks to be performed upon completion of the operations. It may include clean-up procedures, equipment maintenance, data recording, reporting, and any other relevant post-operation activities.

It is important to note that remarks and operational procedures should be tailored to the specific requirements and characteristics of the industry, project, or organization. The level of detail and

complexity of these elements will vary depending on the nature of the operations and the desired outcomes.

Self-Check 1.1

Directions: part I. Choose the Correct answer for the for the given alternative

1. _____are additional notes or comments included in operational specifications to provide clarification, instructions, or specific information about certain aspects of the operations.

   A. Safety Guidelines:
   B. Quality Control Measures:
   C. Remarks:
   D. Marketing and Sales

2. A typical BOQ may include; -

   A. Item number
   B. Description
   C. Quantity
   D. all

3. Project Information
    A. Project Name: Name or description of the project.
    B. Project Location: Location or address of the project site.
    C. Project Number: Unique identification number for the project.
    D. all
4. which of the followings are NOT Sequences of Work
    A. Analyze Activity Dependencies
    B. Optimize Workflow
    C. Consider Trade Coordination
    D. All
5. Which of the following s are NOT Requirement of Tender Documents
    A. Invitation to bid
    B. Optimize Workflow
    C. Instruction to bidders
    D. Information to bidders & bid data

Part II. Write true if the Statement is Correct Write False if not Correct

1. Operational procedures outline the step-by-step instructions or guidelines that need to be followed to carry out the specified operations effectively and efficiently.
2. Bidding and estimating are related but different concepts and processes.
3. "Work and tender" typically refer to the process of bidding for and securing contracts or projects through a competitive tendering process. In this context,
4. One of the Itemized List of Materials is Item/Description
5. The purpose of a Bill of Quantities is to provide a clear and unambiguous description of the materials, components, and workmanship required for a project.

PART-I: Match the items listed under column "A" with those expressions listed under "B" (1 point each)

"Column A"	"Column B "
1. Quantity surveys	A. Unit-price project
2. Bid Components	B. Material Costs
3. Preparing a Bid	C. Preliminary Considerations
4. Time Scheduling	D. Define Project Milestones

Unit two Estimated product / project costs

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

- Estimates Labor Rates and Material Costs
- Project Of Work Cover and Costs
- Recovery Overhead and Margins.
- Calculation Of Estimated Project Costs.

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

- Understand Labor Rates and Material Costs
- Identify Project Of Work Cover and Costs
- Determine Overhead Recovery and Margins.
- Understand Cost Centers of All Required Resources.
- Calculate Of Estimated Project Costs.

2.1. Estimate Labor Rates and Material Costs

Estimating labor rates and material costs for a specific project or industry requires detailed knowledge of the prevailing market conditions, location, project scope, and other factors. As an AI language model, I can provide you with some general guidance on how to approach estimating labor rates and material costs:

Estimating Labor Rates:

1. **Research Local Market Rates:** Start by researching the current labor rates in the specific location where the project will be executed. This can be done by reviewing industry publications, consulting with local trade associations, or contacting subcontractors or labor unions in the area.
2. **Consider Skill Levels:** Labor rates can vary depending on the skill level required for the project. Skilled tradespeople, such as electricians or plumbers, may have higher rates compared to general laborers. Take into account the specific skill requirements of the project to determine accurate labor rates.
3. **Factor in Labor Productivity:** Labor productivity can impact the overall labor cost of a project. Consider the efficiency and productivity levels of the labor force when estimating labor rates. Higher productivity can result in lower labor costs.
4. **Account for Overhead and Benefits:** Labor rates should include allowances for overhead costs, such as payroll taxes, insurance, and benefits. These additional costs are incurred by the employer and should be factored into the labor rate estimation.

Estimating Material Costs:

1. **Develop a Material Takeoff:** Create a detailed list of all the materials required for the project based on the project specifications and quantities. This list will form the basis for estimating material costs.
2. **Obtain Supplier Quotes:** Contact suppliers and request quotes for the materials on your list. Consider reaching out to multiple suppliers to compare prices and ensure you are getting competitive rates.

3. **Consider Delivery and Handling Costs:** In addition to the material costs, factor in any delivery or handling costs associated with transporting the materials to the project site. These costs can vary depending on the distance, logistics, and any special requirements.
4. **Account for Material Waste and Losses:** Anticipate material waste or losses during the construction process and incorporate them into your cost estimation. This can help prevent underestimating the required quantities and costs.
5. **Monitor Market Fluctuations:** Keep track of market trends and fluctuations in material prices. Some materials, such as lumber or steel, may experience significant price changes due to supply and demand factors. Stay updated on market conditions to ensure accurate cost estimations.

It's important to note that labor rates and material costs can vary significantly depending on the project location, economic conditions, and specific project requirements. It's recommended to consult with industry professionals, contractors, or estimators with expertise in the specific industry or project type to obtain accurate and up-to-date cost estimates.

Calculate Material Costs

Calculating material costs involves determining the quantities of materials required for a project and multiplying those quantities by their respective unit prices. Here's a step-by-step process for calculating material costs:

Material Takeoff: Prepare a detailed list of all the materials needed for the project based on the project specifications, drawings, and any other relevant documents. This list should include the specific types, sizes, and quantities of materials required.

Quantity Calculation: Determine the quantities of each material needed for the project. This can be done by measuring or estimating the dimensions of the project components and applying appropriate formulas or conversion factors. For example, if you need to calculate the quantity of paint required for a wall, you would multiply the wall's surface area by the paint coverage rate per square meter.

Unit Price Research: Research the unit prices of the materials on your list. This can be obtained by contacting suppliers, checking price catalogs, or using online resources. Consider factors such as the quality, grade, brand, and any bulk discounts that may apply.

Multiply Quantity by Unit Price: Multiply the quantity of each material by its respective unit price. This will give you the individual cost for each material item.

For example, if you need 100 bricks and the unit price of bricks is $0.50 per piece, the cost for bricks would be 100 x $0.50 = $50.

Summation: Add up the costs of all the individual material items to obtain the total material cost for the project. This will give you an estimate of the overall cost of materials required.

Consider Additional Costs: In addition to the direct material costs, consider any additional costs such as delivery charges, taxes, or handling fees associated with the procurement of materials. These costs should be factored into the total material cost estimation.

What is a Material Safety Data Sheet (MSDS)?

A Material Safety Data Sheet (MSDS) is designed to provide both workers and emergency personnel with the proper procedures for handling or working with a particular substance. MSDS's include information such as physical data (melting point, boiling point, flash point etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill/leak procedures. These are of particular use if a spill or other accident occurs.

2.2. Project Of Work Cover and Costs

A "Project of Work" typically refers to a specific undertaking or initiative that involves a set of planned activities to achieve a defined objective within a specified timeframe. It is often used in project management to outline the scope, goals, deliverables, tasks, and resources required for successful project execution.

When estimating the costs of a project of work, several factors need to be considered. Here are some key aspects to consider when determining project costs:

Scope and Deliverables: Clearly define the scope of the project and the specific deliverables or outcomes expected. This will help in identifying the resources and activities required to achieve those deliverables.

Work Breakdown Structure (WBS): Create a detailed work breakdown structure that breaks down the project into smaller, manageable tasks. This will help identify the specific activities and resources needed for each task.

Resource Allocation: Identify the types and quantities of resources required for each task, including labor, materials, equipment, and any external services or subcontractors that may be needed.

Labor Costs: Estimate the labor costs by considering the number of personnel required, their skill levels, and the estimated hours needed to complete each task. Apply the appropriate labor rates to calculate the labor cost for each resource.

Material Costs: Identify the materials required for the project and estimate their quantities. Determine the unit prices of the materials and multiply them by the quantities needed to calculate the material costs.

Equipment Costs: If the project requires the use of specialized equipment or machinery, consider the cost of renting or purchasing the equipment. Include any maintenance, fuel, or operational costs associated with the equipment.

Subcontractor Costs: If certain tasks or activities will be outsourced to subcontractors or external service providers, obtain quotes or estimates for their services and include those costs in the project budget.

Contingency and Miscellaneous Costs: Account for unexpected or unforeseen expenses that may arise during the project. It is common to include a contingency amount to cover any potential risks or changes in scope.

Overhead Costs: Consider indirect costs such as administrative overhead, project management expenses, insurance, permits, and utilities. These costs are essential for the smooth operation and management of the project.

Review and Monitoring: Regularly review and monitor the project costs throughout its lifecycle. Compare the actual costs incurred with the estimated costs to identify any variances and take corrective actions as needed.

Remember that project costs can vary depending on the nature and complexity of the project, location, market conditions, and other factors. It is essential to conduct thorough research, consult industry experts, and use historical data or benchmarks to ensure accurate cost estimation and budgeting for your specific project of work.

2.3. Recovery Overhead and profit Margins

recovery overhead and profit margins are two components that are often included in project cost estimations to account for indirect costs and to generate a profit for the organization or contractor. Here's an explanation of these terms:

Recovery Overhead: Recovery overhead refers to the indirect costs incurred by the organization or contractor that are not directly attributable to a specific project but are necessary for the overall operation of the business. These costs can include administrative expenses, office rent, utilities, insurance, equipment maintenance, and other general operational costs. Recovery overhead is typically recovered by allocating a percentage of these costs to each project based on factors such as labor hours, direct costs, or project revenue.

To calculate recovery overhead, the organization or contractor may determine a predetermined overhead rate (POR) or overhead recovery rate (ORR) based on historical data or industry benchmarks. This rate is then applied to the direct costs or labor hours of the project to determine the overhead cost to be allocated.

Profit Margin: Profit margin is the amount of profit added to the project cost to generate a return on investment for the organization or contractor. It is typically expressed as a percentage of the project cost or revenue. The profit margin accounts for the risks, expertise, and value provided by the organization or contractor.

The specific profit margin applied can vary depending on factors such as the industry, project complexity, market conditions, and competitive landscape. It is often determined based on the organization's financial goals, market rates, and the perceived value of the services provided.

When estimating project costs, the recovery overhead and profit margin are typically added to the direct costs (e.g., labor, materials, subcontractor costs) to arrive at the total project cost. The overhead and profit margin percentages can vary depending on the organization's internal policies, industry standards, and negotiation with the client or stakeholders.

It's important to note that the recovery overhead and profit margin should be carefully considered and balanced to ensure that the project remains competitive, covers all necessary costs, and generates a reasonable profit for the organization or contractor.

2.4. Calculation Of Estimated Project Costs.

Calculating estimated project costs involves considering various factors and components to develop a comprehensive budget. Here's a general approach to calculating estimated project costs:

Define the Project Scope: Clearly define the scope and objectives of the project. This includes identifying the deliverables, timelines, and any specific requirements or constraints.

Breakdown the Work: Create a work breakdown structure (WBS) that breaks the project down into smaller tasks or activities. This helps in identifying all the necessary components and estimating their costs.

Estimate Resource Requirements: Identify the resources needed for each task, such as labor, materials, equipment, and subcontractors. Estimate the quantities or durations required for each resource.

Determine Labor Costs: Estimate the labor costs by considering the number of personnel required, their skill levels, and the estimated hours or durations needed for each task. Apply the appropriate labor rates to calculate the labor cost for each resource.

Calculate Material Costs: Identify the materials needed for the project and estimate their quantities. Determine the unit prices of the materials and multiply them by the quantities needed to calculate the material costs.

Assess Equipment Costs: If the project requires specialized equipment or machinery, consider the cost of renting or purchasing the equipment. Include any maintenance, fuel, or operational costs associated with the equipment.

Include Subcontractor Costs: If certain tasks or activities will be outsourced to subcontractors or external service providers, obtain quotes or estimates for their services and include those costs in the project budget.

Account for Other Direct Costs: Consider any other direct costs specific to the project, such as permits, licenses, travel expenses, or specialized software.

Add Indirect Costs: Factor in indirect costs, including recovery overhead, such as administrative expenses, office rent, utilities, insurance, and other general operational costs. Determine the appropriate allocation method (e.g., percentage of direct costs, labor hours) to include indirect costs in the project budget.

Include Contingency: Allocate a contingency amount to account for unforeseen risks or changes in the project scope. The contingency can be a percentage of the total estimated costs (e.g., 5-10%) and is intended to cover unexpected expenses.

Calculate Profit Margin: Determine the desired profit margin for the project. This can be a percentage applied to the total estimated costs or revenue.

Summarize and Review: Add up all the estimated costs, including labor, materials, equipment, subcontractors, indirect costs, contingency, and profit margin. Review the budget to ensure it aligns with the project's goals, constraints, and financial objectives.

It's important to note that project cost estimation can be complex and may require input from subject matter experts, historical data, industry benchmarks, and consideration of market conditions. Regular monitoring and updates to the project budget throughout its lifecycle are also essential to manage costs effectively.

depreciation calculation

Quite simply, the price of the newly bought machine, car or whatever it may be is divided by the expected lifespan of the machine. For example, a new delivery pick-up is purchased for 12,000 Birr and its calculated lifespan is five years. Its annual depreciation = 12,000 Birr / 5 = 2,400 Birr/year.

- **Fixed costs** include the costs of power, fuel, taxes on real estate, rent and insurance, and capital, including depreciation and interest.

  The company would have to pay the costs regardless of whether it made a particular product.

- Thus fixed costs are not sensitive to production volume.

Capital costs

Capital costs represent the capital investment in land, buildings, machinery and equipment and represent major expenses for most manufacturing operations. A business woman or businessman, who contracts a loan, has to pay interest for the duration of the loan. Interest is also due for an overdraft on the entrepreneur's current account. These payments are called capital costs.

Staff costs

An entrepreneur who employs staff becomes an employer and he/she will have legal and social responsibility for his/her employees. This responsibility means that he/she has to fulfill a number of requirements that are imposed by laws and regulations, or by collective bargaining/ agreements such as:

- Minimum wages
- Legal duration of working hours
- Overtime payment
- Annual leave
- Sick leave
- Social security/safety

This enumeration/details shows that staff costs are not only salaries or wages. The additional costs that come on top of the salaries are often calculated as a percentage of the salary. This can vary from country to country from a relatively small percentage up to as much as 40% in, for example, highly industrialized countries with a very sophisticated social security net.

Manufacturing costs are divided into three categories:

1. **Direct materials** are the primary material inputs that can be directly and conveniently traced to each job. Examples of direct materials used in building a home include concrete, piping, lumber, drywall, fixtures, and appliances.
2. **Direct labor** is the hands-on work that goes into producing a product or service.

Examples of direct labor used in building a home include the work of pouring the foundation, framing the home, and installing the plumbing.

3. **Manufacturing overhead** includes all other costs of producing a product that cannot be directly or conveniently traced to a specific job. Examples of the manufacturing overhead required to build (not sell) a home include the costs of site supervision, construction insurance, depreciation on construction equipment, and indirect materials (nails, screws, and so on).

Direct and Indirect Costs

Every business generates costs even if there is no ongoing production, service or trading activities. To understand this, it is essential to know that there are direct costs and indirect costs.

Direct costs are those costs that only occur when an enterprise is manufacturing goods or producing a service or buying goods to resell. These costs depend directly on the number of products, services or goods produced. Direct costs are composed of two cost sub-groups in the following figure 2:

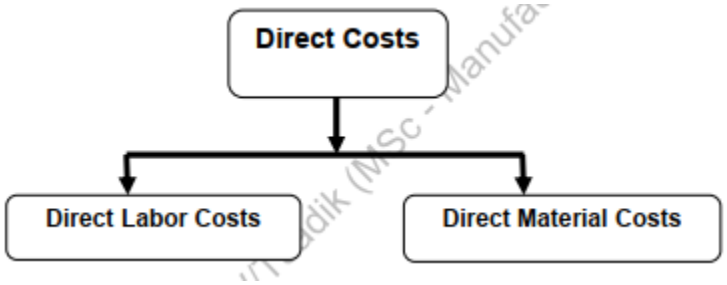


Figure 2 Types of direct costs

Direct Labor Costs	Direct Material Costs
All wages for workers and helpers that are directly involved in the production or the delivery of services. This also includes costs for social security. Staff wages for the retailer and wholesaler are not considered as direct costs because one person generally sells many different items.	Expenditures for all items that become part of a product or are used to produce a service or are bought for resale enter into the category of direct material costs. Costs linked to the acquisition of raw materials such as transport from the supplier to the enterprise are included in the direct costs.

Indirect costs are all other costs generated from business activities that are not direct costs. These are costs that cannot directly be attributed to a specific product or service, for example rent for the office premises, salary for the bookkeeper, interest on the bank loan, telephone costs, fire and car insurance, etc. In wholesale or retail business all staff costs are indirect costs.

To be able to calculate the manufacturing costs of one single product or one single service, the indirect costs have to be attributed proportionally. If the business produces a single product or service, or if the products are quite similar, for example chairs, beds, trousers or shirts, the indirect costs are divided by the number of products and this proportion is added to the direct costs to calculate the total cost per unit of an item. In a service business the indirect costs are generally calculated on the basis of working hours and added to the time spent in delivering the service.

Indirect costs are also called overhead costs

To make the distinction between direct costs and indirect costs is not always easy, for example the glue used in furniture making. The quantity used for one chair is so small that it represents only a very small portion of the price of the glue. The expenditure for a pot of glue is therefore considered as an indirect cost. Also, if a helper serves several workers, his/her salary cannot be attributed to one single product. The salary will therefore be counted as an indirect cost.

Total cost of a product or service:

Sum of Direct Material Costs
+ Sum of Direct Labor Costs
+ Proportion of indirect costs
= Total cost per product or service

In a job order cost system, all of these manufacturing costs are recorded on a document called the **job cost sheet**, which provides a detailed record of the cost incurred to complete a specific job. Refer to Figure 3, for an illustration of how the three types of manufacturing costs are assigned in a job order cost system.

The most important thing to notice in Figure 3 is that direct materials and direct labor costs are assigned to jobs differently than manufacturing overhead costs. For direct costs, all that is needed to keep track of the costs of specific jobs is a set of records called source documents. In a manual (paper-based) accounting system, a source document is a hard copy document similar to the receipt you get when you buy something at a store. But more companies are moving to paperless systems that record all of the information electronically and track it using technology such as bar codes, computer scanning devices, and other technologies

Self-Check 2.1

Directions: I. Choose the Correct answer for the for the given alternative

1. _____are all other costs generated from business activities that are not direct costs.
   A. Indirect cost
   B. Direct cost
   C. Over head cost
   D. Material cost
2. _____includes all other costs of producing a product that cannot be directly or conveniently traced to a specific job.
   A. Manufacturing
   B. Minimum wages
   C. Legal duration of working hours
   D. Overtime payment
3. _____involves considering various factors and components to develop a comprehensive budget.
   A. Define the Project Scope
   B. Breakdown the Work:
   C. Calculating estimated project costs
   D. Estimate Resource Requirements:
4. _____involves determining the quantities of materials required for a project and multiplying those quantities by their respective unit prices.
   A. Calculating material costs
   B. Material Takeoff
   C. Quantity Calculation
   D. Unit Price Research

Part II. Fill the Biank space for the following question

1. _____is designed to provide both workers and emergency personnel with the proper procedures for handling or working with a particular substance.
2. _____is the amount of profit added to the project cost to generate a return on investment for the organization or contractor.
3. _____are all other costs generated from business activities that are not direct costs.
4. _____-typically refers to a specific undertaking or initiative that involves a set of planned activities to achieve a defined objective within a specified timeframe.
5. _____involves determining the quantities of materials required for a project and multiplying those quantities by their respective unit prices.

Unit three. customer benefits and wastage minimize

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

- perceived by customer benefits
- method and cause of reduction wastages costs and components
- maximize customer benefits and minimize costs.

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

- understand perceived by customer benefits
- identify method and cause reduction wastages costs and components
- determine maximize customer benefits and minimize costs.

3.1. perceived by customer benefits

When estimating project costs, it is also important to consider the perceived benefits by the customer. These perceived benefits can have an impact on the overall project budget. Here's how to take customer benefits into account:

Identify Customer Needs: Understand the specific needs and requirements of the customer or client. This includes understanding their goals, desired outcomes, and any specific benefits they are seeking from the project.

Assess Value-Added Features: Identify any value-added features or benefits that the project can provide to the customer. These are additional benefits beyond the basic project requirements that can enhance the customer's experience or deliver additional value.

Quantify Benefits: If possible, quantify the benefits in terms of cost savings, increased efficiency, improved quality, or other tangible outcomes. This can help justify additional costs associated with providing those benefits.

Cost-Benefit Analysis: Conduct a cost-benefit analysis to evaluate the financial impact of the project on the customer. This involves comparing the estimated costs of the project with the quantified benefits to determine if the benefits outweigh the costs.

Value Engineering: Explore value engineering options to optimize costs while maximizing customer benefits. Value engineering involves finding alternative solutions or approaches that provide the desired benefits at a lower cost.

Communication and Alignment: Engage in open communication with the customer to ensure that their perceived benefits align with the project scope and budget. Discuss the trade-offs between costs and benefits and seek agreement on the desired outcomes.

Adjust Budget Priorities: Based on the customer's perceived benefits, adjust the budget priorities accordingly. Allocate resources and funds to areas that directly contribute to delivering the identified benefits.

By considering the perceived benefits by the customer, you can align the project costs with the value that the customer expects to receive. This helps in prioritizing resources, justifying costs, and ensuring customer satisfaction with the project outcomes.

3.1.1. Customer benefits

Customer benefits from products can vary depending on the specific product and the needs of the customer. Here are some common types of customer benefits that products can provide:

A. **Functional Benefits:** Products often fulfill a specific functional need or purpose for customers. This can include features or capabilities that enable customers to perform tasks more efficiently, effectively, or conveniently. For example, a smartphone with a high-resolution camera provides the functional benefit of capturing high-quality photos.

B. **Cost Savings:** Products that help customers save money or reduce expenses can be highly appealing. This can include products that are more energy-efficient, have lower maintenance costs, or provide cost-effective alternatives to existing solutions. For example, energy-saving appliances can offer cost savings on electricity bills.

C. **Time Savings:** Products that help customers save time or streamline processes can be highly valued. This can include automation features, intuitive interfaces, or tools that simplify complex tasks. For example, project management software that automates task tracking and collaboration can save time for teams.

D. **Enhanced Performance:** Products that offer improved performance or superior quality compared to alternatives can be attractive to customers. This can include products with faster processing speeds, better durability, or higher reliability. For example, high-performance sports shoes that enhance athletic performance.

E. **Convenience and Ease of Use:** Products that are user-friendly and offer convenience can be highly desirable. Customers appreciate products that require minimal effort to set up, operate, or maintain. For example, smart home devices that can be controlled through a mobile app offer convenience and ease of use.

F. **Emotional Satisfaction:** Products can also provide emotional benefits that appeal to customers' desires for status, self-expression, or enjoyment. This can include luxury goods, fashionable items, or products that evoke positive emotions. For example, a designer handbag can provide a sense of style and prestige.

G. **Safety and Security:** Products that offer safety features or address security concerns can provide peace of mind for customers. This can include products with built-in safety mechanisms, robust cybersecurity features, or protective equipment. For example, home security systems that provide surveillance and alarm systems.

3.1.2. Performance and cycle times for products made

The performance and cycle times for products can vary depending on the specific type of product and manufacturing processes involved. Here's an overview of these concepts:

Performance: Product performance refers to how well a product meets the functional requirements and specifications set by the customer. It involves evaluating the product's ability to deliver the desired outcomes and perform its intended tasks effectively. The performance of a product can be measured using various parameters, such as speed, accuracy, durability, efficiency, capacity, and reliability.

The performance requirements of a product can vary greatly depending on the industry, product type, and customer expectations. For example, in the automotive industry, performance metrics may include horsepower, fuel efficiency, acceleration, and handling, while in the electronics industry, performance metrics may include processing speed, memory capacity, and battery life.

Cycle Time: Cycle time refers to the time required to complete one cycle of a manufacturing process, from the beginning to the end. It represents the time it takes to produce one unit of a product or complete a specific operation or task in the production process.

Cycle time is a critical factor in manufacturing as it directly impacts production capacity, lead times, and overall efficiency. Shorter cycle times generally lead to higher productivity and faster delivery of products to the market. Manufacturers often focus on reducing cycle times through process optimization, automation, and lean manufacturing techniques to improve efficiency and competitiveness.

The specific performance and cycle times for products depend on various factors, including the complexity of the product, manufacturing technology, production volume, and the desired quality standards. Manufacturers strive to optimize both performance and cycle times to meet

customer expectations, reduce costs, and increase overall productivity. Continuous improvement efforts and technological advancements play a significant role in achieving better product performance and shorter cycle times in manufacturing processes**.**

3.2. methods of reduction wastages costs and components

Reducing wastage costs and improving efficiency in a manufacturing process involves implementing various methods and strategies. Here are some common approaches to reducing wastage costs and optimizing components:

Lean Manufacturing: Lean manufacturing principles focus on eliminating waste and improving efficiency throughout the production process. This includes identifying and minimizing different types of waste, such as overproduction, defects, excess inventory, waiting times, unnecessary motion, and overprocessing. Implementing lean techniques, such as value stream mapping, 5S methodology, and just-in-time production, can help streamline operations and reduce wastage costs.

Process Optimization: Analyze and optimize manufacturing processes to identify bottlenecks, inefficiencies, and areas of potential waste. This can involve studying process flows, conducting time-motion studies, and using data analysis techniques to streamline operations, improve productivity, and reduce wastage. Implementing automation, standardizing procedures, and leveraging technology can also contribute to process optimization.

Quality Control: Implement robust quality control measures to minimize defects and rework. This includes conducting regular inspections, implementing statistical process control (SPC) techniques, and investing in quality assurance systems. By maintaining high-quality standards, the number of defective products and associated wastage costs can be reduced.

Supplier Collaboration: Collaborate closely with suppliers to optimize the supply chain and reduce wastage costs. This can involve implementing just-in-time delivery systems, establishing clear quality requirements, and developing long-term partnerships with reliable suppliers. By

ensuring timely and high-quality supplies, inventory holding costs and the risk of wastage can be minimized.

Employee Training and Engagement: Provide comprehensive training to employees on waste reduction techniques, quality control, and process optimization. Engage employees in continuous improvement initiatives and encourage their involvement in identifying and implementing ideas for waste reduction. Empowering employees to contribute to waste reduction efforts can lead to significant improvements in efficiency and cost savings.

Energy Efficiency: Implement energy-efficient practices and technologies to reduce energy consumption and associated costs. This can include optimizing equipment settings, using energy-efficient machinery, and promoting awareness and behavioral changes among employees to conserve energy.

Material Optimization: Analyze material usage throughout the manufacturing process and identify opportunities for material optimization. This can involve redesigning products to minimize material waste, recycling or reusing scrap materials, and implementing accurate measuring and cutting techniques to minimize material losses.

Continuous Improvement: Foster a culture of continuous improvement by regularly reviewing processes, collecting feedback, and implementing changes based on performance data. Encourage employees to suggest ideas for waste reduction and provide incentives for successful implementation.

By implementing these methods and strategies, manufacturers can effectively reduce wastage costs, improve efficiency, and optimize components in their manufacturing processes. Continuous monitoring, analysis, and adjustment are essential to sustain these improvements over time.

In the context of lean manufacturing, there are commonly recognized seven types of wastage, also known as "muda." These wastages are non-value-adding activities that consume resources without contributing to the final product or customer satisfaction. The seven types of wastage are:

Overproduction: Producing more than what is required or producing ahead of demand. This results in excess inventory, storage costs, and potential obsolescence.

Waiting: Delays or idle time caused by inefficient processes, lack of coordination, or bottlenecks. Waiting wastes time and hampers overall productivity.

Transportation: Unnecessary movement or transportation of materials, parts, or products. Excessive transportation increases lead times, adds costs, and poses the risk of damage or loss.

Overprocessing: Performing more work than necessary or using overly complex processes. Overprocessing includes using higher-grade materials or tighter tolerances than required by the customer, resulting in increased costs without added value.

Excess Inventory: Holding excess inventory beyond what is necessary for immediate production or customer demand. Excess inventory ties up capital, occupies space, and can lead to obsolescence or increased carrying costs.

Motion: Unnecessary or inefficient movement of people, equipment, or materials within the production process. Excessive motion leads to increased fatigue, reduced productivity, and potential safety hazards.

Defects: Production errors, rework, or scrap caused by quality issues. Defects result in wasted materials, additional rework, and potential customer dissatisfaction.

Identifying and minimizing these seven types of wastage are key objectives in lean manufacturing. By eliminating or reducing these wasteful activities, organizations can improve efficiency, reduce costs, enhance quality, and increase customer value.

3.3. maximize customer benefits and minimize costs.

To maximize customer benefits and minimize costs, businesses can follow several strategies:

Customer-Centric Approach: Understand the needs, preferences, and pain points of customers. Conduct market research, gather feedback, and engage in continuous dialogue to align products and services with customer expectations. By delivering value that directly addresses customer needs, businesses can maximize customer satisfaction and loyalty, leading to long-term benefits.

Value Proposition Differentiation: Develop a unique value proposition that differentiates your products or services from competitors. Identify and emphasize the key benefits that set your offerings apart. This allows you to capture the attention of target customers and justify premium pricing, thus maximizing customer benefits while maintaining competitive costs.

Efficient Operations: Streamline internal operations and processes to minimize waste, reduce inefficiencies, and optimize resource utilization. Implement lean manufacturing or lean management principles to improve productivity, reduce cycle times, and eliminate non-value-adding activities. This helps in maximizing output while minimizing costs.

Cost Optimization: Conduct thorough cost analysis and identify areas where costs can be minimized without compromising quality or customer satisfaction. Focus on cost reduction strategies such as strategic sourcing, supply chain optimization, and process improvement. Negotiate favorable terms with suppliers, explore cost-effective alternatives, and leverage economies of scale to reduce costs.

Continuous Improvement: Foster a culture of continuous improvement within the organization. Encourage employees to identify and implement ideas for cost savings and process enhancements. Implement performance measurement systems, set targets, and track progress to ensure ongoing improvement in delivering customer benefits while managing costs.

Technology Adoption: Embrace technology solutions that improve efficiency, enhance customer experience, and reduce costs. Automation, digitalization, and data analytics can streamline operations, enable personalized customer interactions, and provide insights for better decision-making. Technology investments should be evaluated based on their potential to deliver long-term customer benefits and cost savings.

Supplier Collaboration: Build strong partnerships with suppliers and collaborate in areas such as product development, cost reduction initiatives, and supply chain optimization. Engaging suppliers as strategic partners can result in shared cost savings, product innovation, and improved value for customers.

Lifecycle Cost Consideration: Evaluate the total lifecycle cost of products or services, including maintenance, repairs, and disposal. By considering the entire product lifecycle, businesses can identify opportunities to minimize costs and maximize customer benefits over the product's lifespan**.**

Self-Check 3.1

PART-I: Match the items listed under column "A" with those expressions listed under "B" (1 point each)

column "A"	**column "B"**
1. Delays or idle time caused by inefficient processes	A. Transportation
2. Unnecessary movement or transportation of materials, partst	B. Waiting
3. Unnecessary or inefficient movement of people, equipment	C, Defects
4. Production errors, rework, or scrap caused by quality issues.	D Motion
5. pain points of customers.	E. Customer-Centric Approach
6. processes to minimize waste	F. Technology Adoption
7. Embrace technology solutions that improve efficiency	G. Efficient Operations

Unit Four: Production performance variance

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

- customer meet performance pull
- actual cycle time and variability of cycle time.

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Understand customer meet performance pull.
- Determine actual cycle time and variability of cycle time.

4.1. customer meet performance pull

"Customer meet" could refer to a meeting or interaction between a company or organization and its customers. It is a broad term that can encompass various activities, such as:

Customer Meetings: These are formal or informal gatherings where representatives from a company meet with existing or potential customers to discuss business matters, address concerns, provide updates, or gather feedback.

Sales Meetings: These meetings focus on the sales process and involve presenting products or services to customers, negotiating deals, and closing sales.

Customer Support Interactions: These interactions occur when customers reach out to a company's customer support team for assistance, whether it's to resolve issues, seek information, or request help with a product or service.

Focus Groups or Market Research: Companies may organize customer meet-ups in the form of focus groups or research sessions to gather insights, opinions, and feedback on their products, services, or marketing strategies.

The specific meaning of "customer meet" can vary depending on the context in which it is used. If you can provide more details about the specific situation or industry you are referring to, I can provide a more tailored explanation.

"Performance pull" is not a commonly used term, and without further context, it's difficult to provide a specific explanation. However, in general business or organizational contexts, "performance pull" could refer to several things:

Performance Improvement: It could refer to the act of pulling or striving for improved performance in a particular area, such as increasing productivity, efficiency, or quality.

Performance Evaluation: It could refer to a process where individuals or teams assess their performance against specific metrics or goals. This evaluation helps identify areas for improvement or areas where performance is not meeting expectations.

Performance Management: It could refer to the ongoing process of setting goals, monitoring progress, providing feedback, and making adjustments to ensure that individuals or teams are performing at their best.

Performance Pull System: In certain production or manufacturing contexts, a "pull system" is a method where work is pulled based on demand, rather than being pushed based on a predetermined schedule. "Performance pull" in this context might refer to implementing or optimizing such a system to improve efficiency and minimize waste.

4.2. actual cycle time and variability of cycle time operation of a product

Actual Cycle Time:

Actual cycle time refers to the amount of time it takes to complete a specific process or task from start to finish in real-world conditions. It represents the elapsed time required to perform the activities involved in a process, including any delays, interruptions, or inefficiencies that may occur.

For example, in a manufacturing setting, the actual cycle time may be the time it takes for a product to move through each step of the production process, including setup, machining, assembly, inspection, and packaging. It takes into account any factors that affect the time required, such as machine downtime, operator efficiency, or material availability.

Variability of Cycle Time:

Variability of cycle time refers to the degree of variation or fluctuation in the time it takes to complete a process or task. It measures the inconsistency or dispersion of cycle times observed over a series of repetitions.

In other words, it quantifies how much the actual cycle times deviate from the average or expected cycle time. A low variability indicates that the process is consistent and predictable, while a high variability suggests that there are significant fluctuations or uncertainties in the time required to complete the process.

Reducing variability is often a goal in process improvement efforts because it can lead to more reliable and efficient operations. By minimizing variations in cycle time, organizations can enhance productivity, improve customer satisfaction, and optimize resource allocation.

Methods such as statistical process control, lean manufacturing principles, and Six Sigma methodologies are commonly used to identify and address sources of variability in cycle time, aiming to create more stable and predictable processes.

normal time to complete an operation on a product

normal time to complete an operation on a product refers to the average or expected time it takes to perform a specific task or operation as part of the overall production process. It represents the standard or typical time required to complete the operation under normal operating conditions, without any significant delays, interruptions, or exceptional circumstances.

The normal time is often determined through time studies, where the task is observed and timed repeatedly to calculate an average time. This average time serves as a baseline for planning purposes, resource allocation, scheduling, and performance measurement.

The normal time can vary depending on the nature of the operation, complexity of the task, skill level of the workers, efficiency of the equipment and tools used, and other factors. It is important to note that the normal time does not account for any inefficiencies, delays, or variations that may occur in actual production. Therefore, it may serve as a benchmark for performance evaluation and process improvement efforts.

By comparing the actual time taken to the normal time, organizations can identify areas of improvement, such as reducing bottlenecks, streamlining processes, improving worker productivity, or optimizing equipment utilization.

Self-Check 4.1

Directions: part I. Choose the Correct answer for the for the given alternative

1. _____refers to the degree of variation or fluctuation in the time it takes to complete a process or task.
   A. Variability of cycle time
   B. Deviation
   C. Bill of quality
   D. Actual cycle time
2. _____refers to the amount of time it takes to complete a specific process or task from start to finish in real-world conditions.
   A. Variability of cycle time
   B. Deviation
   C. Bill of quality
   D. Actual cycle time
3. _____It could refer to the act of pulling or striving for improved performance in a particular area,
   A. Customer Meetings:
   B. Sales Meetings
   C. Performance Improvement
   D. Performance Evaluation
4. _____refer to implementing or optimizing such a system to improve efficiency and minimize waste.
   A. Performance Improvement
   B. Performance Evaluation
   C. Performance Management
   D. Performance Pull System

Part II. Write true if the Statement is Correct Write False if not Correct

1. "Performance pull" is not a commonly used term, and without further context, it's difficult to provide a specific explanation.
2. "Customer meet" could refer to a meeting or interaction between a company or organization and its customers.

3. Performance Pull System: In certain production or manufacturing contexts, a "pull system" is a method where work is pulled based on demand, rather than being pushed based on a predetermined schedule.

Unit five: Measure quantities of work and check

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

- Measurements item by item and incorrect data and size of parameters.
- computation of the work to prepare the bill of quantities
- corrections and adjustment.
- documenting bill of quantities.

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- measure the item by item and incorrect data and size of parameters.
- prepare Computation of the work of the bill of quantities
- Check the corrections and adjustment.
- Check documenting bill of quantities.

5.1. Measurements item by item and incorrect data and size of parameters.

The reliability of physical resource cost estimates at every stage in the production process is necessary for responsible fiscal/economic management. Unreliable cost estimates result in severe problems.

5.1.1. Manufacturing Equipment and Plant

Manufacturing equipment and plant refers to the tools, instruments, machinery, and other mechanical implements required in the performance of manufacturing work. Manufacturing plant is defined as mass production plants, aggregate processing plants, conveying systems, and any other processing plants, which are erected in place at the job site and are essentially stationary or fixed in place. Equipment is defined as items, which are portable or mobile, ranging from small hand tools through machines, tractors, cranes, and trucks. For estimating purposes, plant and equipment are grouped together as equipment costs.

5.1.2. selection of equipment

An important consideration in the preparation of an estimate is the selection of the proper equipment to perform the required tasks. The cost engineer should carefully consider number, size, and function of equipment to arrive at optimum equipment usage. Some factors to consider during the selection process are

- Conformance to specification requirements.
- Job progress schedule (production rate).
- Importance of the job; type of materials.
- Availability of space and site access.

- Mobility and availability of equipment.
- Suitability of equipment for other uses.
- Onsite batch or production plants.
- Equipment capabilities.
- Loading and unloading of freight/shipment.
- Number of shifts.
- Distances material must be moved.
- Weather conditions.
- Hauling/transportation restrictions.
- Standby time.
- Mobilization and demobilization costs.

The cost engineer preparing the estimate must be familiar with manufacturing equipment and job conditions. The equipment selected should conform to agreement requirements and be suitable for the materials to be handled and conditions that will exist on the project.

5.1.3. **Equipment Productivity**

The "crew concept" for product/project cost estimates requiring detailed estimating, is also being considered in costing equipment. For each significant work task, workers and equipment are expressed in the hourly cost and expected total equipment time should be allocated between both crews. After determining the type of equipment to be employed, the cost engineer should select the specific equipment size that has a production rate suited to the efficient and economical performance of the work. The size and number of units required will be influenced by equipment production rate, job size, availability of space for equipment operations, the manufacturing schedule for the various work tasks, number of shifts to be worked, and the availability of equipment operators. Emphasis must be placed on the importance of establishing a reasonable production rate. Production may be based on actual performance data, commercial manufacturer tables, or rates from historical equipment models and assemblies, or adjusted for product conditions. A certain level of

standby costs may be necessary if the equipment chosen is used on a part-time basis, remaining dormant without operator attendance for a significant period of the operation.

5.1.4 Equipment Ownership and Operating Expense Cost Rates

The company/ industry establishes the method for calculating hourly rates for equipment ownership and operating expense. Similar method and hourly rates can be found in the Cost Book and used in the preparation of cost estimates for owned equipment. Rented equipment is appropriate for inclusion in the estimate at competitive rates if judgment determines this to be a reasonable approach by a careful service provider. The cost engineer may also use current commercially available publications for assistance in determining rates.

Plant Cost

For less highly specialized plant, some salvage may be anticipated, depending on storage cost, resale value, and probability of sale or reuse in the immediate future. The total product charge including operation, maintenance, and repair should be distributed in proportion to the time. Cost of plant required for the production of products should normally be included in the estimate as part of the cost of these materials or supplies manufactured or produced at the industry.

Small Tools

The cost of small power and hand tools and miscellaneous may be estimated as a percentage of the labor cost. The allowance must be determined by the cost engineer in each case, based upon experience for the type of work involved. The small tool cost will be considered as part of equipment cost. Such allowance can range typically up to 12 percent of direct labor cost. Another acceptable approach is to apply an actual small tools cost within the respective crew where it is applicable. The cost engineer must

ensure that this cost is not duplicated in the overhead rate percentages.

material and supplies

Materials and supplies for the purpose of estimating both can be considered materials unless they need to be separated because of different tax rates. Materials are physically incorporated into and become part of the permanent production. Supplies are items used in production but do not become physically incorporated into the product

sources of pricing data

Prices for materials and supplies may be obtained from pricing services, the Cost Book, commercial cost books, catalogs and historical data records. The office should review the source of the pricing contained in these publications and assess the reasonableness prior to use. Standard unit prices from these sources are considered satisfactory only after an applicability determination has been made. Care should be taken when using this type of cost data to make proper allowances for quantity discounts, inflation, and other factors affecting manufacturer cost.

Handling and Storage

If the materials or supplies are a large quantity in bulk that would require extensive equipment for unloading and hauling, it may be desirable to prepare a labor and equipment estimate for the material handling and delivery. The manufacturer is usually required to offload, handle, and stockpile or warehouse materials. These costs should be included in the estimate. An item of electronic equipment requiring special low humidity storage might have this special cost added to the direct cost of the equipment.

Taxes

When applicable, sales tax should be added to the materials or supplies cost. Care should be taken that the sales tax rate is applied as required. The cost engineer should verify the tax rates and the applicability of these rates for the product/project location. Sales tax is considered as direct cost of the materials and supplies and should be applied to Government-furnished equipment and included in the estimate.

***Rule-Based Systems*:** these systems are based on process time and cost calculation of feasible processes from a set of available ones for the manufacture of a part based on design and/or manufacturing constraints. Such a system reflects these constraints in a respective rule class with the information encapsulated in it by an expert in the area. A rule-based algorithm is an example of one such approach that helps to establish design and manufacturing constraints. This approach is shown diagrammatically in Figure 7

Based on a set of user constraints, manufacturing processes are selected that are then used to calculate the product cost. The set of constraints may need to be changed to obtain a different set of manufacturing processes to obtain an acceptable product cost estimate. This methodology is helpful for cost optimization based on process evaluation criteria. However, obtaining the optimized results can be very time consuming, especially when there are a large number of processes to be evaluated.

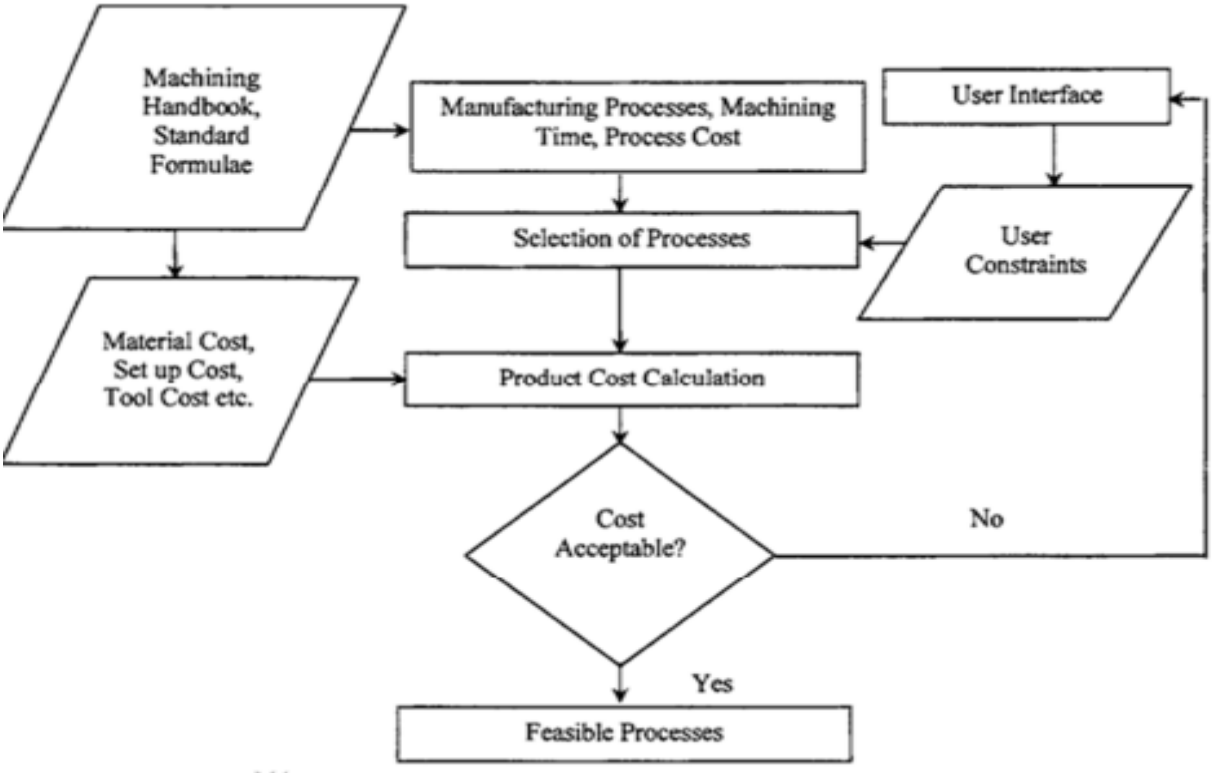


Figure. Cost estimation process model based on user constraints

A rule-based algorithm for the selection and optimization of feasible processes to estimate process time and cost based on parts features. A detailed description of part features with possible processes and constraints was given. Process times were calculated using a standard formula as

Process Time =form feature volume
Material Removal Rate

The process time is then used to calculate *lot time*, which is based on a form feature quantity. The total process cost is subsequently calculated as follows:

Total Process Cost = Lot Time X PHC

Where PHC is the ***productive hour cost*** given by a cost estimation database. The total cost is then calculated as follows:

Total Cost = Material Cost + □(Lot Time X PHC + Tool Cost + Setup Cost)]

Fuzzy-Logic Approach: this approach to cost estimation is particularly helpful in handling uncertainty. Fuzzy rules, such as those for design and production, are applied to such problems to get more reliable estimates. A fuzzy technique, consisting of a decision table providing a means for system rules and indicating the relationships between the input and output variables of the fuzzy logic system, is used to handle the uncertain knowledge on cost estimation. The construction of a set of rules from the decision table enables the estimation of the machining time *Ti* for a given feature, which is multiplied by the unit time cost *Ri* to get the machining cost *Cm* for that feature, i.e., ***Cm*** = *RiTi*

The developed fuzzy-logic-based system was capable of estimating the total product cost apart from enabling the material selection and estimating the assembly cost.

Expert Systems: this approach is based on storing the knowledge in a database and manipulating it on demand to gather quicker, more consistent, and more accurate results based on an attempt to imitate the human expert thought process with the help of an automated logical reasoning approach, normally achieved by rule-based programming. Within the specific context of cost estimation, the expert-system

approach refers to a model and associated procedure exhibiting a degree of expertise comparable to that of a human expert in generating or to help in generating reliable cost estimates.

5.2. computation of the work to prepare the bill of quantities

Preparing a bill of quantities (BOQ) is a detailed document that itemizes and quantifies the materials, labour, equipment, and other resources required to complete a construction project. Here are the general steps involved in preparing a bill of quantities:

Scope and Project Documentation: Review the project plans, specifications, and any other relevant documents to understand the scope of work and project requirements.

Breakdown of Work Packages: Divide the project into logical work packages or sections. This could include categories such as civil works, electrical works, plumbing works, etc.

Measurement and Quantification: Measure and quantify the quantities of materials, labour, equipment, and other resources required for each work package. This can be done through on-site measurements, referencing drawings, or using industry-standard measurement units.

Item Description and Specifications: Provide detailed descriptions for each item in the bill of quantities. This includes specifying the quality, specifications, standards, and any other relevant details for the materials or resources.

Pricing: Assign unit prices to each item in the bill of quantities. These prices can be obtained from suppliers, subcontractors, or based on historical cost data. Ensure that the prices are accurate and inclusive of any necessary allowances or contingencies.

Extensions and Subtotals: Calculate the extended quantities (quantity multiplied by unit price) for each item, and calculate subtotals for each work package and overall sections of the project.

Contingencies and Overheads: Include allowances for contingencies, such as unforeseen work or price fluctuations, as well as any overhead costs associated with the project.

Finalization and Presentation: Review the bill of quantities for accuracy and completeness. Format and present the document in a clear and organized manner, including headings, item numbers, descriptions, quantities, unit prices, and extended totals.

Examples of machine rates for a power saw, a tractor, a team of oxen, and a truck are in the following tables. Although the machine rates in hare the same general format, there is flexibility to represent costs that are specific to the machine type, particularly in the calculation of the operating costs. For the power saw major operating expenses are identified with the chain, bar, and sprocket so they have been broken out separately. For the oxen the fixed costs have been divided into major cost components specific to maintaining animals, in addition to depreciation. For the truck costs have been divided in standing costs and traveling costs to differentiate between costs when the truck is standing by, being loaded, or unloaded as compared to traveling costs.

Machine Rate Calculation for a Power Saw

Machine: Description - McCulloch Pro Mac 650 Power Saw

	Motor cc	60 Delivered Cost	400
	Life in hours	1000 Hours per year	1000
Fuel:	Type	Gas Price per liter	0.56
Oper:	Rate per day	5.50 Social Costs	43.2%

Cost Component		**Cost/hour**
(a) Depreciation	$= \frac{\text{delivered cost} \times .9}{\text{life in hours}}$	0.36
(b) Interest (@ 10%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hours per year}}$	0.03
(c) Insurance (@ 3%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hours per year}}$	0.01
(d) Taxes	$= \frac{\text{annual tax amount}}{\text{average hours per year}}$	-

(e) Labor $= \frac{\text{labor cost per year} \times (1+f)}{\text{average hours per year}}$ 1.89[2]

where f = social costs of labor as decimal

SUB-TOTAL 2.29

(f) Fuel = 0.86 l/hr × .95 × CL +0.86 l/hr × .05 × CO) 0.51

where CL = cost of gas, CO = cost of oil

(g) Lube oil for bar and chain = Fuel cons/2.5 × CO 0.45

(h) Servicing and repairs = 1.0 × depreciation 0.36

(i) Chain, bar, and sprocket 0.67

(j) Other 0.22

TOTAL 4.50[3]

[1] All costs are in US$.

[2] Labor based on 240 days per year.

[3] Add 0.04 if standby saw is purchased.

Machine Rate Calculation for a Tractor

Machine: Description - CAT D-6D PS

	Gross hp	140 Delivered cost	142,000[2]
	Life in hrs	10,000 Hrs per year	1,000
Fuel:	Type	Diesel Price per liter	.44
Oper:	Rate per day	12.00 Social Costs	43.2%
Help:	Rate per day	5.00 Social Costs	43.2%

Cost Component	**Cost/hour**
(a) Depreciation $= \frac{\text{delivered cost} \times .9}{\text{life in hours}}$	12.78
(b) Interest (@ 10%) $= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hours per year}}$	8.52

(c) Insurance (@ 3%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hours per year}}$	2.56
(d) Taxes (@ 2%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hours per year}}$	1.70
(e) Labor	$= \frac{\text{labor cost per year} \times (1+f)}{\text{average hours per year}}$	5.84[3]

where f = social costs of labor as decimal

SUB-TOTAL 31.40

(f) Fuel = .20 × GHP × LF × CL 6.65

where GHP = gross engine horsepower

CL = cost per liter for fuel

LF = load factor (.54)

(g) Oil and grease = 0.10 × fuel cost 0.67

(h) Servicing and repairs = 1.0 × depreciation 12.78

(i) Other (cable, misc) 5.00

TOTAL 56.50

[1] All costs are in US$.

[2] With blade, ROPS, winch, integral arch.

[3] Labor based upon 240 days per year.

Machine Rate Calculation for a Team of Oxen[1]

Description - Pair of oxen for skidding

Gross hp - Delivered cost 2,000

Life in years 5 Days per year 125

Labor Rate per day 7.00 Social Costs 43.2%

Cost Component **Cost/day**

(a) Depreciation	$= \frac{\text{delivered cost} \times .65}{\text{life in days}}$	2.08[2]
(b) Interest (@ 10%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hours per year}}$	0.96
(c) Taxes	$= \frac{\text{annual tax amount}}{\text{average hours per year}}$	-
(d) Pasture	$= \frac{\text{pasture rental per year}}{\text{average days per year}}$	1.10
(e) Food supplements		1.36
(f) Medicine and veterinary services		0.27
(g) Driver	$= \frac{\text{labor cost per year} \times (1+f)}{\text{average days per year}}$	10.02[3]

where f = social costs of labor as decimal

(h) After-hours feeding and care	2.62
(i) Other (harness and chain)	1.00
TOTAL	19.41

[1] All costs are in US$.

[2] Oxen sold for meat after 5 years.

[3] Driver works with two pair of oxen, 250 day year.

Machine Rate Calculation for a Truck[1]

Machine: Description - Ford 8000 LTN

	Gross hp	200	Delivered cost	55,000
	Life in hrs	15,000	Hrs per year	1,500
Fuel:	Type	Diesel	Price per liter	.26
Tires:	Size	10 × 22 Type Radial	Number	10
Labor	Rate per day	12.00	Social Costs	43.2%

Cost Component	**Cost/hour**

(a) Depreciation	$= \frac{\text{delivered cost} \times .9}{\text{life in hours}}$	3.12
(b) Interest (@ 10%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hrs per year}}$	2.20
(c) Insurance (@ 3%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hrs per year}}$	0.66
(d) Taxes (@ 2%)	$= \frac{\text{delivered cost} \times .6 \times \text{rate}}{\text{average hrs per year}}$	0.44
(e) Labor	$= \frac{\text{labor cost per year} \times (1+f)}{\text{average hrs per year}}$	3.30[2]

where f = social costs of labor as decimal

Standing Cost	SUB-TOTAL	9.72
(f) Fuel	= .12 × GHP × CL	6.24

where CL = cost per liter for fuel

(g) Oil and grease = 0.10 × fuel cost	0.62
(h) Servicing and repairs = 1.5 × depreciation	4.68
(i) Tires = $=1.2\times\frac{\text{replacement cost}}{1500\,\text{hrs}}$	2.40
(j) Other (chains, tighteners)	0.20
Traveling Cost TOTAL	23.86

5.3. corrections and adjustment within standard formats

When making corrections and adjustments within standard formats for a bill of quantities or any other document, here are some general guidelines to follow:

Identify the Error: Carefully review the document to identify any errors, omissions, or discrepancies that need to be corrected or adjusted. It could be incorrect quantities, unit prices, descriptions, or any other relevant information.

Mark Corrections Clearly: Use a clear and consistent method to mark the corrections. Common methods include crossing out the incorrect information with a single line, writing the correct information adjacent to the error, and initialing or dating the correction. This helps ensure clarity and transparency.

Provide Explanatory Notes: If necessary, include explanatory notes or comments to provide additional context or clarification for the corrections or adjustments made. This helps to avoid confusion and provides a clear understanding of the changes made.

Maintain Consistency: Ensure that corrections or adjustments are made consistently throughout the document. This includes maintaining the same format, style, and structure as the rest of the document. Consistency helps maintain the professional appearance and readability of the document.

Update Calculations: If corrections or adjustments affect calculations or totals, recalculate and update the affected values accordingly. Double-check the calculations to ensure accuracy.

Review and Verify: After making corrections and adjustments, review the document once again to ensure that all changes have been made accurately and completely. Verify that the document now adheres to the standard format and meets the required specifications.

Communicate Changes: If the document is part of a collaborative or contractual process, it is important to communicate the changes to relevant stakeholders. Inform them about the corrections and adjustments made and provide any necessary documentation or explanations to support the changes.

5.3.1. Standard formats for a bill of quantities

Standard formats for a bill of quantities may vary depending on the industry, region, or specific project requirements. However, here are some common components and sections that are typically included in a standard format

Project Information: Include details such as project name, location, client information, and relevant project reference numbers.

Table of Contents: Provide a clear and organized table of contents that lists the different sections and subsections of the bill of quantities for easy navigation.

Work Packages/Sections: Break down the project into logical work packages or sections. Each section should be clearly labeled and defined, such as civil works, electrical works, plumbing works, etc.

Item Numbering: Assign a unique item number to each item or line in the bill of quantities. This helps to identify and reference specific items easily.

Item Description: Provide a detailed description of each item, including the type of work, materials, specifications, and any relevant technical details. Clear and concise descriptions help ensure accurate understanding.

Quantities: Specify the quantities of materials, labor, equipment, or resources required for each item. Use appropriate units of measurement, such as meters, kilograms, or hours.

Unit Price: Assign a unit price for each item, indicating the cost per unit of measurement. Ensure that the unit price is accurate, inclusive of any necessary allowances or contingencies, and clearly stated.

Extension: Calculate the extended value for each item by multiplying the quantity by the unit price. This provides the total cost for each item.

Subtotals: Calculate subtotals for each work package or section by summing up the extended values of the corresponding items.

Grand Total: Provide a grand total that represents the total cost of the entire bill of quantities, including all work packages and sections.

Terms and Conditions: Include any relevant terms, conditions, or instructions related to the bill of quantities, such as payment terms, contract references, or specifications for pricing adjustments.

Signatures and Date: Include spaces for authorized signatures and the date of preparation or issuance of the bill of quantities.

It's important to note that these are general guidelines, and the specific format and requirements may vary depending on the project, organization, or contractual framework. Always refer to industry standards, project specifications, or consult with relevant stakeholders to ensure compliance with the required format.

5.4. Documenting bill of quantities.

Documenting a bill of quantities involves creating a comprehensive and organized document that accurately represents the quantities, descriptions, and pricing for the various items in the bill. Here are the key steps to document a bill of quantities:

1. **Use a Spreadsheet or Software**: Utilize a spreadsheet software like Microsoft Excel or specialized construction estimating software to create the bill of quantities. These tools provide a structured format and convenient calculations.
2. **Create Columns:** Set up columns to capture the required information. Common columns include item number, item description, quantity, unit of measurement, unit price, extension (quantity multiplied by unit price), and any additional columns specific to the project.
3. **Fill in Item Details:** Begin populating the bill by entering the item details. Assign a unique item number to each line item for identification and reference purposes. Include a clear and concise description of the item, specifying materials, work type, and any relevant specifications.
4. **Enter Quantities:** Document the quantities required for each item. Ensure consistency with units of measurement, such as meters, kilograms, or hours, and accurately record the quantities based on project specifications or measurements.
5. **Specify Unit Prices**: Assign unit prices for each item in the bill. Obtain these prices from suppliers, subcontractors, or historical cost data. Be sure to include any allowances or contingencies in the unit price, if applicable.
6. **Calculate Extensions:** Multiply the quantity by the unit price for each item to calculate the extension. This provides the total cost for each item and helps with subsequent calculations.
7. **Subtotals and Grand Total**: Calculate subtotals for work packages or sections by summing up the extensions for the relevant items. Additionally, calculate the grand total by summing up all the extensions for the entire bill of quantities.

8. **Formatting and Formatting:** Format the document to enhance readability and clarity. Use headers, bold or italicized text, and appropriate font sizes to clearly distinguish different sections and make the document easy to navigate.
9. **Review and Cross-Check:** Thoroughly review the bill of quantities for accuracy. Cross-check quantities, unit prices, extensions, subtotals, and the grand total to ensure consistency and correctness.
10. **Finalize and Share:** Once you are satisfied with the accuracy and completeness of the document, save it in the appropriate format (e.g., PDF or Excel) and share it with relevant stakeholders, such as clients, contractors, or project managers.

5.3.2. Bill of quantities using a spreadsheet

Creating a bill of quantities using a spreadsheet is a commonly used approach as it provides a structured and organized format. Here's how you can create a bill of quantities using a spreadsheet:

Open a Spreadsheet: Launch a spreadsheet software like Microsoft Excel or Google Sheets.

Set Up Column Headers: Create column headers to represent the required information. Common column headers include item number, item description, quantity, unit of measurement, unit price, extension, and any additional columns specific to the project.

Fill in Item Details: Enter the item details in the corresponding columns. Assign a unique item number to each line item for identification. Provide a clear description of the item, including materials, work type, and specifications.

Enter Quantities: Input the quantities required for each item in the appropriate column. Ensure consistency with units of measurement, such as meters, kilograms, or hours.

Specify Unit Prices: Enter the unit prices for each item in the corresponding column. Obtain these prices from suppliers, subcontractors, or historical cost data. Include any allowances or contingencies in the unit price, if applicable.

Calculate Extensions: Use a formula to calculate the extension for each item. Multiply the quantity by the unit price to obtain the extended amount. For example, in Excel, you can use the formula "=Quantity * Unit Price" in the extension column.

Calculate Subtotals and Grand Total: Utilize formulas to calculate subtotals and the grand total. Sum up the extensions for each work package or section to obtain the subtotal. Use the SUM function to add up the extensions for the entire bill of quantities to get the grand total.

Formatting: Format the spreadsheet to enhance readability and clarity. Apply appropriate font styles, bold or italicize headers, and use borders to separate sections. Format numbers to display currency or decimal places as required.

Review and Cross-Check: Thoroughly review the bill of quantities for accuracy. Double-check quantities, unit prices, extensions, subtotals, and the grand total to ensure correctness and consistency.

Save and Share: Save the spreadsheet in the desired format (e.g., Excel, CSV, or PDF) and share it with relevant stakeholders, such as clients, contractors, or project managers.

Self-Check 5.1

Directions: part I. Choose the Correct answer for the for the given alternative

1. _____a large quantity in bulk that would require extensive equipment for unloading and hauling,
   A. Handling and storage
   B. Inventory
   C. Item
   D. BOM
2. _____Input the quantities required for each item in the appropriate column.
   A. Enter Quantities:
   B. Fill in Item Details
   C. Specify Unit Prices:
   D. Calculate Extensions
3. _____is a detailed document that itemizes and quantifies the materials, labour, equipment, and other resources required to complete a construction project.
   A. Scope and Project Documentation
   B. Breakdown of Work Packages
   C. Measurement and Quantification
   D. BOQ
4. Some factors to consider during the selection of equipment process are
   A. Conformance to specification requirements.
   B. Job progress schedule (production rate).
   C. Importance of the job; type of materials.
   D. Availability of space and site access.

Part II. Write true if the Statement is Correct Write False if not Correct

1. Project Information Include details such as project name, location, client information, and relevant project reference numbers.
2. Contingencies and Overheads: Include allowances for contingencies, such as unforeseen work or price fluctuations, as well as any overhead costs associated with the project.

3. Storage is detailed document that itemizes and quantifies the materials, labour, equipment, and other resources required to complete a construction project.
4. Maintain Consistency is Ensure that corrections or adjustments are made consistently throughout the document.

Unit six; Maintain administrative control and withdrawal of resources

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

- administration system and monitoring feedback.
- financial responsibility over the procurement and acquisition system
- Evaluation procurement reports.
- Facilitation of conducting regular meetings and communications principles
- Establishment and maintaining a system for the effective supply and withdrawal.
- Manage and monitor strategic information.

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Evaluate administration system and monitoring feedback.
- Check financial responsibility over the procurement and acquisition system
- Evaluate procurement reports.
- Determine the Facilitation of conducting regular meetings and communications principles
- Select Establishment and maintaining a system for the effective supply and withdrawal.
- Manage and monitor strategic information.

6.1. administration system and monitoring feedback.

An administration system and monitoring feedback are crucial components of any project or organizational management. Here's an overview of these concepts:

Administration System:

An administration system refers to the set of processes, tools, and procedures that facilitate the smooth operation and management of an organization or project. It involves various administrative functions, such as planning, organizing, coordinating, and controlling activities to achieve organizational goals efficiently.

Key elements of an administration system may include:

Documentation and Record-Keeping: Establishing procedures for document management, maintaining records, and ensuring information is properly organized and accessible.

Communication and Coordination: Implementing channels for effective internal and external communication, facilitating collaboration, and ensuring information flows smoothly between different stakeholders.

Resource Management: Managing resources such as personnel, finances, materials, and equipment to optimize utilization and ensure availability as required.

Decision-Making Processes: Establishing frameworks for decision-making, including the delegation of authority, establishing protocols for approvals, and ensuring transparency in the decision-making process.

Project Planning and Scheduling: Developing plans and schedules for projects, setting objectives, allocating resources, and monitoring progress to ensure timely completion.

Monitoring Feedback:

Monitoring feedback involves the systematic collection, analysis, and evaluation of information and feedback to assess the performance, effectiveness, and progress of a project, process, or

system. It helps identify areas of improvement, measure outcomes against predefined targets, and make informed decisions based on data-driven insights.

Key components of monitoring feedback include:

Performance Metrics: Defining key performance indicators (KPIs) that align with project or organizational objectives. These metrics are used to measure and evaluate performance and progress.

Data Collection: Collecting relevant data and feedback through various methods, such as surveys, interviews, observations, or automated systems. Data should be collected consistently and at regular intervals.

Data Analysis: Analyzing collected data to identify trends, patterns, and areas for improvement. This may involve statistical analysis, data visualization, and comparison against benchmarks or targets.

Reporting: Presenting monitoring feedback findings in clear and concise reports or dashboards. Reports should highlight key insights, trends, and recommendations for action.

Action and Improvement: Using monitoring feedback to drive continuous improvement. Implementing corrective actions, making adjustments to plans, and addressing identified issues or bottlenecks.

Stakeholder Engagement: Engaging relevant stakeholders in the monitoring feedback process. Seeking input from stakeholders, considering their perspectives, and incorporating their feedback in decision-making.

Role of Contract Manager

Good practice requires that a Contract Manager is appointed for every contract. For small, routine contracts, this may be one person, who has a portfolio of contracts to manage. For large, complex, high-value contracts this is normally an entity (Engineer, Project Manager etc.) The Contract Manager needs to have the appropriate range of qualifications, skill mix and experience.

A Contract Manager needs to multi-task,



Figure – Contract Manager Responsibilities

6.1.1 procured and acquired resources, organizations

When it comes to monitoring the effectiveness of procured and acquired resources, organizations typically employ various strategies and methods. Here are some common approaches:

Performance Metrics: Establish specific performance metrics or key performance indicators (KPIs) that align with the procured or acquired resources. These metrics should be measurable and provide quantifiable indicators of effectiveness. For example, if the resource is a software application, metrics like system uptime, response time, or user satisfaction could be used to monitor its effectiveness.

Data Analysis: Collect relevant data and analyze it to assess the performance and effectiveness of the procured or acquired resource. This may involve analyzing usage data, performance logs, customer feedback, or other relevant data sources. Data analysis techniques such as trend

analysis, comparative analysis, or statistical analysis can provide insights into the resource's effectiveness.

User Feedback and Surveys: Gather feedback from users or stakeholders who interact with the procured or acquired resource. This can be done through surveys, interviews, or feedback mechanisms. User feedback can provide valuable insights into the resource's usability, functionality, and overall effectiveness.

Regular Audits and Inspections: Conduct regular audits or inspections to assess the condition, compliance, and performance of the procured or acquired resource. This can involve physical inspections, quality checks, or compliance assessments to ensure the resource is meeting the required standards and specifications.

Benchmarks and Comparison: Establish benchmarks or industry standards to compare the effectiveness of the procured or acquired resource against similar resources or competitors. This can help identify areas for improvement and provide a comparative analysis of its performance.

Feedback from Internal Stakeholders: Engage with internal stakeholders, such as project managers, department heads, or operational teams, to gather their feedback and insights on the effectiveness of the procured or acquired resource. Their expertise and experience can provide valuable perspectives on the resource's performance and effectiveness.

Continuous Improvement Initiatives: Based on the monitoring feedback, implement continuous improvement initiatives to address any identified issues or gaps in the effectiveness of the procured or acquired resource. This can involve making necessary adjustments, providing additional training or support, or seeking alternative solutions if required.

6.2. financial responsibility over the procurement and acquisition system

6.2.1 Roles and responsibilities

Senior management roles and responsibilities

High level officers responsible for the cost estimating process are:

- General Manager (Portfolio Investment and Programming)
- General Manager (Integrated Transport Planning)
- General Manager (Project Delivery and Operations)
- General Manager (Trans Link), and
- Chief Engineer (Engineering and Technology).

6.2.2. Financial responsibility

Financial responsibility refers to the obligation and accountability of individuals, organizations, or entities to manage their financial resources in a prudent and ethical manner. It involves making sound financial decisions, adhering to legal and regulatory requirements, and ensuring the effective and responsible use of funds. Here are some key aspects of financial responsibility:

Budgeting: Creating and adhering to a budget is a fundamental aspect of financial responsibility. It involves planning and allocating resources in a way that aligns with financial goals and priorities. A well-planned budget helps control spending, manage cash flow, and achieve financial stability.

Financial Planning: Engaging in effective financial planning is crucial for financial responsibility. This includes setting financial goals, establishing saving and investment strategies, managing debts, and preparing for unforeseen expenses or emergencies. Financial planning helps individuals and organizations make informed decisions and maintain financial stability over the long term.

Accountability and Transparency: Financial responsibility requires maintaining accountability and transparency in financial matters. This involves accurately recording financial transactions, maintaining proper documentation, and providing clear and comprehensive financial reports.

Being transparent with stakeholders and complying with applicable regulations and reporting standards builds trust and credibility.

Risk Management: Assessing and managing financial risks is an essential part of financial responsibility. This includes identifying potential risks, implementing appropriate risk mitigation strategies, and having contingency plans in place. By effectively managing risks, individuals and organizations can protect their financial well-being and minimize potential negative impacts.

Compliance with Laws and Regulations: Financial responsibility necessitates compliance with relevant laws, regulations, and financial reporting standards. This includes accurate and timely filing of tax returns, adherence to accounting principles, and compliance with financial regulations specific to the industry or jurisdiction. Compliance ensures ethical financial practices and minimizes legal and reputational risks.

Ethical Financial Practices: Upholding ethical standards is a fundamental aspect of financial responsibility. It involves conducting financial activities with integrity, honesty, and fairness. Ethical financial practices include avoiding fraudulent activities, maintaining confidentiality of financial information, and acting in the best interests of stakeholders.

Financial Education and Awareness: Promoting financial education and awareness contributes to financial responsibility. Individuals and organizations should invest in improving their financial literacy, staying informed about financial trends and developments, and seeking professional advice when needed. Increased financial knowledge enables better decision-making and enhances overall financial responsibility.

6.2.3. An acquisition system

An acquisition system typically refers to a structured and organized process that an organization follows to acquire goods, services, or assets from external sources. It involves various steps and activities aimed at identifying needs, selecting suppliers or vendors, negotiating contracts, and ultimately procuring the desired resources. Here are the key components of an acquisition system:

1. **Needs Assessment:** The acquisition process begins with a thorough assessment of the organization's needs. This involves identifying the specific goods, services, or assets required to fulfill operational requirements or strategic objectives.
2. **Sourcing Strategy:** Once the needs are determined, an organization develops a sourcing strategy. This strategy outlines the approach for identifying potential suppliers or vendors and determining the most suitable acquisition method, such as competitive bidding, request for proposals (RFPs), or direct negotiations.
3. **Supplier Selection:** The acquisition system involves the selection of suppliers or vendors who can meet the organization's requirements. This typically includes evaluating potential suppliers based on factors such as their capabilities, expertise, financial stability, past performance, and compliance with regulatory or quality standards.
4. **Contract Negotiation:** After selecting a supplier, the acquisition system involves negotiating the terms and conditions of the contract. This includes determining pricing, delivery schedules, payment terms, quality specifications, warranties, and other relevant contractual provisions. The negotiation process aims to establish a mutually beneficial agreement that protects the interests of both the organization and the supplier.
5. **Contract Management:** Once the contract is in place, the acquisition system includes ongoing contract management activities. This involves monitoring supplier performance, ensuring compliance with contractual obligations, managing changes or variations, resolving disputes, and maintaining effective communication with the supplier throughout the contract duration.
6. **Procurement and Delivery:** The acquisition system includes the actual procurement and delivery of the goods, services, or assets. This may involve issuing purchase orders, tracking deliveries, receiving and inspecting the acquired resources, and managing any associated logistics or transportation.
7. **Quality Assurance and Control:** The acquisition system incorporates quality assurance and control measures to ensure that the acquired resources meet the organization's

specified requirements. This may involve conducting inspections, quality checks, or audits to verify compliance with quality standards and contractual obligations.

8. **Performance Evaluation:** Following the acquisition, the system includes evaluating the performance of the acquired resources. This may involve assessing factors such as product/service quality, supplier responsiveness, delivery timeliness, and overall satisfaction. Performance evaluations help inform future procurement decisions and supplier relationships.

6.3. Evaluation procurement reports.

Evaluating procurement reports is an important step in assessing the effectiveness and efficiency of procurement activities within an organization. These reports provide valuable insights into the procurement process, supplier performance, contract management, and overall procurement outcomes. Here are some key considerations for evaluating procurement reports:

Accuracy and Completeness: Verify the accuracy and completeness of the information presented in the procurement reports. Ensure that all relevant data, such as procurement details, contract terms, pricing, delivery information, and supplier performance metrics, are accurately captured and documented.

Compliance with Policies and Regulations: Assess whether the procurement activities, as reported, comply with organizational policies, procedures, and regulatory requirements. Check if the procurement process followed the prescribed guidelines, such as competitive bidding thresholds, approval authorities, and adherence to applicable laws and regulations.

Cost Analysis: Analyze the cost-related information provided in the procurement reports. This includes evaluating the procurement costs against budgeted amounts, assessing cost variations, and identifying any significant deviations or cost-saving opportunities. Consider factors such as price competitiveness, economies of scale, and cost-effectiveness in relation to the acquired resources.

Supplier Performance: Evaluate the performance of suppliers as reported in the procurement reports. Assess factors such as delivery timeliness, product/service quality, adherence to contractual terms, responsiveness to inquiries or issues, and overall satisfaction with supplier performance. Identify any recurring patterns or issues that may require attention or improvement.

Contract Management: Review the contract management aspects presented in the procurement reports. Assess the effectiveness of contract administration, including contract compliance, change management, dispute resolution, and any modifications or extensions. Identify any instances of non-compliance or contract-related risks that need to be addressed.

Risk Assessment and Mitigation: Evaluate the risk assessment and mitigation strategies outlined in the procurement reports. Assess whether potential risks and associated mitigation measures were adequately identified, analyzed, and addressed throughout the procurement process. Identify any gaps in risk management and recommend improvements if necessary.

Key Performance Indicators (KPIs): Consider the KPIs or performance metrics included in the procurement reports. Assess the achievement of targets and benchmarks set for procurement activities, supplier performance, cost savings, or other relevant metrics. Identify areas of success and areas that require improvement or corrective actions.

Recommendations and Lessons Learned: Pay attention to any recommendations or lessons learned presented in the procurement reports. Evaluate the proposed actions or improvements suggested based on the procurement outcomes and experiences. Consider how these recommendations align with organizational objectives and strategies.

6.4. Facilitation of conducting regular meetings and communications principles

Facilitating regular meetings effectively is crucial for maintaining effective communication and collaboration within a team or organization. Here are some tips to help you facilitate regular meetings:

1. **Prepare an agenda:** Create a clear and concise agenda before the meeting. The agenda should outline the topics to be discussed, the goals of the meeting, and the time allocated for each item. Share the agenda with participants well in advance so they can come prepared.
2. **Set clear objectives:** Clearly communicate the purpose and objectives of the meeting to all participants. This will help everyone understand the intended outcomes and stay focused on the agenda items.
3. **Start and end on time:** Begin the meeting on time, regardless of whether all participants have arrived. This encourages punctuality and shows respect for attendees' time. Similarly, make sure to end the meeting on schedule to avoid running over time.
4. **Encourage active participation:** Create a supportive and inclusive environment that encourages active participation from all attendees. Encourage open discussions, ask for input from quieter participants, and manage dominant personalities to ensure everyone has a chance to contribute.
5. **Manage the agenda:** As the facilitator, it's your responsibility to keep the meeting on track. Guide the discussion, ensure each agenda item is adequately covered, and prevent tangents or excessive time spent on individual topics.
6. **Foster effective communication:** Encourage constructive and respectful communication among participants. Set ground rules for the meeting, such as allowing everyone to speak without interruption and using appropriate language and tone.
7. **Summarize key points:** Throughout the meeting, summarize the key points and decisions made. This helps reinforce understanding and ensures everyone is on the same page. Consider assigning someone to take notes during the meeting for documentation purposes.
8. **Assign action items:** Clearly define action items and assign responsibilities before concluding the meeting. Ensure that each action item has a clear owner and a deadline for completion. Follow up on these action items in subsequent meetings.
9. **Evaluate and improve:** After the meeting, take some time to evaluate its effectiveness. Seek feedback from participants and consider areas for improvement. Use this feedback to refine your facilitation approach for future meetings.

10. **Embrace technology:** If your team is geographically dispersed or if circumstances prevent in-person meetings, leverage technology tools for virtual meetings. Platforms like Zoom, Microsoft Teams, or Google Meet offer features for video conferencing, screen sharing, and collaborative document editing.

communications principles and police

Effective communication is essential in the context of law enforcement, as it plays a crucial role in maintaining public safety, building trust with communities, and coordinating efforts among police personnel. Here are some key communication principles that are relevant to the police:

Clear and concise messaging: Police officers should strive to communicate messages in a clear, straightforward, and concise manner. Avoid using jargon or technical terms that may confuse or alienate the public. Use plain language to ensure that information is easily understood by all individuals involved.

Active listening: Active listening is a fundamental aspect of effective communication. Police officers should actively listen to individuals they interact with, including victims, witnesses, suspects, and community members. Show empathy, maintain eye contact, and provide verbal and non-verbal cues to demonstrate that you are fully engaged in the conversation.

Respect and empathy: Treat all individuals with respect and empathy, regardless of their background or circumstances. Remain calm and composed, even in challenging situations. Show empathy and understanding when interacting with victims or individuals in distress, as it can help deescalate tense situations and build trust with the community.

Cultural awareness and sensitivity: Policing often involves interacting with diverse communities. It is important for police officers to be culturally aware and sensitive to different customs, traditions, and beliefs. Avoid making assumptions and stereotypes, and strive to understand and respect cultural differences.

Non-verbal communication: Non-verbal cues such as body language, facial expressions, and tone of voice can significantly impact communication. Police officers should be mindful of their own non-verbal communication and be aware of the non-verbal cues of others. Maintaining open

and approachable body language can help establish rapport and defuse potentially confrontational situations.

Transparency and honesty: Building trust with the community is essential in effective policing. Police officers should strive to be transparent and honest in their communication. Provide accurate and timely information to the public regarding incidents, investigations, and the overall policing process. If information cannot be shared due to ongoing investigations or legal constraints, communicate that clearly and explain the reasons.

Use of appropriate technology: In today's digital age, police departments often utilize various communication technologies. These may include radios, mobile devices, social media platforms, and computer-aided dispatch (CAD) systems. Police officers should be familiar with the appropriate use of these technologies and ensure that they are used securely, responsibly, and in accordance with departmental policies.

De-escalation techniques: Effective communication skills are particularly important in de-escalating potentially volatile situations. Police officers should receive training in de-escalation techniques, which involve using communication strategies to defuse tense encounters and minimize the use of force when possible.

Collaboration and teamwork: Effective communication is essential within the police organization itself. Police officers should be able to communicate and collaborate effectively with their colleagues, supervisors, and other support personnel. This includes sharing information, coordinating efforts, and providing updates on ongoing activities.

Continuous learning and feedback: Communication skills can always be improved. Police officers should engage in continuous learning and seek feedback from supervisors, colleagues, and the community. Actively participate in training programs that focus on communication skills and stay updated on best practices in police communication.

6.5. Establishment and maintaining a system for the effective supply and withdrawal.

Establishing and maintaining an effective system for supply and withdrawal is crucial for organizations to efficiently manage their resources and operations. Here are some steps to help establish and maintain such a system:

Assess needs and requirements: Begin by assessing the organization's needs and requirements for supplies and resources. Identify the types of supplies and resources necessary for the organization's operations, including equipment, materials, inventory, and personnel.

Develop a supply chain management strategy: Create a comprehensive supply chain management strategy that outlines how supplies will be sourced, stored, distributed, and replenished. Consider factors such as lead times, storage capacity, transportation logistics, and cost management.

Source reliable suppliers: Identify and establish relationships with reliable suppliers who can consistently provide high-quality supplies and resources. Conduct supplier evaluations to assess their reliability, quality standards, pricing, delivery capabilities, and ability to meet demand fluctuations.

Implement inventory management systems: Utilize inventory management systems and tools to track and manage supplies effectively. Implement processes for inventory control, including regular stock checks, reorder points, and automated notifications for low stock levels. This helps prevent shortages or excess inventory.

Establish withdrawal procedures: Develop clear procedures for the withdrawal of supplies or resources. Define who can request withdrawals, the approval process, and the documentation required. Ensure that withdrawals are aligned with operational needs and comply with any regulatory or compliance requirements.

Implement tracking and monitoring mechanisms: Implement systems for tracking and monitoring supply and withdrawal activities. This can include barcoding, RFID tagging, or other technologies to track the movement of supplies within the organization. Regularly review and analyze data to identify any inefficiencies, bottlenecks, or areas for improvement.

Ensure effective communication: Establish clear lines of communication between stakeholders involved in the supply and withdrawal processes. This includes suppliers, warehouse personnel, procurement officers, department heads, and end-users. Effective communication helps ensure that supplies are available when needed and that withdrawals are properly documented.

Continuously evaluate and optimize the system: Regularly evaluate the effectiveness of the supply and withdrawal system. Analyze key performance indicators such as lead times, stock accuracy, cost of inventory, and customer satisfaction. Use this data to identify areas for improvement and implement necessary changes to optimize the system's efficiency.

Train and educate personnel: Provide training and education to personnel involved in the supply and withdrawal processes. Ensure that

Train and educate personnel: Provide training and education to personnel involved in the supply and withdrawal processes. Ensure that they understand the procedures, systems, and best practices for managing supplies and resources effectively. This includes training on inventory management, equipment handling, and compliance with relevant regulations.

Regularly review and update the system: The supply and withdrawal system should be regularly reviewed and updated to adapt to changing organizational needs, industry trends, and technological advancements. Stay informed about emerging practices and technologies that can enhance the efficiency and effectiveness of the system.

6.6. Manage and monitor strategic information.

1. Managing and monitoring strategic information is crucial for organizations to make informed decisions, identify trends, and stay competitive in their respective industries. Here are some steps to effectively manage and monitor strategic information:
2. Identify strategic information needs: Determine the types of strategic information that are essential for your organization. This could include market trends, customer insights, competitor analysis, financial data, industry reports, and internal performance metrics. Clearly define the key areas where strategic information is required.

3. Establish information sources: Identify and establish reliable sources of strategic information. This may include industry publications, market research firms, government reports, financial statements, customer surveys, and internal data sources such as CRM systems, ERP systems, and business intelligence tools. Ensure that the information sources are credible, up-to-date, and relevant to your organization's needs.
4. Collect and organize data: Implement processes to collect and organize strategic information effectively. This may involve data collection methods such as surveys, interviews, market research studies, and data mining techniques. Develop a structured approach to store and categorize the information, using tools such as databases, document management systems, or knowledge repositories.
5. Analyze and interpret information: Apply analytical techniques to extract insights from the collected data. This can involve statistical analysis, data visualization, trend analysis, and comparative studies. Use appropriate tools and software to analyze the information and generate meaningful reports or dashboards that highlight key findings and trends.
6. Establish KPIs and metrics: Define key performance indicators (KPIs) and metrics that align with your strategic objectives. These metrics should help you track and monitor the performance of your organization against its strategic goals. Regularly measure and report on these metrics to assess progress and identify areas for improvement.
7. Implement data security measures: Strategic information is often sensitive and confidential. Implement robust data security measures to protect the integrity, confidentiality, and availability of your strategic information. This may include access controls, encryption, data backups, and regular security audits.
8. Establish reporting mechanisms: Develop a reporting framework to communicate strategic information to relevant stakeholders within your organization. This may involve regular reports, executive summaries, presentations, or interactive dashboards. Tailor the format and content of the reports to meet the specific needs of each audience.

9. Foster a data-driven culture: Promote a culture that values the use of strategic information for decision-making. Encourage employees to use data and insights in their day-to-day activities and decision-making processes. Provide training and resources to enhance data literacy and analytical skills within your organization.
10. Continuously monitor and update information: Strategic information is dynamic and subject to change. Regularly monitor the information sources, industry trends, and market conditions to ensure that your strategic information remains relevant and up-to-date. Update your data collection and analysis processes as needed to adapt to changing business needs.
11. Evaluate and improve: Continuously evaluate the effectiveness of your strategic information management and monitoring processes. Seek feedback from stakeholders, assess the impact of strategic information on decision-making, and identify areas for improvement. Make necessary adjustments and enhancements to optimize your strategic information management practices.

Self-Check 6.1

Directions: part I. Choose the Correct answer for the for the given alternative

1. Key elements of an administration system may include:
   A. Resource Management
   B. Decision-Making Processes:
   C. Project Planning and Scheduling
   D. all
2. Key components of monitoring feedback include
   A. Data Collection:
   B. Data Analysis
   C. Reporting
   D. all
3. _____-refers to the obligation and accountability of individuals, organizations,
   A. Budgeting
   B. Financial responsibility
   C. Financial Planning
   D. Accountability and Transparency
4. _____is an important step in assessing the effectiveness and efficiency of procurement activities within an organization.
   A. Evaluating procurement reports
   B. Accuracy and Completeness
   C. Cost Analysis
   D. Supplier Performance

Part II. Write true if the Statement is Correct Write False if not Correct

1. Facilitating regular meetings effectively is crucial for maintaining effective communication and collaboration within a team or organization.
2. Managing and monitoring strategic information is crucial for organizations to make informed decisions, identify trends, and stay competitive in their respective industries.

3. Establishing and maintaining an effective system for supply and withdrawal is crucial for organizations to efficiently manage their resources and operations.
4. Effective communication is essential in the context of law enforcement, as it plays a crucial role in maintaining public safety, building trust with communities, and coordinating efforts among police personnel.
5. Auditing is requires maintaining accountability and transparency in financial matters. T

Unit seven. Assure quality assurance

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

- Estimation production or project costs.
- Comparison of actual costs with estimated cost.
- Motivation or rectifying deviations.
- Approval from management.

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Calculate estimation production or project costs.
- Understand Comparison of actual costs with estimated cost.
- Understand Motivation or rectifying deviations.
- Check approval from management.
- Manage and monitor strategic information.

7.1. Estimation production or project costs.

Estimating production involves predicting or calculating the quantity of goods or services that can be produced within a given timeframe. It is an essential aspect of production planning and helps organizations allocate resources, schedule operations, and meet customer demands. Here are some steps to effectively estimate production:

Define the production unit: Determine the unit of measurement for your production estimation. It could be the number of units produced, weight, volume, or any other appropriate metric based on your industry and product/service.

Gather historical data: Collect and analyze historical production data, including past production levels, production cycles, and any relevant factors that may impact production. This data can serve as a baseline for estimating future production.

Identify production factors: Identify the key factors that influence production levels. This may include factors such as available resources (e.g., labor, materials, equipment), production capacity, efficiency, production processes, and any external factors that may impact production (e.g., market demand, seasonality).

Determine production capacity: Assess your organization's production capacity, which refers to the maximum amount of output that can be generated within a given timeframe. Consider the availability of resources, equipment utilization rates, staffing levels, and any constraints that may limit production capacity.

Analyze demand forecast: Understand the expected demand for your products or services. Analyze market trends, customer orders, historical sales data, and any other relevant information to forecast the demand for your products or services. This will help you align your production estimates with customer needs.

Calculate production rate: Based on the production capacity and demand forecast, calculate the production rate or the average rate at which you expect to produce goods or services. This can be expressed as units per hour, per day, per week, or any other appropriate time unit.

Consider efficiency and downtime: Take into account the efficiency of your production processes and any potential downtime due to maintenance, equipment breakdowns, or other

unforeseen factors. Adjust your estimates to account for potential inefficiencies and downtime to ensure a realistic production estimate.

Review and refine estimates: Regularly review and refine your production estimates based on actual performance and feedback. Compare your estimated production levels with actual production data to identify any discrepancies and adjust your estimates accordingly.

Communicate and collaborate: Share your production estimates with relevant stakeholders, including production teams, supply chain partners, and sales/marketing departments. Collaborate with these stakeholders to ensure alignment between production estimates and overall business goals.

Monitor and adjust: Continuously monitor your production levels, compare them to your estimates, and make necessary adjustments as circumstances change. Regularly review and update your production estimates based on changing market conditions, customer demands, and internal factors.

7.1.1. Cost Analysis /Estimation/

It is a type of economic study that measure that lost and benefits to society of existing or proposed programs. When plans use cost benefit analysis of sieving machine to help our decision. The sieving machine lost analysis focus on a clearly stated. We try to determine the effect of a proposition as a large number of peoples as possible. Analysts formulate our estimates or cost of putting it in to action, the program is suggested to be work.

In order to estimate the production cost of the sieving machine it is necessary to consider what the previously graduated student have done to modify.

Material Cost for Modification Process

To estimate the lost of raw material, consider the cost or raw material for

Mild steel = 10 birr/kg

Angle iron = 15 birr/kg

Sheet metal = 15 birr /km

Flat strip = 8 birr/kg

Sieve = 15 birr /m

Over head cost = 10 birr

Total cost = 73 birr

The total cost for sieving machine should be by assuming as the three different cost types.

There are:-

-The material last

-The manufacturing cost &

- The labor cost

The basic estimating at of the three cost categories can be expressed as follow:-

- Weight of the material
- Cost for unit weight or the material
- Type of operation is used.
- Time classes (duration) to produce the part
- Cost per unit time
- Cost of labor per grade of skill
- Labor expenses per unit time

This machine needs only one person for working here our machine reduce one person and makes free from for other jobs. Here 10 birr saved for one kuntal crops in ½ hour. The amount or birr paid is 20 birr in order to compete our wheel in 4hour.

Operation

It is composed or handling, machining, tool changing tooling cost, handling time in minute to load and un load the work piece obtained from time table.

- Stand stop----------0.085 min
- Change speed ----------0.25 min
- Engage or good----------0.23 min
- Inspect dimension with----------0.42 min
- Micrometer/ eairger cleaning ----------3min

Total 4.033min

Cost or components	
Material	**Cost**
Shaft	10.39 birr
Box and outlets	70.00 birr
Connecting rod	2.19 birr
Standing (legs and column)	30.25 birr
Handle	4.00 birr
Sieve support	2.00 birr
Gears	14.00 birr
Bearing house	15.00birr
Total	177.15birr

General the overall cost is the sum of electrode for welding = 2.50 birr

- Stand cost (for purchased materials) = 100 birr
- Total material cost =177.15birr
- Overhead cost =10birr
- Total labor cost = 180.50 birr
- Total operation cost =5.00 birr
- The overall cost = 472.00birr

Total weight or machine = 652. 14 N

Duties	**No of people engaged**	**Total time in (hr)**	**Cost (birr)**
Roller	-	-	20.00birr
Making bearing house	2	6	10.00birr
Making gears	2	8	30.00birr
Forming Shaft	1	6	20.00birr
Forming connecting	1	4	15.00birr

Making standing guide way	2	4	15.00birr
Doing sieve support	2	4	10.00birr
Making bracket	2	3	8.00birr
Lever handle making	2	4	15.00birr
Box and outlets	2	5	25.00birr
		Total	168.00birr

Standard cost

Part name	**Qty**	**Amount in birr in unit**	**Total amount for each**
Roller	4	12.50birr	50.00birr
Bearing	5	30.00brirr	150.00birr
Sieve	1		
Bolts & nuts	10	-	5.00birr
Rivet	50		2.00birr

Labor Cost For Modification Process

To estimate the labor cost first we win have to consider wage or market and production time spent to produce each component must be known.

- Labor cost = 20 birr/day = 20 birr
- Production cost = 42 hours
- Overhead cost =10 birr
- Total cost =72 birr/day

Finally, the total estimated production cost of the mechanical sieving machine is adding 72 birr for modification process.

Estimating the material is done for direct material that material is appearing in the product. Indirect materials leg cutting oils. Supplies, which don't appear in the production are including the over head cost customarily the weight, volume, length or surface area determine from drawings. This theoretically

computed quantity is then increased by losses such as, waste, scrap, and shrinkage. A general formula material estimation is

$$C_{dm} = W (1+ L_1 + L_2 + L_3) \text{ cm}$$

Where, C_{dm} = cost of direct material for a part, $/unit

W = Theoretical finished weight in compatible dimensions Lb.

L_1 = Percentage loss resulting from scrap which is consequence at errors in manufacturing or engineering.

L_2 = percentage loss reciting from waste, which is caused by manufacturing process.

L_3 = percentage loss reciting from shrink age.

Level Of Cost Evaluation

The American association or cost engineering list, five types of the cost evaluation based on the level or detail and accuracy that is involved.

Kind of estimate	Problem error %
Order of magnitude (ratio)	± 40
Study (scope)	± 30
Preliminary (budget authorization)	± 20
Definite (complete data on project short of detailed drawing and specification)	± 10
Detailed (complete engineering drawing and specifications)	± 5

7.2. Comparing actual costs with estimated costs

Comparing actual costs with estimated costs is an important process for evaluating the accuracy of cost estimates and identifying any variances or deviations. This analysis helps organizations understand the reasons behind cost differences, make informed decisions, and improve future cost estimation processes. Here is a comparison framework:

Gather actual cost data: Collect detailed information on the actual costs incurred during the production or project. This includes expenses related to labor, materials, overhead costs, subcontracting, equipment, and any other relevant cost categories. Ensure that the data is accurate, comprehensive, and covers the same time period or project scope as the initial cost estimate.

Review the initial cost estimate: Retrieve the original cost estimate or budget that was prepared during the planning phase. This estimate serves as a benchmark for comparison. Examine the assumptions, methodologies, and inputs used in the initial estimation process to understand the basis for the estimates.

Compare cost categories: Break down the actual costs and the estimated costs into specific categories or cost elements. This allows you to compare individual cost components and identify areas where variations occur. Common cost categories include direct labor, direct materials, indirect costs, overheads, and contingency reserves.

Calculate cost variances: Calculate the variances between the actual costs and the estimated costs for each cost category. The variance is the difference between the actual cost and the estimated cost expressed as a monetary value or percentage. Identify whether the variance is positive (cost overrun) or negative (cost underrun).

Analyze the reasons for variances: Investigate the factors that contributed to the cost variances. This may involve reviewing project records, conducting interviews with project team members, and analyzing any relevant documentation. Common reasons for cost variances include changes in scope, resource allocation, productivity levels, market conditions, supplier costs, and unforeseen events.

Assess the impact on project performance: Evaluate the impact of cost variances on the overall project or organizational performance. Consider whether the variations affect the project timeline, deliverables, quality, profitability, or customer satisfaction. Determine if the project is still within an acceptable range of cost tolerance.

Identify lessons learned: Extract key lessons learned from the cost comparison exercise. Identify strengths and weaknesses in the cost estimation process and highlight areas for improvement. Assess whether certain cost categories consistently show variances, indicating the need for refining estimation methods or adjusting risk management strategies.

Adjust future cost estimates: Based on the insights gained from the cost comparison analysis, modify future cost estimation processes to enhance accuracy. Incorporate lessons learned, update cost estimation models or tools, refine assumptions, and consider incorporating additional contingency factors to address uncertainties.

Communicate findings and take action: Share the findings of the cost comparison analysis with relevant stakeholders, such as project managers, finance teams, and decision-makers. Discuss the implications of the cost variances and collaborate on actions to mitigate risks, improve cost estimation processes, and optimize resource allocation.

Monitor and track ongoing costs: Continuously monitor and track costs throughout the project or production process. Regularly compare actual costs with updated cost estimates to identify any new variances and take timely corrective actions.

7.3. Motivation or rectifying deviations.

Motivation and rectifying deviations are both important factors in ensuring the success and efficiency of projects and processes within an organization. Here's how motivation and rectifying deviations play a role in improving performance:

Motivation:

1. **Drive and engagement:** Motivation is crucial for inspiring individuals and teams to perform at their best. When employees are motivated, they are more likely to be engaged, proactive, and committed to achieving their goals. This can lead to higher productivity, quality output, and overall performance improvement.

2. **Goal alignment:** Motivation helps align individual and team goals with organizational objectives. When employees understand how their work contributes to the larger picture and see the value in their contributions, they are more motivated to work towards achieving those goals. This alignment fosters a sense of purpose and increases motivation levels.

3. **Rewards and recognition:** Providing appropriate rewards and recognition for exemplary performance can be a powerful motivator. Recognizing and rewarding employees for their efforts and achievements not only boosts their morale but also reinforces positive behaviors and encourages others to strive for excellence.

4. **Professional development and growth opportunities:** Offering opportunities for learning, skill development, and career advancement can motivate employees to improve their performance. When employees see a clear path for growth and development within the organization, they are more likely to be motivated to enhance their skills and contribute to their fullest potential.

5. **Positive work environment:** Creating a positive work environment that fosters trust, collaboration, and open communication can significantly contribute to employee motivation. When employees feel valued, supported, and respected, they are more likely to be motivated and committed to achieving organizational objectives.

Rectifying Deviations:

1. **Identify root causes:** When deviations occur, it is important to identify the underlying causes. This involves analyzing the factors that led to the deviation, such as

miscommunication, inadequate planning, resource constraints, or unforeseen circumstances. Understanding the root causes helps in rectifying deviations effectively.

2. **Take corrective actions:** Once the causes of deviations are identified, appropriate corrective actions should be implemented. This may involve adjusting timelines, reallocating resources, revising processes, or addressing any gaps in knowledge or skills. Taking prompt and targeted corrective actions helps bring performance back on track.
3. **Learn from deviations:** Deviations provide opportunities for learning and improvement. It is important to analyze deviations in a constructive manner and extract valuable lessons from them. This can involve conducting post-mortem reviews, documenting best practices, and implementing preventive measures to avoid similar deviations in the future.
4. **Communicate and align expectations:** Clear and effective communication is essential for rectifying deviations. Ensure that all stakeholders are informed about the deviations, the actions being taken to address them, and any adjustments to expectations or timelines. This helps manage expectations, maintain transparency, and minimize any negative impact on the project or process.
5. **Monitor and track progress:** Regular monitoring and tracking of performance are necessary to ensure that deviations are rectified and performance is back on track. Implement mechanisms to measure progress, track key performance indicators, and provide timely feedback. This allows for continuous improvement and ensures that deviations are addressed promptly.

7.4. Approval from management.

Product Cost Management In Your Organization

Think Big, Start Small — Cost management can have a significant and immediate impact across your organization — increasing profitability, accelerating time-to-market and growing revenues. As such, it's appropriate to think big and aggressively about how to use it with a vision for what is best for your organization. But it's also best to start small and build your success from there. Taking the right implementation approach is the key to effectively starting and building the foundation to expand your cost management initiative.

Assembling a Core Implementation Team You can't drive an effective product cost management initiative alone. It's also difficult to implement from the bottom up, no matter how well-intentioned an individual contributor may be. Assembling the proper team and building support for cost management within the organization are essential. While it is not necessary to build out this entire team on day 1, as success builds, and the deployment expands, having these roles in place will ensure the program is properly supported. Key roles in deploying a product cost management program include:

Executive Sponsor – Someone committed to implementing a cost management program and that recognizes the organizational factors to be considered to make your project goals a reality. He or she can assist by:

- Assessing his or her organization's own cost culture and how it naturally fits into their development environment
- Fostering awareness of the problems cost management can solve
- Mandating the change and communicating the high priority of the product cost management initiative so that teams appreciate the urgency to support and adopt the new system
- Identifying champions in key business functions to spearhead focused initiatives in their own functional areas
- Committing support to sustain implementation resources and activities
- Funding the initiative properly so it has a strong opportunity to succeed

Champions – One or more executives and managers in key business functions whose teams will perform core cost management activities including:

- NPI Engineering
- Current Product Engineering
- Manufacturing Engineering
- Cost Engineers to support Sourcing
- Sourcing

Champions work with the Cost Management Manager to adjust/refine the cost management processes and activities so they work within their teams. They are also responsible for evangelizing and enforcing the use of cost management in their groups. These individuals are often incented on cost reduction or profitability goals tied to the cost management initiative, and in turn, will incent their teams.

Cost Management Manager – As the momentum from early pilot projects builds, assigning a dedicated program leader that has a clear understanding of cost management activities and how they apply to the organization overall will be critical. This individual also works closely with the Executive Sponsor and Champions to rollout cost management tools and activities to the business teams and is ultimately responsible for guiding the teams in initial project selection and process implementation. The Cost Management Manager should be supported by a technical team on the implementation of a cost management system. And, as above, they are often incented on cost reduction or profitability goals tied to the cost management initiative. Finally, the Cost Management Manager is responsible for documenting results of the deployment, and publicizing successes and lessons learned so awareness grows across the company, and the culture evolves to a higher level of cost management skill.

Cost Management Processes and Cost Control Points It's also important to identify your cost management processes and at which points costs can be effectively impacted. This might involve:

- Assessing current cost management process and key cost control points (if they exist)
- Mapping out your current product development process
- Identifying new cost control points to introduce into the development process and establishing the cost estimate characteristics required to support each cost control point
- Working with a cost management solution provider to align to the above processes

Results Tracking and Monitoring Mechanisms "If it can't be measured, it can't be managed" is especially true when it comes to effective product cost management. Key considerations include:

Identifying metrics to collect at the key cost control points; e.g., percentage of parts in a BOM with cost estimates, the number of design alternatives explored, savings identified, etc.
Creating a process for measuring and recording results; e.g., at first functional design milestone, first prototype milestone, and final design milestone submitting costs to ERP or PLM system
Creating a process for monitoring and reviewing results; e.g., every design review includes presentation of anticipated product costs and data
Creating an incentive system for managers to reinforce these behaviors and activities; e.g., emphasizing that product cost is a priority equal to product launch schedule, quality and functionality

Getting Your Implementation Started At the start, focus on one core activity and business group Assemble a small core implementation team, select a specific time-bound project (4-6 weeks), and build early successes. This is the best way to show value (i.e. dollars or time saved) and make incremental adjustments, which will ease the rollout of the program to other groups.

- You may choose to initially focus on either:
- One product with multiple functional groups performing cost management activities over the product's lifecycle
- One functional group performing their function's cost management activities over a number of products

Initial Implementation Recommendations

Define clearly measurable goals for implementing cost management; e.g.; reduce cost of the chassis assembly by 2%, increase speed of generating a detailed cost estimate from by 3 days to 3 hours, etc.

. Identify the core cost management activities that will support your goals:

Identify initial projects, people, and timeframe. Specific selection criteria depend on your organization's short-term goals and cost management solution.

Executive Sponsor and Champions identify projects/groups that could generate results quickly. The Cost Management Manager will facilitate the selection.

Implementation team reaches out to the key manager(s) in the group(s) to get buy-in.

Timeframe for an initial evaluation will be dependent on the scope of the project selected, but can usually be completed in 1-2 weeks if you are well organized. Longer term pilots typically produce "drift" where participants lose interest and return to their primary responsibilities.

Identify relevant process changes for the initial groups:

Cost Management Manager outlines initial plan that defines the cost management activities and cost control points.

Cost Management Manager works with the Executive Sponsor and/or Champions to reinforce process adherence and refine the process details.

The implementation team discusses the plan with the business group selected, including an open discussion of concerns or competing priorities; e.g., allocating time to explore design alternatives for cost reduction.

Establish the type and characteristics of the cost estimates required to support the projects and work with the cost management solution provider on how to configure the system to achieve these estimates.

Train the business group on the cost management processes and tools implemented to support the process.

Complete the project, with weekly check-ins with the business group.

Review and publish results with the implementation team and discuss process refinements.

Once the starter projects are complete, select another set of projects and manage them in a similar fashion to the first. It is important to manage these first initial projects carefully in order to build momentum for continued expansion of your product cost management initial

Self-Check 7.1

Directions: I. Answer all the questions listed below.

Directions: part I. Choose the Correct answer for the for the given alternative

1. _____involves predicting or calculating the quantity of goods or services that can be produced within a given timeframe.
   A. Define the production unit
   B. Analyze demand forecast
   C. Estimating production
   D. Consider efficiency and downtime
2. is an important process for evaluating the accuracy of cost estimates and identifying any variances or deviations.
   A. Gather actual cost data
   B. Comparing actual costs with estimated costs
   C. Review the initial cost estimate
   D. Compare cost categories
3. One or more executives and managers in key business functions whose teams will perform core cost management activities including:
   A. Current Product Engineering
   B. Cost Engineers to support Sourcing
   C. Sourcing
   D. All
4. The total cost for machine should be by assuming as Different different cost types expected. Except
   A. The material last
   B. The manufacturing cost &
   C. The labor cost
   D. Budget

5. The basic estimating of cost categories can be expressed as follow:-

   A. Weight of the material
   B. Cost for unit weight or the material
   C. Type of operation is used.
   D. all

Part II. Write true if the Statement is Correct Write False if not Correct

1. Managing and monitoring strategic information is crucial for organizations to make informed decisions, identify trends, and stay competitive in their respective industries.
2. Clear and effective communication is essential for rectifying deviations.
3. Motivation is crucial for inspiring individuals and teams to perform at their best.
4. Estimating production involves predicting or calculating the quantity of goods or services that can be produced within a given timeframe.
5. Estimating the material is done for in direct material that material is appearing in the product.
6. the efficiency of your production processes and any potential downtime due to maintenance, equipment breakdowns.

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