

*Resource Guide for the course on*



# Project Management Professional (PMP)

Certification Exam Training

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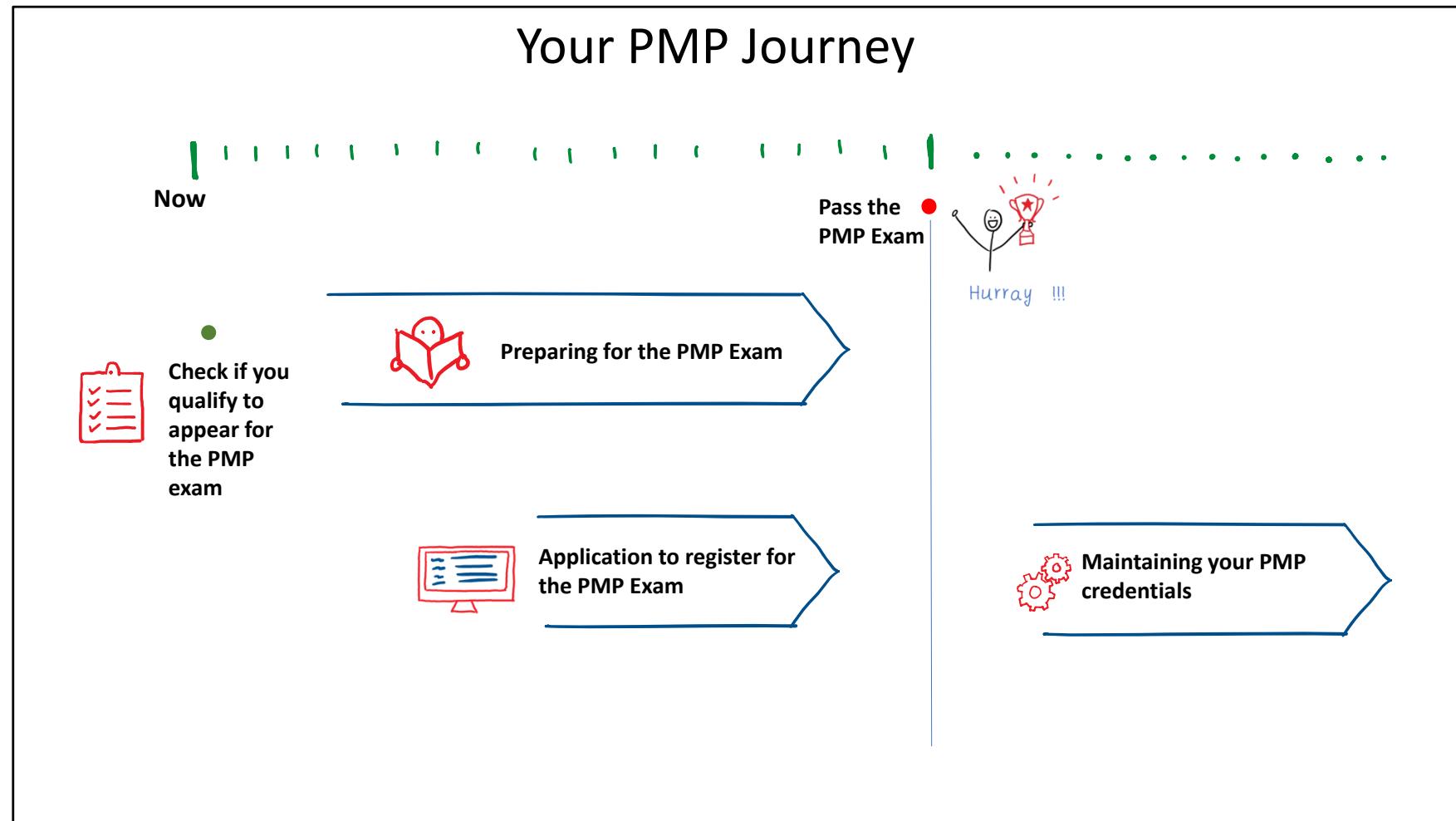
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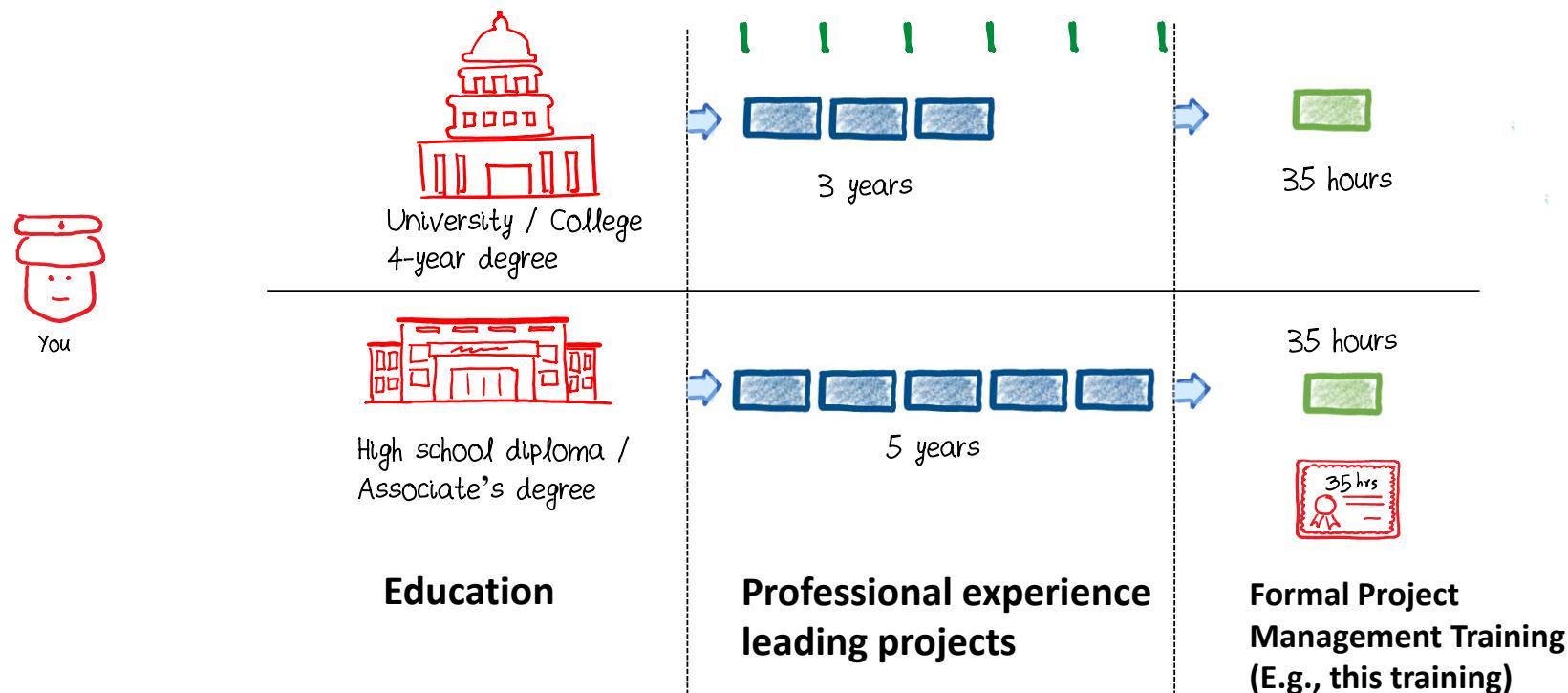
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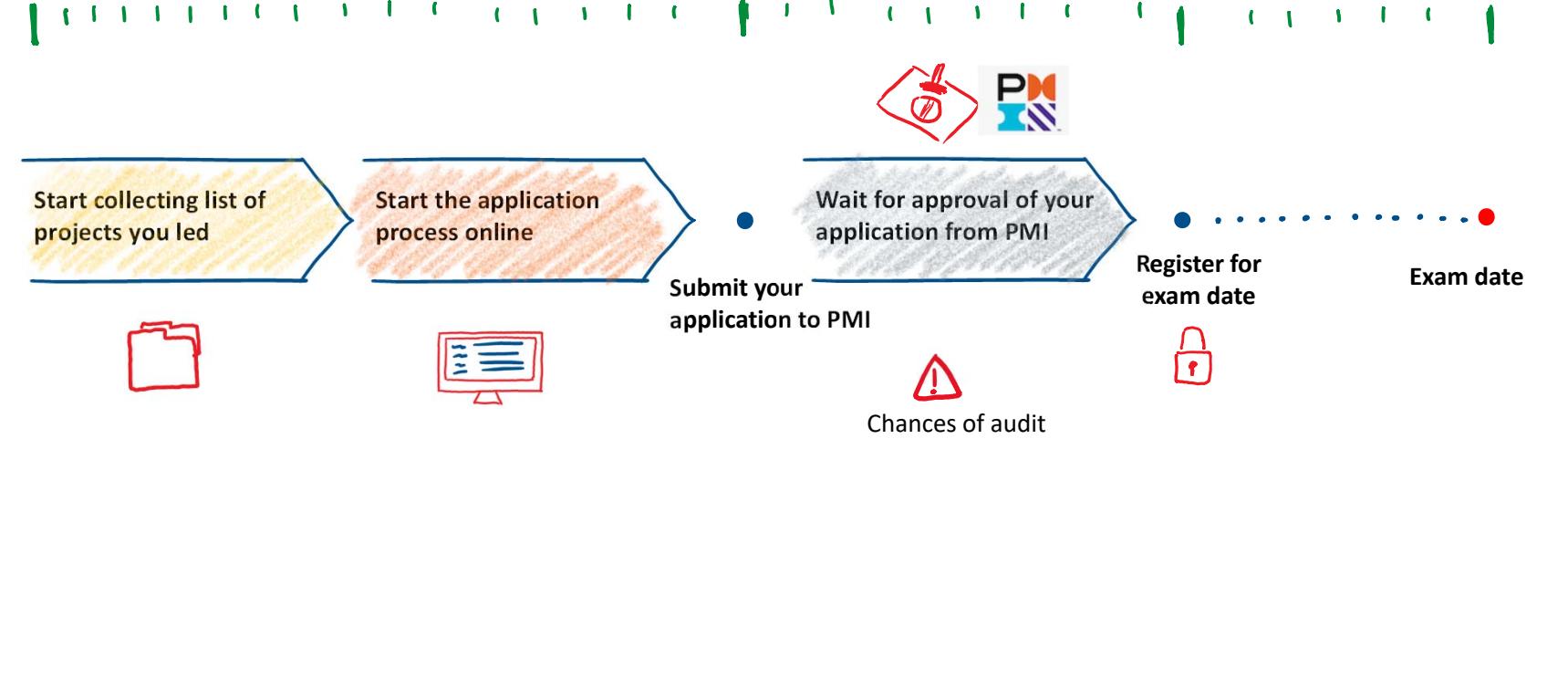
- The journey towards passing the PMP exam starts with checking if you qualify for it according to the criteria set by the Project Management Institute.
- The next step is to start preparing for the exam by following the coursework in the training, which includes listening to videos, taking quizzes, and taking mock exams.
- The recommended duration for preparation is at least one month and up to six months.
- After passing the exam, the journey continues by maintaining professional development units (PDUs) every three years to keep the PMP credential.
- Failing to maintain PDUs may result in losing the PMP credential and having to retake the exam.

# Check if you qualify to take the PMP exam



- PMI has criteria to determine if a candidate is qualified to appear for the PMP exam.
- The criteria are based on education, professional experience leading projects, and formal project management training.
- A four-year degree program qualifies for education.
- At least three years of professional experience leading projects is required.
- At least 35 hours of formal project management training is necessary.
- Candidates with a CAPM certification do not need to fulfill the 35 hours of professional project management training requirement.

# Application to the PMP Exam



- You need to collect a list of all the projects you have led or been a part of that had a defined start and end.
- The application process is done online through PMI's website ([www.pmi.org](http://www.pmi.org))
- After submitting your application, you may need to wait for 1-2 weeks for approval from PMI.
- There is a small chance of an audit for your application to be picked up by PMI for closer scrutiny.
- Once your application has been approved, you can register for the exam within one year.
- If you fail the exam, you can retake it up to three times in one year under one application process.

# Maintaining your PMP credentials



## Education – 35 minimum

- ▲ 8 Ways of Working
- ▲ 8 Power Skills
- ▲ 8 Business Acumen
- Remaining 11 in any area of Talent Triangle

## Giving Back – 25 maximum

- Volunteering
- Creating knowledge
- Working as a professional (8 maximum)

The PMI Talent Triangle®



**Total PDU requirement in 3 years : 60 PDUs**

- After obtaining a PMP certification, you need to maintain it by accumulating professional development units (PDUs) every three years.
- You can maintain your PMP certification by obtaining a minimum of 60 PDUs, with at least 8 PDUs in each of the three areas of the PMI Talent Triangle (formerly called ways of working power, skills, and business acumen).
- The two main categories of PDUs are Education and Giving Back.
- Education PDUs are obtained by attending courses, webinars, reading books and articles related to project management, and other forms of learning.
- Giving Back PDUs are obtained by sharing knowledge with others in the field of project management, such as through teaching, writing articles, presenting at conferences, and working as a practitioner.
- You can claim up to 25 Giving Back PDUs, with a maximum of 8 PDUs from your day-to-day work as a project manager.
- Volunteering with your local PMI chapter is another avenue to accumulate Giving Back PDUs.

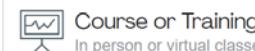
# Maintaining your PMP credentials

## Education

Learning activities that allow you to broaden your knowledge in one of the PMI Talent Triangle skill areas: Technical, Leadership, or Strategic and Business Management.

### PDU Claim Code

PMI, R.E.P. or Chapter provided 10 digit code  
[I have a claim code](#)



### Course or Training

In person or virtual classes, formal education



### Organization Meetings

Chapter, company, or professional meetings limited to 2 PDUs



### Online or Digital Media

Pre-recorded Webinars. Podcasts. digital recordings



### Read

Books, articles, blogs



### Informal Learning

Structured discussions with other professionals or mentors

## Giving Back

Activities that enable you to share and apply your knowledge and skills as a means to contribute to and help build the profession.

### Work as a Practitioner

Working in a profession related to your certification



### Create Content

Authoring books or articles, creating webinars



### Give a Presentation

Preparing for and speaking or presenting



### Share Knowledge

Serving as a moderator, SME, or mentor



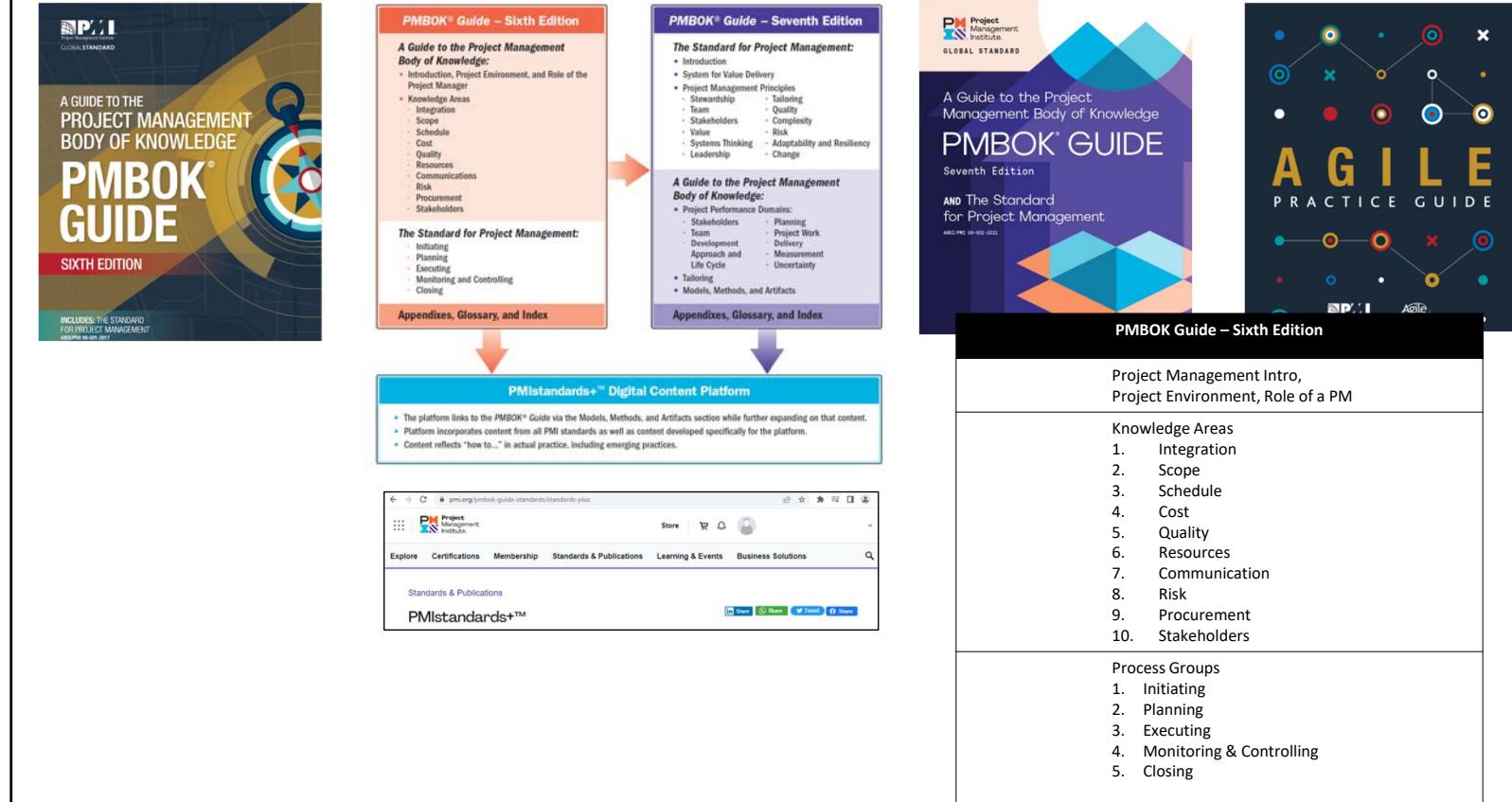
### Volunteer

Volunteering without compensation

These are some areas and avenues to obtain your PD through free or paid subscriptions and purchases.

- You can attend in-person or virtual classroom trainings for formal education that you can claim as PDUs.
- You can also join your local PMI chapter, attend company and professional meetings related to project management, and claim credit for an entire year.
- You can listen to pre-recorded webinars, podcasts, digital recordings, read books and articles on project management to claim stewardship.
- PMI considers not only formal education but also any informal learning through structured discussions with other professionals, experts in the field, and group chats.
- As part of the giving-back category, you can claim working as a practitioner.
- Creating content in project management such as books, articles, webinars, and online courses can also count towards your PDUs.
- If you become an expert, giving speeches and presenting in conferences can be claimed as PDUs.
- Sharing knowledge with the project management community through volunteering activities with local chapters also contributes to your PDUs.

# Course Content



- The PMP exam is based on the content of the Project Management Book of Knowledge (PMBOK) Guide, 6th and 7th editions, and the Agile Practice Guide.
- The PMBOK Guide 6th edition focuses on the foundations of project management and is process-based, covering ten knowledge areas and five process groups, with over 40 processes.
- The PMBOK Guide 7th edition is principle-based, focusing on the project manager and their underlying principles, as well as project performance domains, tailoring, and models, methods, and artifacts.
- The Agile Practice Guide covers the basics of Agile and its implementation in project management, with lifecycles, creating an Agile environment, delivering in an Agile environment, and expanding Agile to larger enterprises and PMOs.
- To pass the exam, one needs to master all these concepts and apply them to project management.

# Exam Questions

PMBOK Guide – Sixth Edition		PMBOK Guide – Seventh Edition	Agile Practice Guide
	<p><b>Project Management Intro, Project Environment, Role of a PM</b></p> <p><b>Knowledge Areas</b></p> <ol style="list-style-type: none"> <li>Integration</li> <li>Scope</li> <li>Schedule</li> <li>Cost</li> <li>Quality</li> <li>Resources</li> <li>Communication</li> <li>Risk</li> <li>Procurement</li> <li>Stakeholders</li> </ol> <p><b>Process Groups</b></p> <ol style="list-style-type: none"> <li>Initiating</li> <li>Planning</li> <li>Executing</li> <li>Monitoring &amp; Controlling</li> <li>Closing</li> </ol>	<p><b>System for Value Delivery</b></p> <p><b>Project Management Principles</b></p> <ol style="list-style-type: none"> <li>Stewardship</li> <li>Team</li> <li>Stakeholders</li> <li>Value</li> <li>Systems Thinking</li> <li>Leadership</li> <li>Tailoring</li> <li>Quality</li> <li>Complexity</li> <li>Risk</li> <li>Adaptability and Resiliency</li> <li>Change</li> </ol> <p><b>Project Performance Domains</b></p> <ol style="list-style-type: none"> <li>Stakeholders</li> <li>Team</li> <li>Development Approach &amp; Life Cycle</li> <li>Planning</li> <li>Project Work</li> <li>Delivery</li> <li>Measurement</li> <li>Uncertainty</li> </ol> <p><b>Tailoring</b> Models, Methods and Artifacts</p>	<p><b>Introduction to Agile</b></p> <p><b>Life Cycle Selection</b></p> <ol style="list-style-type: none"> <li>Predictive</li> <li>Iterative</li> <li>Incremental</li> <li>Agile</li> <li>Hybrid</li> </ol> <p><b>Implementing Agile – Creating an Agile Environment</b></p> <ol style="list-style-type: none"> <li>Agile Mindset</li> <li>Servant Leadership</li> <li>Team Composition</li> </ol> <p><b>Implementing Agile – Delivering in an Agile Environment</b></p> <ol style="list-style-type: none"> <li>Charter</li> <li>Agile Practices</li> </ol> <p><b>Organizational Considerations for Project Agility</b> Scaling Agile Agile PMOs</p>
			

No. of Scored Questions	No. of Pretest (Unscored) Questions	Total Examination Questions
175	5	180

- The PMP exam has a total of 180 questions, with 8 of them being pre-test questions that don't affect the final score.
- All questions are randomly placed within the exam and are derived from the PMBOK Guide 6th and 7th editions, and the Agile Practice Guide.
- 50% of the questions come from the PMBOK Guide and 50% from the Agile Practice Guide.

# Exam Duration


**PMBOK Guide – Sixth Edition**

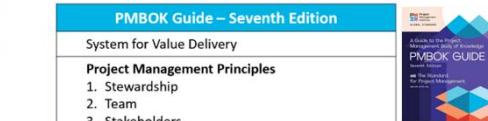
Project Management Intro,  
Project Environment, Role of a PM

**Knowledge Areas**

1. Integration
2. Scope
3. Schedule
4. Cost
5. Quality
6. Resources
7. Communication
8. Risk
9. Procurement
10. Stakeholders

**Process Groups**

1. Initiating
2. Planning
3. Executing
4. Monitoring & Controlling
5. Closing


**PMBOK Guide – Seventh Edition**

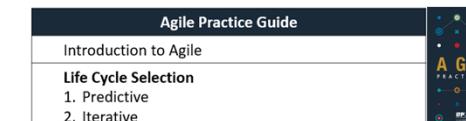
System for Value Delivery

**Project Management Principles**

1. Stewardship
2. Team
3. Stakeholders
4. Value
5. Systems Thinking
6. Leadership
7. Tailoring
8. Quality
9. Complexity
10. Risk
11. Adaptability and Resiliency
12. Change

**Project Performance Domains**

1. Stakeholders
2. Team
3. Development Approach & Life Cycle
4. Planning
5. Project Work
6. Delivery
7. Measurement
8. Uncertainty

Tailoring  
Models, Methods and Artifacts

**Agile Practice Guide**

Introduction to Agile

**Life Cycle Selection**

1. Predictive
2. Iterative
3. Incremental
4. Agile
5. Hybrid

**Implementing Agile – Creating an Agile Environment**

1. Agile Mindset
2. Servant Leadership
3. Team Composition

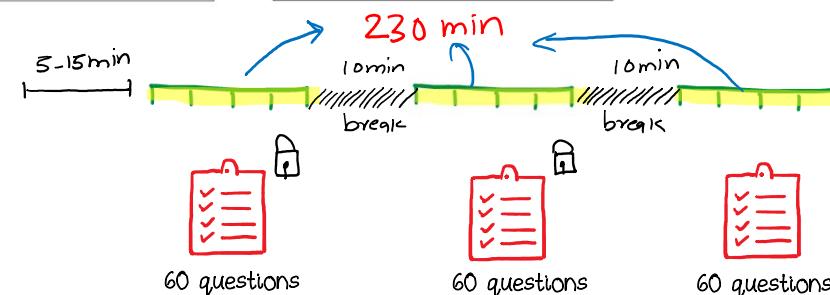
**Implementing Agile – Delivering in an Agile Environment**

1. Charter
2. Agile Practices

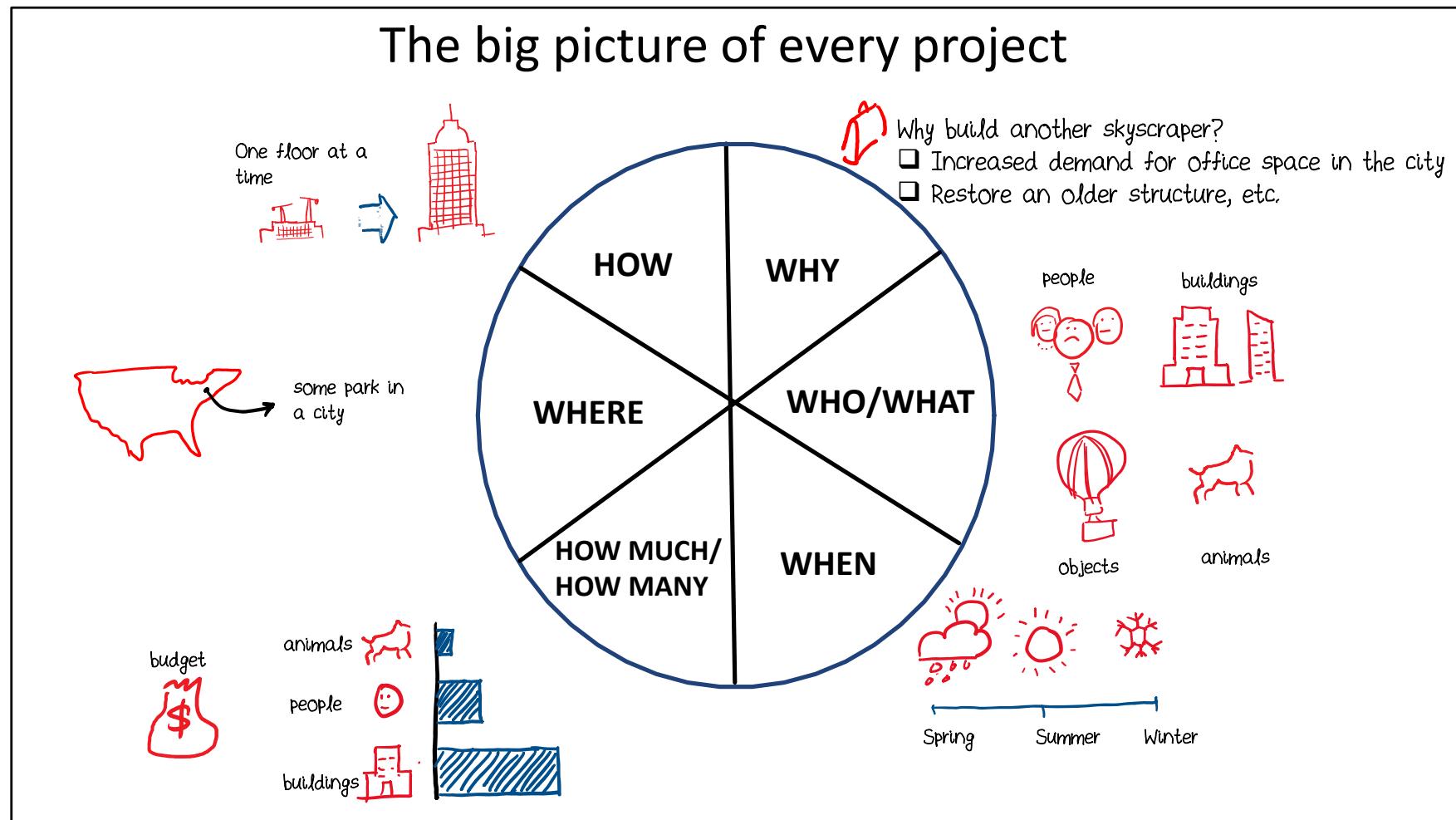
Organizational Considerations for Project Agility  
Scaling Agile  
Agile PMOs

Allotted Examination Time
230 Minutes

Total Examination Questions
180



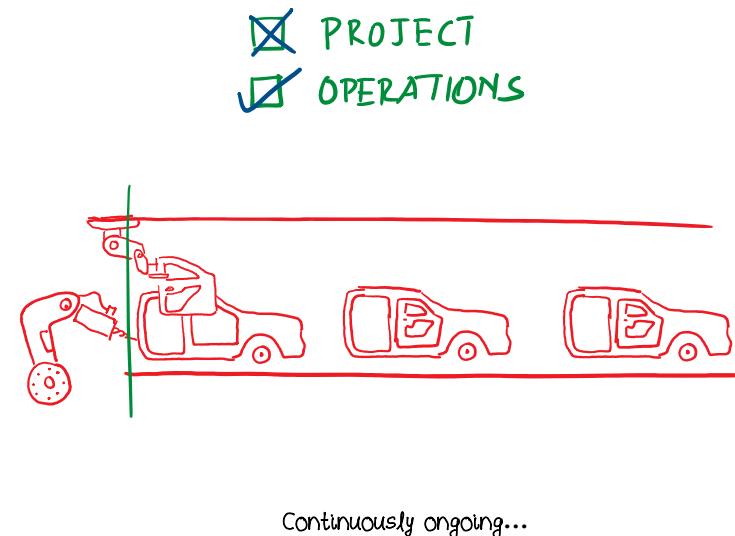
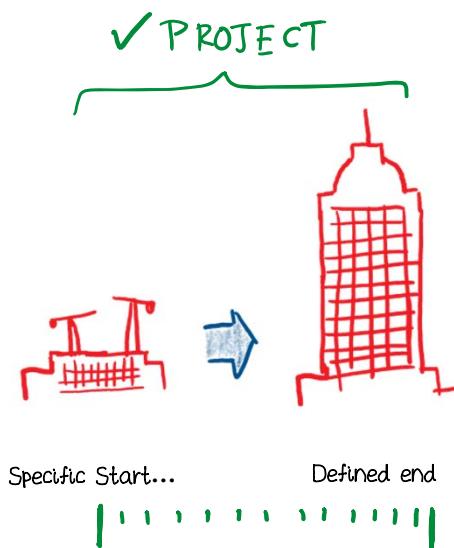
- The exam duration is 230 minutes (just under 4 hours) and includes two breaks after every 60 questions.
- The exam is preceded by a tutorial and survey, both optional and take about 5-15 minutes.
- The 230 minutes allotted for the exam, including review time, are generally sufficient to comfortably answer all 180 questions.



Six visual pathways can help us understand project management:

- The first pathway is the WHO and the what, which includes stakeholders and the project's product or service
- The second pathway is the WHEN – the dimension of time, which includes the project's schedule
- The third pathway is the HOW MUCH/ HOW MANY, which involves quantitatively determining the resources needed for the project
- The fourth pathway is WHERE, which looks at the spatial lines and hierarchical arrangements within organizations involved in the project
- The fifth pathway is HOW, which involves choosing an appropriate methodology or framework for the project
- The sixth pathway is WHY, which considers the business rationale for the project and whether it's worth the effort
- These pathways align with how we see things in the real world. Thinking project management in this way makes it intuitive to manage projects

# What is a Project



A project is a **temporary** endeavor undertaken to create a unique product, service or result.

- Projects are temporary work with a defined start and end, aimed at creating a unique product, service, or result that didn't exist before.
- Projects involve a coordinated set of activities with a defined plan to follow.
- Examples of projects include building a physical structure or creating a website from scratch, while ongoing activities without a defined start and end are considered operations.
- Car manufacturing is not a project, but creating a unique car design is.
- Projects can end prematurely due to lack of budget or support from key stakeholders.

# What is Project Management



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"Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements", and a Project Manager is that individual assigned by the organization to skillfully lead the team to achieving the project objectives.

- Project management guides us in coordinating activities for a project.
- Project management applies knowledge, skills, tools, and techniques for structured methodology.
- Without project management, we wouldn't know where to start or how to approach the work.
- Project management is about efficiently juggling multiple activities and maintaining balance.
- A project manager coordinates activities through project management methodologies and principles.

# Value of a project

Any Project

**Business case:** What is the business rationale for doing the project

**Value:**

The benefit that the project is promising to deliver contained in the business rationale for doing the project

- The business case contains the fundamental rationale behind starting a project and the value it promises to deliver.
- Project sponsors and customers care about the end result of the project and the value it promises to bring, not just how well the project is managed.

# Value of a project

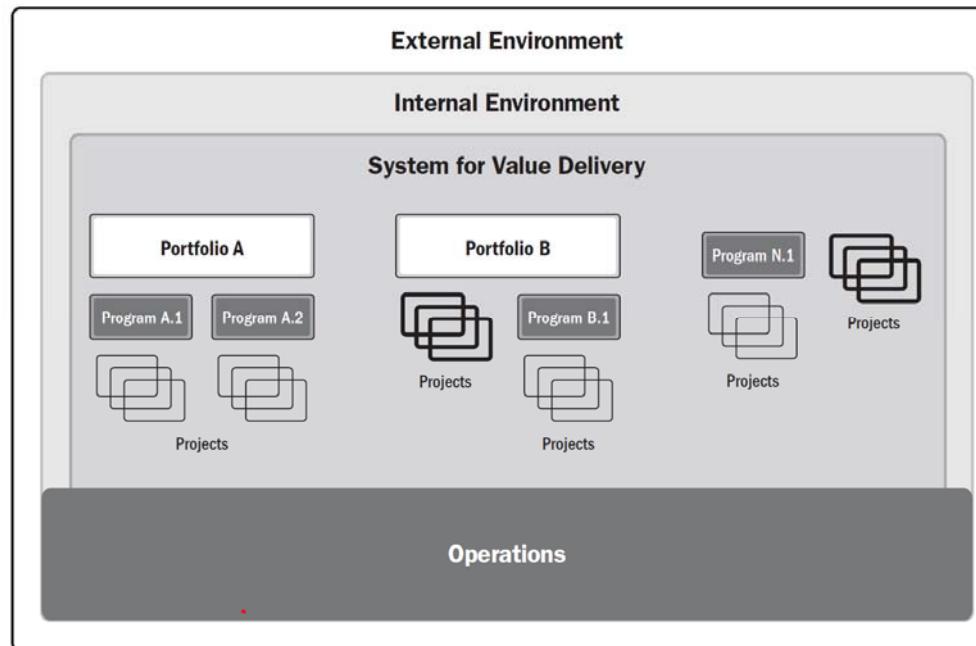
**Value  
generated  
by:**

- Creating a new product, service or result to meet the needs of customers
- Creating positive social or environment contributions
- Improving efficiency, productivity, effectiveness or responsiveness
- Enabling changes within organizations to facilitate transition to its desired future state
- Sustaining benefits enabled by programs, project and operations

- Projects can deliver value in the form of increased sales, revenues, profits, and operational efficiencies.
- However, projects can also be done to cause positive societal changes or environmental contributions.
- The World Bank is an example of an organization that undertakes projects to increase access to basic human needs in places where they are needed most.
- Projects within organizations can also bring about change to transition the company to a better future state.
- Projects, programs, operations, and portfolios are components within the organization that deliver value.

# System of value delivery

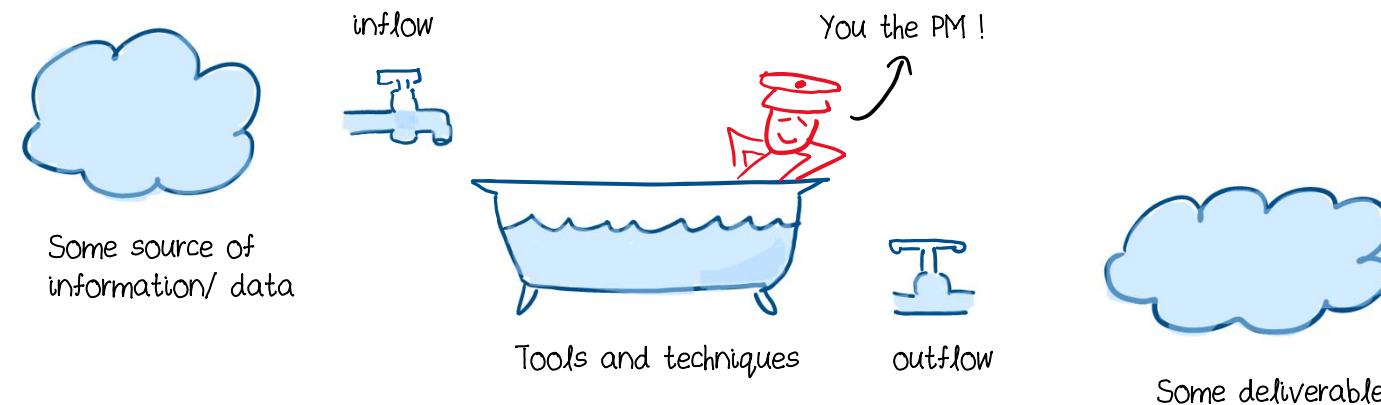
Portfolio, Programs, Projects and Operations



Source: PMBOK Guide 7<sup>th</sup> ed

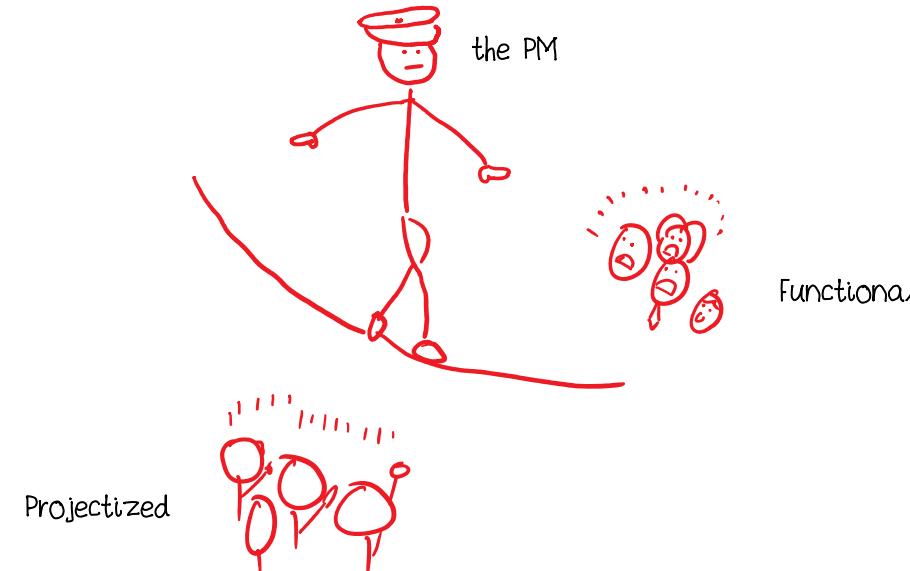
- The system of value delivery consists of multiple components: projects, operations, programs, and portfolios.
- Projects are temporary endeavors with defined starts and ends to create a unique product, service, or result.
- Operations are continuous efforts without a defined start or end, resulting in repeated or duplicated products or services.
- Programs group related projects together, sharing objectives, resources, or technology.
- Portfolios consist of multiple programs, projects, and operations that align with the organization's strategic objectives.
- Internal and external factors influence the system of value delivery, such as organizational strategy, regulations, market conditions, and political situations.
- The system of value delivery translates the organization's vision and objectives into tangible results and generates value, including monetary benefits.

# Systems thinking



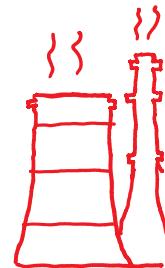
- Systems thinking is used to visualize all the inputs and outputs in project management processes.
- Inputs are fed into a process, where they are mixed together using various tools and techniques to produce outputs.
- The PM is the primary person facilitating this process.
- The outputs are interim project deliverables like project plans, schedules, budgets, and the actual product.
- This is a simplified representation of the systems thinking concept, borrowed from systems theory and modified for project management purposes.

# Matrixed Environment



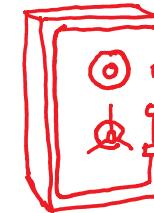
- Understanding the organization's structure and hierarchy is important for project managers.
- There are mainly three types of organizational structures: functional, project-based, and matrix.
- Functional organizations are based on specialties and give authority to functional managers.
- Project-based organizations give authority to project managers and are focused on project delivery.
- Matrix structures share authority between functional and project managers.
- Balanced matrix environments are ideal but rare.
- Weak matrix environments give more authority to functional managers, while strong matrix environments give more authority to project managers.
- Project managers have varying levels of authority over resources and decision-making depending on the type of organizational structure.

# EEF and OPA



Enterprise Environmental Factors

- Government regulations
- Industry standards
- Market conditions
- Political climate

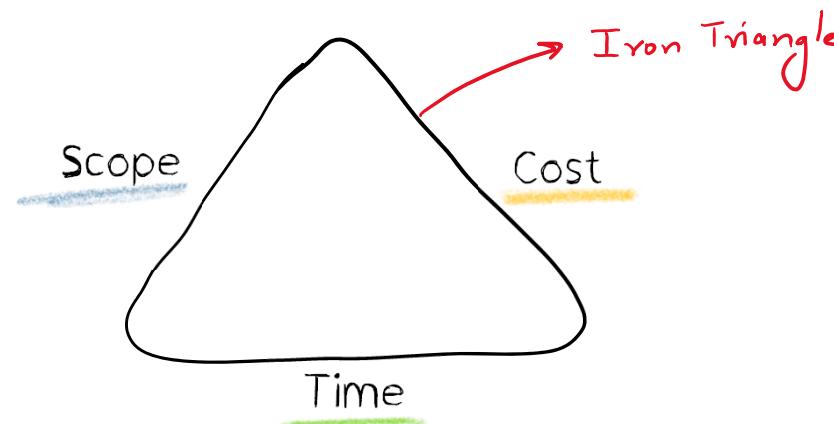


Organizational Process Assets

- Internal policies and procedures
- Guidelines
- Templates
- Systems
- Best practices

- Enterprise Environmental Factors: Not everything in a project is under your control, and external factors may have an influence on the outcome.
- These external factors are called Enterprise Environmental Factors, which may include government regulations, market conditions, and political climates.
- Organizational Process Assets are an organization's internal policies, procedures, guidelines, templates, systems, and best practices that may have been collected from past experiences. These assets are important inputs to many project management processes.

## Project Constraints

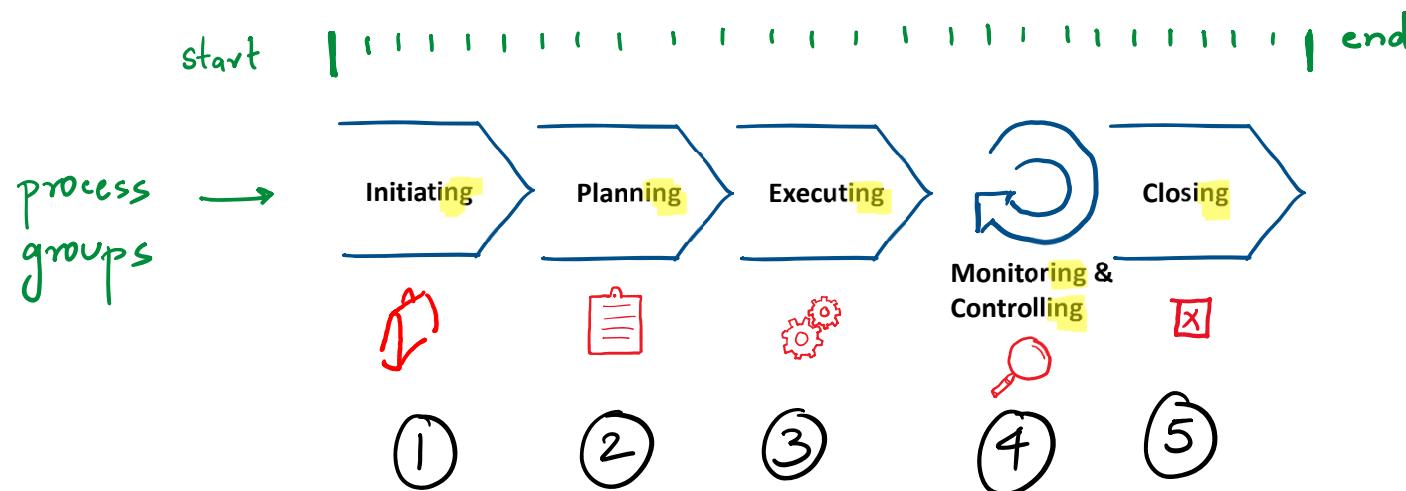


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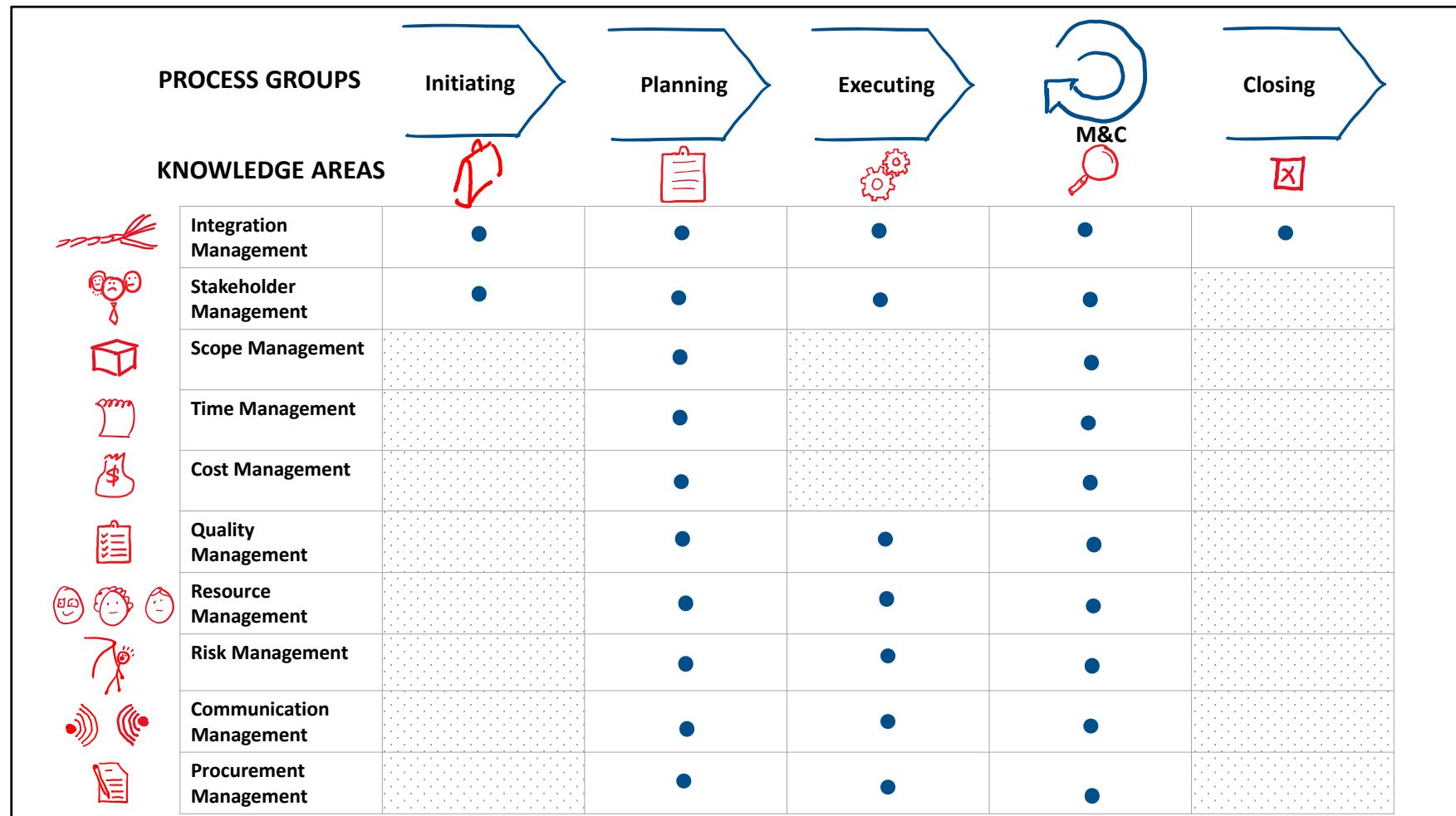
"Iron triangle" because when you alter one project constraint you will end up altering other project constraints

- Project managers need to understand that there are limitations to the resources, time, and budget available for a project.
- These limitations are called project constraints and they dictate the actions that can be taken by the project manager and team.
- Constraints can be of different types and not just limited to scope, time, or cost.
- The iron triangle is a concept that refers to the three constraints of scope, time, and budget that dictate the setup and execution of a project.

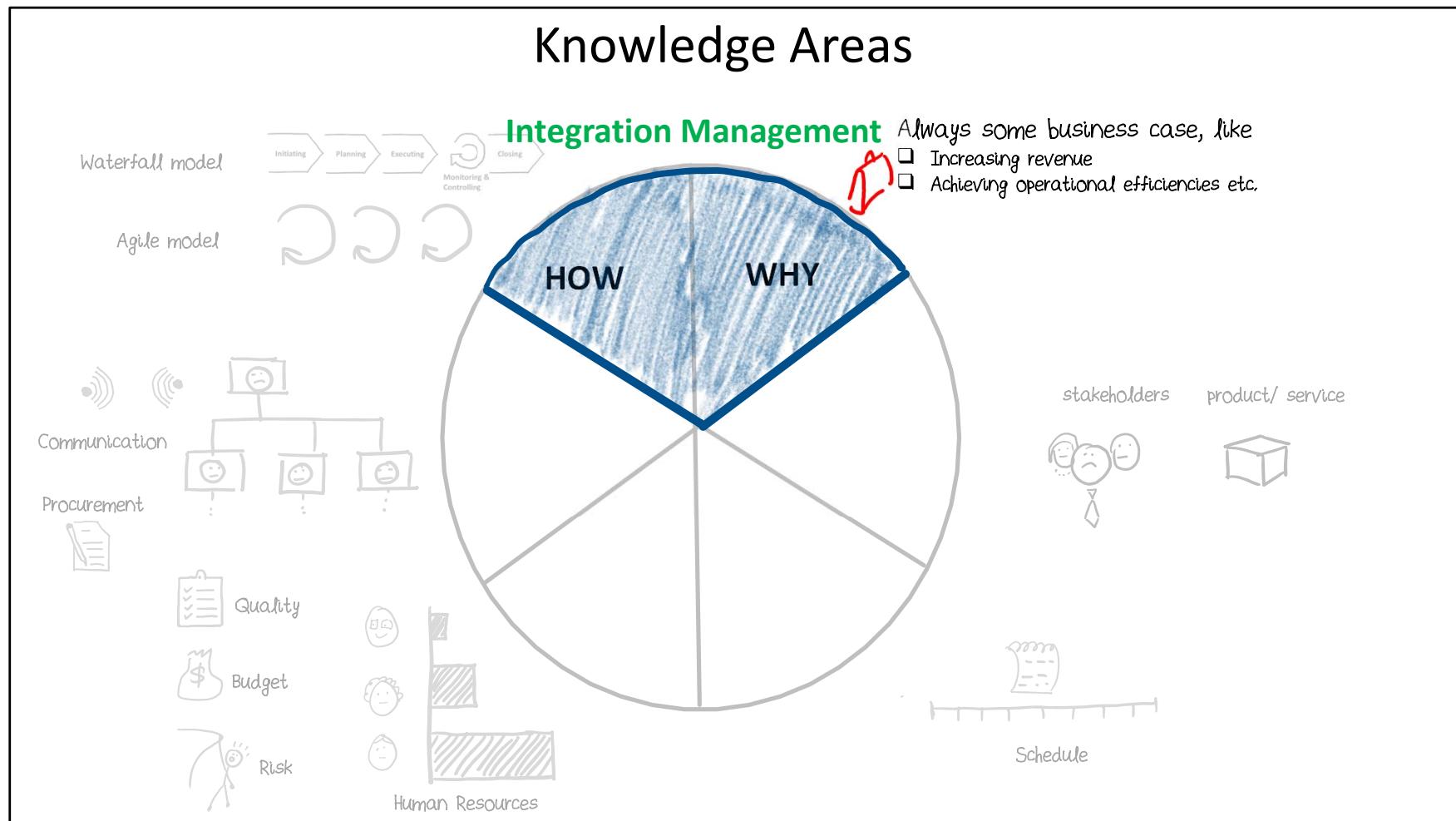
# Process Groups



- Time is a crucial component in a project.
- Projects are divided into five main process groups: initiating, planning, executing, monitoring and controlling, and closing.
- The initiating process group involves putting everything needed to start the project and officially recognizing it.
- The planning phase is where most of the work is done in planning for the project's future, and the project management plans are created.
- The executing phase involves building the final product or service and coordinating with people and resources.
- The monitoring and controlling phase involves tracking progress, identifying areas of changes, and initiating corrective and preventive actions.
- The closing phase includes concluding activities and closing all project management processes and contractual obligations.

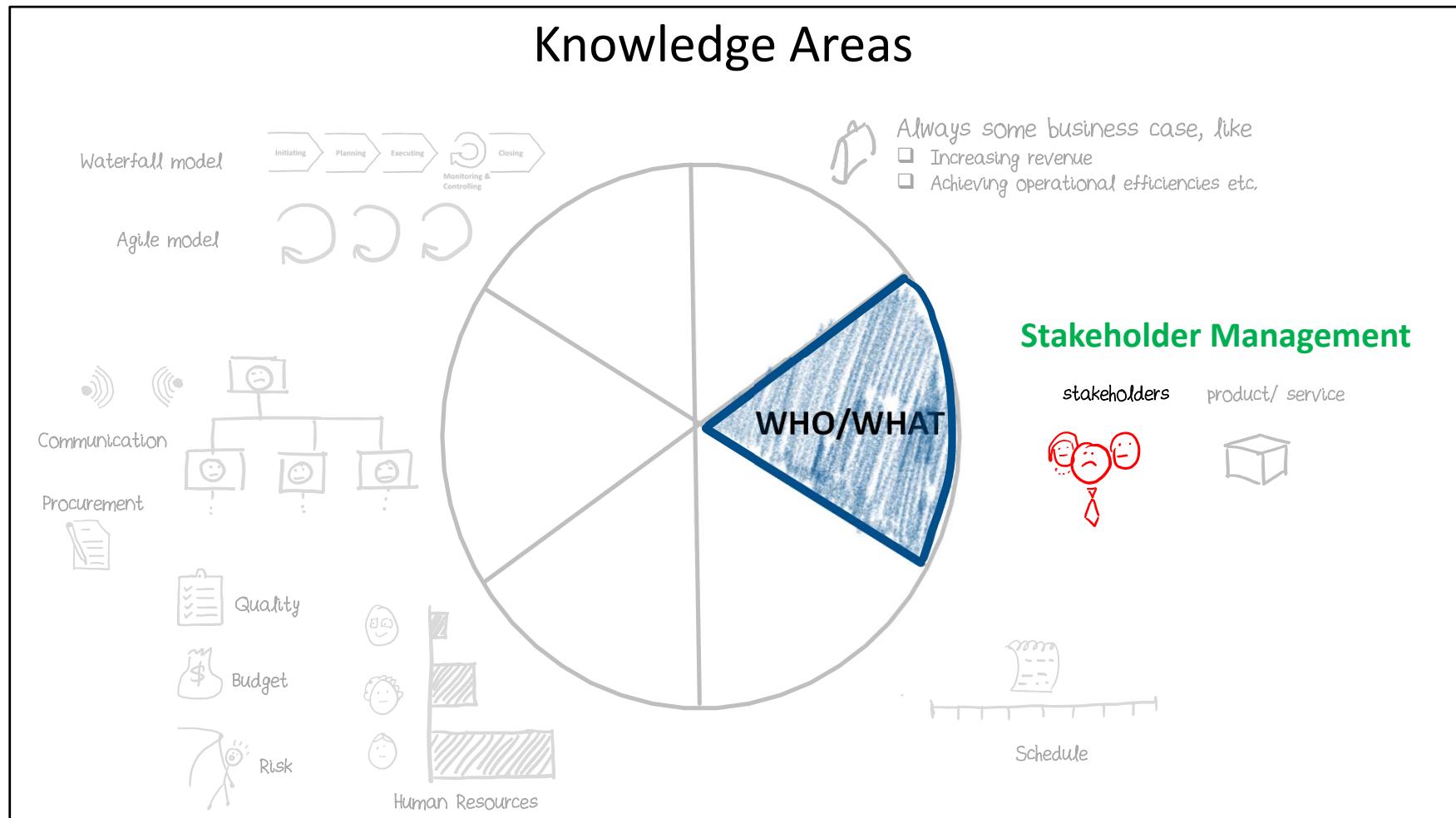


- Project management is divided into 10 knowledge areas and 5 process groups
- The blue dots represent PM Processes in those Knowledge Areas and Process Groups

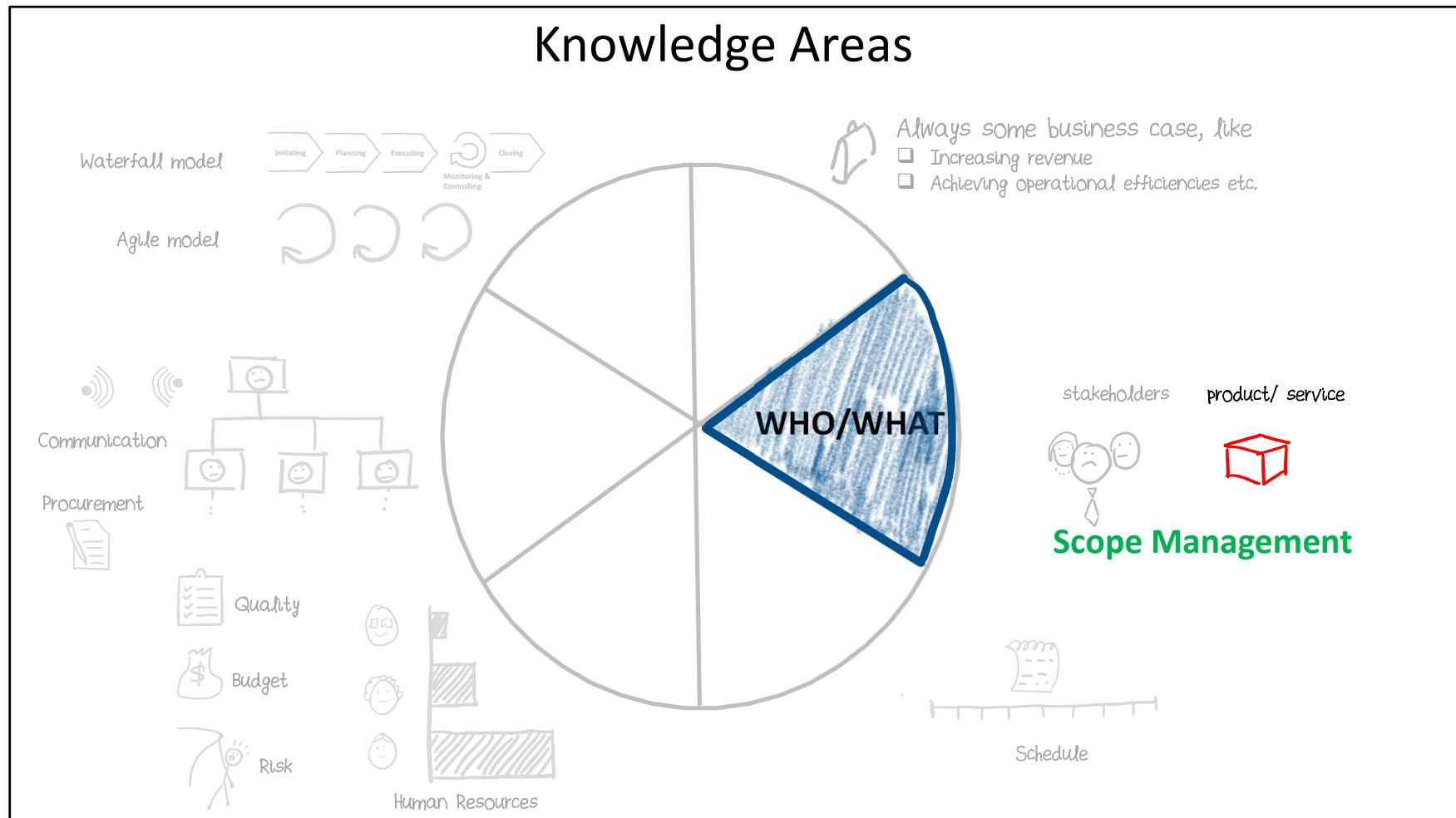


Integration management is one of the ten knowledge areas in project management, and it is concerned with bringing together all the different elements of a project into a cohesive whole. It involves the coordination and management of all the project management processes, including initiating, planning, executing, monitoring and controlling, and closing, to ensure that the project objectives are achieved.

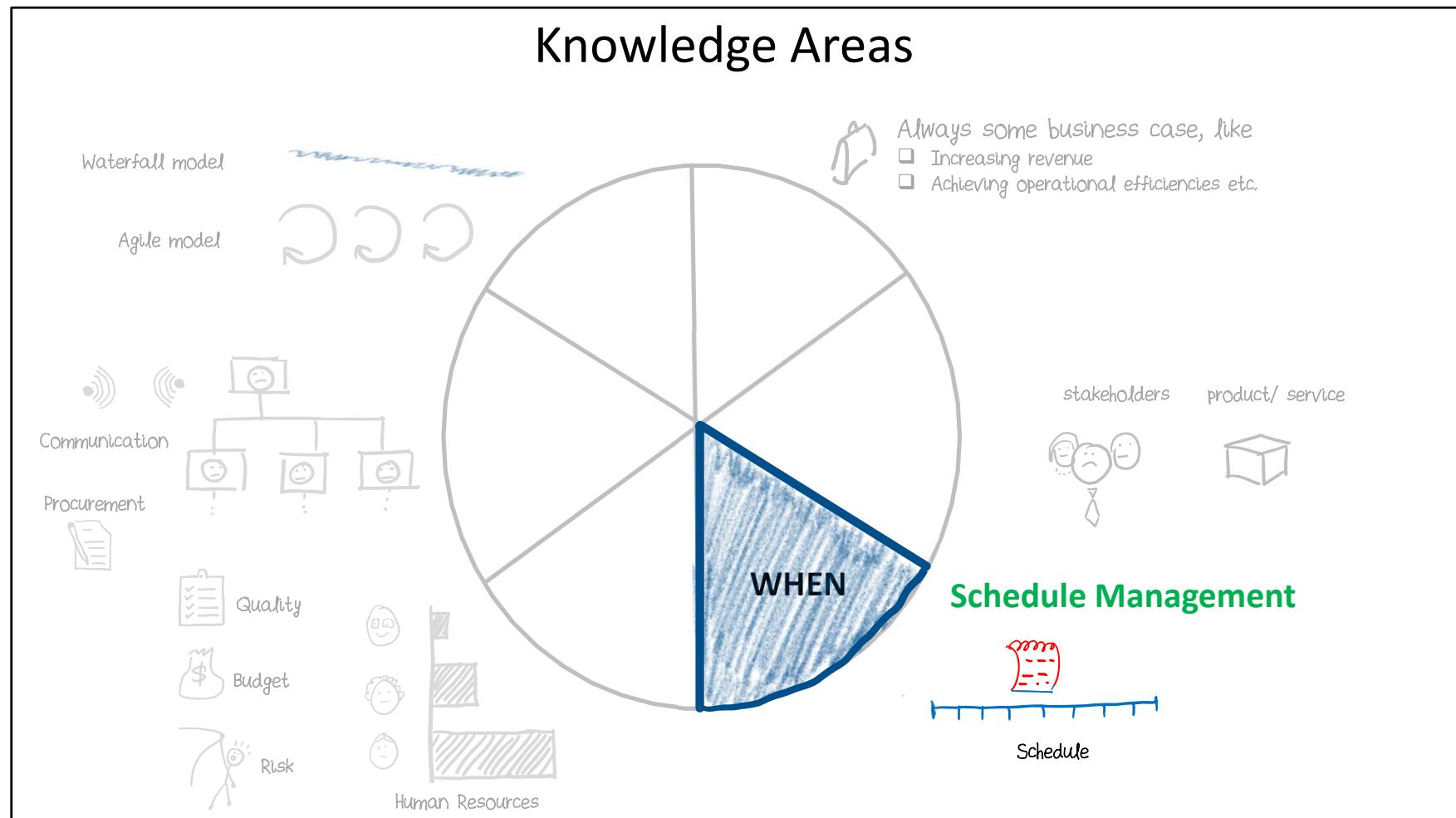
- Integration management is a knowledge area that deals with the why and how of the project.
- It begins with formulating the business case for the project and the defining ultimate goals of the project.
- It also involves planning for the project, considering changes, and balancing various processes to deliver the defined goals.
- Integration management identifies stakeholders and manages their expectations through appropriate tools and techniques.
- It spans all the 5 process groups of project management.



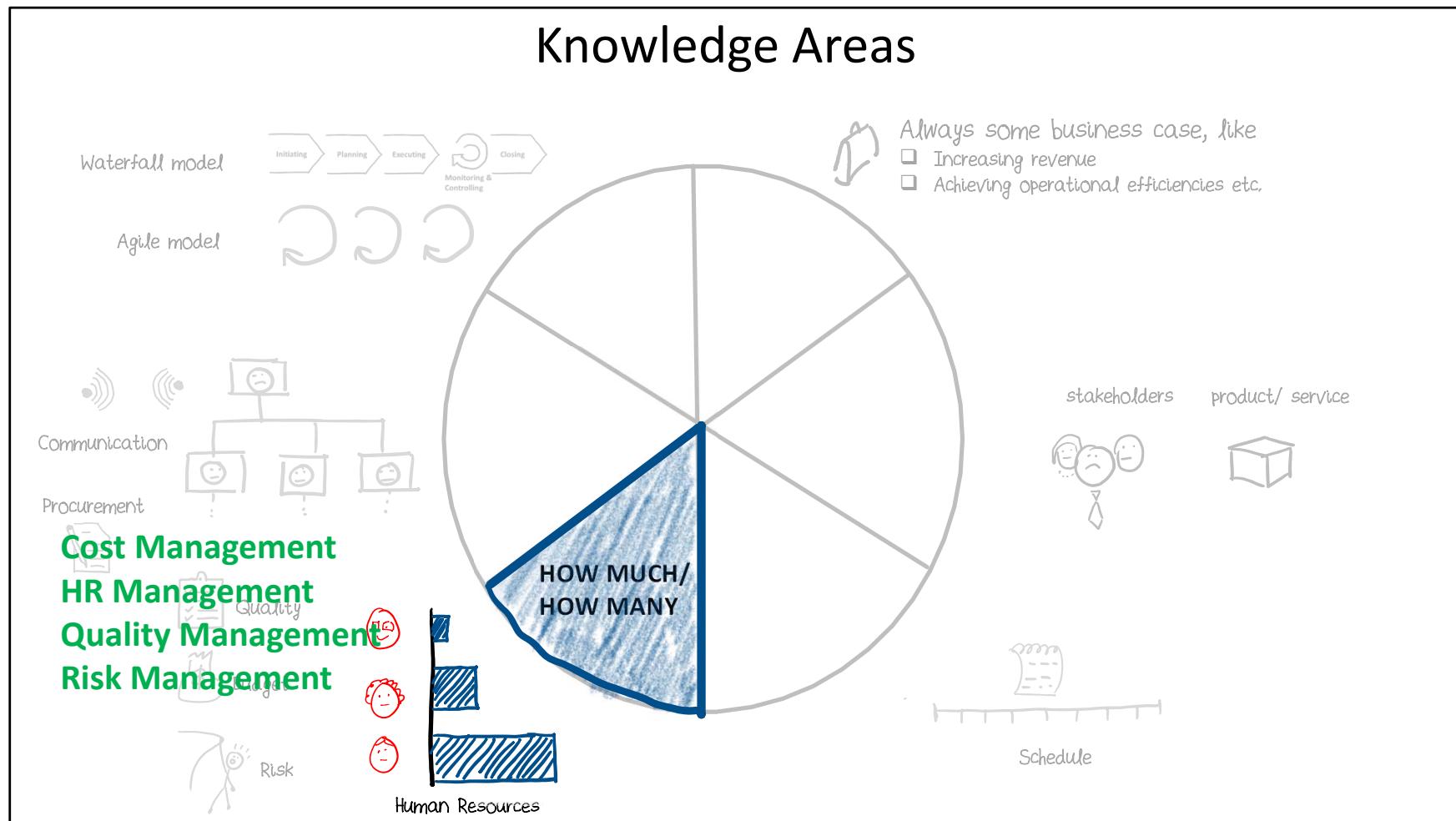
- Stakeholder management is a knowledge area in project management that involves identifying, analyzing, and managing stakeholders who have an interest or influence in the project.
- The main goal of stakeholder management is to ensure that stakeholders' needs and expectations are understood, addressed, and managed effectively to support the success of the project.
- This includes identifying all the stakeholders and determining their level of involvement, assessing their impact on the project, and managing their expectations and concerns.



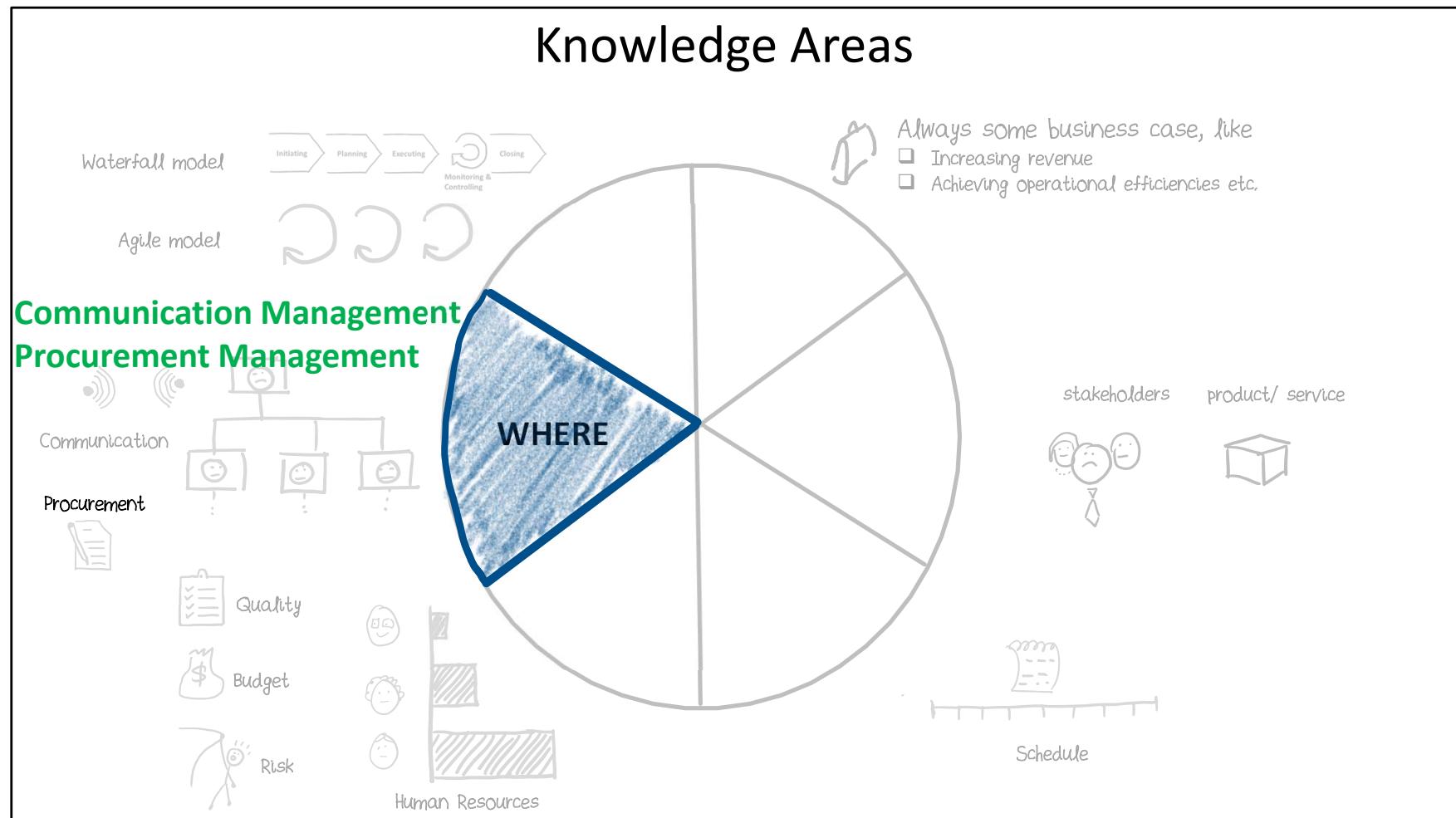
- Scope management in project management refers to the processes and techniques used to define, validate, and control the work that needs to be done on a project.
- It involves identifying all the project deliverables, requirements, and objectives, as well as establishing a plan for how to accomplish them.
- The goal of scope management is to ensure that the project stays on track and that all project work is completed within the agreed-upon timeline and budget.



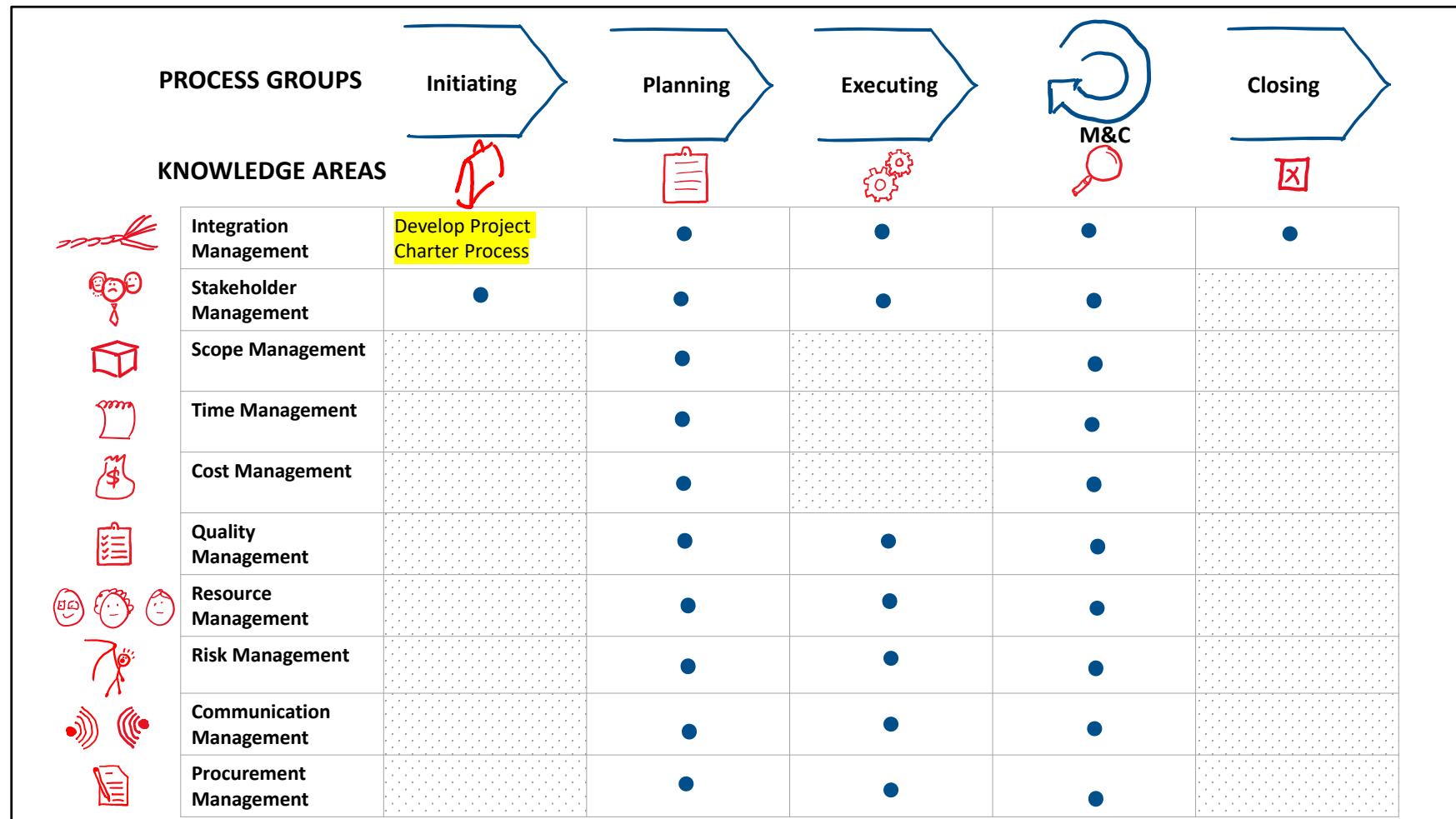
- Schedule management is a knowledge area in project management that deals with the planning, development, monitoring, and control of project schedules.
- It includes the processes required to ensure that the project is completed on time, taking into account all the necessary tasks and resources required to deliver the project objectives.
- The main goal of schedule management is to create a schedule that is realistic, achievable, and meets the needs of all stakeholders.



- The next knowledge areas are quantitative and focus on measuring certain aspects of the project
- Cost management deals with estimating resources cost and establishing budgets to determine if the project continues or stops
- Resource management involves managing people working on the project, including conflicts and motivation, and ensuring their effective use
- Quality management ensures that the project meets the requirements and quality standards set out in the planning process
- Risk management is concerned with identifying and planning for potential risks and evaluating their probability of impact, including positive consequences that can improve project outcomes or efficiencies



- The Communications Management and Procurement Management are two knowledge areas we will discuss in the WHERE portion.
- Communication Management processes are related to general communication among stakeholders and the project team, and the project manager's communication skills are essential to coordinating and delivering the project.
- Processes in Communication Management ensure that project information, including plans, assessments, and meetings, are collected, documented, and archived properly.
- Procurement Management processes are involved in purchasing goods or services from external vendors or contractors, and discussions assume the perspective of a buyer.



Develop Project Charter Process is in the Initiating Process group and in the Integration Management Knowledge Area

# WHY do this project

## Business case



**There always must be a business case to start a project, like...**

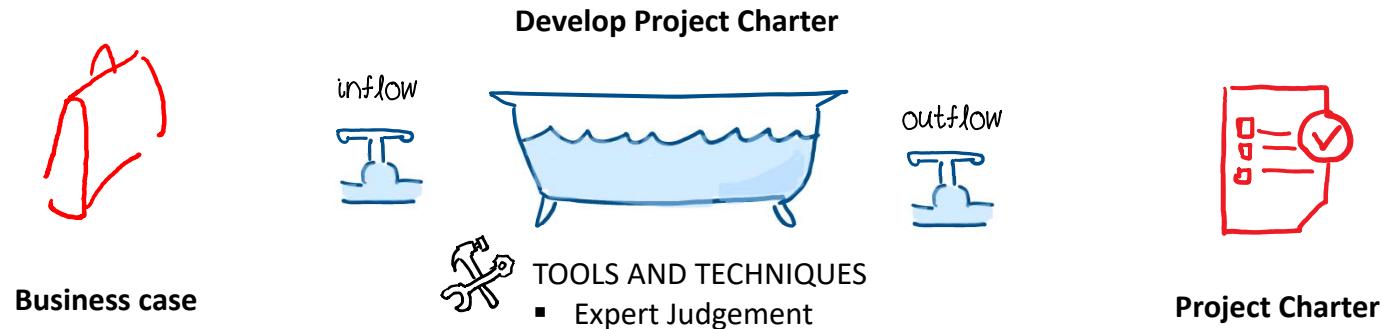
- Increasing revenue
- Achieving operational efficiencies etc.

- 
1. The business case establishes the fundamental rationale behind starting the project
  2. It talks about what your company is trying to get out of the project, whether the investment in the project is worth the effort, and how much money can they make or save from doing it
  3. Describes the cost-benefit analysis

A business case typically outlines the following:

- Problem statement: A clear and concise explanation of the problem or opportunity that the project aims to address.
- Objectives: The specific goals and objectives of the project, including how they align with the overall strategic objectives of the organization.
- Benefits: The expected benefits of the project, both tangible and intangible, and how they will contribute to the organization's bottom line.
- Costs: An estimate of the total cost of the project, including direct and indirect costs, as well as the expected return on investment.
- Risks: Identification and assessment of potential risks associated with the project, along with mitigation strategies.
- Alternatives: An evaluation of alternative solutions to the problem or opportunity, along with a comparison of their costs and benefits.
- Stakeholders: Identification of all stakeholders impacted by the project, along with their interests, needs, and concerns.

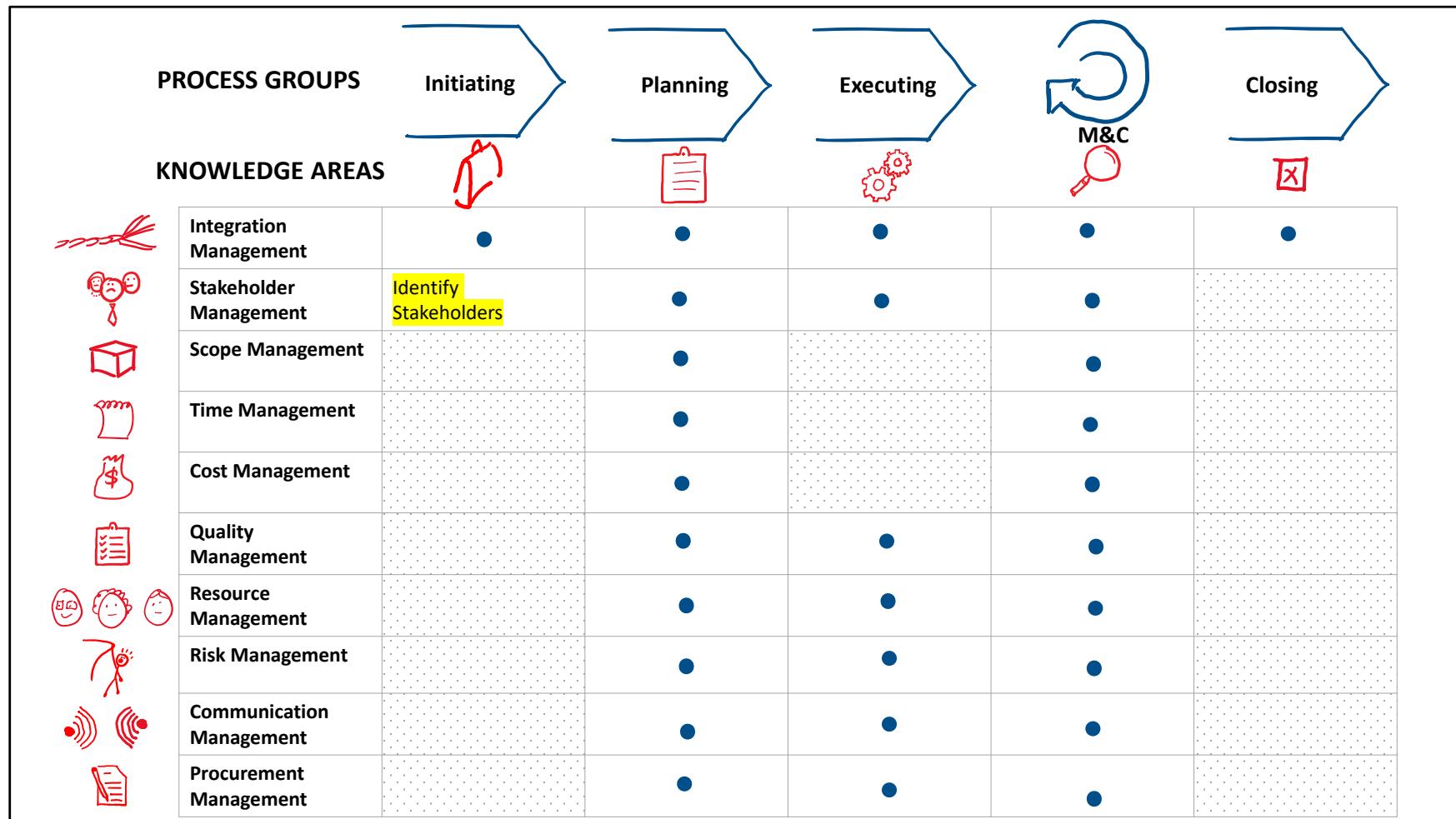
# WHY do this project



## PROJECT CHARTER

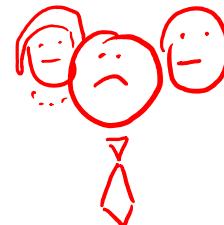
1. The project charter is the official, written acknowledgment and recognition that a project exists.
2. It gives the project manager the authority to assign organizational resources to the project.
3. The charter documents the business need or demand that the project was initiated to address, and it includes a description of the product, service, or result of the project.

- The develop project charter process converts the business case into an official document that authorizes the project manager and assigns resources to the project.
- The project charter is signed by a senior executive and gives the project manager full authority to start the project, obtain resources, and access project funds.
- The expert judgment technique is used to review and agree on the sections of the project charter.



Identify Stakeholders Process is in the Initiating Process group and in the Stakeholder Management Knowledge Area

# WHO is on the project



Project Sponsors/  
Customer



Functional Managers

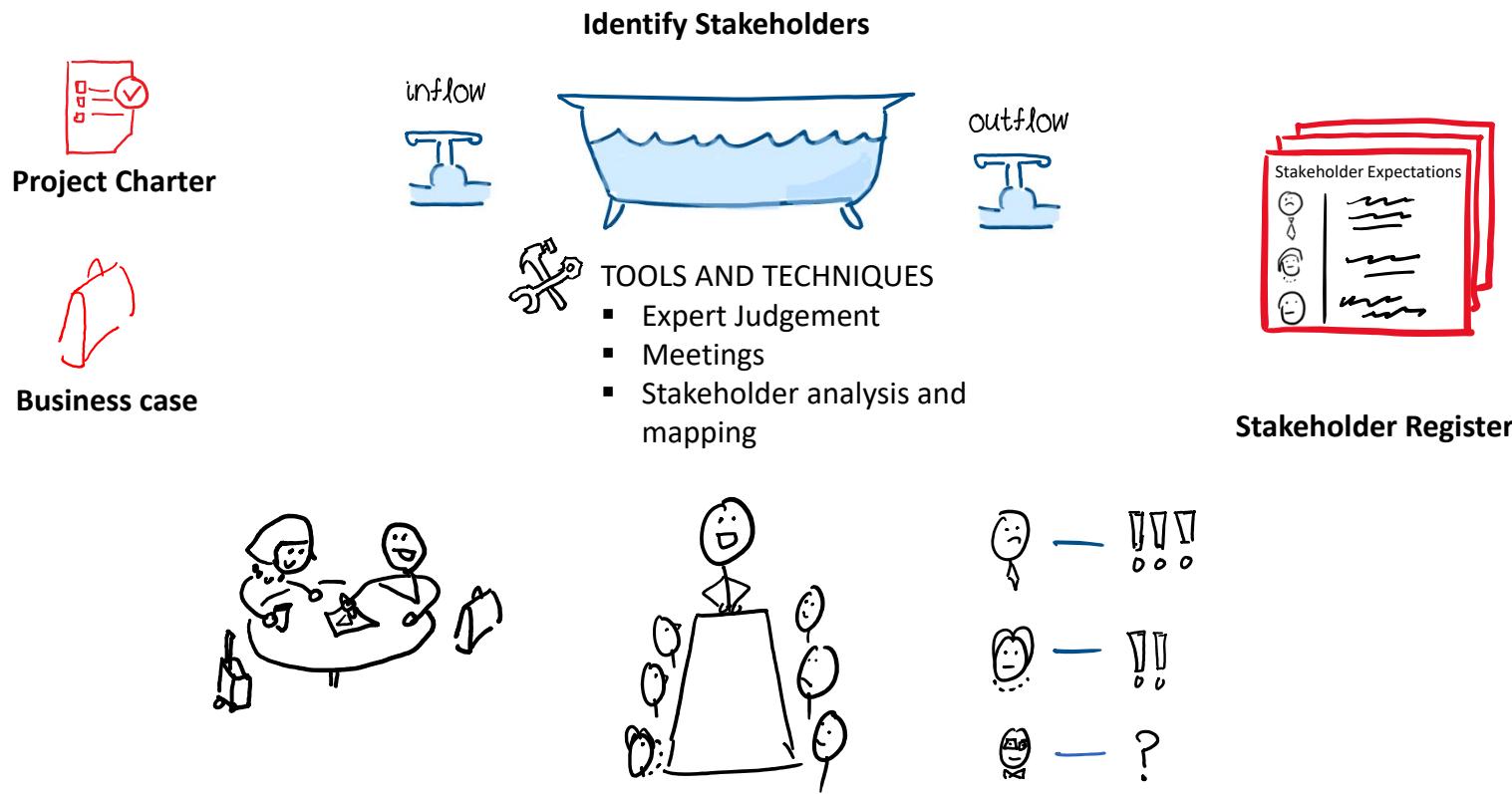


Project Manager

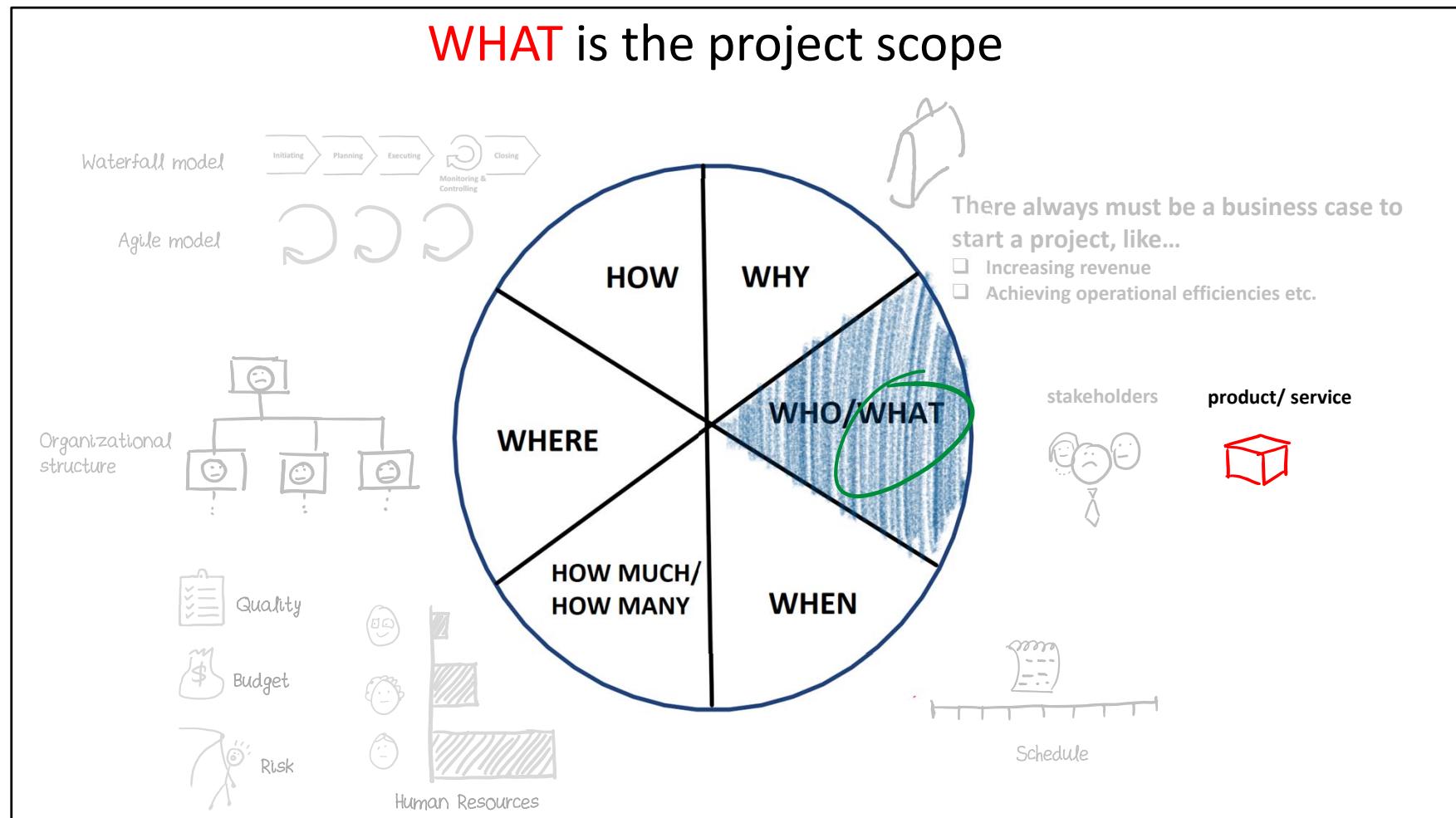
## STAKEHOLDERS

- Any person or group who have a vested interest in the outcome of your project, and usually have something to gain or lose as a result
- Stakeholders can be internal or external to the organization and can include individuals, groups, or organizations.
- Internal stakeholders may include project sponsors, project managers, team members, and other employees of the organization. External stakeholders may include customers, suppliers, government agencies, and community groups.
- Effective stakeholder management is essential for project success, as it helps to ensure that stakeholders are engaged, informed, and supportive of the project.

# WHO is on the project



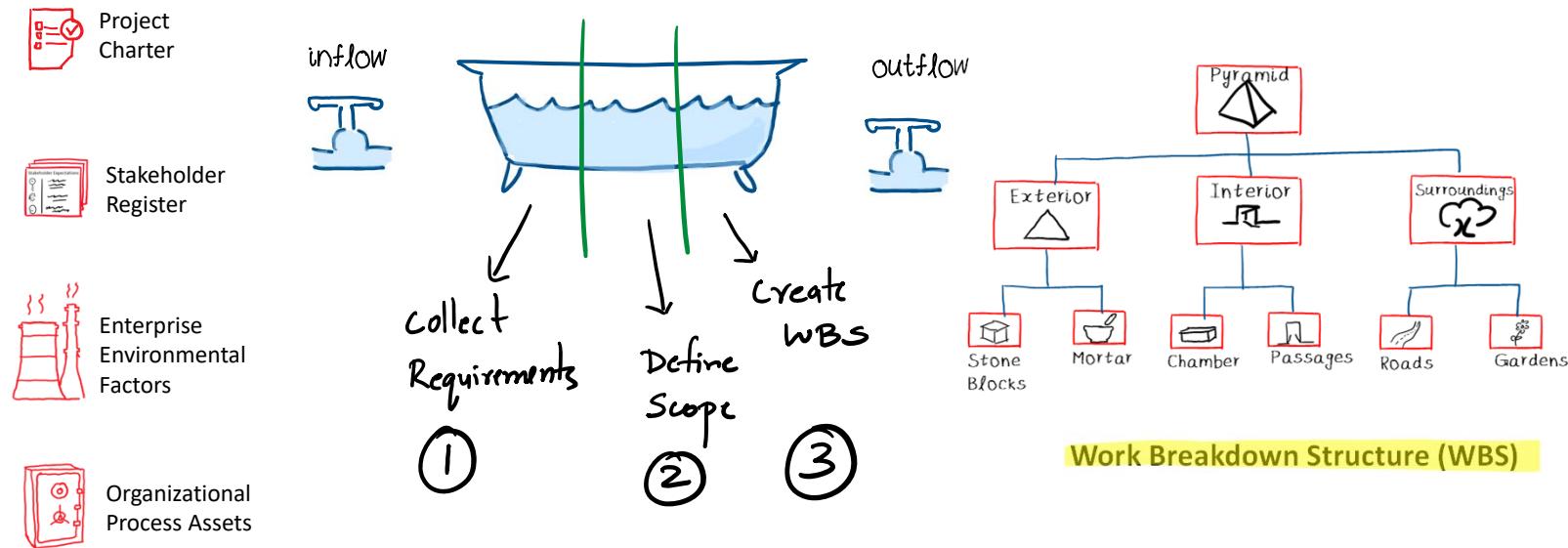
- It is important for the project manager to identify all important people on the project, known as stakeholders.
- The process of identifying stakeholders occurs during the initiating phase and is not the process for identifying project team members or resources.
- Key stakeholders include project sponsors, customers, and functional managers in a matrix environment.
- The project manager assumes total responsibility for the project and is authorized by the project charter as a key stakeholder.
- It is the responsibility of the project manager to establish ground rules, communication channels, and keep track of changing priorities of stakeholders through a stakeholder register.
- Stakeholder analysis is used to understand their specific needs and expectations, and it is important to know what motivates them and their thresholds for support on the project.
- The stakeholder register should be constantly updated to keep track of changing priorities.
- Stakeholders may have varying levels of influence and interest in the project, and their needs and expectations must be considered throughout the project lifecycle.



- Project planning ensures goals can be achieved within time and budget constraints
  - Scope management is important for defining project scope
  - Scope includes product scope (specifications of the product/service) and project scope (work needed to build the product/service)
- Product scope defines the characteristics and qualities of the final deliverable. It encompasses features, functions, and requirements of the product, such as size, shape, design, performance, and any other specific requirements that are essential to meet the product's goals and objectives.
- Project scope, on the other hand, covers all the work that is required to complete the project. It includes project management activities, such as planning, organizing, directing, and controlling the project, as well as tasks that are required to complete the product. Project scope considers the project's goals, objectives, timelines, budgets, and resources that are required to complete the project successfully.

# WHAT is the project scope

## Scope Management



- Work breakdown structure (WBS) is crucial output of scope management
- The work breakdown structure (WBS) is a visual tool that captures what is in the scope statement.
- WBS is created through three processes: collect requirements, define scope, and create WBS
- Inputs for creating WBS include project charter and stakeholder register

# WHAT is the project scope



Project Charter



Stakeholder Register



Enterprise Environmental Factors

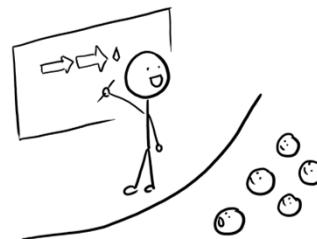


Organizational Process Assets



## TOOLS AND TECHNIQUES

- Workshops
- Interviews
- Prototypes



## COLLECT REQUIREMENTS



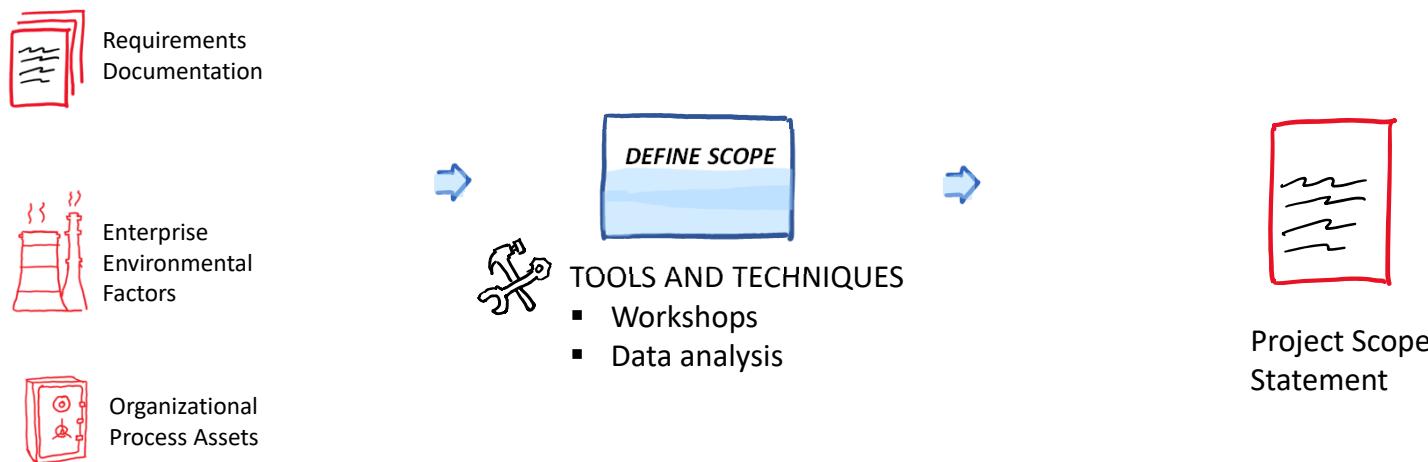
Requirements Documentation

Source	Req.	Test
User 1	✓	✓
User 2	✗	✗
User 3	✓	✓

Requirements Traceability Matrix

- Collect requirements is the first process in the scope management knowledge area.
- Requirements are the characteristics of individual components of the product or service that become the scope of the project.
- Requirements are from the perspective of the end user or customer who will ultimately be using the product or service.
- Tools and techniques used in this process include workshops and interviews with stakeholders.
- The output from this process is the requirements documentation.
- The aim is to collect as many requirements as possible to satisfy stakeholders' expectations and needs.
- It is important to trace back where individual requirements came from, which is captured in the requirements traceability matrix.

# WHAT is the project scope

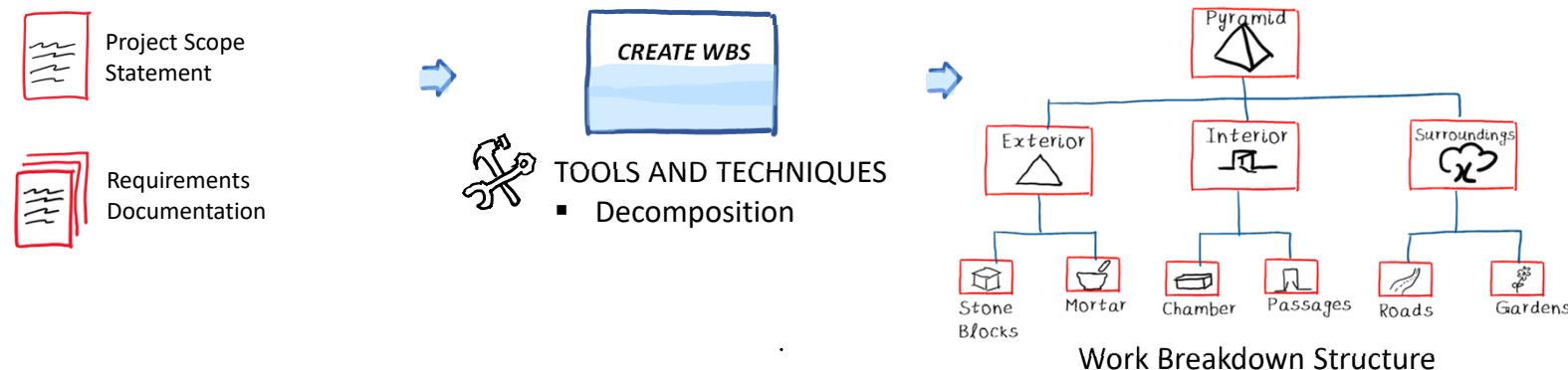


## PROJECT SCOPE STATEMENT

- The purpose is to document exactly what is going to be delivered as part of the project, nothing more, nothing less
- It is an agreement between the project team and the customer that states precisely what the work of the project will produce

- The next step after collecting requirements is creating the project scope statement.
- The project scope statement captures exactly what is and what is not in the scope of the project.
- It includes acceptance criteria and assumptions made on the project.
- The statement of work is sometimes closely linked to the project scope statement.
- The project scope statement is created using workshops and data analysis.
- It serves as an agreement between the project team and the customer, documenting exactly what will be delivered as part of the project.

# WHAT is the project scope



WORK BREAKDOWN STRUCTURE(WBS) is defined as the deliverable -oriented hierarchical decomposition of the work to be executed by the project team to accomplish all project objectives

- A product or service is composed of individual components or parts.
- Decomposition is a technique used to divide a large project scope into manageable components of work.
- The Work Breakdown Structure (WBS) is a hierarchical decomposition of the work to be executed by the project team to accomplish project objectives.
- The WBS helps to accurately estimate the costs, resources, and timelines for the entire project.
- The WBS Dictionary contains additional information about the work, including descriptions, references, and contractual agreements.
- Work packages are the smaller components of work that are more manageable and can be accurately estimated for their cost, resources, and timelines.

# WHAT is the project scope

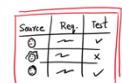
Scope Baseline



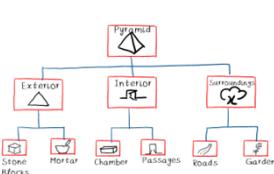
Requirements Documentation



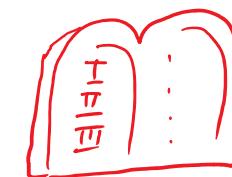
Project Scope Statement



Requirements Traceability Matrix



Work Breakdown Structure

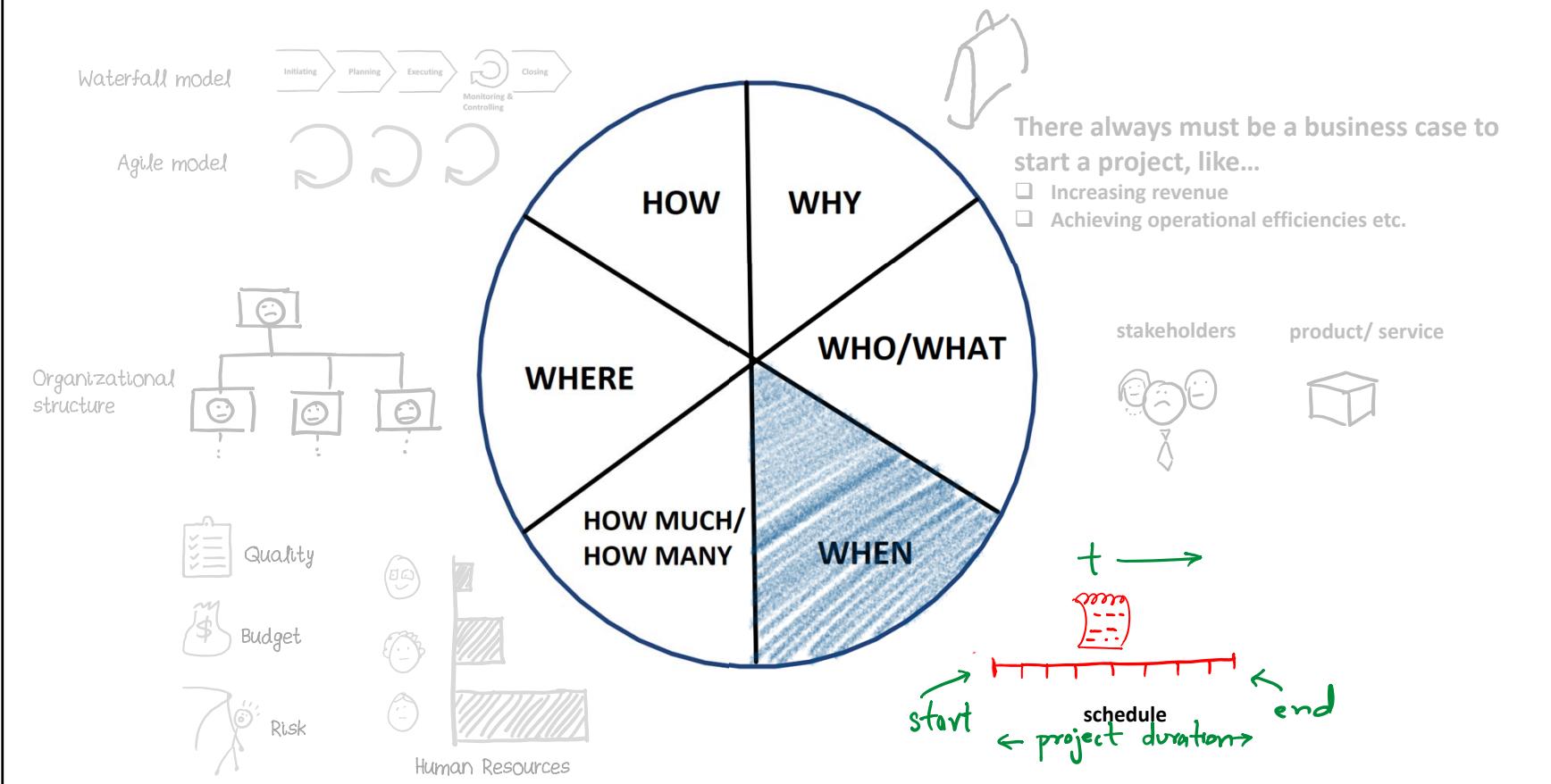


Scope Baseline

- Scope baseline is the initial agreed-upon scope between the parties involved
- It is used as a benchmark to refer back during later phases to compare to in case of changes or variations from it

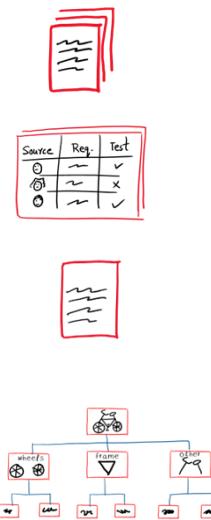
- Project managers often receive requests to add new scope or elements to the project
- The decision to add or not to add is up to the project manager with approval from key stakeholders
- The scope baseline is a collective sum of all the documents obtained from previous scope management processes
- The scope baseline becomes the initial agreed-upon scope and is used as a benchmark for later phases of the project
- Scope creep is any unapproved scope additions and should be rejected unless it goes through project change control procedure
- Gold plating is adding features that do not bring significant improvement to the final product and should not be encouraged
- The work breakdown structure is the most important output of the scope management knowledge area

## WHEN are things to be done



- Project management involves managing time as a key dimension
- Time is a limited resource and projects are temporary in nature
- Schedule management is a knowledge area that focuses on determining the project schedule and setting important milestones and deadlines

## WHEN are things to be done



- TOOLS AND TECHNIQUES
- Decomposition
  - Rolling Wave planning
  - Expert Judgement

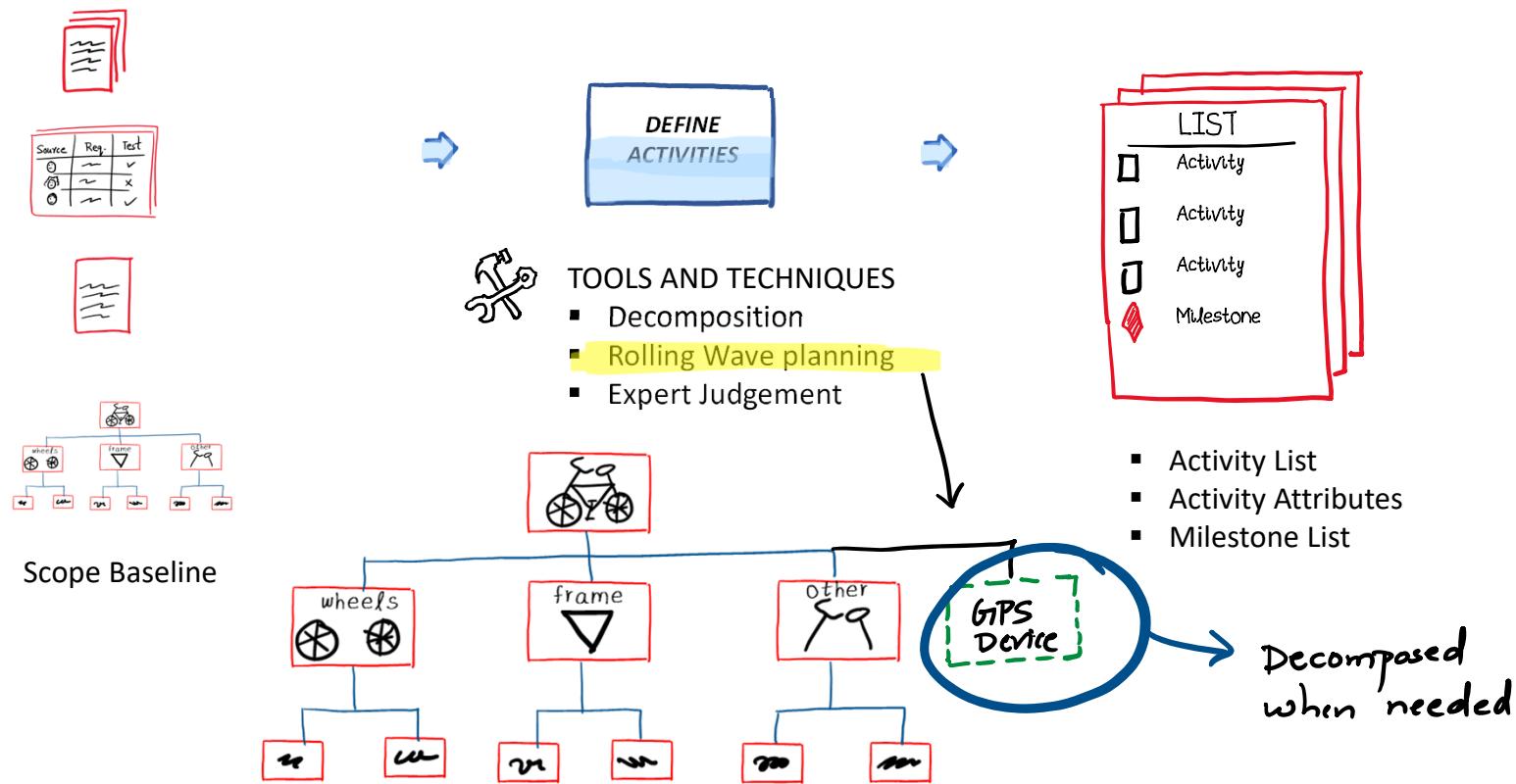


- Activity List
- Activity Attributes
- Milestone List

Scope Baseline

- Work packages are decomposed into activities, which are the tasks needed to complete the work packages
- Activity attributes document the details of activities, and the output of this process is a baseline

# WHEN are things to be done



- Rolling Wave Planning is a technique used in project management to elaborate on the details of the project plan gradually, as more information becomes available.
- It involves decomposing the project into work packages and identifying the activities necessary to complete each work package, but deferring the planning of activities until the work package is about to be executed.
- This allows for a more flexible approach to planning and allows for changes to be made as the project progresses.

# WHEN are things to be done

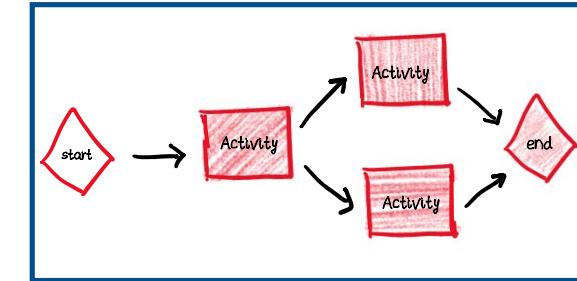


- Activity List
- Activity Attributes
- Milestone List



## TOOLS AND TECHNIQUES

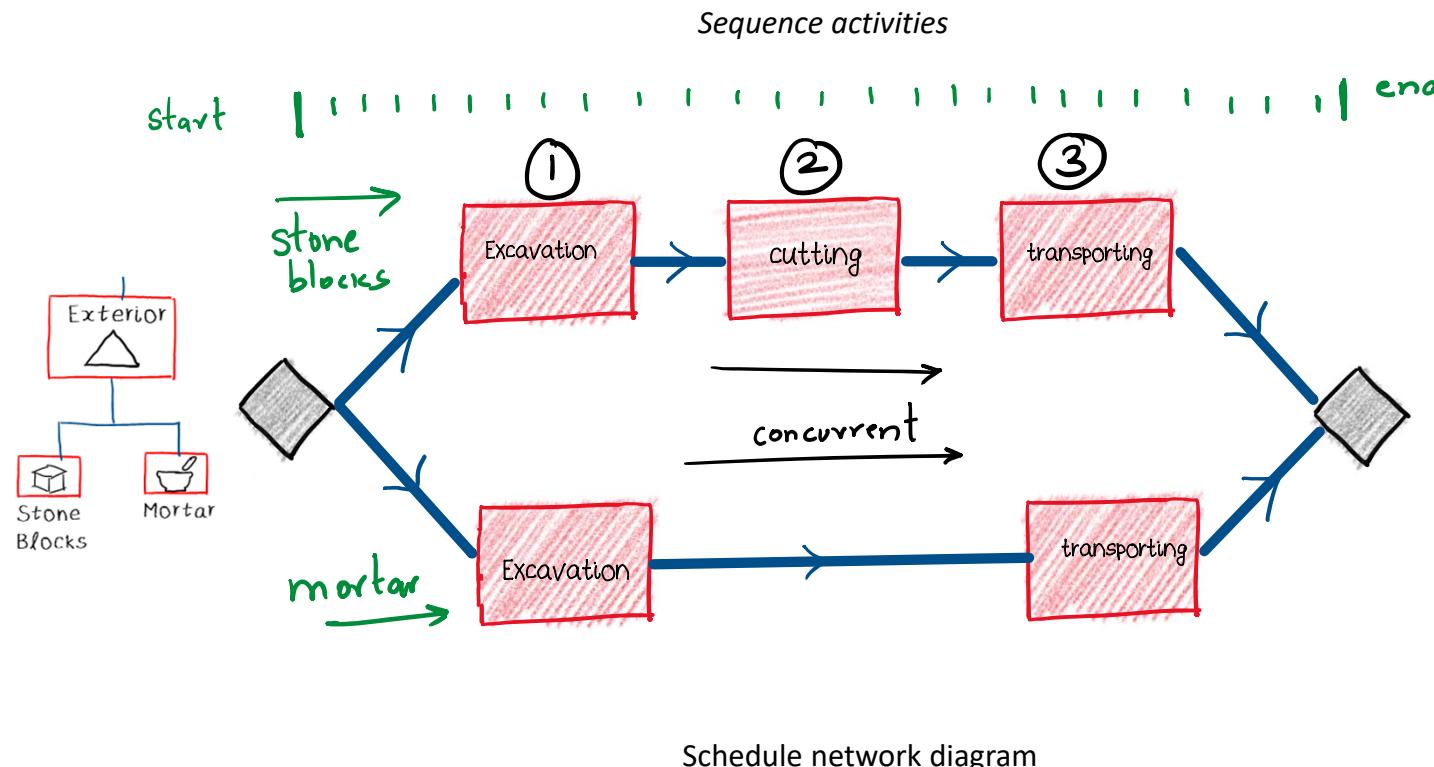
- Precedence Diagramming
- Dependency determination
- Leads and lags
- PM Software



Schedule network diagrams

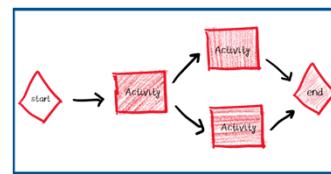
- Sequencing of activities is the next step after identifying all the necessary activities and work packages in project management.
- It involves arranging the activities on a timeline and identifying the dependencies that exist between them.
- The Procedure Diagramming Method (PDM) is a tool used to determine dependencies and create a schedule network diagram.

## WHEN are things to be done



- The output from the Sequence Activities process is a schedule network diagram that is generated using the PDM, dependency determination, leads, lags, and project management software.
- The sequencing of activities takes care of the relationships between these activities and helps to create a realistic schedule based on achievable facts.
- The sequencing of activities under each work package is done through the PDM, and parallel activities that are independent of each other are shown to be happening concurrently.

## WHEN are things to be done

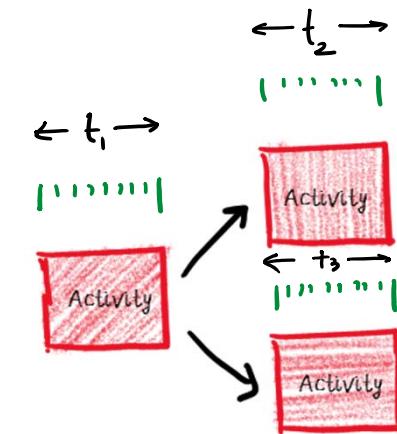


Schedule network diagrams



### TOOLS AND TECHNIQUES

- Estimation methods

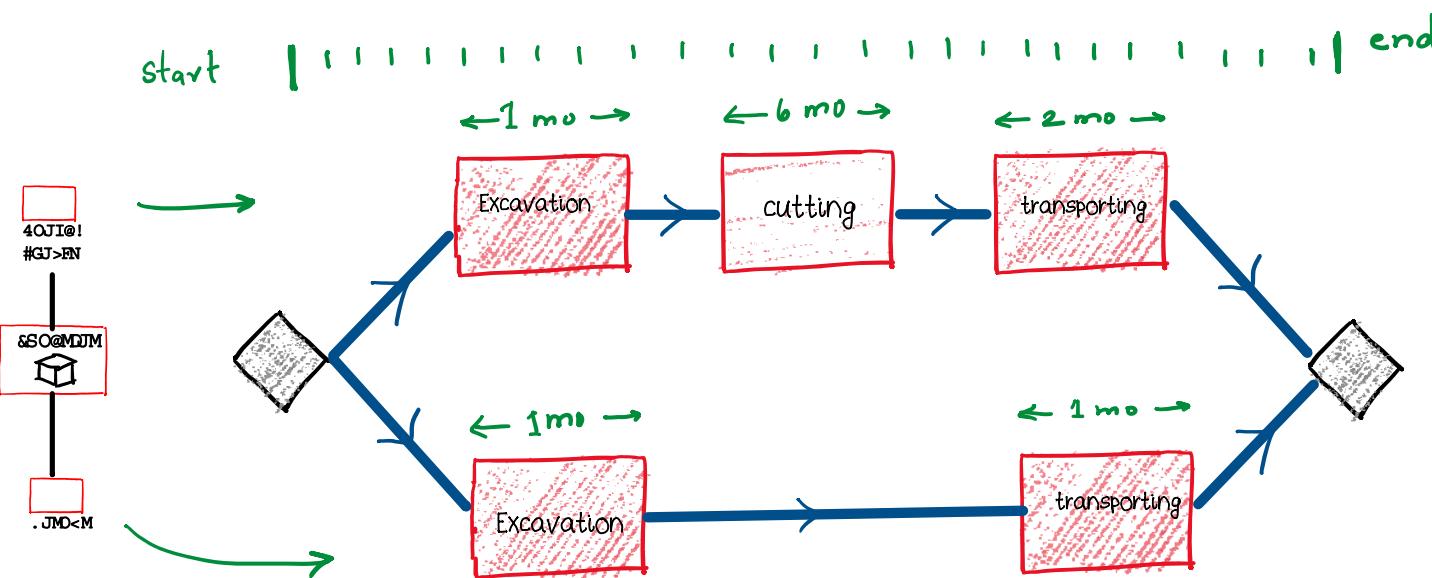


Activity duration estimates

- Estimating durations accurately is the next step after sequencing activities.
- The process estimates the time required for each activity to complete based on the previous prerequisite activities.
- It's important to know the precursor activities in order to estimate accurately.
- Various estimation methods can be used, including current organizational process assets or knowledge gathered through internal or external means.
- The output is the activity duration estimates, which will be used to create the final project schedule.

# WHEN are things to be done

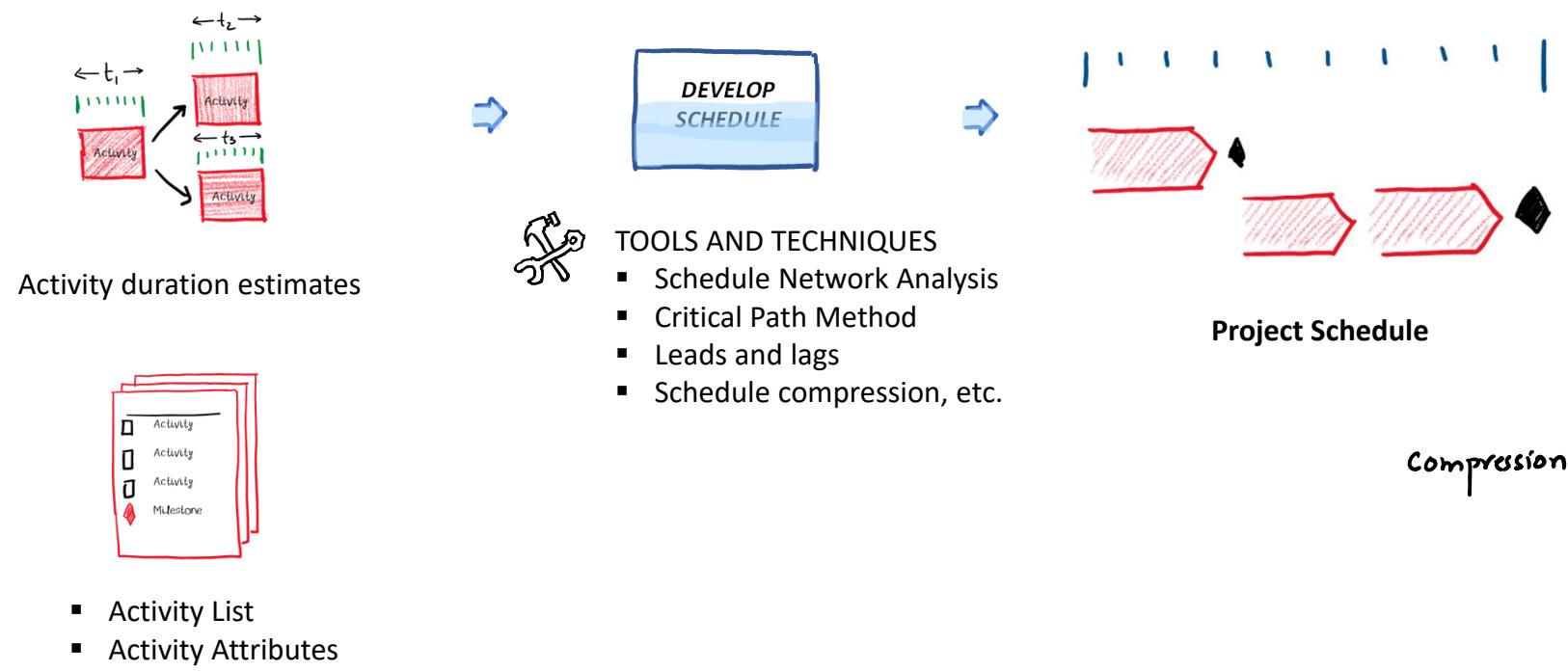
*Estimating activity durations*



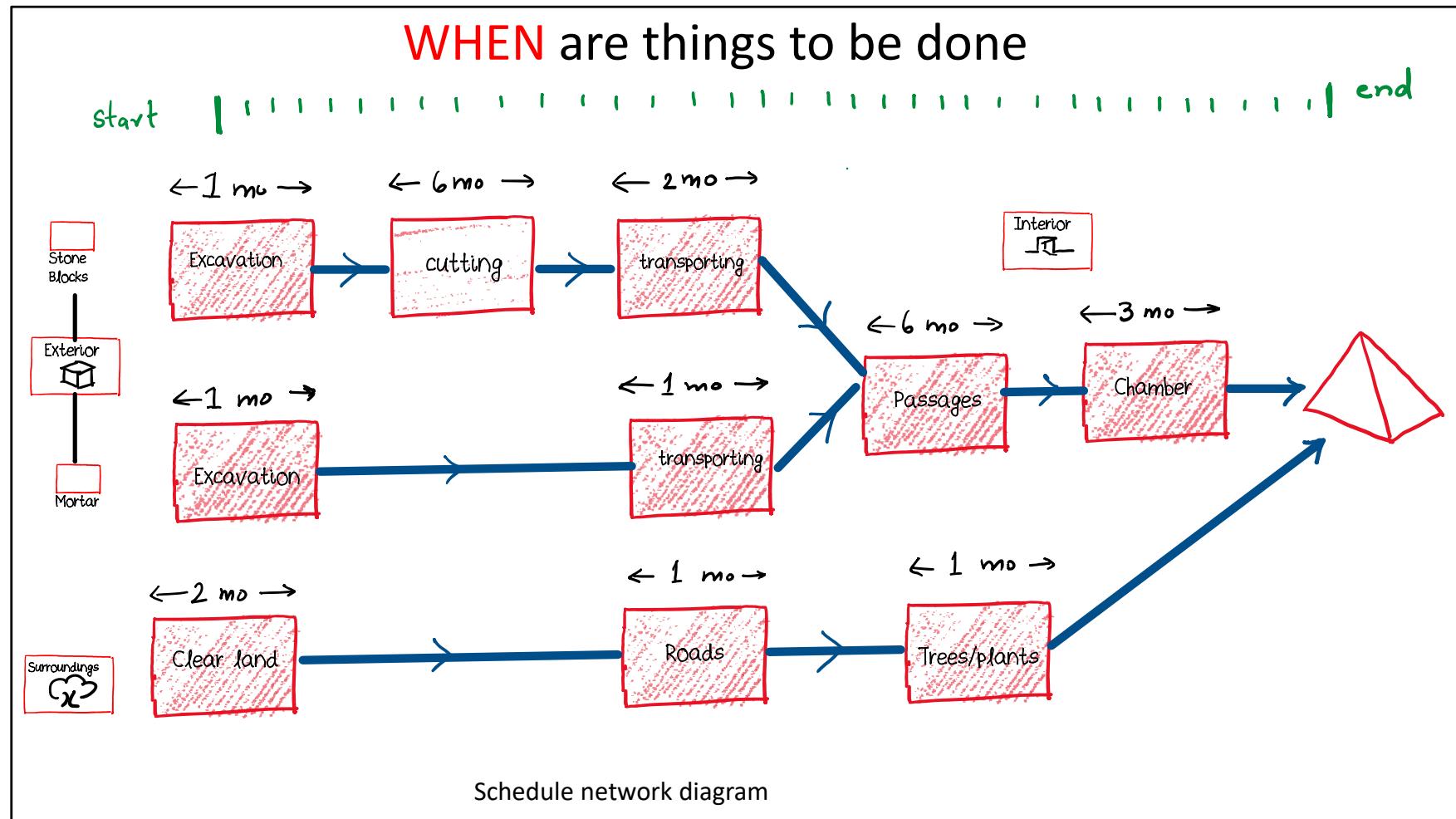
Schedule network diagram

- Activity duration estimates are associated with each activity in the schedule network diagram.
- For example, in the pyramid project, excavation of stones takes one month, cutting takes six months, and transporting takes two months. Excavation and transporting for mortar take one month each.

## WHEN are things to be done



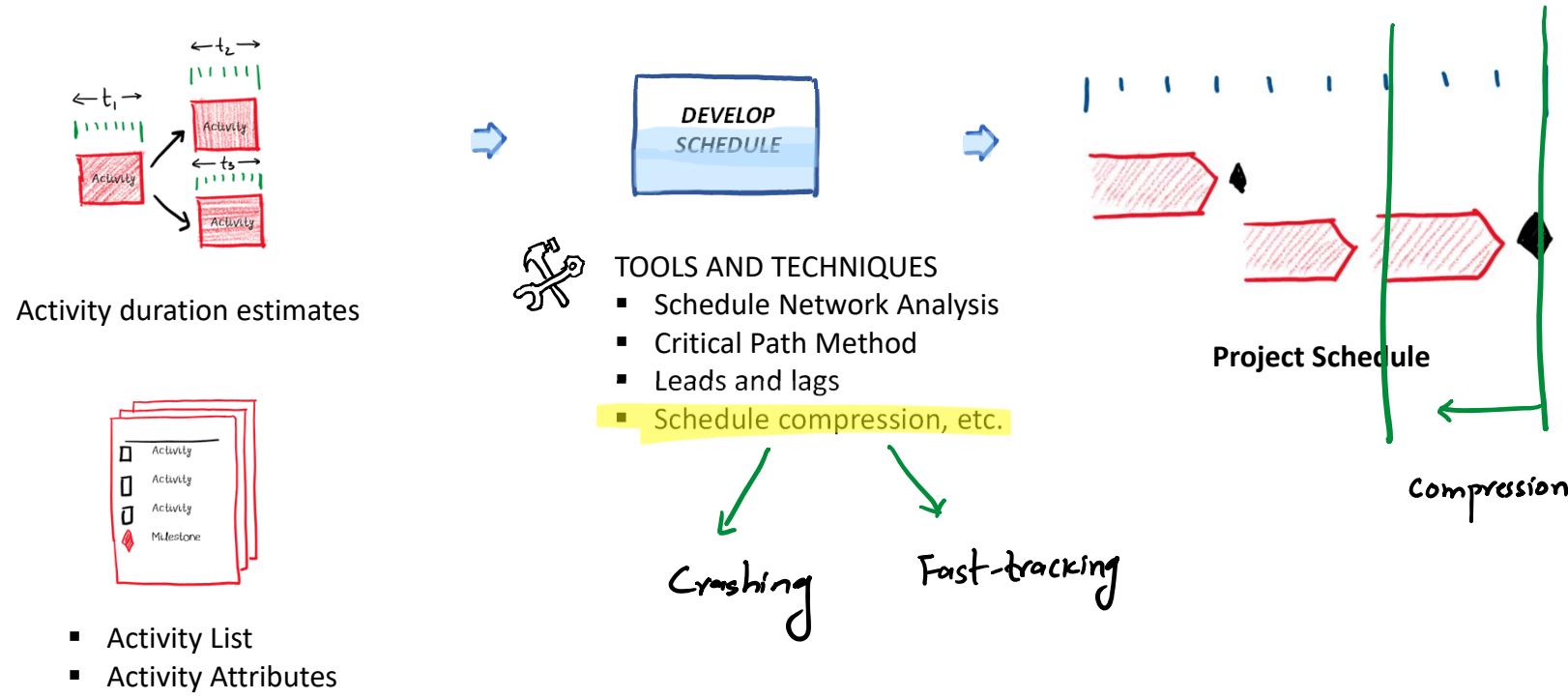
- Develop Schedule is the final step in project planning.
- It produces the project schedule using activity duration estimates and the list of activities and milestones.
- Various tools and techniques are used to create the project schedule.
- The Critical Path method is used to determine the shortest amount of time to finish the project.
- The Critical Path is the longest chain of tasks or activities in the schedule network diagrams, upon whose completion the project can be deemed completed.



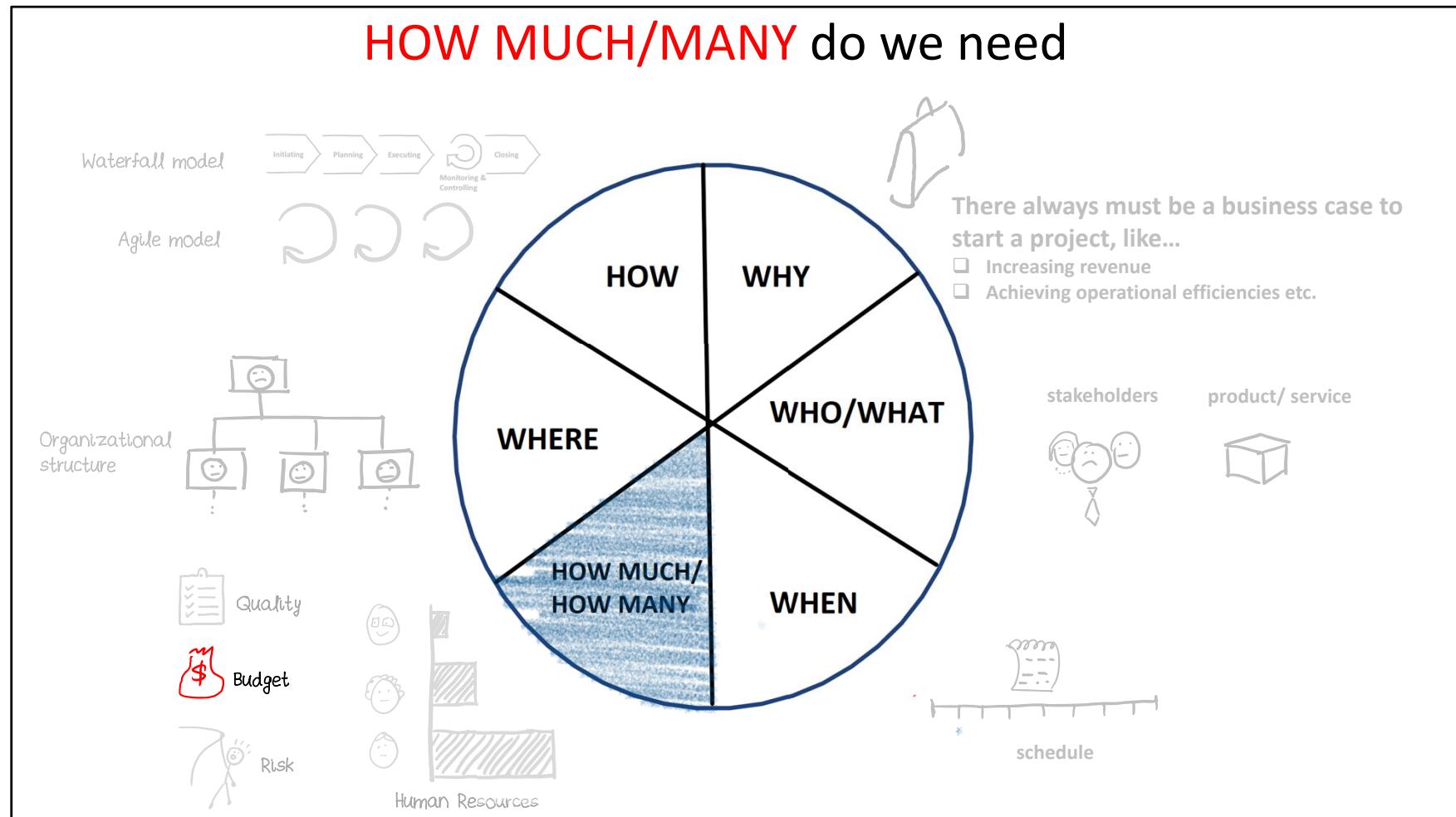
In the example project pyramid:

- Three main paths in the diagram are: preparing stone blocks, preparing mortar, and preparing surroundings
- Critical path method determines the longest chain of tasks, which is the path for preparing stone blocks, cutting them, transporting, and building inside passages and final chamber, taking 18 months
- Activities on the critical path cannot be delayed and have zero float
- Other activities have float and can be delayed without jeopardizing the project schedule
- Final project schedule includes key milestones, including the date for final product delivery.

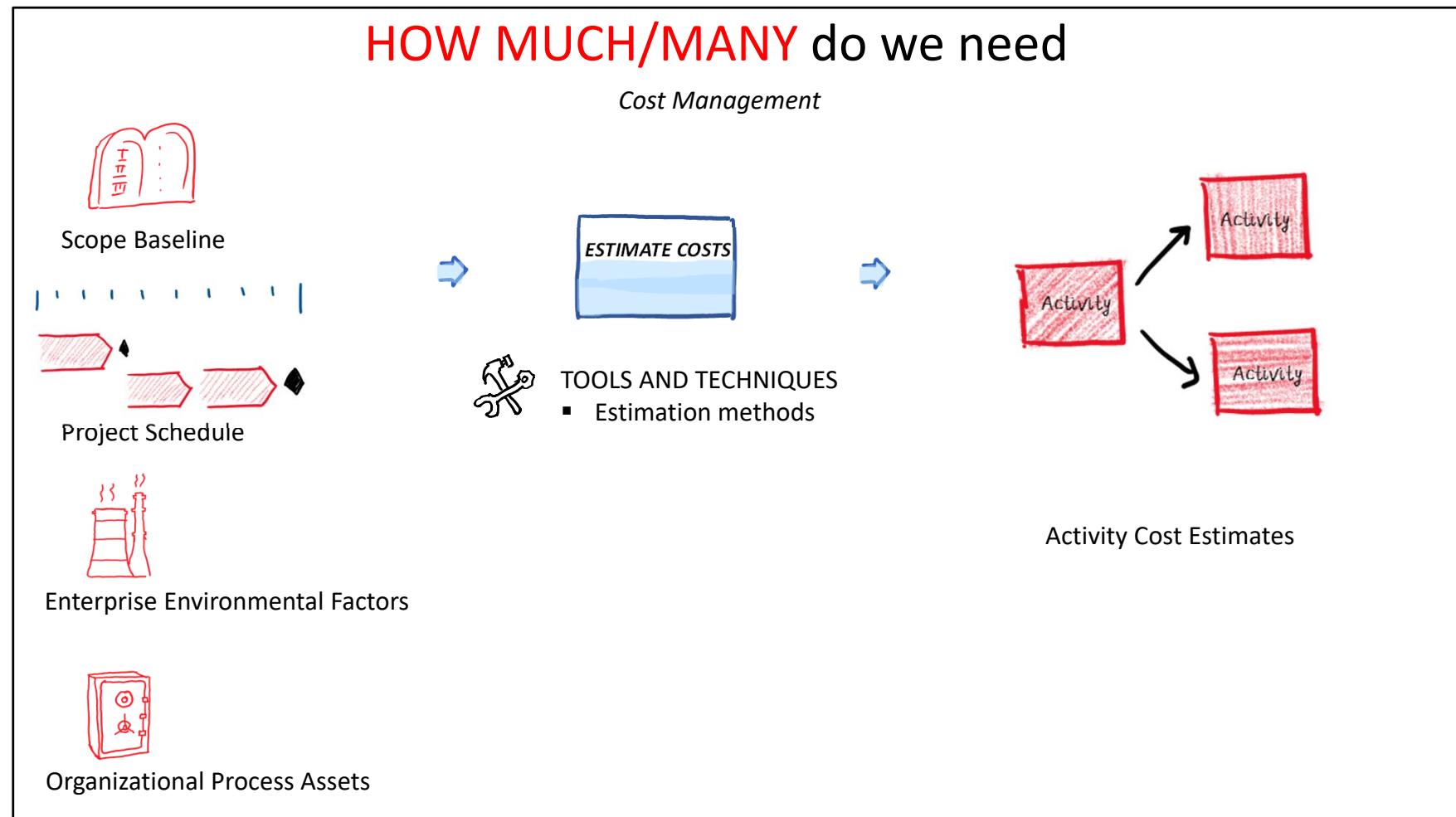
# WHEN are things to be done



- Schedule compression is a technique to shorten the project schedule without changing project scope.
- There are two methods of schedule compression: crashing and fast tracking.
- Crashing is done by adding more resources or increasing work hours to reduce the amount of time to finish the project. It increases the cost and introduces additional risks.
- Fast tracking is done by doing tasks in parallel instead of sequentially, reducing the amount of time needed to finish the tasks. It also increases the amount of risk on the project.
- Both methods are beneficial only for activities that lie on the critical path.
- Crashing and fast tracking can only be used for activities that can be done simultaneously.



- The project schedule is an important deliverable that shows when things will happen on the project.
- The cost, quality, resource, and risk management knowledge areas belong to the "how much" and "how many" portion of the project.
- Cost management involves estimating the amount of money needed to perform each activity based on past projects or current estimates.

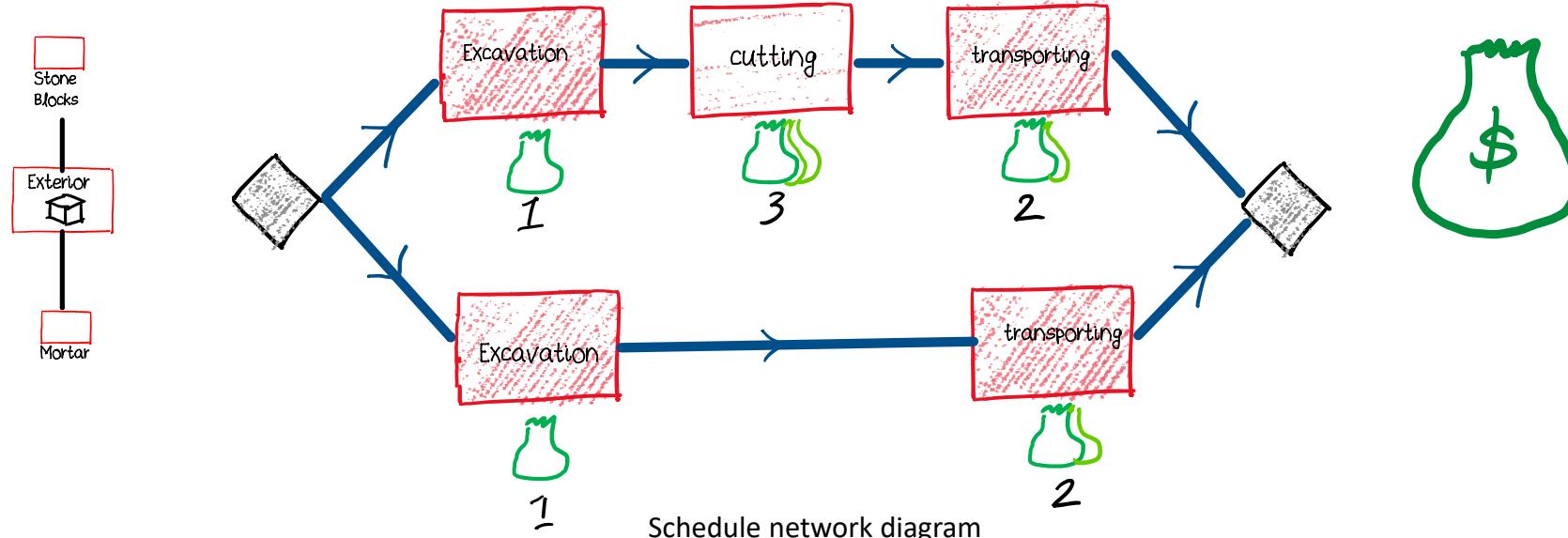


- The estimate costs process produces activity cost estimates that are associated with specific points in time on the project schedule.
- Estimating costs is a process within the cost management knowledge area of project management that involves estimating the amount of money required to complete the project activities.
- The process of estimating costs typically involves breaking down the project scope into individual activities and estimating the cost of each activity based on the resources required, such as labor, materials, and equipment.

# WHEN are things to be done

*Estimating activity durations*

start | ..... | ..... | ..... | ..... | ..... | ..... | ..... | end

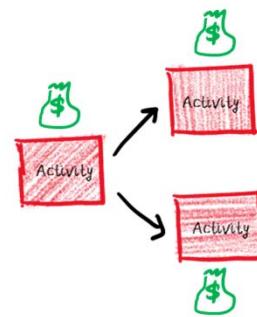


In the Project Pyramid Example:

- Cost estimates can be associated with work packages on the project, such as building the stone blocks or working on the mortar.

# HOW MUCH/MANY do we need

## Cost Management

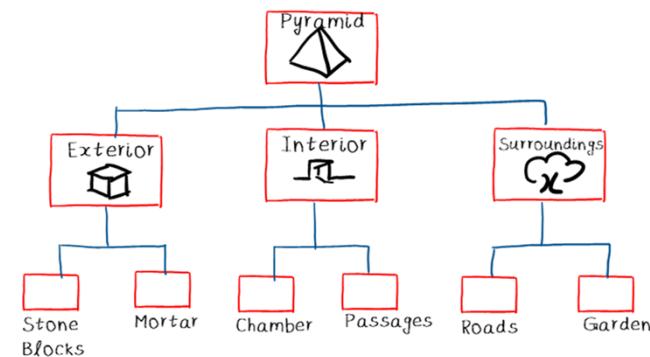


Project Budget

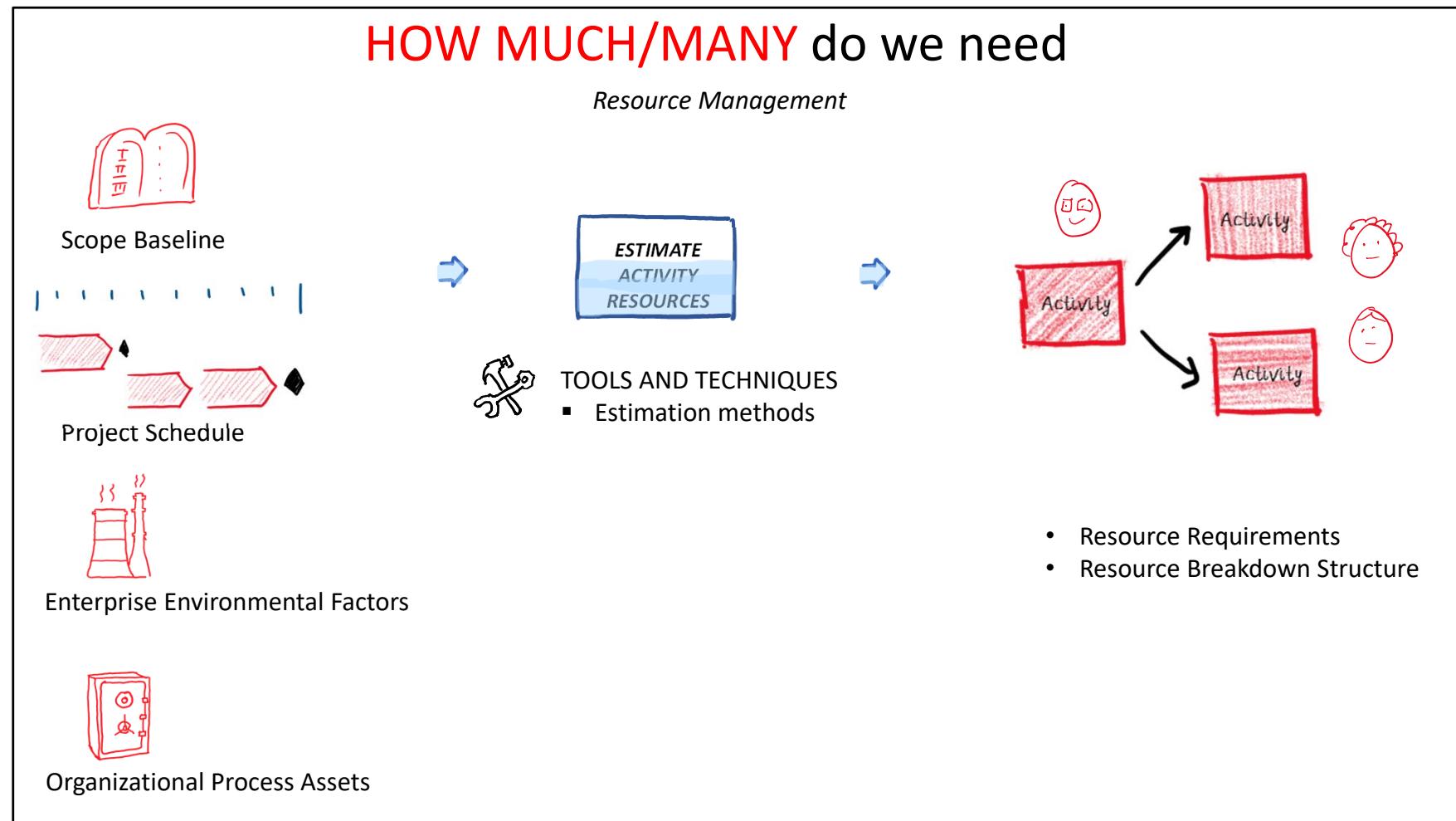


### TOOLS AND TECHNIQUES

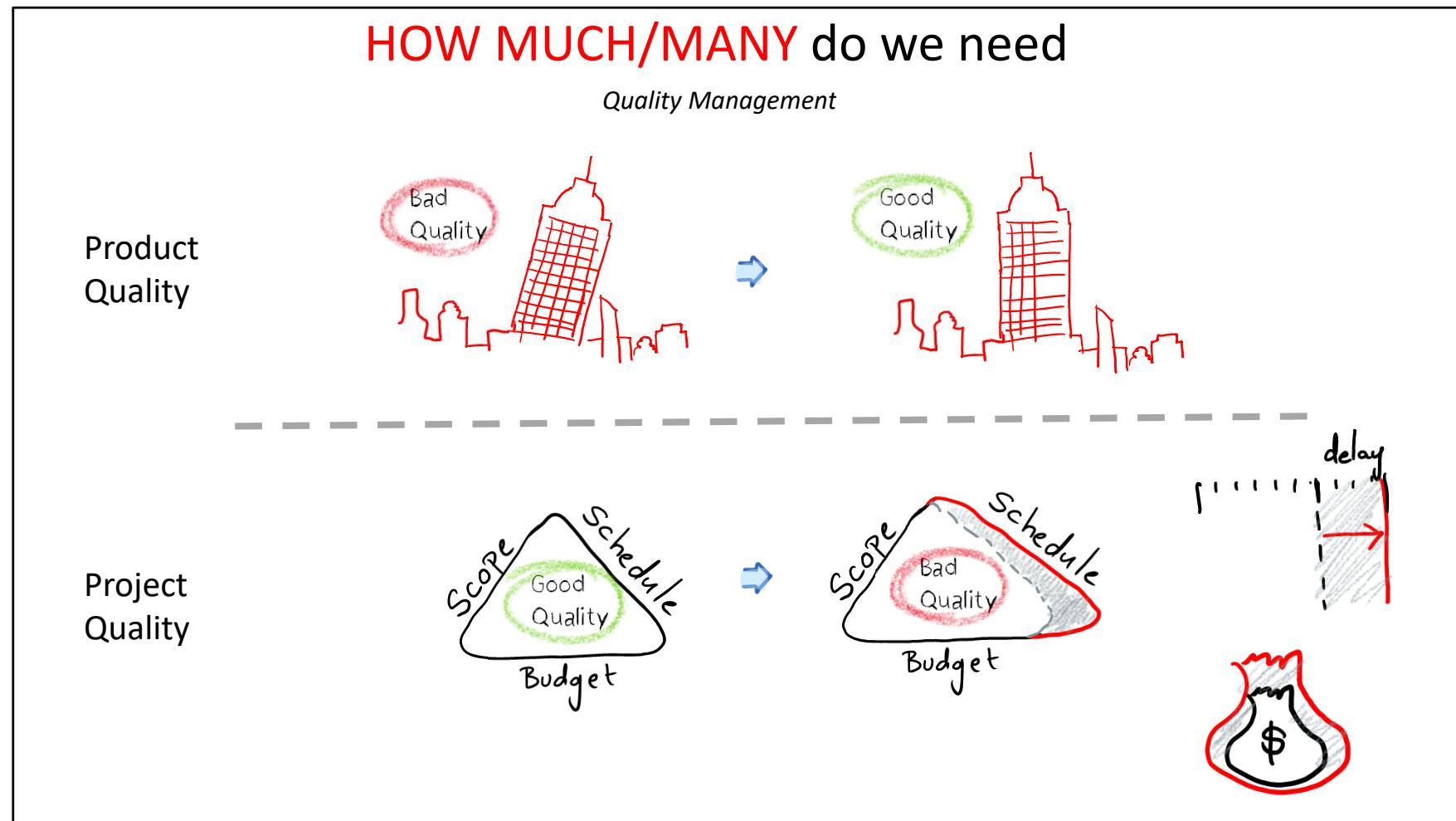
- Cost Aggregation
- Financing



- The final process in the cost management knowledge area is Determine Budget process
- This process aggregates the cost from each activity estimated in the previous process
- Aggregation can be done to higher levels on the WBS structure, called control accounts, for easier monitoring and control of project budget on smaller components
- Control accounts can be broken down by various departmental activities or other scope of the project
- The project budget is an important deliverable from the cost management knowledge area that determines how much money will be spent on the project

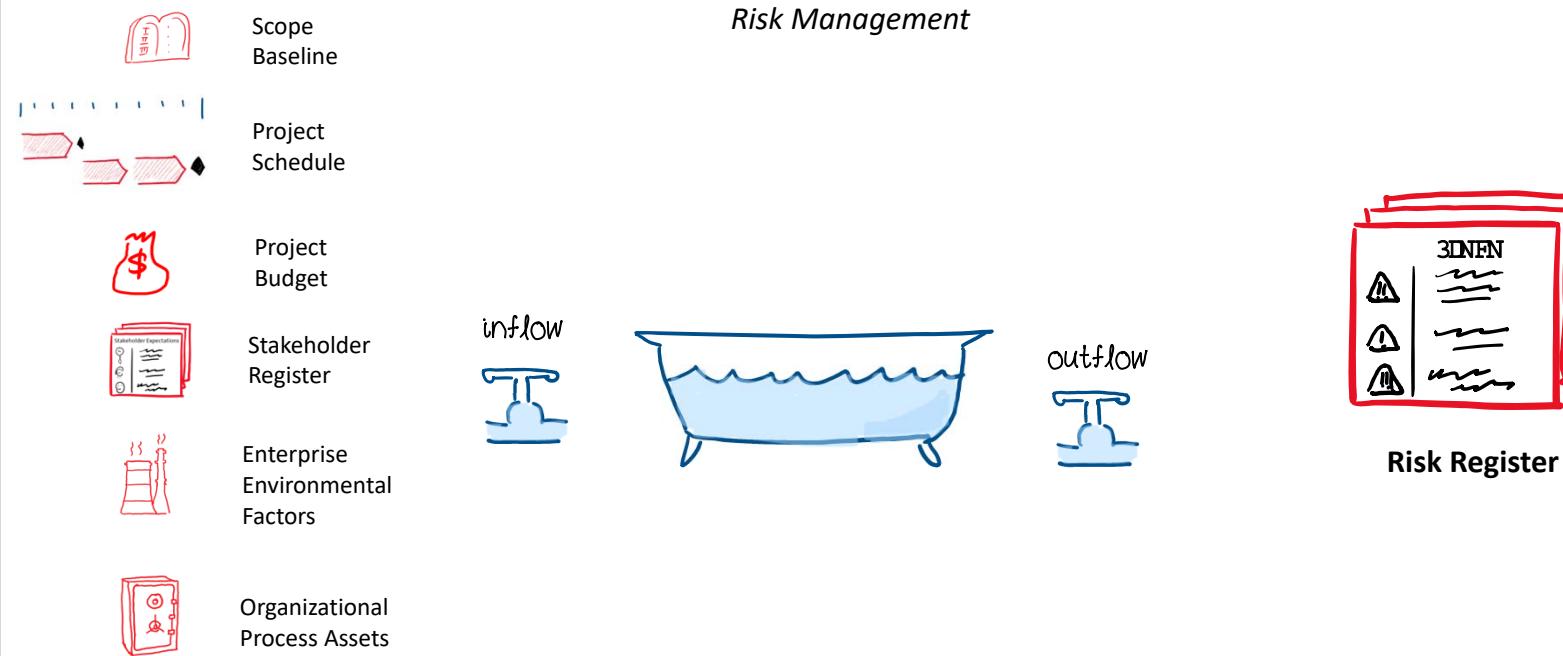


- The resource management knowledge area focuses on estimating the number of resources needed for each project activity.
- The first process in this knowledge area is "estimate accurately resources", which uses inputs from previous processes to determine the number of resources needed for each activity.
- The output of this process includes the resource requirements document and the resource breakdown structure.
- Sometimes, determining the resource assignments on each activity is necessary to estimate the costs that will be incurred on each activity.
- The resource assignments on each activity are illustrated in the resource breakdown structure.
- Through this knowledge area, the project team quantifies the amount of money needed to execute the project and the number of resources with relevant skills needed to work on the project.



- Delivering a project within scope, budget, and time is necessary but not sufficient for success.
- Quality is the measure of satisfying customer or sponsor requirements for the product or service.
- There is product quality (satisfying customer needs) and project quality (efficient execution).
- Quality metrics can include completed tasks, schedule delays, cost overruns, defects, and stakeholder expectations.
- Plan quality process involves input from all three baselines (scope, schedule, cost) and the stakeholder register.
- Quality metrics are important for project communication and overall project status.
- Testing is used to determine product quality, while benchmarking and testing are used to determine project quality.
- Quality improvements can be derived from comparing previous similar activities to the current project activities.

# HOW MUCH/MANY do we need



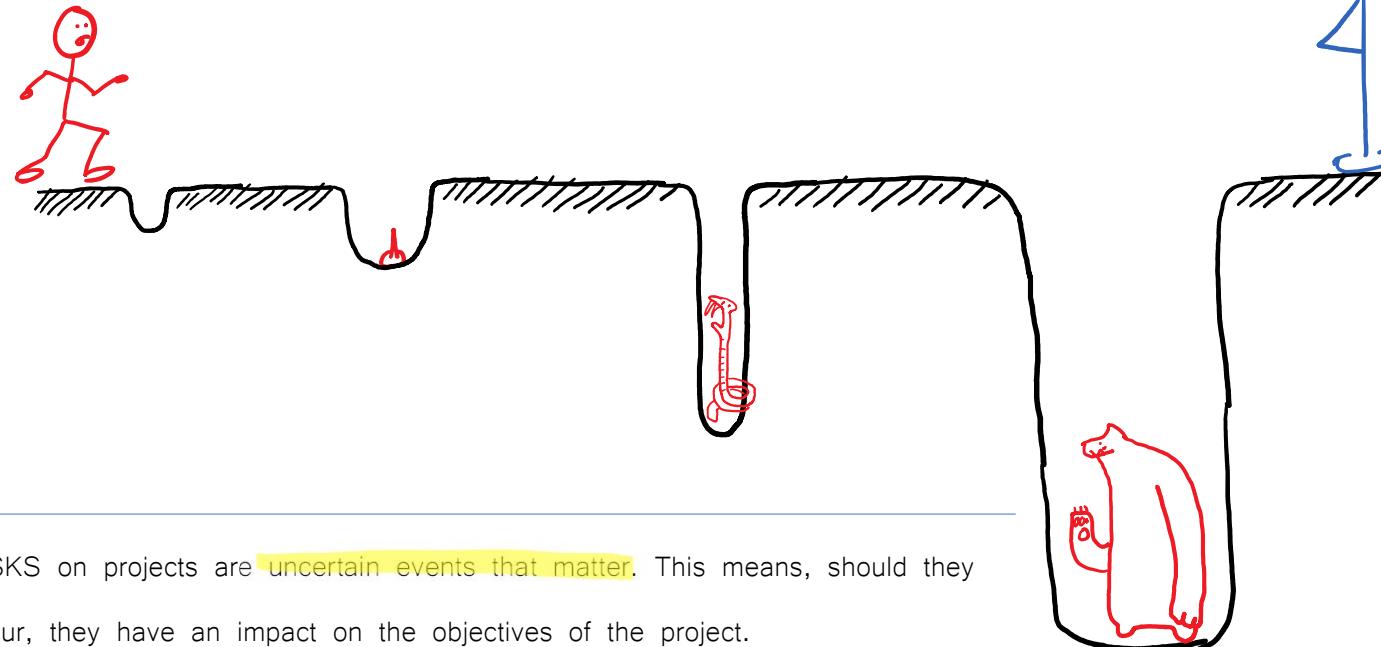
RISKS on projects are uncertain events that matter. This means, should they occur, they have an impact on the objectives of the project.

- Risk management is a critical aspect of project management that involves identifying, analyzing, and mitigating potential risks that could impact the success of a project.
- Projects operate in uncertainties and risks are uncertain events that matter to the project and could affect its objectives.
- Not all uncertainties are risks to the project, only those that matter should be considered.
- Risks present varying degrees of danger and should be navigated to reach successful completion of the project.
- Risk management in project management aims to minimize the likelihood and impact of negative events or risks, while maximizing the chances of positive outcomes.

# HOW MUCH/MANY do we need

*Risk Management*

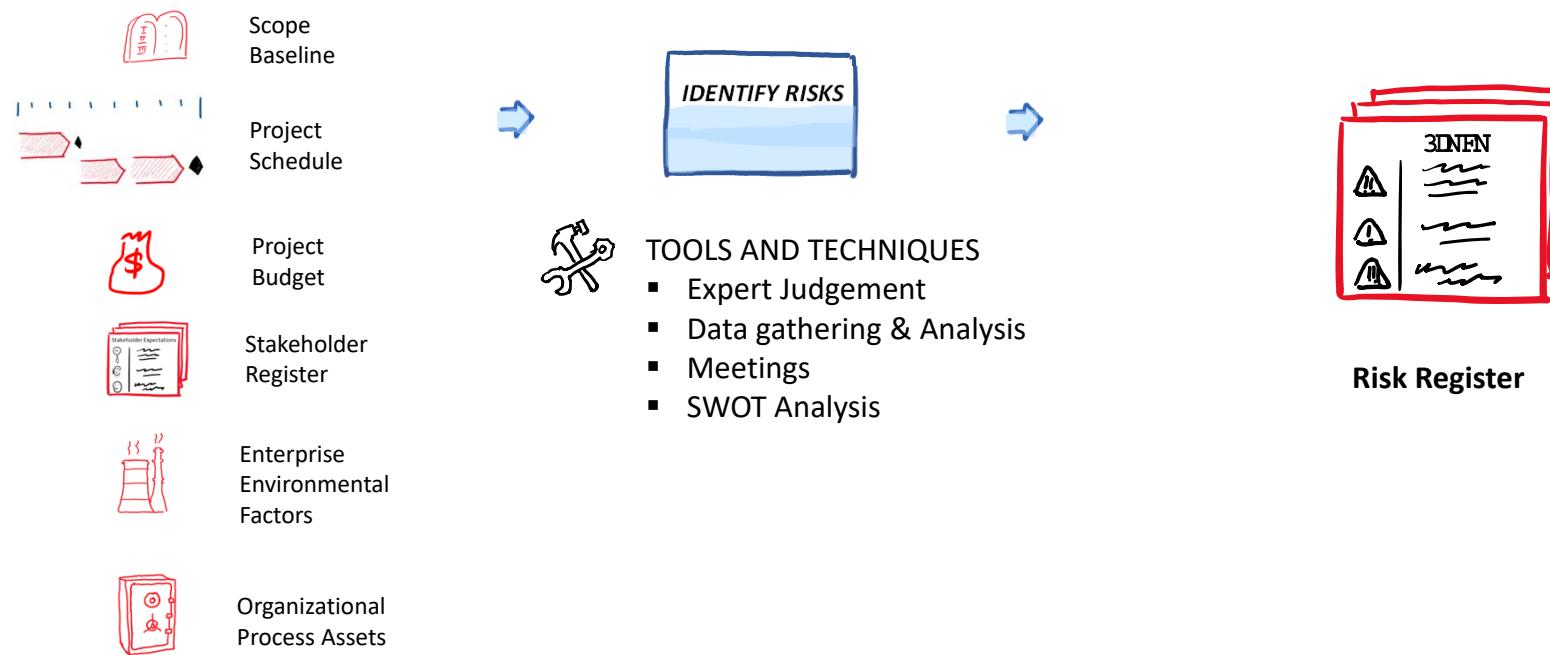
You, the PM



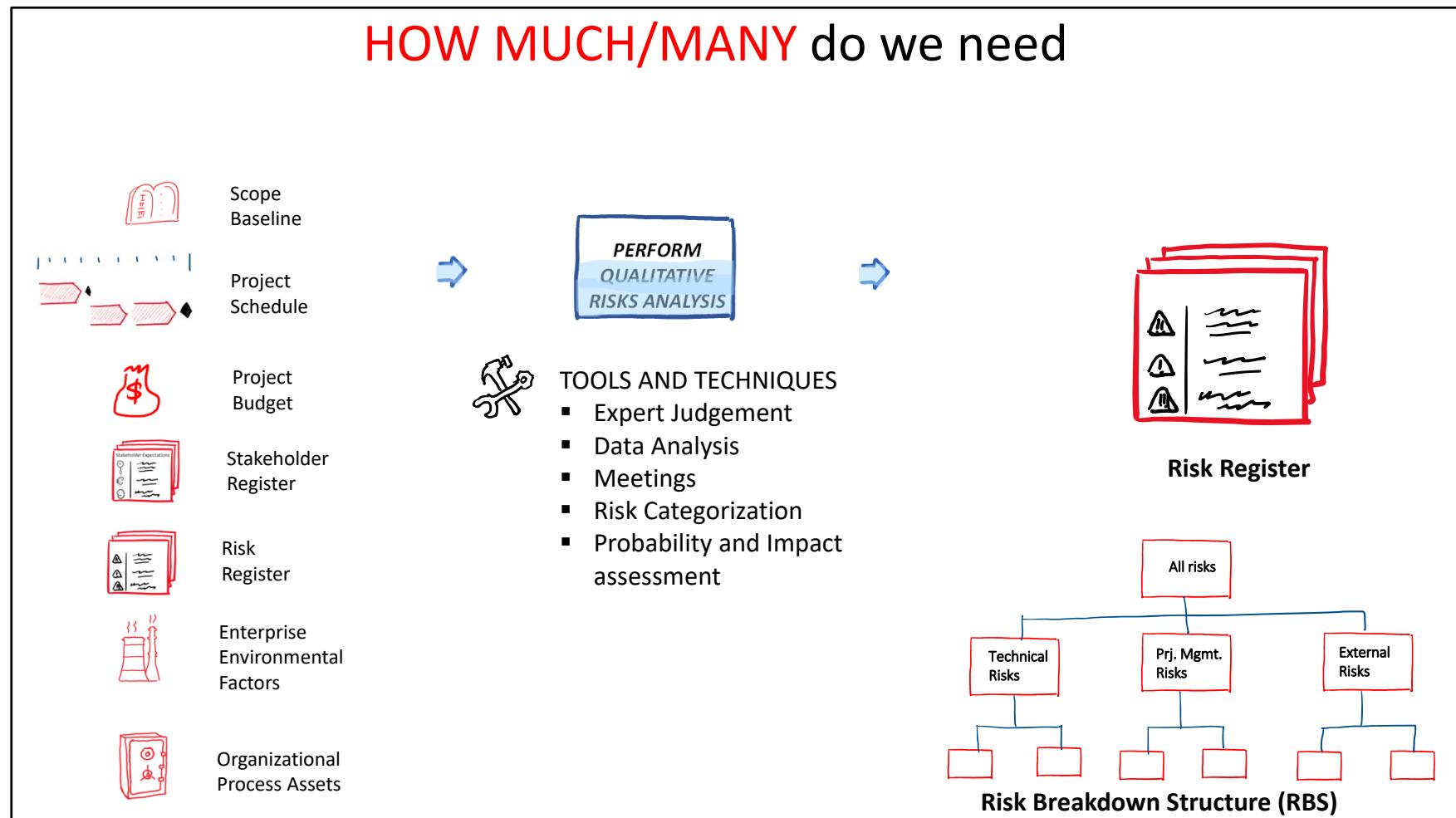
RISKS on projects are **uncertain events that matter**. This means, should they occur, they have an impact on the objectives of the project.

- This illustration discusses the importance of risk management in project management.
- Risks are uncertain events that matter to the project and can affect its objectives.
- The illustration is about navigating a landscape with holes of varying degrees of danger to explain the concept of risks.
- The size of the hole and the potential harm it poses are used as dimensions to quantify and measure risks for analysis.
- The emphasis here is that not all uncertainties are risks, only those that matter to the project should be considered.

# HOW MUCH/MANY do we need



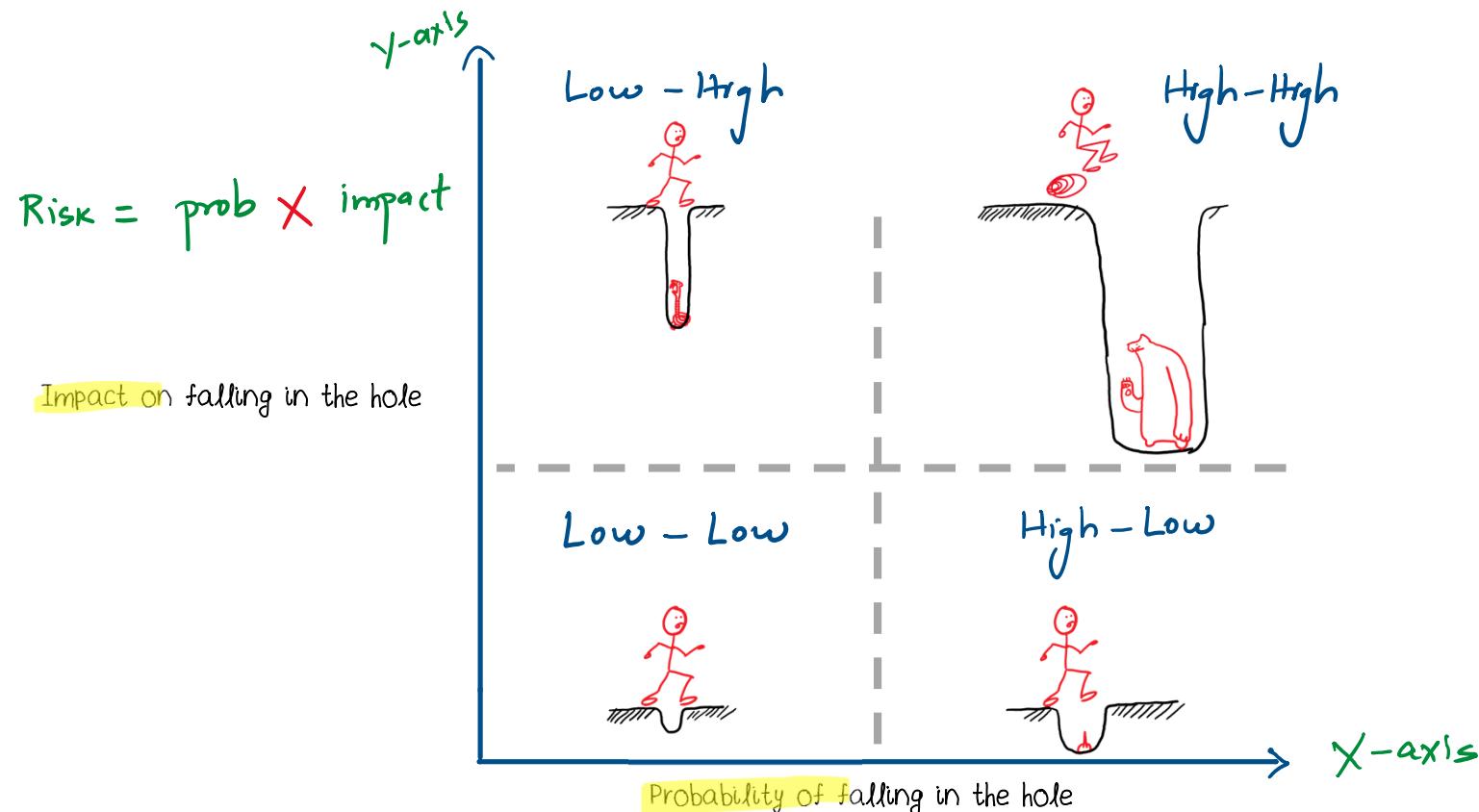
- Risk management planning involves three passes to create the risk register.
- The risk register is the output of each process and gets updated every time.
- The first process is to identify risks by looking at information about the project, including scope, schedule, budget, quality, human resources, and external factors.
- Risks are documented in the risk register, including the risk event, its source, its impact, and the risk owner.
- Tools and techniques used to identify risks include expert judgment, data gathering and analysis, meetings, and SWOT analysis.
- The risk register is updated with additional information at each step of the process.



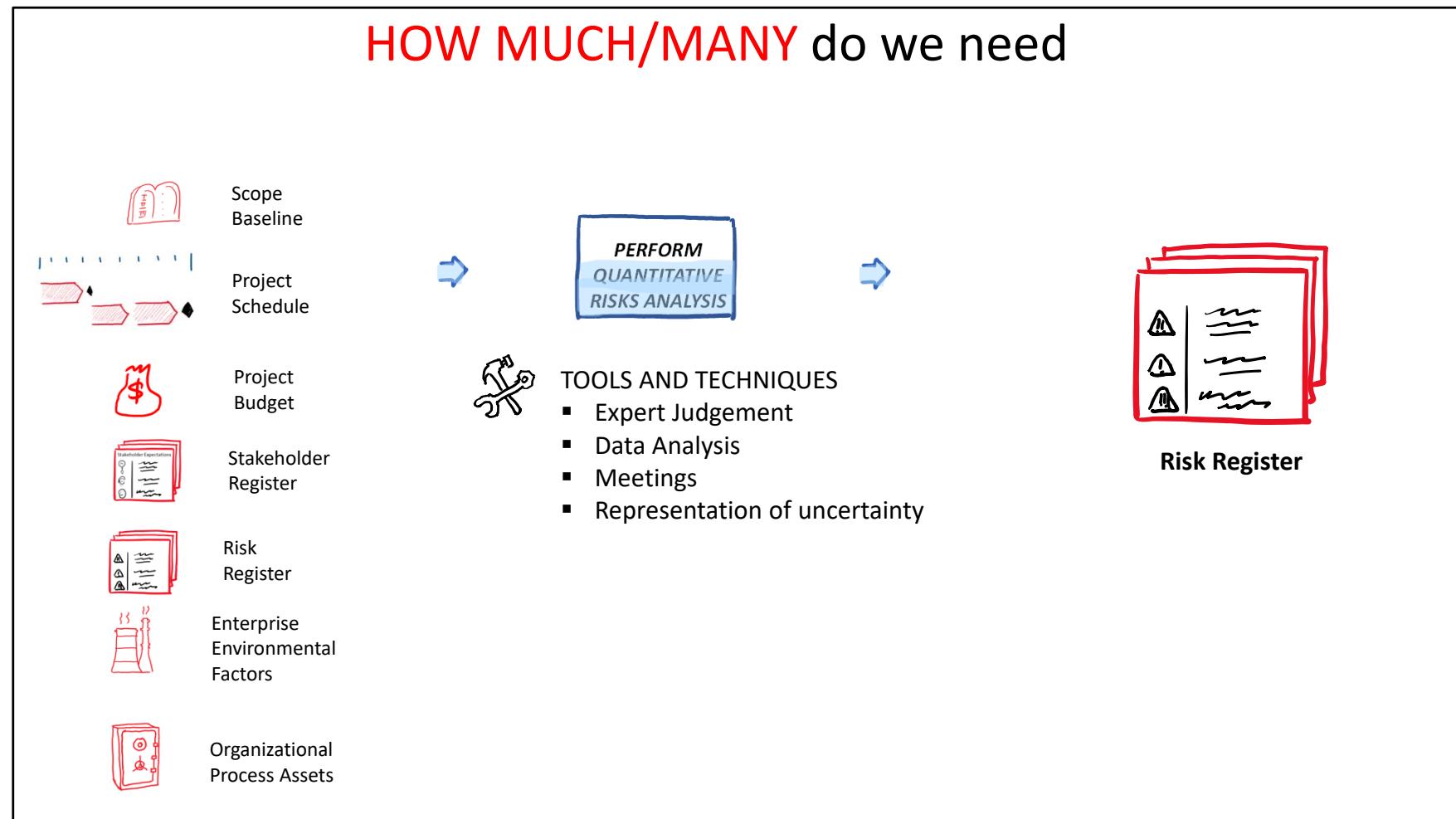
- Perform quantitative risk analysis is the process of determining which identified risks need immediate attention.
- Risks are categorized into big buckets or types and broken down into categories using a risk breakdown structure (RBS).
- Additional data is added to the risk register by quantifying the risks through adding their probabilities and impact.

## HOW MUCH/MANY do we need

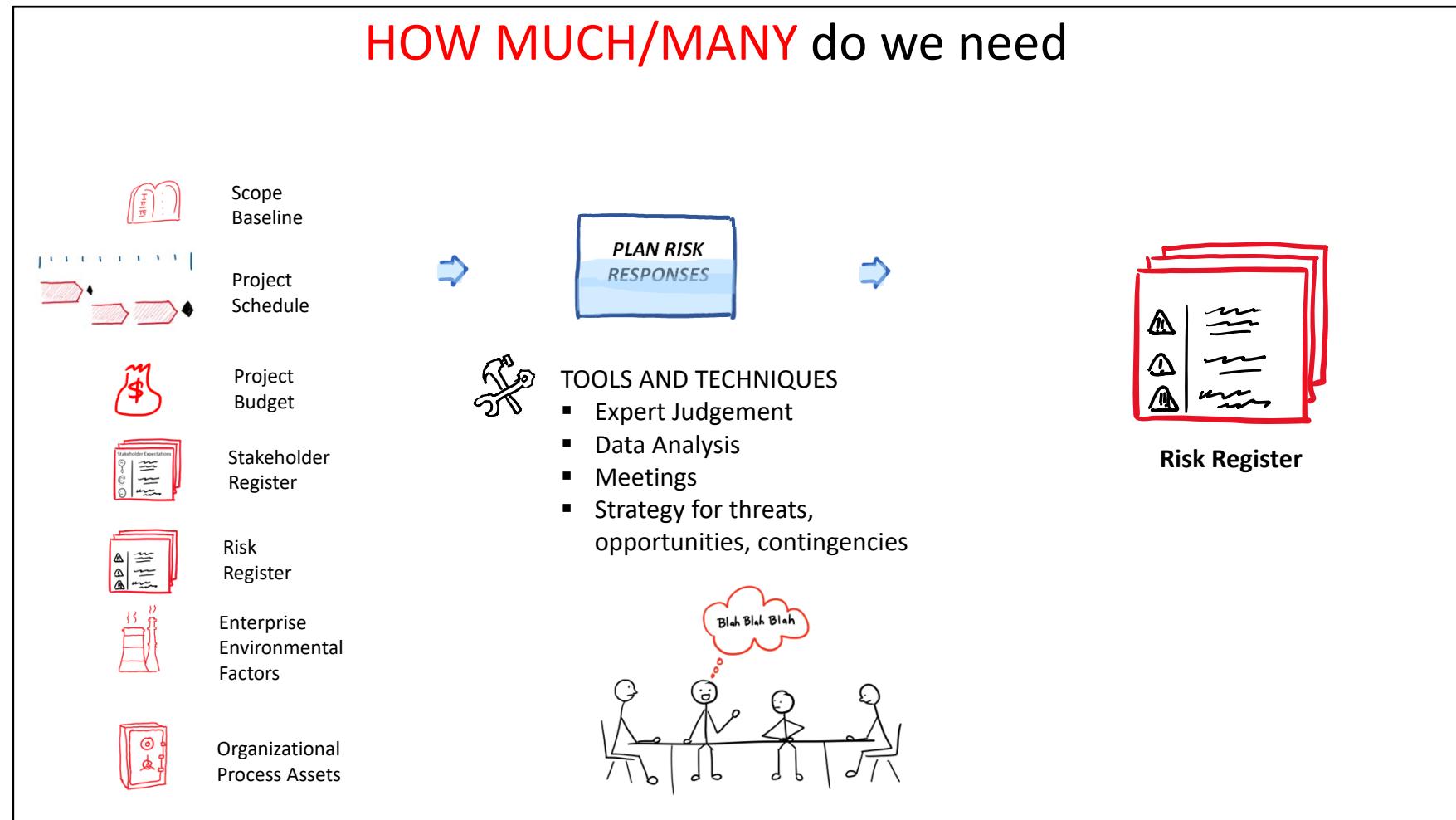
Probability and Impact Matrix



- The probability and impact matrix is used to map risks on a scatter plot, with the probability on the x-axis and the impact on the y-axis.
- The risk of a low probability low impact scenario is lower than that of a high probability low impact scenario.
- A low probability high impact risk scenario needs more attention than a high probability low impact scenario.
- The highest risk scenario is a high probability high impact scenario.



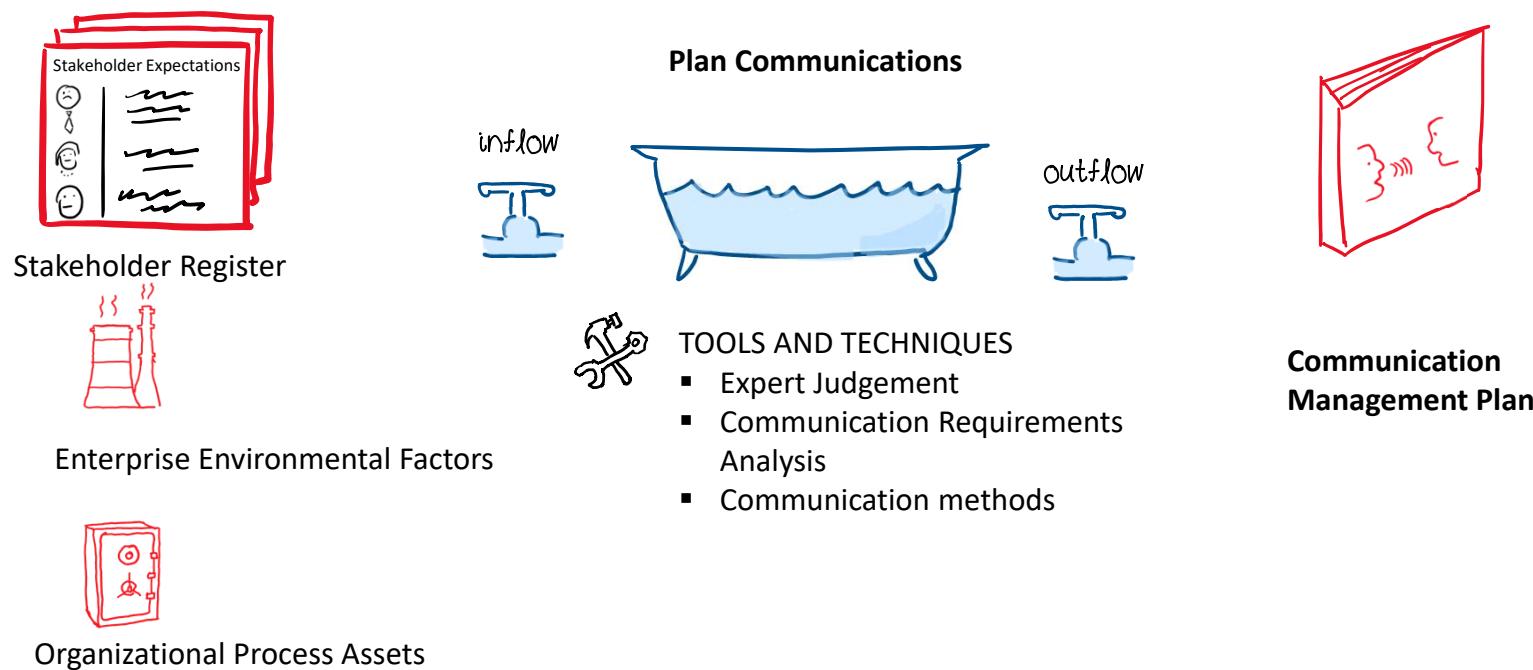
- The next process is to perform quantitative risk analysis.
- This process uses data and mathematical calculations to quantify risks.
- Various modeling and simulation techniques are used, such as the Monaco model, tornado diagrams, and decision tree analysis.
- Quantitative risk analysis associates numbers and calculations to the probability and impact of risks.
- Probability and impact of risks are calculated based on data obtained through modeling and simulation techniques.



- The final process in the planning phase of risk management is to obtain risk responses using the Plan Risk Response process.
- This involves strategizing actions for identified risks, using the data from the risk registers and the results from qualitative and quantitative risk analysis.
- The output is an updated risk register with the addition of risk responses.
- Risk responses can be handled in four ways: avoid, transfer, mitigate, or accept the risks.
- Avoiding risks means circumventing or eliminating the risk, while transferring the risk involves passing it on to a third party.
- Mitigating risks involves reducing the probability or impact of the risk, while accepting risks involves doing nothing or preparing a contingency plan for the consequences.

# WHERE do we reach out

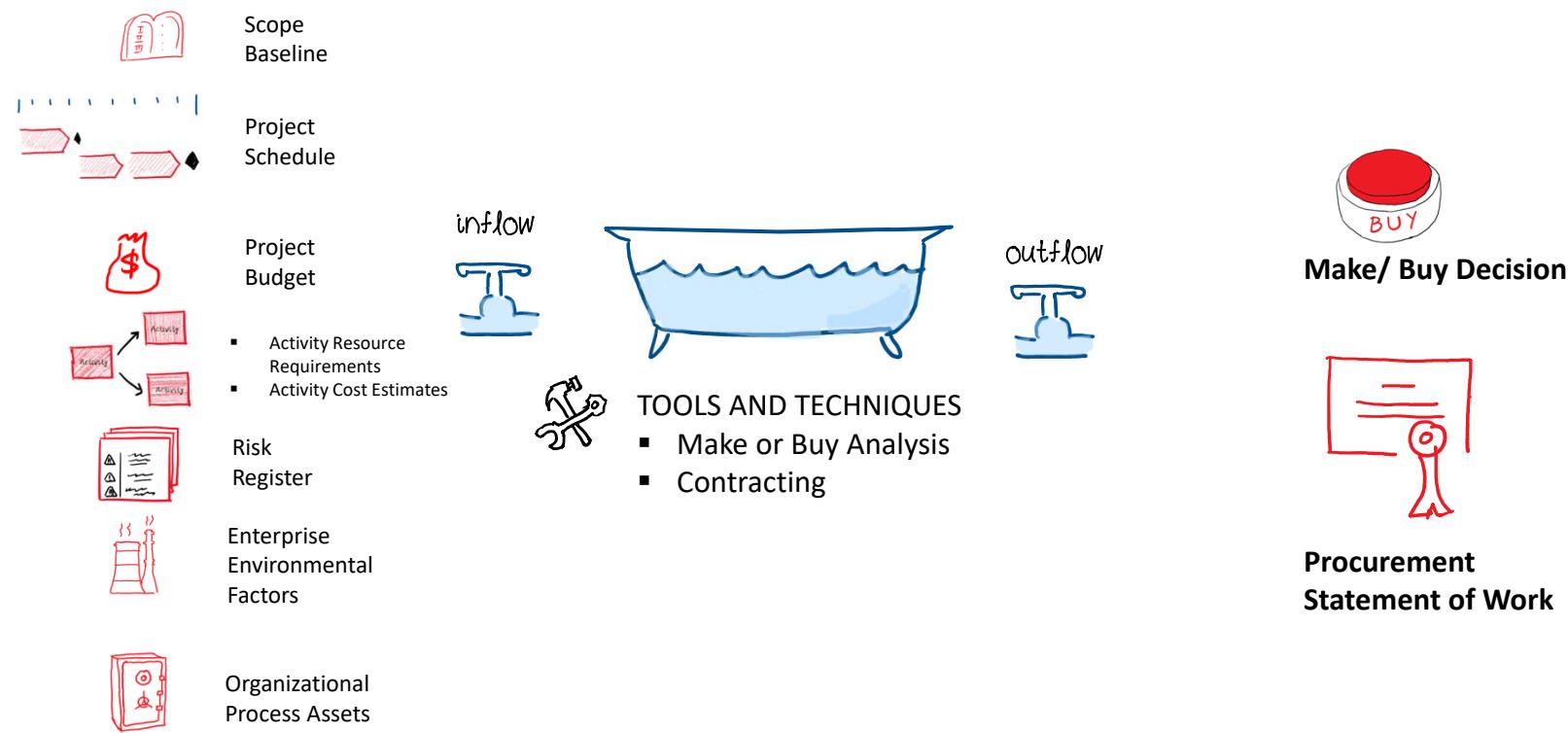
*Communication Management*



- During an ongoing project, project communication is the most important output for customers or sponsors.
- Communication from the project manager is key to keeping stakeholders happy, motivated, and supportive of the project.
- Knowing where to communicate within and outside the organization is important, and different stakeholders require different levels of information.
- Communication requirements are documented in the communication plan, which outlines what stakeholders need to know, when they need to know it, and in what format.
- The communication plan is an important output that includes information on where and how to communicate with relevant stakeholders, and it is informed by the stakeholder register.

# WHERE do we reach out

## Procurement Management



- Procurement management in project management is the process of identifying, acquiring, and managing external goods and services needed to complete a project.
- It involves selecting the right vendors or contractors, negotiating contracts, and ensuring that the work is completed on time, within budget, and meets the project's quality requirements
- The process involves identifying what is needed, how much, and when it will be available.
- Inputs to Plan Procurement Process includes documents related to the project's scope, activities, budget, and timelines.
- Outputs include make or buy decisions, a procurement statement of work, and contract types.
- Make or buy analysis is used to determine whether a contractor or agency needs to be engaged.
- The procurement statement of work includes conditions of work, scope, timelines, and cost.

# HOW to do the project

*Integration Management*



## Project Charter



- ❑ Scope Mgmt. Plan
  - ❑ Cost Mgmt. Plan
  - ❑ Schedule Mgmt. Plan
  - ❑ Quality Mgmt. Plan
  - ❑ Resource Mgmt. Plan
  - ❑ Risk Mgmt. Plan
  - ❑ Communication Mgmt. Plan
  - ❑ Procurement Mgmt. Plan

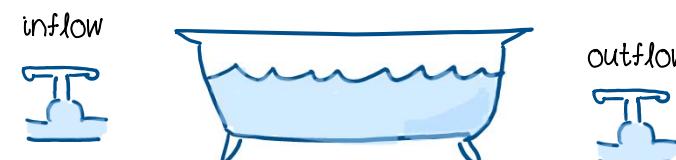


## Enterprise Environmental Factors



## Organizational Process Asset

## Develop Project Management Plan



## TOOLS AND TECHNIQUES

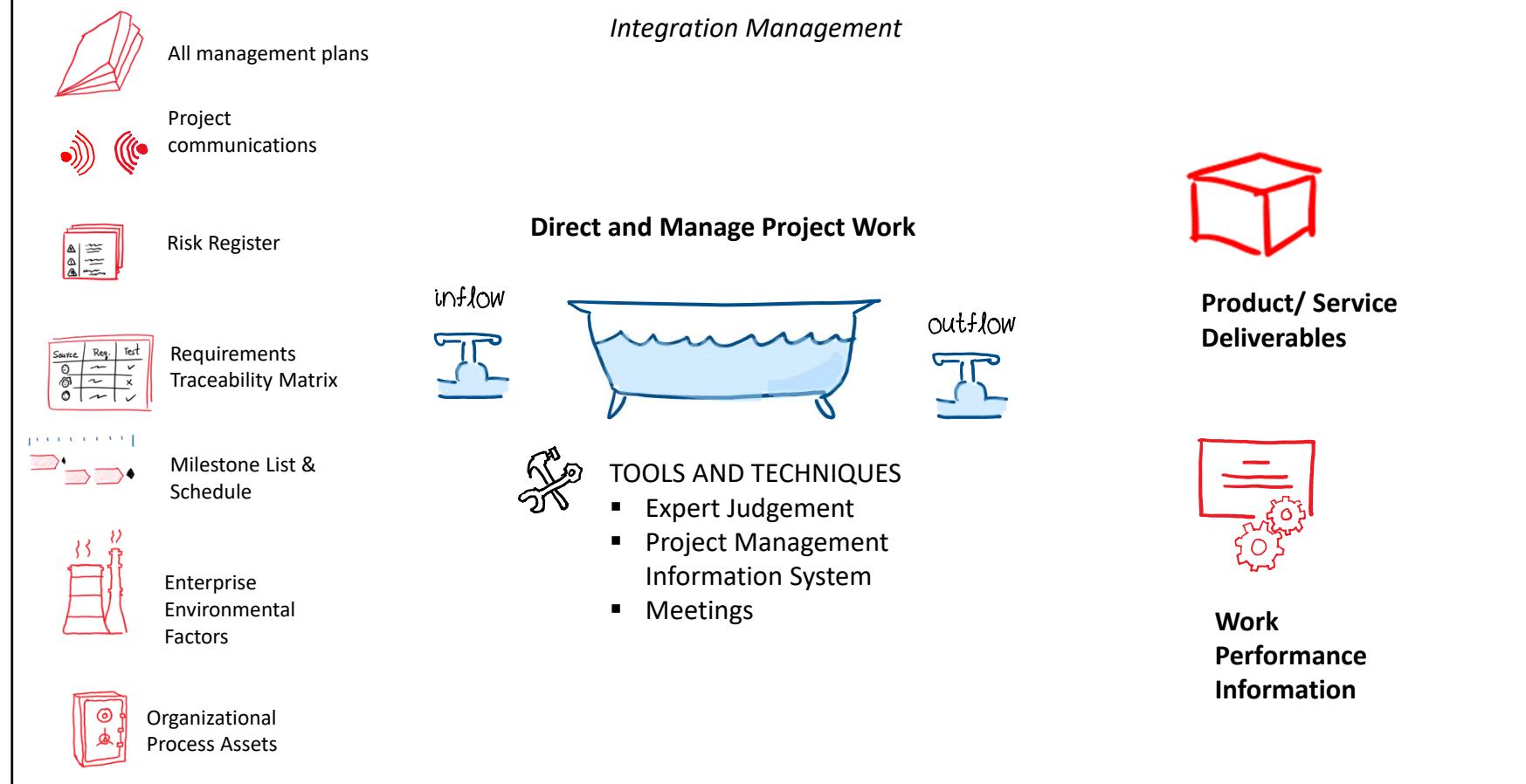
- #### ■ Expert Judgement



# Project Management Plan

- "Develop project management plan" is the final process in the planning phase.
  - The output of this process is the project management plan.
  - The project management plan outlines how the project will be done in subsequent phases and provides a roadmap to completion within the constraints of scope, schedule, and budget.
  - The inputs to this process are the project charter and individual management plans for scope, cost, schedule, quality, resources, risk, communications, and procurement.
  - These inputs are reviewed and consolidated to create the project management plan.

# HOW to do the project



- The executing phase of the project is where the real action takes place in terms of building the product or service.
- The approved project management plan is used as a roadmap for the project, and resource allocation is in place.
- The process used to guide the executing phase is called direct and manage project work in the integration management knowledge area.
- Deliverables are created during the executing phase, and work performance information is collected to track how the project is performing.
- Project management information systems and other tools are used to manage the project and track data.
- Inputs to the executing phase include management plans, risk register, scope baseline, requirements traceability matrix, milestone lists, schedule, project communications, and stakeholder engagement.
- During the executing phase, quality, resources, teams, and communications are managed, and procurement is conducted to onboard external vendors to perform the job on the project.

# HOW to do the project

## *Integration Management*



All management plans



Deliverables



Stakeholder Register



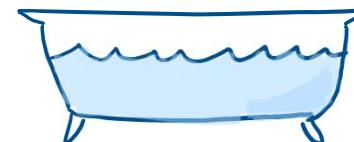
Enterprise  
Environmental  
Factors



Organizational  
Process Assets



## Manage Project Knowledge



### TOOLS AND TECHNIQUES

- Expert Judgement
- Knowledge and information management



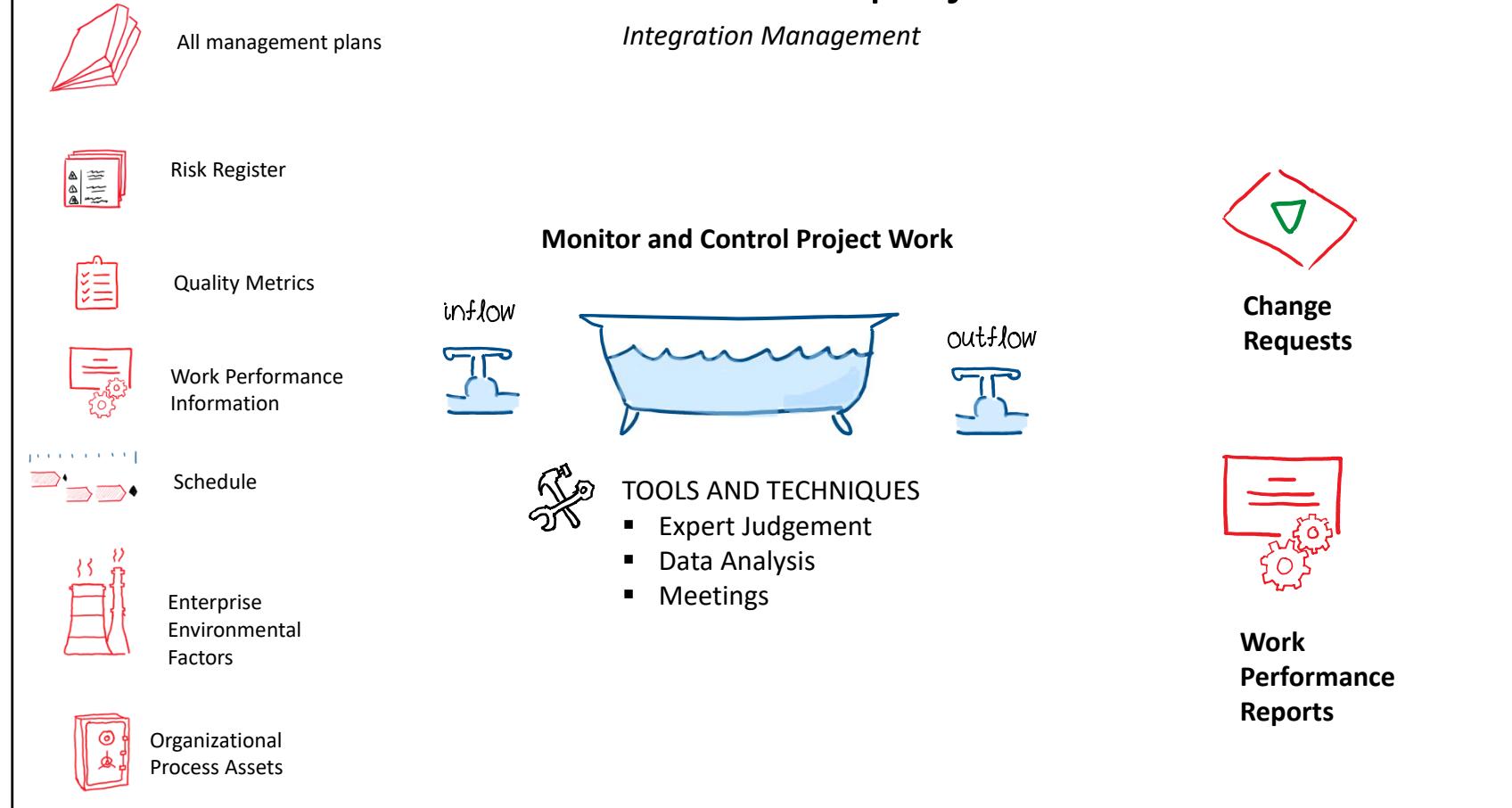
Lessons Learned  
Register



Organizational  
Process Assets  
updates

- Lessons Learned are important observations and insights obtained from a project
- It is important to keep a record of Lessons Learned for the benefit of future projects and the organization
- Manage Project Knowledge is a process in the executing phase that sits in the integration management knowledge area
- Inputs include project management plans, various deliverables, and the stakeholder register
- The output is the Lessons Learned register, which tracks all the observations and insights obtained from the project
- The Lessons Learned register is updated and stored in the organizational assets for later use.

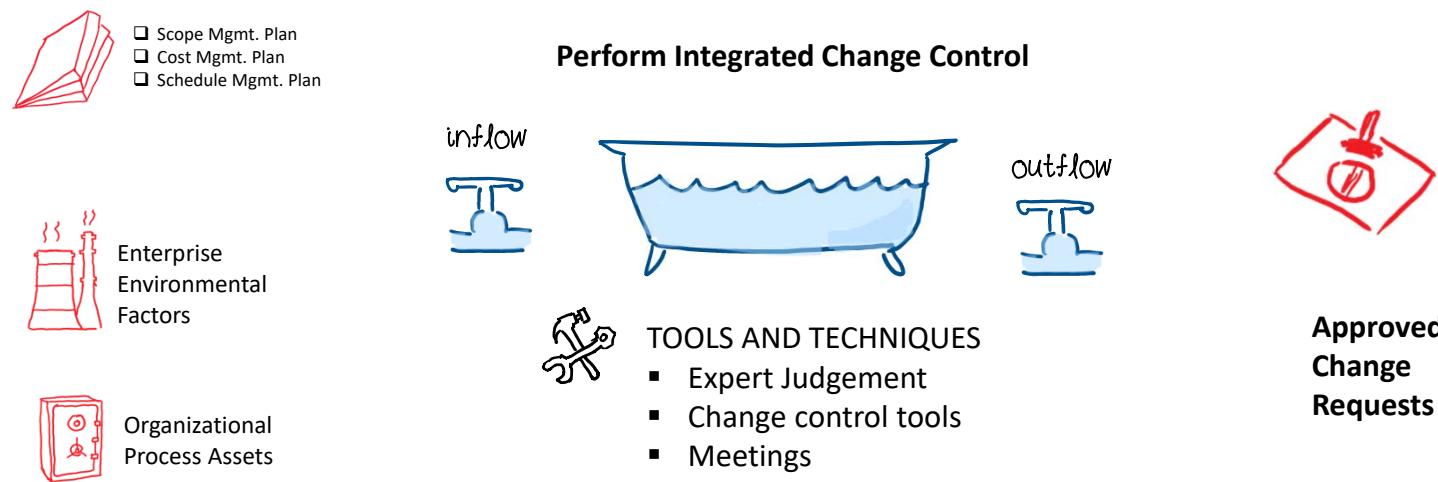
# HOW to do the project



- The Project Manager monitors and controls the project work during the execution phase.
- The process for this is called "Monitor and Control project work".
- The Project Manager ensures that the project work is on track and checks for deviations from the management plans.
- Data collected during the executing phase is used to create work performance reports, which are used to communicate project progress to stakeholders.
- Change requests may arise during this phase, such as requests for additional scope or time extension.
- Inputs for this process include project management plans, risk register, and quality metrics.

# HOW to do the project

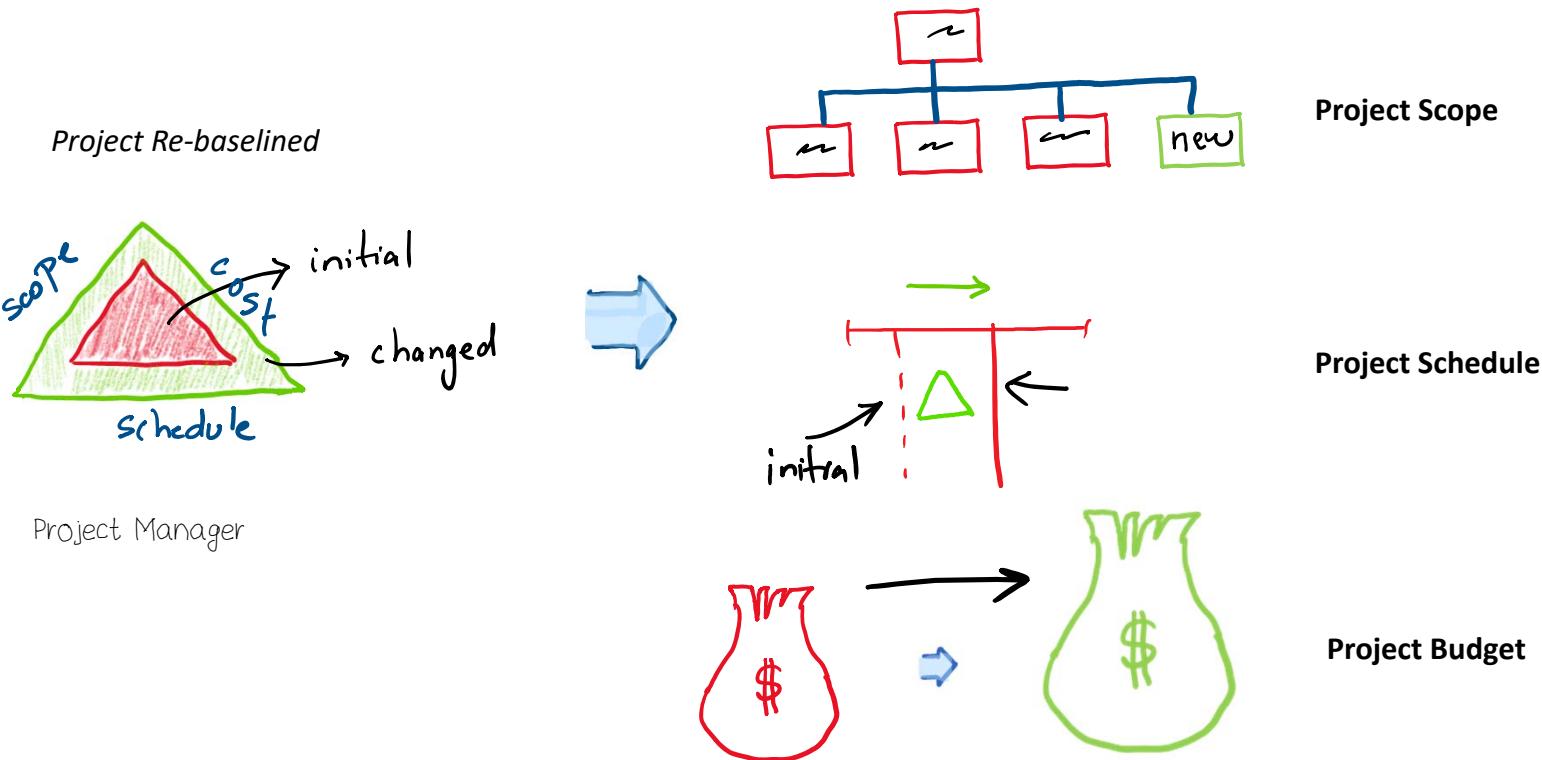
## *Integration Management*



- Changes to a project can be introduced in the middle of the project that need to be managed through a systematic process
- The baseline documents encapsulate the 100% scope of the project agreed upon by stakeholders
- A change request is a formal proposal to modify any project document or baseline
- The perform integrated change control process manages changes introduced to the project
- Inputs to this process include all project management plans prepared so far, such as the scope, schedule, and cost management plans
- The output of this process is approved change requests
- Tools and techniques used in this process include expert judgment, change control tools, and meetings
- Controlling a project to the baselines is an essential part of project management
- The project manager is responsible for executing the change management process for each requested change.

# HOW to do the project

*Integrated Change Control*



- Change requests are made by stakeholders or project team members with valid reasoning and rationale.
- Change request forms are usually filled out to formalize the request.
- Project manager registers the change and conducts a preliminary impact analysis on scope, schedule, cost, and risks.
- Project manager presents the assessment to the Change Control Board for approval or disapproval.
- Change Control Board makes a decision based on the submitted information.
- If approved, project manager re-baselined the project and updates parameters such as scope, schedule, and cost.
- Other project documents may also need to be updated.

# HOW MUCH/MANY do we need

## Cost Management

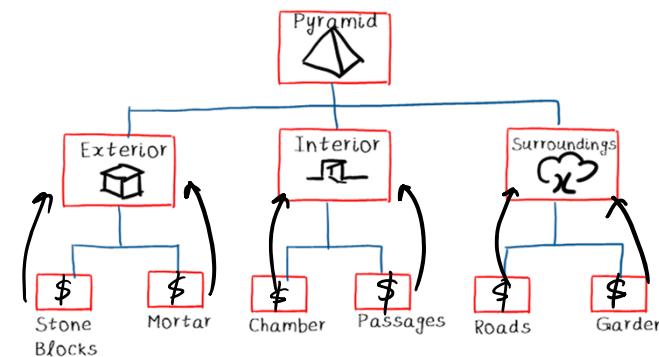


Project Budget



### TOOLS AND TECHNIQUES

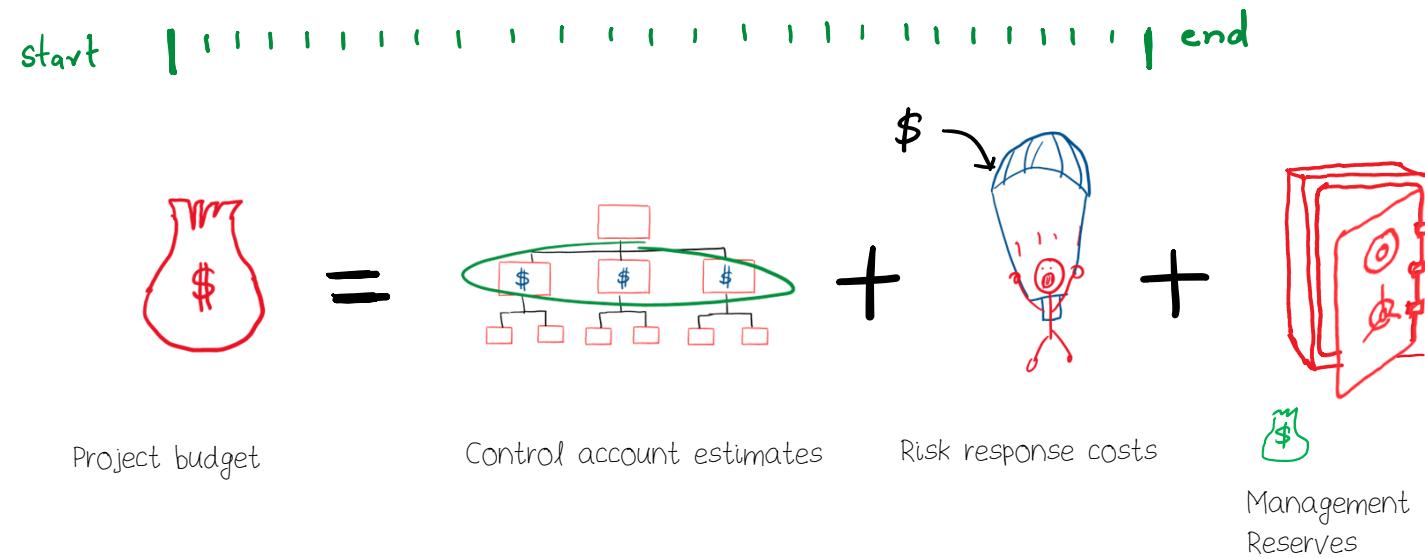
- Cost Aggregation
- Financing



- Project budget is obtained through cost estimation methods and rolling up amounts from control accounts.
- Project manager's job is to ensure project is delivered within the defined budget.
- Control Costs is the process used to monitor and control project costs.
- Earned Value Management is an important concept in project management.
- Inputs to the Control Costs process include project budget, project management plan, and work performance information.
- Outputs of the process include budget forecasts and metrics related to costs and budget.
- Tools and techniques used include Earned Value Management and project management software.

# HOW do you control costs

*Earned Value Management*

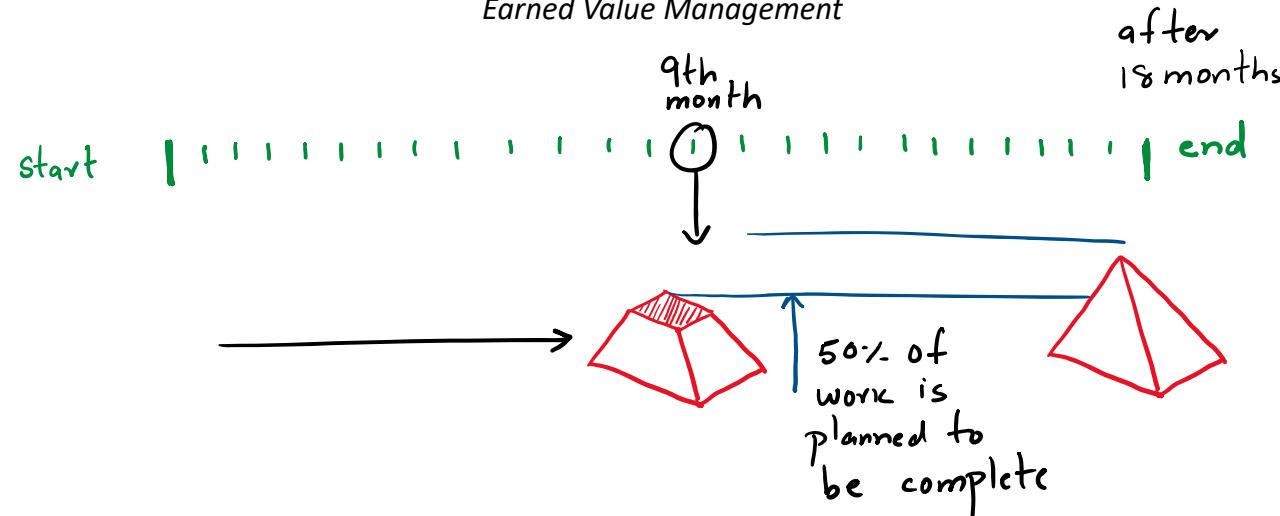


- It is all that money needed to complete the project
- $BAC = \text{Estimated costs} + \text{Contingency reserves (for risk responses)} + \text{management reserves (unplanned changes)}$

- Project budget includes cost estimates, contingency reserves for risk responses, and management reserves for unplanned changes.
- The overall project budget is called the budget at completion (BAC) and includes the initial project budget, contingency reserves, and management reserves.

## HOW do you control costs

Earned Value Management



$$PV = \frac{\text{planned \% work completed}}{\text{BAC}}$$

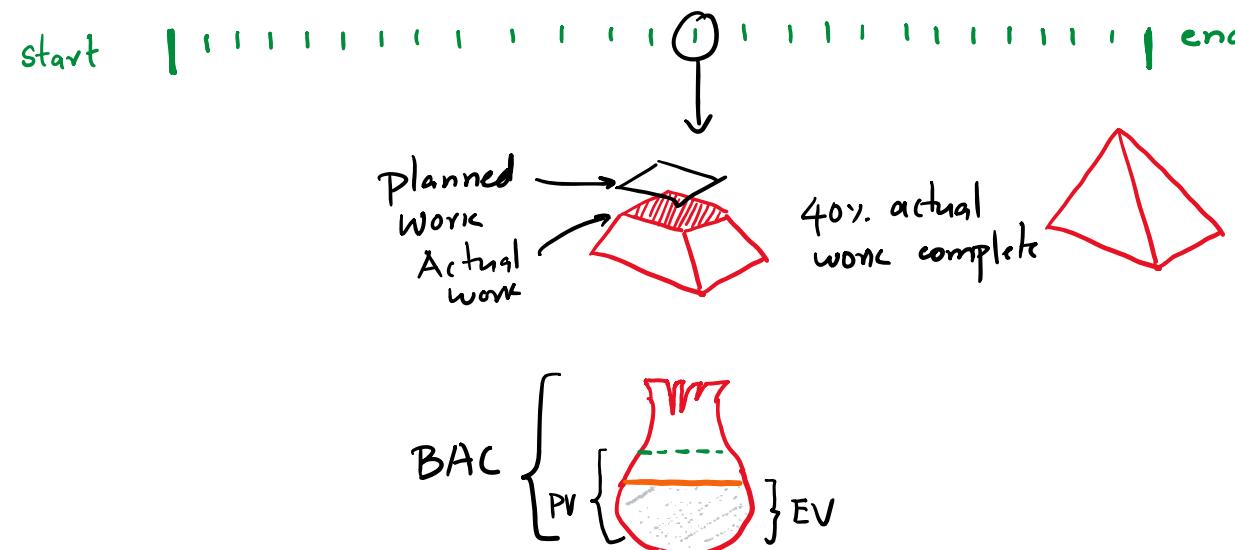
### PLANNED VALUE (PV)

It is the cost of work that has been authorized and budgeted for a schedule activity or WBS component during a given time period or phase.

- Earned Value Management is used to monitor project performance based on project metrics.
- Plan Value is the cost of work authorized and budgeted for a scheduled activity or work package.
- Planned Value = Percentage of work completed \* Budget at Completion (BAC).

# HOW do you control costs

*Earned Value Management*



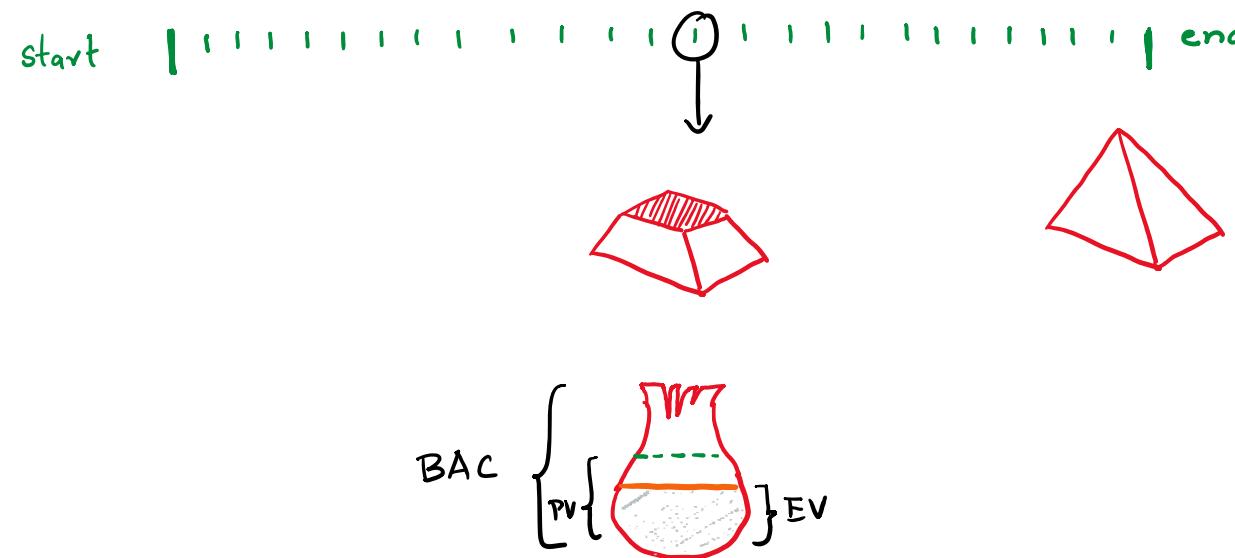
## EARNED VALUE (EV)

It is the value of the work completed to-date as it compares to the budgeted amount assigned to the work component

- Earned Value represents the value of work completed compared to the budgeted amount assigned to that work component.
- Earned Value indicates the value delivered by the project so far.
- Earned Value is based on actual completed work, while Planned Value is based on planned completed work.
- Example: If the project team only completed 40% of the work, the Earned Value is calculated as follows:
- Earned Value = Percentage of actual work completed \* Budget at Completion (BAC).
- In the example, if the BAC is \$100,000 and 40% of the work is completed, the Earned Value would be \$40,000.
- If the team delivers less work than planned, the Earned Value will be less than the Planned Value.
- If the team delivers more work than planned, the Earned Value will be more than the Planned Value.

# HOW do you control costs

*Earned Value Management*

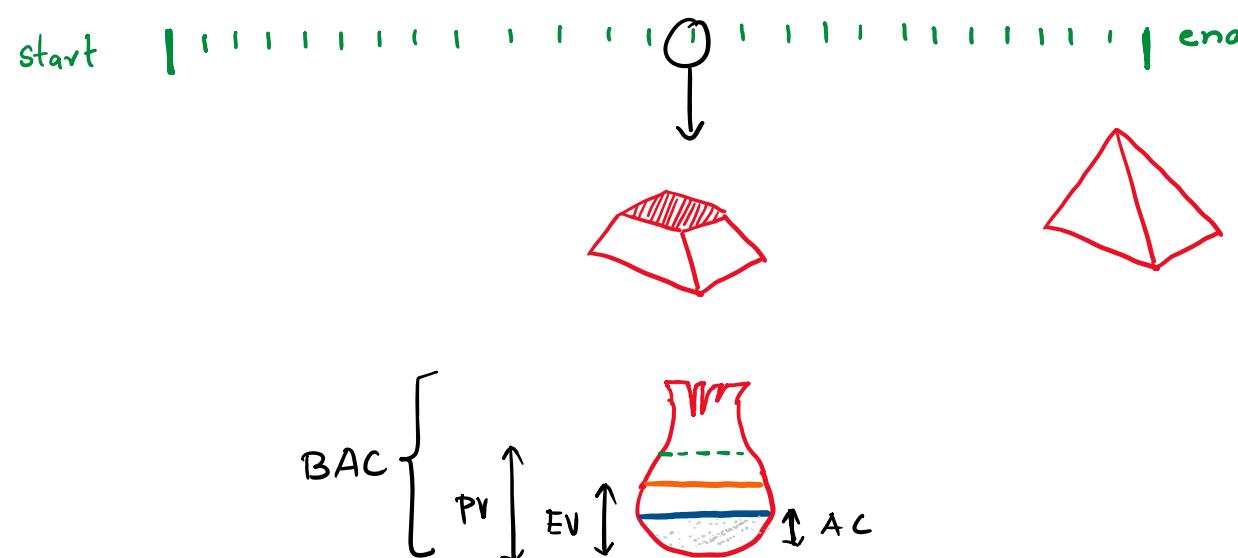


1. SCHEDULE VALUE (SV) = EV - PV
2. SCHEDULE PERFORMANCE INDEX (SPI)= EV/ PV

- Scheduled Variance is the difference between Earned Value and Planned Value.
- Scheduled Variance indicates how much the team is lagging behind or exceeding the expected value on the project.
- Negative Scheduled Variance indicates the team has failed to deliver the expected value.
- Scheduled Performance Index (SPI) is the ratio of Earned Value to Planned Value.
- SPI indicates the health of the project's schedule.
- SPI < 1: Project is behind schedule.
- SPI > 1: Project is ahead of schedule.
- SPI = 1: Project is on schedule.

# HOW do you control costs

*Earned Value Management*



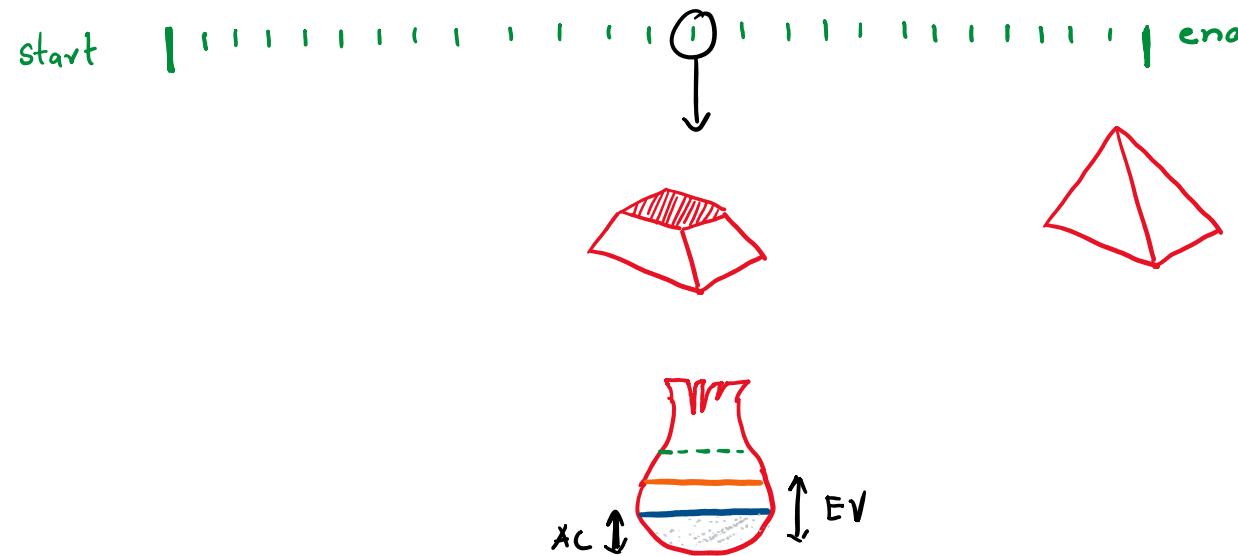
## ACTUAL COST (AC)

It is the cost of completing the work component in a given time period.

- Actual Cost is the sum of all expenditures incurred on the project.

# HOW do you control costs

*Earned Value Management*

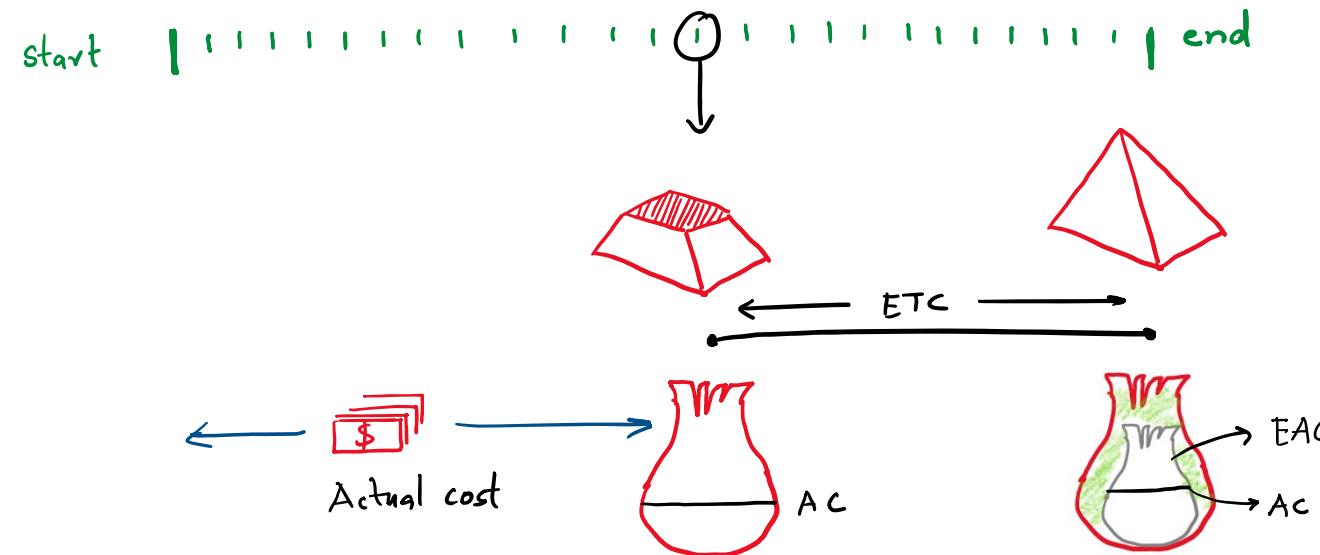


1. COST VARIANCE (CV) = EV - AC
2. COST PERFORMANCE INDEX (CPI) = EV / AC

- Cost Variance is the difference between Earned Value and Actual Cost.
- Example: If the Actual Cost is \$30,000 and Earned Value is \$40,000, the Cost Variance would be \$10,000.
- Cost Variance indicates if the team has spent more or less than the expected budget.
- Cost Performance Index (CPI) is the ratio of Earned Value to Actual Cost.
- CPI < 1: Project is going over budget.
- CPI > 1: Project is under budget.
- CPI = 1: Project is on budget.

# HOW do you control costs

## Budget Forecasting

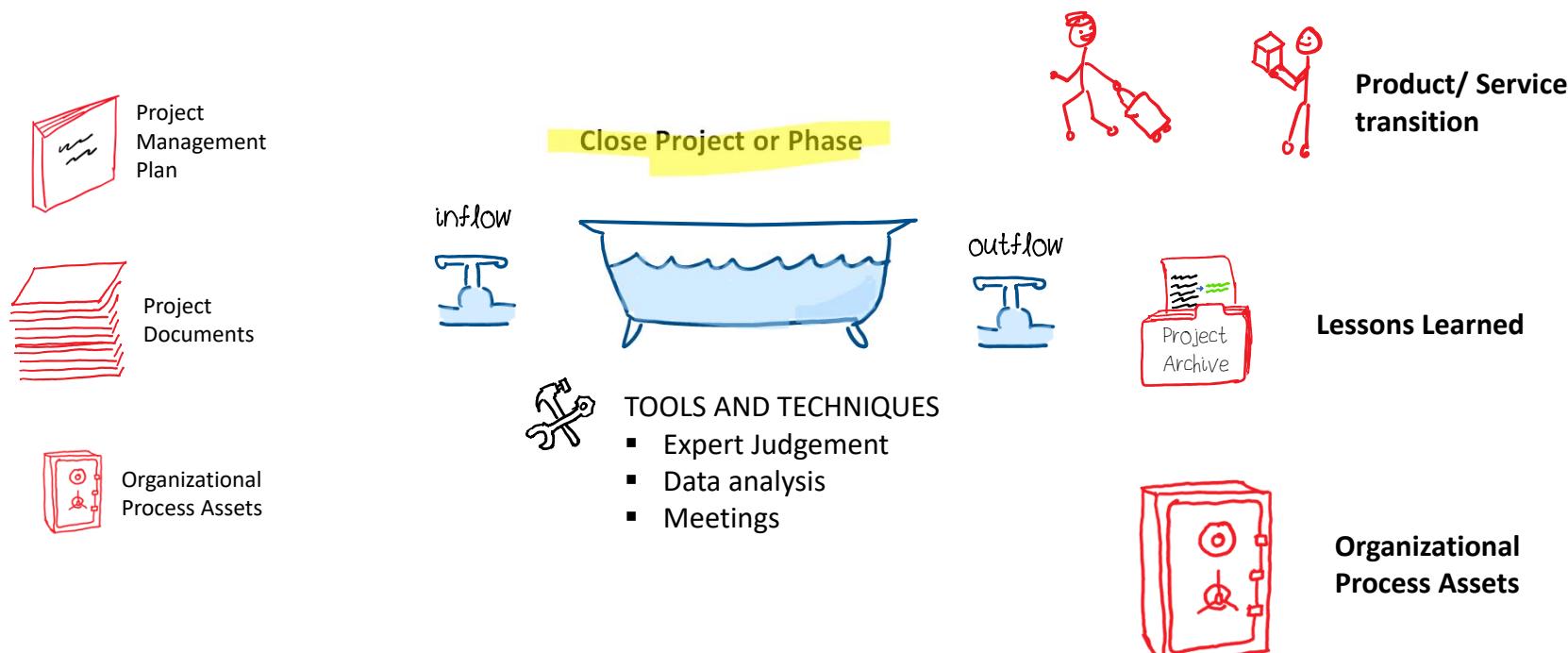


1. Estimate at Completion (EAC) = BAC/CPI
2. Estimate to Completion (ETC) = EAC - AC

- Forecasting allows us to predict future project performance based on gathered information.
- Estimate at Completion (EAC) is calculated by dividing the Budget at Completion (BAC) by the Cost Performance Index (CPI).
- EAC predicts the estimated cost of completing the project.
- Variance at Completion (VAC) is the difference between BAC and EAC.
- VAC represents the amount of money that can be saved or needed beyond the estimated budget.
- Estimate to Completion (ETC) is the additional funding needed from the current point to project completion.
- ETC is calculated by subtracting the Actual Cost (AC) from EAC.
- ETC represents the amount of money required for the remaining project scope.

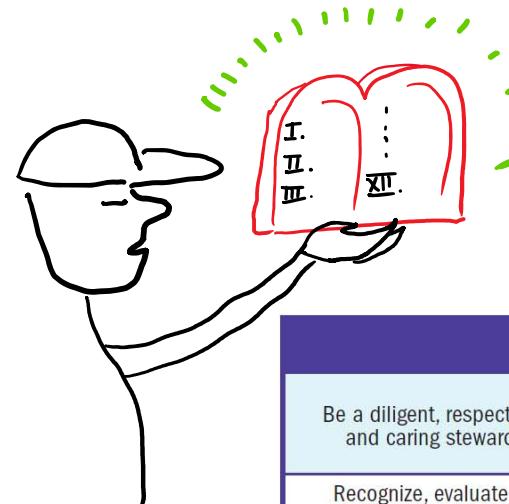
# HOW to do the project

## *Integration Management*



- The closing phase is the final phase of the project, leading to its conclusion.
- The project team delivers the product or service and obtains final acceptance from the sponsor or customer.
- If the project delivers a service, it may be transitioned to a separate team for maintenance and support.
- The closing phase involves the process of Closed Project or Phase.
- Inputs to this process include the project management plan, project documents, and organizational process assets.
- Outputs of the process include updating lessons learned, gathering insights from stakeholders, and identifying areas for improvement.
- Lessons learned help identify areas for improvement and guide future projects.
- The project manager archives all project documents into organizational process assets for future reference and guidance.

# 12 Principles of Project Management



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

- The focus is on you as a project manager and your fundamental principles.
- Principles are core truths or assumptions guiding behavior.
- There are 12 principles of project management.
- The principles are linked to the eight performance domains.
- Principles guide behavior in the performance domains.
- Many of these principles are already internalized and practiced unconsciously.

# STEWARDSHIP

*Be a diligent, respectful, and caring steward*

**Stewards act responsibly to carry out activities with integrity, care, and trustworthiness while maintaining compliance with internal and external guidelines. They demonstrate a broad commitment to financial, social, and environmental impacts of the projects they support.**

- ▶ Stewardship encompasses responsibilities within and external to the organization.
- ▶ Stewardship includes:
  - Integrity,
  - Care,
  - Trustworthiness, and
  - Compliance.
- ▶ A holistic view of stewardship considers financial, social, technical, and sustainable environmental awareness.

Source: PMBOK 7<sup>th</sup> Edition

- The first principle of project management is to be a diligent, respectful, and caring steward on the project.
- Being a steward means taking ownership of the project and fulfilling responsibilities beyond project management tasks.
- Internal responsibilities include managing the well-being of the team and adhering to company policies and procedures.
- External responsibilities include societal obligations and environmental considerations.
- Integrity involves staying strong in the face of unethical behavior and adhering to good principles and professional ethics.
- Care involves displaying emotional intelligence, compassion, and genuine empathy towards team members and project stakeholders.
- Trustworthiness is built by delivering on commitments, being honest, and maintaining open communication.
- Compliance with company policies, standard operating procedures, and applicable laws is essential.
- Project managers have societal responsibilities to address ethical concerns and prioritize the well-being of society.
- Acting responsibly demonstrates a commitment to financial, social, and environmental impacts of the project.

# TEAM

## *Create a Collaborative Project Team Environment*

**Project teams are made up of individuals who wield diverse skills, knowledge, and experience. Project teams that work collaboratively can accomplish a shared objective more effectively and efficiently than individuals working on their own.**

- ▶ Projects are delivered by project teams.
- ▶ Project teams work within organizational and professional cultures and guidelines, often establishing their own “local” culture.
- ▶ A collaborative project team environment facilitates:
  - Alignment with other organizational cultures and guidelines,
  - Individual and team learning and development, and
  - Optimal contributions to deliver desired outcomes.

Source: PMBOK 7<sup>th</sup> Edition

- This principle of project management is about creating a collaborative project team environment.
- Project teams consist of individuals with diverse skills, knowledge, and expertise.
- These teams work together to convert the vision of the company into value.
- Project teams often come from different departments within the organization, each with its own culture and ways of working.
- Cultural and departmental differences can create obstacles to smooth value delivery.
- Collaboration is necessary to overcome these hurdles and achieve efficient flow of information and feedback.
- A collaborative project team environment facilitates alignment, learning, development, and optimal contributions to project outcomes.
- Early team agreements can address differentiating behaviors and establish common working norms.
- Redefining roles and responsibilities based on project needs promotes collaboration.
- Agile teams focus on fulfilling commitments to project objectives and achieve greater results.
- Self-governing teams assign tasks based on skills and take collective ownership of project outcomes.
- Task assignments require clarity on authority, accountability, and responsibility.

# STAKEHOLDERS

## *Effectively Engage with Stakeholders*

**Engage stakeholders proactively and to the degree needed to contribute to project success and customer satisfaction.**

- ▶ Stakeholders influence projects, performance, and outcomes.
- ▶ Project teams serve other stakeholders by engaging with them.
- ▶ Stakeholder engagement proactively advances value delivery.

Source: PMBOK 7<sup>th</sup> Edition

- The traditional process-focused approach of stakeholder management lacks guidance on effective engagement.
- The stakeholder register captures stakeholder influence, interests, impact, and importance, but it doesn't address how to engage with them.
- PMBOK Guide 7 now includes principles of project management that emphasize effective stakeholder engagement.
- Effective stakeholder engagement involves managing expectations, being aware of changing needs, and maintaining good relationships.
- Stakeholders impact various project aspects, and proactive communication and interaction are essential for engagement.
- Project team members should also engage with stakeholders as needed.
- Stakeholders have influence on project performance and outcomes.
- Proactive stakeholder engagement advances the delivery of value.

# VALUE

## *Focus on Value*

**Continually evaluate and adjust project alignment to business objectives and intended benefits and value.**

- ▶ Value is the ultimate indicator of project success.
- ▶ Value can be realized throughout the project, at the end of the project, or after the project is complete.
- ▶ Value, and the benefits that contribute to value, can be defined in quantitative and/or qualitative terms.
- ▶ A focus on outcomes allows project teams to support the intended benefits that lead to value creation.
- ▶ Project teams evaluate progress and adapt to maximize the expected value.

Source: PMBOK 7<sup>th</sup> Edition

- Value is defined in the business case as the outcomes and benefits that the project promises to deliver.
- Value can be achieved through the system of value delivery, including projects, programs, and operations.
- Project success is determined by the ability to achieve value through the delivery of intended outcomes.
- The business case captures the value of the project and is the first input for creating the project charter.
- The business case typically includes sections such as business need, project justification, and business strategy.
- The business need explains the rationale for doing the project.
- Project justification highlights the importance of acting on the business need and the implications of not doing so.
- The business strategy shows how the project aligns with the organization's overall strategy.
- The business case should convey a cohesive message for initiating the project.
- Value should be continuously evaluated and adjusted throughout the project based on business objectives and intended benefits.
- Value can be monetary or qualitative, such as societal good or environmental benefits.

# SYSTEMS THINKING

*Recognize, Evaluate, and Respond to System Interactions*

**Recognize, evaluate, and respond to the dynamic circumstances within and surrounding the project in a holistic way to positively affect project performance.**

- ▶ A project is a system of interdependent and interacting domains of activity.
- ▶ Systems thinking entails taking a holistic view of how project parts interact with each other and with external systems.
- ▶ Systems are constantly changing, requiring consistent attention to internal and external conditions.
- ▶ Being responsive to system interactions allows project teams to leverage positive outcomes.

Source: PMBOK 7<sup>th</sup> Edition

- Projects exist within a larger system, such as a program or portfolio and are governed by organizational policies and procedures.
- Projects should be managed with a holistic view of internal and external factors.
- Systems thinking is the concept of taking a holistic view of a project and its interactions.
- Systems thinking involves recognizing, evaluating, and responding to dynamic circumstances within and surrounding the project.
- Projects are impacted by internal and external factors that alter their state and parameters.
- Projects within the same program can interact and impact each other.
- Processes within a project also form subsystems that interact with each other.
- Having a system-wide view and control of the project is crucial for project success.
- Changes in the project require recognition, evaluation, and response to various system interactions.
- Systems thinking allows project managers to assess and respond to changes in project requirements, scope, schedule, cost, risks, etc.
- Systems thinking involves recognizing, evaluating, and responding to dynamic circumstances to positively affect project performance.

# LEADERSHIP

## *Demonstrate Leadership Behaviors*

**Demonstrate and adapt leadership behaviors to support individual and team needs.**

- ▶ Effective leadership promotes project success and contributes to positive project outcomes.
- ▶ Any project team member can demonstrate leadership behaviors.
- ▶ Leadership is different than authority.
- ▶ Effective leaders adapt their style to the situation.
- ▶ Effective leaders recognize differences in motivation among project team members.
- ▶ Leaders demonstrate desired behavior in areas of honesty, integrity, and ethical conduct.

Source: PMBOK 7<sup>th</sup> Edition

- Leadership behaviors are necessary on projects to manage teams effectively.
- In a matrix environment, project teams consist of members from various functional departments.
- Leadership is different from authority and involves motivating people, influencing their interests, and driving success as a team.
- Authority is the right to exercise power and is automatically given to project managers.
- Leadership has a greater impact on team members, stakeholders, and the project itself.
- Leadership styles vary, including autocratic, directive, laissez-faire, democratic, supportive, participative, and consensus-based.
- Leadership behaviors include being goal-focused, adaptable to change, collaborative in decision-making, effective in communication, coaching and mentoring team members, vested in team development, empathetic, honest, ethical, having a growth mindset, and acting as a role model.
- Demonstrating leadership behaviors supports individual and team needs and contributes to positive project outcomes.
- The entire project team should exhibit leadership behaviors, not just the project manager.
- Effective leaders recognize differences in motivation among team members.
- Leaders demonstrate honesty, integrity, and ethical conduct.

# TAILORING

## *Tailoring Based on Context*

**Design the project development approach based on the context of the project, its objectives, stakeholders, governance, and the environment using “just enough” process to achieve the desired outcome while maximizing value, managing cost, and enhancing speed.**

- ▶ Each project is unique.
- ▶ Project success is based on adapting to the unique context of the project to determine the most appropriate methods of producing the desired outcomes.
- ▶ Tailoring the approach is iterative, and therefore is a continuous process throughout the project.

Source: PMBOK 7<sup>th</sup> Edition

- Tailoring in project management is the deliberate adaptation of approaches, governance, and processes to achieve desired project outcomes.
- Tailoring begins early in the project and continues throughout its lifecycle.
- It involves setting up the project with appropriate approaches, governance models, and processes.
- Tailoring options include selecting methodologies, templates, and artefacts based on the project's needs.
- Tailoring is about finding the right fit for the project and considering factors such as project size and risks.
- It is different from adapting to changes, as tailoring is done before initiating the project.
- Tailoring is a continuous process of improving choices based on changing circumstances.
- Agile projects focus on minimal documentation, while projects with regulatory requirements may require more documentation.
- Tailoring involves hybrid approaches that combine Agile and Waterfall models to meet specific project needs.
- Project managers need to design the project development approach based on the project's context, objectives, stakeholders, governance, and environment.
- Tailoring is necessary for every unique project and contributes to its success.
- Tailoring is an iterative and continuous process throughout the project's lifecycle.

# QUALITY

## *Build Quality into Processes and Deliverables*

**Maintain a focus on quality that produces deliverables that meet project objectives and align to the needs, uses, and acceptance requirements set forth by relevant stakeholders.**

- ▶ Project quality entails satisfying stakeholders' expectations and fulfilling project and product requirements.
- ▶ Quality focuses on meeting acceptance criteria for deliverables.
- ▶ Project quality entails ensuring project processes are appropriate and as effective as possible.

Source: PMBOK 7<sup>th</sup> Edition

- Quality is the degree to which a product, service, or result fulfills requirements and satisfies customers or sponsors.
- Building quality into processes and deliverables is essential for project success.
- Quality should be incorporated at every step of building the product.
- Performance, conformity, reliability, resilience, satisfaction, uniformity, efficiency, and sustainability are dimensions of quality.
- Quality applies to project deliverables such as management plans, communications, and overall satisfaction with project execution.
- Project managers are judged based on quality metrics, including scope, schedule, budget, risk management, stakeholder engagement, and leadership behaviors.
- Building quality involves considering project processes, governance frameworks, and methodologies.
- The focus on quality ensures that deliverables meet project objectives and stakeholder expectations.
- Good product quality satisfies requirements and acceptance criteria.
- Quality emphasizes the effectiveness and appropriateness of tailored processes on the project.

# COMPLEXITY

## *Navigating Complexity*

**Continually evaluate and navigate project complexity so that approaches and plans enable the project team to successfully navigate the project life cycle.**

- ▶ Complexity is the result of human behavior, system interactions, uncertainty, and ambiguity.
- ▶ Complexity can emerge at any point during the project.
- ▶ Complexity can be introduced by events or conditions that affect value, scope, communications, stakeholders, risk, and technological innovation.
- ▶ Project teams can stay vigilant in identifying elements of complexity and use a variety of methods to reduce the amount or impact of complexity.

Source: PMBOK 7<sup>th</sup> Edition

- Project management involves skillfully managing complex projects with best practices, principles, tools, and techniques.
- Navigating complexity means simplifying project management concepts to intuitively understand and manage projects without feeling overwhelmed.
- Complexity in projects arises from human behavior, system behavior, uncertainties, and technological innovations.
- Human behavior complexity includes managing diverse team members, departments, vendors, and contractors.
- System behavior complexity arises from interdependent technological aspects of the project.
- Uncertainties and ambiguities introduce complexity as projects are unique and involve planning for the unknown.
- Technological innovations can introduce complexity by disrupting existing project approaches.
- Complexity needs to be continually evaluated and navigated throughout the project lifecycle.
- Complexity can emerge at any point in the project, and it can be introduced by various events or conditions.
- Vigilance and identification of complex elements are necessary to reduce their impact on the project.
- Various methods can be used to mitigate and manage complexity effectively.

# RISK

## *Optimize Risk Responses*

**Continually evaluate exposure to risk, both opportunities and threats, to maximize positive impacts and minimize negative impacts to the project and its outcomes.**

- ▶ Individual and overall risks can impact projects.
- ▶ Risks can be positive (opportunities) or negative (threats).
- ▶ Risks are addressed continually throughout the project.
- ▶ An organization's risk attitude, appetite, and threshold influence how risk is addressed.
- ▶ Risk responses should be:
  - Appropriate for the significance of the risk,
  - Cost effective,
  - Realistic within the project context,
  - Agreed to by relevant stakeholders, and
  - Owned by a responsible person.

Source: PMBOK 7<sup>th</sup> Edition

- Risk management involves identifying, analyzing, and planning responses to project risks.
- Optimizing risk responses leads to action and addressing the identified risks.
- Risks are uncertain events that matter to the project objectives.
- Project risks are the uncertainties relevant to the project, while unrelated uncertainties are not project risks.
- Project risks can be threats (negative) or opportunities (positive) and opportunities can arise from unexpected use cases or market demands.
- Overall project risk refers to the effect of uncertainty on the project as a whole, while individual risks impact specific project objectives.
- Risk optimization is influenced by the risk culture of the organization.
- Risk appetite represents the organization's willingness to take risks, while risk threshold sets the limit for acceptable risks.
- Risk responses should be cost-effective and change the project's overall risk exposure significantly.
- Risk ownership lies with the individuals or entities responsible for the project objectives affected by the risk.
- The project sponsor and project manager jointly share the ownership of overall project risks.
- Continual evaluation of risks helps maximize positive impacts and minimize negative impacts on the project.
- Risk culture involves risk appetite, attitude, and threshold.
- Risk responses should be appropriate, realistic, and aligned with stakeholder agreements, and proper risk ownership should be assigned to every risk on the project.

# ADAPTABILITY AND RESILIENCE

*Embrace Adaptability and Resiliency*

**Build adaptability and resiliency into the organization's and project team's approaches to help the project accommodate change, recover from setbacks, and advance the work of the project.**

- ▶ Adaptability is the ability to respond to changing conditions.
- ▶ Resiliency is the ability to absorb impacts and to recover quickly from a setback or failure.
- ▶ A focus on outcomes rather than outputs facilitates adaptability.

Source: PMBOK 7<sup>th</sup> Edition

- Adaptability and resiliency are important principles in project management.
- Adaptability refers to responding to changing conditions on the project.
- Resiliency is the ability to absorb impacts and recover quickly from setbacks or failures.
- The Mortar & Pestle project faced setbacks with the drones dropping food during test flights.
- To embrace adaptability and resiliency, the team expanded with experienced members and had open discussions.
- They worked with smaller prototypes, focusing on incremental improvements and constant learning.
- Through this approach, they identified the root cause of the issue: faulty screws in the payload capsule.
- By adapting and making quick adjustments, the team resolved the problem and continued the project.
- Building adaptability and resiliency into the organization and project teams helps accommodate changes and recover from setbacks.
- Focusing on outcomes rather than outputs facilitates adaptability.

# CHANGE

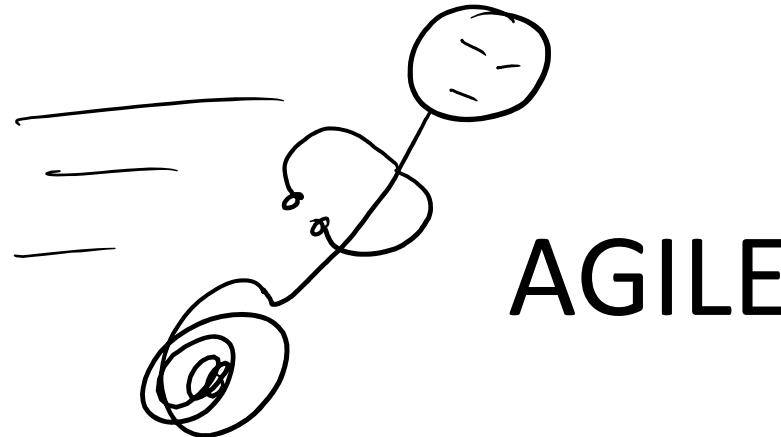
*Enable Change to Achieve the Envisioned Future State*

**Prepare those impacted for the adoption and sustainment of new and different behaviors and processes required for the transition from the current state to the intended future state created by the project outcomes.**

- ▶ A structured approach to change helps individuals, groups, and the organization transition from the current state to a future desired state.
- ▶ Change can originate from internal influences or external sources.
- ▶ Enabling change can be challenging as not all stakeholders embrace change.
- ▶ Attempting too much change in a short time can lead to change fatigue and/or resistance.
- ▶ Stakeholder engagement and motivational approaches assist in change adoption.

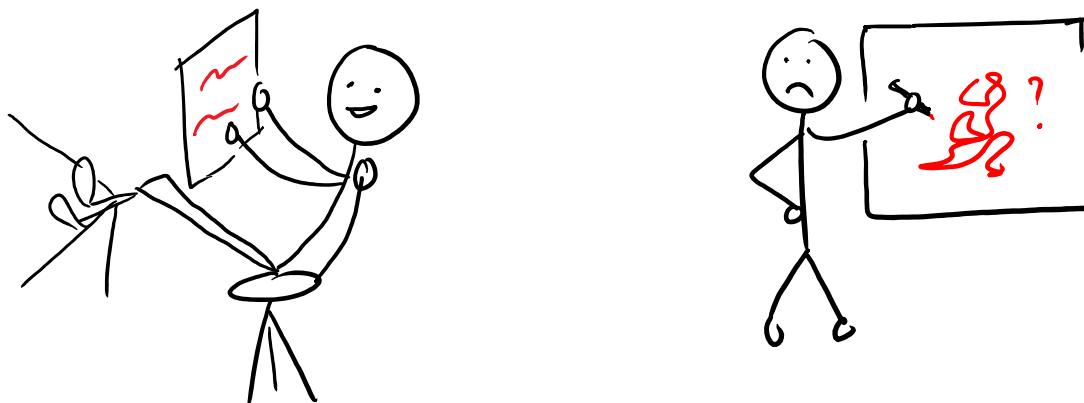
Source: PMBOK 7<sup>th</sup> Edition

- Enabling change involves preparing the organization and team to transition and adapt to a new future state.
- The focus is on realizing and harvesting the benefits derived from project outcomes.
- It differs from project change control, which deals with formal assessment and approval of change requests.
- In the Mortar & Pestle project example, the initial predictive approach led to drone failures.
- The project manager was changed to adopt an adaptive approach, specifically Agile.
- The new approach includes shorter development cycles, quick feedback loops, and continuous improvement.
- Enabling change requires expanding the project team with skilled resources and communicating the benefits.
- Mentoring, coaching, and training are essential for the team to embrace the new approach.
- Successful change enables the team to deliver the project with greater speed and agility.
- Change can originate internally or externally, and it may face resistance or change fatigue.

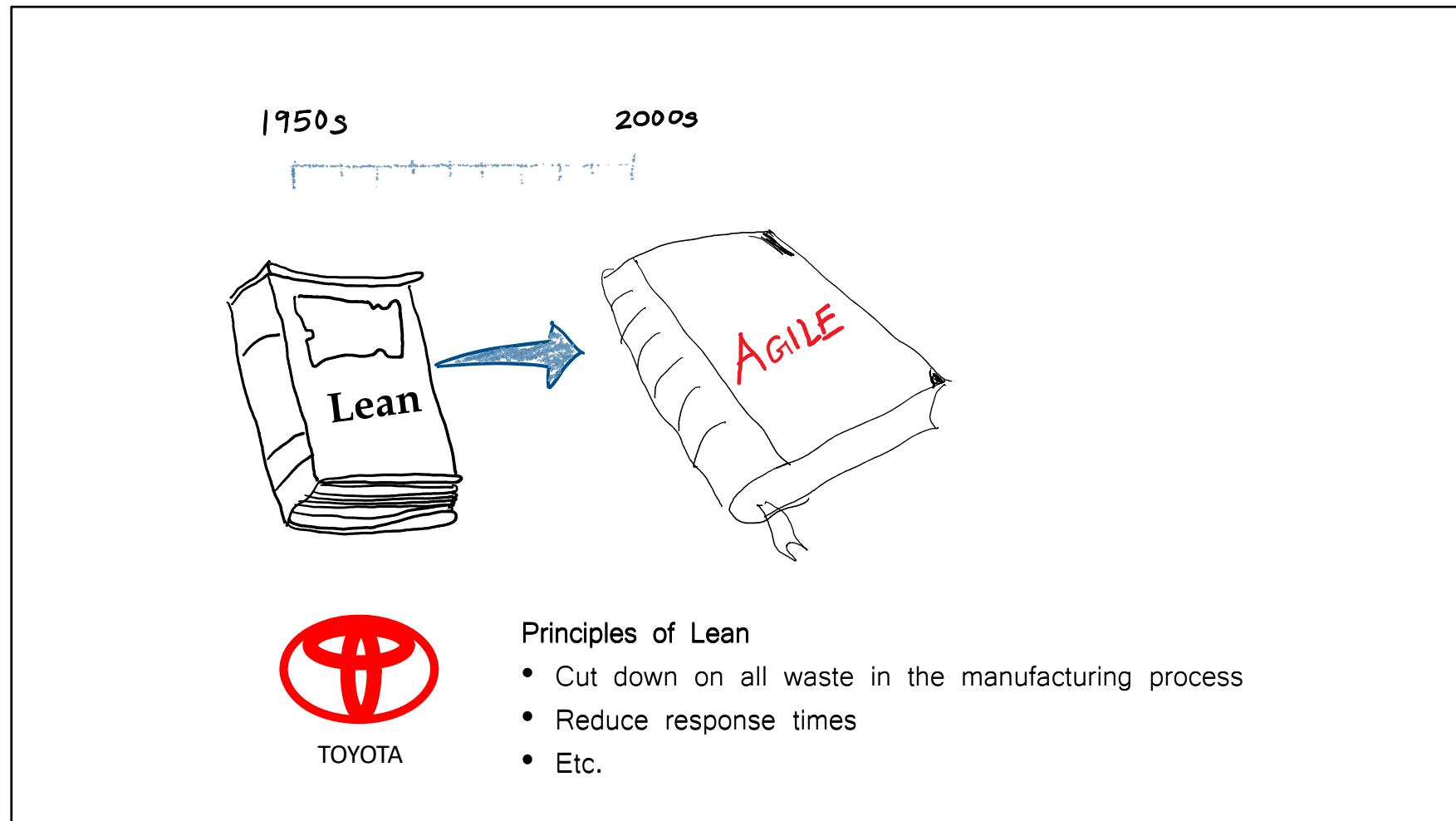


Welcome to the new section to Agile. In this section, we will explore the fundamental principles and concepts behind Agile project management and how it differs from traditional approaches. We will delve into the Agile mindset, emphasizing the importance of adaptability, collaboration, and continuous improvement in project management. You will learn about Agile methodologies such as Scrum and Kanban, and understand how they promote iterative development, frequent feedback, and value delivery. Through practical examples and case studies, you will gain insights into how Agile project management can enhance team productivity, increase customer satisfaction, and enable successful project outcomes. Whether you are new to project management or seeking to enhance your skills, this section will provide you with a solid foundation in Agile practices and principles, empowering you to navigate the dynamic landscape of modern project management with confidence.

## Definable work **vs** High-uncertainty work



- Definable work is characterized by predetermined methods, known requirements, resources, and sequential steps.
- Traditional predictive approaches are used for definable work projects.
- Examples of definable work projects include building homes, malls, airports, bridges, and drug development.
- High uncertainty work involves complex systems and collaboration between multiple experts.
- The scope and requirements of high uncertainty work projects are not fully defined initially.
- Experimentation and continuous improvement are crucial in high uncertainty work projects.
- Agile approach or adaptive approach is suitable for managing high uncertainty work projects.



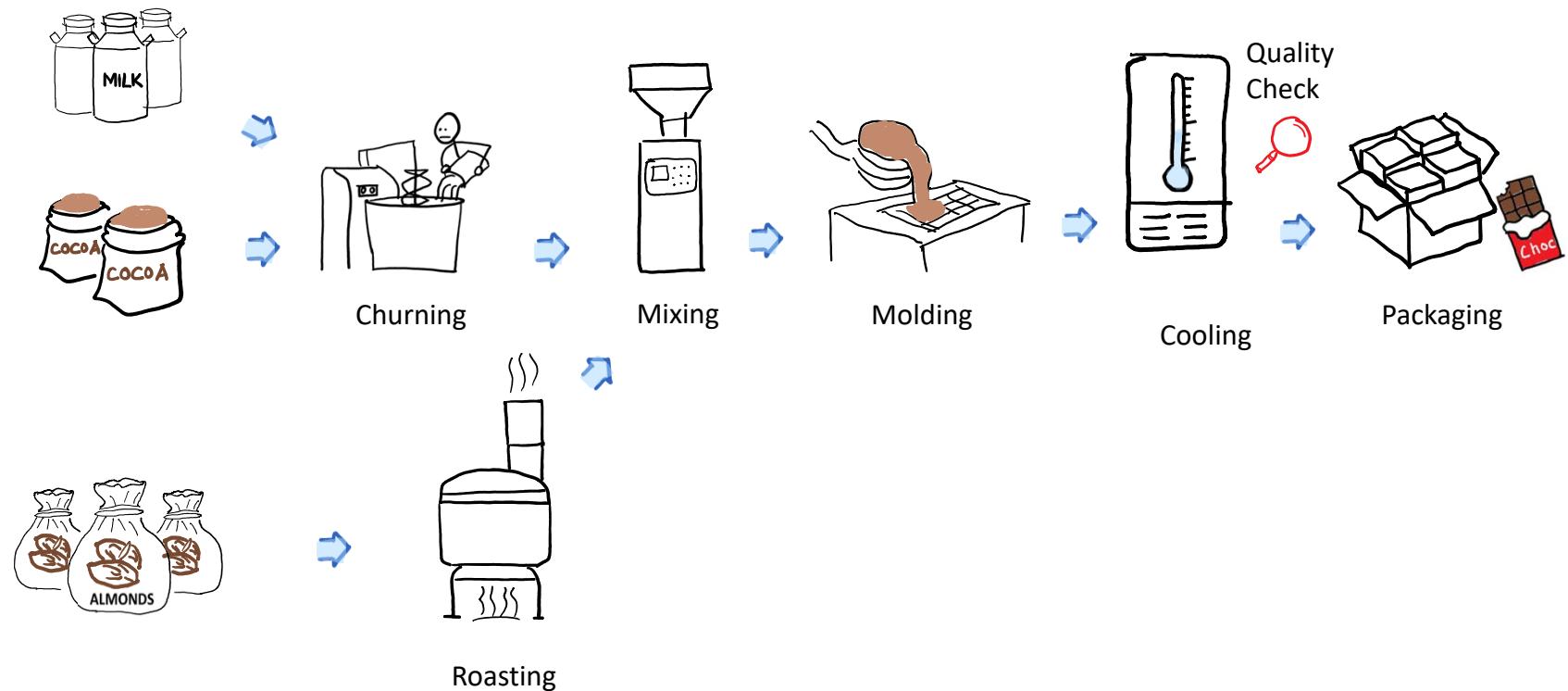
TOYOTA

#### Principles of Lean

- Cut down on all waste in the manufacturing process
- Reduce response times
- Etc.

- Agile concepts have origins in lean production and manufacturing, pioneered by Toyota.
- Lean focuses on reducing waste and cutting down response times in production processes.
- Lean concepts were applied to software development and technology projects to manage risks and uncertainty.
- The adaptive approach to project management, known as Agile, emerged to better manage technology projects.
- An example is introduced: Mortar and Pestle Chocolate Factory, which simplifies the concepts of lean production.
- The factory produces a unique chocolate candy bar with high demand.
- Orders are received from large wholesalers in large quantities.
- The factory's primary focus is to meet the demand and produce chocolate quickly.

# Chocolate Production



- The chocolate production process begins when an order is received from a wholesale supplier.
- The process involves multiple workstations where different operations are carried out.
- The first workstation is for churning milk and cocoa in the right proportion.
- The second workstation is for roasting the elements.
- There are additional workstations for further mixing, molding, cooling, and packaging.
- The final product is loaded into trucks and shipped.
- This process illustrates the production of roasted almond chocolate candy bars in the factory.

# VALUE STREAM

*Chocolate production*

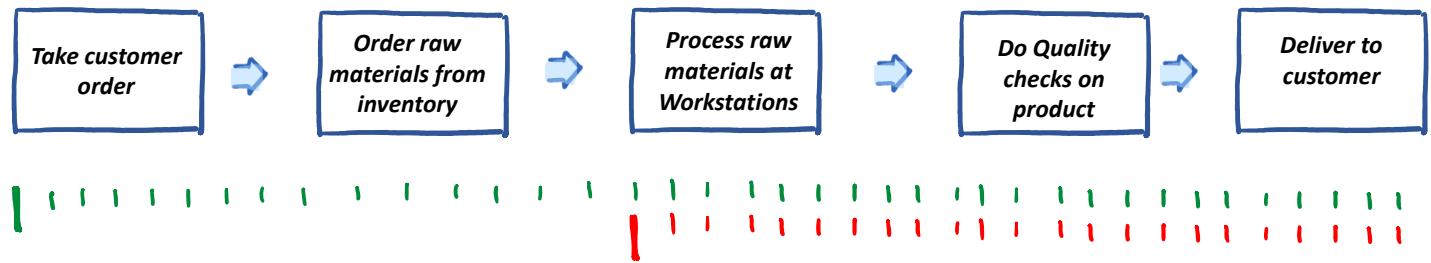


A **value stream** is a sequence of activities an organization takes to delivery upon a customer's request.

- A value stream is a sequence of activities an organization takes to deliver upon a customer's request.
- These individual steps form a chain of steps in what is also called a value chain.
- The flow of value starts when the factory receives the order from the customer, and that value flows through all the steps in the middle, which is where the product is actually built or produced.
- Finally, it ends with some form of monetary benefit that is delivered to the company through the receipt **of cash from the customer**.

# VALUE STREAM

*Chocolate production*



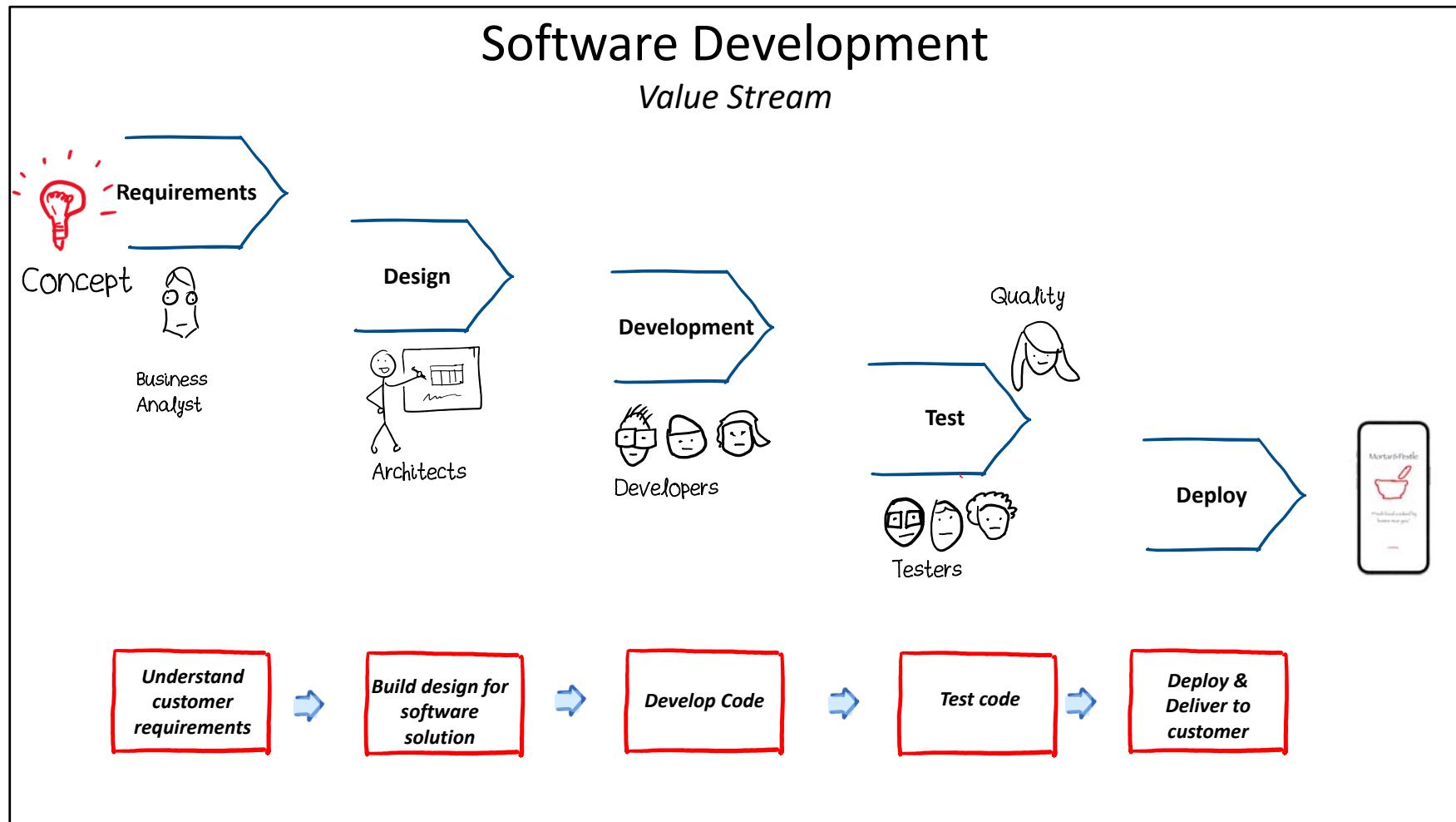
## LEAD TIME

The total time to deliver the final product to the customer from the time the order was received is called the Lead time or Response time.

## CYCLE TIME

The time spent by the factory to create the product is called the Cycle time

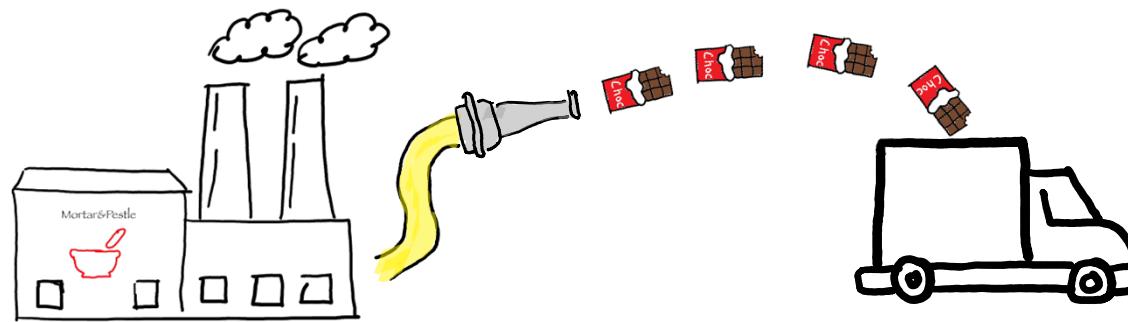
- The lead time or response time cycle is the total time to deliver the final product from the order received.
- Cycle Time is the time spent by the factory to create the product.
- Cycle time is always shorter than Lead time.
- The customer is concerned about the lead time, while the factory focuses on the cycle time.
- A restaurant example is given to illustrate the lead time as the time between placing an order and receiving the food.
- The cycle time is the time spent by the chef preparing the food, which is shorter than the lead time.



- Lean production and manufacturing principles can be applied to software development.
- The value stream in software development follows a similar concept, starting with a customer expressing a need for a software application.
- The value stream in software development involves converting a concept into a monetary benefit through the creation of a software application.
- The tech value stream involves multiple steps in its value chain, similar to a factory's value stream.
- Instead of raw materials, the tech value stream begins with a business idea or concept and understanding the customer's needs.
- The customer requirements serve as the "inventory" of raw materials for building the software product.
- The team works to build, test, and deploy the software product, with the final delivery being a working product of value to the customer.
- The customer is willing to pay when the working product is delivered, even if it is not the final product initially envisioned.
- The working product can be an intermediate increment that eventually becomes a complete solution as envisioned by the customer.

# Chocolate Production

## Throughput



The rate at which the company generates money **through the sale of final product** is called **Throughput**

- Throughput is an important concept in the value stream context.
- It refers to the rate at which a company generates money through the sale of the final product.
- The company's inventory consists of the money invested in purchasing raw materials.
- The operating expense includes the money spent on labor, machinery, buildings, etc., to convert the inventory into a finished product.
- The finished product, ready for sale, represents the money tied up in the final packaged form.
- Throughput is not the rate of production but the rate of generating money through the sale of the final product.
- Throughput measures how fast the company can generate money by delivering value to the customer.
- In software development, throughput is the rate at which the team can deliver a working product to the customer.
- The working product is one that is built with a solid design, robust code, and has been fully tested to provide value to the end user.
- Throughput is not defined as the rate of delivering features that the customer won't use. It focuses on delivering a working product to the customer.

# Software Development

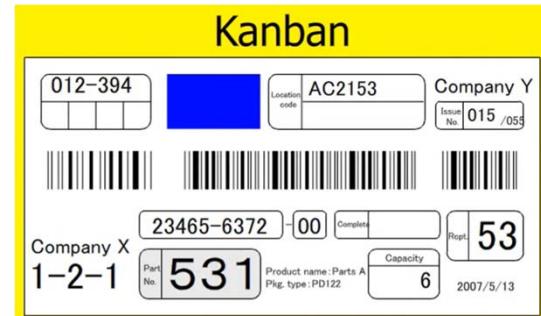
## *Requirements*



Requirements represent something that the software you are building MUST do to fulfill the business need. These are functionalities of the product you are trying to build.

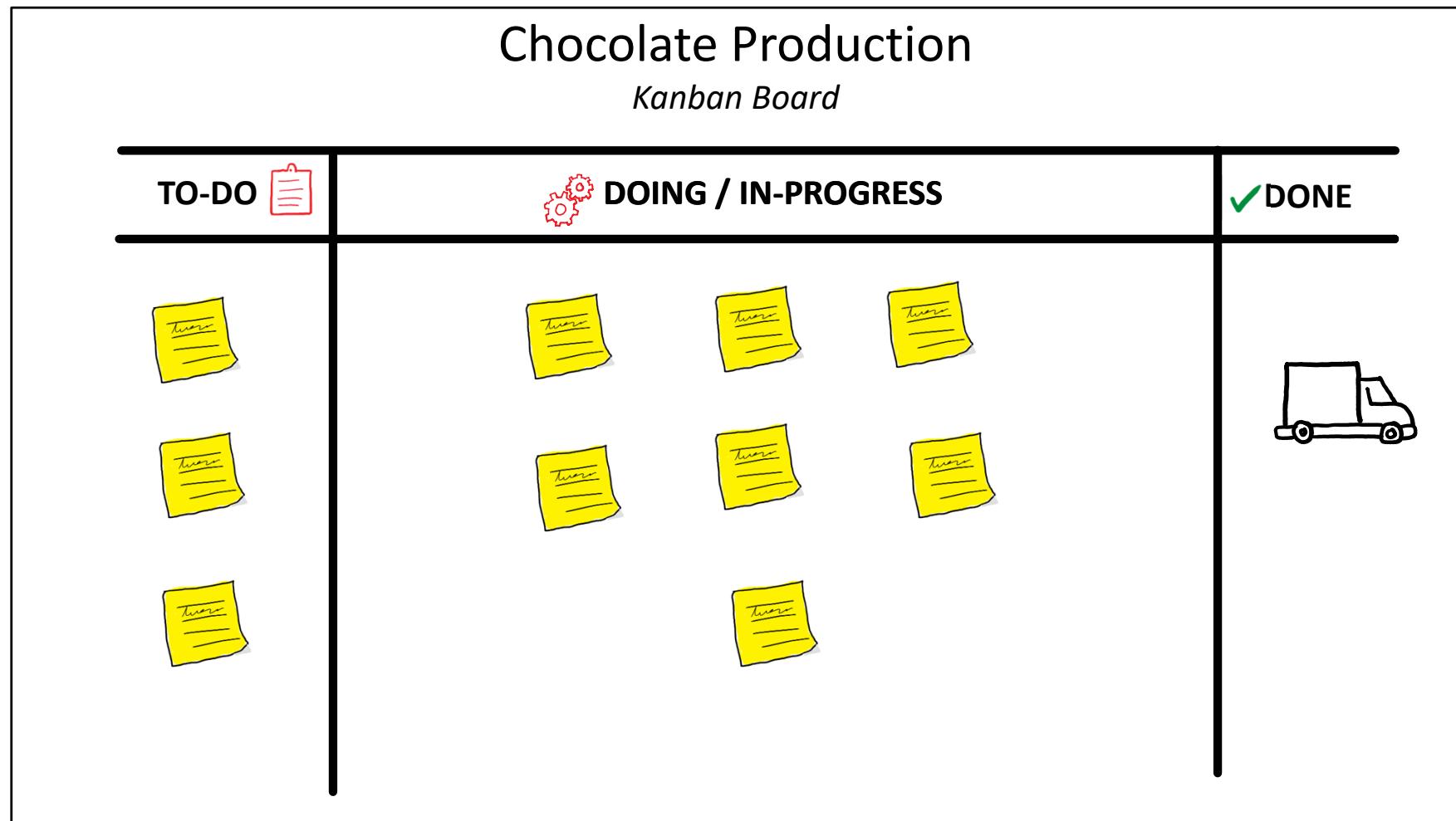
- Requirements represent the functionalities the software must have to fulfill the business need.
- In the example of the Mortar and Pestle app, requirements include showing nearby homes cooking food, displaying cuisines and prices, delivery methods (including drone-based), and secure storage of customer data.
- Requirements are analogous to the inventory of raw materials in the factory value stream.
- In Agile, requirements flow through the value stream as code written by software developers and go through testing, verification, and assembly to create the final working product.
- Agile projects require better ways of managing requirements, especially for high uncertainty work.

# Kanban

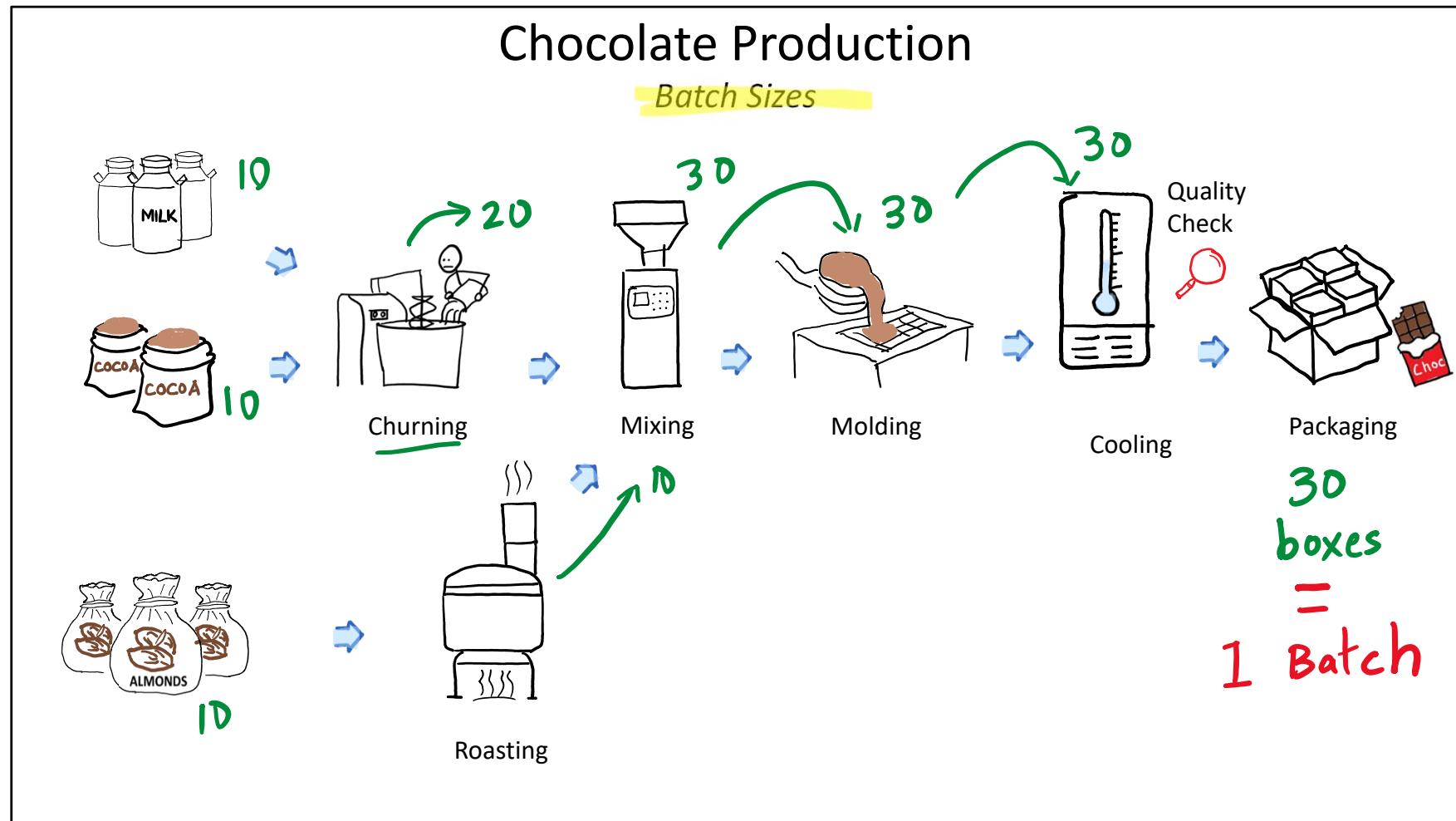


A Kanban is a Japanese word that means a Signal or a Visual Sign or a Card.

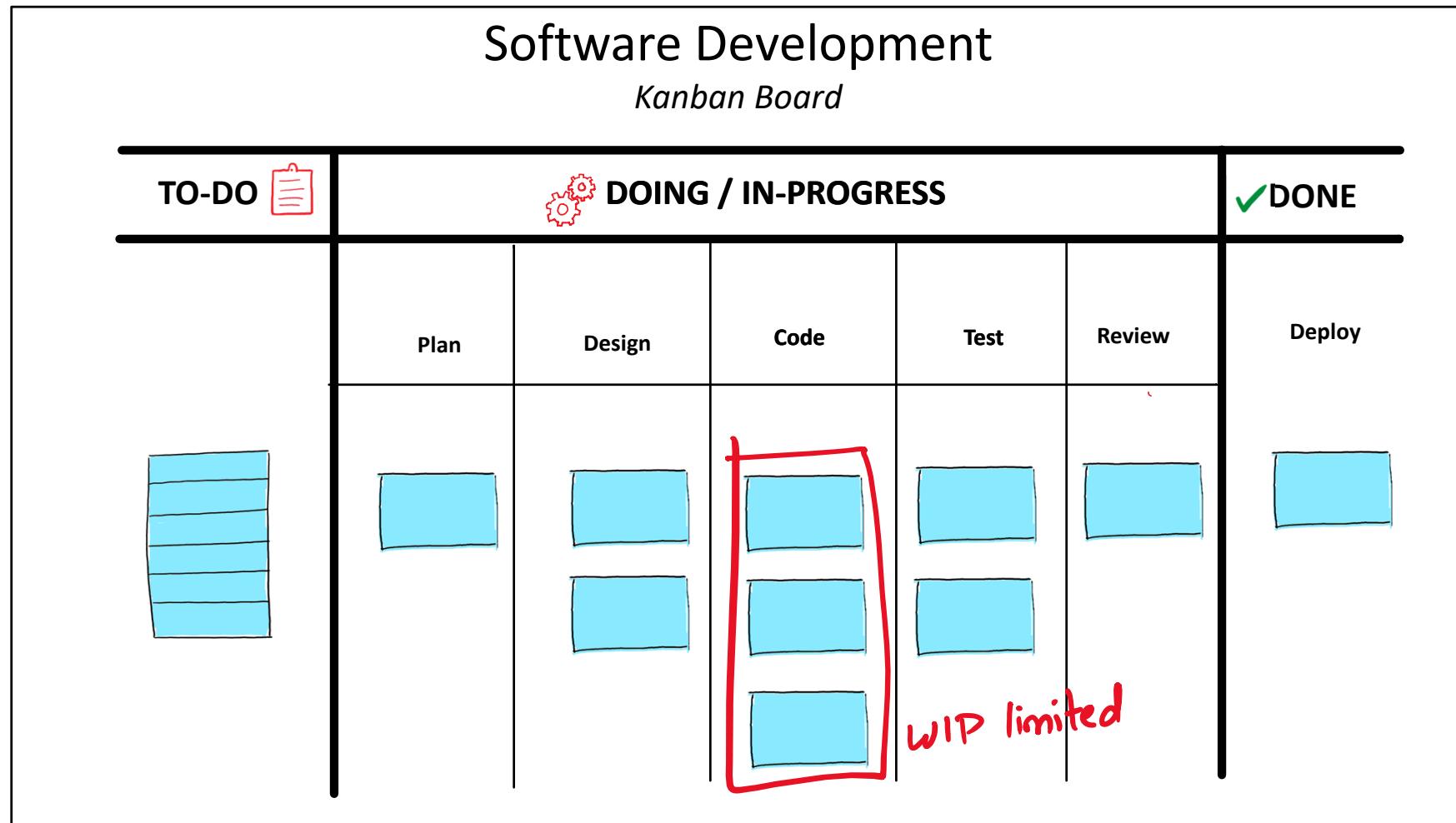
- Kanban is a Japanese term meaning a signal or visual sign, originally used on the factory floor.
- Kanban is a highly visual system of communication between workstations in a production line.
- Kanban cards contain information about the inventory being moved, such as product quantity and identification.
- Workstations pull inventory from upstream workstations based on the cards received.
- The Kanban system is pull-based and demand-driven, with downstream workstations deciding when to pull work from upstream workstations.
- It prevents unnecessary stockpiling and minimizes waste and unnecessary production.
- Workstations cannot produce without a command card from the downstream workstation.
- Kanban is not a forecast-driven system but a pull-based system.



- The Kanban Board consists of three columns: To Do, Doing/In Progress, and Done, which indicate the state of activities.
- Kanban cards are used to show the movement of inventory between workstations.
- The exchange of Kanban cards enables communication between workstations and helps decide when to produce.
- The Kanban system eliminates waste by controlling overproduction at each workstation.
- The Kanban board for software development replaces raw materials with requirements and work items.
- Work in Progress can be further broken down into detailed states or columns for tracking progress.
- The software value stream includes stages like requirements gathering, planning, design, coding, testing, and deployment.
- The combined board for software development represents work items and their status, replacing physical inventory.
- Controlling each column can be achieved by limiting the amount of work allowed in each state.



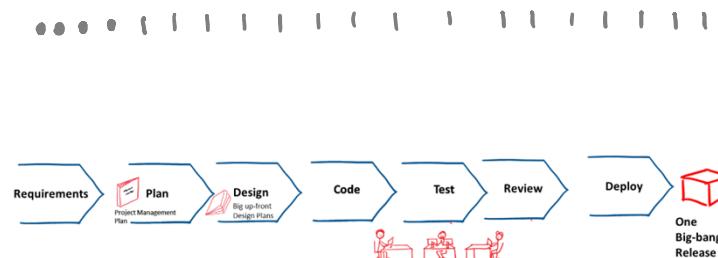
- Batch sizes refer to the quantity of products or work items processed together in a production process.
- A single batch consists of a group of raw materials flowing through the value stream from start to finish.
- Quality checks are crucial at every step of the production process to prevent costly batch discards.
- It is expensive to fix quality issues found later in the production process.
- Reducing the batch size can minimize losses in case of quality issues.
- Smaller batch sizes result in smaller losses if something goes wrong.
- The optimal batch size depends on factors like workstation capacity and bottlenecks.
- In software development, smaller batch sizes are more advantageous in the value stream.
- The optimal batch size in software development is the minimal set of requirements that can be built, tested, and deployed as a working code benefiting the customer immediately.



- Work in Progress Limits (WIP limits) are used to control the amount of work at each workstation.
- WIP limits restrict the number of tasks a workstation can handle simultaneously.
- Imbalanced processing times can lead to work accumulation and delays.
- WIP limits help ensure workstations complete existing tasks before taking on new ones.
- Each workstation may have a specific WIP limit, such as one task at a time.
- WIP limits are displayed on the Kanban board, indicating the maximum number of tasks allowed in the "doing" or "WIP" state.
- Implementing WIP limits and smaller batch sizes can improve the overall lead time and focus on completing achievable work.
- WIP limits help eliminate the waste of waiting in a queue for processing.
- In software development, WIP limits need to be enforced since there are no physical materials to process.
- Software tools often provide built-in functionality for setting and managing WIP limits.

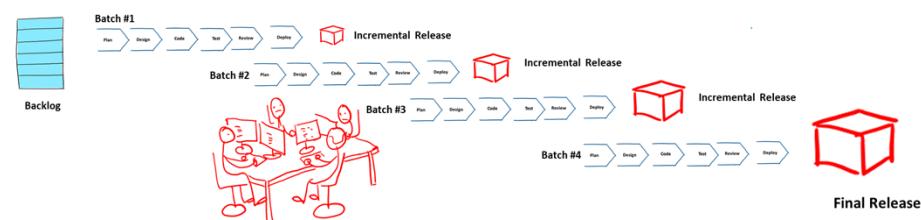
# A Brief History of Agile

2001



## STANDISH GROUP's CHAOS REPORT SURVEY [1994]

- 31% of project got cancelled before they were completed
- 53% costed more than 189% of their estimated budget
- only 16% project completed on time and on budget
- only 42% of the original features and functionalities promised were delivered



- The Standish survey highlighted the significant problems in the software development industry in the 1990s.
- Existing approaches to managing high uncertainty projects were insufficient.
- Agile revolution began in 2001 with the release of the Agile Manifesto

# The Manifesto for Agile Software Development

We are uncovering better ways of developing software by doing it and helping others do it.

Through this work we have come to value:

- ① **Individuals and interactions** *over* processes and tools
- ② **Working software** *over* comprehensive documentation
- ③ **Customer collaboration** *over* contract negotiation
- ④ **Responding to change** *over* following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Source: <https://agilemanifesto.org/>

- A group of 17 individuals met in Utah, USA in 2001 to address common software development problems.
- They formulated the Agile Manifesto, consisting of four values that promote better software development practices.
- The manifesto emphasizes the importance of valuing individuals and interactions, working software, customer collaboration, and responding to change.
- The manifesto does not completely disregard traditional values but suggests a shift in emphasis.
- Agile principles provide a common framework for all Agile methods and focus on a different mindset compared to traditional project management principles.

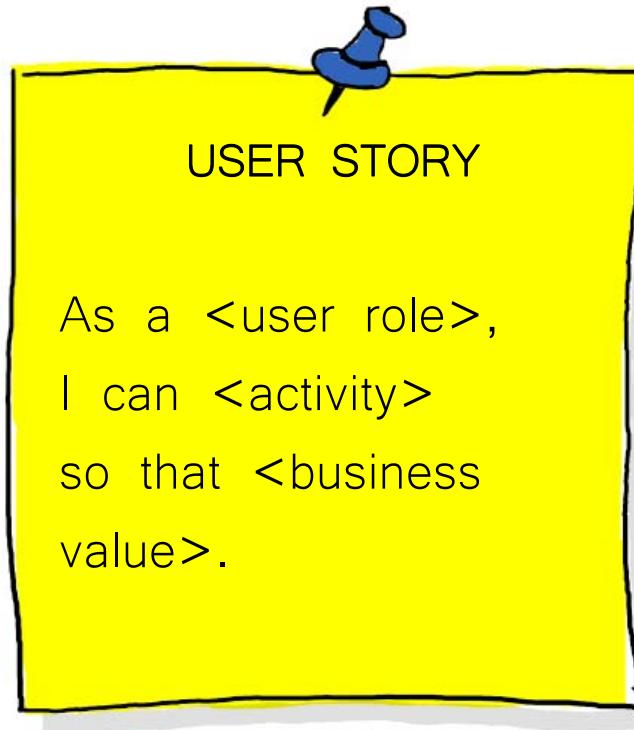
# Principles behind the Agile Manifesto

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 to 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.

Source: <https://agilemanifesto.org/>

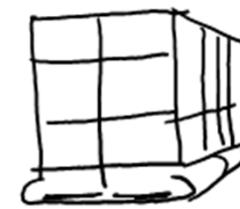
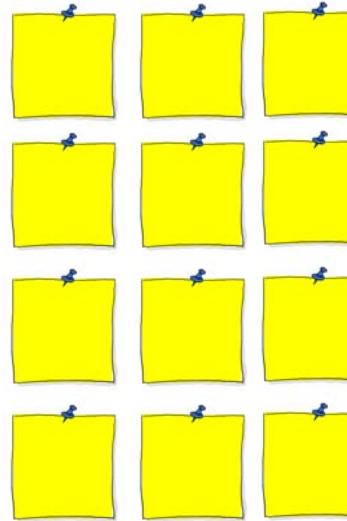
# User Stories

*structure / construct*

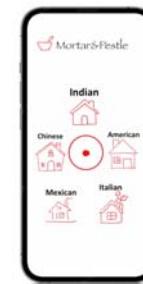
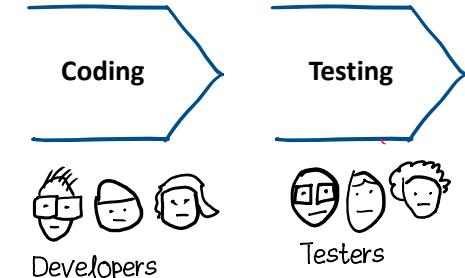


- User stories are fundamental constructs in software development.
- Requirements represent what the software system must do to fulfill the business need.
- User stories are brief statements that describe something the system needs to do for a user.
- User stories have a standard construct: "As a [user role], I can [perform an activity] so that [derive a benefit]."
- User stories focus on the user's experience and how they intend to use the system.
- User stories carry the customer's requirements through the value stream from concept to code, testing, and deployment.
- Software teams work on user stories to build the code, test the functionality, and deploy it as a final product.
- User stories are essential for delivering the intended benefits to the end user.

# Product Backlog

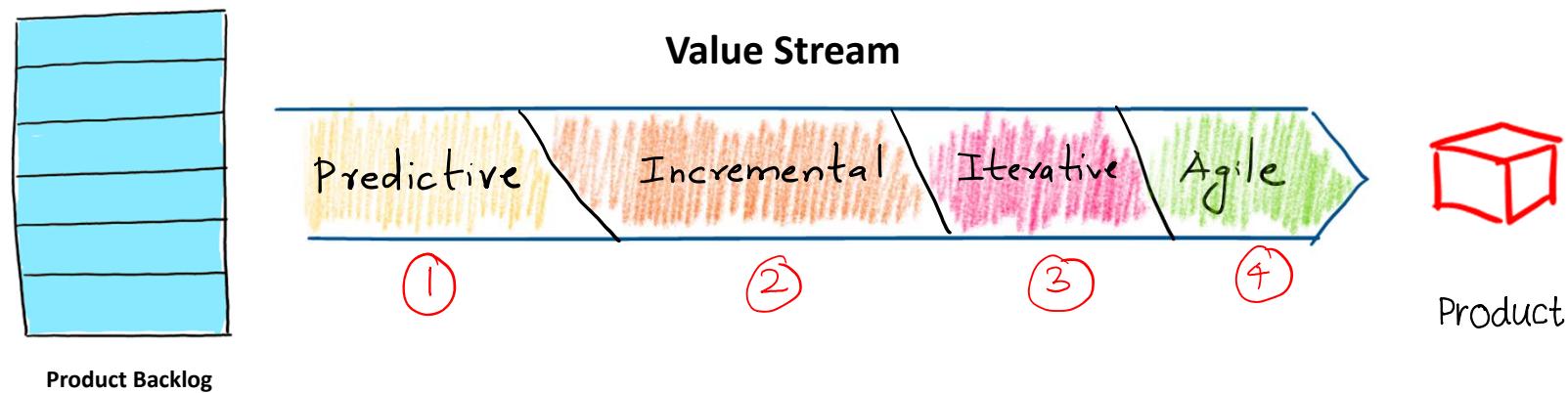


Inventory of User Stories



- User stories are like raw materials in the technology work stream.
- The list of user stories represents the inventory of raw materials.
- The product backlog is the stack of user stories.
- Each user story is represented as a rack in the product backlog.
- User stories in the backlog are waiting to be processed.
- The product backlog is also referred to as a team backlog.
- The backlog is prioritized to determine which user stories the development team will work on.
- The product backlog represents a list of user stories identified for implementation.

# Project Lifecycles



- There are four main categories of project lifecycles: predictive, incremental, iterative, and agile.
- Each lifecycle has its own advantages and disadvantages.
- The choice of lifecycle depends on the needs of the project.
- Project lifecycles determine how user stories flow through the value stream and become an end product.

# Predictive Lifecycle

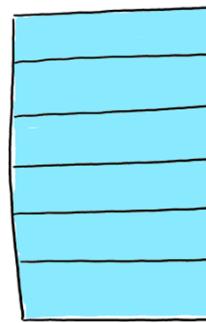


Concept

## Value Stream



Product

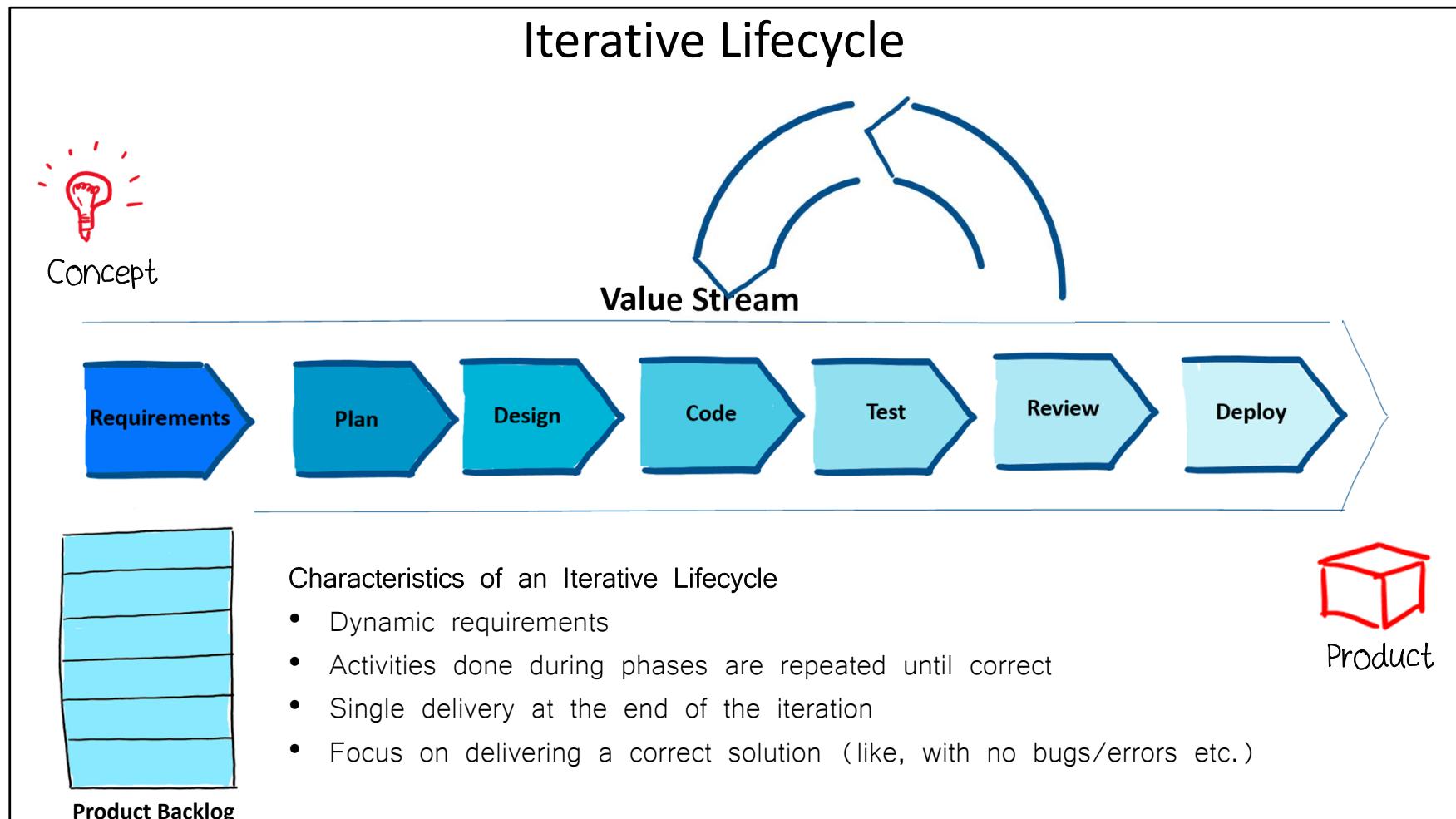


Product Backlog

### Characteristics of a Predictive Lifecycle

- Fixed requirements
- Sequential phases that are performed once
- Single delivery at the end of the project
- Focus on delivering on time and within budget for that fixed scope

- Predictive lifecycles begin with capturing all the project requirements.
- The requirements gathering effort involves collaboration between business stakeholders and the project team.
- The requirements form the basis for project plans and execution.
- Handoffs between teams occur at each phase of the lifecycle.
- Predictive lifecycles have fixed requirements and sequential phases.
- They result in a single delivery of the end product.
- Predictive lifecycles are suitable for projects with fixed scope and well-defined procedures.
- They focus on delivering projects on time and within budget.
- For software projects, requirements are captured early, followed by design, development, testing, and deployment.
- Predictive lifecycles work best for simple projects with known requirements and low risk.



- Iteration is essential for Agile and distinguishes it from other approaches.
- In the technology value stream, user stories flow through various steps to become a working product.
- Traditional approaches work for simple projects with fixed scope, but not for high uncertainty projects.
- Code is not like physical inventory; it requires continuous feedback and improvement.
- The technology value stream involves reviewing, assessing, testing, and improving code.
- This feedback loop is called iteration and can go back to any phase in the value stream.
- Iterative lifecycles are suited for projects with changing requirements.
- All activities are repeated until they meet the customer's needs.
- Iterative lifecycles result in single deliveries at the end of each iteration.
- The focus is on delivering a correct solution without bugs or errors according to customer expectations.

# Incremental Lifecycle

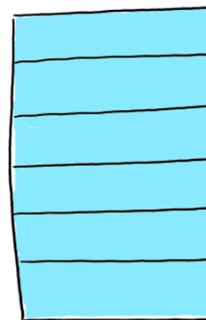


Concept

## Value Stream



Product

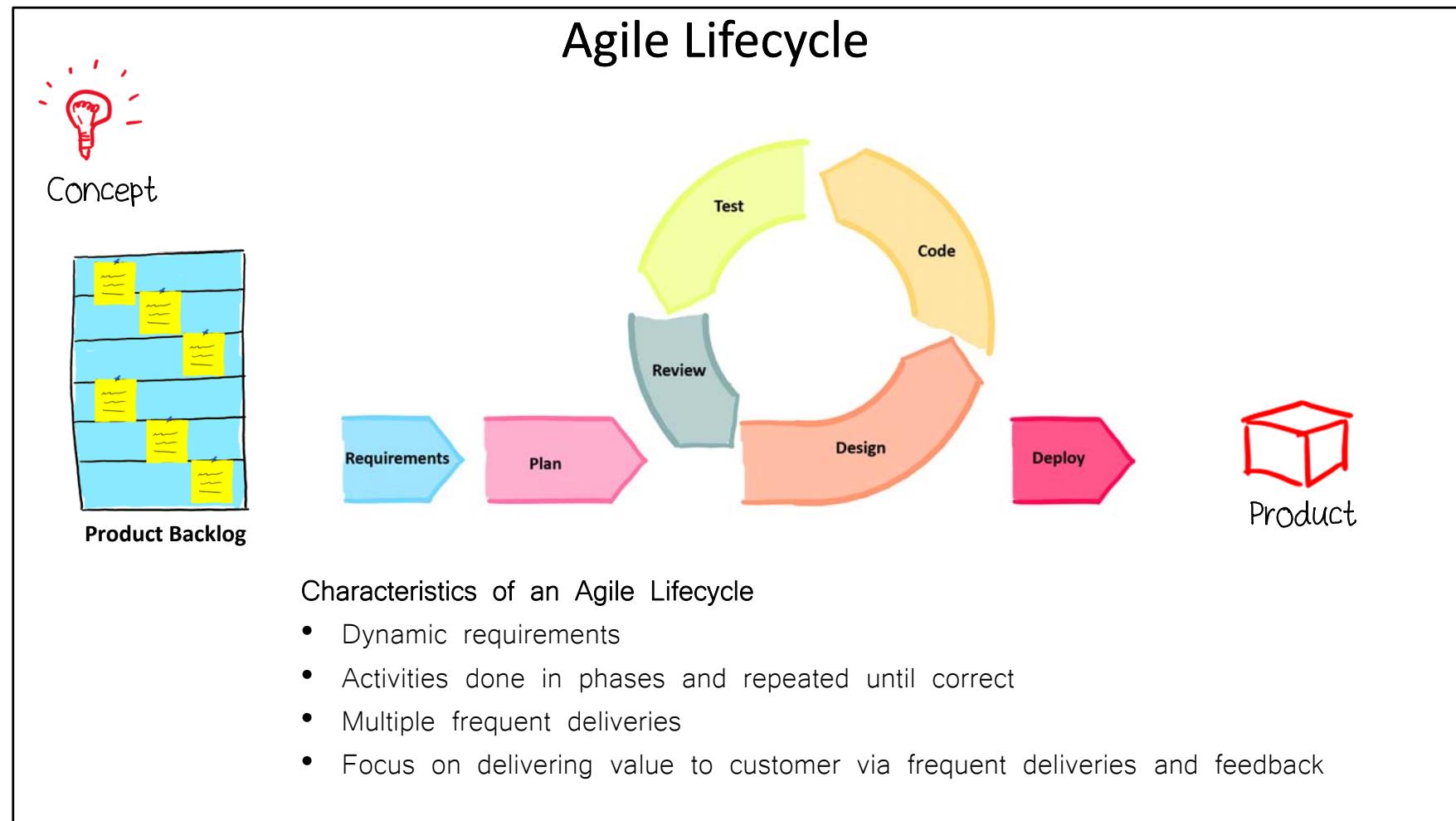


Product Backlog

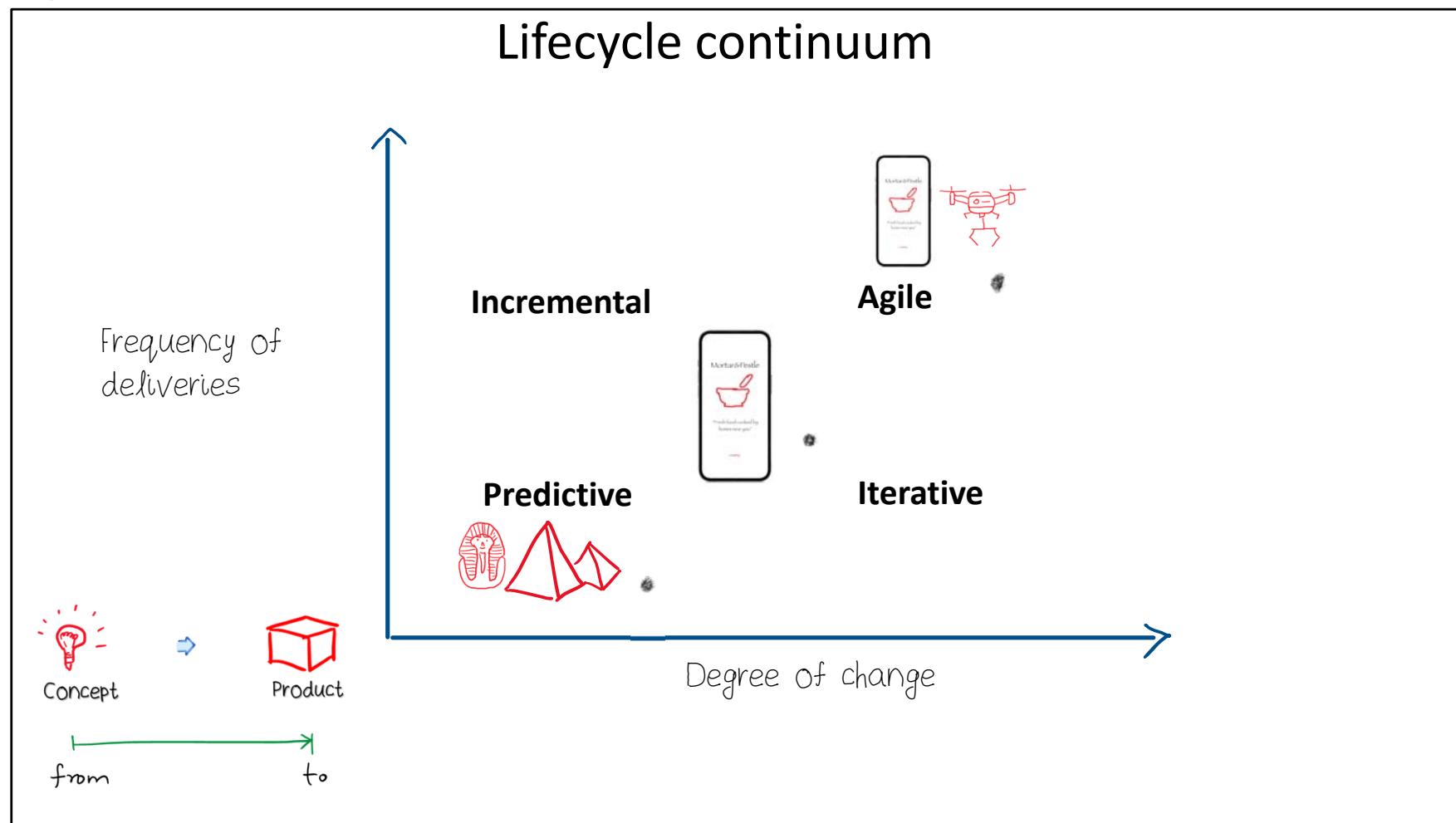
### Characteristics of an Incremental Lifecycle

- Dynamic requirements
- Activities done in sequential phases performed once for an increment
- Multiple deliveries for an increment
- Focus on delivering with speed

- The incremental approach involves prioritizing and delivering a portion of highly prioritized requirements.
- Only selected user stories are sent through the value stream to create a quick working product.
- The customer receives an early version of the product for immediate use and testing.
- Additional sets of user stories are taken up to create subsequent increments of the product.
- The incremental approach is suitable for dynamically changing requirements.
- Activities in each phase of the value stream are performed once for each increment.
- Multiple deliveries may occur within a single increment based on customer needs.
- The focus of the incremental lifecycle is on delivering with speed rather than a perfect product.

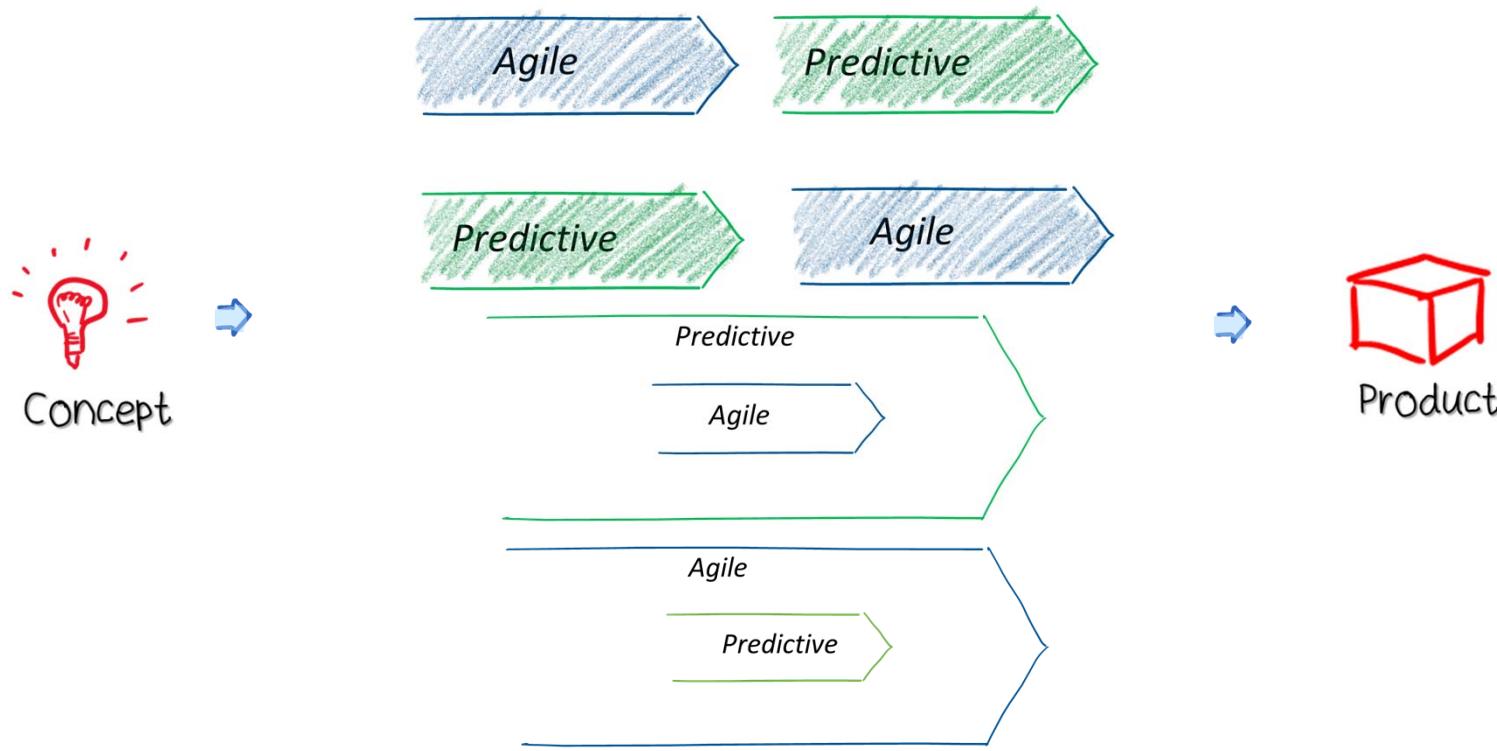


- The Agile lifecycle combines both iterative and incremental lifecycles, and it aims to deliver a superior product in the fastest possible time.
- There are two types of Agile lifecycles: iteration-based and flow-based.
- In the iteration-based Agile lifecycle, important features are prioritized and completed within fixed time boxes.
- Time boxes are agreed-upon periods during which teams work on a specific set of prioritized user stories.
- The team stops work when the time box ends and evaluates progress.
- The team iterates as necessary to deliver fully functioning features. Once features are delivered, a new set is prioritized and goes through the value stream.
- In the flow-based Agile lifecycle, work in progress (WIP) limits are set for each phase.
- Teams work based on their capacity and not solely based on the product backlog.
- User stories flow through each phase, with limited WIP at each stage.
- The focus is on delivering a better product with minimal issues.
- The process continues for the remaining user stories in the product backlog.



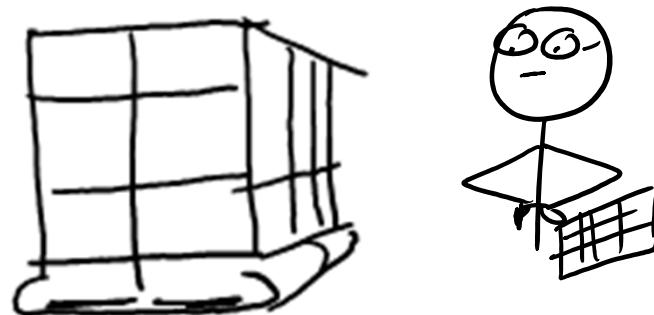
- The choice of the life cycle approach depends on the degree of change and the frequency of deliveries.
- The degree of change refers to how much the requirements and customer needs will change during the project, as well as the speed of technological change.
- The frequency of deliveries refers to how often the project can deliver to the customer.
- Projects with a low degree of change and a single delivery at the end typically follow a predictive life cycle.
- Examples include building structures like skyscrapers or simple websites.
- Adaptive life cycles, such as the incremental and iterative lifecycles, are suitable for projects with a moderate to high degree of change and potential for multiple deliveries.
- Agile lifecycles are used for projects with a high degree of change and frequent deliveries throughout the project.
- The choice of life cycle can be plotted on a continuum based on the degree of change and frequency of deliveries.
- Projects may transition between different life cycles based on changing needs.
- Hybrid life cycles can be formed by combining elements from different life cycles to meet project requirements.

# Hybrid Lifecycles



- Hybrid lifecycles involve combining multiple approaches to lifecycle planning for a project.
- The continuum of life cycles allows projects to transition from one type of lifecycle to another.
- Hybrid lifecycles offer flexibility and can be used to optimize the delivery of value.
- Examples of hybrid lifecycles include starting with an Agile approach and transitioning to a predictive approach for regulatory approvals.
- Another example is starting with a predictive approach for initial approvals and then switching to an Agile approach for product development.
- The choice of hybrid lifecycles depends on the project's scope and nature of work.
- Project managers can decide on the best combination of hybrid lifecycles based on project requirements.
- Hybrid lifecycles can involve predominantly predictive or Agile approaches with portions of scope executed using the other approach.
- The goal of hybrid lifecycles is to optimize the delivery of value from the concept phase to the creation of a working product.
- Project managers have various tools and techniques at their disposal to implement the hybrid lifecycles.

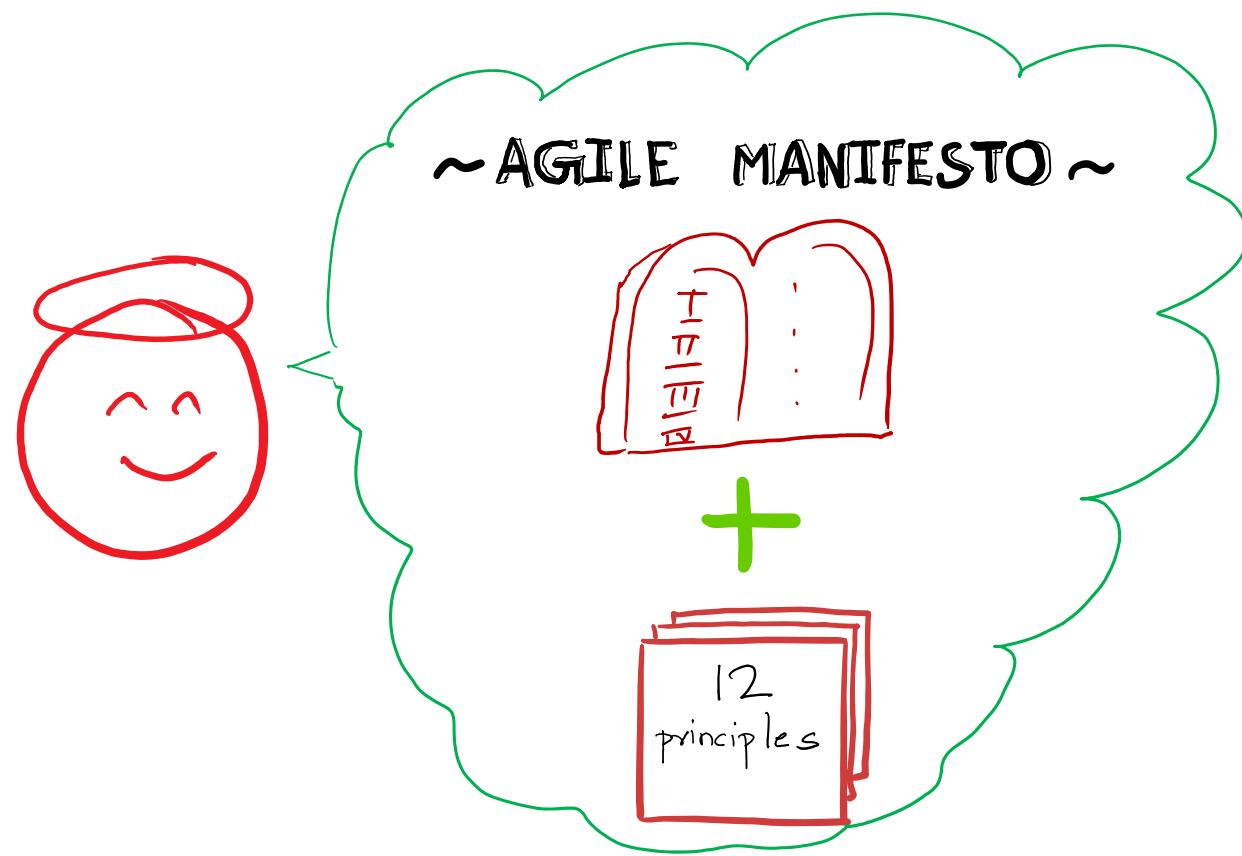
# Product Owner



Inventory of raw materials

- The product backlog is an inventory of user stories and is an important asset in software development.
- The product owner is responsible for owning and managing the product backlog.
- The product owner controls what goes into and out of the product backlog and prioritizes user stories.
- The product owner is accountable for the business value associated with each user story and determines their relative size.
- The role of the product owner is critical in Agile projects as the product backlog is the starting point for generating value.
- The product owner interacts with stakeholders to understand requirements and translate them into user stories.
- The product owner collaborates with the team, including architects and engineers, to elaborate on functional and non-functional requirements.
- Non-functional requirements, such as security needs, are also part of the product backlog.
- The product owner ensures proper understanding, sizing, and conversion of requirements into a working product.
- The product owner minimizes waste and avoids scope creep to deliver a successful product with high business value.

## Agile Mindset



- Agile mindset is based on the values described in the Agile Manifesto and the 12 principles of Agile.
- An Agile team internalizes and embraces the four values of the Agile Manifesto.
- Agile teams prefer the values on the left of the Agile Manifesto and strive to embody them.
- Agile teams work with iterative development and collaboration between self-organizing cross-functional teams.
- Agile methods promote disciplined project management processes, frequent inspection, and adaptation.
- Agile methods emphasize teamwork, self-organization, and accountability.
- Having an Agile mindset involves practices that enable rapid delivery of high-quality software aligned with customer needs and company goals.
- Agile mindset enables direct action, quick reaction, and adaptability on the project.
- Agile teams aim for maximum adaptability and flexibility.

# SERVANT LEADERSHIP

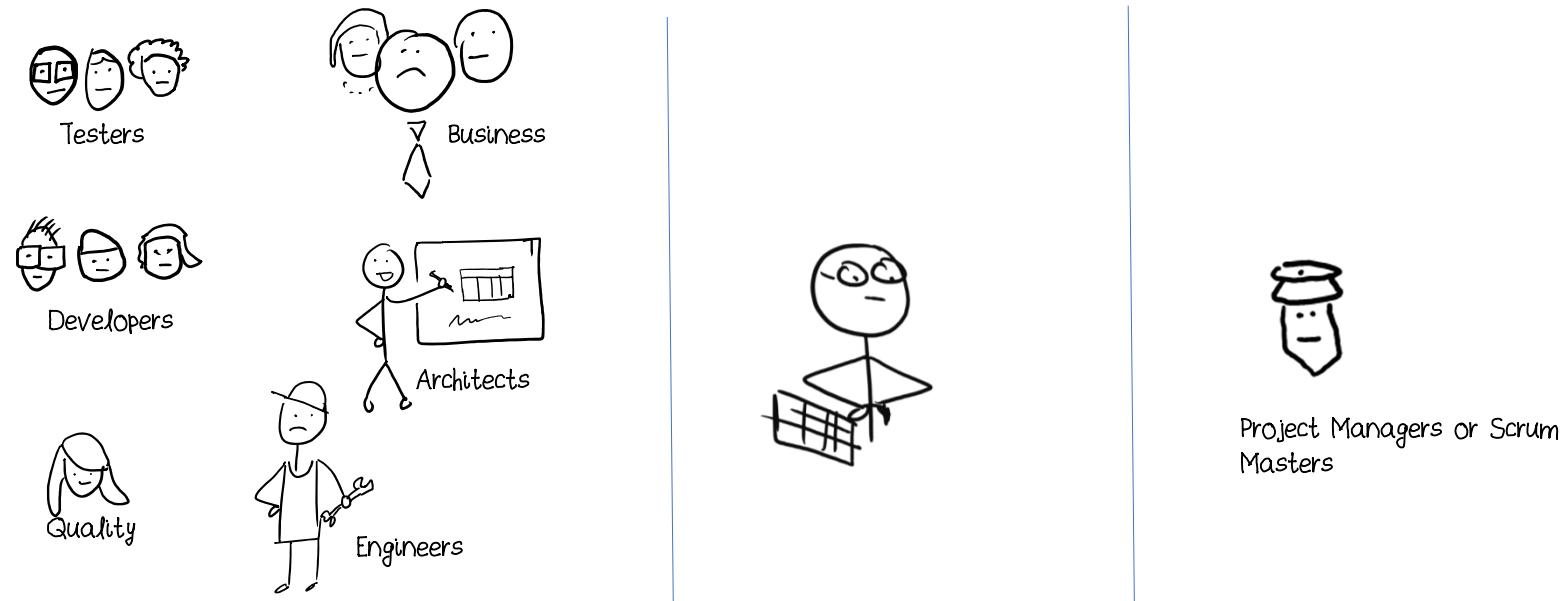
## *Characteristics*



- Remove obstacles that make it hard for employees do their best
- Provide the information, technology, resources, and support for team to do great work
- Ask "how can I help you?", or "what can I do to help you be successful"
- Find opportunities to develop people's skills
- Have a clear vision of future

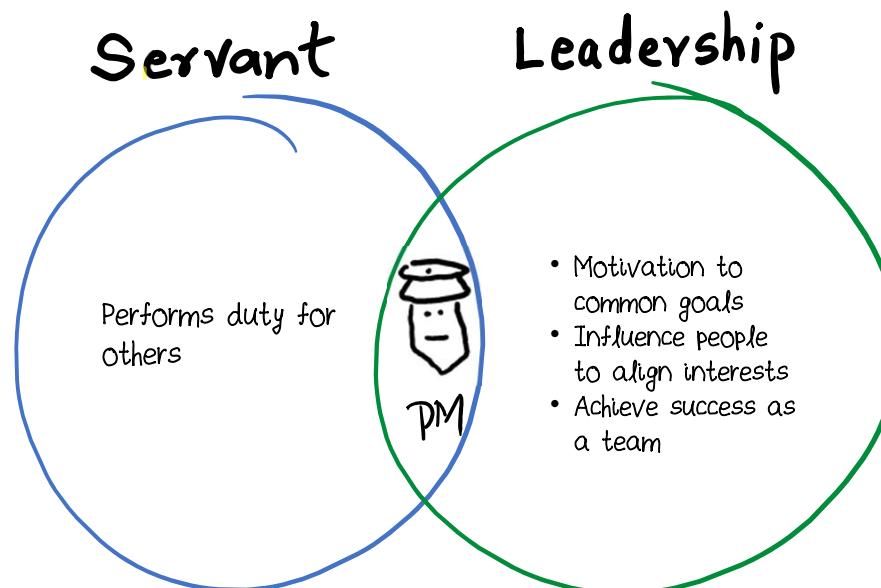
- Agile mindset includes the concept of serving others, even in leadership positions.
- Servant leadership involves working with a purpose and serving to uplift the team.
- The role of a servant leader is to help the team joyfully achieve their goals.
- Success as a servant leader is measured by the team's success.
- Servant leaders focus on others and selflessly put the spotlight on them.
- Servant leaders remove obstacles that hinder the team's work.
- They provide information, technology, resources, and support to enable great work.
- Servant leaders ask how they can help and support team members.
- They identify opportunities to develop people's skills and lead with emotional intelligence.
- Servant leaders have a clear vision of the future and execute projects to deliver value to customers.

# Agile Team

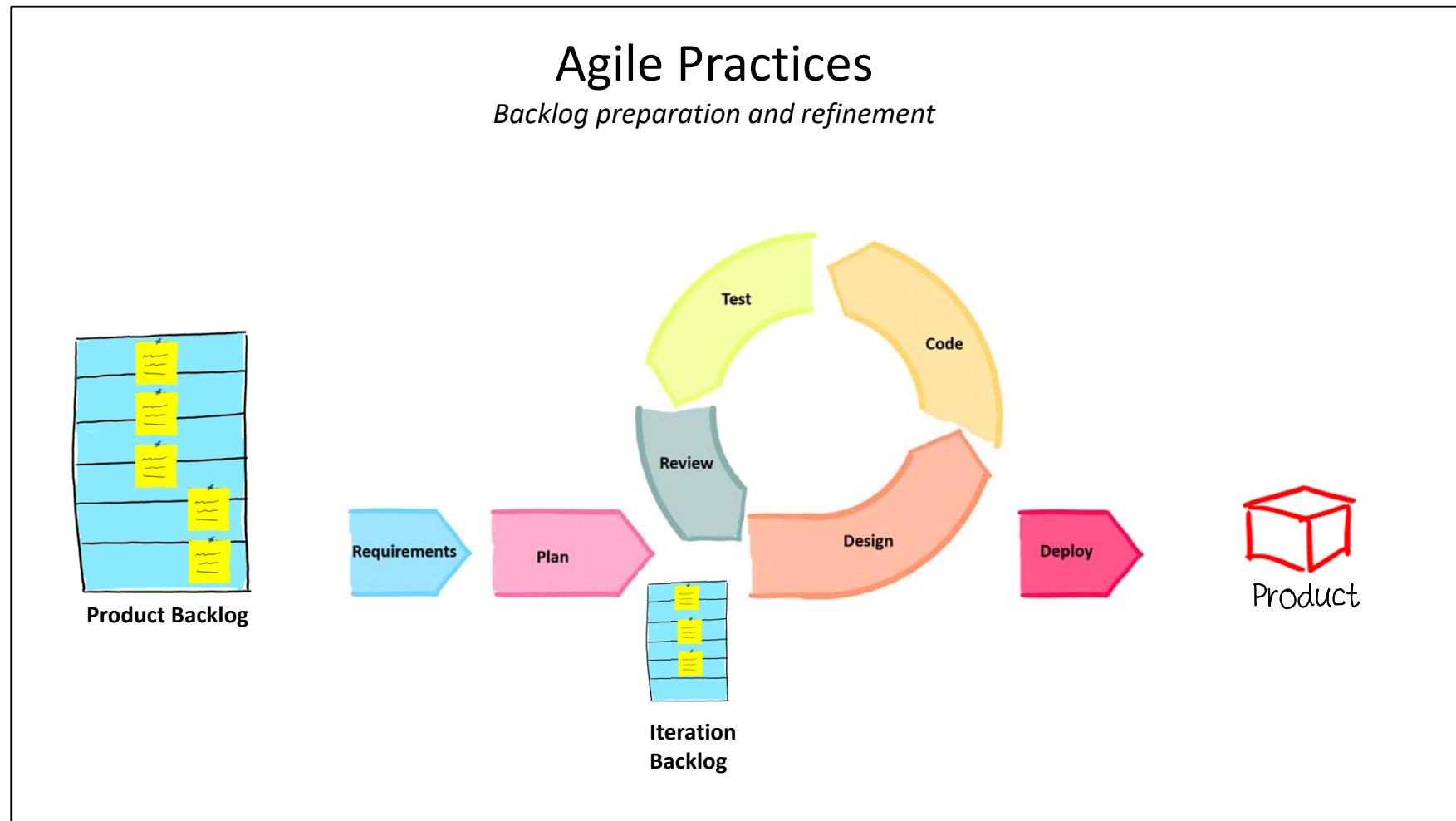


- User stories are inanimate pieces of information without the people who understand and convert them into working code.
- Testers are central to delivering value in an Agile team as testing software is integral to the process.
- An Agile team consists of three distinct roles: product owner, cross-functional team members, and a team facilitator.
- The product owner determines and prioritizes user requirements and maintains the product backlog.
- Cross-functional team members include developers, testers, designers, architects, business analysts, and functional experts.
- They work together to define, build, test, and deliver user stories as a working product.
- The team facilitator, also known as a project manager, scrum master, or team leader, serves as a servant leader.
- The facilitator assists the team, promotes collaboration, and maximizes team performance.

# Role of a Project Manager

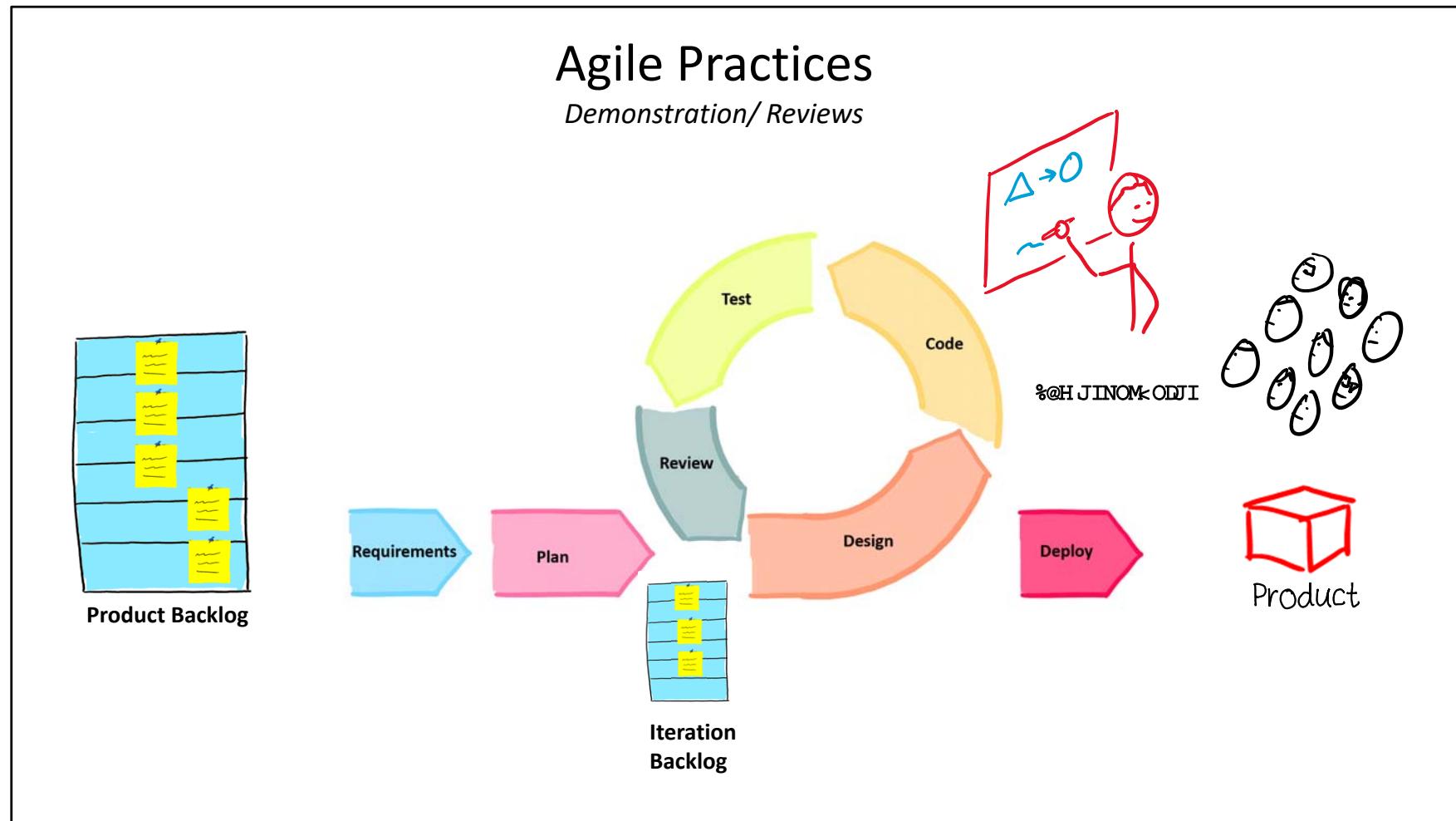


- Project managers in Agile function as team facilitators with a distinct role from traditional project management.
- Humility is an important trait for Agile project managers, promoting servant leadership.
- In Agile, cross-functional teams are self-organized and reorganize based on the product backlog.
- Agile teams are typically co-located, consisting of 5 to 7 members, including the product owner and team facilitator.
- Agile teams are 100% dedicated to the project and do not multitask to maintain focus and productivity.
- Agile teams are transparent and visible, with their work being trustworthy and reliable.



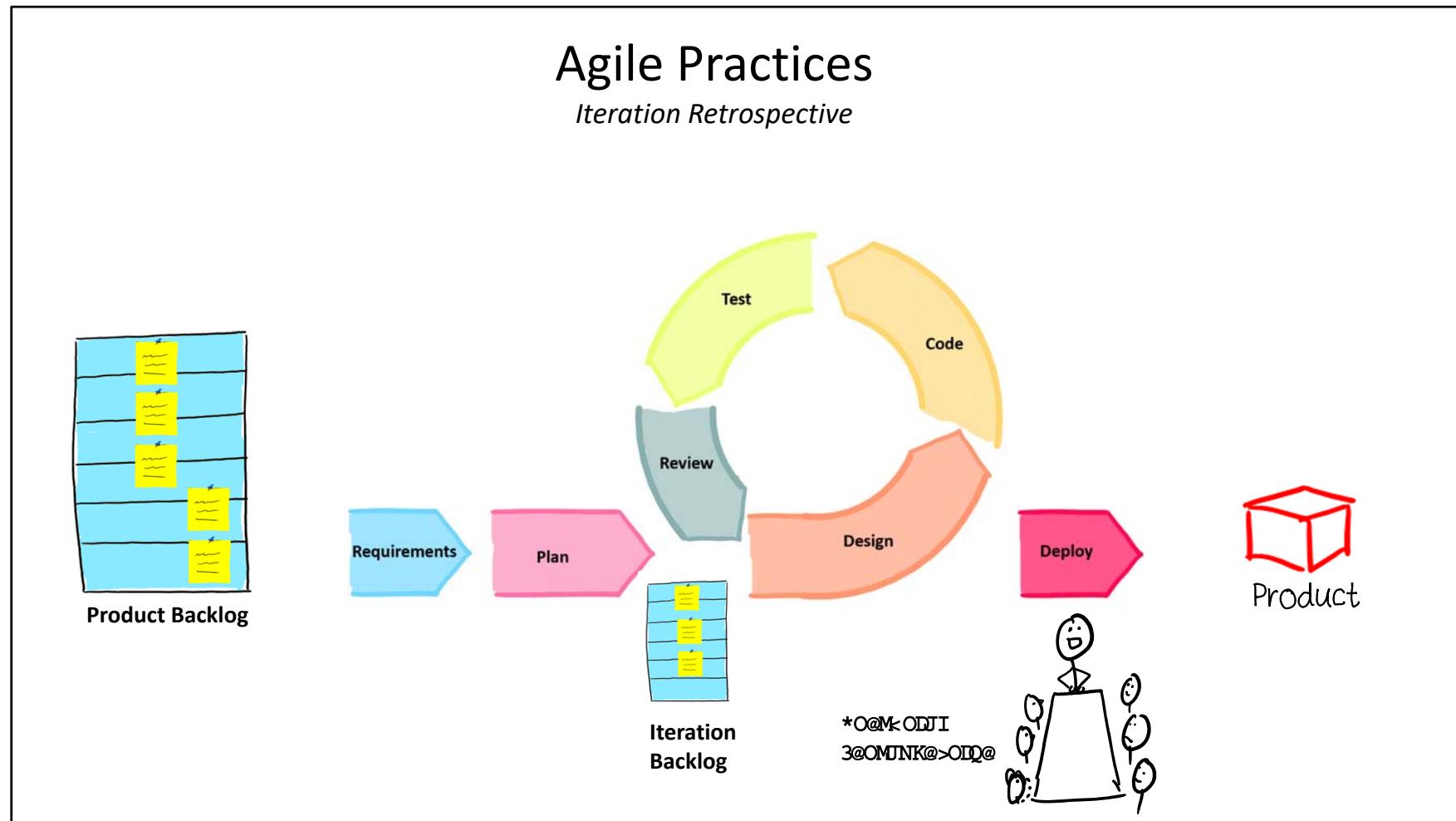
- Iteration is the core of Agile, building a working product within a fixed time box.
- Each iteration aims to deliver value to the customer by building an increment of the product.
- Iterations consist of distinct phases of work, marked by different stages.

- Agile teams follow practices and rituals during these phases of work.
- The product backlog is a list of requirements moderated by the product owner, serving as the team backlog.
- The product backlog needs to be prioritized due to limited team resources.
- Iteration planning involves reviewing user stories, estimating work, assigning priorities, and negotiating scope.
- Backlog preparation and refinement ensure the work is ready for the upcoming iteration.
- The development team commits to delivering a tangible scope within the iteration's duration.
- Planning and refinement occur at the beginning of each iteration and are critical in Agile.
- The result is the iteration backlog, containing the prioritized user stories committed to for the iteration.
- The stories in the iteration backlog are designed, coded, tested, reviewed, and demonstrated as working features before becoming the final product.



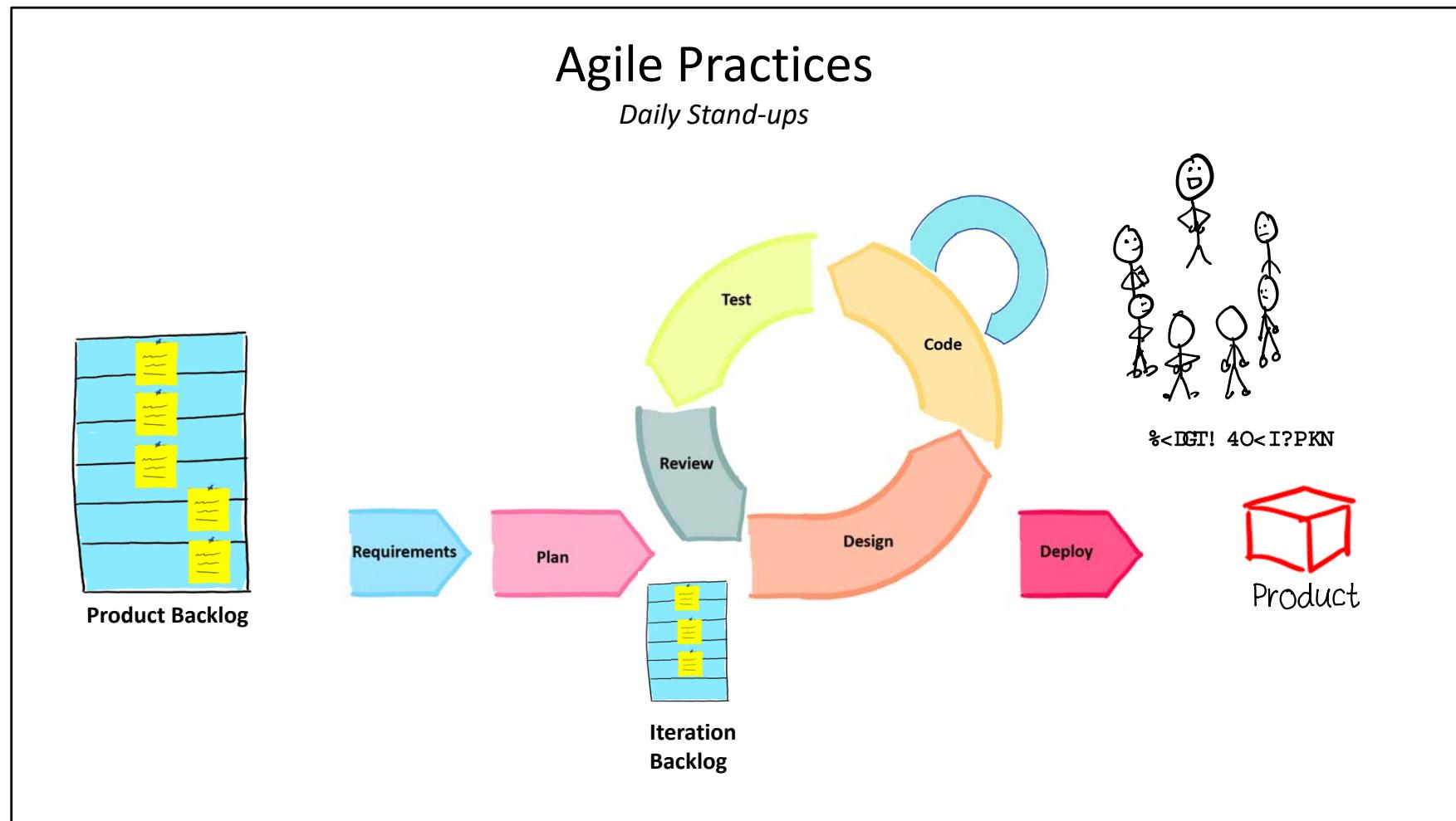
- Before releasing features as a working product, the team follows the practice of demonstrating the built features.
- The team presents the demo to the product owner and other stakeholders to confirm if the features meet their expectations.

- The demo allows for immediate and constant feedback on the usefulness and correctness of the features.
- This feedback helps in course correcting the product lifecycle.
- Any necessary changes to the feature set become updated user stories for the next iteration.
- Frequent demos throughout the Agile lifecycle provide the benefit of incorporating feedback and making necessary adjustments.



- After the demonstration, the team conducts an iteration retrospective before the end of every iteration.
- The goal of the retrospective is to identify lessons learned from the previous iteration and use them to adapt and improve.

- The retrospective is led by the team facilitator, such as the Scrum Master or project manager.
- It is a time-boxed meeting lasting around 30 to 40 minutes.
- The retrospective provides an opportunity for the team to reflect on the previous work and learn from it.
- Questions about what went well, what didn't go well, and how to improve in the next iteration are discussed during the retrospective meeting.

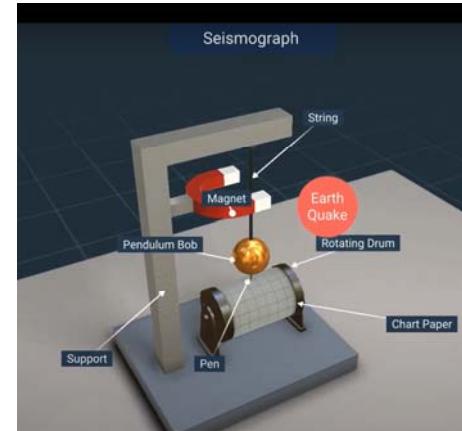


- The daily standups are quick 15-minute meetings that happen daily in agile teams.
- All team members, typically 5 to 7 people, participate in the standups.
- The purpose is to provide quick updates on the progress of work and facilitate communication and collaboration.

- The meeting is conducted while standing up, hence the name "Daily Standups."
- The Kanban board is often used during the standups to discuss progress and visualize the project's status.
- The board shows the stage of user stories, backlog status, and identifies bottlenecks.
- The meeting is fast-paced and lasts for 15 minutes.
- After the standup, team members return to their work with a clear focus on their tasks for the day.

# Minimum Viable Product (MVP)

## *Earthquake Detection Kit*



Minimum  
Viable  
Product (MVP)

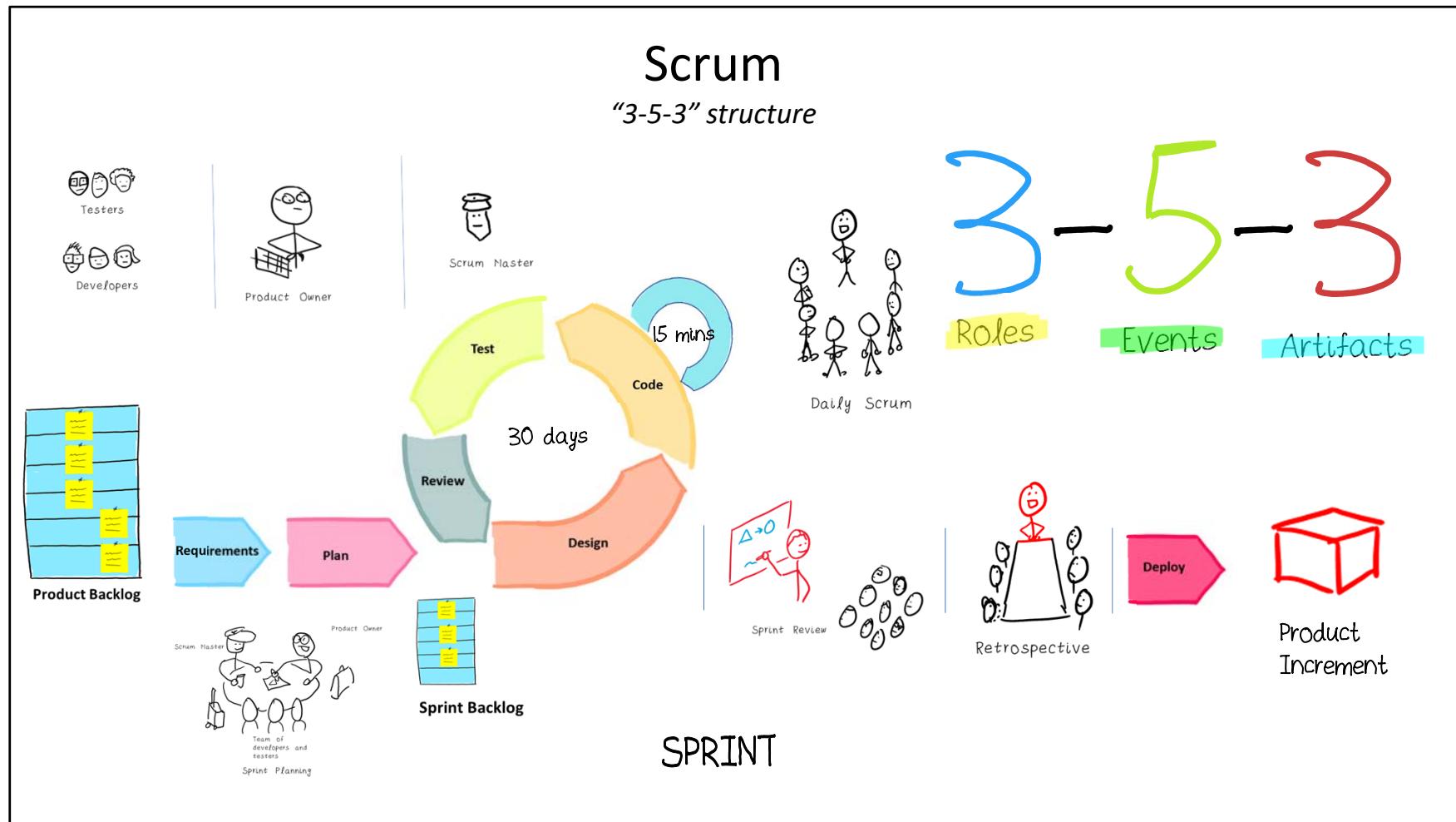
Minimum  
Marketable  
Product (MMP)

Final product  
(a Seismograph)

- Minimum Viable Product (MVP) is a term used in product development.
- It represents an early version of a product that demonstrates the core value proposition.
- MVP allows the team to validate the product idea, learn quickly, and improve through

iterations.

- It is a low-cost version that may not be of high quality or usability.
- Minimum Marketable Product (MMP) is a version closer to the final product that can be marketed and sold.
- MMP has higher quality and usability compared to MVP.
- MMP is sometimes referred to as a Potentially Shippable Increment (PSI).
- MVP provides a concept validation, while MMP delivers tangible value to the customer.

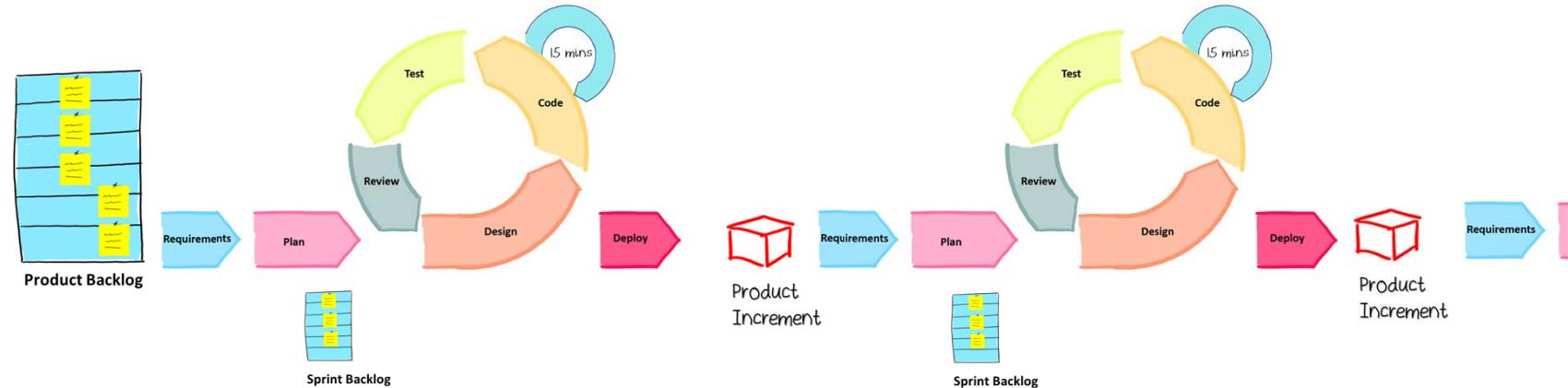


- Scrum is a popular Agile project management framework known for its lightweight approach.
- It helps teams and organizations respond to complexity and adapt to unpredictable changes.

- Scrum consists of three fixed roles: Product Owner, Scrum Master, and Scrum Team.
- The Product Owner represents the customer and has a vision for the product.
- The Scrum Master coaches the team and facilitates their work, removing any obstacles.
- The Scrum Team is responsible for building the product, typically consisting of developers and testers.
- Scrum includes five events: Sprint, Sprint Planning, Sprint Review, Retrospective, and Daily Scrum.
- The Sprint is a time-boxed iteration where work is completed.
- Sprint Planning defines the scope for the Sprint and creates the Sprint backlog.
- Sprint Review involves demonstrating the product to stakeholders and obtaining feedback.
- Retrospective focuses on learning from the previous Sprint to improve in the next one.
- Daily Scrum, or Daily Standup, is a short meeting for the team to discuss progress and daily activities.

- Scrum utilizes three artifacts: Product Backlog, Sprint Backlog, and Product Increment.
- Product Backlog contains all the work to be done, including functional and non-functional requirements.
- Sprint Backlog is a refined version of the Product Backlog, containing committed user stories for the Sprint.
- Product Increment is a pre-version of the final product resulting from implementing user stories in the Sprint.
- The Scrum Board, often a Kanban board, visually represents the progress of the Sprint and user stories.
- Scrum provides a simple and effective framework for executing Agile projects.

## Definition-of-Done



The "definition of done" is a set of acceptance criteria that a user story or feature must meet before it is considered complete.

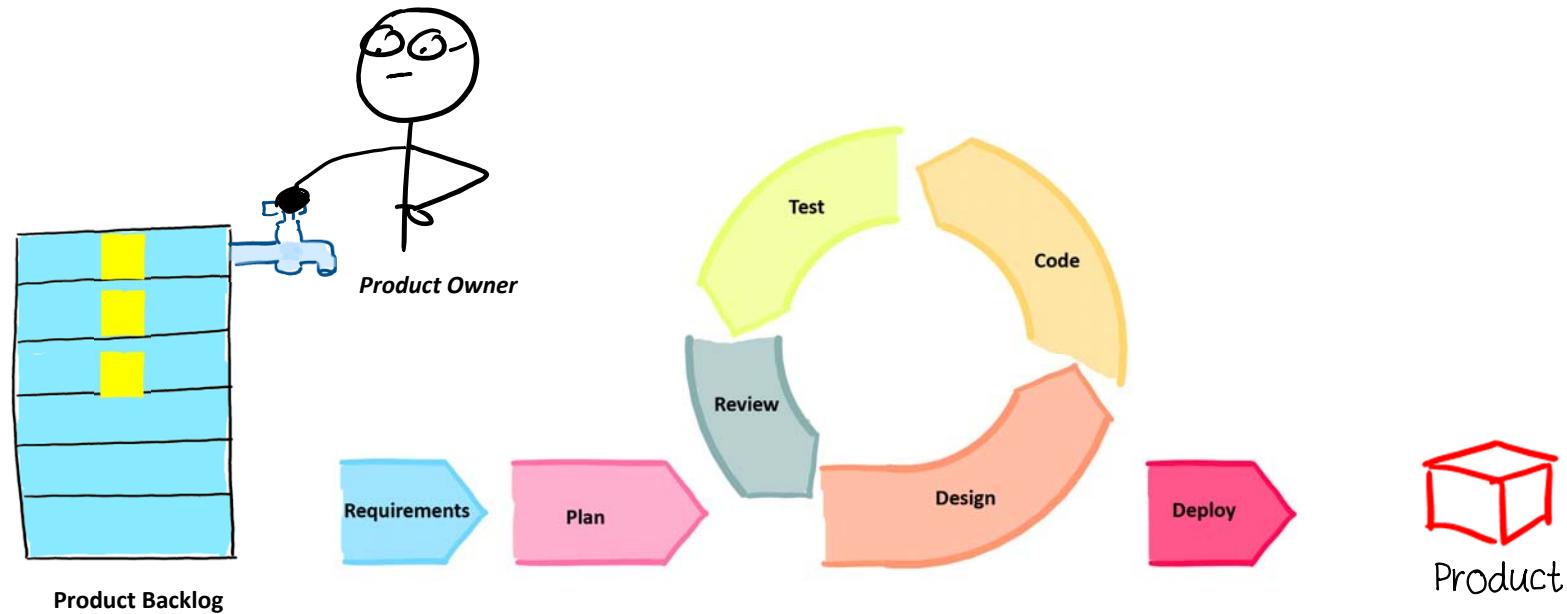
The definition of done should be specific and measurable, and may include criteria such as:

- All required functionality has been implemented and tested
- All code has been reviewed and meets the team's standards for quality
- All necessary documentation has been completed
- The product increment has been demonstrated to the customer and any necessary feedback has been incorporated

- The Definition of Done (DoD) is a set of acceptance criteria that defines when work is considered complete in Agile projects.
- It ensures that the team delivers high-quality shippable increments of work at the end of each iteration.

- The DoD consists of specific and measurable criteria that must be met before a user story, feature, or product increment is considered complete.
- The criteria typically include implementing and testing all required functionality, code review and adherence to quality standards, completion of necessary documentation, and demonstration of the product increment to the customer.
- The DoD serves as a reference point for the development team to ensure that the product increment meets required quality standards and is ready for use by the customer.
- Demonstrating the product increment to the customer allows for feedback incorporation and further improvements in subsequent iterations.

## Story Points

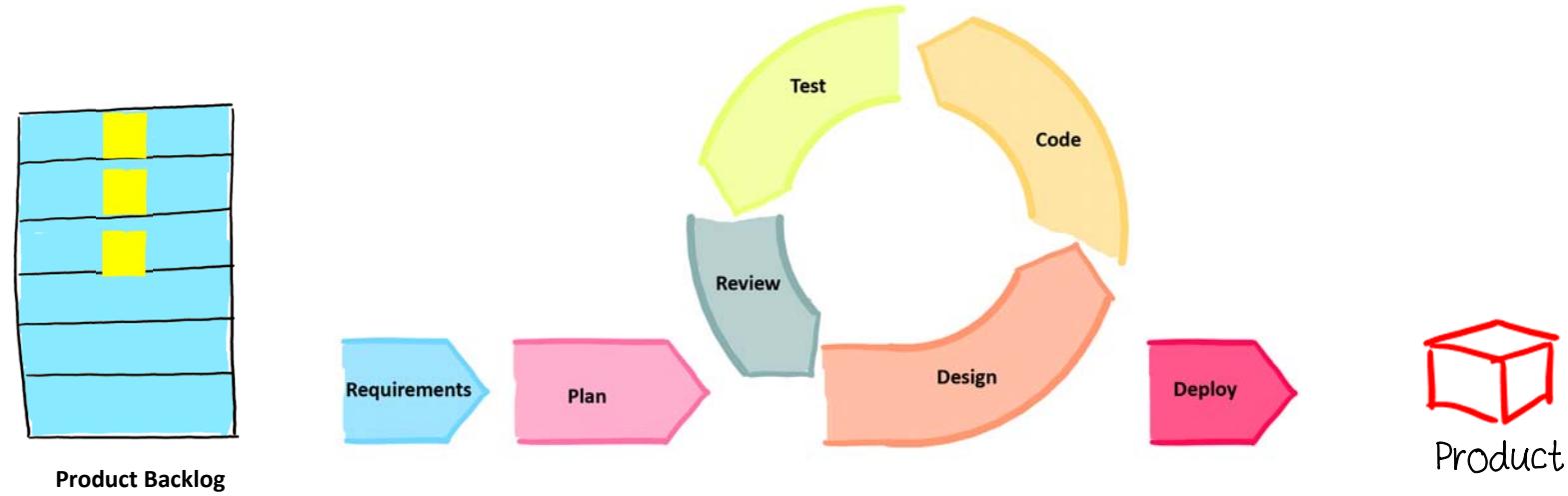


A story point is a unit of measure that is used to estimate the relative size and complexity of a user story or a product backlog item

- Story points are used to estimate the relative size and complexity of user stories or tasks in Agile software development.
- The Fibonacci sequence is commonly used to assign story point values, starting from 1.

- Each user story is compared to a reference story to determine its relative size or complexity.
- Story points are subjective and not a measure of time or effort but provide a common frame of reference for the team.
- Story points help with planning, tracking work, and making informed decisions about iteration scope.
- Planning poker is another method where team members use cards with numbers representing complexity to estimate user stories.

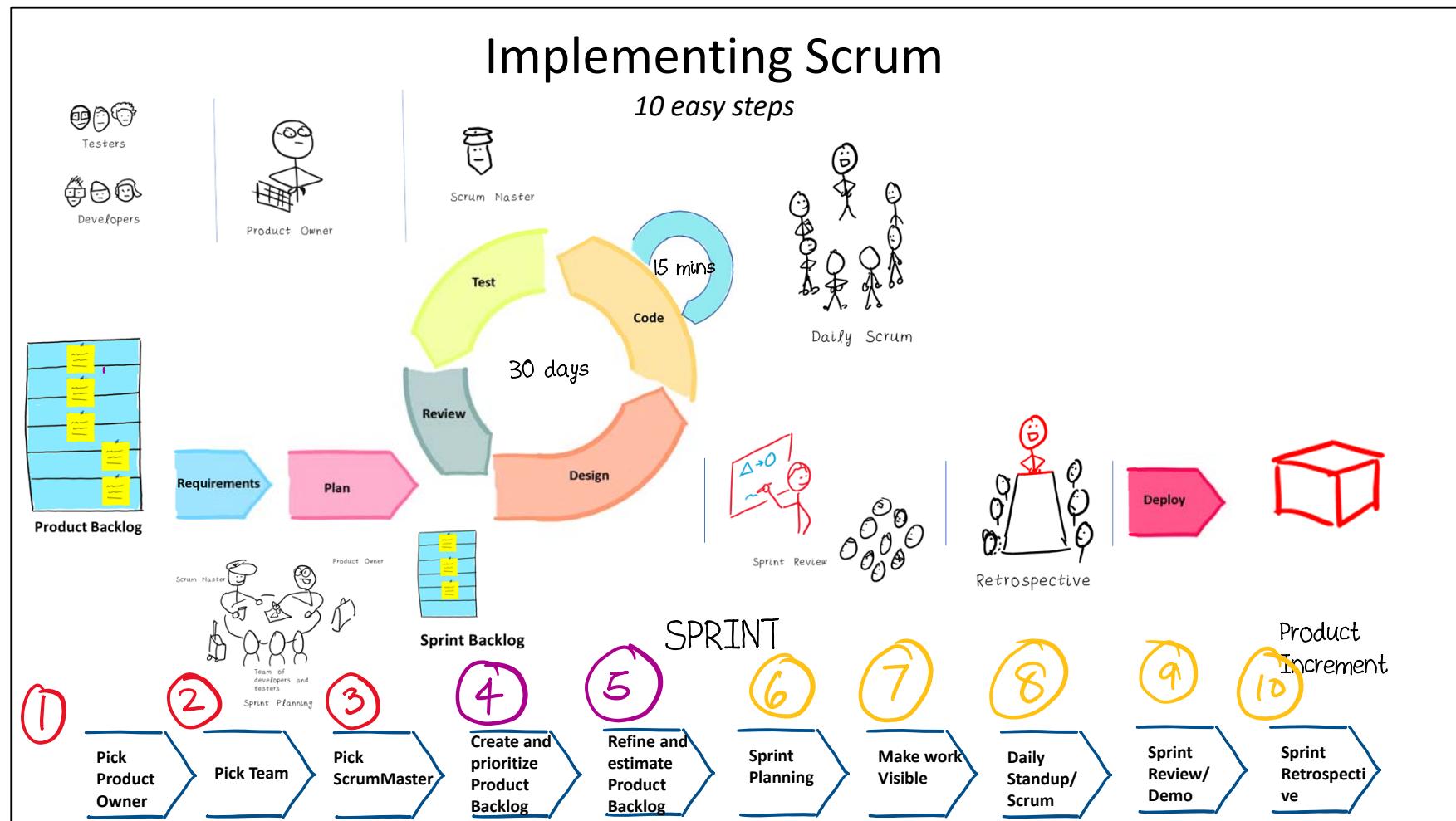
# Velocity



Velocity is measured in terms of the number of story points that a team can complete in each iteration

- Velocity is a measurement used in Agile projects to track progress and determine the team's capacity.
- It is typically measured in terms of the number of story points completed in an iteration.

- Velocity helps the team understand how much work they can realistically take on in future iterations.
- It provides insights into the team's capabilities and can highlight bottlenecks or areas for improvement.
- Velocity is a tool for self-management and not meant to be used as a measure of team performance by management.

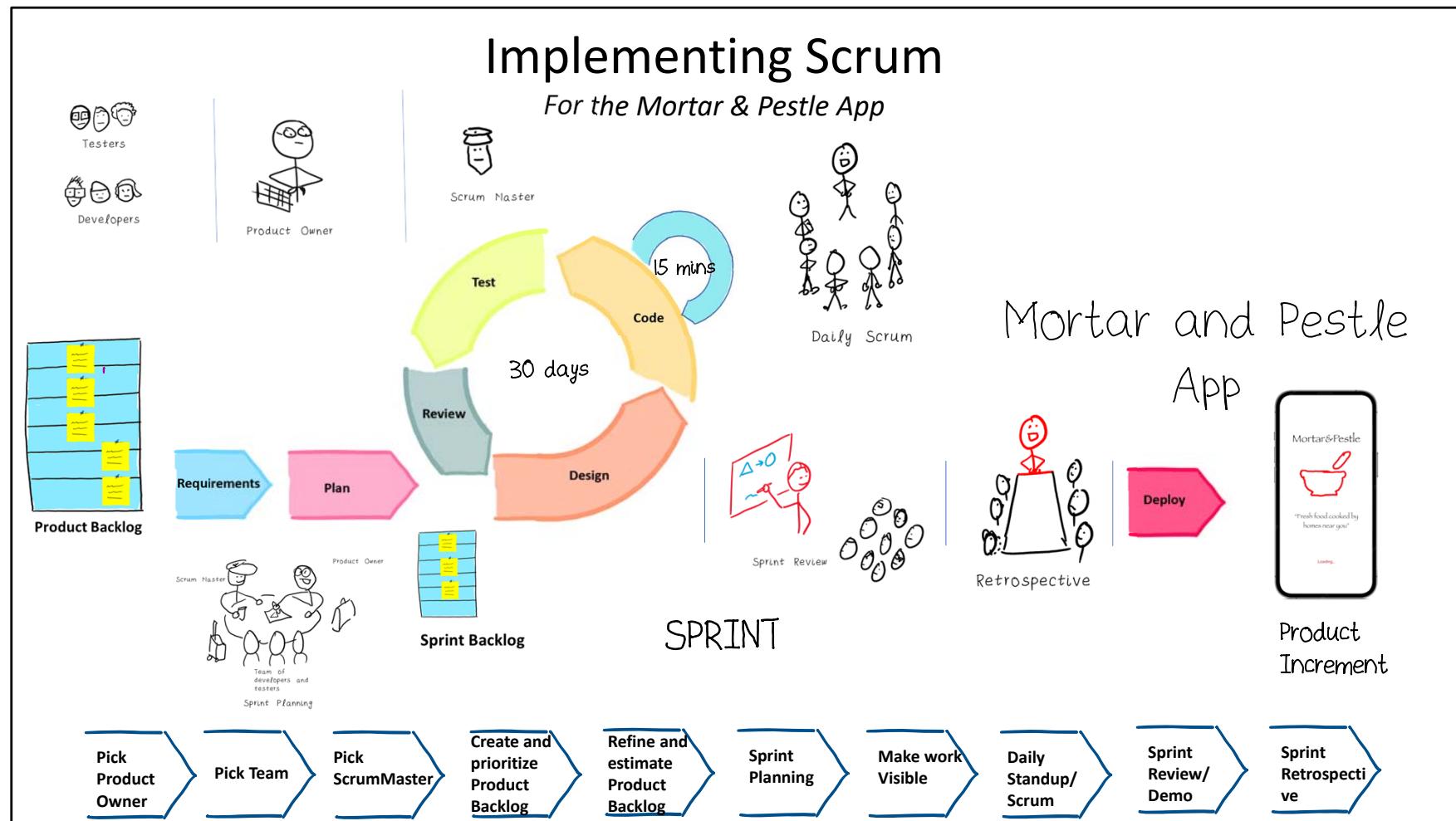


- To get started with Scrum, you need to pick the three important roles: Product Owner, Team, and Scrum Master.
- The Product Owner is a visionary leader who has a clear idea of the project's goals and is responsible for prioritizing and managing the product backlog.

- The Team consists of individuals with the necessary skills to turn the product owner's vision into reality, typically 3 to 9 people.
- The Scrum Master acts as a coach, guiding the team through the Scrum framework and helping overcome obstacles.
- The product backlog is a living document that serves as a to-do list for the product, organized by priority and evolving over time.
- The product owner, with input from stakeholders and the team, makes tough prioritization decisions for the product backlog.
- Refining and estimating the product backlog ensures a clear understanding of effort required and defines the definition of done for each item.
- Sprint planning is where the team, Scrum Master, and product owner come together to plan the upcoming sprint, estimating capacity and setting a sprint goal.
- Making work visible is crucial in Scrum, often achieved through a Scrum board and a burndown chart to track progress.
- The daily standup is a brief meeting where team members answer three questions about their progress and any obstacles they face.
- The sprint review is a showcase of what the team has accomplished during the sprint, open to all stakeholders, where only items meeting the definition

of done are demoed.

- The sprint retrospective is a meeting for the team to reflect on what went well and what can be improved in the next sprint, focusing on process enhancements.
- The team agrees on one process improvement to try in the next sprint and monitors its impact on velocity.
- Following these ten steps helps set up a Scrum team and framework for project success.



- This focuses on implementing the Agile framework using the "Mortar and Pestle" project.
- The Mortar and Pestle app will be built using the Scrum framework, which helps manage and deliver projects effectively.

- The team roles of product owner, Scrum Master, developers, and testers will be introduced and explained.
- Key ceremonies and artifacts of Scrum, such as sprint planning, daily stand-ups, sprint reviews, and retrospectives, will be discussed.
- The goal is to deliver a high-quality software product within a three-month timeframe and a \$1 million budget.
- The Agile approach reduces risks by leveraging existing similar products in the market.
- The lecture will guide participants through the ten steps to create the necessary Scrum framework for the project and future projects.



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