

project management professional PMP

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CHAPTER 7 CLOSING PROCESS GROUP

PROCESS No.46

CLOSE PROJECT OR PHASE

CLOSE PROJECT OR PHASE

The formal acceptance for the phase or project results and the project manager must have a big role in this process to make sure that the project met its objective.

PROCESS No.47

CLOSE PROCUREMENTS

CLOSE PROCUREMENTS

The completion of all the project procurement.

Closeout Meetings:

Sessions held in the end of the project and in these meetings all the Lessons Learned should be documented, and these meetings could include the key stakeholders, staff, and customer.

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Force Majeure Clause:

The superior force, which is normally added as an additional clause in the contract, and it explains the actions from both party when an extraordinary event happen and when that event is beyond the control of each party, such as war, riot, strike and any other events known as (Act of God) such as flood, earthquake, tornado ,, etc

PROCESS No.45**CONTROL STAKEHOLDER ENGAGEMENT****CONTROL STAKEHOLDER ENGAGEMENT**

The process of monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging stakeholders. The key benefit of this process is that it will maintain or increase the efficiency and effectiveness of stakeholder engagement activities as the project evolves and its environment changes

PROCESS No.42

CONTROL COMMUNICATION

CONTROL COMMUNICATION

The process of monitoring and controlling communications throughout the entire project life cycle to ensure the information needs of the project stakeholders are met. The key benefit of this process is that it ensures an optimal information flow among all communication participants, at any moment in time

PROCESS No.43

CONTROL RISKS

CONTROL RISKS

The process of implementing risk response plans , monitoring identified and residual risks, identifying new risks, and evaluating the effectiveness of risk strategies throughout the life of the project

RISK REASSESSMENT

Includes reassessment for current risks and identifying new risks

PROCESS No.44

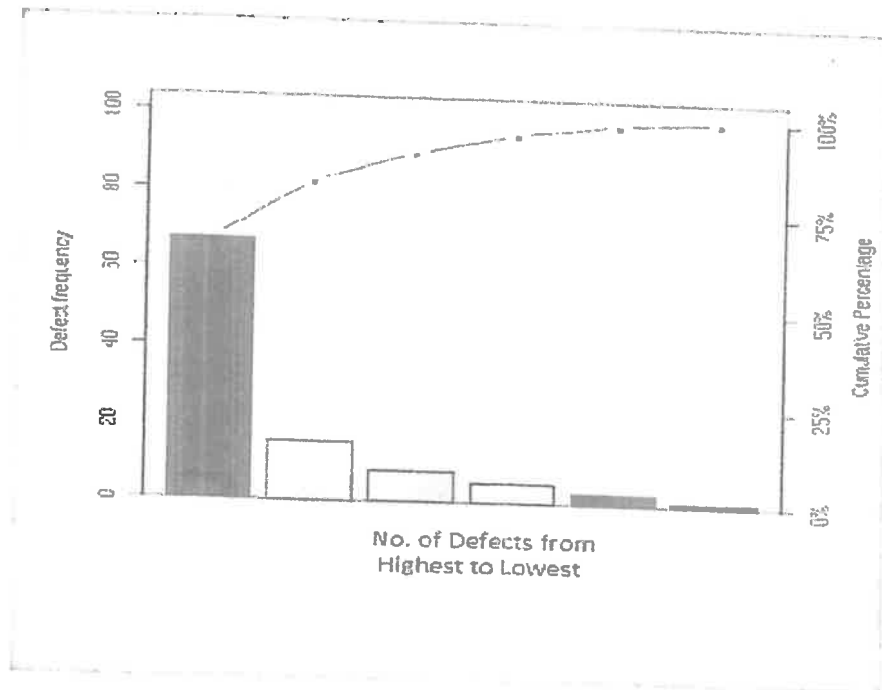
CONTROL PROCUREMENTS

CONTROL PROCUREMENTS

The process of managing procurement relationships, monitoring contract performance, and making changes and corrections to contracts as appropriate. The key benefit of this process is that it ensures that both the seller's and buyer's performance meets procurement requirements according to the terms of the legal agreement

PARETO CHART

A column chart that ranks defects based on the number of occurrences from highest to lowest



PARETO CHART (Histogram Chart)

Pareto Law (80/20 rule): this rule states that 80% of the problems come from 20% of the causes

QUALITY TERMS

JIT (Just in time): it's a method to bring the inventory to zero level.

Grade and Quality: Grade is additional features (like extra options) for the products. Low grade is not always a problem but low quality is always a problem.

Six Sigma: A popular philosophy of quality management that focus on achieving very high level of quality by controlling the process and reducing defects (defect less than 3.4 / million).

Gold plating: Giving the customer more quality than required and that is a very bad practice.

Day 1: Stand one was erected and the actual cost was \$ 1200

Day 2: Stand two was erected and the actual cost was \$ 1500

Day 3: Stand three was only 60% erected and the actual cost was \$ 700

So in the end of day three, what was the

PV, EV, BAC, AC, SPI, CPI, SV, CV, and EAC

Answer:

PV = \$ 3000

EV = \$ 2600

BAC = \$ 5000

AC = \$ 3400

SPI = 0.867

CPI= 0.765

SV= -400

CV= -800

EAC (Estimate at Completion) = $BAC / CPI = 5000 / 0.765 = \$ 6536$

PROCESS No.4 I

CONTROL QUALITY

PERFORM QUALITY CONTROL

The process of monitoring specific project results to determine whether they comply with relevant quality standards

HISTOGRAM

Is another word for column chart and it shows how often something occurs, or its frequency. A Pareto chart is an example of histogram

EARNED VALUE MANAGEMENT (EVM)

(For the Process No.39 and Process No. 40)

The most important topic for the exam, it's about evaluating the project progress and performance and its dealing with three factors (Planned value, Actual cost, Earned value)

So make sure to understand very well all of the following:

BAC (Budget at Completion): How much was originally planned for the project to cost

PV (Planned Value): How much work should have been completed at a point in time based on the plan
 $PV = (\text{Plan \% complete} \times BAC)$

EV (Earned Value): How much work was actually completed during a given period of time?

$EV = (\text{Actual \% complete} \times BAC)$

AC (Actual Cost): The money spend during a given period of time (sum of the cost for the given period of time)

CV (Cost Variance): The difference between what we expected to spend and what was actually spent

$CV = EV - AC$

SV (Schedule Variance): The difference between where we planned to be in the schedule and where we are in the schedule

$SV = EV - PV$

CPI (Cost Performance Index)

$CPI = EV / AC$

SPI (Schedule Performance Index)

$SPI = EV / PV$

Example:

A project to erect 5 steel stands in the city mall, and the planning was to erect one stand /day and the project period was planned to be 5 days (one stand /day) the contract was awarded to a contractor with a fixed price (\$ 5,000). In the end of day three the status was

PROCESS No.37

VALIDATE SCOPE

VALIDATE SCOPE

The process of formalizing acceptance of the completed project deliverables. The key benefit of this process is that it brings objectivity to the acceptance process and increases the chance of final product, service, or result acceptance by validating each deliverable

PROCESS No.38

CONTROL SCOPE

CONTROL SCOPE

Monitoring and controlling the project scope and making sure it's within the project requirements

PROCESS No.39

CONTROL SCHEDULE

CONTROL SCHEDULE

Monitoring the project schedule and controlling the schedule baseline

PROCESS No.40

CONTROL COSTS

CONTROL COSTS

Monitoring the project schedule and controlling the cost baseline

CHAPTER 6 MONITORING & CONTROLLING PROCESS GROUP

PROCESS No.35

MONITOR AND CONTROL PROJECT WORK

MONITOR AND CONTROL PROJECT WORK

The tracking and following up of the whole project to find out whether the project is on the right track or not. In other words we are comparing the actual project performance with the project management plan

NOTE: This process involves tracking, analyzing, and controlling the project processes to meet the project performance criteria. It's about measuring the project performance and analyzing its trends. Monitoring and controlling occurs throughout the project from Start to End.

In this process, we are comparing between the PLAN & ACTUAL

PROJECT MANAGEMENT PLAN

The formal approved document that guides the executing, monitoring and controlling and closing of the project.

PERFORMANCE REPORTS

The reports done by the project team who are performing the work and these reports include but not limited to (project status, issues, schedule, cost, forecasting, and milestones).

PROCESS No.36

PERFORM INTEGRATED CHANGE CONTROL

PERFORM INTEGRATED CHANGE CONTROL

This is where the change requests are reviewed, studied, approved or rejected and after that reviewing the impact of any change to other project elements (coordinating the change across the entire project).

NOTE: Causes of Project Changes

Specifications or Regulations changes.

Inaccurate initial estimates.

Missed requirements.

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COMMUNICATION METHODS

Communication methods include:

- Interactive communication: The best way to exchange information and it includes (meetings, calls, face to face, conference).

Push communication: Sent to specific stakeholders (emails, faxes, memos, letters).

Pull communication: Sent large volume of information to large audience (internet website, e-learning).

PROCESS No.33

CONDUCT PROCUREMENTS

CONDUCT PROCUREMENTS

The process of obtaining seller responses, selecting a seller, and awarding a contract.

QUALIFIED SELLER LIST

A list of pre-approved sellers due to their past experience.

BIDDER CONFERENCES

Meeting between the buyer and the prospective sellers to make better understanding for the procurement (technical and contractual requirements) and the seller will answer all the questions.

INDEPENDENT ESTIMATES

Depending on the organization own estimate rather than depending on an external estimator.

PROCESS No.34

MANAGE STAKEHOLDER ENGAGEMENT

MANAGE STAKEHOLDER ENGAGEMENT

The process of communicating and working with stakeholders to meet their needs/expectations, address issues as they occur, and foster appropriate stakeholder engagement in project activities throughout the project life cycle. The key benefit of this process is that it allows the project manager to increase support and minimize resistance from stakeholders, significantly increasing the chances to achieve project success

TRAINING

Includes formal or informal training to improve the team members' skills and knowledge.

RECOGNITION AND REWARDS

The criteria for rewards and recognition system in the organization and its part of team development process

PROCESS No.31

MANAGE PROJECT TEAM

MANAGE PROJECT TEAM

It involves tracking team member performance, providing feedback and resolving issues.

CONFLICT MANAGEMENT

There are six types for conflict management:

Withdrawing (Avoid): avoiding the problem.

Smoothing: cooling down the problem and turning the attention to what going well.

Compromising: each party should sacrifice.

Forcing: forcing the solution

Collaborating: working together to reach a goal or solution.

Confronting (Problem solving): dealing directly with the problem.

PROCESS No.32

MANAGE COMMUNICATION

MANAGE COMMUNICATION

The process of creating, collecting, distributing, storing, retrieving, and the ultimate disposition of project information in accordance to the communications management plan. The key benefit of this process is that it enables an efficient and effective communications flow between project stakeholders

PROCESS No.29

ACQUIRE PROJECT TEAM

ACQUIRE PROJECT TEAM

Process of obtaining the human resources needed to complete the project

PRE-ASSIGNMENT

Team members selected in advance.

NEGOTIATION

Negotiation for the purpose of staff assignment.

ACQUISITION

Staff acquired from outside your organization.

VIRTUAL TEAMS

Group of individual who may or may not see each other in person, instead they may use communication tools to meet online, share information and collaborate.

PROCESS No.30

DEVELOP PROJECT TEAM

DEVELOP PROJECT TEAM

Process of improving the competencies and interaction of team members to enhance project performance.

TEAM-BUILDING ACTIVITIES

Aiming to make the project team working together effectively and successfully and it consists of these five stages:

Forming: learning about the project and their roles and responsibilities.

Storming: addressing the project work, technical decisions, and conflicts may arise.

Norming: working together and trusting each other.

Performing: performing the project smoothly and effectively (Reaching the optimum performance)

Adjourning: completing the project and move to another one.

CHAPTER 5 EXECUTING PROCESS GROUP

PROCESS No.27

DIRECT AND MANAGE PROJECT WORK

DIRECT AND MANAGE PROJECT WORK

Is the process where the project team is executing the work described in the project management plan to get the final result and product.

Work Performance Information (WPI):

Includes the collected information about the project progress and performance. WPI includes but not limited to:

- Progress and status.
- Completed deliverables and outstanding deliverables.
- Percentage of completion.
- Details of resources.
- Details of quality.
- Details of the expenses.
- Lessons learned.
- Change requests.
- Any preventive and/or corrective actions.

PROCESS No.28

PERFORM QUALITY ASSURANCE

PERFORM QUALITY ASSURANCE

Applying the planned, systematic quality activities to ensure that the project employs all processes needed to meet requirements.

Quality Assurance and Quality Control:

The differences between Quality Assurance and Quality Control

Quality assurance is about following the right steps in the PROCESS and making sure that all the steps are done according to the quality management plan, while the Quality control is about the Inspection of the Final PRODUCT.

The tool used in Quality Assurance is called: Auditing.

The tool used in Quality Control is called: Inspection.

Quality Assurance process is part of Executing Process Group.

Quality Control process is part of Monitoring and Controlling Process Group.

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TYPES OF CONTRACTS

The type of contract will determine the risk sharing between the buyer and the seller and the types of contracts are:

- Fixed-price contracts (lump Sum).
- Cost-reimbursable contracts.
- Time and Material contracts (T&M).

Fixed-price contracts (lump Sum):

It is called LUMP SUM contract that establishes a total price for the whole project and it has three types

- Firm Fixed Price Contract (FFP): the price is not subjected to any change or modification.
- Fixed Price Incentive Fee (FPIF): Incentives will be applied in case of reaching a target
- Fixed Price with Economic Price Adjustment (FPEPA): contains special clause for the pre-defined financial adjustment; such inflation and prices changes.

Cost-reimbursable contracts:

Paying back the seller (contractor) the expenses + the seller Profit, and it has three types:

- Cost Plus Fixed Fee (CPFF): Cost plus fixed fee calculated in advance
- Cost Plus Percentage of Cost (CPPC): Cost plus percentage of the expenses
- Cost Plus Incentive Fee (CPIF): Paying additional incentive for reaching specific targets plus the fixed fee or the percentage of cost

Time and Material contract (T&M):

Contains both fixed-price and cost-reimbursable contracts. The buyer pays the seller a negotiated hourly rate and full reimbursement for materials used to complete the project.

PROCESS No.26

PLAN STAKEHOLDER MANAGEMENT

PLAN STAKEHOLDER MANAGEMENT

The process of developing appropriate management strategies to effectively engage stakeholders throughout the project life cycle, based on the analysis of their needs, interests, and potential impact on project success. The key benefit of this process is that it provides a clear, actionable plan to interact with project stakeholders to support the project's interests

PROCESS No.25

PLAN PROCUREMENT MANAGEMENT

PLAN PROCUREMENT MANAGEMENT

The process of documenting project purchasing decisions, specifying the approach & identifying potential sellers

MAKE-OR-BUY ANALYSIS: Analyzing whether to make the job inside the organization or outsource it for outside the organization

PROCUREMENT DOCUMENTS: It contains the buyer's invitation for bid, request for quotation, request for information, request for proposal and the seller's responses

MAKE (RENT) OR BUY DECISION

Q: Assume you can rent a machine you need for a project for \$250/day, to purchase the machine; the cost is \$7000 plus a daily operational cost of \$50/day

How long will it take for the purchase cost to be the same as the lease cost?

A: let's consider (D) = the number of days to use the item

So in the purchase case, the cost is:

$$\$7,000 + \$50 \times D$$

And in the case of renting, the cost is:

$$\$250 \times D$$

So to get the values of (D) we will assume that

$$\$7,000 + \$50 \times D = \$250 \times D$$

$$\$7,000 = 250 \times D - 50 \times D$$

$$\$7,000 = 200 \times D$$

$$D = 7000/200 = 35 \text{ Days}$$

So if you want to use the machine for more than 35 days, it's better to purchase the machine and if you want to use the machine for less than 35 days, it's better to rent the machine

Basics of Probability:

- Sum of probabilities must equal to one (100%).
- Single event probability must be equal or higher than zero and equal or less than one.
- Joint events probability is equal to the product (multiplying) the probability that one event occurs by the probability that another even occurs.
- Mean=Average (the sum of all the values divided by the numbers of values.
- Median is the number that separate the higher half and the lower half.

PROCESS No.24

PLAN RISK RESPONSES

PLAN RISK RESPONSES

The process of taking steps to enhance opportunities (positive risk) and reduce threats (negative risk) to meeting project objectives.

STRATEGIES FOR NEGATIVE RISKS OR THREATS

Avoid: Changing the project management plan to avoid or eliminate the risk (Example: schedule extension, reducing the scope, or closing the project).

Transfer: Including transferring the risk to a third party (Example: buying an insurance policy to shift the risk to the insurance company).

Mitigate: Reducing the probability and impact of the risk (Example: adding more supports to the bridge will reduce the possibility of failure risk).

Accept: Accepting the risk without any changing in the project management plan or project scope.

STRATEGIES FOR POSITIVE RISKS OR OPPORTUNITIES

Exploit: Making sure that the positive risk is fully realized by using the organization's most talented resources or hiring external experts and using the highest technology.

Enhance: Making sure to increase the probability that a positive opportunity will occur.

Share: Sharing the opportunity with a third party who can capture the opportunity for the benefit of the project.

Accept: Accepting the risk without any changing in the project management plan or project scope.

Expected monetary value analysis (EMV) and Decision tree analysis:

Calculating the average outcome when the future includes scenarios that may or may not happen.
Decision Trees are primarily used to make decisions overall risk on the project.

Q: The project manager needs to make a decision regarding two suppliers

(Supplier A) 80 % delivery on time (from previous deals with the supplier)

The cost is \$ 1200

If not received on time the manager company will lose \$ 4000

(Supplier B) 60 % delivery on time (from previous deals with the supplier)

The cost is \$ 800

If not received on time the manager company will lose \$ 4000

Which supplier will the manager choose?

Supplier A or Supplier B

Expected monetary value for supplier A

$$= 1200 + 20 \% \times 4000 = 2000$$

Expected monetary value for supplier B

$$= 800 + 40 \% \times 4000 = 2400$$

So it's better to choose supplier A

RESERVE ANALYSIS

It includes: Contingency reserve and Management reserve.

Management Reserve: Money and time put aside for Unknown Unknown events

Contingency Reserve: Money and time put aside for Known Unknown events

for the Contingency reserve they added 3 Risks

Reserve no. 1 (There is a probability of 60 % that the prices of materials will go up by 25% and that will impact the project by \$ 250,000)

Reserve no. 2 (There is a probability of 40 % that the cost of labours will be higher than the current prices and that will impact the project by \$ 200,000)

Reserve no.3 (There is a probability of 60 % that the prices of oil will go up by increased by \$0.5/gallon, and that will impact the project by \$ 150,000)

So let's calculate the Contingency reserve

$$\begin{aligned} &= \text{Reserve 1} + \text{Reserve 2} + \text{Reserve 3} = 0.60 \times 250,000 + 0.40 \times 200,000 + 0.60 \times 150,000 \\ &= \$ 320,000 \end{aligned}$$

For the Management reserve they added 10 %

$$\begin{aligned} &= 10\% \times 3,000,000 \\ &= \$ 300,000 \end{aligned}$$

So the Calculations was done in this way

- 1- The cost of materials, design, erection , staff ,,,, etc) was
Total Cost = \$ 3,000,000
- 2- They added their profit 30% of the total cost
 $30\% \times 3,000,000 = \$ 900,000$
- 3- The contingency reserve = \$ 320,000
- 4- The management reserve = \$ 300,000

The total offer = \$ 4,520,000

Levels of Uncertainty

- Known-Unknown : Items that will affect you, although you are not able to predict how or how much they will affect you. (the fluctuations in the oil prices, materials , etc)
- Unknown-Unknown: Items beyond your ability to foresee. (Volcano, Riot, Snow in hot cities, etc)

Levels of Risk Tolerance:

- Risk-avertor: Not likely to take a risk that is considered a high risk.
- Risk-seeker: Willing to take a high risk regardless of the consequences.
- Risk-neutral: Depending to the amount of money at stake.

Triggers:

Early warning signs or indications that risk will occur

RISK CALCULATIONS:

(Oil Field Supplies Company) are preparing their offer to the Ministry of Oil in California to design, manufacture and erect a 10 km pipeline in California, the calculation was done as a lump sum project for the duration of (1year)

The Calculations was done in this way

- The cost of (materials, design, erection , staff ,,,, etc) was
Total Cost = \$ 3,000,000
- They added their profit 30% of the total cost
 $30\% \times 3,000,000 = \$ 900,000$

They added the Risk Calculation

PROCESS No.23

PERFORM QUANTITATIVE RISK ANALYSIS

PERFORM QUANTITATIVE RISK ANALYSIS

The process of numerically estimating the effects of the identified risks on overall project objectives.

Risk:

An uncertain event with positive or negative impact (opportunity is +) and (Threat is -)

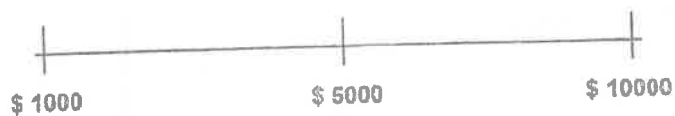
Probability Scale:



Impact Scale:



Or with Numbers (the impact of the risk)



PROCESS No.2.1

IDENTIFY RISKS

IDENTIFY RISKS

The process of determining which risks are likely to affect a project and documenting the characteristics of each risk. (making a list of risks)

PROCESS No.2.2

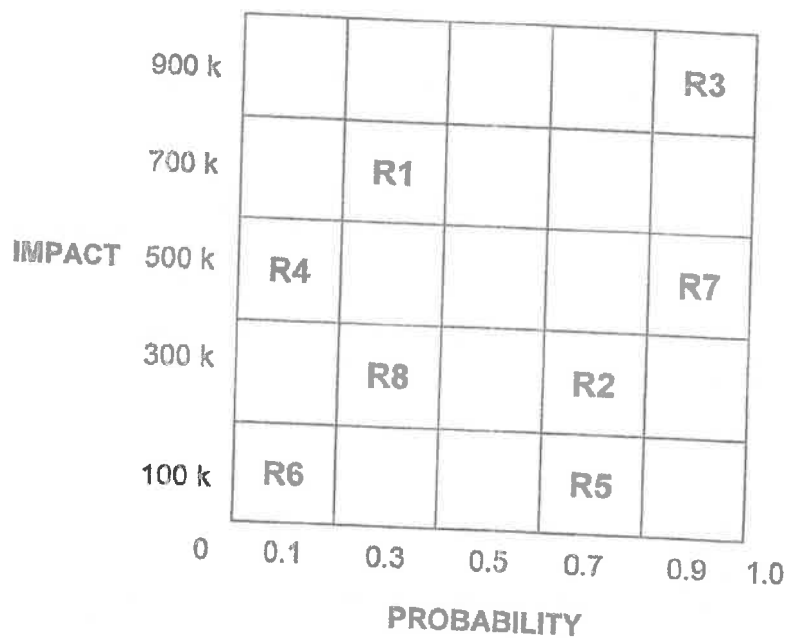
PERFORM QUALITATIVE RISK ANALYSIS

PERFORM QUALITATIVE RISK ANALYSIS

The process of prioritizing risks for further analysis or action based by assessing and combining their probability of occurrence and impact.

PROBABILITY AND IMPACT MATRIX (PIM)

Showing the risk impact (low, medium, high) and its probability of occurrence.



PROCESS No. 19

PLAN COMMUNICATION MANAGEMENT

PLAN COMMUNICATION MANAGEMENT

The process of developing an appropriate approach and plan for project communications based on stakeholder's information needs and requirements, and available organizational assets.

COMMUNICATION MODELS: The components of model are:

- **Encode:** Translate an idea to an understood language.
- **Message and Feedback:** This is the output of Encode.
- **Medium:** Method used to convey the message.
- **Noise:** Anything that interferes with the transmission and understanding of the message.
- **Decode:** Translate the message back to an idea.

COMMUNICATION CHANNELS: The number of the identified channels is calculated using this formula:

Number of Channels= $N(N-1)/2$

N= Number of Individuals.

PROCESS No. 20

PLAN RISK MANAGEMENT

PLAN RISK MANAGEMENT

The Process of deciding how to approach and plan the risk management activities for the project.

3- Staffing Management Plan: Describes when and how human resources will be hired and released in the project.

Organizational Structures:

- Projectized organization.
- Functional organization.
- Matrix organization (Blend of these two).

- **Projectized:**

Advantages: (Efficient project organization, Simplified communications).

Disadvantages: (Lack of professionalism in specialization areas, No "home" when projects are completed).

- **Functional**

Advantages: (Clear career paths in specialization areas, Easier specialist management).

Disadvantages: (Project manager has no authority).

- **Matrix:**

Advantages: (Project objectives are supported from projectized and functional organization).

Disadvantages: (More than one boss for project team members, Potential for conflict between functional and project managers).

We need to know these two definitions:

Project Coordinator:

Weaker than project manager, can be found in weak matrix or functional organization. Have some control on resources but no control on project funds.

Project Expeditor :

The weakest type of project manager. Can be found in functional organization and has no control on resources and no control on project funds. And his/her role is to make sure that the work is done on the right time and its progressing according to the plan.

PROCESS No.18

PLAN HUMAN RESOURCE MANAGEMENT

PLAN HUMAN RESOURCE MANAGEMENT

Plan Human Resource Management is the process of identifying and documenting project roles, responsibilities, required skills, reporting relationships, and creating a staffing management plan. The key benefit of this process is that it establishes project roles and responsibilities, project organization charts, and the staffing management plan including the timetable for staff acquisition and release

1- Roles and Responsibilities : RACI Chart (Known as RAM: Responsibility Assignment Matrix)

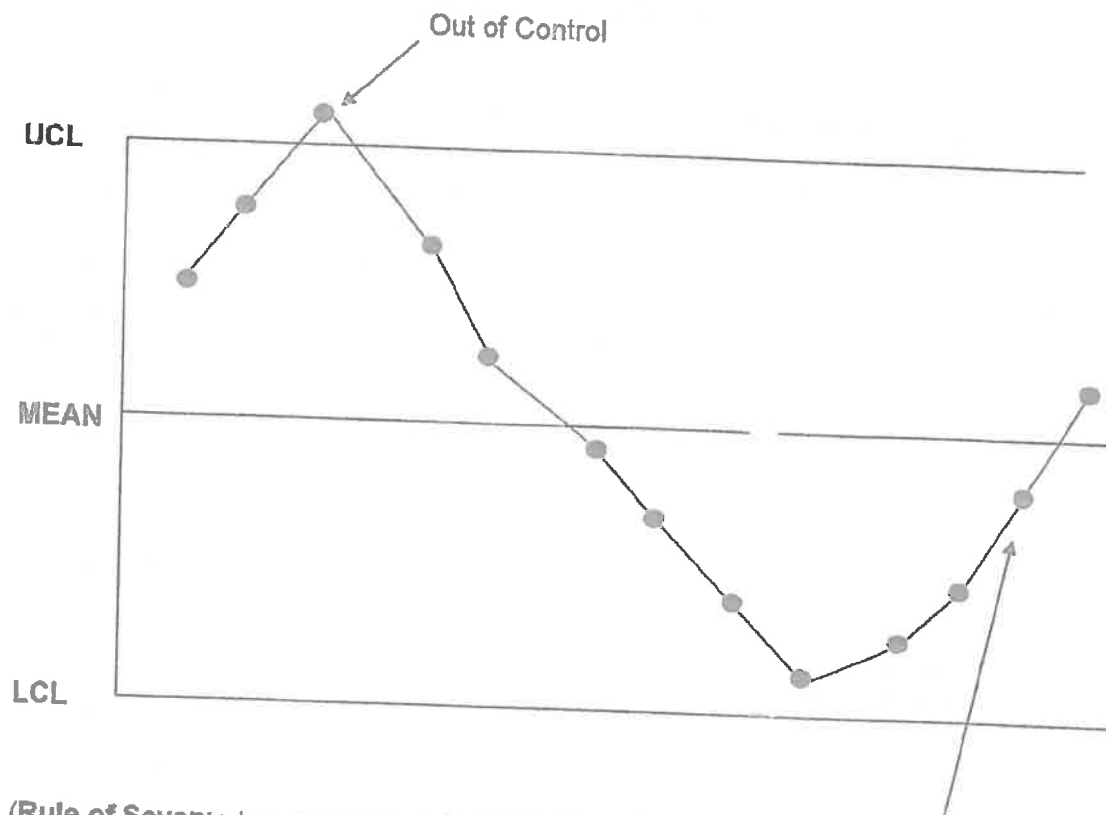
RACI	Account Manager	Design Manager	Purchasing Manager	Store Keeper	Safety Manager
Activity A		C		I	A
Activity B	R		R		
Activity C		I		A	R
Activity D	R		I	I	A
Activity E	I	C	A		I

R=Responsible A=Accountable C=Consult I=Informed

2- Project Organizational Chart : (Showing the Reporting Structure)



CONTROL CHARTS: Charts used to check whether the process is on the accepted limits or not



(Rule of Seven: when seven or more CONSECUTIVE points lie on one side of the mean: That indicates that the process is out of control).

UCL= Upper Control Limit

LCL= Lower Control Limit

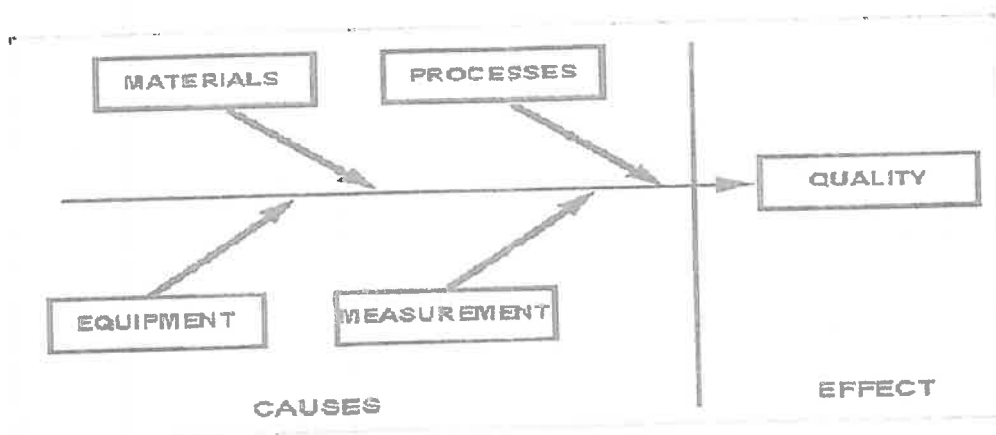
PROCESS No. 17

PLAN QUALITY MANAGEMENT

PLAN QUALITY MANAGEMENT Y

Identifying which quality standards are relevant to the project and determining how to satisfy them.

FLOWCHARTING: Process graphical presentation that shows the relationships among the process components.



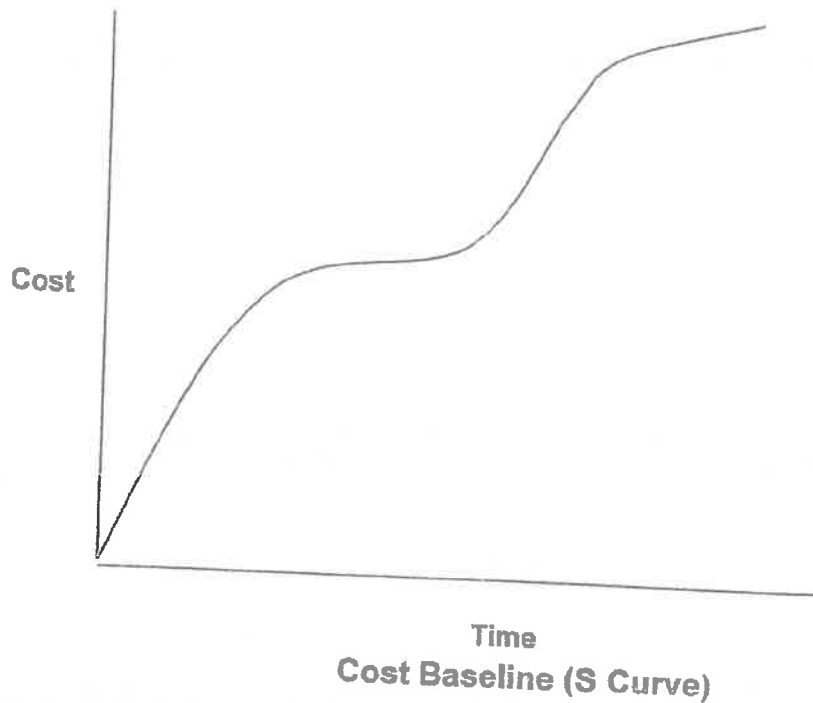
Cause and Effect Diagram, also known as Ishikawa Diagram and Fishbone Diagram

PROCESS No. 16

DETERMINE BUDGET

DETERMINE BUDGET

process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.



COST ASSIGNMENTS METHOD:

- **Percentage Rule:** (X) percent credit is given when the project begins and (Y) percent credit is given when the work is completed, for example (X=40% and Y=60%).
- **Percentage Completed Rule:** Completion percentages are estimated and assessed at specified reporting intervals. This is perhaps the most commonly used rule.
- **Weighted Milestones:** The total work package value is divided up and assigned to milestone intervals within the work package. The value is earned when the milestone is achieved.

Schedule Compression: Shortening the project schedule without affecting the scope. And this is done by either:

Crashing: Adding more resources to the activities to compress their durations

Or

Fast Tracking: Applying more overlapping to compress the schedule

PROCESS No. 14

PLAN COST MANAGEMENT

PLAN COST MANAGEMENT

Plan Cost Management is the process that establishes the policies, procedures, and documentation for planning, managing, expending, and controlling project costs. The key benefit of this process is that it provides guidance and direction on how the project costs will be managed throughout the project

PROCESS No. 15

ESTIMATE COSTS

ESTIMATE COSTS

Adding all the project expenditures to have the project cost estimate.

PROCESS No. 1 1

ESTIMATE ACTIVITY RESOURCES

ESTIMATE ACTIVITY RESOURCES

Estimating the required resources (human, material, and equipment) for each activity. And put these resources on a table

Resource Calendar: Containing information about the resources availability, so it's a relation between time and resources. It's same like normal calendar

PROCESS No. 1 2

ESTIMATE ACTIVITY DURATIONS

ESTIMATE ACTIVITY DURATIONS

Estimating the work units required to complete the activity. Depending on experience, historical information, market study, assumptions, and getting information from people or groups who are familiar with the work an activity involves.

PROCESS No. 1 3

DEVELOP SCHEDULE

DEVELOP SCHEDULE

The process of analyzing activity sequences, activity resource estimates, and activity duration estimates and schedule constraints to create the project schedule.

We need to use some tools in the Develop Schedule process

What if Scenario: Creating scenario (What if) and then calculate possible project duration

PROCESS No.8

PLAN SCHEDULE MANAGEMENT

PLAN SCHEDULE MANAGEMENT

The process of establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule. The key benefit of this process is that it provides guidance and direction on how the project schedule will be managed throughout the project

PROCESS No.9

DEFINE ACTIVITIES

DEFINE ACTIVITIES

The process of identifying the activities required to complete the project. So we keep decomposing till we reach the level of (Activities)

PROCESS No.10

SEQUENCE ACTIVITIES

SEQUENCE ACTIVITIES

Using logical relationships to sequence the project activities (FS, SS, FF, and SF) and (lead & lag)

PROCESS No.6

DEFINE SCOPE

DEFINE SCOPE

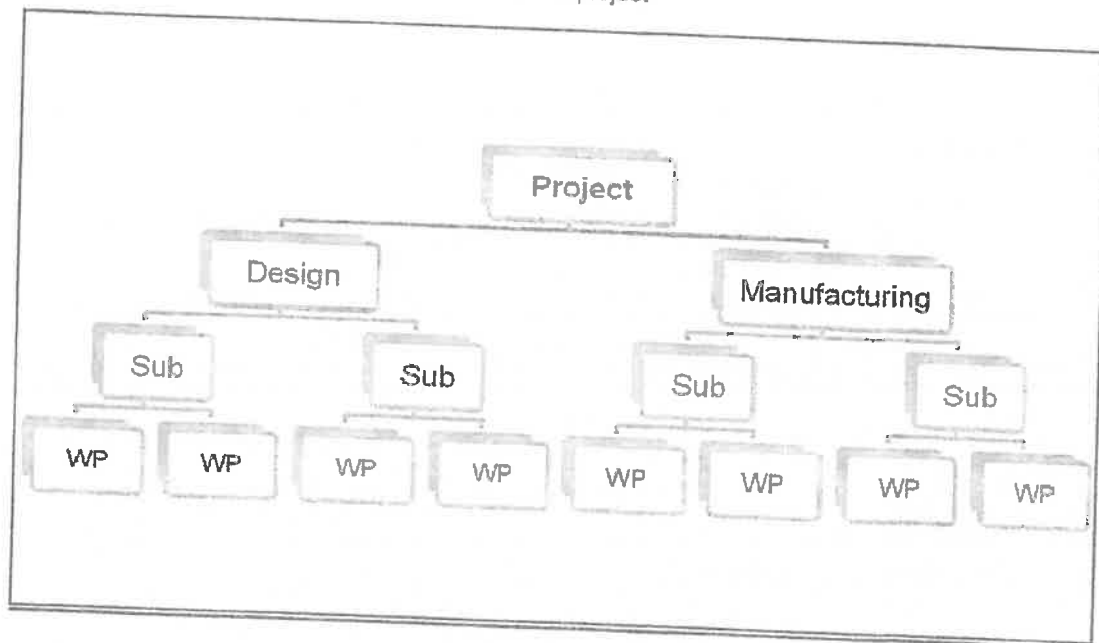
The detailed description of the project deliverables, and it's mainly about defining the constraints, assumptions and the acceptance criteria, it defines what is included and what is not included in the project.

PROCESS No.7

CREATE WBS

CREATE WBS

Creating an organization for all the deliverable of the project



Work Breakdown Structure

The lowest level of WBS is called WORK PACKAGE

CHAPTER 4 PLANNING PROCESS GROUP

PROCESS No.3

DEVELOP PROJECT MANAGEMENT PLAN

DEVELOP PROJECT MANAGEMENT PLAN

Some people think mistakenly that project management plan is the project bar chart or schedule, but actually the project management plan is the formal document that guides the executing, monitoring and controlling and closing of the project. It includes the subsidiaries plans (Cost management plan, Time management plan, Risk management plan, etc)

PROCESS No.4

PLAN SCOPE MANAGEMENT

PLAN SCOPE MANAGEMENT

The process of creating a scope management plan that documents how the project scope will be defined, validated, and controlled. The key benefit of this process is that it provides guidance and direction on how scope will be managed throughout the project

PROCESS No.5

COLLECT REQUIREMENTS

COLLECT REQUIREMENTS

Defining in details, the stakeholder's needs to meet the project requirements. All the requirements must be analyzed and recorded

CHAPTER 3 INITIATING PROCESS GROUP

PROCESS No.1

DEVELOP PROJECT CHARTER

THE PROJECT CHARTER

It's the document that officially starts the project, and it assigned the project manager, the project charter contains the business need, project justification, stakeholders and products (deliverables), it should include the high-level milestones (not high detailed).

PROCESS No.2

IDENTIFY STAKEHOLDERS

IDENTIFY STAKEHOLDERS

The process of identifying all people or organizations having impact on the project, and documenting relevant information regarding their interests, involvement, and impact on project success.

We have to make a list of stakeholders (Stakeholder Register)

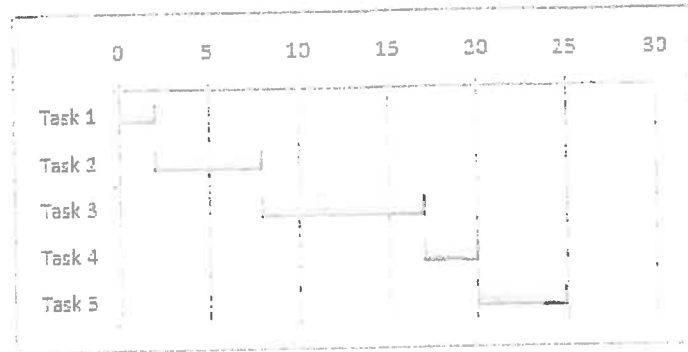
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Q: Draw the PDM for the following table and find the Critical Path.

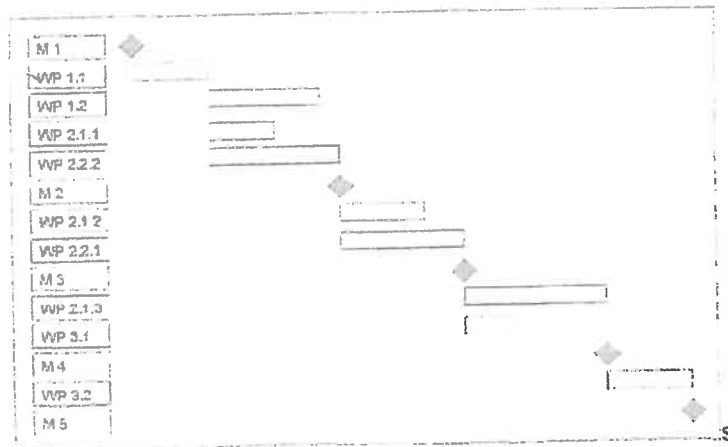
Activity	Dependency	Duration
Start	None	0
A	Start	1
B	A	2
C	B	2
D	Start	2
E	D	1
F	Start	3
G	F	6
H	B,E	3
I	C,G,H	1
Finish	I	0

Types of Schedule: (Bar Chart, Millstone Chart and PDM Chart)

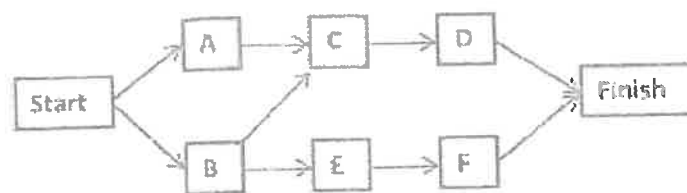
First Type: Bar Chart (Gantt Chart)



Second Type: Milestone Chart



Third Type: Precedence Diagram Method (PDM)



Precedence Diagram Method (PDM)

For the above diagram

Q: What are the ES, EF, LS and LF for activity D?

A: ES=11

$$EF = ES + Du - 1 = 11 + 7 - 1 = 17$$

$$LS = ES + \text{Float} = 11 + 6 = 17$$

$$LF = LS + Du - 1 = 17 + 7 - 1 = 23$$

Total float: The time an activity can be delayed without delaying the project end date

Total float = LS-ES or LF-EF

Q: What is the float for activity D?

A: Float (total float) = (LS-ES) or (LF-EF) = 6

Free float: The time an activity can be delayed without delaying the early start date of its successor(s)

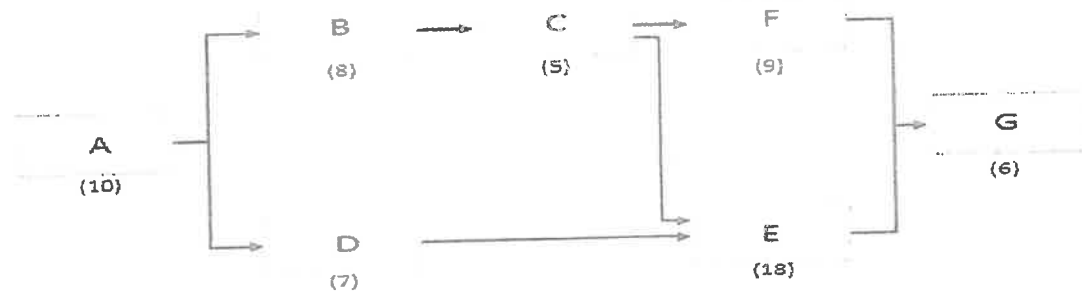
Q: What is the free float for activity D?

A: Free Float = ES (successor) – EF (Activity)

$$= 24 - 17$$

$$= 7$$

Calculating the Critical Path



Q: How many paths in this diagram?

A: 3 Paths

Path1 = A-B-C-F-G (38 days)

Path2 = A-B-C-E-G (47 days)

Path3 = A-D-E-G (41 days)

Q: What is the critical path?

A: Path2 A-B-C-E-G (47days)

Early Start: The earliest possible point in time on which the activity can start.

Early Finish: The earliest possible point in time on which the activity can finish.

Late Start: The latest possible point in time on which the activity can start.

Late Finish: The latest possible point in time on which the activity can finish.

Q: How many paths do we have?

A: 4 Paths

ABF (8 days)

ACF (11 days)

ADF (4 days)

AEF (5 days)

Q: What the Critical Path?

A: ACF (11 days)

Q: What is Float for Activity B ?

A: 3 Days

Q: For Activity B. What is the ES, EF, LS and LF?

A: Early Start = Day 2

Early Finish = Day 7

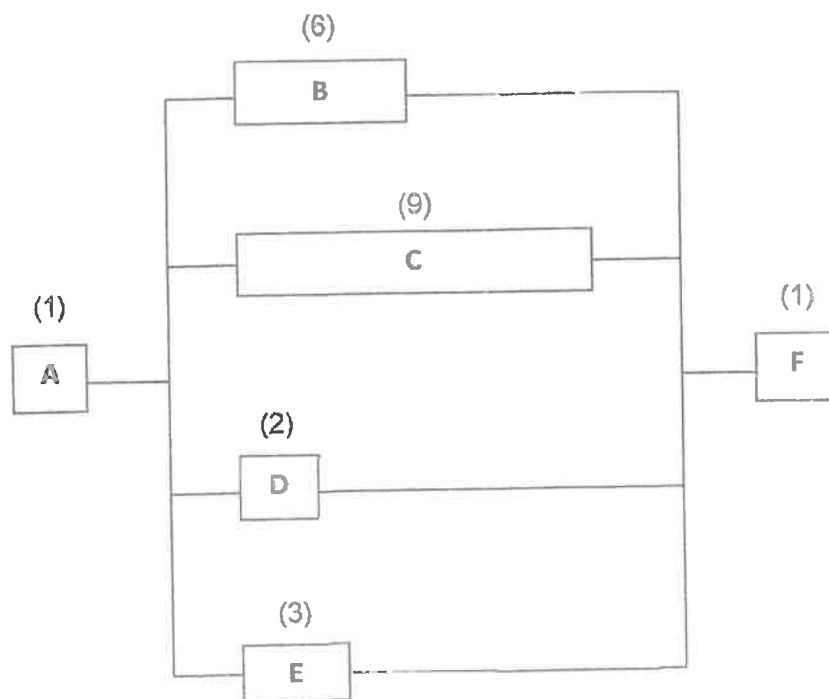
Late Start = Day 5

Late Finish = Day 10

Calculating the Critical Path

We are preparing an offer to the Airport Authority to manufacture a scanning machine to them. So we need to send 4 members of our team to buy a specific component and bring it back to the assembly site so we can manufacture the scanning machine

Our Planned Schedule was



Activity A : Meeting and assigning missions (1 day)

Activity B : One of the team should go to Hong Kong to buy a specific item (6 days)

Activity C : One of the team should go to China to buy a specific item (9 days)

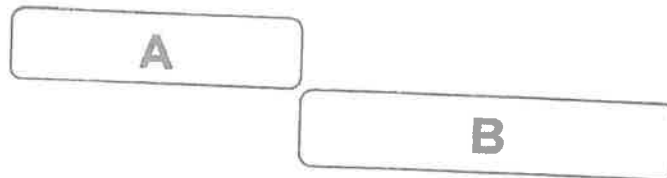
Activity D : One of the team should go to Dubai to buy a specific item (2 days)

Activity E : One of the team should go to Turkey to buy a specific item (3 days)

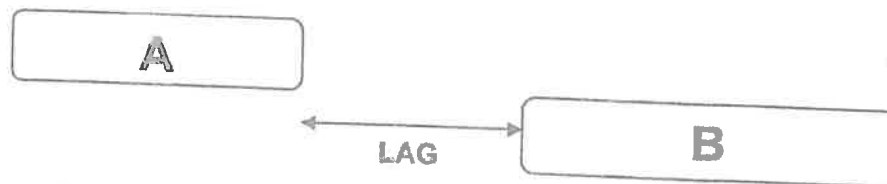
Activity F : Team meeting and assembly for the machine (1 day)

APPLYING LEADS AND LAGS

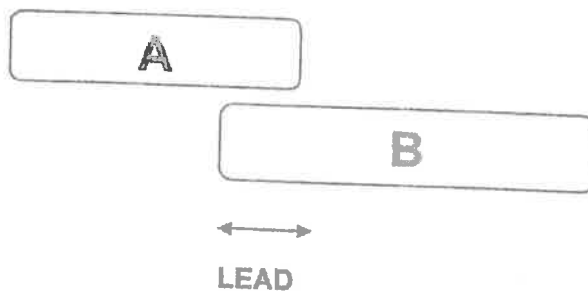
- **Lead:** The acceleration of the successor activity.
- **Lag:** The delay of the successor activity.



FINISH TO START (NO LAG OR LEAD)



FINISH TO START WITH A LAG



FINISH TO START WITH A LEAD

PRECEDENCE DIAGRAMING METHOD includes 4 TYPES OF DEPENDENCIES

- **Finish to Start:** The logical relationship where initiation of work of the successor activity depends upon the completion of work of the predecessor activity. (You cannot start the loading of the truck, unless the truck is parked properly)
- **Start to Start:** The logical relationship where initiation of work of the successor schedule activity depends upon the initiation of the work of the predecessor schedule activity (You cannot start counting the boxes loaded in the truck unless they start loading the boxes)
- **Finish to Finish:** The logical relationship where completion of work of the successor activity can not finish until the completion of work of the predecessor activity. (You cannot finish counting the boxes in the truck unless they finish the loading)
- **Start to Finish:** The logical relationship where completion of the predecessor schedule activity is depending on the initiation of the successor schedule activity. (The store keeper start closing the main gate at 6 pm, so you have to finish loading before 6 pm)

DEPENDENCY DETERMINATION

There are three types of dependencies

- **Mandatory dependencies:** Activities must be done in a specific sequence (you cannot paint the wall unless you build it, it is called (Hard Logic)
- **Discretionary dependencies:** Activities are not required to be done in a specific sequence, you can do any activity before the other, or in the same time (painting the wall and painting the ceiling) you can do anyone first following the best practice (No Mandatory). It is called (Soft Logic).
- **External dependencies:** Depending on inputs from outside the project (You cannot start printing the book unless you receive the paper from China (its type of Mandatory, but it is an External Mandatory)

How to Develop the Schedule & Determine Budget

The project manager should start first with studying the **(Project Charter)** and analyzing all the available information and should ask for any supporting documents and templates from the PMO regarding the similar previous projects

Then the next step should be **(Identify Stakeholder)** and developing the Stakeholder Register (Stakeholder List) and then Developing the **(Project Management Plan)** and detailing the scope **(Define Scope)** and after that will Start **(Create WBS) =Work Breakdown Structure.**

So the result of **(Create WBS)** is the Work Package and after that the result of **(Define Activities)** is the Activity List

Activity List: is the full list for all the activities required to complete the project

The Activity List should be analyzed and for each activity we should know:

- The Cost
- The Duration
- The Resources

Regarding the Cost ... we just add all the Costs to get the Cost Estimation and regarding the Time, we need to know the sequence of the activities, the resource leveling, and the Critical path to develop the Schedule

3. Present Value and Future Value: The higher is the better

The idea is that \$1,000 today is not the same values after few years; the future value can be calculated as:

$$\text{Future value} = \text{Present value} \times (1+R)^n$$

Where R= rate of interest
N= number of years

So to calculate the value of \$1,000 after 3 years with an interest rate of 10% is

$$\begin{aligned}\text{Future value} &= \$1000 \times (1+0.10)^3 \\ &= \$1000 \times (1.10)^3 = \$ 1331\end{aligned}$$

Example

Project A has a Future Value of \$ 500,000 PV

Project B has a Future Value of \$ 350,000 PV

Which project will you choose?

Answer: Project A

4. Payback Period: The lower is the better

The smaller is the better. Imagine you invested \$1,000,000; do you want to get your invested money back in 5 months or 10 months? Of course the earlier is better

So payback period is how long it will take to get back you investment before you start making profit

Example:

Project A payback period 2 years

Project B payback period 22 months

Which project will you choose?

Project B is better because it has less payback period

PROJECT SELECTION METHODS

The major methods are:

1. **Benefit Cost Ratio**: Obtained by dividing the project gross income by the cost, and the higher number is the better

Example:

Project A cost \$ 1,000,000 and it will generate a total income of \$ 1,500,000

Project B cost \$ 1,000,000 and it will generate a total income of \$ 2,000,000

Which project will you choose?

Answer:

BCR for project A = 1.5

BCR for project B = 2

So it's better to choose project B

Note that the Benefit means (the total income) not the (net profit).

2. **Investment Return**: The higher is the better.

Example:

You want to invest \$1,000,000 so which project to choose from these two

Project A which has 15% returns

Project B which has 10% returns

Answer: Project A

How to Select a Project or Make a Choice

WEIGHTING SYSTEM

It's a method to make a choice in different cases, used to select a project, supplier, purchasing.... Etc)

For example:

You need to choose a supplier for pumps and you have three offers. In order to choose one, you make your weighting criteria or weighting system in advance to make a choice and to avoid the personal influence.

For example:

You have three criteria for choosing a supplier

Origin	50%
Age of the company	30%
Number of employees	20%
<hr/>	
Total must be	100%

You have in advance these criteria with your weighting score
for example; you pre-defined your scoring as the following

		Company 1	Company2	Company 3
Origin 50%	<div>50% from UK 25% from India 10% others</div>	25%	50%	25%
Age 30%	<div>30% >20 yrs 10% < 20 yrs</div>	10%	30%	30%
Staff 20%	<div>20% >200 5% < 200</div>	5%	5%	20%
		<hr/>	<hr/>	<hr/>
		40%	85%	75%

So you will choose the company 2

Project, Program, Portfolio, Operation, Sponsor, Sub-Project, PMO and Customer

Match the left and the right sides:

Providing support, and solutions
to different projects

Sponsor

Group of related projects

Sub-Project

Project divided to smaller projects

Operation

Financing the project

Portfolio

Building Bus station

Program

Using the final product or service

PMO

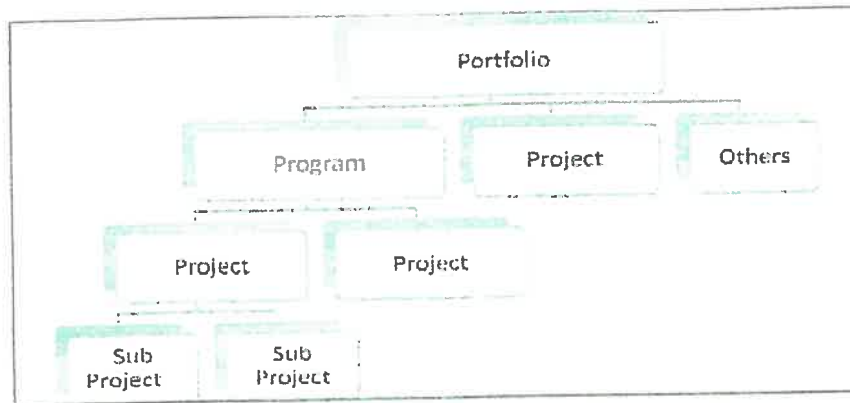
Company having Projects in IT,
Communication and construction

Customer

Weekly cleaning for your room

Project

Portfolio, Program, Project and Sub-Project



Portfolio, Program, Project and Sub-Project



Process Groups of the Project

Lessons Learned:

The learning gained from the process of performing the project. Lessons learned may be identified at any point. Also considered a project record, to be included in the lesson learned knowledge base.

Milestone:

A significant point or event in the project.

Project Charter:

A document that formally authorizes the existence of a project, assigns the project manager, and provides the project manager with the authority to apply organizational resources to project activities.

Project Management Plan:

A formal, approved document that defines how the project is executed, monitored, and controlled. It may be a summary or detailed and may be composed of one or more subsidiary management plans and other planning documents.

Quality:

Totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs

Risk:

An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives.

Reserve Analysis:

It includes: Contingency reserve and Management reserve.

Management Reserve: Money and time put aside for Unknown events

Contingency Reserve: Money and time put aside for Known events

Variance:

A quantifiable deviation, departure, or divergence away from a known baseline or expected value

(PMBOK® Guide) –Fifth Edition, Project Management Institute, Inc., 2013

Sponsor:

The person or group that provides the financial resources, in cash or in kind, for the project.

Stakeholder:

Person or organization (e.g., customer, sponsor, performing organization, or the public) that is actively involved in the project, or whose interest may be positively or negatively affected by execution or completion of the project. A stakeholder may also exert influence over the project and its deliverables.

Brain Storming:

A general data gathering and creativity technique that can be used to identify risks, ideas or solutions.

Delphi Technique:

A way to gather expert opinions, ideas, or solutions by hiding their identities

Deliverable:

Any unique and verifiable product, result, or capability to perform a service that must be produced to complete a process, phase, or project.

Enterprise Environmental Factors:

Any or all external environmental factors and internal organizational environmental factors that surround or influence the project success. And include organizational culture and structure, infrastructure, existing resources, market conditions, and project management software.

Organizational Process Assets:

Any or all process related assets, from any or all of the organizations involved in the project that are or can be used to influence the project's successes. These process assets include formal and informal plans, policies, procedures, and guidelines. The process assets also include the organizations' knowledge bases such as lessons learned and historical information.

Expert Judgment:

Judgment provided based upon expertise in an application area, knowledge area, discipline, industry, etc. and it could be from internal or external expert

Historical Information:

Documents and data on prior projects including project files, records, correspondence, closed contracts, and closed projects.

CHAPTER 2 IMPORTANT (PMI) DEFINITIONS

let's start with some important definitions that we need to know so we can start studying the material

***All the following definitions are from the PMBOK® (Project Management Body of Knowledge) the 5th edition)**

Project:

A temporary endeavor undertaken to create a unique product, service, or result.

Program:

A group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually.

Portfolio:

A collection of projects or programs and other work that are grouped together to facilitate effective management of that work to meet strategic business objectives.

Operation:

Ongoing execution of activities that produce the same product or provide repetitive services

Project Management:

The application of knowledge, skills, tools, and techniques to the project activities to meet the project requirements.

Project Management Office (PMO):

An organizational body or entity assigned various responsibilities related to the centralized and coordinated management of those project(s) under its domain. The responsibility of a PMO is to provide project management support functions (templates, design, documents, method of statementetc).

Standard:

A document that provides, for common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.

Regulation:

Requirements imposed by a government body

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Process Groups Knowledge Areas	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Integration	Develop Project Charter	Develop Project Management Plan	Direct & Manage Project Work	Monitor & Control Project Work Perform Integrated Change Control	Close Project or Phase
Scope		Plan Scope Management Collect Requirements Define Scope Create WBS		Validate Scope Control Scope	
Time		Plan Schedule Management Define Activities Sequence Activities Estimate Activity Resources Estimate Activity Durations Develop Schedule		Control Schedule	
Cost		Plan Cost Management Estimate Costs Determine Budget		Control Costs	
Quality		Plan Quality Management	Perform Quality Assurance	Control Quality	
Human Resource		Plan Human Resource Management	Acquire Project Team Develop Project Team Manage Project Team		
Communications		Plan Communications Management	Manage Communications	Control Communications	
Risk		Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Response		Control Risks	
Procurement		Plan Procurements Management	Conduct Procurements	Control Procurements	Close Procurements
Stakeholder	Identify Stakeholder	Plan Stakeholder Management	Manage Stakeholder Engagement	Control Stakeholder Engagement	

The processes are 47

PROCESS

Actions and activities performed to get specific results, products or services) and each process has inputs and o outputs (the tools and techniques are used to help the inputs to be an output.



Inputs, Tools and Techniques and Outputs

PMBOK® Guide –Fifth Edition, Project Management Institute, Inc., 2013

PROCEDURE

A fixed, step-by-step sequence of activities or course of actions (with definite start and end points) that must be followed in the same order to complete the process.

EACH PROCESS HAS TWO HOMES. That means each process (47 processes) must fall in one (Process group) and one (Knowledge area) (see the next page)
This following Chart is Called **(PROJECT MANAGEMENT FRAMEWORK)**

The Process Groups are five:

- 1- Initiating.
- 2- Planning.
- 3- Executing.
- 4- Monitoring and Controlling.
- 5- Closing.

The Knowledge Areas are Ten:

- 1- Project Integration Management.
- 2- Project Scope Management.
- 3- Project Time Management.
- 4- Project Cost Management.
- 5- Project Quality Management.
- 6- Project Human Resource Management.
- 7- Project Communication Management.
- 8- Project Risk Management.
- 9- Project Procurement Management
- 10- Project Stakeholder Management

Exam Organization

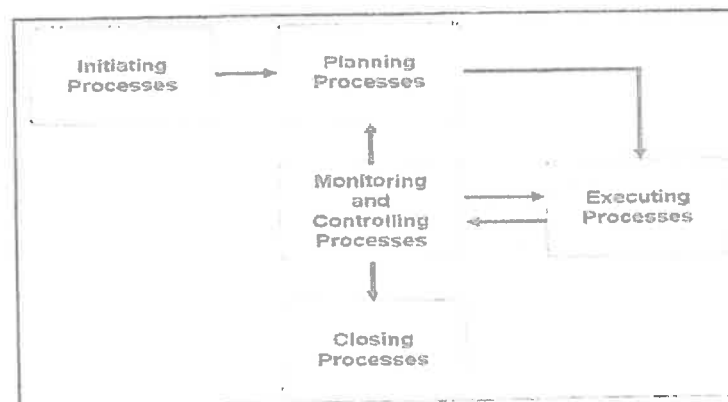
In general, the questions of the exam are divided approximately according to the following areas:

- Initiating Process Group 13 %
- Planning Process Group 24 %
- Executing Process Group 30 %
- Monitoring and Controlling Process Group 25 %
- Closing Process Group 8 %

What is the Core of the Exam?

The core of the PMP exam is the following:

- 5 Process Groups.
- 10 Knowledge Areas.
- 47 Processes.



Process Groups Interaction

CHAPTER 1 PROJECT MANAGEMENT PROFESSIONAL (PMP)

What is the Project Management Institute (PMI)?

PMI is a professional organization for project management knowledge and frameworks, PMI's global standards are the foundation of the profession.

Founded in 1969 in Pennsylvania USA. With more than 500,000 members.
For more information about PMI

What is the Project Management Professional (PMP)?

PMP credential is a globally recognized certification that will open the door for you to work in different sectors and demonstrate a high level in leading and directing the project team.

You can get the PMP certificate only from PMI.

- PMP is a registered mark of the Project Management Institute, INC

PMP Requirements

According to PMI, you need to have either:

- A four-year degree (Bachelor's or the global equivalent) and at least three years of project management experience, with 4,500 hours working in projects and 35 hours of project management education.

Or

- A secondary diploma (High school or the global equivalent) with at least five years of project management experience, with 7,500 hours working in projects and 35 hours of project management education.

PMP Exam

The exam is a:

- 200 Questions.
- 4 Hours exam (72 seconds per question).
- MCQ (Multiple Choice Questions).
- Exam fees (\$ 405 for PMI members and \$ 555 for non members).
- Passing mark is 61%

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