

video 1

Project:

a temporary endeavour undertaken to create a unique product, service, or result
projects end when their objectives have been reached or the project has been terminated

attributes:

- Unique purpose
- Temporary: definite start & end date
- Developed using progressive elaboration
- Require resources often from various areas
- Should have a primary customer or sponsor
- Involves uncertainty

operations:

work done to sustain the business

project VS operations:

project:

- a temporary group activity with a start and end date
- produces a unique product, service or result
- projects have a fixed budget

operations:

- ongoing execution of activities
- produce the same output repeatedly or provide a repetitive service
- operations have to earn profit- it is work done to sustain a business

IT project

- planned beginning & planned deadline
- defined outcome and key deliverables
- evaluated as to time, cost, scope, quality assurance and are fit for purpose it is intended
- budget
- team of skilled specialist people

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Project management:

The application of knowledge, skills, tools & techniques to project activities to meet project requirements

Stakeholders:

A person or an organisation who has a “stake” or an interest in the performance or outcome of the project

- project sponsor: direction & funding
 - senior management role in the organisation
 - might also champion/advocate for the project
 - committed project sponsor critical to success
 - establish a good relationship and communication with project manager for:
 - objective setting & upfront planning
 - key staffing
 - policies & priority setting
 - monitoring & execution
 - conflict resolution
- project manager
- project team
 - teamwork
 - communication
 - commitment
 - efficiency in executing project goals & objective
 - correctly mapping tasks to individual team members’ competencies
- support staff
- customers
- suppliers
- opponents to the project

“Super tools”: tools that have high use and high potential for improving project success

- software for task scheduling
- scope statements
- requirements analyses

- lessons-learned reports

Tools already extensively used that have been found to improve project importance:

- progress reports
- kick-off meetings
- Gantt charts
- change requests

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Program:

A group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually

Program manager: provide leadership & direction for project managers

Project portfolio management:

Organisations group and manage projects and programs as a portfolio of investments that contribute to the entire enterprise's success

Portfolio managers:

make wise investment decisions

project portfolio management VS project management:

portfolio: strategic goals

- on the right project?
- in the right areas?
- have the right resources to be competitive?

Project management: tactic goals

- carry out project well?
- on time on budget?
- Stakeholders know what they should do?

Project success:

- Met scope, time & cost goals
- Satisfied the customer/sponsor
- Met main objective

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Project manager role

The person responsible for working with project sponsor, project team & other people involved to meet project goals

- Hold project kickoff meeting
- Lay out the project targets, plan & workflow
- Negotiate for resources
- Establish the project's policies & procedures
- Obtain funds
- Execute the plan
- Encourage the team to focus on deadlines
- Evaluate the performance
- Brief project sponsor
- Manage costs-procurement
- Brief team
- Brief customer
- Close out the project

Project managers take role of both leader & manager

Leader: long-term goals & big-picture objectives

Manager: day-to-day details of meeting specific goals

Project management office (PMO):

Organisational group responsible for coordinating the project management function throughout an organisation

Key factors in growth of PMOs:

- Growing strategic value of PMO
- Increased role of PMO in training
- Ever-present challenge of resource management

Project management institute (PMI):

International professional society for project managers founded in 1969

Provide certification as a project management professional (PMP)

Ethics:

A set of principles that guide decision making based on personal values of what is “right” and “wrong”

PMP certification: must agree to PMI’s Code of Ethics and Professional Conduct

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systems thinking:

take a holistic view of carrying out projects within the context of the organisation

systems approach: more analytical approach to management and problem solving

- Systems philosophy: an overall model for thinking about things as systems
- Systems analysis: problem-solving approach
- Systems management: address business, technological and organisational issues before making changes to systems

Organisation frames:

- Structural frame:
 - Roles & responsibilities, coordination & control
 - Organisational charts
- Human resources frame:
 - Harmony between needs of the organisation and needs of people
- Political frame:
 - Coalition composed of varied individuals & interest groups
 - Key issues: conflict & power
- Symbolic frame:
 - Symbols & meanings related to events
 - Culture, language, traditions & image

Organisational structures:

- Functional: functional managers report to CEO
- Project: project managers report to CEO
- Matrix: personnel often report to 2+ bosses

Organisational culture:

A set of shared assumptions, values & behaviours that characterise the function of an organisation

Culture is the underlying causes of many company problems

10 characteristics:

High:

- Member identity: the degree to employees identify with the organisation as a whole rather than their types of job or profession

- Group emphasis
- Risk tolerance
- Reward criteria
- Conflict tolerance
- Unit integration: the degree to which departments within an organisation are encouraged to coordinate with each other
- Open systems focus

Balanced:

- People focus: the degree to which management's decisions take into account the effect of outcomes on employees within the organisation
- Means-end orientation: the degree to which management focuses on outcomes rather than on techniques and processes used to achieve results
- Control

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importance of top management commitment:

- Provide adequate resources
- Approve unique project needs in a timely manner
- Get cooperation from other parts of the organisation
- Mentor & coach on leadership issues

IT governance:

Address the authority and control for key IT activities in organisations

- IT infrastructure
- IT use
- Project management

video 3

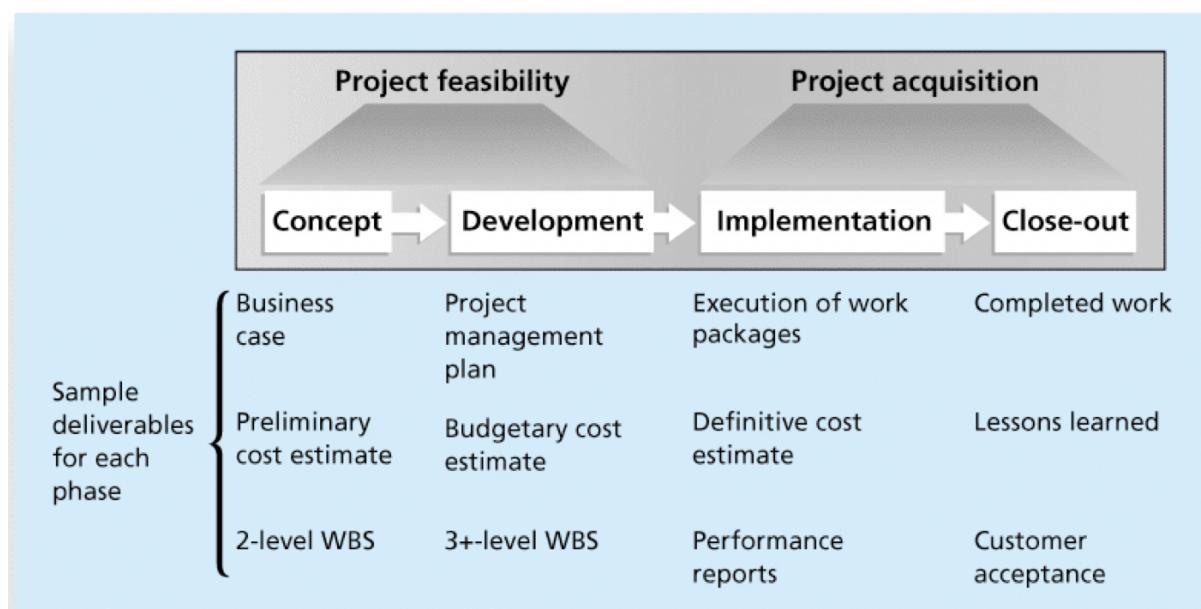
project life cycle:

a collection of project phases that defines:

- What work will be performed in each phase
- What deliverables will be produced and when
- Who is involved in each phase
- How management will control and approve work produced in each phase

Deliverable: a product/service produced or provided as part of a project

Phases of traditional project management life cycle:



Management reviews (phase exits / kill points):

evaluate the project's progress, likely success & continued compatibility with organisational goals

should occur after each phase

Product life cycle:

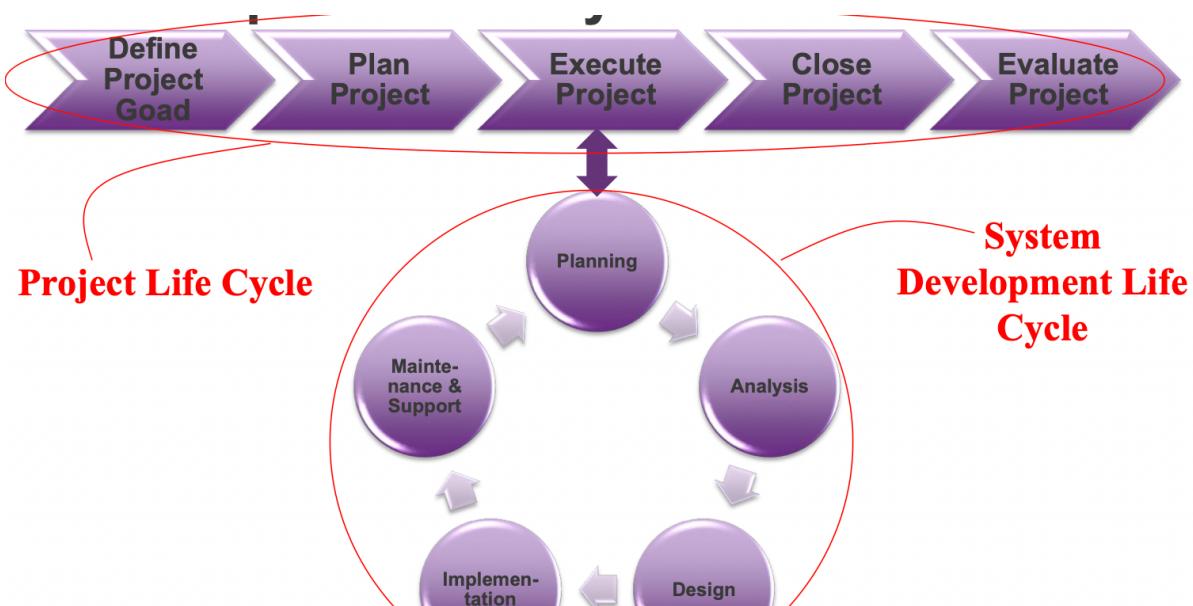
Systems development life cycle (SDLC):

A framework for describing the phases involved in developing and maintaining information systems

- Predictive life cycle:

- Waterfall model
- Spiral model

- Incremental build model:
 - Progressive development of operational software
 - Each release provides added capabilities
- Prototyping model:
 - Generate functional requirements & physical design specifications simultaneously
- Rapid application development (RAD) model:
 - Evolving prototype
 - Tools: computer-aided software engineering, joint requirements planning & joint application design
- Adaptive software development (ASD) life cycle:
 - Extreme programming
 - Feature driven development
 - Dynamic systems development model
 - scrum



video 4

recent trends affecting IT project management:

- globalisation
 - issues:
 - communications
 - trust
 - common work practices
 - tools
 - suggestions:
 - employ greater project discipline
 - think globally but act locally
 - consider collaboration over standardisation
 - keep project momentum going
 - use newer tools and technology
- outsourcing: an organisation acquires goods and/or sources from an outside source
offshoring: outsourcing from another country
- virtual teams
 - advantages:
 - workers available 24/7 → competitiveness & responsiveness
 - lower costs
 - more expertise & flexibility
 - work/life balance
 - disadvantages:
 - communications
 - network & informal information
 - dependency on technology
- Agile project management

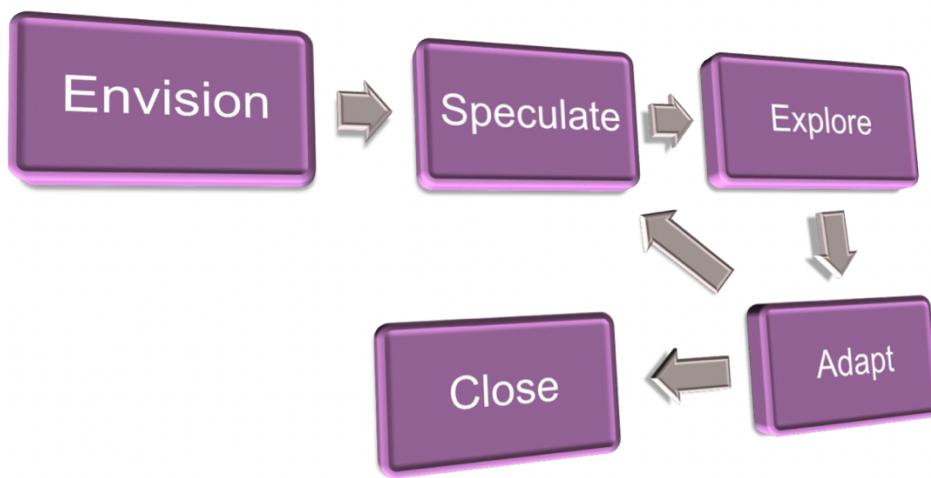
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Agile project management:

- Projects can be managed and implemented in small deliverables called features
- When business needs are frequently changing/business wants to receive product benefits earlier
- Items are created in small logical chunks of work called iterations/sprints

Characteristics of Agile projects:

- Sprints: normally 4-12 weeks
- Communication critical: face-to-face encouraged
- Co-located
- 100% sponsor commitment
- Changes to requirements are anticipated & accommodated



Scrum:

Leading agile development method for completing projects with a complex innovative scope of work

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Activity 1

PMLC (project management life cycle):

A collection of phases

Traditional project phases:

- Concept
- Development
- Implementation
- Close-out

Product life cycle (System Development Life Cycle SDLC):

- **Waterfall Model:**
 - Linear
 - Traditional
 - Well understood
 - Easier to manage than Agile when working on large complex applications
- **Spiral Model:**
 - Refinements to waterfall model
 - Most software is developed using an iterative/spiral rather than linear approach
- **Agile Model:**
 - Lean approach
 - Able to move quickly and easily
 - Based on iterative and incremental development
 - Requirements and solutions evolve through collaboration
 - Useful where requirements are unknown or change quickly
 - Time & cost goals are set, but scope is flexible

Project driven VS non-project driven organisations:

- project management:
 - driven: mature & respected
 - non-driven: in infancy, often looked at with scepticism
- project manager:
 - driven: responsible for profitability & loss
 - non-driven: ambiguous responsibility for profitability & loss

- organisational structure:
 - driven: fully projectized or matrix
 - non-driven: functional
- career paths:
 - driven: flexible, one can ascend quickly to higher positions
 - non-driven: traditional, moving upwards in company ladder is difficult (wait manager to get fired/resign/retire)
- industries:
 - driven:
 - construction
 - aerospace
 - research
 - non-driven:
 - manufacturing
 - services
 - farming
 - natural resources

organisational structure:

- **functional:**
 - classical, traditional, departmental
 - PM has little authority
 - Individuals can specialise, focus not always on the project
- **project:**
 - PM has high authority
 - Potential under utilisation of resources
 - No career progression for project team
- **matrix:**
 - PM has moderate to high authority
 - Formal project accountability
 - More adaptable to change
 - Sharing of knowledge across projects
 - Multiple supervisors
 - Budget and cost become more difficult
 - Team members have multiple bosses

Systems thinking:

View projects in the context of the whole environment (organisation and system)

Activity 2

Systems approach and its significance for project managers

Systems approach: view projects in the context of the entire environment including both the inside and outside of the organisation

So that projects are optimally designed and planned

Enables project managers to take many internal and external factors into consideration when planning a project, including all the other ongoing projects in organisation

4 frames:

- Structural:
 - deal with how organisation is structured and focus on roles and responsibilities
 - Important to understand these roles and responsibilities when dealing with project stakeholders, especially in procuring resources
- Human resources:
 - Focus on meeting the needs of the organisation and its people
 - PMs must understand various human resources policies and procedures
- Political:
 - Address organisational and people politics
 - Many PMs fail because they don't understand the political environment
- Symbolic:
 - focus on symbols & meanings
 - Important to understand an organisation's culture & dress code

Product life cycles VS project life cycles:

Product life cycle is a model for common product development processes and fits into a larger project life cycle, which includes the additional phases of project initiation, planning, controlling and closing.

Each life cycle contains phases, deliverables and decisions to be made before moving on to a subsequent phase but the focus and work product are very different.

Delivering a project in incremental iterations:

Allow stakeholders to review & evaluate project progress at many points through the project's life span

Key product development activities (eg. requirements definition, design, construction, testing) are performed during each iteration

Each iteration results in a more refined product

Enables stakeholders to agree on changes to requirements or product design as the project is in progress

How organisational culture is related to project management:

Organisational culture is a set of shared assumptions, values and behaviours that characterise the functioning of an organisation

If an organisation values project management and follows the guidelines for applying it, it will be much easier to practice good project management

Agile advantages:

- Useful where requirements can be scoped during development
- Lean approach
- High customer involvement
- Rapid development

Agile NOT for all projects:

Large complex projects requiring mission critical solutions may be better suited to traditional approach

Projects with clear requirements can use traditional, agile or combination of both

Agile VS traditional:

Agile is lean (only uses what is needed)

Scope can be easily adapted

Focus on producing deliverables quickly

Does cycles of development but traditional doesn't

How to decide when to use Agile or traditional?

- Agile:
 - Requirements can be easily changed during development
 - Developers are experienced and adaptive to change
- Traditional:
 - Large complex projects
 - Mission critical where requirements are very clear
 - Larger teams

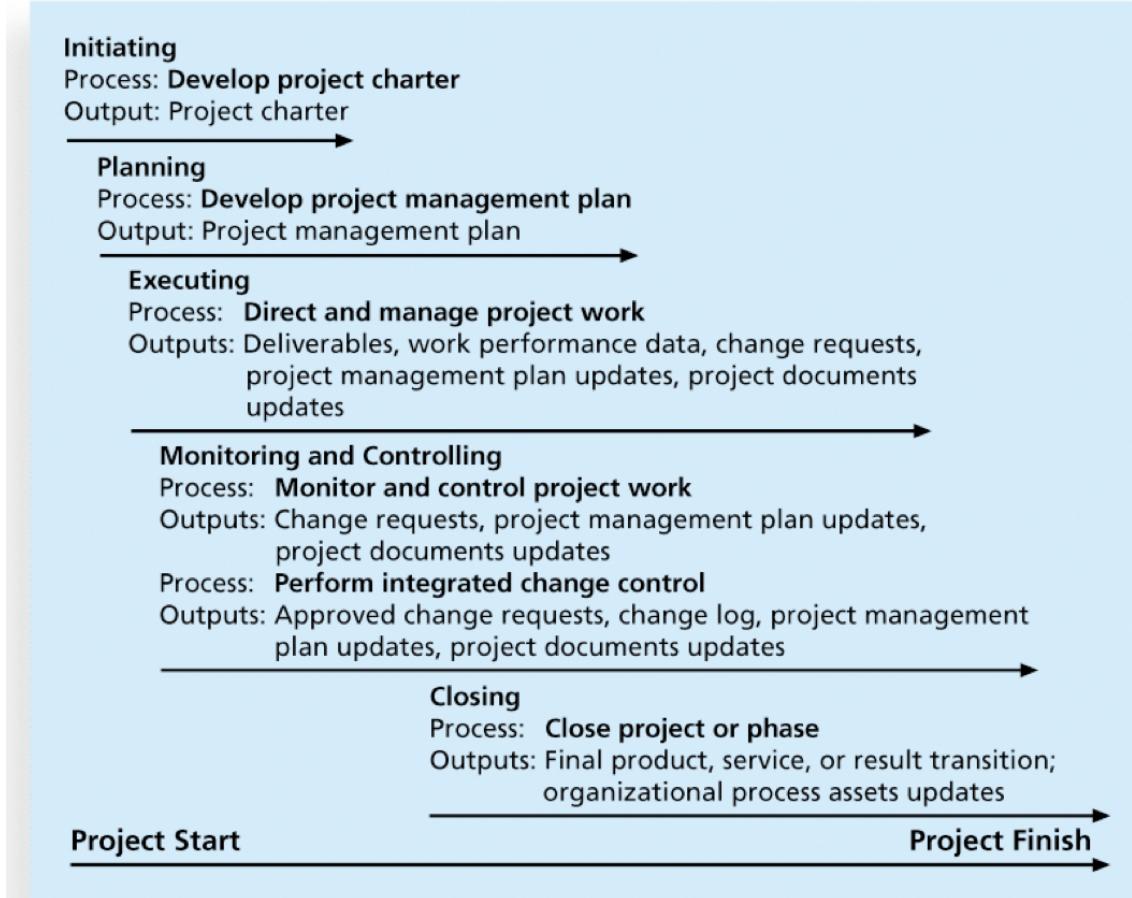
ALSO SEE WEEK 11

INTEGRATION MANAGEMENT

video 1

project integration management processes

1. Develop project charter: work with stakeholders to create the project charter (document that formally authorises a project)
2. Develop project management plan: coordinate all planning efforts to create the project management plan (a consistent, coherent document)
3. Direct and manage project work: carry out project management plan by performing the activities included in it
4. Monitor & control project work: oversee activities to meet the performance objectives of the project
5. Perform integrated change control:
 - identify, evaluate, manage changes throughout the project life cycle
 - coordinate changes that affect the project's deliverables and organisational process assets
6. Close the project/phase: finalise all activities to formally close the project/phase



Strategic planning:

Determine long-term objectives, predict future trend & project the need for new products & services

- Identify potential projects
- Use realistic methods to select which projects to work on
- Formalise project initiation by issuing a project charter

SWOT analysis:

S: strengths

W: weaknesses

O: opportunities

T: threats

IT planning process:

1. IT strategy planning:

- Tie IT strategy to mission & vision of organisation
- Identify key business areas

2. Business area analysis:

- Document key business processes that could benefit from IT

3. Project planning

- Define potential projects
- Define project scope, benefits & constraints

4. Resource allocation

- Select IT projects
- Assign resources

video 2

methods for selecting projects:

- Focus on broad organisational needs
 - There is a need for the project
 - There are funds available
 - There's a strong will to make the project succeed
- Categorise IT projects
 - Project's impetus: address
 - Problem
 - Opportunity
 - Directive: new requirement imposed by management, government or some external influence
 - Time window
 - Overall priority of the project
- Perform financial analyses
 - NPV: calculate the expected monetary gain/loss from a project by discounting all expected future cash inflows & outflows to the present point in time
 - ROI (return on investment): NPV/discounted costs
IRR (internal rate of return): discount rate that makes NPV=0
 - Payback:
Amount of time it will take to recoup, in the form of net cash inflows, the total dollars invested in a project
- Use a weighted scoring model
- Implement a balanced scorecard:
convert an organisation's value drivers (eg. customer service, innovation, operational efficiency, financial performance) to a series of defined metrics

video 3

1. Develop a project charter

project charter: a document that formally recognises the existence of a project and provides direction on the project's objectives and management

Input:

- Statement of work (SOW)
- Business case
- Agreements
- Enterprise environmental factors
- Organisational process assets
 - Formal & informal plans
 - Policies
 - Procedures
 - Guidelines
 - Information systems
 - Financial systems
 - Management systems
 - Lessons learned
 - Historical information

Output: signed charter – key output of project integration management

Tools & techniques:

- Expert judgement
- Facilitation techniques

2. Develop a project management plan

project management plan: a document used to coordinate all project planning documents and help guide a project's execution and control

Input:

- Project charter
- Outputs from planning processes
- Enterprise environmental factors
- Organisational process assets

Output: project management plan

Tool & technique: expert judgement

4. Monitor & control project work

Include collecting, measuring and disseminating performance information

Input:

- Project management plan
- Schedule & cost forecasts
- Validated changes
- Work performance information
- Enterprise environmental factors
- Organisational process assets

Baseline: approved project management plan + approved changes

video 4

5. Perform integrated change control

main objectives:

- Influence the factors that create changes to ensure that changes are beneficial
- Determine that a change has occurred
- Manage actual change control process

Inputs:

- Project management plan
- Work performance information
- Change requests
- Enterprise environmental factors
- Organisational process assets

Outputs:

- Project management plan
- Work performance information
- Change requests
- Enterprise environmental factors
- Organisational process assets

Integrated change control:

A formal process used to approve and manage all necessary project document and deliverable changes

Key activities:

- Identify that a change needs to occur or has occurred
- Establish a governance structure for reviewing and approving requested changes
- Manage the approved changes when and as they occur
- Maintain the integrity of project artifacts as changes occur
- Communicate to all relevant stakeholders
- Configuration management

Change control system:

Formal documented process that describes:

- when and how official project documents and work may be changed

- who is authorised to make changes and how to make them includes:
 - a change control board (CCB)
 - a formal group of people responsible for approving/rejecting changes on a project
 - include stakeholders from entire organisation
 - provide guidelines for preparing change requests
 - evaluate change requests
 - manage the implementation of approved changes
 - **configuration management**
 - ensure the descriptions of the project's products are correct & complete
 - identify and control the functional and physical design characteristics of products and their support documentation
 - identify & document configuration requirements, control changes, record and report changes, audit the products to verify conformance to requirements
 - a process for communicating changes

6. Close projects/phases

Finalise all activities and transfer the completed/cancelled work to the appropriate people

Inputs:

- Project management plan
- Accepted deliverables
- Organisational process assets

Outputs:

- Final product/service/result transition
- Organisational process asset updates

Tool & technique: expert judgement

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ACTIVITY 1

Describe integration management:

Tie together all the other aspects involved in a project to make it a success

Relate to project life cycle:

It's done in all project life cycle phases

As project progresses, integration management becomes more focused

Relate to stakeholders:

it requires PM to know all the project stakeholders, to know their interests and concerns about the project and to manage relationships with them

Relate to other project management knowledge areas:

Pull together info from all the other knowledge areas

Importance of selecting a right project:

- Cost: As organisations have limited budget and resources, they need to choose the most profitable and appropriate projects given the budget and resources
- Business benefits: need to select projects that align with their business objectives and that will bring the most value for the organisation in terms of profit, market share customer relationships, safety issues, environmental concerns and government regulations

Methods for selecting projects:

- Focus on broad organisational needs
- Categorise information technology projects
- Perform net present value or other financial analyses
- Use a weighted scoring model
- Implement a balanced scorecard

3 main objectives of performing integrated change control

- Influence the factors that create changes to ensure that changes are beneficial
- Determine that a change has occurred
- Manage actual change control process

Importance of following a well-integrated change control process on IT projects:

- Avoid scope creep

- Avoid incompatibility problems
- Make effective use of resources and new technologies

SCOPE MANAGEMENT

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scope:

all the work involved in creating the products of the project and the processes used to create them

deliverable:

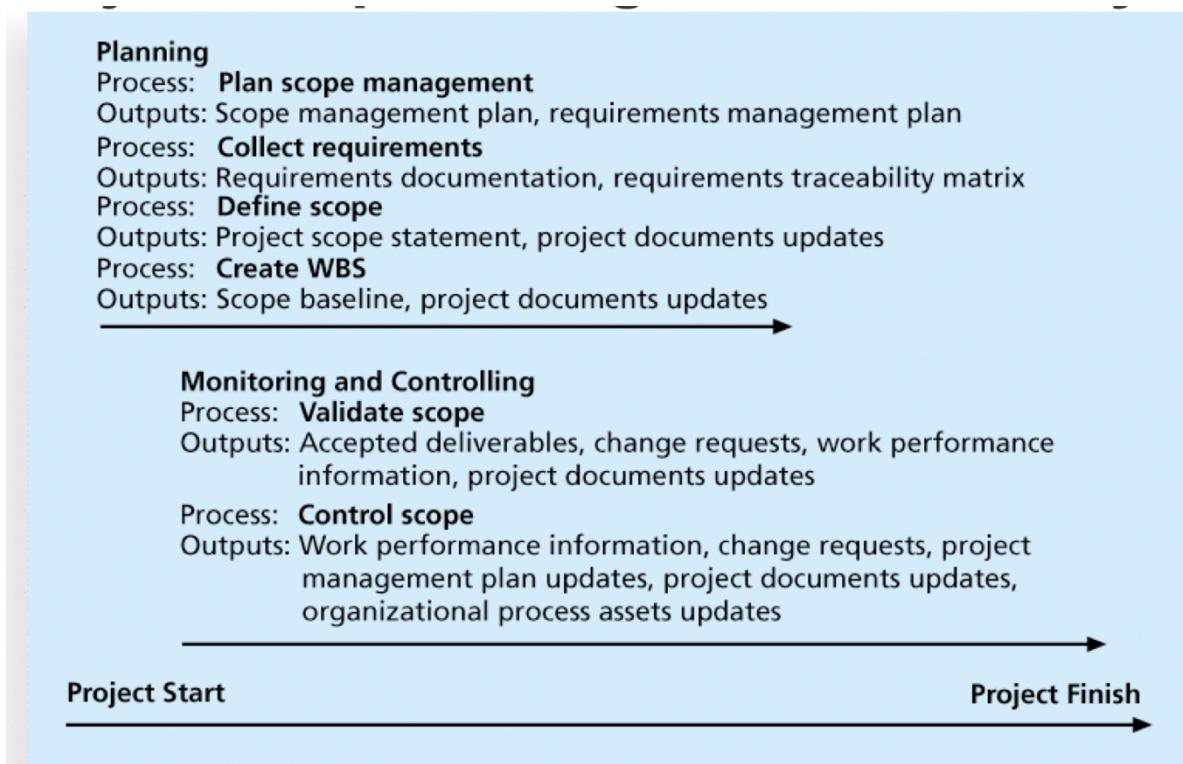
a product produced as part of a project, such as hardware/software, planning documents, meeting minutes

scope management:

define & control what is or is not included in a project

scope management processes:

- Planning scope: determine how the project's scope and requirements will be managed
- Collecting requirements: define & document the features and functions of the products produced during the project as well as the processes used for creating them
- Defining scope: review the project charter, requirements, documents & organisational processes assets to create a scope statement
- Creating the WBS: subdivide the major project deliverables into smaller, more manageable components
- Validating scope: formalise acceptance of the project deliverables
- Controlling scope: control changes to project scope throughout the life of the project



Planning scope management:

Use: expert judgement & meetings

Outputs:

- scope management plan: subsidiary part of project management plan
 - how to prepare a detailed project scope statement
 - how to create a WBS
 - how to maintain and approve WBS
 - how to obtain formal acceptance of the completed project deliverables
 - how to control requests for changes to project scope
- requirements management plan

document how project requirements will be analysed, documented and managed

requirement:

 - condition/capability that must be met by the project or present in the product, service or result to satisfy an agreement or other formally imposed specification
 - need to be elicited, analysed and recorded in enough detail to be included in the scope baseline and be measured once project execution begins

scope statement: describe the characteristics of product

- project justification
- brief description of project's deliverables
- summary of all project deliverables
- statement of what determines project success – user acceptance criteria
- scope-related information
 - boundaries
 - constraints
 - assumptions
- reference supporting documents (eg. product specifications)

methods for collecting requirements:

- interviewing
- focus groups and facilitated workshops
 - JAD (joint application development): use highly organised and intensive workshops to bring together project stakeholders (sponsors, users, business analysts, programmers...) to jointly define and design information systems
- using group creativity & decision-making techniques
- questionnaires & surveys
- observation
- prototyping: develop a working replica of the system or some aspects of the system
- benchmarking: generate ideas by comparing specific project practices or product characteristics to those of other projects or products inside/outside the performing organisation

requirements documentation:

- functional & non-functional requirements
 - functional: what system should do
 - non-functional: how system works
- business rules
- impact on any other systems and/or departments
- support and training requirements
- specific acceptance criteria for each requirement

- quality requirements
- requirements traceability matrix: a table that lists requirements, various attributes of each requirement and the status of the requirements to ensure that all requirements are addressed

video 2

WBS (work breakdown structure):

- a deliverable-oriented grouping of work involved in a project that defines the total scope of the project
- a foundation document that provides the basis for planning and managing project schedules, costs, resources and changes
- main technique: decomposition (subdivide project deliverables into small pieces)
- work package: a task at the lowest level of WBS
- scope baseline:
 - approved project scope statement
 - associated WBS
 - WBS dictionary: detailed info about each WBS item
- Approaches:
 - Using guidelines
 - Analogy approach: similar projects
 - Top-down approach: start with largest items
 - Bottom-up approach: start with specific tasks
 - Mind-mapping approach

video 3

scope control: control changes to project scope

goals of scope control:

- Influence the factors that cause scope changes
- Assure changes are processed according to procedures developed as part of integrated change control
- Manage changes when occurring

Variance: difference between planned and actual performance

Best practices:

- Keep scope realistic
- Involve users in project scope management
- Use off-the-shelf hardware and software whenever possible
- Follow good project management processes
- Principles from IBM's Rational Unified Process (RUP):
 - Adapt the process
 - Balance competing stakeholder priorities
 - Collaborate across teams
 - Demonstrate value iteratively
 - Elevate the level of abstraction
 - Focus continuously on quality

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scope creep:

changes to the scope baseline of a project

envision stage:

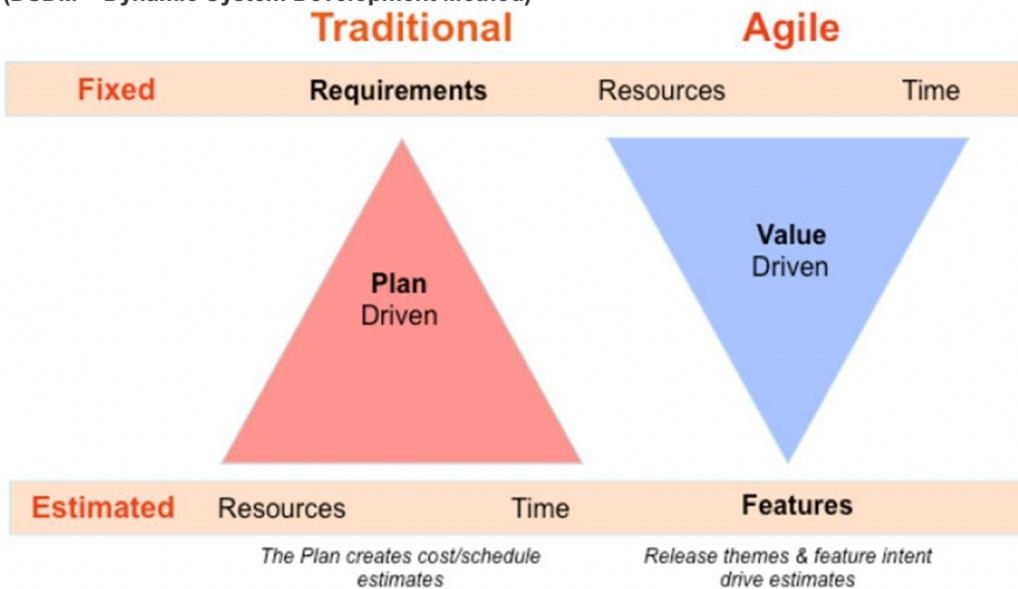
- Determine user requirements
- Confirm team members
- Set up team collaboration tools
- A document project charter – describing scope & overall objectives
- Creation of product data sheet (PDS)
 - Project description
 - Project objectives
 - Timelines
 - Cost estimates
 - Constraints
 - Prioritisation

Speculate stage:

- Feature based delivery plan
- Estimates for each feature
- A set of requirements for the sprint
- A list of features to be developed
- Effort estimates for each feature
- Risks will be identified

Flipping the Triangle (DSDM Consortium)

(DSDM = Dynamic System Development Method)



Agile principles:

- Highest priority: satisfy the customer through early & continuous delivery of valuable software
- Welcome changing requirements even late in development
- Deliver working software frequently (couple of weeks to couple of months)

Agile control mechanisms:

- Scope is managed by the backlog list
- Scope is controlled by completing features and adding new features
- Never adjust the scope of current sprint

Traditional VS Agile scope management:

Traditional:

- Attempt to identify & document complete scope at the beginning of the project
- View scope change after the requirements phase is complete as negative
- PM rigidly control & discourage changes once stakeholders sign off on requirements
- The cost of change increases over time while ability to make changes decreases
- Often include scope bloat (unnecessary features included out of fear of mid-project change)

Agile:

- High level requirements gathered at the beginning of the project & refined throughout the project
- View changes as positive to improve product
- Product owner determines the value and priority of new requirements and add to the product backlog
- Fix resources & schedule initially
- New features with high priority don't necessarily cause budget/schedule slip, they simply push out the lowest-priority features
- Iterative development allows for changes with each new sprint
- Determine scope based on what features directly support the project vision, the release goal & sprint goal
- Create the most valuable features first to guarantee the inclusion and to ship those features as soon as possible
- Less valuable features might never be created, which may be accepted to the business and the customer after they have the highest-value features

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Activity 1

Project scope management:

- Activities:
 - Plan scope management
 - Collect requirements
 - Define scope
 - Create WBS
 - Validate scope
 - Control scope
- Deliverables:
 - Scope statement
 - Scope management plan
 - WBS

Importance of scope management:

- Verify deliverables (ensure we have done what we set out to do as described in the plan)
- Avoid scope creep
- Ensure everyone involved has the same understanding of the project requirements

Collecting requirements:

- Elicitation
- Analysis
- Specification
- Validation

Why difficult:

Changes over time

- At the beginning, users often don't really know what they need and describe what they want instead
- Users change mind all the time
- Normally stakeholders hesitate to share info due to political/cultural barriers

Different ways to develop WBS:

- Guidelines: some organisations provide guidelines
- Analogy approach: review WBS of similar projects and tailor it to your project
- Top-down approach: start with the largest items of the project and break them down
- Bottom-up approach: start with the specific tasks and roll them up
- Mind-mapping approach: write tasks in a non-linear, branching format and then create WBS structure

Main techniques for validating scope:

- Requirements traceability matrix
- Workshops with users
- Documents sign-off

SCHEDULE MANAGEMENT

video 1

schedule management processes

- Planning schedule management: determine the policies, procedures and documentation that will be used for planning, executing & controlling the project schedule
- Defining activities: identify the specific activities that the project team members and stakeholders must perform to produce the project
- Sequencing activities: identify & document the relationships between project activities
- Estimating activity durations: estimate the number of work periods that are needed to complete individual activities
- Develop the schedule: analyse activity sequences, activity resource estimates & activity duration estimates to create the project schedule
- Control the schedule: control & manage changes to the project schedule

Planning

Process: **Plan schedule management**

Outputs: Schedule management plan

Process: **Define activities**

Outputs: Activity list, activity attributes, milestone list, project management plan updates

Process: **Sequence activities**

Outputs: Project schedule network diagrams, project documents updates

Process: **Estimate activity resources**

~~Outputs: Activity resource requirements, resource breakdown structure, project documents updates~~

Process: **Estimate activity durations**

Outputs: Activity duration estimates, project documents updates

Process: **Develop schedule**

Outputs: Schedule baseline, project schedule, schedule data, project calendars, project management plan updates, project documents updates

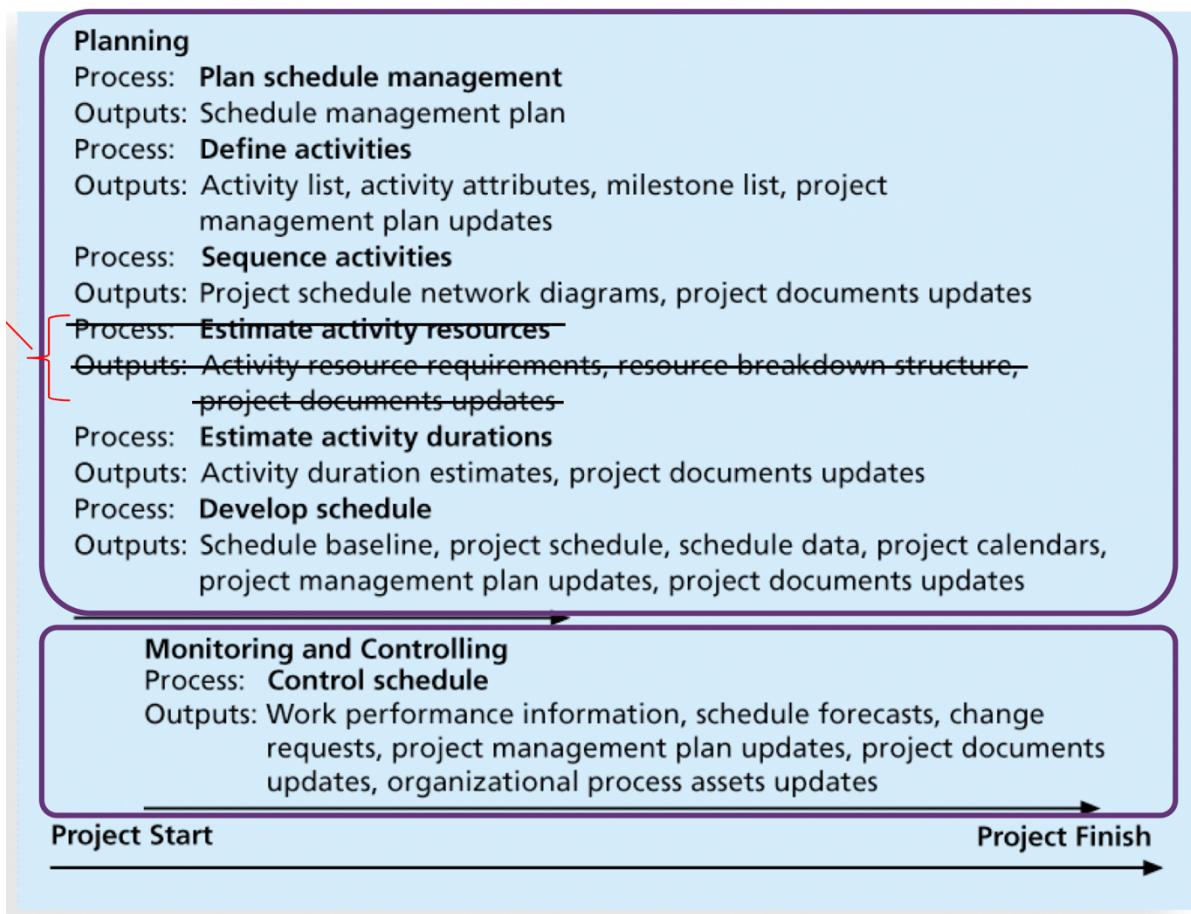
Monitoring and Controlling

Process: **Control schedule**

Outputs: Work performance information, schedule forecasts, change requests, project management plan updates, project documents updates, organizational process assets updates

Project Start

Project Finish



Planning schedule management

Tool:

- Expert judgement
- Analytical techniques
- Meetings

Schedule management plan:

- Project schedule model development
- Scheduling methodology
- Level of accuracy and units of measure
- Control thresholds
- Rules of performance measurement
- Reporting formats
- Process descriptions

Defining activities:

activity/task: an element of work normally found on the WBS that has an expected duration, a cost and resource requirements

activity definition: develop a more detailed WBS and supporting explanations to understand all the work to be done

goal: to ensure that the project team completely understands all the work it must do as part of the project scope so the team can start scheduling

progressive elaboration of WBS item: rolling wave planning

outputs:

- Activity list:
a tabulation of activities to be included on a project schedule that includes:
 - Activity name
 - Activity identifier or number
 - A brief description of the activity
- Activity attributes:
 - Predecessors
 - Successors
 - Logical relationships
 - Leads and lags
 - Resource requirements
 - Constraints

- Imposed dates
- Assumptions related to activity
- A milestone list: a significant event that normally has no duration
 - Often takes several activities & a lot of work to complete a milestone
 - Useful tools for setting schedule goals and monitoring progress
- Project management plan updates

video 2

sequencing activities:

review activities & determine dependencies

dependency/relationship: sequencing of project activities/tasks

types of dependencies:

- Mandatory:
 - Sometimes referred to as hard logic
 - Inherent in the nature of the work being performed on a project
 - Eg. cannot test code until after the code is written
- Discretionary:
 - Sometimes referred to as soft logic
 - Defined by project team
- External:
Relationships between project and non-project activities

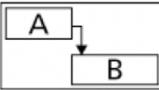
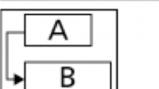
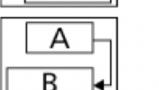
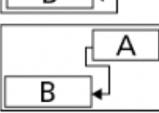
Network diagram:

A schematic display of the logical relationships among, or sequencing of, project activities

Formats:

- Activity-on-arrow (AOA): arrow diagramming method
 - Arrow: activity
 - Node/circle: starting & ending points of activities
 - Can only show finish-to-start dependencies
- Activity-on-node (AON): precedence diagramming method
 - Box: activity
 - Arrow: relationships between activities
 - Better at showing different types of dependencies

Task dependency types:

Task dependency	Example	Description
Finish-to-start (FS)	 Task A is at the top, followed by Task B. A vertical arrow points from the bottom of Task A down to the top of Task B.	Task (B) cannot start until task (A) finishes.
Start-to-start (SS)	 Task A is at the top, followed by Task B. A vertical arrow points from the top of Task A down to the top of Task B.	Task (B) cannot start until task (A) starts.
Finish-to-finish (FF)	 Task A is at the top, followed by Task B. A vertical arrow points from the bottom of Task A down to the bottom of Task B.	Task (B) cannot finish until task (A) finishes.
Start-to-finish (SF)	 Task A is at the top, followed by Task B. A vertical arrow points from the top of Task A down to the bottom of Task B.	Task (B) cannot finish until task (A) starts.

video 3

duration:

actual amount of time worked on an activity + elapsed time

effort:

the number of workdays/work hours required to complete a task

effort does not normally equal duration

three-point estimate:

an estimate that includes an optimistic, most likely and pessimistic estimate

needed for PERT & Monte Carlo simulations

Program evaluation and review technique (PERT):

- Network analysis technique used to estimate project duration when there is a high degree of uncertainty about the individual activity duration estimates
- Use probabilistic time estimates
 - Apply the critical path method (CPM) to a weighted average duration estimate
 - PERT weighted average = (optimistic + 4 * most likely + pessimistic)/6

Developing the schedule:

Use results of other time management processes to determine the start and end date of the project

Tools & techniques:

- Gantt charts: list project activities & corresponding start and finish dates in a calendar format
 - Add milestones to Gantt charts:
SMART criteria:
 - Specific
 - Measurable
 - Assignable
 - Realistic
 - Time-framed
- Critical path analysis
- Critical chain scheduling
- PERT analysis

supplementary video

critical path method (CPM):

a network diagramming technique used to predict total project duration

critical path:

- the series of activities that determines the earliest time by which project can be completed
- longest path through the network diagram
- 0 total & free float
- Can be more than one critical path
- Can change as project progresses

total float/slack:

amount of time an activity may delay from its early start without delaying planned project finish date

total float = late start – early start

free float/slack:

amount of time an activity can delay without delaying the early start of an immediately following activities

free float = early start of following activity - early finish of activity

main techniques to shorten schedules:

- Shortening durations of critical activities by adding more resources/changing scope
- Crashing activities by obtaining the greatest amount of schedule compression for the least incremental cost
- Fast tracking activities by doing them in parallel or overlapping them

Critical chain scheduling:

A method of scheduling that considers limited resources when creating a project schedule and includes buffers to protect the project completion date

- Use theory of constraints (TOC)
- Attempt to minimise multitasking (a resource works on more than one task at a time)
- Remove buffers (additional time to complete a task) from individual tasks and instead creates:
 - A project buffer: additional time added before project's due date
 - Feeding buffers: additional time added before tasks on the critical path

video 4

control the schedule:

- Goals:
 - Know the status of the schedule
 - Influence factors that cause schedule changes
 - Determine the schedule has changed
 - Manage changes when they occur
- Tools & techniques:
 - Progress reports
 - Schedule change control system
 - Project management software
 - Variance analysis (eg. analysing float/slack)
 - Performance management (eg. earned value)
 - Resource optimisation techniques (eg. resource leveling)

Agile & time management:

- Core values of Agile:
- Product owner defines and prioritises the work to be done within a sprint, so collaboration & time management are designed into the process
- Teams focus on producing a useful product in a specified timeframe with strong customer input
- Don't emphasise defining all work before scheduling it

Schedule control suggestions:

- Perform reality checks on schedules
 - First review the draft schedule/estimated completion date in the project charter
 - Prepare a more detailed schedule with project team
 - Make sure schedule is realistic & followed
 - High-level periodic reviews
 - Alert top management in advance if there are schedule problems
- Allow for contingencies
- Don't plan for everyone to work at 100% capacity all the time
- Hold progress meetings with stakeholders
- Be clear and honest in communicating schedule issues

Working with people- project managers should use:

- Empowerment
- Incentives
- Discipline
- Negotiation

TUTORIAL

Activity 1

Time management: **ALSO MOCK**

- Basically sequencing and scheduling
- Work out the activities, the duration and the dependencies between the activities

Schedule baseline: **ALSO MOCK**

Take a screenshot of the original plan of the project so we can track our progress when there is any changes happen during the project

Importance of correct scheduling:

We can continuously track the project progress to ensure it doesn't go over the original schedule

A correct scheduling allows us to track it more precisely

WBS VS work package:

Work package is the lowest level in WBS which is basically the deliverables of the project

Work package is a subpart of WBS

Activity-on-Arrow VS Activity-on-Node:

AOA:

for big networks

need dummy activities for start-to-start and end-to-end dependencies

AON:

For complex networks with uncommon dependencies

Network diagrams NOT used in Agile:

Network diagrams should only be used for traditional methods

In Agile, requirements are vague at the beginning and grow over time so it's impossible to develop network at beginning

In Agile, we use burndown charts during iterations (sprints)

MOCK

NO Gantt chart in Agile:

- In Agile projects, requirements are normally vague, so cannot have exact detailed schedule of whole project
- In most cases, we expect requirements to change often which affects the schedule
- Not suitable or waste of time to use Gantt chart to plan everything outright at the start
- More appropriate to plan every sprint and monitor progress by using burndown charts

COST MANAGEMENT

video 1

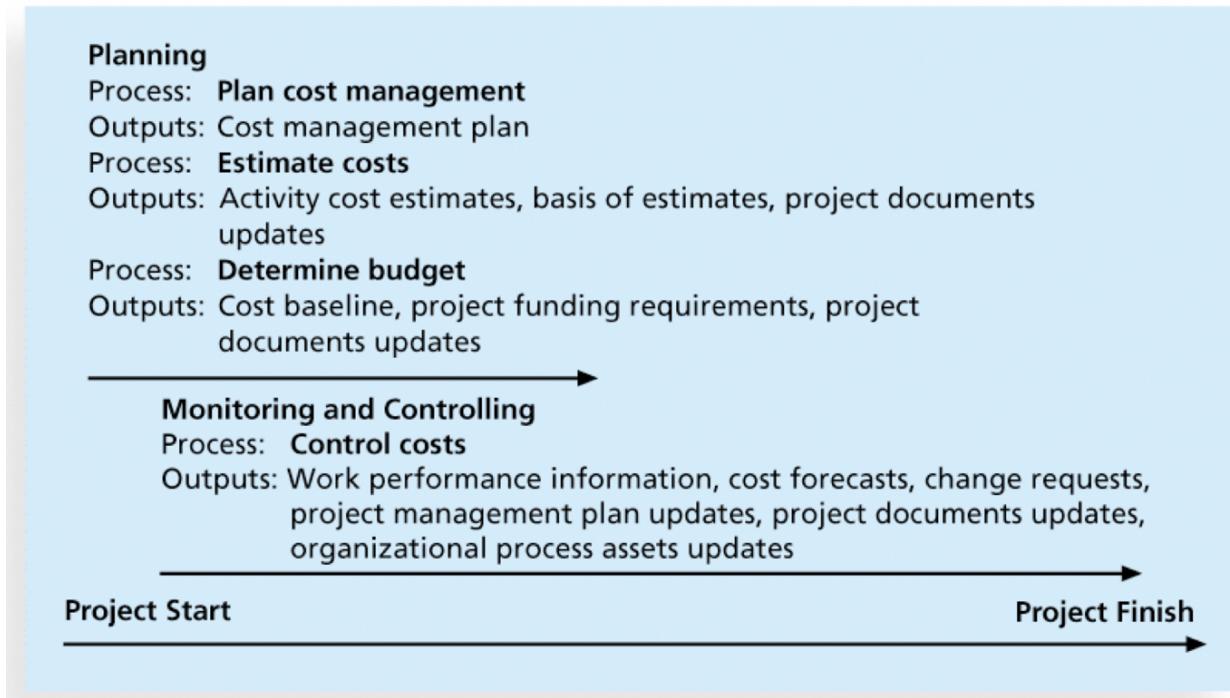
cost: a resource sacrificed/foregone to achieve a specific objective or sth given up in exchange

usually measured in monetary units like dollars

project cost management:

the processes required to ensure that the project is completed within an approved budget

- Planning cost management: determine the policies, procedures and documentation that will be used for planning, executing and controlling project cost
- Estimating costs: develop an approximation/estimate of the costs of the resources needed to complete a project
- Determining the budget: allocate overall cost estimate to individual work items to establish a baseline for measuring performance
- Controlling costs: control changes to project budget



Basic principles:

Profits: revenues – expenditures

Profit margin: revenues/profits *100%

Life cycle costing: total cost of ownership, development, support cost

Cash flow analysis: determine the estimated annual costs and benefits for a project and the resulting annual cash flow

Learning curve theory: when many items are produced repetitively, the unit cost of the items decreases in a regular pattern as more units are produced

Reserves: dollars included in a cost estimate to mitigate cost risk by allowing for future situations that are difficult to predict

- Contingency reserves (known unknowns): future situations that may be partially planned for
- Management reserves (unkown unkowns): unpredictable future situations

Types of costs & benefits:

- Tangible costs/benefits: easily measure in dollars
- Intangible costs/benefits: difficult to measure in monetary terms
- Direct costs: directly related to producing products & services
- Indirect costs: indirectly related to performing the project
- Sunk costs: money that has been spent in past

video 2

cost management plan:

- Include:
 - Level of accuracy and units of measure
 - Organisational procedure links
 - Control thresholds
 - Rules of performance measurement
 - Reporting formats
 - Process descriptions
- tool:
 - expert judgement
 - analytical techniques
 - meetings

types of cost estimates:

- rough order of magnitude (ROM)/ ballpark:
 - early stage, often 3-5 yrs before project completion
 - provide estimate of cost for selection decisions
 - -50%~100% accurate
- budgetary:
 - early, 1-2yrs out
 - put dollars in budget plan
 - -10~25% accurate
- Definitive:
 - Later in project, less than 1yr out
 - Provide details for purchases, estimates actual costs
 - -5%~10%

Tools & techniques for cost estimates:

- Analogous/ top-down: actual cost of a previous similar project as the basis
- Bottom-up: estimate individual work items/activities and summing them
- Parametric modelling: use project characteristics/parameters in a mathematical model

Eg. \$50 per line of code:

- Programming language the project is using
- Level of expertise of the programmers
- Size & complexity of data involved

Typical problems with IT cost estimates:

- Estimates are done too quickly

- People lack estimating experience
- Human beings are biased towards underestimation
- Management desires accuracy

video 3

cost budgeting:

allocate the project cost estimate to individual work items over time

- required input: WBS
- goal: produce a cost baseline
 - a time-phased budget that project managers use to measure and monitor cost performance
 - team members should document any assumptions made when developing cost baseline

cost control:

a continual process of comparing the current actual project expenditures to the defined budget and determining when issues have arrived that need to be dealt with

- monitor cost performance
- ensure only appropriate project changes are in a revised cost baseline
- inform project stakeholders of authorised changes that will affect costs
- necessary to have change control system to define procedures for changing cost baseline
- tools & techniques:
 - performance review meetings
 - performance measurement: EVM (earned value management)

EVM:

A project performance measurement technique that integrates scope, time & cost data

Given a baseline (original plan + approved changes), you can determine how well the project is meeting its goals

Must enter actual information periodically to use EVM:

- whether a WBS item was completed
- how much of the work was completed
- how much the completed work actually cost

EVM terms:

- PV (planned value): budgetary cost of work scheduled (BCWS) / budget

portion of approved total cost estimate planned to be spent on an activity during a given period

- AC (actual cost): actual cost of work performed (ACWP)
total direct & indirect costs incurred in accomplishing work on an activity during an given period
- EV (earned value): budgetary cost of work performed (BCWP)
Estimate of the value of the physical work actually completed
Based on the original planned costs for the project/activity and the rate at which team is completing work
- RP (rate of performance): actual work completed/work planned to have been completed
- BAC (budget at completion): original total budget for the project

EV (earned value) = PV * RP (percentage completed)

CV (cost variance) = EV-AC

SV (schedule variance) = EV-PV

CPI (cost performance index) = EV/AC*100%

SPI (schedule performance index) = EV/PV*100%

EAC (estimate at completion) = BAC/CPI

Estimate time = original time/SPI

CV < 0 OR CPI < 100%: over budget

SV < 0 OR SPI < 100%: behind schedule

Portfolio management:

Many organisations collect & control an entire suite of projects/investments as one set of interrelated activities in a portfolio

5 levels:

- Put all projects in one database
- Prioritise the projects in database
- Divide projects into 2 or 3 budgets based on types of investment
- Automate repository
- Apply modern portfolio theory, including risk-return tools that map project risk on a curve

video 4

traditional VS Agile cost management:

traditional:

- Cost based on fixed scope
- Estimate project costs and fund projects before project starts
- New requirements mean high costs, so cost overrun common
- Scope bloat may happen so money wasted on non-required features
- Projects cannot generate revenue until project is complete

Agile:

- Schedule, not the scope, has biggest impact on cost
- Product owners often secure project funding after product roadmap stage is complete
- Sometimes fund projects one release at a time
- Can replace lower-priority requirements with new, equivalently-sized high-priority requirements with no impact on time/cost
- Only product features that users really need are created as Agile development teams complete requirements by priority
- Can release working, revenue-generating functionality early, creating a self-funding project

Manage cost in Agile

- cost is mostly a direct expression of project time
- easy to determine team cost
- scrum teams consist of full-time, dedicated team members -> a set team cost that should be the same for each sprint
- once determine velocity (development speed), we can determine how many sprints the project will take (how long project will be)
- other costs: resources (eg. hardware, software, licenses) & other supplies needed

lower project costs:

- self-funding project
- increase velocity (eg. 10 ->12 story points/sprint)
- reduce time
- lower number of sprints required by not completing low-priority requirements

TUTORIAL

Activity 1

Direct VS indirect cost:

Direct:

Directly attributed to project activities (eg. hardware purchase, labour cost)

Indirect:

Cannot be directly attributed to project (eg. energy cost, rent)

Sunk cost:

Money spent in the past that cannot be recovered

Tangible VS intangible costs/benefits:

Tangible: can be measured (cost of feasibility study)

Intangible: difficult to measure (eg. increased customer satisfaction)

Why estimating effort is difficult:

- inexperience
- done too quickly
- bias to underestimating

Different technique used in creating cost estimates:

Eg. provide new laptops for 100 people

- analogous estimate:
search similar organisations that recently purchased about the same number and type of laptops
- parametric estimate:
decide on key factors (eg. basic category of laptop required & other requirements)
- bottom-up estimate:
determine detailed hardware & software requirements, training & support costs

MOCK

Types of cost estimates:

- rough order of magnitude (ROM):
 - provide an estimate of what a project will cost
 - very early in a project or even before a project is officially started
- budgetary estimate:
 - allocate money into an organisations' budget
 - many organisations develop budgets at least 2 years into future
 - 1 to 2 years prior to project completion
- Definitive estimate:
 - Provide an accurate estimate of project costs
 - Used for making many purchasing decisions for which accurate estimates are required
 - For estimating final project costs

RISK MANAGEMENT

video 1

project risk management:

identify, analyse and responding to risk through the life of a project and in the best interests of meeting project objectives

improve project success by:

- Help select good projects
- Determine project scope
- Develop realistic estimates

Risk:

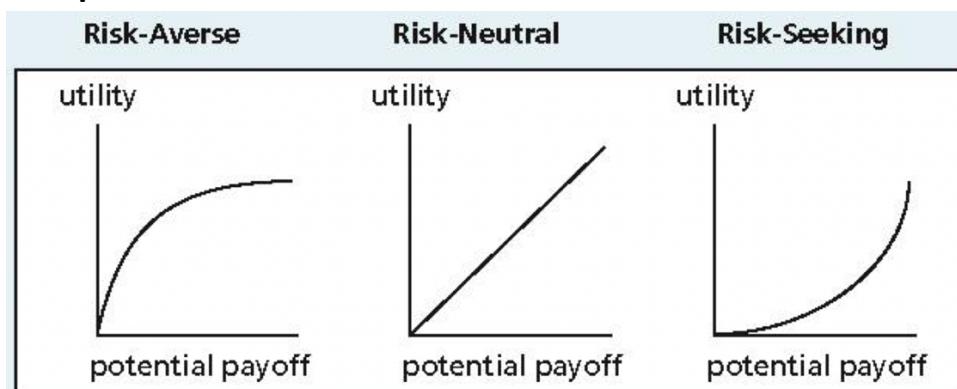
An uncertainty that can have a negative/positive effect on meeting project objectives

- Negative:
potential problems that might occur in the project and how they might impede project success
- Positive: opportunities (risks that result in good things happening)

Risk terms:

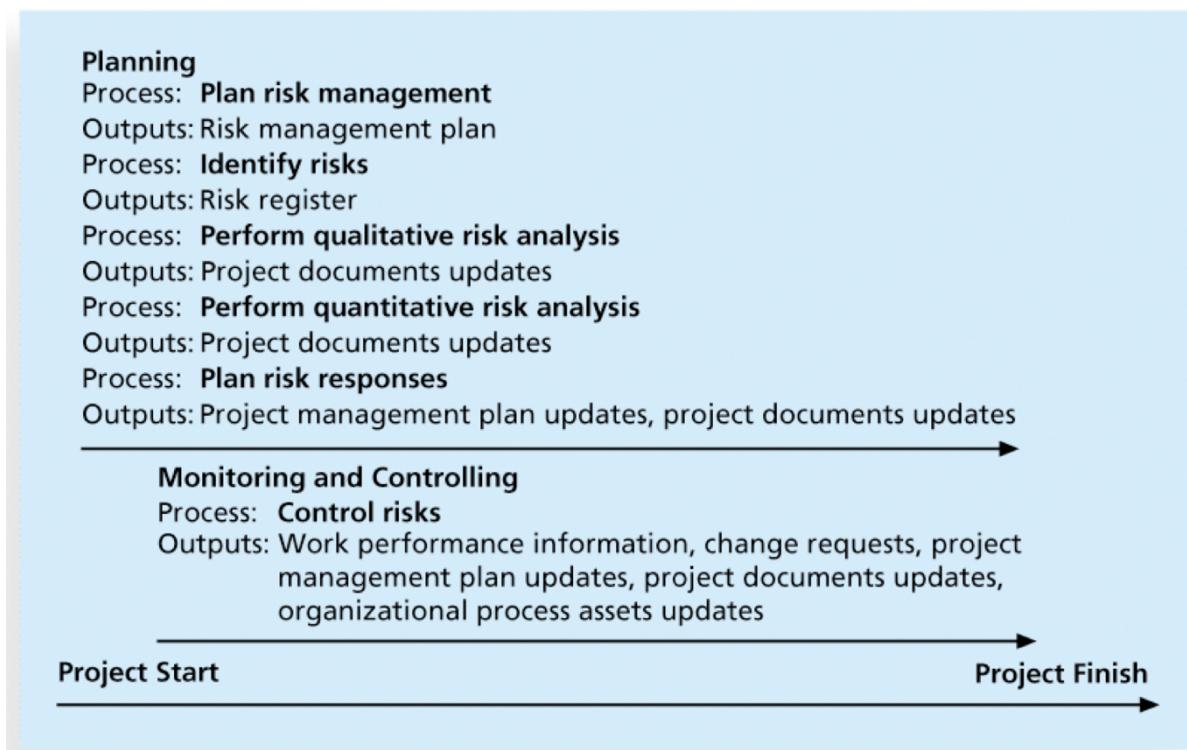
- Risk appetite: the degree of uncertainty an entity is willing to take on, in anticipation of a reward
- Risk tolerance: the maximum acceptable deviation an entity is willing to accept as the potential impact
- Risk utility: the amount of satisfaction/pleasure received from a potential payoff
- Known risks: has been identified & analysed, can be managed proactively
- Unknown risks: have not been identified & analysed and cannot be managed

Risk preference:



Project risk management processes

- Planning risk management: decide how to approach & plan risk management activities for the project
- Identifying risks: determine which risks are likely to affect a project and document the characteristics of each
- Performing qualitative risk analysis: prioritise risks based on their probability and impact of occurrence
- Performing quantitative risk analysis: numerically estimate effects of risks on project objectives
- Planning risk responses: take steps to enhance opportunities and reduce threats to meeting project objectives
- Controlling risk: monitor identified and residual risks, identify new risks, carry out risk response plans and evaluate the effectiveness of risk strategies throughout the life of the project



Planning risk management:

- output:
risk management plan (a plan that documents the procedures for managing risk through a project)

- methodology
 - roles & responsibilities
 - budget and schedule
 - risk categories
 - risk probability and impact
 - revised stakeholders' tolerances
 - tracking
 - risk documentation
- project team should review project documents and understand the organisation's and the sponsor's approaches to risk
 - level of detail will vary with the needs of the project

video 2

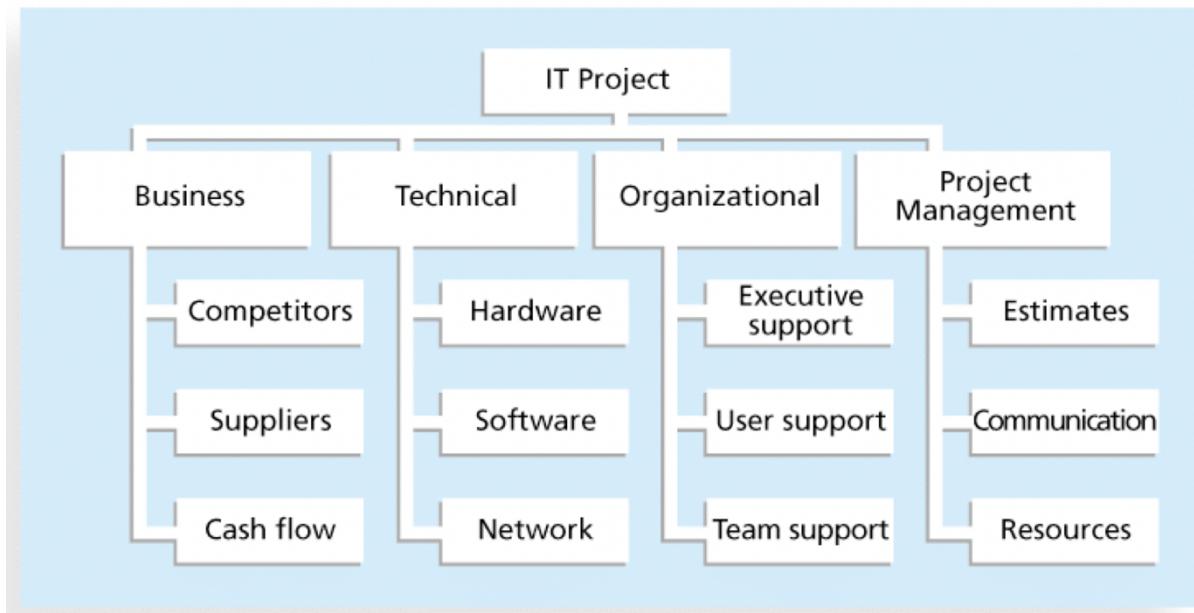
broad categories of risk:

- market risk
- financial risk
- technology risk
- people risk
- structure/process risk

risk breakdown structure:

a hierarchy of potential risk categories for a project

identify & categorise risks



Identifying risks:

Understand what potential events might hurt/enhance a particular project

Tools & techniques:

- brainstorming
- the Delphi technique
 - used to derive a consensus among a panel of experts
 - a systematic interactive procedure based on independent and anonymous input from project risk experts
 - facilitators use repeated rounds of questioning and written responses and consensus may be reached in a few rounds of this process

- avoid the biasing effects possible in oral methods
- interviewing: fact-finding technique for collecting information people with similar project experience/stakeholders & subject matter experts
 - face-to-face
 - phone
 - email
 - instant-messaging discussions
- SWOT analysis
- Root cause analysis
- Diagramming techniques
 - Cause & effect diagrams: fishbone diagram/Ishikawa
 - Systems/process flowchart
 - Influence diagram

Main output:

A list of identified risks and other information needed to begin creating a risk register risk register:

- A document that contains the results of various risk management processes, often presented in a table
- A tool for documenting potential risk events & related information
Risk events: specific uncertain events that may occur to the detriment (due to negative risk) or enhancement (due to positive risk)
- Contents:
- An identification number for each risk event
- A rank for each risk event
- Name of each risk event
- Description of each risk event
- Category under which each risk event falls
- Root cause of each risk
- Triggers (indicators/symptoms) for each risk
- Potential responses to each risk
- Risk owner (person who will own or take responsibility for each risk)
- Probability & impact of each risk
- Status of each risk

video 3

performing qualitative risk analysis:

assess the likelihood and impact of identified risks to determine magnitude & priority
(prioritise risks based on their probability & impact of occurrence)

risk qualification tools & techniques:

- Probability/impact matrix/chart: list relative probability of a risk occurring and the relative impact of the risk occurring
- top ten risk item tracking: a qualitative risk analysis tool that helps to identify risks and maintain an awareness of risks throughout the life of a project
- expert judgement

risk management review:

- objectives:
 - keep management and probably customer aware of major influences that could prevent/enhance the project's success
 - consider alternative strategies for addressing the risks
 - promote confidence in project team by demonstrating that team is aware of significant risks, has a strategy in place and is effective carrying out the strategy
- watch list: a list of risks that are low priority but are still identified as potential risks

video 4

performing quantitative risk analysis

often follows qualitative risk analysis but both can be done together

large complex projects involving leading edge technologies often require extensive quantitative risk analysis

techniques:

- data gathering
 - interviewing experts
 - collecting probability distribution information
- analysis and modelling techniques
 - decision tree analysis
 - a diagramming analysis technique used to help select the best course of action in situations in which future outcomes are uncertain
 - EMV (estimated monetary value): the product of a risk event probability and the risk event's monetary value
 - Simulation:
 - Use a representation/model of a system to analyse the expected behaviour or performance of the system
 - Monte Carlo analysis simulates a model's outcome many times to provide a statistical distribution of the calculated results
 - Monte Carlo simulation must have three estimates + an estimate of the likelihood of the estimate being between the most likely and optimistic values
 - sensitivity analysis: a technique used to show the effects of changing one or more variables on an outcome

video 5

planning risk responses:

develop options and define strategies for reducing negative risks and enhancing positive risks

- negative risks: TARA
 - transference: shift the consequence of a risk and responsibility for its management to a third party
 - avoidance
 - mitigation/reduction
 - acceptance
- positive risks:
 - exploitation
 - sharing
 - enhancement
 - acceptance

residual risks: remain after all response strategies have been implemented

secondary risks: direct result of implementing a risk response

controlling risks:

execute risk management process to respond to risk events and ensure that risk awareness is an ongoing activity performed by the entire project team throughout the entire project

- redistribution of resources devoted to risk management may be necessary because of changes in risk exposure
- monitor risks based on defined milestones and make decisions regarding risks and their response strategies
- workarounds: unplanned responses to risk events that must be done when there are no contingency plans

contingency plans:

predefined actions that the project team will take if an identified risk event occurs

fallback plans:

for risks that have a high impact on meeting project objectives

put into effect if attempts to reduce the risks are not effective

risk control:

outputs:

- work performance information
- change requests
- updates to project management plan
- other project documents
- organisational process assets

tools & techniques:

- risk reassessment/audits
- variance & trend analysis
- technical performance measurements
- reserve analysis
- status meetings/periodic risk reviews – top ten risk item tracking

TUTORIAL

Activity 1

Tools & techniques for identifying risks:

- information gathering techniques:
 - brainstorming
 - Delphi Technique
 - Interviewing
 - Root cause analysis
- SWOT analysis
- Diagramming technique

Risk appetite:

The degree of uncertainty an entity is willing to take on, in anticipation of a reward

Risk tolerance:

- How much risk an individual/organisation can tolerate
- The maximum acceptable deviation that an entity is willing to accept on the project/business objectives as the potential impact

Risk utility:

the amount of satisfaction/pleasure received from a potential payoff

different responses to negative risks:

- Risk transference:
shift the consequence of a risk and responsibility for its management to a third party (internal/external)
- Risk avoidance:
 - Avoid/eliminate a specific threat
 - Usually by eliminating its causes or not taking that risk
- Risk mitigation (reduction):
Reduce the impact of a risk event by reducing the probability of its occurrence
- Risk acceptance:
Project team decides to accept the risk and its consequences because the severity of the risk is lower than their risk tolerance

different responses to negative risks:

- Risk exploitation:
Doing whatever you can to make sure the positive risk happens
- Risk sharing:
Allocate ownership of the risk to another party
- Risk enhancement:
Change the size of the opportunity by identifying and maximising key drivers of the positive risk
- Risk acceptance:
Project team does not take any actions towards a risk

QUALITY MANAGEMENT

video 1

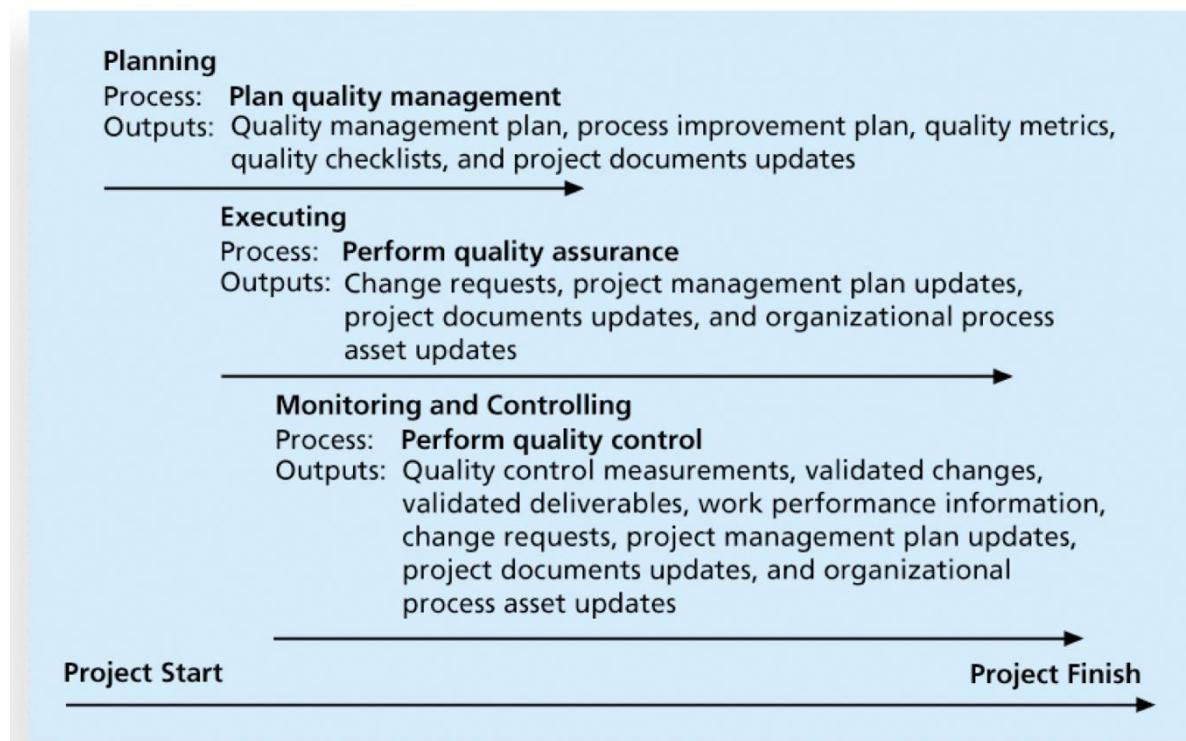
quality:

- the degree to which a set of inherent characteristics fulfils requirements-ISO (International Organisation for Standardisation)
- conformance to requirements: processes & products meet written specifications
- fitness to use: can be used as it was intended

project quality management:

ensure that project will satisfy the needs for which it was undertaken

- planning quality management:
identify which quality standards are relevant to project and how to satisfy them
- performing quality assurance:
periodically evaluate overall project performance to ensure the project will satisfy the relevant quality standards
- performing quality control:
monitor specific project results to ensure they comply with the relevant quality standards



Planning quality:

The ability to anticipate situations and prepare actions to bring about the desired outcome

- prevent defects (any instance where product/service fails to meet customer requirements) by:
 - select proper materials
 - train and indoctrinate people in quality
 - plan a process that ensure the appropriate outcome
- design of experiments: a technique that helps identify which variables have the most influence on the overall outcome of a process

scope aspects:

- functionality: the degree to which a system performs its intended function
- performance: address how well a product/service performs the customer's intended use
- reliability: the ability of a product/service to perform as expected under normal conditions
- maintainability: the ease of performing maintenance on a product
- features: system's special characteristics that appeal to users
- system outputs: screens & reports the system generates

video 2

performing quality assurance:

take responsibility for quality throughout the project's life cycle

- quality assurance: all activities related to satisfying the relevant quality standards for a project
- another goal: continuous quality improvement (Kaizen: improvements/changes)
- lean: evaluate processes to maximise customer value when minimising waste
- benchmark: generate ideas for quality improvements by comparing specific project practices or product characteristics to those of other projects/products within or outside the performing organisation
- quality audit: a structured review of specific quality management activities that help identify lessons learned that could improve performance on current or future projects

modern quality management:

- require customer satisfaction
- prefer prevention to inspection
- recognise management responsibility for quality

ISO 9000:

A quality system standard

- continuous cycle of planning, controlling & documenting quality in an organisation
- minimum requirements needed for an organisation to meet its quality certification standards
- help organisations reduce costs & improve customer satisfaction

ISO offer standards to provide a framework for the assessment of software processes

Improving quality:

- establish leadership that promotes quality
 - top management be quality-minded
 - large percentage of quality problems are associated with management
- understand the cost of quality
 - cost of conformance + cost of nonconformance
 - conformance (一致性): delivering products that meet requirements and fitness for use
 - cost of nonconformance: take responsibility for failures or not meeting quality expectations

5 cost categories related to quality:

- prevention cost: cost of planning and executing a project so it is error-free or within an acceptable error range
- appraisal cost: cost of evaluating processes and their outputs to ensure quality

- internal failure cost: cost incurred to correct an identified defect before the customer receives the product
 - external failure cost: cost that relates to all errors not detected and correlated before delivery to the customer
 - measurement & test equipment costs: capital cost of equipment used to perform prevention and appraisal activities
- focus on organisational influences and workplace factors that affect quality
a dedicated workspace and a quiet work environment: improve programmer productivity
- follow maturity models (frameworks for helping organisations improve the processes & systems)
 - software quality function deployment model: define user requirements & plan software projects
 - Software Engineering Institute's capability maturity model integration (CMMI): process improvement approach that provides organisations with essential elements of effective processes
Levels: incomplete -> performed -> managed -> defined -> quantitatively managed -> optimising
 - PMI's (Project Management Institute) maturity model:
 - Help organisations assess & improve their project management capabilities
 - Address standards for excellence in project, program and portfolio management best practices and explain capabilities necessary to achieve best practices

video 3

controlling quality

outputs:

- Acceptance decisions
- Rework
- Process adjustments: correct/prevent further quality problems based on quality control measurements

7 basic tools for quality:

- Cause-and-effect diagram
 - Fishbone/Ishikawa diagrams
 - Trace complaints about quality problems back to the responsible production operations
- Quality control chart:
 - A graphic display of data that illustrates the results of a process over time
 - Main use: prevent defects, not detect & reject them
 - Determine a process is in/out of control
 - In control:
 - any variations in results of the process are created by random events
 - No need to be adjusted
 - Out of control:
 - any variations in results of the process are created by non-random events
 - need to identify causes of the events and adjust the process to correct/eliminate them
 - seven run rule: if 7 data points in a row are all below the mean, above the mean or all increasing or decreasing, then the process needs to be examined for non-random problems
- Check sheet
 - Tally sheet/ checklist
 - Collect & analyse data
 - Useful in improving the process for handling complaints
- Scatter diagram
 - Show if there is a relationship
 - Closer data points are to the “line of best fit”, the more closely the two variables are related
- Histogram
 - A bar graph of a distribution of variables
 - Each bar represents an attribute/characteristic of a problem situation
 - Height represents frequency
- Pareto chart

- A histogram that help identify and prioritise problem areas
- 80-20 rule: 80% problems are often due to 20% causes
- Stratification: a technique that shows data from a variety of sources to see if a pattern emerges
 - Flowchart
 - Graphic displays of the logic and flow of processes that help analyse how problems occur and how processes can be improved
 - Show activities, decision points and the order of how information is processed
 - Run chart
 - Display the history & pattern of variation of a process over time
 - Perform trend analysis & forecast future outcomes based on historical results
 - Statistical sampling: choose part of a population of interest for inspection

Six sigma:

A comprehensive and flexible system for achieving, sustaining & maximising business success

Sigma is uniquely driven by close understanding of:

- customer needs
- disciplined use of facts, data and statistical analysis
- diligent attention to managing, improving & reinventing business processes

target for perfection: ≤ 3.4 defects per million opportunities (DPMO)

follow 5-phase improvement process DMAIC:

a systematic, closed-loop process for continued improvement that is scientific and fact based

- Define: define problem/opportunity, process & customer requirements
- Measure: define measures then collect, compile and display data
- Analyse: scrutinise process details to find improvement opportunities
- Improve: generate solutions and ideas for improving the problem
- Control: track and verify the stability of the improvements and the predictability of the solution

Six 9s of quality:

- A measure of quality control
- Equal to 1 fault in 1 million opportunities
- Telecommunications industry: 99.9999% service availability (30s downtime a year)
- Target goal for the number of errors in a communications circuit, system failure or errors in lines of code

Testing:

Should be done during almost every phase of IT product development life cycle

- Unit testing: each individual component (often a program) to ensure it is as defect-free as possible
- Integration testing: functionally grouped components
- System testing: entire system as one entity
- User acceptance testing: independent test performed by end users prior to accepting the delivered system

PROCUREMENT MANAGEMENT

video 4

procurement: purchasing/outsourcing

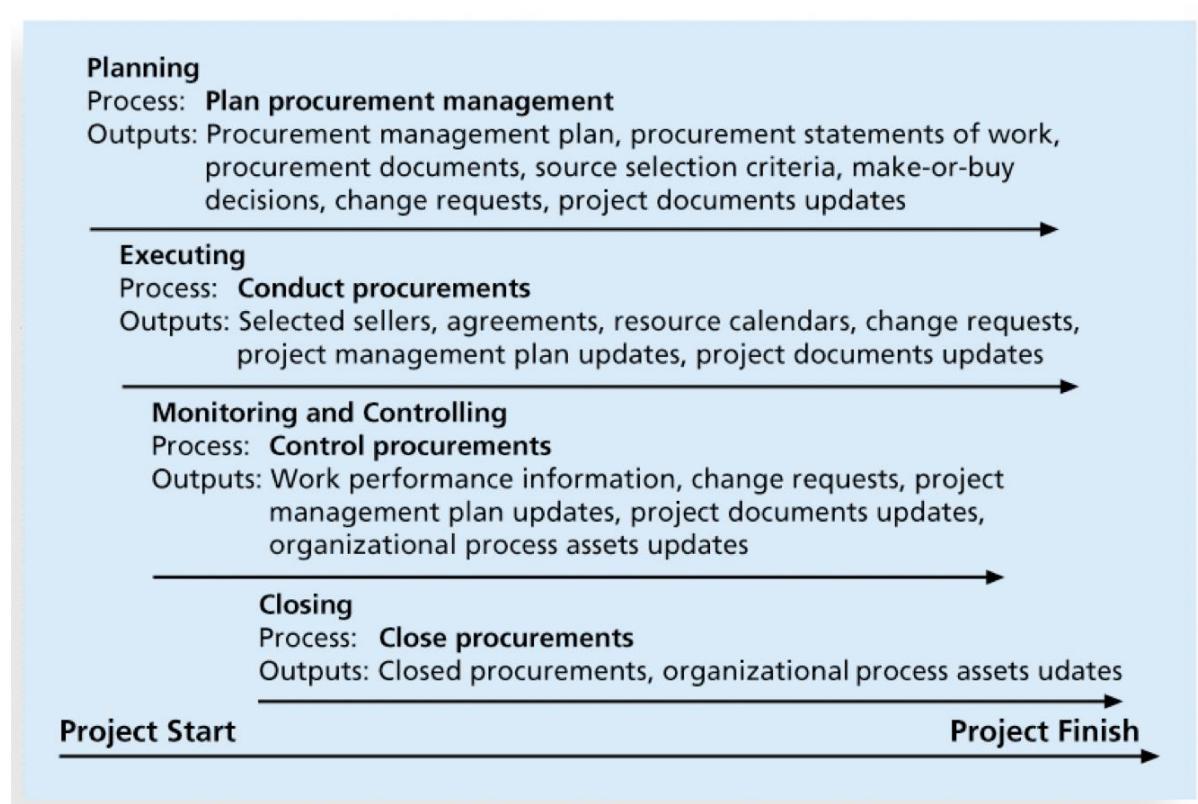
acquiring goods and/or services from an outside source

- Access skills & technologies
- Reduce both fixed & recurrent costs
- Allow client organisation to focus on its core business
- Provide flexibility
- Increase accountability

Project procurement management:

Acquiring goods & services for a project from outside the performing organisation

- Planning procurement management: determine what to produce and when and how to do it
- Conducting procurements: obtain seller responses, select sellers and award contracts
- Controlling procurements: manage relationships with sellers, monitor contract performance and make changes as needed
- Closing procurements: complete and settle each contract/agreement, including resolving of any open items



Planning procurement management

- Identify which project needs can best be met by using products/services outside the organisation
- Important decision: make or buy
- Procurement management plan:
Describe how procurement processes will be managed, from developing documentation for making outside purchase or acquisitions to contract closure

Contract:

A mutually binding agreement that obligates the seller to provide the specified products/services and obligates the buyer to pay for them

Can clarify responsibilities and sharpen focus on key deliverables of a project

More accountability for delivering the work as stated in the contract because contracts are legally binding

- Fixed price/lump sum contracts:
 - FFP (firm-fixed price)
 - FP-EPA (fixed price with economic price adjustment)
 - FPI (fixed-price incentive fee)
- Cost reimbursable contracts
 - CPAF (cost plus award fee)
 - CPIF (cost plus incentive fee)
 - CPFF (cost plus fixed fee)
 - CPPC (cost plus percentage of cost)
- Time and material contracts: hybrid of fixed price and cost reimbursable contracts
- Unit price contracts: buyer pay seller a predetermined amount per unit of service

PTA (point of total assumption):

The cost at which the contractor assumes total responsibility for each additional dollar of contract cost

PTA = (ceiling price – target price) / government share + target cost

Tools & techniques for planning purchases & acquisitions:

- Expert judgement
- Market research
- Make-or-buy analysis

Statement of work (SOW):

A description of the work required for the procurement

A type of scope statement

Contract SOW: SOW used as part of a contract to describe only the work required for the particular contract

Procurement documents

- Request for proposals (RFP): solicit proposals from prospective sellers
Proposal: a document prepared by a seller when there are different approaches for meeting buyer needs
 - SOW
 - Schedule information
- Requests for quotes (RFQ): solicit quotes/bids from prospective suppliers
Bid (tender/quote): a document prepared by sellers providing pricing for standard items that have been clearly defined by the buyer

Source selection criteria:

Evaluate proposals/bids from sellers, choosing the best one, negotiating the contract and awarding the contract

Prepare some form of evaluation criteria preferably before issuing formal RFP/RFQ

Beware of proposals that look good on paper, be sure to evaluate factors

Can require a technical presentation as part of a proposal

Conducting procurements:

- Organisations can advertise to procure goods & services by:
- Send appropriate documentation to potential sellers
- Obtain proposals/bids
- A bidders' conference can help clarify the buyer's expectations
- Shortlisted sellers may be asked to prepare a best and final offer (BAFO)
- Select a seller
- Award a contract

Controlling procurements:

- Ensure seller's performance meet contractual requirements
- Contracts are legal relationships, so legal contracting professionals should be involved in writing and administering contracts
- PM and team members watch for constructive change orders (oral/written acts/omissions by someone with actual/apparent authority that can be construed to have the same effect as a written change order)

Change control in contracts:

- Changes to any part of the project need to be reviewed, approved and documented by the same people in the same way that the original part of the plan was approved
- Evaluation of any change should include an impact analysis
- Changes must be documented in writing

- PM and teams should stay closely involved to make sure the new system will meet business needs
- Have backup plans
- Use tools & techniques (eg. contract change control system, buyer-conducted performance reviews, inspections & audits)

Closing procurements:

Contract closure involves completing and setting contracts and resolving any open items

Project team should:

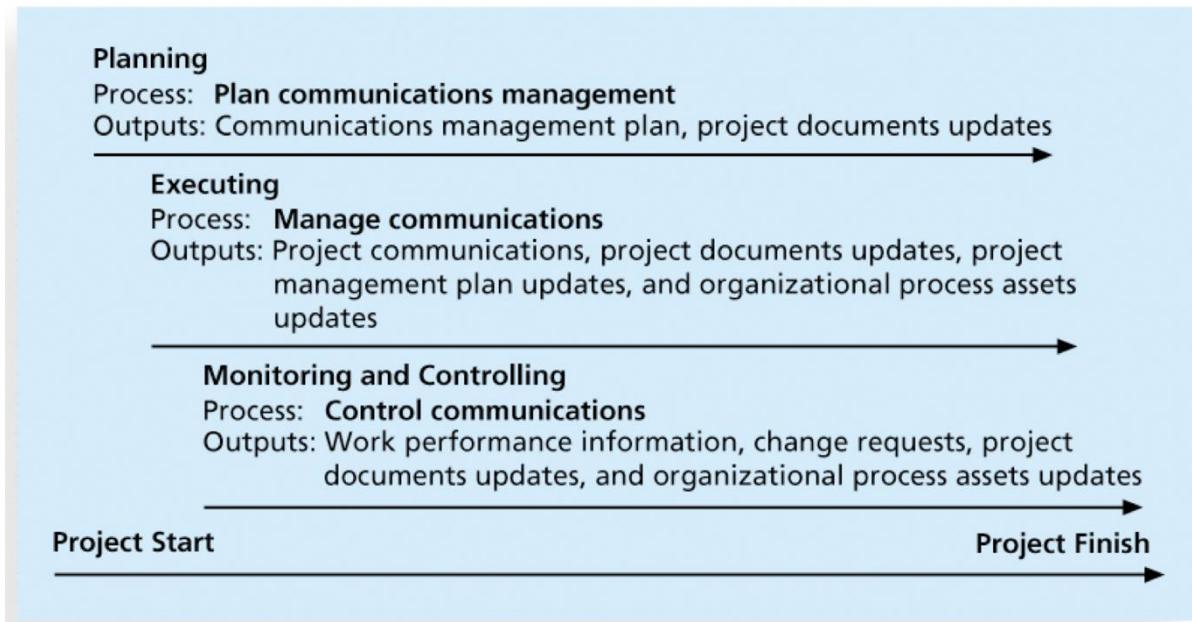
- Determine if all work was completed correctly and satisfactorily
- Update records to reflect final results
- Archive information for future use (record management system)
- Procurement audits identify lessons learned
- Contract should include requirements for formal acceptance and closure

COMMUNICATIONS MANAGEMENT & STAKEHOLDER MANAGEMENT

video 1

communications management:

- Planning communications management: determine the information and communications needs of stakeholders
- Managing communications: create, distribute, store, retrieve and dispose project communications based on communications management plan
- Controlling communications: monitor and control communications to ensure stakeholder communication needs are met



Keys to good communications:

- Focus on group & individual communication needs
- Understand individual & group preferences for communications
 - Personal preferences affect communication needs
 - Personal differences can lead to miscommunication
 - Receiver may not interpret a message exactly as the sender intended
 - Geographic location and cultural background affect the complexity of project communications
 - Different working hours
 - Language barriers
 - Different cultural norms
- Use formal & informal methods for communicating
 - Different people respond positively to different levels/types of communication
 - Communication includes different dimensions (eg. writing, speaking, listening)

- Encourage more face-to-face interactions
 - Short frequent meetings are often effective
 - Stand-up meetings force people to focus on what they really need to communicate
- Distribute important info in an effective and timely manner
 - Include detailed technical info that affects critical performance
 - Don't bury crucial info
 - Don't be afraid to report bad info
 - Oral communication via meetings & informal talks helps bring info out into the open
 - Info about project is disseminated to the right recipient at the right time using the right mode
- Set the stage for communicating bad news
- Determine the number of communication channels

Communications channels:

Number of channels:

$$n*(n-1)/2 \quad (n: \text{number of people})$$

As number of people involved increases, the complexity of communications increases because there are more communications channels/pathways through which people can communicate

Planning communications management:

- Every project should include some type of communications management plan (a document that guides project communications)
- Communications plan should be part of the overall project management plan
- Vary with needs of project
- For small projects, communications management plan can be part of team contract
- For large projects, should be a separate document

Communications management plan contents:

- Stakeholder communications requirements
- Info to be communicated (including format, content, level of detail)
- Who will receive the info & who will produce it
- Suggested methods/technologies for conveying the info
- Frequency of communication
- Escalation procedures for resolving issues
- Revision procedures for updating communications management plan
- Glossary of common terminology

video 2

managing communications

- Managing communications is a large part of a project manager's job
- Stakeholder communications analysis is a good starting point
- Getting project information to the right people at the right time and in a useful format is as important as developing the information in the first place
- Important considerations include use of technology, appropriate methods and media to use and performance reporting

Communication methods

- Interactive communication:
 - 2 or more people interact to exchange information
 - Meetings, phone calls, video conferencing
 - Most effective way to ensure common understanding
- Push communication:
 - Info is sent/pushed to recipients without their request
 - Reports, emails, faxes, voice mails..
 - Ensure info is distributed but not ensure it is received/understood
- Pull communication:
 - Info is sent to recipients at request
 - Website, bulletin boards, e-learning, knowledge repositories (eg. blog)

Reporting performance:

Keep stakeholders informed about how resources are being used to achieve project objectives

- Status reports: where project stands at a specific point in time (in terms of scope, time & cost)
- Progress reports: what project team has accomplished during a certain period of time
- Forecasts: predict future project status & progress based on past info & trends

Controlling communications:

- Main goal: ensure optimal flow of info throughout the entire project life cycle
- Use various reporting systems, expert judgement & meetings
- May require changes to earlier processes of planning and managing project communications if any problems exist
- Can use external facilitator to assess how well communications are working

Improving project communications:

- Develop better communication skills

- As organisations become more global, they realise they must invest in ways to improve communication with people from different countries and cultures
 - Take leadership to improve communication
- Run effective meetings
 - Determine if a meeting can be avoided
 - Define purpose and intended outcome of the meeting
 - Determine who should attend meeting
 - Provide an agenda to participants before meeting
 - Prepare handouts & visual aids, make logistical arrangements ahead of time
 - Run meeting professionally
 - Set ground rules for meeting
 - Build relationships
- Use emails and other technologies effectively
 - SharePoint: create custom websites to access documents and applications stored on shared devices
 - Google Docs: allow users to create, share & edit documents, spreadsheets & presentations online
 - Wiki: website designed to enable anyone who accesses it to contribute/modify web page content
- Use templates for project communications: can develop own templates, use some provided by outside organisations or use sample from textbooks

Lessons learned reports

PM and team members should each prepare a lessons-learned report

- a reflective statement that documents important things an individual learned from working on project
- provide valuable reflections on what worked and what did not

PM often combines info from all lessons-learned reports into a project summary report

Project archives & software:

Project archives: a complete set of organised project records that provide an accurate history of project

Many project teams create a project website to store important product documents & other info

STAKEHOLDER MANAGEMENT

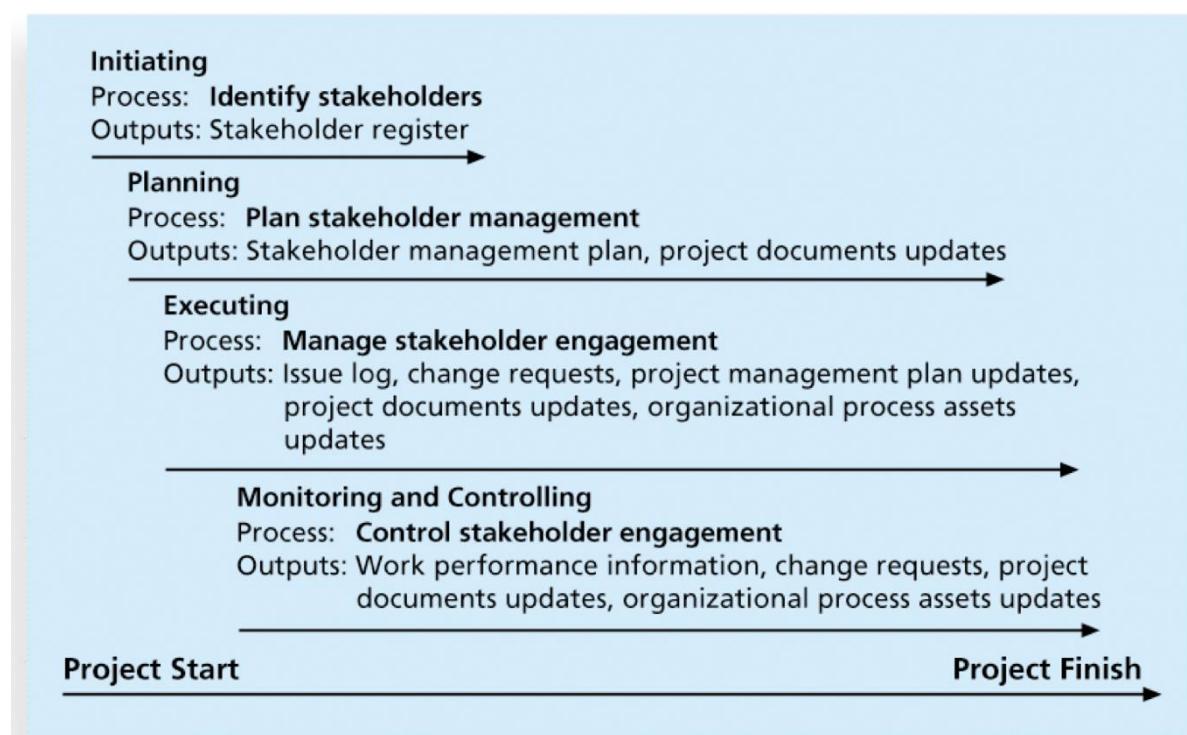
video 3

stakeholder management:

- identify all people or organisations affected by a project
- analyse stakeholder expectations
- effectively engage stakeholders

processes:

- identifying stakeholders: identify everyone involved in the project or affected by it & determine the best ways to manage relationships with them
- planning stakeholder management: determine strategies to effectively engage stakeholders
- managing stakeholder engagement: communicate and work with project stakeholders to satisfy their needs & expectations, resolve issues and foster engagement in project decisions and activities
- controlling stakeholder engagement: monitor stakeholder relationships and adjust plans and strategies for engaging stakeholders as needed



Identifying stakeholders:

Project stakeholders: individuals, groups or organisations who may affect, be affected by or perceive themselves to be affected by a decision, activity or outcome of a project

- internal stakeholders:
 - project sponsor

- project team
- supporting staff
- internal customers
- top management
- other functional managers
- other project managers
- external stakeholders:
 - customers
 - competitors
 - suppliers
 - government officials
 - concerned citizens
- additional stakeholders:
 - program director
 - project manager's family
 - labour union
 - potential customers

stakeholder register:

basic info on stakeholders

- identification info:
 - name
 - position
 - role
 - contact info
- assessment info:
 - major requirements & expectations
 - potential influences
 - phases of project in which stakeholders have most interest
- stakeholder classification:
 - internal/external?
 - supportive/resistant?

Classify stakeholders:

- power/interest grid:
 - power: level of authority
 - interest: level of concern
- engagement levels:
 - unaware: unaware of project and its potential impact
 - resistant: aware of project yet resistant to change
 - neutral
 - supportive: aware of project and supportive of changes
 - leading: aware of project

video 4

stakeholder management plan:

- current and desired engagement levels
- interrelationships between stakeholders
- communication requirements
- potential management strategies for each stakeholder
- methods for updating the stakeholder management plan

often include sensitive info, so should not be part of official project documents (available for all stakeholders review)

only PM and a few team members should prepare the plan

issue log:

a tool used to document, monitor and track issues that need resolution

best practice:

- be clear from start
- explain the consequences
- have a contingency plan
- avoid surprises
- take a stand

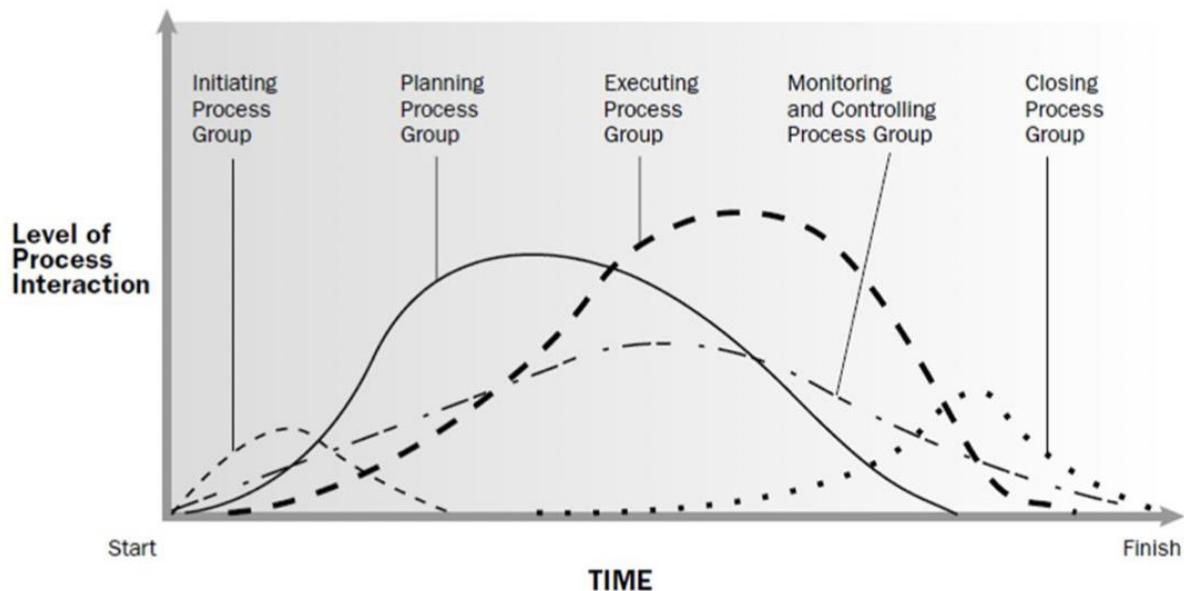
ways to control engagement:

engagement: a dialogue in which people seek understanding and solutions to issues of mutual concern

- key stakeholders should be invited to actively participate in a kick-off meeting rather than merely attending it
- PM emphasise a dialogue is expected at the meeting
- PM meet with important stakeholders before kick-off meeting
- Project schedule should include activities & deliverables related to stakeholder engagement, eg. surveys, reviews, demonstrations & sign-offs

Monitoring & control processes:

- Measure and report progress, handle changes to scope, time, cost and quality
- Manage project team
- Manage risk mitigation strategies
- Monitor procurement contracts



Monitoring:

Collect & report information concerning previously defined project performance elements

Control:

Use the info supplied by monitoring techniques to bring project actual results in line with stated project performance standards

Keys to effective monitoring & controlling:

- The organisation and project manager must foster an environment that allows for the honest reporting of results
- To reduce the chances for biased reporting, the process should be as automated as possible and there needs to a separation of responsibilities
- Time must be allocated in the project schedule to perform the tasks of monitoring and control
- All members of project team, stakeholders and other management resources should receive training on effective monitoring and control techniques

Earned Value Management (EVM):

A technique used to help determine and manage project progress and the magnitude of any variations from the planned values concerning cost, schedule and performance

EVM key values:

- Planned value (PV):
 - budgetary cost of work scheduled (BCWS)
 - the budgeted cost for the work scheduled to be completed up to a given point in time
 - final PV of a task = task's budget at completion (BAC)
- budget at completion (BAC):
total amount budgeted for the task
- earned value (EV):
 - budgeted cost of work performed (BCWP)
 - the budgeted amount of work actually completed on the task during a given time period
 - $EV = \text{project budget} * \text{percent complete}$
- Actual cost (AC):
 - actual cost of work performed (ACWP)
 - total cost incurred in accomplishing work on the task during a given time period
- cost variance (CV):
 - show whether and by how much the project is under or over the approved budget
 - $CV = EV - AC$
 - Actual dollar value by which a project is either overrunning or under running its estimated cost
 - Negative CV: over budget/ cost overrun
 - Positive CV: below budget
- Cost performance indicator (CPI):
 - Show the project's cost efficiency or utilisation of the resources on project
 - $CPI = EV / AC$
 - <100%: over budget
 - >100%: below budget
- Schedule variance (SV):
 - Show whether work is ahead/behind approved schedule

- $SV = EV - PV$
 - Difference in dollar value between the amount of work that should have been completed in a given time period and the work actually completed
 - Negative SV: behind schedule
 - Positive SV: ahead schedule
- Schedule performance indicator (SPI):
 - Project's schedule efficiency
 - The rate at which the project is progressing (ahead/behind schedule)
 - $SPI = EV / PV$
 - < 100%: behind schedule
 - > 100%: ahead of schedule
- Budget at completion (BAC):

Budget for total job
- Estimate to completion (ETC):
 - From the point, how much more do we expect it to cost to finish the job
 - $ETC = (BAC - EV) / CPI$
 - $ETC = BAC / CPI - AC$
- Estimate at completion (EAC):
 - What do we currently expect the total project to cost
 - $EAC = BAC / CPI$
 - $EAC = AC + ETC$

Report performance:

Collect & disseminate performance information

- All project & product related data
 - Schedule
 - Costs
 - Quality
 - Risks
 - Human resources
 - Procurement (if needed)
- Distribution of performance information to stakeholders

Frequency of reports determined by:

- Type of report
- Size of project
- Importance of project as stated in the communication plan

Categories:

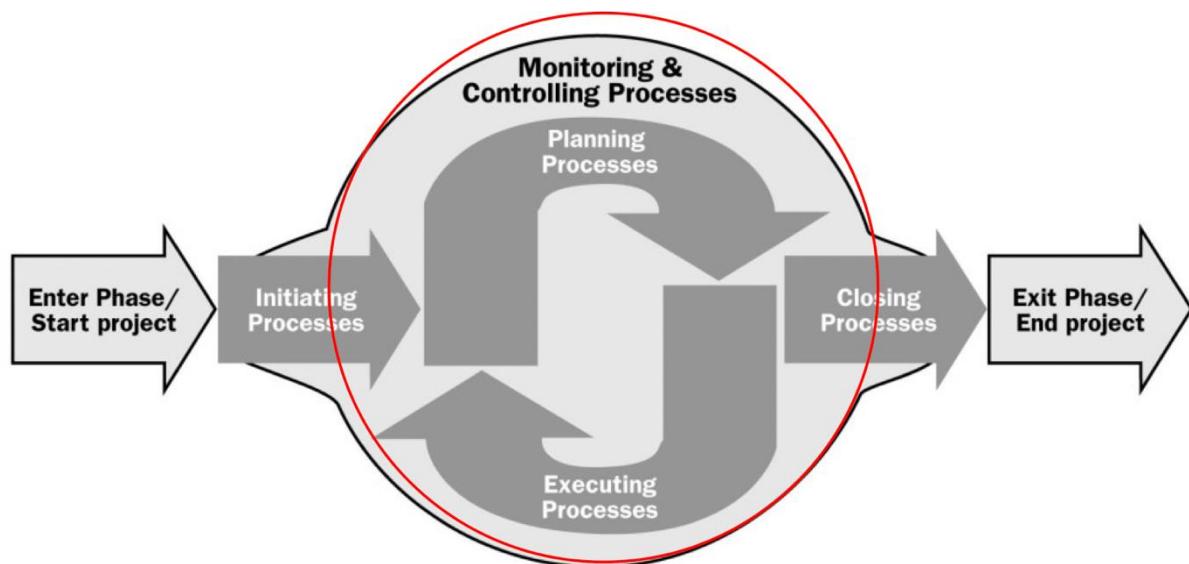
- Progress reports:
 - physical progress to date
 - actual data VS planned data
- Status reports
 - Identify where the project is today (date the report is prepared)
 - Info from collected performance data to calculate SV and CV
- Project reports
 - Earned value numbers:
 - EAC
 - ETC
 - SPI
 - CPI
 - Forward looking: give projections/forecasts of project finish
- Exception reports:
 - Exceptions
 - Problems
 - Risks

PROJECT MANAGEMENT PROCESS

video 1

project management can be viewed as a number of interlinked processes
process: a series of actions directed toward a particular result

- Initiating processes
- Planning processes
- Executing processes
- Monitoring & controlling processes
- Closing processes



Methodology:

how things should be done

Standard:

what should be done

video 2

project pre-initiation:

- Determine the scope, time & cost constraints for the project
- Identify the project sponsor
- Select project manager
- Develop business case for a project
- Meet with project manager to review the process and expectations for managing project
- Determine if project should be divided into 2 or more smaller projects

Project initiation:

Define & authorise a project/project phase

Recognise & start a new project/project phase

Formally select & start off projects

- Develop project charter
- Identify stakeholders

Kick-off meeting:

Stakeholders can meet each other, review goals of project and discuss future plans

Project planning:

Devise and maintain a workable scheme to ensure project addresses the organisation's needs

Key outputs:

- team contract
- project scope statement
- WBS
- Project schedule (Gantt chart with all dependencies & resources entered)
- List of prioritised risks (part of risk register)

Project executing:

- Usually take the most time & resources
- Many project sponsors and customers focus on deliverables related to providing the products, services or results desired from the project
- A milestone report can help focus on completing major milestones

Project monitoring & controlling:

- Measure progress toward project objectives, monitor deviation from the plan and take correction actions
- Affect all other process groups
- Occur during all phases of project life cycle
- Output:

- Performance reports
- Change requests
- Updates to various plans

Project closing

- Gain stakeholder and customer acceptance of the final products and services
- Most include a final report and presentation to sponsor/senior management
- Even if not completed, should be closed out to learn from past
- Outputs:
 - Project files
 - Lessons-learned reports
 - Updates to organisational process assets

video 3

types of life cycle

- Predictive life cycle
 - More traditional approach
 - Bulk of planning occur upfront
 - Execute in a single pass
 - Sequential process
- Iterative life cycle:
Allow feedback for unfinished work to improve and modify the work
- Incremental life cycle:
Provide finished deliverables that the customer may be able to use immediately
- Agile life cycle:
Both iterative & incremental to refine work items and deliver frequently

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

Definable work VS high uncertainty work

- Definable:
 - Characterised by clear procedures that have been proven successful or similar projects in the past
 - Low level of execution uncertainty and risk
- High uncertainty:
 - New design, problem solving and not-done-before work is exploratory
 - High rates of change, complexity and risk
 - May pose a problem for traditional predictive approach

4 values of Agile Manifesto:

- Individual and interactions over processes and tools
- Working software over comprehensive documentation

- Customer collaboration over contract negotiation
- Responding to change over following a plan

Choose approach:

- Predictive:
 - Heavy constraints
 - Inexperienced & dispersed teams
 - Large risks
 - Generally clear up-front requirements
 - Fairly rigid completion date
- Agile:
 - Less rigid constraints
 - Experienced and preferably co-located teams
 - Smaller risks
 - Unclear requirements
 - More flexible scheduling

video 4

scrum roles:

- Product owner: responsible for business value of project and deciding what work to do and in what order, as documented in product backlog
- Scrum master: ensure team is productive, facilitate daily scrum, enable close cooperation across all roles & functions, remove barriers. That prevent the team from being effective
- Scrum team/development team: cross-functional team of 5-9 people who organise themselves and the work to produce the desired results of each sprint (normally 2-4 weeks)

Scrum artefact:

Artefact: useful object created by people

- Product backlog: list of features prioritised by business value
- Sprint backlog: highest-priority items from product backlog to be completed within a sprint
- Burndown chart: cumulative work remaining in a sprint on a day-by-day basis

Scrum ceremonies:

- Sprint planning session: a meeting with the team to select a set of work from the product backlog to deliver during sprint
- Daily scrum: a short meeting for development team to share progress and challenges and plan work for the day
- Sprint reviews: a meeting in which the team demonstrates to the product owner what it has completed during the sprint
- Sprint retrospectives: a meeting in which the team looks for ways to improve the product and the progress based on a review of the actual performance of the development team

