

FREE PDF BOOK · 2026 EDITION

96 Free PMP Lessons in Simple English

For professionals whose first language is not English. A complete PMP exam guide for the July 2026 exam, then every lesson with a real story, a picture, the key rule, an exam-style question and a memory card. Plus formulas, a glossary and an exam-day checklist.

96

lessons

96

exam-style questions

17

parts + exam guide

2026

new exam outline

[Read the lessons online →](#)

[Free PMP practice questions →](#)





What is inside this book

· click any part to jump to it

Part 0 Your PMP exam guide

eligibility · exam format · the 26 tasks · how to read questions · study plan

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Project Initiation
& Business Value

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Delivery
Approach

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Toolkit Your exam toolkit

formula sheet · glossary · answer traps · exam-day checklist · progress tracker



How to use this book

1. **Read one lesson a day.** Each lesson has two pages: the situation and the picture, then the key idea, an exam-style question and your memory card.
2. **Answer the question before you look at the answer.** PMP questions test judgment: what should the project manager do **first**, **next** or **best**?
3. **Open the full lesson** with the link on every page. The full version on pmclear.com adds worked examples, the common traps, more exam questions, quick checks and calculators.
4. **Practise.** PMCLEAR has 2,000 exam-level PMP questions with every answer explained in simple English, and timed 45, 90 and 180-question exams.

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PART 0 · YOUR PMP EXAM GUIDE

What is the PMP?

The **PMP (Project Management Professional)** is a certification from the **Project Management Institute (PMI)**. It shows that you can lead projects of any kind: **predictive** (plan first, then build), **agile** (build in short cycles and learn) and **hybrid** (a mix of both).

Employers around the world know the PMP. It is not a test of memory: most questions describe a real project situation and ask what a good project manager should do.

180

questions

240

minutes

3

domains

26

tasks



Good news for non-native speakers: the exam uses business English, not literary English. If you learn the key exam words (see the glossary at the end of this book) and practise reading scenarios, language is no longer the barrier.

Your road to the PMP in 5 steps

1**Learn**

Study the 3 domains and the PMI way of thinking

2**Qualify**

Project experience + 35 hours of training

3**Apply**Online application on pmi.org**4****Pass**

180 questions in 240 minutes

5**Maintain**

60 PDUs every 3 years



Can I take the PMP exam?

· the eligibility rules

1. Experience leading projects (choose your education level)

Secondary diploma (high school or equivalent)

60 months

Associate degree or equivalent

48 months

Bachelor's degree or higher

36 months

Degree from a PMI GAC-accredited program

24 months

- Experience from the **last 10 years**.
- Months **do not overlap**: two projects in the same month count as one month.
- You must have **led** the work (planning, directing, reporting), not only taken part.

2. Project management training

35

hours of project management training

or

CAPM®

an active CAPM certification (the 35 hours are waived)

Books and practice exams on their own do not count as training hours. Keep certificates and project records: some applications are selected for an **audit**, and PMI then asks for proof.

3. After approval

You have a **1-year eligibility period** and can take the exam **up to 3 times** in that year. You take it at a **Pearson VUE test centre** or **online** from home or office (OnVUE).

The PMP exam, at a glance

EXAM FORMAT

180 questions
170 scored + 10 unscored

240 minutes
4 hours to answer the questions

2 scheduled breaks
10 minutes each

Scenario, visual and other question formats

WHAT THE EXAM COVERS

People **33%**
Lead teams · resolve conflict · engage stakeholders

Process **41%**
Plan work · deliver results · track progress

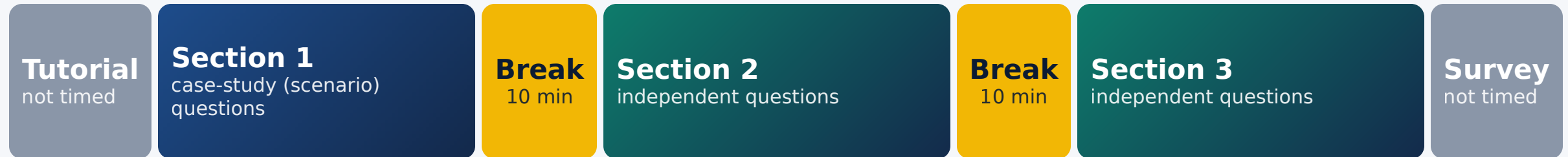
Business Environment **26%**
Governance · risk · compliance · change

Predictive, agile and hybrid appear across all three

Source: PMI, PMP Examination Content Outline (July 2026) · PMCLEAR is an independent study tool



Exam day: how the 240 minutes work



240 minutes for 180 questions (170 scored + 10 unscored pretest questions that you cannot recognise) · the breaks are not part of the 240 minutes



About 80 seconds per question

$240 \text{ minutes} \div 180 \text{ questions} = 1 \text{ minute } 20 \text{ seconds}$. Long scenarios take longer, short ones less. Check your time at each break.



A break closes the section

When a break starts, you cannot go back to the questions before it. Review your flagged questions **before** you start the break.



Answer every question

There is no penalty for a wrong answer. Never leave a question empty: choose your best answer, flag it, and move on.

The number of case-study questions can differ from one exam form to another. PMI does not publish a pass mark: you receive pass or fail and a report on how you did in each domain.



What the exam tests: 3 domains, 26 tasks · the official task list

People

33%

1. Develop a common vision
2. Manage conflicts
3. Lead the project team
4. Engage stakeholders
5. Align stakeholder expectations
6. Manage stakeholder expectations
7. Help ensure knowledge transfer
8. Plan and manage communication

In this book: Parts [13](#) · [14](#)

Process

41%

1. Develop an integrated project management plan and plan delivery
2. Develop and manage project scope
3. Help ensure value-based delivery
4. Plan and manage resources
5. Plan and manage procurement
6. Plan and manage finance
7. Plan and optimize quality of products/deliverables
8. Plan and manage schedule
9. Evaluate project status
10. Manage project closure

In this book: Parts [1](#) · [2](#) · [5](#) · [6](#) · [7](#) · [8](#) · [10](#) · [12](#) · [16](#)

Business Environment

26%

1. Define and establish project governance
2. Plan and manage project compliance
3. Manage and control changes
4. Remove impediments and manage issues
5. Plan and manage risk
6. Continuous improvement
7. Support organizational change
8. Evaluate external business environment changes

In this book: Parts [9](#) · [11](#) · [12](#) · [15](#)

Agile parts 3 and 4 support tasks in all three domains. Part 17 (Exam Strategy) teaches how to answer questions from every domain.
Source: PMI, PMP Examination Content Outline, July 2026. Fees, rules and dates can change: always check pmi.org before you apply.



Predictive, agile and hybrid: know which world the question is in



■ **about 40%** predictive

■ **about 60%** agile and hybrid

Read the first lines of a scenario and decide: which approach is this project using? The right answer follows the rules of **that** approach.

	Predictive	Agile	Hybrid
Planning	Detailed plan at the start	Plan a little, often (backlog, sprints)	Detailed where work is stable, iterative where it is not
Change	Change request → change control board	Welcome change; Product Owner reorders the backlog	Each part follows its own rule
Progress	Baselines, earned value, milestones	Working increments, burndown, velocity	Both, in one report
Team	PM assigns and directs work	Self-managing team, servant leader	Depends on the part
Words in the question	baseline · CCB · WBS · phase gate	sprint · backlog · Product Owner · retrospective	"some teams use..." · "the hardware part..."

Learn more: [Part 2: Delivery Approach](#) · [Part 3: Agile Practices](#)

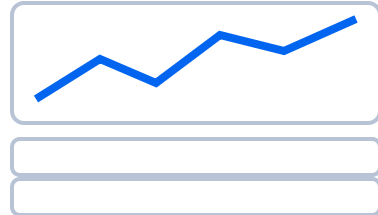


The 8 question formats · know them before exam day



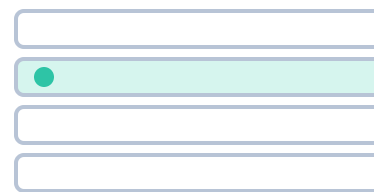
Case or scenario NEW

Several questions about one longer project story. Read the story once, then go back to it for each question.



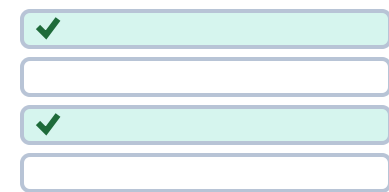
Graphic-based NEW

A chart, board or diagram is part of the question. Read the axes and labels first.



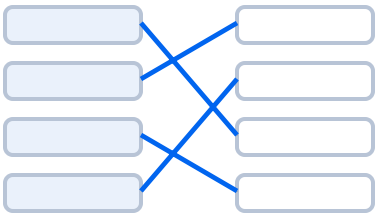
Multiple choice

Four options, one correct. The most common type.



Multiple response

Choose two or more. The question tells you how many.



Matching test centre

Match terms to definitions or steps to their purpose.



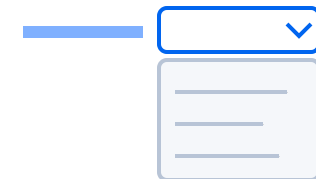
Enhanced matching

test centre
Matching with drop-down lists for each row.



Point and click test centre

Click the right area of a picture, chart or screen.



Pull-down list test centre

Choose the right word from a list to complete a sentence.

"Test centre" formats are used in the computer-based exam at a test centre. Case-study and graphic-based questions are new in the July 2026 exam. Many questions are short scenarios of 2 to 5 sentences.

Source: PMI, PMP Examination Content Outline, July 2026. Fees, rules and dates can change: always check pmi.org before you apply.



Think like PMI: the 12 rules behind the right answers



1. Assess before acting

Get the facts and analyse the impact first.



2. Follow the process

Use the plan, the change process and the agreed rules.



3. Collaborate first

Solve problems at the lowest level; escalate with options.



4. Serve the team

Remove impediments, coach, empower.



5. Honest and early

Share bad news early and openly.



6. Safety, law, ethics first

Never trade them for time or money.



7. Value over the plan

Deliver business value, not just tasks.



8. Talk to people directly

Understand stakeholders; communicate early.



9. Plan for risk

Act on the plans you made for risks.



10. Tailor, don't skip

Adjust the process to the project; never bypass it.



11. Respect roles

Let the right person decide (sponsor, PO, CCB).



12. Keep improving

Learn lessons, retrospect, share.

Use the 12 rules as an elimination checklist: an option that breaks a rule is almost always wrong. Full lessons: [Part 17: Exam Strategy](#) · [lesson 89](#).



How to read a PMP question: decode, then answer

EXAMPLE

Two weeks into execution of a predictive project, a senior stakeholder asks a developer to add a new report. The stakeholder has been with the company for 20 years. The developer has already started the work. **What should the project manager do FIRST?**

- A. Add the report, because the stakeholder is senior
- B. Submit a change request to the change control board
- C. Stop the unapproved work and assess the impact of the request
- D. Remove the developer from the project

Answer: C. First stop the work that has no approval and understand the impact (rule 1: assess before acting). Then the change request goes to the board (B is the NEXT step). A is gold plating; D punishes instead of fixing the process.

1 Read the last sentence first.

What is asked: FIRST, NEXT, BEST, MOST likely, EXCEPT?

2 Find the approach and your role.

Predictive, agile or hybrid? Are you the PM, the Scrum Master, a team member?

3 Find the trigger.

What just happened that needs a decision? Usually one problem per question.

4 Remove the noise.

Would the answer change without this detail? If not, ignore it (20 years with the company).

5 Eliminate, then choose.

Cross out options that break a PMI rule. Between the last two: which comes first, and who should decide?

Full lessons: [Part 17: Exam Strategy](#)



Your 8-week study plan

· about 45 minutes a day, 6 days a week

Week 1

Lessons 1-12

Project Initiation & Business Value · Delivery Approach

☐ 12 lessons ☐ 60+ practice questions

Week 2

Lessons 13-24

Delivery Approach · Agile Practices

☐ 12 lessons ☐ 60+ practice questions

Week 3

Lessons 25-36

Agile Metrics & Events · Scope & Requirements · Schedule

☐ 12 lessons ☐ 60+ practice questions

Week 4

Lessons 37-48

Schedule · Cost & EVM · Quality · Risk

☐ 12 lessons ☐ 60+ practice questions

Week 5

Lessons 49-60

Risk · Procurement · Change & Configuration Control · Monitoring & Control · Stakeholders & Communication

☐ 12 lessons ☐ 60+ practice questions

Week 6

Lessons 61-72

People & Team Leadership

☐ 12 lessons ☐ 60+ practice questions

Week 7

Lessons 73-84

Business Environment · Closing & Integration

☐ 12 lessons ☐ 60+ practice questions

Week 8

Lessons 85-96

Closing & Integration · Exam Strategy

☐ 12 lessons ☐ 60+ practice questions

Every day: one or two lessons + 10 practice questions. Read every explanation, also when you were right.

Weeks 9-10: two or three full timed exams (180 questions). Review every mistake and find the PMI rule you missed. [Practise on pcclear.com →](#)



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Project Initiation & Business Value

Exam domain: Process

1. The project charter: the official 'go'
2. Business case and project selection: NPV, IRR, payback and benefit-cost ratio
3. Assumptions, constraints and competing demands
4. Kick-off, the project management plan and project documents
5. EEFs and OPAs: the environment and the organisation's assets
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7. The PMO and project governance
8. Project roles and the RACI chart





LESSON 1 OF 96 · PROJECT INITIATION & BUSINESS VALUE

All approaches

The project charter: the official 'go'

Goal: After this lesson you can explain what the charter does, what it contains, who signs it, and what to do when someone wants to start work without one.

The situation: “Start now, paperwork later”

A senior executive calls: *“The customer is ready. Start the robot cell immediately. The charter will be written later.”*

It sounds efficient. But without a charter nobody has formally authorised the money, nobody has agreed the objectives, and you have no formal authority to use people from other departments.

In PMP logic, the project **does not exist** until the charter is signed.

“Charter will follow”, “start immediately”, “verbal approval” → get the charter signed first. Work with the sponsor to develop it.

What is in a charter

Why

Purpose, business justification, measurable objectives and success criteria.

What

High-level scope and requirements, key deliverables, summary milestones, summary budget.

Who & how much authority

Sponsor, the **project manager named** and their authority level, key stakeholders.

Risks & limits

High-level risks, key assumptions and constraints.

Approval

Signed by the **sponsor** or initiator.

Not included

Detailed schedule, detailed budget, WBS: those come in planning.

One to three pages; high-level; signed by the sponsor.



What the charter does

The **project charter** formally **authorises** the project and **gives the project manager authority** to use organisational resources. It links the project to the organisation's strategy.

Your memory card

- Charter = **authorises the project** and **names the PM** with authority
- Signed by the **sponsor/initiator**, not the PM
- High-level: purpose, objectives, scope, milestones, budget, risks
- “Start now, charter later” → **get it signed first**

EXAM-STYLE QUESTION

A senior executive tells you to start a project immediately and says the charter will be written later. What should you do FIRST?

- A.** Start planning informally to save time
- B.** Log the verbal instruction and proceed
- C.** Work with the sponsor to develop and sign the project charter
- D.** Hold a kickoff meeting with the team

Answer: C. No charter = no authorised project and no PM authority; get it signed first.

Open the full lesson →

More free PMP questions →

The full lesson on pmclean.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 2 OF 96 · PROJECT INITIATION & BUSINESS VALUE

All approaches

Business case and project selection: NPV, IRR, payback and benefit-cost ratio

Goal: After this lesson you can explain what a business case contains, calculate present value and NPV by discounting cash flows, interpret IRR, payback, benefit-cost ratio and ROI, and choose between projects using both financial and strategic criteria.

The situation: Two good ideas, one budget

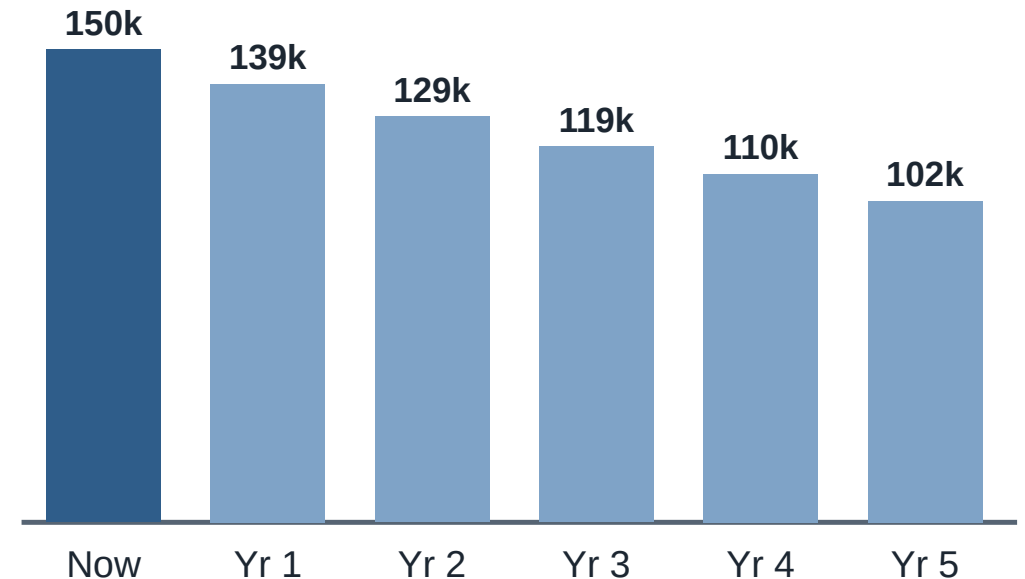
You work in the project management office of a regional grocery chain. The executive team has \$500,000 for improvement projects this year and two proposals on the table.

Project A, self-checkout lanes, costs \$500,000 and should save about \$150,000 in labor every year for five years. **Project B**, new warehouse software, also costs \$500,000. Its savings start slowly while staff learn the system (\$50,000 in year 1), then grow to \$250,000 a year by year 4.

Over five years, Project A saves \$750,000 and Project B saves \$850,000. Project A pays back its cost sooner. The chief financial officer says, “Payback is not enough. Show me the NPV at our 8% discount rate.”

Order: strategy → business case (why and is it worth it?) → charter (authorization) → plan (how). On the exam, the business case is the document that justifies the project.

See it in one picture: money later is worth less



What \$150k is worth today (8% discount rate)

Each bar is \$150,000 received in a different year, discounted at 8%. The further away the money, the less it is worth today. This is why NPV, not the simple total, is used to compare projects.



Where the business case fits

Organizations have more good ideas than money and people. **Portfolio management** decides which projects to fund, based on strategy. The document that argues for one project is the **business case**.

The business case comes **before** the project charter. It answers: why should we do this, what will it cost, what value will it bring, what are the options (including doing nothing), and what are the risks? It is usually owned by the **sponsor**, often with help from the project manager or a business analyst.

If the business case is approved, the **project charter** formally authorizes the project and the project manager. A **benefits management plan** then describes how and when the promised benefits will be measured. The business case is not a one-time document: it is checked at stage gates and whenever major changes happen, to confirm the project is still worth doing.

Your memory card

- Business case = why the project is worth doing; it comes before the charter and is reviewed at gates
- Money later is worth less: $PV = FV \div (1 + r)^t$; the discount rate is set by finance
- NPV = sum of discounted cash flows. Above 0 adds value; choose the **highest NPV**; never count time twice
- IRR = rate where NPV = 0; accept if above the hurdle rate; NPV wins if they conflict
- Payback: shortest is best, but it ignores time value and everything after payback
- BCR above 1.0 is good; ROI may ignore timing

EXAM-STYLE QUESTION

A sponsor must choose one of two projects. Project 1 has an NPV of \$260,000 and lasts four years. Project 2 has an NPV of \$210,000 and lasts two years. Both fit the strategy equally well. Which project should be selected?

- A.** Project 2, because it delivers its benefits two years sooner
- B.** Project 1, because its net present value is higher
- C.** Project 2, because its value per year of duration is higher
- D.** Either project, because both have a positive NPV

Answer: B. NPV already accounts for when the money arrives, so the duration is already in the number. Choose the highest NPV: Project 1. If the projects were not mutually exclusive and money allowed, both could be funded because both are positive.

Open the full lesson →

More free PMP questions →

The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 3 OF 96 · PROJECT INITIATION & BUSINESS VALUE

All approaches

Assumptions, constraints and competing demands

Goal: After this lesson you can tell assumptions from constraints, manage them in the assumption log, and explain how the competing constraints affect each other.

The situation: 6 bar... or not?

The robot cell plan assumed that the customer's compressed air supply would be a stable 6 bar. Nobody measured it. During installation, measurements show 4.5–5.5 bar, fluctuating. The grippers fault.

At the same time, the customer insists the go-live date cannot move, the budget is fixed, and the line must meet a specific safety standard.

One of these was a belief that turned out false. The others are fixed limits. They need very different handling.

An assumption proven false → update the assumption log, assess the impact as a risk or issue, and agree actions with the responsible party.

Competing constraints



The classic triangle, plus quality, risk, resources and benefits.



Assumptions vs constraints

Every project starts with both:

Your memory card

- **Assumption** = believed true → verify and monitor ·
Constraint = fixed limit → plan within
- False assumption → update log, assess as risk/issue, agree actions
- Competing constraints: scope, time, cost, quality, risk, resources, benefits
- Make trade-offs transparent; change through governance

EXAM-STYLE QUESTION

The plan assumed the customer would provide 6 bar compressed air. Measurements during installation show 4.5 to 5.5 bar. The assumption is in the assumption log. What should the project manager do?

- A.** Ignore the measurements, since the assumption was agreed
- B.** Update the assumption log, assess the impact as an issue or risk, and agree corrective actions with the customer
- C.** Adjust the machines to 4.5 bar without telling the customer
- D.** Stop installation until 6 bar is available

Answer: B. False assumption → update the log, assess impact, agree actions with the responsible party.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 4 OF 96 · PROJECT INITIATION & BUSINESS VALUE

Predictive · hybrid

Kick-off, the project management plan and project documents

Goal: After this lesson you can describe the purpose of a kick-off, explain what the project management plan contains, and tell plans and baselines from project documents.

The situation: Everyone heard something different

The robot cell's kick-off was a 20-minute call. Afterwards, the customer believed training was included; the mechanical team thought the guarding was subcontracted; the controls lead didn't know who approved design changes.

Two weeks later, three small disputes. Nobody had lied; they simply never heard the same story at the same time.

A good kick-off aligns everyone. A good project management plan keeps them aligned.

Kick-off happens after the charter is signed: not before the project is authorised.

The kick-off

Purpose

Align everyone on objectives, scope, roles and ways of working; build relationships.

Typical agenda

Objectives and success criteria ·
scope and exclusions ·
milestones · roles and RACI ·
communication ·
risks · next steps

When

After the charter is signed; often at the end of planning (predictive) or before the first iteration (agile). Big projects: one per phase.

One meeting, one shared story.



The kick-off meeting

The **kick-off** starts the project with all key stakeholders: objectives, scope and exclusions, milestones, roles and responsibilities, communication, key risks and next steps. It builds shared understanding and relationships.

Your memory card

- **Kick-off** after the charter: objectives, scope, exclusions, roles, communication, risks
- **PM plan** = subsidiary plans + scope/schedule/cost **baselines**
- **Project documents** = logs and registers, updated as you go
- Tailor the plan; baselines change only through change control

EXAM-STYLE QUESTION

After a short kick-off call, stakeholders have different understandings of scope, ownership and approvals. What would have BEST prevented this?

- A.** A longer project charter
- B.** A well-prepared kick-off meeting with all key stakeholders covering objectives, scope and exclusions, roles and decision rights
- C.** More detailed status reports
- D.** A Monte Carlo simulation

Answer: B. The kick-off aligns everyone on scope, roles and how decisions are made.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 5 OF 96 · PROJECT INITIATION & BUSINESS VALUE

All approaches

EEFs and OPAs: the environment and the organisation's assets

Goal: After this lesson you can tell enterprise environmental factors from organisational process assets, and use OPAs to plan better and improve them for the future.

The situation: Starting from zero, again

A new PM at the integrator is planning a robot cell. There is no risk register template, no lessons-learned repository and no estimating database. Every previous project built its own tools from scratch, and made the same mistakes.

Meanwhile, a new provincial regulation adds documentation requirements, the region is short of certified welders, and the company culture expects every decision to go to the director.

Some of these things the PM can use and improve. Others the PM must simply work within.

Quick test: can the organisation's project people use and update it as an asset? → OPA. Is it a condition around the project? → EEF.

EEFs vs OPAs

Enterprise environmental factors (EEFs)

Conditions you **can't control directly** that influence the project.

Internal: culture, structure, available staff and skills, IT systems, risk appetite.

External: laws and regulations, market conditions, standards, weather, politics, exchange rates.

Organisational process assets (OPAs)

The organisation's **own resources** you can use and improve.

Processes and templates: policies, procedures, checklists, templates.

Knowledge: lessons learned, historical data (estimates, defect rates), past project files.

Work within EEFs; use and improve OPAs.



Two kinds of influences

Every project is shaped by its surroundings:

Your memory card

- **EEFs** = conditions around the project (laws, markets, culture, infrastructure)
- **OPAs** = the organisation's templates, procedures, lessons, historical data
- Work **within** EEFs; **use and improve** OPAs
- No OPAs? Create, tailor and contribute back

EXAM-STYLE QUESTION

A newly appointed project manager finds that the organisation has no risk register template, no lessons-learned repository and no estimating database. What should the project manager do?

- A.** Create the tools needed for this project and contribute them, with lessons learned, to the organisation's process assets
- B.** Postpone planning until the PMO creates templates
- C.** Copy a previous employer's templates without adaptation
- D.** Manage risks and estimates informally

Answer: A. Create and tailor what's needed, then contribute it back as OPAs.

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LESSON 6 OF 96 · PROJECT INITIATION & BUSINESS VALUE

All approaches

Organisational structures and the PM's authority

Goal: After this lesson you can describe functional, matrix and projectized structures, and adapt how you get resources to the PM's level of authority.

The situation: “Who do you work for?”

The robot cell needs a structural engineer 50% of her time. Two weeks in, she has missed three deliverables. In private she explains: her functional manager has also assigned her to two other projects; her total load is 150%.

The PM cannot simply order her to prioritise the robot cell: in this company the functional manager controls her time.

Knowing the organisation's structure tells you **how much authority you have** and therefore **how** to get things done.

In functional and weak matrix structures, the PM works through functional managers: negotiate with data, influence with expert and referent power, use governance when objectives are at risk.

Authority across structures

Functional manager decides

Project manager decides

Functional

Weak matrix

Balanced

Strong matrix

Projectized

The further right, the more the PM controls resources and budget.



Five structures

Structures range from functional (departments rule) to projectized (projects rule), with matrix types in between:

Your memory card

- Functional → weak → balanced → strong matrix → projectized: **PM authority grows**
- Low authority: work **through** functional managers; negotiate with data
- Over-allocation is a **resource** problem, not a performance problem
- Use expert and referent power; escalate through governance if needed

EXAM-STYLE QUESTION

In a strongly functional organisation, the project manager is a part-time coordinator with no budget authority. A functional manager reassigns two team members to departmental work without notice. What should the project manager do?

- A.** Instruct the team members to continue project work
- B.** Work with the functional manager to understand the needs and agree availability, escalating through governance if objectives are at risk
- C.** Report the functional manager to the sponsor
- D.** Re-plan without discussion and accept the delay

Answer: B. Work through functional managers; use governance when objectives are threatened.

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The PMO and project governance

Goal: After this lesson you can describe the three types of PMO, explain phase gates, tolerances and approval thresholds, and tailor governance instead of bypassing it.

The situation: “This template is a waste of time”

The PMO requires every project, including agile ones, to submit a 40-page design document before development starts. The robot cell's software team says it is wasteful and proposes to simply ignore it.

Meanwhile, a phase gate is coming: the project meets three of five criteria, and the sponsor wants to “present it positively”.

Governance can feel like bureaucracy. But it exists to protect the organisation's money and decisions, and the PMP expects you to work **with** it.

Three types of PMO

Supportive PMO

Low control.
Provides templates, training, lessons learned, best practices. Like a consultant.

Controlling PMO

Moderate control.
Requires compliance: frameworks, templates, reporting, audits.

Directive PMO

High control.
Directly manages projects; PMs report to the PMO.

From advisor (supportive) to manager (directive).



Three types of PMO

A **project management office** standardises project governance and shares resources, methods and tools. Its level of control varies:

Your memory card

- PMO types: **supportive** (advise) · **controlling** (require) · **directive** (manage)
- Governance: **gates, tolerances, thresholds, steering**
- Inside tolerance → act; outside → **escalate promptly** with options
- Rule doesn't fit? **Tailor with agreement**; never ignore or circumvent

EXAM-STYLE QUESTION

The PMO requires a 40-page detailed design document from every project, including agile ones. The agile team considers it wasteful and proposes ignoring it. What should the project manager do?

- A.** Support the team and ignore the requirement
- B.** Insist on the full document
- C.** Produce the document personally
- D.** Engage the PMO to understand the purpose and propose a tailored alternative that meets the governance need

Answer: D. Tailor governance with the governance body; meet its intent without waste.

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LESSON 8 OF 96 · PROJECT INITIATION & BUSINESS VALUE

All approaches

Project roles and the RACI chart

Goal: After this lesson you can describe the main project roles, especially the sponsor's, and build a RACI chart with exactly one accountable person per activity.

The situation: Everyone and nobody

On the robot cell, the HMI alarm list has been “nearly finished” for three weeks. The controls lead thinks the customer owns it. The customer thinks the integrator owns it. The PM thought both were working on it together.

When everyone is a little responsible, nobody is. A simple chart would have shown, on day one, who does the work and who owns the result.

Roles at a glance

Sponsor

Provides funding and authority; issues the charter; champions the project; decides beyond the PM's authority; owns the business case.

Project manager

Leads the team to deliver the objectives; plans, coordinates, communicates, manages risks and changes.

Functional manager

Owns people and technical standards in a department; negotiates resources with the PM.

Customer / user

Defines needs, accepts deliverables, realises benefits.

Team

Does the work; estimates it; in agile, decides how.

Product owner (agile)

Owns the backlog and value; decides what and in which order.

Each role has a clear focus.



Key roles

The exam often asks **whose job** something is:

Your memory card

- **Sponsor:** funding, authority, charter, business case · **PM:** delivery
- **Product owner:** backlog and value (agile)
- RACI: **R** does · **A** owns (only one) · **C** input before · **I** told after
- Unclear ownership → one row in a RACI chart

EXAM-STYLE QUESTION

Ownership of an important deliverable is unclear; two team leads each believe the other is responsible, and work has stalled. What would MOST likely have prevented this?

- A.** A more detailed Gantt chart
- B.** A responsibility assignment matrix (RACI) with one accountable person for each deliverable
- C.** More frequent status meetings
- D.** A larger contingency reserve

Answer: B. A RACI with exactly one 'A' per deliverable makes ownership explicit.

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PART 1 REVIEW · CHECK YOURSELF

Project Initiation & Business Value

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 1. I can explain what the charter does, what it contains, who signs it, and what to do when someone wants to start work without one.
- ☐ 2. I can explain what a business case contains, calculate present value and NPV by discounting cash flows, interpret IRR, payback, benefit-cost ratio and ROI, and choose between projects using both financial and strategic criteria.
- ☐ 3. I can tell assumptions from constraints, manage them in the assumption log, and explain how the competing constraints affect each other.
- ☐ 4. I can describe the purpose of a kick-off, explain what the project management plan contains, and tell plans and baselines from project documents.
- ☐ 5. I can tell enterprise environmental factors from organisational process assets, and use OPAs to plan better and improve them for the future.
- ☐ 6. I can describe functional, matrix and projectized structures, and adapt how you get resources to the PM's level of authority.
- ☐ 7. I can describe the three types of PMO, explain phase gates, tolerances and approval thresholds, and tailor governance instead of bypassing it.
- ☐ 8. I can describe the main project roles, especially the sponsor's, and build a RACI chart with exactly one accountable person per activity.

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Delivery Approach

Exam domain: Process

- 9. Choosing the delivery approach: predictive, agile or hybrid
- 10. The predictive life cycle: phases and gates
- 11. Hybrid delivery and tailoring
- 12. Rolling wave planning and progressive elaboration
- 13. The agile mindset: values, principles and empiricism
- 14. Agile roles: Product Owner, Scrum Master and Developers
- 15. Iterations, increments and timeboxing
- 16. Sprint planning: goal, capacity and commitment





LESSON 9 OF 96 · DELIVERY APPROACH

All approaches

Choosing the delivery approach: predictive, agile or hybrid

Goal: After this lesson you can choose a delivery approach from the level of uncertainty, and explain predictive, iterative, incremental and agile life cycles.

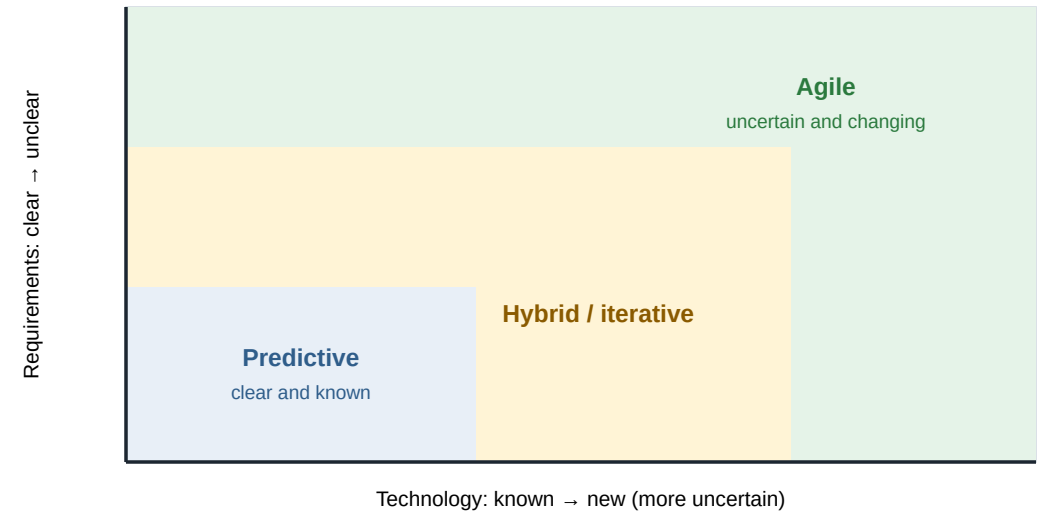
The situation: One project, two kinds of work

The robot cell has two very different parts. The steel frame, guarding and electrical panels are well understood: drawings exist, and changing them late means cutting steel. The MES integration software is different: users will only know what they need when they see the first screens.

Should the whole project be run the same way? No. The right approach depends on **how uncertain the work is** and **how expensive late changes are**.

Exam shortcut: clear + stable → predictive · unclear, evolving, users will refine → agile · both kinds of work → hybrid.

Uncertainty decides the approach



The more uncertain the requirements and the technology, the more adaptive the approach.



The key question: how uncertain?

Two kinds of uncertainty drive the choice:



Your memory card

- Choose by **uncertainty** (requirements, technology) and **cost of change**
- Predictive · iterative (improve) · incremental (pieces) · agile (both, short cycles)
- **Hybrid**: right approach per part; control the interfaces
- Agile is not always better; fit the approach to the work

EXAM-STYLE QUESTION

Requirements for a new reporting system are unclear, and users say they will refine them as they see results. Which approach fits BEST?

A. Predictive

B. Agile

C. Waterfall with detailed upfront requirements

D. No formal approach

Answer: B. High requirements uncertainty and value from feedback → agile.

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LESSON 10 OF 96 • DELIVERY APPROACH

Predictive • hybrid

The predictive life cycle: phases and gates

Goal: After this lesson you can describe predictive phases and gates, explain when predictive fits, and reduce its typical risks.

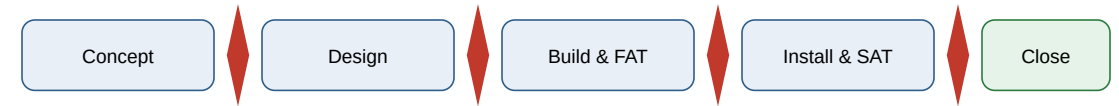
The situation: Why plan the steel first?

You cannot “iterate” a 4-tonne robot base. Once the steel is cut and welded, changing it costs days and thousands of dollars. That is why the robot cell's mechanical work is designed, reviewed and approved before fabrication starts.

The predictive life cycle is not old-fashioned. It is the right tool when the work is clear and changes are expensive.

At a gate, the PM presents objective results, risks and options. Governance decides; the PM never “presents the data positively”.

Phases and gates



◆ = phase gate: go / no-go / conditional, based on exit criteria

Each phase ends with a decision point.



Phases and gates

A predictive project moves through **phases** (for example concept, design, build, install, close). At the end of each phase, a **phase gate** reviews the results against exit criteria and decides: **go, no-go or go with conditions**.



Your memory card

- Predictive: **plan up front**, phases, **gates**, change control
- Fits **clear requirements** and **costly late changes**
- Gates need **objective data**; outcomes: go / no-go / conditional
- Reduce risks with reviews, prototypes, early testing, rolling wave

EXAM-STYLE QUESTION

At a phase gate, the project fails two of five exit criteria. What should the project manager do?

- A.** Present the results positively to secure approval
- B.** Present the results objectively, with an assessment of risks and options, and let the governance body decide
- C.** Postpone the gate indefinitely
- D.** Proceed to the next phase without the review

Answer: B. Gates rely on honest information; governance may decide go, no-go or conditional.

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LESSON 11 OF 96 • DELIVERY APPROACH

Hybrid

Hybrid delivery and tailoring

Goal: After this lesson you can design a hybrid approach with controlled interfaces, and tailor processes and governance to the project's context.

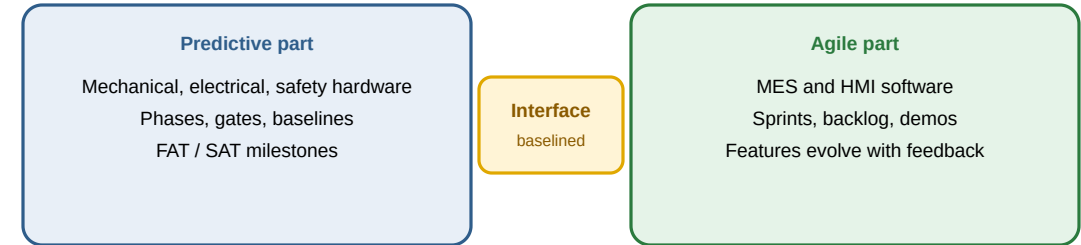
The situation: The signal list that kept changing

On the robot cell, the hardware follows phases and gates, and the MES software runs in two-week sprints. It works well, until the software team decides in a sprint to change the meaning of several PLC signals. The panel drawings, already approved and tied to a contractual FAT date, are suddenly wrong.

Each side was doing its own job correctly. The failure was at the **boundary** between them.

Agile changes that affect baselined or contracted items (hardware, interfaces, milestones, budget) go through integrated change control. Inside the agile part, the product owner decides.

A hybrid project



Signals, data, timing and milestones at the interface go through change control; each side works in its own way inside.

Each part uses the approach that fits it; the interface is controlled.



Hybrid: the right approach for each part

A **hybrid** project uses predictive methods where work is stable or costly to change, and agile methods where it is uncertain. The key is the **interface**.

Your memory card

- **Hybrid** = predictive for stable parts + agile for uncertain parts
- **Baseline the interfaces**; change them through integrated change control
- Inside the agile part, the **product owner** decides
- **Tailor** deliberately to context, with governance agreement

EXAM-STYLE QUESTION

In a hybrid project, hardware follows a predictive stage-gate cycle while software is developed iteratively. The software team proposes changes that would alter several signal definitions at the hardware-software interface. What is the BEST approach?

- A.** Freeze all software features until hardware is complete
- B.** Let the software team change the interface freely
- C.** Convert the whole project to predictive
- D.** Baseline the interface and manage changes to it through change control, while software features behind it evolve iteratively

Answer: D. Control the interface; let each side work in its own way inside.

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LESSON 12 OF 96 • DELIVERY APPROACH

Predictive • hybrid

Rolling wave planning and progressive elaboration

Goal: After this lesson you can plan near-term work in detail and later work at a high level, and explain progressive elaboration and the agile planning levels.

The situation: Plan the part you can see

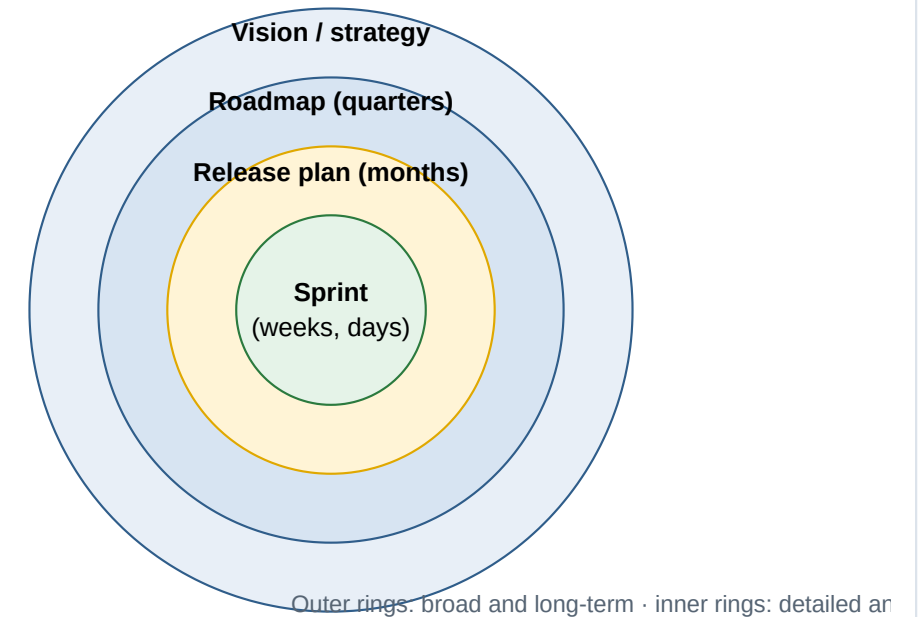
The robot cell plant expansion runs for two years. The civil works and steel for the next three months are fully designed. But the layout of the final production area depends on product decisions the customer will make next year.

Planning that area in detail now would be guesswork, and the guesses would need to be redone. Not planning it at all would leave a hole in the budget and schedule.

The answer: plan in detail what you can see, keep the rest at a high level, and refine as you go.

Exam shortcut: near-term work is clear, later work depends on future decisions → rolling wave planning.

The agile planning onion



Broad and long-term outside; detailed and near-term inside.



Progressive elaboration

Plans become **more detailed and accurate** as more information becomes available. This is normal and expected, in every approach.

Your memory card

- **Progressive elaboration:** plans gain detail as information arrives
- **Rolling wave:** near-term detailed, later work as planning packages
- Agile planning onion: vision → roadmap → release → sprint → day
- Detail ≠ scope creep; new scope still needs change control

EXAM-STYLE QUESTION

In a plant expansion, the civil works for the next 12 months are well understood, while the final production area layout depends on decisions to be made next year. How should the project manager plan?

- A.** Plan everything in full detail now
- B.** Delay all planning until the decisions are made
- C.** Use rolling wave planning: detailed near-term planning, high-level later work, elaborated as decisions are made
- D.** Exclude the production area from the plan

Answer: C. Rolling wave: detail what you can see, keep the rest high-level, refine later.

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LESSON 13 OF 96 • DELIVERY APPROACH

Agile • hybrid

The agile mindset: values, principles and empiricism

Goal: After this lesson you can explain where agile came from, state the four values and the main ideas of the twelve principles, explain empiricism and why it fits complex work, distinguish being agile from doing agile, and judge when an agile approach fits a project.

The situation: “We have stand-ups now. So we are agile, right?”

A national retail chain decided to “go agile” for its new mobile shopping app. Within a month, the team had daily stand-ups, two-week sprints, a Kanban board and sticky notes everywhere. Six months later, the app was late, customers had not seen a single version, and the team was exhausted.

When an outside coach looked closer, the picture was clear. Every requirement had been fixed in a 200-page specification before the first sprint. Changes needed approval from three committees. The team reported percent-complete to management, but nobody had shown working software to a real customer. The sprints were just a predictive plan cut into two-week pieces.

The team had adopted agile **practices** without the agile **mindset**. The practices only work because of the values and principles behind them: learning from real feedback, delivering value early, welcoming change, and trusting the people doing the work.

See it in one picture: the four values

Individuals and interactions

over

processes and tools

Working software

over

comprehensive documentation

Customer collaboration

over

contract negotiation

Responding to change

over

following a plan

The right side still has value; the left side is valued more.

Each value compares two good things and states which one wins when they conflict. Agile teams still use processes, documents, contracts and plans; they simply do not let them replace people, results, collaboration and learning.



Where agile came from

In February 2001, seventeen software practitioners met at a ski resort in Snowbird, Utah. They represented different lightweight methods: Scrum, Extreme Programming (XP), DSDM, Crystal, Feature-Driven Development and others. They agreed on a short statement of shared values and principles: the **Manifesto for Agile Software Development**.

It was a reaction, above all, to the heavy, document-driven development processes common at the time, in which requirements were fixed early, software was delivered only at the end, and many projects failed or delivered systems nobody wanted. But the ideas were not new. Iterative and incremental development had been used since the 1950s and 1960s, including at NASA and IBM, and Lean thinking from the Toyota Production System had already shaped manufacturing.

Agile is therefore best understood as a family of approaches sharing one mindset, not a single method. Scrum and Kanban are the best-known members today.

Your memory card

- Agile Manifesto (2001): four values and twelve principles; a family of methods, not one method
- Values: left side valued **more**, right side still has value
- Principles: early and frequent delivery, welcome change, trusted motivated people, working product as progress, sustainable pace, simplicity, regular reflection
- Empiricism: transparency, inspection, adaptation; short cycles exist for feedback
- Agile fits complex work (Cynefin); stable complicated work may suit predictive
- Roots: Lean (value, waste, flow, pull, kaizen) and XP (TDD, CI, pairing, refactoring)

EXAM-STYLE QUESTION

A team has used two-week sprints for six months, but the sponsor has not seen any working product. All requirements were frozen at the start, and changes need committee approval. What is the most important problem?

- A.** The sprints are too long; they should be one week
- B.** The team is not using a Kanban board to show its work
- C.** The team uses agile events without the agile mindset
- D.** The committee should meet more often to approve changes

Answer: C. The practices exist but the values are missing: no early delivery, no customer collaboration, no responding to change. Fix the delivery and feedback loop, not the ceremonies. If the team delivered every sprint and only the board was missing, that would be a minor issue.

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LESSON 14 OF 96 • DELIVERY APPROACH

Agile • hybrid

Agile roles: Product Owner, Scrum Master and Developers

Goal: After this lesson you can describe the three Scrum accountabilities as defined in the 2020 Scrum Guide, say who decides what in a Scrum Team, explain how a project manager fits around an agile team, and recognize common role anti-patterns and how to correct them.

The situation: “Who is the boss here?”

A city's transit agency has formed its first Scrum Team to build a trip-planning app. The team has a Product Owner from the customer service department, a Scrum Master who was previously a project coordinator, and seven Developers: programmers, a designer and a tester.

In the first weeks, confusion is everywhere. The department director emails the Developers directly with new feature requests. The Scrum Master starts assigning tasks every morning, “to keep things moving”. A senior architect who is not on the team blocks a design decision. And the agency's project manager wonders what her job is now.

Every one of these problems comes from unclear roles. Scrum defines three accountabilities very precisely, and it deliberately has no “boss” of the team. That is not a gap; it is how the framework creates ownership and fast decisions.

See it in one picture: three accountabilities, one team



The Product Owner owns the what and the order; the Developers own the how and the sprint plan; the Scrum Master owns the team's effectiveness. Stakeholders and managers are outside the team and influence it through the Product Owner and the Sprint Review.



From roles to accountabilities

Scrum is defined by *The Scrum Guide*, written by Ken Schwaber and Jeff Sutherland. Its 2020 edition speaks of three **accountabilities** rather than “roles”: the **Product Owner**, the **Scrum Master** and the **Developers**. Together they form one **Scrum Team**.

The word change matters. A role sounds like a job title; an accountability is a responsibility for an outcome. One person can hold one accountability; the Product Owner and Scrum Master are each one person, while “Developers” covers everyone who builds the increment, whatever their job title (programmer, designer, tester, analyst).

Other agile frameworks use other names (for example, “team lead” or “customer” in XP), and many organizations add roles. On the PMP exam, questions about agile roles usually follow the Scrum model, but be careful not to treat Scrum rules as rules for every agile approach.

Your memory card

- Scrum Guide 2020: three accountabilities, Product Owner, Scrum Master, Developers, in one Scrum Team (≤ 10 , cross-functional, self-managing)
- Product Owner: maximizes value; one person; orders the Product Backlog; only one who can cancel a sprint
- Developers: how, how much, who does what; own the Sprint Backlog and the Definition of Done
- Scrum Master: Scrum adoption and team effectiveness; servant leader; removes impediments; does not assign tasks
- Requests go through the Product Owner; managers do not direct daily work
- PMs work around agile teams: coordination, integration, governance, stakeholders

EXAM-STYLE QUESTION

During a sprint, a senior manager asks a developer to start an urgent new feature immediately. What should the developer do?

- A.** Start the feature, since a senior manager has authority
- B.** Ask the Scrum Master to decide whether to accept it
- C.** Refer the manager to the Product Owner to decide its priority
- D.** Add the feature to the Sprint Backlog and finish it this sprint

Answer: C. All new work goes through the Product Owner, who orders the Product Backlog. If it is truly urgent and threatens the Sprint Goal, the PO may decide to change scope with the Developers or even cancel the sprint. Only if the feature were already in the Sprint Backlog would the developer simply work on it.

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LESSON 15 OF 96 • DELIVERY APPROACH

Agile • hybrid

Iterations, increments and timeboxing

Goal: After this lesson you can explain what a timebox is and why it works, describe the sprint as a container for the Scrum events, define a Done increment, choose a sensible iteration length, and recognize anti-patterns such as hardening sprints and changing the Sprint Goal mid-sprint.

The situation: “We will show it when it's finished”

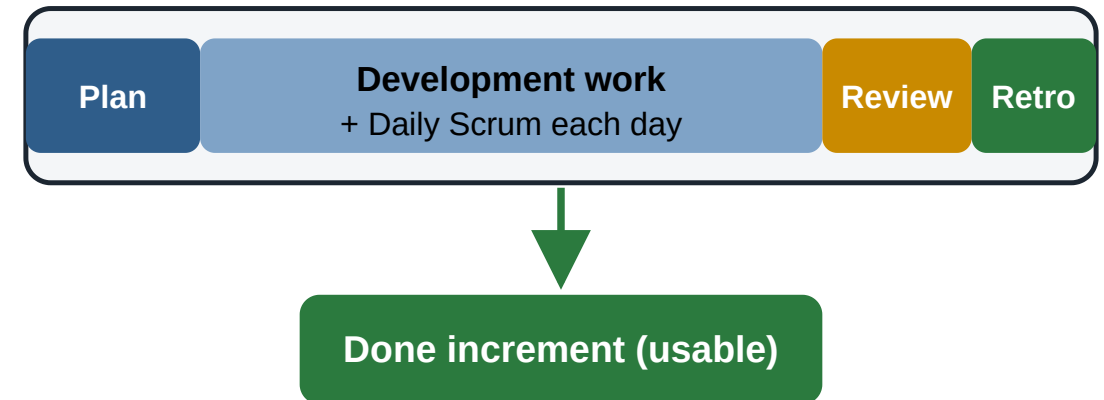
The transit agency's trip-planning team started with good intentions: two-week sprints. But in practice, a sprint ended whenever the team felt the work was ready. Some sprints lasted ten days, others five weeks. Testing was postponed to a “hardening sprint” before each release, which always took longer than planned.

The Product Owner never knew when she would see working software. Stakeholders stopped coming to reviews because there was often nothing new to see. And when the first release finally reached riders, it contained bugs that had been hidden for months.

The team was using the vocabulary of iterations without the discipline of a **timebox**. A timebox is a fixed, maximum period of time that does not stretch, combined with a demanding rule: what comes out at the end must be **Done**.

See it in one picture: one sprint, one Done increment

One sprint: a fixed timebox (e.g. 2 weeks)



The next sprint starts immediately after the previous one ends.
Releases can happen during the sprint, at its end, or later.

Sprint Planning opens the timebox, Daily Scrums guide the work, the Review inspects the increment with stakeholders and the Retrospective improves the process. Then the next sprint starts at once.



What an iteration is

An **iteration** is a short, fixed period in which a team plans, builds, tests and reviews a piece of the product. Scrum calls its iterations **sprints**; other frameworks use the general word iteration. Each iteration ends with something usable and an opportunity to learn.

Iterations turn a long, uncertain project into a series of short cycles. Each cycle is a chance to inspect the product and the way of working, and to adapt the plan. This is empiricism (see the agile mindset lesson) put into a calendar.

Your memory card

- Iteration (sprint) = short fixed period producing a usable increment; Scrum sprints $\leq$ one month
- Timebox: fixed time, flexible scope; counters Parkinson's law, forces priorities, creates cadence, limits risk
- The sprint contains Planning, Daily Scrums, Review and Retrospective; the next sprint starts immediately
- Increment: usable, meets the Definition of Done, can be released at any time
- Sprint Goal is protected; scope can be renegotiated with the PO; only the PO can cancel a sprint
- Hardening sprints, phase sprints and stretched sprints are anti-patterns

EXAM-STYLE QUESTION

Two days before the end of a sprint, the Developers realize that two of the six selected items will not meet the Definition of Done. The Sprint Goal can still be achieved. What should happen?

- A.** Extend the sprint by two days to finish all six items
- B.** Present all six items at the Sprint Review as complete
- C.** Finish the sprint on time; return the two items to the backlog
- D.** Start a hardening sprint to complete the two items

Answer: C. The timebox is fixed. Unfinished items are not presented as complete; they return to the Product Backlog for the Product Owner to reorder. The team reviews the forecast in the retrospective. If the goal itself were lost, the team would discuss it with the Product Owner during the sprint.

Open the full lesson →

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LESSON 16 OF 96 • DELIVERY APPROACH

Agile • hybrid

Sprint planning: goal, capacity and commitment

Goal: After this lesson you can run Sprint Planning around its three topics (why, what and how), write a useful Sprint Goal, size the sprint using velocity and capacity, explain what the team commits to, and handle changes and surprises during the sprint.

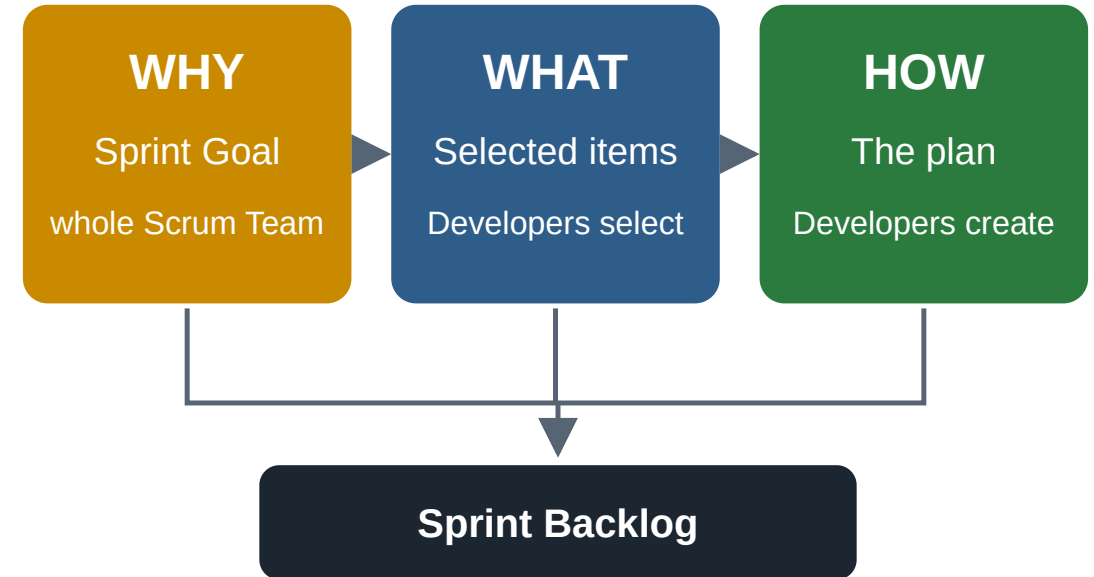
The situation: “Just take the top ten items”

At the transit agency's third Sprint Planning, the Product Owner arrives with a list: *“These are the top ten items. Please take all of them.”* The Developers look at the list: ten unrelated items, from a new map style to a bug in the fare calculator, adding up to about 45 points. Their velocity is about 28, and two people have training days this sprint.

Previous sprints followed the same pattern. The team accepted everything, worked long days, finished six or seven items, and ended each sprint with a sense of failure. Stakeholders saw a mix of small changes but nothing that felt like progress.

Sprint Planning in Scrum is designed to avoid exactly this. It starts not with a list, but with a question: **why is this sprint valuable?** It lets the people doing the work decide how much fits. And it ends with a plan the team believes in.

See it in one picture: why, what and how



Timebox: at most 8 hours for a one-month sprint.

Sprint Planning answers three questions. The whole Scrum Team crafts the goal (why); the Developers select the items (what) and create the plan (how). Together they form the Sprint Backlog.



The purpose of Sprint Planning

Sprint Planning starts the sprint by laying out the work to be performed. The entire **Scrum Team** collaborates on the plan, and other people (for example, an expert) can be invited to provide advice.

It is timeboxed to a maximum of **eight hours for a one-month sprint**; shorter sprints usually need less (about two to four hours for a two-week sprint). The Product Owner makes sure participants are prepared to discuss the most important Product Backlog items and how they map to the Product Goal.

The result is the **Sprint Backlog**: the Sprint Goal, the Product Backlog items selected for the sprint, and an actionable plan for delivering the increment.

Your memory card

- Sprint Planning creates the Sprint Backlog: Sprint Goal + selected items + plan
- Why: the whole Scrum Team crafts a Sprint Goal (one outcome)
- What: the Developers select items, using velocity, capacity and the DoD
- How: the Developers plan the work, often in tasks of one day or less
- Commitment = Sprint Goal; selected items are a forecast
- Timebox: up to 8 hours for a one-month sprint

EXAM-STYLE QUESTION

During Sprint Planning, the Product Owner insists that the team take 40 points of work. The Developers' recent velocity is 30 points, and one developer will be on vacation. What should happen?

- A.** The Developers accept 40 points to meet the Product Owner's needs
- B.** The Scrum Master decides on a compromise of 35 points
- C.** The Developers select the amount they forecast they can complete
- D.** The team accepts 40 points and plans overtime for the gap

Answer: C. The Developers select how much they can complete, using past performance and capacity: probably fewer than 30 points this sprint. The PO decides the order of the backlog. The Scrum Master can coach the PO on this rule.

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PART 2 REVIEW · CHECK YOURSELF

Delivery Approach

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 9. I can choose a delivery approach from the level of uncertainty, and explain predictive, iterative, incremental and agile life cycles.
- ☐ 10. I can describe predictive phases and gates, explain when predictive fits, and reduce its typical risks.
- ☐ 11. I can design a hybrid approach with controlled interfaces, and tailor processes and governance to the project's context.
- ☐ 12. I can plan near-term work in detail and later work at a high level, and explain progressive elaboration and the agile planning levels.
- ☐ 13. I can explain where agile came from, state the four values and the main ideas of the twelve principles, explain empiricism and why it fits complex work, distinguish being agile from doing agile, and judge when an agile approach fits a project.
- ☐ 14. I can describe the three Scrum accountabilities as defined in the 2020 Scrum Guide, say who decides what in a Scrum Team, explain how a project manager fits around an agile team, and recognize common role anti-patterns and how to correct them.
- ☐ 15. I can explain what a timebox is and why it works, describe the sprint as a container for the Scrum events, define a Done increment, choose a sensible iteration length, and recognize anti-patterns such as hardening sprints and changing the Sprint Goal mid-sprint.
- ☐ 16. I can run Sprint Planning around its three topics (why, what and how), write a useful Sprint Goal, size the sprint using velocity and capacity, explain what the team commits to, and handle changes and surprises during the sprint.

[Open the full lessons →](#)[Test yourself: 10 exam-level questions →](#)

Agile Practices

Exam domain: Process

- 17. The Product Backlog and refinement
- 18. User stories: INVEST, acceptance criteria and splitting
- 19. Definition of Done and Definition of Ready
- 20. Story points and relative estimation
- 21. Velocity and capacity: measuring and forecasting team throughput
- 22. Release planning: fixed date, variable scope
- 23. Spikes and the risk-adjusted backlog
- 24. MVP, increments and delivering value early

am, at a glance

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WHAT THE EXAM CO

People

Lead teams · resolve conflict · engage

Process

Plan work · deliver results · track pro

Business Environment

Governance · risk · compliance · cha

Predictive, agile and hybrid app



LESSON 17 OF 96 · AGILE PRACTICES

Agile · hybrid

The Product Backlog and refinement

Goal: After this lesson you can explain what the Product Backlog is and who is accountable for it, describe the qualities of a healthy backlog (DEEP), order items using value, risk, dependencies and weighted shortest job first, and run backlog refinement as an ongoing activity.

The situation: “The backlog has 600 items. Where do we start?”

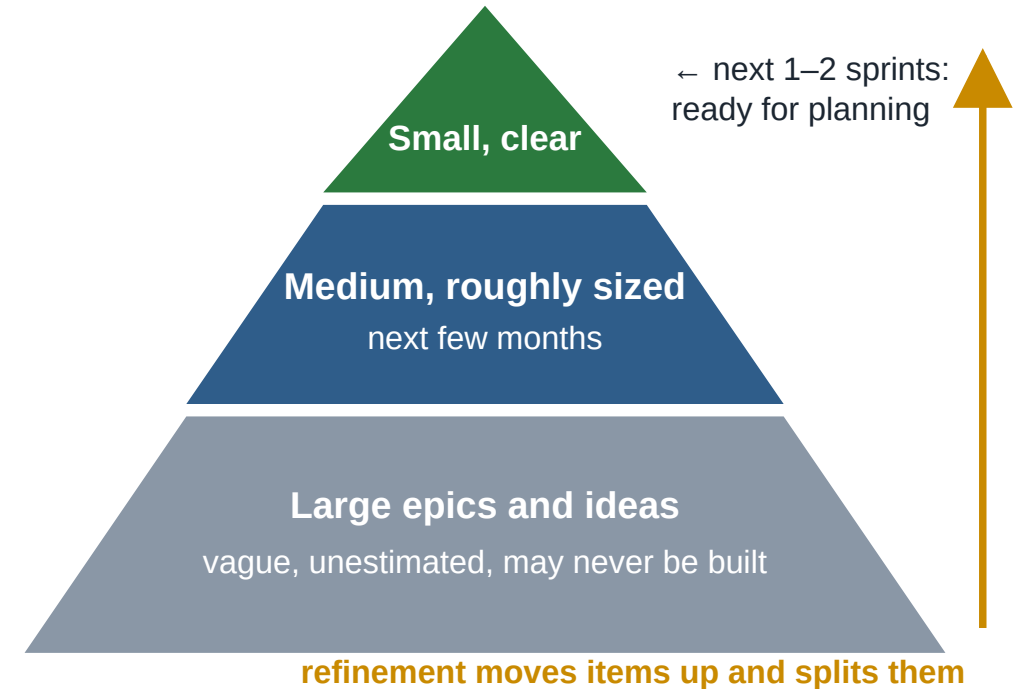
The physiotherapy clinic chain's booking app has been live for six months. Its backlog now contains about 600 items: ideas from clinic managers, complaints from patients, bug reports, technical tasks, and features someone mentioned once in a meeting.

Every Sprint Planning starts with an argument. Each clinic manager believes their request is most important. Large items such as “improve the waiting list” are discussed again and again without anyone knowing what they really mean. The Developers spend hours estimating items that are never built.

The new Product Owner decides to treat the backlog as what it should be: not a wish list, but an **ordered** plan of the most valuable work, detailed at the top and rough at the bottom, constantly refined.

Product Backlog = one ordered, emergent list; the single source of the team's work; commitment = the Product Goal.

See it in one picture: the backlog iceberg



Only the top of the backlog needs detail. Further down, items are larger and rougher. Refinement moves items up, splits them and adds detail just before they are needed.



What the Product Backlog is

The Scrum Guide defines the **Product Backlog** as an emergent, ordered list of what is needed to improve the product. It is the **single source of work** undertaken by the Scrum Team. If work is not in the backlog, the team does not do it.

Items in the backlog can be features, bug fixes, technical work, research spikes or improvements identified in retrospectives. They do not have to be written as user stories (see the next lesson), although many teams use that format.

The backlog's commitment is the **Product Goal**: a long-term objective that describes a future state of the product, for example “patients can manage all their clinic appointments online without calling”. Every item should help move toward it. The Scrum Team must fulfill or abandon one Product Goal before taking on the next.

Your memory card

- Product Backlog: emergent, ordered, single source of work; commitment = Product Goal
- Product Owner is accountable for it; anyone can suggest, only the PO orders
- DEEP: Detailed appropriately, Estimated, Emergent, Prioritized (an iceberg)
- Ordering: value, urgency, risk, dependencies, size, learning
- WSJF = $\text{cost of delay} \div \text{size}$; small urgent items often first; a decision aid, not a rule
- Refinement: ongoing activity, not an event; Developers size; the 10% figure is older guidance

EXAM-STYLE QUESTION

Several department heads each send their requests directly to the Developers and insist their items are the most important. What should happen?

- A.** The Developers decide which department's items to do first
- B.** The Scrum Master ranks the requests by department size
- C.** Each department receives an equal share of every sprint
- D.** Requests go to the Product Owner, who orders them

Answer: D. The Product Owner is accountable for ordering the Product Backlog; stakeholders influence through the PO, ideally with transparent criteria such as WSJF. If there were no Product Owner, the first step would be to establish one.

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LESSON 18 OF 96 · AGILE PRACTICES

Agile · hybrid

User stories: INVEST, acceptance criteria and splitting

Goal: After this lesson you can write a user story with a clear user, need and benefit, check it against INVEST, write testable acceptance criteria (including Given-When-Then), split large stories into vertical slices, and use story mapping to see the whole product.

The situation: “As a system, I want a database table”

The transit agency's backlog contains items such as “As a developer, I want a new database table for stops” and “Build the trip planner”. The first is a technical task disguised as a story; the second is so large it could take months.

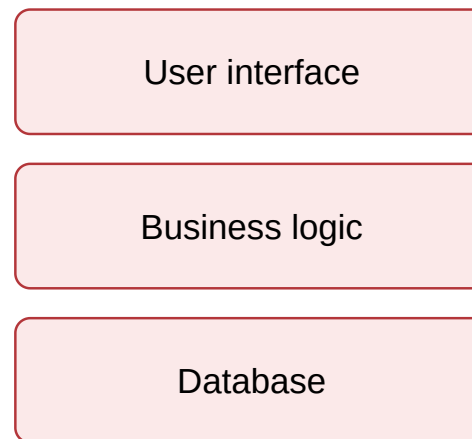
In Sprint Planning, nobody can estimate “Build the trip planner”, and when the database table is finished, there is nothing for riders to try. The Product Owner cannot judge the value of either item, and the Developers argue about what “done” means for each.

User stories, used well, solve these problems. They describe a small piece of value from a user's point of view, start a conversation rather than replace it, and come with clear criteria for acceptance. Large stories are split into thin, usable slices.

As a [user], I want [goal], so that [benefit]. Real user, real need, stated reason.

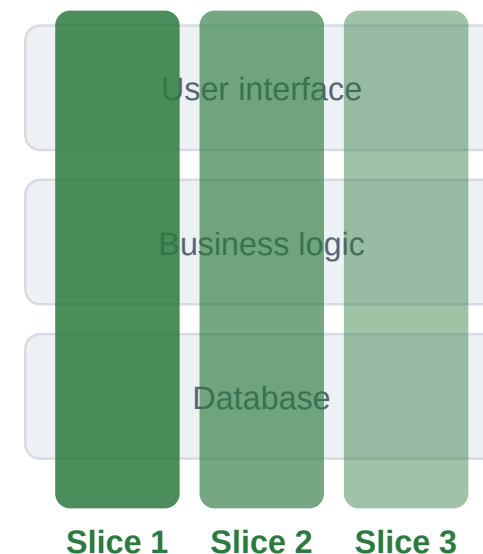
See it in one picture: slice vertically

Horizontal (avoid)



no value until all three

Vertical (prefer)



Each vertical slice is a small feature users can try.

Left: splitting by technical layer gives three pieces that are useless alone. Right: each vertical slice goes through all layers and gives riders something they can use and test.



What a user story is

A **user story** is a short description of a piece of functionality from the point of view of the person who wants it. The most common format, introduced at the company Connextra in 2001, is: **As a** <type of user>, **I want** <some goal>, **so that** <some benefit>.

Example: “As a rider, I want to see when my connecting bus will arrive, so that I know whether to run for the transfer.” It names a real user, a need and the reason. The reason matters: it helps the team find better solutions and helps the Product Owner judge value.

User stories come from Extreme Programming and are widely used in Scrum, but the Scrum Guide does not require them. Product Backlog items can take other forms (use cases, job stories, plain descriptions) when those fit better.

Your memory card

- Story: as a [user], I want [goal], so that [benefit]; a common practice, not a Scrum requirement
- Three Cs: card (reminder), conversation (details), confirmation (criteria and tests)
- INVEST: Independent, Negotiable, Valuable, Estimable, Small, Testable
- Acceptance criteria are story-specific; Given-When-Then turns them into tests; the DoD applies to all items
- Epics are split into small stories; split vertically (usable slices), not by technical layer
- Splitting patterns: workflow, business rules, data, happy path then exceptions, interface, operations

EXAM-STYLE QUESTION

A Product Owner writes the story: “As a customer, I want to manage my account.” The Developers cannot estimate it, and it seems too big for one sprint. Which INVEST qualities are most clearly missing?

A. Independent and Negotiable

B. Valuable and Testable

C. Small and Estimable

D. Negotiable and Valuable

Answer: C. The story is too large (not Small) and too vague to size (not Estimable). It should be treated as an epic and split, for example into change address, change password and view invoices. A story that delivered nothing to users would fail Valuable instead.

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LESSON 19 OF 96 · AGILE PRACTICES

Agile · hybrid

Definition of Done and Definition of Ready

Goal: After this lesson you can explain the Definition of Done as defined in the 2020 Scrum Guide, distinguish it from acceptance criteria, describe what happens to work that is not Done, explain why a Definition of Ready is optional and how it can help or harm, and evolve a Definition of Done over time.

The situation: “Done... except for testing”

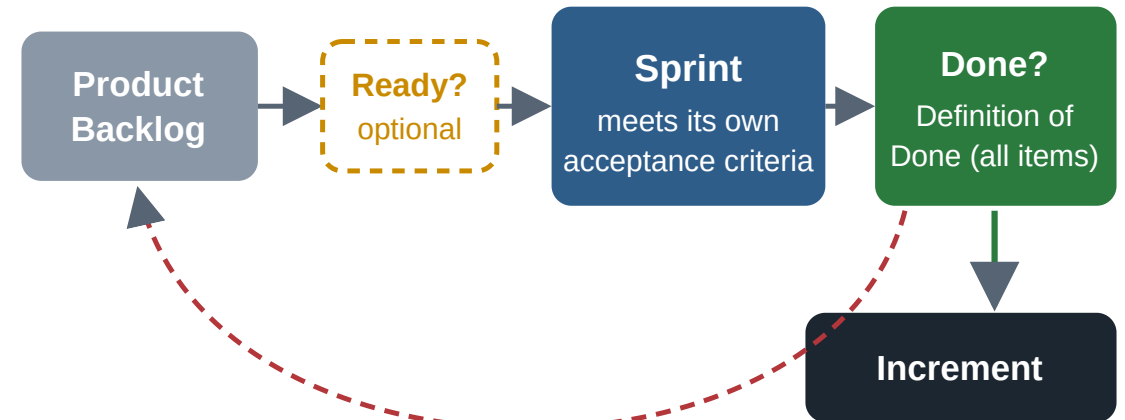
At the clinic chain's Sprint Review, a Developer demonstrates the new appointment-cancellation feature. The Product Owner is pleased and tells the clinic managers it will go live next week. Afterwards, the tester mentions quietly that it has not been tested on older phones, the privacy officer has not reviewed it, and the help text still describes the old process.

So was it really Done or not? The Developer thought so: the code worked on his laptop. The tester thought not. The Product Owner had promised a release based on a single word that meant very different things to different people.

Scrum solves this with the **Definition of Done**: one shared, explicit list of quality standards that every item must meet before anyone calls it Done. Some teams also use a **Definition of Ready**, a checklist for items entering a sprint, but it is not part of Scrum and must be used carefully.

Definition of Done = one shared quality standard for every item; the commitment of the increment.

See it in one picture: from backlog to Done



Not Done → back to the Product Backlog

DoD: part of Scrum · DoR: optional practice

An item may pass an optional readiness check, is built in the sprint against its own acceptance criteria, and becomes part of the increment only when it also meets the Definition of Done. Otherwise it returns to the Product Backlog.



What the Definition of Done is

The Scrum Guide describes the **Definition of Done (DoD)** as a formal description of the state of the increment when it meets the quality measures required for the product. The moment a Product Backlog item meets the DoD, an increment is born.

The DoD is the **commitment** of the increment, just as the Sprint Goal is the commitment of the Sprint Backlog. It creates **transparency**: everyone shares the same understanding of what work was completed as part of the increment.

A typical DoD lists things such as: code reviewed; automated tests passing; integrated in the main build; deployed to a test environment; security and accessibility checks met; documentation updated (see the example in the Picture section).

Your memory card

- DoD = formal description of the increment's quality; the commitment of the Increment
- Organizational DoD is the minimum; otherwise the Scrum Team creates one; teams on one product share one DoD
- Not Done → not released, not presented as complete, back to the Product Backlog; no partial credit
- Acceptance criteria are per item; the DoD applies to all items; Done needs both
- Weak DoD → undone work and technical debt; a DoD usually becomes stricter over time
- Definition of Ready: optional, not in the Scrum Guide; a helpful checklist, never a gate

EXAM-STYLE QUESTION

At the end of a sprint, a feature meets all its acceptance criteria, but the security scan required by the team's Definition of Done has not been run. What should happen at the Sprint Review?

- A.** Present it as complete; acceptance criteria matter most
- B.** Present it as 90 percent complete with the scan pending
- C.** Do not present it as complete; it returns to the backlog
- D.** Release it to production and run the scan afterwards

Answer: C. An item that does not meet the DoD cannot be presented as complete or released; it returns to the Product Backlog. The team may discuss the work and what remains at the review. If the scan had been run and passed, the item would be Done.

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LESSON 20 OF 96 · AGILE PRACTICES

Agile · hybrid

Story points and relative estimation

Goal: After this lesson you can explain why agile teams estimate relatively, what a story point represents, how to run planning poker and affinity estimation, why the Fibonacci-like scale is used, and how to avoid the common mistakes of converting points to hours or using them to compare teams.

The situation: “How many hours will that take?”

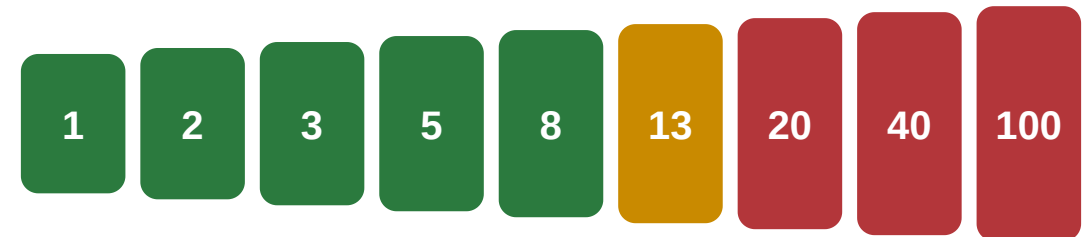
The transit app's Developers are asked to estimate a new feature: showing real-time bus arrivals on the trip screen. The Product Owner wants a number in hours. One Developer says 6 hours, another says three days. Both are guessing, and both know it.

Then the Scrum Master asks a different question: *“Compared with ‘view stop timetable’, which we all know took about a week, is this smaller, about the same, or bigger?”* Within a minute, everyone agrees it is bigger, maybe two or three times as big.

People are poor at predicting absolute durations but surprisingly good at comparing sizes. That is the idea behind **story points**: estimate how big work is **relative** to other work, then let the team's measured velocity translate size into time.

See it in one picture: the point scale

Gaps grow with size, because uncertainty grows with size



fits in a sprint

split soon

epic: split first

Reference story “view stop timetable” = 3 points

The modified Fibonacci scale. Green values usually fit in a sprint; 13 should be split soon; 20 and above are epics that must be split before planning.



Absolute versus relative estimation

Absolute estimation asks “how long will this take?” in hours or days.

Relative estimation asks “how big is this compared with something we know?” Research on human judgment shows that people are much better at the second question. We can tell that one building is about twice as tall as another long before we can say how many meters tall either is.

Relative estimation also avoids a hidden problem of hours: different people work at different speeds. An expert may need 4 hours for a task a newcomer needs 12. Story points describe the **work**, not the person, so the team can agree on a size even when their personal speeds differ.

Your memory card

- Relative estimation: compare with known work; people are better at comparing than predicting
- Story point = effort + complexity + uncertainty, on the team's own scale with reference stories
- Fibonacci-like scale: gaps grow with size and uncertainty; 13+ should be split
- Planning poker: simultaneous reveal (no anchoring), extremes explain, re-vote
- Developers estimate; the PO explains; affinity estimation sizes many items fast
- Time and cost come from velocity, not from converting points to hours

EXAM-STYLE QUESTION

During planning poker, four developers show 2, 3, 3 and 13 for the same story. What should happen next?

- A.** Use the average of the four cards, 5, as the estimate
- B.** Accept 13 to be safe, since it is the highest card
- C.** Those who chose 2 and 13 explain their thinking
- D.** Accept 3, since most of the developers chose it

Answer: C. The extremes explain their reasoning, which usually reveals different assumptions; then the team re-votes. If all had shown 3, the team would simply accept 3.

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LESSON 21 OF 96 · AGILE PRACTICES

Agile · hybrid

Velocity and capacity: measuring and forecasting team throughput

Goal: After this lesson you can calculate velocity and its range from past sprints, adjust a sprint forecast for team capacity, explain what changes velocity and why it stabilizes, and recognize the common misuses of velocity as a performance target.

The situation: “Last sprint you did 34 points. Do 40 this time.”

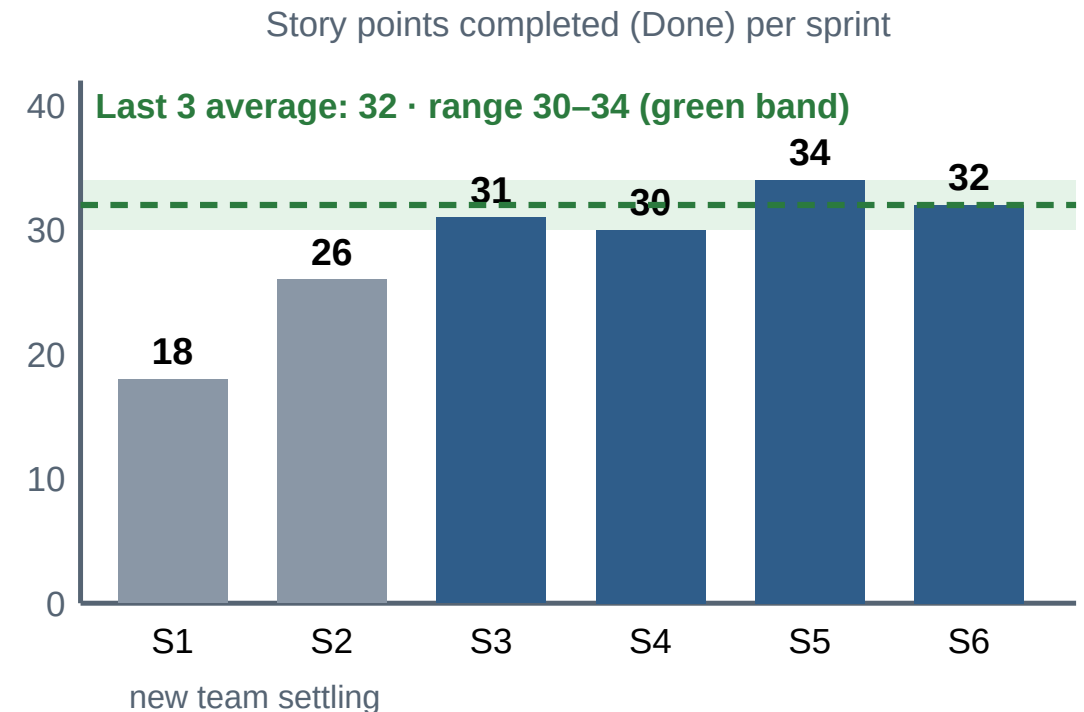
A software team of six Developers is building an online appointment-booking system for a chain of physiotherapy clinics. They work in two-week sprints. Over the last six sprints they completed 18, 26, 31, 30, 34 and 32 story points.

At the start of sprint planning, a department manager drops in: “You did 34 points two sprints ago. Let’s aim for 40 this sprint. And by the way, the mobile team next door does 50 points a sprint. Why are you slower?”

Meanwhile, one Developer is going on vacation for a week, and Monday is a statutory holiday. The Product Owner wants to know how much the team can realistically take on.

Velocity = story points of items that met the Definition of Done in the iteration. No partial credit.

See it in one picture: velocity settles, then forecasts



The first two sprints (grey) are low while the new team settles. From sprint 3, velocity is stable: average of the last three sprints = 32, range 30–34 (green band). Use that, not the best single sprint, to forecast.



What velocity is

Velocity is the amount of work a team completes in one iteration, measured in the same unit the team uses to size its backlog, usually **story points**. It is a measure of the team's historical **throughput**, used mainly for forecasting.

Only work that meets the **Definition of Done** counts. A story that is 90% finished at the end of a sprint earns **zero** points in that sprint. This rule keeps velocity honest: partial work is not value, and estimating “percent done” for knowledge work is unreliable.

Velocity is not part of the Scrum Guide. Scrum asks the team to consider its past performance and its capacity in sprint planning; velocity is one common way to do that. Kanban teams measure throughput in items per week instead (see the flow metrics lesson).

Your memory card

- Velocity = points of Done items per iteration; no partial credit
- Story points are relative and team-specific
- Forecast with the average of the last 3–5 sprints, and keep the range (yesterday's weather)
- Adjust for capacity: $\text{velocity} \times (\text{available} \div \text{normal capacity})$
- The Developers decide how much to take on; velocity is a forecast, not a promise
- Not a target (Goodhart's law), not for comparing teams, not a measure of value

EXAM-STYLE QUESTION

A team completed 24, 30, 27 and 29 story points in its last four sprints. The Product Owner asks how many points to plan for the next sprint, under normal conditions. What is the best answer?

- A.** About 30, the best recent result
- B.** About 28, the average of recent sprints
- C.** About 24, the lowest result, to be safe
- D.** About 110, the total of the four sprints

Answer: B. Average = $(24 + 30 + 27 + 29) \div 4 = 27.5 \approx 28$, with a range of 24–30. If capacity were reduced, the forecast would be scaled down. For a high-confidence commitment, the low end of the range could be used.

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LESSON 22 OF 96 · AGILE PRACTICES

Agile · hybrid

Release planning: fixed date, variable scope

Goal: After this lesson you can build a release forecast from a prioritized backlog and a velocity range, explain what will, might and will not be delivered by a date, use MoSCoW and MVP thinking to shape scope, and update and communicate the plan every sprint.

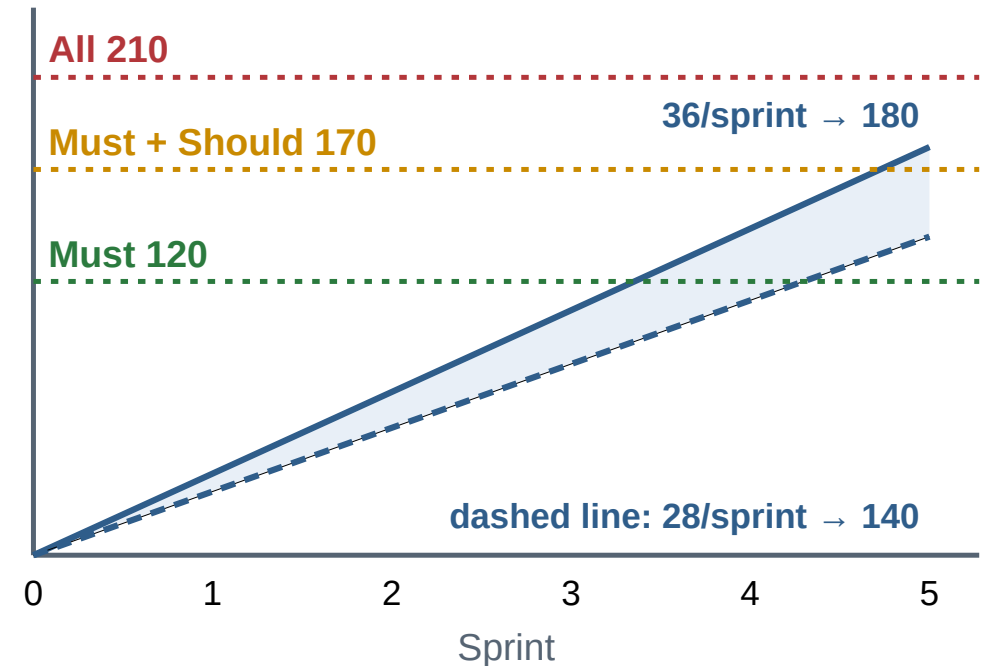
The situation: “Will everything be ready for the spring campaign?”

The physiotherapy clinic chain plans a large spring marketing campaign. The new booking app must be live when the campaign starts, five sprints from now. The date cannot move: the advertising is already booked.

The Product Backlog for the release contains 210 story points: online booking, payment, appointment reminders, a waiting list, patient reviews, a loyalty program and a chat feature. The team's recent velocity ranges from 28 to 36 points per sprint.

The marketing director asks the classic question: “*Will everything be ready?*” A traditional plan would answer with one date for one fixed scope. An agile release plan answers differently: with the date fixed, it shows what **will** be ready, what **might** be ready, and what **will not**.

See it in one picture: what fits by the date



In five sprints the team will complete between 140 points (low velocity) and 180 points (high). Must-haves (120) fit even at the low velocity. Must + Should (170) fit only near the high end. All 210 points do not fit.



Releases, roadmaps and sprints

A **sprint** (iteration) produces a usable increment every few weeks. A **release** puts one or more increments into the hands of users, often after several sprints, sometimes after every sprint. A **product roadmap** shows the planned sequence of releases and goals over a longer period, usually several quarters.

Release planning connects these levels: which backlog items are expected in which release, and when. It is not a commitment to an exact feature list; it is a forecast that is updated as the team learns. In Scrum, the Product Owner is accountable for ordering the backlog and for decisions about releases.



Your memory card

- Agile releases fix date and team; scope is the variable; quality (DoD) is never the variable
- Forecast: low velocity $\times$ sprints = will be done; high $\times$ sprints = might be done; beyond = won't
- Order the backlog by value; MoSCoW: Must-haves should fit the low forecast
- MVP = smallest version to learn; MMF = smallest releasable piece of value
- Burn-up charts show scope growth; burn-downs can hide it
- Update and share the release plan every sprint, in terms of confidence

EXAM-STYLE QUESTION

A release must ship in 6 sprints. The team's recent velocity ranges from 20 to 26 points, and the ordered backlog holds 170 points. What should the Product Owner tell stakeholders?

- A.** All 170 points will be delivered if the team works harder
- B.** About 120 points will be delivered; up to 156 might be
- C.** Nothing can be forecast until the third sprint is complete
- D.** The release date must move so that all 170 points are delivered

Answer: B. Low: $20 \times 6 = 120$ (will be done). High: $26 \times 6 = 156$ (might be done). The last 14 points or more will not be done by the date. If the date were flexible, $170 \div 20 = 9$ sprints at worst would be the forecast instead.

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LESSON 23 OF 96 · AGILE PRACTICES

Agile · hybrid

Spikes and the risk-adjusted backlog

Goal: After this lesson you can explain what a spike is and when to use one, design a timeboxed spike with a clear question and output, order a backlog by both value and risk, track risk with a risk burndown chart, and connect agile risk practices to formal risk management.

The situation: “We can't estimate it, we've never used that system”

The transit app must accept fare payments through a provider the agency signed a contract with last month. Nobody on the team has used its interface. In refinement, the Developers refuse to estimate the payment stories: *“It could be three days or three weeks. We simply don't know.”*

The Product Owner is worried. Payment is the most valuable feature of the next release, and the launch date is fixed. If the integration turns out to be difficult, the team needs to know now, not in the last sprint.

Agile teams have two tools for exactly this situation. A **spike** is a short, timeboxed piece of research that turns “we don't know” into “now we know enough to estimate and decide”. A **risk-adjusted backlog** deliberately moves risky, valuable work to the front, so that the team learns early while there is still time to change course.

Spike = timeboxed research item; output = knowledge that enables a decision or an estimate.

See it in one picture: value and risk



Do valuable, risky work first so that the team learns early. Safe valuable work follows. Low-value work comes last; low-value, high-risk work is avoided.



What a spike is

A **spike** is a timeboxed investigation whose output is **knowledge**, not product functionality. The term comes from Extreme Programming: like a spike driven through all layers of a problem, it is a narrow, deep exploration to answer a specific question.

Typical questions, all of them concrete: Can our system connect to this payment provider? Which of two libraries performs better under load? How do users react to this kind of screen? The answer lets the team estimate, choose a design or decide whether to continue at all.

A spike is a backlog item like any other: the Product Owner orders it, and it is planned into a sprint. It simply produces a decision or an estimate instead of a feature.

Your memory card

- Spike = timeboxed research; output is knowledge for a decision or estimate (from XP)
- Technical spikes explore technology; functional spikes explore product behavior or user response
- Good spike: clear question, timebox, expected output, decision point; code is usually thrown away
- Risk-adjusted backlog: high value + high risk first; avoid low value + high risk
- Risks become backlog items: spikes, prototypes, load tests, early reviews
- Risk burndown shows exposure falling; a long flat line is a warning

EXAM-STYLE QUESTION

The team cannot estimate a story because it depends on an external interface that nobody has used. The story is highly valuable and needed for the next release. What should the team do?

- A.** Estimate it at the maximum size to be safe
- B.** Run a timeboxed spike to learn about the interface
- C.** Move the story to the bottom of the backlog
- D.** Ask the vendor to estimate the work for the team

Answer: B. A timeboxed spike answers the specific question, after which the story can be estimated and planned. If the uncertainty were small, a normal estimate with a wider range would do.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 24 OF 96 · AGILE PRACTICES

Agile · hybrid

MVP, increments and delivering value early

Goal: After this lesson you can explain the minimum viable product and the build-measure-learn loop, distinguish an MVP from a minimum marketable product or feature, choose a suitable MVP type, measure outcomes rather than outputs, and decide when to persevere or pivot.

The situation: “Let's build the whole video platform”

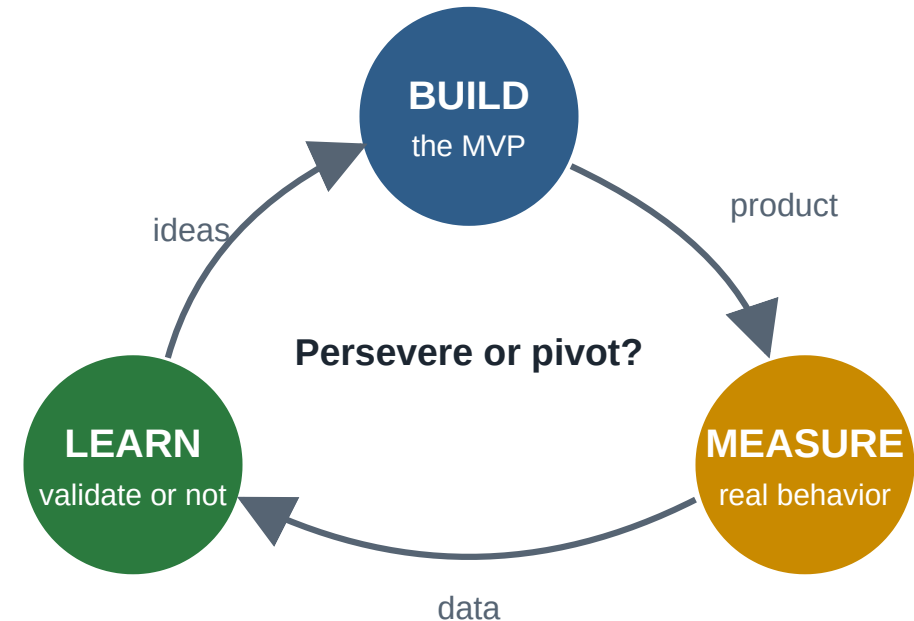
The physiotherapy clinic chain wants to offer online video consultations. The first plan is ambitious: a complete video platform inside the booking app, with scheduling, payments, exercise videos, chat and integration with patient records. Estimated effort: nine months.

A Developer asks an awkward question: *“Do we know patients actually want video physiotherapy? And will physiotherapists be able to treat people this way?”* Nobody in the room knows. The whole plan rests on two assumptions that have never been tested.

If the assumptions are wrong, nine months of work will be wasted. If they are right, the team still does not know which features matter most. The smarter question is: **what is the smallest thing we could do to learn whether this idea works?**

MVP = smallest experiment that tests the riskiest assumptions with real users.

See it in one picture: the learning loop



Goal: the fastest, cheapest loop that answers the riskiest question

Build the smallest product that can test an assumption, measure real behavior, learn, and decide whether to persevere or pivot. Plan in reverse: what must we learn, what must we measure, what must we build?



What an MVP is

A **minimum viable product** is the version of a new product that allows a team to collect the maximum amount of validated learning about customers with the least effort. The term was coined by Frank Robinson in 2001 and popularized by Eric Ries in *The Lean Startup* (2011).

The key word is **learning**. An MVP is an experiment designed to test the riskiest assumptions behind a product idea. It is not simply “version 1.0” or “the first release with fewer features”.

“Minimum” means the least effort needed to learn. “Viable” means it must work well enough that real users can use it and their behavior tells you something true. A broken or unusable MVP teaches nothing except that broken products fail.

Your memory card

- MVP = smallest experiment testing the riskiest assumptions with real users (Robinson; Ries, *The Lean Startup*)
- Build-measure-learn; plan in reverse: learn → measure → build
- Write testable hypotheses before the experiment
- MVP types: landing page, concierge, Wizard of Oz, single feature, pilot
- Measure outcomes with actionable metrics, not vanity metrics
- Persevere, pivot or stop based on evidence; stopping early saves money

EXAM-STYLE QUESTION

A company wants to launch a new subscription service but is unsure whether customers will pay for it. The sponsor proposes a twelve-month project to build the complete service. What should the project manager recommend first?

- A.** Start the twelve-month project with a detailed plan
- B.** Conduct a two-year market study before deciding
- C.** Build a small MVP to test willingness to pay
- D.** Build the full service, then run a satisfaction survey

Answer: C. An MVP tests the riskiest assumption cheaply and quickly before the big investment; the evidence then guides the decision. If demand were already proven, planning the full service would be reasonable.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 3 REVIEW · CHECK YOURSELF

Agile Practices

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 17. I can explain what the Product Backlog is and who is accountable for it, describe the qualities of a healthy backlog (DEEP), order items using value, risk, dependencies and weighted shortest job first, and run backlog refinement as an ongoing activity.
- ☐ 18. I can write a user story with a clear user, need and benefit, check it against INVEST, write testable acceptance criteria (including Given-When-Then), split large stories into vertical slices, and use story mapping to see the whole product.
- ☐ 19. I can explain the Definition of Done as defined in the 2020 Scrum Guide, distinguish it from acceptance criteria, describe what happens to work that is not Done, explain why a Definition of Ready is optional and how it can help or harm, and evolve a Definition of Done over time.
- ☐ 20. I can explain why agile teams estimate relatively, what a story point represents, how to run planning poker and affinity estimation, why the Fibonacci-like scale is used, and how to avoid the common mistakes of converting points to hours or using them to compare teams.
- ☐ 21. I can calculate velocity and its range from past sprints, adjust a sprint forecast for team capacity, explain what changes velocity and why it stabilizes, and recognize the common misuses of velocity as a performance target.
- ☐ 22. I can build a release forecast from a prioritized backlog and a velocity range, explain what will, might and will not be delivered by a date, use MoSCoW and MVP thinking to shape scope, and update and communicate the plan every sprint.
- ☐ 23. I can explain what a spike is and when to use one, design a timeboxed spike with a clear question and output, order a backlog by both value and risk, track risk with a risk burndown chart, and connect agile risk practices to formal risk management.
- ☐ 24. I can explain the minimum viable product and the build-measure-learn loop, distinguish an MVP from a minimum marketable product or feature, choose a suitable MVP type, measure outcomes rather than outputs, and decide when to persevere or pivot.

[Open the full lessons →](#)[Test yourself: 10 exam-level questions →](#)

Agile Metrics & Events

Exam domain: Process

- 25. Burndown and burn-up charts
- 26. Kanban and WIP limits
- 27. Flow metrics: lead time, cycle time, throughput and Little's Law
- 28. The cumulative flow diagram: reading flow and spotting bottlenecks
- 29. Information radiators and transparency
- 30. The Daily Scrum (daily stand-up)
- 31. The Sprint Review: inspecting the product with stakeholders
- 32. The Sprint Retrospective: improving how the team works





Burndown and burn-up charts

Goal: After this lesson you can build and read sprint and release burndown charts and burn-up charts, recognize the common patterns and what they mean, explain why burn-up charts show scope change better, and use these charts for forecasting without turning them into tools of micromanagement.

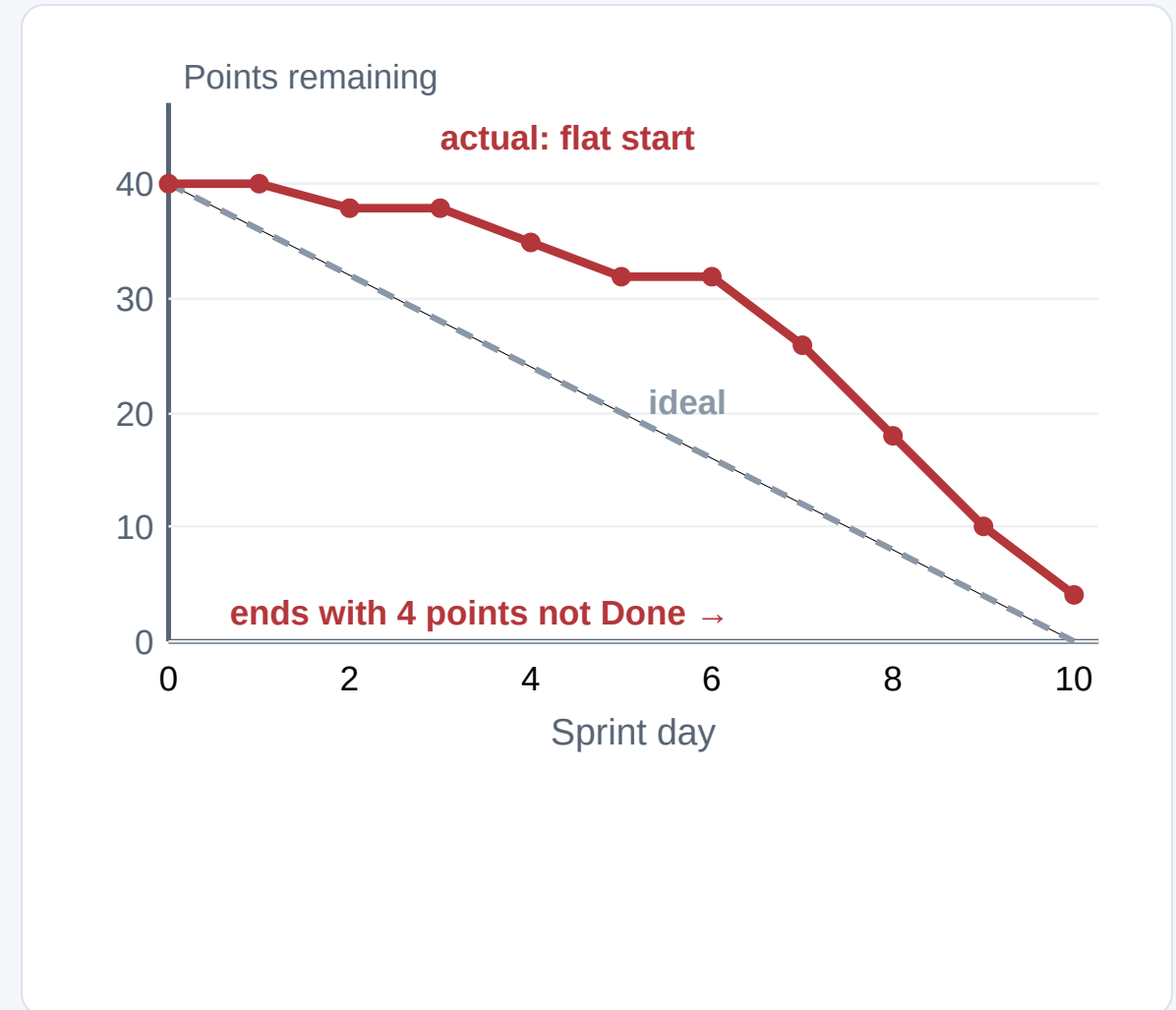
The situation: “The chart says we're behind. Are we?”

Exactly halfway through a two-week sprint, the transit app's Scrum Master shares the sprint burndown chart at the Daily Scrum. The ideal line runs neatly from 40 points down to zero. The team's actual line has hardly moved: after five days, 35 points remain.

A Developer protests: “We're working on everything! Most stories are 80% done.” Another says: “That's the problem. Nothing is finished.” The department manager, looking at the same chart, asks whether the team should work the weekend.

Burn charts are simple pictures, but reading them well takes some practice and context. A flat line can mean blocked work, too many items in progress, or stories that are too large. A rising line can mean new work. And the same chart can help a team improve, or be misused to pressure it.

See it in one picture: a sprint burndown



The grey dashed line is the ideal pace. The team's red line stays flat while many stories are in progress, then falls steeply at the end. Four points are not Done and return to the Product Backlog.



What burn charts show

Burn charts show progress over time in a single picture. A **burndown** chart shows the work **remaining**; it starts high and should fall to zero. A **burn-up** chart shows the work **completed**, rising toward a line that represents the total scope.

They are among the most common **information radiators** in agile teams: large, visible displays that make progress transparent to everyone without meetings or reports. Their power is simplicity: anyone can understand a line that should reach zero by a date.

The 2020 Scrum Guide does not require burn charts; it says various practices exist to forecast progress, like burn-downs, burn-ups or cumulative flows. Teams choose the tools that help them.



Your memory card

- Burndown: work remaining over time; burn-up: work completed plus a separate scope line
- Sprint burndown is the Developers' tool; release charts serve the PO and stakeholders
- Flat = nothing finishing · steep end = items too large · rising = scope added · above zero at end = not Done
- Only Done work burns down; no partial credit
- Burn-ups separate pace from scope change; better for stakeholder conversations
- Forecast with ranges by extending trends; update every sprint

EXAM-STYLE QUESTION

A sprint burndown chart has been flat for the first five days of a ten-day sprint, although the Developers report that they are busy. What is the most likely explanation?

- A.** The Developers are not working on sprint items
- B.** The ideal line was drawn incorrectly at planning
- C.** Many items are in progress, but few or none are Done
- D.** The Product Owner has removed items from the sprint

Answer: C. A flat line with a busy team usually means too much work in progress and nothing finishing, or blockers. The response is to limit WIP and swarm. If the team were idle, a flat line would mean something else, but that is not indicated.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 26 OF 96 · AGILE METRICS & EVENTS

Agile

Kanban and WIP limits

Goal: After this lesson you can explain the origins and principles of the Kanban method, design a board with explicit policies and WIP limits, explain why a pull system improves flow, choose classes of service, compare Kanban with Scrum, and decide when Kanban fits.

The situation: “Everything is urgent, and nothing gets finished”

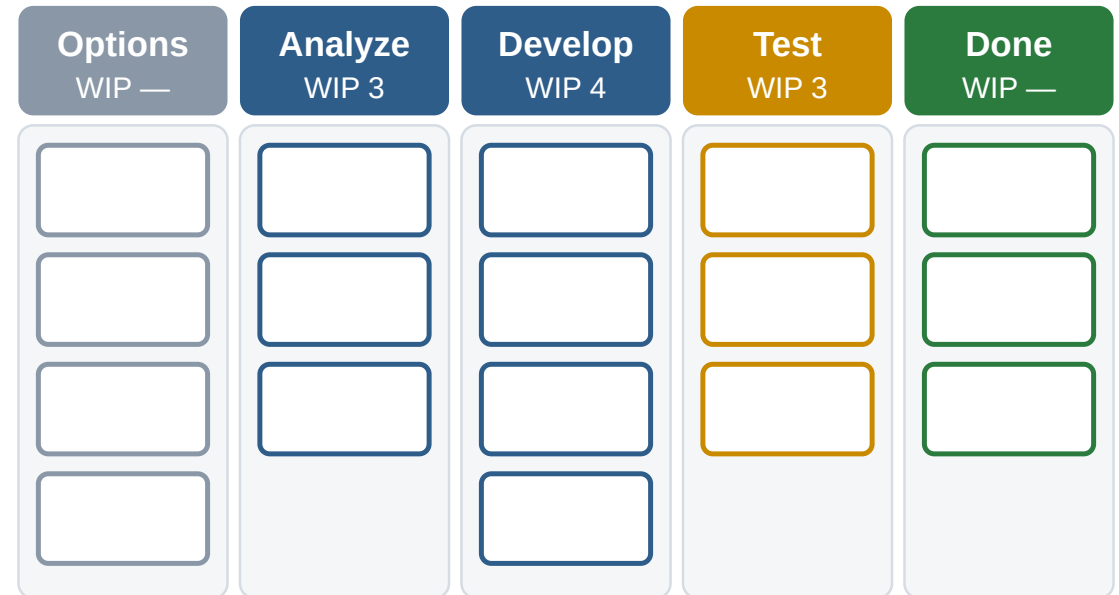
A regional power utility runs an IT team that supports its customer portal: outage maps, bill payments, meter readings. Requests arrive every day from customers, call-center staff and managers. Each one seems urgent, so the team starts each request as soon as it arrives.

After a few months, the board shows more than 40 open items.

Developers switch between five tasks a day. Even simple fixes take weeks because they wait behind half-finished work. The team tried two-week sprints, but urgent outage-related fixes could not wait for the next sprint.

The team adopts **Kanban**. It makes all work visible, limits how many items can be in each stage at once, and pulls new work only when there is capacity. Within two months, the average lead time drops by more than half, and nobody has to work longer hours to achieve it.

See it in one picture: a board with WIP limits



Test is full (3/3)

Pull, don't push: work moves only when the next column has space

Each column has a WIP limit. Test is full, so Developers cannot push more work into it; they help testing or pull other work that does not add to the queue. This is how a pull system exposes and relieves bottlenecks.



Where Kanban comes from

Kanban means “signboard” or “visual card” in Japanese. At Toyota in the 1950s, Taiichi Ohno used kanban cards to signal when a workstation needed more parts. Production was **pulled** by real demand instead of being **pushed** by a schedule, which kept inventory low and exposed problems quickly. This became a core part of the Toyota Production System and of Lean thinking.

In the 2000s, David J. Anderson adapted these ideas to knowledge work, first at Microsoft and then at Corbis, creating the **Kanban Method**. Instead of physical parts, the “inventory” is unfinished work: requests, features, fixes. The goal is the same: smooth, predictable flow of value.

Your memory card

- Kanban: from Toyota (Ohno); adapted to knowledge work by David Anderson
- Practices: visualize, limit WIP, manage flow, explicit policies, feedback loops, improve experimentally
- Starts with what you do now; no required roles or sprints
- WIP limits + pull → shorter lead times (Little's Law), less switching, visible bottlenecks
- Column full → stop starting; help finish
- Classes of service handle urgency; strictly limit expedite items

EXAM-STYLE QUESTION

A maintenance team receives unpredictable requests every day, many of which cannot wait two weeks. The team wants an agile approach. Which approach fits best?

- A.** Scrum with four-week sprints to batch requests
- B.** Kanban with WIP limits and service classes
- C.** A predictive plan with a monthly change board
- D.** Scrum with requests added mid-sprint as they arrive

Answer: B. Kanban handles continuous, unpredictable flow; classes of service manage urgency; WIP limits keep lead times short. For product development with clear sprint goals, Scrum would fit better.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 27 OF 96 · AGILE METRICS & EVENTS

Agile

Flow metrics: lead time, cycle time, throughput and Little's Law

Goal: After this lesson you can define and measure WIP, throughput, cycle time, lead time and work item age, apply Little's Law and state its conditions, explain why limiting work in progress shortens delivery times, and use percentiles to make reliable service commitments.

The situation: “Why does every permit take five weeks?”

A city's building-permit office reviews applications from homeowners and contractors. Six reviewers approve about six applications a week. Yet applicants wait about five weeks for an answer, and complaints are reaching the mayor's office.

The office manager's first idea is to start reviewing every application the day it arrives, so that nobody waits. Soon about 30 applications are “in progress” at once. Reviewers switch between files all day, phone calls about half-finished files interrupt everyone, and the waiting time does not improve.

A colleague who has worked with Kanban suggests the opposite: “*Start fewer. Finish more.*” Limit the number of applications in review, and let new ones wait until a reviewer is free. It sounds wrong, but the arithmetic, known as Little's Law, says it will cut the average wait dramatically.

See it in one picture: lead time and cycle time

One application, from request to result



The applicant waits 25 days (lead time). The office works on the file for 16 of them (cycle time). The 9 days before work starts are pure queue time.



Why measure flow

Many kinds of work are a stream of items rather than one large project: support tickets, permit applications, change requests, small features, maintenance jobs. For this work, the key questions are: how long does an item take, how many do we finish, and how predictable are we?

Flow metrics answer these questions from simple data: when each item started and when it finished. They come from Lean manufacturing and queueing theory, and are central to Kanban. They are also useful in predictive and hybrid projects, for example for change requests or procurement approvals that move through the same steps again and again.

Your memory card

- Flow metrics: WIP, throughput, cycle time (start → finish), lead time (request → delivery), work item age
- Little's Law: average lead time = average WIP ÷ average throughput (stable system, consistent units)
- Same throughput, lower WIP → shorter lead time; “stop starting, start finishing”
- Near 100% utilization, queues explode; keep some slack
- Commit with percentiles (e.g. 85% within 18 days), not averages
- Watch work item age to rescue items before they break the service level

EXAM-STYLE QUESTION

A support team has an average of 40 tickets in progress and resolves an average of 10 tickets per day. The system is stable. What is the average lead time for a ticket?

- A.** 4 days
- B.** 0.25 days
- C.** 400 days
- D.** 50 days

Answer: A. Little's Law: lead time = WIP ÷ throughput = 40 ÷ 10 = 4 days. If the system were growing out of control, the law would only describe the past.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 28 OF 96 · AGILE METRICS & EVENTS

Agile

The cumulative flow diagram: reading flow and spotting bottlenecks

Goal: After this lesson you can build and read a cumulative flow diagram, measure WIP, throughput and approximate lead time from it, recognize the patterns of bottlenecks, blockers and growing demand, and choose a sensible response to each pattern.

The situation: “Everyone is busy, so why is nothing finished?”

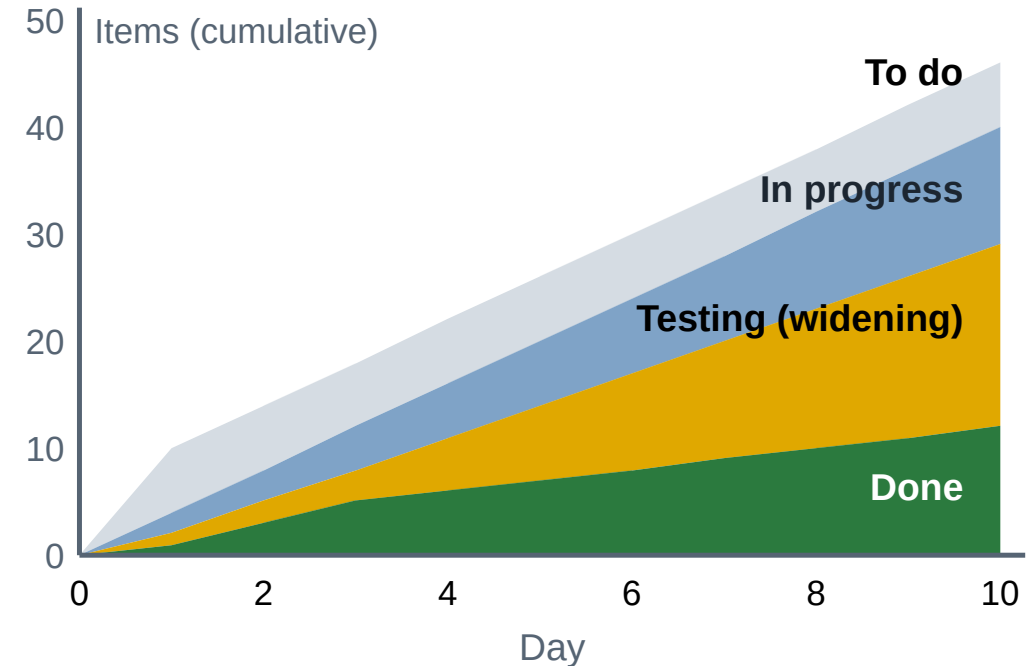
A software team at a regional insurance company develops small improvements to its claims system. Its Kanban board has four columns: To do, In progress, Testing and Done. For two weeks the developers have been busy, the board is full of cards, and yet the business owner says almost nothing new has reached users.

The daily stand-up does not explain it: everyone reports progress. Each individual card looks fine. The problem is in the **system**, and you cannot see a system by looking at one day's board.

The **cumulative flow diagram (CFD)** shows the history of the whole board on one chart. In this case it shows a striking pattern: the Testing band is getting wider every day while the Done line is flattening. Work is piling up in front of the single tester.

A CFD shows, over time, how many items have reached each stage. Lines only rise or stay flat.

See it in one picture: a bottleneck in testing



Over ten days, the yellow Testing band grows from 1 to 17 items, while the green Done line flattens. Developers keep starting work, but it waits in front of testing. Testing is the constraint.



What a cumulative flow diagram is

A CFD is a stacked area chart. The horizontal axis is **time** (days or weeks). The vertical axis is the **cumulative number of items** that have reached each stage of the workflow. Each stage of the board becomes one colored band.

“Cumulative” is the key word. The top line shows all items that have **ever** arrived on the board; the next line shows all items that have ever **started**; and so on down to the bottom line, all items that have ever been **finished**. Because these are running totals, the lines never go down (unless items are removed from the board).

The CFD was popularized for software by David Anderson's work on Kanban in the 2000s, but the idea comes from manufacturing and queueing theory. It is one of the most information-rich charts in agile and Lean practice.

Your memory card

- A CFD stacks the cumulative count of items in each stage over time; lines never go down
- Vertical distance = WIP in a stage · slope of Done = throughput · horizontal distance $\approx$ average lead time
- A band widening over time = bottleneck at or after that stage
- Flat line = blocked; flat Done = nothing delivered
- Top line steeper than Done = demand above capacity → prioritize
- Bottleneck: limit WIP upstream and swarm on the constraint (theory of constraints)

EXAM-STYLE QUESTION

A team's cumulative flow diagram shows the band for “Code review” growing wider every day, while the bands before and after it stay roughly constant. What should the team do first?

- A.** Add more developers so that more items enter code review
- B.** Stop starting new work and help clear the code review queue
- C.** Remove the code review stage from the workflow altogether
- D.** Ask the product owner to add more items to the backlog

Answer: B. Work enters code review faster than it leaves. Stop adding work upstream (limit WIP) and swarm on reviews; then look for lasting fixes such as more reviewers or smaller changes. If the band were stable, no urgent action would be needed.

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The full lesson on pmclean.com adds the worked example, the common traps, more exam questions and a quick check.



Information radiators and transparency

Goal: After this lesson you can explain why transparency is a pillar of agile work, describe what makes an information radiator effective, choose radiators for a team and for stakeholders, design them for remote and hybrid teams, and avoid turning visibility into surveillance.

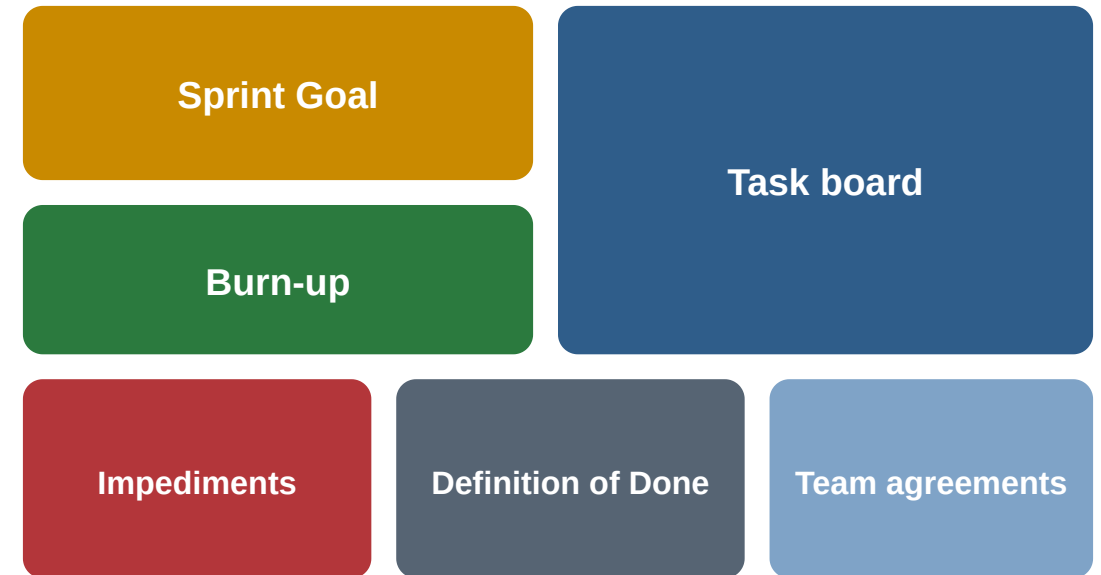
The situation: “I never know what the team is doing”

The city's permit-application software team works hard, but the director of building services complains: *“I never know where things are. I have to send emails and wait for a weekly report that is out of date when it arrives.”*

Inside the team, things are not much better. Two Developers discovered they had been working on the same bug for a day. A blocker reported on Monday was still unresolved on Thursday because nobody outside the stand-up knew about it.

The new Scrum Master decides to act. She puts up a large board in the team area and a matching online dashboard: the Sprint Goal, the task board, a burn-up chart, an impediment list and the Definition of Done. Within two weeks, the director stops asking for status emails; she simply walks past or opens the dashboard.

See it in one picture: a team wall



Visible to anyone passing by: no login, no report, no meeting needed

Six radiators answer the most common questions without anyone having to ask: what are we trying to achieve, what is happening, how are we progressing, what is blocking us, and what rules do we follow?



Transparency as a pillar

Empirical process control rests on three pillars: **transparency**, inspection and adaptation (see the agile mindset lesson). The Scrum Guide puts it simply: inspection without transparency is misleading and wasteful. You cannot inspect what you cannot see, and you cannot adapt well if you inspect the wrong picture.

Transparency means that the important aspects of the work, and its problems, are visible to those responsible for the outcome. It is not the same as reporting. A report is pushed to people at intervals; transparency means the information is available all the time, to anyone who needs it.

Your memory card

- Transparency is a pillar of empiricism; inspection without it is misleading
- Information radiator: large, visible, current, simple, where people pass (Cockburn)
- Information refrigerator: exists but must be searched for
- Common radiators: task board, Sprint Goal, burn charts, CFD, impediments, DoD, build status
- Effective = visible, simple, current, honest, actionable; owned and updated by the team
- Remote teams: one shared board and dashboard, shown at every stand-up

EXAM-STYLE QUESTION

Senior stakeholders repeatedly email the project manager for status updates on an agile team's progress. What is the best long-term response?

- A.** Send a detailed status report every single morning
- B.** Set up radiators stakeholders can check any time
- C.** Invite all stakeholders to every Daily Scrum
- D.** Ask the Product Owner to answer every email personally

Answer: B. Information radiators make progress visible on demand, so stakeholders do not need to ask; conversations can then focus on decisions. A brief summary at the Sprint Review complements this.

Open the full lesson →

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The full lesson on pcclear.com adds the worked example, the common traps, more exam questions and a quick check.



The Daily Scrum (daily stand-up)

Goal: After this lesson you can explain the purpose and rules of the Daily Scrum as defined in the 2020 Scrum Guide, choose a format that focuses on the Sprint Goal, handle impediments and side discussions correctly, and recognize when a stand-up has turned into a status meeting.

The situation: “Every morning we report to the manager”

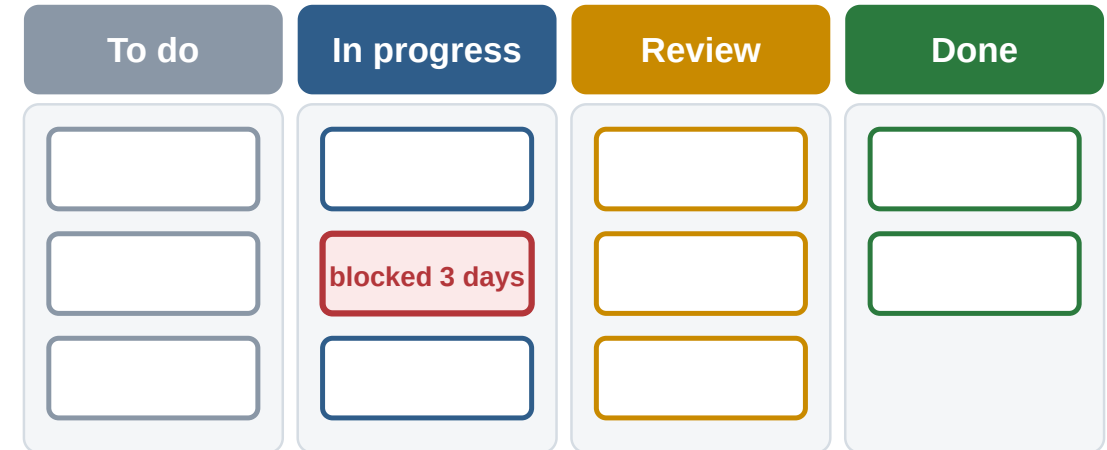
At a hospital's IT department, the team building a new patient-portal feature holds a stand-up every morning. It takes 35 minutes. Each person turns to the department manager and lists what they did yesterday. The manager asks questions, gives instructions, and sometimes starts a technical debate that the rest of the team quietly waits through.

Developers say, privately, that the meeting is the least useful part of their whole day. Problems are mentioned (“still waiting for the test database”) but nobody does anything about them. The Sprint Goal is never mentioned at all, not even once a week.

In Scrum, this event is called the **Daily Scrum**. It has a clear purpose, a 15-minute timebox and a specific audience: the Developers. It is not a report to a manager; it is the team's daily planning meeting.

Daily Scrum = inspect progress toward the Sprint Goal + adapt the plan for the next day.

See it in one picture: walk the board



Start at Done, move left: what can we finish today?

15 minutes · same time and place · for the Developers

Start with the work closest to Done and move left. The highlighted item has been blocked for three days: it becomes the first topic, and someone owns its removal right after the meeting.



Purpose of the Daily Scrum

According to the 2020 Scrum Guide, the purpose of the Daily Scrum is to **inspect progress toward the Sprint Goal** and **adapt the Sprint Backlog** as necessary, adjusting the upcoming planned work. It is a short daily inspect-and-adapt loop inside the sprint.

The Guide also lists its benefits: it improves communication, identifies impediments, promotes quick decision-making and, as a result, eliminates the need for other meetings. A good Daily Scrum replaces many small coordination emails and conversations.

Your memory card

- Purpose: inspect progress toward the Sprint Goal and adapt the Sprint Backlog
- For the Developers; PO and SM join as Developers only if working on sprint items
- 15 minutes, same time and place, every working day
- 2020 Scrum Guide: no mandatory questions; walking the board keeps the focus on finishing
- Impediments are raised in the meeting and removed afterward; the Scrum Master causes their removal
- Side discussions go to a parking lot, right after the meeting

EXAM-STYLE QUESTION

A functional manager attends the Daily Scrum every morning and asks each developer for a status update, which often makes the meeting run 30 minutes. What should the Scrum Master do?

- A.** Let the manager continue, since status is useful
- B.** Coach the manager: the event is for the Developers
- C.** Cancel the Daily Scrum and email status instead
- D.** Ask the Product Owner to run the meeting

Answer: B. The Daily Scrum is the Developers' event for inspecting progress and adapting the plan. The Scrum Master coaches the manager and offers other sources of status, such as radiators. The manager may observe quietly if the team agrees.

[Open the full lesson →](#)

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 31 OF 96 · AGILE METRICS & EVENTS

Agile · hybrid

The Sprint Review: inspecting the product with stakeholders

Goal: After this lesson you can explain the purpose and rules of the Sprint Review as defined in the 2020 Scrum Guide, run it as a working session rather than a demonstration, handle unfinished work and stakeholder feedback correctly, and distinguish it from the Sprint Retrospective and from formal acceptance.

The situation: “Twenty slides and no questions”

At the end of each sprint, the city's permit-application team presents its work to the building services department. The Scrum Master prepares twenty slides with screenshots, a list of completed stories and the velocity chart.

Stakeholders listen politely, ask few questions and leave after forty minutes.

Two sprints later, the permit inspectors finally try the new online scheduling feature in real life and discover it does not match how inspections are actually booked. Weeks of work need to change. Nobody had raised the problem in the reviews, because nobody had actually used the software there.

The Sprint Review is meant to prevent exactly this. It is not a presentation for approval; it is a **working session** where stakeholders see and use the real increment, discuss what has changed in their world, and help decide what to do next.

Sprint Review = inspect the increment with stakeholders + adapt the Product Backlog.

See it in one picture: a working session

1. Context

PO: goal, what is Done, what is not

2. Demonstrate

Working increment, used for real

3. Feedback

Stakeholders try it and react

4. Market & changes

What has changed outside?

5. Adapt the backlog

Reorder, add, remove items

6. Look ahead

Release forecast, next steps

A conversation about the product, not a slide show

A good Sprint Review moves from context, to the real increment in stakeholders' hands, to feedback, to decisions about the Product Backlog and the forecast.



Purpose of the Sprint Review

The 2020 Scrum Guide defines the purpose of the Sprint Review as to **inspect the outcome of the sprint** and **determine future adaptations**. The Scrum Team presents the results of its work to key stakeholders, and progress toward the **Product Goal** is discussed.

It is the main moment where the people who build the product and the people who use or fund it look at the real result together. Its value comes from the conversation: feedback, new information and decisions about what comes next.

Your memory card

- Purpose: inspect the sprint's outcome and determine future adaptations; discuss progress toward the Product Goal
- A working session, not a presentation: stakeholders use the real increment
- Scrum Team + key stakeholders invited by the PO; up to 4 hours for a one-month sprint
- Only Done work is shown as complete; undone items return to the backlog
- Feedback goes to the Product Backlog via the PO; the output is a revised backlog
- Not a release gate or contractual acceptance

EXAM-STYLE QUESTION

During a Sprint Review, a key stakeholder asks for a new feature that was not planned. What should happen?

- A.** The Developers add it to the current sprint immediately
- B.** The Scrum Master decides whether it is important enough
- C.** The Product Owner captures it in the Product Backlog
- D.** The team rejects it, since the sprint scope is fixed

Answer: C. Feedback and requests go to the Product Owner, who adds them to the Product Backlog and orders them against other work. If it were critical, the PO might place it at the top for the next sprint.

Open the full lesson →

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 32 OF 96 · AGILE METRICS & EVENTS

Agile · hybrid

The Sprint Retrospective: improving how the team works

Goal: After this lesson you can explain the purpose and rules of the Sprint Retrospective as defined in the 2020 Scrum Guide, facilitate it through five stages, choose a format, turn insights into concrete improvements, build the psychological safety it needs, and compare it with lessons learned in predictive projects.

The situation: “Same complaints, every two weeks”

The clinic chain's booking-app team holds a retrospective at the end of every sprint. The format never changes: everyone lists what went well and what went badly on sticky notes. The same problems appear every time: slow code reviews, unclear stories, too many interruptions from the support desk.

The meeting ends with a long list of complaints and no clear actions. Nobody owns anything, and nobody checks anything later. After a few months, people start skipping it: *“Nothing ever changes, so why bother?”*

The retrospective is the engine of continuous improvement in Scrum. When it works, a team becomes a little better every sprint, and small improvements compound into large ones. When it fails, as here, it becomes a ritual of complaint that slowly destroys morale.

Retrospective = inspect how we work → choose the most helpful improvements → act on them, possibly in the next Sprint Backlog.

See it in one picture: five stages

1. Set the stage

safety, focus, prime directive

2. Gather data

facts and feelings about the sprint

3. Generate insights

why did it happen? root causes

4. Decide what to do

one or two concrete actions, owners

5. Close

appreciation, improve the retro

Derby and Larsen, Agile Retrospectives (2006)

A retrospective moves from creating safety, through data and insights, to a few concrete actions, and ends by improving the retrospective itself. Most failing retrospectives stop after stage 2.



Purpose of the Sprint Retrospective

According to the 2020 Scrum Guide, the purpose of the Sprint Retrospective is to **plan ways to increase quality and effectiveness**. The Scrum Team inspects how the last sprint went with regard to **individuals, interactions, processes, tools and its Definition of Done**.

The team identifies the most helpful changes to improve its effectiveness. The most impactful improvements are addressed as soon as possible, and they may even be added to the **Sprint Backlog** for the next sprint, so that improvement work is planned like any other work.

It is the last event of the sprint, after the Sprint Review. It is timeboxed to a maximum of **three hours for a one-month sprint**; usually shorter for shorter sprints (about 45 to 90 minutes for two weeks).

Your memory card

- Purpose: plan ways to increase quality and effectiveness; inspect people, interactions, processes, tools and the DoD
- Last event of the sprint; up to 3 hours for a one-month sprint; for the Scrum Team only
- Five stages: set the stage, gather data, generate insights, decide, close
- Safety first: the Prime Directive; focus on the system, not blame
- Few, specific, owned experiments; the most important can go into the next Sprint Backlog
- Start each retrospective by checking the previous actions

EXAM-STYLE QUESTION

A team raises the same three problems in every retrospective, but nothing changes. What should the Scrum Master do?

- A.** Stop holding retrospectives, since they are not working
- B.** Report the problems to senior management for resolution
- C.** Find root causes; agree owned actions; follow up
- D.** Ask the team to list even more problems next time

Answer: C. Move beyond data: find root causes, choose one to three concrete, owned experiments (possibly in the Sprint Backlog) and review them at the next retrospective. Issues outside the team can be escalated as impediments.

Open the full lesson →

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 4 REVIEW · CHECK YOURSELF

Agile Metrics & Events

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

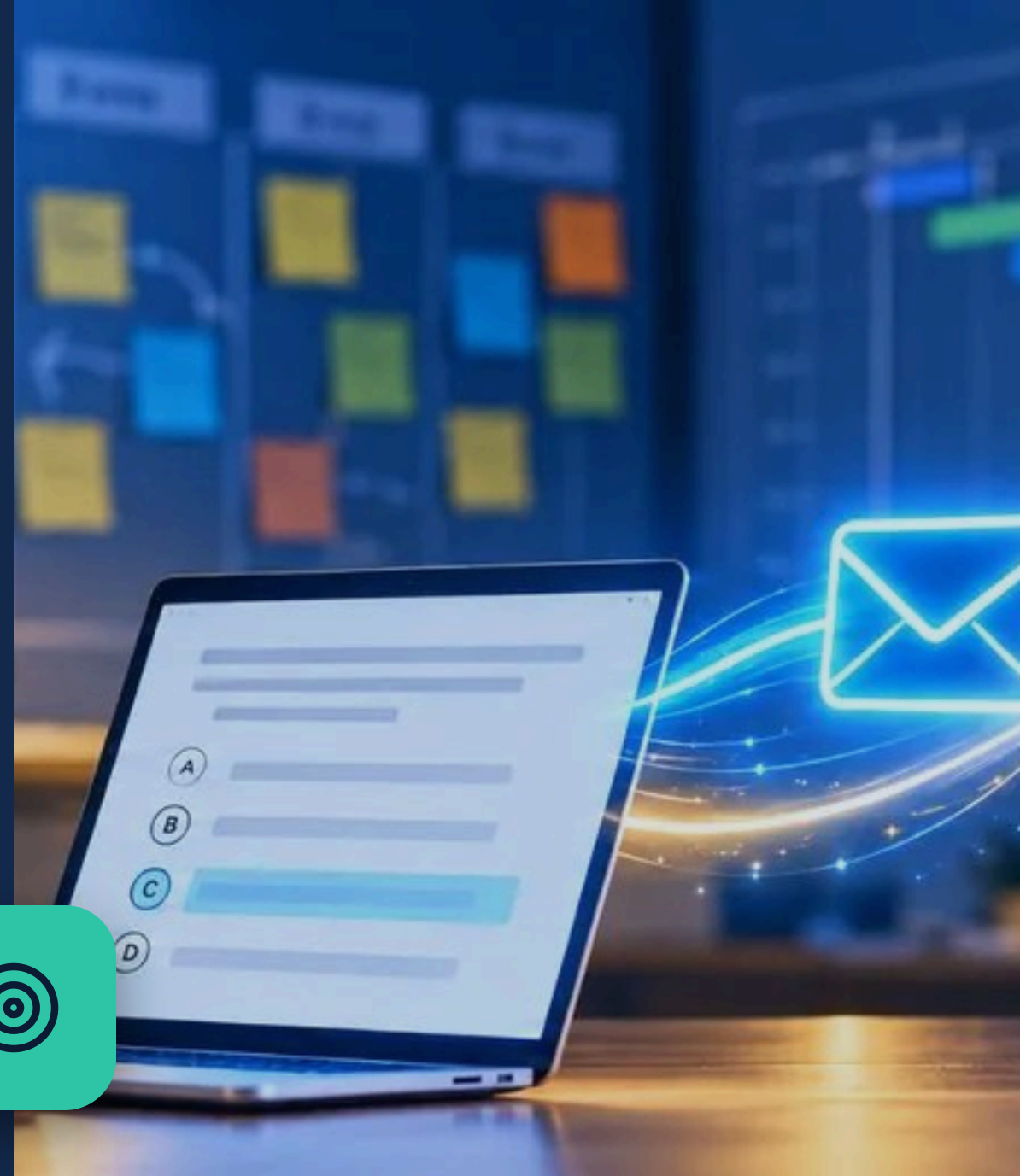
- ☐ 25. I can build and read sprint and release burndown charts and burn-up charts, recognize the common patterns and what they mean, explain why burn-up charts show scope change better, and use these charts for forecasting without turning them into tools of micromanagement.
- ☐ 26. I can explain the origins and principles of the Kanban method, design a board with explicit policies and WIP limits, explain why a pull system improves flow, choose classes of service, compare Kanban with Scrum, and decide when Kanban fits.
- ☐ 27. I can define and measure WIP, throughput, cycle time, lead time and work item age, apply Little's Law and state its conditions, explain why limiting work in progress shortens delivery times, and use percentiles to make reliable service commitments.
- ☐ 28. I can build and read a cumulative flow diagram, measure WIP, throughput and approximate lead time from it, recognize the patterns of bottlenecks, blockers and growing demand, and choose a sensible response to each pattern.
- ☐ 29. I can explain why transparency is a pillar of agile work, describe what makes an information radiator effective, choose radiators for a team and for stakeholders, design them for remote and hybrid teams, and avoid turning visibility into surveillance.
- ☐ 30. I can explain the purpose and rules of the Daily Scrum as defined in the 2020 Scrum Guide, choose a format that focuses on the Sprint Goal, handle impediments and side discussions correctly, and recognize when a stand-up has turned into a status meeting.
- ☐ 31. I can explain the purpose and rules of the Sprint Review as defined in the 2020 Scrum Guide, run it as a working session rather than a demonstration, handle unfinished work and stakeholder feedback correctly, and distinguish it from the Sprint Retrospective and from formal acceptance.
- ☐ 32. I can explain the purpose and rules of the Sprint Retrospective as defined in the 2020 Scrum Guide, facilitate it through five stages, choose a format, turn insights into concrete improvements, build the psychological safety it needs, and compare it with lessons learned in predictive projects.

[Open the full lessons →](#)[Test yourself: 10 exam-level questions →](#)

Scope & Requirements

Exam domain: Process

- 33. Collecting requirements and the traceability matrix
- 34. WBS and the scope baseline
- 35. Validate scope vs control scope (and gold plating)





LESSON 33 OF 96 · SCOPE & REQUIREMENTS

Predictive · hybrid

Collecting requirements and the traceability matrix

Goal: After this lesson you can choose an elicitation technique for a situation, tell different types of requirements apart, and use a traceability matrix to make sure nothing is lost.

The situation: The requirement that disappeared

In the robot cell workshops, the customer's IT manager asked for automatic recipe download from the MES. Everyone nodded, and it was written in the minutes.

Six months later, at the factory acceptance test, the IT manager asks: *"Where is the MES download?"* Nobody designed it. It was in the minutes, but it never reached the design specification.

Requirements are not lost because people are careless. They are lost because there is **no thread** connecting each requirement to its design, its test and its acceptance. That thread is the traceability matrix.

Exam shortcut: can't describe their real work → observation
· must see it → prototype · many people far away → questionnaire · conflicting stakeholders → facilitated workshop.

From need to proof

Business need · "Reduce manual loading labour by 2 operators per shift."



Business case & charter

Stakeholder requirement · "Operators must change product type in under 10 minutes."



Requirements documentation

Solution requirement · "Gripper quick-change tool; recipe selection on the HMI."



Design specification

Acceptance test · "FAT step 14: changeover timed at ≤ 10 min, 3 runs."



Test protocol & sign-off

Every requirement should travel down this chain and arrive at a test.



Getting the right requirements

Different situations need different **elicitation** techniques:

Your memory card

- Choose elicitation by situation: **observe** real work, **prototype** when they must see it, **workshop** to agree
- Requirements: **business** → **stakeholder** → **solution** → **transition**
- **RTM** links each requirement to source, design and test; empty cells = danger
- Agile: stories with **acceptance criteria** do the same job

EXAM-STYLE QUESTION

During acceptance testing, the customer reports that an approved requirement for automatic recipe download was never implemented. The requirement was recorded in workshop minutes but not in the design specification. What would have BEST prevented this?

- A.** A more detailed project charter
- B.** A requirements traceability matrix linking requirements to design and tests
- C.** More frequent status meetings
- D.** A larger testing team

Answer: B. The RTM links each requirement to its design and test, so a missing link is visible early.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 34 OF 96 · SCOPE & REQUIREMENTS

Predictive · hybrid

WBS and the scope baseline

Goal: After this lesson you can build a simple WBS, explain the 100% rule and the work package, and name the three parts of the scope baseline.

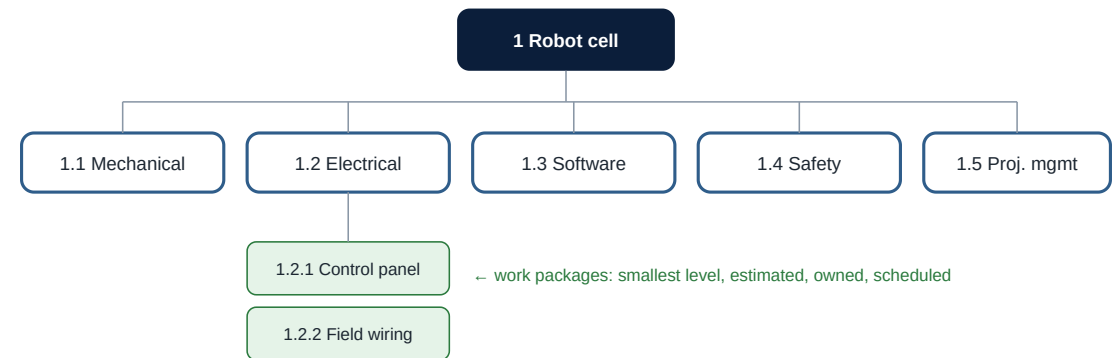
The situation: Who owns the interlocks?

The robot cell plan has a line called “Guarding”. The guarding subcontractor installs the fence, then leaves. The electricians assumed the subcontractor would install the door interlocks and their wiring. The subcontractor assumed the electricians would. Nobody did it. The interlocks were simply not inside anybody's box of work.

A good work breakdown structure prevents this: every piece of work is in exactly **one** box, and each box has a clear description.

Creating the WBS is called decomposition. The team that does the work helps create it.

A WBS for the robot cell



Level 1: the product. Level 2: major deliverables. Lowest level: work packages.



What a WBS is

A **work breakdown structure** breaks the total scope into smaller and smaller parts, organised by **deliverables**, until each part can be estimated, assigned and controlled.

Your memory card

- **WBS** = all deliverables and work, decomposed to **work packages**
- **100% rule**: everything in scope, nothing outside
- **Scope baseline** = scope statement + WBS + WBS dictionary
- Write **exclusions**; define boundaries in the WBS dictionary

EXAM-STYLE QUESTION

A subcontractor installed perimeter fencing but not the door interlocks, which the design team assumed were included in the 'Guarding' work package. Both interpretations are reasonable. What would have MOST likely prevented this?

- A.** A more detailed Gantt chart
- B.** A WBS dictionary entry defining the content and boundaries of the work package
- C.** A larger contingency reserve
- D.** More frequent site meetings

Answer: B. The WBS dictionary defines exactly what each work package contains and where its boundaries are.

Open the full lesson →

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 35 OF 96 · SCOPE & REQUIREMENTS

Predictive

Validate scope vs control scope (and gold plating)

Goal: After this lesson you can explain the order control quality → validate scope, handle a customer who refuses acceptance, and recognise scope creep and gold plating.

The situation: “It passed, but we won't sign”

The robot cell passed every internal test against the specification. At the acceptance meeting, the customer's operations manager refuses to sign: *“It doesn't meet our expectations for changeover speed.”* Changeover speed is not in the acceptance criteria.

Meanwhile, you discover that a programmer added an extra diagnostics screen “because the customer will like it”, and a customer engineer has been asking technicians for “small extras” directly.

Three different scope problems in one week. This lesson shows how to tell them apart.

Order on the exam: control quality first, then validate scope. Verified deliverables go to the customer for acceptance.

From correct to accepted

Control quality (internal, first)
Team checks the deliverable against the **specification**: “Is it correct?”



Verified deliverable

Validate scope (with the customer)
Customer formally reviews against the **acceptance criteria**: “Is it accepted?”



Accepted deliverable

Close project or phase
Formal handover of accepted deliverables



Final product / transition

Quality control checks correctness; validate scope obtains formal acceptance.



Correct first, then accepted

Two different checks, in this order:

Your memory card

- **Control quality** (correct?) → **validate scope** (accepted?)
- **Scope creep** = uncontrolled requests · **Gold plating** = uninvited team extras
- Refused acceptance → review against **acceptance criteria**; new wishes = change requests
- Agile: the sprint review is where increments are inspected and accepted

EXAM-STYLE QUESTION

All deliverables of a packaging line passed internal quality control. At the acceptance meeting, the customer refuses to accept, citing 'operational expectations' for changeover speed, which are not in the documented acceptance criteria. What should the project manager do?

- A.** Insist on signature, since quality control was passed
- B.** Ask the team to improve changeover speed immediately
- C.** Review the deliverables with the customer against the agreed acceptance criteria and handle the new expectation through change control
- D.** Escalate to arbitration

Answer: C. Validate scope uses agreed criteria; new expectations become change requests.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 5 REVIEW · CHECK YOURSELF

Scope & Requirements

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 33. I can choose an elicitation technique for a situation, tell different types of requirements apart, and use a traceability matrix to make sure nothing is lost.
- ☐ 34. I can build a simple WBS, explain the 100% rule and the work package, and name the three parts of the scope baseline.
- ☐ 35. I can explain the order control quality → validate scope, handle a customer who refuses acceptance, and recognise scope creep and gold plating.

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Schedule

Exam domain: Process

- 36. Dependencies, leads and lags: the logic behind every schedule
- 37. Critical path and float: forward pass, backward pass and what they mean
- 38. Schedule compression: crashing, fast tracking and the time-cost trade-off
- 39. Resource levelling vs resource smoothing

Exam, at a glance

FORMAT

Questions

Scored + 10 unscored

Minutes

Minutes to answer the questions

and breaks

Each

Other question formats

WHAT THE EXAM COVERS

People

Lead teams · resolve conflict · engage stakeholders

Process

Plan work · deliver results · track progress

Business Environment

Governance · risk · compliance · change management

Predictive, agile and hybrid approaches



LESSON 36 OF 96 · SCHEDULE

Predictive · hybrid

Dependencies, leads and lags: the logic behind every schedule

Goal: After this lesson you can identify the four relationship types, classify any dependency as mandatory or discretionary and internal or external, apply leads and lags to calculate dates, and explain which dependencies can be changed to shorten a schedule.

The situation: “Why can't the painters start tomorrow?”

You are managing the renovation of a dental clinic. The owner wants to reopen as soon as possible and asks why the painters cannot start tomorrow, at the same time as the drywall crew.

The drywall crew explains that walls must be hung, taped and dry before anyone can paint. The electrician adds that the city inspector must approve the wiring before any wall is closed. The owner's office manager says the dentist prefers that no work is done during patient hours next door.

These are all **dependencies**, but they are not the same kind. Some are physics, some are law, some are preferences, and some depend on people outside your project. Some can be changed to save time; others cannot.

Every activity, except the first and last, should have at least one predecessor and one successor. Activities with no links are “dangling” and hide real delays.

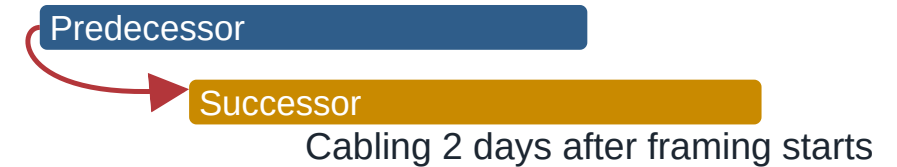
See it in one picture: the four relationship types

FS

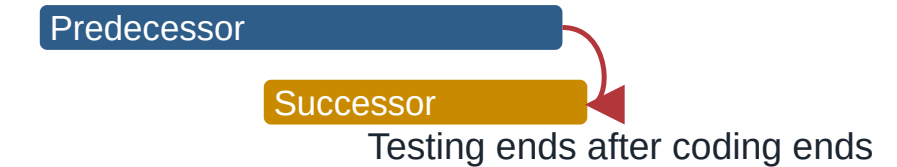
finish → start

**SS**

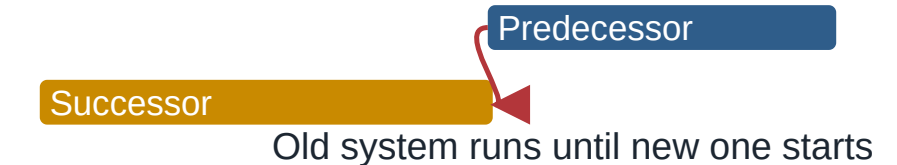
start → start

**FF**

finish → finish

**SF**

start → finish



Blue = predecessor, orange = successor, red arrow = the dependency. The arrow always runs from the controlling end of the predecessor to the controlled end of the successor.



Why schedule logic matters

A schedule is not a list of dates. It is a **model**: activities connected by dependencies. When one date changes, the model shows what else moves. If the logic is wrong or missing, the schedule looks fine on paper but fails in reality.

In the PMBOK process view, defining the logic is called **sequencing activities**. Its main output is the **project schedule network diagram**. Good sequencing is the foundation for the critical path, for float, and for every compression decision later.

Your memory card

- Four relationship types: FS (most common), SS, FF and SF (rare: handovers and shifts)
- Every dependency has two attributes: **mandatory or discretionary**, and **internal or external**
- Fast tracking changes **discretionary** logic only; external dependencies are tracked as risks
- Lag = waiting time, no resources; lead = overlap (negative lag); work with an owner = an activity
- FS + lag: start after finish + lag · SS + lag: start after start + lag · FF + lag: finish after finish + lag
- Several predecessors → take the latest date they allow

EXAM-STYLE QUESTION

A new patient-records system is being tested. Final acceptance testing cannot be completed until data migration from the old system has been completed, but testing can begin earlier with sample data. Which relationship best describes the link between migration and acceptance testing?

- A. Finish-to-start
- B. Start-to-start
- C. Start-to-finish
- D. Finish-to-finish

Answer: D. The finish of testing is controlled by the finish of migration: finish-to-finish. If testing could not start at all before migration ended, the answer would be finish-to-start.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 37 OF 96 • SCHEDULE

Predictive • hybrid

Critical path and float: forward pass, backward pass and what they mean

Goal: After this lesson you can build a forward and backward pass on a network diagram, calculate total and free float, identify the critical path (including when it changes), and explain what a delay does to the end date and what the method cannot tell you.

The situation: “Can we move in on day 12?”

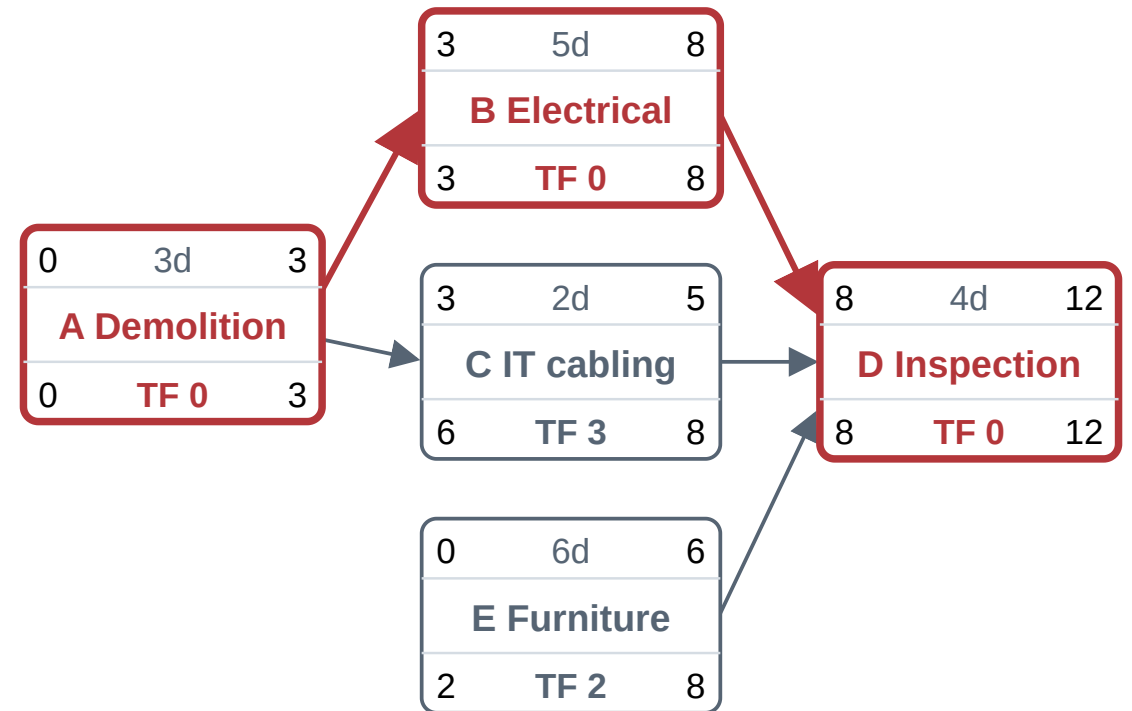
You are managing the fit-out of a new office floor for an insurance company. The work has five activities: **A** demolition of the old interior (3 days), **B** electrical rough-in (5 days, after A), **C** IT cabling (2 days, after A), **E** furniture order and delivery (6 days, can start immediately), and **D** final inspection and move-in preparation (4 days, after B, C and E are all done).

The client's facilities manager asks two questions: “When is the earliest we can move in?” and “The cabling contractor says he may start late. Does that matter?”

Adding up all the durations (3 + 5 + 2 + 6 + 4 = 20 days) gives the wrong answer, because some work happens in parallel. You need to know which chain of activities controls the end date, and how much slack every other activity has.

Critical path = the longest path through the network = the shortest time in which the project can be finished.

See it in one picture: the network with all four dates



How to read a node: top row = ES • duration • EF; bottom row = LS • total float • LF.

Red = critical path (zero float).

Forward pass gives the top row; backward pass gives the bottom row. Activities with zero total float (red) form the critical path A → B → D: 12 days.



Why the critical path matters

Every project has activities that can be delayed without hurting the end date, and activities that cannot. The **critical path** is the longest chain of dependent activities from start to finish. Its length is the **shortest possible project duration**.

Knowing it tells the project manager where to focus. A one-day slip on the critical path delays the whole project by one day. A one-day slip elsewhere may cost nothing. Without this knowledge, managers spread their attention evenly, or worse, put pressure on the wrong activities.

The method was developed in the late 1950s (DuPont and Remington Rand created CPM; the US Navy created PERT for the Polaris program at almost the same time). It remains the basis of every scheduling tool, from Microsoft Project to Primavera.

Your memory card

- Critical path = longest path = shortest project duration; zero total float when the end date equals the early finish
- Forward pass: $EF = ES + \text{duration}$; at a merge take the **largest** EF
- Backward pass: $LS = LF - \text{duration}$; at a burst take the **smallest** LS
- Total float = $LS - ES$ (protects the end date); free float = successor's $ES - EF$ (protects the next activity)
- Delay beyond float moves the end date by $(\text{delay} - \text{float})$; the critical path can change
- Negative float = the plan cannot meet the imposed date → compress, change logic, reduce scope or renegotiate

EXAM-STYLE QUESTION

A network has three paths: Start-P-Q-End (12 days), Start-R-S-End (15 days) and Start-T-End (14 days). Activity T is delayed by 2 days. What is the effect on the project?

- A.** The project is delayed by 2 days, because T is on a path
- B.** The project is not delayed, because T is not on the critical path
- C.** The project is delayed by 1 day, and T's path becomes critical
- D.** The project is delayed by 3 days, because float is lost on two paths

Answer: C. T's path becomes $14 + 2 = 16$ days, longer than 15. The project moves by $2 - 1 = 1$ day, and Start-T-End becomes the new critical path. If T had been on the 12-day path, a 2-day delay would cost nothing.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 38 OF 96 • SCHEDULE

Predictive • hybrid

Schedule compression: crashing, fast tracking and the time-cost trade-off

Goal: After this lesson you can calculate cost slopes and choose which activities to crash, explain when fast tracking is the better option, find the point where compression stops paying for itself, and recognize the risks and limits of both techniques.

The situation: “Open two weeks earlier, please”

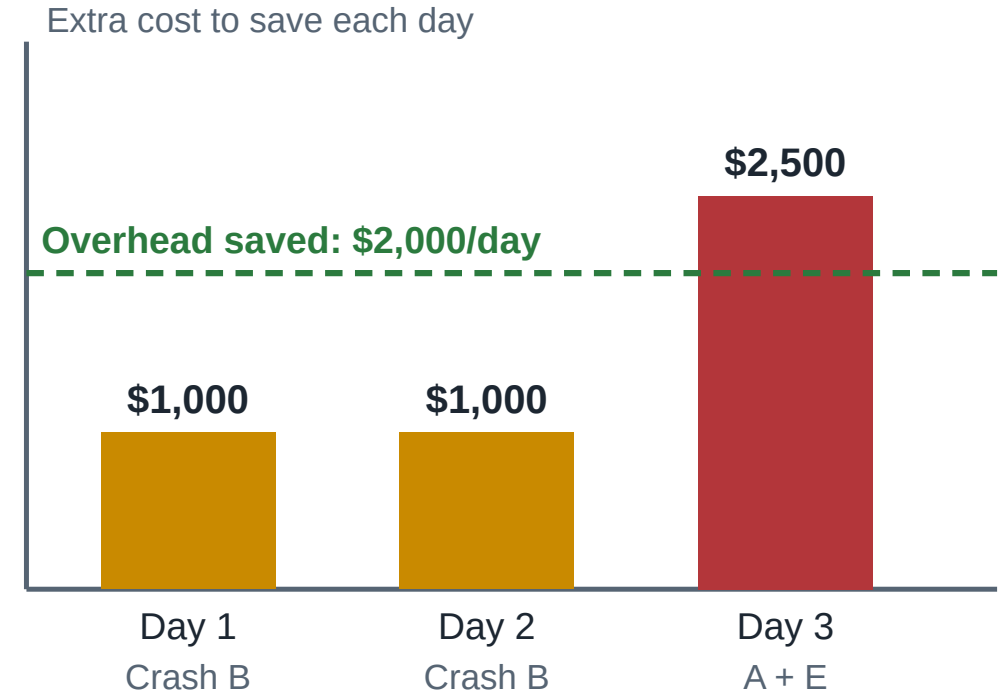
You are managing the fit-out of a new sporting-goods store in a shopping mall. The schedule says 15 working days to opening. Then the mall owner calls: a large neighboring store opens on day 12, and the client wants to open the same day to catch the crowds.

The client's operations director asks: “How much would it cost to finish three days earlier? And is there a way to do it without spending more?”

There are two classic answers. **Crashing** adds resources (overtime, extra crews, faster delivery) to shorten critical activities, and it costs money. **Fast tracking** overlaps activities that were planned in sequence, and it costs risk.

Compression = same scope, shorter time. Work only on the critical path, and re-check the critical path after every step.

See it in one picture: which days are worth buying?



Each bar is the extra cost of saving one more day. Below the green line, the day pays for itself through overhead saved. The third day costs \$500 more than it saves, so it is worth buying only if opening on day 12 is worth at least that much more.



What schedule compression is

Schedule compression means shortening the schedule **without reducing the project scope**. It is used when a new deadline is imposed, when the project has fallen behind, or when finishing early creates value (earlier revenue, avoided penalties, a market opportunity).

There are two main techniques: **crashing** and **fast tracking**. Both work only on the **critical path**, because only critical activities control the end date. Shortening an activity with float simply gives it more float.

If neither technique is acceptable, the remaining options are to reduce scope (with the sponsor's agreement), change the approach or technology, accept the later date, or negotiate the deadline. These decisions usually go through change control, because they affect the baseline.

Your memory card

- Compression = same scope, shorter time; only the **critical path** matters
- Crashing adds resources and money; $\text{cost slope} = (\text{crash cost} - \text{normal cost}) \div (\text{normal} - \text{crash duration})$
- Crash the cheapest critical activity, **one day at a time**, and re-check all paths
- Two critical paths → shorten both: a shared activity or one on each path
- Stop when the next day costs more than it is worth (indirect cost saved, bonus, revenue)
- Fast tracking overlaps **discretionary** logic; little cost, more risk and rework

EXAM-STYLE QUESTION

A project is two weeks behind schedule. The sponsor says no additional funds are available, but the deadline cannot move. Several critical activities follow each other only because the team prefers that order. What should the project manager do?

- A.** Crash the critical activities using paid overtime for the team
- B.** Fast-track the critical activities with discretionary sequencing
- C.** Reduce the project scope without consulting the sponsor
- D.** Crash the non-critical activities that have the lowest cost

Answer: B. Fast tracking overlaps discretionary activities without extra money, at the cost of added risk, which must be assessed and recorded. If money were available and risk had to stay low, crashing would be the better answer.

Open the full lesson →

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The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 39 OF 96 • SCHEDULE

Predictive • hybrid

Resource levelling vs resource smoothing

Goal: After this lesson you can explain the difference between levelling and smoothing, and predict what each does to the end date and the critical path.

The situation: Four welders on a two-welder team

The robot cell schedule looks fine on paper: 10 days. But on days 3 and 4 it needs **four** welders, and the company has only **two**.

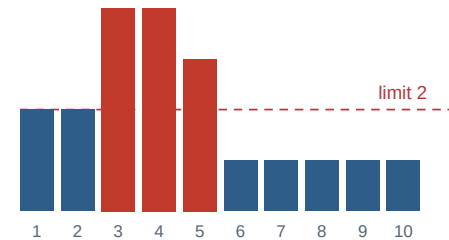
You have two choices: move work so that no day needs more than two welders, even if the project gets longer, or only move work inside its float so that the end date stays the same, accepting that some peaks may remain.

These are **resource levelling** and **resource smoothing**.

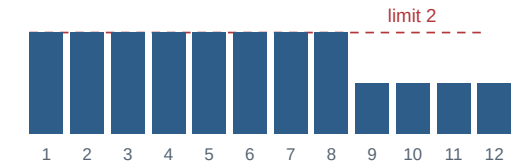
Exam shortcut: “end date cannot change” → smoothing. “limited resources, date may move” → levelling.

See it in one picture

Before: welders needed per day



After levelling: 12 days instead of 10



Before: days 3-5 need more welders than available (red). After levelling: never more than 2, but the work takes longer.



Two ways to fix resource problems

Both start from a **resource histogram**: a bar chart showing how many people are needed each day.

Your memory card

- **Levelling** = respect resource limits; end date and critical path **can change**
- **Smoothing** = even out usage **within float**; end date **does not** change
- Start from the **resource histogram**
- After levelling: recheck the critical path; baseline changes go through change control

EXAM-STYLE QUESTION

The customer will not accept any change to the go-live date. The resource histogram shows that two electricians are over-allocated during week 6, and some of their activities have float. Which technique should the project manager use?

A. Resource levelling

B. Resource smoothing

C. Fast tracking

D. Crashing

Answer: B. Smoothing moves work within float without changing the end date.

Open the full lesson →

More free PMP questions →

The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 6 REVIEW · CHECK YOURSELF

Schedule

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 36. I can identify the four relationship types, classify any dependency as mandatory or discretionary and internal or external, apply leads and lags to calculate dates, and explain which dependencies can be changed to shorten a schedule.
- ☐ 37. I can build a forward and backward pass on a network diagram, calculate total and free float, identify the critical path (including when it changes), and explain what a delay does to the end date and what the method cannot tell you.
- ☐ 38. I can calculate cost slopes and choose which activities to crash, explain when fast tracking is the better option, find the point where compression stops paying for itself, and recognize the risks and limits of both techniques.
- ☐ 39. I can explain the difference between levelling and smoothing, and predict what each does to the end date and the critical path.

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Cost & EVM

Exam domain: Process

- 40. Estimating techniques: analogous, parametric, three-point and bottom-up
- 41. Cost baseline, budget and reserves
- 42. Earned value basics: PV, EV, AC, variances and performance indexes
- 43. Forecasting with earned value: EAC, ETC and VAC
- 44. TCPI and reading performance reports





LESSON 40 OF 96 • COST & EVM

Predictive

Estimating techniques: analogous, parametric, three-point and bottom-up

Goal: After this lesson you can choose the right estimating technique for the stage and information available, calculate PERT and triangular estimates with their standard deviation and ranges, combine uncertainty along a path, and explain the biases and accuracy ranges behind every estimate.

The situation: “Just give me a number”

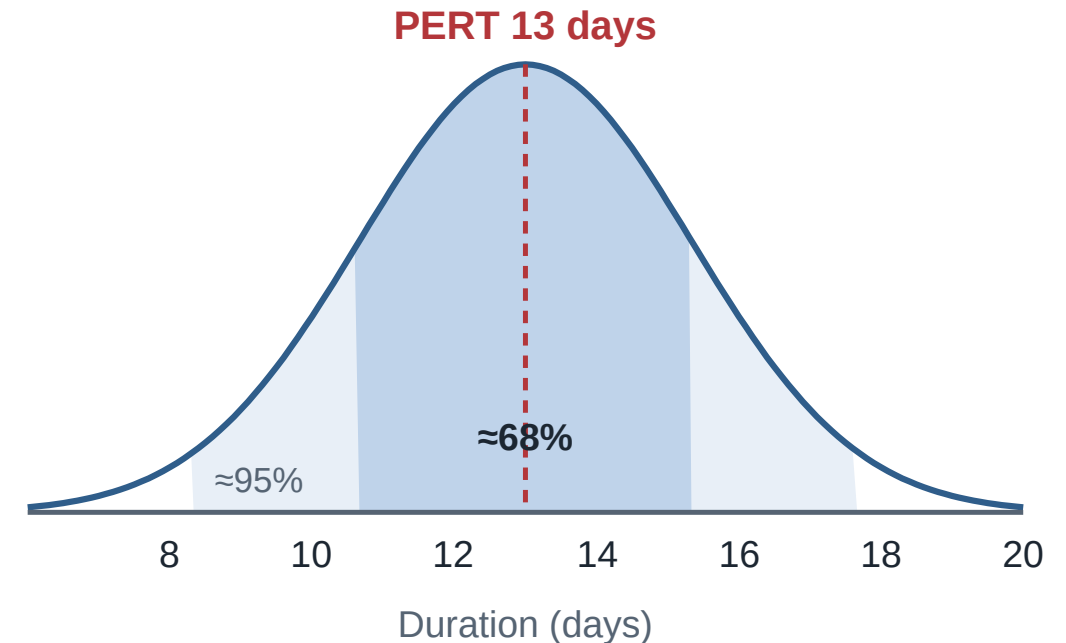
A regional bank is moving its call center to a new 8,000-square-foot office. The facilities director asks you for an estimate of the electrical and data cabling work. “Just give me a number for the board meeting on Friday.”

You have very little detail yet: no drawings, only a floor area. But you remember that a similar office last year cost about \$90,000, and your electrical contractor quotes a typical rate of \$12 per square foot. Later, when drawings exist, you will be able to estimate every work package separately.

Each of these is a different estimating technique, with a different accuracy and cost. And every estimate hides uncertainty: the cabling might take 8 days if everything goes well, or 22 days if the old ceiling hides problems.

An estimate = a number + its range + its assumptions. A single number without a range hides the uncertainty.

See it in one picture: an estimate is a range



PERT gives 13 days, but the real outcome will be somewhere in a range. Dark band $\approx$ 68% of outcomes (10.7–15.3 days); light band $\approx$ 95% (8.3–17.7 days). The pessimistic tail is longer than the optimistic one.



What an estimate is, and what it is not

An **estimate** is a quantified assessment of the likely amount of something (cost, duration, effort or resources), based on the information available at the time. It is a forecast, not a promise and not a target.

Three quantities are often confused. **Effort** is the work needed, in person-hours or person-days. **Duration** is the number of working periods the activity takes, which depends on how many people work on it. **Elapsed time** is calendar time, including weekends and holidays. Forty hours of effort may be one week of duration for one person, or half a week for two.

Every estimate should come with its **basis of estimate**: the assumptions, the method, the source data and the expected range. “\$96,000, parametric, \$12/sq ft from the contractor's last three jobs, $\pm 25\%$ ” is far more useful than “\$96,000”.

Your memory card

- Estimate = number + range + assumptions (basis of estimate); effort $\neq$ duration
- Analogous: similar past project, fast, least accurate · Parametric: rate $\times$ quantity · Bottom-up: sum of work packages, most accurate
- Triangular $(O + M + P) \div 3$ · PERT $(O + 4M + P) \div 6$ · $\sigma \approx (P - O) \div 6$
- $\pm 1\sigma \approx 68\%$, $\pm 2\sigma \approx 95\%$: plan to the confidence you need, with contingency
- Along a path: means add, **variances** add, σ does not
- ROM -25% to $+75\%$ $\rightarrow$ definitive -5% to $+10\%$ as detail grows (cone of uncertainty)

EXAM-STYLE QUESTION

The sponsor needs a cost estimate for a new warehouse project by tomorrow for a portfolio review. Only the floor area and the cost of a similar warehouse built two years ago are known. Which technique should the project manager use?

- A.** Bottom-up estimating based on the work breakdown structure
- B.** Analogous estimating, adjusted for known differences
- C.** Three-point estimating for every activity in the schedule
- D.** Vendor bid analysis after issuing a request for proposal

Answer: B. Analogous estimating is fast and uses a similar past project, adjusted for differences such as size and inflation. With a reliable cost per square meter, parametric would also fit. Bottom-up would be right later, once a WBS exists.

[Open the full lesson !\[\]\(838036f8c987c259e5bd255a3dd853fd_img.jpg\)](#)

[More free PMP questions !\[\]\(ca8aa3a411e33484d719a76daef0e46f_img.jpg\)](#)

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 41 OF 96 • COST & EVM

Predictive • hybrid

Cost baseline, budget and reserves

Goal: After this lesson you can build a cost baseline and project budget from estimates and reserves, explain who controls contingency and management reserve and how each is used, draw a time-phased baseline (S-curve), and reconcile planned spending with funding limits.

The situation: “How much money do you need, and when?”

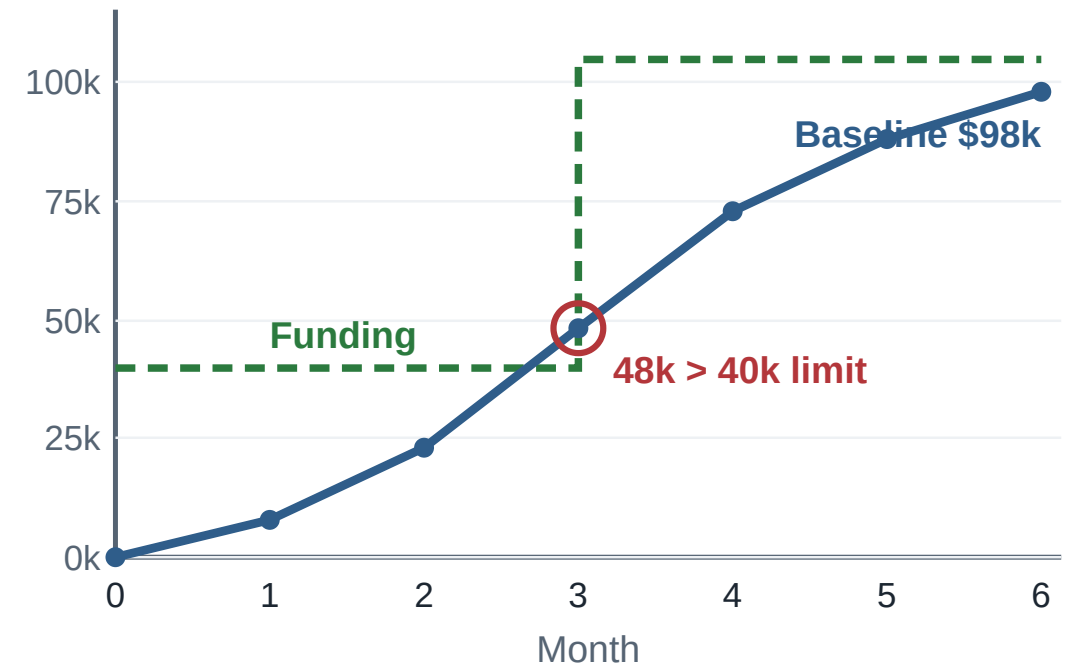
The city has approved the renovation of a public library branch. Your team has estimated every work package: demolition, electrical, accessibility upgrades, shelving, IT and furniture. Together they add up to \$90,000.

The risk register lists several identified risks, such as asbestos found behind old walls and late delivery of accessible doors. Their expected cost is about \$8,000. The finance department also wants a small amount set aside for problems nobody has thought of.

Then the city's budget officer adds a constraint: “We can release at most \$40,000 in the first quarter. The rest comes in the second quarter.” Your plan spends \$48,000 in the first three months.

Activities → work packages → control accounts → + contingency = cost baseline → + management reserve = project budget.

See it in one picture: the S-curve and the funding limit



Blue: the cost baseline accumulating over six months to \$98,000 (BAC). Green steps: money the city releases. In month 3 planned spending (\$48,000) is above the first-quarter funding (\$40,000), so the plan must be reconciled.



From estimates to budget

Estimating answers “how much will each part cost?”. **Determining the budget** answers “how much do we authorize in total, and when will it be spent?”. Its main output is the **cost baseline**: the approved, time-phased budget against which performance is measured.

The budget is built by **cost aggregation**: activity estimates are added into work package estimates, work packages into **control accounts**, and control accounts into the project total. Reserves are then added at the right levels (see the table in the Picture section).

This structure matters. It lets the project manager see cost performance at each level, and it connects the money to the scope (WBS) and the schedule, which is the basis for earned value management in the next lessons.

Your memory card

- Activities → work packages → control accounts → + contingency = **cost baseline (BAC)** → + management reserve = **project budget**
- Contingency: identified risks, inside the baseline, used by the PM as planned
- Management reserve: unidentified risks, outside the baseline, needs approval; when used, BAC increases
- Baseline changes only through change control; never rebaseline to hide variances
- Time-phased baseline = S-curve = planned value (PV) over time
- Funding limit exceeded → reconcile by rescheduling work with float

EXAM-STYLE QUESTION

The work package estimates for a project total \$450,000. The contingency reserve is \$40,000 and the management reserve is \$25,000. What is the budget at completion (BAC)?

A. \$450,000

B. \$515,000

C. \$490,000

D. \$475,000

Answer: C. BAC = estimates + contingency = 450,000 + 40,000 = \$490,000. The project budget, including management reserve, would be \$515,000.

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LESSON 42 OF 96 • COST & EVM

Predictive • hybrid

Earned value basics: PV, EV, AC, variances and performance indexes

Goal: After this lesson you can explain why earned value is needed, measure EV with an appropriate method, calculate CV, SV, CPI and SPI and their percentages, interpret them correctly in one sentence, and explain the main limits of the method.

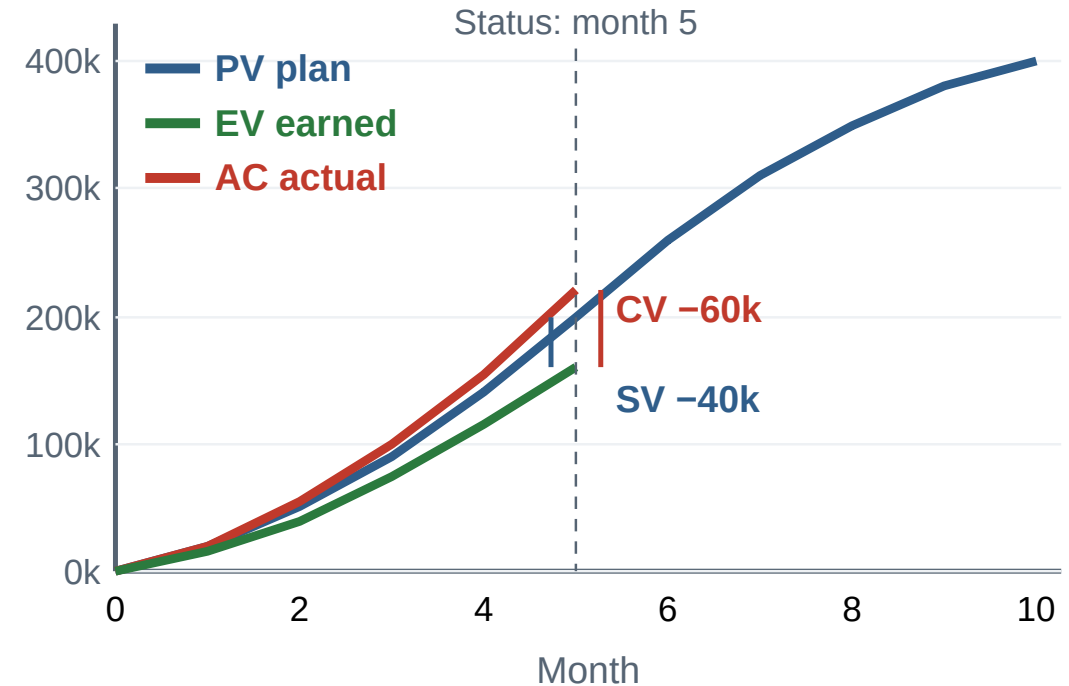
The situation: “We have spent half the budget. Are we halfway?”

You are managing the installation of a new nurse-call and patient-monitoring system in a 200-bed hospital. The budget is \$400,000 over 10 months. At the end of month 5, the finance report says \$220,000 has been spent.

The hospital's chief operating officer asks: “We have spent a little more than half the money in half the time. That sounds about right. Are we on track?”

You cannot answer from spending alone. Spending tells you what you **paid**, not what you **got**. Maybe the team has done more work than planned; maybe much less. To know, you must compare three numbers: what you planned to do, what you actually did, and what it cost.

See it in one picture: the three curves



At month 5 the plan (PV, blue) says \$200,000 of work should be done. Only \$160,000 has been earned (EV, green), and it cost \$220,000 (AC, red). EV is below PV: behind schedule. AC is above EV: over budget.



Why spending alone tells you nothing

A project can have spent exactly the planned amount and still be in trouble, if the work done is far behind. It can also be over budget by month 5 simply because it is ahead of schedule. Spending and schedule must be judged **together**, against the work actually completed.

Earned value management integrates scope, schedule and cost into one set of measures. It was developed for US defense programs in the 1960s and is now a standard (ANSI/EIA-748 in the United States, and PMI's *Standard for Earned Value Management*). It answers two questions objectively: **are we ahead or behind schedule?** and **are we over or under budget?**

Older textbooks use different names for the same three measures: **BCWS** (budgeted cost of work scheduled) for PV, **BCWP** (budgeted cost of work performed) for EV, and **ACWP** (actual cost of work performed) for AC. The long names are useful because they say exactly what each measure is. If you meet them in other sources, they are not new concepts. EVM is built on the time-phased cost baseline from the previous lesson. Without a baseline that links budget to scope and time, there is nothing to compare against.

Your memory card

- Spending alone says nothing: compare **EV** (work done) with PV (plan) and AC (cost)
- $PV = \text{budgeted cost of work scheduled}$ · $EV = \text{budgeted cost of work done}$ · $AC = \text{actual cost}$
- $CV = EV - AC$ · $SV = EV - PV$: negative is bad
- $CPI = EV \div AC$ · $SPI = EV \div PV$: below 1.0 is bad
- Measure EV with an agreed, objective method (0/100, 50/50, milestones, units); limit level of effort
- SPI drifts to 1.0 at the end; earned schedule measures delay in time

EXAM-STYLE QUESTION

At a status review, a project has a planned value of \$80,000, an earned value of \$88,000 and an actual cost of \$96,000. How is the project performing?

- A. Behind schedule and under budget
- B. Ahead of schedule and over budget
- C. Behind schedule and over budget
- D. Ahead of schedule and under budget

Answer: B. $SV = 88 - 80 = +\$8,000$ (ahead). $CV = 88 - 96 = -\$8,000$ (over budget). $SPI = 1.10$, $CPI = 0.92$. The PM should ask why: perhaps overtime is buying speed.

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LESSON 43 OF 96 • COST & EVM

Predictive • hybrid

Forecasting with earned value: EAC, ETC and VAC

Goal: After this lesson you can calculate EAC, ETC and VAC, choose the right EAC formula from the cause of the variance, show why $BAC \div CPI$ and $AC + (BAC - EV) \div CPI$ are the same forecast, and present a forecast as a range that supports a decision.

The situation: “So what will it cost in the end?”

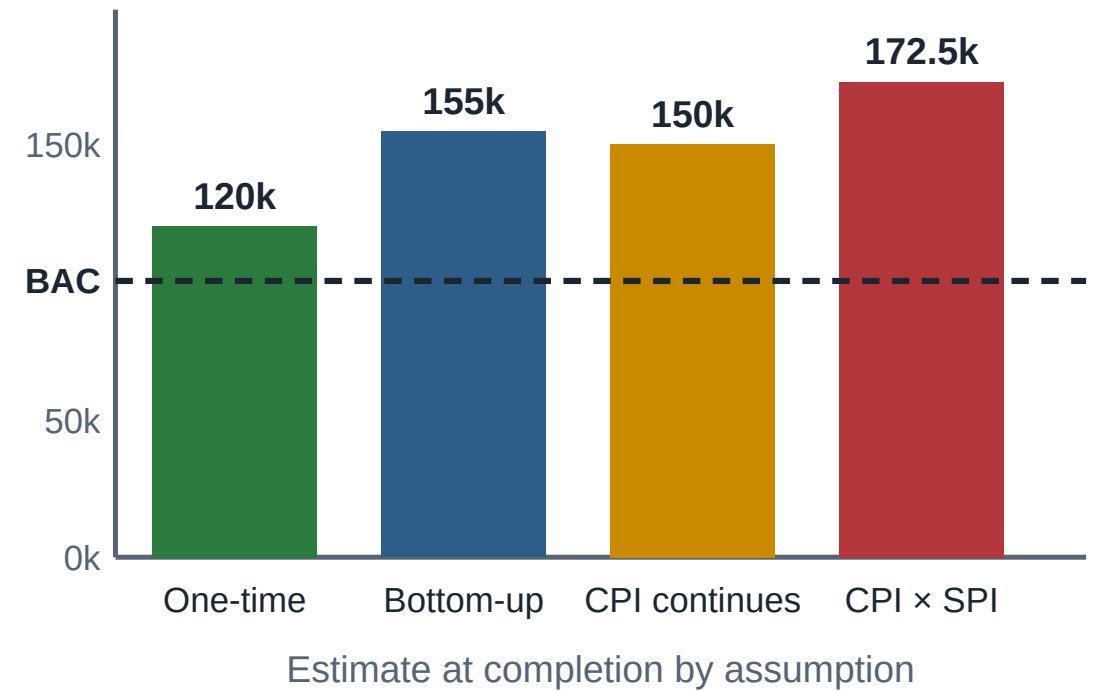
A city utility is replacing 1,000 old water meters at a budgeted \$100 each: $BAC = \$100,000$. By the status date, 500 meters should have been installed ($PV = \$50,000$). Only 400 are done ($EV = \$40,000$), and the work has cost \$60,000 (AC).

The utility director asks the obvious question: “So what will the whole job cost?” You already know the CPI (0.67) and SPI (0.80) from the previous lesson. But they describe the past. The director needs the future.

The answer depends on **why** the project is over budget. If a crew damaged a delivery once, the rest may go to plan. If each meter simply takes longer than estimated, the overrun will continue. If old pipes need new fittings that nobody budgeted for, the original estimate is no longer valid.

$EAC = AC + ETC$, always. $ETC = EAC - AC$. $VAC = BAC - EAC$ (negative = overrun).

See it in one picture: one project, four forecasts



The same EV data ($BAC \$100k$, $EV \$40k$, $AC \$60k$, $CPI 2/3$, $SPI 0.8$) gives four different forecasts. The right one depends on the cause of the variance, not on the numbers.



Why forecast, and what the terms mean

Variances and indexes tell you how the project has performed so far. Sponsors make decisions about the future: approve more money, reduce scope, stop the project. **Forecasting** turns performance data into an expected final result, early enough to act.

Three forecast measures are used everywhere:

Your memory card

- $EAC = AC + ETC$ always; $VAC = BAC - EAC$ (negative = overrun)
- Remaining work at budget = $BAC - EV$; the question is at what efficiency it will be done
- One-time cause → $EAC = AC + (BAC - EV)$
- Continuing cause → $EAC = BAC \div CPI$ ($= AC + (BAC - EV) \div CPI$)
- Schedule must still be met → $EAC = AC + (BAC - EV) \div (CPI \times SPI)$
- Original estimate wrong → $EAC = AC + \text{bottom-up ETC}$

EXAM-STYLE QUESTION

A project has a BAC of \$200,000. Earned value is \$80,000 and actual cost is \$100,000. The overrun was caused by a one-time equipment failure that has been repaired, and the rest of the work is expected to proceed as planned. What is the estimate at completion?

A. \$250,000

B. \$200,000

C. \$220,000

D. \$240,000

Answer: C. $EAC = AC + (BAC - EV) = 100,000 + 120,000 = \$220,000$. If the cause were continuing, $BAC \div CPI = 200,000 \div 0.8 = \$250,000$.

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LESSON 44 OF 96 • COST & EVM

Predictive • hybrid

TCPI and reading performance reports

Goal: After this lesson you can calculate the to-complete performance index for a budget or a forecast target, judge whether a recovery target is realistic, read an earned value performance report including trends and thresholds, and turn it into a clear recommendation.

The situation: “The team says it can still finish on budget”

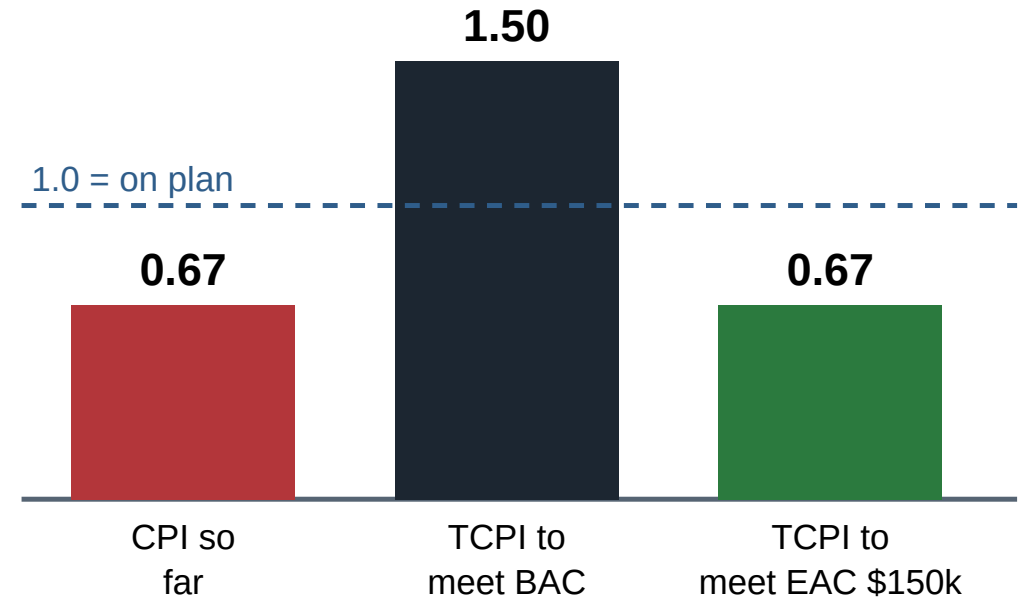
Back at the city water-meter program: BAC \$100,000, EV \$40,000, AC \$60,000. The forecast from the last lesson is about \$150,000. The installation supervisor is confident: “We had a bad start. We will be faster now and still finish within \$100,000.”

Is that realistic? Only \$40,000 of budget is left, and \$60,000 of work remains. To finish on budget, the crews must do \$60,000 of planned work for \$40,000 of real cost. That means working 50% more efficiently than planned, after working 33% less efficiently than planned so far.

The **to-complete performance index (TCPI)** turns this argument into one number. Together with the indicators you already know, it lets you read a performance report and test any promise of recovery.

TCPI = work remaining ÷ money remaining. Above 1.0 = must work better than planned; below 1.0 = can work worse than planned.

See it in one picture: efficiency achieved vs efficiency needed



The crews have achieved 0.67. Finishing within the original \$100,000 would need 1.50 for the rest of the program: not credible. Finishing at the \$150,000 forecast needs exactly today's performance.



What TCPI measures

CPI looks **back**: how efficiently have we worked so far? TCPI looks **forward**: how efficiently must we work from now on to hit a cost target?

It compares the **work remaining** (in budget terms) with the **money remaining** to do it. If there is less money left than work left, the remaining work must be done more efficiently than planned, and TCPI is above 1.0.

Your memory card

- $TCPI = \text{work remaining} \div \text{money remaining} = (BAC - EV) \div (BAC - AC)$, or $\div (EAC - AC)$ for a new target
- TCPI above 1.0 = must work better than planned; compare it with CPI
- TCPI more than about 0.05-0.10 above CPI → target unrealistic without a real change
- $AC \geq BAC$ with work left → meeting BAC is impossible; use an EAC
- Data → information → reports; a report gives status, cause, forecast, options, recommendation
- Watch trends over several periods; act before thresholds are crossed

EXAM-STYLE QUESTION

A project has a BAC of \$500,000, an earned value of \$300,000 and an actual cost of \$350,000. The sponsor insists that the project must finish within the original budget. What efficiency must the remaining work achieve?

A. 0.86

B. 1.33

C. 1.17

D. 0.75

Answer: B. $TCPI = (500,000 - 300,000) \div (500,000 - 350,000) = 200,000 \div 150,000 = 1.33$. CPI so far is $300 \div 350 = 0.86$, so this would need a large improvement.

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PART 7 REVIEW · CHECK YOURSELF

Cost & EVM

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 40. I can choose the right estimating technique for the stage and information available, calculate PERT and triangular estimates with their standard deviation and ranges, combine uncertainty along a path, and explain the biases and accuracy ranges behind every estimate.
- ☐ 41. I can build a cost baseline and project budget from estimates and reserves, explain who controls contingency and management reserve and how each is used, draw a time-phased baseline (S-curve), and reconcile planned spending with funding limits.
- ☐ 42. I can explain why earned value is needed, measure EV with an appropriate method, calculate CV, SV, CPI and SPI and their percentages, interpret them correctly in one sentence, and explain the main limits of the method.
- ☐ 43. I can calculate EAC, ETC and VAC, choose the right EAC formula from the cause of the variance, show why $BAC \div CPI$ and $AC + (BAC - EV) \div CPI$ are the same forecast, and present a forecast as a range that supports a decision.
- ☐ 44. I can calculate the to-complete performance index for a budget or a forecast target, judge whether a recovery target is realistic, read an earned value performance report including trends and thresholds, and turn it into a clear recommendation.

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Quality

Exam domain: Process

- 45. Planning quality and the cost of quality
- 46. Manage quality vs control quality (and control charts)
- 47. The quality tools: which one, when?





LESSON 45 OF 96 • QUALITY

All approaches

Planning quality and the cost of quality

Goal: After this lesson you can explain why prevention beats inspection, sort costs into the four cost-of-quality categories, and tell quality from grade.

The situation: “Just inspect it at the end”

To save money, the sponsor proposes cancelling the design reviews and supplier checks for the robot cell. *“Final inspection will catch anything important.”*

Your data from previous projects says otherwise: a defect found in design costs about \$1 to fix; found at the customer's site, about \$100; found by the customer in production, \$500 or more, plus the reputation damage.

Quality is not added by inspection at the end. It is **planned and built in**.

A temporary platform in standard steel (low grade) must still have perfect welds (high quality).

The four costs of quality

Cost of conformance (spend to get it right)

Prevention: training, design reviews, supplier qualification, poka-yoke.

Appraisal: inspection, testing, audits, calibration.

Cost of non-conformance (paid when it goes wrong)

Internal failure (found before delivery): rework, scrap, re-testing.

External failure (found by the customer): warranty, field repairs, lost reputation, liability.

Spending on prevention and appraisal reduces the much bigger cost of failures.



Quality vs grade

Two words the exam loves to mix up:

Your memory card

- **Quality** = meeting requirements · **Grade** = category (low grade OK, low quality never)
- Cost of quality: **prevention, appraisal** (conformance) · **internal, external failure** (non-conformance)
- Prevention is cheaper than inspection; inspection is cheaper than failure
- Quality is planned and built in, not inspected in

EXAM-STYLE QUESTION

To reduce costs, the sponsor proposes removing design reviews and supplier qualification, relying on final inspection. Historical data show that defects found at final inspection cost six times more to fix than defects prevented in design. What should the project manager do?

- A.** Accept the proposal, since final inspection will protect the customer
- B.** Present a cost-of-quality analysis showing the likely increase in failure costs, so the sponsor can make an informed decision
- C.** Keep the activities without telling the sponsor
- D.** Double the final inspection effort

Answer: B. The cost of quality shows that prevention is cheaper than failure; the sponsor decides with transparent data.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 46 OF 96 · QUALITY

All approaches

Manage quality vs control quality (and control charts)

Goal: After this lesson you can tell quality assurance from quality control, read a control chart, and apply the rule of seven.

The situation: Everything is within limits... isn't it?

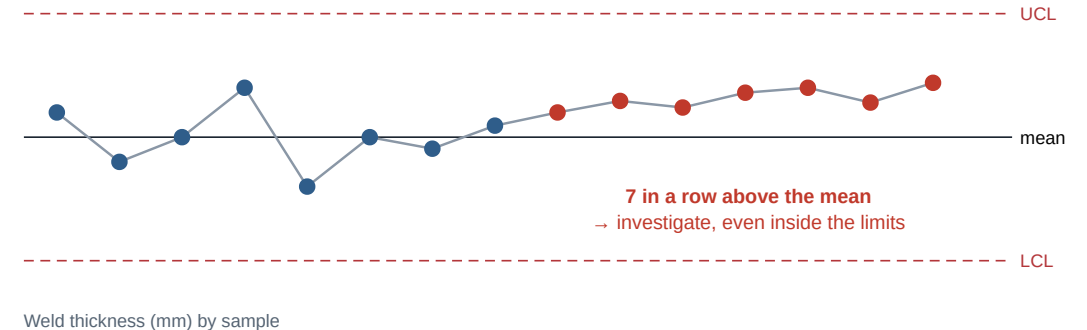
Two things happen in the same week. A quality audit finds that the welding team has been skipping the pre-weld checklist for six weeks. And the weld thickness chart shows the last seven samples all **above** the average, although every value is still inside the limits.

The production supervisor says: *"No defects, all within limits: no problem."*

He is wrong twice. The first issue is about the **process**; the second is a **pattern** in the product data. Both need action.

Exam shortcut: audit, process, "are we following procedures?" → manage quality · inspect, measure, test the deliverable → control quality.

A control chart with a warning



All points are inside the limits, but the last seven (red) are above the mean: the process has shifted.



Process vs product

Quality management has two sides:

Your memory card

- **Manage quality** = process, audits · **Control quality** = product, inspection
- Control chart: mean, **UCL/LCL** (from the process) vs **spec limits** (from the customer)
- Outside limits or **7 in a row** on one side → investigate
- Don't wait for defects; correct process non-compliance now

EXAM-STYLE QUESTION

A control chart shows the last seven measurements above the mean, although all are within the control limits and within specification. The supervisor says no action is needed. What should the project manager do?

- A.** Agree, since all values are within limits
- B.** Treat the pattern as a sign that the process may be out of control and investigate the cause
- C.** Widen the control limits
- D.** Reject the last seven batches

Answer: B. Rule of seven: a non-random pattern suggests an assignable cause.

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LESSON 47 OF 96 · QUALITY

All approaches

The quality tools: which one, when?

Goal: After this lesson you can pick the right quality tool from the question being asked, and read a Pareto chart.

The situation: The gripper keeps dropping parts

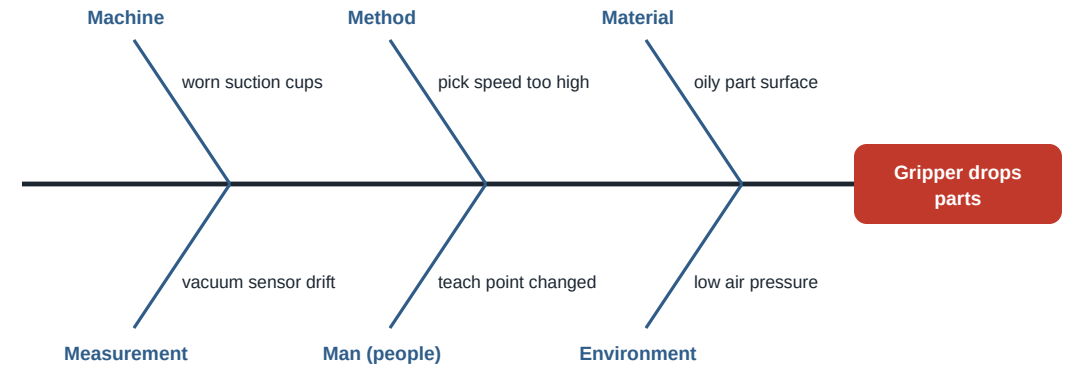
During the robot cell's first production week, the gripper drops parts several times a shift. Everyone has a theory: worn suction cups, oily parts, low air pressure, a changed teach point.

You need to do three things: list all possible causes systematically, find out which problems happen most often, and check whether one factor really drives the defects.

Each of those questions has its own quality tool.

Key words: “root cause” → fishbone · “most frequent”, “80/20” → Pareto · “correlation”, “relationship” → scatter · “stable”, “over time” → control chart.

A fishbone for the gripper



The six “M” categories help the team list causes systematically before choosing what to test.



Match the tool to the question

The exam rarely asks you to draw a tool. It asks you to **choose** the right one from the situation. Start from the question:

Your memory card

- **Fishbone / 5 whys** = possible causes · **Pareto** = most frequent (80/20)
- **Scatter** = relationship · **Control chart** = stability over time
- **Check sheet** = collect data · **Histogram** = distribution · **Flowchart** = process steps
- Choose the tool from the **question**, not from habit

EXAM-STYLE QUESTION

The quality engineer suspects that ambient temperature affects the rate of adhesive defects and has recorded both values for sixty shifts. Which tool should be used to examine the relationship?

- A.** Pareto chart
- B.** Cause-and-effect diagram
- C.** Scatter diagram
- D.** Check sheet

Answer: C. A scatter diagram plots two variables to show correlation.

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PART 8 REVIEW · CHECK YOURSELF

Quality

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 45. I can explain why prevention beats inspection, sort costs into the four cost-of-quality categories, and tell quality from grade.
- ☐ 46. I can tell quality assurance from quality control, read a control chart, and apply the rule of seven.
- ☐ 47. I can pick the right quality tool from the question being asked, and read a Pareto chart.

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Risk

Exam domain: Business Environment

- 48. Risk process and the risk register
- 49. Risk analysis: probability, impact, EMV and decision trees
- 50. Risk responses: threats, opportunities, escalation and contingency

Exam, at a glance

FORMAT

Questions

Scored + 10 unscored

Minutes

Minutes to answer the questions

and breaks

each

Other question formats

WHAT THE EXAM COVERS

People

Lead teams · resolve conflict · engage

Process

Plan work · deliver results · track progress

Business Environment

Governance · risk · compliance · change

Predictive, agile and hybrid approaches





LESSON 48 OF 96 · RISK

All approaches

Risk process and the risk register

Goal: After this lesson you can tell a risk from an issue, describe the risk process in order, and write a proper entry in a risk register.

The situation: “Nothing went wrong... yet”

Kick-off of the robot cell. The team is optimistic. But you notice three things: the vision supplier has never inspected this part type, the guarding supplier is very busy, and nobody has measured the customer's compressed air.

None of these is a problem **today**. Each one **might** become a problem later. That is exactly what a **risk** is: an uncertain event that, if it happens, affects the project.

Good project managers do not wait for problems. They find risks early, decide which ones matter, and prepare a response while it is still cheap.

A risk that occurs becomes an issue. If it was planned, implement the planned response. If it was not planned, create a workaround.

See it in one picture: the risk process

1**Plan**

Decide how risk will be managed: method, roles, risk appetite, thresholds.

2**Identify**

Find risks: workshops, checklists, lessons learned, assumptions.

3**Qualitative**

Rank risks by probability and impact. Fast, for every risk.

4**Quantitative**

Put numbers on the biggest risks: EMV, Monte Carlo, decision trees.

5**Plan responses**

Choose a strategy and an owner for each important risk.

6**Implement**

The risk owner executes the planned response when needed.

7**Monitor**

Track triggers, review risks, find new ones, audit the process.

↻ Step 7 feeds back into step 2: risk management continues for the whole project.

Risk management is a loop, not a one-time workshop. New risks appear throughout the project.



Risk, issue or assumption?

Three words that the exam loves to mix up:

Your memory card

- **Risk** = may happen · **Issue** = has happened · **Assumption** = believed true
- Write risks as **cause** → **event** → **effect**
- Every risk: **owner**, probability, impact, **trigger**, response
- Risk management is a **loop** for the whole project; thresholds decide what to escalate

EXAM-STYLE QUESTION

During execution, a key component supplier informs the project manager that delivery will be three weeks late. This possibility was never identified in the risk register. What should the project manager do FIRST?

- A.** Add the late delivery to the risk register and assess its probability
- B.** Develop a workaround to minimise the impact and record the event in the issue log
- C.** Wait for the next risk review meeting
- D.** Implement the contingency plan for supplier delays

Answer: B. It has happened, so it is an issue, not a risk. No response was planned, so the PM creates a workaround and logs the issue.

[Open the full lesson →](#)

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 49 OF 96 • RISK

All approaches

Risk analysis: probability, impact, EMV and decision trees

Goal: After this lesson you can rank risks with a probability and impact matrix, calculate expected monetary value (EMV) with the correct signs, solve a decision tree, and explain what EMV can and cannot tell you about the contingency reserve.

The situation: Twenty risks, one sponsor, one big question

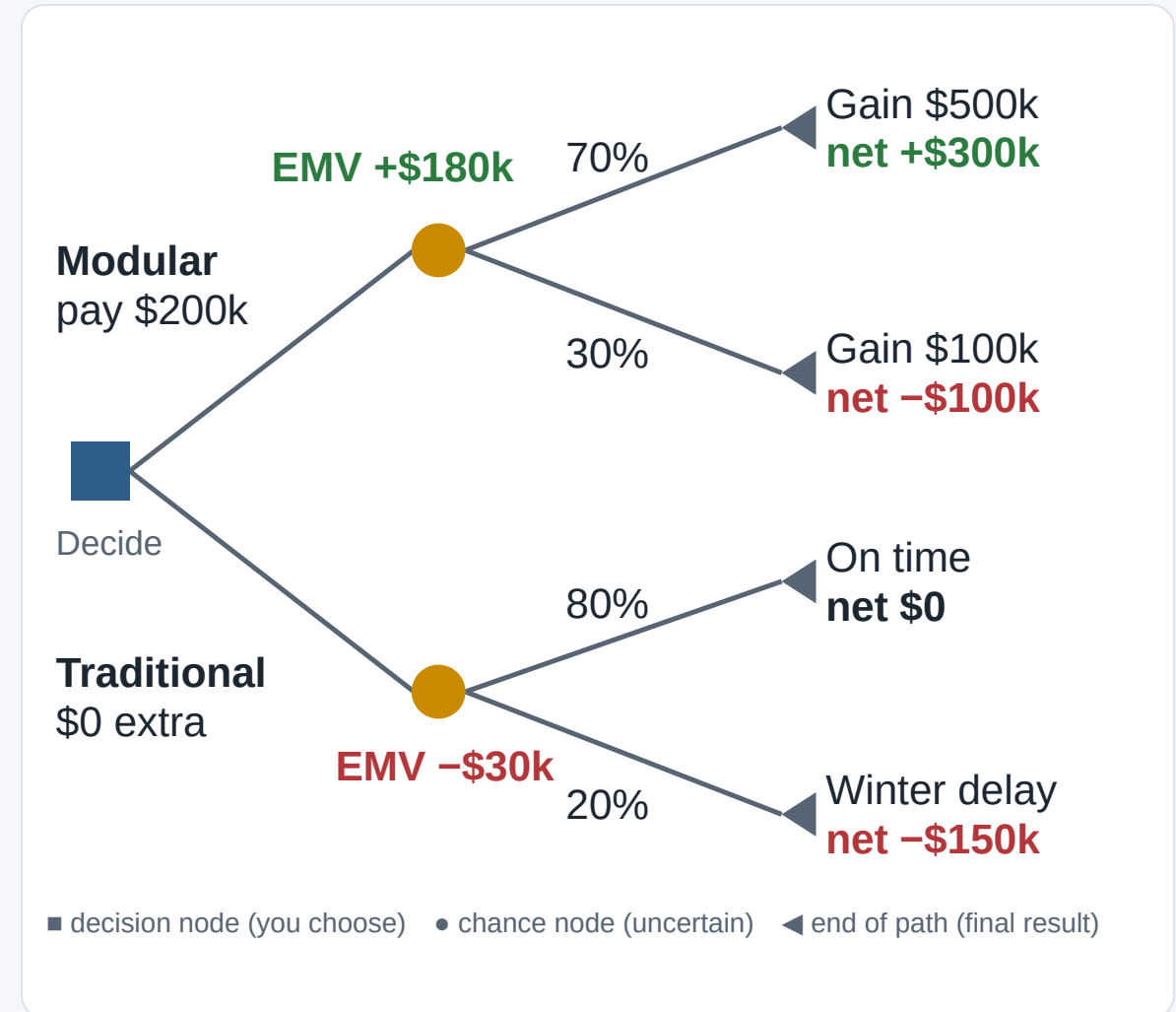
You manage the build-out of a new outpatient clinic in a leased building. Opening day is in nine months. In the risk workshop, the team identified 20 risks: a permit delay, a late X-ray unit, undocumented wiring, a fire-door certification, a possible furniture discount, and more.

You cannot give all 20 risks the same attention. Some are likely and expensive. Some are unlikely and cheap. A few are unlikely but dangerous.

Then the sponsor asks two questions: “Which risks should worry us most?” and “How much money should we keep aside for them?” A week later the architect adds a third: “Should we pay \$200,000 extra for prefabricated modular exam rooms that could let us open earlier?”

Exam order: identify → qualitative analysis → quantitative analysis (only when it adds value) → plan responses. You cannot plan good responses before you know which risks matter.

See it in one picture: the decision tree



Fold the tree back from right to left. Modular: $0.70 \times \$500k + 0.30 \times \$100k = \$380k$, minus the \$200k cost = **+\$180k**. Traditional: $0.80 \times \$0 + 0.20 \times (-\$150k) = -\$30k$. A risk-neutral organization chooses modular.



Where risk analysis fits

Risk management is a cycle, not a single meeting. In predictive projects it usually follows this order: **plan** how risks will be managed → **identify** risks → **analyze** them (first qualitatively, then quantitatively if needed) → **plan responses** → **implement** the responses → **monitor** and repeat.

Analysis is the bridge between a long list of risks and a short list of actions. Its job is to answer two questions: **which risks matter most?** and **how big is the uncertainty, in money or time?**

The input is the **risk register**, where each risk is written as cause → event → effect and has an owner. The output is an updated register: each risk has a priority, and the most important ones may also have numbers (EMV, probability of meeting a date).

Your memory card

- Qualitative analysis ranks **every** risk (probability × impact, defined scales); quantitative analysis puts numbers on the **top** risks or the whole project
- $EMV = \text{probability} \times \text{impact}$. **Threats negative, opportunities positive**. EMV is a long-run average; it almost never happens exactly
- Outcomes on a chance node are **alternatives**: probabilities add up to 100%; never add the outcomes together
- Decision tree: fold back from right to left; net EMV = expected value – option cost (subtract once); risk-neutral → best net EMV
- Net EMV of the risks = a **starting estimate** for contingency reserve; few large or connected risks → simulation or confidence level (P80)
- Contingency reserve = identified risks (inside the baseline) · management reserve = unidentified risks (outside, needs approval)

EXAM-STYLE QUESTION

The team has identified 35 risks for a new distribution center, and the sponsor wants to know which ones deserve the most attention before the steering meeting in three days. No risk has been analyzed yet. What should the project manager do?

- A.** Run a Monte Carlo simulation that includes all 35 identified risks
- B.** Develop and approve detailed response plans for all 35 risks
- C.** Rate each risk's probability and impact and rank them by priority
- D.** Transfer the highest-impact risks to suppliers through contract changes

Answer: C. Prioritizing risks is qualitative analysis: fast, applied to every risk, and done before quantitative analysis or response planning. Another answer could be right later: once the top risks are known, a Monte Carlo simulation could support a schedule or budget decision.

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The full lesson on pcclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 50 OF 96 • RISK

All approaches

Risk responses: threats, opportunities, escalation and contingency

Goal: After this lesson you can choose an appropriate response strategy for any threat or opportunity, judge whether a response is worth its cost, write a complete risk response with owner, trigger, contingency and fallback plans, and explain residual risks, secondary risks, workarounds and escalation.

The situation: From a ranked list to a plan of action

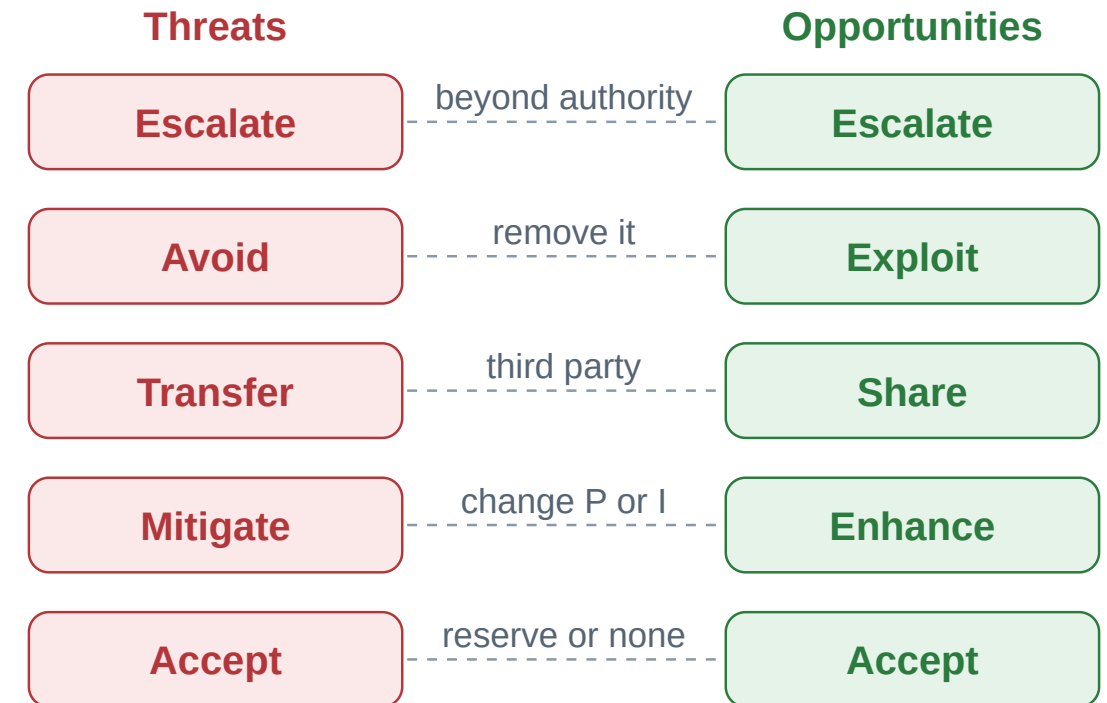
In the risk analysis lesson, the outpatient clinic team ranked its risks. The permit delay (R1) was red, the late X-ray unit (R2) and network rework (R3) were yellow, the fire-door certification (R4) was low-scoring but safety-critical, and a furniture discount (O1) was a possible opportunity.

Now the sponsor asks: “So what are we going to do about them?” Ranking risks does not change anything; responses do. But every response costs money or time, and some create new risks of their own.

For each risk the team must decide: should we remove it, reduce it, hand it to someone else, or accept it? Who will own it? What signal tells us it is happening, and what will we do then? And what if the response itself fails?

Every significant risk needs a strategy, actions, one owner and a date. Responses are executed, not just documented.

See it in one picture: mirrored strategies



Each threat strategy has an opportunity twin. Escalate and accept apply to both. Avoid removes a threat; exploit makes an opportunity certain. Transfer moves a threat's impact; share gives an opportunity to a better-placed partner. Mitigate shrinks a threat; enhance grows an opportunity.



Where responses fit

After risks are identified and analyzed, the team **plans risk responses**: it chooses strategies and actions for the risks that need them, in order of priority. Then it **implements** those responses: agreed actions are carried out, and contingency plans are executed when triggers occur. Finally, it **monitors** risks and responses throughout the project.

A good response is **appropriate** to the significance of the risk, **cost-effective**, **realistic** in the project's context, **agreed** by the relevant stakeholders, **owned** by one named person, and **timely**. A brilliant response that nobody owns or that comes too late is worthless.

Your memory card

- Threats: escalate, avoid, transfer, mitigate, accept · Opportunities: escalate, exploit, share, enhance, accept
- Transfer moves the financial impact, not the event; active acceptance = reserve or contingency plan
- Response worth it if EMV reduction > cost (safety and legal risks may need responses anyway)
- One risk owner per risk; trigger → contingency plan → fallback plan if it fails
- Residual risk remains after the response; secondary risk is created by it
- Workaround = unplanned response to an occurred problem

EXAM-STYLE QUESTION

A project team identifies that a key software component may be delivered late by its vendor. The project manager negotiates a contract clause under which the vendor pays a daily penalty for late delivery. Which risk response strategy is this?

- A. Avoid
- B. Mitigate
- C. Accept
- D. Transfer

Answer: D. Transfer shifts the financial consequence to a third party through a contract, insurance or bond. The delay can still happen. If the PM also asked for weekly progress checks to make lateness less likely, that part would be mitigation.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 9 REVIEW · CHECK YOURSELF

Risk

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 48. I can tell a risk from an issue, describe the risk process in order, and write a proper entry in a risk register.
- ☐ 49. I can rank risks with a probability and impact matrix, calculate expected monetary value (EMV) with the correct signs, solve a decision tree, and explain what EMV can and cannot tell you about the contingency reserve.
- ☐ 50. I can choose an appropriate response strategy for any threat or opportunity, judge whether a response is worth its cost, write a complete risk response with owner, trigger, contingency and fallback plans, and explain residual risks, secondary risks, workarounds and escalation.

[Open the full lessons →](#)[Test yourself: 10 exam-level questions →](#)

Procurement

Exam domain: Process

- 51. Contract types and who carries the risk
- 52. Procurement: plan, conduct, control and claims





LESSON 51 OF 96 · PROCUREMENT

Predictive · hybrid

Contract types and who carries the risk

Goal: After this lesson you can explain the main contract families and who carries cost risk in each, choose a suitable type for a given level of scope certainty, calculate fees and prices for incentive contracts including the point of total assumption, and describe contract approaches used in agile work.

The situation: “Just make them give us a fixed price”

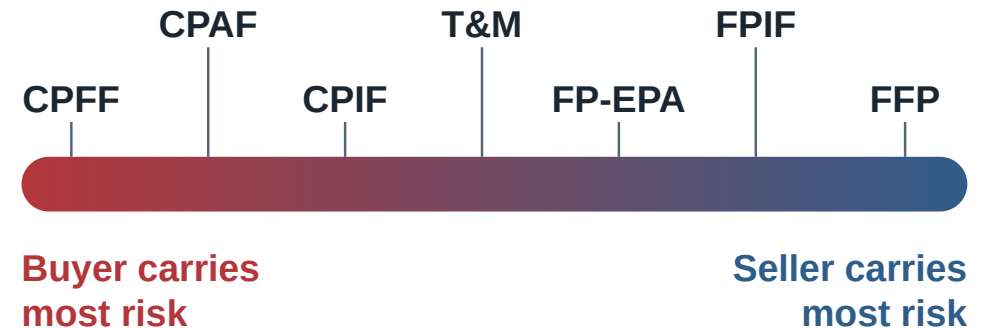
A provincial transit authority needs three things from outside suppliers this year: 40 identical bus shelters, a new passenger-information display system that has never been built before, and on-call engineering support for unpredictable repairs.

The finance director wants the same answer for all three: *“Fixed price. That way the supplier carries the risk, not us.”* The engineering manager disagrees: *“No serious company will quote a fixed price for a system nobody has designed yet. Or if they do, the price will be enormous.”*

Both have a point. The contract type decides who pays when costs turn out higher than expected, and how hard the seller works to control costs. The right choice depends on how well the scope can be defined.

Clear, stable scope → fixed price. Uncertain or changing scope → cost-reimbursable or time and materials.

See it in one picture: who carries the cost risk?



Scope clear and stable → fixed price (right)

Scope uncertain → cost-reimbursable (left)

Moving right, the seller carries more of the cost risk and the buyer needs a clearer scope. Moving left, the buyer carries more risk and needs more oversight.



Why the contract type matters

A contract is a legally binding agreement: the seller provides specified products or services, and the buyer pays. Every contract also allocates **risk**: if the work costs more than expected, someone pays for it. The contract type decides who.

Sellers are not charities. If they carry more risk, they include a **risk premium** in their price. So pushing all risk to the seller is not free; the buyer pays for it in advance, whether the risk occurs or not. And if the seller underestimates and starts losing money, quality, relationships and even delivery can suffer.

The art of contracting is to put each risk with the party best able to manage it, at a fair price. That depends mostly on how clearly the scope can be described.

Your memory card

- Contract type = who carries cost risk; clear scope → fixed price, uncertain scope → cost-reimbursable or T&M
- Fixed price: seller carries most risk (FFP, FPIF, FP-EPA)
- Cost-reimbursable: buyer carries most risk (CPFF, CPIF, CPAF); needs oversight
- T&M: fixed rates, open total; use a not-to-exceed cap
- Share ratio is buyer/seller; final fee = target fee + seller share × (target cost – actual cost)
- PTA = (ceiling – target price) ÷ buyer share + target cost; above it, the seller pays all

EXAM-STYLE QUESTION

A city needs a consultant to investigate the cause of repeated failures in a water treatment process. Nobody knows how long the investigation will take or what it will find. Which contract type is most appropriate?

- A.** Firm fixed price, to protect the city's budget
- B.** Cost-reimbursable, with an incentive or award fee
- C.** Fixed price with economic price adjustment
- D.** Fixed price incentive fee with a low ceiling price

Answer: B. When scope cannot be defined, a fixed price is either impossible or very expensive. Cost-reimbursable contracts fit; an incentive or award fee encourages efficiency. T&M with a not-to-exceed cap could also work for a small investigation.

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LESSON 52 OF 96 · PROCUREMENT

Predictive · hybrid

Procurement: plan, conduct, control and claims

Goal: After this lesson you can describe the procurement steps in order, choose between RFI, RFP and RFQ, run a fair selection, and handle a claim correctly.

The situation: Buying the guarding

The robot cell needs perimeter guarding. Should your shop build it, or should you buy it? If you buy, how do you choose a supplier fairly? And what happens when, halfway through, the supplier says: *“Your drawings were unclear; we want \$8,000 more”*?

Procurement is a process with three parts: **plan** what to buy and how, **conduct** the selection, and **control** the contract until it is closed. Each part has classic exam traps.

The three procurement steps

1 · Plan procurement

Make-or-buy analysis · contract type · statement of work (SOW) · selection criteria · RFI / RFP / RFQ

2 · Conduct procurement

Bidder conference (same answers to everyone) · evaluate proposals against the criteria · negotiate · award the contract

3 · Control procurement

Monitor performance · inspections and audits · approve payments · manage changes and **claims** · close the contract

Plan → conduct → control. Each step produces documents used in the next.



Plan: make or buy?

The first decision: do it ourselves or buy it? A **make-or-buy analysis** compares the total costs, then considers capacity, skills, risk, quality and confidentiality.

Your memory card

- **Plan → conduct → control**; make-or-buy compares **total** costs
- RFI = learn the market · RFP = ask for solutions · RFQ = ask for prices
- Fair selection: published criteria, bidder conference, same answers to all
- Claims: follow the contract, **negotiate first**; close only after claims are settled

EXAM-STYLE QUESTION

During contract execution, a seller submits a claim for additional payment, arguing that the statement of work was ambiguous. Relations remain good. What should the project manager do FIRST?

- A.** Refer the claim to litigation
- B.** Follow the contract's claims procedure, starting with negotiation
- C.** Reject the claim, since the contract is fixed price
- D.** Pay the claim to protect the relationship

Answer: B. Claims are handled per the contract; negotiation is the preferred first method.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 10 REVIEW · CHECK YOURSELF

Procurement

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 51. I can explain the main contract families and who carries cost risk in each, choose a suitable type for a given level of scope certainty, calculate fees and prices for incentive contracts including the point of total assumption, and describe contract approaches used in agile work.
- ☐ 52. I can describe the procurement steps in order, choose between RFI, RFP and RFQ, run a fair selection, and handle a claim correctly.

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Change & Configuration Control

Exam domain: Business Environment

53. Integrated change control

54. Configuration management: the right version everywhere





LESSON 53 OF 96 · CHANGE & CONFIGURATION CONTROL

Predictive · hybrid

Integrated change control

Goal: After this lesson you can describe the change control steps in order, say what the project manager does **FIRST** with a change request, and recognise the four types of change request.

The situation: “Just add one more sensor”

During installation, the customer's engineer asks a technician: *“Can you just add one more sensor at the infeed? It's small.”* The technician wants to help.

But one sensor means a new I/O point, PLC code, a drawing update, testing, maybe a safety review, and someone has to pay for it. If every “small” request is done informally, the project slowly drifts from its plan, its budget and its contract.

Integrated change control is how a project says **yes, no or later** to change in a controlled way.

Customer asks for a change → the PM's FIRST step is evaluate the impact. Not “say yes”, not “say no”, not “send it straight to the CCB without analysis”.

The change control steps

1**Request**

Anyone may raise a change request, in writing.

2**Log**

Record it in the change log.

3**Analyse**

PM assesses impact on scope, schedule, cost, quality, risk, resources.

4**Decide**

The CCB (or the authority in the plan) approves, rejects or defers.

5**Update**

Update plans, baselines and documents.

6**Communicate**

Tell everyone affected.

7**Implement & verify**

Do the work; verify it matches the approved change.

The order matters: analyse before deciding, update and communicate before (and while) implementing.



The rule

Every change to an approved **baseline** (scope, schedule, cost) or to the approved plan goes through one process. “Integrated” means the impact is assessed on **everything** at once: a scope change usually affects schedule, cost, quality and risk too.



Your memory card

- Change to a baseline → **analyse impact first**, then the defined authority decides
- Request → log → analyse → decide → update → communicate → implement & verify
- 4 types: **corrective, preventive, defect repair, update**
- Emergency safety fix: act now, document and review afterwards

EXAM-STYLE QUESTION

A key stakeholder asks the project manager to add a reporting feature that was not in the approved scope. The stakeholder says it is urgent and would be easy to build. What should the project manager do FIRST?

- A.** Add the feature, since it is easy and the stakeholder is important
- B.** Reject the request, since it is outside the approved scope
- C.** Evaluate the impact of the request on the project objectives
- D.** Submit the request to the change control board immediately without analysis

Answer: C. Every change request starts with an impact analysis; the decision comes later from the right authority.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 54 OF 96 · CHANGE & CONFIGURATION CONTROL

All approaches

Configuration management: the right version everywhere

Goal: After this lesson you can explain the four configuration management activities and the difference between configuration management and change control.

The situation: Six cells, four software versions

The customer has six identical robot cells. After a week of troubleshooting, the engineers discover that the cells run **four different firmware versions** and **two different safety PLC programs**, and nobody can say which version was tested and approved.

Every engineer who visited the site had “just updated” something. Each change might have been fine, but now no one knows what is really installed.

Configuration management prevents exactly this: it makes sure everyone knows **which version is the right one**, and where it is.

The four activities

1 · Identify

Decide which items are controlled (drawings, PLC code, firmware, BOM) and give each an ID and version.

2 · Control changes

No change to a controlled item without an approved change request.

3 · Status accounting

Record which version is current, where it is installed and what changed.

4 · Verify & audit

Check that what is built and installed matches the approved configuration.

Identify → control → record → verify.



What is a configuration item?

A **configuration item** is anything whose exact version matters: drawings, PLC and robot programs, HMI files, firmware, the bill of materials, safety documents. Each one gets an ID and a version number, and changes only through approved change requests.

Your memory card

- **Configuration items:** drawings, programs, firmware, BOM, documents with IDs and versions
- Four activities: **identify, control, status accounting, verify & audit**
- Change control **decides**; configuration management keeps **versions** correct everywhere
- Lost control → stop, audit, compare, restore **approved** (not newest) versions

EXAM-STYLE QUESTION

During installation, the project manager discovers that electricians are using revision C of the wiring drawings, while revision E is the approved version. Revision C was still on the shared drive. What should the project manager do FIRST?

- A.** Let the electricians finish and correct the differences during commissioning
- B.** Stop the affected work, make sure only the approved revision is available, and assess the work already done
- C.** Send an email reminding the team to use the latest drawings
- D.** Ask the electricians to compare the two revisions and decide

Answer: B. Contain the configuration failure: stop wrong work, control the documents, then assess what was already built.

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PART 11 REVIEW · CHECK YOURSELF

Change & Configuration Control

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 53. I can describe the change control steps in order, say what the project manager does FIRST with a change request, and recognise the four types of change request.
- ☐ 54. I can explain the four configuration management activities and the difference between configuration management and change control.

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Monitoring & Control

Exam domain: Process

- 55. Monitoring and controlling project work
- 56. Issues, impediments and when to escalate

Exam, at a glance

WHAT

Questions

scored + 10 unscored

utes

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and breaks

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er question formats

WHAT THE EXAM CO

People

Lead teams · resolve conflict · engage

Process

Plan work · deliver results · track pro

Business Environment

Governance · risk · compliance · cha

Predictive, agile and hybrid app



LESSON 55 OF 96 · MONITORING & CONTROL

All approaches

Monitoring and controlling project work

Goal: After this lesson you can turn performance data into useful reports, use variance and trend analysis, and decide when to act yourself and when to escalate.

The situation: Green, green, green... late

For three months, every robot cell status report was green. Then, two weeks before FAT, the team announced a four-week delay.

Looking back, the signs were there: CPI drifting down from 0.99 to 0.91, wiring progress stuck at “90%” for weeks, defects increasing. Each number alone looked acceptable. Nobody looked at the **trend**, and nobody compared progress with the plan objectively.

Monitoring is not collecting numbers. It is **comparing, analysing, forecasting and acting early**.

How data becomes a decision

Work performance **data**

“Wiring: 60% done; \$14,200 spent; 3 NCRs.” Raw facts from the work.



Compared with the plan and analysed

Work performance **information**

“Wiring is 4 days behind, CPI 0.88, defects trending up.” Facts in context.



Summarised for an audience

Work performance **reports**

Dashboard for the steering committee with forecasts and recommendations.



Decisions: corrective or preventive actions via change requests

Each step adds meaning: from raw facts, to comparison with the plan, to a report that drives action.



Data → information → reports

Monitoring turns raw facts into decisions:

Your memory card

- **Data → information → reports → decisions**
- Variance (how far?), **trend** (which direction?), forecast (where will we end?)
- Corrective/preventive actions that change the plan go through **change control**
- Within tolerance: act and monitor · outside: **escalate promptly** with options

EXAM-STYLE QUESTION

The cumulative CPI has fallen from 0.99 to 0.91 over four months. Each month remained within the organisation's tolerance of ± 10 percent. What should the project manager do?

- A.** Take no action, since each value is within tolerance
- B.** Investigate the cause of the declining trend now and plan corrective or preventive actions
- C.** Rebaseline the cost to restore a CPI of 1.0
- D.** Wait until the CPI falls below 0.90 before acting

Answer: B. Trend analysis shows a growing problem; acting early is cheaper than waiting for a breach.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 56 OF 96 · MONITORING & CONTROL

All approaches

Issues, impediments and when to escalate

Goal: After this lesson you can manage issues with an issue log, help remove impediments, and choose between solving, supporting and escalating.

The situation: Three problems before lunch

Monday morning on the robot cell project. The robot arrives with a damaged gearbox. The software team says it cannot test because the purchase order for a test PLC is stuck in a three-signature approval loop. And two engineers argue about who owns the HMI alarm list.

Each problem needs a different owner and a different reaction. If the PM tries to solve all of them personally, nothing gets done. If the PM escalates all of them, the sponsor stops listening.

The skill is knowing **who should solve what**, and escalating only what really needs it.

PMP mindset: try to solve it at the lowest effective level first, then escalate with options. Never escalate as the first step, and never hide what you cannot solve.

Who solves it?

Can the **team** solve it itself?→
yes

Team solves it (self-organising); PM supports

Is it within the **PM's authority**?→
yes

PM acts: removes the impediment, negotiates, decides; logs it

Outside PM authority, or beyond **thresholds**?→
yesEscalate to sponsor / governance with **facts, impact and options**

Safety, legal or ethical?

→

Act immediately within policy and inform the right authority

Start at the lowest effective level. Safety, legal and ethical problems are acted on immediately.



Issues and impediments

An **issue** is a current problem that needs action. An **impediment** (agile term) is anything blocking the team's progress. Both are recorded, owned and tracked until resolved.

Your memory card

- **Issue** = current problem → issue log with owner, priority, due date
- **Impediments**: the servant leader removes what the team can't
- Solve at the **lowest effective level**; escalate when beyond authority or thresholds
- Escalate with **facts, impact, options and the decision needed**

EXAM-STYLE QUESTION

An agile team has been unable to test for two sprints because purchase orders for test hardware are stuck in an approval workflow requiring three executive signatures. The team has raised this at every daily stand-up. What should the project manager do?

- A.** Advise the team to plan its sprints around the missing hardware
- B.** Record it in the risk register and review it at the next sprint review
- C.** Work with procurement and the approving executives to remove the impediment, escalating if necessary
- D.** Ask the team to buy the hardware with personal credit cards

Answer: C. A servant leader removes organisational impediments through proper channels.

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PART 12 REVIEW · CHECK YOURSELF

Monitoring & Control

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 55. I can turn performance data into useful reports, use variance and trend analysis, and decide when to act yourself and when to escalate.
- ☐ 56. I can manage issues with an issue log, help remove impediments, and choose between solving, supporting and escalating.

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Stakeholders & Communication

Exam domain: People

- 57. Identifying and analysing stakeholders
- 58. Engaging stakeholders and handling resistance
- 59. Planning communication: who, what, how and when
- 60. The communication model, noise and channels





LESSON 57 OF 96 · STAKEHOLDERS & COMMUNICATION

All approaches

Identifying and analysing stakeholders

Goal: After this lesson you can identify stakeholders early, classify them on a power/interest grid, and use an engagement assessment matrix to plan where to focus.

The situation: The person nobody invited

The robot cell is half installed when the operators' union representative hears that “automation means layoffs”. Nobody had invited the union to any meeting. Now the representative threatens to oppose the start-up.

Management says no jobs will be lost; operators will be retrained. But nobody told the people affected, and the rumour spread faster than the facts.

Stakeholders you forget do not disappear. They appear later, when they are hardest to manage.

The robot cell stakeholders on a grid

High power

Keep satisfied

Divisional VP · plant safety-budget owner

Manage closely

Plant manager (sponsor side) · safety officer

Low power

Monitor

Canteen supplier · neighbouring line

Keep informed

Machine operators · maintenance technicians

Low interest

High interest

Each box needs a different engagement strategy.



Who is a stakeholder?

Anyone who can **affect** the project, or who is **affected by** it (or thinks they are). Identify them **early** and keep identifying them: new stakeholders appear when organisations change.

Your memory card

- Stakeholders = anyone who **affects or is affected**; identify early and continuously
- Grid: **manage closely** · **keep satisfied** · **keep informed** · **monitor**
- Engagement matrix: **current vs desired**; close the gaps step by step
- Engage resistant people by understanding their concerns, not by orders

EXAM-STYLE QUESTION

Midway through the project, the customer reorganises its engineering and maintenance departments under a newly hired director who has not yet been involved. What should the project manager do?

- A.** Continue working with the previous stakeholders until the structure settles
- B.** Update the stakeholder register, analyse the new director's interests and influence, and engage the director early
- C.** Wait for the director to make contact
- D.** Ask the sponsor to brief the director instead

Answer: B. Stakeholder identification is continuous; new key stakeholders are analysed and engaged early.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 58 OF 96 · STAKEHOLDERS & COMMUNICATION

All approaches

Engaging stakeholders and handling resistance

Goal: After this lesson you can plan, manage and monitor stakeholder engagement, and respond to the typical warning signs of disengagement or resistance.

The situation: The director who stopped coming

The customer's compliance director, whose signature is needed for the design freeze, has missed three steering meetings and no longer answers emails. A colleague mentions that the director thinks the project is “somebody else's problem”.

Meanwhile, the sponsor has started visiting the engineers every day, giving them direct technical instructions that contradict the team's decisions.

Two stakeholders, two opposite problems: one too far away, one too close. Both need engagement, not instructions.

PMP mindset: when a stakeholder behaves unexpectedly, first understand why (usually in a private, direct conversation), then adapt the engagement plan.

The engagement cycle

Plan engagement

Strategy per stakeholder or group, based on the analysis.

Manage engagement

Meet, listen, negotiate, address concerns, build trust.

Monitor engagement

Is the strategy working? Has interest or influence changed? Adjust.

Plan → manage → monitor, and around again.



Engagement is a cycle

You **plan** how to engage each stakeholder, **manage** the engagement through real interaction, and **monitor** whether it works, adjusting when interest or influence changes.

Your memory card

- Engagement = **plan** → **manage** → **monitor**, continuously
- Unexpected behaviour → **understand first**, privately and directly
- Involve people: they support what they help create
- Update the engagement plan when interest or influence changes

EXAM-STYLE QUESTION

A senior customer official whose endorsement is required for the design freeze has stopped attending steering meetings and no longer responds to reports. What should the project manager do NEXT?

- A.** Continue sending reports and record the non-attendance
- B.** Ask the sponsor to instruct the official to attend
- C.** Reassess the official's engagement, meet directly to understand their concerns, and update the engagement plan
- D.** Proceed with the design freeze and seek endorsement later

Answer: C. Monitor and adapt engagement: understand the stakeholder directly and adjust the approach.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmclean.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 59 OF 96 · STAKEHOLDERS & COMMUNICATION

All approaches

Planning communication: who, what, how and when

Goal: After this lesson you can build a simple communications plan and choose between interactive, push and pull communication.

The situation: Too much and not enough

The robot cell team spends twelve hours a week in meetings, many repeating the same topics. At the same time, the customer's maintenance team keeps getting the shutdown dates wrong, and 200 operators on three shifts cannot find the current safety procedures.

The problem is not the amount of communication. It is that the **right information is not reaching the right people in the right form.**

A communications plan fixes this by answering five simple questions for each audience.

Communication is planned from the receiver's needs, not the sender's convenience.

Three communication methods

Interactive

Two-way, real time: meetings, calls, video. **Best for** discussion, conflict, decisions, bad news.

Push

Sent to specific people: emails, reports, memos. **Best for** notices and updates that must reach someone.

Pull

People access when they need it: portal, intranet, wiki. **Best for** large audiences and reference information.

Match the method to the purpose and the audience.



Five questions

For each stakeholder or group, the **communications management plan** answers: **who** needs it, **what** information, **how** (method and format), **when** (frequency) and **who** is responsible.



Your memory card

- Plan per audience: **who** · **what** · **how** · **when** · **who is responsible**
- **Interactive** = discuss/decide · **Push** = send · **Pull** = access when needed
- Bad news and conflict → **interactive**, then confirm in writing
- Plan from the **receiver's** needs; update the plan as needs change

EXAM-STYLE QUESTION

The project must share procedures, drawings and training videos with more than 200 operators across three shifts. The material changes occasionally, and people consult it when they need it. Which method is MOST appropriate?

- A.** Push: email all documents after every update
- B.** Interactive: a meeting with every shift for each update
- C.** Pull: a controlled portal where staff access the current material, with notices of major changes
- D.** Printed copies posted in the canteen

Answer: C. Pull suits large audiences and reference information; notices highlight major changes.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 60 OF 96 · STAKEHOLDERS & COMMUNICATION

All approaches

The communication model, noise and channels

Goal: After this lesson you can explain the sender-receiver model, reduce noise, confirm understanding through feedback, and calculate communication channels.

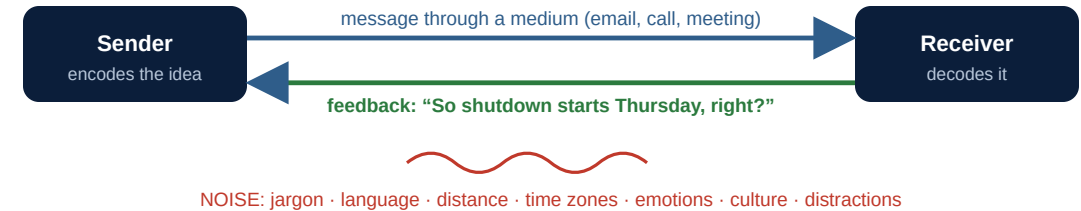
The situation: Monday or Thursday?

At the end of a technical briefing, you say: *“Preparation starts Monday, shutdown Thursday.”* The customer's maintenance supervisor, whose English is his second language, hears “shutdown Monday”, and plans his crew for the wrong day. You said it correctly. He listened carefully. Still, the message failed.

Communication only works when the **receiver understands what the sender meant**, and the only way to know is to check.

For critical information, the sender asks for feedback: “Can you summarise the key dates?” Don't assume silence means understanding.

The communication model



The message goes one way; feedback comes back; noise interferes in between.



The communication model

The **sender** encodes an idea into a message and sends it through a **medium**. The **receiver** decodes it. **Noise** can distort it. **Feedback** confirms whether it was understood.

Your memory card

- Sender **encodes** → medium → receiver **decodes** → **feedback**
- **Noise**: jargon, language, distance, culture, emotion
- Critical information: **confirm understanding**
- Channels = $n(n - 1) \div 2$; watch for questions about the **increase**

EXAM-STYLE QUESTION

A project team grows from 6 to 10 members. By how many communication channels does the complexity increase?

A. 4

B. 30

C. 45

D. 15

Answer: B. 6 people: 15 channels. 10 people: 45. Increase: $45 - 15 = 30$.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 13 REVIEW · CHECK YOURSELF

Stakeholders & Communication

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 57. I can identify stakeholders early, classify them on a power/interest grid, and use an engagement assessment matrix to plan where to focus.
- ☐ 58. I can plan, manage and monitor stakeholder engagement, and respond to the typical warning signs of disengagement or resistance.
- ☐ 59. I can build a simple communications plan and choose between interactive, push and pull communication.
- ☐ 60. I can explain the sender-receiver model, reduce noise, confirm understanding through feedback, and calculate communication channels.

[Open the full lessons →](#)[Test yourself: 10 exam-level questions →](#)

People & Team Leadership

Exam domain: People

- 61. Leadership styles and sources of power
- 62. Motivation: what really drives people
- 63. Conflict management: five techniques and when to use each
- 64. Emotional intelligence: respond, don't react
- 65. Team development: the Tuckman stages
- 66. Virtual and distributed teams
- 67. Servant leadership
- 68. Self-organising and cross-functional teams
- 69. Team charter and working agreements
- 70. Training, skills gaps and knowledge transfer
- 71. The four values: responsibility, respect, fairness, honesty
- 72. Ethics in practice: gifts, conflicts of interest and reporting





LESSON 61 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

Leadership styles and sources of power

Goal: After this lesson you can choose a leadership style that fits the person and the situation, and recognise the five sources of power.

The situation: One team, three people

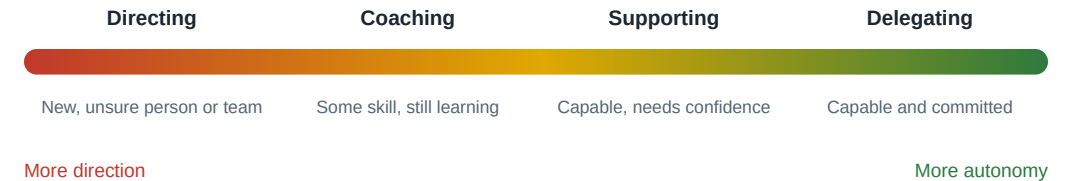
On the robot cell, a new graduate engineer is nervous about her first PLC task. A mid-level technician knows the work but keeps checking every decision with you. And your senior controls engineer asks to lead the vision integration alone.

If you lead all three the same way, you will either suffocate the senior engineer or abandon the graduate.

Good leaders adapt their style to the person and the situation.

The same person may need different styles for different tasks. There is no single best style; match the style to the need.

From direction to autonomy



As capability and confidence grow, the leader gives more autonomy.



Situational leadership

The right style depends on the person's **competence** and **commitment** for **this** task:

Your memory card

- Match the style to the **person and the task**: directing → coaching → supporting → delegating
- **Servant leadership** is the agile default; directive in emergencies
- Power: **expert, referent** (best) · reward · legitimate · punitive (last resort)
- Delegate with **objectives, boundaries and checkpoints**

EXAM-STYLE QUESTION

A highly capable controls engineer, who has consistently delivered complex work on time, asks to take full responsibility for planning and executing a critical-path integration. What is the MOST appropriate leadership response?

- A.** Decline, since critical-path work should be led by the project manager
- B.** Delegate the integration with clearly agreed objectives, boundaries and checkpoints
- C.** Approve it but review every decision personally
- D.** Assign a more senior engineer and ask the requester to shadow

Answer: B. Capable and committed → delegate, with boundaries and checkpoints to manage the risk.

Open the full lesson →

More free PMP questions →

The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



Motivation: what really drives people

Goal: After this lesson you can explain the main motivation theories and choose a response that addresses the real cause of low motivation.

The situation: “Any trainee could do this”

Your most experienced commissioning technician has been verifying I/O lists for three months. His pay is good, his supervisor is fair, the working conditions are fine. But he has become quiet and slow, and he told a colleague: *“Any trainee could do this job.”*

The sponsor suggests a bonus. Would that help?

Motivation theories explain why money alone often doesn't fix this, and what does.

If hygiene factors are fine but people are demotivated, look at motivators: recognition, challenge, growth.

Herzberg's two-factor theory

Hygiene factors (prevent dissatisfaction)

Salary · working conditions · job security · company policies · supervision.

If missing → unhappy. If present → not unhappy, but not motivated either.

Motivators (create motivation)

Achievement · recognition · responsibility · meaningful work · growth.

These are what make people want to do more.

Fixing hygiene removes unhappiness; adding motivators creates motivation.



Herzberg: two kinds of factors

Herzberg's two-factor theory is the most tested on the PMP:

Your memory card

- **Herzberg:** hygiene (pay, conditions) prevents unhappiness; **motivators** (recognition, growth) create motivation
- Maslow (needs in levels) · McGregor X/Y · McClelland · Vroom · Pink (autonomy, mastery, purpose)
- Low motivation with fair pay → **enrich the role**, recognise, develop
- Teams: reward **team** outcomes; give credit to the team

EXAM-STYLE QUESTION

An engineer recently received a raise, has good working conditions and a fair supervisor, but says she feels 'stuck' because her work never changes and her ideas are never recognised. According to Herzberg, what is missing?

- A.** Hygiene factors such as pay
- B.** Motivators such as recognition, responsibility and growth
- C.** Basic safety needs
- D.** Better working conditions

Answer: B. Hygiene factors are satisfied; motivators are missing.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 63 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

Conflict management: five techniques and when to use each

Goal: After this lesson you can name the five conflict techniques, know which is usually best, and recognise the situations where another technique is right.

The situation: Two arguments in one day

Morning: two controls engineers disagree about sensor placement on the robot cell. The discussion is getting louder, and the design is due next week.

Afternoon: during a test, the team argues about whether to stop the line after an unexpected robot movement near the fence. The first conflict needs everyone's ideas. The second needs a decision in seconds. The PMP expects you to know the difference.

Default: collaborate. Exception: immediate danger → force/direct. A short withdraw can be right when emotions are high and the decision can wait.

The five techniques and when they fit

Collaborate / problem-solve · win-win; open discussion of interests



Usually the **best**; needs time and trust

Compromise / reconcile · each side gives something



When collaboration fails or time is short; lose-lose elements

Smooth / accommodate · emphasise agreement, yield on a point



Preserve the relationship on minor issues

Withdraw / avoid · postpone, step back



Temporarily, to let emotions cool, when the decision can wait

Force / direct · decide using authority



Immediate safety hazard, emergencies, legal/ethical issues

Collaboration is the usual exam answer, but each technique has a situation where it is right.



Five techniques

Each technique has a PMP name pair. Learn both names:

Your memory card

- Five: **collaborate, compromise, smooth, withdraw, force**
- Default **collaborate; force/direct** for immediate danger
- Short **withdraw** when emotions run high and time allows
- Address conflict early, privately, on the **issue**, not the person

EXAM-STYLE QUESTION

Two team members disagree about a technical approach. The decision is needed next week. What should the project manager do FIRST?

- A.** Decide the approach
- B.** Encourage them to collaborate on a solution
- C.** Escalate to their functional managers
- D.** Remove one of them from the project

Answer: B. Collaboration is the default when there is time; it creates a solution both can support.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 64 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

Emotional intelligence: respond, don't react

Goal: After this lesson you can describe the four parts of emotional intelligence and use a simple notice-pause-understand-respond routine in difficult situations.

The situation: The Friday email

Late on Friday, the customer's operations director emails you, copying the sponsor: *"Your team's gross negligence has delayed our production."* You know the delay was caused mainly by the customer's own late utilities, and you have the records.

Your first instinct: reply to everyone, attach the evidence, prove you are right.

You might win the argument and lose the customer. Emotional intelligence is the skill of choosing the response that works, not the one that feels good right now.

Exam pattern: when emotions are high, the right answer usually acknowledges feelings, stays calm, and moves to a private, direct conversation about facts.

The four parts of EI

Self-awareness

Notice your own emotions and triggers. *"I'm getting defensive."*

Self-management

Control your reaction; pause before responding.

Social awareness

Read others' emotions and concerns; empathy.

Relationship management

Influence, resolve conflict, build trust.

Start with yourself; then read others; then manage the relationship.



Four parts of emotional intelligence

Emotional intelligence (EI) starts with yourself and then moves to others:

Your memory card

- EI = **self-awareness, self-management, social awareness, relationship management**
- Routine: **notice → pause → understand → respond**
- Empathy ≠ agreement; acknowledge feelings, then discuss facts
- Emotional issues → **direct, private conversation**, not public emails

EXAM-STYLE QUESTION

Late on Friday, the customer's operations director emails the project manager, copying the sponsor, accusing the team of 'gross negligence' for a delay that was mainly caused by the customer's late utilities. How should the project manager respond?

- A.** Reply to all at once with documentary evidence
- B.** Acknowledge the email, then speak directly with the director to understand the concerns before reviewing the facts together and agreeing a recovery path
- C.** Forward the email to the sponsor and wait for instructions
- D.** Ignore the email and send a recovery plan without discussing responsibility

Answer: B. Emotional intelligence: manage your reaction, understand the other person, then resolve the facts in a direct conversation.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



Team development: the Tuckman stages

Goal: After this lesson you can recognise each stage of team development and choose the right support for it, including when a team moves back a stage.

The situation: A great team suddenly struggles

The robot cell team had been working smoothly for months: predictable, confident, few arguments. Then two experienced engineers joined from another division.

Within a week, meetings became tense, agreed conventions were questioned, and two pieces of work were delivered in inconsistent styles.

Nothing was “wrong” with the new people. The team had simply moved **back** a stage, and needed a different kind of support.

Teams can move back to forming or storming when members change or a big change happens. Exam answer: help the team re-form, e.g. by revisiting working agreements together.

The five stages

1 ·

Forming

Polite,
unsure
“What is
my role?”

PM: Give
direction:
goals,
roles,
team
charter

2 ·

Storming

Conflict,
testing
“My way is
better.”

PM: Coach:
facilitate
conflict,
clarify
agreements

3 ·

Norming

Agreement,
trust
“This is how
we work.”

PM:
Support:
reinforce
norms,
encourage

4 ·

Performing

Effective,
autonomous
“We can
handle it.”

PM:
Delegate:
remove
blockers,
protect focus

5 ·

Adjourning

Closing,
moving on
“What
happens
next?”

PM:
Recognise,
capture
lessons,
release well

↺ A new member, a reorganisation or a big change can send the team **back** to an earlier stage.

Each stage needs a different kind of leadership.



Five stages

Bruce Tuckman described five stages most teams go through:

Your memory card

- **Forming → storming → norming → performing → adjourning**
- Leadership: direct → coach → support → delegate
- Storming is **normal**; teams can **move back** after changes
- Re-form by revisiting working agreements **together**

EXAM-STYLE QUESTION

A stable, high-performing agile team has just absorbed two experienced engineers. Discussions have become contentious, conventions are being questioned and work quality is inconsistent. What is the MOST appropriate action?

- A.** Remind the new engineers that existing conventions are not negotiable
- B.** Recognise that the team has likely moved back to an earlier stage and facilitate a session to revisit the working agreements together
- C.** Split the newcomers into a separate team
- D.** Increase the PM's code reviews

Answer: B. Membership changes cause regression to storming; re-forming together restores norms.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 66 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

Virtual and distributed teams

Goal: After this lesson you can identify the typical problems of virtual teams and choose practical ways to include everyone, build trust and avoid misunderstandings.

The situation: The silent office in Pune

The robot cell software is developed by engineers in Toronto, Kraków and Pune. All design decisions are made in a weekly meeting at 10:00 Toronto time, which is late evening in Pune.

Over the months, the Pune engineers stopped contributing. Their objections now arrive by email **after** decisions are implemented, causing expensive rework.

They are not less committed. The way the team works simply leaves them out.

Exam pattern: the answer usually changes the team's way of working (rotation, async input, tools), not the people.

Virtual team challenges and fixes

Challenge	What helps
Time zones	Rotate meeting times; asynchronous decision log; overlap hours
Isolation, low trust	Onboarding buddy, regular 1:1s, some informal time, occasional face-to-face
Misunderstandings in writing	Move heated topics to voice/video quickly; confirm decisions in writing
"Us vs them" between sites	Shared goals, joint events, cross-site pairing
Unequal infrastructure	Offline-capable tools, flexible update windows, backup connectivity
Cultural differences	Make expectations explicit (deadlines, disagreement, decisions); alternative ways to contribute

Most problems come from the structure of the work, not from the people.



Benefits and costs

Virtual teams give access to talent anywhere, lower travel costs and round-the-clock work. But they lose informal contact, suffer from time zones and misunderstand each other more easily.



Your memory card

- Virtual teams: talent anywhere, but **time zones, isolation, misunderstandings**
- Fix the **structure**: rotate times, async input, visible boards
- Heated writing → **voice/video**, then confirm in writing
- Build trust deliberately: onboarding, 1:1s, informal time

EXAM-STYLE QUESTION

A distributed team makes all design decisions in a weekly meeting held late at night for one location. Engineers there contribute less, and their objections arrive after decisions are implemented. What would MOST effectively address the problem?

- A.** Require them to attend regardless of the hour
- B.** Appoint one representative from that location
- C.** Rework the decision process with the team, e.g. rotating meeting times and an asynchronous design log open for comment before decisions
- D.** Move design ownership to the main office

Answer: C. Fix the structure: inclusive timing and asynchronous input before decisions.

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The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 67 OF 96 · PEOPLE & TEAM LEADERSHIP

Agile · hybrid

Servant leadership

Goal: After this lesson you can describe what a servant leader does and does not do, and pick the servant-leadership answer in exam situations.

The situation: Who is the boss here?

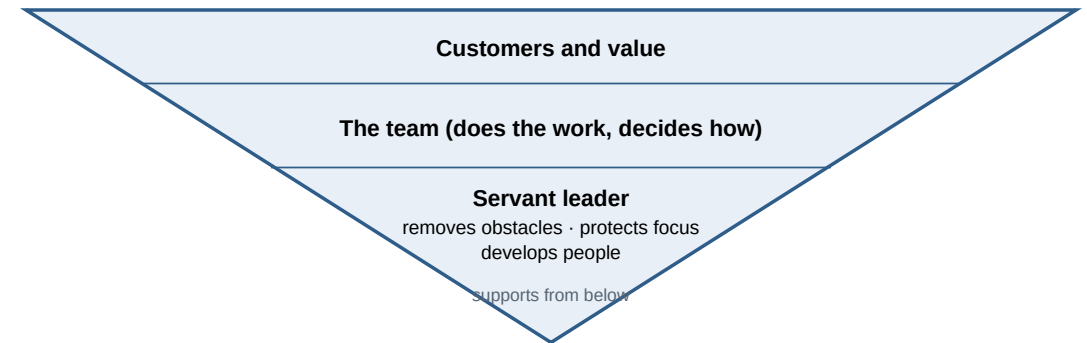
On the robot cell's software side, stakeholders keep walking up to developers with “quick requests” during the sprint. The test hardware purchase has been stuck in approvals for two sprints. And at the release party, the sponsor thanks only the PM.

Three situations, one question: what does a leader do when the team, not the leader, does the work?

The answer is servant leadership: the leader's job is to make the team successful.

Exam pattern: the servant-leader answer helps the team succeed (removes a blocker, coaches, facilitates) rather than doing the work or deciding for them.

The inverted pyramid



The leader supports the team, which serves the customer.



Leading by serving

A **servant leader** puts the team's needs first so the team can deliver value. Authority is used to **remove obstacles**, not to control every task.



Your memory card

- Servant leader = **remove impediments, protect focus, develop people**
- New requests → **product owner**; blockers → leader removes them
- Give **credit to the team**
- Servant ≠ passive: decide in emergencies, hold people accountable

EXAM-STYLE QUESTION

Stakeholders keep interrupting agile team members during the sprint with new requests. What should the project manager do?

- A.** Ask the team to handle the requests in their spare time
- B.** Redirect the stakeholders to the product owner and protect the team's focus
- C.** Add the requests to the current sprint
- D.** Ban stakeholders from contacting the team

Answer: B. New requests go to the product owner, who manages the backlog; the leader protects focus.

Open the full lesson →

More free PMP questions →

The full lesson on pcclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 68 OF 96 · PEOPLE & TEAM LEADERSHIP

Agile · hybrid

Self-organising and cross-functional teams

Goal: After this lesson you can explain who decides what in an agile team, and how to help a team become self-organising without taking decisions away from it.

The situation: “Please just tell us what to do”

A newly formed agile team on the robot cell's MES integration keeps asking the PM to assign tasks every morning. When a story is finished, they wait for instructions.

At the same time, a senior developer on another team picks a caching approach the PM thinks is slightly less elegant, but it meets the acceptance criteria and is low-risk.

In the first case the PM must help the team **take** ownership; in the second, the PM must **leave** the ownership where it is.

The PM/servant leader coaches self-organisation with questions and removes blockers. Override a team decision only when safety, compliance or acceptance criteria are at risk.

Self-organising and cross-functional

Self-organising

The team decides **how** to do its work: who takes which task, which technical approach, how to meet the sprint goal. The **what** and **why** come from the product owner.

Cross-functional

The team has **all the skills** needed to deliver a working increment: design, build, test, integrate. Few hand-offs to other teams.

Who decides...	Agile answer
What to build and in which order	Product owner (backlog priority)
How much the team commits to in a sprint	The team
How the work is done (tasks, technical approach)	The team
Removing organisational blockers	Servant leader / scrum master / PM

The product owner owns what and why; the team owns how.



Who decides what

In agile teams, decision rights are clear:

Your memory card

- Product owner = **what & why** · team = **how & how much**
- Coach self-organisation with questions; step back gradually
- Override team decisions only for **safety, compliance or acceptance criteria**
- **Cross-functional** + T-shaped skills = fewer hand-offs

EXAM-STYLE QUESTION

A self-organising team chooses a technical approach the project manager considers slightly less elegant. It meets the acceptance criteria, carries low risk and follows architecture guidelines. What should the project manager do?

- A.** Override the decision to prevent technical debt
- B.** Respect the decision, share the concern as a question, and support the team
- C.** Escalate to the architect for a ruling
- D.** Record the decision as a future defect source

Answer: B. The team owns how; the PM coaches without taking the decision away.

Open the full lesson →

More free PMP questions →

The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 69 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

Team charter and working agreements

Goal: After this lesson you can explain what a team charter contains, why the team must create it together, and how to use it when problems arise.

The situation: Three companies, three habits

The robot cell team includes the integrator's engineers, two agency contractors and the customer's automation specialists, across two sites for eighteen months.

In the first month, one group expects replies within an hour, another within two days. One group decides by consensus, another by the senior engineer. Meetings start late; people talk over each other.

None of this is bad will. Nobody ever **agreed** how the team would work.

When a team-wide pattern appears (people late, decisions slow), the answer is usually: the team revisits its working agreement together, not the PM imposing new rules.

What goes into a team charter

Values

Safety first ·
respect · honesty ·
help each other

Working agreements

Core hours ·
meeting rules ·
response times ·
how we review
code and drawings

Decision-making

Which decisions
need consensus,
which the owner
makes, how to
escalate

Communication

Tools, channels,
when to call instead
of email, time
zones

Conflict

Talk directly first;
how disagreements
are resolved

Definition of done

(agile) What
“finished” means
for every item

Short and practical: one page the team actually uses.



What a team charter is

A **team charter** (or set of working agreements) records the team's shared values, rules and ways of working. It is different from the **project charter**, which authorises the project.



Your memory card

- **Team charter** = values + working agreements + decision rules + communication
- Created by the **whole team**; visible; used daily
- Team pattern → **revisit the agreement together**; individual issue → private talk
- Review in retrospectives and when members change

EXAM-STYLE QUESTION

A new project combines the integrator's engineers, agency contractors and the customer's specialists in one team for eighteen months. Their expectations about hours, decision-making and tools differ. What should the project manager do at the start?

- A.** Issue team rules based on the integrator's policies
- B.** Allow each group to keep its own practices
- C.** Facilitate the creation of a team charter with all three groups
- D.** Wait until conflicts arise

Answer: C. A team charter created together sets shared expectations early.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 70 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

Training, skills gaps and knowledge transfer

Goal: After this lesson you can find skills gaps early, plan training as part of resource management, and protect the project from single points of knowledge.

The situation: Four weeks' notice

The robot cell uses a PLC platform nobody on the team has used before. The sponsor says: *“They're good engineers; they'll learn on the job.”*

Then Ana, the only person who knows the safety PLC, announces she is leaving in four weeks. Nobody else understands her work.

Skills are a resource like money and time. They must be planned, and knowledge must not live in one person's head.

“Learn on the job” for a critical, unfamiliar technology is a risk, not a plan. Assess the gap and propose a targeted approach.

A skills matrix shows the gaps

Skill	Ana	Ben	Chen	Dmitri	Eva
New PLC platform	✓✓	–	–	✓	–
Vision system	✓	✓✓	–	–	–
Safety PLC	✓✓	–	–	–	–
Robot programming	–	✓	✓✓	✓✓	✓

✓✓ expert · ✓ can work with help · – none. The **safety PLC row** shows a single point of failure: if Ana leaves or is sick, nobody can do it.

One look shows where the project is fragile.



Plan skills like any other resource

During resource planning, compare the **skills needed** with the **skills available**. Gaps are risks. Close them with training, mentoring, pairing or hiring, and include the time and cost in the plan.



Your memory card

- Skills are a **resource**: compare needed vs available in planning
- Close gaps: **training, mentoring, pairing**; include time and cost
- Avoid **single points of knowledge**; spread knowledge continuously
- Departure → **prioritised transfer now**, by working together

EXAM-STYLE QUESTION

The project will use a PLC platform none of the six controls engineers has used. The schedule is tight, and the sponsor suggests the engineers 'learn on the job'. What should the project manager do?

A. Accept the suggestion

B. Assess the skills gap and its risk, then propose a training approach, such as targeted training with vendor mentoring, in the resource management plan

C. Replace the team with contractors

D. Delay development until all engineers complete a long course

Answer: B. Skills gaps are identified and closed in planning; a targeted approach balances risk and schedule.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 71 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

The four values: responsibility, respect, fairness, honesty

Goal: After this lesson you can apply the four values of the PMI Code of Ethics to common project situations and recognise the ethical answer on the exam.

The situation: “Present it positively”

At a phase gate, the robot cell fails two of five exit criteria. The sponsor, under pressure, asks you privately to “present the data positively”.

The same week, your junior colleague wants to hide a two-week slip from the monthly report “because we'll recover it”. And you realise you promised the customer free spare parts at lunch, without the authority to do so.

Three small temptations. Each has a clear professional answer.

Exam pattern: the ethical answer is transparent, follows policy and law, and never trades honesty or safety for schedule, money or relationships.

The four values

Responsibility

Own your decisions and mistakes;
keep commitments;
protect safety;
report violations through proper channels.

Respect

Treat everyone with dignity;
listen;
respect cultures and property;
address disrespect.

Fairness

Decide impartially;
avoid and disclose conflicts of interest;
equal information for all bidders.

Honesty

Report truthfully;
never mislead;
correct your own errors;
no hidden information.

Responsibility · respect · fairness · honesty.



Four values

The **PMI Code of Ethics and Professional Conduct** rests on four values. Each has **aspirational** standards (what we strive for) and **mandatory** standards (what we must do).

Your memory card

- Four values: **responsibility, respect, fairness, honesty**
- Ethical answer = **transparent, legal, within policy**
- Never trade honesty or safety for schedule, money or relationships
- Own and correct your own mistakes promptly

EXAM-STYLE QUESTION

At a phase gate review, the project fails two of five exit criteria. The sponsor privately asks the project manager to 'present the data positively' so that the gate is approved. What should the project manager do?

- A.** Present the data positively and document the request
- B.** Present the results objectively with an assessment of risks and options, and let governance decide
- C.** Postpone the gate review indefinitely
- D.** Report the sponsor to the PMO before the review

Answer: B. Honesty: governance decisions need accurate information; the PM presents facts and options.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 72 OF 96 · PEOPLE & TEAM LEADERSHIP

All approaches

Ethics in practice: gifts, conflicts of interest and reporting

Goal: After this lesson you can handle gifts, conflicts of interest, confidential information and suspected misconduct the way the PMP expects.

The situation: An eventful procurement

While the robot cell team evaluates bids for the conveyor subcontract, a bidder invites you to an exhibition abroad with premium hospitality. You learn that one evaluator is the brother-in-law of another bidder's owner. A competitor's full proposal lands in your inbox by mistake. And a junior engineer tells you, privately, that a colleague may have faked vibration test results. Each situation tests fairness, honesty and responsibility. None of them can be ignored.

Gifts and hospitality: follow organisational policy and law. During an active procurement, decline significant benefits from bidders. Small customary gifts may be acceptable where policy allows, with disclosure.

Common situations and the ethical response

Situation	Ethical response
Bidder offers a luxury trip during evaluation	Decline; disclose per policy
Small customary gift abroad, allowed by policy if disclosed	Accept graciously; disclose
Evaluator is related to a bidder's owner	Disclose; recuse from that evaluation
Sponsor wants a relative's firm without bidding	Follow procurement policy; competitive process; raise the conflict
Competitor's bid emailed to you by mistake	Don't read it; notify sender; delete/return as instructed
Colleague may have falsified test records	Verify facts; report through proper channels; protect the reporter as policy allows
Customer's confidential photos posted online by a team member	Contain (remove), assess with legal/contracts, inform the customer as required
Splitting an order to avoid an approval threshold	Never: it circumvents governance

The answer is always transparent and within policy and law.



Conflicts of interest

A **conflict of interest** exists when personal interests could influence, or appear to influence, professional decisions. Recognise it, **disclose** it and **step aside** from the decision. Fairness must be real and visible.



Your memory card

- Conflicts of interest: **recognise → disclose → step aside**
- Gifts: follow policy and law; **decline bidders' benefits** during procurement
- Never use confidential information obtained by mistake
- Suspected misconduct: **verify and report** through proper channels; protect reporters

EXAM-STYLE QUESTION

During bid evaluation for a maintenance contract, a shortlisted vendor invites the project manager to an international exhibition at the vendor's expense, including premium hospitality, describing it as 'purely educational'. What should the project manager do?

- A.** Accept, since it is educational
- B.** Accept but abstain from scoring that vendor
- C.** Decline and disclose the offer according to policy
- D.** Check whether the value is below the reporting threshold

Answer: C. Avoid real and perceived conflicts of interest: decline and disclose.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 14 REVIEW · CHECK YOURSELF

People & Team Leadership

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- | | |
|---|--|
| ☐ 61. I can choose a leadership style that fits the person and the situation, and recognise the five sources of power. | ☐ 67. I can describe what a servant leader does and does not do, and pick the servant-leadership answer in exam situations. |
| ☐ 62. I can explain the main motivation theories and choose a response that addresses the real cause of low motivation. | ☐ 68. I can explain who decides what in an agile team, and how to help a team become self-organising without taking decisions away from it. |
| ☐ 63. I can name the five conflict techniques, know which is usually best, and recognise the situations where another technique is right. | ☐ 69. I can explain what a team charter contains, why the team must create it together, and how to use it when problems arise. |
| ☐ 64. I can describe the four parts of emotional intelligence and use a simple notice-pause-understand-respond routine in difficult situations. | ☐ 70. I can find skills gaps early, plan training as part of resource management, and protect the project from single points of knowledge. |
| ☐ 65. I can recognise each stage of team development and choose the right support for it, including when a team moves back a stage. | ☐ 71. I can apply the four values of the PMI Code of Ethics to common project situations and recognise the ethical answer on the exam. |
| ☐ 66. I can identify the typical problems of virtual teams and choose practical ways to include everyone, build trust and avoid misunderstandings. | ☐ 72. I can handle gifts, conflicts of interest, confidential information and suspected misconduct the way the PMP expects. |

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Business Environment

Exam domain: Business Environment

- 73. Compliance and safety: the non-negotiables
- 74. Legal issues: IP, licences, confidentiality and data privacy
- 75. The external environment: markets, economy, politics and weather
- 76. Organisational change: helping people adopt what the project delivers
- 77. Strategy, portfolios, programs and operations
- 78. Sustainability and social responsibility
- 79. AI tools in projects: benefits, risks and governance
- 80. Value delivery: outputs, outcomes and benefits

Exam, at a glance

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Questions

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WHAT THE EXAM CO

People

Lead teams · resolve conflict · engage

Process

Plan work · deliver results · track pro

Business Environment

Governance · risk · compliance · cha

Predictive, agile and hybrid app



LESSON 73 OF 96 · BUSINESS ENVIRONMENT

All approaches

Compliance and safety: the non-negotiables

Goal: After this lesson you can identify the sources of compliance requirements, plan and track them with a compliance register, explain why safety and legal requirements cannot be traded off against schedule or cost, respond correctly to a compliance or safety breach, and keep compliance built into both predictive and agile work.

The situation: “The inspection is on Friday. Just get it done.”

You are the project manager for a new outpatient wing at a regional hospital. The building inspection is on Friday, and the opening date is fixed: the hospital has already scheduled patients. On Tuesday, walking the site, you see a subcontractor's crew working on the roof edge without fall protection.

The subcontractor's foreman shrugs: *“We're behind. The harnesses slow us down. It's only for two days, and nothing will happen.”* Your own construction manager adds quietly: *“If we stop them now, we miss the inspection.”*

This is a classic test of professional responsibility. Schedule pressure is real, but some requirements are **non-negotiable**: safety, the law, and the professional ethics that the PMI Code of Ethics asks every project manager to uphold.

See it in one picture: layers of obligation

Laws and regulations

must comply; set by government

Mandatory standards and codes

building, electrical, safety codes

Contract requirements

agreed obligations to the customer

Organizational policies

internal rules and procedures

Voluntary standards and good practice

chosen; may become required by contract

Higher layers cannot be overridden by lower ones

Compliance requirements come in layers. Laws and mandatory codes sit at the top and cannot be overridden by contracts, internal policies or schedule pressure.



What compliance means

Compliance means meeting the requirements that apply to the project and its product: laws, regulations, mandatory standards, contract terms and organizational policies. Non-compliance can lead to fines, legal action, stopped work, rejected deliverables, damage to reputation and, in the case of safety, injury or death.

Compliance is part of the **business environment** domain of the PMP exam, which is 26% of the exam since July 2026. The exam expects project managers to identify compliance requirements early, plan for them, monitor them and act decisively when they are at risk.

Your memory card

- Compliance = meeting laws, regulations, mandatory codes, contract terms and policies; part of the Business Environment domain
- Layers: law and mandatory codes > contract > internal policy > voluntary practice
- Identify requirements early with experts; compliance register: source, owner, evidence, verification
- Build compliance into schedule, budget, quality, risk and procurement
- Safety is never traded for schedule: stop, make safe, report, then manage the impact
- Breach response: contain, assess, report, correct, learn; never hide

EXAM-STYLE QUESTION

A project is two days behind schedule before a critical inspection. The project manager sees workers on a high platform without required fall protection. The site lead says stopping will cause the project to miss the inspection. What should the project manager do first?

- A.** Let the work continue and address safety after the inspection
- B.** Ask the workers to be careful until the inspection is over
- C.** Stop the unsafe work and ensure protection is in place
- D.** Ask the sponsor whether to accept the safety risk

Answer: C. Safety comes first: stop the unsafe work and make it safe, then report and manage the schedule impact. If the problem were a minor paperwork delay, the PM could plan a correction without stopping work.

Open the full lesson →

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 74 OF 96 · BUSINESS ENVIRONMENT

All approaches

Legal issues: IP, licences, confidentiality and data privacy

Goal: After this lesson you can recognise intellectual property, licensing, confidentiality and privacy issues, and respond with contain → consult → report → correct.

The situation: Four legal surprises

On the MES project, a developer wants to use an open-source library whose licence would force the customer's software to become open source, but the contract gives the customer exclusive rights. Another developer copied real employee data into a shared test system. A team member posted photos of the customer's prototype online, against the NDA. And developers have been pasting the customer's code into a public AI chatbot.

None of them meant harm. All four create real legal exposure for both companies.

Exam pattern: contain the exposure, consult the specialist function, report as required, then use a compliant alternative. Never hide it, never “just use it until the end of the project”.

Common legal situations

Area	Typical situation	PMP response
Intellectual property	Design may infringe a competitor's patent	Formal legal assessment; options (design-around, licence); sponsor decides
Software licences	Open-source licence conflicts with customer's exclusive rights · one licence shared by many	Legal/IP review before use · correct the violation, obtain licences
Confidentiality	Team member posts photos of customer's machine	Remove, assess with legal/contracts, inform customer as required
Data privacy	Real employee data copied into a test system	Remove, report per data-protection procedure, use anonymised data
Data residency / AI tools	Customer data to a foreign cloud or public AI tool	Check contract and policy first; choose compliant options
Export control	Controller shipped to a controlled destination	Hold; consult export compliance; obtain licence

Each has the same pattern: stop, ask, report, correct.



The PM is not a lawyer, but must recognise the risk

The PM's job is to **recognise** legal issues early, **contain** them, and involve the **right specialists**. Engineering opinions (“the patent is weak”) are not legal advice.

Your memory card

- Recognise IP, licence, confidentiality, privacy and export issues early
- **Contain → consult → report → correct**
- Legal questions go to **legal specialists**, not engineering opinion
- Never hide a breach or keep using something non-compliant

EXAM-STYLE QUESTION

A developer copied a snapshot of the customer's production database, containing employee names and badge records, into a test environment accessible to the whole team and two external contractors. It has been there for three weeks. What should the project manager do FIRST?

- A.** Restrict access to internal staff and continue testing
- B.** Remove the personal data, report the situation according to data-protection procedures, and arrange compliant test data
- C.** Ask the customer for retrospective permission
- D.** Delete the data at the end of testing

Answer: B. Contain, report, use compliant alternatives.

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LESSON 75 OF 96 • BUSINESS ENVIRONMENT

All approaches

The external environment: markets, economy, politics and weather

Goal: After this lesson you can scan the external environment (PESTLE), turn external changes into risks or issues, and respond through the right channels.

The situation: The world kept changing

Halfway through the robot cell programme, the exchange rate moved 8% against the currency of the servo supplier. A new import tariff added 18% to the conveyor components. The only gearbox supplier is in a region where unrest is growing. And a competitor's product launch has cut the customer's demand forecast in half.

None of this was caused by the project. All of it affects the project.

External change → reassess (don't rely on old ratings or a supplier's “business as usual”), plan a proportionate response, and use specialists (finance, legal) and governance where needed.

PESTLE: six kinds of external factors

P • Political

Unrest near a supplier, trade policy, tariffs.

E • Economic

Exchange rates, inflation, interest rates, demand changes.

S • Social

Community concerns, labour availability, workforce attitudes.

T • Technological

New technology, obsolescence of chosen components.

L • Legal

New regulations, permits, export controls.

E • Environmental

Weather, climate, environmental permits, sustainability rules.

A simple checklist for what could change around the project.



Scan the environment

A **PESTLE** scan reviews political, economic, social, technological, legal and environmental factors. Do it at the start, and keep monitoring.

Your memory card

- Scan with **PESTLE**; keep monitoring
- External change → **reassess** risks; plan proportionate responses
- Use specialists (finance, legal) and **governance** where needed
- Business case affected → raise with the sponsor

EXAM-STYLE QUESTION

The sole supplier of custom gearboxes is in a region where political unrest has recently escalated, with reports of border closures. Deliveries are due in four months, and the supplier says it is 'business as usual'. What should the project manager do?

- A.** Rely on the supplier's assurance
- B.** Cancel the contract immediately
- C.** Treat it as a new risk: assess probability and impact, consider responses such as qualifying an alternative supplier or buffer stock, and monitor closely
- D.** Wait until the delivery date approaches

Answer: C. New external risks are analysed and given timely, proportionate responses.

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LESSON 76 OF 96 · BUSINESS ENVIRONMENT

All approaches

Organisational change: helping people adopt what the project delivers

Goal: After this lesson you can explain why people resist change, use a simple model (awareness, desire, knowledge, ability, reinforcement) and choose actions that lead to real adoption.

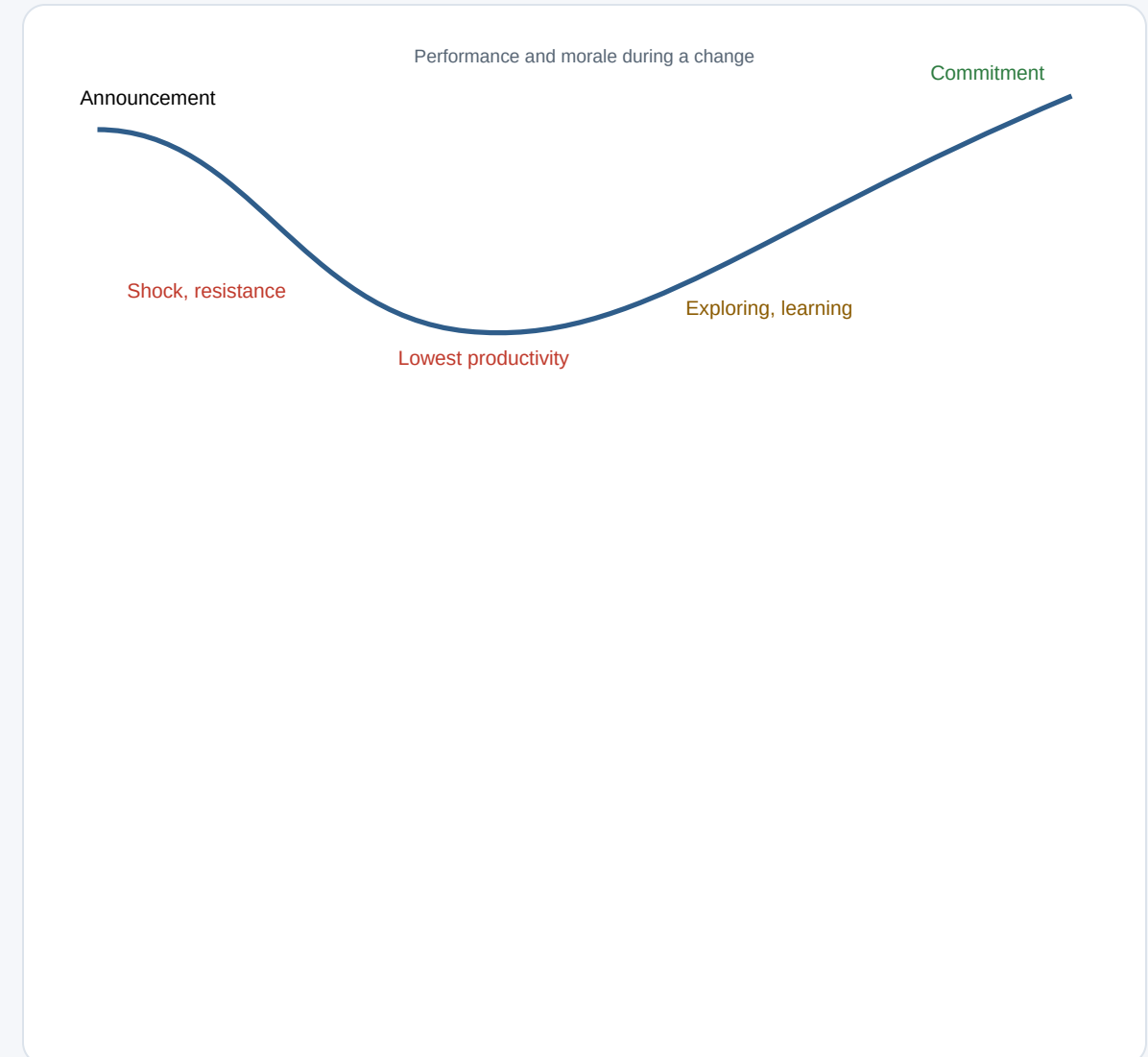
The situation: “The spreadsheets work fine”

The new production scheduling system passed every test. Training sessions were full. Six weeks after go-live, planners are back on their old spreadsheets, and some supervisors say the new system “will be gone in a year anyway”.

The project delivered a system. The organisation did not adopt it. Without adoption, there are no benefits.

Training fixes how, not why. If people ask “why do we need this?”, start with awareness and desire, led by business leaders.

The change curve



Performance often dips before it improves. Support people through the dip.



Why people resist

People resist when they don't understand **why**, fear losing competence or status, don't have time to learn, or expect the change to fail. Resistance is information, not stubbornness.

Your memory card

- Outputs $\neq$ adoption; benefits need **adoption**
- Steps: **awareness** → **desire** → **knowledge** → **ability** → **reinforcement**
- Training fixes how, not why; leaders explain why
- Involve informal leaders; reinforce; support people through the dip

EXAM-STYLE QUESTION

A new scheduling system will replace spreadsheets used for years. Training is well attended, but planners keep asking why the change is needed and say the spreadsheets work fine. Go-live is in six weeks. What should the project manager do?

- A.** Add more training sessions
- B.** Work with business leaders to communicate the reasons and benefits clearly, and let planners raise concerns, before more training
- C.** Remove spreadsheet access immediately
- D.** Postpone go-live until all planners agree

Answer: B. Change starts with awareness and desire; training covers knowledge.

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LESSON 77 OF 96 · BUSINESS ENVIRONMENT

All approaches

Strategy, portfolios, programs and operations

Goal: After this lesson you can explain the difference between projects, programs, portfolios and operations, and respond when strategy or portfolio priorities change.

The situation: From strategic to sustaining

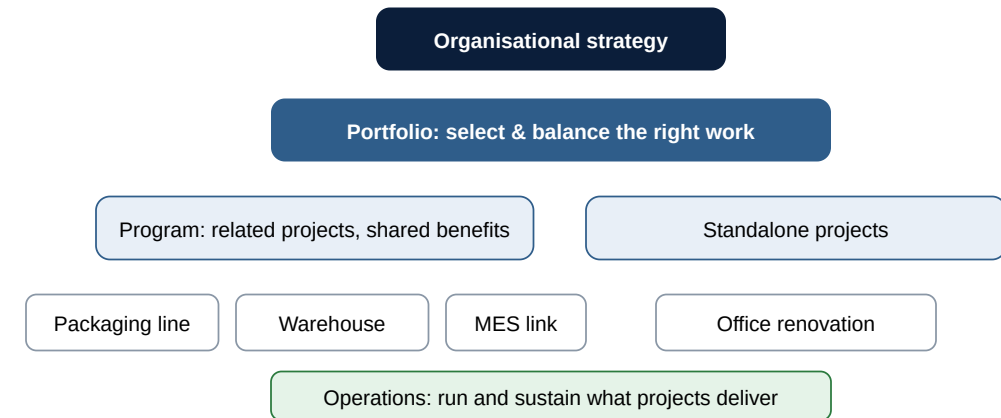
The robot cell expansion was approved as a “strategic” project. Six months later, after a portfolio review, it is reclassified as “sustaining”. Two senior engineers are moved to a higher-priority programme, and the sponsor asks you to deliver with the smaller team.

At the same time, the plant starts three related projects (a packaging line, warehouse automation and an MES link) whose benefits depend on each other.

Projects don't live alone. They live inside strategy, portfolios and programs.

When strategy or portfolio priorities change, the PM analyses the impact, presents options to the sponsor and re-plans through governance. Don't resist legitimate portfolio decisions, and don't work around them.

From strategy to operations



Strategy → portfolio → programs and projects → operations.



Four levels

Each level has a different job:

Your memory card

- **Portfolio** = choose & balance · **program** = coordinate for combined benefits · **project** = deliver
- **Operations** = ongoing work after handover
- Priorities change → analyse, present options, **re-plan through governance**
- Don't resist or work around legitimate portfolio decisions

EXAM-STYLE QUESTION

After a portfolio rebalancing, a project is reclassified from 'strategic' to 'sustaining', two senior engineers are reassigned, and the sponsor asks to deliver the remaining scope with the reduced team. What should the project manager do?

- A.** Continue against the existing baseline
- B.** Ask the reassigned engineers to help informally
- C.** Refuse without the original resources
- D.** Assess the impact, present options to the sponsor, and re-plan through change control

Answer: D. Analyse, present options, re-plan through governance.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 78 OF 96 · BUSINESS ENVIRONMENT

All approaches

Sustainability and social responsibility

Goal: After this lesson you can recognise environmental, social and governance responsibilities in projects and handle them through the right processes.

The situation: More than time, cost and scope

The company announced a carbon-reduction strategy. A team member found that recycled steel would cut the robot cell's embodied carbon by 30%, with a 4% cost increase and a two-week delay. Neighbours complained about night-time piling noise. And a news report alleged forced labour at a sub-supplier of cable assemblies.

None of these appear in a classic project triangle. All of them are part of a responsible project.

Sustainability opportunities and obligations go through the normal processes: change control for changes, risk management for exposures, procurement/compliance channels for supply-chain issues, stakeholder engagement for communities.

Environmental, social, governance**Environmental**

Energy use, materials (recycled steel), waste (hazardous oil), emissions.

Social

Worker safety, community (noise), labour practices in the supply chain, accessibility.

Governance

Ethics, transparency, compliance, honest reporting.

Three dimensions of responsible delivery.



ESG in projects

Projects increasingly have to consider **environmental**, **social** and **governance** effects:

Your memory card

- **ESG**: environmental, social, governance responsibilities
- Use existing processes: change control, risk, procurement/compliance, stakeholder engagement
- Communities and supply-chain workers are stakeholders too
- Measure baselines for sustainability targets

EXAM-STYLE QUESTION

Following a new corporate sustainability strategy, the team finds that recycled-content steel would reduce embodied carbon by 30 percent, with a two-week delay and a four percent cost increase. What should the project manager do?

- A.** Implement it immediately
- B.** Ignore it; not in original scope
- C.** Present the option with its impacts through change control so the sponsor can decide
- D.** Wait for a formal mandate before evaluating

Answer: C. Strategy-driven changes are evaluated and decided through governance.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 79 OF 96 · BUSINESS ENVIRONMENT

All approaches

AI tools in projects: benefits, risks and governance

Goal: After this lesson you can identify good uses of AI in project work, recognise the confidentiality, accuracy and accountability risks, and apply simple rules for responsible use.

The situation: Faster, but at what risk?

MES developers discovered that a public AI chatbot is great at debugging. They began pasting large parts of the customer's control software into it. The customer contract has strict confidentiality clauses, and the company's AI policy is unclear. Meanwhile, the PM uses an AI assistant to draft meeting minutes and translate status reports, which saves hours every week. Both are AI in projects. One is a productivity gain; the other is a potential contract breach.

Unclear policy + confidential data → pause the practice and get guidance from legal, security or compliance. Don't ban all AI on your own, and don't “just remove the comments”.

Good uses and risks

Good uses (with checks)

- ✓ Drafting reports, meeting minutes and emails
- ✓ Summarising long documents
- ✓ Generating risk ideas or test cases to review
- ✓ Analysing schedule or cost data
- ✓ Translating and simplifying language

Watch out

- ✗ Pasting confidential customer data or code into public tools
- ✗ Trusting outputs without checking (AI can be confidently wrong)
- ✗ Letting AI make decisions people are accountable for
- ✗ Bias in AI-based assessments of people
- ✗ Using tools not approved by company policy

AI is a powerful assistant, not a decision-maker.



Where AI helps

AI tools can speed up drafting, summarising, analysis, translation and idea generation. They are most useful as an **assistant** whose work is checked.

Your memory card

- AI = powerful **assistant**: drafting, summarising, analysis, translation
- Four checks: **allowed? protected? verified? accountable?**
- Unclear policy + confidential data → **pause and get guidance**
- Humans own decisions; be transparent about AI use

EXAM-STYLE QUESTION

Developers have begun pasting parts of the customer's proprietary control software into a public generative AI chatbot for debugging help. The organisation's AI policy is unclear, and the contract has strict confidentiality clauses. What should the project manager do FIRST?

A. Encourage the practice

B. Ask the developers to stop sharing customer code with external AI tools until assessed against the contract and policy, and seek guidance from legal, security or compliance

C. Allow it if comments are removed

D. Ban all AI tools organisation-wide

Answer: B. Pause, then get specialist guidance; confidentiality comes first.

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LESSON 80 OF 96 · BUSINESS ENVIRONMENT

All approaches

Value delivery: outputs, outcomes and benefits

Goal: After this lesson you can distinguish outputs, outcomes and benefits, define success in terms of value, and react when delivery does not produce the expected outcome.

The situation: On time, on budget, no savings

The last three automation projects at the plant were all delivered on time and on budget, and all were celebrated. Yet the expected reductions in labour cost and scrap never appeared after go-live.

The sponsor asks: *“How can every project be successful and none of them pay off?”*

Because they were measured on **outputs**, not on **value**.

Define success with outcome and benefit measures, owners and a tracking plan, not only time and cost. If outputs don't move outcomes, inspect and adapt.

The value chain

Outputs



What the project delivers:
the robot cell, the MES
dashboard

Outcomes



What changes:
changeover in 10
minutes, downtime -20%

Benefits



The measurable gain: 2
fewer operators per shift,
less scrap

Value



What it is worth to the
organisation and its
customers

Outputs are only the beginning.



From output to value

Projects create **outputs**. Outputs enable **outcomes** (changes in how things work). Outcomes produce **benefits**, which create **value**.

Your memory card

- **Output → outcome → benefit → value**
- Define success with **outcome and benefit measures** and owners
- Outputs not moving outcomes → **inspect and adapt**
- Deliver value early and incrementally where possible

EXAM-STYLE QUESTION

The last three automation projects met their time and cost targets, yet expected reductions in labour cost and scrap did not materialise. The sponsor asks how to avoid this. What should the project manager recommend?

- A.** Tighter schedule and budget targets
- B.** Success measures that include business outcomes and benefits, with owners and a plan to track them after delivery
- C.** Remove time and cost targets
- D.** Hold PMs responsible for benefits after closure

Answer: B. Define success by value: outcomes, benefits, owners, tracking.

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PART 15 REVIEW · CHECK YOURSELF

Business Environment

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 73. I can identify the sources of compliance requirements, plan and track them with a compliance register, explain why safety and legal requirements cannot be traded off against schedule or cost, respond correctly to a compliance or safety breach, and keep compliance built into both predictive and agile work.
- ☐ 74. I can recognise intellectual property, licensing, confidentiality and privacy issues, and respond with contain → consult → report → correct.
- ☐ 75. I can scan the external environment (PESTLE), turn external changes into risks or issues, and respond through the right channels.
- ☐ 76. I can explain why people resist change, use a simple model (awareness, desire, knowledge, ability, reinforcement) and choose actions that lead to real adoption.
- ☐ 77. I can explain the difference between projects, programs, portfolios and operations, and respond when strategy or portfolio priorities change.
- ☐ 78. I can recognise environmental, social and governance responsibilities in projects and handle them through the right processes.
- ☐ 79. I can identify good uses of AI in project work, recognise the confidentiality, accuracy and accountability risks, and apply simple rules for responsible use.
- ☐ 80. I can distinguish outputs, outcomes and benefits, define success in terms of value, and react when delivery does not produce the expected outcome.

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Closing & Integration

Exam domain: Process

- 81. Closing a project or phase (including early termination)
- 82. Lessons learned: capture, apply and share
- 83. Transition to operations and benefits realisation
- 84. Contract closure: settling claims and closing procurements
- 85. Integration: the project manager as integrator
- 86. Integrating and reporting a hybrid project
- 87. Case study 1: the robot cell project (predictive / hybrid)
- 88. Case study 2: the MES software product (agile)





LESSON 81 OF 96 · CLOSING & INTEGRATION

All approaches

Closing a project or phase (including early termination)

Goal: After this lesson you can list the closing activities in the right order and close properly, even when a project is terminated early.

The situation: Everyone wants to leave

The robot cell has been accepted. The functional managers want their engineers back immediately. The subcontractor still has an open claim for waiting time, two punch-list items remain, and nobody has scheduled the lessons-learned session.

Across the plant, a different project was just cancelled by the steering committee. Its team is being approached by other managers, and the vendor asks: *"Should we keep working?"*

Both projects need the same thing: a proper **close**.

Close formally, in order: accept → close contracts → transfer → lessons → report → archive → release → sign-off. Keep key people until lessons and records are done.

The closing activities

1 · Confirm acceptance

All deliverables formally accepted against criteria.

2 · Close contracts

Claims settled, payments made, procurements closed.

3 · Transfer

Hand over product, documents, support to operations.

4 · Lessons learned

Final session; update the register and OPAs.

5 · Final report

Objectives, scope, cost, schedule, quality, benefits plan.

6 · Archive

Project records stored for future use and audits.

7 · Release resources

People and equipment released, with recognition.

8 · Sign-off

Formal closure by the sponsor.

Roughly in this order; some happen in parallel.



What closing includes

Closing a project (or a phase) finishes all activities in an orderly way:

Your memory card

- Close in order: **accept** → **contracts** → **transfer** → **lessons** → **report** → **archive** → **release** → **sign-off**
- Keep key people for lessons and records
- **Terminated projects are closed formally**
- Resolve claims before closing contracts

EXAM-STYLE QUESTION

After a portfolio review, the steering committee terminates a partially completed project. Team members are being approached by other managers, and the vendor asks whether to continue. What should the project manager do NEXT?

- A.** Perform the closing activities: document status and reasons, settle procurements, capture lessons learned and release resources formally
- B.** Release the team and stop the vendor; documentation is unnecessary
- C.** Continue to a natural stopping point
- D.** Appeal the decision

Answer: A. Terminated projects are closed formally.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 82 OF 96 · CLOSING & INTEGRATION

All approaches

Lessons learned: capture, apply and share

Goal: After this lesson you can run lessons learned throughout the project, apply them immediately, and turn them into organisational assets.

The situation: Waiting until the end

Midway through the eight-cell project, the team discovered that teaching robot programs in a dedicated pre-commissioning cell cut on-site debugging by about 40% on the first two cells.

The company procedure says: “Collect lessons learned at project closure.” If the team waits, cells 3 to 8 will not benefit.

Lessons learned are worth most **while they can still change something**.

Exam shortcut: a valuable lesson mid-project → record it and apply it now, within your authority; don't wait for closure.

The lessons learned cycle

1 · Capture



Retrospectives, phase reviews, issue resolutions: what worked, what didn't, why

2 · Record



Lessons learned register: situation, impact, recommendation, owner

3 · Apply now



Change the plan for the rest of **this** project

4 · Share



Organisational knowledge base (OPAs) for future projects

Capture → record → apply now → share.



Throughout, not only at the end

Capture lessons **continuously** (retrospectives, phase reviews, after major issues), record them in a **lessons learned register**, apply them in the current project, and share them with the organisation at closure.



Your memory card

- Capture lessons **throughout**, not only at the end
- Record specific, actionable lessons, including successes
- **Apply now** within your authority; share at closure as OPAs
- Blame-free capture keeps lessons honest

EXAM-STYLE QUESTION

Midway through a project, the team finds that a new pre-commissioning practice reduced on-site debugging by almost 40 percent on the first two workcells. Six more workcells remain. The organisation's procedure is to collect lessons learned at closure. What should the project manager do?

- A.** Record it for the closure workshop
- B.** Share it informally
- C.** Record it in the lessons learned register now and incorporate it into the plan for the remaining workcells
- D.** Submit it to the PMO before changing anything

Answer: C. Lessons are captured and applied throughout.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 83 OF 96 · CLOSING & INTEGRATION

All approaches

Transition to operations and benefits realisation

Goal: After this lesson you can plan a handover against readiness criteria, transfer ownership of documents and benefits, and handle a customer who wants to take over too early.

The situation: “We'll take it now”

The robot palletising line is ready. The customer's operations director wants to take ownership immediately to start production. But maintenance hasn't been trained, spare parts aren't in stock and the service contract isn't signed.

Also, the business case promises 15% less scrap within twelve months of go-live, measured long after the project team has left.

A project creates outputs. **Operations** turns them into benefits, if the handover is done well.

Customer wants it early but readiness gaps exist → make gaps and risks transparent and agree a managed transition with the accountable stakeholders. Not “hand it over anyway”, not “refuse until perfect”.

Readiness criteria for the palletising line

Transition readiness criterion	Status
Operators trained on all shifts	✓
Maintenance technicians trained	✗ planned next month
Critical spare parts in stock	✗ on order
Service contract signed	✗ in negotiation
Manuals and training material handed over (editable) with an owner	✓
Benefits owner named; measurement plan and baseline transferred	✓

Three gaps that matter for safe, reliable operation.



Transition is planned, not improvised

Agree **transition readiness criteria** early with operations: trained people, spare parts, support contracts, documents with owners, monitoring in place. Check them before handover.

Your memory card

- Agree **transition readiness criteria** early; check before handover
- Gaps → make risks visible, **agree a managed transition**
- Transfer documents (editable) and ongoing tasks with owners
- Benefits: plan, baseline and measurement go to a **benefits owner**

EXAM-STYLE QUESTION

The project is ready to hand over a new line, but maintenance staff are untrained, spare parts are not stocked and no service contract is signed. The operations director wants to take ownership immediately. What should the project manager do?

- A.** Hand over immediately
- B.** Refuse until every item is complete
- C.** Review the readiness criteria with operations and maintenance, make the gaps and risks transparent, and agree a transition plan such as supported operation
- D.** Hand over and record the gaps as lessons learned

Answer: C. Transition against readiness criteria; agree a managed path with accountable stakeholders.

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 84 OF 96 · CLOSING & INTEGRATION

All approaches

Contract closure: settling claims and closing procurements

Goal: After this lesson you can close a contract correctly: acceptance, punch list, claims, payments, warranty, records and formal notice.

The situation: Almost closed

All conveyor deliverables were installed and accepted. The project manager wants to close the subcontract and release the team. But the subcontractor has an open claim for site waiting time, two punch-list items remain, and the final invoice is waiting.

Closing now would leave money, liability and a dispute hanging, possibly for years.

Open claim or unfinished items → resolve first, then close formally. Don't use payment as leverage to force a claim's withdrawal.

Contract closure checklist

Before closing a contract	Check
All deliverables accepted	Formal acceptance against criteria
Punch-list items	Closed or formally agreed (e.g. retention until done)
Claims and disputes	Settled (negotiation first)
Payments	Final invoice approved; retention released per contract
Warranty	Start date and terms documented
Records	Contract file complete; procurement audit / lessons
Formal notice	Written confirmation that the contract is closed

Every line done before the formal closure notice.



Close only when everything is settled

A contract is closed when **all obligations** on both sides are met:

Your memory card

- Close when **all obligations** are met: acceptance, punch list, claims, payment
- **Settle claims first** (negotiation); never use payment as leverage
- Document warranty, complete records, issue **written closure**
- Procurement audit → lessons for future procurements

EXAM-STYLE QUESTION

All deliverables under a subcontract are installed and accepted, and the project manager wants to close it. The subcontractor has an open claim for additional site waiting time, and two minor punch-list items remain. What should the project manager do?

- A.** Close the contract immediately
- B.** Close and handle the claim informally afterwards
- C.** Resolve the claim and the punch-list items, confirm all obligations are met, then formally close the contract
- D.** Withhold final payment until the claim is withdrawn

Answer: C. Close only after claims are settled and obligations met.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 85 OF 96 · CLOSING & INTEGRATION

All approaches

Integration: the project manager as integrator

Goal: After this lesson you can explain the integration processes, why the PM looks at the whole picture, and how knowledge (explicit and tacit) is managed.

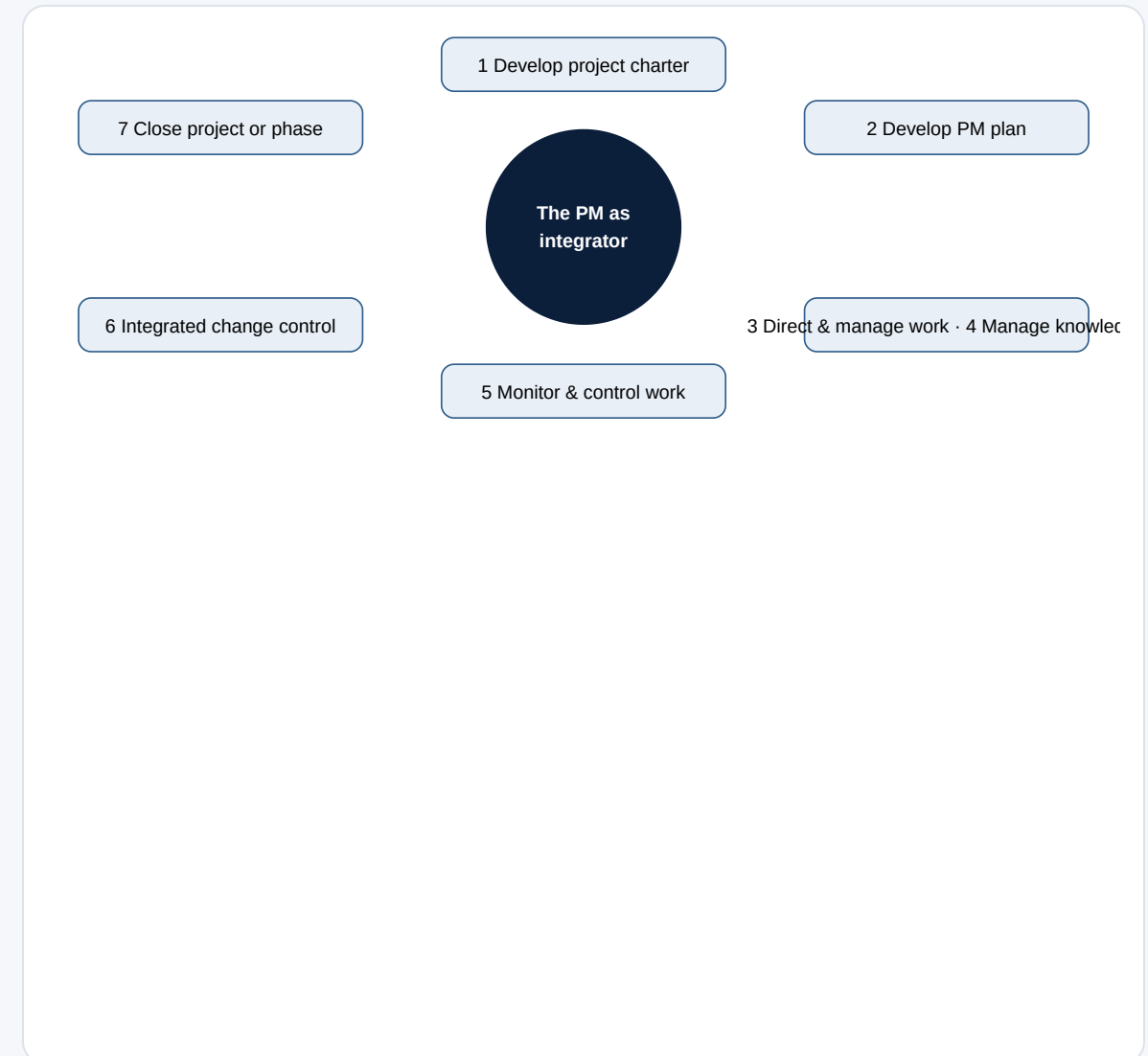
The situation: Everyone optimised their own part

On the robot cell, the mechanical lead optimised for fabrication cost, the controls lead for programming speed, procurement for the cheapest supplier, and the software team for features. Each made sense alone. Together they created a late, over-budget project with a hardware-software mismatch.

The one person whose job is to see **the whole** is the project manager.

Exam pattern: a problem in one area (scope, cost, a supplier) → assess the integrated impact before acting.

The integration processes



From charter to closure, the PM holds everything together.



What integration means

Integration management brings all parts of the project together: knowledge areas, teams, approaches, stakeholders. It is the PM's core responsibility; the PM cannot delegate accountability for the whole.



Your memory card

- **Integration:** the PM holds the whole project together
- Charter → plan → direct → knowledge → monitor → change control → close
- Assess changes for **integrated** impact
- Knowledge = **explicit** (documents) + **tacit** (people)

EXAM-STYLE QUESTION

Procurement proposes switching to a cheaper vision system supplier, saving \$12,000 on the purchase price. What should the project manager do FIRST?

- A.** Approve, since it saves money
- B.** Reject, since the original supplier was approved
- C.** Assess the integrated impact on scope, quality, schedule, cost and risk, and process it through change control
- D.** Ask the team to vote

Answer: C. Integration: assess all impacts together before deciding.

[Open the full lesson →](#)

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The full lesson on pmclean.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 86 OF 96 · CLOSING & INTEGRATION

Hybrid

Integrating and reporting a hybrid project

Goal: After this lesson you can explain why hybrid projects need deliberate integration, manage the interfaces between predictive and agile parts, set up one governance and change process that respects both, and build an integrated performance report that combines earned value with agile measures without hiding problems.

The situation: Two teams, one opening day

A regional hospital is opening a new outpatient wing. The building works (design, construction, fit-out) are managed predictively, with stage gates, a fixed contract and a detailed schedule. The new **patient portal** (online booking, check-in kiosks, test results) is developed by an agile team in two-week sprints.

Each part is well managed on its own. The construction manager reports earned value every month; the portal's Product Owner shows a burn-up chart at every sprint review. Yet the hospital's board feels it has no clear picture. Two reports, two vocabularies, and nobody can answer: *"Will the wing open on time, with everything working?"*

Then a problem appears at the boundary: the check-in kiosks need the building's network, which is scheduled for the very end of construction. The portal team cannot test kiosk features until then.

Hybrid = the right approach for each part, plus deliberate integration of the parts.

See it in one picture: one roadmap, two lanes

Building works (predictive)



Patient portal (agile)



Network ready
kiosk features →

Opening day

◆ stage gate · dashed red = interface dependency

The PM integrates both lanes in one plan and one report.

The building lane moves through stage gates; the portal lane moves in sprints. The red dashed line is an interface: kiosk features need the building network. The PM manages these crossings and the shared opening date.



What makes a project hybrid

A **hybrid** project combines predictive and adaptive (agile) approaches. Usually, each part of the work gets the approach that fits it: work with stable requirements and costly late changes (buildings, hardware, regulated processes) is planned predictively; work with uncertain or changing requirements (software, user experience) is delivered iteratively.

The PMI *Agile Practice Guide* describes several hybrid patterns: predictive and agile components running **in parallel** (as in the hospital), agile development followed by a predictive rollout, or a predictive project that uses agile practices such as daily stand-ups. The July 2026 PMP exam gives agile and hybrid delivery strong emphasis.

Hybrid is not a compromise. Done well, it uses each approach where it creates the most value. Done badly, it combines the paperwork of predictive with the unpredictability of agile. The difference is **integration**.

Your memory card

- Hybrid = right approach for each part + deliberate integration
- One milestone roadmap with interface points; each part keeps its own rhythm
- Interfaces need owners on both sides, roadmap dates and risk entries
- Backlog changes inside agreed limits → Product Owner; changes to shared milestones, budget or scope → integrated change control
- One integrated risk register
- AgileEVM lets agile parts report in EVM terms; CPI 0.84 = about 19% more cost than value, not 16% over

EXAM-STYLE QUESTION

In a hybrid project, the agile software team discovers that a feature can be built more simply than planned, which frees time in the current release. The change does not affect the release date, the budget or any other team. How should this change be handled?

- A.** Submit it to the change control board for formal approval
- B.** Let the Product Owner reorder the Product Backlog accordingly
- C.** Ask the sponsor to approve a revised project charter
- D.** Record it as an issue and escalate it to the program manager

Answer: B. Changes inside the agreed boundaries are normal backlog management: the Product Owner decides. If the change moved a shared milestone or the total budget, integrated change control would apply.

[Open the full lesson →](#)

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The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 87 OF 96 · CLOSING & INTEGRATION

Predictive · hybrid

Case study 1: the robot cell project (predictive / hybrid)

Goal: After this case you can work through a multi-exhibit question set the way the 2026 exam presents it: read the questions, find the right exhibit, apply the concept.

The situation: The situation

You are the project manager for an eight-month robot cell project for a packaging customer. The hardware follows a predictive plan with FAT and SAT milestones; the HMI software is developed in sprints.

It is month 6. You have four exhibits on your desk: the earned value report, an email from the customer, an extract from the risk register and this week's site update.

Answer the four exam questions below, using the exhibits. Each question depends mainly on one exhibit.

In the 2026 exam, case studies combine several exhibits (emails, tables, charts) with several questions. Read the questions first.

The exhibits

Exhibit A · Earned value report (month 6)

BAC	\$1,200,000
PV	\$600,000
EV	\$540,000
AC	\$630,000

Note: the overrun comes mainly from repeated rework on welded frames; the cause has not been removed.

Exhibit B · Email from the customer

*From: Operations Director
Subject: One more thing*

Given our long relationship, please add an automatic label-printing station to the cell as a goodwill gesture. It should be easy for your team. We need it at go-live.

Exhibit C · Risk register extract

R-08	Certified welder shortage
Trigger	More than 2 welders unavailable in any week
Response	Contingent: engage pre-approved subcontractor WeldPro (sponsor-approved)
Owner	Fabrication lead

Exhibit D · Site update (week 27)

Three of the five certified welders will be unavailable next week (two sick, one family emergency). Frame fabrication is on the critical path.

Use these four exhibits to answer the exam questions below.



How to work through a case study

Read the questions first, then the exhibits. You'll know what to look for.

One fact per question: each question usually depends on one exhibit. Find it; ignore the rest.

Watch the numbers: write the key values down (PV, EV, AC, dates).

Apply the PMI mindset: assess before acting, follow the process, collaborate, be honest.



Your memory card

- Read the **questions first**, then find the exhibit for each
- Write down key numbers; compare against EV
- Use the exhibit's wording (“cause not removed”, “pre-approved”) to pick the concept
- Apply the mindset: analyse, follow the process, act on plans

EXAM-STYLE QUESTION

Using Exhibit A, which statement BEST describes the project's status at month 6?

- A.** Ahead of schedule and under budget
- B.** Behind schedule and over budget
- C.** On schedule and over budget
- D.** Behind schedule and under budget

Answer: B. $SPI = 540 \div 600 = 0.90$ (behind). $CPI = 540 \div 630 \approx 0.86$ (over budget).

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 88 OF 96 · CLOSING & INTEGRATION

Agile · hybrid

Case study 2: the MES software product (agile)

Goal: After this case you can combine agile metrics, flow, product ownership and leadership concepts across several exhibits.

The situation: The situation

You support an agile team building the MES dashboard for the robot cell customer. A release must be ready for the customer's plant-wide rollout.

Four exhibits have landed on your desk: sprint data, a note about the flow diagram, an email from the sales director and a proposal from an executive.

Answer the four exam questions below. Again: read the questions first.

Ask yourself for each question: is it about forecasting, flow, product ownership or leadership? That tells you which concept to apply.

The exhibits

Exhibit A · Sprint data

Sprint	1	2	3	4	5
Velocity	34	38	36	31	28

Remaining release backlog: **150 points**.
Two developers were replaced after sprint 3. Developers report growing technical debt.

Exhibit B · Kanban/flow note

The cumulative flow diagram shows the “In test” band widening for six weeks. “In development” is stable. “Done” rises slowly. Developers say they are “always busy”.

Exhibit C · Email from the sales director

A competitor just launched mobile alarm notifications. Stop current work and build this immediately. Customers are calling it game-changing.

(The product owner has not yet assessed it.)

Exhibit D · Executive proposal

“Velocity has dropped from 38 to 28. Starting next sprint, the target is 40 points, with a team bonus if it is reached.”

Use these four exhibits to answer the exam questions below.



Agile case studies

Agile case questions often combine **numbers** (velocity, WIP, points) with **role** questions (whose decision is it?) and **mindset** questions (servant leadership, sustainable pace).



Your memory card

- Identify the **concept** per question: forecasting, flow, ownership, leadership
- Forecast as a **range**; widening band → **WIP limits**
- New demands → **product owner** decides by value
- Velocity is never a target; fix causes

EXAM-STYLE QUESTION

Using Exhibit A, how many sprints should the team forecast to complete the remaining release backlog?

- A.** Exactly 4 sprints
- B.** About 4 to 6 sprints, refined as velocity stabilises
- C.** Exactly 5 sprints
- D.** 8 sprints

Answer: B. $150 \div 38 \approx 4$; $150 \div 28 \approx 5.4 \rightarrow$ about 4-6 sprints, as a range.

Open the full lesson →

More free PMP questions →

The full lesson on pmclean.com adds the worked example, the common traps, more exam questions and a quick check.



PART 16 REVIEW · CHECK YOURSELF

Closing & Integration

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 81. I can list the closing activities in the right order and close properly, even when a project is terminated early.
- ☐ 82. I can run lessons learned throughout the project, apply them immediately, and turn them into organisational assets.
- ☐ 83. I can plan a handover against readiness criteria, transfer ownership of documents and benefits, and handle a customer who wants to take over too early.
- ☐ 84. I can close a contract correctly: acceptance, punch list, claims, payments, warranty, records and formal notice.
- ☐ 85. I can explain the integration processes, why the PM looks at the whole picture, and how knowledge (explicit and tacit) is managed.
- ☐ 86. I can explain why hybrid projects need deliberate integration, manage the interfaces between predictive and agile parts, set up one governance and change process that respects both, and build an integrated performance report that combines earned value with agile measures without hiding problems.
- ☐ 87. I can after this case you can work through a multi-exhibit question set the way the 2026 exam presents it: read the questions, find the right exhibit, apply the concept.
- ☐ 88. I can after this case you can combine agile metrics, flow, product ownership and leadership concepts across several exhibits.

[Open the full lessons →](#)[Test yourself: 10 exam-level questions →](#)

Exam Strategy

Exam domain: All domains

- 89. The PMI mindset, part 1: rules 1-4
- 90. The PMI mindset, part 2: rules 5-8
- 91. The PMI mindset, part 3: rules 9-12 and the full list
- 92. Question words: FIRST, NEXT, BEST, EXCEPT and more
- 93. Reading long scenario questions: decode before you answer
- 94. Eliminating wrong answers: the 8 distractor types
- 95. The exam format and question types
- 96. The final weeks and exam day





LESSON 89 OF 96 • EXAM STRATEGY

All approaches

The PMI mindset, part 1: rules 1-4

Goal: After this lesson you can apply the first four rules of the PMI mindset that sit behind a large share of exam answers.

The situation: Why the 'obvious' answer is often wrong

Experienced project managers often find PMP questions strange. In real life, when a customer asks for a small extra, many of us just do it. When two engineers argue, we decide. When a supplier is late, we escalate.

The exam rewards a specific way of thinking: the **PMI mindset**. It is not unrealistic; it is how a calm, ethical, process-aware, people-centred project manager behaves.

Across the 12 rules in these three lessons, you will recognise the logic behind most of the 270 advanced drill questions you have practised.

When two answers both look good, choose the one that understands the situation first and uses the proper process.

The first four rules

Rule 1 • Assess before you act

Understand the situation, the facts and the impact before choosing an action.

Clue words: "FIRST", "a problem is reported", "sponsor wants immediate action"

Rule 2 • Follow the process

Changes go through change control; risks through the risk process; contracts through the contract. No shortcuts, no hidden work.

Clue words: "just do it quickly", "small change", "verbal instruction"

Rule 3 • Collaborate and solve at the lowest level

Talk directly, privately and early. Help people solve it together. Escalate only after real attempts, with options.

Clue words: "disagree", "conflict", "refuses"

Rule 4 • Serve and empower the team

Remove impediments, protect focus, coach, give credit. Don't take decisions away from a capable team.

Clue words: "blocked", "interrupted", "team chose"

Each rule comes with clue words that often appear in the question.



Rules 1-4

These four rules decide many People and Process questions:

Your memory card

- **1** Assess before acting · **2** Follow the process
- **3** Collaborate; solve at the lowest level; escalate with options
- **4** Serve and empower the team
- Not passive: act at once on danger or when a plan exists

EXAM-STYLE QUESTION

A key stakeholder angrily demands that the project manager immediately replace a supplier who delivered one late shipment. What should the project manager do FIRST?

- A.** Replace the supplier as demanded
- B.** Escalate the demand to the sponsor
- C.** Gather the facts about the delay and its impact, and review the contract terms before deciding on a response
- D.** Ignore the request, since the supplier is usually reliable

Answer: C. Rule 1: assess facts and impact; rule 2: follow the contract.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 90 OF 96 · EXAM STRATEGY

All approaches

The PMI mindset, part 2: rules 5-8

Goal: After this lesson you can apply rules 5-8: honesty, safety and ethics, value over plan, and stakeholder understanding.

The situation: Pressure from above

Many difficult PMP questions put the project manager under pressure from someone powerful: a sponsor who wants better-looking numbers, a customer who wants free extras, an executive who wants to ignore market data, a director who won't engage.

The correct answer almost never gives in to the pressure, and almost never fights it head-on. It stays **honest, legal, value-focused** and **respectful**.

If an answer involves hiding, bending rules or ignoring evidence, it is almost certainly wrong, however reasonable it sounds.

Rules 5-8

Rule 5 · Be honest and transparent

Report the truth, early: delays, overruns, mistakes, failed criteria. Never hide or “present positively”.

Clue words: “present the data positively”, “don’t alarm”, “rebaseline monthly”

Rule 6 · Safety, law and ethics come first

Immediate danger → stop. Never trade compliance or ethics for time, money or relationships. Disclose conflicts of interest.

Clue words: “only ten minutes”, “gift”, “relative’s company”, “by mistake”

Rule 7 · Value over the plan

Projects exist to deliver value. Adapt when evidence changes; raise business-case problems with the sponsor.

Clue words: “demand halved”, “used by 2%”, “on time but no savings”

Rule 8 · Understand stakeholders, communicate early

Find what people really need; engage resistant stakeholders directly; tailor communication; bad news early, interactively.

Clue words: “stopped attending”, “resistant”, “misunderstood”

Honest, legal, valuable, respectful.



Rules 5-8

These rules decide most ethics, Business Environment and stakeholder questions:

Your memory card

- **5** Honest and transparent, early
- **6** Safety, law and ethics first
- **7** Value over the plan
- **8** Understand stakeholders; communicate early and directly

EXAM-STYLE QUESTION

The project is running three weeks late. The sponsor suggests rebaselining every month so reports stop showing red. No changes have been approved. What should the project manager do?

- A.** Rebaseline monthly as suggested
- B.** Explain that baselines change only through approved changes, keep reporting variance honestly, and present a recovery plan or a formal change request
- C.** Stop reporting schedule performance
- D.** Report only forecasts

Answer: B. Rule 5 (honesty) + rule 2 (change control).

Open the full lesson →

More free PMP questions →

The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 91 OF 96 · EXAM STRATEGY

All approaches

The PMI mindset, part 3: rules 9-12 and the full list

Goal: After this lesson you can apply rules 9-12 and use all 12 rules as a checklist when answering difficult questions.

The situation: Twelve rules, one way of thinking

After hundreds of practice questions, a pattern appears. The correct answers are calm, honest, collaborative, process-aware and value-focused. The wrong answers are rushed, hidden, unilateral, or ignore roles and evidence.

These last four rules complete the picture.

Use the 12 rules as a checklist: if an answer breaks one, eliminate it.

Rules 9-12

Rule 9 · Plan for risk, act on plans

Identify risks early; when a trigger fires, implement the planned response; unplanned events → workaround and issue log; escalate what's beyond you.

Clue words: "trigger", "pre-approved", "never identified"

Rule 10 · Tailor, don't bypass

Adapt processes and governance to the context, with agreement. Never ignore rules or split orders to avoid them.

Clue words: "wasteful template", "ignore", "split the order"

Rule 11 · Respect roles and decision rights

Sponsor authorises and funds; PO owns the backlog; the team owns how; the CCB approves changes. Don't take others' roles.

Clue words: "take over", "decide for", "who is in charge"

Rule 12 · Learn and improve continuously

Retrospectives, lessons learned applied now, trends investigated early, knowledge shared.

Clue words: "at closure", "waste of time", "same problem again"

Risk, tailoring, roles, learning.



Rules 9-12

These rules decide many risk, governance, agile-role and improvement questions:

Your memory card

- **9** Plan for risk, act on plans · **10** Tailor, don't bypass
- **11** Respect roles and decision rights · **12** Learn and improve continuously
- Use all 12 as an **elimination checklist**
- Ask: which rule is this question testing?

EXAM-STYLE QUESTION

The product owner is rarely available, and the team builds features of little value. What reflects the PMI mindset BEST?

- A.** The PM takes over the product owner role
- B.** Raise the issue with the product owner, show the impact, and work with the PO and sponsor to secure availability or an empowered proxy
- C.** Let the team continue guessing
- D.** Suspend sprints

Answer: B. Rule 11 (respect roles) + rule 8 (engage directly).

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 92 OF 96 • EXAM STRATEGY

All approaches

Question words: FIRST, NEXT, BEST, EXCEPT and more

Goal: After this lesson you can identify the question word, understand exactly what it asks, and avoid misreading reversed questions.

The situation: The right answer to the wrong question

A student knew everything about change control. The question asked what to do **FIRST** when a customer requests a change. She chose “Submit it to the change control board”, a correct step, but not the first one. The first is to **analyse the impact**. Many exam mistakes are not knowledge mistakes. They are **reading** mistakes.

Several options can be correct actions. Only one fits the question word. Order the plausible options in time, then pick by the word.

What each question word asks

Question word	What it really asks	Typical right answer
FIRST	The step before any other	Assess, analyse, talk to the person, check the plan
NEXT	Something already happened; what follows	The logical next process step (often after analysis)
BEST / MOST	Several are acceptable; choose the strongest	The one that solves the root cause, follows the mindset
LEAST	Find the weakest option	Read carefully: reversed question
EXCEPT / NOT	Three are true; one is false	Find the one that does NOT fit
SHOULD HAVE / to PREVENT	Looking back: what would have avoided this?	A planning or prevention activity (RTM, WBS dictionary, risk plan)

Find the word first; it decides what 'correct' means.



Find the question word

Before reading the options, find the question word. It defines what “correct” means:

Your memory card

- Find the **question word** before reading options
- **FIRST** = earliest step · **NEXT** = what follows · **BEST** = strongest
- **EXCEPT / NOT / LEAST** reverse the question
- Watch absolutes, “already”, “approved” and **who** the actor is

EXAM-STYLE QUESTION

A customer asks for a change to the approved scope. What should the project manager do FIRST?

- A.** Submit the change to the change control board
- B.** Evaluate the impact of the change on the project objectives
- C.** Update the scope baseline
- D.** Implement the change to keep the customer satisfied

Answer: B. Impact analysis comes before submission, approval and implementation.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmpclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 93 OF 96 · EXAM STRATEGY

All approaches

Reading long scenario questions: decode before you answer

Goal: After this lesson you can decode a long, complex question in five steps: last sentence, facts, trigger, noise, simple words.

The situation: Drowning in words

Advanced PMP questions are long, formal and full of details: names, numbers, history, emotions. For a reader whose first language is not English, they can feel like a wall of text.

But almost every long question contains only **one decision** and **one trigger phrase**. The rest is context or deliberate noise.

Decoding is a skill you can practise, exactly like the Decode section after each PMCLEAR question.

**If you can say the question in one simple sentence,
you are ready to look at the options.**

The decoding routine

1 · Read the **last sentence** first

What is actually asked?
Which question word?

2 · Read the scenario for **facts**

Approach
(agile/predictive/hybrid), role,
what already happened,
constraints

3 · Find the **trigger**

The phrase that decides the
answer ("never identified",
"pre-approved", "safety")

4 · Ignore the **noise**

Names, numbers and details
that don't affect the decision

5 · Say it in **simple words**

"A planned risk happened;
what now?" → then look at
the options

Last sentence → facts → trigger → noise → simple words.



Five steps to decode

Use the same routine every time:



Your memory card

- Decode: **last sentence** → **facts** → **trigger** → **noise** → **simple words**
- One question = usually **one decision and one trigger**
- Noise test: would the answer change without this detail?
- Check the **approach** and the **role**

EXAM-STYLE QUESTION

A large infrastructure programme with a distinguished steering committee has delivered three phases successfully. During phase four, a risk identified at initiation, for which the sponsor pre-approved a contingent response, occurs on a Friday afternoon while the sponsor is abroad. What should happen FIRST?

- A.** Wait for the sponsor to return before acting
- B.** Convene a risk workshop to reassess the risk
- C.** The risk owner implements the pre-approved contingent response
- D.** Submit a change request to the change control board

Answer: C. Rule 9: act on the plan; the sponsor's absence is noise.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 94 OF 96 • EXAM STRATEGY

All approaches

Eliminating wrong answers: the 8 distractor types

Goal: After this lesson you can recognise the typical distractor types, eliminate two or three options quickly, and decide between the last two.

The situation: Four answers that all sound right

Advanced PMP questions are designed so that every option sounds reasonable. That is why students often say: “I could argue for any of them.”

But wrong options are not random. They follow **patterns**: escalating too early, waiting, bypassing the process, taking over someone's role, punishing, hiding, the right step at the wrong time, or extreme words.

Learn the patterns and the options start sorting themselves.

Most questions become a choice between two options after eliminating the ones that break a mindset rule.

The 8 distractor types

Distractor type	Sounds like...	Why it's usually wrong
Escalate first	“Inform the sponsor immediately”	Skips the PM's own responsibility to assess and act
Do nothing / wait	“Monitor and review at the next meeting”	Passive when action is needed
Bypass the process	“Implement it quickly”, “just do it”	Ignores change control, contracts, governance
Do it yourself	“The PM decides / writes / fixes it”	Takes over others' roles; not servant leadership
Punish or blame	“Report to HR”, “remove the member”	Before understanding the cause
Hide or bend	“Present positively”, “split the order”	Dishonest or circumvents rules
True but not the question	A correct step, wrong time	Fails the question word (FIRST/NEXT)
Extreme words	“always”, “never”, “all”, “immediately cancel”	Real situations rarely allow absolutes

Learn to recognise them in seconds.



Eliminate, then choose

You rarely need to find the right answer directly. Usually you **eliminate** two or three options that break a mindset rule, then compare the rest.



Your memory card

- Eliminate the **8 distractor types** first
- Down to two → root cause? first? more rules? right decision-maker?
- Prefer proactive, collaborative, process-respecting answers
- Choose, flag, move on; don't get stuck

EXAM-STYLE QUESTION

A team member has missed three deadlines and seems withdrawn; he was previously very reliable. What should the project manager do FIRST?

- A.** Start a formal performance improvement process
- B.** Discuss his missed deadlines at the next retrospective
- C.** Meet privately with him to express concern and understand what is happening
- D.** Ask colleagues to absorb his work quietly

Answer: C. Eliminate punishment (A), public exposure (B) and hiding (D): private, empathetic conversation.

[Open the full lesson →](#)

[More free PMP questions →](#)

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 95 OF 96 • EXAM STRATEGY

All approaches

The exam format and question types

Goal: After this lesson you know the question types you may meet, how to approach each, and where to check the current official exam numbers.

The situation: No surprises on exam day

A well-prepared student saw her first drag-and-drop question on exam day and lost five minutes figuring out how it worked. Another student had never practised case studies with exhibits. Knowing the **format** doesn't replace knowing the content, but it removes surprises that cost time and confidence.

Practise every item type before the exam, especially case studies with exhibits, and use the official tutorial/sample questions from PMI.

Item types and tips

Item type	What you do	Tip
Multiple choice	Choose one of four	Eliminate distractors first
Multiple response	Choose several (the question says how many)	Treat each option as true/false
Matching / drag and drop	Match items to categories or order steps	Start with the pairs you're sure of
Hotspot	Click the right area of a chart or diagram	Read axes and labels first
Fill in the blank	Type a value (often a calculation)	Write the formula, then calculate
Case studies	Several questions on one scenario with exhibits	Read the questions first; one exhibit per question

Always check the current official numbers (questions, time, breaks, domain weights) in PMI's exam content outline and handbook, and in the free PMCLEAR guide "PMP exam format 2026". They change between versions.

Practise each type before the exam.



What to expect

The PMP exam covers three domains (People, Process, Business Environment) with predictive, agile and hybrid scenarios, and uses several item types beyond simple multiple choice.

Your memory card

- Three domains; predictive, agile and hybrid scenarios
- Item types: multiple choice, multiple response, matching, hotspot, fill-in, **case studies**
- Practise every type, including exhibits
- Confirm numbers in **current official PMI materials**

EXAM-STYLE QUESTION

Which TWO actions are appropriate when the trigger of an identified risk with a pre-approved contingent response occurs? (Choose the option listing both.)

A. Reassess the probability; wait for the sponsor

B. Implement the contingent response; update the risk register

C. Submit a change request; hold a workshop

D. Develop a workaround; close the risk

Answer: B. Implement the plan and keep records current.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



LESSON 96 OF 96 • EXAM STRATEGY

All approaches

The final weeks and exam day

Goal: After this lesson you can plan your final four weeks, pace yourself during the exam, and stay calm when questions feel hard.

The situation: Knowing enough isn't enough

One candidate knew the material well. In his mock exam he ran out of time with 25 questions unanswered: he had spent eight minutes on a few long case-study questions early on.

Another candidate panicked after five hard questions in a row and started second-guessing everything.

Pacing and calm are skills. You can practise them, just like earned value.

A mock exam is only useful if you review every wrong (and lucky) answer afterwards.

Your final four weeks

When	Focus
Weeks 4–3 before	Finish all lessons; drill weak areas from “My mistakes”
Weeks 3–2	Full-length timed mock exams (at least 2); review every wrong answer with the Decode
Last week	Mindset rules, formulas, question words; light practice; sleep
Day before	No new topics; check ID, location or online setup; rest
Exam day	Pacing checkpoints, breaks, flag and return, stay calm

From learning to performing.



The last four weeks

Move from learning to **performing**: full-length timed mocks, thorough review of mistakes, and the mindset rules.

Your memory card

- Final weeks: **timed mocks + full review** of mistakes
- Pace with **checkpoints**; keep a review reserve
- **Choose, flag, return**; take every break
- Calm: one question at a time. Good luck!

EXAM-STYLE QUESTION

Two weeks before the exam, a candidate scores 68% on a full-length mock exam. What is the MOST effective next step?

- A.** Take another mock immediately
- B.** Review every wrong and guessed answer, identify the concept and mindset rule behind each, and target the weak areas
- C.** Read the whole guide again from the start
- D.** Postpone the exam without analysis

Answer: B. Learning comes from reviewing mistakes and targeting weak areas.

Open the full lesson →

More free PMP questions →

The full lesson on pmclear.com adds the worked example, the common traps, more exam questions and a quick check.



PART 17 REVIEW · CHECK YOURSELF

Exam Strategy

Tick each line you can explain to a colleague in your own words. If you cannot, open the lesson again.

- ☐ 89. I can apply the first four rules of the PMI mindset that sit behind a large share of exam answers.
- ☐ 90. I can apply rules 5–8: honesty, safety and ethics, value over plan, and stakeholder understanding.
- ☐ 91. I can apply rules 9–12 and use all 12 rules as a checklist when answering difficult questions.
- ☐ 92. I can identify the question word, understand exactly what it asks, and avoid misreading reversed questions.
- ☐ 93. I can decode a long, complex question in five steps: last sentence, facts, trigger, noise, simple words.
- ☐ 94. I can recognise the typical distractor types, eliminate two or three options quickly, and decide between the last two.
- ☐ 95. I can after this lesson you know the question types you may meet, how to approach each, and where to check the current official exam numbers.
- ☐ 96. I can plan your final four weeks, pace yourself during the exam, and stay calm when questions feel hard.

[Open the full lessons →](#)[Test yourself: 10 exam-level questions →](#)

YOUR EXAM TOOLKIT

Keep these pages open while you study

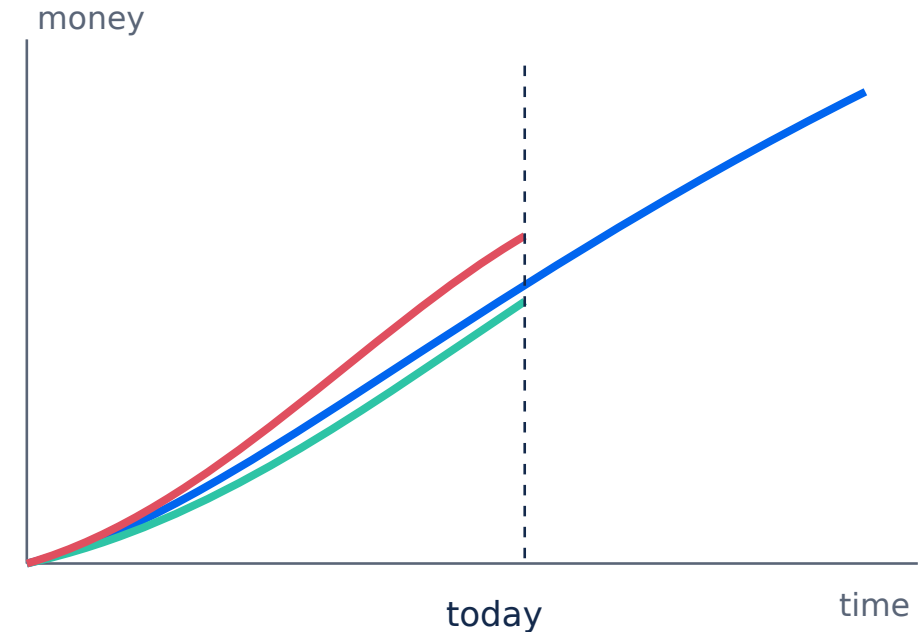
-  Formula sheet: earned value
-  Formula sheet: schedule, risk and more
-  Glossary: 36 exam words in simple English
-  12 answer traps to eliminate
-  Exam-day checklist
-  Your progress tracker: 96 lessons





Formula sheet 1: earned value (EVM)

CV	$EV - AC$ Cost variance. Negative = over budget.
SV	$EV - PV$ Schedule variance. Negative = behind schedule.
CPI	$EV \div AC$ Value for each dollar spent. Below 1 = over budget.
SPI	$EV \div PV$ Speed against the plan. Below 1 = behind.
EAC	$BAC \div CPI$ Forecast if the current cost performance continues.
EAC	$AC + (BAC - EV)$ Forecast if the rest goes as planned (the problem was one-time).
EAC	$AC + (BAC - EV) \div (CPI \times SPI)$ Forecast when cost and schedule both affect the rest.
ETC	$EAC - AC$ How much more money is needed.
VAC	$BAC - EAC$ Expected budget surplus (+) or overrun (–) at the end.
TCPI	$(BAC - EV) \div (BAC - AC)$ Efficiency needed to finish on budget. Above 1 = harder.



— PV planned value — AC actual cost — EV earned value

Read it in 3 seconds: EV below PV = behind schedule. AC above EV = over budget. In this picture the project is **behind schedule and over budget** ($SPI < 1$, $CPI < 1$).



Memory trick: every variance starts with **EV**; every index puts **EV** on top. Above 1 or positive = good.

Full lessons: [Part 7: Cost & EVM](#)



Formula sheet 2: estimates, schedule, risk, communication, flow

PERT (beta) estimate	$(O + 4M + P) \div 6$	O = optimistic, M = most likely, P = pessimistic
Triangular estimate	$(O + M + P) \div 3$	Simple average of the three
Standard deviation (PERT)	$(P - O) \div 6$	Bigger = more uncertain
Total float	$LS - ES$ or $LF - EF$	Zero float = on the critical path
Communication channels	$n \times (n - 1) \div 2$	n = number of people. 10 people = 45 channels
Expected monetary value	$EMV = \text{probability} \times \text{impact}$	Threats negative, opportunities positive
Little's Law (flow)	$\text{cycle time} = \text{WIP} \div \text{throughput}$	Less work in progress = faster delivery
Project selection	NPV: higher · IRR: higher · payback: shorter · BCR: above 1	Pick the option with the best number

Try it: O = 4 days, M = 6 days, P = 14 days → PERT = $(4 + 24 + 14) \div 6 = 7$ **days**. A team grows from 5 to 8 people → channels go from 10 to **28**.



Glossary: 36 exam words in simple English · 1 of 2

Baseline

The approved plan (scope, time, cost) you measure against. Changed only through change control.

Backlog

The ordered list of work for an agile team. The Product Owner orders it.

Burndown chart

Shows work remaining over time in a sprint or release.

Change control board (CCB)

The group that approves or rejects change requests.

Charter

The document that authorises the project and names the project manager.

Contingency reserve

Money or time for known risks. Part of the cost baseline.

Management reserve

Money for unknown risks. Not in the baseline; needs approval.

Critical path

The longest path of activities. Delay here delays the project.

Crashing

Adding resources to shorten the schedule. Costs more.

Fast tracking

Doing activities in parallel. Adds risk.

Definition of Done

The shared checklist that every item must meet to be complete.

Deliverable

A product, result or service the project must produce.

Escalate

Pass a decision to a higher level, with facts and options.

Gold plating

Adding extra work the customer did not ask for. Not allowed.

Impediment

Anything that blocks the team. The Scrum Master or PM removes it.

Increment

A usable piece of the product produced in a sprint.

Issue

A problem that is happening now (a risk is in the future).

Kick-off meeting

The meeting that starts the project or phase with all key people.



Glossary: 36 exam words in simple English · 2 of 2

Lessons learned

What went well and badly, recorded during and after the project.

MVP

Minimum viable product: the smallest version that tests the idea with users.

Product Owner

Maximises product value; owns and orders the backlog.

Retrospective

The team's meeting to improve how it works.

Risk register

The list of risks with owners, analysis and responses.

Risk owner

The person who watches a risk and acts on its response.

RACI

Who is Responsible, Accountable, Consulted, Informed.

Scope creep

Uncontrolled growth of scope without approval.

Servant leader

A leader who serves the team: removes blocks, coaches, protects focus.

Sponsor

Provides money and support; the key decision-maker for the business.

Sprint

A fixed time-box (1 to 4 weeks) to produce an increment.

Stakeholder

Anyone who affects or is affected by the project.

Tailoring

Adapting the approach and processes to fit the project.

Velocity

Work an agile team completes per sprint. Used for its own forecasts only.

WBS

Work breakdown structure: all project work broken into smaller parts.

Work package

The lowest level of the WBS; can be estimated and assigned.

WIP limit

The maximum number of items allowed in a stage at once.

Workaround

An unplanned response to a risk that has happened.



12 answer traps: cross these options out first



Escalate first

Going to the sponsor before trying to solve it yourself.



Do nothing / wait

Ignoring a problem, hoping it goes away.



Punish people

Replacing, blaming or reporting a team member first.



Act without facts

Doing something before analysing the situation.



Change the baseline alone

Changing scope, time or cost without approval.



Gold plating

Giving extras the customer did not ask for.



Hide bad news

Delaying or softening reports to look good.



The wrong decision-maker

PM doing the Product Owner's or sponsor's job.



Skip the process

"Just do it quickly" around change control.



Only a document

"Update the plan" when people need action now.



Absolute words

"always", "never", "all" in an option: be careful.



Right action, wrong time

A good step, but not the FIRST or NEXT one.

Full lesson: [Part 17: Exam Strategy](#) (the 8 distractor types).



Exam-day checklist

The week before

- ☐ Read your PMI confirmation email: time, place or online rules
- ☐ Online exam: run the system test on the same computer and network
- ☐ Do one last timed practice exam, then rest
- ☐ Review your formula sheet and glossary

The day before

- ☐ Prepare your ID: the name must match your PMI registration exactly
- ☐ Plan your route or prepare a quiet, clean room for online
- ☐ No new topics. Light review, then sleep well

On exam day

- ☐ Arrive 30 minutes early (online: check in early)
- ☐ Eat, drink water, use the restroom before you start
- ☐ Read every question to the end: find FIRST, NEXT, BEST, EXCEPT

During the exam

- ☐ About 80 seconds per question; check your time at each break
- ☐ Choose, flag, move on. Never leave a question empty
- ☐ Review flagged questions BEFORE each break: you cannot go back
- ☐ Take both breaks: stand up, breathe, drink

Check the current exam-day and ID rules in your PMI and Pearson VUE emails: they are the final word. You can do this! 💪



Your progress tracker: 96 lessons

· print this page or colour a box after each lesson

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96

■ People ■ Process ■ Business Environment ■ Exam strategy

Click a number to open the lesson.

24

lessons: one quarter done 🎉

48

lessons: half way: take your first timed exam

72

lessons: three quarters: practise case studies

96

lessons: book your exam date

KEEP GOING

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