Fundamentals

Certified Associate in Project Management

KNOWLEDGE CHEATSHEET

COORDINATE THE WHOLE PROJECT

Purpose — Business need → **Authorize** — Charter → **Integrate** — Plan and people → **Deliver** — Outcomes and value

01 Project management fundamentals and core concepts

Projects, programs and portfolios

- A **project** is a temporary endeavor that creates a unique product, service or result. Temporary describes its duration; its benefits can last much longer. A contract is not required.
- **Operations** sustain ongoing, repetitive business activity. Projects introduce change and transition outputs to operations; both can share resources and stakeholders.
- A **program** coordinates related projects and other work to obtain benefits unavailable through separate management. A **portfolio** selects and balances projects, programs and operations against strategy; its components need not be related.
- Projects can respond to market demand, stakeholder needs, technology, legal obligations or process improvement. Success includes **business outcomes and stakeholder value**, alongside scope, schedule, cost and quality.

Governance, roles and authority

- The **sponsor** champions the business need, secures support and funding, and handles escalations beyond delegated authority. The **project manager** integrates work and coordinates delivery; functional managers manage departmental capabilities and resource commitments.
- A **PMO** standardizes governance and shares methods, templates, knowledge and resources. A supportive PMO advises; a controlling PMO requires compliance; a directive PMO directly manages projects.
- In a **functional** structure, functional managers hold most authority. A **matrix** shares authority: weak favors the functional manager, balanced shares it, and strong favors the project manager. Project-oriented structures give substantial project authority.
- **Governance** defines decision rights, oversight, approval limits and escalation paths. Coordinate with other projects over dependencies and shared resources; raise issues to the designated authority when they exceed the team's remit.
- The project manager's **sphere of influence** includes the team, organization, industry and profession. Build relationships with peer managers, customers and suppliers; connect relevant industry trends and professional learning to project decisions.

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Context and tailoring

- **Enterprise environmental factors (EEFs)** are conditions influencing the project: internal culture, structure, infrastructure and resource availability; external laws, market conditions and industry standards.
- **Organizational process assets (OPAs)** are reusable organizational processes and knowledge: policies, templates, approved supplier lists, historical estimates and lessons learned repositories.
- **Tailoring** selects an appropriate life cycle, processes, artifacts, tools and governance for the project. Consider requirement stability, risk, complexity, culture, regulation, stakeholder needs, team location and available skills.
- Balance **scope, schedule, cost, quality, resources and risk** together. Improving one constraint can affect others; tailor deliberately with the team rather than applying every possible process or artifact.

Life cycles and process groups

- A **project life cycle** organizes phases from start to finish. A **product life cycle** spans the product's creation, use, growth and retirement and can contain many projects.
- **Predictive** delivery plans substantial scope and work up front. **Iterative** delivery repeatedly refines a solution; **incremental** delivery adds usable portions. **Adaptive** delivery uses frequent feedback to adjust work; **hybrid** combines approaches.
- The five **process groups** are Initiating, Planning, Executing, Monitoring and Controlling, and Closing. They are logical groups of management activity, not mandatory sequential project phases; they can overlap and recur within phases.
- **Initiating** authorizes the project or phase and identifies stakeholders. **Planning** refines objectives and the approach; **Executing** performs work; **Monitoring and Controlling** evaluates and adjusts it; **Closing** completes formal closure or termination.
- **Performance domains** describe interacting areas of project effectiveness: stakeholders, team, development approach and life cycle, planning, project work, delivery, measurement and uncertainty. They provide a complementary view to process groups and knowledge areas.

Charter, plan and integration

- The **project charter** formally authorizes the project and the project manager's use of organizational resources. It captures purpose, measurable objectives, high-level scope, milestones, risks, key stakeholders and approval requirements.
- The **project management plan** integrates subsidiary plans and baselines and explains how work will be executed, monitored, controlled and closed. A **baseline** is an approved reference used to measure performance.

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Purpose → **Authorize** → **Integrate** → **Deliver**

Purpose: Business need
Authorize: Charter
Integrate: Plan and people
Deliver: Outcomes and value

- **Integration management** connects the charter, plan, execution, knowledge, monitoring, change control and closure. The project manager maintains the whole-project view and resolves trade-offs across disciplines.
- **Work performance data** are raw observations; **information** results from contextual analysis; **reports** present that information for decisions. Keep the assumption, issue and change logs distinct.

Leadership and team development

- **Leadership** builds trust, direction and motivation through relationships and influence. **Management** organizes and coordinates work. Core competencies combine technical project management, leadership, and strategic and business understanding, including industry and organizational knowledge.
- **Emotional intelligence** includes self-awareness, self-management, social awareness and relationship management. Use empathy, active listening and constructive feedback to reduce tension and understand concerns before choosing an action.
- Team development commonly follows **forming, storming, norming, performing, adjourning**. Teams can revisit stages after membership changes. Training, mentoring, recognition and clear working agreements support improvement.
- A **team charter** records values, ground rules, decision-making and conflict approaches. Use **SMART** objectives: specific, measurable, achievable, relevant and time-bound. Assess team outcomes and collaboration, not merely meeting attendance.

Conflict, responsibilities and knowledge

- **Collaborate/problem solve** explores underlying interests for a durable shared solution. **Compromise/reconcile** gives each side partial satisfaction. **Smooth/accommodate** emphasizes agreement or yields; **withdraw/avoid** postpones; **force/direct** imposes a position.
- A **responsibility assignment matrix (RAM)** links work to roles. **RACI** means responsible, accountable, consulted and informed. Clarify who performs work and who owns the decision; assign one clear accountable owner per item.
- **Explicit knowledge** is codified in documents and repositories. **Tacit knowledge** resides in experience and judgment and is shared through discussion, mentoring, networking and storytelling.
- Capture **lessons learned** throughout delivery and transfer useful knowledge into organizational repositories. Record context and recommendations; closure is the final consolidation, not the first opportunity to learn.

Stakeholder analysis and engagement

- **Stakeholders** can affect, be affected by, or perceive themselves affected by the project. Identify them early and revisit the analysis at phase changes, organizational changes and other significant events.
- The **stakeholder register** records identification, roles, interests, requirements and assessment information. A **power/interest grid** guides engagement; the **salience model** considers power, legitimacy and urgency.

Fundamentals / Predictive Planning

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COORDINATE THE WHOLE PROJECT

Purpose Business need → **Authorize** Charter → **Integrate** Plan and people → **Deliver** Outcomes and value

- A **stakeholder engagement assessment matrix** compares current and desired engagement: unaware, resistant, neutral, supportive or leading. The **engagement plan** defines actions to close the gaps.
- **Identify** stakeholders, **plan** engagement, **manage** involvement and concerns, then **monitor** relationships and adapt. Listen to new or resistant stakeholders and balance expectations with approved objectives rather than dismissing them.

Communication planning and feedback

- The **communications management plan** defines who needs what information, why, when, in which format, through which channel, from whom and with what escalation path. Use the charter, stakeholder analysis, plans and organizational context.
- **Interactive** communication exchanges information with feedback, such as a discussion. **Push** sends information to recipients, such as reports. **Pull** lets recipients retrieve it from a portal or knowledge repository.
- **Manage Communications** creates, distributes, stores and retrieves information. **Monitor Communications** checks whether communication meets stakeholder needs. Receipt or acknowledgment alone does not establish understanding; seek meaningful feedback.
- Tailor formality, detail, language and medium to the audience, urgency and sensitivity. Internal/external, formal/informal and upward/downward/horizontal are different dimensions; a report can fit several simultaneously.
- For distributed teams, agree on **time zones, work calendars, preferred channels, accessible records and response expectations**. Meetings need a purpose, participation, decisions and action owners; use the five Cs: correct, concise, clear, coherent and controlled.
- Potential two-way communication channels among **n people = n(n - 1) / 2**. Count every participant, including the project manager; the formula describes potential pairs, not the number of required meetings.

02 Predictive planning and control

Scope, requirements and the WBS

- **Product scope** describes features and functions; **project scope** is the work required to deliver them. Scope management plans how scope is defined, validated and controlled; requirements management plans how requirements are analyzed and maintained.
- Scope processes are **Plan Scope Management, Collect Requirements, Define Scope, Create WBS, Validate Scope and Control Scope**. Define Scope produces the scope statement, including deliverables, exclusions and acceptance criteria.
- The **work breakdown structure (WBS)** hierarchically decomposes the total project scope into manageable deliverables and **work packages**. Apply the **100% rule**: include all required work without duplication. The WBS does not define activity sequence.

Predictive Planning

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PLAN, MEASURE AND CONTROL

Baseline Scope, time, cost → **Execute** Deliver work → **Measure** Compare results → **Control** Approve changes

- The **scope baseline** comprises the approved scope statement, WBS and WBS dictionary. The **dictionary** describes components through work descriptions, ownership, estimates, resources, assumptions and acceptance details as appropriate.
- **Decomposition** breaks work packages into schedule activities. **Rolling wave planning** details near-term work while keeping later work at a higher level. **Progressive elaboration** adds detail as knowledge improves without automatically changing approved scope.

Schedule model and dependencies

- Schedule processes are **Plan Schedule Management, Define Activities, Sequence Activities, Estimate Activity Durations, Develop Schedule and Control Schedule**. The schedule model combines logic, durations, calendars, resources and constraints.
- In precedence relationships, **finish-to-start (FS)** means the successor cannot start until its predecessor finishes; **start-to-start (SS)** constrains starts; **finish-to-finish (FF)** constrains finishes; **start-to-finish (SF)** links predecessor start to successor finish.
- A **lag** delays the successor relative to a dependency; a **lead** allows overlap. Distinguish mandatory from discretionary dependencies and internal from external dependencies before changing schedule logic.
- A **milestone** is a significant event with zero duration. A **network diagram** shows dependencies; a **Gantt chart** shows activities across time. A mandatory milestone may reflect a contractual deadline.

Critical path and float

- The **critical path** is the longest-duration path through the network; it determines the earliest possible finish under the model's assumptions. Multiple critical paths can exist, and the critical path can change.
- The **forward pass** calculates early dates: earliest finish = earliest start + duration; at a merge, use the latest predecessor finish. The **backward pass** calculates late dates: latest start = latest finish - duration; use the earliest successor late start.
- **Total float = LS - ES = LF - EF**: allowable delay without delaying the project finish or violating a schedule constraint. **Free float** allows delay without delaying a successor's early start. Critical activities usually have zero total float in an unconstrained network.
- Parallel activities contribute the **longest dependent branch**, not the sum of every duration. Use one consistent calendar and date convention; distinguish elapsed days from working days when converting remaining work into iterations.

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Estimating and schedule optimization

- **Analogous estimating** uses comparable previous work. **Parametric estimating** applies a rate or model, such as units multiplied by cost per unit. **Bottom-up estimating** estimates detailed components and aggregates them.
- With optimistic **O**, most likely **M** and pessimistic **P** estimates, the **triangular mean = (O + M + P) / 3**; the **PERT weighted mean = (O + 4M + P) / 6**. Estimates depend on assumptions and data quality.
- **Crashing** adds resources or cost to shorten eligible critical work. **Fast tracking** overlaps work normally performed in sequence, increasing coordination and rework risk. Shortening a noncritical activity may not shorten the project.
- **Resource leveling** adjusts work for resource availability and may change the critical path or finish date. **Resource smoothing** uses available float while keeping the critical path and project finish unchanged.

Costs, budgets and reserves

- Cost processes are **Plan Cost Management, Estimate Costs, Determine Budget and Control Costs**. Record the basis of estimates, scope assumptions, precision, resource rates, schedule effects and relevant risks.
- **Determine Budget** aggregates estimates and contingency into a time-phased **cost baseline**. Add **management reserve** to obtain the total project budget; management reserve sits outside the performance measurement baseline.
- **Contingency reserve** addresses identified uncertainty, including actively accepted risks. **Management reserve** addresses unforeseen work within scope and requires the specified authority; neither permits uncontrolled scope additions.
- Use **reserve analysis** to assess remaining time or money against risk exposure. The **cost management plan** sets units, control thresholds, reporting and rules for performance measurement; a forecast is an estimate, not automatic spending approval.

Earned value and performance indices

- **PV (planned value)** is the budget for scheduled work; **EV (earned value)** is the budgeted value of completed work; **AC (actual cost)** is the cost incurred. **BAC** is the total authorized performance measurement budget.
- **CV = EV - AC** and **CPI = EV / AC** measure cost performance. Negative CV or CPI below 1 indicates over-budget performance for the work completed; CPI above 1 indicates favorable cost efficiency.
- **SV = EV - PV** and **SPI = EV / PV** measure schedule performance in budgeted-value terms. Negative SV or SPI below 1 indicates less work completed than planned; inspect the network to assess the finish-date effect.
- Use matching units and a defined earning rule. Conventional EVM schedule variance is **not measured in days**. In earned schedule analysis, the distinct time-based measure is **SV(t) = ES - AT**, using earned schedule and actual time.

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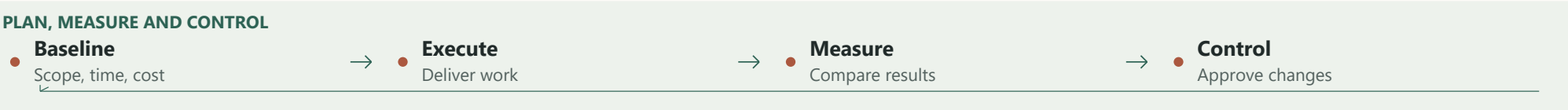

Forecasting completion costs

- **ETC** estimates the cost of remaining work; **EAC = AC + ETC** estimates total final cost. **VAC = BAC - EAC** forecasts the budget surplus or overrun; negative VAC predicts an overrun.
- If remaining work follows the original budgeted rate, **EAC = AC + (BAC - EV)**. If current cost efficiency continues, **EAC = BAC / CPI**. Use a fresh bottom-up ETC when the original estimate is no longer reliable.
- If both cost and schedule inefficiency are expected to affect remaining costs, one forecast is **EAC = AC + (BAC - EV) / (CPI × SPI)**. Select the formula from the stated assumptions, not merely the available numbers.
- **TCPI** is the efficiency required on remaining work: **(BAC - EV) / (BAC - AC)** to meet BAC, or **(BAC - EV) / (EAC - AC)** to meet an authorized EAC. A target above 1 requires better-than-unit efficiency.

Quality planning, assurance and control

- **Plan Quality Management** identifies relevant standards, objectives, metrics and methods. A **quality metric** defines an attribute and how it is measured; a **quality measurement** is the observed result.
- **Manage Quality** turns the plan into quality activities and improves processes, including audits. **Control Quality** inspects and tests outputs for correctness and records results. Quality is a shared responsibility throughout delivery.
- **Verified deliverables** have passed correctness checks in Control Quality. **Validate Scope** obtains formal acceptance from the authorized customer or stakeholder and produces **accepted deliverables**. Testing and formal acceptance serve different purposes.
- **Cost of conformance** includes prevention and appraisal, such as training and inspection. **Cost of nonconformance** includes internal failure, such as rework, and external failure, such as warranty claims or defects reaching customers.
- **Quality** is the degree to which requirements are fulfilled; **grade** categorizes intended features. A low-grade product can be high quality. Build quality into work and prevent defects rather than relying entirely on final inspection.

Analysis and quality tools

- A **cause-and-effect/Ishikawa diagram** organizes possible causes; **five whys** explores causal chains. Confirm causes with evidence. A **flowchart** shows process steps and decisions; a **check sheet** gathers structured observations.
- A **Pareto chart** ranks categories to focus improvement. A **histogram** shows a distribution; a **scatter diagram** explores association between variables. Correlation alone does not establish causation.

Predictive Planning

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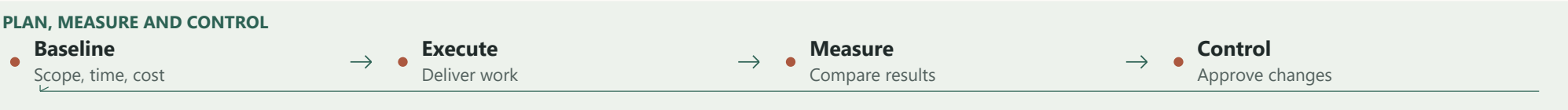

- A **control chart** tracks process stability over time. Control limits describe process behavior; specification limits express requirements. A process can be stable while still failing specifications.
- **Statistical sampling** inspects a selected subset; **attribute sampling** classifies items, such as pass/fail, while variable measurement records a numerical value. **Quality audits** assess compliance and process effectiveness; inspections assess outputs.

Resource planning and team support

- Resource processes are **Plan Resource Management, Estimate Activity Resources, Acquire Resources, Develop Team, Manage Team and Control Resources**. Plan roles, training, acquisition, release and physical-resource controls.
- **Acquire Resources** obtains people, facilities, equipment, materials and supplies. **Develop Team** improves competencies and collaboration; **Manage Team** handles feedback, performance, conflict and changes; **Control Resources** focuses on physical resources.
- A **resource breakdown structure** groups resources by category and type. Resource calendars record availability; organizational charts show reporting relationships. Negotiate shared-resource commitments with functional managers.
- **Colocation** can speed collaboration; **virtual teams** broaden access to expertise but need deliberate communication and knowledge sharing. Reduce task switching, address skill gaps, and support new members with mentoring rather than assuming immediate full productivity.

Risk identification and analysis

- A **risk** is an uncertain event or condition affecting objectives; it may be a **threat** or **opportunity**. An **issue** is a present condition needing action. Identify and reassess risks throughout the life cycle.
- Risk processes are **Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses, Implement Risk Responses and Monitor Risks**. Tailor analysis depth to exposure and complexity.
- Use interviews, brainstorming, expert judgment, prompt lists, assumptions analysis and a **risk breakdown structure**. The **risk register** records individual risks, causes, owners and responses; the **risk report** summarizes overall exposure and significant trends.
- **Qualitative analysis** prioritizes risks using probability, impact and other relevant factors. **Quantitative analysis** numerically models combined effects on objectives; it is not required for every project.
- **Sensitivity analysis** identifies influential variables, often with a **tornado diagram**. **Monte Carlo simulation** generates outcome distributions; a cumulative S-curve shows the probability of meeting a cost or date. **EMV = probability × monetary impact**, with signs reflecting gains or losses.

Predictive Planning

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PLAN, MEASURE AND CONTROL

Baseline — Scope, time, cost → **Execute** — Deliver work → **Measure** — Compare results → **Control** — Approve changes

Risk responses and monitoring

- For threats: **avoid** removes the exposure, **mitigate** reduces probability or impact, **transfer** shifts responsibility for consequences, **accept** acknowledges exposure, and **escalate** moves risks outside project authority to the appropriate owner.
- For opportunities: **exploit** aims to ensure realization, **enhance** increases probability or benefit, **share** partners with a party able to help realize value, **accept** takes advantage if it occurs, and **escalate** transfers ownership upward when appropriate.
- Assign a **risk owner**, response actions, triggers and funding. **Active acceptance** can establish contingency reserves. A **fallback plan** applies if the main response fails; a **workaround** responds to an event without a preplanned response.
- **Residual risk** remains after a response; **secondary risk** is created by the response itself. Monitor triggers, new risks, response effectiveness and reserve adequacy; use audits, analysis and risk reviews rather than treating the register as static.

Procurement strategy and contracts

- Procurement processes are **Plan Procurement Management, Conduct Procurements and Control Procurements**. Make-or-buy analysis considers skills, capacity, cost, risk and control. The **procurement strategy** sets the delivery, contracting and procurement approach.
- The **procurement statement of work (SOW)** defines purchased work. **RFI** requests information; **RFQ** requests price quotations; **RFP** requests proposals. Set source-selection criteria before evaluation and use bidder conferences to clarify requirements fairly.
- **Firm fixed price (FFP)** suits clearly defined scope and places more cost-overrun risk on the seller. **FPIF** adds incentives; **FPEPA** allows specified economic adjustments. Contract risk depends on scope clarity, terms and enforceability.
- **Cost-reimbursable** contracts pay allowable costs plus a fee: **CPFF** fixes the fee, **CPIF** links incentives to performance, and **CPAF** uses award criteria. **Time and materials** pays agreed rates and benefits from ceilings and oversight.
- In a **cost plus percentage of cost** arrangement, the fee grows with actual costs. This creates a weak cost-control incentive for the seller; distinguish it from a fixed fee or a performance-based incentive.
- Contract agreements define scope, prices, milestones, acceptance, changes, claims and termination terms. **Control Procurements** monitors compliance and seller performance and handles contractual closure; follow authorized procedures rather than informally changing commitments.

Predictive Planning / Adaptive Delivery

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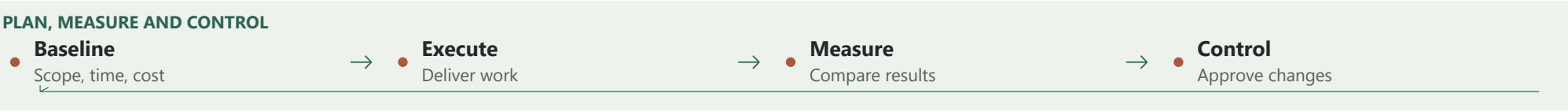

Integrated change control and closure

- For a proposed change, **record the request, analyze impacts, obtain the designated decision, update controlled documents and communicate** before implementing an approved baseline change. A **change control board (CCB)** reviews changes within its authority.
- A **corrective action** realigns future performance with the plan; a **preventive action** reduces future performance threats; **defect repair** corrects a nonconforming output. Route requests through the applicable change procedures.
- **Scope creep** is uncontrolled expansion without corresponding adjustments to time, cost or resources. A beneficial feature still needs authorization. **Configuration management** controls product attributes and versions; change control governs modification decisions.
- At **project or phase closure**, confirm acceptance and obligations, transition outputs and support arrangements, settle contracts, release resources, archive records and consolidate lessons learned. Record the reason and completed work when a project ends early.

03 Adaptive delivery and continuous improvement

Agile values and approach selection

- The **Agile Manifesto** values individuals and interactions, working software, customer collaboration and responding to change over their paired alternatives. Processes, documentation, contracts and plans still have value.
- Adaptive approaches suit evolving requirements, uncertainty and opportunities for frequent feedback. Predictive approaches suit relatively stable requirements and a well-understood delivery path. A fixed deadline or new technology alone does not determine the approach.
- Use **short feedback cycles, transparent artifacts and continuous stakeholder collaboration** to expose misunderstandings early. Plan enough to act, refine as learning occurs, and maintain quality rather than treating agility as an absence of planning.
- A **hybrid** project can combine predictive governance or physical construction with adaptive software delivery. Align interfaces, acceptance, reporting and change decisions across the approaches.

Adaptive Delivery

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DELIVER AND LEARN IN SHORT CYCLES

Order — Value and risk → **Build** — Usable increment → **Review** — Stakeholder feedback → **Improve** — Adapt the approach

Scrum accountabilities and artifacts

- The **product owner** is accountable for product value and effective Product Backlog management. **Developers** create the usable Increment and manage their work. The **Scrum Master** coaches Scrum, facilitates effectiveness and helps remove impediments.
- The **Product Backlog** is the emergent, ordered list of product work, associated with a **Product Goal**. The **Sprint Backlog** contains the **Sprint Goal**, selected backlog items and the Developers' delivery plan.
- An **Increment** is an integrated, usable addition meeting the **Definition of Done (DoD)**. The DoD is a shared quality commitment; item-specific **acceptance criteria** describe expected behavior. A **Definition of Ready** is an optional team agreement, not a required Scrum artifact.
- Use **self-managing, cross-functional teams** with the collective skills to deliver. Servant leadership supports autonomy and collaboration; the project manager or Scrum Master does not assign every task or replace the product owner's prioritization accountability.

Iterations, reviews and retrospectives

- A **Sprint** is a fixed-length container of one month or less. **Sprint Planning** establishes why the Sprint is valuable, what can be done and how the work will be approached, using capacity and past performance.
- The **Daily Scrum** is a short Developers' event to inspect progress toward the Sprint Goal and adapt the plan. Share progress, upcoming work and impediments as useful; it is not a manager's status interrogation.
- The **Sprint Review** inspects the outcome with stakeholders and adapts future work. The **Sprint Retrospective** improves quality and team effectiveness by examining working practices, interactions, tools and problems.
- **Backlog refinement** continually clarifies and splits upcoming work; it is not a prescribed Scrum event. Incomplete items return to the Product Backlog for reconsideration; do not extend the Sprint or automatically place them first in the next Sprint.

Backlogs, stories and priorities

- Organize large capabilities into **themes, epics and user stories** as useful. A story expresses a user, a need and a benefit, supported by conversation and acceptance criteria; it is not a complete specification by itself.
- Convert relevant WBS deliverables into **value-oriented backlog items**, then split and order them into feasible increments. Retain dependencies and required outcomes rather than mechanically treating every WBS element as one Sprint.
- Order work by **value, risk, urgency, dependencies and learning**. Reassess priorities as information changes. During a Sprint, Developers and the product owner may clarify or renegotiate scope without undermining the Sprint Goal.
- A **spike** is a timeboxed learning activity to reduce uncertainty. **Technical debt** is future work caused by expedient design or implementation choices; make it visible and address it deliberately alongside features and risk reduction.

Adaptive Delivery

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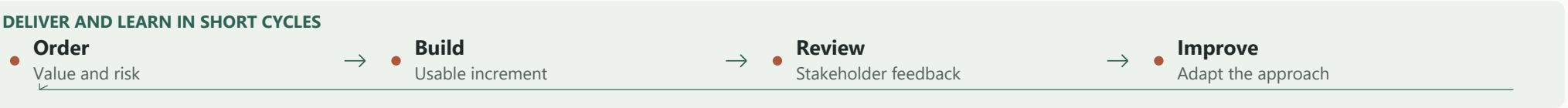

Adaptive estimation and forecasting

- **Story points** express relative size or effort using the team's shared scale; they are not fixed hours. Collaborative estimation exposes assumptions. Use lightweight estimates early and refine near-term work as details become clearer.
- **Velocity** is completed estimated work per iteration. Forecast with a representative history from the same team and estimation scale, adjusting for capacity, holidays and changed conditions. Do not compare teams or infer a precise probability from an average alone.
- A rough forecast is **iterations remaining = remaining estimated work / expected velocity**, rounded up for complete iterations. Use consistent units; a duration-based calculation also needs working calendars and a defined iteration length.
- A **burndown** plots remaining work; a **burnup** plots completed work and can show total scope. **Information radiators** make progress and impediments visible. Investigate repeated missed forecasts through capacity, dependencies, slicing, quality and retrospective learning.

Kanban and flow metrics

- **Kanban** visualizes workflow, defines explicit policies, limits **work in progress (WIP)** and pulls work when capacity is available. It supports variable incoming demand without requiring timeboxed iterations.
- When a WIP limit is reached, **finish or unblock existing work** before starting more. Queue new requests and evaluate urgency under explicit policies; exceeding the limit silently hides bottlenecks.
- **Throughput** is completed items per time period. **Cycle time** measures elapsed time from work start to completion; **lead time** includes the wider interval from request or commitment to delivery, according to defined boundaries.
- A **cumulative flow diagram** shows work across states; widening bands can reveal queues. Under stable conditions, **average WIP = average throughput × average cycle time**. Use consistent boundaries and units; choose feedback meeting cadences appropriate to the workflow.

Adaptive Delivery / Business Analysis

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DELIVER AND LEARN IN SHORT CYCLES

Order Value and risk → **Build** Usable increment → **Review** Stakeholder feedback → **Improve** Adapt the approach

Methods, coordination and release readiness

- **XP** emphasizes engineering practices such as automated testing, refactoring, pairing and continuous integration. **DSDM** uses timeboxing and MoSCoW prioritization to protect time, cost and quality while varying lower-priority scope. **Scrumban** combines Scrum and Kanban practices.
- A **Scrum of Scrums** coordinates cross-team dependencies and impediments through team representatives. Scaling approaches such as SAFe or LeSS require deliberate coordination; a representative meeting alone does not define an entire scaling framework.
- Build quality and testing into every increment. A completed increment must be **usable and meet the DoD**; release also depends on product, operational, regulatory and business decisions. The entire backlog need not be empty before value is released.
- Keep quality standards intact while negotiating scope and priorities. Plan operational transition, documentation, training, support and deployment readiness early; a successful demo alone is not proof that all release conditions are satisfied.

04 Business analysis, requirements and value

Business case and benefits

- The **business case** explains the problem or opportunity, objectives, alternatives, expected benefits, costs, risks and recommendation. Feasibility examines whether a proposed solution is viable; approval is a governance decision.
- The **benefits management plan** defines target benefits, measures, owners, timing and how benefits will be sustained. Distinguish an **output** delivered by the project from an **outcome** enabled by its use and the **benefit** that outcome creates.
- The sponsor or business owner is accountable for business justification under organizational governance; the **business analyst (BA)** supports needs analysis and evidence. The project manager keeps delivery aligned with the business need and escalates threats to continued value.
- **Current-state analysis** identifies the problem and causes; **future-state analysis** defines desired capabilities. **Gap analysis** identifies what must change. Revisit viability if competitors, regulation or strategy materially change the expected benefits.

Business Analysis

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CONNECT REQUIREMENTS TO BUSINESS VALUE

Need — Problem or opportunity → **Define** — Requirements → **Trace** — Delivery and tests → **Evaluate** — Benefits realized

Investment and market evaluation

- **ROI = net benefit / investment cost × 100%**, using an explicitly defined period and cost basis. **Payback period** measures time to recover investment and does not by itself capture all later benefits or time value of money.
- **Net present value (NPV)** discounts future net cash flows and subtracts the investment. **Internal rate of return (IRR)** is the discount rate that makes NPV zero. Evaluate against the required return and relevant assumptions; an annualized yield is not the same as a cash amount.
- **SWOT** examines internal strengths and weaknesses and external opportunities and threats. **Benchmarking** compares practices or results with peers to identify improvement opportunities; neither alone proves customer demand.
- Use customer research, focus groups and **prototypes or MVP experiments** to test market assumptions before full investment. A prototype explores an idea; a **minimum viable product** is the smallest useful experiment or offering that enables validated learning.

Business analysis and elicitation

- The **BA** identifies needs, elicits and analyzes requirements, supports traceability and evaluates solution value. Collaborate with the project manager on delivery impacts, the product owner on priorities, SMEs on expertise and users on actual workflows.
- Identify affected **internal and external stakeholders**, their interests, influence and decision rights. A business analysis communication approach specifies audiences, channels, artifacts, timing and review responsibilities; include distributed or less-visible user groups.
- Use **interviews** for depth, **observation** for actual work, **surveys** for broad input, **focus groups** for moderated feedback and **facilitated workshops** to reconcile cross-functional requirements.
- **Brainstorming** separates idea generation from evaluation. **Delphi** uses anonymous expert rounds with controlled feedback. **Affinity diagrams** group related ideas; **mind maps** show relationships around a topic.
- Prepare elicitation objectives and participants, listen actively, document findings, then **confirm elicitation results** with participants. Resolve ambiguity and conflicting interpretations before treating notes as agreed requirements.

Business Analysis

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KNOWLEDGE CHEATSHEET

CONNECT REQUIREMENTS TO BUSINESS VALUE

Need — Problem or opportunity → **Define** — Requirements → **Trace** — Delivery and tests → **Evaluate** — Benefits realized

Requirement types and models

- **Business requirements** describe organizational goals; **stakeholder requirements** describe stakeholder needs. **Solution requirements** define capabilities and qualities; **transition requirements** enable the move to the new state, such as migration and training.
- **Functional requirements** describe behavior or capabilities. **Nonfunctional requirements** define qualities and constraints, such as reliability, uptime, usability, security, data integrity and performance; make them measurable.
- A **context diagram** defines the system boundary and external interactions. **Process flows** show sequence and decisions; **data flow diagrams** show data movement and transformation; **use cases** describe actor-system interactions, including alternatives.
- **Wireframes** communicate screen structure; **user interface flows** show navigation. **Low-fidelity prototypes** quickly explore concepts; **high-fidelity prototypes** closely represent intended interaction or appearance. Review models with users to expose gaps.

Traceability and requirement control

- A **requirements traceability matrix (RTM)** links requirements to their origins, business objectives, designs, deliverables, tests and acceptance evidence. Maintain identifiers, status, owners and relevant dependencies.
- **Bidirectional traceability** exposes missing implementation and work without a justified requirement. It supports change-impact analysis, coverage assessment and delivery readiness; it helps control scope but does not independently prevent scope creep.
- For a requirement change, clarify the need, analyze value and impacts, obtain approval through the applicable governance, then update controlled requirements, traceability and plans or backlog. Elicitation-stage edits still follow the agreed decision process.
- Use **MoSCoW**: must have, should have, could have and won't have this time. **Weighted ranking** scores alternatives against agreed criteria. Resolve competing requirements with stakeholders and explicit decision rights rather than accepting every request.

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Roadmaps and delivery horizons

- A **product roadmap** communicates product direction, intended outcomes and the expected sequence of major capabilities. Collaborate with product leadership, sponsors, users and delivery stakeholders; uncertain distant dates are forecasts.
- A **release plan** groups capabilities into expected releases and milestones; an **iteration plan** details a near-term timebox. Keep strategic direction, release forecasts and immediate work at different levels of detail.
- A **story map** organizes user activities and stories across a journey and helps slice releases that deliver coherent user value. It is useful for discussing a roadmap with an adaptive team.
- Validate the smallest valuable release against goals, dependencies, risks and acceptance conditions. A new feature request should trigger value and impact analysis; a roadmap guides evolution without freezing all future requirements.

Verification, validation and solution evaluation

- **Requirements verification** checks that requirements are well formed, clear, consistent, complete and testable. **Requirements validation** checks that they accurately represent stakeholder needs and support the intended business outcome.
- Use **peer reviews and structured walkthroughs** to find ambiguity, omissions and standards violations. Define measurable **acceptance criteria** and expected results before testing; log defects and analyze discrepancies rather than assuming successful execution proves value.
- **Functional testing** checks behavior; **integration testing** checks interfaces and combined components; **performance testing** checks load and response characteristics. **User acceptance testing (UAT)** evaluates fitness for intended business use with authorized users.
- **Day-in-the-life scenarios** simulate realistic end-to-end user work; **exploratory testing** combines learning and test design during execution. Select techniques from the evaluation objective and trace results back to requirements.
- A **go/no-go decision** considers acceptance evidence, unresolved defects, operational readiness, risk and business value under designated authority. Obtain formal sign-off where required, plan the handover, and measure realized benefits after deployment.