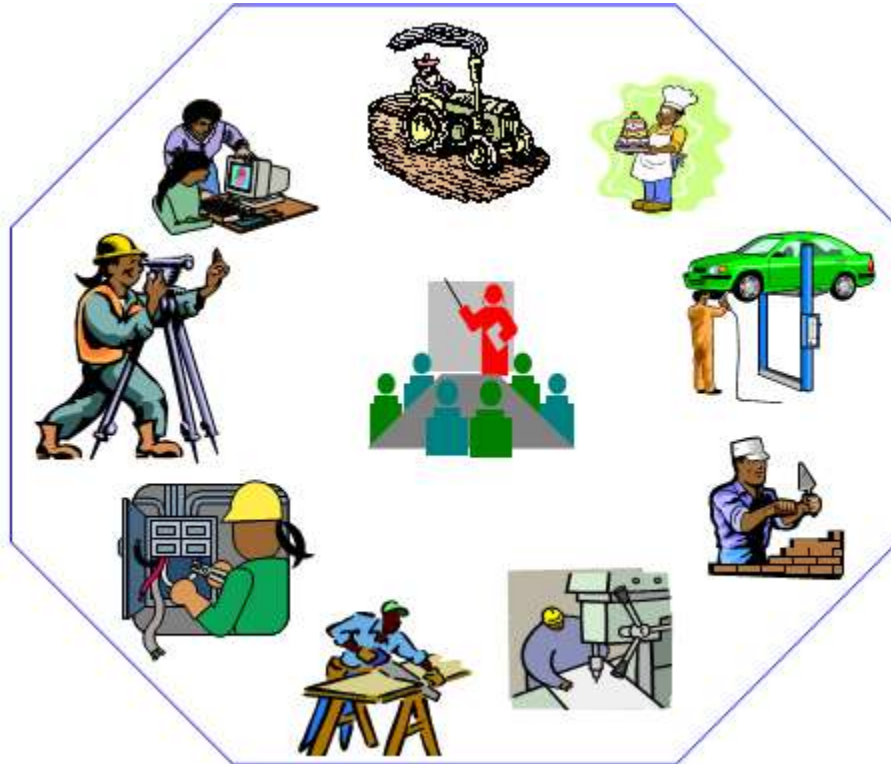




WELDING

Level-IV

Based on Feb 2021, Version 1 Occupational standard



Module Title: - Manage Product Cost Estimation and Bill of Materials

LG Code: IND WLD4 M07 LO (1-6) LG (32-38)

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LG #32

LO #1- Plan and prepare for work

Instruction sheet

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

- Identifying and clarifying work.
- Preparing time scheduling, sequences of work and labor.
- Preparing format (take off sheet) and materials bill of quantities.
- Determining cost centers of resources.
- Supplying Information regarding remarks.

This guide will also assist you to attain the learning outcome stated on the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- The work to be performed and managed is identified and clarified according to work requirements and/or tender
- Essential time scheduling , sequences of work and labor are prepared based on available resources and specifications
- Format (take off sheet) and materials bill of quantities are prepared based on technical specifications
- Cost centers of all required resources in all respect of fields are determined according to operational specifications
- Information regarding remarks is supplied due to operational procedures

Learning Instructions:

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1. Read the specific objectives of this Learning Guide.
2. Read all the information sheets in this learning guide.
3. Accomplish the self-check to make sure that you have understood all the theories behind all topics.
4. Do the LAP test to make sure you have acquired all the skill needed to do the task

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Information Sheet 1	Identifying and clarifying work.
----------------------------	---

1.1 Identify and clarify the work

Management is a process of accomplishing organizational goals. The process of accomplishing goals occurs at the corporate, business, and functional levels of an organization. Organizational goals are set in order to increase the value of the firm because the owners (the stockholders) expect growth on their investment on a continual basis. For example, if you have invested one thousand dollars in a business, as a rational investor you expect the value of your investment to increase each year. That is why managers must focus on creating value for the shareholders, and they do so by making choices (decisions) that will lead to an increase in the value of the firm.

The 5 P's of management provide managers with a framework for making these good choices and for building a process which creates value for the shareholders. By contrast, the traditional management approach is to focus on functions of management in order to achieve the goals of the organization. In the global economy, where the competition is based on knowledge, the environment is changing rapidly. Employees, suppliers, and shareholders have more knowledge and information than ever before, and there is, therefore, a need for a framework which enables managers to make decisions which lead to value creation. The 5 P's of management provide such a framework.

1.2 5-P Work Plan

The 5 Ps is: 1. Plan

2. Process

3. People

4. Possessions

5. Profits

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5PS management

Plan

Planning is the key to the success of an organization. It is necessary because businesses operate amid uncertainty and risk, and the managers do not have the opportunity of making decisions under a background of certainty. Planning involves setting clear and realistic goals, organizing business activity based on the revenues forecast, formulating strategies, preparing budgets, and implementing strategies, and evaluation and control systems.

Process

An organizational process includes both business process and operational process. The business process is based on the business model of the firm. The business process guides the firm in generating revenues, managing costs, and generating profits. Managers select a business model that has the potential of creating value for the shareholders.

People

In order to market effectively, people are an essential part of the equation. Some marketing experts have suggested that the "people" component represents the people who deliver the service you are marketing a critical factor for a service business. But I think there are two other types of people important to your marketing: the people you are marketing to, and the people who help you spread the word about your business.

To make realistic decisions about marketing, you need to have a clear definition of your target market and understand their needs. Only then can you know who you should be

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delivering your marketing messages to, and what you need to communicate. With a solid definition of your target market and a well-defined message in hand, you can reach out directly to the people who might become your clients, and ask other people to pass your message along to those they know.

Positioning

Your marketplace is crowded with competitors, and your prospects are besieged with marketing messages. For your message to find its way through all this noise, it must be exactly on target. In any professional field, it's not enough to simply describe what you do. You must be able to tell your prospects exactly how your work helps them solve problems and reach goals, and the benefits and results they can expect to see from it.

What this targeted messaging requires is that you become very specific about not only who your offer is for, but what it will help them do, and why your solution is the right one for them. You must position your business in the mind of your prospective clients as the best possible choice for exactly what they need. Broadcasting a muddy or generic marketing message won't be enough. Your clients need to understand "what's in it for me?"

Profit

Managing a business without concern for profits is not good management. Managers adopt management processes which have the potential of generating long-term profits. They make their decisions based on the understanding that the first step in business is to survive, the second is to generate profits, and the third is to create value for the shareholders. Managers evaluate organizational performance with both qualitative and quantitative measures.

1.3 Tender/cost

A tender is an invitation to bid for a project or accept a formal offer such as a takeover bid. Tendering usually refers to the process whereby governments and financial institutions invite bids for large projects that must be submitted within a finite deadline. The term also refers to the process whereby shareholders submit their shares or securities in response to a takeover offer.

Type of tendering

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1. Open tendering
2. Selective tendering
3. Two-stage tendering

1. Open Tendering

This is a method occasionally used by public authorities to obtain tenders by advertising in the press and/or technical journals, and any contractor who responds to the advertisement is supplied with the tender documents. A deposit is usually requested which is returned on receipt of a bona fide tender. The employer does not bind himself to accept the lowest or any tender. Ideally, tenderers should be informed, at the time of issuing the tender documents, of the number of contractors to whom issue has been made. This procedure offers the principal advantage of full competition from all interested contractors. It can, however, result in an excessively long list of tenderers with much abortive tendering and waste of resources. It has been estimated that tender costs for civil engineering projects average 1fl per cent of company turnover. It could also result in tenders being awarded to contractors who are not adequately equipped financially or technically to undertake the work. It is a very inefficient process and is now little used. The Wood Report² advised against its use and stated 'We cannot, however, endorse the use of open competition. It has little to offer over some form of selection prior to invitation to tender, and we cannot entertain any justification for its continued use in the face of repeated condemnation in past reports, and the poor performance on such contracts in our statistical survey'.

2. Selective Tendering

Selective tendering, based on approved lists or pre-qualification, is strongly recommended in an ICE document as being the best procedure, affording maximum efficiency and economic advantage. It offers both a popular and a relatively straightforward procedure, ensuring the receipt of meaningful tenders with the least delay. In this method tenders are invited from selected contractors chosen by the engineer and the employer. Lists of contractors suitable for specific categories and values of civil engineering projects are compiled by both large promoting organizations

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and consulting civil engineers. Only contracting organizations of repute with adequate financial and technical resources will be listed, and the lists are normally subject to periodic review. A NJCC Code4 recommends that a short list of suitable tenderers should be drawn up either from the employer's approved list of contractors or from an ad hoc list of contractors of established skill,

Why do we have 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 the 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

Why is a reasonable bidding period important?

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 \$ to their bid

Preparing a Bid

Preliminary Considerations

- ✓ Become familiar with
- ✓ Instruction to bidders

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- ✓ Proposal form
- ✓ Alternates
- ✓ General and supplementary/special conditions
- ✓ Drawing and specifications (addenda)
- ✓ Form of the contract
- Pre bid meeting (in-house)
- Pre bid meeting (with owner)
- Jobsite visit
- Observe job site specific conditions that must be covered in the bid (site access, logistics...)
- Bid invitations
- 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

Bid Components

- Material Costs – anything that becomes a part of the finished structure
- Material Allowance – What is it? Example?
- Direct Labor costs
 - ✓ Basic wage rates of the labor categories
 - ✓ Production rate that applies to the work type
 - ✓ The largest areas of uncertainty
 - ✓ Where is the most reliable labor productivity information to found?

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.

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- 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.

PROCESS

- 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.

1.3.1 Defining the Scope of Services

- Before preparing an estimate or calling for an estimate to be prepared, it is critical to set expectations for the estimate.
- Equally important is ensuring that everyone involved in preparing and analyzing the estimate has agreed to the decisions made.
- Certain steps are recommended to define detailed cost estimating services for a project:

Define the scope of the estimate, identifying both inclusions and exclusions.

- Items to be excluded from an estimate are important. If not specifically excluded, all items included in the contract documents will be part of the estimate.

Define the basis to be used for pricing, including a clear definition of what is included in unit pricing.

- There are no standard guidelines for deciding what costs to apply to unit pricing, so consistency is vital.

Establish the procurement and construction (manufacturing) schedule for preparing the estimate.

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- Include the expected construction (manufacturing) start time, any planned phasing of construction (manufacturing), the expected construction (manufacturing) completion date, the anticipated commissioning process, and the actual move-in schedule.
 - Establish a schedule for preparing and reviewing the estimate.
 - First, all parties need to agree when documents will be provided and when estimates must be completed.
 - The documents must be completed in advance or the estimate will have to be based on incomplete plans.
 - Overlapping the estimating process with a quality review of the documents can be a reasonable alternative.
 - Choose a format for the estimate
 - ✓ It is difficult and time-consuming to reformat and reprice estimates as an afterthought.
 - ✓ Specify the level of detail, amount of description required of work items, and pricing philosophy.
 - ✓ If standardized databases are to be used, define procedures acceptable for overriding such pricing.
- ☞ For most industrial companies, cost estimation methods mostly determine the performances of two strategic functions: **product design** and **pricing** (or quotation).

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Self-Check -1	Written Test
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Instruction 1:- Choose the best answer (4Pts)

1. -----is Visual depiction of the requirements in a bill of materials, where all components are listed by levels.(1Pts)
A) Bill of material B) Production C) Plant maintenance D) Product structure tree
2. Management is a process of accomplishing organizational goals. (1Pts)
A) TRUE B) FALSE
3. A method occasionally used by public authorities to obtain tenders by advertising in the press and/or technical journals, and any contractor who responds to the advertisement is supplied with the tender documents. (1Pts)
A) Open tendering
B) Selective tendering
C) Two-stage tendering
D) none of the above

Instruction 2:- gives short and precise answer (8Pts)

1. What is bill of material? (2Pts)
2. List type of bill of material.(2Pts)
3. What information listed on bill of material?(2Pts)
4. List 5P Work plan.(2Pts)

Note: Satisfactory rating - 11 points Unsatisfactory - below 11 points

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

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Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

4. _____

Test II

1. _____

2. _____

3. _____

4. _____

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Information Sheet 2	Preparing time scheduling, sequences of work and labor.
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2.1 Introduction

In computing, scheduling is the method by which work is assigned to resources that complete the work. The work may be virtual computation elements such as threads, processes or data flows, which are in turn scheduled onto hardware resources such as processors, network links or expansion cards.

A scheduler is what carries out the scheduling activity. Schedulers are often implemented so they keep all computer resources busy (as in load balancing), allow multiple users to share system resources effectively, or to achieve a target quality of service. Scheduling is fundamental to computation itself, and an intrinsic part of the execution model of a computer system; the concept of scheduling makes it possible to have computer multitasking with a single central processing unit (CPU).

Time scheduling is one of the fundamental tasks of project planning. Realistic time schedules are the key to success of project implementation. But time planning simply faces one problem.

2.2 Project scheduling

Scheduling is the determination of the timing of the activities comprising the project to enable managers to execute the project in a timely manner. The project scheduling issued for:

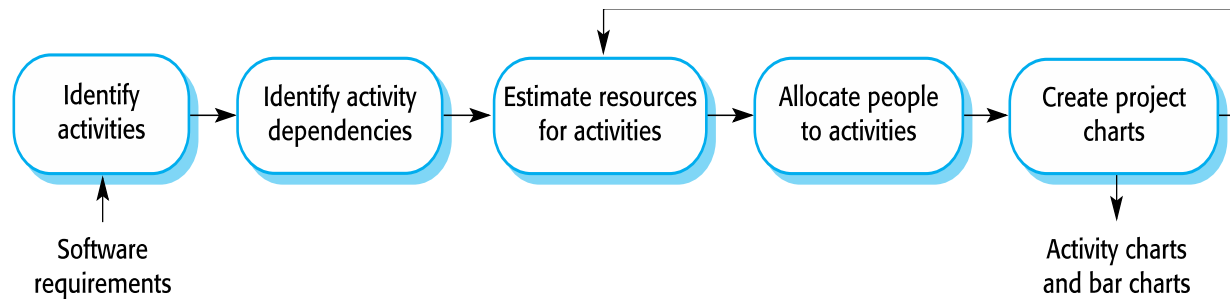
- Knowing the activities timing and the project completion time.
- Having resources available on site in the correct time.
- Making correction actions if schedule shows that the plan will result in late completion.
- Assessing the value of penalties on project late completion.
- Determining the project cash flow.

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- Evaluating the effect of change orders on the project completion time.
- Determining the value of project delay and the responsible parties.

Important to note that the schedule evolves over time. During early stages of planning, a macroscopic schedule is developed that identifies all major SE activities. As the project gets under way, each entry is refined into a detailed schedule where specific tasks required to accomplish an activity are identified and scheduled.



2.2.1 The Critical Path Method

The most widely used scheduling technique is the critical path method (CPM) for scheduling. This method calculates the minimum completion time for a project along with the possible start and finish times for the project activities. Many texts and managers regard critical path scheduling as the only usable and practical scheduling procedure. Computer programs and algorithms for critical path scheduling are widely available and can efficiently handle projects with thousands of activities. The critical path itself represents the set or sequence of activities which will take the longest time to complete. The duration of the critical path is the sum of the activities' durations along the path. Thus, the critical path can be defined as the longest possible path through the "network" of project activities. The duration of the critical path represents the minimum time required to complete a project. Any delays along the critical path would imply that additional time would be required to complete the project. There may be more than one critical path among all the project activities, so completion of the entire project could be delayed by delaying activities along any one of the critical paths. For example, a project consisting of two activities performed in parallel that each requires three days would have each activity critical for a completion in three days. Formally, critical path scheduling assumes that a project has been divided into activities of fixed duration and well defined predecessor relationships. A predecessor relationship implies that one

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activity must come before another in the schedule. The CPM is a systematic scheduling method for a project network and involves four main steps:

- A forward path to determine activities early-start times;
- A backward path to determine activities late-finish times;
- Float calculations; and
- Identifying critical activities.

2.2.2 Scheduling Work - Work Loading

Scheduling occurs in every organization. Manufacturers must schedule production, which includes developing schedules for workers, equipment, purchases, maintenances, and so on. Hospitals must schedule admissions, surgery, nursing assignments, and support services such as meal preparation, maintenance, and cleaning. Educational institutions must schedule classrooms, laboratories and instruction. Effective scheduling can enable an organization to meet due dates and increase utilization of resources (equipment and personnel). It can yield cost savings and increases in productivity. Scheduling encompasses allocating workloads to specific work centers and determining the sequence in which operations are to be performed. Detailed scheduling involves development of the Production schedule at the front line level of an organization eg. Day-to-day operations. It operates within and is confined by the master schedule.

Loading: the assignment of jobs to a processing center without specifying when the work is to be done and in what sequence.

Infinite loading: Ignores capacity constraints, but helps identify bottlenecks in a proposed schedule to enable proactive management

Finite loading: Allows only as much work to be assigned as can be done with available capacity – but doesn't prepare for inevitable slippage

Sequencing: the process of setting priorities for jobs to be carried out on a work center.

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Scheduling: the assignment of jobs to a work center with the time specification and the sequence in which they are to be done.

2.3 Time management

Time management is the managing of your time so that time is used to your advantage and it gives you a chance to spend your most valuable resource in the way you choose. Time management is a skill that can be learned which involves techniques for prioritizing activities and using time effectively while eliminating disruptions and time wasters. Time Management is an endless series of decisions, small and large, that gradually change the shape of your life. No one has total control over a daily schedule. Someone or something always will always make demands. However everyone has some control and probably more than they realize. Even within structured time, there are opportunities to select which tasks or activities to handle and what priority to assign to that task. It is through the exercise of these choices that allow you control over your time. The secret to effective time management lies in organizing and planning. Each person will plan their own week to harmonize with his or her unique requirements, inclinations and interests. Each thirty minutes saved through planning is time which can be used to make life richer and better. Time management begins with the use of an assessment of your current time usage, followed by the creation of a calendar, schedule or planner with daily lists. To begin, make a semester calendar. Use a wall or desk calendar for major exams, due dates, and meetings; basically the events that you must do and that do not change. Use your class syllabi to help you complete the calendar. You should then keep a pocket calendar or use the month calendars in a planner as a reminder of classes, appointments, meetings, and errands. In addition, a weekly schedule should be used, which should be made once a semester of all classes, exercise routine, work and extracurricular activities, housekeeping duties, sleeping and eating, and blank spaces to fit in necessary activities as they come up, which is usually done weekly, preferably on a Sunday night before the week begins. These blank spaces should be utilized for studying and the completion of assignments. Study time should be scheduled at a ratio of two hours of study per hour of class. Moreover, a daily list should

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be made each day, either when you wake up in the morning or each night before you go to bed. The list should be kept short, about five or six items, both academic and personal. The list should also be prioritized and the items should be small specific goals such as read five pages in psychology, not read a chapter of psychology. Additionally, you must learn to use your schedules every day and learn to say "no" so that you can keep to your schedules.

Choosing a Time Management Method that Works for You

Not all time management methods work for everyone. Understanding who you are as a student/learner can help you assess which method is best for you. After assessment, choose a time management organizational tool that can assist you in being a more productive time manager.

2.3.1 Organizational & Time Management Tools

In order to accomplish your goals you will need to use Organizational and time Management Tools

Which Planner is right for you?

Tech

PDA

Blackberry

Palm Pilot

Computer Scheduling Programs (e.g. Outlook)

Schedules/Calendars

Daily Planning

- To Do Lists

Weekly Calendar

Monthly Calendar

Semester Calendar

Semester on a Page

4-Year Plan

Use a General Course Catalog

Seven Hints on Time Planning

1. Build your schedule around your commitments. Some activities have fixed time requirements and others are flexible. The most common which you must consider are:
 - FIXED: classes, eating, organizations, church, employment

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- FLEXIBLE: sleeping, study, recreation, personal grooming
2. Plan sufficient study time to do justice to each subject. Most college classes are planned to require about two hours of outside work per week per credit. By multiplying your credit load by two you can get a good idea of the time you should provide for studying. Of course, if you are a slow reader, or have other study deficiencies, you may need to plan more time in order to meet the competition from your classmates. Break assignments into smaller segments, such as library research, read articles & take notes, rough draft, edit paper, final draft. Break study tasks into smaller segments, such as: read chapter, outline chapter, make note cards, study note cards, review for exam.
 3. Study at a regular time and in a regular place. Establishing habits of regularity in studying is extremely important. Knowing what you are going to study, and when, saves a lot of time in making decisions, finding necessary materials, etc. Avoid generalizations in your schedule such as "study". Commit yourself more definitely to "study history" or "study chemistry" at certain hours.
 4. Study as soon after class as possible. Check over lecture notes while they are still fresh in your mind. Start assignments while your memory of the assignment is still accurate. Remember, one hour of study immediately after class is probably better than two hours of study a few days later.
 5. Utilize off hours for study. Those scattered one or two hours free periods between classes are easily wasted. Using them for study will result in free time for recreational activities later on.
 6. Study no more than two hours on any one course at one time. After studying for two hours you begin to tire and your ability to concentrate decreases rapidly. To keep up your efficiency, take a break and then switch to studying another subject.
 7. Borrow time-don't steal it. Whenever an unexpected activity arises that takes up time you had planned to use studying, decide immediately where you can trade for "free" time to make up the missed study time and adjust your schedule for that week.

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Self-Check -2	Written Test
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Instruction 1:- Choose the best answer. (5Pts)

1. A scheduler is not included what carries out the scheduling activity.(1Pts)
A) True B) False
2. Time scheduling is one of the fundamental tasks of project planning.(1Pts)
A) True B) False
3. The project scheduling not issued for: (1Pts)
A) Making correction actions if schedule shows that the plan will result in late completion.
B) Assessing the value of penalties on project late completion.
C) Determining the project cash flow.
D) NONE
4. The most widely used scheduling technique is the -----for scheduling.(1Pts)
A) Project scheduling
B) Critical path method
C) CPM
D) B and C
5. -----The process of setting priorities for jobs to be carried out on a work center. (1Pts)
A) Loading
B) Scheduling
C) Sequencing
D) Time management

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

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

Score = _____

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Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

4. _____

5. _____

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Information Sheet 3	Preparing format (take off sheet) and materials bill of quantities.
----------------------------	--

3.1 Introduction

Taking off sheet and taking off in Manufacturing process involves recording dimensions and is referred to as taking off because it involves reading or scaling (taking off) dimensions from a drawing and entering this information in a standard manner on purpose ruled paper called dimension paper or taking off sheet.

A dimension paper also known as a takeoff sheet or measurement sheet is used to enter measurements taken off from an architectural drawing or building plan. The traditional quantity takeoff sheet in the form of A4 paper is widely used at professional learning institutions of quantity surveying, but it's also used by consulting quantity surveyors, engineers, contractors, and building estimators.

Normally, the taking off sheet is available in A4 size, but it can be wider since it contains more columns than the standard dimension sheet. This sheet has 8 columns while the standard sheet has 5 or fewer columns. A contractor or project engineer can choose between two types of sheets – ruled paper with faint and margins or blank paper with margins and no faint.

3.2 Bill of material

Bill of material is a one of the PP master data which contains information like list of components and its quantity required to produce an assembly or FG. In SAP different BOM categories are available which are used in different applications or functional areas in an organization

Bill of materials (BOM): a listing of all of the raw materials, parts, subassemblies, and assemblies needed to produce one unit of a product.

- Each finished product has its own bill of materials.
- Product structure tree: Visual depiction of the requirements in a bill of materials, where all components are listed by levels.

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- Basically, a bill of material (BOM) is a complete list of the components making up an object or assembly.
- It is also part of material requirements planning (MRP) input.

Processes that utilize a BOM

- Production
- Materials planning
- Product costing
- Plant maintenance

Types of BOMs

There are two types of bills of material.

1 – Engineering BOM

It defines the design (i.e., drawing) of the end product. The engineering department makes such a design. The design itself specifies the requirement. It has alternate or substitutes part numbers. The dimensions of each sub-assembly are also specified in such BOM. Each line of BOM specifies the description part, name of the part, part number, unit of measurement and its size, and other relevant specifications

#2 – Manufacturing BOM

The requirements herein are specified from the angle of actual manufacturing rather than just designing. However, engineering BOM aids the manufacturing BOM. MBOM specifies the processes which are required at the execution stage and thereby keeping all things ready for manufacturing activities

#3 – Sales BOM

It is treated as a sales item rather than just an item of inventory. The requirements are specified in the sales order document.

What information is on a BOM?

1. Quantity
2. Item ID#
3. Description of Item
4. Cost of Item
5. Total Project Cost

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Quantity

- Tells user how many of each part is needed for each project
- Example: A chair needs 1 seat, 4 legs, 1 back, and 5 nails.

Item ID

- Tells us which part to order
- Can be any of the following:
- Catalog number, UPC, or any other identification number.
- ✓ Example:
- ✓ The chair needs a 2PC seat, 5DR legs, and 6TU8 back, and 1 inch nails.

Description of Item

- ✓ Provides a check that the correct item is being ordered.

Cost of Item

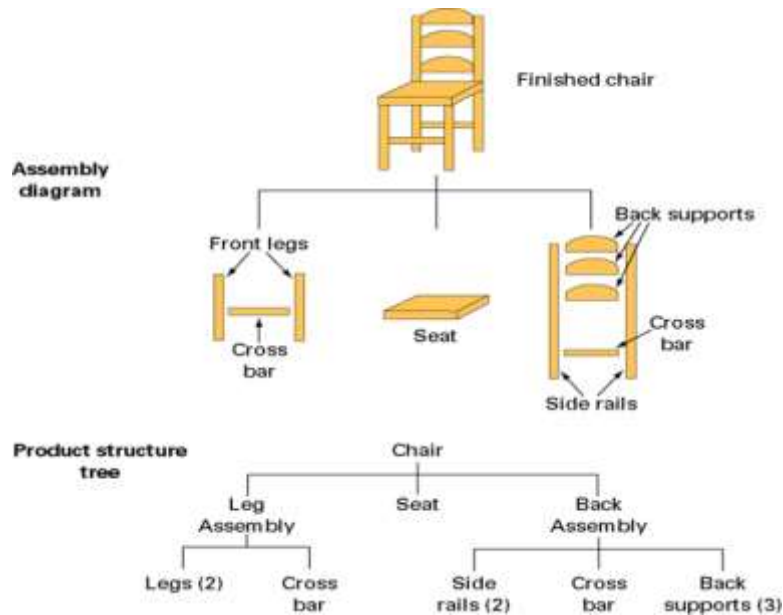
- Cost is included to show how much each part is per item and the total cost of all like parts.
- ✓ Example: The cost of a leg is \$5 per leg. Then the total price of the legs ordered would be \$20 because there are 4 leg

Total Project Cost

- Shows the total cost of all items and is also the total cost of the direct materials used in the project.
- ✓ Example:
- Seat-\$10, Back-\$5, Leg-\$5 per leg, Nail-\$.5 per nail
- Total Cost of a chair = $10 + 5 + 5*4 + .5*5 = \$37.50$

Assembly Diagram & Product Structure Tree

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Bill of Materials Example

Creating a bill of the material requires knowledge of that sector. Detailed knowledge is not expected, but you should have a broad view of the product. As a basic example, we will consider the manufacture of bicycles. Let's say there is a demand for 100 bicycles. Question is what parts/components/assemblies/sub-assemblies are ought to be required. A bill of material can be created in tabular form or flow chart form. Well, there are so many types of bicycles. Deliberately, we consider "Mountain-bike" as complicated products so that BOM can be understood in a detailed manner.

Details of all significant parts of mountain-bike:

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Parts of a Mountain Bike



Detailed BOM: (Tabular Format)

Part Name	Part Number	Per Unit	Total Quantity Required	Unit Cost
Wheels				
Spokes	N0453	60	-	\$ 18.00
Hub	N0461	1	100	\$ 2.15
Rim	N0473	2	200	\$ 16.86
Tyre	N0482	2	200	\$ 42.58
Valve	N0491	2	200	\$ 1.02
Frame				
Saddle	VW0411	1	100	\$ 11.02
Seat Post	VW0412	1	100	\$ 8.18
Handle grip	CV0612	2	200	\$ 6.38
Shock Absorber	BK8920	1	100	\$ 1.05
Front Brakes	BK8956	1	100	\$ 24.20
Fork	BK8025	1	100	\$ 28.90
Head tube	BK8056	1	100	\$ 21.20
Top tube	BK8189	1	100	\$ 22.50
Down tube	BK8089	1	100	\$ 22.50
Seat tube	BK8420	1	100	\$ 21.50
Seat Stay	BK7459	2	200	\$ 14.52
Chain Stay	BK7460	2	200	\$ 14.52
Rear Brakes	BK6489	1	100	\$ 24.20
Cogset	BK6478	1	100	\$ 13.23
Rear derailleur	BK6415	1	100	\$ 8.19
Front derailleur	BK6490	1	100	\$ 8.19
Chain	BK5563	1	100	\$ 22.89
Chain rings	BK5548	1	100	\$ 27.23
Pedal	BK5593	2	200	\$ 12.16
Crank Arm	BK5518	2	200	\$ 16.18



3.3 Importance of Quantity Takeoff and Required Documents

The quantity of material in a project can be accurately determined from the drawings. The estimator must review each sheet of the drawings, calculate the quantity of material and record the amount and unit of measure. Each estimator must develop a system of quantity takeoff that ensures that a quantity is not omitted or calculated twice. A well-organized check-list of work will help reduce the chances of omitting an item. The estimator must, also, add an appropriate percentage for waste for those items where waste is likely to occur during construction. The material quantity takeoff is extremely important for cost estimating because it often establishes the quantity and unit of measure for the costs of labor and contractor's equipment.

3.3.1 Contract documents

The contract is defined by the contract documents, which are developed from the tender documents. In a logical order, these documents refer to the following subjects:

- Input from the client (task description).
- Output of the contract (specifications, results to be achieved).
- Prices for the contractor's contribution.
- Responsibilities and procedures (liability, resources provided, time schedule,
- Payment conditions, changes procedures, etc).

Contract documents are usually arranged according to the following sequence:

- General (for any project).
- Special (for a specialty area of the project).
- Supplementary (unique to a given project).
- Additional (during bidding or negotiation).
- Agreement form (for signing very important and particular clauses).
- Modifications (during contract fulfillment).

The complete contract agreement usually consists of the following documents:

- Conditions (general, special, supplementary).
- Drawing and specifications.
- Agenda.
- Agreement form.

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- Modifications.

The most important document from the legal point of view is the agreement. It is sometimes called the contract. Since so many documents are included as contract documents, the agreement is the better term for this particular one. The form of the agreement can be standardized and used for many projects, or a unique document can be prepared for each project. The standard form of agreement prescribed by the American Institute of Architects has proved to be satisfactory and has been used on many building projects with good results. The form followed for non-building projects is often more varied. Many agencies have own standard forms, which are used on all their projects.

Information usually included in the agreement of three parts. The first part is a short introductory paragraph which defines the parties, gives the date of the agreement, and state that each party agrees to what follows. The second part contains the elements of contract and defines the work to be undertaken. The final paragraph confirms the agreement and provides space for signatures of the parties. Thus, the agreement usually composed of the following articles:

1. A short introductory paragraph.
2. Scope of the work.
3. Time of completion.
4. Contract documents.
5. Performance bond.
6. Contractor's insurance.
7. Owner's insurance.
8. Laws, regulations and permits.
9. Payments.
10. Extensions of time.
11. Changes in the work.
12. Owner's right to terminate the work.
13. Contractor's right to terminate the work.
14. Confirmation and signatures.

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3.3.2 Quantity take-off: Why?

Owner perspective:

- Initial (preliminary) estimate of the project costs at the different stages of the Project.
- Preparing the BOQ as a requirement of the contract documents.
- Estimating the work done for issuing the contractor payments.

Contractor perspective:

- Pricing different work items.
- Identifying the needed resources (Labor, Equipment, etc.).
- Project schedule.
- Preparing invoices for work done.
- Subcontractors' payments.
- Review and control of crews' production rates.

3.4 Quantity Development

After the scope has been analyzed and broken down into construction tasks, each task must be quantified prior to pricing. Equal emphasis should be placed on both accurate quantity calculation and accurate pricing. Quantities should be shown in standard units of measure and should be consistent with design units. Assistance for preparing “takeoffs” may be provided by others within the organization in support of cost engineering; however, the responsibility for the accuracy of the quantities remains with the cost engineer. Distinction should be made between “net” quantities without waste versus quantities that include waste or loss. This is necessary to ensure duplication does not occur within the estimate.

The detail to which the quantities are prepared for each task is dependent on the level of design detail. Quantity calculations beyond design details are often necessary to determine a reasonable price to complete the overall scope of work for the cost estimate. A simple example would be fabrication waste material that is a material cost to the project. Project notes will be added at the appropriate level in the estimate to explain the basis for the quantity calculations, to clearly show assumed quantity allowances or quantity contingencies, and to record quantities determined by cost engineering

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judgment that will be reconciled upon design refinement. Use the following recommended guidelines in quantity development:

- Coordinate the quantity takeoff process and plan with the estimator.
- Ensure full project scope is reflected within the estimate.
- Include a list of materials in quantity takeoffs.
- Utilize a process that easily records the quantity development, i.e., document source and date, estimator name and date, location within the project, demonstrated calculations and additions such as waste or loss.
- Use a systematic approach similar to the construction methodology required.
- Check scales and dimensions on each drawing sheet.
- Highlight or mark drawing areas where quantities have been determined to ensure all scope is captured but not double counted.

3.5 Bill of Quantities

The Bill of Quantities (BOQ) is defined as a list of brief descriptions and estimated quantities. The quantities are defined as estimated because they are subject to admeasurement and are not expected to be totally accurate due to the unknown factors which occur in civil engineering work. The objective of preparing the Bill of Quantities is to assist estimators to produce an accurate tender efficiently and to assist the post contract administration to be carried out in an efficient and cost-effective manner. It should be noted that the quality of the drawings plays a major part in achieving these aims by enabling the taker-off to produce an accurate bill and also by allowing the estimator to make sound engineering judgments on methods of working. Figure shows a sample of a bill of quantities.

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Number	Item description	Unit	Quantity	Rate	Amount	

Item No.	Description	Unit	Qty	Unit Price		Total Price	
				(L.E)	(US\$)	(L.E)	(US\$)
Section (03) - Earth Work							
	Reference shall be made to section (3) of specifications .						
3.01	Excavation in any type of soil (except rock) including scaffoldings , dewatering of ground and surface water and transportation of water either to sewerage networks or open drains during the whole foundation construction period (till completion of filling) , shoring or sheet piling of excavation sides , transportation of excavated material to dump areas approved by the organization and compensation for excavation outside the geometric measured volumes .						
	rate per cubic metre						
	From existing level (± 0.00 to (-2.00 ms)	M ³	1000			0	
	For parts deeper than (-2.00) To (-4.00 ms)	M ³	50			0	
	For parts deeper than (-4.00) To (-6.00 ms)	M ³	0			0	
3.02	As previous item (3.01) , but for manual excavation for exploratory pits including filling of these pits .						
	rate per cubic metre						
	From existing level (± 0.00 to (-2.00 ms)	M ³	10			0	
	For parts deeper than (-2.00) To (-4.00 ms)	M ³	10			0	



The bill of quantities, when completed, is traditionally presented in trade format; that is, in a given order, for example:

- Demolition and alteration
- Groundwork
- Concrete work
- Masonry Etc.

Also, the bill of quantities is classified into the following work groups:

- Civil works which includes: Earth works (leveling, excavation, backfilling, transportation of excavated soil); Foundation works (plain and reinforced concrete, piling foundations); Brick works (internal and external); Skelton reinforce concrete (columns, beans, slabs and stairs); Water proofing; Staircases; Plastering, Flooring; Painting; Metal works (windows, doors, accessories); etc.
- Sanitary works which includes: Water feeding systems; Internal and external plumbing works; Finishes of plumbing works; etc
- Electrical works which includes: Electrical cables; Wiring; Accessories; Internal connections; etc.
- Mechanical works which includes: Air conditioning systems; Elevators; etc

Measurement Practice

It is vitally important that measurement practice applied to buildings is both accurate and consistent. There are a number of situations that require a quantity surveyor to measure and record dimensions from both drawings as well as on site, depending on the stage of the project. In order to standardize measurement rules and conventions, there are a number of standard codes and methods of measurement that are available. These are outlined below.

There are various approaches to measurement for bills of quantities and these are as follows:

- Each (numbers): Piles, doors, Windows, Precast concrete, etc.
- Length (meter): Windows sills, Pipes, Skirts, stair steps, etc.

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- Area (Square meter): Flooring, painting, plastering, Brick walls (12 cm or less), etc.
- Volume (Cubic meter): Brick walls (>12 cm thick), Excavation, Backfilling, Reinforced Concrete, etc.
- Weight (Ton): Metallic works, Reinforcement steel, etc.
- Lump Sum: Some electrical and plumbing works, Manholes, etc.
- Effort (Man-day): Renting of equipment or labor, etc.

The advantages of having a Bill of Quantities

- The Standard Method of Measurement provides detailed guidelines for the measurement of works.
- Reduces the possibility of measurement related disputes at the post-construction stage.
- Standard methods of measurement also contain an exhaustive list of work items.
- Provided uniformity among the tenders and also reduces the pricing risks for the bidders and consequently more competitive tenders can be expected.

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Self-Check -3	Written Test
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Instruction 1:- choose the best answer. (3 Pts)

1. The quantity of material in a project can be accurately determined from the -----
-----.(1Pts)

A) Drawing B) Takeoff sheet C) Quantity D) All

2. Contract documents are usually arranged according to the following sequence:(1Pts)

- A) General ;Special Supplementary; Additional ;Agreement form
- B) Agreement form ;General ;Special Supplementary; Additional
- C) General ; Additional ;Agreement form; Special Supplementary
- D) General ; Additional ;Special Supplementary; Agreement form

3. -----should be shown in standard units of measure and should be consistent with design units.(1Pts)

A) Quantities B) Time management C) Development D) takeoff sheet

Instruction 2:- give short and precise answer. (6 Pts)

- 1. What is dimension paper? (3Pts)
- 2. List Information usually included in the agreement.(3Pts)

Note: Satisfactory rating - 9 points Unsatisfactory - below 9 points

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

Score = _____

Rating: _____

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Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

Test II

1. _____

2. _____



Information Sheet 4	Determining cost centers of resources.
----------------------------	---

4.1 Introduction

A cost center is a department or function within an organization that does not directly add to profit but still costs the organization money to operate. Cost centers only contribute to a company's profitability indirectly, unlike a profit center, which contributes to profitability directly through its actions. Managers of cost centers, such as human resources and accounting departments are responsible for keeping their costs in line or below budget.

4.2 How a Cost Center Works

A cost center indirectly contributes to a company's profit through operational efficiency, customer service, or increasing product value. Cost centers help management utilize resources in smarter ways by having a greater understanding of how they are being used. Although cost centers contribute to revenue indirectly, it is impossible to discern the actual revenue generated. Any associated benefits or revenue-producing activities of these departments are disregarded for internal management purposes.

The main function of a cost center is to track expenses. The manager of a cost center is only responsible for keeping costs in line with budget and does not bear any responsibility regarding revenue or investment decisions. Expense segmentation into cost centers allows for greater control and analysis of total costs. Accounting for resources at a finer level such as a cost center allows for more accurate budgets, forecasts, and calculations based on future changes.

Cost centers provide metrics more relevant to internal reporting. Internal management utilizes cost center data to improve operational efficiency and maximize profit. External users of financial statements, including regulators, taxation authorities, investors, and creditors, have little use for cost center data. Therefore, external financial statements are generally prepared with line items displayed as an aggregate of all cost centers. For this reason, cost center accounting falls under managerial accounting, as opposed to financial or tax accounting.

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Examples of Cost Centers

Cost centers include a company's accounting department, the information technology (IT) department, and maintenance staff. Manufacturing entities typically have a cost center for quality control. The customer service center of an entity only generates costs such as salaries and telephone expenses, and is therefore a cost center.

Cost centers do not need to be as large as departments. In fact, a department may have multiple cost centers within it. A cost center may be any defined group in which management finds benefit in segregating the cost of the group. For example, a cost center may include all expenses related to a specific quality improvement project, grant award, or job position. A downside to having this fine level of detail is the heavy requirements of information tracking that potentially outweigh the benefits of the knowledge obtained.

4.2.1 Configuration and implementation

For many types of businesses, over & above the net profit for a year, it is necessary to know the profit of each and every activity it is involved in. If we try to achieve this kind of information by defining a chart of accounts for this purpose, the chart of accounts would become very complex and lengthy. Also such kind of information may be confidential and we may not want to divulge such information to the tax authorities.

To achieve both, we can use the concept of cost centers.

To activate the cost center for a company, select Masters → Companies and double click on the required company. Click on “Other options” tab and check “Maintain Cost Centers “

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Edit Record - Company Master - ASCFA

Name * ARC Software Technologies Short Name * Arc Software Te Code * AST A/c Year * 0607 ID 27

Alias Name * ARC Software Technologies

Address Statutory Numbers Other Options

Maintain Inventories Contra A/c
 Contra A/c

Maintain Cost Centres Rounding Off A/c
 Round Off

Apportion Expenses to Purchase

Apportion Expenses to Sales

Enable Automatic TDS Mode

www Address Corporate

Save Cancel Exit

Developed by ARC Software Consultants Tel : 2510 5100 Fax: 2510 5252 Email info@arc-india.com 28/06/06

The maintenance of the cost center data is in parallel to your accounts data and for every entry that you add in your accounting system if that entry affects any income and expenditure account, you will have to apportion such entries to different cost center you have defined.

After enabling the cost center option you need to define the cost center groups and different cost centers within such groups.

Just like in the Accounts and Items Master you have hierarchical system whereby you can define multiple cost center groups and within each of these groups, multiple cost centers.

To explain the concept of cost centers we take an analogy of firm which has branches in all the states of the country and this firm would like to know branch wise profitability. In addition to this, these branches are divided into different regions.

Considering the above we will define the regions as cost center groups and the branches as cost centers.

To add a cost center group select Master → Cost Center and click “Add Cost Center Group” icon.

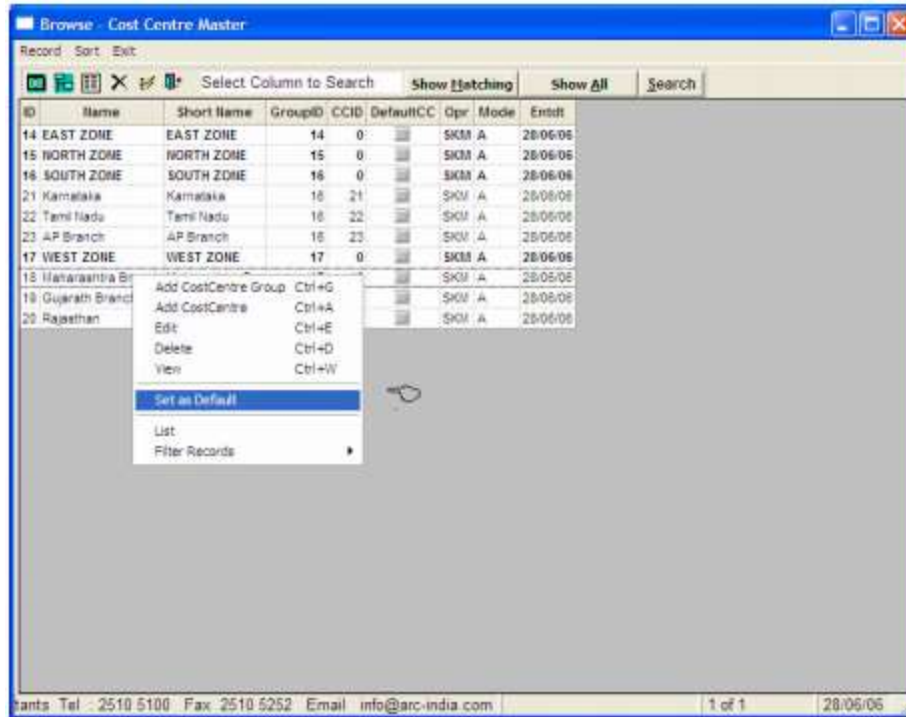
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Now under each of the zones, considering that there is one branch in each state, we will define each state as Cost Center. To achieve this click on “Add Cost Center” Icon.

This way you can define different states under each of the Zones that we have added earlier. Once this is done you can define one of the Cost Centers as default so that this Cost Center will be automatically selected while adding transactions.

To do this, right click on the Cost Center and select “Set as default”



Now you are ready to enter the transactions along with Cost Center details. There is no change in the way you enter normal transaction. Only on saving any transaction an additional window will pop up where in you will have to allocate all the amounts used For expenditure or income in that entry to one or more Cost Centers and then save the entry.

This is true for all the transactions except Stock Adjustment where in no accounts are effected.

1. If an entry you are making does not affect Income or Expenditure accounts then the Cost Center window will not open at all.
2. If the entry you are making effects multiple accounts, and if any of these accounts pertain to income or expenditure group then the Cost Center window will pop up and you will have to apportion such expenses to one or more Cost Centers.
3. The amount that you debit or credit to income or expenditure account in the main entry has to tally with the amount you apportion to different Cost Center in the Cost Center window.



4. It is always advisable to enable the Cost Center system for a company before you start adding transaction to ensure consistency of data between your accounting system and Cost Center system.
5. If for any reason you enable the Cost Center Option after having entered transactions, be sure that you modify all your earlier entries and allocate the income or expenditure to the proper Cost Centers.

Below we show an entry through bank where in two accounts are debited. First one is the professional charges account and the second one is an advance account.

On saving the above entry, the cost center window will open for you to allocate the professional charges amount of Rs 25,000/- to one or more cost centers as shown below.

Account	D/C	Amount	Cost Centre	Narration
Professional Charges	D	15,000.00	Maharashtra Branch	pd for June
Professional Charges	D	10,000.00	Gujarath Branch	pd for June

The advance account does not appear in the above window since it is not part of income or expenditure account. You can apportion the amount on one or more than one



cost centers. To insert blank rows for apportioning the amount to more than one cost center, you can press Ctrl+Shift+Number , where the number is the number of rows you require to insert.

A similar window will open up while saving Purchase, Sales and Journal Entries.

To generate Cost center report, click on Reports -> Other Reports -> Cost Centre report.

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Self-Check -4	Written Test
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Instruction 1:- choose the best answer. (2Pts)

1. -----is a department or function within an organization that does not directly add to profit but still costs the organization money to operate.(1Pts)
A) Center works B) Cost center C) Operational cost D) All
2. Cost centers do not need to be as large as departments.(1Pts)
A) True B) False

Instruction 2:- give short answer precisely.(3 Pts)

1. What is cost center?(3Pts)

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

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

Test II

1. _____

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Information Sheet 5	Supplying Information regarding remarks.
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5.1 Introduction

Information is the summarization of data. Technically, data are raw facts and figures that are processed into information, such as summaries and totals. But since information can also be the raw data for the next job or person, the two terms cannot be precisely defined, and both are used interchangeably. It may be helpful to view information the way it is structured and used, namely: data, text, spreadsheets, pictures, voice and video. Data are discretely defined fields. Text is a collection of words. Spreadsheets are data in matrix (row and column) form. Pictures are lists of vectors or frames of bits. Voice is a continuous stream of sound waves. Video is a sequence of image frames. See universal server.

5.2 PLANS AND SPECIFICATIONS

A key part of the process of designing and constructing weathertight homes is having a solid base of detailed plans, specifications and documents. They are a means of communicating between parties, and of ensuring that the appropriate designs, materials and construction techniques are used.

Plans and specifications are defined by the Building Act 2004. They include:

- the drawings, specification and other documents (see below) from which the building is to be constructed, altered, demolished or removed
- the proposed procedures for inspection during construction
- the definition of the intended building use
- Details of specified systems and procedures for their inspection and maintenance.

REQUIREMENTS FOR PLANS AND SPECIFICATIONS

A good set of documents:

- accurately represents the extent and content of the project by defining:
 - ✓ the scope of work to be done

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- ✓ the materials and products to be used by product name and manufacturer identification number or reference
- ✓ acceptable standards of workmanship
- ✓ levels of finish required by the client
- shows sufficient detail so that the main contractor or sub trades do not have to guess what is required is presented:
 - ✓ clearly and concisely
 - ✓ neatly and legibly
 - ✓ in a logical sequence
 - ✓ with consistency between drawings and specifications
 - ✓ with the drawings of different consultants coordinated to prevent conflicts, ambiguity or contradictions
 - ✓ with all dimensions shown and drawn to scale

5.2.1 COMMON OMISSIONS FROM PLANS AND SPECIFICATIONS

Some sets of drawings show the easy, straightforward aspects of construction (which both the designer and builder could reasonably be expected to know) and do not include the complicated or non-standard parts of the building. Where a particular construction detail is required, it must be shown in sufficient detail so that the builder (and, where subject to Building Code compliance, the BCA) can understand what is intended.

Areas where specification and drawing detail are sometimes lacking are:

- appropriate referencing of current standards, and Acceptable Solutions
- roof structure, and roof and deck falls with adequate drainage
- flashing details, particularly:
 - ✓ at the intersection and ends of flashings
 - ✓ miscellaneous penetrations in walls and roofs
- cladding junctions and movement control joints

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- window/door joinery installation including air seals and sill supports
- provision for service installation and replacement and access for maintenance
- trade literature specific to the materials and construction methods chosen
- Details that incorporate allowance for construction tolerances.

5.3 Material Safety Data Sheets

A material safety data sheet is a technical document which provides detailed and Comprehensive information on a controlled product related to:

- health effects of exposure to the product
- hazard evaluation related to the product's handling, storage or use
- measure to protect workers at risk of exposure
- Emergency procedures.

The data sheet may be written, printed or otherwise expressed, and must meet the Availability, design and content requirements of WHMIS legislation. The legislation provides for flexibility of design and wording but requires that a minimum number of categories of information be completed and that all hazardous ingredients meeting certain criteria be listed subject to exemptions granted under the Hazardous Materials Information Review Act.

5.3.1 The Purpose of the Data Sheet

The data sheet is the second element of the WHMIS information delivery system and is intended to supplement the alert information provided on labels. The third element of the system is the education of employees in hazard information on controlled products, including instruction in the content and significance of information on the MSDS.

Responsibilities Related to the MSDS

Suppliers

1. Develop or obtain a MSDS for each controlled product imported or sold for use in a workplace
2. Ensure the MSDS for the controlled product:
 - ✓ Discloses information that is current at the time of sale or importation of the product

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- ✓ Was prepared and dated not more than three years before the date of sale or importation
 - ✓ Is available in both official languages
3. Ensure the purchaser of the controlled product has a copy of the current MSDS at the time of or prior to the purchaser receiving the controlled product
 4. Make available any information that is considered confidential (trade secret) information and therefore exempt from disclosure to any physician or nurse who requests that information for the purpose of making a medical diagnosis or providing medical treatment.

Employer

1. Ensures that an up-to-date supplier MSDS is obtained from the supplier the first time a controlled product is received in the workplace
2. Evaluates the data sheet received to determine its date of production. The data sheet must be dated within 3 years of current date
3. Maintains up-to-date MSDSs:
 - ✓ As soon as practical but no later than 90 days after new hazard information becomes available to the employer
 - ✓ At least every three years
4. Ensures a copy of all data sheets which are required for the workplace are made readily available at the worksite to:
 - ✓ Workers who may be exposed to the controlled product
 - ✓ The occupational health committee (OHC)
5. Ensure that the employee who works with a controlled product or in proximity to a controlled product is instructed in:
 - ✓ The content required on the MSDS
 - ✓ The purpose and significance of information contained in it Instruction must ensure that employees know procedures for the safe use, storage, handling and disposal of controlled products including procedures in the event of an emergency involving a controlled product.

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6. Provide confidential (trade secret) information to a doctor or nurse who request this information for purposes of making a medical diagnosis or rendering medical treatment in an emergency.
7. The employer can produce data sheets in order to provide additional information or alter the format used as long as there is no less information provided than the original supplier MSDS contained.

Worker

Following training by the employer:

1. Follows the safe work or preventative measures as instructed by the employer
2. Knows where the sheets are located and how to find pertinent information on safe use and first aid measures

5.3.2 Material Safety Data Sheet Content

A supplier material safety data sheet must provide at least nine categories or sections of content and approximately sixty items of information distributed among those categories. An MSDS must be reviewed at least every three years. The categories must have the following similar headings:

I. Hazardous Ingredients

This section will include:

- The chemical names and concentrations concerning the hazardous ingredients
- The LD 50 and LC50 indicate the short term toxic potential
- CAS number which is useful in locating more information especially if the product is known by numerous names\

II. Preparation Information

This section includes:

- The name address and telephone number of who prepared the MSDS
- The date the MSDS was prepared
- If more than three years old, it must be updated

III. Product Information

This section:

- Identifies the product by the name on the supplier label

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- Provides the chemical name, family and formula (including molecular weight)
- Lists the product identifiers, manufacturer and supplier names, addresses and emergency telephone numbers

IV. Physical Data

This section includes information indicating how it looks and how it will behave when it is used, stored, spilled and how it will react with other products indicated through:

- The state it is in e.g. liquid
- The odor and appearance of the product
- The specific gravity, vapor density, evaporation rate, boiling point and the freezing point
- The vapor pressure, the higher the concentration the higher the possible air concentration
- The odor threshold, which is the lowest airborne concentration of a chemical that can be perceived by smell
- The pH reflecting the corrosive or irritant nature of the product

V. Fire and Explosion Hazard

This section describes:

- The temperature and conditions that can cause the chemical to catch fire or explode
- UEL (upper explosion limit) or UFL (upper flammable limit) will indicate the highest concentration of a substance in the air that will produce a fire or explosion when a source of ignition (heat, spark or flame) is present
- LEL (lower explosion limit) or LFL (lower flammable limit) will indicate the lowest concentration of a substance in the air that will produce a fire or explosion when a source or ignition is present
- From the LEL to the UEL, the mixture is explosive. Below the UEL the mixture is too lean to burn; above the LEL the mixture is too rich to burn. However, concentrations above the UEL are still very dangerous because if the

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concentration is lowered (by introducing fresh air), it will enter the explosive range

- Means of extinction including the type of fire extinguisher required
- Personal Protective Equipment required for fire fighting
- Some of the storage requirements however more of this information is found in the reactivity data section

VI. Reactivity Data:

This section describes:

- The chemical stability of the product and its reactions to light, heat, moisture, shock and incompatible materials
- Storage requirements based on the reactivity or instability of the product
- Incompatible products that must not be mixed or stored near each other
- The need for disposal before they become extremely reactive

VII. Toxicology Properties:

This section describes:

- The harmful effects of exposure
- How the product is likely to enter the body and what effects it has on the organs in the body
- The short-term (acute) and long-term (chronic) health effects from exposure to the product
- The exposure limits, which indicates the maximum concentration in air of a hazardous substance (gas, vapor, dust, mist, and fume) to which nearly all workers (without personal protective equipment) can be repeatedly exposed without adverse health effects. Exposure limits are expressed in three ways:
 - ✓ TWA (time weighted average) indicating the maximum average concentration to which workers can safely be exposed for a normal 8-hour workday or 48-hour workweek
 - ✓ STEL (short-term exposure limit) indicating the maximum concentration to which workers can safely be exposed for a period of

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up to 15 minutes. The STEL is higher than the TWA. It may not be sustained more than four times a day

- ✓ C (ceiling) describes the concentration that may not be safely exceeded at any time, even for an instant. The C is higher than the STEL

- If these limits are to be exceeded, the worker must use recommended personal protective equipment. Exposure limits are expressed as ppm for gases and vapors and as mg/m³ for dusts, fumes and mists
- Note these limits may be expressed as OEL, PEL and TLV
- Information used to assess the health problems of any employee who uses the chemical and determine if that worker's problems are related to the chemical

VIII. Preventative Measures:

This section provides:

- Instruction for the safe use, handling and storage of the product
- The personal protective equipment or safety devices required
- The steps for cleaning up spills
- Information on the waste disposal requirements

IX. First Aid Measures:

This section describes:

- Specific first aid measures related to acute effects of exposure to the product
- First aid steps in the correct sequence
- Information to assist in planning for emergencies

The MSDS may contain additional sections providing further information related to the specific product.

Location of the MSDSs

- Hard copy readily available
- Computer terminals
- Employees and others must know where the MSDS is and how to use them

MSDS revisions are required every 3 years or sooner if new product information is available.

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5.4 Trade Secret Exemptions

Information may be withheld to protect industries' right to protect confidential business information. This information is referred to as trade secrets.

The producer of the product can withhold:

- The name and concentration of any ingredient
- Name of relevant toxicological studies

Once a claim is filed to withhold information the product label must state:

- Date the exemption filed
- Claim registration number

The MSDS must state:

- That an exemption has been granted
- Date it is granted
- Registry number
- Product hazards

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Self-Check - 5	Written test
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Instruction 1:- choose the best answer.(3Pts)

1. Plans and specifications are defined by the Building Act 2004. They include:
(1Pts)
 - A) The drawings, specification and other documents (see below) from which the building is to be constructed, altered, demolished or removed
 - B) The proposed procedures for inspection during construction
 - C) The definition of the intended building use
 - D) All of the above

2. -----Is a technical document which provides detailed and Comprehensive information on a controlled product? (1Pts)
 - A) Common omissions
 - B) Logical sequence
 - C) Material safety data sheet
 - D) None of the above

3. One of the choices is not Material Safety Data Sheet Content (1Pts)
 - A) Hazardous Ingredients
 - B) Preparation Information
 - C) Date the exemption filed
 - D) Toxicology Properties

Instruction 2:- give short answer. (6 Pts)

1. What is information? (2Pts)
2. Write Requirements for plans and specifications.(2Pts)
3. Write the purpose of data sheet.(2Pts)

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Note: Satisfactory rating - 9 points

Unsatisfactory - below 9 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

Test II

1. _____

2. _____

3. _____

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Operation Sheet 1– prepares bill of material and take of sheet for Chinook Helicopter.

Objective of preparing bill of material and take of sheet for Model Chinook Helicopter.

1. Prepare detail bill of material
2. Prepare tools, equipment and machineries
3. Prepare basic flow chart format
4. Prepare take off sheet





LG #33

LO #2- Develop estimated product / project costs

Instruction sheet

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

- Selecting and applying labor rates and material costs.
- Determining and applying estimates of unit costs.
- Identifying and applying costs to the project of work.
- Applying overhead recovery and margins.
- Calculating complete estimate project costs.

This guide will also assist you to attain the learning outcome stated on the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Appropriate labor rates and material costs are selected and applied based on operational specifications
- Estimates of unit costs, as appropriate, are determined and applied based on company reference data
- Costs to the project of work cover, environmental protection agency requirements, seeking approvals, waste management fees and other statutory or additional costs are identified and applied due to requirements
- Overhead recovery and margins are applied according to company policy
- Completed estimated project costs for inclusion in tender or bill are calculated based on organizational computer supported cost calculation formats

Learning Instructions:

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1. Read the specific objectives of this Learning Guide.
2. Read all the information sheets in this learning guide.
3. Accomplish the self-check to make sure that you have understood all the theories behind all topics.
4. Do the LAP test to make sure you have acquired all the skill needed to do the task

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Information Sheet 1	Selecting and applying labor rates and material costs.
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1.1 Introduction

Material cost is the cost of materials used to manufacture a product or provide a service. Excluded from the material cost are all indirect materials, such as cleaning supplies used in the production process. Follow these steps to determine the amount of material cost to assign to a unit of production (such as a completed finished goods item):

1. Ascertain the standard quantity of the material used to manufacture one unit.
2. Add the standard amount of scrap associated with manufacturing one unit.
3. Determine the standard amount of scrap associated with setting up the production run, and apportion it to the individual unit.
4. If any scrap is then sold, apportion the revenue back to the individual unit.

For many materials, the cost of scrap and the revenue from the resale of scrap are so small that it is not worthwhile to apportion it to the material cost.

If the material cost has been established as a standard, then you can subsequently calculate the material yield variance to see if actual materials usage was as expected, or you can calculate the purchase price variance to see if the purchase price of the material was as expected. These variances are useful for investigating problems in the production and purchasing areas of a business.

1.2 Obtain and agree Labor unit cost projections

- Labor unit cost projections are obtained and agreed
- Direct Labor Price Standard

Direct labor price standard

- Is the rate per hour incurred for direct labor
- It is based on current wage rates adjusted for anticipated changes, such as cost of living adjustments
- Includes employer payroll taxes, and fringe(border) benefits

Direct Labor Efficiency Standard

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- Is the time required to make one unit of the product
- It is critical in labor-intensive companies
- Allowances should be made for rest periods, cleanup, machine setup, and machine downtime

Direct Labor

- The standard direct labor cost per unit is calculated as follows

Labor Cost = Total Material Cost X Markup value

1.2.1 Manufacturing Overhead Standard

- For manufacturing overhead, a standard predetermined overhead rate is used
- The predetermined rate is computed by dividing budgeted overhead costs by an expected standard activity level
- The standard manufacturing overhead rate per unit is the predetermined overhead rate times the standard activity level (for example, direct labor hours)

Standard Cost per Unit

- Sum of the standard costs for direct materials, direct labor, and manufacturing overhead

Labor Productivity

Importance of Productivity Increases

- Productivity increases are important because:
 - ✓ Productivity growth is the basic source of increases in real wages and living standards.
 - ✓ Productivity growth is an anti-inflationary force in that it offsets increases in nominal wages

Basic Cost Behavior Patterns

Understand the reasons for estimating fixed and variable costs

- By now you understand the importance of cost behavior. Cost behavior is the key distinction for decision making.
- Costs behave as either fixed or variable. Fixed costs are fixed in total; variable costs vary in total.

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- On a per-unit basis, fixed costs vary inversely with activity and variable costs stay the same. Cost behavior is critical for decision making.

Methods Used to Estimate Cost Behavior

- Three methods used to estimate costs are: engineering estimates, account analysis, and statistical methods.

1.2.2 Engineering Estimates

- Cost estimates are based on measuring and then pricing the work involved in a task.
- Identify the activities involved:
 - ✓ Labor
 - ✓ Rent
 - ✓ Insurance
- Estimate the time and cost for each activity.
- Engineering cost estimates are based on measuring and then pricing the work involved in a task. Managers first identify activities such as labor, rent, and insurance and then estimate the time and cost required for each activity.

1.3 Account Analysis

- Review each account comprising the total cost being analyzed.
- Identify each cost as either fixed or variable
- Estimating costs using account analysis involves a review of each account making up the total costs being analyzed. Then, each cost should be identified as either fixed or variable, depending on the relation between the cost and some activity.
- Fixed costs are those costs that are fixed in total regardless of the activity level and variable costs. Variable costs are those costs that vary in total as activity changes.
- Relevant range for a projection is usually between the upper and lower limits (bounds) of past activity levels for which data is available
- A statistical cost analysis analyzes costs within the relevant range using statistics. Do you remember how we defined relevant range?

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- A relevant range is the range of activity where a cost estimate is valid. The relevant range for cost estimation is usually between the upper and lower limits of past activity levels for which data is available.

Statistical Cost Estimation

Estimate costs using statistical analysis

- Analyze costs within a relevant range, which is the limit within which a cost estimate may be valid.
- Relevant range for a projection is usually between the upper and lower limits (bounds) of past activity levels for which data is available.

Obtain and analyze Logistic support contracts, supply agreements or equivalent

- Logistic support contracts, supply agreements or equivalent are obtained and analyzed

1.3.1 What is the Supply Chain Management (SCM?)

- The best companies around the world are discovering a powerful new source of competitive advantage. It's called supply-chain management and it encompasses all of those integrated activities that bring product to market and create satisfied customers.
- The Supply Chain Management Program integrates topics from
 - manufacturing operations,
 - purchasing,
 - transportation, and
 - Physical distribution into a unified program.
- Successful supply chain management, then, coordinates and integrates all of these activities into a seamless process. It embraces and links all of the partners in the chain. In addition to the departments within the organization, these partners include vendors, carriers, third party companies, and information systems providers.
- Within the organization, the supply chain refers to a wide range of functional areas.

These include

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- Supply Chain Management-related activities such as inbound and outbound transportation,
- warehousing, and
- Inventory control.
- Sourcing, procurement, and supply management fall under the supply-chain umbrella, too.
- Forecasting, production planning and scheduling, order processing, and customer service all are part of the process as well.
- Importantly, it also embodies the information systems so necessary to monitor all of these activities.
- Simply stated, "The supply chain encompasses all of those activities associated with moving goods from the raw-materials stage through to the end user."
- supply-chain management defines as follows:

"The delivery of enhanced customer and economic value through synchronized management of the flow of physical goods and associated information from sourcing to consumption."

1.3.2 What is the importance of Supply Chain Management?

- Clearly,

"Supply Chain Management has an important role to play in moving goods more quickly to their destination. "

- Seventy-five percent or more of respondents included the following activities as part of their company's Supply Chain Management department functions:
- Inventory management
- Transportation service procurement
- Materials handling
- Inbound transportation
- Transportation operations management
- Warehousing management
- Most difficult to bring under the umbrella of Supply Chain Management are:
- Third party invoice payment/audit

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- Sales forecasting
- Master production planning
- Objectives of Supply Chain Management
- The fundamental objective is to "add value".
- Supply Chain Management becomes a tool to help accomplish corporate strategic objectives:
 - reducing working capital,
 - taking assets off the balance sheet,
 - accelerating cash-to-cash cycles,
 - Increasing inventory turns, and so on.
- The seven principles Supply-Chain Principles
- Segment customers based on service needs.
- Customize the Supply Chain Management network.
- Listen to signals of market demand and plan accordingly
- Differentiate product closer to the customer
- Strategically manage the sources of supply
- Develop a supply-chain-wide technology strategy.
- Adopt channel-spanning performance measures
- Five areas in which supply chain management can have a direct effect on corporate value. They include
 - Profitable growth
 - Working-capital reductions
 - Fixed-capital efficiency
 - Global tax minimization
 - Cost minimization

1.4 Understanding Warehouse Costs and Risks

- Both buyer and seller were accustomed to a transactional pricing and costing system that combined a monthly price per unit for storage with the costs of materials handling and administrative services

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- Warehousing is nothing more than the management of space and time.
- The space management portion, storage, has a cost per month, because there is a monthly cost for warehouse space.
- The time management component includes labor involved in handling materials as they move in and out of the warehouse.
- If you are buying or selling warehouse services, or simply providing warehousing services for your own organization, the models that are presented in this article will enable you to isolate and analyze the costs of warehousing.
- All companies with warehouses incur the same elements of cost, but they compile them differently. The goal of this article is to convey a costing system that can be used to compare costs of one warehouse with another or one company to others.
- Some warehousing costs tend to be ignored or misallocated, because the analyst does not recognize where they belong.
- In any costing system, allocation of overhead costs is a matter of judgment, and no specific formula will be correct for every user.
- The cost models shown here have been designed to ensure that no item is overlooked. We assume that each user will customize the models, and make individual judgments regarding allocation of administrative costs.

1.5 Four Categories of Warehouse Costs

- Handling
 - Storage
 - Operations administration
 - General administrative expenses
1. Handling. All expenses associated with moving product in or out of the warehouse should be included in the handling cost center.
- ✓ The largest component is the labor used to handle the product that moves through the distribution center.

It includes

- ✓ Receiving,

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- ✓ put-away,
- ✓ order selection, and
- ✓ Loading.

It also may include labor to

- ✓ Re-warehouse,
- ✓ repackage, or
- ✓ Refurbish (restore) damaged product.

Handling also includes all costs associated with the equipment used to handle product in the warehouse, such as

- ✓ The depreciation of equipment cost, and
- ✓ The cost of fuel, or electricity to power the equipment.

Other handling expenses are the detention of truck or rail cars, operating supplies, and trash disposal. In effect, handling includes all those costs that are associated with “goods in motion.”

2. Storage. Storage expenses are costs associated with “goods at rest.”

- ✓ These costs would be incurred whether or not any product ever moved.
- ✓ Because storage expenses are related to

The cost of occupying a facility, and these costs are normally accumulated each month; Storage is expressed as a monthly cost.

- ✓ If an entire building is dedicated to an operation, storage expenses are the total occupancy cost for that facility.

3. Operations administration. These expenses are incurred to support the operation of the distribution center.

Closing the facility would eliminate these costs. Included are

- ✓ Costs for line supervision,
- ✓ clerical effort,
- ✓ information technology,
- ✓ supplies,
- ✓ insurance, and
- ✓ Taxes.

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4. General administrative expenses. Expenses not incurred for a specific distribution center are included in this category.

- ✓ General management,
- ✓ non-operating staff, and
- ✓ General office expenses are examples.

Allocation of such expenses to each warehouse is a judgment call.

1.6 The Risk Factor

- Cost per unit is escalated when a distribution center is not fully utilized. Fixed costs always will be influenced by the rate of utilization.
- Variable costs, such as
- Labor, never are quite as flexible as they seem.
- Management may be reluctant (unwilling) to eliminate experienced workers, particularly when they will be needed for a coming busy season.
- The same is true for forklift trucks and other materials handling equipment. Therefore, the primary risk in controlling costs is the rate of utilization
- Errors represent another unknown risk. People make mistakes, which may result in product damage and errors, or shipping errors.
- Just as the insurance underwriter factors in the risk of loss, the warehouse operator must make a realistic estimate of risk costs.
- Risk may be expressed as a percentage of total warehousing costs.
- It should be based on past experience. Methods to reduce risk should be explored.
- The simplest way to calculate the risk factor is to include it in the size of the markup.
- Many time and material agreements have a low percentage of profit, but the unit pricing agreement must factor in a higher profit percentage that reflects the substantial risk of changing volume.

Developing a Handling Price

- A building block approach, using the categories of warehousing costs included in this article, can be used to develop an hourly selling price.

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- First, all of the costs listed in section I, Handling, are totaled.
- Next, a portion of the costs
- in section III, Operating Administrative Expense, and
- In section IV, General Administrative Expense are added to direct handling expense, in order to develop a burdened handling expense.
- An additional percentage of profit is added to develop a handling sales price. This figure is divided by the hours billed, to convert the figures into a handling fee per man-hour.
- While you may not invoice your customers by the hour, the hourly fees can be used to check the validity of current pricing.

Convert Information to usable form and stored ready for retrieval and application

Information is converted to usable form and stored ready for retrieval and application

Documentation developing good user documentation is an important part of the implementation process. An example of documentation is a manual of operating procedures and sample data input and output. Documentation is extremely important when solving problems or making changes, especially if the people who developed the system are no longer with the firm.

1.7 Identify and calculate labor cost

Identify and estimate the types and numbers of appropriate personnel and the time required

- Bill of materials: A list of the materials or parts needed to make a product
- Part print analysis: Examining the working drawings to find the most efficient and effective way of producing the part
- Process chart: A chart detailing the manufacturing sequence
- The types and numbers of appropriate personnel are identified and the time required is estimated.
- A bill of materials is a list of the materials or parts needed to make one product
- Quantity
- Order of operations

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- Working drawings provide specific features and dimensions. They are used to create a part print analysis that includes the finished shape and size of the part, the materials needed and the tolerances
- The National Estimating Society has defined Cost Estimating¹ as:
- The art of approximating the probable cost of something based on information available at the time.

Cost estimating cannot:

Be applied with cookbook (Book that give instruction) precision, but must be tailored to a particular system,

- Substitute for sound judgment, management, or control,
- Produce results that are better than input data, or
- Make the final decisions.

Despite these limitations, cost estimating is a powerful tool because it:

- Leads to a better understanding of the problem,
- Improves management insight into resource allocation problems, and
- Provides an objective baseline to measure progress.

The reliability of cost estimates varies over time.

- The closer you get to the actual completion of a project, the estimate becomes more accurate.

Four types of cost estimates represent various levels of reliability.

- Conceptual Estimate: Rough order of magnitude or back of the envelope.

Often inaccurate because there are too many unknowns.

- Preliminary Estimate: Used to develop initial budget, more precise.
- Detailed Estimate: Serves as a basis for daily project control.
- Definitive Estimate: Accuracy should be within 10% of final cost.

Important to repeat estimating process (i.e., re-estimate) on a regular basis as more information becomes available

- This will keep estimate current as well as increase the accuracy

All cost estimates are constructed by the following tasks:

- Identifying the purpose and scope of the new system.

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- Choosing an estimate type.

Conceptual, preliminary, detailed, or definitive type estimate

- Identifying system performance and/or technical goals.
- Laying out a program schedule.
- Selecting a cost element structure (CES).
- Collecting, evaluating, and verifying data.
- Choosing, applying, cross-checking estimating methods to develop the cost estimate.
- Performing risk and sensitivity analysis
- Time-phasing the cost estimate by fiscal year for cash flow purposes.
- Providing full documentation.

Life Cycle Costs

Most cost estimates in the federal government represent total Life Cycle Costs (LCC).

- LCC estimates include all costs to develop, produce, operate, support, and dispose of a new system.
- Important to look beyond the immediate cost of developing and producing a system and consider all costs of a system's life cycle.

What may appear to be an expensive alternative among competing systems may be the least expensive to operate and support

Life Cycle Cost Estimates can be used to:

- Compare various alternatives before committing funds to a project,
- Support "Estimate-to-Budget" transition after time-phasing to account for when funds will be spent.

A LCC estimate is summarized using a detailed cost element structure (CES) that

- Identifies the activities required to complete project development and the effort, loading, and duration of each task,
- Provides a framework against which the cost estimate is organized.
- Enhances cost data collection and estimate reporting.
- Facilitates comparing estimates when a standard CES is used.

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1.7.1 Cost Element Structure (CES)

A CES provides a standard vocabulary for the identification and classification of cost elements to be used in cost estimating.

- Helps to identify costs that may be initially overlooked.
- Should be tailored for each project.

The CES should be reviewed to ensure that there is no 'double counting' of costs that could be allocated to more than one element.

- For example, logistics support costs could be included in the investment or operations and support phase.

The CES is hierarchical in nature to accommodate early development (when relatively little data is available) through deployment, when more detailed data is available.

Data Collection Data Required

- All CES elements will need data to support the estimate
- Historical cost and non-cost data need to be collected to support various estimating techniques
- Technical non-cost data describes the physical, performance, and engineering characteristics of a system
- Important to pick data that is a predictor of future cost

Important to have technical and schedule data because they act as cost drivers

Identify both direct and indirect costs

- Direct costs are called "touch labor" and include direct manufacturing, engineering, quality assurance, material, etc. costs which have a direct bearing on the production of a good.

Also included are direct non-wage costs such as training, supplies, and travel.

- Indirect costs are considered "overhead" and include such things as general & administrative support, rent, utilities, insurance, network charges, and fringe benefits. These expenses are typically charged to a company as a whole.

Example: sick/annual leave, retirement pay, health insurance, etc.

Some direct costs may be burdened with indirect costs and some may not

- Need to know to avoid double-counting or, worse yet, underestimating

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- Important to ask when collecting data whether costs are burdened with indirect costs

Data can be collected in a variety of ways

- Contractor site visits
- Data requests for all relevant CES elements
- Documented cost estimates, if available for earlier versions of the current system

Can save valuable research time for statistical analysis

- Published cost studies

Data collection is a critical and time consuming step in the cost estimating process!

Typical data sources

Two types of data sources:

- Primary & Secondary

Primary data is found at the original source (e.g., contractor reports, actual program data, etc.)

Preferred source of data

- Secondary data is derived from primary data of another similar system such as documented cost estimates, cost studies/research, proposal data, etc.
- Second choice to primary data due to data gaps
- May be best alternative when time constraints or data availability limit primary data collection

1.8 Data Analysis

1.8.1 Data Validity/Integrity

Important to ensure that the cost data collected is applicable to the estimate.

- Identifying limitations in the historical data is imperative for capturing uncertainty
- When using historical cost data for a similar system, appropriate adjustments need to be made to account for differences in the new system being estimated.
- Data may need to be “mapped” from the contractor’s accounting system to the Cost Element Structure (CES)
- Proposal data should be validated to ensure that contractor motivations to “buy-in” or low-bid their estimates are not occurring.

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- Compare previous contractor proposal bids and actual costs for similar programs.
- Look for trends in underbidding.
- Participate in a fact-finding trip to discuss contractor proposal estimates and gather supporting data/evidence.

1.8.2 Normalization

Involves making adjustments to the data so that it can account for differences in

- Inflation rates,
- Direct/indirect costs,
- Recurring and non-recurring costs,
- Production rate changes or breaks in production,
- Anomalies such as strikes, major test failures, or natural disasters causing data to fluctuate, and
- Learning curve (cost improvement) effects due to efficiencies gained from continually repeating a process

Analysis of the data may indicate the need for more suitable data to add credibility to the estimate. Accounting for Economic Changes (e.g., inflation)

- Lack of cost data uniformity due to upward movement in prices and services over time.
- Index numbers are used to deflate or inflate prices to facilitate comparison analysis.

Wrong to compare costs

- Cost estimators use inflation indices to convert costs to a constant year dollar basis to eliminate distortion that would otherwise be caused by price-level changes.
- Constant dollar estimates represent the cost of the resources required to meet each year's workload using resource prices from one reference year
- Constant dollars reflect the reference year prices for all time periods allowing analysts to determine the true cost of changes for an item

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Cost Estimating Methodologies

Once data has been collected and normalized to constant dollars, there are five methodologies available for estimating costs:

- Expert Opinion,
- Analogy,
- Parametric,
- Engineering, and
- Actual

Expert Opinion

Useful in assessing differences between past projects and new ones for which no historical precedent exists.

Expert Opinion - Steps

- Gather a group of experts together,
- Describe overall program in enough detail so experts can provide an estimate,
- Each member of the expert group then does an independent of the resources needed,
- Estimates are gathered anonymously (secretly) and compared,
- If there exists significant divergence (deviation) among the estimates, the estimates will be returned to the expert group,
- The expert group then discusses the estimates and the divergence and works to resolve differences, and
- The expert group once again submits an anonymous, independent estimate which continues until a stable estimate results.

Analogy

Estimates costs by comparing proposed programs with similar, previously completed programs for which historical data is available.

- Actual costs of similar existing system are adjusted for complexity, technical, or physical differences to derive new cost estimates
- Analogies are used early in a program cycle when there is insufficient actual cost data to use as a detailed approach

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Compares similarities and differences

- Focus is on main cost drivers.

Analogy - Steps

- Determine estimate needs/ground rules,
- Define new system,
- Breakout new system into subcomponents for analogy estimating,
- Assess data availability of historical similar systems,
- Collect historical system component technical and cost data,
- Process/normalize data into constant year dollars (e.g. Current exchange)

Develop factors based on prior system,

- Example: Program Management is 10% of total development cost

Develop new system component costs.

- Obtain complexity (and other translation) factors
- Apply factors to historical costs to obtain new system costs

Parametric

- Utilizes statistical techniques called Cost Estimating Relationships (CER).
- Relates a dependent variable (cost) to one or more independent variables
- Based on specific factors that have a high correlation to total cost
- Square feet for office floor space,
- Number of floors in a high rise building for cabling estimates,
- Database size, etc.
- Can be used prior to development.
- Typically employed at a higher CES level as details are not known.
- Most cases will require in-house development of CER.

Parametric CERs - Steps

Define the dependent variable (e.g., cost dollars, hours, etc.) and what the CER will estimate, select independent variables to be tested for developing estimates of the dependent variable,

- Variables should be quantitatively measurable and available

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- If there is a choice between developing a CER based on performance or physical characteristics, performance characteristics are generally the better choice because they are known early on

Collect data concerning the relationship between the dependent and independent variables,

- Most difficult and time consuming step, but essential that all data is checked to ensure that all observations are relevant, comparable, and free of unusual costs

Explore the relationship between the dependent and independent variables,

- Use statistical analysis to judge strength of relationship and validity of equation

Select the relationship that best predicts the dependent variable, and

- A high correlation often indicates that the independent variable will be a good predictive tool

Document your findings.

Identify independent variables tested, data gathered along with sources, time period (normalization for inflation effects), and any adjustments made to the data

Engineering

Also referred to as bottoms up or detailed method.

- Underlying assumption is that future costs for a system can be predicted with a great deal of accuracy from historical costs of that system.
- Involves examining separate work segments in detail and then synthesizing these detailed estimates along with any integration costs into a total program estimate.
- Estimate is built up from the lowest level of system costs.
- Uses detailed cost element structure (CES).
- Must include all components and functions.
- Can be used during development and production.

Engineering Steps

- Understand program requirements,
- Prepare program baseline definition,
- Define ground rules and assumptions,

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- Develop detailed cost element structure,
- Develop functional estimates, and
- Use other program history
- Compile estimate data
- Develop rates and factors
- Incorporate supplier/subcontractor prices
- Include integration costs to “glue” the separate components into an integrated system (may need to use a CER for this estimate)

Summarize estimate.

Actual

- Bases future costs on recent historical costs of same system.
- Used later in development or production.
- Preferred method.
- Costs are calibrated to actual development or production productivity for your organization

Fundamental estimation questions

- How much effort is required to complete an activity?
- How much calendar time is needed to complete an activity?
- What is the total cost of an activity?
- Project estimation and scheduling are interleave management activities.

Applying contingency to estimates

- Apply an increase to the estimate as a contingency in line with the uncertainty, risk and the length of time to execution. Apply the contingency as a percentage of the estimate, 10% is often used as an average.

Calculate the labor hours for non-contract elements of work.

The labor cost will vary depending on job location, availability of skilled labor, contract wage regulations, union or open shop labor requirements, general market conditions, and so on.

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Estimate Time requirements for work activities and other lead times

- A process chart (flow chart) organizes the processes for each part of a product into a logical sequence production.

Activities to obtain good time estimates

- Identify the work that needs to be done

Work breakdown structure (WBS)

- Identify the dependency between work units

Dependency Graph

- Estimate the duration of the work to be done Schedule

Calculate the costs or rates for required work

The costs or rates for required work must be calculated.

Types of estimates

- Different types of estimates reflect the range of accuracy expected from the estimate.

Three types of project estimates are:

- Order of magnitude: obtained in the initiation phase of a project for the whole project with a range of –25 to +75%.
- Budget estimate: an estimate derived during the planning phase for the whole project with a range of –10% to +25%
- Definitive estimate: an estimate derived at the start of each project stage for that stage with a range of –5% to +10%

On the other hand Types of Cost Estimating

- Rough Estimates -30% to +60%
- Semi-detailed Estimates -15% to +20%
- Detailed Estimates -3% to +5%

Estimating methods

Three commonly used methods of estimating are:

1. Top down estimating
2. Bottom up estimating
3. Parametric (factor) estimating

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Top-down method

The top-down method is also known as the analogous method.

It is used to determine order of magnitude estimates in the initiation phase of the project.

The method uses the actual durations, effort or costs from previous projects as a basis for estimating the effort or costs for the current project.

1. Identify a previous project or section of a previous project that is similar to the current project.
2. Assess the extent to which the current project is similar to the previous project – the comparison factor (e.g 1.5 if the current project is estimated to be 50% larger).
3. Compute the estimate for the current project based on the actual durations, effort or costs from the previous project and the comparison factor.

Bottom-up method

- The bottom-up method is considered to be the most accurate method for generating project estimates.
- It is used to determine budget or definitive estimates during the planning phase and at the start of each project stage.
- The method uses the Work Breakdown Structure (WBS) developed during the planning stage of the project. Estimates are created for all tasks at the lowest level of the WBS and then these are accumulated to determine the estimates for the whole project.
- The consensus technique* is usually used to obtain task estimates for the low level tasks on the WBS, because as well as producing reliable estimates it also builds active involvement, cooperation and commitment. Experts with the skills required to perform the work should be included in the estimating process.
- One disadvantage of the bottom-up method is that it is much more time-consuming than other methods.

Parametric method

- The parametric method is also known as the object based method.

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- It is used to obtain definitive estimates and to confirm bottom up estimates where possible.

A simple concept is used, namely:

- If the amount of effort needed to carry out a particular activity for a particular object is known, and the number of objects is known, the effort required to perform the activity for all the objects can be determined.
- The amount of effort for the single activity can be determined either from a standard, which has been established from previous experience, or by executing a sample activity if no standard exists.

Steps in deriving the estimate:

1. Identify an item to be estimated.
2. Estimate the number of items.
3. Estimate the effort per item.
4. Multiply effort per item by number of items to determine the total effort.
 - For example, if the assembly of one library shelving stack takes an hour and a half and there are 40 stacks to assemble then the total effort is 60 hours.

Estimating techniques

Three commonly used techniques for obtaining estimates are:

1. Weighted average estimating
2. Consensus estimating
3. Phase ratios

Weighted average estimates

- Weighted average estimating is also known as sensitivity analysis estimating.
- With this technique three estimates are obtained for each item rather than one. This provides a more accurate estimate than when only one estimate value is provided.
- The three estimates are known as the best case (O = Optimistic), worst case (P = pessimistic) and most likely (M = Median).

These are then used in the following formula to determine the estimated effort:

Consensus (agreement) estimating

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Steps in conducting a consensus estimating session:

- A briefing is provided to the estimating team on the project.
- Each person is provided with a list of work components to estimate.
- Each person independently estimates O, M and P for each work component.
- The estimates are written up on the whiteboard.
- Each person discusses the basis and assumptions for their estimates.
- A revised set of estimates is produced.
- Averages for the O, M and P values are calculated.
- These averages are then used in the weighted averages formula to calculate the estimated effort.

Phase ratios

- Project phase ratios provide a means of generating a top-down order of magnitude duration estimate for a project, or they can be used as a sense check of bottom-up duration estimates of the time allocated to each project phase.
- Phase ratio estimating uses an estimate for one phase of a project to derive the likely size of the other phases, and hence an overall estimate for the project.
- For example, if analysis takes 5 weeks, and this represents 10% of the project, then the project is likely to take 50 weeks.
- The concept behind this method is that similar types of projects would normally spend the same percentage of time in each phase.
- Phase ratios are not accurate enough to be used as a budget or definitive estimates.

Phase ratio percentages

The phase ratio technique is based on studies that average the proportion of time that a large sample of projects has spent on standard project phases. An initial set of project phase ratios is provided below.

These should be refined based on results from completed projects.

Initiation	5%
Planning	20%
Analysis	10%

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Design	10%
Construction	20%
Testing	20%
Implementation	10%
Closure	5%

1.9 Identify and establish physical resource requirements

1.9.1 Identify Physical resource requirements.

- Lists of materials are produced and quantities calculated.
- Quantities against project or standard contracts are established.
- Supplier prices for materials and consumables are obtained.
- Plant or equipment requirements are identified and costed.

Establish Quantity against project or standard contracts

- Quantities of labor against project or standard contracts should be established accordingly to calculate project cost.

Obtain Supplier prices for consumables materials

Supplier prices for consumables materials must be obtained in order to perform the estimation of the project.

Identify and cost Plant or equipment requirements.

- 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.

Defining the Scope of Services

- Before preparing an estimate or calling for an estimate to be prepared, it is critical to set expectations for the estimate.
- Equally important is ensuring that everyone involved in preparing and analyzing the estimate has agreed to the decisions made.

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- Certain steps are recommended to define detailed cost estimating services for a project:

Define the scope of the estimate, identifying both inclusions and exclusions. Items to be excluded from an estimate are important. If not specifically excluded, all items included in the contract documents will be part of the estimate. Define the basis to be used for pricing, including a clear definition of what is included in unit pricing.

- For example, should prices quoted in the body of the estimate represent costs to the general contractor or costs to the installing contractor, or are they the raw costs of the installing contractor? In each case, the cost will be substantially different and subject to a series of different markups.
- There are no standard guidelines for deciding what costs to apply to unit pricing, so consistency is vital. For example, it is important to associate markups of a particular item of work with that item everywhere it is mentioned.

Establish the procurement and construction schedule for preparing the estimate.

Include the expected construction start time, any planned phasing of construction, the expected construction completion date, the anticipated commissioning process, and the actual move-in schedule.

1.9.2 Establish a schedule for preparing and reviewing the estimate.

First, all parties need to agree when documents will be provided and when estimates must be completed. Scheduling submittal of the estimate and the final documents for the same time can cause problems. Either the documents must be completed in advance or the estimate will have to be based on incomplete plans. Overlapping the estimating process with a quality review of the documents can be a reasonable alternative.

Choose a format for the estimate (see sidebar).

It is difficult and time-consuming to reformat and reprice estimates as an afterthought. Specify the level of detail, amount of description required of work items, and pricing philosophy. If standardized databases are to be used, define procedures acceptable for overriding such pricing.

Develop estimated product/project costs

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Select and apply appropriate labor rates and material costs

- Level of labor specialization can:
- Reduce the employee's scope of expertise (higher levels of specialization)
- Increase the employee's scope of expertise (lower levels of specialization)
- Work satisfaction helps define level of specialization
- Specialization can result in employee boredom

Specialization: Management's View

Specialization: Employee's View

Advantages:

- Minimal credentials required
- Minimal responsibilities
- Minimal mental effort needed
- Reasonable wages

Disadvantages:

- Boredom (dullness)
- Little growth opportunity
- Little control over work
- Little room for initiative
- Little intrinsic satisfaction

Eliminating Employee Boredom

- Job enlargement
- Horizontal expansion of the job through increasing the scope of the work assigned.
- Job enrichment
- Vertical expansion of the job through increased worker responsibility
- Adding work planning or inspection to a routine assembly task
- Job rotation
- Shifting of cross trained workers to other tasks
- Broadens understanding and can reduce fatigue

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Identify and apply Costs to the project of work cover

Costs to the project of work cover, environmental protection agency requirements, seeking approvals, waste management fees and other statutory or additional costs are identified and applied.

Calculate complete estimated project costs for inclusion in a tender or bill

Completed estimated project costs for inclusion in a tender or bill must be calculated.

Verify cost estimate

Source Actual cost information from a completed tender/cost estimate product/project.

- Actual cost information is sourced from a completed tender/cost estimate product/project.

Compare Actual costs with estimated cost to identify deviations

- Actual costs must be compared with estimated cost to identify deviations.

Explain Deviations according to established organizational framework, procedures and routines.

Summary table

Obtain Assistance/approval from management.

Assistance/approval from management is obtained.

The Estimate Report

- Regardless of how an estimate is prepared, it should be presented in a clear, concise manner. The following elements are typically included in an estimate report:

1. Project title, location, list of individuals who worked on the estimate, and the date
2. Written overview of findings
3. Summary chart of estimate findings, preferably on one sheet of paper, with appropriate backup material appended or referenced
4. List of any estimate values or quotes provided by others and included in the estimate
5. Reconciliation of estimate to budget and/or previous estimates, with identification of variances and explanations for same
6. Recommendations for corrective actions if costs vary from budget
7. Method used to prepare the estimate

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8. Documents on which the estimate is based
9. Assumed schedule (bid date, construction start, completion)
10. Type of contract and procurement method assumed
11. Outline of items included and specific lists of items excluded from estimate
12. Time basis of currency included in estimate and basis of escalation included
13. Design and construction contingencies included
14. Market conditions at the time of the estimate and projected to the bid date
15. Outline specifications, performance, and quality levels assumed in estimate
16. A list of alternatives examined
17. General comments on any special conditions that might affect future prices

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Self-Check -1	Written Test
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Instruction 1:- Choose the best answer. (5Pts)

1. -----is the cost of materials used to manufacture a product or provide a service.(1Pts)
 - A) Production cost
 - B) Manufacturing cost
 - C) Material cost
 - D) None of the above

2. On Manufacturing Overhead Standard(1Pts)
 - A) For manufacturing overhead, a standard predetermined overhead rate is NOT used
 - B) The predetermined rate is computed by dividing budgeted overhead costs by an expected standard activity level
 - C) The standard manufacturing overhead rate per unit is the predetermined overhead rate times the Material cost.
 - D) All of the above

3. -----within a relevant range, which is the limit within which a cost estimate may be valid.(1Pts)
 - A) Analyze costs
 - B) Manufacturing cost
 - C) Machine depreciation cost
 - D) Material cost

4. The best companies around the world are discovering a powerful new source of competitive advantage. It's called-----.(1Pts)
 - A) Supply chain management
 - B) Logistic support contracts
 - C) Statistical Cost Estimation
 - D) Account Analysis

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5. -----are those costs that are fixed in total regardless of the activity level and variable costs.(1Pts)

- A) Fixed cost
- B) Estimating cost
- C) Statically cost
- D) None of the above

Instruction 2:- give short answer. (8Pts)

1. Describe about Direct labor price standard.(2Pts)
2. Three methods used to estimate costs are(2Pts)
3. Write about risk factor. (2Pts)
4. Three commonly used methods of estimating are(2Pts)

Note: Satisfactory rating - 13 points Unsatisfactory - below 13 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

- 1.____
- 2.____
- 3.____
- 4.____
- 5.____

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Test II

1. _____

2. _____

3. _____

4. _____



Information Sheet 2	Applying overhead recovery and margins.
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2.1 Introduction

The Overhead Recovery tab of your budget will provide you with three options for overhead recovery. Overhead recovery will ensure that you are recovering all costs for running your business within the jobs you bid. On the Overhead Recovery tab, you will select the recovery method for your budget. Please note that this can be over-ridden within an estimate if required.

2.2 Multiple Overhead Recoveries

Multiple Overhead Recovery will apply a markup to each of your COGS (Labor, Equipment, Material and Subs). You will be able to adjust your Equipment Markup, Material Markup or Subs Markup. Your Labor Markup will be calculated for you based on the numbers you add to the other three fields. The highest markup percentage should be allocated to Labor, as this is the hardest element to manage within a company. These are all indirect costs of running a business, and your selling prices must be enough to recoup these expenses and make a profit.

2.2.1 What Are Indirect Overhead Costs?

Indirect overhead costs are those expenses that cannot be allocated directly to the cost of manufacturing a product or providing a service. They do not vary directly with production volume. A business can have two types of indirect overhead: manufacturing and fixed/admin overhead.

Examples of items that make up fixed and administrative overhead are:

- Office rent
- Utilities
- Administrative salaries
- Insurance
- Legal and accounting fees
- Advertising costs
- Licenses and permits

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Indirect manufacturing overhead expenses are such items as:

- Quality control wages of personnel
- Materials handling, such as forklift operators
- Equipment maintenance and cleaning
- Factory clerical staff
- Rent and depreciation of production building and equipment
- General factory supplies
- Factory supervisors

What Are the Overhead Recovery Methods?

The structure of the manufacturing process determines the method used to allocate indirect costs. The most common allocation methods are the number of direct labor hours and the number of machine hours used to produce a product.

A process that uses mostly labor to make a product will use labor hours to allocate overhead costs. On the other hand, it makes more sense to use machine hours as the allocation basis for a process that is highly automated.

2.2.2 How Do You Calculate the Overhead Recovery Rate?

Let's take the example of the Hasty Hare Corporation, a manufacturer of sneakers for rabbits, and calculate its overhead burden rate. The process of making sneakers is highly automated, so Hasty Hare's accountants use machine hours to determine the overhead burden rate.

We have the following figures for costs and production of the company's best-selling sneaker, Blazing Feet:

- Direct labor costs - \$28/pair
- Direct materials costs - \$47/pair
- Machine-hours available/year - 15,000 hours
- Machine-hours required for Blazing Feet - 1/2 hour
- Indirect manufacturing overhead - \$115,000
- Fixed and administrative overhead - \$425,000
- Target profit margin - 15 percent

To find the overhead burden rate:

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$(\text{Indirect manufacturing overhead} + \text{fixed overhead})/\text{machine-hours} = (\$115,000 + \$425,000)/15,000 \text{ hours} = \$36/\text{machine-hour}$

Since it takes one-half hour of machine time to make a pair of Blazing Feet, the overhead burden rate is \$18 per pair ($1/2 \times \36).

What Is the Final Selling Price?

The purpose of calculating the overhead burden rate is to make sure the selling price recovers all costs and leaves a reasonable profit. Let's calculate the selling price for Blazing Feet.

Total cost of production = direct labor + materials + overhead burden

Total cost of production = \$28 + \$47 + \$18 = \$93/pair

Since Hasty Hare wants to make a 15% profit margin, the final selling price is:

Final selling price = $\$93/(1 - 0.15) = \$93/0.85 = \$110/\text{pair}$

To verify: Selling price less product costs = profit

$\$110 - \$93 = \$17$

Profit margin = $\$17/\$110 = 15\%$

How to Fine-Tune the Overhead Recovery Rate

The allocation of overhead burden rates is intended to assess more accurately the profitability of a product. In some cases, a combination of allocation methods may be required rather than an overall approach for all indirect costs, such as using machine hours in the example of Hasty Hare.

For example, it could make more sense to allocate employee benefits costs on the basis of a labor recovery rate calculation and spread maintenance costs on the basis of machine hours.

Whichever cost recovery strategies you choose, the object is to account for your total operating costs across all of the products and services that the company sells.

2.2.3 Calculate Fixed Manufacturing Overhead

An important metric for any small business owner whose company manufactures products is the unit cost of production. Unfortunately, this figure can sometimes be elusive to calculate and the costs not so clear. The most obvious production costs and the easiest to identify are the direct materials and labor hours used to make the product.

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But, other expenses are necessary to the manufacturing process: the non-direct fixed overhead costs.

2.2.4 What Is Fixed Manufacturing Overhead?

Every business has two types of costs: fixed and variable. In a manufacturing business, the variable costs are the labor man-hours and materials used directly to make and assemble the products. When someone mentions the fixed overhead of a business, they usually are referring to fixed expenses that are not directly related to a manufacturing process. Examples of these kinds of costs are office rent, administrative salaries, accounting fees, insurance, licenses and permits, etc. However, a manufacturing business also has fixed expenses that support the production process.

Several of these types of fixed costs are as follows:

- Rent for manufacturing facilities.
- Factory office rent and supplies.
- Factory administrative office salaries.
- Depreciation of production equipment.
- Salaries paid to non-hourly employees such as production floor supervisors.
- Materials management staff compensation.
- Quality assurance staff salaries.
- Insurance and property taxes on plant equipment, inventory and facilities.
- Machine supplies.
- Repairs and maintenance.
- Sanitation personnel.

2.2.5 How to Apply Manufacturing Overhead

Accountants use two methods to keep track of manufacturing overhead: absorption costing and variable costing. Under absorption costing, product costs include direct labor, direct materials and fixed manufacturing overhead expenses. With the variable costing method, direct labor and materials costs are listed separately from fixed manufacturing overhead expenses. To simplify this, let's use an example of the Flying Pigs Corporation, which makes roller skates for the swine market.

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The Flying Pigs Example

The annual manufacturing figures for the Flying Pigs Corporation are as follows:

Annual production volume: 40,000 pairs of skates

Material cost of wheels, steel and leather straps: \$700,000

Direct labor costs: \$560,000

Total fixed manufacturing overhead costs: \$420,000

The product unit cost under the absorption method:

- Materials: \$700,000
- Labor: \$560,000
- Fixed overhead: \$420,000
- Total product costs: \$1,680,000
- Product cost per unit: $\$1,680,000/40,000 = \42

The variable costing approach gives the following result:

- Materials: \$700,000
- Labor: \$560,000
- Total variable costs: \$1,260,000
- Product cost per unit: $\$1,260,000/40,000 = \31.50

2.3 Which Method is better?

Either one is correct as long as management understands the sources of the figures they are looking at or how they intend to use this information. You might look at these calculations and wonder where the fixed manufacturing costs went under the variable method. These costs didn't disappear; they just get posted in a different place on the income statement.

The calculation of fixed manufacturing overhead expenses is an important factor in the determination of unit product costs. Simply using the variable costs of direct materials and labor is not enough when calculating the "true" cost of production. Fixed overhead costs of production must be included; it's just a question of how and where.

2.4 What Is Margin?

Margin is the money borrowed from a brokerage firm to purchase an investment. It is the difference between the total value of securities held in an investor's account and the

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loan amount from the broker. Buying on margin is the act of borrowing money to buy securities. The practice includes buying an asset where the buyer pays only a percentage of the asset's value and borrows the rest from the bank or broker. The broker acts as a lender and the securities in the investor's account act as collateral.

In a general business context, the margin is the difference between a product or service's selling price and the cost of production, or the ratio of profit to revenue. Margin can also refer to the portion of the interest rate on an adjustable-rate mortgage (ARM) added to the adjustment-index rate.

Understanding Margin

Margin refers to the amount of equity an investor has in their brokerage account. "To margin" or "to buy on margin" means to use money borrowed from a broker to purchase securities. You must have a margin account to do so, rather than a standard brokerage account. A margin account is a brokerage account in which the broker lends the investor money to buy more securities than what they could otherwise buy with the balance in their account.

Using margin to purchase securities is effectively like using the current cash or securities already in your account as collateral for a loan. The collateralized loan comes with a periodic interest rate that must be paid. The investor is using borrowed money, or leverage, and therefore both the losses and gains will be magnified as a result. Margin investing can be advantageous in cases where the investor anticipates earning a higher rate of return on the investment than what he is paying in interest on the loan.

For example, if you have an initial margin requirement of 60% for your margin account, and you want to purchase \$10,000 worth of securities, then your margin would be \$6,000, and you could borrow the rest from the broker.

- Margin is the money borrowed from a broker to purchase an investment and is the difference between the total value of investment and the loan amount.
- Margin trading refers to the practice of using borrowed funds from a broker to trade a financial asset, which forms the collateral for the loan from the broker.

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- A margin account is a standard brokerage account in which an investor is allowed to use the current cash or securities in their account as collateral for a loan.
- Leverage conferred by margin will tend to amplify both gains and losses. In the event of a loss, a margin call may require your broker to liquidate securities without prior consent.

Buying on Margin

Buying on margin is borrowing money from a broker in order to purchase stock. You can think of it as a loan from your brokerage. Margin trading allows you to buy more stock than you'd be able to normally. To trade on margin, you need a margin account. This is different from a regular cash account, in which you trade using the money in the account.

By law, your broker is required to obtain your consent to open a margin account. The margin account may be part of your standard account opening agreement or may be a completely separate agreement. An initial investment of at least \$2,000 is required for a margin account, though some brokerages require more. This deposit is known as the minimum margin. Once the account is opened and operational, you can borrow up to 50% of the purchase price of a stock. This portion of the purchase price that you deposit is known as the initial margin. It's essential to know that you don't have to margin all the way up to 50%. You can borrow less, say 10% or 25%. Be aware that some brokerages require you to deposit more than 50% of the purchase price. (Related: Buying on Margin Explainer Video)

You can keep your loan as long as you want, provided you fulfill your obligations such as paying interest on time on the borrowed funds. When you sell the stock in a margin account, the proceeds go to your broker against the repayment of the loan until it is fully paid.

There is also a restriction called the maintenance margin, which is the minimum account balance you must maintain before your broker will force you to deposit more funds or sell stock to pay down your loan. When this happens, it's known as a margin call. A margin call is effectively a demand from your brokerage for you to add money to your

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account or close out positions to bring your account back to the required level. If you do not meet the margin call, your brokerage firm can close out any open positions in order to bring the account back up to the minimum value. Your brokerage firm can do this without your approval and can choose which position(s) to liquidate.

In addition, your brokerage firm can charge you a commission for the transaction(s). You are responsible for any losses sustained during this process, and your brokerage firm may liquidate enough shares or contracts to exceed the initial margin requirement.

Special Considerations

Because using margin is form of borrowing money it comes with costs, and marginable securities in the account are collateral. The primary cost is the interest you have to pay on your loan. The interest charges are applied to your account unless you decide to make payments. Over time, your debt level increases as interest charges accrue against you. As debt increases, the interest charges increase, and so on. Therefore, buying on margin is mainly used for short-term investments. The longer you hold an investment, the greater the return that is needed to break even. If you hold an investment on margin for a long period of time, the odds that you will make a profit are stacked against you.

Not all stocks qualify to be bought on margin. The Federal Reserve Board regulates which stocks are marginable. As a rule of thumb, brokers will not allow customers to purchase penny stocks, over-the-counter Bulletin Board (OTCBB) securities or initial public offerings (IPOs) on margin because of the day-to-day risks involved with these types of stocks. Individual brokerages can also decide not to margin certain stocks, so check with them to see what restrictions exist on your margin account.

A Buying Power Example

Let's say that you deposit \$10,000 in your margin account. Because you put up 50% of the purchase price, this means you have \$20,000 worth of buying power. Then, if you buy \$5,000 worth of stock, you still have \$15,000 in buying power remaining. You have enough cash to cover this transaction and haven't tapped into your margin. You start borrowing the money only when you buy securities worth more than \$10,000.

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Note that the buying power of a margin account changes daily depending on the price movement of the marginable securities in the account.

2.5 Other Uses of Margin

2.5.1 Accounting Margin

In business accounting, margin refers to the difference between revenue and expenses, where businesses typically track their gross profit margins, operating margins, and net profit margins. The gross profit margin measures the relationship between a company's revenues and the cost of goods sold (COGS). Operating profit margin takes into account COGS and operating expenses and compares them with revenue, and net profit margin takes all these expenses, taxes and interest into account.⁵

2.5.2 Margin in Mortgage Lending

Adjustable-rate mortgages (ARM) offer a fixed interest rate for an introductory period of time, and then the rate adjusts. To determine the new rate, the bank adds a margin to an established index. In most cases, the margin stays the same throughout the life of the loan, but the index rate changes. To understand this more clearly, imagine a mortgage with an adjustable rate has a margin of 4% and is indexed to the Treasury Index. If the Treasury Index is 6%, the interest rate on the mortgage is the 6% index rate plus the 4% margin, or 10%.

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Self-Check -2	Written test
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Instruction 1:- Choose the best answer. (4Pts)

1. An important metric for any small business owner whose company manufactures products is the -----.(1Pts)
 - A) unit cost of production
 - B) profit
 - C) Overhead Recovery Rate
 - D) Factory supervisors
2. -----is the money borrowed from a brokerage firm to purchase an investment.(1Pts)
 - A) Production
 - B) Margin
 - C) Manufacturing Overhead
 - D) All of the above
3. -----is borrowing money from a broker in order to purchase stock. You can think of it as a loan from your brokerage.(1Pts)
 - A) Buying on margin
 - B) margin account
 - C) Margin trading
 - D) Margin
4. In, ----- margin refers to the difference between revenue and expenses, where businesses typically track their gross profit margins, operating margins, and net profit margins.(1Pts)
 - A) Mortgage Lending
 - B) Adjustable-rate mortgages
 - C) business accounting
 - D) None of the above

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Instruction 2:- give short answer. (6Pts)

1. List some Examples of items that make up fixed and administrative overhead.(2Pts)
2. What is selling price?(2Pts)
3. What Is Fixed Manufacturing Overhead?(2Pts)

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

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

3. _____

Test II

1. _____

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2. _____

3. _____



Information Sheet 3	Calculating complete estimate project costs.
----------------------------	---

3.1 Introduction

Good cost estimation is essential for keeping a project under budget. Many costs can appear over the life cycle of a project, and an accurate estimation method can be the difference between a successful plan and a failed one. Estimation, however, is easier said than done. Projects bring risks, and risks bring unexpected costs.

Cost estimation is the process that takes those factors into account, and calculates a budget that meets the financial commitment necessary for a successful project. Project cost estimation applies to everything from building a bridge to developing that new killer app. It all costs money, so the clearer you are on the amount required, the more likely you'll achieve your objective.

4 Principles of Cost Estimation

1. Cost estimation is used to predict the quantity, cost and price of the resources required by the scope of a project. A project might be any process that is started to perform work activities and/or create assets. The accuracy of the estimate depends heavily on the level of project scope definition: as the design and conditions of the project become better defined, so do the estimated values. Think of the 5 estimate classes of AACE shared above.

2. Cost estimation is needed to provide decision-makers with the means to make investment decisions, choose between alternatives and to set up the budget during the front end of projects. For this, estimates made by vendors and contractors need to be validated by clients as well. In later phases of the project, the budget estimate is used as a baseline to assess the performance of a project.

Related to this principle, it is always challenging to collect and read the huge amount of cost data, which doesn't help with the decision making. Analyzing and visualizing the cost data opens the doors to making the data useful and meaningful. The dashboards of a project control software system are the data-driven graphical representations of a

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project; dashboards can provide decision-makers with a quick overview of a project's progress and turn the data into decision points.

3. Estimating is done by breaking down the total scope of a project in manageable parts, to which resources can be assigned and cost. There are standardized ways of breaking down a project, like the Work Breakdown Structure (WBS) and the Cost Breakdown Structure (CBS), but depending on the needs of the project team and external parties multiple structures are often implemented to align reporting and sharing of cost data.

4. A cost estimate is more than a list of costs. It also includes a detailed Basis of Estimate (BOE) report that describes the assumptions, inclusions, exclusions, accuracy and other aspects that are needed to interpret the total project cost. Otherwise, it would be a meaningless number. The BOE is required to communicate the estimate to the various parties involved in the decision making but is also handy during closeout when the performance of the project is compared with other projects. It is the vital part often overlooked, that allows you to learn from your experience and mistakes.

Cost estimation, however, is easier said than done. An accurate estimation method can be the difference between a successful plan and a failed one. Keep these 4 principles in mind and you already have a framework to start making estimates. Make sure to set up the estimate in a structured way to allow for an easy transition into project cost estimating software, which will help you make more solid and accurate estimates in the long run.

12-Step Process for Cost Estimation

The U.S. government has identified a 12-step process that results in reliable and valid cost estimates. Those twelve steps are outlined below.

1. **Define Estimate's Purpose:** Determine the purpose of the estimate, the level of detail which is required, who receives the estimate and the overall scope of the estimate.

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2. **Develop Estimating Plan:** Assemble a cost-estimating team, and outline their approach. Develop a timeline, and determine who will do the independent cost estimate. Finally, create the team's schedule.
3. **Define Characteristics:** Create a baseline description of the purpose, system and performance characteristics. This includes any technology implications, system configurations, schedules, strategies and relations to existing systems. Don't forget support, security, risk items, testing and production, deployment and maintenance, and any similar legacy systems.
4. **Determine Estimating Approach:** Define a work breakdown structure (WBS), and choose an estimating method that is best suited for each element in the WBS. Cross-check for cost and schedule drivers; then create a checklist.
5. **Identify Rule and Assumptions:** Clearly define what is included and excluded from the estimate, and identify specific assumptions.
6. **Obtain Data:** Create a data collection plan, and analyze data to find cost drivers.
7. **Develop Point Estimate:** Develop a cost model by estimating each WBS element.
8. **Conduct Sensitivity Analysis:** Test sensitivity of costs to changes in estimating input values and key assumptions, and determine key cost drivers.
9. **Conduct Risk and Uncertainty Analysis:** Determine the cost, schedule and technical risks inherent with each item on the WBS and how to manage them.
10. **Document the Estimate:** Have documentation for each step in the process to keep everyone on the same page with the cost estimate.
11. **Present Estimate to Management:** Brief decision-makers on cost estimates to get approval.
12. **Update Estimate:** Any changes must be updated and reported on. Also, perform a postmortem where you can document lessons learned.

3.2 Challenges of Cost Estimation

There are many factors that are uncertain when cost estimating. For example, if the project is not like prior ones, then experience won't help guide you. If the planning

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horizon is further out, the greater the uncertainty. That said, the longer the project's duration, the less in focus cost estimations will be.

Then there is the team: the level of skill and experience available are going to have a big factor on overall costs of the project.

3.3 Project Cost Estimation Techniques

These entire factors impact project cost estimation, making it difficult to come up with precise estimates. Luckily, there are techniques that can help with developing more accurate cost estimation.

Analogous Estimating

Seek the help of experts who have experience in similar projects, or use your own historical data. If you have access to relevant historical data, try analogous estimating, which can show precedents that help define what your future costs will be in the early stages of the project.

Statistical Modeling

There is statistical modeling, or parametric estimating, which also uses historical data of key cost drivers and then calculates what those costs would be if the duration or another aspect of the project is changed.

Bottom-Up Estimating

A more granular approach is bottom-up estimating, which uses estimates of individual tasks and then adds those up to determine the overall cost of the project.

Three-point Estimate

Another approach is the three-point estimate, which comes up with three scenarios: most likely, optimistic and pessimistic ranges. These are then put into an equation to develop estimation.

Reserve Analysis

Reserve analysis determines how much contingency reserve must be allocated. This approach tries to wrangle uncertainty.

Cost of Quality

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Cost of quality uses money spent during the project to avoid failures and money applied after the project to address failures. This can help fine-tune your overall project cost estimation. And comparing bids from vendors can also help figure out costs.

Dynamic Tools

Whenever you're estimating costs, it helps to use online software to collect all of your project information. Project management software that can be used in congress with many of these techniques to help facilitate the process. Use online software to define your project teams, tasks and goals. Even manage your vendors and track costs as the project unfolds. We'll show you how.

How ProjectManager.com Can Help with Cost Estimation

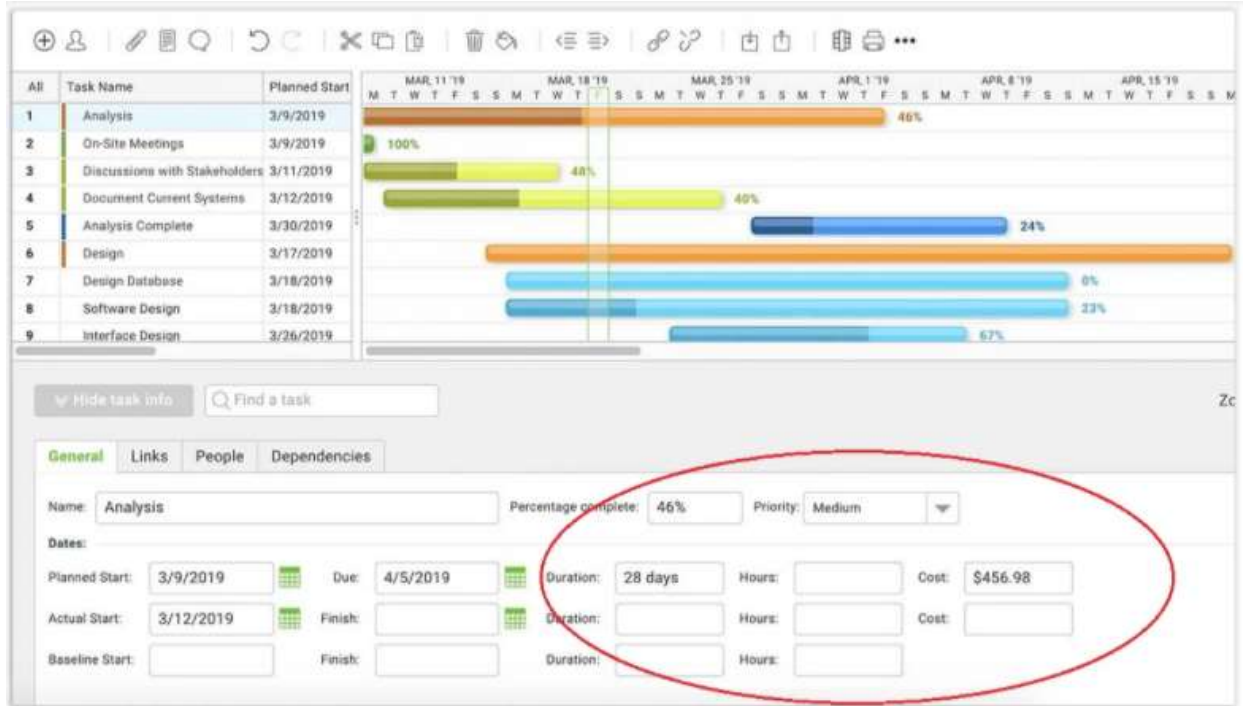
ProjectManager.com is project management software that has features to help create a more accurate project cost estimate. Our online Gantt chart can be used to help you track costs and expenditures for projects and tasks.

3.3.1 Estimate Costs of Specific Tasks

When estimating individual tasks, costs can also be collected and tracked on our online Gantt chart. Here you can add a column for the estimated costs, baseline cost and the actual costs to help you keep the project on budget once it's been executed.

Our online Gantt chart can not only track tasks, but you can set it up to track materials and fixed costs associated with each project task, and monitor the difference between budget and actual costs, as you can with each task. All this data is collected on one page.

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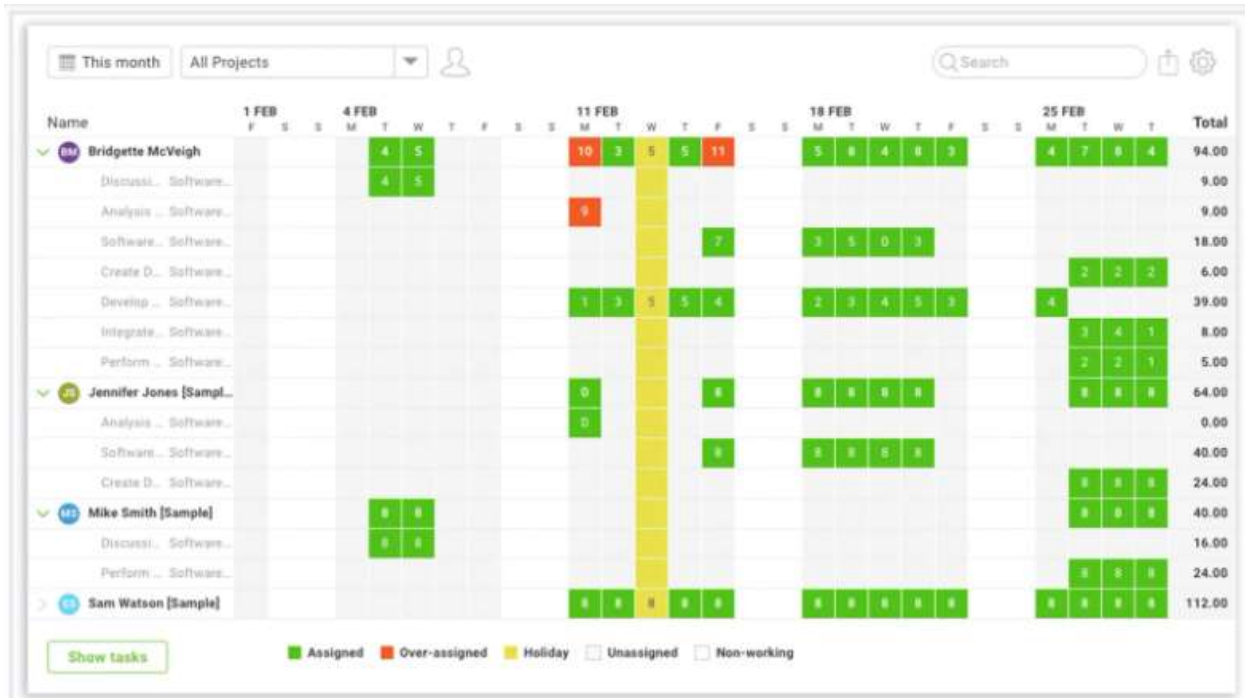


Start by creating a project and then going to the Gantt view on ProjectManager.com. If you already have data, you can import it by clicking on the import button on the top right-hand side of the page. Or you can use this online Gantt chart to collect the data. It can be easily shared with team members and stakeholders when you're ready to get input or approval.

Estimate Cost of Resources

The resource management feature on ProjectManager.com is another tool that can help you achieve a more accurate project cost estimate. It offers a way to look at your costs through the workload across tasks and projects.

When planning a project with our resource management tool, you can account for employee schedules, equipment rentals, holidays and office space, among other factors that will have an impact on your budget. Distributing project resources is one way to balance a budget.



Create a resource plan by scheduling the dates for planned resources, how long you'll need them and the people who will be involved. That includes any equipment or site rentals. Also, break that down into the amount of resources needed for each activity on a daily basis. Then create a schedule with detailed resources, including duration and estimated costs.

When estimating costs on a project, you want to have the best tools to help you calculate a more accurate budget. **ProjectManager.com** is cloud-based project management software with online Gantt charts and resource management features that give you control over your project costs.

3.4 Subcontractor Management Plan

Identification

This is the Subcontractor Management Plan; document number XYZ001, for the SYSTEM Z project.

Purpose

The Subcontractor Management Plan outlines the relationship between the XYZ Contractors in the SYSTEM Z project and the methods by which Company ABC, as the prime contractor, will assure the production of quality deliverables from each of its



subcontractors and assure the development of long term business relationships between the Companies.

Scope

This document is applicable to all phases of the SYSTEM Z project. Company ABC and all subcontractors to Company ABC will adhere to the approach outlined in this document.

Approach

The approach to managing the subcontractors is based on the following guiding principles:

- a) A Project Office will be established to effectively support the needs of the subcontractors,
- b) Effective channels of communications will be clearly defined and established,
- c) A Statement of Work will be developed jointly by the team with each subcontractor taking responsibility for the deliverables and services outlined in its areas of responsibility,
- d) Each subcontractor will have its responsibilities and authorities clearly defined in the Statement of Work,
- e) Each subcontractor will have its deliverables identified and required content clearly specified in the Statement of Work,
- f) Each subcontractor will have the services it is responsible for providing clearly identified and described in the Statement of Work,
- g) All constraints imposed on the subcontractor will be clearly identified in the Statement of Work, including schedule and budget constraints,
- h) Each subcontractor will have requirements for quality clearly identified to it in the Statement of Work, including the requirement to allow independent quality inspections of materials and processes,
- i) All products and services provided by the subcontractor will be subject to the acceptance of Company ABC and XYZ,
- j) Each subcontract will contain appropriate terms and conditions,
- k) Adequate facilities will be provided to meet the needs of the subcontractors, and

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3.4.1 Contract Organization Chart

XYZ has entered into a business partnership with Company ABC, Subcontractor-A, Subcontractor-B and Subcontractor-C, to jointly plan, develop, implement and support an integrated solution for the future SYSTEM Z. XYZ has also let a contract with Subcontractor-D to provide Independent Verification and Validation services. These various terms will be used to refer to various groupings of corporations throughout this document:

Subcontractors

This grouping includes Subcontractor-A, Subcontractor-B, and Subcontractor-C.

XYZ Partners

This group includes the Subcontractors plus Company ABC, the prime contractor.

XYZ Team

This group includes the XYZ Partners plus XYZ, the customer.

The major elements that comprise the SYSTEM Z project are presented in 2.0. These functional elements are mapped to the individual corporate elements in Section 2.2.



Elements of the SYSTEM Z Project.

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Roles and Responsibilities

At a high-level, Table 1 show the mapping of SYSTEM Z functional elements to the XYZ Team (plus the IV&V contractor).

Table Mapping of Functional Elements to Corporations.

Functional Element	Corporation					
	XYZ	Company ABC	Sub A	Sub B	Sub C	Sub D
Project Management	X	X				
Project Office (Support)	X	X				
Business Process Re-engineering	X		X		X	
Management of Change			X			
Organizational Design/Human Resources			X			
Communications				X		

Functional Element	Corporation					
	XYZ	Company ABC	Sub A	Sub B	Sub C	Sub D
Information Technology	X	X				
Training	X	X				
Quality Assurance		X				
Independent Verification and Validation						X



3.5 Overheads

Overhead costs, often referred to as overhead or operating expenses, refer to those expenses associated with running a business that can't be linked to creating or producing a product or service. They are the expenses the business incurs to stay in business, regardless of its success level.

Overhead costs are all of the costs on the company's income statement except for those that are directly related to manufacturing or selling a product, or providing a service. A potter's clay and potting wheel are not overhead costs because they are directly related to the products made. The rent for the facility where the potter creates is an overhead cost because the potter pays rent whether she's creating products or not.

Overhead Cost Examples

A company's overhead costs depend on the nature of the business. A retailer's expenses will be different from a repair shop or a crafter's. Typical examples include:

- Rent
- Utilities
- Insurance
- Salaries that aren't job- or product-specific
- Office equipment such as computers or telephones
- Office supplies

3.5.1 Types of Overhead Costs

Overhead costs can be broken down into three types:

- Fixed
- Variable
- Semi-variable

Fixed expenses are the same every month – such as rent. Variable costs increase or decrease, depending on how busy the business is. This could include wages for certain employees. Semi-variable costs are those that are incurred regardless of the activity level, but which might increase as business gets busier. For example, an accountant in

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the U.S. always use printer toner, but might use more of it in the first quarter of the year when preparing and printing tax forms for clients.

It is important to monitor overhead costs. Because they aren't directly related to revenues, they can drain a business unnecessarily when not properly controlled. The classic small business example of unnecessary overhead is the start-up entrepreneur who rents office space in a trendy location for an operation that could be home-based until growth requires more room for staff and equipment. The money spent on rent might be better invested in advertising or promotion for the new, unknown business.

3.5.2 Raw materials and consumables

While manufacturing a product or providing a service, a business may need to use components or byproducts. These consumptions can be divided into:

- Raw materials and intermediate components
- Consumables
- Goods to be sold

Raw materials, intermediate components and consumables are costs that are directly attributable to the production of a good or a service, thus including everything that is used to manufacture the final product or service.

In most situations the raw materials and consumables items are variable costs, meaning that these items will vary along with the volume of production.

It is common for a company to hold an inventory or stock of its consumptions.

3.5.3 Raw Materials and intermediate components

Raw materials are also called direct material. In a short definition, the raw materials are the inputs (commodities, parts or substances) that are used in the manufacturing, transformation or assembly process of a product. Examples of raw materials:

- Metal
- Minerals
- Plastic

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- Chemicals
- Wood
- Non processed food

More often than not, the inputs that a factory receives have gone through some sort of previous processing. These are intermediate components:

- The parts that are used in the production of a car have gone through some sort of previous processing. In most cases, an automotive factory is just an assembly line where most components of the car are put together. The seats, the speedometers, the glasses, the lights and many other parts have been manufactured by the suppliers.
- While manufacturing clothes, a factory does not usually use raw cotton or any other raw material. It uses fabrics that have be previously manufactured by suppliers.

3.5.4 Consumables

Consumables are supplies that are used in the production process, such:

- As machine oil in a factory.
- Printing ink in a printing company. Printing ink can also be stated as a raw material if it can be precisely measured the amount that is consumed per impression or work – be aware that ink or toners for office use in non-graphic companies should be deemed as an office material in operating expenses.

The mains difference between raw materials and consumables is that become components or are transformed to give ways to the final product or service, whilst the consumables are needed for productions but are not incorporated in the product or service. It is usually difficult to assign how much (quantity) of a given consumable is used in the manufacturing of one product.

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3.5.5 Raw materials and consumables in services

Although it is usually not commonly accounted as such, there are certain consumptions of raw materials or consumables that are needed in services. Take the following example.

Example – Hotel

Hotels provide services: renting rooms, renting conference spaces, providing meals, spas and many more; there is not a product coming out of the activity of an hotel. But while providing those service, and hotel needs to have buy breakfast food and bathroom supplies, which are goods that will be consumed by its guests. Such consumptions should be regarded as consumables for providing the service.

Goods to be sold

Goods to be sold are items that the company acquires to be resold in the exact same condition in which they are bought. Retail stores buy manufactured products that are then resold to the final consumer. Goods to be sold are “consumed” in the sense that they are necessary for the retail activity, but are not transformed or manufactured.

Goods to be sold are also variable costs.

Waste removal fees

The City of Edmonton provides a wide range of programs and services to the public including the delivery of Waste Management Utilities that serve the needs of citizens. The City-owned utilities provide vital services which play an integral part in the day-to-day lives of City of Edmonton residents.

The following information is designed to help your organization evaluate its current waste removal costs and develop a baseline for future cost comparisons. Although disposal costs vary widely across the country, every ton of waste avoided can help your organization save money. The annual waste removal charge developed with this guide

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should be used as one of the factors to help you convert waste reduction results into savings.

Waste removal cost

Name of Waste Removal Company: _____			
Telephone Number: _____		Contract Expires: _____	
Removal Schedule:			
Number of times _____ per (day/week/month/other) _____			
Day of week: _____		Time(s): _____	
Day of week: _____		Time(s): _____	
Waste Removal Charge (If charged as flat fee or part of rent)			
_____	x	_____	=
Waste removal fee		Time periods per year (if applicable)	
			Annual Waste Removal Charge
Waste Removal Charge (If charged by weight or volume)			
_____	per	_____	x
Waste removal charge		Unit of weight or volume	
		x	_____
			Units of waste removed annually
			=

			Annual waste removal cost
If applicable, add:			
_____	per	_____	x
Hauling container(s) rental fee		Time period	
		x	_____
			Time periods per year
			=

			Annual waste container rental cost
_____	+	_____	=
Annual waste removal charge		Annual waste container rental cost	
			Annual Waste Removal Charge
Waste Removal Charge (If charged per pull)			
_____	x	_____	=
Charge per pull		Pulls per year	

			Annual waste pulling charge
If applicable, add:			
_____	per	_____	x
Hauling containers(s) rental fee		Time period	
		x	_____
			Time periods per year
			=

			Annual waste container rental cost
_____	per	_____	x
Tipping fee		Unit of weight or volume	
		x	_____
			Units of waste removed annually
			=

			Annual tipping fee
_____	+	_____	x
Annual waste pulling charge		Annual waste container rental cost	
		x	_____
			Annual tipping fee
			=
			Annual Waste Removal Charge



3.6 Communications costs

Communication cost becomes significant for the parallel computation of explicit schemes where the ratio of communication to computation is high. Here, the basic concept to reduce communication cost is not to communicate between the blocks at each time step [2, 3]. Again, we employ extrapolation and filtering.

- Means costs of phone calls, faxes or postage incurred by the insured person to communicate with the Giardia, credit agencies, financial-service providers, other creditors or debt- collection agencies and the cost of replacement documents.
- Means those services performed by a Crisis Management Firm in providing consulting services to the Insured on internal and external communications, including media-management, to minimize the potential harm to the Insured following a Reputational Crisis.
- means those net costs actually payable by a Service Provider to a Network Provider for the provisioning and delivery of telecommunications services related to the cost of the data collection network used for the global collection of data from exchanges and third party providers for the Reuters/Bridge Business.

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Self-Check -3	Written test
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Instruction 1:- choose the best answer. (5Pts)

1. -----is essential for keeping a project under budget.(1Pts)
 - A) Estimation
 - B) Accounting Margin
 - C) Good cost estimation
 - D) Cost Breakdown Structure
2. Determines how much contingency reserve must be allocated. This approach tries to wrangle uncertainty.(1Pts)
 - A) Three-point Estimate
 - B) Reserve Analysis
 - C) Cost of Quality
 - D) All of the above
3. -----are all of the costs on the company's income statement except for those that are directly related to manufacturing or selling a product.(1Pts)
 - A) Overhead costs
 - B) Subcontractors
 - C) Estimate Cost of Resources
 - D) None of the above
4. -----are the inputs (commodities, parts or substances) that are used in the manufacturing, transformation or assembly process of a product.(1Pts)
 - A) Raw material
 - B) Consumable material
 - C) Intermediate component
 - D) All of the above
5. -----becomes significant for the parallel computation of explicit schemes where the ratio of communication to computation is high.(1Pts)
 - A) Overhead cost
 - B) Communication cost

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- C) Waste removal cost
- D) B and C

Instruction 2:- give short answer. (8Pts)

1. List first four step processes for cost estimation. (2Pts)
2. List typical example of overhead cost. (2Pts)
3. List some example of raw material. (2pts)
4. Write difference between consumable and raw material. (2pts)

Note: Satisfactory rating - 13 points Unsatisfactory - below 13 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____
2. _____
3. _____
4. _____
5. _____

Test II

1. _____

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2. _____

3. _____

4. _____



LG #33

LO #3- Measure and check correct quantities of work

Instruction sheet

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

- Quantifying measurements item by item.
- Doing computation of the work.
- Checking incorrect data and size of parameters
- Making corrections and adjustment.

This guide will also assist you to attain the learning outcome stated on the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- Measurements are quantified item by item according to technical specifications
- Computation of the work to prepare the bill of quantities is done based on company policies
- Incorrect data and size of parameters are checked as per accepted standards
- Corrections and adjustment are made within standard formats
- Bill of quantities is finalized and documented based on organizational requirements
- The administration system through which resources are procured and acquired is monitored for its effectiveness due to organizational regulations
- Financial responsibility is exercised over the procurement and acquisition system and its maintenance based on the cooperate procedures
- Procurement reports are evaluated in preparation for management team meetings due to requirements
- Regular meetings are facilitated and conducted between team members and the client to report on progress based on organizational regulations

Learning Instructions:

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5. Read the specific objectives of this Learning Guide.
6. Read all the information sheets in this learning guide.
7. Accomplish the self-check to make sure that you have understood all the theories behind all topics.
8. Do the LAP test to make sure you have acquired all the skill needed to do the task

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Information Sheet 1	Quantifying measurements item by item.
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1.1 Specification

A specification often refers to a set of documented requirements to be satisfied by a material, design, product, or service. A specification is often a type of technical standard.

There are different types of technical or engineering specifications (specs), and the term is used differently in different technical contexts. They often refer to particular documents, and/or particular information within them. The word specification is broadly defined as "to state explicitly or in detail" or "to be specific".

A **requirement specification** is a documented requirement, or set of documented requirements, to be satisfied by a given material, design, product, service, etc.[1] It is a common early part of engineering design and product development processes in many fields.

A **functional specification** is a kind of requirement specification, and may show functional block diagrams.

A **design or product specification** describes the features of the solutions for the Requirement Specification, referring to either a designed solution or final produced solution. It is often used to guide fabrication/production. Sometimes the term specification is here used in connection with a data sheet (or spec sheet), which may be confusing. A data sheet describes the technical characteristics of an item or product, often published by a manufacturer to help people choose or use the products. A data sheet is not a technical specification in the sense of informing how to produce.

Specifications are a type of technical standard that may be developed by any of various kinds of organizations, in both the public and private sectors. Example organization types include a corporation, a consortium (a small group of corporations), a trade association (an industry-wide group of corporations), a national government (including its military, regulatory agencies, and national laboratories and institutes), a professional association (society), a purpose-made standards organization such as ISO, or vendor-

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neutral developed generic requirements. It is common for one organization to refer to (reference, call out, cite) the standards of another.

1.2 Manufacturing Specification

A manufacturing specification contains all the information that is needed to make the product. It describes the stages of manufacture and the materials needed, using flowcharts, diagrams, notes and samples. This means that if more than one product is made then each product should be the same. A manufacturing specification is done once the final product has been developed. It explains exactly what the product is and how it is made. It should provide enough information so that anyone could use the specification to make the product again and again. It ensures that a product is always made in the same way and each product is identical and made to a set standard.

A manufacturing specification should contain the following information:

- Fabric details including quality, quantity, color, cost
- Component details, quality, quantity, color, cost.
- Tools and equipment to be used, in detail.
- Instructions for making in simple steps.
- Tolerances allowed in the making. E.g. a seam should be 1.5cm +/- 0.1 cm.
- How long each process should take.
- Health and safety considerations.
- Pattern lay plan.
- Samples of fabrics and components.

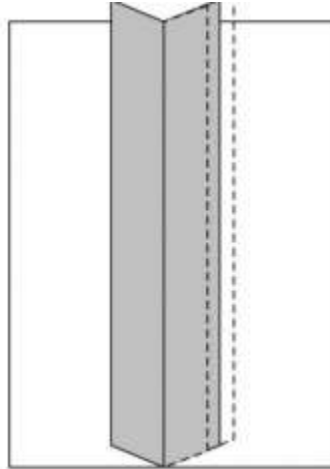
1.3 Tolerance levels

There will be an ideal size set by a manufacturer for a product, but small deviations from that size can be allowed. For example, a cushion cover may have an ideal size of 45 x 45 cm, but in reality, the cushion cover sizes permitted of a batch of cushions may vary between 44.5 and 45.5cm. This means that the tolerance is +/-0.5cm.

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Tolerance levels may be given for the size of a product, the seam allowances, the placement of components and embellishments. A seam may be 1.5cm with a tolerance of +/-0.2cm, so it can vary between 1.3cm and 1.7cm.



1.4 Working drawings

A working drawing shows the exact details of the design; it contains information about fabric, components, sizes and construction techniques to be used. Swatches and samples of components are often put on too.

1.5 International standard

International standards are technical standards developed by international organizations (intergovernmental organizations), such as Codex Alimentarius in food, the World Health Organization Guidelines in health, or ITU Recommendations in ICT and being publicly funded, are freely available for consideration and use worldwide.

International standards may be used either by direct application or by a process of modifying an international standard to suit local conditions. The adoption of international standards results in the creation of equivalent, national standards that are substantially the same as international standards in technical content, but may have

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- (i) editorial differences as to appearance, use of symbols and measurement units, substitution of a point for a comma as the decimal marker, and
- (ii) Differences resulting from conflicts in governmental regulations or industry-specific requirements caused by fundamental climatic, geographical, technological, or infrastructural factors, or the stringency of safety requirements that a given standard authority considers appropriate.

International standards are one way of overcoming technical barriers in international commerce caused by differences among technical regulations and standards developed independently and separately by each nation, national standards organization, or company. Technical barriers arise when different groups come together, each with a large user base, doing some well-established thing that between them is mutually incompatible. Establishing international standards is one way of preventing or overcoming this problem.

1.5.1 MECHANICAL DESIGN SPECIFICATION

Standard” shall mean and include a Standard Specification, Standard Code of Practice or other Standard issued by a recognized association or body set up for the purpose.

“Australian Standard” or the abbreviation **“AS”** shall mean a Standard issued by the Standards Association of Australia.

“Draft Report” or the abbreviation **“DR”** shall mean a draft of an Australian Standard issued by the Standards Association of Australia.

“British Standard” or the abbreviation **“BS”** shall mean a Standard issued by the British Standards Association.

“International Standard” or the abbreviation **“ISO”** shall mean a Standard issued by the International Standards Organization.

“Principal “ – The Principal is as defined in GC21 and is Tweed Shire Council.

“Principals’ Authorized Person” - is as defined is GC21

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“**Contractor**” denotes the person or corporation bound to execute construction and related work on behalf of the Principal.

“**Designer**” means a company, consultant or Professional Engineer who is qualified and is competent to perform the engineering works required for the Asset Creation process on behalf of a Developer.

“**The Code**” means the Water Services Association Codes (Sewerage Code of Australia (WSA-02) and the Sewage Pumping Station Code of Australia (WSA-04) and Water Supply Code of Australia (WSA-03), Vacuum Sewerage Code (WSA 06) and Pressure Sewerage Code of Australia (WSA 07))

“**WS-SPEC**” means the national standard water industry specifications.

1.5.2 SCOPE

The intent of this Standard Specification is to provide a means of ensuring a uniform approach to and standardization of the design and installation of mechanical equipment. All works specified within this document shall be a minimum requirement. All other mechanical specifications (IE ME xx) shall include:

- Preparation and supply of 3 hard copies and 3 electronic copy of operation and maintenance manuals.
- Supply of detailed installation drawings, installation instructions and commissioning procedures.

1.5.3 STANDARDS

The Principal shall possess, or have access to; the latest edition of all documents required to comply with this Specification, including all current amendments and supplements of those documents. The Contractor shall include all relevant specifications and requirements of these documents into the design of the works.

a) Council Land Development Specifications

Development Design Specification – D11 Water Supply Development Design Specification – D12 Sewerage System Development Construction Specification – C401 Water Reticulation Development Construction Specification – C402 Sewerage System

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b) WSAA Codes of Practice,

WSA-02 – Sewerage Code of Australia

WSA-04 - Sewage Pumping Station Code of Australia WSA -03 – Water Supply Code of Australia

c) WS-SPEC Water Services Specification,

d) Australian Standards

References in this Specification or the Drawings to Australian Standards are noted by their prefix AS or AS/NZS the Designer shall use the latest edition of all relevant **Australian Standards**, including all current amendments, supplements and replacements applicable thereto. Australian Standards are listed within WSA-02, WSA-04 and WSA-03.

The following Australian Standards with latest amendments are applicable to the materials and works covered by this Specification.

AS 1100 Technical drawing - general principles AS 1101 Graphic symbols for general engineering - Hydraulic and pneumatic systems AS 1102 Graphical symbols for electro technical documentation –

- General information and
- general index

AS 1104 Informative symbols for use on electrical and electronic equipment AS 1111.1 ISO metric hexagon bolts and screws - Product grade C - Bolts AS 1111.2 ISO metric hexagon bolts and screws - Product grade C - Screws AS 1112.1 ISO metric hexagon nuts - Style 1 - Product grades A and B

- AS 1112.2 ISO metric hexagon nuts - Style 2 - Product grades A and B
- AS 1112.3 ISO metric hexagon nuts - Product grade C
- AS 1112.4 ISO metric hexagon nuts - Chamfered thin nuts - Product grades A and B AS 1214 Hot-dip galvanized coatings on threaded fasteners (ISO metric course thread series)
- AS 1217 Acoustics – Determination of sound power levels of noise sources

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- AS 1237 Plain washers for metric bolts, screws and nuts for general purposes - General plan
- AS 1252 High strength steel bolts with associated nuts and washers for structural engineering
- AS 1319 Safety Signs for the Occupational Environment
- AS 1379 Specification and supply of concrete AS 1418 Set Cranes, hoists and winches Set
- AS 1442 Carbon steels and carbon manganese steels – Hot rolled bars
- AS 1443 Carbon steels and carbon manganese steels – Cold finished bars
- AS 1532 Short pitch transmission precision roller chains and chain wheels
- AS 1554 Part I Structural steel welding
- AS 1565 Copper and copper alloys - Ingots and castings
- AS 1594 Hot rolled steel flat products
- AS 1627 Part 4 Metal finishing - preparation and pretreatment of surfaces abrasive blast cleaning
- AS 1646.1 Elastomeric seals for waterworks purposes - General requirements
- AS 1646.2 Elastomeric seals for waterworks purposes - Material requirements for pipe joint seals used in water and wastewater applications - Specifies by prescription formulation
- AS 1646.3 Elastomeric seals for waterworks purposes - Material requirements for pipe joints seals used in water and wastewater applications with the exception of natural rubber and polyisoprene compounds
- AS 1646.4 Elastomeric seals for waterworks purposes - Material requirements for pipe joint seals used in water and wastewater applications - Thermoplastic elastomers and vulcanizes
- AS 1657 Fixed platforms, walkways, stairways and ladders - Design, construction and installation
- AS 1796 Certification of welders and welding supervisors
- AS 1830 Grey cast iron
- AS 1831 Ductile cast iron

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- AS 1832 Iron castings – Malleable cast iron
- AS 2074 Cast steels
- AS 2129 Flanges for pipes, valves and fittings
- AS 2417 Pumps –International acceptance codes
- AS 2528 Bolts, stud bolts and nuts for flanges and other high and low temperature applications.
- AS2550 Cranes, hoists and winches - Safe use - General requirements
- AS 2566 Buried flexible pipelines - Structural design
- AS 2625 Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts - General guidelines
- AS 2700 color standards for general purposes
- AS 2729 Rolling bearings - Dynamic load ratings and rating life
- AS 2784 Endless wedge belt and V-belt drives
- AS 3600 Concrete structures
- AS 3610 Formwork for concrete
- AS 3678 Structural steel-Hot-rolled plates, floorplates and slabs
- AS 3972 Portland and blended cements
- AS 4100 Steel structures
- AS 4671 Steel reinforcing materials
- AS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
- ASTM A240 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- ASTM A276 Standard Specification for Stainless Steel Bars and Shapes
- ASTM A480 Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
- IS EN 10088-2 Stainless Steels - Part 2: Technical Delivery Conditions For Sheet/plate And Strip Of Corrosion Resisting Steels For General Purposes

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1.6 EQUIPMENT SAFETY

1.6.1 General

All equipment shall be designed to afford maximum protection and a safe working environment for operating personnel. Grilles, bars or mesh shall be provided behind covers where moving equipment may be reached. Alternatively, interlocks shall be provided to stop equipment in the event that covers are opened. Fire protection facilities shall be provided to meet the requirements of the Work Cover Authority of NSW, the NSW Fire Brigade, Building Code of Australia and the Occupational Health and Safety Act. The Contractor must work in a safe manner at all times. No work must be carried out unless specifically authorized. The Contractor must observe all local safety procedures. The Contractor must comply with the relevant NSW Workplace Health and Safety Act and Regulations currently in force. A risk assessment approach is needed during designing access for maintenance purposes and also during installation or replacement of equipment. Design and construction of infrastructure shall be planned and executed to minimize impact on the environment. Where a choice of alternative solutions is possible, an objective environmental risk assessment shall be undertaken to give due weight to reducing the risks to the environment resulting from the construction and operation of the infrastructure.

1.6.2 Guards

All exposed moving parts shall be provided with guards in accordance with the statutory requirement to afford maximum protection and a safe working environment for operating personnel staff and visitors. Guards 41211 are provided for protecting personnel against exposed moving parts and hot surfaces. Guards 41211 are easily removable by standard tools for maintenance access. The Contractor shall provide the necessary safety interlock devices to facilitate protection of operating personnel, as well as to prevent damage to the mechanical portions of the equipment. Guards shall be galvanized after fabrication and shall be designed to facilitate maintenance of the equipment. In addition all equipment and guards shall be painted to the required color coding to comply with the Australian Standards. All drive guards shall be fabricated

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such that the guards can be removed without disturbing the sensing devices, chain or belt tensioners, field instruments and lubricators.

1.6.3 Safety sign

The Contractor shall supply and install all safety and warning signs as required. Safety signs 41211 comply with AS 1319. The signs q11211 warn of potential hazards assist in preventing accidents and give operational and emergency procedures for potentially hazardous situations. Signs shall provide warnings where equipment may start automatically, where equipment may move without warning and where other potential hazards may occur. Warning sirens and beacon lights shall be installed for equipment where there is a hazard, such as when equipment starts automatically or when equipment fails to start. The contents of piping, conduits and ducts shall be identified as per AS 1345. Arrows shall be provided to show the direction of flow.

1.6.4 Fail safe

All items of equipment qh2ll are designed for safe operation. Machinery shall be designed to ensure that the plant will remain in a safe condition in the event of any failure in part of the machinery or its associated safeguards, control circuits or its power supply.

1.6.5 DESIGN LIFE

Unless stated otherwise in this specification, all equipment and materials shall be designed and constructed to have a working life of at least 25 years when operating at % time. Valves and pipework ding be designed and constructed to have a design life of at least 50 years. Structures of concrete and steel shall be designed and constructed to have a design life of at least 50 years.

1.6.6 Material

All materials used in the Works shall be new and handled, transported and stored in accordance with the relevant Australian Standards and the manufacturer's recommendations.

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Materials Anil is obtained from an approved manufacturer or supplier. The Contractor shall remove defective materials and materials not conforming to the requirements of this Specification_ The Works shall be made good at the Contractor's expense. Materials shall be selected appropriate to the application and installed environment to afford a long life free from corrosion and wear and with the required strength.

Other than for equipment so approved by the Principal's Authorized Person, all materials in contact with sewage, screenings, grit and sludge shall be of an appropriate grade of stainless steel grade 316, or a non-metallic corrosion and ultra-violet resistant material such as FRP, ABS or equivalent. Marine grade aluminum may be utilized in other corrosive areas such as walkways and access platforms. Mechanical equipment of mild steel construction shall be hot dip galvanized. This includes pipe and machinery supports, platforms, stairs, handrails, baseplate, covers, and other items as specified. Structural steel shall comply with the requirement of AS3678. Galvanizing shall comply with the requirements of AS/NZS 4680.

1.6.7 Corrosion protection

Where dissimilar metal surfaces come in contact that is not compatible, protection shall be provided by an insulation gasket and washers between the dissimilar metals.

Refer to Tweed Shire Council Standard specification for Corrosion Protection for Electrical and Mechanical Equipment Structures-EL06 for specific applications. The Designer shall show on the Drawings the extent of external corrosion protection required to be provided by the Contractor. Ductile iron pipework shall be provided with protective polyethylene sheathing wrapped and taped in accordance with the pipeline manufacturer's instructions or epoxy coating as specified in the design. Steel pipe work shall be protected by fusion bonded polyethylene (FBPE, known commercially as Sintakote) or epoxy coating. At welded joints, the pipeline shall be protected from corrosion by the application of either polyethylene heat shrink sleeves or by a suitable tape wrap system in accordance with the manufacturer's installation requirements.

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The Designer shall assess the need for cathodic protection (sacrificial anode or impressed current) for metallic piping systems based on the aggressiveness of the soil and groundwater characteristics along the alignment of a proposed pipeline and with particular reference to construction through old landfill sites, low lying anaerobic wetlands and coastal tidal areas. The assessment of the aggressiveness of the soil shall be part of the geotechnical investigations for the work and the Designer will assess the geotechnical advice to determine whether cathodic protection is required. Galvanized surfaces shall not be repaired with zinc rich paint (Cold Gal) alone. A full painting system shall be used where repairs to galvanized surfaces is required. The approval of the Principal's Authorized Person shall be obtained before repairing a galvanized surface with a paint system.

1.7 Painting and coating

1.7.1 General

Refer to Tweed Shire Council Standard specification-Corrosion Protection for Electrical and Mechanical Equipment Structures-EL06. Where practicable, each succeeding coat of paint shall be of a different color. Finish colors shall be as specified or as otherwise agreed with the Principal's Authorized Person. Each coat shall produce a minimum dry film thickness as specified. In areas where this thickness is not developed, sufficient additional coats shall be applied to produce it. Where alternative painting systems are specified, selection from among the alternatives is at the Contractor's option and subject to approval of the Principal's Authorized Person. The Contractor may substitute other paint materials for those specified only with written approval from the Principal's Authorized Person. Unless otherwise approved by the Principal's Authorized Person in writing, all coatings applied under a single paint system shall be the product of a single manufacturer.

Proprietary Equipment

All proprietary-mechanical equipment, such as pumps, motors, gearboxes and conveyors, whether the equipment is fully immersed or not, shall satisfy the

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requirements of the 'Painting and Coatings' section of this specification. Where necessary, painting and coatings on proprietary equipment shall be upgraded. Care shall be exercised to protect all instruments, bearings, and all operational pans from contamination and damage when applying the paint system.

Fasteners

Bolts and screws shall be in accordance with AS 1111.1 and AS 1111.2, respectively. Washers shall be in accordance with AS 1237. Nuts shall be in accordance with AS 1112.1, AS 1112.2, AS 1112.3 and AS 1112.4. Extensive use of stainless steel, especially for nuts, bolts and screws shall be adopted for components coming in contact with influent or effluent water or exposed to a corrosive environment. On mechanical equipment and motors in contact with sewage, sludge or other corrosive environments, fasteners shall be stainless steel grade 316.

All bolts and studs for gland joints, couplings joints and flanges shall be stainless steel grade 316 unless specified otherwise. Associated nuts and washers shall be stainless steel grade 304. Where high strength is required and approval is given by Principal's Authorized Person, high tensile bolts, nuts and washers may be used. A 1/4", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 4", 4 1/2", 5", 5 1/2", 6", 6 1/2", 8", 10", 12", 14", 16", 18", 20", 24", 28", 32", 36", 40", 48", 56", 64", 72", 80", 96", 112", 128", 144", 160", 176", 192", 208", 224", 240", 256", 272", 288", 304", 320", 336", 352", 368", 384", 400", 416", 432", 448", 464", 480", 496", 512", 528", 544", 560", 576", 592", 608", 624", 640", 656", 672", 688", 704", 720", 736", 752", 768", 784", 800", 816", 832", 848", 864", 880", 896", 912", 928", 944", 960", 976", 992", 1008", 1024", 1040", 1056", 1072", 1088", 1104", 1120", 1136", 1152", 1168", 1184", 1200", 1216", 1232", 1248", 1264", 1280", 1296", 1312", 1328", 1344", 1360", 1376", 1392", 1408", 1424", 1440", 1456", 1472", 1488", 1504", 1520", 1536", 1552", 1568", 1584", 1600", 1616", 1632", 1648", 1664", 1680, 1696, 1712, 1728, 1744, 1760, 1776, 1792, 1808, 1824, 1840, 1856, 1872, 1888, 1904, 1920, 1936, 1952, 1968, 1984, 2000, 2016, 2032, 2048, 2064, 2080, 2096, 2112, 2128, 2144, 2160, 2176, 2192, 2208, 2224, 2240, 2256, 2272, 2288, 2304, 2320, 2336, 2352, 2368, 2384, 2400, 2416, 2432, 2448, 2464, 2480, 2496, 2512, 2528, 2544, 2560, 2576, 2592, 2608, 2624, 2640, 2656, 2672, 2688, 2704, 2720, 2736, 2752, 2768, 2784, 2800, 2816, 2832, 2848, 2864, 2880, 2896, 2912, 2928, 2944, 2960, 2976, 2992, 3008, 3024, 3040, 3056, 3072, 3088, 3104, 3120, 3136, 3152, 3168, 3184, 3200, 3216, 3232, 3248, 3264, 3280, 3296, 3312, 3328, 3344, 3360, 3376, 3392, 3408, 3424, 3440, 3456, 3472, 3488, 3504, 3520, 3536, 3552, 3568, 3584, 3600, 3616, 3632, 3648, 3664, 3680, 3696, 3712, 3728, 3744, 3760, 3776, 3792, 3808, 3824, 3840, 3856, 3872, 3888, 3904, 3920, 3936, 3952, 3968, 3984, 4000, 4016, 4032, 4048, 4064, 4080, 4096, 4112, 4128, 4144, 4160, 4176, 4192, 4208, 4224, 4240, 4256, 4272, 4288, 4304, 4320, 4336, 4352, 4368, 4384, 4400, 4416, 4432, 4448, 4464, 4480, 4496, 4512, 4528, 4544, 4560, 4576, 4592, 4608, 4624, 4640, 4656, 4672, 4688, 4704, 4720, 4736, 4752, 4768, 4784, 4800, 4816, 4832, 4848, 4864, 4880, 4896, 4912, 4928, 4944, 4960, 4976, 4992, 5008, 5024, 5040, 5056, 5072, 5088, 5104, 5120, 5136, 5152, 5168, 5184, 5200, 5216, 5232, 5248, 5264, 5280, 5296, 5312, 5328, 5344, 5360, 5376, 5392, 5408, 5424, 5440, 5456, 5472, 5488, 5504, 5520, 5536, 5552, 5568, 5584, 5600, 5616, 5632, 5648, 5664, 5680, 5696, 5712, 5728, 5744, 5760, 5776, 5792, 5808, 5824, 5840, 5856, 5872, 5888, 5904, 5920, 5936, 5952, 5968, 5984, 6000, 6016, 6032, 6048, 6064, 6080, 6096, 6112, 6128, 6144, 6160, 6176, 6192, 6208, 6224, 6240, 6256, 6272, 6288, 6304, 6320, 6336, 6352, 6368, 6384, 6400, 6416, 6432, 6448, 6464, 6480, 6496, 6512, 6528, 6544, 6560, 6576, 6592, 6608, 6624, 6640, 6656, 6672, 6688, 6704, 6720, 6736, 6752, 6768, 6784, 6800, 6816, 6832, 6848, 6864, 6880, 6896, 6912, 6928, 6944, 6960, 6976, 6992, 7008, 7024, 7040, 7056, 7072, 7088, 7104, 7120, 7136, 7152, 7168, 7184, 7200, 7216, 7232, 7248, 7264, 7280, 7296, 7312, 7328, 7344, 7360, 7376, 7392, 7408, 7424, 7440, 7456, 7472, 7488, 7504, 7520, 7536, 7552, 7568, 7584, 7600, 7616, 7632, 7648, 7664, 7680, 7696, 7712, 7728, 7744, 7760, 7776, 7792, 7808, 7824, 7840, 7856, 7872, 7888, 7904, 7920, 7936, 7952, 7968, 7984, 8000, 8016, 8032, 8048, 8064, 8080, 8096, 8112, 8128, 8144, 8160, 8176, 8192, 8208, 8224, 8240, 8256, 8272, 8288, 8304, 8320, 8336, 8352, 8368, 8384, 8400, 8416, 8432, 8448, 8464, 8480, 8496, 8512, 8528, 8544, 8560, 8576, 8592, 8608, 8624, 8640, 8656, 8672, 8688, 8704, 8720, 8736, 8752, 8768, 8784, 8800, 8816, 8832, 8848, 8864, 8880, 8896, 8912, 8928, 8944, 8960, 8976, 8992, 9008, 9024, 9040, 9056, 9072, 9088, 9104, 9120, 9136, 9152, 9168, 9184, 9200, 9216, 9232, 9248, 9264, 9280, 9296, 9312, 9328, 9344, 9360, 9376, 9392, 9408, 9424, 9440, 9456, 9472, 9488, 9504, 9520, 9536, 9552, 9568, 9584, 9600, 9616, 9632, 9648, 9664, 9680, 9696, 9712, 9728, 9744, 9760, 9776, 9792, 9808, 9824, 9840, 9856, 9872, 9888, 9904, 9920, 9936, 9952, 9968, 9984, 10000.

Sockets

All socketed pipes shall be rubber ring jointed. Rubber rings shall comply with AS 1646. In connecting pipes with rubber rings, the pipes shall be cleaned prior to connecting and care shall be taken to ensure that the rubber ring is maintained in a plane at right angles to the axis of the pipe. Each pipe shall be installed and connected as recommended by the manufacturer and each joint checked with a feeler gauge to ensure that the ring is in place. For pipes with skid type rubber ring joints, only the lubricant specified in writing by the manufacturer shall be applied in making that joint. The Contractor shall make the joint such that the witness mark, at no point, shall be more than one (1) mm from the end of the socket. Should this either refer to AS and or Manufacturer's requirements. Ductile iron pipes shall be joint using either the standard "Tyton" rubber ring spigot and socket jointing system or the "Tyton-loc gasket" system.

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Gasket

Flange gaskets shall be in accordance with AS 4087. Gaskets shall be manufactured from an elastomer (neoprene/fabric) complying with AS 1646 and may contain a reinforcement material. The minimum working pressure for gaskets shall be 1600 kPa at 3.0mm thick. The gasket material shall be suitable for contact with the fluid being conveyed, the operating conditions and environment. Pipes and fittings shall be in their correct position, alignment and grade before the joints are made and no springing of joints shall be permitted. Pipe anchorages shall be provided to absorb static and dynamic thrusts from pipe fittings and valves.

Flange

Flanged joints connecting pipes, fittings, valves and pumps shall comply with AS 2129 (Flanges shall be Table E) or metallic flanges to AS 4087, Class PN16, as appropriate. Mating pipe flanges shall be drilled to suit the specified drilling of the adjoining valve or equipment. Raised face flanges shall be mated with raised face flanges. Flat faced flanges shall be mated with flat face flanges. Flanges on all steel, ductile iron, PVC, and GRP pipes shall be fully fixed flanges. Flanges on ABS and PE pipes may be stub flanges with loose metal backing rings or full face up to 100 mm pipe diameter. On ABS and PE pipes of 100 mm diameter and larger, stub flanges with metal backing rings shall be used. Backing rings shall be manufactured from 316 or 316L stainless steel. All bolts shall be stainless steel Grade 316 and all nuts and washers shall be stainless steel Grade 304. Uniflanges shall only be used with prior written approval of Principal's Authorized Person. Flanges for ductile iron pipes and fittings shall be integrally cast or fabricated and attached to the ductile iron pipe by screwing with mating threads filled with a suitable epoxy resin. Flange contact surfaces shall be raised face. Flange faces are to be coated with an approved soluble lacquer.

Pressure gage

Pressure gauges shall comply with the requirements of AS1349. Pressure gauges shall be industrial Bourdon Tube gauges with a glycerin filled diaphragm seal and

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q11211 be suitable for the service specified. Unless noted otherwise, gauges shall have a nominal diameter of 100mm and shall be fitted with a 10mm threaded tank

The hydraulic oil type pressure gauges shall be used for process fluids that readily damage standard pressure indicators (i.e. the process fluid is in contact with a diaphragm that has hydraulic oil on the other side which transmits the pressure signal to the indicator).

Bearing and lubrication

All ball or roller bearings shall be rated in accordance with AS 2729. Where lubrication is required the bearing housings shall be fitted with seals and shall be grease lubricated. Grease nipples shall be provided for all bearings. Where access is restricted, capillary tubing shall be run from the bearings and grouped and labelled at a convenient accessible location. Bearing housings 41211 be fitted with grease pressure relief devices to prevent overpressure. The bearing re-lubrication interval shall be calculated from the bearing grease manufacturer's data. Plain bearings shall have steel shafts fuming in bronze or self-lubricating graphite impregnated bushes and shall have a loading, based on projected area. Materials other than steel and bronze may be accepted where the Contractor submits full details for approval of the Principal's Authorized Person The Contractor shall furnish all mechanical equipment with the correct lubricants to prevent corrosion during storage and installation and for starting and commissioning the plant. Lubricants shall be as recommended by the relevant equipment manufacturer. Plates indicating the type of oil or grease, quantity and change period shall be fixed to the equipment items adjacent to the oil or grease lubrication points. Plates shall be engraved stainless steel grade 316, fastened with stainless screw.

Drivers and coupling

Pumps and equipment shall be fitted with rigid or flexible couplings as recommended by manufacturer to suit application. Care shall be taken in checking alignment of driving and driven shafts. The motor and driven equipment shall be in alignment from all

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aspects in accordance with manufacturer's requirements. The whole assembly including pulleys and couplings should be balanced to eliminate vibration.

Belt drivers

V-belt and wedge-belt drives shall comply with AS 2784. All drives shall be designed with a minimum service factor of 2 based on motor rated power. Belts shall be standard commercial items readily available locally and normally kept in stock. Pulleys and sprockets shall be either keyed or taper type locking bush onto the shaft.

The belt manufacturer's recommendations for installation and alignment shall be strictly adhered to when fitting belt drives.

Chain drive

Chains used for power transmission shall be standard roller chains comprising steel links and hardened steel pins and rollers. Chains shall comply with AS1532 and shall have a minimum pitch of 19 mm. Sprockets shall be of steel with flame hardened teeth, with hardness not less than 360 Brinell. Access covers for inspection and lubrication of the chains and sprockets shall be provided in an easily accessible location. Automatic lubrication feeds are to be provided in hard to access locations. For special application such as flight and chain scrapers in sedimentation tanks proprietary plastic chains may be used subject to approval of the Principal's Authorized Person.

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Self-Check -1	Written test
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Instruction 1:- choose the best answer. (5Pts)

1. _____ is a kind of requirement specification, and may show functional block diagrams.(1Pts)

- A) Design specification
- B) Product specification
- C) Functional specification
- D) None

2. _____ describes the features of the solutions for the Requirement Specification, referring to either a designed solution or final produced solution.(1Pts)

- A) Requirement specification
- B) Design specification
- C) Product specification
- D) B and C

3. _____ contains all the information that is needed to make the product.(1Pts)

- A) Manufacturing specification
- B) Tolerance level
- C) Product specification
- D) All of the above

4. _____ Shows the exact details of the design; it contains information about fabric, components, sizes and construction techniques to be used.(1Pts)

- A) Tolerance level
- B) International standard
- C) Working drawing
- D) None of the above

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5. AS 1830 used for which mechanical component on international standard.(1Pts)

A) Grey cast iron

B) Mechanical seal

C) Fasteners

D) None of the above

Instruction 2:- give short answer. (6Pts)

1. What is specification? (2Pts)

2. What is international standard? (2Pts)

3. List at least five a manufacturing specification should contain. (2Pts)

Note: Satisfactory rating - 11 points

Unsatisfactory - below 11 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

4. _____

5. _____

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Test II

1. _____

2. _____

3. _____



Information Sheet 2	Doing computation of the work.
----------------------------	---------------------------------------

2.1 What is bill of quantity?

This Bill of Quantities shall be read in conjunction with such contract documents as, but not limited to, the Conditions of Contract, Specifications, the Instructions to Tenderer, the Drawings and other pertinent data. The tenderer shall be deemed to have fully acquainted himself with the detailed description of the Works to be done, the way in which he shall carry out the Works and the requirements and standards of the Works.

Bills of Quantities comprise a list of items of work which are briefly described. The Bills also provide a measure of the extent of work and this allows the work to be priced. The work included in the item is defined in detail by the rules in the Method of Measurement. The item descriptions are therefore shorthand to allow the relevant rules of the Method to be identified. The measure may be a single item or number, dimension (linear meter, square meter, and cubic meter), time (hrs. weeks) or weight.

2.2 Function of Bills

The Bills of Quantities may serve a number of functions as:

- A breakdown of the tendered price, with no contractual status, but providing information for the selection from tenderers.
- An estimate measure of the work for the tendered price, to be used to
- Arrive at a revised contract price once the actual quantities of work carried out are measured. This is the re measure form of contract.
- A schedule of rates as the contract basis for valuing variations in the work.
- A basis for measure of the value of work completed for interim payments.

2.3 Method of Measurement

Many contracts are let using Bills of Quantities, although this does not necessarily mean that the works are to be valued by re-measurement. The Bills of Quantities are required

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to be prepared using rules in a specified Method of Measurement. Many Standard Methods of Measurement are now in common use.

The Method of Measurement will specify the division of work into categories. In the building industry the division is usually on the basis of different trades, and is generally very detailed. In the engineering industry the division is usually less complex and composite items are used describing the completed construction operation. There is normally a division for preliminary items such as mobilization, site set up and insurances. In contrast to the remainder of the Methods, preliminary items require large lump sums, in some cases time related, but with little detail to allow the build-up to the item to be ascertained.

Standard Methods of Measurement have become increasingly more complicated. They give rise to claims for additional payment based on interpretation of the Method. The tendency has been for the Methods to provide detailed sub-division of work and therefore scope for claims based on ambiguities of interpretation, failure to measure the tendered Bills in accordance with the Method and the application of exceptions to measure.

2.3.1 Mistakes in Bills

Mistakes in the bill descriptions or quantities are unlikely to be remedied as a legal rectification of the terms of the contract to reflect the true intention of the parties. It is more likely than not, that the common intention will be that the tendered price should prevail, rather than a price revised to account of the error. Most standard forms of contract which adopt Bills of Quantities make provision to deal with errors in bill descriptions and quantities, distinct from the effect of variations.

2.3.2 How to Prepare a Bill of Quantities

A Bill of Quantities (BoQ) lists the total materials required to complete the architect's design for a construction project, such as a house or other structure. The BoQ enables you to get quotes for the project that are as accurate as possible. BoQs are typically

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prepared by a quantity surveyor or engineer who has expertise at estimating the materials required for a project. However, even if you don't prepare the BoQ yourself, it's still worth knowing what a BoQ should look like so you can evaluate the quality of the finished product.

	A	B	C	D	E	E	F
	Item No.	Description	Unit	Qty	Material Rate	Labour Rate	Total Cost
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

Set up a spreadsheet for your bill of quantities:- Include columns for the item numbers, description, unit of measurement, quantity, rate for the item, labor, and total cost for the item. Your item numbers will be consecutive, starting from 1. Restart the item numbers for each section or category of the build.

The columns for the rate for each item and total costs will be filled in by contractors bidding on the project. You typically won't have any values in those columns while you're drafting your BoQ.

Prepare a list of materials you'll need to complete the project. Look at the architect's plans and write a basic list of all the building materials required and the amounts needed of each. This includes wiring, hardware, and other fixtures.

- For example, if you're building a machine, you might need framing materials, sheet metal, RHS, wiring, and pipe.



- Identify the unit of measurement for each of your materials. This may be a standard unit. For example, if you've included paint on your list of materials, the unit of measurement may be gallons or liters.
- Once you've determined the materials you'll need, fill them in on your spreadsheet. For example, if you need paint for your project, you might list "green paint" next to item #1. In the column for unit of measurement, you would write "gallons." Then you would include the number of gallons you needed in the quantity column.
- You can add 15-20% to your material calculations to account for waste.

Break down the project into specific sections or categories. Since different parts of your project will likely be handled by different contractors or subcontractors, split up your list of materials into those sections. That way, each contractor or subcontractor will know exactly what their costs will be for the project.

- If you're building a machine, some different parts might include "framing," "electrode," "electrical," "RHS," "Pipe," and "sheet metal."
- Some materials may fall under more than one part. For example, if you have "framing" and "sheet metal," they may both need to use the same electrode. This means you need to divide the overall number of electrode you estimated between the two.

Estimate the labor required to complete each part. Based on the amount of work to be done, determine the number of man-hours it will take to finish. This should be a conservative estimate since some workers are more efficient than others.

- You can talk to contractors to get an idea of how many hours it would take to finish a given part. A quantity surveyor would usually be able to estimate this off the top of their head, based on their experience with similar projects.

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Make an initial cost estimate based on the designer design. Look at the average prices for the materials and labor in your area. You can find out materials prices by checking hardware stores. To learn labor prices, you can talk to contractors in your area who work on similar projects.

- When you total your material prices and your labor costs, you'll have a general idea of how much money your project will cost to complete.
- Print off a separate copy of the BoQ for your initial cost estimate. This information isn't usually included on the official BoQ you submit to contractors for bids. Use it to compare bids you get from contractors to find the best bid for your project.

Draft a schedule based on the estimates in the BoQ. Once you have labor estimates, it's possible to determine how long it will take to complete your project. Keep this schedule loose to account for things, such as weather, that could cause delays.

- For example, if you've estimated it will take 1,000 man-hours to build your machine, assuming the contractors work 40 hours a week and there are no delays, it would take them 25 weeks to complete your house. However, to allow for delays, you're better off planning for it to take 30 to 40 weeks.

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Self-Check -2	Written test
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Instruction 1:- give short answer. (6Pts)

1. What is bill of quantity? (2Pts)
2. List three function of bill of quantity. (2Pts)
3. Describe method of measurement. (2Pts)

Note: Satisfactory rating - 6 points Unsatisfactory - below 6 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____ Date: _____

1. _____

2. _____

3. _____



Information Sheet 3	Checking incorrect data and size of parameters
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3.1 Parameter

Parameter generally, is any characteristic that can help in defining or classifying a particular system (meaning an event, project, object, situation, etc.). That is, a parameter is an element of a system that is useful, or critical, when identifying the system, or when evaluating its performance, status, condition, etc.

Parameter has more specific meanings within various disciplines, including mathematics, computer programming, engineering, statistics, logic, linguistics, electronic musical composition.

In addition to its technical uses, there are also extended uses, especially in non-scientific contexts, where it is used to mean defining characteristics or boundaries, as in the phrases 'test parameters' or 'game play parameters'.

When a system is modeled by equations, the values that describe the system are called parameters. For example, in mechanics, the masses, the dimensions and shapes (for solid bodies), the densities and the viscosities (for fluids), appear as parameters in the equations modeling movements. There are often several choices for the parameters, and choosing a convenient set of parameters is called parametrization.

For example, if one were considering the movement of an object on the surface of a sphere much larger than the object (e.g. the Earth), there are two commonly used parametrizations of its position: angular coordinates (like latitude/longitude), which neatly describe large movements along circles on the sphere, and directional distance from a known point (e.g. "10km NNW of Toronto" or equivalently "8km due North, and then 6km due West, from Toronto"), which are often simpler for movement confined to a (relatively) small area, like within a particular country or region. Such parametrizations are also relevant to the medialization of geographic areas (i.e. map drawing).

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3.2 What are standards?

A standard is a repeatable, harmonized, agreed and documented way of doing something. Standards contain technical specifications or other precise criteria designed to be used consistently as a rule, guideline, or definition. They help to make life simpler and increase the reliability and the effectiveness of many of the goods and services we use.

Standards result from collective work by experts in a field and provide a consensus at the time when the standards are developed. As standards in the international arena are established on a consensus and broad stakeholder basis, they represent what can be agreed upon. A published standard is therefore the harmonized synthesis of what the group is prepared to publish. In terms of international and regional standardization, this is even more important than at the national level: the importance of consensus is critical because of large and diverse stakeholder groups and needs. Ultimately this may mean that a standard might lack some of the clarity, detail or specific criteria certain stakeholder groups or individuals would have preferred.

Standards do not necessarily have to be developed by standardization bodies, such as ISO or the IEC. Any organization can establish standards for internal or external use. However, to be truly called a standard, the requirements stated above must be met.

3.3 How Standards Work

Adherence to standards is voluntary, unless they are a requirement of legislation or regulation, or are incorporated as part of a formal contract. To increase global tradability and compatibility of products and services, it is important that, whenever possible, standards are harmonized globally to ensure they are truly trans-boundary.

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3.3.1 What are standards for?

Standards are an important way of protecting consumers. While consumer protection is often visible through government policies or consumer protection organizations, standards create an extra protective environment that lies behind the perception of most consumers. This is particularly true where consumers have little or no choice in what they are offered. In rural communities in developing countries, consumers do not generally have the luxury of comparing features and selecting their suppliers or products from the Internet. Therefore it is incumbent on the standards to ensure that whatever product or service is provided is fit for purpose, safe and has value. An important aspect of this protection is to ensure the product or service delivers as claimed, performs as specified, and is reliable, durable and safe.

3.4 TYPES OF ERRORS

Measurement errors may be classified as either random or systematic; depending on how the measurement was obtained (an instrument could cause a random error in one situation and a systematic error in another).

Random errors are statistical fluctuations (in either direction) in the measured data due to the precision limitations of the measurement device. Random errors can be evaluated through statistical analysis and can be reduced by averaging over a large number of observations (see standard error).

Systematic errors are reproducible inaccuracies that are consistently in the same direction. These errors are difficult to detect and cannot be analyzed statistically. If a systematic error is identified when calibrating against a standard, applying a correction or correction factor to compensate for the effect can reduce the bias. Unlike random errors, systematic errors cannot be detected or reduced by increasing the number of observations.

When making careful measurements, our goal is to reduce as many sources of error as possible and to keep track of those errors that we cannot eliminate. It is useful to know

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the types of errors that may occur, so that we may recognize them when they arise. Common sources of error in physics laboratory experiments:

Incomplete definition (may be systematic or random) — one reason that it is impossible to make exact measurements is that the measurement is not always clearly defined. For example, if two different people measure the length of the same string, they would probably get different results because each person may stretch the string with a different tension. The best way to minimize definition errors is to carefully consider and specify the conditions that could affect the measurement.

Failure to account for a factor (usually systematic) — The most challenging part of designing an experiment is trying to control or account for all possible factors except the one independent variable that is being analyzed. For instance, you may inadvertently ignore air resistance when measuring free-fall acceleration or you may fail to account for the effect of the Earth's magnetic field when measuring the field near a small magnet. The best way to account for these sources of error is to brainstorm with your peers about all the factors that could possibly affect your result. This brainstorm should be done before beginning the experiment in order to plan and account for the confounding factors before taking data. Sometimes a correction can be applied to a result after taking data to account for an error that was not detected earlier.

Environmental factors (systematic or random) — be aware of errors introduced by your immediate working environment. You may need to take account for or protect your experiment from vibrations, drafts, changes in temperature, and electronic noise or other effects from nearby apparatus.

Instrument resolution (random) — all instruments have finite precision that limits the ability to resolve small measurement differences. For instance, a meter stick cannot be used to distinguish distances to a precision much better than about half of its smallest scale division (0.5 mm in this case). One of the best ways to obtain more precise measurements is to use a null difference method instead of measuring a quantity directly. Null or balance methods involve using instrumentation to measure the

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difference between two similar quantities, one of which is known very accurately and is adjustable. The adjustable reference quantity is varied until the difference is reduced to zero. The two quantities are then balanced and the magnitude of the unknown quantity can be found by comparison with a measurement standard. With this method, problems of source instability are eliminated, and the measuring instrument can be very sensitive and does not even need a scale.

Calibration (systematic) — whenever possible, the calibration of an instrument should be checked before taking data. If a calibration standard is not available, the accuracy of the instrument should be checked by comparing with another instrument that is at least as precise, or by consulting the technical data provided by the manufacturer. Calibration errors are usually linear (measured as a fraction of the full scale reading), so that larger values result in greater absolute errors.

Zero offset (systematic) — when making a measurement with a micrometer caliper, electronic balance, or electrical meter, always check the zero reading first. Re-zero the instrument if possible, or at least measure and record the zero offset so that readings can be corrected later. It is also a good idea to check the zero reading throughout the experiment. Failure to zero a device will result in a constant error that is more significant for smaller measured values than for larger ones.

Physical variations (random) — it is always wise to obtain multiple measurements over the widest range possible. Doing so often reveals variations that might otherwise go undetected. These variations may call for closer examination, or they may be combined to find an average value.

Parallax (systematic or random) — this error can occur whenever there is some distance between the measuring scale and the indicator used to obtain a measurement. If the observer's eye is not squarely aligned with the pointer and scale, the reading may be too high or low (some analog meters have mirrors to help with this alignment).

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Instrument drift (systematic) — most electronic instruments have readings that drift over time. The amount of drift is generally not a concern, but occasionally this source of error can be significant.

Lag time and hysteresis (systematic) — some measuring devices require time to reach equilibrium, and taking a measurement before the instrument is stable will result in a measurement that is too high or low. A common example is taking temperature readings with a thermometer that has not reached thermal equilibrium with its environment. A similar effect is hysteresis where the instrument readings lag behind and appear to have a "memory" effect, as data are taken sequentially moving up or down through a range of values. Hysteresis is most commonly associated with materials that become magnetized when a changing magnetic field is applied.

Personal errors come from carelessness, poor technique, or bias on the part of the experimenter. The experimenter may measure incorrectly, or may use poor technique in taking a measurement, or may introduce a bias into measurements by expecting (and inadvertently forcing) the results to agree with the expected outcome.

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Self-Check -3	Written test
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Instruction 1:- choose the best answer. (3Pts)

1. _____ is any characteristic that can help in defining or classifying a particular system (meaning an event, project, object, situation, etc.).(1Pts)

A) Error

B) Parameter

C) Systematic error

D) None of the above

2. A standard is not a repeatable, harmonized, agreed and documented way of doing something.(1Pts)

A) True

B) False

3. Standards are not an important way of protecting consumers.(1Pts)

A) True

B) False

Instruction 2:- give short answer. (4Pts)

1. List at type of error and explain it. (2Pts)

2. What are standard? (2Pts)

Note: Satisfactory rating - 7 points

Unsatisfactory - below 7 points

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

Score = _____

Rating: _____

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Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

Test II

1. _____

2. _____

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Information Sheet 4	Finalizing and documenting bill of quantities.
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4.1 Introduction

In a nutshell, a Bill of Materials (BOM) is the complete list of all the items that are required to build a product. But, it is more than a mere shopping list. A list of material, or the Bill of Materials is a list of all the production and assembly needs of an item.

For example a baker may include raw material such as bread flour, but also the necessary infrastructure for product structure, such as kneading machines and ovens in the Bill Of Materials.

In addition to that, instructions on how exactly production and assembly should work is also a part of BOM. A list of materials is used within all forms of production and assembly: assembly by stock (Assembly To Stock), assembly by order (Assembly To Order), manufacturing by stock (Made To Stock), and manufacturing by order (Made To Order.) A bill of materials usually appears in a hierarchical format, with the highest level displaying the finished product and the bottom level showing individual components and materials.

In a nutshell, it is the complete list of all the items that are required to build a product structure. A well-defined BOM helps companies:

- Plan purchases of raw materials
- Estimate material costs
- Gain inventory control
- Track and plan material requirements
- Maintain accurate records
- Ensure supply robustness and reduce waste

4.2 Types of BOM

Bill of Materials is used in almost all fields related to supply chain. Due to prolonged use, there are two activities for which different versions of bill of material were created.

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The two most important types are: 1) Engineering Bill Of Materials (EBOM) and Manufacturing Bill Of Materials (MBOM) or the list of manufacturing materials. As the names indicate, these lists of materials are specifically designed for the design and production phases of the items.

Engineering Bill of Materials (EBOM)

The engineering bill of materials (EBOM) defines the finished product as it was originally designed. It lists the items, parts, components, subassemblies, and assemblies in the product as engineering designed it. The EBOM is often created by the product engineers based on a CAD drawing during resource planning. For a finished product, more than one EBOM may be created.

Manufacturing Bill of Materials (MBOM)

This type of BOM is a set of documents that have all the information related to assemblies that are needed to finalize and ship a final product. It includes things like packaging materials such as boxes, quick start guides, CDs, or any other related item that completes the packaging of a particular thing.

4.3 A good BOM always includes certain essential elements:

Full representation of the inventory item:

A comprehensive, informative description of each material or part must be included in a structured list. This description helps you and others identify individual parts and distinguish between similar parts and materials.

Unique part names:

Each part, material, or assembly should also include a detailed, unique name that allows anyone to identify the part easily without having to reference other sources.

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Unique part numbers:

The BOM should assign item number to each item, which allows anyone involved in the manufacturing cycle to reference and identify parts instantly. To avoid confusion, each part must receive only one part number.

Phase:

Make sure to record the lifecycle stage of each part in the BOM. For example, for parts that are in assembly process, a term like “In Production” can be used. Other terms, such as “Unreleased” or “In Design” can be used for item attributes that have not yet been approved. Such terms are especially helpful during new product introductions since they allow progress to be tracked easily.

The available inventory:

It is the relevant components and material provision ready to use.

Safety stock:

Minimum amount your company has in case there is a deficit. Safety stock calculations include safety stock days and safety stock percent as gross requirement.

Temporary raw material:

It is optional, and you may not use it if your goal is to save inventory costs. The component quantity might be a simple list of replacement parts or shippable product or similar products.

Lead time (cycle time, delivery time, waiting time, etc.):

It is the time that elapses from when you place the order of an order until it arrives. The product cycle management prefers a note of the existing or change timeline.

Scheduled receptions:

Orders of delivery dates in past, might arrive in the next few days.

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It is the number of articles, material components, and supplies that are a part of the manufacturing process. If it is a finished product (independent demand), the corresponding quantity comes from the Master Production of Schedule.

A master production schedule (MPS) is an inventory plan for individual commodities to be produced in each time period such as production, staffing and inventory. Links go to manufacturing where the plan indicates when and how much of each product demand will exist.

This plan includes significant processes, parts, and other resources in order to optimize production, to identify bottlenecks, and to anticipate needs and completed goods. Since a MPS drives much factory activity, its accuracy and viability dramatically affect profitability. Otherwise, if it is configurable material or component parts with dependent demand, the gross needs will be those dictated by the explosion of needs. So, there is an urgent requirement to define total needs. Using MPS helps businesses avoid shortages, costly expediting, last minute scheduling, and inefficient allocation of resources.

To sum up, you must note that regardless of what kind of software or even excel sheets that you use for your BOMs, it is crucial to have all the information in it. Moreover, you also need to make sure that requirement planning is accurate so that you build high-quality products. A comprehensive BOM is also essential because it has all the valuable information to keep a check on it.

In the end, manufacturers rely sincerely on this Bill of Materials to build product. Therefore, you can choose to have either part of the names of quantities or complete information depending on your requirements. Since, there is a tremendous amount of information in a Bill of Materials, companies either use a software or an automated tool to do it. In any case, it is more important to have a BOM with comprehensive information so that it is helpful for future reference.

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Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

Test II

1. _____

2. _____

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LG #34

LO #4- Maintain administrative control over resource acquisition process

Instruction sheet

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

- Procuring and acquiring the administration system.
- Exercising financial responsibility.
- Evaluating procurement reports.
- Facilitating and conducting regular meeting,

This guide will also assist you to attain the learning outcome stated on the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- The administration system through which resources are procured and acquired is monitored for its effectiveness due to organizational regulations
- Financial responsibility is exercised over the procurement and acquisition system and its maintenance based on the cooperate procedures
- Procurement reports are evaluated in preparation for management team meetings due to requirements
- Regular meetings are facilitated and conducted between team members and the client to report on progress based on organizational regulations

Learning Instructions:

9. Read the specific objectives of this Learning Guide.
10. Read all the information sheets in this learning guide.
11. Accomplish the self-check to make sure that you have understood all the theories behind all topics.
12. Do the LAP test to make sure you have acquired all the skill needed to do the task

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Information Sheet 1	Procuring and acquiring the administration system
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1.1 Procurement

Procurement is the act of obtaining goods or services, typically for business purposes. Procurement is most commonly associated with businesses because companies need to solicit services or purchase goods, usually on a relatively large scale.

Procurement generally refers to the final act of purchasing but it can also include the procurement process overall which can be critically important for companies leading up to their final purchasing decision. Companies can be on both sides of the procurement process as buyers or sellers though here we mainly focus on the side of the soliciting company.

1.2 How Procurement Works

Procurement and procurement processes can require a substantial portion of a company's resources to manage. Procurement budgets typically provide managers with a specific value they can spend to procure the goods or services they need. The process of procurement is often a key part of a company's strategy because the ability to purchase certain materials or services can determine if operations will be profitable.

In many cases, procurement processes will be dictated by company standards often centralized by controls from the accounts payable division of accounting. The procurement process includes the preparation and processing of a demand as well as the end receipt and approval of payment.

1.3 ANNUAL PROCUREMENT PLANNING

Procurement Planning is a key tool to assist Agencies in transforming their annual activity plans into a budget, and also assists in the efficient usage of funds allocated. The preparation of an Annual Procurement Plan can assist Agencies in achieving

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improved purchasing power (by grouping procurements together rather than separately), better planning of procurements resulting in faster processes, and reduce the risk of problems occurring during the procurement process.

An Annual Procurement Plan should be prepared by each Agency along with the Annual Budget Bid. This should be revised based on the actual budget allocation and submitted to the Procurement Unit in MoFT within one month of the tabling of the Budget in Parliament. The steps involved in preparing the procurement plan are as follows:

Step 1: Review planned activities and recurrent costs and identify each procurement of goods, works or services within those expected to be in excess of \$200,000 SBD

Step 2: Estimate the value of the Procurement.

Step 3: Decide Procurement Method based on the Purchasing Limits. (Either Competitive Tender, Restricted Tender or Single Sourcing

Step 4: Determine authority (CTB or MTB) for contract Award based on the Purchasing Limits.

Step 5: Estimate timing of each step in the Procurement Process (Q1, Q2, Q3, or Q4).

Step 6: Monitor and update plan at least quarterly to take account of Budget variances or delays, and produce a status report.

1.4 PREPARATION OF SPECIFICATIONS

Once it is decided that a good or service will be procured, it is then necessary to prepare specifications for the required goods/service. A specification is a clear, complete and accurate statement of the particular technical needs or essential characteristics of goods/works/services that SIG requires.

A good specification will:

- State the requirements clearly, concisely and logically.
- State how the item is to be used, including the context of usage.
- Contain enough information for suppliers to accurately scope a solution and offer.
- Be able to be used as the fundamental basis of the contract between buyer and seller.

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1.5 PURCHASING LIMITS AND SELECTION OF PROCUREMENT METHOD

The Requesting Officer will first check whether the goods, works or services requested can be procured under an existing Preferred Supplier Arrangement. If no arrangement is in place then the procurement procedures to be selected depend on the estimated value of the procurement as stated in the table below.

Table

Purchasing limits	Procurement procedure
Up to \$10,000	Accountable Officer must approve the Sole Supplier/Contractor based on one Written Quotation.
More than \$10,000 up to \$200,000	Accountable Officer must approve the Supplier/Contractor based on a minimum of three Written Quotations.
More than \$200,000 up to \$500,000	Ministerial Tender Board must approve the Supplier/Contractor based on a competitive Tender.
More than \$500,000	Central Tender Board must approve the Supplier/Contractor based on a competitive Tender.

1.6 Procurement methods and their application

Approved methods of procurement

The following procurement methods are approved as per article 33 of the Proclamation.

- a) Open bidding
- b) Restricted bidding
- c) Request for quotations
- d) Single source/ direct procurement 19
- e) Request for proposal, and
- f) Two stage bidding
 - Except as otherwise provided in the Proclamation and this Directive, public bodies shall use open bidding as the preferred procedure of procurement.
 - Public bodies may use a method other than open bidding only where conditions for use of such other method stipulated in the Proclamation and this Directive are satisfied.

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- A Public Body using a method of procurement other than open bidding, pursuant to article 33/3 of the Proclamation. Shall record a statement of the grounds and circumstances on which it relied to justify the use of that method.

Acquiring

An acquisition is defined as a corporate transaction where one company purchases a portion or all of another company's shares or assets. Acquisitions are typically made in order to take control of, and build on, the target company's strengths and capture synergies. There are several types of business combinations: acquisitions (both companies survive), mergers (one company survives), and amalgamations (neither company survives).

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Self-Check -1	Written test
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Instruction 1:- choose the best answer (3Pts)

1. _____ is a key tool to assist Agencies in transforming their annual activity plans into a budget, and also assists in the efficient usage of funds allocated. (1Pts)

- A) Acquiring
- B) Procurement planning
- C) Annual budget bid
- D) None

2. _____ is the act of obtaining goods or services, typically for business purposes.

- A) Procurement (1Pts)
- B) Bid
- C) Tender
- D) All of the above

3. _____ acquisition is defined as a corporate transaction where one company purchases a portion or all of another company's shares or assets. (1Pts)

- A) Acquiring
- B) Procurement
- C) Tender
- D) None of the above

Instruction 2:- give short answer (4Pts)

1. Define procurement (2Pts)

2. A good specification for procurement will (2Pts)

Note: Satisfactory rating - 7 points Unsatisfactory - below 7 points

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

Score = _____

Rating: _____

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Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

Test II

1. _____

2. _____



2.1 Introduction

Financial responsibility refers to the process of managing money and other similar assets in a way that is considered productive and is also in the best interest of the individual, or the family, or the business company. Being adept at financial tasks and money management involves cultivation of a mindset which makes it possible to look beyond the needs of the present so as to provide for the needs of future. Besides, it is essentially important to understand the various basic principles so as to achieve a high level of financial responsibility.

2.2 The process of financial responsibility

The process of financial responsibility commences with understanding the difference between what you want and what you need. Being clear with this distinction is helpful in ensuring that the more important purchases are taken care of, while the purchases not essential to maintain a decent quality of life are acquired after fulfilling the needs. For instance, some examples of needs and requirements include food, clothing, and shelter. A majority of people also feel that getting educational credentials of at least university level has also become a basic need in the present day world.

How can owners and operators demonstrate financial responsibility?

The type and degree of financial responsibility depends upon the type and size of the business. However, owners and operators of a business can demonstrate their financial responsibility in different ways like:

- Obtaining commercial environmental impairment liability insurance
- Demonstrating self-insurance
- Obtaining surety bonds, guarantees, or letters of credit
- Placing the requisite amount into a trust fund run by a third party
- Relying on coverage proffered by a state financial assurance fund



Besides, local governments feature four additional compliance methods tailored to their special characteristics like a bond rating test, a guarantee, a financial test, and a dedicated fund.

2.3 Cost of demonstrating financial responsibility

The cost of demonstrating financial responsibility relies upon the method used. Besides, it also, in some cases, depends upon the type of system employed. The most common mechanisms used to conform to the requirements of financial responsibility include state funds and insurance.

Importance of Financial Responsibility

Financial responsibility is important because it impacts your future. Making the right decisions early in life concerning your money can help you become financially independent and live a comfortable life during retirement.

Time Frame

When you are starting out in life, it's a good idea to understand how money works. The earlier you start to save, the more compound interest works in your favor. You earn interest on top of interest.

Effects

Make sure you pay yourself first out of every paycheck. Strive to save 10 percent of your savings. If this amount is too difficult, start at a lower percent and work your way up.

Benefits

Many people have a substantial amount of credit card debt. Credit cards should be used for convenience and emergency purposes only. If you can pay off the balance when you receive your statement, you can keep from accumulating debt and paying finance charges.

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Financial Records

Financial records are documents that provide evidence of or summarize business transactions. A well-organized set of financial records is an essential part of an accounting department. At the most detailed level, financial records can include invoices and receipts. At a more aggregated level, financial records include subsidiary ledgers, the general ledger, and the trial balance. At the most aggregated level, they include the income statement, balance sheet, and statement of cash flows.

Importance of financial records

For most of the entrepreneurs, corporates and business houses in India, financial record management has always been an integral part of their entire business activities. In fact, it is the least funny part of their job which can't be overlooked due to its legal and strategic implications.

Since Records and documents are the elementary backbones of any organization, it is absolutely necessary to store, preserve and manage those records so that they can be unitized later to drive future business growth. Be it in an academic sector or in the field of finance and banking, Smart record keeping is extremely essential to maintain the regular flow of your operational activities.

Good records keeping Strategy will help you extract the following benefits:

- Regularly monitor the overall growth of your business
- Help you to strategize market-oriented business policies.
- Identify income sources & track deductible expenses.
- Faster decision marking and higher work-efficiency.
- Allows you to attain complete regulatory compliances.
- Protect highly prioritized records from natural calamities.

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2.4 Why Do You Need Financial Document Management?

A. Be a watchdog of your organizational activities:

Physical Records like financial statements, audit books, and sales and purchase reports can show whether your business is growing at a positive rate. It provides a window of authentic verification which allows you to detect the loopholes and enable you to formulate market-oriented business policies. In short, it enhances the likelihood of business success.

B. Prepare Authentic Financial-Statements:

A solid document management system ensures the complete availability of various commercial documents such as profit and loss statements, balance sheets and other accounting records. These records are helpful to prepare accurate financial statements.

For Example:

- Records like income and expenditure statements show the overall profit and expenses of your organization in the given period of time.
- On the other hand, complex accounting documentations like balance sheets are the most authentic proof for your existing legal assets, liabilities and equities, on a given period of time.

C. Proper Identification of Your Income Sources:

All kinds of commercial and non-commercial organization extract monetary and property benefits from various income sources. Information related to these income sources are required to separate business from nonbusiness receipts and taxable from nontaxable income. Advance document archiving systems can help you to identify and verify these income sources with the highest degree of authenticity and accuracy.

D. Tracing Your Deductible Expenses:

Systematically organized file management facilities can help you to trace your each and every expense that you have invested in your business. Because, if you do not record your expenses in a proper way, you may lose or misplace them. This would further create multiple problems while filling the annual tax returns.

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E. Properly File Your Tax Returns:

You need smart and efficient record management infrastructures which can accommodate records related to your income, expenses and credit reports. However, these are the same records which you usually used to prepare the financial statements. These records also a mandatory requirement to prepare and file proper solid tax returns.

Accountability & Integrity in Workplace

Accountability and integrity are some of the most important values individuals can exercise in the workplace. Accountability is being responsible or answerable for an action. Integrity describes an individual who makes the choice to commit to honesty before she is faced with choosing between right and wrong. Without either value in the workplace, the culture within the company is at risk for poor organizational development.

Trust

When employers and employees are mutually accountable to each other, employees can trust that their work will be rewarded appropriately. Accountability between both parties -- along with leadership integrity -- can help provide employees with a sense of empowerment and belonging. Integrity allows employees to not fear retribution for their honest opinions and ideas. Accountability allows employees to exercise autonomy with the expectation that they will feel more invested in the company and, therefore, will perform better, more efficiently and more creatively.

Commitment

When employees active practice accountability and integrity in the workplace, they tend to feel more pride and ownership in the company. Managers, however, must set the stage for this to happen by treating all employees as valued members of a team who each have an integral role in helping the company achieve its goals. According to the Online Ethics Center for Engineering and Research, when employees feel pride in their place of employment because of the accountability and integrity practiced, they are more likely to work more efficiently, reduce risks and have better loss control.

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Stability

Managers acting with integrity and practicing accountability are more likely to project a sense of stability to employees, which is important for employee retention, according to the Pay scale website. Along with a sense of stability, employees with bosses who have integrity and are accountable to those who work for them know that their managers will share company information regarding goals. When a company does not provide its employees with stability through accountability and integrity, there is a higher chance the culture will be one of fear and that every employee must fend for herself. Additionally, an unstable work environment may give employees the impression that their boss plays favorites, does not encourage professional growth and creates an environment that does not promote high performance and productivity.

Standards

One of the best ways to lead is by example. If management allows its leaders to act without accountability and integrity, other employees will follow suit. The leaders of a company serve as the foundation of a company, so it is vital that this foundation is built on accountability and integrity. This is because a manager with weak values is more likely to produce employees who emulate his unwanted values. Conversely, a company supported with strong values will produce a culture that has an environment that performs well.

2.5 Transparency of financial processes

In financial reporting, transparency is considered to be reports that have high quality and clear information which makes them easy to understand. The company's budgeting and forecasting should be readily available for possible as well as existing investors to access and comprehend.

Why is Transparency Important in Financial Reporting?

When preparing reports there are companies that go to great lengths to mislead potential investors in order to be more appealing. It goes without saying that these companies should be avoided at all costs. Some companies ignore their knowledge of why it is necessary to be transparent in their financial reporting. Consequently, this makes them a significantly higher risk investment with the possibility of lower returns.

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The best way to illustrate why it is important to be transparent in financial reporting is to use an example that involves two companies. Their shares have a similar market value and their financial leverage and total market risk exposure are about the same; as is their income, expenses and corporate financial. There is only one difference between them that market analysts take into great consideration when deciding which would be better to invest in. The first company is only involved in one business venture. Their financial reporting is very clear and the budgeting and forecasting easy to understand. The second company has overextended their reach and is trying to run several areas of business at the same time. Their financial reporting figures are complicated and off-putting. The decision of which company would be better to invest their money in would be made through the simplicity of the first's financial budgeting and their reports.

It is important for companies to understand the psychology of their investors. This makes them realize that people are more likely to make investments in a company that has complete transparency in their financial reporting. When reports are opaque there is no sense of the actual risks or true state that the company is in. There is the possibility that the company is trying to hide the fact that it may be going bankrupt because of a surplus of debt. The corporate financial is an indicator of whether or not the business will be growing at a rate that makes investing in it worthwhile. If the evidence of its potential can't be seen because of too many holding companies, it becomes difficult to evaluate possible growth on investments.

2.6 Legal Compliance

Legal compliance is the process by which a company adheres to the complex rules, policies and processes that regulate business practice in a particular jurisdiction.

Compliance involves not only knowing and understanding the legislation that applies to the organization, but also being able to demonstrate that the business and its entities are in compliance at all times.

A robust compliance process includes, but is not limited to, keeping records of checks, having policies and procedures in place around the legislation, and retaining evidence that the right people are taking responsibility for compliance.

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A failure to pay attention to measuring compliance can lead to a company not only falling foul of regulators, but also facing fines, censures, reputational damage and even, in some instances, the prospect of jail time for directors.

Compliance requirements differ by jurisdiction, making evaluating legal compliance a difficult and sizeable responsibility for entity managers tasked with its tracking.

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Self-Check -2	Written test
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Instruction 1:- choose the best answer (5Pts)

1. When you are starting out in life, it's a good idea to understand how money works.

(1Pts)

- A) Effects
- B) Time Frame
- C) Benefits
- D) All of the above

2. _____are documents that provide evidence of or summarize business transactions. (1Pts)

- A) Time frame
- B) Financial record
- C) Financial responsibility
- D) None

3. _____is being responsible or answerable for an action. (1Pts)

- A) Accountability
- B) Responsibility
- C) Integrity
- D) None

4. _____describes an individual who makes the choice to commit to honesty before she is faced with choosing between right and wrong. (1Pts)

- A) Integrity
- B) Responsibility
- C) A & C
- D) None

5. _____is considered to be reports that have high quality and clear information which makes them easy to understand. (1Pts)

- A) Integrity
- B) Transparency

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C) Accountability

D) Responsibility

Instruction 2:- give short answer (4Pts)

1. What is financial responsibility? (2Pts)

2. Why Do You Need Financial Document Management list three benefits. (2Pts)

Note: Satisfactory rating - 9 points

Unsatisfactory - below 9 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

4. _____

5. _____

Test II

1. _____

2. _____



Information Sheet 3	Evaluating procurement reports
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3.1 Introduction

3.1.1 Procurement Reports

Procurement is the process of finding and agreeing to terms, and acquiring goods, services, or works from an external source, often via a tendering or competitive bidding process.

Procurement generally involves making buying decisions under conditions of scarcity. If sound data is available, it is good practice to make use of economic analysis methods such as cost-benefit analysis or cost-utility analysis.

Procurement as an organizational process is intended to ensure that the buyer receives goods, services, or works at the best possible price when aspects such as quality, quantity, time, and location are compared. Corporations and public bodies often define processes intended to promote fair and open competition for their business while minimizing risks such as exposure to fraud and collusion.

Almost all purchasing decisions include factors such as delivery and handling, marginal benefit, and price fluctuations. Organizations which have adopted a corporate social responsibility perspective are also likely to require their purchasing activity to take wider societal and ethical considerations into account.

3.2 Report

A report is an informative document with data organized in a narrative, graphic, or tabular form. Reports can be prepared on random requests or periodic regularity as required by the user. Procurement organizations use various reports (e.g.: spend report, supplier base report, accounts payable report) to study factors influencing enterprise-wide spend and to streamline the entire procurement operation.

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Self-Check -3	Written test
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Instruction 1:- give short answer (4Pts)

1. What is procurement report?

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

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____



4.1 Planning Effective Meetings

Meeting management tends to be a set of skills often overlooked by leaders and managers. The following information is a rather "Cadillac" version of meeting management suggestions. The reader might pick which suggestions best fits the particular culture of their own organization. Keep in mind that meetings are very expensive activities when one considers the cost of labor for the meeting and how much can or cannot get done in them. So take meeting management very seriously.

The process used in a meeting depends on the kind of meeting you plan to have, e.g., staff meeting, planning meeting, problem solving meeting, etc. However, there are certain basics that are common to various types of meetings. These basics are described below.

4.2 Selecting Participants

- The decision about who is to attend depends on what you want to accomplish in the meeting. This may seem too obvious to state, but it's surprising how many meetings occur without the right people there.
- Don't depend on your own judgment about who should come. Ask several other people for their opinion as well.
- If possible, call each person to tell them about the meeting, it's overall purpose and why their attendance is important.
- Follow-up your call with a meeting notice, including the purpose of the meeting, where it will be held and when, the list of participants and whom to contact if they have questions.
- Send out a copy of the proposed agenda along with the meeting notice.
- Have someone designated to record important actions, assignments and due dates during the meeting. This person should ensure that this information is distributed to all participants shortly after the meeting.



4.3 Developing Agendas

- Develop the agenda together with key participants in the meeting. Think of what overall outcome you want from the meeting and what activities need to occur to reach that outcome. The agenda should be organized so that these activities are conducted during the meeting.

In the agenda, state the overall outcome that you want from the meeting

- Design the agenda so that participants get involved early by having something for them to do right away and so they come on time.
- Next to each major topic, include the type of action needed, the type of output expected (decision, vote, action assigned to someone), and time estimates for addressing each topic
- Ask participants if they'll commit to the agenda.
- Keep the agenda posted at all times.
- Don't overly design meetings; be willing to adapt the meeting agenda if members are making progress in the planning process.
- Think about how you label an event, so people come in with that mindset; it may pay to have a short dialogue around the label to develop a common mindset among attendees, particularly if they include representatives from various cultures.

4.4 Opening Meetings

- Always start on time; this respects those who showed up on time and reminds late-comers that the scheduling is serious.
- Welcome attendees and thank them for their time.
- Review the agenda at the beginning of each meeting, giving participants a chance to understand all proposed major topics, change them and accept them.
- Note that a meeting recorder if used will take minutes and provide them back to each participant shortly after the meeting.
- Model the kind of energy and participant needed by meeting participants.

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- Clarify your role(s) in the meeting.

4.5 Establishing Ground Rules for Meetings

- You don't need to develop new ground rules each time you have a meeting, surely. However, it pays to have a few basic ground rules that can be used for most of your meetings. These ground rules cultivate the basic ingredients needed for a successful meeting.
- Four powerful ground rules are: participate, get focus, maintain momentum and reach closure. (You may want a ground rule about confidentiality.)
- List your primary ground rules on the agenda.
- If you have new attendees who are not used to your meetings, you might review each ground rule.
- Keep the ground rules posted at all times.

4.6 Time Management

- One of the most difficult facilitation tasks is time management -- time seems to run out before tasks are completed. Therefore, the biggest challenge is keeping momentum to keep the process moving.
- You might ask attendees to help you keep track of the time.
- If the planned time on the agenda is getting out of hand, present it to the group and ask for their input as to a resolution.

4.7 Evaluations of Meeting Process

- It's amazing how often people will complain about a meeting being a complete waste of time -- but they only say so after the meeting. Get their feedback during the meeting when you can improve the meeting process right away. Evaluating a meeting only at the end of the meeting is usually too late to do anything about participants' feedback.
- Every couple of hours, conduct 5-10 minutes "satisfaction checks".
- In a round-table approach, quickly have each participant indicate how they think the meeting is going.

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4.8 Evaluating the Overall Meeting

- Leave 5-10 minutes at the end of the meeting to evaluate the meeting; don't skip this portion of the meeting.
- Have each member rank the meeting from 1-5, with 5 as the highest, and have each member explain their ranking
- Have the chief executive rank the meeting last.

4.9 Closing Meetings

- Always end meetings on time and attempt to end on a positive note.
- At the end of a meeting, review actions and assignments, and set the time for the next meeting and ask each person if they can make it or not (to get their commitment)
- Clarify that meeting minutes and/or actions will be reported back to members in at most a week (this helps to keep momentum going).

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Self-Check -4	Written test
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Instruction 1 choose the best answer (2Pts)

1. _____tends to be a set of skills often overlooked by leaders and managers. (2Pts)

- A) Meeting management
- B) Production management
- C) A & B
- D) None

Instruction 2 gives short answer (3Pts)

Write the basic of meeting management (3Pts)

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

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

Test II

1. _____

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LG #35

LO #5- Supervise the provision and withdrawal of resource

Instruction sheet

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

- Establishing and maintaining System.
- Managing and monitoring strategic information.
- Establishing maintaining communications principles and policies.
- Obtaining and monitoring feedback.

This guide will also assist you to attain the learning outcome stated on the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- system A for the effective supply and withdrawal of resources is established and maintained based on company procedures
- Strategic information on the usage and movement of resources within the production area is managed and monitored based on company regulations
- Communications principles and policies between on-site personnel and providers of physical resources are established and maintained according to policies.
- Feedback from the operators and production staff is obtained and monitored at commencement, during and on completion of the project based on organizational guidelines.

Learning Instructions:

13. Read the specific objectives of this Learning Guide.
14. Read all the information sheets in this learning guide.
15. Accomplish the self-check to make sure that you have understood all the theories behind all topics.
16. Do the LAP test to make sure you have acquired all the skill needed to do the task

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Information Sheet 1	Establishing and maintaining System.
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1.1 Supply chain management

Supply chain management is a frequently encountered phrase these days, as managers strive to improve factory performance. The trouble is that all too often the real meaning is lost. Instead, a casual observer might interpret the activities at the factory as evidence of an intensive effort to improve supplier management.

Supply chain management affects manufacturing in a variety of ways, from both a daily operational, and a strategic perspective. It is an important aspect of manufacturing, for industry managers and entrepreneurs alike; impacting upon processes including but not limited to the availability of inputs needed for production processes, costs and profitability of manufactured items, company infrastructure and ways in which companies interact with their suppliers and customers.

Reliable delivery of inputs is imperative to enabling manufacturers to fulfil time-sensitive orders. Effective supply chain management ensures that raw materials consistently arrive at manufacturing production facilities on time, in turn preventing the need to source additional materials from alternative sources, subsequently avoiding higher prices and preventing lower profitability.

Hewlett-Packard has successfully used this methodology and is making efforts to implement the practice of good supply chain management at all its divisions. HP identified the need to improve its process for manufacturing and delivering products to customers as profit margins suffered pressure from increasing competition. Other factors have contributed to a renewed focus, namely:

- More instances of multisite manufacturing, where several independent entities are involved in the production and delivery process;
- Increasingly cut-throat marketing channels, such as independent computer dealers;
- The maturation of the world economy, with heightening demand for “local” products;

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- Competitive pressures to provide exceptional customer service, including quick, reliable delivery.

8 key benefits of effective supply

Supply chain optimization isn't a simple undertaking, but effective SCM offers numerous benefits that improve the bottom line. Here's a look at eight of the most important benefits of effective supply chain management.

1.2 Better collaboration

Information flow is a prominent challenge for companies. According to Oracle, 76% of companies lack an automated flow of information across the supply chain, and half of companies say fragmented information results in lost sales opportunities. Integrated software solutions remove bottlenecks and allow for the seamless sharing of information, providing a big-picture view of the supply chain from end to end. Thanks to improved access to data, supply chain leaders have the information they need, in context, to make more informed decisions.

1.3 Improved quality control

Companies that have greater control over not only their direct suppliers but also their suppliers' suppliers benefit from improved quality control. Implementing standard minimum quality criteria, for instance, enables direct suppliers to identify and partner with secondary suppliers that meet those requirements. Likewise, process guidelines can help suppliers comply with your company's quality requirements. Some companies go beyond simply providing criteria, conducting periodic audits or requesting documentation verifying suppliers' compliance steps. Hafez recommends implementing a Management Operating System (MOS) for monitoring key performance indicators including:

- On-time delivery
- Scrap rates, reworks and similar issues at suppliers
- Final product quality (as received by end customers)
- Time for complaint resolution
- Findings from supplier quality assessments

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By analyzing performance data, companies can partner with the highest-performing vendors and suppliers to maintain strict quality control.

Higher efficiency rate

Having real-time data on the availability of raw materials and manufacturing delays allows companies to implement backup plans, such as sourcing materials from a backup supplier, preventing further delays. Without real-time data, companies often don't have time to initiate plan B, resulting in issues such as out-of-stock inventory or late shipments to end consumers.

Keeping up with demand

"If consumer sales increase by 5 percent in a given week, a retailer could end up ordering 7 percent more product in response to the increase and a feeling that demand will continue,"

Shipping optimization

According to Logistics Management's The State of Logistics Report, freight transportation costs increased by 7% from 2016 to 2017, while private and dedicated trucking costs increased by 9.5%. Less-than-truckload costs rose by 6.6%, and full truckload costs rose by 6.4%. Due to rising costs, shipping optimization is a priority for supply chain leaders. Identifying the most efficient shipping methods for small parcels, large bulk orders and other shipping scenarios helps companies get orders to customers faster while minimizing costs. Not only do those cost savings boost the company's bottom line, but savings can be passed on to consumers as well to improve customer satisfaction.

1.4 Reduced overhead costs

With more accurate demand predictions, companies can reduce the overhead costs associated with storing slow-moving inventory by stocking less low-velocity inventory to make room for higher-velocity, revenue-producing inventory. Warehouse fulfillment costs contribute significantly to overhead. Reduce these costs by optimizing your warehouse layout, adopting the right automation solutions to improve productivity and implementing a better inventory management system.

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1.5 Improved risk mitigation

Analyzing big-picture and granular supply chain data can reveal potential risks, enabling companies to put backup plans in place to readily respond to unexpected circumstances. By taking proactive action, rather than reacting to supply chain disruptions, quality control issues or other concerns as they arise, companies can avoid negative impacts. Understanding risks also helps companies achieve leaner operations.

Improved cash flow

The benefits discussed above allow companies to make smarter decisions, choose the right partners, accurately predict and respond to market and demand changes and reduce supply chain disruptions, but that's not all: they also improve the company's bottom line. For example, working with reliable suppliers not only means fewer disruptions and more satisfied customers, but it also improves cash flow by allowing you to invoice (and get paid for products and services) sooner.

Withdraw resource

A withdrawal is the process of deleting items from the catalog to ensure that the catalog is up to date and represents only those items that are actually in the collection. Although withdrawn items do not appear in Alma and are not published to Primo, librarians and staff users can view a historical record of these items in Analytics reports. Withdrawn items appear as Lifecycle = Deleted in Analytics.

1.6 Withdrawing One or More Items

There are two methods for withdrawing (deleting) items on the Items List page. One option is to use the Withdraw row action to withdraw one item at a time. The other option is to use the check box column to select more than one item and select Withdraw items.

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Self-Check -1	Written test
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Instruction 1 choose the best answer (3Pts)

1. _____ is a frequently encountered phrase these days, as managers strive to improve factory performance. **(1Pts)**
 - A) profitability of manufactured items
 - B) Supply chain management
 - C) Hewlett-Packard
 - D) preventing lower profitability
2. Companies that have greater control over not only their direct suppliers but also their suppliers' suppliers benefit from improved quality control. **(1Pts)**
 - A) Better collaboration
 - B) Higher efficiency rate
 - C) Improved quality control
 - D) NONE
3. _____ is the process of deleting items from the catalog to ensure that the catalog is up to date and represents only those items that are actually in the collection. **(1Pts)**
 - A) Withdraw resource
 - B) Improved cash flow
 - C) Improved risk mitigation
 - D) NONE

Instruction 2 gives short answer (3Pts)

1. List 8 key benefits of effective supply. **(3Pts)**

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points

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

Score = _____

Rating: _____

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Answer Sheet

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Test I

1. _____

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Test II

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Information Sheet 2	Managing and monitoring strategic information.
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2.1 Introduction

Strategic management is the ongoing planning, monitoring, analysis and assessment of all necessities an organization needs to meet its goals and objectives. Changes in business environments will require organizations to constantly assess their strategies for success. The strategic management process helps organizations take stock of their present situation, chalk out strategies, deploy them and analyze the effectiveness of the implemented management strategies. Strategic management strategies consist of five basic strategies and can differ in implementation depending on the surrounding environment. Strategic management applies both to on premise and mobile platforms.

2.2 Benefits of strategic management

Strategic management is generally thought to have financial and nonfinancial benefits. A strategic management process helps an organization and its leadership to think about and plan for its future existence, fulfilling a chief responsibility of a board of directors. Strategic management sets a direction for the organization and its employees. Unlike once-and-done strategic plans, effective strategic management continuously plans, monitors and tests an organization's activities, resulting in greater operational efficiency, market share and profitability.

2.3 Strategic management concepts

Strategic management is based around an organization's clear understanding of its mission; its vision for where it wants to be in the future; and the values that will guide its actions. The process requires a commitment to strategic planning, a subset of business management that involves an organization's ability to set both short- and long-term goals. Strategic planning also includes the planning of strategic decisions, activities and resource allocation needed to achieve those goals.

Having a defined process for managing an institution's strategies will help organizations make logical decisions and develop new goals quickly in order to keep pace with evolving technology, market and business conditions. Strategic management can, thus,

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help an organization gain competitive advantage, improve market share and plan for its future.

2.3.1 Five stages of strategic management process

There are many schools of thought on how to do strategic management, and academics and managers have developed numerous frameworks to guide the strategic management process. In general, the process typically includes five phases:

- assessing the organization's current strategic direction;
- identifying and analyzing internal and external strengths and weaknesses;
- formulating action plans;
- executing action plans; and
- Evaluating to what degree action plans have been successful and making changes when desired results are not being produced.

2.4 Strategic information

Strategic information systems (SIS) are information systems that are developed in response to corporate business initiative. They are intended to give competitive advantage to the organization. They may deliver a product or service that is at a lower cost, that is differentiated, that focuses on a particular market segment, or is innovative.

Monitoring

Monitoring is the systematic and routine collection of data during project implementation for the purpose of establishing whether an intervention is moving towards the set objectives or project goals. In this case, data is collected throughout the life cycle of the project. The data collection tools are usually embedded into the project activities in order to ensure that the process is seamless. There are several types of monitoring in M&E and they include process monitoring, technical monitoring, assumption monitoring, financial monitoring and impact monitoring.

Process monitoring/ physical progress monitoring

In process monitoring, routine data is collected and analyzed in order to establish whether the project tasks and activities are leading towards the intended project results. It authenticates the progress of the project towards the intended results. This kind of monitoring measures the inputs, activities and outputs. In other words, process

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monitoring answers the questions “what has been done so far, where, when and how has it been done?” Most of the data collected during project implementation usually serves this kind of monitoring.

Technical monitoring

Technical monitoring involves assessing the strategy that is being used in project implementation to establish whether it is achieving the required results. It involves the technical aspects of the project such as the activities to be conducted. In a safe water project for example, physical progress monitoring may show that there is little or no uptake of chlorination as a water treatment strategy. Technical monitoring may establish that this could be a result of installing chlorine dispensers at the water source and women are too time constrained that they have no time to line up to get chlorine from the dispensers. This may prompt a change of strategy where the project might opt for household distribution of bottled chlorine.

Assumption monitoring

Any project has its working assumptions which have to be clearly outlined in the project log frame. These assumptions are those factors which might determine project success or failure, but which the project has no control over. Assumption monitoring involves measuring these factors which are external to the project. It is important to carry out assumption monitoring as it may help to explain success or failure of a project¹. For example, a project that was promoting the use of contraceptives may realize that uptake of use of contraceptives has dropped. The drop in use of the contraceptive could however, be attributed to increased taxation on the importation of contraceptives in the country which makes them more expensive, rather than on project failure.

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Self-Check -2	Written test
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Instruction 1 choose the best answer (3Pts)

1. _____ is the ongoing planning, monitoring, analysis and assessment of all necessities an organization needs to meet its goals and objectives.

(1Pts)

- A) Improved cash flow
- B) Strategic management
- C) market share
- D) ALL

2. _____ are information systems that are developed in response to corporate business initiative. **(1Pts)**

- A) Strategic management
- B) Strategic information systems
- C) SIS
- D) B & C

3. Any project has its working assumptions which have to be clearly outlined in the project log frame. **(1Pts)**

- A) Strategic management
- B) Assumption monitoring
- C) Technical monitoring
- D) physical progress monitoring

Instruction 2 gives short answer (6Pts)

- 1. What are the Benefits of strategic management? **(3Pts)**
- 2. List five stages of strategic management process **(3Pts)**

Note: Satisfactory rating - 9 points

Unsatisfactory - below 9 points

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

Score = _____

Rating: _____

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Answer Sheet

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Information Sheet 3	Establishing maintaining communications principles and policies.
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3.1 Communication Principles

Communication is fundamental to all relationships. Poor communication is the most frequently cited cause of discontent within organizations and it would be reasonable to expect that most employers are seeking to appoint people with good communication skills. It is no surprise, then, that people often cite “excellent communication skills” as one of their key qualities on their CV. So, what do we mean by good communication? How do we recognize it, and how do we ensure that we really do have excellent communication skills? Furthermore, why can communication go so badly wrong and what can we do to improve our communication skills? This paper seeks to address these questions and give practical tips and ideas to help each of us improve as communicators.

3.2 What is the purpose of communication?

At its most fundamental level, the aim is to hear and be heard. Whether we are communicating in the written word, verbally, in pictures or through movement, if the message that we wish to convey is altered in any way, we have not communicated our true meaning. This forms the basis of misunderstanding and miscommunication. How and why do these misunderstandings occur? Unfortunately, they happen all too simply, because we interpret meaning from what we see and hear, based on our own experiences.

3.3 The Principles

3.3.1 Trustworthiness

Effective relationships are built on trust and, with respect to communication; trust that both parties are applying the same principles. Without a sense of trust, it may be difficult to really engage in meaningful communication. If I say something to someone in confidence, I need to trust them to keep that confidence. If someone asks me a question, I trust that my answer is being listened to and that I am being heard. If I am

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asked for my opinion, I need to trust that my opinion is believed to be as valid as the next person's.

3.3.2 Active Listening

Active listening means being focused entirely on the person speaking, and not interrupting or starting to fashion your own response before someone has finished their sentence. This “inner chatter” that goes on in our heads is a barrier to hearing. The moment we start thinking about our response, we stop listening actively. Not only is this disrespectful to the person who is speaking, but also we might hear only half of the message and assume how the message finishes. If we have already come to a conclusion, we have ceased to listen. Active listening is difficult and takes practise. Most people want to talk rather than listen. Use your ears and mouth in that proportion i.e. listen twice as much as you speak!

3.3.3 Non-judgmental

Judging others is not a good basis for building relationships. It is very easy to say that we should be nonjudgmental, but an extremely difficult principle to live by. It is so easy to judge; we do it all the time. As human beings we seem to be programmed to judge other people. What is meant by being judgmental? Put simply, it means that the person who is judging another thinks that “I’m right, you’re wrong”. “I’m better than you are” or “you’re better than me” and “my ideas are better than your ideas” are other examples of passing judgement.

3.3.4 Value Difference

Value the different contributions that people you interact with bring to your relationships. Their opinions may be different but not better or worse. If you can create a trusting environment, whereby people know that their contributions will be valued, they are not being judged; people are respectfully listening to them and appreciating their input, that what they say remains confidential and that they are being listened to fully, you create an environment for active engagement and fruitful relationships.

3.3.5 No Assumptions

People can interpret words they hear in a way that was not intended by the person who said them. If someone says one thing and another takes those words to mean

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something completely different, communication has not occurred. There has simply been an exchange of words without comprehension. This happens when we assume that we understand what is meant without checking things out. It is important to clarify what someone means, rather than make assumptions that you have understood what they are trying to convey.

3.3.6 Authenticity

Be truthful in your communications. We communicate in a number of ways, not just by the words we use. How we say things and movement of the body all have a bearing on the message that is conveyed to the listener or observer. Research tells us that words actually have the least impact on our communication (around 7%). The manner in which we say things – tone, speed, etc (music 38%) and our body language (dance – 55%) are far more important in conveying our message. It is important that all three elements of words, music and dance are congruent. People are generally attuned to picking up non-verbal signals and can tell if there is a mixed message between the words, music and dance.

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4.1 Monitoring Feedback

Feedback is the process of communicating the results and learning from your work to the various stakeholders within and outside of your organization. It is a key way to demonstrate your accountability. Feedback can stimulate changes that will improve the way in which you work and your effectiveness. It can provide examples of good practice to be shared with others, and can inform your national and international advocacy work.

How to do monitoring and evaluation, learning and feedback

There are many learning and feedback frameworks, such as M&E systems, action-research projects, impact assessments, reviews and reports. Whatever system you use, make sure it has a clear purpose, a plan for collecting data, time to analyze the results and ways to communicate them to stakeholders. You may need to change your existing M&E system to make sure it provides the information you need on how your activities are affecting children.

4.2 Positive and negative feedback

Positive feedback: If the signal feedback from output is in phase with the input signal, the feedback is called positive feedback.

Negative feedback: If the signal feedback is of opposite polarity or out of phase by 180° with respect to input signal, the feedback is called as negative feedback.

As an example of negative feedback, the diagram might represent a cruise control system in a car, for example, that matches a target speed such as the speed limit. The controlled system is the car; its input includes the combined torque from the engine and from the changing slope of the road (the disturbance). The car's speed (status) is measured by a speedometer. The error signal is the departure of the speed as measured by the speedometer from the target speed (set point). This measured error is interpreted by the controller to adjust the accelerator, commanding the fuel flow to the engine (the effector). The resulting change in engine torque, the feedback, combines



with the torque exerted by the changing road grade to reduce the error in speed, minimizing the road disturbance.

4.3 Limitations of negative and positive feedback

While simple systems can sometimes be described as one or the other type, many systems with feedback loops cannot be so easily designated as simply positive or negative, and this is especially true when multiple loops are present.

In general, feedback systems can have many signals fed back and the feedback loop frequently contain mixtures of positive and negative feedback where positive and negative feedback can dominate at different frequencies or different points in the state space of a system.

5 Reasons Why Feedback is Important

Effective feedback, both positive and negative, is very helpful. Feedback is valuable information that will be used to make important decisions. Top performing companies are top performing companies because they consistently search for ways to make their best even better. For top performing companies 'continuous improvement' is not just a showy catchphrase. It's a true focus based on feedback from across the entire organization – customers, clients, employees, suppliers, vendors, and stakeholders. Top performing companies are not only good at accepting feedback, they deliberately ask for feedback. And they know that feedback is helpful only when it highlights weaknesses as well as strengths.

Effective feedback has benefits for the giver, the receiver, and the wider organization. Here are five reasons why feedback is so important.

4.4 Feedback is always there

If you ask someone in your organization when feedback occurs, they will typically mention an employee survey, performance appraisal, or training evaluation. In actuality, feedback is around us all the time. Every time we speak to a person, employee, customer, vendor, etc., we communicate feedback. In actuality, it's impossible not to give feedback.

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4.4.1 Feedback is effective listening

Whether the feedback is done verbally or via a feedback survey, the person providing the feedback needs to know they have been understood (or received) and they need to know that their feedback provides some value. When conducting a survey, always explain why respondents' feedback is important and how their feedback will be used.

4.4.2 Feedback can motivate

By asking for feedback, it can actually motivate employees to perform better. Employees like to feel valued and appreciate being asked to provide feedback that can help formulate business decisions. And feedback from client, suppliers, vendors, and stakeholders can be used to motivate to build better working relations.

4.4.3 Feedback can improve performance

Feedback is often mistaken for criticism. In fact, what is viewed as negative criticism is actually constructive criticism and is the best kind of feedback that can help to formulate better decisions to improve and increase performance.

4.4.4 Feedback is a tool for continued learning

Invest time in asking and learning about how others experience working with your organization. Continued feedback is important across the entire organization in order to remain aligned to goals, create strategies, develop products and services improvements, improve relationships, and much more. Continued learning is the key to improving.

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Self-Check -4	Written test
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Instruction 1 choose the best answer (4Pts)

1. The process of communicating the results and learning from your work to the various stakeholders within and outside of your organization. **(2Pts)**
 - A) Feedback
 - B) Monitoring
 - C) Evaluation
 - D) NONE
2. If the signal feedback from output is in phase with the input signal, the feedback is called **(2Pts)**
 - A) Positive feedback.
 - B) Negative feedback
 - C) changing road
 - D) NONE

Instruction 2 gives short answer (3Pts)

1. List 5 Reasons Why Feedback is Important **(3Pts)**

Note: Satisfactory rating - 7 points Unsatisfactory - below 7 points

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

Score = _____

Rating: _____

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LG #36

LO #6- Assure quality and verify all data

Instruction sheet

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

- Verifying complete estimate production or project costs.
- Comparing actual costs.
- Motivating or rectifying deviations.
- Obtaining Assistance/approval from management.

This guide will also assist you to attain the learning outcome stated on the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- Completed estimated production or project costs for inclusion in a tender or bill are verified in compliance with a computer supported cost calculation format
- Actual costs are compared with estimated cost to identify deviations according to operational regulations and standards
- Deviations are motivated or rectified according to established organizational framework, procedures and routines.
- Assistance/approval from management is obtained based on company policies

Learning Instructions:

17. Read the specific objectives of this Learning Guide.

18. Read all the information sheets in this learning guide.

19. Accomplish the self-check to make sure that you have understood all the theories behind all topics.

20. Do the LAP test to make sure you have acquired all the skill needed to do the task

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Information Sheet 1	Verifying complete estimate production or project costs.
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1.1 Cost of production

Cost of production refers to the total cost incurred by a business to produce a specific quantity of a product or offer a service. Production costs may include things such as labor, raw materials, or consumable supplies. In economics, the cost of production is defined as the expenditures incurred to obtain the factors of production such as labor, land, and capital, which are needed in the production process of a product.

For example, the production costs for a motor vehicle tire may include expenses such as rubber, labor needed to produce the product, and various manufacturing supplies. In the service industry, the costs of production may entail the material costs of delivering the service, as well as the labor costs paid to employees tasked with providing the service.

1.2 Types of Costs of Production

There are various types of costs of production that businesses may incur in the course of manufacturing a product or offering a service. They include the following:

1. Fixed costs

Fixed costs are expenses that do not change with the amount of output produced. This means that the costs remain unchanged even when there is zero production or when the business has reached its maximum production capacity. For example, a restaurant business must pay its monthly, quarterly, or yearly rent regardless of the number of customers it serves. Other examples of fixed costs include salaries and equipment leases.

Fixed costs tend to be time-limited, and they are only fixed in relation to the production for a certain period. In the long term, the costs of producing a product are variable and will change from one period to another.

2. Variable costs

Variable costs are costs that change with the changes in the level of production. That is, they rise as the production volume increases and decrease as the production volume

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decreases. If the production volume is zero, then no variable costs are incurred. Examples of variable costs include sales commissions, utility costs, raw materials, and direct labor costs.

For example, in a clothing manufacturing facility, the variable costs may include raw materials used in the production process and direct labor costs. If the raw materials and direct labor costs incurred in the production of shirts are \$9 per unit and the company produces 1000 units, then the total variable costs are \$9,000.

3. Total cost

Total cost encompasses both variable and fixed costs. It takes into account all the costs incurred in the production process or when offering a service. For example, assume that a textile company incurs a production cost of \$9 per shirt, and it produced 1,000 units during the last month. The company also pays a rent of \$1,500 per month. The total cost includes the variable cost of \$9,000 ($\$9 \times 1,000$) and a fixed cost of \$1,500 per month, bringing the total cost to \$10,500.

4. Average cost

The average cost refers to the total cost of production divided by the number of units produced. It can also be obtained by summing the average variable costs and the average fixed costs. Management uses average costs to make decisions pricing its products for maximum revenue or profit.

The goal of the company should be to minimize the average cost per unit so that it can increase the profit margin without increasing costs.

5. Marginal cost

Marginal cost is the cost of producing one additional unit of output. It shows the increase in total cost coming from the production of one more product unit. Since fixed costs remain constant regardless of any increase in output, marginal cost is mainly affected by changes in variable costs. The management of a company relies on marginal costing to make decisions on resource allocation, looking to allocate production resources in a way that is optimally profitable.

For example, if the company wants to increase production capacity, it will compare the marginal cost vis-à-vis the marginal revenue that will be realized by producing one more

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unit of output. Marginal costs vary with the volume of output being produced. They are affected by various factors, such as price discrimination, externalities, information asymmetry, and transaction costs.

1.3 How to Calculate the Cost?

The first step when calculating the cost involved in making a product is to determine the fixed costs. The next step is to determine the variable costs incurred in the production process. Then, add the fixed costs and variable costs, and divide the total cost by the number of items produced to get the average cost per unit.

$$\text{Average Cost Per Unit} = \frac{\text{Fixed Costs} + \text{Variable Costs}}{\text{Total No. of Items Produced}}$$

For the company to make a profit, the selling price must be higher than the cost per unit. Setting a price that is below the cost per unit will result in losses. It is, therefore, critically important that the company be able to accurately assess all of its costs.

1.4 Production Cost Formula

The production cost formula is composed of costs that the business or a company incurs in making finished goods or delivering specific services and includes typically direct labor, general overhead expenses, direct material expenses, or expenses on raw materials and supplies expenses.

The production costs should be directly aligned with the revenue generation of the business. The manufacturing business typically has raw materials costs and labor costs. In contrast, typical service industry is composed of technical labor developing a specific service and material costs incurred in delivering such services to the clients. Production cost formula is generally used in managerial accounting to segregate costs to direct and indirect costs.

The production cost formula can be expressed as follows: –

Production Cost Formula = Direct Labor + Direct Material + Overhead Costs on Manufacturing

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1.5 Explanation of the Total Production Cost Formula

The calculation of Production Cost Equation can be done by using the following steps:

- **Step 1:** Firstly, Determine the costs of direct material. Direct materials usually are composed of costs that are related to the procurement of raw materials and utilizing them to produce finished goods.
- **Step 2:** Next, determine the costs of direct labor. The cost of direct labor is usually composed of costs on labor costs and costs on manpower that are in line with the process of production. Such costs generally consist of wages, salaries, and the benefits the business compensates to the labor for delivering finished goods or services.
- **Step 3:** Next, Determine the costs of manufacturing. Such costs typically comprise of costs that can't be attributed to the production process but indirectly impacts the production. Such costs can be bifurcated into indirect labor costs, indirect material costs, and variable costs on overhead.
- **Step 4:** Next, add the resulting value in step 1, step 2, and step 3 to arrive at the cost of production.

Examples of Total Production Cost Formula (with Excel Template)

Production Cost Formula – Example #1

Let us take the example of a manufacturing business that incurs \$25,000 indirect labor. It incurs \$30,000 in manufacturing overheads and \$50,000 in the direct material costs. Help the business to determine the overall cost of production.

	A	B
2	Item Name	Value
3	Direct Labor	\$25,000
4	Direct Material	\$50,000
5	Manufacturing Cost	\$30,000
6		

Calculation of Production Cost can be done as follows:

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		Production Cost = Direct Labor + Direct Material + Overhead Costs on Manufacturing	=B3+B4+B5
			B
2	Item Name	Value	
3	Direct Labor	\$25,000	
4	Direct Material	\$50,000	
5	Manufacturing Cost	\$30,000	
6	Production Cost	=B3+B4+B5	
7			

$$= \$25,000 + \$50,000 + \$30,000$$

Production Cost will be –

B6		=B3+B4+B5
	A	B
2	Item Name	Value
3	Direct Labor	\$25,000
4	Direct Material	\$50,000
5	Manufacturing Cost	\$30,000
6	Production Cost	\$105,000
7		

Production Cost = \$105,000

Therefore, the manufacturing business incurs a production cost of \$105,000 when manufacturing finished goods.

Production Cost Formula – Example #2

Let us take the example of a business that specializes in the production of chairs. The raw material cost accounts for \$75,000. The wages and salaries for the labor and workers account for \$40,000. The company compensates benefits worth \$3,000 to the labor for delivering exceptional service. The company additionally bears once in a while polishing costs on chairs of \$30,000.

The business stores the finished chairs in a rented warehouse. They pay a rental amount of \$20,000. They additionally pay \$15,000 as the wage for security guards. Help the business of finished chairs to determine the cost of production.

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Use the given data for the calculation of production cost.

	A	B
2	Item Name	Value
3	Worker Wages	\$40,000
4	Worker Benefits	\$3,000
5	Direct Material	\$75,000
6	Polishing Cost	\$30,000
7	Rental Expense	\$20,000
8	Security Personnel Wages	\$15,000
9		

Calculation of Direct Labor using below formula can be done as follows,

B9	Direct Labor = Wages of Production Workers + Benefits of the Production Workers	=B3+B4
	A	B
2	Item Name	Value
3	Worker Wages	\$40,000
4	Worker Benefits	\$3,000
5	Direct Material	\$75,000
6	Polishing Cost	\$30,000
7	Rental Expense	\$20,000
8	Security Personnel Wages	\$15,000
9	Direct Labor	\$43,000
10		

Direct labor = Wages of Production Workers + Benefits of the Production Workers
= \$40,000 + \$3,000

Direct Labor = \$43,000

The direct material costs correspond to the cost of raw material procured by the business, and it would be regarded as \$75,000. The costs of manufacturing would account for the sum of polishing, rental expense, and wages for the security guards.

Calculation of Manufacturing Cost using below formula can be done as follows,

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B10		=B6+B7+B8
		B
2	Item Name	Value
3	Worker Wages	\$40,000
4	Worker Benefits	\$3,000
5	Direct Material	\$75,000
6	Polishing Cost	\$30,000
7	Rental Expense	\$20,000
8	Security Personnel Wages	\$15,000
9	Direct Labor	\$43,000
10	Manufacturing Cost	\$65,000
11		

Manufacturing Cost =
Polishing Cost + Rental
Expense+ Wage for
Security Personnel

Manufacturing Cost = Polishing Cost + Rental Expense+ Wage for Security Personnel
= \$30,000 + \$20,000 + \$15,000

Manufacturing Cost = \$65,000

Calculation of Production Cost can be done as follows:

		=B9+B5+B10
		B
2	Item Name	Value
3	Worker Wages	\$40,000
4	Worker Benefits	\$3,000
5	Direct Material	\$75,000
6	Polishing Cost	\$30,000
7	Rental Expense	\$20,000
8	Security Personnel Wages	\$15,000
9	Direct Labor	\$43,000
10	Manufacturing Cost	\$65,000
11	Production Cost	=B9+B5+B10
12		

Production Cost =
Direct Labor + Direct
Material + Overhead
Costs on Manufacturing

= \$43,000 + \$75,000 + \$65,000



A		B
2	Item Name	Value
3	Worker Wages	\$40,000
4	Worker Benefits	\$3,000
5	Direct Material	\$75,000
6	Polishing Cost	\$30,000
7	Rental Expense	\$20,000
8	Security Personnel Wages	\$15,000
9	Direct Labor	\$43,000
10	Manufacturing Cost	\$65,000
11	Production Cost	\$183,000
12		

Production Cost = \$183,000

Therefore, the manufacturing business incurs a production cost of \$183,000 when manufacturing chairs.



Self-Check -1	Written test
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Instruction 1 choose the best answer (4Pts)

1. _____refers to the total cost incurred by a business to produce a specific quantity of a product or offer a service. **(1Pts)**
 - A) Cost of production
 - B) service industry
 - C) Fixed costs
 - D) NONE
2. _____refers to the total cost of production divided by the number of units produced. **(1Pts)**
 - A) Total cost
 - B) Average cost
 - C) Marginal cost
 - D) Variable costs
3. _____are costs that change with the changes in the level of production. **(1Pts)**
 - A) Total cost
 - B) Marginal cost
 - C) Variable costs
 - D) Fixed costs
4. _____is the cost of producing one additional unit of output. **(1Pts)**
 - A) Marginal cost
 - B) Average cost
 - C) Variable costs
 - D) NONE

Instruction 2 gives short answer (6Pts)

1. List Types of Costs of Production**(3Pts)**

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2. What is production cost? (3Pts)

Note: Satisfactory rating - 10 points

Unsatisfactory - below 10 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

4. _____

5. _____

Test II

1. _____

2. _____



Information Sheet 2	Comparing actual costs.
----------------------------	--------------------------------

2.1 Comparing actual costs

Actual and estimate costs show the difference between prediction and the reality of the costs. Estimated costs are those used to plan for expenses and record transactions beforehand, while actual costs are the result of the actual cost-incurring activity.

The terms actual and estimate are often used in an accounting sense to refer to the prices of assets when they are being bought or sold. In accounting, prices are calculated before and after transactions actually take place, so companies can stay ahead of the game and properly project their gains and losses ahead in time. This helps them make better decisions and, of course, show investors where the companies are heading.

2.1.1 Actual cost

Of the two terms, actual is the most simple to explain. An actual amount is the amount paid for a product or service. When the transaction occurs, this is the money that changes hands, and the amount that is officially recorded in the books as the final price. Nothing can change the actual price--it is always the final number. In contracting, for instance, the actual amount includes all direct labor, materials and miscellaneous charges. Because they are direct and have already been incurred, they are considered actual, set in stone.

2.1.2 Estimate cost

The estimate, on the other hand, is a highly flexible number, and has a number of different definitions depending on the circumstances. The classic kind of estimate refers to a price set on a project, especially some type of operation or services. To reach such an estimate, a variety of factors are taken into consideration, including the labor needed to complete the project and the materials involved. This is also sometimes called the "standard cost."

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Market Value

Estimated cost can also refer to the market price of an asset. This is especially true of property, houses and stocks. These items have constantly fluctuating market values based on many different factors. A stock's price might change from moment to moment, while housing prices rise and fall with interest in property and banking loan practices. The problem is that market values do not accurately reflect actual prices. People use a number of formulas to accurately calculate market value and use the results to judge how fair offers are, but that does not mean the market value always wins out. Lower and higher offers are often accepted, which leads to an estimated cost differing from the actual cost.

Accounting

Companies always prefer that their estimated costs match their actual costs as closely as possible, and a number of accounting methods are used to compare estimated and actual costs month by month, and calculate them closer together. Of course, some factors will always be unpredictable, leading to a slight difference between the two no matter how accurate the data is.

Example

Actual cost also applies to manufacturing products as well. The actual cost of manufacturing a product is the total expenditures required to build or manufacture the product. Think of actual cost as the end result of a manufacturing process.

First, a company starts planning the production and forecasts what the expenses will be. Second, the company budgets what it will be able to afford and adjusted to the production levels to meet the budget. If everything goes according to plan, the actual costs will equal the budgeted costs. In the real world, things can go wrong and budgets are not always met. The end result is the actual cost. It could be plus or minus the budgeted or forecasted cost.

2.2 Differences between actual cost & Estimated Cost

Actual cost	Estimated cost
It gives an emphasis on "What should be the Cost".	It presumes that what will be the cost.

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It uses the parameter of efficiency	It uses the perception of efficiency applied.
It is revised at frequent intervals	It cannot be revised since there is no need of revision.
It is ascertained on the assumption that free movement of cost will not be allowed.	It is ascertained-on the assumptions that free movement of cost.
It is more stable in nature.	It is more flexible and changed at every change of situation.
It is a reliable tool of cost control.	It cannot be used as a cost control.
It is used only when complete cost data are available.	It can be used in every situation.
It is used for finding variances.	Variances cannot be find out from the estimated costs.
Scientific basis is applied to set standard cost.	There is no scientific basis used but only approximations are used to set estimated cost.
It is applied if the organization has standard costing system.	It is applied in every business organization



Self-Check -2	Written test
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Instruction 1 gives short answer (6Pts)

1. What is actual cost? **(2Pts)**
2. What is estimated cost? **(2Pts)**
3. Compare actual cost with estimated cost**(2Pts)**

Note: Satisfactory rating - 6 points Unsatisfactory - below 6 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____

3. _____

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Information Sheet 3	Motivating or rectifying deviations.
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3.1 Deviation

In mathematics and statistics, deviation is a measure of difference between the observed value of a variable and some other value, often that variable's mean. The sign of the deviation reports the direction of that difference (the deviation is positive when the observed value exceeds the reference value). The magnitude of the value indicates the size of the difference.

3.2 Standard Deviation

The standard deviation is a statistic that measures the dispersion of a dataset relative to its mean and is calculated as the square root of the variance. The standard deviation is calculated as the square root of variance by determining each data point's deviation relative to the mean. If the data points are further from the mean, there is a higher deviation within the data set; thus, the more spread out the data, the higher the standard deviation.

- Standard deviation measures the dispersion of a dataset relative to its mean.
- A volatile stock has a high standard deviation, while the deviation of a stable blue-chip stock is usually rather low.
- As a downside, the standard deviation calculates all uncertainty as risk, even when it's in the investor's favor—such as above average return.

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Self-Check -3	Written test
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Instruction 1 gives short answer (6Pts)

1. Explain deviation **(3Pts)**
2. What is standard deviation? **(3Pts)**

Note: Satisfactory rating - 6 points Unsatisfactory - below 6 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

2. _____



Information Sheet 4	Obtaining Assistance/approval from management.
---------------------	--

4.1 Obtaining Approval from management

Managing approvals can be difficult when it's handled by emails, spreadsheets, paper, or other old-school methods. Emails get missed, spreadsheets are cumbersome, paper is...well, paper. Yet many businesses still handle approvals with these methods. Approval Management (also known Approval Management Engines or AME) seeks to replace these tired, manual approval processes with workflow automation.

When an approval is for how much to spend on a cake for the next office party, the risk is low. When the approval is for a **critical piece of production equipment or a new hire**, the risk is very high. When does approval management make sense? Any of these situations requires a dedicated approval management system:

- Risk is significant.
- Speed is critical.
- Transparency is required.
- Approvals may be audited.
- Approval structure is complex.

Consider Your Current Approval Management "System"

Consider how you currently manage approvals and how it impacts you, your department and the rest of your organization.

- Are critical deadlines missed or put in jeopardy because a critical approval is sitting on someone's desk?
- Do people spend an inordinate amount of time trying to find the status of an approval?
- Do people even know what the approval process is and who needs to approve various requests?
- If needed, could you provide a complete audit trail of every approval?
- Are requests sometimes approved improperly?

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Integrity's approval management software provides a system to manage approval workflow transparently, effectively and accurately. Approval requests are submitted through a self-service portal, routed based on preset business rules and tracked every step of the way. Tracking means submitters can see where approvals are and auditors can see a full history of who approved what and when.

4.2 Build Your Own Automated Approval Process with Integrity

Administrators can quickly build approval forms and workflows in a drag and drop interface and then make changes as the business changes. Need to assign a stand-in approver in case the main approver is unavailable? No problem. Need to configure alerts to keep an approval request moving forward? It's easy with our drag-and-drop approval process builder.

Plus, you don't need to know how to write code to add business logic or design approval matrices to ensure the right person is making decisions at the right time. Integrity is designed to handle any approval process right out of the box.

4.3 Proof Mode

Approving every change in a system can be cumbersome. Setting Proof Mode in the Approval Constants allows the system to logically group changes to transactions. The system saves the changes within a transaction to work files. Other users cannot view or use the changes in a transaction until the originator of the change submits it to the system for processing.

Users can view transactions using the Transaction Workbench program (P00A11). The Transaction Workbench allows the originating user to view the transaction detail, submit the transaction, or cancel the transaction. In some cases, the user who created the transaction might decide the changes are not necessary and cancel the transaction. If the user submits the transaction, the system moves the changes within the transaction from the work file to the production file. You can run the Approvals Management system in proof mode with approval processing deactivated. However, you must activate Proof Mode if the Approvals Management system is active.

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4.3.1 Approvals Processing

After you activate Approvals Management processing, the system compares data in transactions you submit to the appropriate rule sets before moving the transactions to production. The system creates an approval request when it evaluates a rule to be true. The system does not move changes in a transaction to production until the appropriate person (approver) approves the approval request. If the approver rejects the request, the system rejects the transaction and the data does not move to production. Approvers you assign to an approval request can view and approve or reject approval requests using the Approvals Workbench program. The system automatically moves the transaction data from the work files to production once the last approver approves the approval request.

Email Processing

Email messages can be sent from the approvals management system in:

- Real-time, using Send Distribution
- Batch, using the Approvals Email Processor

The Approvals Email Processor uses the Electronic Document Delivery (EDD) system to send email messages. The EDD system provides email formatting options not available when using the Send Distribution functionality.

Timecard Approval Workbench

Use the Timecard Approval Workbench to review and manage timecards controlled by the Approvals Management application. You use the Timecard Approval Workbench to approve or reject timecards and to monitor timecards in process.

The Timecard Approval Workbench was customized for payroll timecard approvals only and therefore differs slightly from the standard Approvals Management Workbench. The Timecard Approval Workbench has additional selection fields and detail formats.

Timecard Email Processor

Use the Timecard Email Processor to process e-mail in batch for the approvals management system. You can run this program via Unattended Operations, which allows you to choose when the notifications occur. The system sends the e-mail message using the Electronic Document Delivery system.

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Self-Check -4	Written test
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Instruction 1 choose the best answer (2Pts)

1. _____ can quickly build approval forms and workflows in a drag and drop interface and then make changes as the business changes. **(2Pts)**
- A) Administrators
 - B) Approval Process
 - C) approval management
 - D) NONE

Instruction 2 gives short answer (4Pts)

1. Explain about proof mood. **(4Pts)**

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points

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

Score = _____

Rating: _____

Answer Sheet

Name: _____

Date: _____

Test I

1. _____

Test II

1. _____

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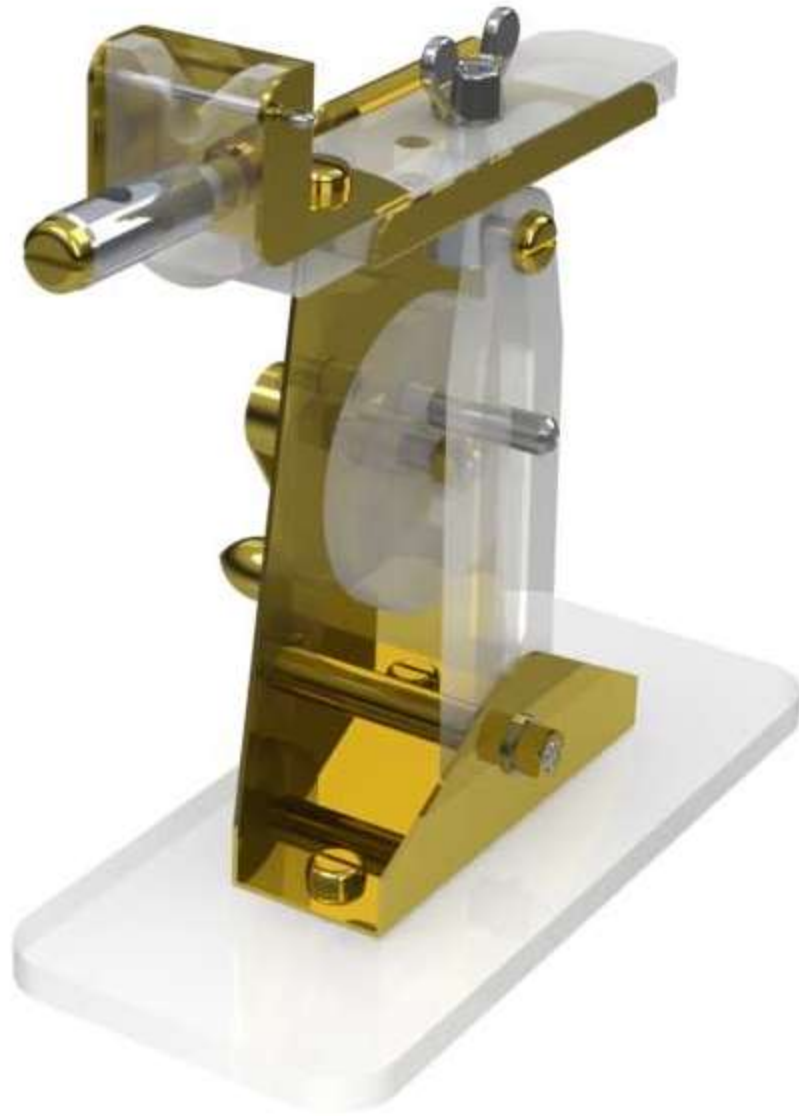


Operation Sheet 2– prepares bill of material and cost estimation for Model shaping machine.

Objective to prepare bill of material and cost estimation for model shaping machine

1. Prepare detail bill of material
2. Prepare tools, equipment and machineries according to their specification.
3. Prepare cost of material
4. Prepare manufacturing , overhead, and production cost
5. Monitoring/check the quality of document.
6. Apply quality assurance

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