

# The PMBOK ready reckoner

## About this document

I created this document as a ready reckoner for all PMP aspirants. This gives the logical workflow of a project from start till end. You may freely distribute this.

## The workflow

The following steps depict the workflow of a project, as per PMBOK. It traverses through the project management life cycle (process groups) of initiation, planning, execution, monitoring and control and closing. During these phases, the 44 processes of PMBOK, grouped along nine knowledge areas and five process groups gets activated at tandem, and the final project goal is achieved. During this process we can see the Schewhart's PDCA (plan, do, check and act) pattern playing at the project level as well as at the project phases level.

- **Select the right projects** - Select the right projects to execute, which are in line with the organizations strategy. For this we use ratios like NPV (net present value), IRR (internal rate of return), BCR (benefit cost ratio), Payback period etc. This ensures that the right projects, which are in alignment to the organizational strategy and which will give the maximum benefits within a desired time frame only are selected for execution.
  - $FV_n = PV(1+r)^n$  where n - the number of years and r is the percentage of interest.
- **Opportunity cost** - the opportunity given up, by selecting one project over the other
- **Continuous alignment to the organizational strategy** - An organization's business strategy is not static. It changes with the market conditions, hence is very dynamic in nature. When the organizational strategy itself changes, some of the projects can become redundant and at the same time it can open room for some new projects. The right selection of projects, coupled with continuous alignment to the organizations strategy is called as project portfolio management.
- An organization's project portfolio can include projects and programs
- The key characteristics of a project are;
  - fixed start and end dates
  - performed by people
  - continuous elaboration

- limited resources
- Unique output
- The key differentiator of projects and operations is that, projects are temporary in nature, resulting in unique outputs - where as operations are ongoing in nature .
- **Programs** - are a collection of projects, which when executed together yields in some additional benefits, than when performed one after the other.
- **Sub projects** - for ease of execution, large projects can be broken down into sub-projects
- **Project chartering** - The process of selection and approval of the right projects for execution is called project chartering. This ensures that, only the approved projects are funded.
- **Project charter** - Is a document approved by the project sponsor. It contains;
  - Vision statement of the project
  - Business case
  - Project sponsor name and his/her roles and responsibilities
  - Project manager's name and his/her responsibilities
  - High level scope of the projects
  - Key risks, assumptions and dependencies
  - Milestones
- **Project charter** is the only document, where the project manager's name and roles and responsibilities are documented and approved by the senior management representative (sponsor). Hence we say that the project charter gives authority to the project manager.
- Any changes to the project charter needs to be approved by the project sponsor
- Project charter and the high level scope statement forms the input for project planning phase from the project initiation phase.
- Organizational structures
  - Functional organization
    - Least authority for the project manager
    - Project manager plays the role of an expeditor
    - One plus point is that, the project team will have a home to go, at the end of the project
  - Projectized organization
    - In a projectized organization, the project manager has maximum authority

- All the project managers, report to the program manager
- Matrix organization
  - A matrix organization is a mix of projectized and functional organization
  - A matrix organization can take 3 forms. Strong matrix, weak matrix and balanced matrix
    - In a strong matrix, the project manager has more authority than the functional manager
    - In a balanced matrix, both the project manager and the functional manager, share an equal power.
    - In a weak matrix, the functional manager has more power than the project manager
- **The steps involved during planning phase include;**
  - Elaboration of the high level scope into a detailed scope statement
  - Decomposition of the detailed scope into work packages, resulting in a work break down structure (WBS)
  - The general rule of thumb is that - work packages should be between 8 and 80 hours of work. We call it as a 8-80 rule
  - A work breakdown structure do not depict any work flow. It just shows the breakdown of work.
  - It is at the work package level, the estimates of cost, time and scope are frozen. Because of this fact, at the work package level the project manager stops control.
  - The work packages are further broken down into activities
  - Once the activities are identified, activity costs and durations are estimated. For activity cost and duration estimates, we use techniques such as analogous estimation, parametric estimation, three point estimates and wide band delphi. Wide band delphi is performed by experts.
  - Estimating using CPM - When estimating using a one time estimate (CPM), one estimate per task is received. For example, the person doing the estimating in effect says that the task will take exactly five days.
  - PERT - Program evaluation and review technique
    - This method has three estimates per activity
      - Optimistic
      - Pessimistic
      - Most likely
    - Can be used to estimate time or cost
    - PERT formula  $(P+4M+O)/6$
    - Standard deviation of a task using PERT =  $(P-O)/6$
    - Variance of a task using PERT =  $((p-O)/6)^2$

- The next step is activity sequencing. For this we use AON (activity on node or PDM-precedence diagramming method), AOA (activity on arrow or ADM - arrow diagramming method and GERT (flow charts)
- The AON diagram can represent the following dependencies
  - finish to start
  - finish to finish
  - start to finish
  - finish to start
- The AON is the most widely used in all software packages
- The AOA diagram can implement only F-S dependency
  
- **Hammock** - Hammock is used in AON diagrams, to represent those activities which cuts across the phases of the project. Example :- Project management activities span throughout the life cycle of the project. We represent project management as hammock.
  
- **Dummies** - are used in AOA diagrams, to show the F-S start dependency (ease of diagramming). Dummies do not consume any resources and do not have any duration by itself. It is represented as a dotted line.
  
- **ES,EF** - Early start and Early finish of an activity. In an activity on node (PDM), a forward pass is performed to calculate the early start and early finish dates.
  
- **LS,LF** - Late start and Late finish of an activity. In an AON or PDM, a backward pass is performed to compute the late start and the late finish.
  
- **Float** - is the amount of time an activity can be delayed, without affecting the project's end date.  $\text{float} = \text{LS} - \text{ES}$  or  $\text{LF} - \text{EF}$
  
- Float and SLACK are same
  
- When we connect all the activities, whose float is equal to zero, we get the critical path.
  
- **Critical path** - is the longest path in the network or is the shortest time in which the project can be completed.
  
- A critical path can run over a dummy.
  
- A project can have multiple critical paths. That means, the project is more complex to handle.

- **Mandatory dependencies or Hard logic** - are dependencies on which the project manager do not have any say. Example - The clearance to start construction of a building, The waiting time for curing of concrete
- **Discretionary dependencies or soft logic** - are dependencies on which the the project manager has a say
- Inorder to get realistic schedules, we apply mandatory dependencies, discretionary dependencies, leads, lags and buffers to the network diagram.
- A project manager uses schedule to communicate the project details / progress with the team
- **A milestone chart** is a rolled up schedule, which will show only the major milestones. A project manager uses a milestone chart to communicate the project status, with the senior management (stakeholders).
- **Fast tracking** - The process of performing tasks in parallel
- **Crashing** - The process of reducing the duration of a task by deploying more resources
- The subsidiary plans include risk management plan, quality management plan, human resource plan, contract management plan etc.
- **Risk management process include**
  - Risk management planning
  - Risk identification
  - Qualitative risk analysis
  - Quantitative risk analysis
  - Risk response planning
  - Risk monitoring and control
- **Risk planning involves;**
  - Identification of the risks (risk register)
  - Positive risks and negative risks
  - Qualitative risk analysis (probability x impact)
    - Risk rating matrix
  - Quantitative risk analysis (decision tree, monte cralo analysis)
    - Expected monetary value (probability x consequences)
  - Risk response planning
    - Risk response strategies
      - Avoidance
      - Mitigation

- Acceptance
  - Transference
  - Contingency planning - planning the specific actions that will be taken if a risk event occurs.
  - Residual risks - Some risks will remain after risk mitigation or risk response planning. These are candidates for periodic monitoring.
  - Secondary risks - New risks created by the risk response strategies selected
  - Fall back planning - Specific actions that will be taken if the contingency plan is not effective
- Risk management planning is continuous in nature
- **Human resource planning** involves forecasting of human resource requirements and devising strategies for getting the human resources on board as and when required.
  - Responsibility matrix
  - Resource histogram
  - Staffing management plan
  - Halo effect
  - Powers of the project manager
    - Formal
    - Reward
    - Penalty
    - Expert
    - Referent
  - Leadership styles
    - Directing
    - Facilitating
    - Coaching
    - Supporting
    - Autocratic
    - Consultative
    - Consensus
  - Conflict resolution techniques
    - Confronting
    - Compromising
    - Withdrawal (avoidance)
    - Smoothing
    - Forcing
  - Maslow's hierarchy of needs
    - Physiological
    - Safety
    - Social

- Esteem
- Self actualization
- Herzberg's theory
  - Hygiene factors
  - Motivating agents
- Stages of team formation
  - Forming
  - Storming
  - Norming
  - Performing
- Plan purchases and acquisitions involve identifying and planning the what, when, how, from where of purchases
- **Quality planning**
  - Quality is defined as conformance to requirements and fitness for use
  - Gold plating is providing customers extras (either as unwanted features or as unwanted quality)
  - Prevention is preferred over inspection
  - Marginal analysis - Optimal quality is reached at the point where the incremental revenue from improvement equals the incremental cost to secure it.
  - Just in time (JIT) - Approach to decrease the amount of inventory a company carries, by synchronizing the supply system to the production planning and control system.
  - Probability - likelihood that something will occur
  - Standard deviation - A measure of how far you are from the mean.  $(P-O)/6$  is the pert formula for standard deviation.
  - Sigma levels
    - +/- 1 sigma = 68.26%
    - +/- 2 sigma = 95.46%
    - +/- 3 sigma = 99.73%
    - +/- 6 sigma = 99.99%
- The project manager has the ultimate responsibility for the quality of the product
- Quality control tools
  - Inspection
  - Pareto diagram
  - Fish bone diagram (ishikawa diagram)
  - Check lists
  - Statistical sampling
  - Control charts
    - Upper control limit (UCL)
    - Lower control limit (LCL)
    - Mean

- Specification limits
- Out of control
- Assignable cause
- Random cause
- Rule of seven
- Flow charting
- Trend analysis
- As per PMBOK, it is not mandatory that, every project should use all the processes explained in the PMBOK. The project manager can pick and choose, depending on the project needs.
- During project execution, the project team executes the plan
- **Earned value management (EVM)** is the key tool used for monitoring and controlling of a project.
- The building blocks of **earned value management** system are;
  - PV - Planned value (BCWS - budgeted cost of work scheduled)
  - EV - Earned value (BCWP - budgeted cost of work performed)
  - AC - Actual cost (ACWP - actual cost of work performed)
  - SV (schedule variance) = EV-PV
  - SPI (schedule performance index) = EV/PV
  - CV (cost variance) = EV-AC
  - CPI (cost performance index) = EV/AC
  - **SV%** (schedule variance %) =  $((EV-PV)/PV)*100$
  - **BAC** (budget at completion) = sum of planned values of all work packages of the project
  - **EAC** (estimate at completion) =  $AC+(BAC-EV)/CPI$
  - **50/50 rule** - A task is considered 50% complete when it begins and gets credit for the last 50%, only when it is completed.
  - **20/80 rule** - A task is considered 20% complete when it begins and gets credit for the last 80% only when it is completed.
  - **0/100 rule** - A task does not get credit for partial completion, only for full completion.
- During the closing phase of a project, we perform a lessons learned exercise, dismantle the team, close the contract with the client and the sub contractors.
- **Professional responsibility**
  - Do the right thing
  - Follow the right process
  - Act ethically, fairly and professionally
  - Watch for conflicts of interest or the appearance of conflicts of interest
  - Report violations
  - Increase knowledge and practices

## PMBOK ready reckoner Ver 1.0

- Deal with problems
- Ensure individual integrity
- Contribute to the project management knowledge base
- Enhance individual competence
- Balance stakeholders interest
- Interact with team and stakeholders in a professional and cooperative manner

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