



مدیریت پروژه بر اساس PMBOK به همراه الحاقیه ساخت (ویرایش هفتم)

بخش ششم:
مدل‌ها، روش‌ها و Artifacts

ارائه دهندگان:

سید محمدرضا علوی‌پور

(PhD, PMP, CMIT)

دانشگاه Illinois Tech آمریکا



What we will learn?

- ☐ Overview
- ☐ Commonly Used Models
- ☐ Models Applied Across Performance Domains
- ☐ Methods Applied Across Performance Domains
- ☐ Commonly Used Artifacts
- ☐ Artifacts Applied Across Performance Domains

Overview

Introduction

- ❑ This section provides a **high-level description** of some **commonly used** models, methods, and artifacts that are **useful in managing projects**.
- ❑ The items listed in this section are **not intended** to be exhaustive or prescriptive, **but rather** to help project teams think about the **options available to them**.

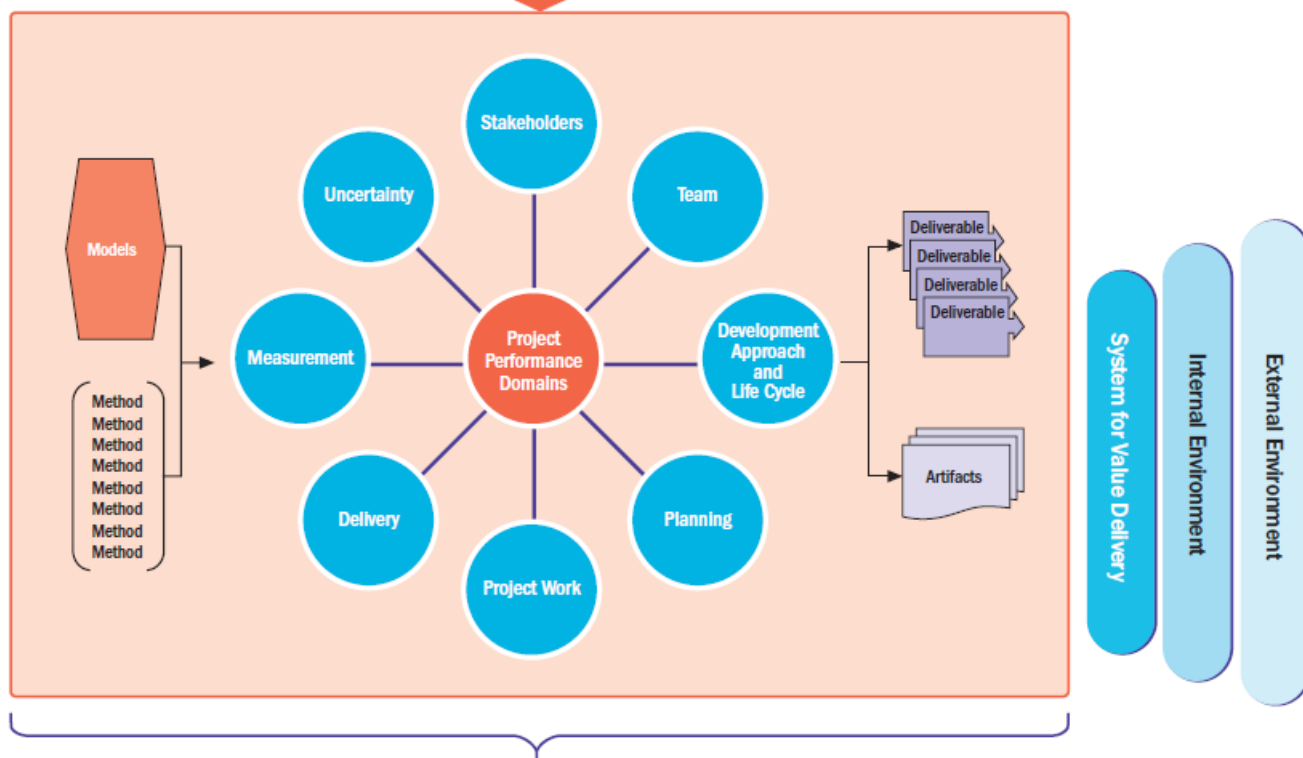
In the context of this guide, terms are defined as follows:

- ▶ **Model.** A model is a thinking strategy to explain a process, framework, or phenomenon.
- ▶ **Method.** A method is the means for achieving an outcome, output, result, or project deliverable.
- ▶ **Artifact.** An artifact can be a template, document, output, or project deliverable.

Tailor to fit the project context

Principles of Project Management			
Be a diligent, respectful, and caring steward	Create a collaborative team environment	Effectively engage with stakeholders	Focus on value
Recognize, evaluate, and respond to system interactions	Demonstrate leadership behaviors	Tailor based on context	Build quality into processes and deliverables
Navigate complexity	Optimize risk responses	Embrace adaptability and resiliency	Enable change to achieve the envisioned future state

Guide Behavior



Commonly Used Models

Introduction

- ❑ **Models** reflect small-scale, simplified views of reality and **present scenarios**, strategies, or approaches for **optimizing work processes and efforts**.
- ❑ A **model** helps to **explain how something works** in the real world.
- ❑ **Models** can **shape behavior** and **point to approaches** for solving problems or **meeting needs**.
- ❑ **Some models** were **developed** with projects and project teams in mind, **others** are **more general** in nature.
- ❑ The content in this section does **not describe** how to develop or create new models.

Introduction

- ❑ The **model descriptions** presented provide a high-level view.
- ❑ Project **team members** and **other stakeholders** can refer to **many sources** (e.g., PMI's library of standards products and PMISTandards+™) for more-complete descriptions and explanations of the models.

What models?

1. Situational leadership models
 - i. Situational Leadership II
 - ii. OSCAR Model
2. Communication models
 - i. Cross-cultural communication
 - ii. Effectiveness of communication channels
 - iii. Gulf of execution and evaluation
3. Motivation models
 - i. Hygiene and motivational factors
 - ii. Intrinsic versus extrinsic motivation
 - iii. Theory of needs
 - iv. Theory X, Theory Y, Theory Z

4. Change models
 - i. Managing change in organizations
 - ii. ADKAR model
 - iii. The 8-Step process for leading change
 - iv. Virginia stair change model
 - v. Transition model
5. Complexity models
 - i. Cynefin framework
 - ii. Stacey matrix
6. Project team development models
 - i. Tuckman ladder
 - ii. Drexler/Sibbet team performance model
7. Other models
 - i. Conflict model
 - ii. Negotiation
 - iii. Planning
 - iv. Process groups
 - v. Salience model

Situational leadership models

- ❑ A **subset** of a vast array of **leadership models**
- ❑ Leadership styles are also **tailored Situational**
- ❑ Leadership models describe **ways to tailor one's leadership style** to meet the needs of the individual and the project team.

Situational leadership models - Situational Leadership® II

- ❑ Ken Blanchard's Situational Leadership® II **measures** project team member development using

1. Competence

- ❖ Competence is the **combination** of ability, knowledge, and skill.

2. Commitment

- ❖ Commitment speaks to the confidence and motivation an individual has.

*As an individual's competence and commitment **evolve**,*

leadership styles evolve from directing

to coaching

to supporting

to delegating

in order to meet the individual's needs.

Situational leadership models – OSCAR Model

- ☐ The **OSCAR** coaching and mentoring model was developed by **Karen Whittleworth** and **Andrew Gilbert**.
- ☐ It helps **individuals** adapt their coaching or leadership styles to **support individuals** who have an action plan for personal development.
- ☐ The model refers to **five contributing factors**.

Let's see these factors!

Situational leadership models – OSCAR Model

- ▶ **Outcome.** An outcome identifies the long-term goals of an individual and the desired result from each conversation session.
- ▶ **Situation.** A situation enables conversation about the current skills, abilities, and knowledge level of the project team member; why the person is at that level; and how that level impacts the individual's performance and peer relationships.
- ▶ **Choices/consequences.** Choice and/or consequences identify all the potential avenues for attaining the desired outcome and the consequences of each choice so an individual can choose viable avenues for reaching their long-term goals.
- ▶ **Actions.** An action commits to specific improvements by focusing on immediate and attainable targets that an individual can work toward within a specified time frame.
- ▶ **Review.** Holding regular meetings offers support and helps to ensure that individuals remain motivated and on track.

Communication models

- ❑ **Communication models** demonstrate concepts associated with
 1. **How** sender and receiver frames of reference impact the effectiveness of communication
 2. **How** the communication medium influences the effectiveness of communication
 3. **Types of disconnects** between end-user expectations and reality

What are communication models?

Communication models – Cross-Cultural communication

❑ A communication model developed by Browaeys and Price

1. Incorporates the idea that the **message itself**

2. **How** it is **transmitted** is **influenced** by

sender's current knowledge, experience, language, thinking, and communication styles, as well as stereotypes and relationship to the receiver.

3. Similarly, the receiver's knowledge, experience, language, thinking, and communication styles, as well as stereotypes and relationship to the sender will influence **how the message is interpreted**.

Communication models – Effectiveness of Communication Channels

- ❑ **Alistair Cockburn** developed a model that describes the **communication channels** along the axes of effectiveness and richness.
 - ❖ As defined by Richard Daft and Robert Lengel, **richness** relates to the **amount of learning** that can be **transmitted** through a medium.
 - ❖ **Media richness** is a function of characteristics, including the ability to:
 - ▶ Handle multiple information cues simultaneously,
 - ▶ Facilitate rapid feedback,
 - ▶ Establish a personal focus, and
 - ▶ Utilize natural language.
 - ❖ Richer communication channels: Face-to-Face
 - ❖ Less rich communication channels: Note or a text message

Communication models – Gulf of execution and Evaluation

- ❑ **Donald Norman** described the gulf of execution as the degree to which an item corresponds with what a person expects it to do.
 - ❖ Said another way, it is the **difference** between
 - ✓ Intention of a user
 - ✓ What the item allows them to do or supports them in doing
 - *A car that has the ability to parallel park itself would have a gulf of execution if the driver expected to push a button labeled “park” and have the car park itself, and the car did not park itself.*

Motivation models

- ☐ People perform better when they are motivated, and
- ☐ People are motivated by different things

Let's see four models described in PMBOK!

Motivation models – Hygiene and motivational factors

- ❑ **Frederick Herzberg** believed that job satisfaction and dissatisfaction stem from conditions called **motivational factors**.
- ❑ **Motivational factors** include matters that relate to the **content of the work**, such as achievement, growth, and advancement.
 - ❖ **Insufficient motivational factors** lead to **dissatisfaction**.
 - ❖ **Sufficient motivational factors** lead to **satisfaction**.
- ❑ Herzberg also identified **hygiene factors** related to the **work**, such as company policies, salary, and the physical environment.
 - ❖ If hygiene factors are insufficient, they cause **dissatisfaction**.
 - ❖ However, even if they are sufficient, they do **not lead to satisfaction**.

Motivation models – Intrinsic versus extrinsic motivation

- ❑ Daniel Pink published several books about the **intrinsic factors that motivate people.**
- ❑ He stated that while **extrinsic rewards**, such as salary, are motivators to a certain extent,

once a **person is paid fairly** for their work, the motivational power of extrinsic rewards ceases to exist.
 - ❖ For **complicated and challenging work**, such as much of the work on projects, **intrinsic motivators** are far **longer lasting** and more effective.

Pink identifies three types of intrinsic motivators

Motivation models – Intrinsic versus extrinsic motivation

- ❑ Pink identifies three types of intrinsic motivators: autonomy, mastery, and purpose:
 - ▶ **Autonomy.** Autonomy is the **desire to direct one's own life**. This is aligned with being **able to determine** how, where, and when to accomplish work. Autonomy includes flexible work hours, working from home, and work on self-selecting and self-managing project teams.
 - ▶ **Mastery.** Mastery is about **being able to improve and excel**. The desire to do excellent work, learn, and achieve goals are aspects of mastery.
 - ▶ **Purpose.** Purpose speaks to the need to **make a difference**. **Knowing** the project vision and how work contributes to achieving that vision allows **people to feel** like they are making a difference.

Motivation models – Theory of needs

- ❑ **David McClellan's model** states that all people are driven by needs of achievement, power, and affiliation.
- ❑ The **relative** strength of **each need** depends on an individual's experiences and culture.
 - ▶ **Achievement.** People who are motivated by achievement, such as reaching a goal, are motivated by **activities and work** that is challenging, but reasonable.
 - ▶ **Power.** People who are motivated by **power** like to organize, motivate, and lead others. They are motivated by increased responsibility.
 - ▶ **Affiliation.** People who are motivated by **affiliation** seek acceptance and belonging. They are motivated by being part of a team.

Motivation models – Theory X, theory Y, and theory Z

- ❑ **Douglas McGregor** devised the Theory X and Theory Y models, which represent a spectrum of employee motivation and corresponding management styles.
 - ▶ **Theory X.** The X side of the spectrum assumes **individuals work** for the sole purpose of income.
 - ❖ They are not ambitious or goal oriented. The corresponding management style to motivate these individuals is a hands-on and top-down approach.
 - ❖ This management style is often seen in a **production or labor-intensive environment**, or one with many **layers of management**.

Motivation models – Theory X, theory Y, and theory Z

- ❑ **Douglas McGregor** devised the Theory X and Theory Y models, which represent a spectrum of employee motivation and corresponding management styles.
 - ▶ **Theory Y.** The Y side of the spectrum assumes that individuals are **intrinsically motivated** to do good work.
 - ❖ The **corresponding management style** has a more personal coaching feel.
 - ❖ The **manager** encourages creativity and discussion.
 - ❖ This **management style** is often seen in creative and knowledge worker environments.

Motivation models – Theory X, theory Y, and theory Z

- ❑ **Douglas McGregor** devised the Theory X and Theory Y models, which represent a spectrum of employee motivation and corresponding management styles.
 - ▶ **Theory Z.** Abraham Maslow saw Theory Z as a transcendent dimension to work **where** individuals are motivated by self-realization, values, and a higher calling.
 - ❖ The **optimal management style** in this situation is one that cultivates insight and meaning.
 - ❖ **William Ouchi's version of Theory Z** focuses on **motivating employees** by creating a job for life where the focus is on the **well-being of employees and their families**. This style of management seeks to promote high productivity, morale, and satisfaction.

Change models

- ❑ Many projects contain an aspect of changing systems, behaviors, activities, and sometimes, cultures.
- ❑ Managing this type of change requires **thinking about how** to transition from the current to the future desired state.

There are many models that describe the **activities** **necessary** for successful change management.

Change models – Managing change in organizations

❑ A Practice Guide [3] is an **iterative model** has **five associated elements** interconnected through a series of feedback loops:

- ▶ **Formulate change.** This element focuses on **building the rationale** to help people understand why change is needed and how the future state will be better.
- ▶ **Plan change.** The **identification of activities** helps people prepare for the transition from the current to the future state.
- ▶ **Implement change.** This **iterative element** focuses on demonstrating the future state capabilities, checking to ensure the capabilities are having the intended impact, and **making necessary improvements or adaptations** in response.
- ▶ **Manage transition.** This element considers **how to address needs** related to the change that may surface once the **future state is achieved**.
- ▶ **Sustain change.** This element seeks to **ensure that the new capabilities** continue and **previous processes** or behaviors cease.

Change models – Adkar model

❑ **Jeff Hiatt** developed the ADKAR® Model which focuses on **five sequential steps** that **individuals undergo** when adapting to change:

- ▶ **Step 1: Awareness.** This step identifies **why** the change is **necessary**.
- ▶ **Step 2: Desire.** Once people know why the change is necessary, there needs to be a **desire to be part of** and support the change.
- ▶ **Step 3: Knowledge.** People need to understand **how to change**. This includes understanding new processes and systems in addition to new roles and responsibilities. **Knowledge** can be imparted through training and education.
- ▶ **Step 4: Ability.** In this step, **knowledge is supported** with hands-on practice and access to expertise and help as needed.
- ▶ **Step 5: Reinforcement.** Reinforcement **supports the sustainment** of the change. This can include rewards, recognition, feedback, and measurement.

Change models – The 8-step process for leading change

- ❑ **John Kotter** introduced the **8-Step Process** for Leading Change for transforming organizations.
- ❑ It is a **top-down approach** where the **need** for and approach to change **originates** at the top levels of the organization, and then is promoted down through the organization's layers of management to the change recipients.

Change models – The 8-step process for leading change

- ▶ **Step 1: Create urgency.** Identify **potential threats and opportunities** that drive the need for change.
- ▶ **Step 2: Form a powerful coalition.** Identify the **change leaders**. Change leaders are not necessarily based on hierarchy. The change leaders should be influential people from a variety of roles, expertise, social, and political importance.
- ▶ **Step 3: Create a vision for change.** Identify the **values** that are central to the change. Then create a brief vision statement that summarizes the change. Next, identify a strategy to realize the vision.
- ▶ **Step 4: Communicate the vision.** **Communicate** the vision throughout the change process. **Apply** the vision throughout all aspects of the organization. Senior management and the change coalition should consistently communicate the vision and demonstrate the urgency and benefits of the change.

Change models – The 8-step process for leading change

- ▶ **Step 5: Remove obstacles.** All change comes with **obstacles**. Sometimes the obstacles are outdated processes, sometimes they are based on the organizational structure, and sometimes they are people resistant to change. Regardless, all obstacles **need to be addressed**.
- ▶ **Step 6: Create short-term wins.** Identify **quick and easy wins** to build momentum and support for the change.
- ▶ **Step 7: Build on the change.** Once the **short-term wins** are complete, the organization needs to set goals for continued improvement.
- ▶ **Step 8: Anchor the changes in corporate culture.** Ensure the change becomes ingrained into the **culture**: continue to communicate the vision, tell success stories, recognize people in the organization who embody and empower the change, and continue to support the change coalition.

Change models – Virginia stair change model

- ❑ **Virginia Satir** developed a model of how people experience and cope with change.
- ❑ Its purpose is to help project **team members understand**
 1. What they are feeling
 2. Enable them to move through change more efficiently.

Change models – Virginia stair change model

- ▶ **Late status quo.** This **initial stage** is when everything feels familiar and can be characterized as “**business as usual.**” For some people, business as usual may be good because they know what to expect. For others, this status may feel a bit stale or boring.
- ▶ **The foreign element.** **Something happens** that shifts the status quo **in this stage**. This may include initiating a project that introduces change to people’s usual way of working. There is often a period of resistance and reduction in performance **after the change is introduced**. People may ignore the change or dismiss its relevance.

Change models – Virginia stair change model

► **Chaos.** People are in unfamiliar territory. They are no longer comfortable, and performance drops to its lowest level. Feelings, actions, and behaviors are **unpredictable**. Some people feel anxious, others may shut down, and some individuals may feel excited. Chaos can make people **very creative** as they try to find ways to make sense of the situation. **They try** various ideas and behaviors to see which of these has a positive outcome.

Change models – Virginia stair change model

- ▶ **The transforming idea.** People come to a **point** where they come up with an idea that helps them make **sense of the situation**. They begin to see how they can find a way out of the chaos and cope with the new reality. Work performance begins to increase.
- ▶ **Practice and integration.** People try to **implement** their new ideas or behaviors. There may be setbacks and a period of trial and error, but **eventually they learn** what works and what doesn't. This leads to improved performance. Often performance is at a higher level than it was before the **foreign element** was introduced.
- ▶ **New status quo.** People **get used to the new environment**, and their performance stabilizes. Eventually, the **new status quo** becomes the normal way of working.

Change models – Transition model

- ❑ **William Bridges'** Transition Model provides an understanding of what occurs to individuals psychologically when an **organizational change** takes place.
- ❑ This model **differentiates** between change and transition.
 - ❖ **Change** is situational and happens **whether or not** people transition through it.
 - ❖ **Transition** is a psychological process where people **gradually accept** the details of the new situation and the changes that come with it.

Change models – Transition model

- ❑ The model identifies three stages of transition associated with change:
 - ▶ **Ending, losing, and letting go.** The **change** is introduced in this stage. It is often **associated** with fear, anger, upset, uncertainty, denial, and resistance to the change.
 - ▶ **The neutral zone.** The **change** is happening in this stage. In some instances, people may feel frustration, resentment, confusion, and anxiety about the change. Productivity may **drop** as people learn **new ways of doing work**. In other instances, **people may become** very creative, innovative, and passionate about trying new ways of working.
 - ▶ **The new beginning.** At this point, **people** accept and even embrace the change. They are becoming **more adept** at the new skills and the new ways of working. People are often **open to learning** and are **energized** by the change.

Complexity models

- ☐ Projects exist in a state of **ambiguity** and require **interactions** among multiple systems, often with uncertain outcomes.
- ☐ **Complexity** is a challenge to work with.

Two models described here!

Complexity models – Cynefin framework

- ❑ The **Cynefin framework**, created by Dave Snowden, is a **conceptual framework** used to **diagnose** cause-and-effect relationships as a decision-making aid.
- ❑ The framework offers **five problem and decision-making** contexts

Complexity models – Cynefin framework

- ▶ **Where** there is an **obvious cause-and-effect relationship**, best practices are used to make decisions.
- ▶ **Complicated relationships** **exist** when there is a set of known unknowns or a range of correct answers. In these situations, it is best to assess the facts, analyze the situation, and apply good practices.
- ▶ **Complex relationships** include unknown unknowns. There is **no apparent cause and effect**, and there are **no obvious right answers**. In complex environments, one should probe the environment, sense the situation, and respond with action. This style uses **emergent practices** that allow for repeated cycles of probe-sense-respond as complex environments change in reaction to multiple stimuli, and what worked once may not be effective the next time.

Complexity models – Cynefin framework

- ▶ In chaotic environments, the cause and effects are **unclear**. There is **too much confusion** to wait to **understand the situation**. In these situations, the first step is to **take action to try and stabilize** the situation, then sense **where there is some stability**, and respond by taking steps to get the chaotic situation to a **complex situation**.
- ▶ Disordered relationships lack clarity and may require breaking them into **smaller parts** whose context **links** with one of the **other four contexts**.

Complexity models – Stacey matrix

- ❑ **Ralph Stacey** developed the Stacey matrix which is similar to the Cynefin framework, but it looks at **two dimensions** to determine the relative complexity of a project:
 - (a) the relative **uncertainty** of the requirements for the **deliverable**, and
 - (b) the relative **uncertainty** of the technology that will be used to **create the deliverable**.
- ❑ **Based on the relative uncertainty** of these dimensions, a project is considered simple, complicated, complex, or chaotic.

Project team development models

- ❑ Project teams move through **different stages of development**.
- ❑ **Understanding the stage** of the team in **its development** helps project managers support the project team and its growth.

The **two models** presented illustrate how project teams move through **different stages** to become high-performing project teams.

Project team development models – Tuckman ladder

❑ **Bruce Tuckman** articulated the stages of team development as forming, storming, norming, and performing. Many people add a fifth stage, adjourning.

► **Forming.** The project team first comes together. Members get to know each other's name, position on the project team, skill sets, and other pertinent background information. This might occur in the kickoff meeting.

► **Storming.** Project team members jockey for position on the team. This phase is where people's personalities, strengths, and weaknesses start to come out. There might be some conflict or struggle as people figure out how to work together. Storming might go on for some time or pass relatively quickly.

Project team development models – Tuckman ladder

❑ **Bruce Tuckman** articulated the stages of team development as forming, storming, norming, and performing. Many people add a fifth stage, adjourning.

► **Norming.** The project team starts to function as a collective body. At this point, project team members know their places on the team and how they relate to and interface with all the other members. They are starting to work together. There might be **some challenges as work progresses**, but these issues are resolved quickly, and the project team moves into action.

► **Performing.** The project team becomes operationally efficient. This is the mature project team stage. Project teams that have been together for a while are able to develop a synergy. By working together, project team members accomplish more and produce a high-quality product.

Project team development models – Tuckman ladder

❑ **Bruce Tuckman** articulated the stages of team development as forming, storming, norming, and performing. Many people add a fifth stage, adjourning.

► **Adjourning.** The project team completes the work and disperses to work on other things. If the project team has formed good relationships, some project team members might be sad about leaving the project team.

Project team development models – Drexler/Sibbet team performance model

- ❑ Allan Drexler and David Sibbet developed a **team performance model** with seven steps.
 - ❖ Steps 1 through 4 **describe** the stages in creating a project team, and
 - ❖ Steps 5 through 7 **cover** project team sustainability and performance.

Project team development models – Drexler/Sibbet team performance model

- ▶ **Step 1: Orientation.** Orientation answers the question of why. In this stage, the project team learns the purpose and mission for the project. This usually occurs at a kickoff meeting, or is documented in a business case, project charter, or lean start-up canvas.
- ▶ **Step 2: Trust building.** Trust building answers the question of who. This stage sheds light on who is on the project team and the skills and abilities each person brings. It can also include information about key stakeholders who may not be part of the project team but can influence the project team.
- ▶ **Step 3: Goal clarification.** Goal clarification answers what. In this stage, the project team elaborates the high-level project information. This may include finding out more about stakeholder expectations, requirements, assumptions, and deliverable acceptance criteria.

Project team development models – Drexler/Sibbet team performance model

- **Step 4: Commitment.** Commitment addresses the question of how. In this stage, the project team starts to define plans to achieve the goals. This can include milestone schedules, release plans, high-level budgets, resource needs, and so forth.
- **Step 5: Implementation.** High-level plans are decomposed into greater levels of detail, such as a detailed schedule or backlog. The project team starts working together to **produce deliverables**.

Project team development models – Drexler/Sibbet team performance model

► **Step 6: High performance.** After the project team has worked together for some time, project team members reach a high level of performance. They work well together, don't need much oversight, and experience synergies within the project team.

► **Step 7: Renewal.** Renewal is the stage of working through changes on the project team or the project. The deliverables, stakeholders, environment, project team leadership, or team membership may change. This causes the project team to consider if the past behavior and actions are **still sufficient**, or if the project team needs to go back to a previous stage to reset the expectations and ways of working together.



Other models

The models described here cover a wide range of topics, including conflict management, negotiation, planning, Process Groups, and salience.

Other models – Conflict model

- ❑ Conflict is **common** on projects. Conflict can be healthy and productive when **handled well**.
- ❑ It can result in **greater trust** among project team members and a **deeper commitment** to the outcomes.
- ❑ **Fear of conflict** can restrict communication and creativity. However, conflict can be unhealthy as well.
- ❑ **Addressing conflict inappropriately** can lead to dissatisfaction, lack of trust, and reduced morale and motivation.

Other models – Conflict model

❑ The model based on work by **Ken Thomas and Ralph Kilmann** describes **six ways of addressing conflict** by focusing on the **relative power** between the individuals and the desire to maintain a good relationship as follows:

► **Confronting/problem solving.** Confronting a conflict **treats** the conflict as a problem **to be solved**. This style of conflict resolution is used **when** the relationship between parties is important, and when each person has confidence in the other party's ability to problem-solve.

► **Collaborating.** Collaborating involves incorporating multiple views about the conflict. The objective is to learn about the various views and see things from multiple perspectives. This is an effective method when there is trust among the participants and when there is time to come to consensus. A project manager may facilitate this type of conflict resolution between project team members.

Other models – Conflict model

❑ The model based on work by **Ken Thomas and Ralph Kilmann** describes six ways of addressing conflict by focusing on the relative power between the individuals and the desire to maintain a good relationship as follows:

► **Compromising.** There are some conflicts in which all parties will not be fully satisfied. In those instances, finding a way to compromise is the best approach. Compromise entails a willingness to give and take. This allows all parties to get something they want, and it avoids escalating the conflict. This style is often used when the parties involved have equal “power.” A project manager may compromise with a technical manager regarding the availability of a project team member to work on the project.

Other models – Conflict model

- ❑ The model based on work by **Ken Thomas and Ralph Kilmann** describes six ways of addressing conflict by focusing on the relative power between the individuals and the desire to maintain a good relationship as follows:

- ▶ **Smoothing/accommodating.** Smoothing and accommodating are useful when reaching the overarching goal is more important than the disagreement. This approach maintains harmony in the relationship and can create good will between the parties.

This approach is also used when there is a difference in the relative authority or power of the individuals. For example, this approach may be appropriate when there is a disagreement with the sponsor. Since the sponsor outranks the project manager or project team member, and there is a desire to maintain a good relationship with the sponsor, adopting an accommodating posture may be appropriate.

Other models – Conflict model

❑ The model based on work by **Ken Thomas and Ralph Kilmann** describes six ways of addressing conflict by focusing on the relative power between the individuals and the desire to maintain a good relationship as follows:

► **Forcing.** Forcing is used when there is not enough time to collaborate or problem-solve. In this scenario, one party forces their will on the other. The party forcing has more power than the other party. A forcing style may be used if there is a health and safety conflict that needs to be resolved immediately.

► **Withdrawal/avoiding.** Sometimes a problem will go away on its own, or sometimes discussions get heated and people need a cooling-off period. In **both scenarios**, withdrawing from the situation is appropriate. Withdrawal is also used in a **no-win scenario**, such as complying with a requirement imposed by a **regulatory agency** instead of challenging the requirement.

Other models – Negotiation

- ❑ There are many models for **negotiation**. One model is **Steven Covey's** principle of **“Think Win-Win.”**
- ❑ This principle applies to all interactions, not just negotiations, **but** it is described here in the context of negotiation. In negotiations, there are different possible outcomes:
 - ▶ **Win-win.** This is the optimal outcome, where each person is satisfied with the outcome.
 - ▶ **Win-lose/lose-win.** This describes a competition perspective where in order to win, someone else loses. It may also come from a martyr perspective where someone chooses to lose so that others can win.
 - ▶ **Lose-lose.** This outcome can occur when win-win outcomes may have been possible, but competition overwhelms collaboration. In this scenario, everyone ends up worse off.

Other models – Negotiation

❑ A **win-win perspective** is generally found when the following aspects are present:

▶ **Character.** The parties involved are mature, demonstrate integrity, and share the perspective that there is enough value for everybody.

▶ **Trust.** The parties trust each other, establish agreements on how to operate, and are accountable.

▶ **Approach.** Each party is willing to look at the situation from the other's point of view. The parties work together to identify key issues and concerns. They identify what an acceptable solution looks like and identify options to achieve an acceptable solution.

Other models – Planning

- ❑ **Barry Boehm** developed a model that **compares** the time and effort invested in developing plans to **reduce risk**, including the delay and other costs associated with overplanning.
- ❑ By taking more time to plan up front, many projects can **reduce** uncertainty, oversights, and rework.
 - ❖ However, the longer the time spent planning, the longer it takes to get a return on investment,
the more market share could be lost, and the more circumstances can change by the time the output is delivered.

Other models – Planning

- ❑ The **intent of this model** is to help identify the optimum amount of planning, sometimes called the **sweet spot**.
 - ❖ The sweet spot is **different for every project**; therefore, there is no correct answer for the right amount of planning overall.
- ❑ This model demonstrates that there is a **point** where additional planning becomes **counterproductive**.

Other models – Process groups

- ❑ **Project management processes** can be organized into logical groupings of project management inputs, tools and techniques, and outputs that are tailored to meet the needs of the organization, stakeholders, and the project.
- ❑ Groups of processes are **not project phases**.
- ❑ The Process Groups interact within **each phase of a project life cycle**.
- ❑ It is possible that all of these processes could occur **within a single phase**.
- ❑ **Processes** may be iterated within a **phase or life cycle**.
- ❑ The **number of iterations** and interactions between processes **varies** based on the needs of the project.

Other models – Process groups

Projects that follow a process-based approach may use the following five process groupings as an organizing structure:

- ▶ **Initiating.** Those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase.
- ▶ **Planning.** Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve.
- ▶ **Executing.** Those processes performed to complete the work defined in the project management plan to satisfy the project requirements.
- ▶ **Monitoring and Controlling.** Those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.
- ▶ **Closing.** Those processes performed to formally complete or close a project, phase, or contract.

Remember this right?

Other models – Salience model

- ☐ The **Salience Model** is about stakeholders.
- ☐ Salience means prominent, noticeable, or perceived as important.
- ☐ This model was proposed by Ronald K. Mitchell, Bradley R. Agle, and Donna J. Wood.
- ☐ The authors denoted a **stakeholder identification** based on three variables:
 1. Power to **influence**,
 2. Legitimacy of the **stakeholders' relationships** with the project, and
 3. Urgency of the **stakeholders' claim** on the project for stakeholder engagement.

Models Applied Across Performance Domains

Introduction

- ❑ **Different models** are more likely to be useful in different project performance domains.
- ❑ While the **needs of** the project, stakeholders, and organizational environment will determine which models are most applicable for a specific project, there are some performance domains that are more likely to **make use of each model**.
- ❑ Table 4-1 suggests the **performance domain(s)** where each **model is most likely** to be of use;
however, the **project manager and project team** have the ultimate responsibility for selecting the right models for their project.

Mapping models likely to be used in each performance domain

Model	Performance Domain							
	Team	Stakeholders	Dev Approach and Life Cycle	Planning	Project Work	Delivery	Measurement	Uncertainty
Situational Leadership Models:								
Situational Leadership® II	X				X			
OSCAR	X				X			
Communication Models:								
Cross-cultural communication	X	X		X	X			
Effectiveness of communication channels	X	X		X	X			
Gulf of execution and evaluation		X				X		
Motivation Models:								
Hygiene and motivation factors	X			X	X			
Intrinsic versus extrinsic motivation	X			X	X			
Theory of needs	X			X	X			
Theory X, Theory Y, and Theory Z	X			X	X			
Change Models:								
Managing Change in Organizations		X		X	X			
ADKAR®		X		X	X			
8-Step Process for Leading Change		X		X	X			
Transition		X		X	X			
Complexity Models:								
Cynefin framework			X	X	X	X		X
Stacey matrix			X	X	X	X		X
Project Team Development Models:								
Tuckman Ladder	X				X			
Drexler/Sibbet Team Performance	X				X			
Other Models:								
Conflict	X	X			X			
Negotiation		X		X	X	X		
Planning			X	X	X			
Process Groups				X	X	X	X	
Salience		X		X	X			

Commonly Used Methods

Introduction

- ❑ A method is a means for achieving an outcome, output, result, or project deliverable.
- ❑ The methods described here are a **sampling of those commonly used** to support project work.
- ❑ There are **many methods** that are not described here, either
 1. Because they are used in project management the same way they are in **other disciplines**, such as interviewing, focus groups, checklists, and so forth, or
 2. Because they are not frequently used across a **broad spectrum** of projects (i.e., the methods are industry specific).

Introduction

- ☐ The content in this section is **not meant** to describe how a method is performed.
- ☐ The descriptions are presented at a **high level with more detailed information** available from many sources, including PMIstandards+.

Data gathering and analysis

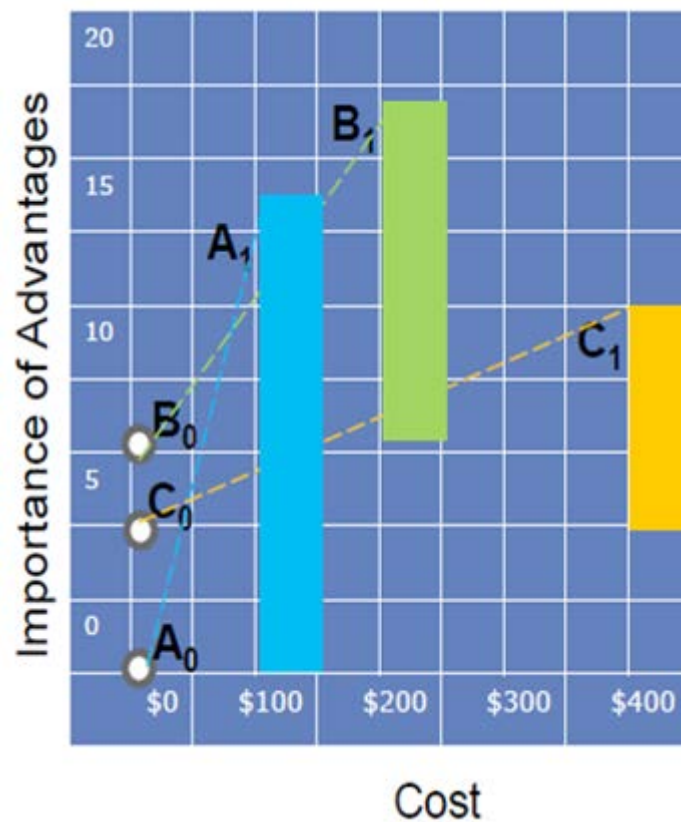
- ❑ Data gathering and analysis methods are used to collect, assess, and evaluate data and information to gain a **deeper understanding** of a situation.
- ❑ The data gathering and analysis methods described here, **coupled with** the artifacts described in Section 4.6.6, are often used to inform decisions.

4.6.6 VISUAL DATA AND INFORMATION

Visual data and information are artifacts that organize and present data and information in a visual format, such as charts, graphs, matrices, and diagrams. Visualizing data makes it easier to absorb data and turn it into information. Visualization artifacts are often produced after data have been collected and analyzed. These artifacts can aid in decision making and prioritization.

Data gathering and analysis

► **Alternatives analysis.** Alternatives analysis is used to evaluate **identified options** in order to select the options or approaches to perform the work of the project.



Factors	Drawings Only	Partial Model	Complete Model	
Factor: Visual Appeal	<u>Judged on paper only</u>	Visual judging of some details	Visual judging of all details	
Criterion: Want a modern style		Greater ability to judge	1 Much greater ability to judge	5
Factor: Seat comfort	<u>Cannot be physically tested</u>	Can physically test two seats	Can physically test 10 seats	
Criterion: Want 30-min seat comfort		More extensive test of comfort	6 Much more extensive test of comfort	10
Factor: Durability	<u>Judged by specifications</u>	Can physically test 10% of details	Can physically test 75% of details	
Criterion: Want highly durable furniture		More extensive test of durability	2 Much more extensive test of durability	7
Total Importance	0	9	22	

Remember this right?

Data gathering and analysis

► **Assumption and constraint analysis.** An **assumption** is a factor that is considered to be true, real, or certain, without proof or demonstration.

A **constraint** is a limiting factor that affects the execution of a project, program, portfolio, or process.

This form of analysis **ensures** that assumptions and constraints are **integrated into the project plans and documents**, and that there is **consistency among them**.

Assumption or Constraint	Could this Be Proven False? (Y/N)	If False, Would it Effect Project? (Y/N)	Convert to Risk? (If Y/Y, then Y)
Will et all Resources that are Needed	Y	Y	Y
All Relevant Shareholders will Come to next Meeting	N	Y	N
Achieving the First Milestone within a Month	Y	Y	Y
Add Text Here	N	Y	N

Data gathering and analysis

- **Benchmarking.** Benchmarking is the **comparison** of actual or planned products, processes, and practices to those of **comparable organizations**, which identifies best practices, generates ideas for improvement, and provides a basis for measuring performance.

Praxie Benchmarking Analysis

Want more best practices? Visit www.Praxie.com

Benchmarking Analysis							
Benchmarks	Core Feature 1 Benchmark Description	Core Feature 1 Score (1 = weak; 10 = strong)	Core Feature 2 Benchmark Description	Core Feature 2 Score (1 = weak; 10 = strong)	Core Feature 3 Benchmark Description	Core Feature 3 Score (1 = weak; 10 = strong)	Overall Benchmark Score
Our Organization		6		3		9	18
Benchmark Organization 1		4		7		6	17
Benchmark Organization 2		10					10
Benchmark Organization 3							0
Benchmark Organization 4							0
Benchmark Organization 5							0

Data gathering and analysis

► **Business justification analysis methods.** This group of analysis methods is associated with authorizing or justifying a project or a decision. The outcomes of the following analyses are often used in a business case that justifies undertaking a project:

► **Payback period.** The payback period is the time needed to recover an investment, usually in months or years.

► **Internal rate of return (IRR).** The internal rate of return is the projected annual yield of a project investment, incorporating both initial and ongoing costs into an estimated percentage growth rate a given project is expected to have.

► **Return on investment (ROI).** Return on investment is the percent return on an initial investment, calculated by taking the projected average of all net benefits and dividing them by the initial cost.

Remember you learned this right?

Data gathering and analysis

IRR	ROI
Calculates the rate of return for a shorter duration	Calculates the performance of return over a certain period of time
IRR takes account of the time value of money. It is used to calculate the annual growth rate of money	ROI can tell the growth rate of investment from beginning to end of the investment period
IRR is a complicated calculation but gives an accurate calculation to determine long-term potential of an investment	While calculating, ROI does not take into account the future value of money

Remember you learned this right?

Data gathering and analysis

► **Business justification analysis methods.** This group of analysis methods is associated with authorizing or justifying a **project or a decision**. The outcomes of the following analyses are **often used in a business case** that justifies undertaking a project:

► **Net present value (NPV).** Net present value is the future value of expected benefits, expressed in the value those benefits have at the **time of investment**. NPV considers current and future costs and benefits and inflation.

► **Cost-benefit analysis.** A cost-benefit analysis is a financial analysis tool used to determine the **benefits provided** by a project **against its costs**.

Remember you learned this right?

Data gathering and analysis

- **Check sheet.** A check sheet is a tally sheet that can be used as a **checklist** when gathering data. Check sheets can be used to collect and segregate data into categories. Check sheets can also be used to create histograms and matrices.

Check Sheet

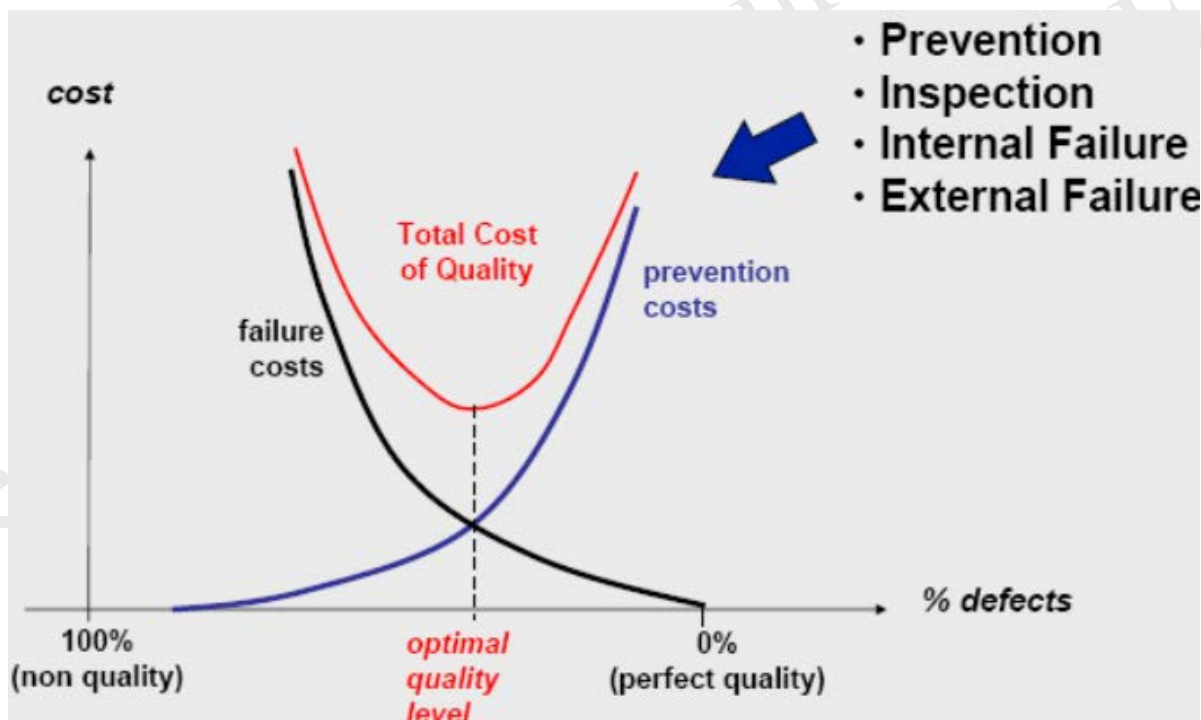
Vehicle Breakdown Maintenance Check Sheet

Name of operator: David Sheet Number: 12
 Date: 04-Nov-2020
 Place: Amherst, Ohio

Defect Types	Frequency					Total
	Vehicle 1	Vehicle 2	Vehicle 3	Vehicle 4	Vehicle 5	
Brake pads worn out	X		X			2
Fuel tank leakage		X				1
Steering locked				X		1
Engine oil seepage		X	X			2
AC not working	X			X		2
Battery darined out			X			1
Lights not working	X				X	2
Total	3	2	3	2	1	

Data gathering and analysis

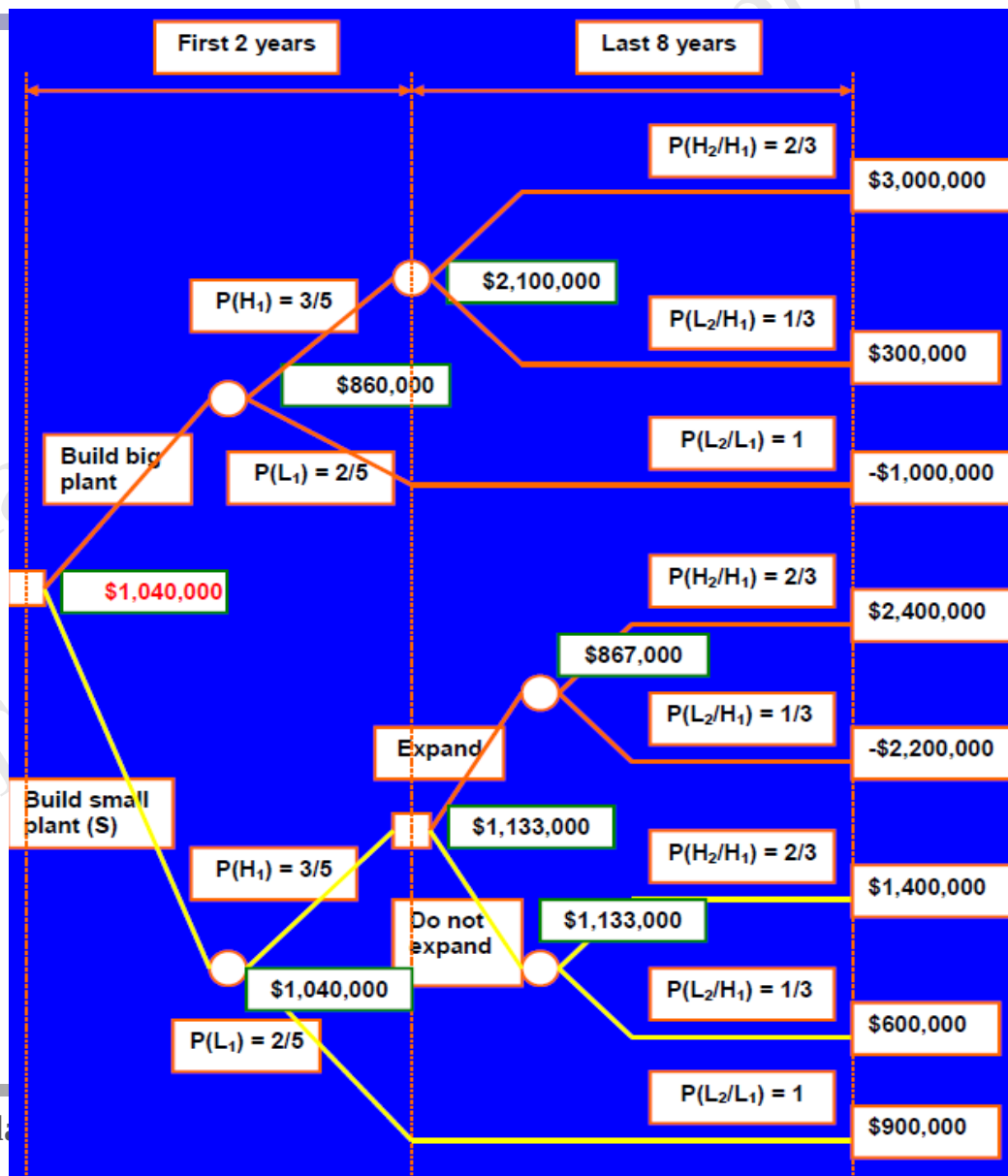
► **Cost of quality.** The cost of quality includes **all costs incurred** over the life of the product by investment in preventing nonconformance to requirements, appraisal of the product or service for conformance to requirements, and failure to meet requirements.



Data gathering and analysis

► **Decision tree analysis.** A decision tree analysis is a diagramming and calculation method for **evaluating the implications** of a chain of multiple options in the presence of **uncertainty**. Decision trees can use the information generated from an **expected monetary value analysis** to populate the branches of the decision tree.

Remember you learned this right?



Data gathering and analysis

► **Earned value analysis.** Earned value analysis is a method that utilizes a set of measures associated with scope, schedule, and cost to determine the cost and schedule performance of a project.

EAC efficiency factor		Percent complete			Comment
		Early: 0%–40%	Middle: 20%–80%	Late: 60%–100%	
CPI	Cumulative	x	x	x	Assumes the contractor will operate at the same efficiency for remainder of program; typically forecasts the lowest possible EAC
	3-month average	x	x	x	Weights current performance more heavily than cumulative past performance
	6-month average		x	x	
	12-month average		x	x	
CPI x SPI	Cumulative	x	x		Usually produces the highest EAC
	6-month average		x	x	A variation of this formula ($CPI_6 \times SPI$), also proven accurate ^a
SPI	Cumulative	x			Assumes schedule will affect cost also but is more accurate early in the program than later
Regression		x			Using CPI that decreases within 10% of its stable value can be a good predictor of final costs and should be studied further
Weighted		x		x	Weights cost and schedule based on $.x(CPI) + .x(SPI)$; statistically the most accurate, especially when using 50% CPI x 50% SPI ^a

Source: Industry.

^aAccording to DOD comments based on the work of David S. Christensen.

Remember you learned this right?

Data gathering and analysis

► **Expected monetary value (EMV).** The expected monetary value is the estimated value of an **outcome expressed** in monetary terms. It is used to quantify the value of uncertainty, such as a risk, or compare the value of alternatives that are not necessarily equivalent. The EMV is calculated by **multiplying the probability** that an event will occur and the **economic impact** the event would have should it occur.

Remember you learned this right?



رویکردی جامع برای ارزیابی اقتصادی در پروژه همراه با آموزش مدل‌سازی در اکسل (Excel)
تحلیل حساسیت، سرمایه‌گذاری، عدم قطعیت و ریسک: تصمیم‌گیری تحت ریسک

Decision making under risk – Example 3

Example 3: A company has a large water treatment facility located in the flood plain of a river. The construction of a levee to protect the facility during periods of flooding is under consideration.

Using historical records that describe the maximum height reached by the river during each of the last 50 years, the frequencies shown in Column B of the following table were determined. From these frequencies are calculated the probabilities that the river will reach a particular level in any one year. The probability for each height is determined by dividing the number of years for which each particular height was the maximum by 50, the total number years.

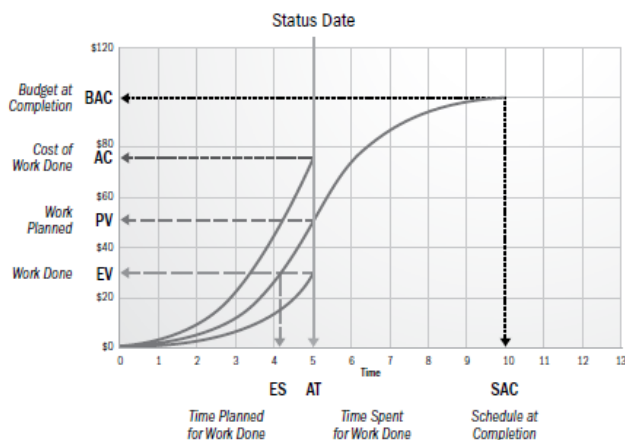
The damages that are expected if the river exceeds the height of the levee are related to the amount by which the river height exceeds the levee. These costs are shown in Column D. If the flood crest is 15 ft and the levee is 10 ft, the anticipated damages for a difference of 5 ft will be \$100,000, whereas a flood crests of 20 ft for a levee 10 ft high (difference 10 ft) would create damages of \$150,000.

The cost of constructing levees of various heights is shown in Column E. The company considers a MARR of 12% and it is felt that after 15 years the treatment plant will be relocated away from the flood plain. The company wants to select the levee height that minimizes its total expected costs.

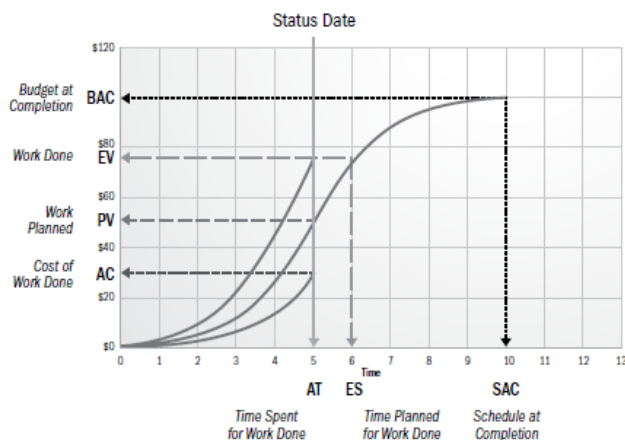
Data gathering and analysis

► **Forecast.** A forecast is an estimate or prediction of conditions and events in the project's future, based on information and knowledge available at the time of the forecast. **Qualitative forecasting** methods use the opinions and judgments of subject matter experts. **Quantitative forecasting** uses models where past information is used to predict future performance. **Causal or econometric forecasting**, such as regression analysis, identifies variables that can have significant impact on future outcomes.

(a) Underperformance



(b) Overperformance

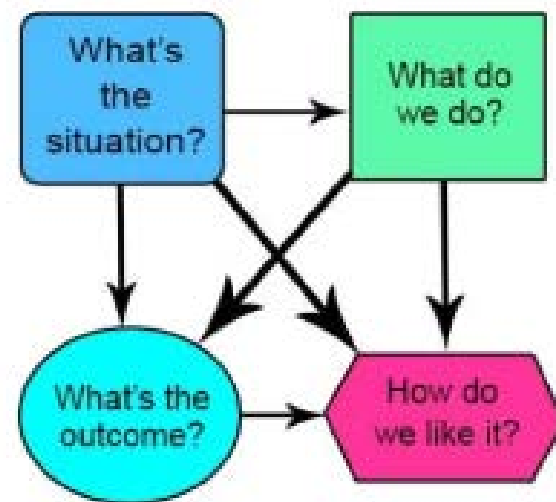


Remember you
learned this right?

Figure 4-2. Graphical View of the EVM Performance Data Points

Data gathering and analysis

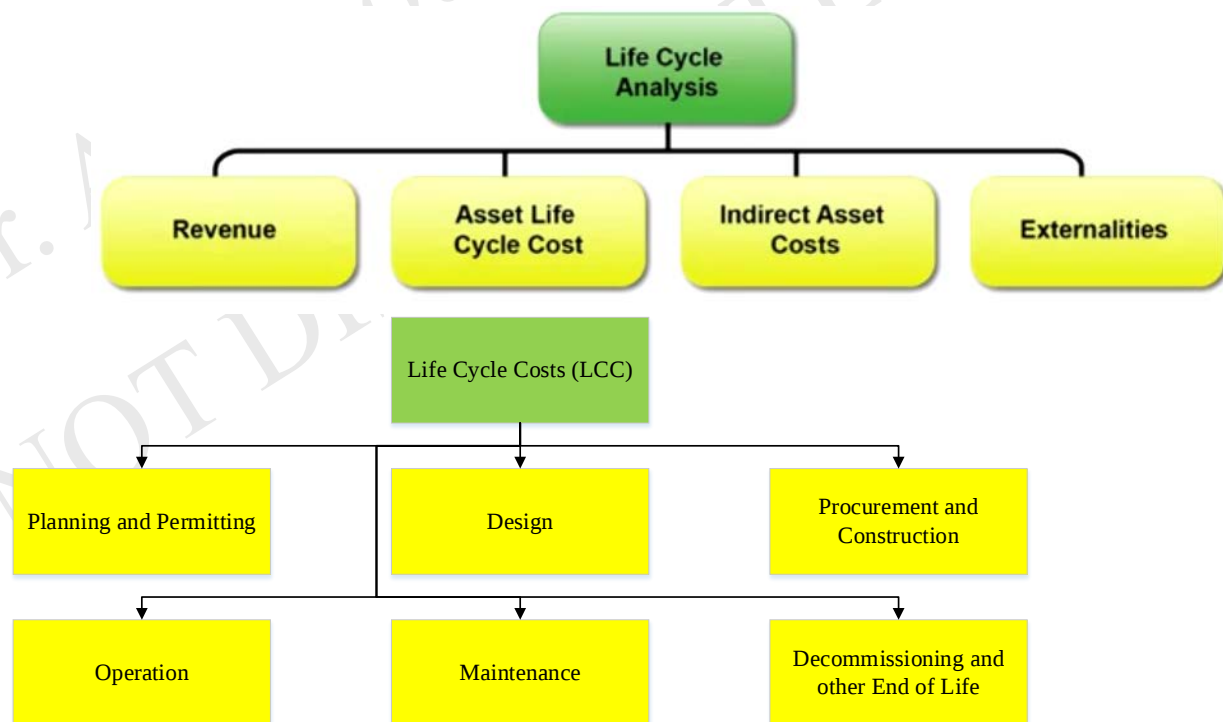
► **Influence diagram.** This diagram is a graphical representation of situations showing causal influences, time ordering of events, and other relationships among variables and outcomes.



Data gathering and analysis

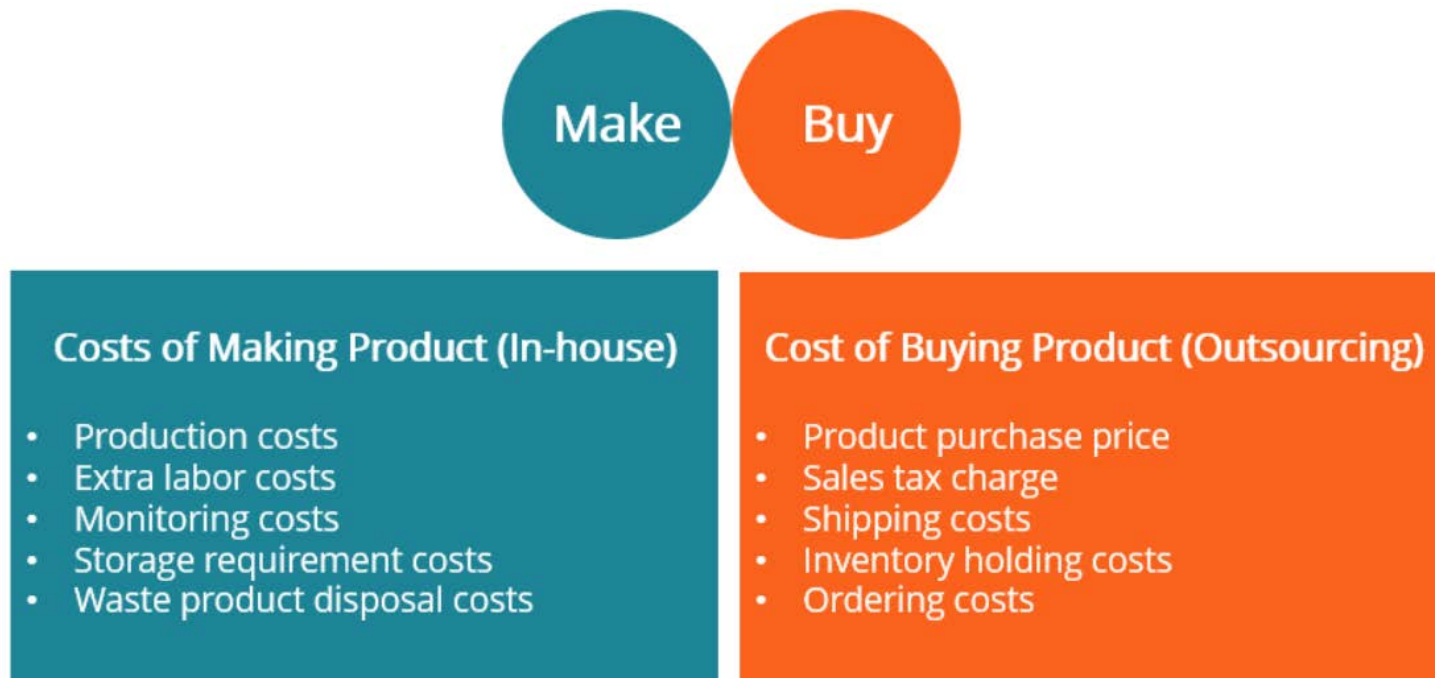
► **Life cycle assessment.** This assessment is a **tool used to evaluate** the total environmental impact of a product, process, or system. It includes all aspects of producing a project deliverable, from the origin of materials used in the deliverable to its distribution and ultimate disposal.

Remember you
learned this right?



Data gathering and analysis

► **Make-or-buy analysis.** A make-or-buy analysis is the process of **gathering and organizing data** about product requirements and **analyzing them** against available alternatives such as the purchase versus internal manufacture of the product.



Remember you learned this right?

Data gathering and analysis

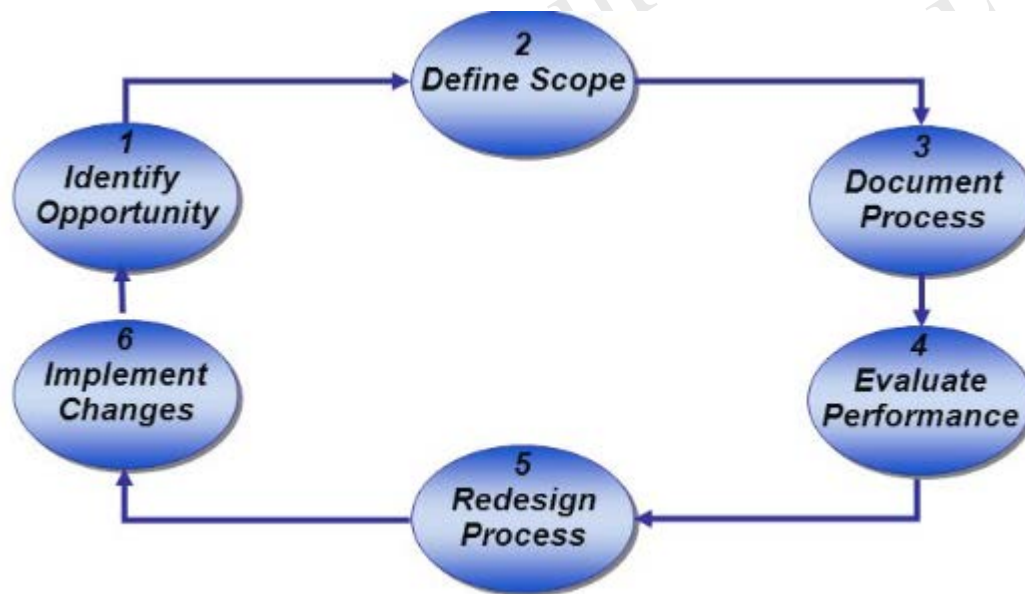
► **Probability and impact matrix.** A probability and impact matrix is a **grid for mapping** the probability of occurrence of each risk and its impact on project objectives if that risk occurs.

IMPACT	High	Medium	High	High
	Medium	Low	Medium	High
	Low	Low	Low	Medium
		Low	Medium	High
		LIKELIHOOD		

Remember you learned this right?

Data gathering and analysis

► **Process analysis.** This analysis is a systematic review of the steps and procedures to perform an activity.



Data gathering and analysis

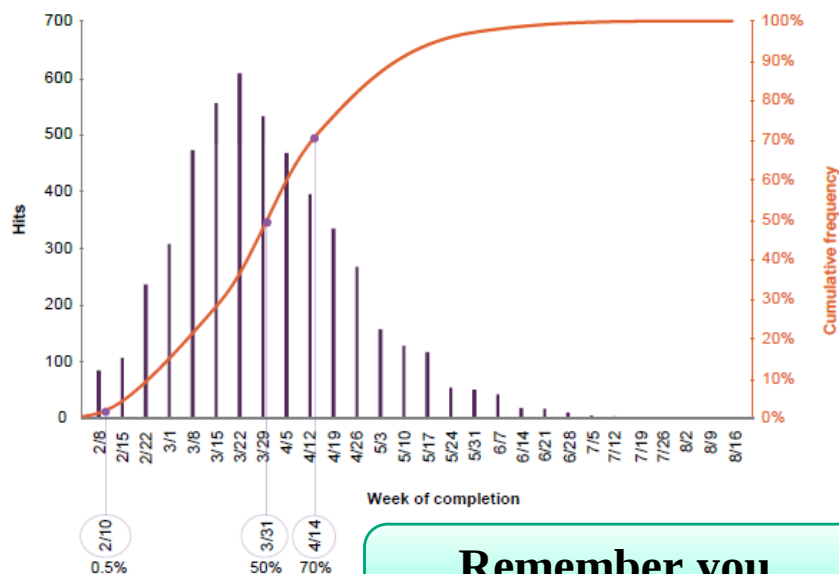
► **Regression analysis.** A regression analysis is an analytical technique where a series of input variables are examined in relation to their corresponding output results in order to develop a **mathematical or statistical** relationship.

Variables	Coefficient values	Prob. Values	VIF
Constant	7.255*	0.000	1.212
Risk Management	-0.425*	0.002	1.625
Project control	-0.211*	0.010	2.012
Change Management	-0.361*	0.001	2.145
Diagnostic Tests: R-square		0.647	
Adjusted R-square		0.547	
F-statistics (prob.value)		9.766* (0.000)	
Note: * represents significant at 99 percent confidence interval. Dependent variable is project cost.			

Data gathering and analysis

► **Reserve analysis.** This analytical technique is used to evaluate the **amount of risk** on the project and the amount of schedule and budget reserve to determine whether the reserve is sufficient for the remaining risk. The reserve contributes to reducing risk to an acceptable level.

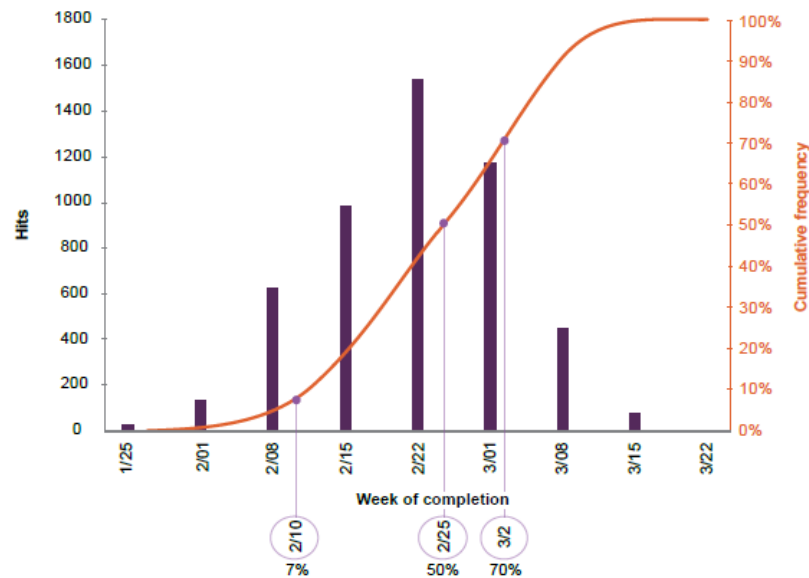
House Construction Schedule Results from a Risk Driver Simulation



Source: GAO. | GAO-16-89G

Remember you
learned this right?

The Cumulative Distribution of the House Construction Schedule

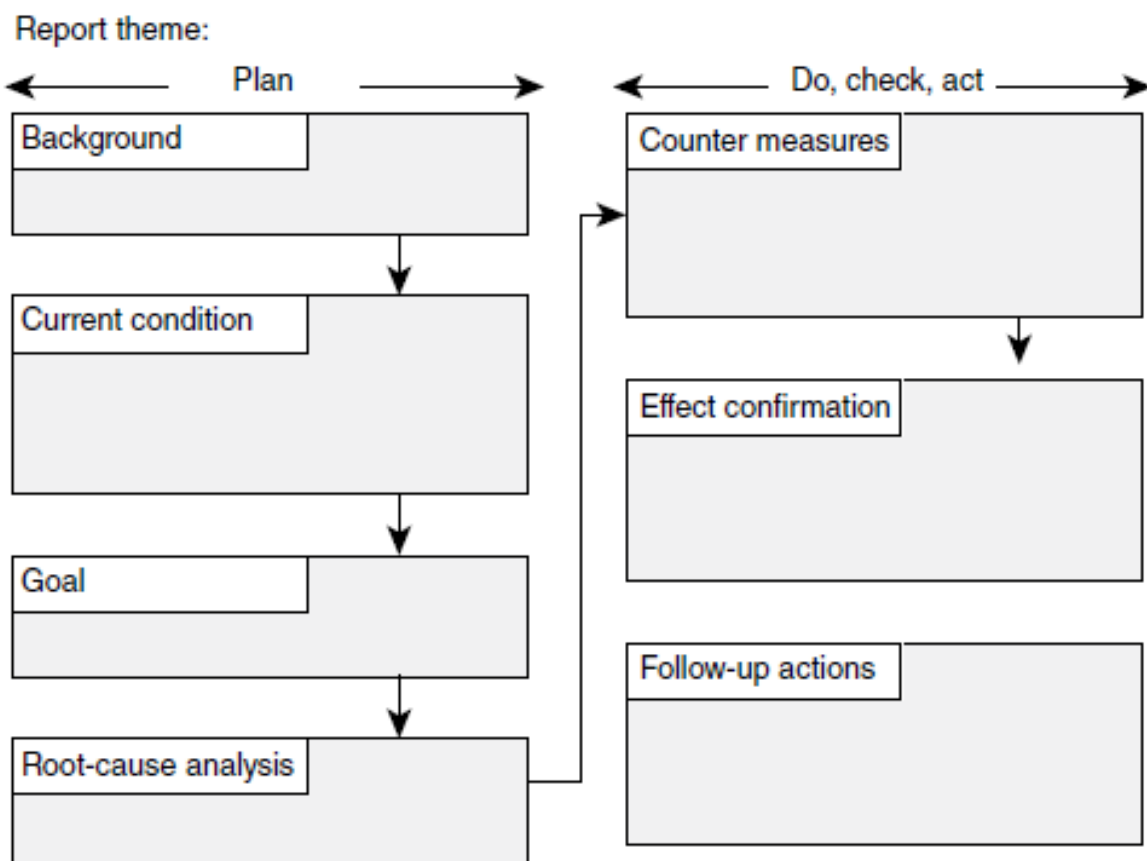


Source: GAO. | GAO-16-89G

Data gathering and analysis

- **Root cause analysis.** This analytical technique is used to determine the basic underlying cause of a variance, defect, or a risk. A root cause may underlie more than one variance, defect, or risk.

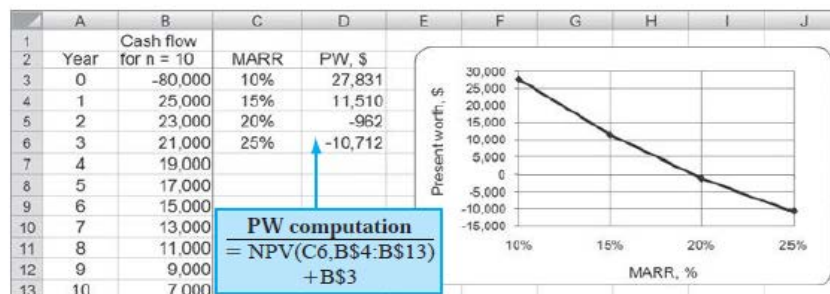
Remember you
learned this right?



Typical flow of the problem-solving A3 report

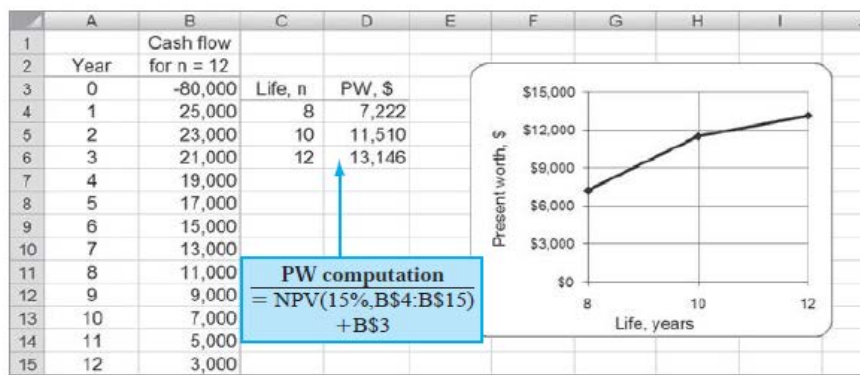
Data gathering and analysis

► **Sensitivity analysis.** This analytical technique is used to determine which individual project risks or other sources of uncertainty have the most potential impact on project outcomes by correlating variations in project outcomes with variations in elements of a quantitative risk analysis model.



Sensitivity analysis of PW to variation in
(a) MARR values and
(b) life estimates,

(a)



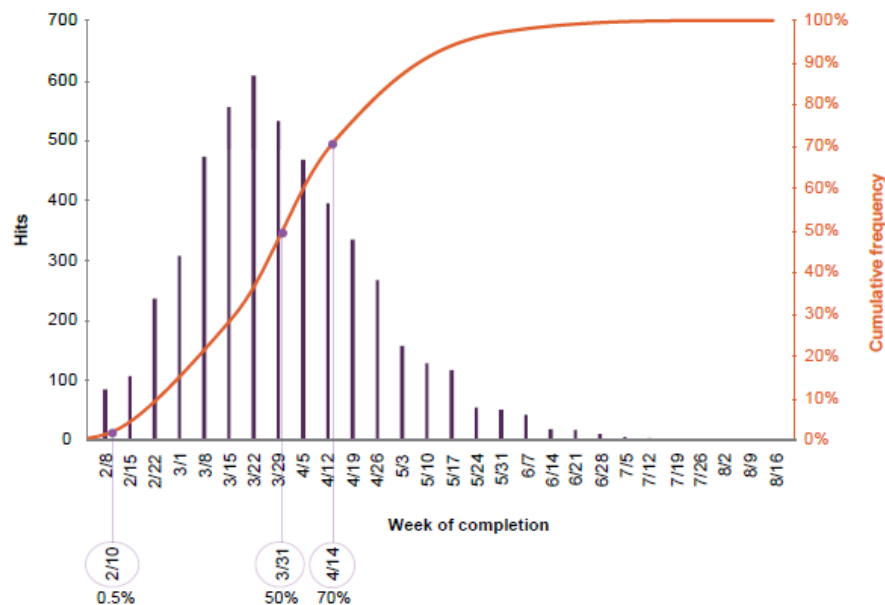
(b)

**Remember you
learned this right?**

Data gathering and analysis

► **Simulations.** This **analytical technique** uses models to show the combined effect of uncertainties in order to evaluate their potential impact on objectives. A **Monte Carlo** simulation is a method of identifying the potential impacts of risk and uncertainty using **multiple iterations** of a computer model to develop a probability distribution of a range of outcomes that could result from a decision or course of action.

House Construction Schedule Results from a Risk Driver Simulation

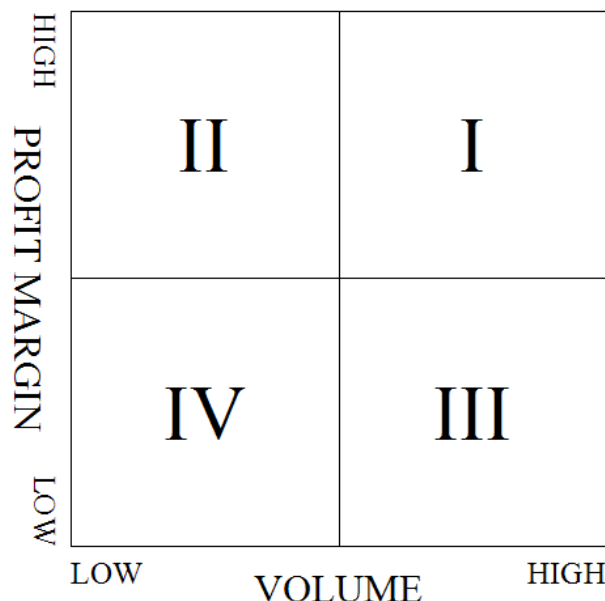


Remember you
learned this right?

Data gathering and analysis

► **Stakeholder analysis.** This technique involves systematically gathering and analyzing quantitative and qualitative information about stakeholders to determine **whose interests** should be taken into account throughout the project.

Remember you
learned this right?



Data gathering and analysis

► **SWOT analysis.** A SWOT analysis assesses the strengths, weaknesses, opportunities, and threats of an organization, project, or option.

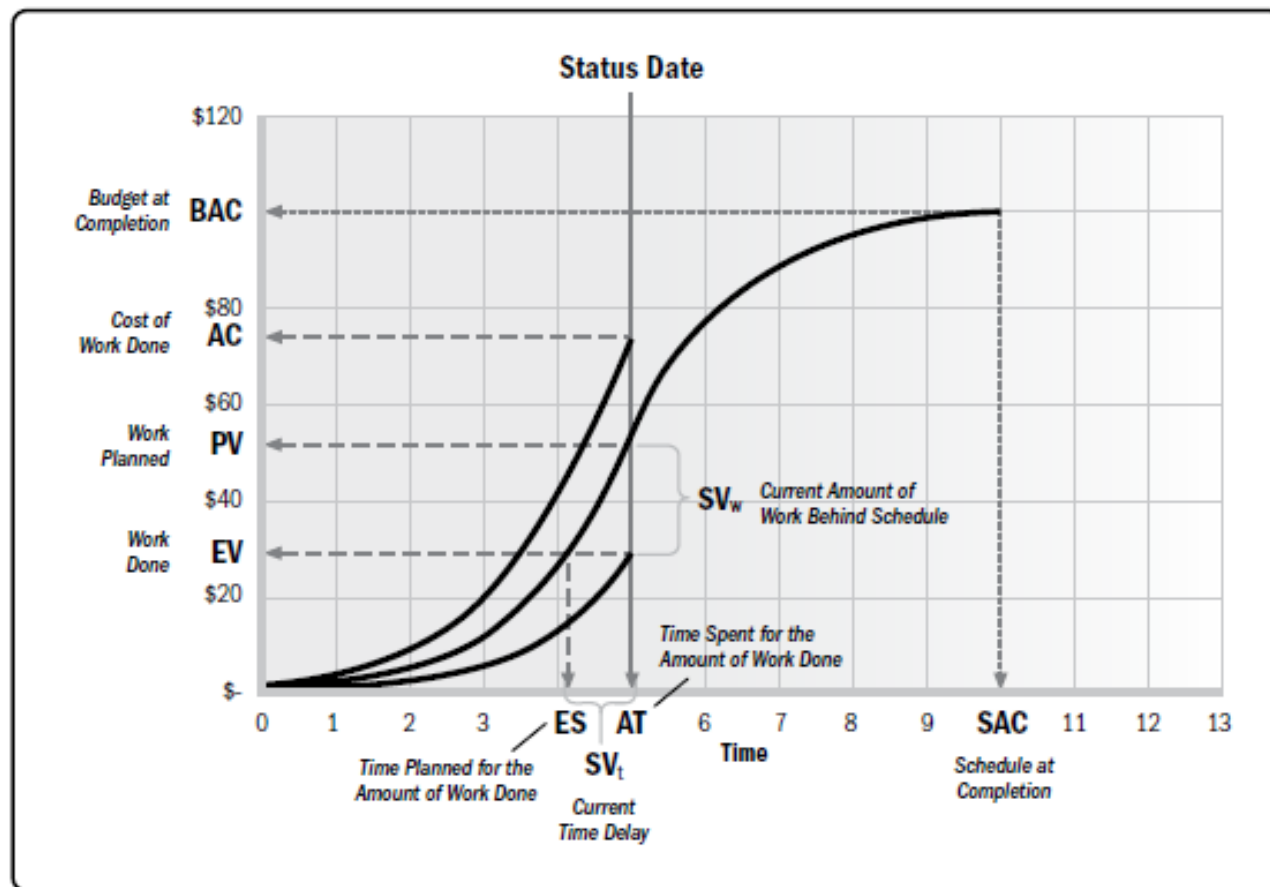
Remember you
learned this right?

	Positive	Negative
Internal	Strengths 1. Strong need 2. Grassroots support 3. Political support 4. Funding 5. Strong, creative leadership 6. Collaborative process	Weaknesses 1. FHWA tends to be large, slow government 2. Mega projects are very complex 3. Mega projects are very costly 4. Mega projects are likely to present many unforeseen problems 5. Mega projects always have environmental impacts
External	Opportunities 1. Opportunities Improve the economy of the effected area 2. Improve safety for those that live in the area 3. Conserve the environment by eliminating other impacts	Threats 1. Environmental constraints 2. Limited funding 3. Scope creep 4. Time - delays increase costs 5. Politics - People use large projects to satisfy personal needs 6. Opposition - People hate change

Data gathering and analysis

- **Trend analysis.** A trend analysis uses **mathematical models** to forecast future outcomes based on **historical results**.

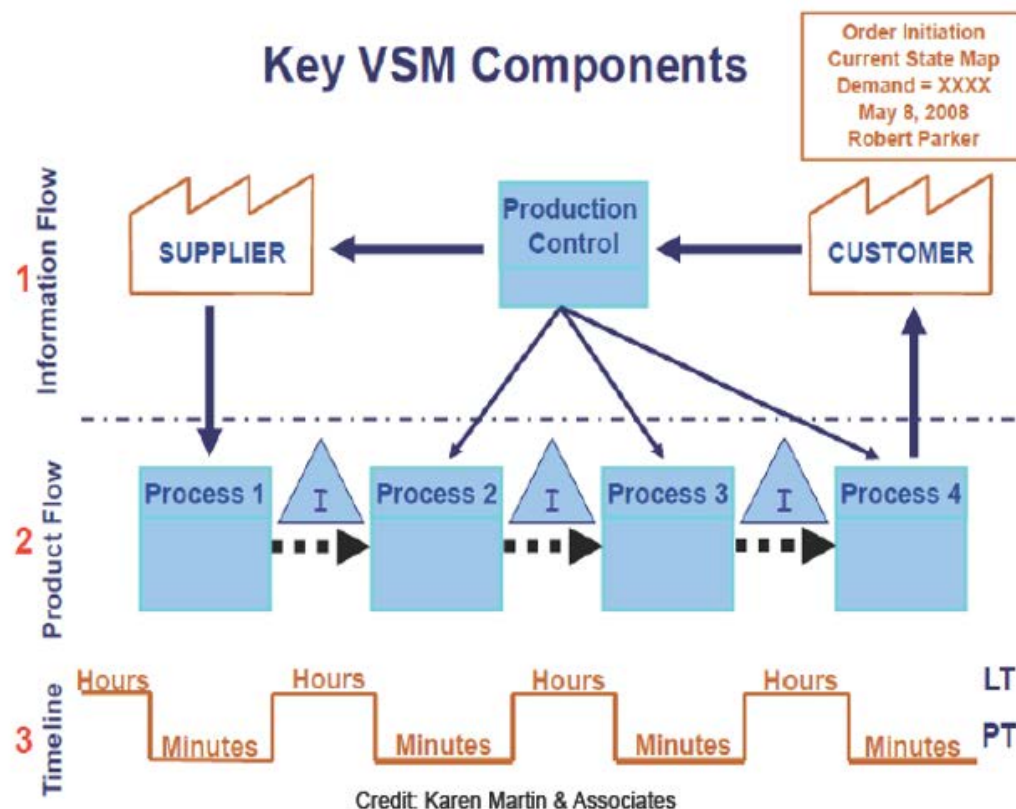
Remember you
learned this right?



Data gathering and analysis

- **Value stream mapping.** Value stream mapping is a lean enterprise method used to document, analyze, and improve the flow of information or materials required to produce a product or service for a customer.

Remember you
learned this right?



Data gathering and analysis

- **Variance analysis.** Variance analysis is used to determine the cause and degree of difference between the baseline and actual performance.

Job: 317 Weston Apartments		July 16, 2004							
Code	Description	Contract Amount	Billed to Date	Costs			Hours		
				Actual	Budget	Overrun	Actual	Budget	Overrun
Phase 1: Bldg 1									
06110	Rough Carpentry	35,000.00	25,000.00	29,375.21	29,200.00	175.21	1,295	1,300	-5
06120	Lumber	42,000.00	39,000.00	36,579.32	37,000.00	-420.68	0	0	0
06150	Trusses	15,000.00	0.00	13,560.00	13,560.00	0.00	0	0	0
	Phase Total	92,000.00	64,000.00	79,514.53	79,760.00	-245.47	1,295	1,300	-5
Phase 2: Bldg 2									
06110	Rough Carpentry	35,000.00	0.00	11,526.33	29,200.00	-17,673.67	526	1,300	-774
06120	Lumber	42,000.00	0.00	18,265.35	37,000.00	0.00	0	0	0
06150	Trusses	15,000.00	0.00	0.00	13,560.00	-13,560.00	0	0	0
	Phase Total	92,000.00	0.00	29,791.68	79,760.00	-31,233.67	526	1,300	-774
	Job Total	184,000.00	64,000.00	109,306.21	159,520.00	-31,479.14	1,821	2,600	-779

Sample Job Cost Report

Remember you learned this right?

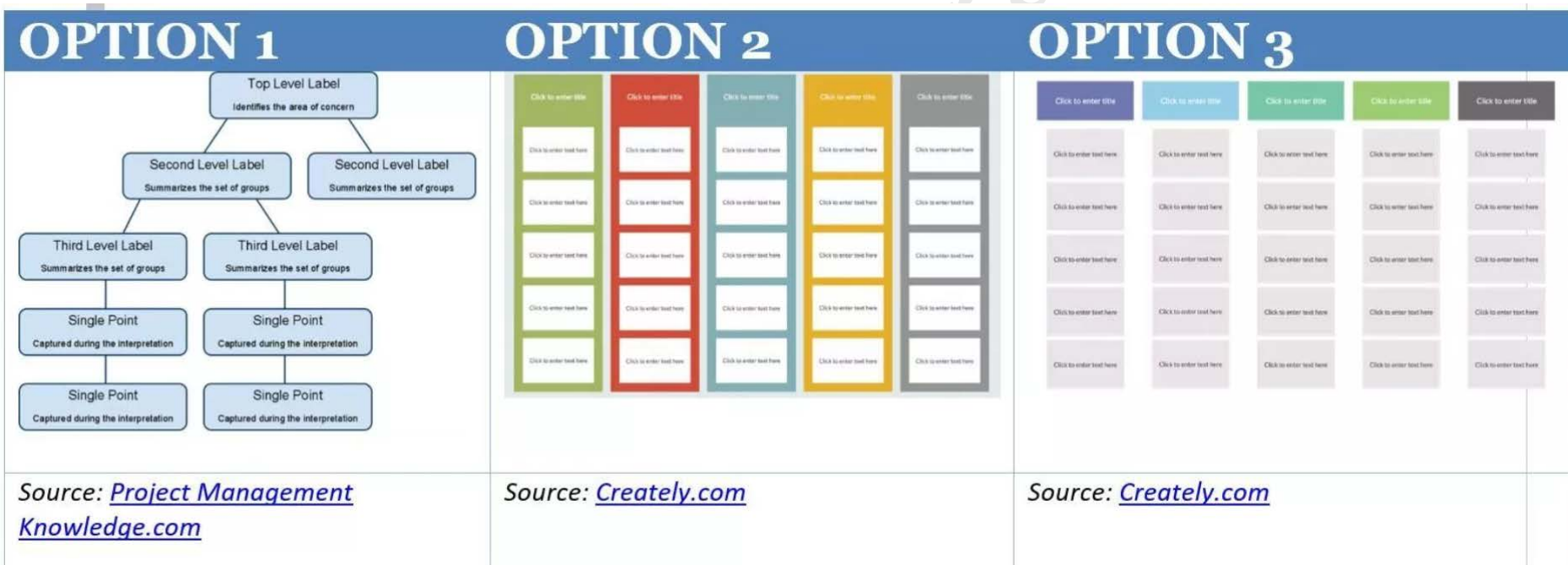
Data gathering and analysis

► **What-if scenario analysis.** This analytical technique evaluates scenarios in order to predict their effect on project objectives.

Scenario Analysis for Budget Adjustment for the Extra Work			
Budget Adjustment =	\$ 150	The approved budget is increased to accommodate past underperformance	
New Adjusted Budget (New BAC) =	\$ 1,150	The new total approved budget	BAC + Budget Adjustment
To Complete on New Budget CPI (TCPI) =	1.15	Future cost performance required to complete within the adjusted budget (New BAC) = New Work Remaining/New Budget Remaining	$(\text{New BAC} - \text{EV}) / (\text{New BAC} - \text{AC})$
Scenario Analysis for Schedule Adjustment			
Schedule Adjustment =	2	The approved schedule is increased to accommodate past underperformance	
New Adjusted Schedule (New SAC) =	12	The new total approved schedule duration	SAC + Schedule Adjustment
To Complete on New Schedule SPI (TSPI) =	1.07	Future schedule performance required to complete within the newly adjusted schedule = New Work Rate/Original Work Rate = 85.71/80	$[(\text{BAC} - \text{EV}) / (\text{New SAC} - \text{AT})] / [(\text{BAC} - \text{PV}) / (\text{SAC} - \text{AT})]$
Original Work Rate Assumed in the Baseline =	\$ 80.00	The original time remaining (i.e., SAC - AT = 5 Time Periods), a work rate of \$80.00 per time period was assumed = Work Planned Remaining/Time Remaining = (\$1,000 - \$600)/(10 - 5) = \$400/5 time periods	$(\text{BAC} - \text{PV}) / (\text{SAC} - \text{AT})$
New Work Rate Assumed in the New SAC =	\$ 85.71	In the new time remaining (i.e., New SAC - AT = 7 Time Periods), a work rate of \$85.71 per time period is now required = Current Work Remaining/New Time Remaining = (\$1,000 - \$400)/(12 - 5) = \$600/7 time periods	$(\text{BAC} - \text{EV}) / (\text{New SAC} - \text{AT})$

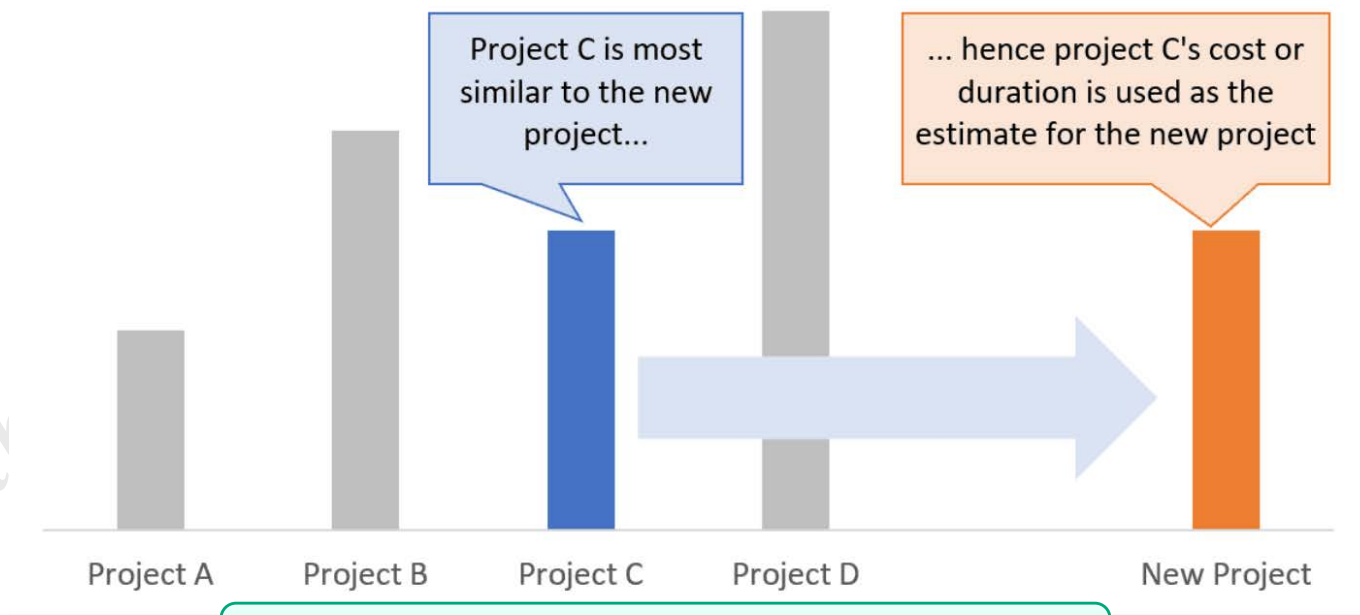
Remember you learned this right?

- **Affinity grouping.** Affinity grouping involves classifying items into similar categories or collections on the basis of **their likeness**. Common affinity groupings include T-shirt sizing and Fibonacci numbers.



- **Analogous estimating.** Analogous estimating assesses the duration or cost of an activity or a project using **historical data** from a similar activity or project.

One-Point Estimating



Remember you learned this right?

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► **Function point.** A function point is an estimate of the amount of business functionality in an information system. Function points are used to calculate a functional size measurement (FSM) of a software system.

	Complexity	Batch computations	Statistical computations	Report computations	Internal Data utilized by the application	Send data to other applications	Gather data from other applications	Web pages performing 'Inserts'	Web pages performing 'Updates'	Web pages requesting services (search, buy, activate, ...)	Web pages performing 'Displays'	Web pages performing 'Inserts'
Identity Management	H	1				1	1	1	1	1	0,5	
Identity Management	M	0,8				0,6	0,8	0,8	0,5	0,6	0,25	
Identity Management	L	0,6				0,3	0,6	0,6	0	0,3		
Self-Caring	H	0,6				1	0,6	0,6	1		0,5	1
Self-Caring	M	0,4				0,6	0,4	0,4	0,5		0,3	0,6
Self-Caring	L	0,2				0,3	0,2	0,2			0,1	0,3
HDA	H			1		1	1	1	1			1
HDA	M			0,6		0,6	0,8	0,8	0,6			0,6
HDA	L			0,3		0,3	0,6	0,6	0,3			0,3
...	H	1				1		1			0,4	1

► **Multipoint estimating.** Multipoint estimating assesses cost or duration by applying an average or weighted average of optimistic, pessimistic, and most likely estimates when there is uncertainty with the individual activity estimates.

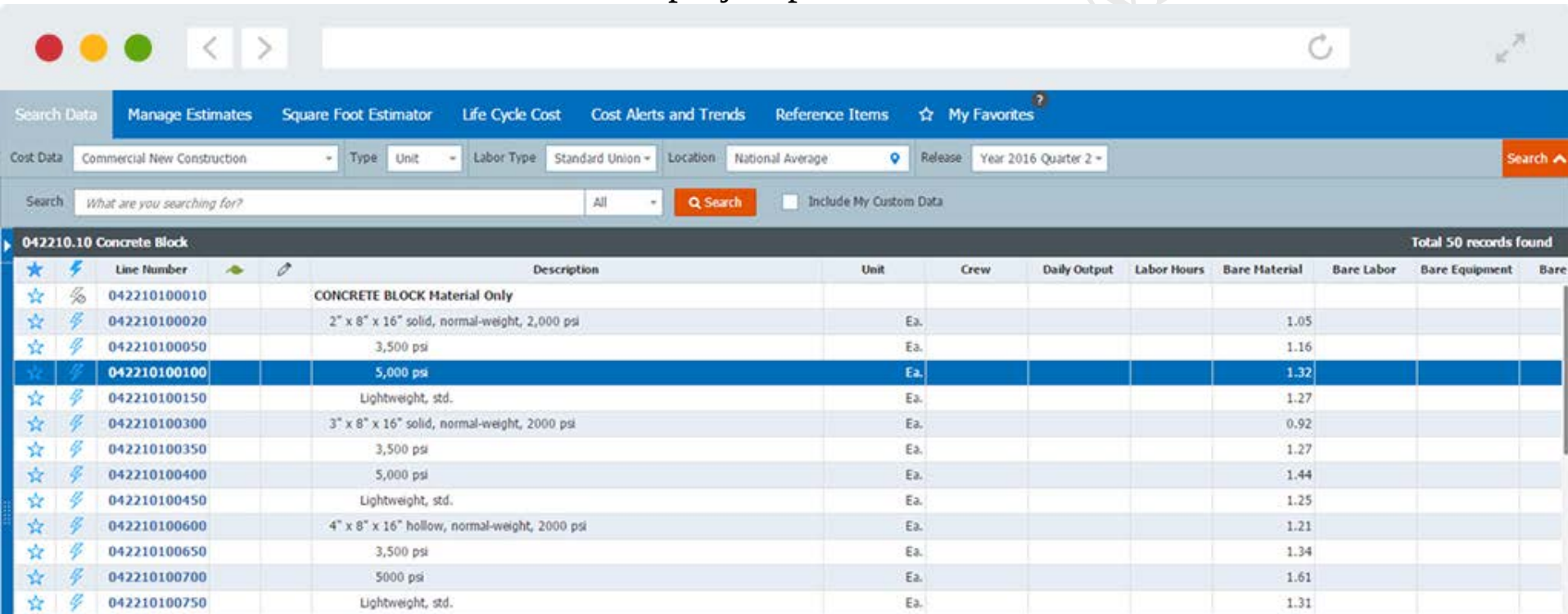
Some Identified Risks for a House Construction Schedule

Risk	Likelihood of risk	Effect on remaining duration		
		Optimistic	Most likely	Pessimistic
Design is incomplete	80%	95%	125%	150%
Site investigation is inadequate	30	100	120	135
Material is unavailable	25	100	125	130
Material is late or defective	35	95	110	130
Inspectors are unavailable	30	125	150	200
Rework will be necessary	25	100	110	135
Materials are purchased incorrectly	10	100	110	130
Soil conditions are poor	25	100	115	135
Owner makes changes	50	95	110	130

Source: GAO | GAO-16-89G.

Remember you learned this right?

► **Parametric estimating.** Parametric estimating uses an algorithm to calculate cost or duration based on historical data and project parameters.

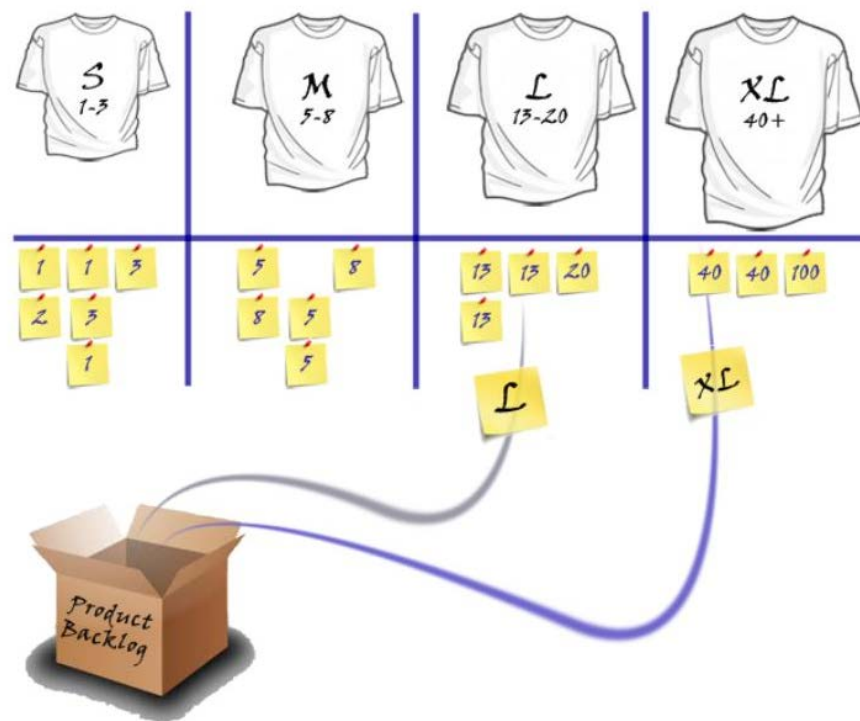


Line Number	Description	Unit	Crew	Daily Output	Labor Hours	Bare Material	Bare Labor	Bare Equipment	Bare
042210100010	CONCRETE BLOCK Material Only								
042210100020	2" x 8" x 16" solid, normal-weight, 2,000 psi	Ea.				1.05			
042210100050	3,500 psi	Ea.				1.16			
042210100100	5,000 psi	Ea.				1.32			
042210100150	Lightweight, std.	Ea.				1.27			
042210100300	3" x 8" x 16" solid, normal-weight, 2000 psi	Ea.				0.92			
042210100350	3,500 psi	Ea.				1.27			
042210100400	5,000 psi	Ea.				1.44			
042210100450	Lightweight, std.	Ea.				1.25			
042210100600	4" x 8" x 16" hollow, normal-weight, 2000 psi	Ea.				1.21			
042210100650	3,500 psi	Ea.				1.34			
042210100700	5000 psi	Ea.				1.61			
042210100750	Lightweight, std.	Ea.				1.31			

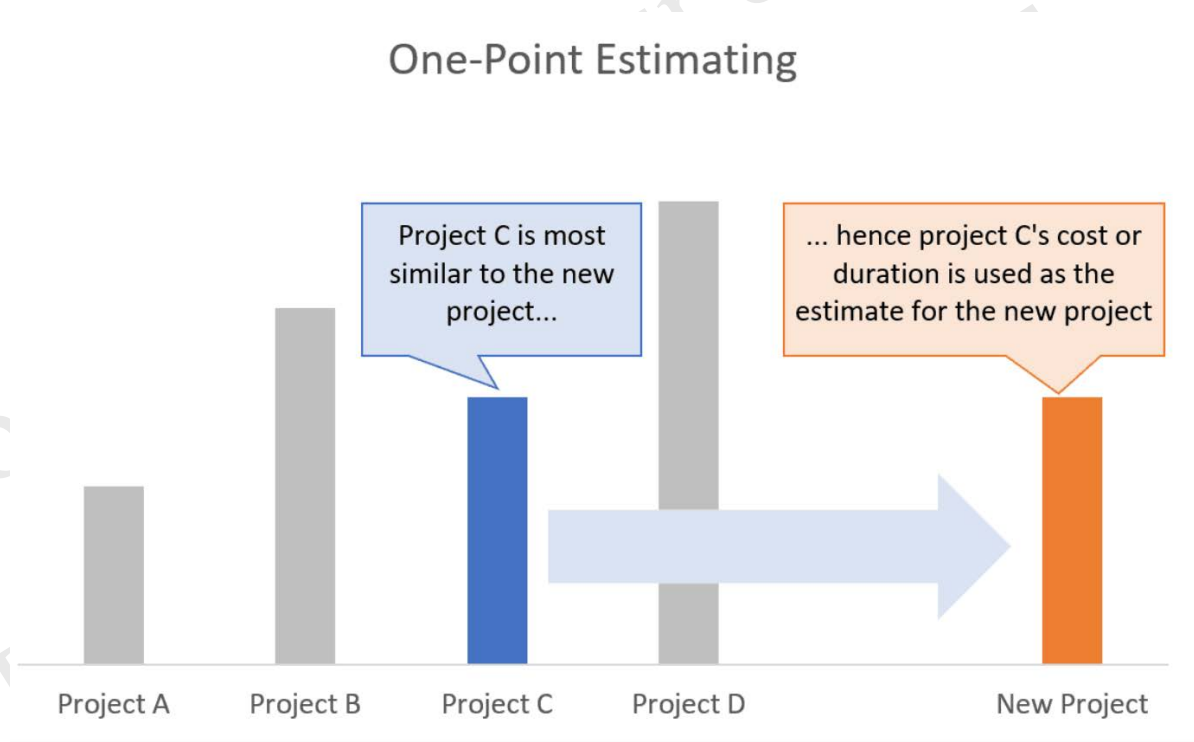
Remember you learned this right?

Estimating

► **Relative estimating.** Relative estimating is used to create estimates that are derived from performing a comparison against a similar body of work, taking effort, complexity, and uncertainty into consideration. Relative estimating is not necessarily based on **absolute units** of cost or time. Story points are a common unitless measure used in relative estimating.



- **Single-point estimating.** Single-point estimating involves using data to calculate a single value that reflects a best-guess estimate. A single-point estimate is opposed to a range estimate, which includes the best- and worst-case scenario.



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► **Story point estimating.** Story point estimating involves project team members assigning abstract, but relative, points of effort required to implement a **user story**. It tells the project team about the difficulty of the story **considering** the complexity, risks, and effort involved.

How much is known about the task	Everything	Almost everything	Something	Almost nothing	Nothing	Nothing
Dependencies	None	Almost none	Some	Few	More than few	Unknown
How much work effort	Less than 2 hours	Half a day	Up to two days	Few days	Around a week	More than one week
Story Points	1	2	3	5	8 Should be split into smaller items	13 Must be split into smaller items

To get story points - pick the column which represents your task the best. If it fits more than one column, pick higher one.

teamhood – professional task management software for Agile Teams. www.teamhood.com

► **Wideband Delphi.** Wideband Delphi is a variation of the Delphi estimating method where subject matter experts complete multiple rounds of producing estimates individually, with a project team discussion after each round, until a consensus is achieved. For Wideband Delphi, those who created the highest and lowest estimates explain their rationale, following which everyone reestimates. The process repeats until convergence is achieved. Planning poker is a variation of Wideband Delphi.

Wideband Delphi Estimation Sheet						
Project: <Project Name>			Estimation Units: Person Hours			
Estimation Team Member: <Name>			Date: <MM-DD-YY>			
Task	Initial Estimate	Change 1	Change 2	Change 3	Change 4	Final
Task1	n_1	-1				
Task2	n_2	-2				
Task3	n_3	-4				
Task4	n_4	5				
Task5	n_5	0				
Task6	n_6	0				
Task7	n_7	2				
Task8	n_8	-3				
Net Change		-3				
Total		$\sum n_i$	$\sum n_i - 3$			

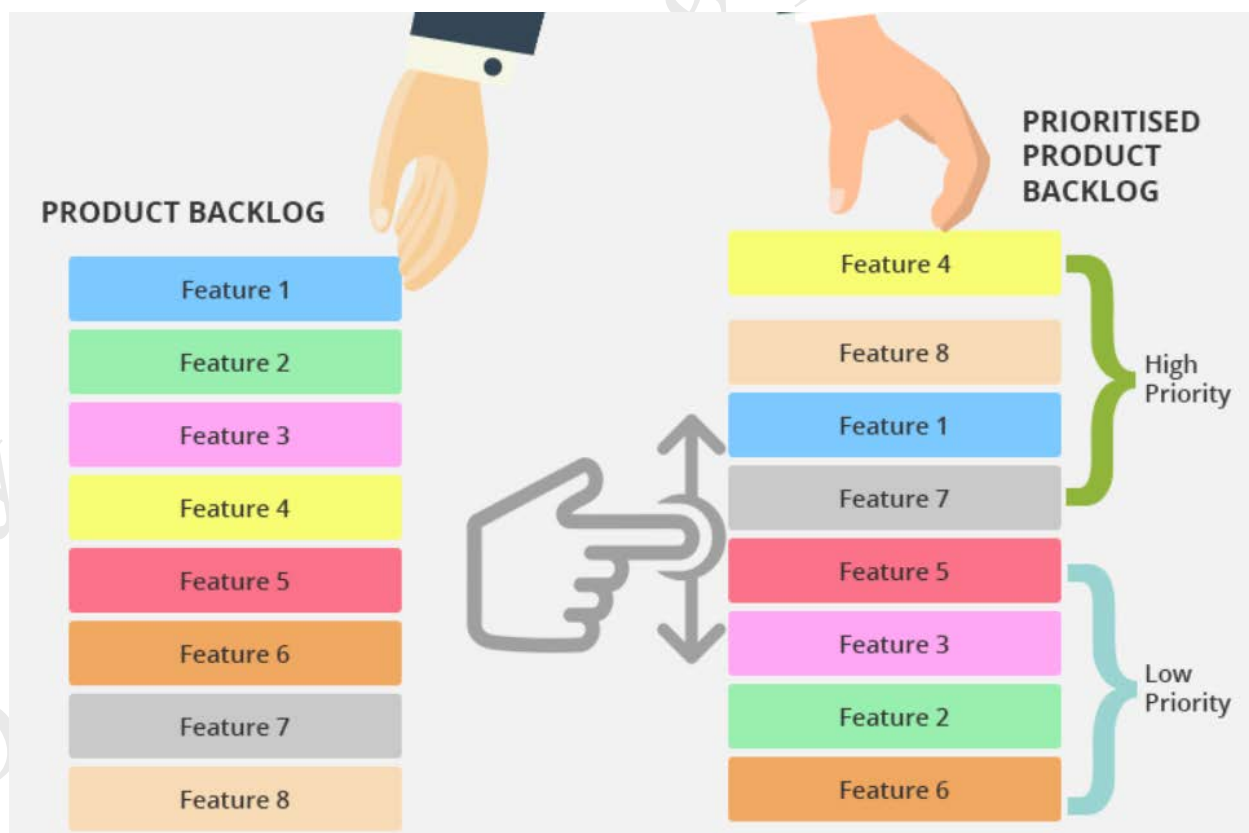
Meetings and events

Meetings are an important means for engaging the project team and other stakeholders.

They are a primary means of communication throughout the project.

Meetings and events

► **Backlog refinement.** At a backlog refinement meeting, the backlog is progressively elaborated and (re)prioritized to identify the work that can be accomplished in an upcoming iteration.



Meetings and events

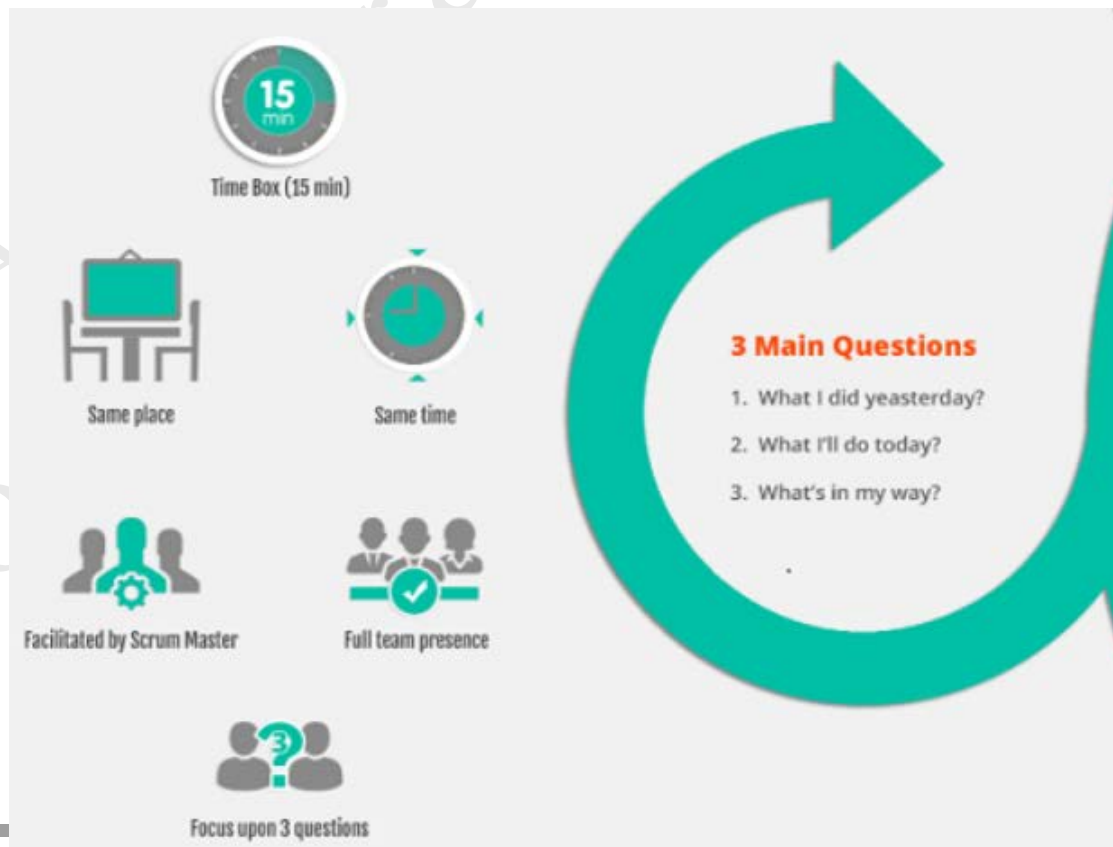
► **Bidder conference.** Meetings with prospective sellers prior to the **preparation of a bid or proposal** to ensure **all prospective vendors** have a clear and common understanding of the procurement. This meeting may also be known as contractor conferences, vendor conferences, or pre-bid conferences.

Meetings and events

► **Change control board.** A change control board meeting includes the group of people who are accountable for reviewing, evaluating, approving, delaying, or rejecting changes to the project. The decisions made at this meeting are recorded and communicated to the appropriate stakeholders. This meeting may also be referred to as a change control meeting.

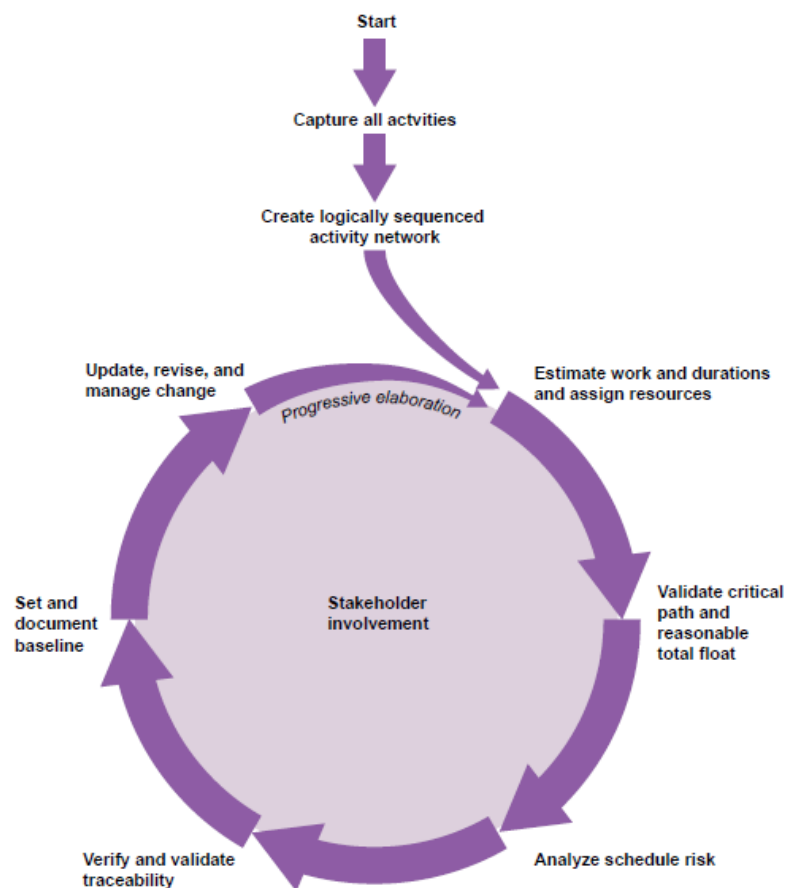
Meetings and events

► **Daily standup.** A standup is a brief collaboration meeting during which the project team reviews its progress from the previous day, declares intentions for the current day, and highlights any obstacles encountered or anticipated. This meeting may also be referred to as a daily scrum.



Meetings and events

► **Iteration planning.** An iteration planning meeting is used to clarify the details of the backlog items, acceptance criteria, and work effort required to meet an **upcoming iteration commitment**. This meeting may also be referred to as a sprint planning meeting.



Meetings and events

► **Iteration review.** An iteration review is held at the end of an iteration to demonstrate the work that was accomplished during the iteration. This meeting may also be referred to as a sprint review.

Meetings and events

► **Kickoff.** A kickoff meeting is a gathering of project team members and other key stakeholders at the outset of a project to formally set expectations, gain a common understanding, and commence work. It establishes the **start** of a project, phase, or iteration.

Meetings and events

► **Lessons learned meeting.** A lessons learned meeting is used to identify and share the knowledge gained during a project, phase, or iteration with a focus on improving project team performance. This meeting can address situations that could have been handled better in addition to good practices and situations that produced very favorable outcomes.

Remember you learned this right?

Meetings and events

- **Planning meeting.** A planning meeting is used to create, elaborate, or review a plan or plans and secure commitment for the plan(s).

Meetings and events

- **Project closeout.** A project closeout meeting is used to obtain final acceptance of the delivered scope from the sponsor, product owner, or client. This meeting indicates that the product delivery is complete.

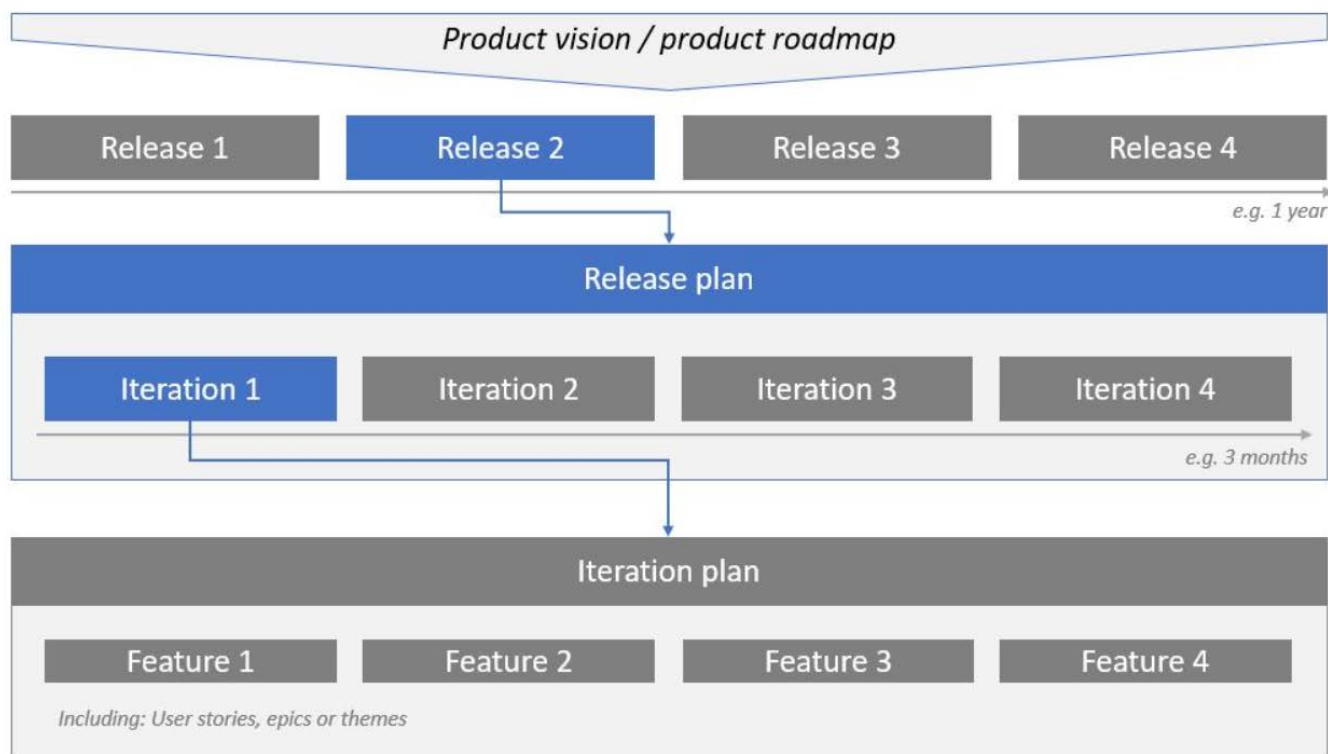
Meetings and events

► **Project review.** A project review meeting is an event at the end of a phase or a project to assess the status, evaluate the value delivered, and determine if the project is ready to move to the next phase, or transition to operations.

Meetings and events

- **Release planning.** Release planning meetings identify a high-level plan for releasing or transitioning a product, deliverable, or increment of value.

Agile Release Planning



Meetings and events

- ▶ **Retrospective.** A retrospective is a regularly occurring workshop in which participants explore their work and results in order to improve both process and product. Retrospectives are a form of lessons learned meeting.

Meetings and events

► **Risk review.** A meeting to analyze the status of existing risks and identify new risks. This includes determining if the risk is still active and if there have been changes to the risk attributes (such as probability, impact, urgency, etc.). Risk responses are evaluated to determine if they are effective or should be updated. New risks may be identified and analyzed and risks that are no longer active may be closed. **Risk reassessment** is an example of a risk-review meeting.

Top Prioritized Risks in the House Construction Schedule

Priority	Risk	80th percentile date	Calendar days saved
	All	April 23, 2026	
1.	Design is incomplete	April 1	22
2.	Machines are not available	March 23	9
3.	Material is not available	March 17	6
4.	Efficacy of the general contractor	March 10	7
5.	Materials are late or defective	March 4	6

Source: GAO | GAO-16-39G.

Meetings and events

- ▶ **Steering committee.** A meeting where senior stakeholders provide direction and support to the project team and make decisions outside of the project team's authority.

Other methods

The methods described in this section don't fit into a specific category; however, they are common methods that are used for a variety of purposes on projects.

موسسه مهندسی و مدیریت ساخت علوی پور (ACEMI)

دفتر آموزش



تهران، بلوار فردوس شرق، مجتمع آبگینه، طبقه سوم اداری، واحد C42



+۹۸ ۲۱ ۴۶ ۱۰۰ ۴۴۵



+۹۸ ۲۱ ۴۶ ۱۰۰ ۴۵۰



info@dralavipour.com



www.dralavipour.com



@alavipour_pm



@acemi_social



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