PM Notebook

Summarizing Project Management Concepts for the PMP Exam

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Road to PMP

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No great man ever complains of want of opportunity.
Ralph Waldo Emerson

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CHAPTER 1 – INTRODUCTION

Project Management

Project management is the application of knowledge, skills, tools, and techniques to manage activities to meet the project requirements.

Portfolio, Program, Project and Operations

Portfolio –

- A group of projects, programs, and operations that are linked together by a **business goal** to facilitate effective management to meet **strategic** business objectives.
- Usually the responsibility of **senior management.**
- Success is measures in terms of aggregate performance of portfolio components.

Program – A group of projects that are closely linked, to the point where managing them together provides **some benefit**. Programs usually include an element of ongoing activity.

Project – a **temporary** endeavor that is **progressively elaborated** and produces a **specific result**.

- **Tactical –** One operational goal. Probably does not entail contributions by most employees. e.g. Moving to a new building
- **Strategic –** has a primary goal of gaining the competitive advantage by focusing on the organization's overall direction.

Operations/Processes –

- Ongoing work to support the business and systems of the organization.
- Permanent endeavors.
- Produce repetitive outputs.

Projects intersect with operations in many cases including –

- At each closeout phase.
- While expanding outputs.
- During the product development process.
- Until the end of the product life cycle.
- When improving operations or the product development lifecycle.

Project Initiation Context

Why projects are created –

1. Regulatory, legal, or social requirements.
2. Stakeholder requests.
3. Technological advances.

4. Create, improve, or fix products, processes, or services.

Benefits Realization Management (BRM)

Benefits Realization Management (BRM) – provides organizations with a way to measure how projects and programs add true value to the enterprise.

Identify Benefits

Position the intended business results as criteria for determining the best project and program investments by –

- **Utilizing** the appropriate tools, such as a benefits register, benefits realization roadmap, and benefits breakdown structures.
- **Confirming** that key stakeholders, sponsors, and customers have reviewed and approved the benefits realization roadmap.
- **Developing** meaningful metrics and key performance (KPI) indicators to measure the actual delivery of benefits versus the planned benefits

Execute Benefits

Prepare to capture and realize both intended and unintended benefits to minimize risks to future benefits and maximize the opportunity to gain additional benefits by –

- **Ensuring** the project or program remains aligned with the organization's **strategic objectives**.
- **Evaluating** risks and KPIs related to financials, compliance, quality, safety, and stakeholder satisfaction, as they might impact the delivery of benefits
- **Recording** progress and reporting to key stakeholders as directed in the communication plan
- **Ensuring** key stakeholders and beneficiaries **have reviewed**, understand, and act in accordance with identified benefit realization dependencies.

Sustain Benefits

Deliver continuous value from outputs and outcomes once they transition back to the business by –

- **Implementing** the required change control based on defined level of tolerance, and taking corrective action.
- **Performing** a benefits assessment, which includes formally verifying that the benefits have been delivered and are being realized.
- **Sharing** crucial information about how the deliverables are contributing to business success.
- **Monitoring** the continued **suitability** of the new capability or other change factors.
- **Monitoring actual benefit** results against targets and managing for variances.

Business Documents

Contains, but not limited to –

Business Case

A document studies why it is worth to spend money on the project (benefits/reasons/financial validity.) It is the result of **Business Case Analysis (BCA),** it **could be at program level** and it is the responsibility of **project sponsor**. It tells us the following –

- Identify business needs (business problems, opportunities, stakeholders affected, etc.)
- Project feasibility –
    - **Market Demand –** For example, building more fuel-efficient cars in response to gasoline shortages.
    - **Social Need**
    - **Ecological/Environmental Impact**
    - **Organizational Need**
    - **Customer Requests**
- Project determination (organization strategies, goals, objectives, known risks, gap analysis, etc.)
- Analysis of the situation.
- Recommendations for the project.
- Documents high-level strategic and operational assumptions.
- Should be **reviewed periodically** on **multi-phase projects** to ensure the project is on track to deliver the business benefits.
- **Critical Success Factors –** what constitutes success and the ways you know that you are project is successful.
- **Business value –** the value/benefits that your project creates for the organization. It is generally described in **Business Case document**.
    - **Tangible –** Like monetary assets and market share.
    - **Intangible –** Like goodwill, reputation and brand recognition.

Benefit Management Plan

Describes how and when the benefits of the deliverables of the project will bring and describes how to measure the benefits (also including the alignment with organization strategies, assumptions and risks). Often created by **business analyst**.

- **Target Benefits –** Such as expected tangible and intangible value.
- **Strategic Alignment –** How project benefits align to the business strategies.
- **Timeframe –** When will benefits be realized (by phase / short-term / long-term / ongoing / etc.)
- **Metrics –** The measures to be used to show benefits realized, direct measures, and indirect measures.
- **Assumptions –** The factors expected to be in place or to be in evidence.
- **Risks –** The risks for realization of benefits.

Project Selection Methods

Project Selection is a process to assess each project idea and select the project with the highest priority.

- Projects are still just **suggestions** at this stage, so the selection is often made based on only brief descriptions of the project.
- Any selection technique must be evaluated based on the degree to which it will meet the organization's objective for the project.
- The most important criterion for building project selection method is **realism**.

Benefit Measurement Methods (Comparative Approach)

Depreciation

- **Depreciation –** A reduction in the value of an asset over time.
- **Salvage Value –** The estimate resale value of an asset at the end of its useful life.
- **Book Value –** The asset's cost minus the asset's accumulated depreciation

Straight Line Depreciation – The same amount of depreciation is taken each year.
E.g. A $1000 item with a 10-year useful life and no salvage value would be depreciated at $100 per year.

Accelerated Depreciation – Faster than straight line.

- **Double Declining Balance**
- **Sum of Years Digits (SYD)**

Double Declining Balance – Percentage is double the straight line depreciation.

Year	Calculation of Depreciable Cost	Depreciable Cost	Percent	Depreciation Amount
1	Initial Cost	$10,000	40%	$4,000
2	$10,000 - $4,000	$6,000	40%	$2,400
3	$6,000 - $2,400	$3,600	40%	$1,440
4	$3,600 - $1,440	$2,160	40%	$864
5	$2,160 - $864	$1,296	40%	$518
		Total Depreciation:		$9,222

Sum of Years Digits (SYD) –

$$SYD = \frac{n\,(n+1)}{2} = 5years = \frac{5(5+1)}{2} = 15$$

$$Depreciation\ Expense = \frac{Remaining\ useful\ life}{sum\ of\ years\ digit} * Depreciable\ Cost$$

Year	Depreciation base	Remaining life of machine	Depreciation fraction	Depreciation expense
	$			$
1	225,000	5	5/15*	75,000
2	225,000	4	4/15	60,000
3	225,000	3	3/15	45,000
4	225,000	2	2/15	30,000
5	225,000	1	1/15	15,000
				225,000

*1 + 2 + 3 + 4 + 5 = 15

Return on Investment (ROI)

- Measures the gain or loss generated on an investment relative to the amount of money invested.
- It defines the **cumulated net income** from an investment at a given point in time or during a defined period.
- It includes investment, direct and indirect costs and may include allowances for capital cost, depreciation, risk of loss, and/or inflation.
- It is most commonly stated as a **percentage** of the investment or as a **dimensionless** index figure.
- It is typically used for personal financial decisions, to compare a company's profitability or to compare the efficiency of different investments.

$$\boldsymbol{ROI = \frac{Net\ Profit\ (Return)}{Investment\ (Cost)}}$$

Future Value (FV)

Future Value (FV) – To determine the future value of present money.

$$\boldsymbol{FV = PV\ (1 + i)^n}$$

PV = Present value
i = interest rate
n = number of periods

Present Value (PV)

Present Value (PV) – The current worth of a future sum of money given a specific rate of return.

$$\boldsymbol{PV = \frac{FV}{(1 + i)^n}}$$

FV = Future value
i = interest rate
n = number of periods

E.g. Receiving $100 at the end of two years with interest rate of 8% = $58 now.

$$\boldsymbol{\frac{100}{(1 + 0.08)^2} = 85.7}$$

Net Present Value (NPV)

Net Present Value (NPV) / Net Present Worth (NPW) – The difference between the project's current value of cash inflow and the current value of cash outflow over many time periods. The NPV must **always be positive**. When picking a project, **one with a higher NPV is preferred**.

To calculate NPV, you need to calculate the PV of both income and cost figures. You then sum the income PVs and subtract the sum of cost PVs to get the value of NPV.

$$\boldsymbol{NPV = -C_0 + \sum_{t=1}^{T} \frac{C_t}{(1+r)^t}}$$

Simplified –

$$\boldsymbol{NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_T}{(1+r)^T}}$$

$-C_0$ = Initial investment
C = Future cash flow
r = Interest rate
T = Time period

Internal Rate of Return (IRR)

Internal Rate of Return (IRR) – is a method of calculating rate of return. It is a discount rate that makes the **Net Present Value (NPV) of all cash flows from a particular project equal to zero**. In other words, if we computed the present value of future cash flows from a potential project using the internal rate as the discount rate and subtracted out the original investment, our net present value of the project would be zero.

- IRR is considered the minimum discount rate that management uses to identify what capital investments or future projects will yield an acceptable return and be worth pursuing.
- You can think of the internal rate of return as the interest percentage that company has to achieve in order to break even on its investment in new capital.
- The term "internal" refers to the fact that its calculation does not involve external factors, such as inflation or the cost of capital.
- **The higher the IRR number, the better.**

$$\boldsymbol{IRR = 0 = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_T}{(1+r)^T}}$$

$-C_0$ = Initial investment
C = Future cash flow
r = Interest rate
T = Time period

Example – Tom is considering purchasing a new machine, but he is unsure if it's the best use of company funds at this point in time. With the new $100,000 machine, Tom will be able to take on a new order that will pay $20,000, $30,000, $40,000, and $40,000 in revenue.

Since it's difficult to isolate the discount rate unless you use an excel IRR calculator. You can start with an approximate rate and adjust from there. Let's start with 8 percent.

$$\left(\frac{\$20{,}000}{(1+8\%)^1}+\frac{\$30{,}000}{(1+8\%)^2}+\frac{\$40{,}000}{(1+8\%)^3}+\frac{\$40{,}000}{(1+8\%)^4}\right)-\$100{,}000=\$5{,}393$$

As you can see, our ending NPV is not equal to zero. Since it's a positive number, we need to increase the estimated internal rate. Let's increase it to 10 percent and recalculate.

$$\left(\frac{\$20{,}000}{(1+10\%)^1}+\frac{\$30{,}000}{(1+10\%)^2}+\frac{\$40{,}000}{(1+10\%)^3}+\frac{\$40{,}000}{(1+10\%)^4}\right)-\$100{,}000=0$$

As you can see, Tom's internal return rate on this project is 10 percent. He can compare this to other investing opportunities to see if it makes sense to spend $100,000 on this piece of equipment or investment the money in another venture.

Other Methods

Discounted Cash Flow – future cash flows are estimated and discounted by using cost of capital to give their present values.

Economic Value Added (EVA) –

- An estimate of economic profit, or the value created in excess of the required return of the shareholders.
- It is also defined as **the net profit after the deduction** of taxes, capital expenditure, and opportunity cost.
- Indicates whether a company s creating or destroying value to its shareholders.
- Example – for a project cost of $100, the estimated return for 1st year is $5, assuming the same money can be invested to gain 8% per year, then the EVA is $5 – $100 * 8% = -$3.

Murder Board / Scrub-Down – a committee of questioners set up to critically review the project and to identify as many possible threats to the project.

Opportunity Cost – is the cost that is given up when selecting another project. **It is the cost of the project not selected**.

Payback Period / Management Horizon –

- The time necessary for the organization to recover the cost invested before it starts accumulating profit.
- The project with the **shorter period is better.**
- The initial investment in the project will not impact the selection criteria when payback period is used for project selection.

Peer Reviews – you present the project proposal to the peers in the organization. These peers review the project and then recommend some best practices adopted in other projects. The peers also check for the viability of the project.

Scoring Model – the project selection committee lists relevant criteria, weighs them according to their importance and their priorities, and then adds the weighted values.

		Requirement score				
Criteria	**Weight**	**A**	**B**	**C**	**D**	**E**
Value	20%	80	45	40	15	35
Risk	20%	60	85	30	20	75
Difficulty	15%	55	80	50	15	25
Success	10%	30	60	55	65	30
Compliance	5%	35	50	60	50	50
Relationships	5%	80	70	50	85	80
Stakeholder	15%	25	50	45	60	60
Urgency	10%	60	25	40	65	80
Weighted Scores	100%	54.8	60.0	43.3	38.0	52.3

Benefit/Cost Ratio (BCR) – the ratio between the **Present Value of Inflow** (the cost invested in a project) and the **Present Value of Outflow**, which is the **value of return** from the project. Projects that have a **higher Benefit Cost Ratio or lower Cost Benefit Ratio** are generally chosen over others.

Constrained Optimization Methods / Mathematical Model

Used for larger projects that require complex and comprehensive mathematical calculations.

- **Linear Programming**
- **Non Linear Programming**
- **Integer Programming**
- **Dynamic Programming**
- **Multiple Objective Programing**

Non-Financial Considerations

Other organizational factors. May include political issues, change of management, speculative purposes, shareholders' requests, etc.

Constraints

Constraints are factors that limit the team's options.

1. **Time**
2. **Cost**
3. **Scope –** What should be included in the project and what should not.

4. **Resources –** People or material you need for your project.
5. **Quality**
6. **Risk –** Whenever you make assumptions about a project, you are introducing risk.

Triple Constraint / Iron Triangle – **Time**, **cost** and **scope**

Theory of Constraints

- Identifying the most important limiting factors, eliminate them, then looking at the next most important limiting factors.
- Systematically improving that constraint until it is no longer the limiting factors.
- Constraints are often referred to as **bottlenecks.**
- **The Goal by Dr. Eliyahu M. Goldratt**

Project Lifecycle

Project Management Lifecycle – Refer to **Initiation, Planning, Executing, Monitoring & Controlling, and Closing (IPECC).**

Project Lifecycle –

- **Unique** to each type of project.
- Refers to methodology and phases of a project within an organization.
- Each phase can consist of any activities from the process groups.
- Have a **definite end**.
- Phases may **repeat**.
- Phases are generally sequential but can **overlap**.

Product Lifecycle / Project Lifecycle Management (PLM) –

- The process of managing the entire lifecycle of a product from its conception, through design and manufacture, to service and disposal.
- PLM integrates people, data, processes, and business systems to provide a product information backbone for companies.
- A product can spawn or require many projects over its life and each project has its own project lifecycle.
- **Does not** have a **definite end**.
- Phases occur only **once**.
- Phases are **sequential**.

The five stages of a product's life are –

1. **Development / Conception –** generating ideas and creating the product.
2. **Introduction –** marketing the product and selling it.
3. **Growth –** sales increase
4. **Maturity –** product is accepted widely and sales are at their peak.

5. **Decline / Withdrawal / Retirement** – selling out all of your inventory and move on to the next product.

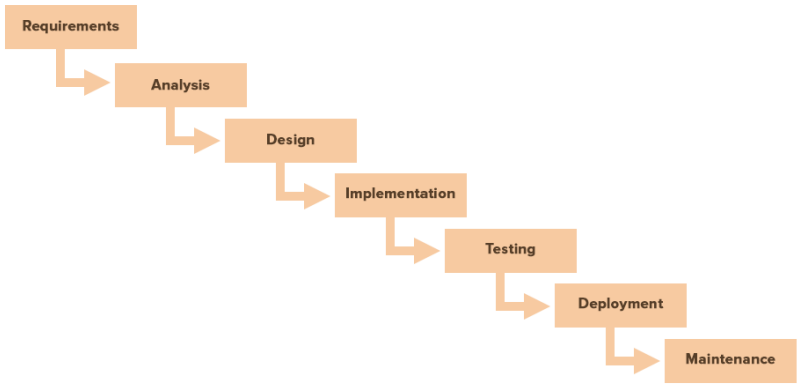
Project Management Methodology (PMM)

A project management methodology is essentially a set of guiding principles and processes for managing a project. Your choice of methodology defines how you work and communicate.

Predictive Lifecycle / Plan-Driven / Waterfall

Predictive life cycles are ones in which the project scope, and the time and cost required to deliver that scope, are determined as early in the project life cycle as practically possible.

- **Fixed in scope**. **Variable in time and cost.**
- Divided into discrete stages.
- Sequential, heavily requirements-focused.
- Easy-to-use.
- Implies **high risk**.
- Best for –
    - Short, simple projects.
    - Projects with clear and fixed requirements.



Iterative and Incremental Lifecycles / Iterations

- Iterative and incremental life cycles are ones in which project phases intentionally repeat one or more project activities as the project team's understanding of the product increases.
- **Iterations** develop the product through a series of **repeated cycles**.
- **Increments successively add** to the functionality of the product.
- For each iteration, you have to collect requirements, define scope, and define the WBS.
- Risk is analyzed before the start of each iteration.
- Work items are documented into a **backlog** where an accumulation of work waiting to be done or orders to be fulfilled is available.

Adaptive Lifecycle / Change-Driven / Agile

Adaptive life cycles are intended to respond to high levels of change and ongoing stakeholder involvement.

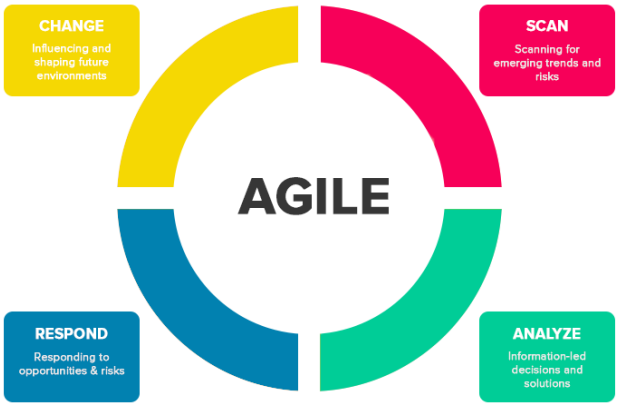
Characteristics

- Adaptive methods **are also iterative and incremental**, but differ in that iterations are **very rapid** (usually with duration of 1 to 4 weeks).
- **Fixed in time and cost**. **Variable in scope.**
- Documentation is **not considered an added value** in agile projects.
- Face-to-face and **informal communication**.
- Usually **fist-to-five (or fist-of-five)** voting methods is used in agile projects.

- **Team and Management –**
  - **Self-organizing teams**.
  - PM has a **servant leadership** approach.
  - Team functions with an absence of centralized control.
  - Team members are generalists (instead of SMEs), they are local domain experts, and they determine how plans and components should integrate.
  - Collaboration to boost productivity.

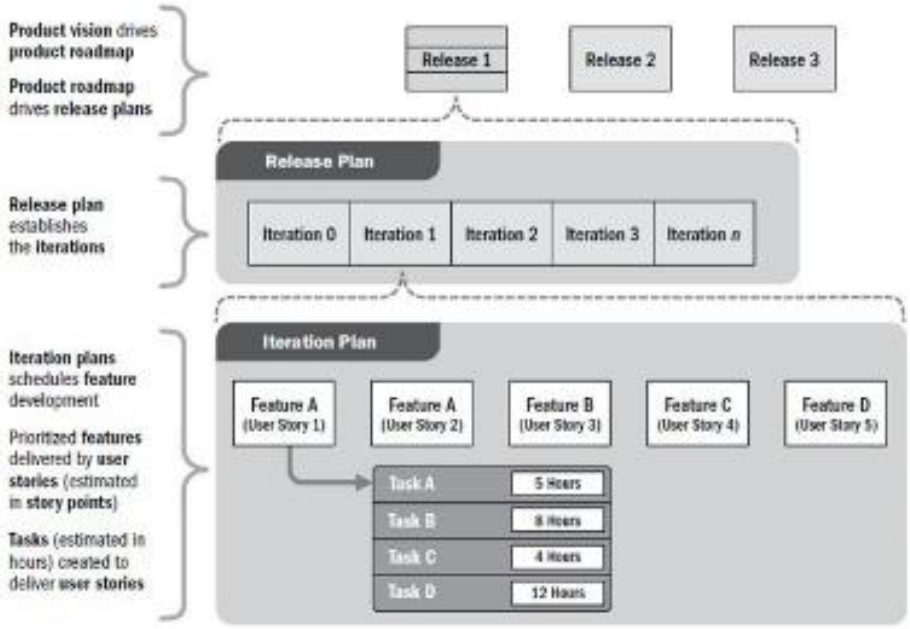
- **Scope (or Backlog) –**
  - **No new work during the iteration.**
  - Emerging requirements (also called **progressive elaboration**).
  - Scope is not fully defined at start.
  - The team estimate their capacity regarding the items on the backlog.

- **Risk –**
  - **More risky.**
  - Risk is considered when selecting the contents for each iteration.



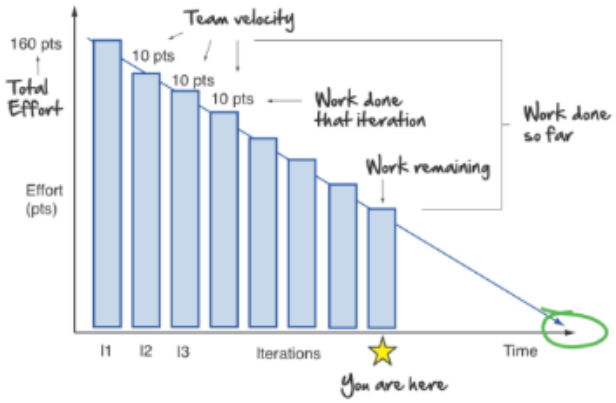
Agile Release Planning

- High-level summary of when we expect the product to be released.
- **Product roadmap**.
- The number of iterations/sprints.



Iteration Burndown Chart

A chart that shows how quickly (rate/velocity) you and your team are burning through your customer's user stories. It tracks the work remaining, and help analyzing the variance.



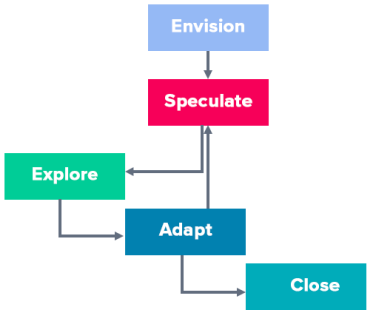
Terms

Backlog (Product Scope) – a prioritized list of requirements. **Owned by product owner**.
Grooming the Backlog / Backlog Refinement / Scrum Artifact – The owner of the product prioritizes the backlog before each iteration/sprint of the project.
Timebox – a previously agreed period of time during which a person or a team works steadily towards completion of some goal.
Story Points – an abstract measure of effort required to implement a user story. The team work together to agree on estimates in a group setting.

Scrum

- **Scrum** is a specialized agile method.
- Focuses on project team.
- Involves **daily 15-minutes stand-up meeting**.
- Can easily lead to scope creep because there's no fixed end-date.

Sprint – Refers to an **iteration or development cycle** in Scrum.
Sprint Review – To look back at what worked in that sprint.
Retrospective – the last meeting done in a sprint. The entire team, including both the Scrum Master and the product owner should participate to determine what could be changed that might make the next sprint more productive.
Planning Poker / Scrum Poker – a consensus-based, mostly used to estimate effort or relative size of development goals in software development. In planning poker, members of the group make estimates by playing numbered cards face-down to the table, instead of speaking them aloud. The cards are revealed, and the estimates are then discussed. By hiding the figures in this way, the group can avoid the cognitive bias of anchoring, where the first number spoken aloud sets a precedent for subsequent estimates.



Extreme Programming (XP)

Extreme programming (XP) is a software development methodology which is intended to improve software quality and responsiveness to changing customer requirements.

- A type of **agile** software development.
- Advocates frequent "**releases**" in short development cycles, which is intended to improve productivity and introduce checkpoints at which new customer requirements can be adopted.
- Analysis, design, coding, and testing phases are done **everyday**.

Hybrid Lifecycle / Structured Agile

A **combination** of predictive, iterative, incremental, and/or agile approaches is a hybrid approach.

Gates Methodology

Gates methodology is a project management technique in which an initiative or project (e.g., new product development, process improvement, and business change) is divided into distinct stages or phases, separated by decision points (known as **gates**.)

Gate / Tollgate / Phase Gate / Stage Gate / Water Gate / Kill Point / Exit Gate / Phase Exit Review – a standardized control point where the **projects phase is reviewed and/or audited and approved (or not) to continue with the next phase**. The gates allow to verify if the project reaches the expected performance.

- Called a **Kill Point** because it is an opportunity to kill the project.
- **Funding** might occur at phase gates.
- **Not necessary** to have a phase gate at **project closure**.

Integrated Project Management (IPM)

- Sometimes called Integrated Project Delivery.
- Emphasizes sharing and standardization of processes across the organization.
- Requires extensive upfront planning to ensure that all processes are well-integrated.

Projects integration Sustainable Methods (PRiSM)

- Developed by Green Project Management (GPM) Global.
- Focuses on accounting for and minimizing adverse environmental impacts of the project.
- Extends beyond the end of the project to maximize sustainability.

Projects IN Controlled Environments (PRINCE2)

- Official project management methodology of the UK government.
- Requires extensive documentation.
- Based on 7 principles, 7 themes and 7 processes. The 7 PRINCE2 principles, for instance, are –
    - Continued business justification
    - Learn from experience
    - Defined roles and responsibilities
    - Manage by stages
    - Manage by Exception
    - Focus on products
    - Tailor to suit the project environment

Project Documents

Refer to any project-related documents that are not part of the project management plan.

Activity Attributes	Lessons Learned Register	Quality Control Measurements	Risk Report
Activity List	Milestone List	Quality Metrics	Schedule Data
Assumptions Log	Physical Resource Assignments	Quality Reports	Schedule Forecasts

Basis of Estimates	Project Calendars	Requirements Documentation	Stakeholder Register
Change Log	Project Communications	Requirements Traceability Matrix	Team Charter
Cost Estimates	Project Schedule	Resource Breakdown Structure	Test and Evaluation Documents
Cost Forecasts	Project Schedule Network Diagram	Resource Calendars	
Duration Estimates	Project Scope Statement	Resource Requirements	
Issue Log	Project Team Assignments	Risk Register	

Additional Terms

Application Areas – The areas of expertise, industry, or function where a project is centered. E.g. IT, healthcare, etc.

Cultural and Social Environment – How a project affects people and how these people may affect the project. Includes economics, religions, demographics, etc.

MACD – Move, Add, Change, and Delete

Line of Business (LOB) – is a general term which refers to a product or a set of related products that serve a particular customer transaction or business need.

Management by Exception (Financial) – The practice of examining the financial and operational results of a business, and only bringing issues to the attention of management if results represent substantial differences from the budgeted or expected amount.

PMI Talent Triangle –

1. **Technical Project Management –** enable the PM to effectively apply project management knowledge. Examples are resource management, tailoring, risk management, rolling-wave planning, integrated change control, etc.
2. **Leadership / Interpersonal –** allows PM to guide, motivate, and direct the team. Includes influencing the organization, sharing power, creating an environment to meet project objectives, and helping a group of people to bond.

3. **Strategic and Business Management –** ensure that the PM can see the high-level overview of the organization and effectively negotiate and implement decisions and actions that support strategic alignment and innovation.

Progressive Elaboration – Refers to the technique of which the plan for the particular project is being continuously and constantly modified, detailed, and improved as newer and more improved sets of information becomes available to the project management team.