Agile Project Management Review

The following study materials reproduce key points related to iterative, incremental, agile, and hybrid projects. Some fill-in-the-blank worksheets with answer keys are also included.

Module 1 Agile Concepts Review

Here are key points about agile that are presented in Module 1.

- In the 1990s, teams experimented with new and old project management ideas and, in grassroots fashion, founded frameworks, for example, Scrum. Common themes:
  - Better collaboration between business teams and software developers
  - Self-organizing teams with close relationships
  - Efficient ways to develop, test, and deliver working products/features and frequent delivery of this business value

- In 2001, 17 software developers coined "agile" as an umbrella term and acknowledged agile commonalities using the **Agile Manifesto** (value statements) and **agile principles.**

- Predictive is best for **definable work** and agile is best for **high-uncertainty work.** Fit the methodology to the need. (Combining agile and predictive approaches makes hybrid projects.) Plan in increments/iterations when early results are needed before all requirements can be known.

- Agile uses **progressive elaboration.** Since the phases of agile projects are typically very short, the progressive elaboration in this case occurs between phases. (Changes to plans during a phase are discouraged.) Each agile iteration or sprint is its own brief project phase with a full or partial set of Process Groups (Initiating, etc.).

- Agile uses **rolling wave planning.** The work to be accomplished in the near term is planned in detail, while future work is planned in a more general manner.

- If agile team sizes are small and stable, the cost and staffing curve will be fairly flat and therefore easy to predict and plan for.

- Agile projects may have significant uncertainty and risk related to that uncertainty. This risk gradually lowers as more things are decided and executed.

- Agile approaches, by design, work to keep the cost of changes lower throughout the project so that changes can be accommodated even late in a project.

- **Iterative life cycle:** "The project scope is generally determined early in the project life cycle, but time and cost estimates are routinely modified as the project team's understanding of the product increases. Iterations develop the product through a series of repeated cycles, while increments successively add to the functionality of the product."
- **Incremental life cycle:** "An adaptive project life cycle in which the deliverable is produced through a series of iterations that successively add functionality within a predetermined time frame. The deliverable contains the necessary and sufficient capability to be complete only after the final iteration."
- **Agile life cycle** (change-driven or adaptive): A type of iterative *and* incremental project life cycle. The increment to produce is approved before the start of the iteration. While iterative and incremental life cycles can have longer iterations, agile iterations are very rapid (e.g., two to four weeks long), to address risk and costs as issues emerge.

Fill in the blanks for the worksheet in Exhibit 1-1 (shown completed in Exhibit 1-2).

Exhibit 1-1: Project Life Cycle Types Worksheet

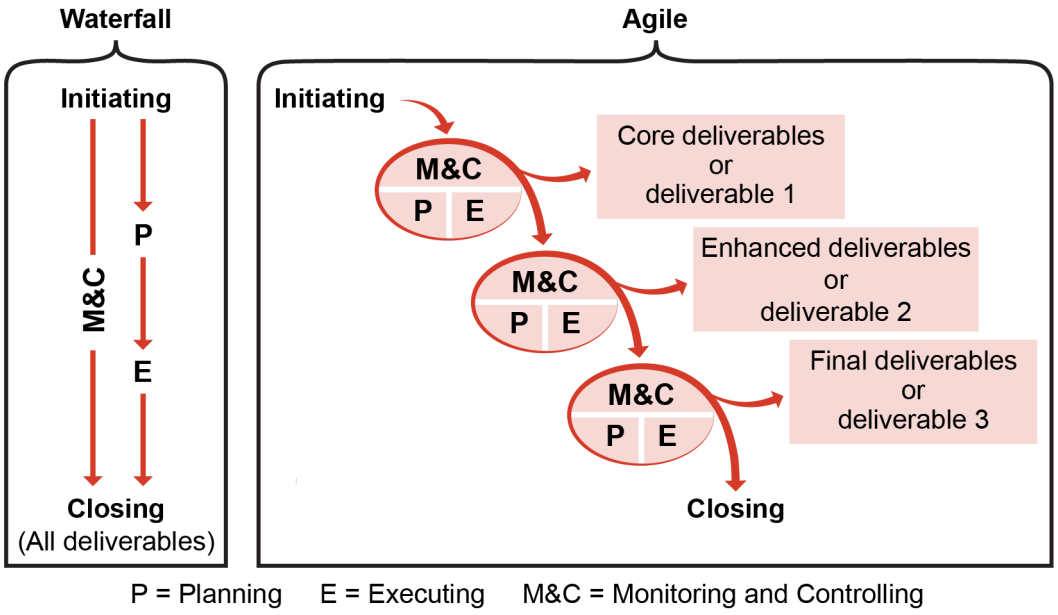
Approach	Requirements	Activities	Delivery	Goal
Predictive	Fixed	Performed once for the entire project	Single delivery	Manages _____
		Repeated until _____		
Incremental	Dynamic	Performed _____ for a given _____		
Agile	Dynamic	Repeated until _____		Customer value via _____ and _____

Exhibit 1-2: Completed Project Life Cycle Types

Approach	Requirements	Activities	Delivery	Goal
Predictive	Fixed	Performed once for the entire project	Single delivery	Manages cost
Iterative	Dynamic	Repeated until correct	Single delivery	Correctness of solution
Incremental	Dynamic	Performed once for a given increment	Frequent smaller deliveries	Speed
Agile	Dynamic	Repeated until correct	Frequent small deliveries	Customer value via frequent deliveries and feedback

Review predictive (waterfall) and agile (iterative and incremental) in Exhibit 1-3.

Exhibit 1-3: Predictive (Waterfall) Life Cycle versus Agile Life Cycle



Fill in the blanks for the worksheet in Exhibit 1-4 (shown completed in Exhibit 1-5).

Exhibit 1-4: Project Life Cycle Continuum Worksheet

Predictive	Iterative...Incremental	Agile
Requirements are defined up-front before development begins.	Requirements _____ _____ during delivery.	Requirements _____ _____ during delivery.
Deliver plans for the eventual deliverable. Then deliver only a single final product at end of project timeline.	Delivery can be _____ _____ .	Delivery occurs _____ _____ .
Change is constrained as much as possible.	Change is _____ .	Change is _____ .
Key stakeholders are involved at specific milestones.	Key stakeholders are _____ _____ .	Key stakeholders are _____ _____ .
Risk and cost are controlled by detailed planning of mostly knowable considerations.	Risk and cost are controlled _____ _____ .	Risk and cost are controlled _____ _____ .

Exhibit 1-5: Completed Project Life Cycle Continuum

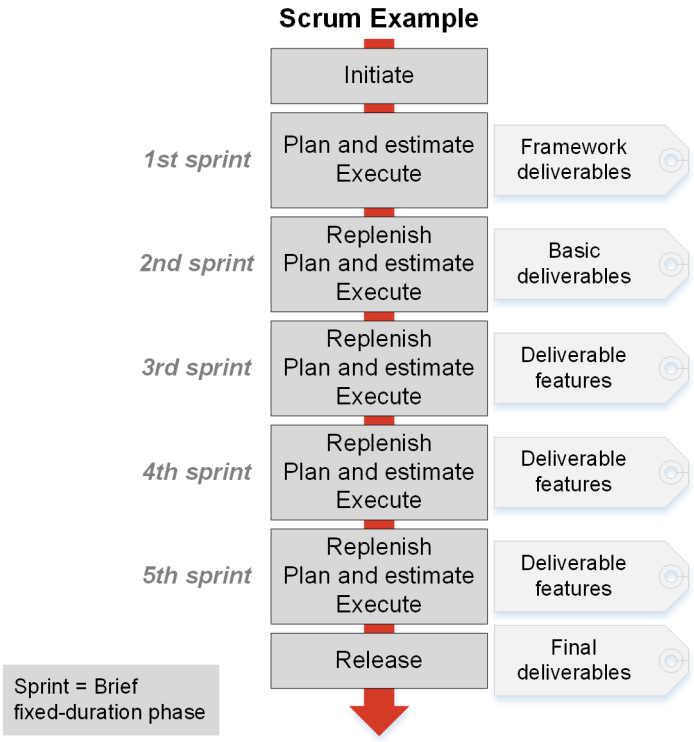
Predictive	Iterative	Incremental	Agile
Requirements are defined up-front before development begins	Requirements can be elaborated at periodic intervals during delivery		Requirements are elaborated frequently during delivery
Deliver plans for the eventual deliverable. Then deliver only a single final product at end of project timeline	Delivery can be divided into subsets of the overall product		Delivery occurs frequently with customer-valued subsets of the overall product
Change is constrained as much as possible	Change is incorporated at periodic intervals		Change is incorporated in real-time during delivery
Key stakeholders are involved at specific milestones	Key stakeholders are regularly involved		Key stakeholders are continuously involved
Risk and cost are controlled by detailed planning of mostly knowable considerations	Risk and cost are controlled by progressively elaborating the plans with new information		Risk and cost are controlled as requirements and constraints emerge

Review some specifics about agile:

- Agile projects use a product backlog to control scope and prioritize iteration activities.
- Agile projects can use sequential or overlapping project phases.
- When the team meets in its regular review and planning session, team members determine how many of the highest-priority requirements can be completed in the current iteration.
- Agile projects have brief phases or iterations called sprints.
  - In **iteration-based agile,** iterations are fixed in duration so each phase will likely have the same costs and be straightforward to budget.
  - In **flow-based agile,** the duration of each sprint is allowed to be flexible to complete the sprint's deliverable(s). Work-in-process (WIP) is constrained.
- At the end of each iteration, the product is ready for customer review, meaning that features are stable, complete, and finished, but customer acceptance is not required.
- Sponsor and customer review the product to provide feedback. Incremental deliverables are valuable and reassuring to the customer.

Note the Scrum terms in Exhibit 1-6.

Exhibit 1-6: Iteration-Based Agile Life Cycle (Scrum Example)



Review the following agile concepts:

- High-uncertainty work is hard to define or has fast-changing requirements.
- Requirements uncertainty + complexity = risk.
- Agile projects address risk, requirements uncertainty, and complexity by exploring the feasibility of potential solutions in short cycles, building on success and learning from failures.
- Evaluation and feedback are the tools agile uses to embrace uncertainty.
- Baby steps to move to agile: Divide projects or deliverables into smaller releases or select a few agile tools.

Fill in the worksheet shown in Exhibit 1-7 (shown completed in Exhibit 1-8).

Exhibit 1-7: The Agile Manifesto for Software Development Worksheet

We value these items more (and so are higher priority)	These items still have value (but are lower priority)
	over processes and tools.
Working software...	
Customer collaboration...	
	over following a plan.

Exhibit 1-8: Completed Agile Manifesto for Software Development

We value these items more (and so are higher priority)	These items still have value (but are lower priority)
Individuals and interactions...	over processes and tools.
Working software...	over comprehensive documentation.
Customer collaboration...	over contract negotiation.
Responding to change...	over following a plan.

Fill in the worksheet below (shown completed afterward).

The same authors also developed a set of 12 clarifying principles:

1. Our highest priority is to satisfy _____ through _____ and _____ delivery of valuable software.
2. Welcome _____, even ____ in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference for the _____ timescale.
4. _____ and _____ must work together daily throughout the project.
5. Build projects around _____. Give them the _____ and _____ they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is _____.
7. _____ is the primary measure of progress.
8. Agile processes promote _____development. The sponsors, developers, and users should be able to _____.
9. Continuous attention to _____ and good _____ enhances agility.
10. Simplicity—the art of maximizing the amount of _____—is essential.
11. The best architectures, requirements, and designs emerge from _____ teams.
12. At _____ intervals, the team reflects on _____, then tunes and adjusts its behavior accordingly.

The completed 12 clarifying principles:

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference for the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity—the art of maximizing the amount of work not done—is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Continue reviewing agile concepts:

- A person who embraces the four Agile Manifesto values, clarified by the 12 principles, then adopts what is called an **agile mindset.**
- Success on an agile project requires more than just motivated, self-organizing team members. It requires a deeper level of commitment from the customer or sponsor.
- Contracts need to flexible and cannot take the place of daily committed interaction

Fill in the worksheet shown in Exhibit 1-9 (shown completed in Exhibit 1-10).

Exhibit 1-9: Agile Roles Worksheet

Agile Role **(Indicate if Scrum Master, Product Owner, or Cross-Functional Team Member)**	**Agile Role Information**
	Like a project manager role except that the role must be viewed through the agile mindset.
	Customer representative who commits to those daily in-person interactions and collaborations to provide feedback and direction on priority.
	A generalizing specialist.
	Specialist with required technical expertise.
	Keeps agile process on track but surrenders other types of management whenever possible.
	Perhaps the most important agile role.
	Has some level of skill in other team members' areas of expertise.
	Plans work for the overall project and the next iteration and discusses potential changes in direction or requirements with sponsor.
	Represents the needs of a number of other stakeholders from the customer's side.
	A servant leader whose purpose is to facilitate, problem solve, encourage collaboration, and encourage/enforce use of the agile framework.

Exhibit 1-10: Completed Agile Roles

Agile Role	Agile Role Information
Scrum master	Like a project manager role except that the role must be viewed through the agile mindset.
Product owner	Customer representative who commits to those daily in-person interactions and collaborations to provide feedback and direction on priority.
Cross-functional team member	A generalizing specialist.
Cross-functional team member	Specialist with required technical expertise.
Scrum master	Keeps agile process on track but surrenders other types of management whenever possible.
Product owner	Perhaps the most important agile role.
Cross-functional team member	Has some level of skill in other team members' areas of expertise.
Product owner	Plans work for the overall project and the next iteration and discusses potential changes in direction or requirements with sponsor.
Product owner	Represents the needs of a number of other stakeholders from the customer's side.
Scrum master	A servant leader whose purpose is to facilitate, problem solve, encourage collaboration, and encourage/enforce use of the agile framework.

Continue reviewing the agile concepts:

- Project managers on hybrid projects may direct and control predictive project work but act as the product owner for the agile parts of a project.
- **Iteration planning meetings.** A meeting to get the product owner to provide iteration direction for the team (backlog refinement). Includes clarifying "done" in terms of the quality or functionality of the deliverable. Agile tasks:
  - An **epic** is undecomposed work that will need to be decomposed into stories later.

  - A **spike** is a potential task that requires research; assignment gives the team member time to figure out what to do and how much work it will be.
  - A **story** is a description of a small chunk of new work to be done that can be completed on its own and focuses on what the deliverable needs to be able to do.
  - A **defect** is a description of a problem with an existing deliverable and how the deliverable should work once it is fixed.

- **Daily standup meetings.** A meeting limited to 15 minutes to respect team members' time. Each person shares what they got done yesterday, what they plan to do today, and issues that could get in the way. Problem solving is reserved for offline discussions.

- **Demonstration meetings.** A show-and-tell meeting where a team member shows a working deliverable/feature to the product owner to prove a usable product was made.

- **Retrospective meetings.** An end-of-iteration meeting to indicate what got done versus the plan and what worked well versus what needs improvement, plus an action plan.

Review some basic concepts of kanban boards.

- A **kanban board** is a physical board with sticky notes or a virtual board in software with a set of several columns for holding work in various stages of completion.
- A **product backlog** is a decomposed set of current requirements and overall scope to be done. It is a prioritized list in the form of epics, spikes, stories, or defects.
- There are one or more work-in-process (WIP) columns, possibly with size limits.
- Completed work is moved to a done column.
- Kanban boards empower team members because they can choose what to work on next, but the choice is part of a discussion

Review concepts related to agile project success.

- Customer satisfaction is a critical success factor for an agile or hybrid project.

- Project success depends on continuous, active communication on the part of all parties.

- Defining success involves defining what is meant by "done:"
  - "Done" for a user story (work item) will include acceptance criteria for features; passing of required individual tests, system tests, and quality tests; and a successful demonstration of the working deliverable to the product owner.
  - "Done" for an iteration is the completion of all planned WIP for that iteration.
  - "Done" for the project is the project's release criteria, which may change.

- To promote sustainable development, a project success criteria can be team health.

Review the following points related to agile and compliance requirements:

- When switching to agile, predictive compliance processes may become obsolete. A roadmap can track open projects and projects still missing compliance artifacts.
- While agile prefers collaboration over contract negotiation, any project will need legally reviewed, enforceable contracts. Agile contracts can build in scope flexibility by prioritizing schedule or budget limitations.
- On agile projects, there may be a mindset to overcome that the project can worry about compliance later. No project methodology can omit mandatory requirements.
- External requirements may force parts of a project to be done in a predictive fashion.

Review concepts related to agile and culture.

- A culture assessment looks at aspects of culture related to agile readiness: buy-in, trust in the team, and the decision-making powers of the team.
- It is vital for employees to feel they are in a safe work environment (e.g., ability to experiment and fail but learn) in order for agile to succeed.
- Evaluate culture as a set of priorities (e.g., priority of time to market for a telecom versus a priority on stability and throughput for a government organization).
- Siloed organizations can hinder attempts to form cross-functional agile teams.
- In a matrix organization, agile is easier, especially if some roles have authority that cuts across departments directed toward overall process flow efficiency.
- Switching to agile is a second-order change: transformational and irreversible.
- Finance needs to adapt and capitalize the agile product differently.
- Management should move toward team incentives and shorter-term budgets.
- Many organizations tackle change management projects as agile projects because they build in feedback and replanning at regular intervals. Changes are added to the backlog, treated as experiments, tested for a time, and refined or abandoned based on feedback.
- External changes will be easier to make since the project is planned in detail for only the next iteration. The product owner and the team decide how to reprioritize the backlog.

Agile Concepts from Module 2

Review the following agile concepts.

- **Self-organizing teams:** "A team formation where the team functions with an absence of centralized control."
- Project manager and team member roles are more fluid, equal, and collaborative.
- Project managers in agile teams are less hands-on: They provide support but trust team members to work with minimal supervision.
- The "servant leader" model of leadership emerges through the manager's service to the team: putting the team's interests first, building knowledge and skills to work autonomously, and creating a harmonious and collaborative team environment.

Fill in the worksheet shown in Exhibit 1-11 (shown completed in Exhibit 1-12).

Exhibit 1-11: Predictive versus Agile Project Management Approaches Worksheet

Predictive Approach	Agile Approach
Hierarchical structure: authority passes from project sponsor to project manager to team members	Decision making power is _____. Team members work closely with _____.
Project manager is responsible for making initiating, planning, executing, controlling, and closing project work and ultimately is responsible for project success.	_____ shares in planning, estimating, and executing project work, drawing on _____ _____.
Deviations from authority are viewed as issues that are escalated up the hierarchy for resolution.	Project teams are _____. Emphasis is on ____ ____, _____, creativity, and harmony.
Project managers focus on processes to ensure monitoring and control.	Team facilitators focus on processes that foster __ _____ and _____.

Exhibit 1-12: Completed Predictive versus Agile Project Management Approaches

Predictive Approach	Agile Approach
Hierarchical structure: authority passes from project sponsor to project manager to team members	Decision making power is shared. Team members work closely with stakeholders.
Project manager is responsible for making initiating, planning, executing, controlling, and closing project work and ultimately is responsible for project success.	Project team shares in planning, estimating, and executing project work, drawing on their own expertise and experience.
Deviations from authority are viewed as issues that are escalated up the hierarchy for resolution.	Project teams are "self-organized." Emphasis is on collaboration, innovation, creativity, and harmony.
Project managers focus on processes to ensure monitoring and control.	Team facilitators focus on processes that foster communication and collaboration.

Review information on agile team roles:

- **Cross-functional team members** produce high-quality incremental work in the shortest possible time. They help define the backlog. They possess product area expertise and are ideally full time on the project.
- The **product owner** represents customer interests and is responsible for delivering value to the customer. The product owner defines the project's direction and prioritizes work, based on business analysis and stakeholder discussions, and provides feedback. The product owner needs expertise in business analytics and organizing workflow. This role may be shared with a sponsor, who oversees the budget.
- The **Scrum master** (servant leader, team facilitator, or project manager) focuses on the team, making the jobs of the team members easier and building the team's performance through coaching and skill and competency development. This position requires people skills and knowledge of the organization and its processes.

Review some concepts related to the servant leader.

- The servant leader emphasizes facilitator and coach roles. The *Agile Practice Guide* says the role is to "facilitate the team's discovery and definition of agile."
- While the traditional leader communicates a vision, the servant leader works with the team to define a team goal.
- A traditional leader creates a productive work environment; a servant leader helps the team define what they need to be creative and supports the team to create their own environment. A servant leader is focused less on process and more on results.

- A servant leader puts the needs of the team above individual needs.
- The *Agile Practice Guide* lists essential traits for servant leaders:
  - Good listening skills and emotional intelligence. Emotional intelligence begins with self-awareness and leading others to empathy.
  - Ability to create harmony—to resolve conflict in an empathetic way and to persuade rather than force.
  - Builds communities in the organization based on shared values and goals.
  - Solves problems—learns from experience and sees patterns, context, and solutions.
  - A desire to nurture the growth of team members, professionally and personally.
- Effective agile project managers suit their leadership style to the current need, such as adaptability, tolerance of stress, desire for influence, etc.
- Agile projects assume expertise, commitment, and trust. In this respect, the agile team begins at the fourth stage of the situational leadership model.
- Servant leaders address and remove impediments and manage conflict in part by working on their own communication skills, especially listening, influencing, analytical skills, and problem-solving skills.
- When mediating conflicts and creating agreements, the agile team leader will apply consensus-building skills but will also try to develop these abilities in the team.
- Conflicts in daily standup meetings are usually resolved in separate meetings with those directly involved in the conflict.
- Coaching is the preferred method of changing behavior—showing how a task is done, motivating behavior change, and encouraging all team members to become leaders.

Review the following information about agile stakeholders.

- Product owners work with stakeholders continuously and directly throughout the project.
- The product owner must negotiate the nature, priority, and timing of deliverables and plan appropriate communications with stakeholders. This requires collaboration and trust.
- Stakeholders may also need to be educated in the agile process itself regarding:
  - The important role of timely stakeholder feedback.
  - The positive nature of change and how it will be managed and communicated.
  - Benefits of the agile approach in delivering greater value.

Review the following information about acquiring and forming agile teams.

- Agile teams tend to be smaller (three to ten cross-functional members).
- Team members are "generalizing specialists." They have a defined area of expertise but good general skills. The *Agile Practice Guide* refers to this as a "T-shaped" person.
- Team members should be dedicated 100 percent to the project to avoid multi-tasking (mistakes are more likely), foster a team identity, and support collaboration.
- Onboarding discussions should include a summary of the team's values, such as collaboration and respect. A basic value for agile teams is participation: All members are expected to participate in meetings, brainstorming, and problem solving.
- During the forming stage, agile team members help define roles and responsibilities, team ground rules, and meetings.
- In addition to a project charter, an agile team may use an **agile team charter** (a form of social contract) to document team agreements concerning ground rules (e.g., meeting behavior), team values (e.g., full participation), and work processes and terminology (e.g., work-in-process limits). The *Agile Practice Guide* refers to rules and understandings about work processes as "working agreements."
- The process of creating the team charter may be the team's first experience of collaborating. Team charters may not be needed for established teams.
- Colocation is preferred on agile projects, since it makes collaboration easier and eliminates communication-related delays that could hinder the rapid delivery of work.

Review information on agile meetings.

- Rules about meetings are woven into the DNA of agile projects and are very prescriptive.
- Standup meetings are held daily and should last no longer than 15 minutes.
- The standup meeting agenda is highly formatted. If a problem arises, it is tabled and assigned to a separate meeting with only those team members directly involved.
- Only the meeting leader, the Scrum master, and team members are allowed to speak. Stakeholders may attend but may not speak.
- Although the Scrum master facilitates the meeting, meeting attendees address each other, not the Scrum master.

Review the following information on agile project collaboration.

- In agile environments, when a project is subject to high variability, the value of team benefits gained from collaboration cannot be understated. Higher productivity coupled with more innovative problem solving will allow a team to adapt efficiently to changes as they arise, as will increased communication and knowledge sharing.
- For consensus building, agile teams may use the "fist of five" approach. The team leader calls for a show of support for an option. A closed fist indicates no support; five fingers indicate full support. A team member voting less than three fingers explains his or her reasoning. The voting is repeated until everyone holds up three or more fingers. If a decision cannot be reached, the leader may table the decision.

- In an agile project, the product manager interacts with the product owner, who represents the needs of the customer and other constituents, such as product users.
- In agile projects, stakeholders are considered integral to the team; their input as subject matter experts, testers, and evaluators of the delivered product is essential.
- Active engagement with stakeholders is especially important for projects that experience high levels of change.
- A project manager may institute a policy of "aggressive transparency," inviting stakeholders to reviews and meetings throughout the project life cycle, sharing updates in a public project space, or using interactive communications technology.
- Agile projects focus on **co-creation**, which places greater emphasis on bringing stakeholders into the project team as partners. It is a step beyond merely incorporating stakeholder views into design or other plans; rather, it brings customers (stakeholders) into the fold as active participants in the development, design, and/or construction phases. This can reveal new ways of problem solving.
- With the ability to bypass some layers of organizational hierarchy, agile teams can adapt more quickly to address unexpected issues and changes. This allows for more efficient information sharing, which can help mitigate risk, build trust, reduce costs, and ultimately increase the likelihood of project success.
- In agile projects, the voice of the customer (VOC) from quality function deployment (QFD) can be used to create user stories.

Review information on agile team development.

- Provide mentoring that helps stakeholders and team members develop an agile mindset and "advocate for team members' training and development," including directing them to agile courses, coaches, or events.
- Agile projects work to empower team members by giving team members autonomy over the way they do their assigned work.
- In agile projects, small opportunities to celebrate may arise as well at the end of each sprint or iteration. A retrospective session might include a team celebration.

Agile Concepts from Module 3

Review the following information related to portfolio and program management in relation to agile.

- To integrate multiple agile projects, the program manager may want to adopt a framework such as Scrum of Scrums (SoS), which helps coordinate the work of multiple small teams on one large agile project or on several projects in a program.
- When an organization has decided to use agile or hybrid projects, the PMO should develop agile-specific tools, templates, measurements, and so on. The PMO will also

provide expert agile coaching and consulting and up-to-date information on customer attitudes. It may recommend a particular project life cycle for a particular project.

- Instead of regularly assembling new and variable-size teams and attempting to provide stable pieces of scope, for agile the PMO feeds chunks of less-stable scope to stable teams based on priority and velocity.

- PMOs may measure the following in regard to adoption of one or more agile framework(s):
  - **Engagement duration.** How long agile projects are taking versus how long similar predictive projects have taken.
  - **Progress.** Evaluation of periodic status reports both for the information they contain regarding ongoing projects and for their value in monitoring, controlling, and correcting course.
  - **Quality (e.g., defects).** The number of quality issues such as number of defects when using agile as compared to the number when using predictive methods.
  - **Dependencies.** PMOs compare how soon internal or external dependencies are identified and how much time is available for decision making before they became an issue to the time available on average on predictive projects.

- A controlling or directive PMO may develop agile-specific policies and procedures, and it may mandate use of specific agile methodologies and allowed tailoring options. However, the desire to provide consistency to projects could be at odds with perhaps the most important thing any PMO should do: Develop an agile mindset. This means that the PMO places high importance on customer collaboration and cross-functional team member engagement and buy-in. The advantages of mandates regarding methodology or tailoring could include a universal set of agile metrics and a workforce that understands the chosen methodology well and can easily join different agile teams. However, it would violate the principle of self-organizing teams and would prevent those teams from regularly reflecting on what works and refining their approaches.

- A supportive PMO can make this transition fairly easily by designing itself as an internal "seller" of valuable services and allowing agile teams to "buy" those services and self-select in. This is called being invitation-oriented.

- Organizations that decide to adopt agile will need to bring the PMO along using change management to change not only their policies and procedures and so on but also their mindset (an aspect of culture, so expect it to be difficult and require sustained effort).

Review the following information about organizational structures and agile.

- Agile projects or other methodologies that emphasize a high degree of collaboration may face administrative and cultural barriers in a functional or weak matrix structure.

- A strong matrix organization is suited to agile projects because it encourages the Scrum master, product owner, and team to collaborate on decision making, budgeting, realistic and achievable planning, and execution.
- Virtual structures will be especially challenging for agile teams because one precept is that face-to-face interaction is the best way to communicate on such projects.

Review the following information related to incremental value.

- Providing incremental value is a form of reassurance to clients. This is a basic purpose of a demonstration ceremony. In addition to confidence and visibility, increments provide clients with greater control, such as the ability to provide feedback.
- On iterative projects, feedback helps refine requirements for successive iterations so the final deliverable is superior to what it would have been.
- On incremental projects, the deliverables received so far may not be modifiable (excepting after rework given an approved change request), but the remaining deliverables could be replanned.
- On iterative, incremental, and agile projects, feedback allows:
  - Exploring uncertainty at a low cost.
  - Testing of requirements for technical feasibility.
  - Assessing the degree of customer acceptance and suitability.
  - Deviation from the initial vision or concept.
  - Validating whether resources have sufficient capability and capacity to succeed.
  - Reflecting on the processes used and improving their efficiency and effectiveness.
- Incremental deliverables provided after regular iterations in agile create a work cadence, or pace, that can be sustained and helps ensure that the team gets used to delivering working product on a regular basis.
- Agile stresses the need for all deliverables presented to customers to be fully tested on an individual and system (integrated) basis and be fully functional for the demonstration. Otherwise, a poorly functioning deliverable could be interpreted as being indicative of the future quality of the remaining deliverables.
- An iterative life cycle provides partially completed or unfinished work on purpose to elicit feedback and refine plans, but be careful to set expectations properly.
- If increments will be released as saleable goods or services before the end of the project, business and reputation risks will be increased, such as not providing sufficient value or mass use revealing new flaws.
- On an iterative life cycle, a prototype or other deliverable must be produced that can be subjected to repeatable testing using the scientific method.

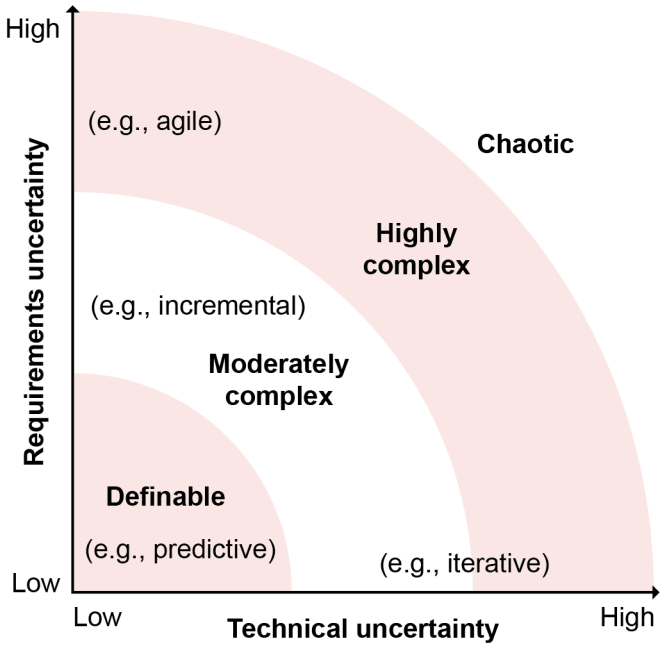
- On an incremental or agile life cycle, feasibility starts with the **minimum viable product (MPV),** the product, service, or result with just those features or qualities that enable that deliverable to do the basic things that it was meant to do.
- Determining a feasible MVP from a project manager/team perspective involves decomposing project tasks to the level that work needed for the MVP is completely separate from other work.
- Frequency of delivery can produce a significant amount of business value for both the project team's organization and for clients.
- For the project team's organization, frequent delivery may enable the producing organization to justify more frequent progress billings and make use of those funds sooner. One example of this is to bill for stories at a fixed price (i.e., microdeliverables).
- For clients, urgency can equate to faster time to market. Getting to market faster than a competitor can be key to capturing early market share. It can also enable becoming more adaptive to change in general.

Review the following information related to choosing a project management life cycle.

- Requirements and technical uncertainty are one source of project complexity, but even straightforward projects from these perspectives can have high complexity. Part of this will be due to project magnitude.
- During the introductory phase of the product life cycle, projects are used to generate and develop product concepts and possibly new production or marketing methods. This phase may favor use of iterative or agile methodologies.

Exhibit 1-13 shows how project life cycle choice may relate to requirements and/or technical uncertainty.

Exhibit 1-13: Requirements versus Technical Uncertainty



Review the following information related to the *PMBOK® Guide's* Process Group and Knowledge Area mapping and agile projects.

- The PMI asserts that this mapping holds true even for agile projects. However, some of these processes will look very different on an agile project, and agile will use different terminology and very different timing for many processes.
- The Initiating Process Group will frequently revisit and revalidate the project charter and its objectives (unlike on a predictive project that freezes the charter once approved) and will regularly perform Initiating processes to adjust for changes (often at the beginning of each new iteration).
- For the Planning Process Group, an initial set of plans will continue to evolve over the course of the project, adapted to address unexpected changes as they arise. The intent is that plans are never made in isolation.
- For the Executing Process Group, items are pulled from the backlog based on priority and capacity rather than being an arbitrary or difficult-to-reschedule process. After each work iteration, the team undergoes a retrospective review to assess work completed, review project metrics, and discuss their next steps.
- For the Monitoring and Controlling Process Group, the backlog provides a single space to control project work, perform collaborative change control, and validate the current understanding of the scope. The project team will begin work on a story, defect, spike, or epic at or near the top of the prioritized backlog when capacity is available and there are no constraints. Control is exercised by backlog grooming. Progress is often measured in the form of burnup or burndown charts.

- For the Closing Process Group, even if a project is closed prematurely or due to a budget limit, it is highly likely that value will still have been generated by the project.
- For the Project Integration Management Knowledge Area, agile approaches integration as a total team task. Product owner (feedback), Scrum master (accountability), and cross-functional team members (domain experts) all need to contribute.
- For the Project Scope Management Knowledge Area, scope planning will deliberately be restricted to only high-level planning up front. Often there is a gap between requirements as stated and actual business needs. Agile allows scope to evolve or be better understood after experimentation and refinement. In agile, current project requirements equal the backlog.
- For the Project Schedule Management Knowledge Area, a form of rolling wave planning called iterative scheduling with a backlog can be used, and it basically means scheduling only for the upcoming iteration in detail. A similar form of scheduling is called on-demand scheduling and is used with the Kanban System to limit total work-in-process and maintain a steady delivery throughput.
- For the Project Cost Management Knowledge Area, project budgets are kept lightweight. When a project team is stable, costs per iteration will be stable and cost estimates can be based on the estimated number of iterations.
- For the Project Quality Management Knowledge Area, delivery in small increments means that quality processes will be performed for each story or defect before it is considered "done." The process of Control Quality leads to verified deliverables, which become an input to Validate Scope. Validate Scope in turn has an output of accepted deliverables. These two processes will be done for each story or defect. Quality will also emphasize looking for root causes of problems during retrospectives.
- For the Project Resource Management Knowledge Area, in terms of human resources, resourcing will require finding team members who are capable of self-organizing and who are generalizing specialists. Ideally teams should also be able to be colocated. Stabilizing the team at a small but highly effective size lets variable amounts of scope be fed to a predictable capacity team for stable throughput.
- For the Project Communications Management Knowledge Area, communications are by design much more frequent, streamlined, and collaborative to enable adapting to changing requirements. Teams are also kept small enough to facilitate face-to-face daily communication.
- For the Project Risk Management Knowledge Area, short iterations are used to create a shared understanding of the inherent risks of high-uncertainty projects and to limit the need to develop detailed risk responses—for the most part—to current iteration deliverables. Risks related to tasks can be documented within those items on the kanban board. A risk response can be to change priorities in the backlog.
- For the Project Procurement Management Knowledge Area, often a contract will be split into a master services agreement (MSA) that covers contractual obligations that will not change and an addendum to address the agile work so that this part of the contract can be amended as needed without needing to revisit the master contract.

- For the Project Stakeholders Management Knowledge Area, teams need to emphasize direct, regular, and proactive involvement of a key stakeholder, the product owner. For the most part, the product owner will communicate with other stakeholders on the client side and get their feedback.

Review the following information related to hybrid life cycles.

- The most basic way to create a hybrid life cycle is to use one methodology for one or more phases and then switch to a different methodology in a different phase or phases.
- A project may, for example, blend agile and predictive methodologies at the same time in all project phases. This might be a project that is so highly tailored that it does not really fit into any category but uses some tools or methods from each.
- A project that is best suited to being a predictive project overall might still have a small element that could be run as an agile mini-project for just those tasks within a phase that have requirements uncertainty or a high risk of scope creep.
- An agile project might benefit from or require a predictive component due to, for example, an external dependency.

Review the following information related to the Kanban Method.

- In lean manufacturing, a kanban is a visual card displayed when there is an actual demand. This is a "pull system" that starts with a signal at the end of the process and works backward upstream. The intent is to buy or build only what a customer has actually ordered. Kanban systems avoid long queues of work-in-process (WIP) waiting to be worked on. These delays are often much longer than the time required for actual processing.
- The Kanban Method of agile project management mirrors lean and just-in-time ideals. It requires use of feedback loops and improvement in a collaborative fashion. It places clear limits on the amount of work-in-process that can be in the queue at any given time, which forces it to be a pull system. Movement of a kanban card to a later column creates more capacity for another item.
- No value can be gained from work until it is fully complete and delivered, so it is more important to complete work already started than to begin new work.
- Kanban cards have a unique identifier, "assigned to" information, "submitted by" information, a description, a blocker description and status, iteration information, project/release information, etc. Column placement shows card status.
- The Kanban Method sets explicit process policies such as for how items can be added to columns or moved to other columns.

- The Kanban Method is a type of flow-based agile, meaning that the duration of each sprint is not timeboxed but is allowed to extend to fit the required duration of the stories or other items selected. This makes this framework flexible and ensures that the incentive is to select the highest priority items and complete them first. The emphasis is on quality and productivity.
- Begin by understanding the current state.

- Evolve from the current state in increments.
- Respect the culture and roles, responsibilities, and authority levels of persons.
- Encourage all project team members and stakeholders toward acts of leadership.

Exhibit 1-14 and Exhibit 1-15 show a kanban board and cards.

Exhibit 1-14: Kanban Cards Example

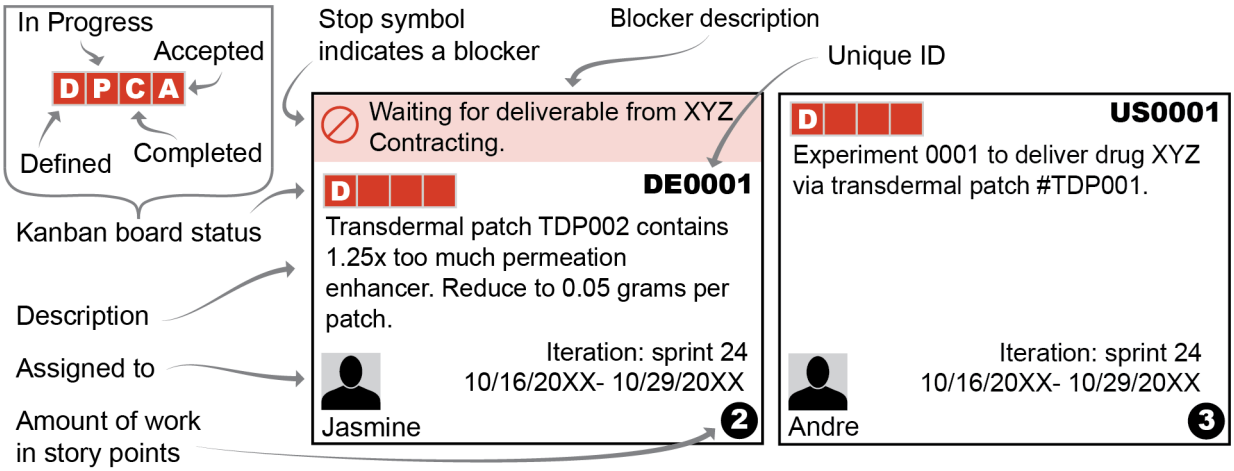
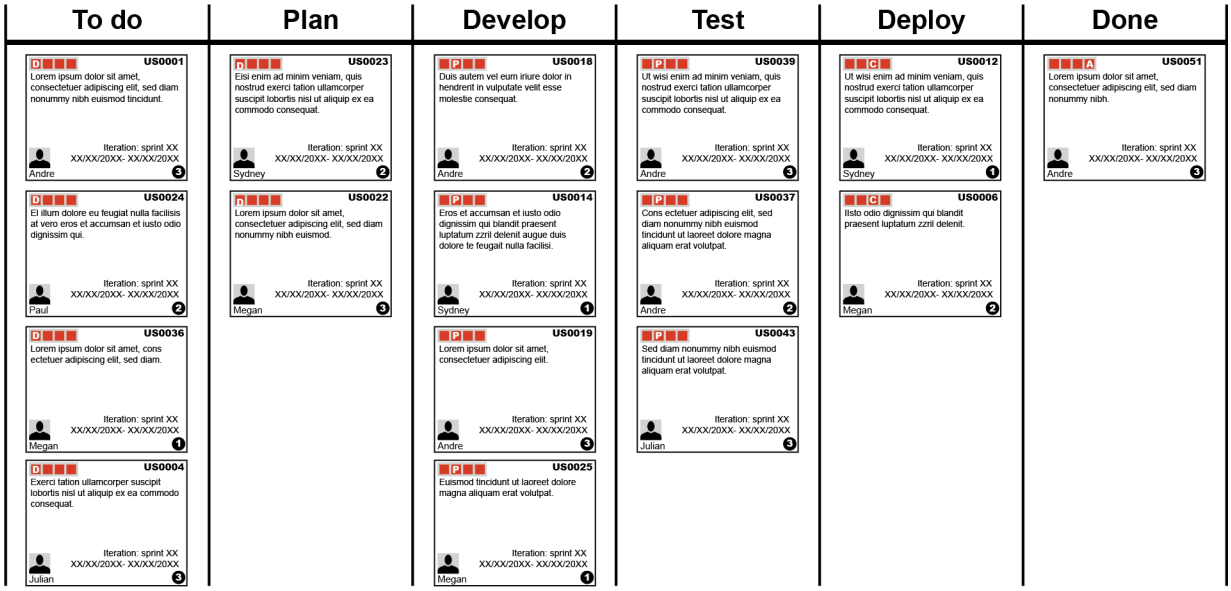


Exhibit 1-15: Kanban Board Example



Review the following information related to Scrum.

- Scrum is a type of iteration-based agile developed for a single small team. Scrum is a term from rugby because the key concept is to get the team to move as a whole toward a goal, just as a rugby team in a scrum works to move the ball by passing it back and forth while moving the team as a unit. Everyone gets a lead role at times.

- Scrum features timeboxed sprints that produce potentially releasable deliverables in increments. The product owner needs to be involved daily and is responsible for maximizing the value of the product. The Scrum master is a servant leader. Cross-functional team members are generalizing specialists. Ideally, the team is capable of doing all of the work without needing to rely on persons outside the team. Ceremonies include sprint planning (also called iteration planning), daily scrum (15-minute daily standup meetings), sprint review (demonstration meetings), and sprint retrospectives. These meetings are also timeboxed.
- Scrum's kanban board is called a scrumboard. It is a visual reminder of the team's scope of work to accomplish for that iteration. The idea is to complete all of that work, helping out others to get things done as is feasible. Scrumboards may not necessarily specify strict limits on WIP.
- Scrumbut describes any heavily tailored form of Scrum.
- Scrumban combines the words scrum and kanban because its original purpose was to help teams move from Scrum toward the more rigorous rules of the Kanban Method. Scrumban uses short sprints and a kanban board, but the duration of sprints can vary, so it is a flow-based method (like the Kanban Method).
- Scrum of Scrums (SoS) is a scaling framework. While individual team size remains limited, in SoS, many small teams can exist. A representative from each scrum team is selected to report on that team's activities during the current iteration as well as impediments.An even higher level meeting is called a Scrum of Scrum of Scrums.
- Another scaling framework is Large-Scale Scrum (LeSS), which has the same goal as SoS and uses the same Scrum of Scrums concept. LeSS keeps its own framework very light and easy to comprehend by mimicking the principles of Scrum in the larger team hierarchies as much as possible. One difference from Scrum is that sprint planning has two distinct steps: what and how. The integration team also restricts its retrospectives to cross-team improvements and refinement.
- Enterprise Scrum is another scaling framework for Scrum. This framework is intended to help an entire organization transform into the Scrum model so that the organization can collaborate and create what is sometimes called disruptive innovation.

Review the following information about eXtreme Programming.

- eXtreme Programming (XP) is a small-team agile framework that works to distill a holistic set of best practices for programming into their purest form based on whether the best practice meets XP's core values of simplicity, courage, respect, communication, and feedback.
- Principles include mutual benefit, humanity, economics, self-similarity, diversity, reflection, flow, opportunity, improvement, redundancy, failure, quality, baby steps, and accepted responsibility.
- XP creates a set of four practice areas (organizational, technical, planning, and integration), and within each area are some primary and secondary practices. Important

practices include relentless testing, refactoring (continuous improvement of code), automating testing, and test-first programming (developing the test before the code).

Review the following information related to other agile frameworks.

- The Crystal Family of Methodologies is a set of scaling frameworks for larger and larger team sizes and greater and greater amounts of criticality. Criticality has four categories: Comfort (C), Discretionary Money (D), Essential Money (E), and Life (L).
- The Dynamic Systems Development Method (DSDM) fixes quality, time, and cost at project initiation and allows scope to be variable (such as functionality). This is called constraint-driven agility.
- AgileUP focuses on formally ensuring that a given release iterates and incorporates feedback from the following disciplines: modeling, implementation, testing, deployment, configuration management, project management, and environmental awareness.
- The Scaled Agile Framework (SAFe®) is a scaling framework that scales by ensuring that processes, roles, and tasks at the portfolio, program, project, and team levels all fit certain patterns so they are easy to incorporate. It employs systems thinking, economic sense, placing value on keeping options open, ensuring that milestones enable objective evaluation, and so on.
- Disciplined Agile (DA) is a scaling framework that incorporates elements from many types of agile with an attempt to balance between the extremes of prescriptive detail and narrow focus. Techniques that were selected need to be scalable (in team size, program complexity, etc.), offer guidance on how to work within the enterprise such as across departments, and enable use of the method across the entire project life cycle.

Review information related to tailoring of agile projects.

- Tailoring can make a good methodology into one that is fit for purpose if done right, but it also creates risk. Removal of one aspect can create unintended consequences because many principles or requirements support or enable a different principle or requirement. Getting rid of one can make it much harder to achieve the other. A best practice is to start by working within the framework as much as possible to learn firsthand about these symbiotic relationships among the elements.
- Tailoring is often needed for agile to work at all in some organizations that are not used to working in such open and collaborative ways. When executives fail to understand the need for agile, some tailoring may be needed to help win over this support, for example, rebranding some agile terms and concepts using lean terminology, such as small batch sizes instead of increments, short cycles rather than sprints, and continuous improvement rather than retrospectives.

- A deeper cultural problem exists when the culture fears things like transparency in work status, sharing of work, failure, or lack of early requirements definition. These issues usually require change management. Transform one project team at a time by demonstrating courage in these areas, such as admitting mistakes to the team or fully committing to use of a kanban board to show project status (even if negative).
- When organizational structure makes forming cross-functional teams difficult (i.e., organizational silos), consider working to convince leadership to alter some incentives so they promote cross-functional collaboration.
- A common scenario is the organization not allowing project teams to be self-organizing. Moreover, in some cases, the Scrum master may not even have much say in who is assigned to the team.
- Teams lacking needed skills can be given greater freedom as they mature and prove their ability to handle the responsibility.
- If virtual teams are a tailoring need or choice, be sure the team is equipped with screen-sharing technology, voice or videoconferencing, project-specific messaging boards, and a virtual kanban board.
- For a large project, one may tailor by breaking the project into several smaller projects or use a scaling framework.
- In some cases a project will have fairly stable requirements and/or little technical uncertainty. It may be best to run the project or its most stable phases as a predictive or hybrid project.
- Another reason to tailor agile methods is if a project has stringent compliance requirements.
- Team members may at times discuss omitting a given ceremony or agile tool or want to add something from a different agile framework. To make wise voluntary tailoring decisions, the Scrum master should ask for some time to research the issue.

Review the following information related to EEFs, OPAs, and agile.

- An agile PMIS will have agile tools such as a kanban board and card system.
- An agile PMIS may facilitate prioritization of stories, but it will not select these priorities or generate new stories.
- An agile PMIS will often be a cloud-based system.
- When team management elements are hindering the use of a different project methodology such as agile, it is important to work to influence decision makers to create elements that will accommodate such projects.
- On agile projects, OPAs can include the results of retrospectives and the definition of "done" if this definition is shared across projects.
- On an agile project, documentation might be lower in priority than working deliverables, but it is still needed and be done primarily as the work is getting done.

- Review of an initial version of an agile roadmap versus a final version can show how much scope changed.

Review the following information related to configuration management.

- Agile releases for configuration on an agile project consist of approved deliverables that have been collected for a release. The Scrum master and the product owner decide which items to include in the release and which to hold.
- Agile projects with virtual deliverables such as software will typically use automated systems to ensure that everyone is working on the correct version.

Review the following information related to integration in agile.

- "Big picture" integration requires regularly assessing whether the project is still providing business value, and this is especially important on agile projects due to their evolving understanding of project requirements.
- An analogy for the Scrum master on an agile project would be a leader of a jazz band, who sets the tone but all members are free to take the lead and improvise while staying within the bounds of an overall structure to produce value rather than chaos.
- On an agile project, integration helps identify dependencies and gaps sooner.
- Agile collects work performance data during Executing such as kanban board status and information from daily standups. At the end of the iteration, the Scrum master reviews the work performance data against what was planned to be done and determines variances and root causes. The Scrum master also revises the estimate of total stories for the project. This is work performance information. During the retrospective, the Scrum master presents information on the status of stories complete, remaining, and total, and the team discusses how to improve throughput if needed. This discussion plus the product owner's reports to management are work performance reports.
- A project charter is needed for any type of project. An agile project charter may be kept lightweight, meaning that it is used to state the vision and mission of the project, its potential benefits, and its success or release criteria.
- Agile projects may wait to define scope except at a very high level. What is definitely excluded from scope may be possible to define, however.
- Helping to define a project charter may be a good way to get a new agile team to start coalescing into a collaborative team. However, since the project is not approved until the charter is signed, the team does not yet officially exist at this point and any work they do to develop the charter is an operations expense.
- An agile project will create success or release criteria, but the project sponsor and the team may agree to modify them during the project.
- The vision is the most important part of an agile project charter, and it needs to be developed with care and shared early to develop a collective team and stakeholder alignment. The vision should answer the why part of the project (why it is important).

- The mission statement should explain the what part of the project. What needs to get done to enact the vision? This is a high-level description of the end results.
- The benefits statement (which could be a link to the benefits management plan) discusses who benefits and how each stakeholder group should benefit.
- Success criteria constitute the high-level definition of "done."
- An agile project charter may discuss how the team plans to work together such as the nature of the workflow.
- The Direct and Manage Project Work and Monitor and Control Project Work processes will be impacted by servant leadership and different methods of controlling change.

Exhibit 1-16 shows an example of an agile project charter.

Exhibit 1-16: Agile Project Charter

Project: B71 Preclinical R&D Phase, #AG-00134, 1/1/20xx-12/31/20xx
Vision (Why) Complete the preclinical research needed to green-light clinical trials on an anti-scarring agent that can be marketed to hospitals to significantly improve patient outcomes in post-surgery recovery. The drug, if successful, should provide a stable revenue stream and a payback period within the patent period.
Mission (What) R&D anti-scarring agents B71-A, B71-B, and B71-C to find a drug or combination thereof, dosage, and delivery mechanism that is safe and effective in reducing post-surgery scarring on laboratory animals, to provide sufficient evidence of safety and efficacy for approval for testing in humans.
Sales Questions A safe and effective anti-scarring agent will improve patient quality of life and may have the side benefit of reducing infection risk, creating demand from insurance payers. Even if only the primary benefit of anti-scarring is delivered, the drug will have markets for both medically necessary and elective surgery. There are no similar drugs on the market, so this drug would likely have a fast payback period and positive net present value. Brand name recognition may retain strong market share after patent expiry.
Laboratory and IT System Impact Assessment Two researchers and lab space from each of the New York, Chicago, and Austin labs, plus one full-time analytics resource for drug simulation models. Dr. Zibinia Carter full-time as product owner.
Success Criteria • Provide laboratory evidence by the end of 12 months that one or more anti-scarring agents tested are or are not effective and safe for use with laboratory animals. • Present documentation proving use of scientific method for all testing protocols sufficient for peer review and pharmaceutical license application. • Present a team recommendation for the anti-scarring agent to pursue in later trials because it presents the best overall opportunity, including strategic fit, product safety potential, value to health-care providers, insurers, and patients, feasibility to mass-produce, and positive net present value to Quanta.
Assumptions Experimental results to date for agents B71-A, B71-B, and B71-C will be able to be replicated.
Exclusions No agents will be tested during this period other than B71-A, B71-B, or B71-C (or combinations thereof).
Risks A safe and effective agent and/or delivery mechanism may not be found. Quarterly phase gates will be used to approve or reject project continuation. A final phase gate at the end of one year will be used to determine whether to authorize additional R&D time, cancel the project, or proceed to the next phase.
Approval: _____ Job Title: _____ Date: _____

Review the following additional information related to agile project integration.

- By bringing members into the decision-making process and giving a voice to their expertise, project managers grant employees a certain amount of ownership of the project. By delegating aspects of control to the team members, especially those with broader skill sets, the project manager gives the team the space and ability to adapt to changes as they occur.
- Overall integration planning will consist of ensuring that detailed plans reflect the priorities on the roadmap and doing detailed integration planning for the next iteration during the iteration planning ceremony.
- Because agile is so collaborative, even integration is a whole team effort, though one person such as the Scrum master or product owner might be held accountable for integration.
- Integration methods or tests to perform might be listed in the definition of "done" or in the notes for a given story or defect. Integration decisions may result in some stories having blockers if they cannot be integrated until later.
- Retrospectives are used to determine what did not integrate as planned and how to improve integration in the next iteration.
- Successful integration relies heavily on testing. For example, acceptance test-driven development (ATDD) involves the team collaborating on how to develop automated tests before creating the deliverable.
- A **roadmap** is a high-level strategic plan that provides a vision of the deliverable and focuses on outcomes rather than on outputs and on big-picture integration rather than details. There may be a roadmap for a project, a program, or an entire agile organization. It is not a tactical-level plan. (This is the backlog.) Rather it addresses the vision of the deliverable and the need for and priority of epics rather than stories. Epics can arranged into categories that are sometimes called themes.
- Roadmap grooming involves reprioritizing, adding, deleting, or modifying themes and epics.
- Roadmaps should avoid committing to a rigid timeline, being too deterministic, or becoming an overloaded backlog (avoid adding stories to it).
- The process of creating a roadmap may be as important or more important than actually having a roadmap. That is, the process of planning can be more important than the plan itself.

Agile Concepts from Module 4

Here are some key points about agile that are presented in Module 4.

Review the following information about agile and scope management.

- On agile projects, completion of the project scope is based on the latest set of project release criteria and completion of all items in the backlog deemed to be in scope by the product owner and team.

- Communicating what is out of scope can reduce unnecessary discussions during agile ceremonies.
- While the product scope drives the project scope on a predictive project, the process is reversed on an agile project: The project scope drives the product scope. This is possible because the product is usually virtual.
- On agile projects, the scope remains in flux and the closest thing to a scope baseline is the set of items approved for development in a current iteration.
- Product scope in particular comes under the influence of feedback from the product owner and other stakeholders, including customers. The goal should be to produce working deliverables to get feedback that helps product owners better understand actual customer requirements.
- Like any other important decision on an agile project, scope planning is a total team task that occurs in ceremonies, though individuals may work on their own to develop parts of these plans.
- Develop scope and requirements management plans in collaboration with the project team to ensure that the agile mindset is maintained, such as collaborating on tools to use.
- At a strategic level, scope planning should be kept lightweight to reduce the risk of wasted effort. The first step in an agile scope plan is often to perform tee-shirt sizing to create a rough estimate of project scope and then to plan in a little more detail, such as by developing a roadmap with themes and epics.
- At a tactical level, the scope management plan will typically specify use of a backlog and backlog grooming in agile ceremonies to ensure that the scope of the next iteration will generate the most value possible given the feedback to date.
- An agile scope management plan should indicate what tools will be used to monitor and control scope.
- Plans for continued refinement of story point estimates as well as limits on how many story points can be assigned in total or per person for a given iteration can reduce the risk of stories not getting completed in an iteration. Similarly, trends in total story points in the backlog (as stories are added, completed, re-estimated, etc.) can be used to help estimate the scope that remains to be completed.
- An agile requirements management plan may indicate acceptable requirement formats, how to document them in user stories or other items, and acceptable tools to use to gather requirements such as interviews or surveys.
- All projects have requirements, and all projects need to define these requirements. Agile projects usually keep requirements documentation more lightweight. The process of collecting and prioritizing requirements never really ends until the project ends.
- A priority for requirements collection is using collaborative discussions when possible.
- Progressive elaboration is the key for collecting and prioritizing requirements because requirements will unfold over time as will their relative value to customers.

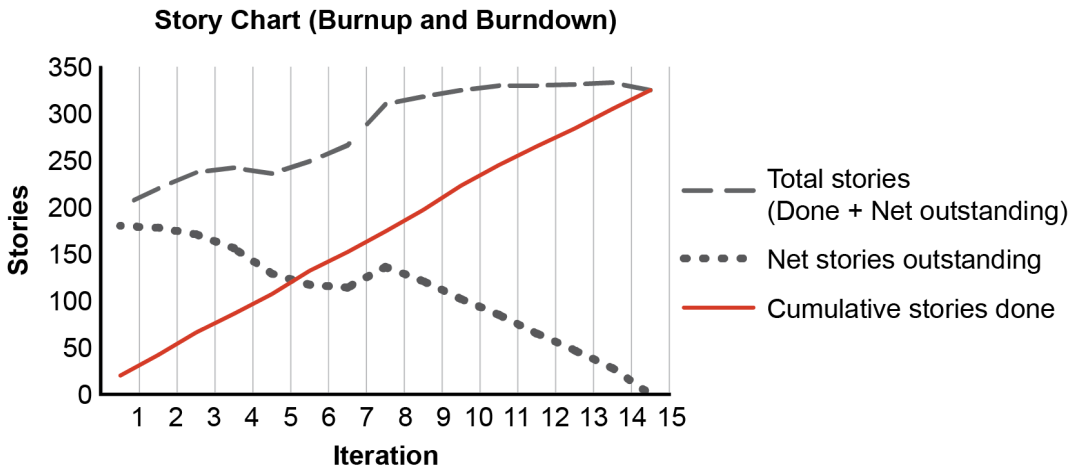
- On agile/hybrid projects, the product owner is responsible for gathering written or verbal requirements from other stakeholders as well as getting their feedback on deliverables to help modify these requirements.
- Basic assumptions in agile include that the people who will be doing the work know how to do that work and that the persons providing requirements do not necessarily know how to do the work. Therefore the product owner ensures that requirements express the "what" and not the "how."
- The agile team decides on the "how" (including feasibility) but is open to feedback from stakeholders on continuously improving or even pivoting direction on the "what."
- The goal is to get feedback, not to insist on there being one right way to proceed. In many cases, disruptive innovation can succeed only if people abandon preconceived notions and let the market indicate what it actually wants.
- Agile requirements are then captured as stories, defects, epics, or spikes in the product backlog. Backlog grooming and selection of items for the current iteration constitute requirements prioritization.
- Tee-shirt sizing is one of several techniques that can be used to estimate either overall project scope or the scope of work for an individual story.
- Tee-shirt sizing simplifies estimation by creating only three to five categories for a project's scope based on tee-shirt sizing methods: extra-small (XS), small (S), medium (M), large (L), and extra-large (XL).
- The idea is to enable good decision making while setting realistic expectations for the level of precision of the estimate. In other words, tee-shirt sizing is a different way of expressing something like a rough order of magnitude (ROM) estimate.
- The organization will need to define what it means by each tee-shirt size for an entire project scope. This can be in terms of project duration, number of team members required, and/or total project cost.
- Tee-shirt sizing is a team activity. Once what each size means is discussed to ensure that it is a shared assumption, each team member writes down their estimate of the project's tee-shirt size on their own and then everyone shares their estimate. Discussion follows.
- The next step in scoping is to define the product scope using an agile roadmap.
- Agile and hybrid projects are designed to deliver results quickly. One way they do this is by limiting project scope to initially deliver less, in other words to define an MVP.
- Problems with defining an MVP include an unclear vision, not differentiating minimum viable versus minimum valuable to the customer, needing to create numerous technical debts to create the MVP quickly, or tasks having numerous dependencies.
- Agile often is used for creative work, which is inherently more difficult to estimate.
- Agile breaks down scope using a product backlog. Inputs for this process can include the project charter with its vision and mission, the agile roadmap, and an MVP.
- The team sets up the backlog format, including tailoring, the definition of "done," and any required acceptance tests. The backlog is the functional equivalent of a WBS.

- Backlog preparation also includes populating the backlog with stories, defects, epics, and spikes and placing them in an initial order with highest priority items at the top.
- The final version of an "agile WBS" can only be known at project completion. However, the "100 percent rule" of WBS still applies, except that in this case it means that 100 percent of the scope that can be known to date is included in the backlog.
- While grouping similar tasks on predictive projects is intended to create economies of scale, attempting to do so on high-uncertainty projects can cause significant economic damage. Therefore, planning occurs in smaller batches for less risk, better worker motivation, easier administration, and less work-in-process (WIP).
- Highly detailed personas then become the basis for developing epics and user stories. According to the *Agile Practice Guide,* a **persona** is "an archetype user representing a set of similar end users described with their goals, motivations, and representative personal characteristics."
- When developing personas, consider who will want the deliverable (e.g., demographics), why they will want it, how they will use it, how it will benefit them, pains they want to avoid, and how the persona differs from other personas.
- Developing personas is an essential learning process for the team so they can come to a shared agreement regarding their audience.
- Themes are major groupings of epics. Epics are broadly defined user stories or sets of stories that have yet to be broken down or decomposed. Epics are the equivalent of what would be called a planning package in a work breakdown structure. Themes and epics are good ways of organizing work items at a level of detail that makes the likely major areas of the project clear while allowing these areas to be flushed out in more detail at the last responsible moment. This is an example of rolling wave planning.
- A good way to develop themes and epics is to start with the vision and the current requirements and work as a team to develop categories and subcategories of objectives that can be traced back to these requirements and forward to personas, perhaps by developing a requirements traceability matrix.
- Scope monitoring and validation and scope control use roadmap grooming and backlog grooming. Backlog refinement or grooming starts with the product owner, Scrum master, or a team member creating or flushing out stories for the upcoming iteration.
- In iteration planning, scope validation occurs when teams select as a group what to work on next. In demonstrations, the product owner validates that the verified deliverable is acceptable and is what was asked for and, if so, moves the item into the done (accepted deliverables) column on the kanban board.
- For flow-based agile such as the Kanban Method, the backlog refinement process is conducted on a just-in-time basis, meaning that the next story to be moved into work-in-process is discussed.
- For iteration-based agile such as Scrum, the team uses the timeboxed one-hour iteration planning session to discuss stories for the upcoming iteration.

- Scrum masters can use trend analysis in retrospectives to control scope. Scope can be measured using story points, stories, or features (deliverables that may require one or more stories to complete).
- A cycle time chart shows how long team members took from starting to being "done" with an average story, while a lead time chart shows how long it took for a customer request for a feature to be delivered, so the former is an internal metric and the latter is a customer metric.
- While some organizations track story points to measure scope, if the measurement doesn't distinguish whether a story is or is not done, it will violate the agile principle that the primary measure of progress is working deliverables.
- A story chart or feature chart is both a burnup chart—showing cumulative increase in stories/features and cumulative stories/features done—and a burndown chart—showing stories/features remaining with the goal to get to zero stories or features.

Exhibit 1-17 shows a story chart.

Exhibit 1-17: Story Chart or Feature Chart



Review the following information related to scheduling in agile.

- No project is immune from constraints. An agile project can be schedule-driven.
- A schedule-driven project can be planned to deliver as much scope as is possible within a budget that is also constrained. If the budget is less of a constraint, a schedule-driven project can invest in as many resources as is feasible.
- An agile roadmap can be used as a milestone schedule. The plan may specify a milestone for the MVP with corresponding success criteria.

- The plan may be to add later subsequent milestones and their success criteria on a just-in-time basis to enable flexibility. Milestones fall at the end of an iteration.
- Hybrid projects often have complications when it comes to scheduling. There is the potential for iteration periods not matching up and causing unnecessary delays for deliverable handoff. (Matching up iteration cycles can help if possible.)
- Team capacity per period, called **velocity,** enables planning in detail how much of the backlog the team can feasibly accomplish during each iteration. The current size of the backlog versus the team's capacity helps estimate the longer-term schedule.
- In addition to the size of the backlog varying over time, the experience level of the team with the work for a given iteration also creates variance in capacity.
- Once high-level tasks have been defined in the form of a roadmap and epics (or an equivalent), the team progressively decomposes the roadmap into backlog items in the form of user stories, defects, or spikes.
- The product owner typically writes stories and other items, but any team member can define a task. This process may occur outside of the ceremonies. However, the team decides as a group during ceremonies whether these tasks are valid, in scope, and can be done within project constraints.
- Per the *Agile Practice Guide,* a **user story** is "a brief description of deliverable value for a specific user [i.e., a persona]. It is a promise for conversation to clarify details."
  - A user story is not exhaustive and is written in plain language.
  - A user story describes a want or need, in other words, results that should provide value. This value could encompass multiple requirements.
  - The promise for conversation cannot be held with a persona (fictional), but it could be a conversation with the person who created the user story such as the product owner or with fellow team members/stakeholders who have expertise.
  - The details are "how" the value should be provided.
  - Template: "As a [persona], I want [a particular feature or requirements] so that [a specific benefit] is received."
  - Example: "As a dedicated comparison shopper, I should be able to compare similar items side-by-side in my shopping cart and easily review the product details without leaving the shopping cart area so that I don't become frustrated and buy nothing."
- Use of the first person pulls the focus toward how the element will actually be used by someone rather than what needs to get done. The goal is to draw team members into discussions. These discussions are more important than the stories themselves.
- If a story is proving difficult to estimate or it is difficult to get clarity on the details, this may be a sign that the story needs to be split into one or more smaller stories.

- User stories also need to have success criteria (or acceptance criteria) associated with them. This is the definition of "done," and it can include passing required individual and system tests as well as satisfying the requirements inherent in the story. It is a best practice never to change success criteria for an item that is part of work-in-process during an iteration.
- An alternative to user story mapping is to develop use cases. This older method focuses on the needed functionality behind the feature and is good for projects with relatively less uncertainty or higher complexity. Unified Modeling Language is used to create a diagram with actors, systems, and goals. These charts can be more detailed than user story maps and can help plan for multiple iterations.
- A defect is a task that can be placed in an agile backlog to correct an error that exists in previous deliverables. These can be defects in deliverables that have already been released to customers, or they can be defects found as team members are performing quality tests. The defect is described along with how it can be replicated if this is known. If the defect cannot be replicated, it may be very difficult to fix or to verify that a change has fixed it.
- The *Agile Practice Guide* defines a **spike** as "a short time interval within a project, usually of fixed length, during which a team conducts research or prototypes an aspect of a solution to prove its viability."
- Spikes can be scheduled for areas of a project that are especially high in requirements uncertainty or technical uncertainty.
- In agile, teams use backlog grooming for prioritizing and sequencing tasks.
- If there is a capacity constraint on the team such as one team member who is becoming a bottleneck, some organizations create weighted models to schedule the highest value, shortest duration tasks first. One such model is called CD3, which is cost of delay divided by duration.
- Estimating the cost of delay requires placing an objective value on the task's business value, the information value to the project that the completed task would provide (i.e., value of feedback), and/or the urgency of this task because the value may erode over time (e.g., due to a competitor offering the feature first). This might be estimated as a certain number of dollars per week. Estimating duration should be a time duration estimate such as number of weeks. The tasks with the highest CD3 ratios are done first.
- Factoring in the cost of delay helps show how the cost of idle work is typically higher than the cost of idle workers on an agile project.
- User story mapping is a way to avoid "analysis paralysis."

- User story mapping can be done as part of the process to develop a product's vision and roadmap or in special story mapping sessions during a project.
- A user story map is a visual map that shows workflows. It is typically constructed as a team event on a large whiteboard.

Fill in the worksheet below (shown completed afterward).

User story mapping steps worksheet:

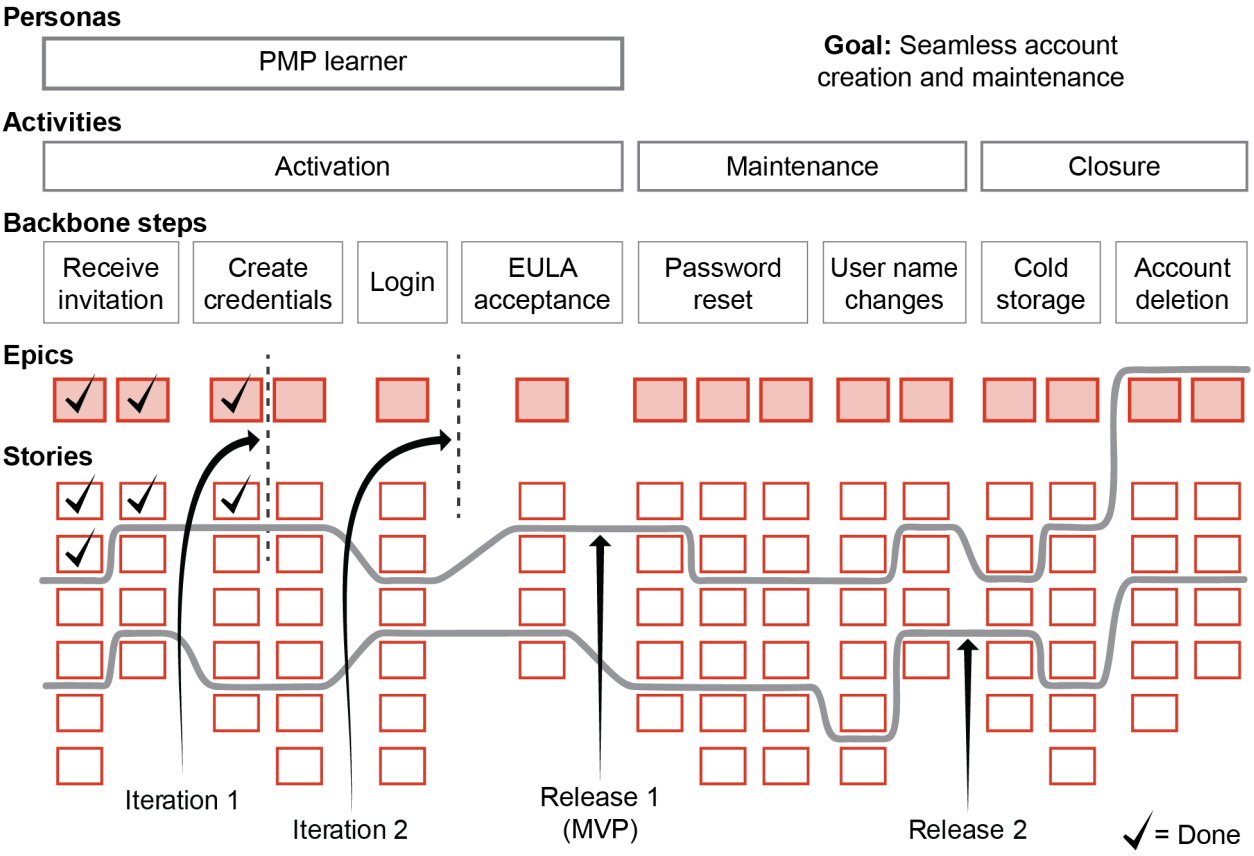
1. Clarify mapping ____ and _____.
2. Create _____.
3. Create a _____ (user journey in major tasks or steps).
4. Create _____ and put them above the backbone.
5. Create _____.
6. Search for _____.
7. Prioritize activities and stories and validate scope.
8. Slice the map into major _____, _____, or _____.

Completed user story mapping steps (with some important points added):

1. **Clarify mapping goal and scope.** Determine the mapping goal. Set some constraints on the activity. Just as with a story, think about who, what, and why.
2. **Create personas.** For example, a real-estate app may have a home seller persona and a home buyer persona.
3. **Create a story backbone (user journey in major tasks or steps).** This lists the major things the deliverable needs to do. Place the steps in the order that shows the ideal user flow. The goal isn't to freeze things in a particular order but to start a conversation.
4. **Create activities (themes) and put them above the backbone.** Put the steps in the backbone into context.
5. **Create epics.** Brainstorming can be encouraged. Look for variations, exceptions, the needs of other users, or other business requirements.
6. **Search for gaps.** Have people walk through the scenario from other persona perspectives while other team members listen and note whether there are any missing steps or the flow seems disjointed. Involve other stakeholders at this point.
7. **Prioritize activities and stories and validate scope.** Determine which activities and stories are the most important and arrange the items with the highest priority. The team can make zones such as "must have," "should have," "could have," and "out of scope."
8. **Slice the map into major releases, features, or iterations.** Draw lines horizontally across the whiteboard or paper to indicate what could get done as its own major product release or feature. The first slice will be the minimum viable product (MVP). Next, use vertical lines to determine what can likely get done in each iteration. If the map is sequenced from left to right in the logical flow of activities, having the iterations proceed from left to right should minimize dependencies.

Exhibit 1-18 shows a user story mapping example.

Exhibit 1-18: User Story Mapping for PMP User Account Activation/Maintenance



Review how to estimate story points in agile.

- The team considers factors that affect task duration, including task size and complexity, general experience and relative experience of person(s) assigned, scoping effort, ability to automate, and risk.
- Difficulty level is relative.
- Ensure that stories or other items are small enough so they are easier to estimate. Approach estimation as a team discussion.
- Estimating project task durations using story points involves assigning an abstract difficulty level in "points" to each story. The difficulty level is a ranking relative to the other stories in the backlog.
- The problem with absolute estimates is that they are educated guesses but clients may treat them as definitive.
- Story points are educated guesses too, but their abstract nature makes them harder to misinterpret as being definitive. Story point estimating is also fast and lightweight.
- The problem with estimates using a simple linear scale is that people are not very good at differentiating between, say, 6 or 7.

- Tee-shirt sizes of XS, S, M, L, and XL can be assigned a certain range of story points (determined as a team task), such as XS being 0.5 points, S being 1-3 points, M being 5-8 points, L being 13-21 points, and XL being 34+ points.
- The Fibonacci sequence starts with 0 and 1 and then adds the most recent number to the number before it in the sequence to create cumulatively larger numbers.
- The sequence is usually shown as 0, 0.5, 1, 2, 3, 5, 8, 13, 21, 34, 55 and so on.
- Usually there is an upper limit that will be the most complex story point value that can be assigned. Stories beyond the assigned top would be broken down more.
- Story point estimation starts by listing stories in the backlog (or iteration). Find a "base story" that would qualify as a one-point story.
- After a discussion and question-asking period for each story being ranked, team members are asked to individually determine a Fibonacci value for that story.
- Team members write this number on a card or a piece of paper and then all turn them up at the same time and have a discussion about the differences (blind initial survey). This is called wideband Delphi and may use planning poker cards.

Review function point estimating:

- For software development in particular, an alternative to story point estimation is function point estimation. A software tool or an expert looks at the logical design of the software to determine the functional size of a system, which results in an objective measurement rather than a relative one (as in story point estimation).
- Function point estimating does not get the team involved in developing a shared understanding of the work (a benefit of story point estimation).

Review iterative scheduling with a backlog:

- Used for iteration-based agile projects.
- Developing an agile/hybrid schedule requires calculating load versus capacity. **Load** is the total remaining backlog for the project as measured in story points. **Capacity** is how much work in story points the team can do in an iteration. Both load and capacity can vary.
- Load can change on an agile project when stories are added, modified, deleted, or completed in the backlog. Load can also change if story points are revised.
- Many agile projects limit scheduling complexity by fixing the team size.
- Vacation schedules, sick time, and variable percentage of time on the project will create variable capacity.
- No two agile teams are identical. Translating story points into time estimates requires historical data from the specific team. Only after the first iteration can the number of story points planned versus actually completed be known, and this will provide the first estimate of a team's velocity.
- **Velocity** is a team's capacity in story points per iteration (or week) for stories (or features) actually completed. No story points should be counted as done until the underlying story is done.

- The story points for all tasks in the backlog can be divided by story points per iteration to estimate the total number of iterations.
- As more iterations are completed, the Scrum master can refine these estimates by averaging the actual story points completed per iteration.
- Once the number of iterations (or number of weeks for flow-based agile) is estimated, each iteration can be plotted on a calendar. Re-estimate as things change.
- If an agile team is cross-functional and can get most work done without needing to rely on external resources, resource overloads will be infrequent, since the other team members should be able to help.

Review on-demand scheduling.

- Used for flow-based agile projects.
- On-demand scheduling is influenced by the theory of constraints in lean manufacturing. The main priority in these projects is completing work that has been started before starting any new work. This is done by keeping work-in-process within strict limits. Therefore, the next iteration is begun and scheduled only when the appropriate resources become available.
- Capacity per week, for example, might need to be substituted in place of capacity per iteration to create a uniform time period for estimates.
- On-demand scheduling is often used on incremental projects (i.e., those that produce one or more prototypes) because some tasks will be repeated during each iteration.

Review agile release planning.

- Agile release planning can indicate how many iterations will be needed for each release of deliverables to customers. Because features represent value to the customer, agile release planning can provide a customer with an estimate for when a project will start to realize value.
- This may then lead to further refinement of the order of planned releases, such as by planning some faster-to-develop releases earlier.

Review measuring, modifying, and controlling the schedule in agile.

- Short iteration cycles in agile environments makes schedule control easier because feedback is received more quickly and frequently.
- A kanban board visualizes the progress of individual tasks and helps make any schedule issues obvious.
- During iteration planning sessions, team members commit to certain tasks.
- For iteration-based frameworks that use iterative scheduling with a backlog, schedule control involves ensuring that the load accepted for the iteration seems feasible to complete within the timeboxed iteration.
- For flow-based frameworks that use on-demand scheduling, the list of deliverables to complete is not changed, but the iteration duration is instead extended as needed.
- Daily standups provide the Scrum master with daily information on variances from expectations.

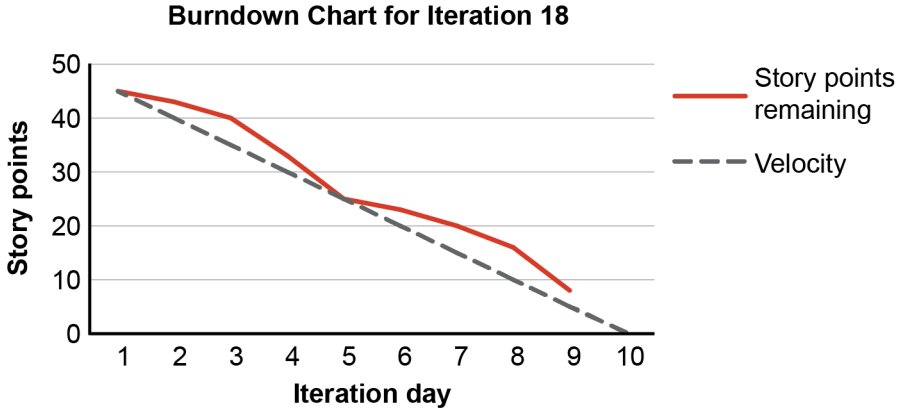
- During retrospectives on iteration-based agile projects, the Scrum master compares estimates of what was expected to be done in the iteration to what was actually done. On flow-based agile projects, the Scrum master compares estimates of the expected duration of the iteration to its actual duration. Either process may result in the Scrum master revising the number of story points the team is expected to be able to complete, reprioritizing stories, or reestimating story points.

Review information on cost and budget planning in agile.

- Agile cost management plans should be as lightweight as possible.
- For agile projects that have a stable team size and use few physical resources, planning cost management can be straightforward. The plan can specify that the project will be costed using a run rate (a rate of project spending per week or per fixed duration iteration). The plan can be adjusted to a new run rate if inputs such as team size change.
- The cost and budget plan can also specify when and if more detailed planning should occur for a given iteration and/or on a just-in-time basis using rolling wave planning.
- The product owner needs to be present in all agile ceremonies so that any decisions related to costs can be discussed as a team and the product owner can approve or decline expenses.
- Scrum masters, working closely with product owners and team members, use rolling wave planning to estimate costs on agile projects. The concept is to commit to a definitive estimate (–5 to +10 percent) for the upcoming iteration and a rough order of magnitude (ROM) estimate (–25 to +75 percent) for the remainder of the project.
- The first iteration for an iteration-based agile framework will be straightforward to calculate, as the team members for the iteration will be known and their cost for the iteration can be calculated. However, what cannot be known with certainty is how much scope will get done during that iteration.
- The first iteration for a flow-based agile framework will commit to a particular amount of scope, typically the minimum viable product (MVP). Because the time period for the iteration can vary, producing a definitive estimate may be difficult.
- One way to produce a budget for an entire agile project even when some scope has yet to be identified is to use dummy tasks. Rather than attempting to define the scope up front just to produce a budget, the Scrum master can estimate how much scope may be needed, add these “tasks” to the known scope, and then use the project’s run rate to create a budget.
- Keeping agile and hybrid projects on track occurs primarily at the detail level. For an agile project, this is accomplished mostly by using the kanban board and ceremonies, especially daily standup meetings. It also means tracking the team’s progress relative to velocity as well as relative to iteration commitments.

Exhibit 1-19 shows the team's average velocity (here it is 45 story points of completed stories per iteration) versus story points remaining to get done per day of the iteration.

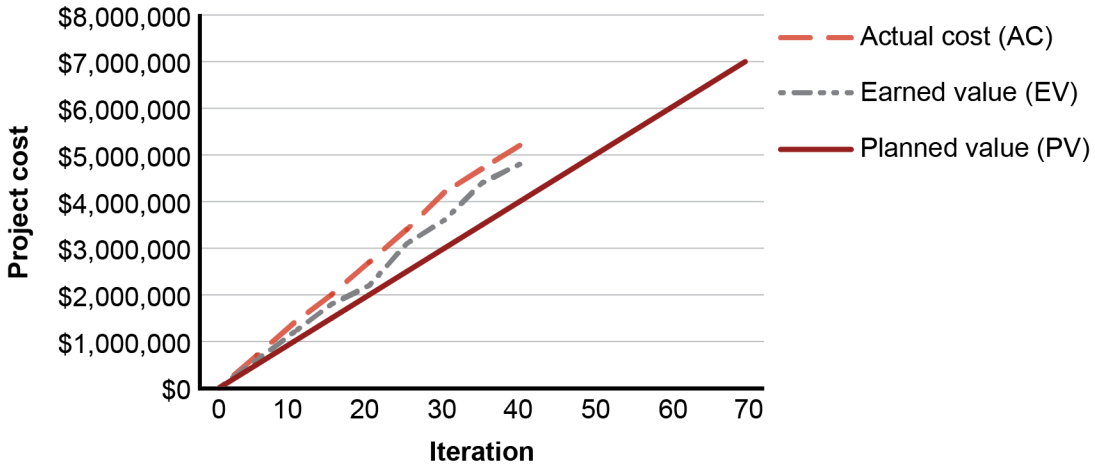
Exhibit 1-19: Burndown Chart for a Single Iteration



- In a burndown chart, when the team is getting behind, story points remaining are above the velocity line. On a burnup chart, being below the velocity line indicates being behind schedule.
- Burndown or burnup charts can reveal not only progress toward the goal but also how consistently the team is getting work done. However, it could be that the team is making steady progress on stories but the final tests for stories and so on are making the chart appear to have a lag.
- When work does not get done during the iteration, it either gets carried forward to the next iteration as part of the backlog or work-in-process (on iteration-based agile projects) or the iteration period is extended (on flow-based agile projects).
- A great way for agile projects to anticipate problems with costs (and schedules) is to study trends in velocity.
- If the budget constraint becomes an issue, the product owner and the team may engage in redlining to reduce scope and will also reprioritize regularly. Redlining involves cutting scope and identifying the things the project cannot afford or cannot do before the deadline. Reprioritizing the backlog will also be a vital step since more redlining may still be needed later.
- The *Agile Practice Guide* states that many EVA metrics can be of use in agile projects. Earned value will be the monetary value of completed work such as releases, features, or stories. Planned value and actual cost will also be in monetary amounts.
- If the project's run rate is very predictable, then the PV can simply be calculated as a running cost per iteration that will end at the last iteration projected to be needed for the project, which would then be the budget at completion (BAC).

Exhibit 1-20 shows an s-curve chart using monetary values for PV, EV, and AC.

Exhibit 1-20: S-Curve Chart for Agile Project



- The *Agile Practice Guide* also notes that for schedule control, some alternative inputs could be used as a proxy when lacking monetary values for EV or PV. For example, the SPI could be calculated using story points, stories, or features. The completed items are divided by the planned items to calculate the SPI.

Agile Concepts from Module 5

Review information related to resource planning in agile.

- When planning project resources on agile or hybrid projects, a best practice is to form teams or allow teams to self-organize with a requirement that whenever possible and needed, team members should be able to devote full time to the project for the duration.
- Agile resourcing plans should reinforce agile principles to the degree feasible, including acquiring cross-functional generalizing specialists, allowing potential team members to volunteer for particular projects, colocating the team, and providing teams with the agency to collaborate and self-manage.
- On many agile projects, team member salaries or contracts will be the primary cost driver. Agile project resourcing plans may need to carefully plan how much total expense for team members can be budgeted for an acceptable run rate.
- Estimating the resources required for a task such as a story is a team discussion that takes place during iteration planning ceremonies. Story points will be re-estimated.
- On iteration-based agile projects, the iteration period will be set and the team will commit to a certain number of tasks to complete in that period based on their story points. On flow-based agile projects, the team will determine the scope that needs to be done because it represents a stand-alone chunk of value that can be delivered to the customer, and then the team will estimate the number of work periods that are needed.

- Information on team velocity will become available and increasingly better as the project proceeds.
- Acquire a team that can handle all of the work that it will encounter without needing to rely on external resources whenever this is feasible. Team members should work well in a collegiate atmosphere and feel secure enough to experiment, ask for help, admit to not know how to do something, and admit to failure. Team members selected should be able to take and give constructive criticism.
- The expectation on agile projects is that if team members need help, they will ask for it. Similarly, if team members need to do research or learn new skills, they will do this.
- Agile teams manage themselves for the most part. Scrum masters need to provide team members with performance data during retrospectives so they can self-manage. Scrum masters may need to engage in some management tasks such as removing a team member who is not able to self-manage.
- Scrum masters ensure that teams have the physical resources they need to succeed.

Review the following information on procurement on agile projects.

- Procurement planning needs to ensure that contracts enable rather than hinder the agile mindset.
- Develop contracts that emphasize value delivered and enable teams to be flexible enough to produce a variable amount of scope.
- Set expectations early that the project can succeed only if a collaborative atmosphere is supported and reinforced by the contract.
- **Share risk versus reward.** Contracts can be developed that encourage the parties to pursue risk (opportunities) and innovate because if the product is successful, each party gets some share of the profits. Given losses, both parties share some losses.
- **Use a master services agreement (MSA) plus addenda.** Develop an MSA that contains all terms and conditions that will not change. Then have the MSA govern a set of lightweight addenda. These contract add-ons can be individually negotiated. Specification of the scope, schedule, and/or budget for incremental deliverables should be contained in an addendum.
- **Base milestones and payment terms on incremental value.** Contracts should emphasize incremental delivery of actual business value by ensuring that milestones and milestone payments avoid arbitrary divisions of scope to avoid a risk that no meaningful feedback can be received from the interim deliverable.
- **Create fixed-price microdeliverables.** Agile projects can charge the product owner a fixed price for microdeliverables such as user stories within a given story point range. This gives the product owner control over project costs.
- **Pay per use.** Money is the surest proof of demand.
- Whenever possible, agile projects prefer keeping as many things as possible in the realm of collaborative discussions rather than resorting to contract remedies.

Review concepts from quality management on agile projects.

- In agile projects, quality is the everyone's responsibility: The team owns quality. It is the job of the Scrum master, the product owner, and the cross-functional team.
- Quality assurance (ensuring that processes are designed and operate with sufficient quality) is addressed using retrospective ceremonies. Standards for this continuous improvement process need to encourage and reward changes that generate measurable and lasting results.
- It is vital that the retrospective process encourage experimentation to seek better ways to achieve goals or to find and address root causes of issues. Plans should also include ways to identify and abandon experiments that are not adding value.
- The Scrum master may need to plan to revisit the goals of retrospectives and reinvigorate the team if people fall into anti-patterns such as treating the retrospective as just another meeting.
- Quality control (testing for quality in deliverables) is not a separate step in agile but is instead built into the smallest batch size of work: user story, defect, or spike.
- The idea is to ensure that quality errors are both very small and easy to correct and are discovered earlier so they can be addressed sooner. An agile way of expressing this concept is "to aim small is to miss small."
- Quality control is planned at the detail level by building quality control steps into the definition of "done" for each task. The definition can be revised in various ceremonies.
- Once deliverables are validated as passing quality control tests by the person(s) doing the work, plans will specify who will need to review and accept or reject specific stories. Usually this will be the product owner, but it could also be a task assigned to other stakeholders.
- Retrospectives determine what the team is trying to achieve and set goals and related measurements to achieve this rather than solely focusing on problems.
- Retrospectives focus on how the team can discover and address the root causes.
- Retrospectives improve quality from an efficiency and an effectiveness perspective.
- Automating quality tests reduces risk of the steps not getting done fully.
- For a software project, quality control means developing testing protocols for stories or defects both at the individual task level and at the system or integration level.
- A SAFe® concept called the architectural runway involves building out the software architecture to support the near-term likely project requirements such as the epics on the roadmap. Some ad hoc architecture development is still supported. The chief software architect may serve as the product owner for this iteration. The process should be kept brief.
- For non-software projects, in many cases it will be feasible and helpful to use the agile concept of building quality into the smallest steps by having the persons doing the task also perform quality checks during task execution or just at the end. However, some more traditional quality assurance and quality control steps may also be planned.

- Verified deliverables will be reviewed by the product owner and perhaps other stakeholders against the success criteria and marked either as accepted or rejected. This review can be a demonstration ceremony or offline use. Use by internal customers before the product reaches external customers improves quality.

Review concepts from risk management and agile.

- Agile and hybrid projects may rely more heavily on rolling wave planning for risk management because of their requirements and/or technical uncertainty and the need to plan only the upcoming iteration in detail.
- Agile and hybrid projects may plan to perform certain risk management steps during iteration planning meetings (risk identification, analysis, and planned responses), others during daily standups (such as a discussion of blockers for a given team member's work), and others during retrospectives (such as the efficiency and effectiveness of risk mitigation steps taken during the iteration).
- Team members need to feel safe to identify and discuss risks without being branded as naysayers.
- Short iterations for planning can create the risk of inefficient or poorly planned iterations, possible rework or work that is not usable, or a failure to keep the big-picture, long-term horizon in view (excessive focus on the short term). Just-in-time risk planning may not always leave enough time.
- People conflict risks may be significant, since the team needs synergy.
- Requirements may not be correctly identified, feedback could be poor or nonexistent, or very high priority requirements may be identified after too much of the budget/schedule has been used.
- There may not be a technical solution that can be devised for a requirement, or the project could spend too much time going down the wrong road.
- The requirement to provide working deliverables that have been fully tested at the end of an iteration means that risks on agile or hybrid projects tend to be identified quickly and before they become too large. Having the product owner be involved on a daily basis means that the client will be kept fully informed of emerging risks.
- Scrum masters will be involved in helping to analyze the risks that team members bring up since this is part of their role: removing team impediments and blockers. Product owners can also help analyze risks because they are in a good position to assess the potential impact of the risk on the overall project and its integration.
- Risk responses are typically planned at the iteration level and tend to be small in scale.
- Risk monitoring occurs during iteration planning ceremonies, daily standups, and retrospective ceremonies as needed.

Agile Concepts from Module 6

Here are some key points about agile that are presented in Module 6.

Review concepts related to change control and agile.

- In agile practice, change is anticipated and welcomed. One of the four values stated in the Agile Manifesto is the value of "responding to change over following a plan." One of the 12 principles behind the manifesto is "Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage."
- It is assumed that products will change through iterations. If these changes result in the customer receiving value sooner, then the change is worth the disruption of plans.
- Manage expectations by informing the product owner about the costs and risks of making a change to product or project scope priority and then make changes as quickly as possible. This allows the product owner and the project team to receive feedback about the effectiveness of the change.
- The change control process should not itself become an impediment. The Scrum master may need to influence this process.
- Agile methodology deals with the challenge of plans not being as reliable as people hope they will be by breaking the planning task into smaller chunks.
- Adjusting the iteration duration to the anticipated rate of change allows the agile team to respond quickly to changes (longer duration for more stable projects).
- During iteration planning, changes from previous iterations are added to the product backlog and the backlog is groomed.
- Agile teams capture change requests in ceremonies. In daily standups, team members may report a problem. The response will be discussed offline. If the response is to address the problem through a change, the change request becomes a new item in the product backlog for a future iteration.
- Team members are empowered to make small changes that do not affect product scope or delay iteration work.
- A change is never initiated during an iteration. If the issue has serious or broad implications, the project manager and the product owner may cancel/replan the iteration.
- Retrospective meetings may result in changes to work processes.
- Changes can be tracked using index cards, software, or spreadsheets.
- The product owner weighs the change against the needs of the organization (e.g., its business strategy), customers (the user stories), and the team capabilities and resources.
- The project manager's focus may be on facilitating discussions, using appropriate information-gathering and problem-solving tools, and leading whatever decision-making approach has been chosen.
- The team members participate fully in discussions about the change.

Review stakeholder management in agile projects.

- When product owners and team facilitators create responsive, trustful relationships with stakeholders, the process and the resulting product are more likely to meet stakeholder expectations and engender their support. Trustful relationships are built through inclusiveness and transparency
- Stakeholders can be involved in creating and mapping user stories that are then decomposed into more narrow requirements. This supports meeting stakeholder expectations.
- Stakeholders deliver feedback during iteration reviews within the timeboxed period. Their timely feedback allows the team to proceed efficiently, and they need to be made aware of how feedback delays impact the project.
- Stakeholders are directly involved in decision making, which helps avoid the delays associated with hierarchical structures.
- Stakeholders can help identify potential risks at the beginning of a cycle when the risks can be addressed proactively.
- Because of the stakeholders' role in providing feedback, the product owner, project manager, and core team are especially committed to developing trusting and respectful relationships with all stakeholders. Stakeholders should be made to feel as if they are just as much a part of the team as its core members.
- It will be in the team's interest for stakeholders to go beyond minimal requirements during information gathering and reviews and to see the success of the project as their own success.
- Because of the iterative nature of agile projects, the task of managing stakeholder expectations comes up sooner and the engagement of stakeholders in controlling changes is more critical. The participation of certain stakeholders in demonstrations and reviews may challenge stakeholders' expectations. The product owner, project leader, and core team must continually review and reconfirm stakeholder assumptions and expectations.
- Stakeholders must also be kept apprised of changes from previous iterations, the reasoning behind the changes, and their resolution.

Review the following information related to communication planning and agile.

- One of the characteristics of agile projects is the democratization of communication. This enables the timely and quick communication of information that is needed in agile. It also supports agile's commitment to collaboration. This attitude is shown in the fact that key stakeholders considered essential to the project's success are included in project meetings, including daily standups or scrums and review meetings. The Scrum master encourages informal conversations to develop relationships and share information.
- The need for transparency and collaboration also drives a greater use of **social computing** (various online communication tools) for networking and developing deeper levels of trust with stakeholders.

- Social computing is also a response to the diversity of project teams, with many younger members more comfortable with it.
- In the interests of faster and clearer communication, agile and similar methodologies often rely on visual tools (kanban board) and timeboxing of project meetings.
- The preference in agile methodology for colocated project teams recognizes the complexity of communication and the value of face-to-face communication.
- If colocation is not feasible, one can use a fishbowl window (a continuous videoconferencing connection) or remote pairing (screen sharing).
- A thoughtful approach to communications needs and methods is especially important in environments subject to high levels of change.
- Changing situations or events can also require a change in communications tactics to avoid ambiguity and redundancy.
- It is vital that an agile project have flexible, transparent, and streamlined communications.
- Face-to-face and concise methods of communication are preferred in agile/hybrid projects. To keep communication channels simpler, teams may be deconstructed into sub-teams. Scrum of Scrums (and other agile scaling frameworks) break large teams into smaller teams that have representatives who join other higher-level teams to minimize communication channels.
- Meetings are an important form of communication in agile methodologies since they are an efficient way to communicate information and make decisions.
- During the sprint, team members communicate spontaneously and continuously, without rules. During the sprint daily standup or scrum, however, communication is highly regimented in order to save time and keep to the 15-minute timebox.
- In a daily standup (or scrum), each team member delivers very brief answers to agreed questions. In iteration-based agile or scrum, these questions focus on what has been accomplished since the last meeting, what will be accomplished next, and what impediments exist.
- In flow-based agile daily standups, the questions focus on making sure that work is moving forward as efficiently as possible by identifying any distractions from the team's focus and any opportunities to improve workflow.
- Avoid letting daily standups become a series of status reports. This is an anti-pattern—a known mistake to be avoided.
- Another mistake is to derail the standup by trying to solve problems that are identified during the meeting. (Do this offline.)
- Agile teams may use various approaches to communicate backlog refinement. Iteration-based agile teams may have a time-boxed, one-hour meeting midway through the sprint. Flow-based agile teams may simply communicate by changing the task or kanban board.

- Demonstrations/reviews are designed to capture feedback. The teams decide on appropriate timing of these meetings—for example, when significant work has been done or when feedback may help decide direction.
- Retrospectives are opportunities for teams to learn from completed work and improve future work. During these meetings, both feelings and facts can be introduced and discussed.

Review information related to knowledge transfer in agile.

- The Agile Manifesto decrees that working software is more valuable than comprehensive documentation. The emphasis in this value should be on the word "comprehensive." Comprehensive documentation (explicit knowledge) can endanger speed and efficiency, especially considering the high rate of change in agile.

- Knowledge sharing enables better collaboration, the heart of agile teams. All members should be able to do each other's jobs—at least well enough to understand the job. New members must be able to grasp the direction of work quickly. In agile project management methodologies, teams must find knowledge transfer methods that offer fast and effective internalization and externalization of knowledge transfer.

- Ceremonies in agile or Scrum practice play a key role in knowledge transfer:
  - The iteration or sprint planning meeting is an opportunity for the product owner, team, and Scrum master to discuss the prioritized product backlog and create shared understanding of the product and the work to be done in this sprint/iteration. The team shares their expertise (their tacit knowledge) in estimating time requirements and deciding what work will be done and who will be responsible for performing it. The output (explicit knowledge) is the sprint backlog.
  - The daily standup is used to communicate work done, work to be done, and impediments that must be addressed offline.
  - The iteration review or demonstration is designed to elicit stakeholder feedback.
  - The retrospective at the end of the sprint or iteration is an opportunity for the product owner and the team to discuss what is and is not working, identify problems, and develop solutions as a group. This ritual supports continuous improvement for the current project and for future projects.

- During the sprint, team members elaborate requirements for their assigned tasks by working directly with customer representatives—a formalized exchange of knowledge.

- Artifacts, such as the kanban board and burnup/burndown charts, are accessible to all team members and provide transparency about the status of work and project resources.

- In pair programming, two team members work side by side on a single task. They share a computer; one may "drive" the computer while the other observes and comments. It is highly social and therefore enables the transfer of tacit knowledge. Discussion as the

pair works is spontaneous, informal, and possibly wide-ranging. Pair programming can be used to ensure project continuity: If one pair member is unavailable, the partner can perform the work. Pair programming can also be used as a training tool.

- Documentation is necessary for project continuity: It decreases time spent on learning what has been done and reduces time wasted as a result of misunderstandings. However, documentation should not become wasteful itself.
- Document significant work rather than everything.
- Include documentation in the backlog with resource estimates.
- Be mindful of user needs. What do they need to know? What is not essential? Let the customer decide how much documentation is enough.
- Use the test-driven documentation (TDD) approach to narrow the focus of documentation. The test both describes the work and validates it.
- Document only content that is stable. That way it will be less likely that it will need to be revised.
- Use technology to capture and include screen images and/or narration.
- Consider communication options other than print—for example, a video or whiteboard conversation.
- "Test" documentation by sharing it with someone who can review it from a user/customer perspective.
- Make sure the documentation is visible to team members and users.

Review information related to project closure and agile.

- In agile/hybrid projects, the closure criteria are represented by the prioritized backlog list (subject to change).
- The product owner collects user stories from the customer. Each user story has specific acceptance criteria. These are objective requirements that must be met before the user story can be considered done. This is shared with the team for transparency.
- The product owner is responsible for when a deliverable is complete at the end of each sprint or iteration.
- The *PMBOK® Guide—Seventh Edition* defines **definition of done (DoD)** as "a checklist of all the criteria required to be met so that a deliverable can be considered ready for customer use."

- The definition of done must be understood and agreed on by the team. Each team will define its own "done" criteria. It may include work that is ready for release because it was tested, integrated, and compiled, or it may mean work actually delivered.to the customer.
- Fulfillment of acceptance criteria and delivery of work may occur at multiple points.

Predictive Project Integration Review

The key points about predictive project integration management are as follows:

- Integration is the key task project managers perform, because it involves getting all of the persons and project parts to work together as one unit.
- Business documents and agreements are key inputs to the project charter.
- Without a charter there is no project.
- The charter is not a project plan, and it is never updated once it is signed off on.
- The charter is like the U.S. Constitution. It is a bedrock reference point against which improper changes might be declared "unconstitutional."
- Many organizations have different names for Initiating inputs and outputs; learn the PMI terminology for the exam.
- The project management plan is a plan of plans.
- Review the "Project Management Plan and Project Documents" exhibit that shows what is in the plan versus what is a project document.
- Direct and Manage Project Work is the process that will consume the bulk of actual project time, because it is where the actual work gets done.
- Manage Project Knowledge involves the use of existing knowledge and the creation of new knowledge to achieve project objectives and aid future projects. This process is performed throughout the project.
- Monitor and Control Project Work is an umbrella process that is done from the earliest part of Initiating to the final moments of Closing.
- Project managers never make unilateral changes. They can reject some changes, but if there is any doubt about what to do, they fill out change request forms for themselves and on behalf of others.
- Closing can involve project phases, in which case the deliverables are handed off to the next phase and lessons learned help inform the next phase.
- Closing is vital, and there are many questions on properly closing the project to release resources and pass on organizational learning.

Exhibit 1-21 provides a worksheet for you to fill out. For each process in this Knowledge Area, first write a one-sentence description of what you think the process accomplishes and then list the key benefits of the process. Exhibit 1-22 follows providing some sample answers. Your answers do not need to exactly match, but you can mark significant differences for review.

Exhibit 1-21: Integration Management Worksheet

Integration Management	One-Sentence Description	Key Benefits
Develop Project Charter		
Develop Project Management Plan		
Direct and Manage Project Work		
Manage Project Knowledge		
Monitor and Control Project Work		
Perform Integrated Change Control		
Close Project or Phase		

Exhibit 1-22: Completed Integration Management Worksheet

Integration Management	One-Sentence Description	Key Benefits
Develop Project Charter	Develop the project charter to document project existence, give the project manager authority to use resources, and list high-level requirements, assumptions, constraints, and risks.	• Well-defined project start and boundaries. • Formal record of project. • Formal acceptance and commitment to the project.
Develop Project Management Plan	Create the plan of plans and integrate all subplans into a comprehensive whole.	• Central document that defines the basis of all project work.
Direct and Manage Project Work	Lead and perform project work and implement approved changes as corrective or preventive action or defect repairs.	• Overall management of project work.
Manage Project Knowledge	Use existing knowledge and create new knowledge to achieve the project's objectives and contribute to organizational learning.	• Prior organizational knowledge leveraged to produce or improve project outcomes. • Knowledge created by the project available to support organizational operations and future projects.
Monitor and Control Project Work	Track, analyze, forecast, and report on progress to meet objectives, making change requests as needed.	• Stakeholders understand the current situation and steps taken. • Forecast scope, schedule, and budget.
Perform Integrated Change Control	Review and approve or deny change requests; determine how to change deliverables, OPAs, project documents, and the project management plan; and document their disposition.	• Integrated, holistic review of change requests reduces risks of unintended consequences.
Close Project or Phase	Finalize all transitions, contracts, and payments for the project or phase and mark its formal end.	• Formal ending of work. • Lessons learned. • Resources freed up.

Exhibit 1-23 asks you to list examples of EEFs and OPAs for each process. Exhibit 1-24 shows the completed chart. Don't worry if you don't have all of the items on your list. Knowing the major ones is what is important.

Exhibit 1-23: Integration Management EEFs and OPAs Worksheet

Integration Management	EEFs	OPAs
Develop Project Charter		
Develop Project Management Plan		
Direct and Manage Project Work		
Manage Project Knowledge		
Monitor and Control Project Work		
Perform Integrated Change Control		
Close Project or Phase		

Exhibit 1-24: Completed Integration Management EEFs and OPAs Worksheet

Integration Management	EEFs	OPAs
Develop Project Charter	• Government/industry standards: codes of conduct, quality, worker protection • Legal and regulatory requirements and/or constraints • Marketplace conditions • Organizational culture/structure • Political climate • Stakeholder expectations and risk thresholds	• Organizational standard processes, policies, and procedures • Portfolio, program, and project governance framework • Monitoring and reporting methods • Templates • Historical information and lessons learned
Develop Project Management Plan	• Government/industry standards • Legal and regulatory requirements and/or constraints • *PMBOK® Guide* for vertical market/focus (e.g., agile) • Organizational culture/structure • Infrastructure	• Organizational standard processes, policies, and procedures • Project management plan template (includes guidelines and criteria for tailoring and project closure guidelines) • Change control procedures/approval process • Monitoring and reporting methods • Historical information and lessons learned
Direct and Manage Project Work	• Organizational culture/structure • Infrastructure • Stakeholder risk thresholds	• Organizational standard processes, policies, and procedures • Issue and defect management, procedures, controls, and status database • Performance measurement database for process/product data • Change control and risk control procedures • Historical information and lessons learned
Manage Project Knowledge	• Organizational, stakeholder, and customer culture • Geographic distribution of facilities and resources • Organizational knowledge experts • Legal and regulatory requirements/constraints	• Organizational standard processes, policies, and procedures • Personnel administration • Organizational communication requirements • Formal knowledge- and information-sharing procedures

Integration Management	EEFs	OPAs
Monitor and Control Project Work	• PMIS • Infrastructure • Stakeholders' expectations and risk thresholds • Government or industry standards	• Organizational standard processes, policies, and procedures • Financial controls procedures • Monitoring and reporting methods • Issue and defect management procedures • Organizational knowledge base
Perform Integrated Change Control	• Legal and regulatory restrictions, requirements, or constraints • Government or industry standards • Organizational governance framework • Contracting and purchasing constraints	• Change control procedures • Procedures for approving and issuing change authorizations • Configuration management knowledge base with versions and baselines of all official organizational standards, policies, procedures, and project documents
Close Project or Phase		• Project/phase closure guidelines/ requirements • Configuration management knowledge base with versions and baselines of all official organizational standards, policies, procedures, and project documents

Scope Management Review

The key points about scope management (primarily from a predictive project perspective) are as follows:

- Scope is about what you will do and will not do; you want to do exactly that, no more and no less.
- Plan Scope Management has two plan outputs, not one: the scope management plan and the requirements management plan.
- Constraints are not requirements. "I need it by next month" is a constraint, not a requirement.
- The ability to trace requirements allows project managers to determine who needs to review the potential impact of a given change.
- The scope baseline has three subcomponents: the project scope statement, the WBS, and the WBS dictionary.
- The WBS ensures that everything is accounted for and assigned an owner.
- Validate Scope is in Monitoring and Controlling and involves the customer reviewing deliverables (not processes) that have already been internally verified using Control Quality. Verified deliverables then become accepted (or rejected) deliverables.
- Control Scope involves variance analysis, which measures variance from the scope baseline.

Exhibit 1-25 and Exhibit 1-26 continue the brief description and key benefit activity.

Exhibit 1-25: Scope Management Worksheet

Scope Management	One-Sentence Description	Key Benefits
Plan Scope Management		
Collect Requirements		
Define Scope		
Create WBS		
Validate Scope		
Control Scope		

Exhibit 1-26: Completed Scope Management Worksheet

Scope Management	One-Sentence Description	Key Benefits
Plan Scope Management	Documents how to define, validate, and control scope.	• Guidance on how to manage scope at all times.
Collect Requirements	Elicit, document, and manage stakeholder needs and expectations.	• Basis for defining and managing project and product scope.
Define Scope	Define the project scope statement to describe the project and product deliverables, acceptance criteria, exclusions, constraints, and assumptions.	• Sets boundaries on deliverables. • Sets which requirements are in or out.
Create WBS	Create a deliverable-oriented WBS that divides deliverables and work into parts that can be time- and cost-estimated.	• Structured vision of what needs to be delivered.
Validate Scope	Get formal customer acceptance of completed interim and final deliverables as part of monitoring and controlling.	• Acceptance process has objectivity. • Better chance of final deliverable acceptance if parts are accepted.
Control Scope	Monitor project and product scope status and manage scope baseline changes.	• Continual scope baseline maintenance.

Exhibit 1-27 and Exhibit 1-28 continue the EEFs and OPAs activity.

Exhibit 1-27: Scope Management EEFs and OPAs Worksheet

Scope Management	EEFs	OPAs
Plan Scope Management		
Collect Requirements		
Define Scope		
Create WBS		
Validate Scope		
Control Scope		

Exhibit 1-28: Completed Scope Management EEFs and OPAs Worksheet

Scope Management	EEFs	OPAs
Plan Scope Management	• Organization culture, infrastructure, personnel administration, and marketplace conditions	• Policies and procedures • Historical information and lessons learned
Collect Requirements	• Organization culture, infrastructure, personnel administration, and marketplace conditions	• Policies and procedures • Historical information and lessons learned
Define Scope	• Organization culture, infrastructure, personnel administration, and marketplace conditions	• Scope statement policies, procedures, and templates • Project files and lessons learned
Create WBS	• Industry-specific WBS standards	• WBS policies, procedures, and templates • Project files and lessons learned
Validate Scope		
Control Scope		• Control scope policies, procedures, and guidelines • Monitoring and reporting methods and templates

Schedule Management Review

The key points about schedule management (primarily from a predictive project perspective) are as follows:

- Planning sets how to measure the schedule and control thresholds, etc.
- Activities are first defined in schedule management (not the WBS).
- Finish-to-start (FS) is the default precedence diagramming method (PDM), finish-to-finish (FF) and start-to-start (SS) are parallel, and start-to-finish (SF) is rare.
- Project managers look to discretionary dependencies and free float (delays that don't affect any successor activity) when juggling the schedule.
- Leads are early starts, lags are late starts.
- Bottom-up estimating is the most accurate method.
- Resource leveling can extend the schedule; smoothing cannot.
- Crashing throws resources at an activity; fast tracking does things on parallel tracks.

Exhibit 1-29 and Exhibit 1-30 continue the brief description and key benefit activity.

Exhibit 1-29: Schedule Management Worksheet

Schedule Management	One-Sentence Description	Key Benefits
Plan Schedule Management		
Define Activities		
Sequence Activities		
Estimate Activity Durations		
Develop Schedule		
Control Schedule		

Exhibit 1-30: Completed Schedule Management Worksheet

Schedule Management	One-Sentence Description	Key Benefits
Plan Schedule Management	How to plan, manage, execute, and control schedule.	• Guidance, policy, and direction on how to manage the schedule.
Define Activities	Define specific actions needed to produce deliverables.	• Decompose work packages into activities. • Estimate, schedule, execute, and monitor and control project work.
Sequence Activities	Identify relationships between activities and put them into logical order.	• Finds the order with greatest efficiency given all project constraints.
Estimate Activity Durations	Estimate work periods needed to complete activities.	• Time to complete each activity is a major input to Develop Schedule.
Develop Schedule	Combine sequence, duration, and constraints into a realistic schedule, adjusting and compressing as needed.	• Generates a schedule model with planned completion dates.
Control Schedule	Monitor activity progress and manage schedule baseline changes.	• Ability to recognize variance from schedule and take corrective and preventive action to reduce risk.

Exhibit 1-31 and Exhibit 1-32 continue the EEFs and OPAs activity.

Exhibit 1-31: Schedule Management EEFs and OPAs Worksheet

Schedule Management	EEFs	OPAs
Plan Schedule Management		
Define Activities		
Sequence Activities		
Estimate Activity Durations		
Develop Schedule		
Control Schedule		

Exhibit 1-32: Completed Schedule Management EEFs and OPAs Worksheet

Schedule Management	EEFs	OPAs
Plan Schedule Management	• Organizational culture and structure • Resource availability and skills • PMIS scheduling tool • Guidelines and criteria for tailoring standard processes and procedures • Commercial databases	• Monitoring and reporting tools • Schedule control tools, policies, procedures, and guidelines • Templates and forms • Historical information and lessons learned
Define Activities	• Organizational culture and structure • Published commercial data • PMIS	• Historical information and lessons learned • Standardized processes • Activity list templates • Scheduling methodology
Sequence Activities	• Government/industry standards • PMIS • Scheduling tools • Work authorization systems	• Portfolio and program plans and project dependencies and relationships • Scheduling methodology project files, policies, procedures, and guidelines • Networking templates • Historical information and lessons learned
Estimate Activity Durations	• Databases and commercial information on duration estimation and productivity metrics • Team member locations	• Historical duration information • Project calendars • Estimating policies • Scheduling methodology • Lessons learned
Develop Schedule	• Government and industry standards • Communication channel	• Scheduling methodology • Project calendars
Control Schedule		• Schedule control policies, procedures, guidelines, and tools • Monitoring and reporting methods

Costs and Budget Review

The key points about cost management, including budgeting (primarily from a project perspective), are as follows:

- Estimates start out rough and become more precise (progressive elaboration). The rough order of magnitude is –25 percent to +75 percent (multiply by 0.75 for the low end and 1.75 for the high end).
- The project manager owns the contingency reserve; management or the sponsor controls the management reserve, and its amounts are usually a secret.
- The cost baseline includes the contingency reserve and excludes the management reserve. The project budget includes all reserves.
- Get lots of practice solving for variables in earned value analysis (EVA).
- Earned value is the first or top term listed for SV, SPI, CV, and CPI.
- While EAC_{New} (redo bottom up) is the most common estimate at completion (EAC) method in practice, it is difficult to test. If variances will persist, use EAC_{CPI}; if they won't, use EAC_{BAC}. Use $EAC_{CPI*SPI}$ if a firm deadline is mentioned.

Exhibit 1-33 and Exhibit 1-34 continue the brief description and key benefit activity.

Exhibit 1-33: Cost Management Worksheet

Cost Management	One-Sentence Description	Key Benefits
Plan Cost Management		
Estimate Costs		
Determine Budget		
Control Costs		

Exhibit 1-34: Completed Cost Management Worksheet

Cost Management	One-Sentence Description	Key Benefits
Plan Cost Management	How to plan, manage, expend, and control costs.	• Guides and directs managing costs.
Estimate Costs	Use estimating techniques to approximate money for activities and reserves.	• Determines cost needed to complete work.
Determine Budget	Develop the cost baseline by aggregating costs for activities or work packages.	• Cost baseline becomes benchmark for variance analysis.
Control Costs	Monitor cost status and forecast, and manage cost baseline changes.	• Means to recognize and predict variance, correct, and minimize risk.

Exhibit 1-35 and Exhibit 1-36 continue the EEFs and OPAs activity.

Exhibit 1-35: Cost Management EEFs and OPAs Worksheet

Cost Management	EEFs	OPAs
Plan Cost Management		
Estimate Costs		
Determine Budget		
Control Costs		

Exhibit 1-36: Completed Cost Management EEFs and OPAs Worksheet

Cost Management	EEFs	OPAs
Plan Cost Management	• Organizational culture and structure • Global/regional market availability of products, services, and results • Currency exchange rates • Published resource cost rate information • PMIS (cost alternatives)	• Financial controls and databases • Historical information and lessons learned • Cost estimating and budgeting policies, procedures, and guidelines
Estimate Costs	• Market conditions • Published cost rate information/ price lists • Exchange rates and inflation	• Cost estimating policies and templates • Historical information and lessons learned
Determine Budget	• Exchange rates and inflation	• Cost budget policies, procedures, guidelines, and tools • Reporting methods • Historical information and lessons learned
Control Costs		• Cost budget policies, procedures, guidelines, and tools • Reporting methods

Resource Management Review

The key points about resource management (primarily from a predictive project perspective) are as follows:

- The resource management plan includes three parts: roles and responsibilities, project organizational charts, and a resource management plan.
- OPAs are critical for this process, as organizational resource policies and procedures must be followed.
- Determining what motivates persons and teams will open them to be influenced.
- Hierarchical charts show staffing requirements by role and reporting relationships.
- Only one person can be accountable for a given activity in a RACI chart.
- Recognition and rewards are tailored to fit individual motivations, and many good ones are nonfinancial.
- Estimating team and physical resources is necessary to perform the project work.
- Acquire Resources happens during Executing because this is when the bulk of the team and resources are allocated to (or taken off) the project.
- Project managers emphasize interpersonal skills when developing the project team.
- Formal training must be in the resource management plan.

- Teams may skip steps or get stuck in various steps of the Tuckman ladder (forming, storming, norming, performing, and adjourning).
- The team performance assessment is an output of Develop Team and an input to Manage Team. It is a team appraisal.
- The project performance appraisal is a tool and technique of Manage Team. It is an individual assessment that is added to the personnel file.

Exhibit 1-37 and Exhibit 1-38 continue the brief description and key benefit activity.

Exhibit 1-37: Resource Management Worksheet

Resource Management	One-Sentence Description	Key Benefits
Plan Resource Management		
Estimate Activity Resources		
Acquire Resources		
Develop Team		
Manage Team		
Control Resources		

Exhibit 1-38: Completed Resource Management Worksheet

Resource Management	One-Sentence Description	Key Benefits
Plan Resource Management	Create roles, responsibilities, skills, hierarchies, and a staffing management plan, including staff acquisition and release, resource calendars, training, and recognition and rewards.	• Roles and responsibilities. • Required skills. • Reporting relationships. • Staffing management plan.
Estimate Activity Resources	Estimate type and quantity of materials, human resources, equipment, and supplies per activity.	• Identify type, quantity, and characteristics of resources. • More accurate cost and duration estimates.
Acquire Resources	Confirm availability of and obtain needed team, facilities, equipment, supplies, and other resources to complete activities.	• Guides team and resource selection and responsibility assignment.
Develop Team	Improve group interactions, team maturity, and individual competencies.	• Improved teamwork. • Enhanced people skills and competencies. • Motivated employees. • Reduced staff turnover. • Project performance.
Manage Team	Track individual performance, give feedback, resolve issues, and manage team changes.	• Influences behavior. • Manages conflict and resolves issues. • Appraises individuals.
Control Resources	Ensure that physical resources assigned to project are available as planned, monitor use of resources, perform any necessary corrective actions.	• Ensures that resources are available at right time and place and released when no longer needed.

Exhibit 1-39 and Exhibit 1-40 continue the EEFs and OPAs activity.

Exhibit 1-39: Resource Management EEFs and OPAs Worksheet

Resource Management	EEFs	OPAs
Plan Resource Management		
Estimate Activity Resources		
Acquire Resources		
Develop Team		
Manage Team		
Control Resources		

Exhibit 1-40: Completed Resource Management EEFs and OPAs Worksheet

Resource Management	EEFs	OPAs
Plan Resource Management	• Organizational culture and structure • Resource location, competency, and availability • Marketplace conditions	• Resource policies and procedures • Safety and security policies • Resource management plan templates • Historical information and lessons learned
Estimate Activity Resources	• Organizational culture and structure • Resource location, competency, and availability • Published estimating data • Marketplace conditions	• Staffing and rental/purchase policies and procedures • Historical information and lessons learned
Acquire Resources	• Organizational culture and structure • Resource location, competency, and availability • Marketplace conditions	• Policies and procedures for allocating, acquiring, and assigning resources • Historical information and lessons learned
Develop Team	• Human resource management policies • Team member skills and knowledge • Geographic distribution of team	• Historical information and lessons learned
Manage Team	• Human resource management policies	• Certificates of appreciation • Corporate apparel • Other organizational prerequisites
Control Resources		• Resource control and assignment policies • Escalation procedures • Lessons learned repository

Procurement Management Review

The key points about procurement management are as follows:

- OPAs are critical for procurement management because organizations often have well-developed procurement policies.
- Make-or-buy is a strategic decision that weighs the costs and benefits of how to acquire each project resource but also considers risks, capabilities, and existing resources.
- The most appropriate type of contract hinges on who bears the risk and how much certainty there can be in cost and time estimates at the time the contract is made.

- Fixed-price contracts transfer the most risk to the seller (e.g., a vendor). Cost-reimbursable contracts and time and material contracts transfer most of the risk to the buyer.
- All procurement items need a procurement statement of work (SOW) so the seller can generate a bid.
- Bidder conferences are a critical part of the procurement process. This is where bidders can prove that they have the promised capabilities; the conference serves as a forum for questions and feedback. Any information given to one bidder is given to all so that the process remains fair and unbiased.
- Contract terms and conditions specify how issues are escalated, how to apply the contract change control system, and whether arbitration is a required step.
- Procurement audits occur after the contract is closed to assess whether to work with the other party again.

Exhibit 1-41 and Exhibit 1-42 continue the brief description and key benefit activity.

Exhibit 1-41: Procurement Management Worksheet

Procurement Management	One-Sentence Description	Key Benefits
Plan Procurement Management		
Conduct Procurements		
Control Procurements		

Exhibit 1-42: Completed Procurement Management Worksheet

Procurement Management	One-Sentence Description	Key Benefits
Plan Procurement Management	Document procurement decisions including contract types, selection criteria, and potential sellers.	Make/buy/lease? What, how, how much, and when to acquire.
Conduct Procurements	Get seller responses, select a seller, and award a contract.	Agreements align internal and external stakeholder expectations.
Control Procurements	Manage relationships, contract performance, changes or corrections to contracts, and closing contracts.	Ensures that both seller's and buyer's performance meets requirements.

Exhibit 1-43 and Exhibit 1-44 continue the EEFs and OPAs activity.

Exhibit 1-43: Procurement Management EEFs and OPAs Worksheet

Procurement Management	EEFs	OPAs
Plan Procurement Management		
Conduct Procurements		
Control Procurements		

Exhibit 1-44: Completed Procurement Management EEFs and OPAs Worksheet

Procurement Management	EEFs	OPAs
Plan Procurement Management	• Marketplace conditions • Marketplace offerings • Suppliers and their past performance and reputation • Industry terms and conditions • Local requirements • Legal advice • Contract management systems • Established pre-qualified supplier system • Financial accounting and payments system	• Pre-approved seller lists • Formal procurement policies, procedures, and guidelines • Contract types
Conduct Procurements	• Local laws and regulations • Economic environment • Marketplace conditions • Historical information • Prior agreements • Contract management systems	• Previously qualified sellers • Organizational policies and templates • Financial policies and procedures
Control Procurements	• Contract change control system • Marketplace conditions • Accounts payable system • Buying organization’s code of ethics	• Procurement policies

Delivery of Value and Quality Management Review

The key points about quality management are as follows:

- Quality is the degree to which a set of inherent characteristics fulfills requirements. (Quality is defined by the customer.)
- Grade is specified by scope, but quality must meet the quality management plan.
- Manage Quality happens during Executing because it corrects/improves processes. The key review is an audit.
- Control Quality results in verified deliverables (verifying that the deliverables conform to quality standards so customers don't experience defects). The key review is an inspection.
- Cost of quality (COQ) is a summation of costs: cost of conformance (prevention and appraisal costs) plus cost of nonconformance (internal and external failure costs).

Exhibit 1-45 and Exhibit 1-46 continue the brief description and key benefit activity.

Exhibit 1-45: Quality Management Worksheet

Quality Management	One-Sentence Description	Key Benefits
Plan Quality Management		
Manage Quality		
Control Quality		

Exhibit 1-46: Completed Quality Management Worksheet

Quality Management	One-Sentence Description	Key Benefits
Plan Quality Management	How to demonstrate compliance with quality requirements and standards.	• Guides and directs managing and validating quality.
Manage Quality	Audit processes, quality requirements, and measurement results during Executing to verify standards and operational definitions.	• Facilitates improvement of quality processes.
Control Quality	Measure deliverables and monitor and record quality activity results to assess conformance and recommend changes.	• Identify and eliminate root causes of process or product quality issues. • Validate that deliverables and work meet stakeholder acceptance requirements.

Exhibit 1-47 and Exhibit 1-48 continue the EEFs and OPAs activity.

Exhibit 1-47: Quality Management EEFs and OPAs Worksheet

Quality Management	EEFs	OPAs
Plan Quality Management		
Manage Quality		
Control Quality		

Exhibit 1-48: Completed Quality Management EEFs and OPAs Worksheet

Quality Management	EEFs	OPAs
Plan Quality Management	• Government agency regulations • Application area rules, standards, and guidelines • Geographic distribution • Organizational structure • Marketplace conditions • Working or operating conditions • Cultural perceptions of quality	• Organizational quality policies, procedures, guidelines, and templates • Historical databases and lessons learned
Manage Quality		• Organizational quality policies, procedures, and guidelines • Quality templates • Results from previous audits and lessons learned
Control Quality	• PMIS and/or quality management software • Government regulations • Rules, standards, guidelines	• Quality standards, policies, work guidelines, and templates • Issue and defect reporting procedures

Uncertainty and Risk Management Review

The key points about risk management are as follows:

- Risks include both threats and opportunities.
- Responses are strongly shaped by project risk appetite, tolerance, and threshold.
- Risk management is everyone's responsibility and a regular part of meetings.
- The risk register is progressively elaborated: identified, prioritized, and then quantified risks; then planned responses; then owners, status, outcomes, and results.
- Probability and impact are defined so estimators make comparable risk estimates.
- Qualitative analysis is nuanced and mandatory; quantitative analysis is optional.
- Avoiding, transferring, and mitigating for threats correspond to exploiting, sharing, and enhancing for opportunities, just with a different perspective on what to do about them.
- Secondary risks are unintended consequences of responses, and residual risks are risks that remain despite a response.

Exhibit 1-49 and Exhibit 1-50 continue the brief description and key benefit activity.

Exhibit 1-49: Risk Management Worksheet

Risk Management	One-Sentence Description	Key Benefits
Plan Risk Management		
Identify Risks		
Perform Qualitative Analysis		
Perform Quantitative Analysis		
Plan Risk Responses		
Implement Risk Responses		
Monitor Risks		

Exhibit 1-50: Completed Risk Management Worksheet

Risk Management	One-Sentence Description	Key Benefits
Plan Risk Management	How to conduct risk activities.	• Ensures that the degree of risk management matches risks and project value.
Identify Risks	List risks and their characteristics.	• Documents existing risks. • Knowledge and ability to anticipate risks.
Perform Qualitative Analysis	Categorizing and ranking risks by assessing probability and impact in a matrix.	• Reduce uncertainty. • Focus on high-priority risks.
Perform Quantitative Analysis	Numerically analyzing the impact of threats and opportunities on project objectives using EMV, etc.	• Quantitative risk information to support decision making and reduce uncertainty.
Plan Risk Responses	Develop options and actions to enhance opportunities and reduce threats.	• Addresses by risk priority. • Can add schedule, budget, and plan resources.
Implement Risk Responses	Implement agreed-upon risk response plans.	• Ensures that risk responses are executed as planned. • Minimize project threats. • Maximize project opportunities.
Monitor Risks	Execute responses, track risks, monitor residual risks, and evaluate risk process.	• Efficient risk approach. • Optimum responses.

Exhibit 1-51 and Exhibit 1-52 continue the EEFs and OPAs activity.

Exhibit 1-51: Risk Management EEFs and OPAs Worksheet

Risk Management	EEFs	OPAs
Plan Risk Management		
Identify Risks		
Perform Qualitative Analysis		
Perform Quantitative Analysis		
Plan Risk Responses		
Implement Risk Responses		
Monitor Risks		

Exhibit 1-52: Completed Risk Management EEFs and OPAs Worksheet

Risk Management	EEFs	OPAs
Plan Risk Management	• Overall risk thresholds set by the organization or key stakeholders	• Organization risk policy • Risk categories • Common definitions of risk concepts and terms • Templates (risk statements, plan, register, and reports) • Roles and responsibilities • Authority levels • Historical information and lessons learned
Identify Risks	• Published risk data • Academic studies • Benchmarking results • Industry studies	• Historical project files and risk data • Organizational and project process controls • Risk statement templates and checklists from previous projects
Perform Qualitative Analysis	• Published risk data • Industry studies	• Historical project files and risk data
Perform Quantitative Analysis	• Published risk data • Industry studies	• Historical project files and risk data
Plan Risk Responses	• Risk appetites and thresholds of key stakeholders	• Templates for risk management plan, register, and report • Historical databases • Lessons learned
Implement Risk Responses		• Lessons learned repository
Monitor Risks		

Stakeholder Management Review

The key points about stakeholder management are as follows:

- Identify Stakeholders is a critical process that happens early in Initiating.
- Project managers set and manage stakeholder expectations so they remain realistic.
- Stakeholders can be unaware, resistant, neutral, supportive, and leading; project managers assess their current and desired state.
- Power is authority level; impact is the stakeholder's ability to make changes to the project's plans or execution; influence is how active the stakeholder is; and interest is the stakeholder's level of concern.

- Stakeholders who have high power and interest should be managed closely, those with high power and low interest need to be kept satisfied, those with high interest and low power should be kept informed, and those with low power and interest should be monitored.
- Stakeholder issues are reported in the issue log, and it is kept up to date with who owns the issue and its status.

Exhibit 1-53 and Exhibit 1-54 conclude the brief description and key benefit activity.

Exhibit 1-53: Stakeholder Management Worksheet

Stakeholder Management	One-Sentence Description	Key Benefits
Identify Stakeholders		
Plan Stakeholder Engagement		
Manage Stakeholder Engagement		
Monitor Stakeholder Engagement		

Exhibit 1-54: Completed Stakeholder Management Worksheet

Stakeholder Management	One-Sentence Description	Key Benefits
Identify Stakeholders	Identify the names, interests, involvement, influence, interdependencies, and impact of people, groups, and organizations who could impact or be impacted by a decision, activity, or outcome of the project.	• Identify the appropriate focus for a stakeholder or group of stakeholders.
Plan Stakeholder Engagement	How to engage stakeholders at all times based on needs, interests, and impact.	• Clear, actionable plan to interact with stakeholders and support project.
Manage Stakeholder Engagement	Work with stakeholders to meet needs/ expectations, address issues as they occur, and inspire engagement at the right level and time.	• Increase support and minimize resistance from stakeholders, improving odds of project success.
Monitor Stakeholder Engagement	Manage overall stakeholder relationships and adjust strategies for engaging stakeholders.	• Maintain or increase stakeholder engagement in a changing environment.

Exhibit 1-55 and Exhibit 1-56 conclude the EEFs and OPAs activity.

Exhibit 1-55: Stakeholder Management EEFs and OPAs Worksheet

Stakeholder Management	EEFs	OPAs
Identify Stakeholders		
Plan Stakeholder Engagement		
Manage Stakeholder Engagement		
Monitor Stakeholder Engagement		

Exhibit 1-56: Completed Stakeholder Management EEFs and OPAs Worksheet

Stakeholder Management	EEFs	OPAs
Identify Stakeholders	• Organizational culture, structure, governance • Government or industry standards • Global, regional, or local trends • Geographic distribution of facilities and resources	• Stakeholder register templates • Prior stakeholder registers • Lessons learned
Plan Stakeholder Engagement	• Organizational culture, structure, governance • Personnel administration policies • Stakeholder risk appetites • Established communication channels • Global, regional, or local trends • Geographic distribution of facilities and resources	• Organizational policies and procedures for social media, ethics, and security • Organizational communication requirements • Standardized guidelines for development, exchange, storage, and retrieval of information • Historical information and lessons learned • Software needed to support effective stakeholder engagement
Manage Stakeholder Engagement	• Organizational culture, structure, governance • Personnel administration policies • Stakeholder risk appetites • Established communication channels • Global, regional, or local trends • Geographic distribution of facilities and resources	• Organizational policies and procedures for social media, ethics, and security • Organizational communication requirements • Standardized guidelines for development, exchange, storage, and retrieval of information • Historical information and lessons learned
Monitor Stakeholder Engagement	• Organizational culture, structure, governance • Personnel administration policies • Stakeholder risk appetites • Established communication channels • Global, regional, or local trends • Geographic distribution of facilities and resources	• Organizational policies and procedures for social media, ethics, and security • Organizational communication requirements • Standardized guidelines for development, exchange, storage, and retrieval of information • Historical information and lessons learned

Communications Management Review

The key points about communications management are as follows:

- Project managers consider vertical/horizontal, formal/informal, official/unofficial, internal/external, and verbal/nonverbal communications dimensions.
- They determine stakeholder information needs, communication types, and media.
- They set up authorized communication representatives to minimize official channels, complexity, and risk of missed/inaccurate communications.
- Project managers consider urgency, frequency, availability, ease of use, environmental factors, and confidentiality when selecting media.
- In the sender-receiver model, the sender encodes the message and transmits it in a medium, and the receiver decodes it. Acknowledgment proves receipt but little else. Feedback is encoded, sent via a medium, and decoded by the sender, and it does indicate the receiver's level of understanding. Noise is any hindrance to communication.

Exhibit 1-57 and Exhibit 1-58 continue the brief description and key benefit activity.

Exhibit 1-57: Communications Management Worksheet

Communications Management	One-Sentence Description	Key Benefits
Plan Communications Management		
Manage Communications		
Monitor Communications		

Exhibit 1-58: Completed Communications Management Worksheet

Communications Management	One-Sentence Description	Key Benefits
Plan Communications Management	How to communicate given constraints of available organizational assets and stakeholders' information needs and requirements.	• Identifies most effective and efficient communication methods for each stakeholder.
Manage Communications	Create, collect, distribute, store, retrieve, and dispose of project information.	• Efficient and effective communications flow between stakeholders.
Monitor Communications	Ensure that stakeholders' information needs are met.	• Optimal flow of information at all times.

Exhibit 1-59 and Exhibit 1-60 continue the EEFs and OPAs activity.

Exhibit 1-59: Communications Management EEFs and OPAs Worksheet

Communications Management	EEFs	OPAs
Plan Communications Management		
Manage Communications		
Monitor Communications		

Exhibit 1-60: Completed Communications Management EEFs and OPAs Worksheet

Communications Management	EEFs	OPAs
Plan Communications Management	• Organizational culture, structure, governance • Personnel administration policies • Stakeholder risk thresholds • Established communication channels, tools, and systems • Global, regional, and local trends • Geographic distribution of facilities and resources	• Organizational policies and procedures for social media, ethics, security, issues, risk, change, and data management • Organizational communication requirements • Standardized guidelines for development, exchange, storage, and retrieval of information • Historical information and lessons learned
Manage Communications	• Organizational culture, structure, governance • Personnel administration policies • Stakeholder risk thresholds • Established communication channels, tools, and systems • Global, regional, and local trends • Geographic distribution of facilities and resources	• Organizational policies and procedures for social media, ethics, security, issues, risk, change, and data management • Organizational communication requirements • Standardized guidelines for development, exchange, storage, and retrieval of information • Historical information and lessons learned
Monitor Communications	• Organizational culture, structure, governance • Established communication channels, tools, and systems • Global, regional, and local trends • Geographic distribution of facilities and resources	• Organizational policies and procedures for social media, ethics, and security • Organizational communication requirements • Standardized guidelines for development, exchange, storage, and retrieval of information • Historical information and lessons learned