

**BSc in Computer Engineering**  
**CMP4103**  
**Computer Systems and Network Security**

**Lecture 9**  
**Project Management**

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## 1. Project Management

Project management is the discipline of planning, organising, motivating, and controlling resources to achieve specific goals.

### 1.1 What is a Project

A project is a temporary group activity designed to produce a unique product, service or result.

#### 1.1.1 Temporary

A project is temporary in that it has a defined beginning and end in time, and therefore defined scope and resources.

#### 1.1.2 Unique

A project is unique in that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal. So a project team often includes people who don't usually work together, sometimes from different organisations and across multiple geographies.

The development of software for an improved business process, the construction of a building or bridge, the relief effort after a natural disaster, the expansion of sales into a new geographic market, all are projects.

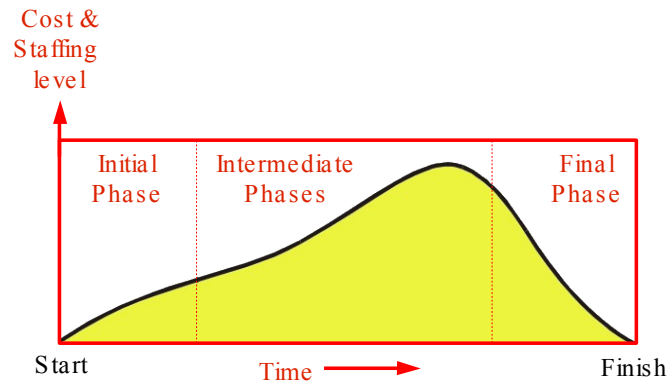
#### 1.1.3 Managed

All must be expertly managed to deliver the on-time, on-budget results, learning and integration that organisations need.

Project management, then, is the application of knowledge, skills and techniques to execute projects effectively and efficiently. It's a strategic competency for organisations, enabling them to tie project results to business goals and thus, better compete in their markets.

It has always been practised informally, but began to emerge as a distinct profession in the 1960s.

## 1.2 Project life-cycle



Projects vary in size and complexity. No matter how large or small, simple or complex, all projects can be mapped to the following life cycle structure.

- Starting the project.
- Organising and preparing.
- Carrying out the project work.
- Closing the project.

This generic life cycle structure is often referred to when communicating with upper management or other entities less familiar with the details of the project. This high-level view can provide a common frame of reference for comparing projects, even if they are dissimilar in nature.

### 1.3 Project Management Institute (PMI)

PMI is the world's largest not-for-profit membership association for the project management profession. PMI has more than 700,000 members, Project Management Professional (PMP) credential holders in nearly every country in the world.

PMI advocates a project management methodology that is used globally and is reinforced by a globally recognised standard and certification programme, extensive academic and market research programmes, chapters and communities of practice.

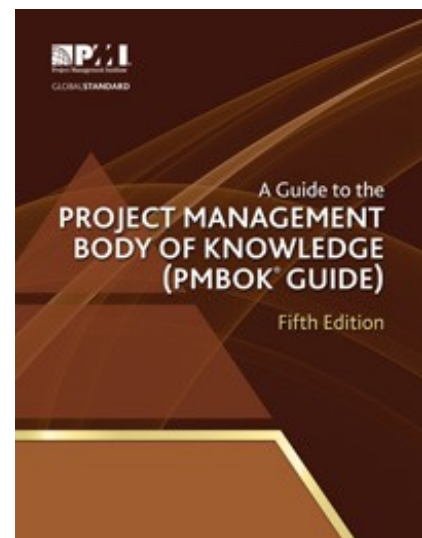
The PMI methodology is contained in the Project Management Body of Knowledge (PMBOK). It identifies project management processes in five groups:

1. Initiating.
2. Planning.
3. Executing.
4. Monitoring and Control.
5. Closing.



Project management knowledge draws on ten areas:

- Project Integration Management.
- Project Scope Management.
- Project Time Management.
- Project Cost Management.
- Project Quality Management.
- Project Human Resource Management.
- Project Communications Management.
- Project Risk Management.
- Project Procurement Management.
- Project Stakeholders Management.



All management is concerned with these, of course. But project management brings a unique focus shaped by the goals, resources and schedule of each project.

## 1.4 Project IN Controlled Environments (PRINCE)

PRINCE version 2 is a project management methodology. It was developed by the UK government agency Office of Government Commerce (OGC) and is used extensively within the UK government as the de facto project management standard for its public projects. The methodology encompasses the management, control and organisation of a project. PRINCE2 is also used to refer to the training and accreditation of authorised practitioners of the methodology who must undertake accredited qualifications to obtain certification.



PRINCE2 is based on seven principles:

- Continued business justification.
- Learn from experience.
- Defined roles and responsibilities.
- Manage by stages.
- Manage by exception.
- Focus on products.
- Tailored to suit the project environment.

PRINCE2 also has seven themes:

- Business case.
- Organisation.
- Quality.
- Plans.
- Risk.
- Change.
- Progress.





## 1.5 PRINCE2 Processes

The principles and themes come into play in seven processes:

### **Starting up a project (SU)**

Project team is appointed and a project brief is prepared. In addition the overall approach to be taken is decided and the next stage of the project is planned. Once this work is done, the project board is asked to authorise the next stage, that of initiating the project.

### **Initiating a project (IP)**

A business case is developed to ensure quality on the project is agreed together with the overall approach to controlling the project itself. Project files are also created as is an overall plan for the project.

### **Directing a project (DP)**

How the project board will control the overall project and dictate how the project board should authorise a stage plan. How the board can give ad hoc direction to a project and the way in which a project should be closed down.

### **Controlling a stage (CS)**

Projects should be broken down into stages and these sub-processes dictate how each individual stage should be controlled. How progress should be monitored and how the highlights of the progress should be reported to the project board. A means for capturing, assessing and corrective action should be taken. Escalation mechanism to the project board.

### **Managing stage boundaries (SB)**

This stage dictates the overall project plan, risk register and business case amended as necessary. The process also covers what should be done for a stage that has gone outside its tolerance levels. Also how the end of the stage should be reported.

### **Managing product delivery (MP)**

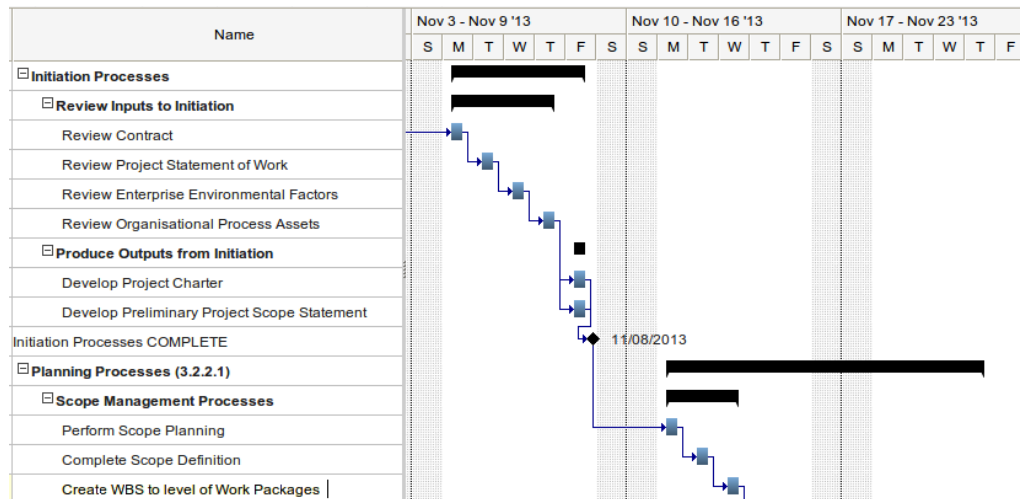
The Managing product delivery process has the purpose of controlling the link between the Project Manager and the Team Manager(s) by placing formal requirements on accepting, executing and delivering project work.

### **Closing a project (CP)**

Formally de-commission and reallocation of the project resources. Document follow on actions that are identified and the project itself be formally evaluated.

## 2. Project Management Tools

### 2.1 Gantt chart



A Gantt chart is a type of bar chart, developed by Henry Gantt in the 1910s, that illustrates a project schedule. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. Modern Gantt charts also show the dependency relationships between activities. Gantt charts can be used to show current schedule status using percent-complete shadings and a vertical "TODAY" line.

Although now regarded as a common charting technique, Gantt charts were considered revolutionary when first introduced. Gantt charts are also used in information technology to represent data that has been collected.

Gantt charts are a central tool to Project Management applications like:

- Planner <http://winplanner.sourceforge.net>
- Project Libre <http://www.projectlibre.org>
- Microsoft Project <http://office.microsoft.com/project>
- Open Workbench <http://www.itdesign.de/en/ppm/open-workbench>
- dotProject <http://www.dotproject.net>
- Ganttter <http://www.ganttter.com>

For the purpose of this course we will use the Open Source Planner.

Linux install:

```
CEDAT:~ $ sudo apt-get install planner
```

```
CEDAT:~ $ sudo yum install planner
```

## 2.2 CobiT and PMI



As we saw in an earlier lecture Control Objectives for Information and related Technology (CobiT) is a framework for IT management created by the Information Systems Audit and Control Association (ISACA), and the IT Governance Institute (ITGI). CobiT provides managers, auditors, and IT users with a set of generally accepted measures, indicators, processes and best practices to assist them in maximising the benefits derived through the use of information technology and developing appropriate IT governance and control in a company.

CobiT combines frameworks like Project Management Institute (PMI), ISO 27000 and ITIL to build IT Governance to provide:

- Value Delivery.
- Risk Management.
- Resource Management.
- Performance Measurement.
- Strategic Alignment.

CobiT has high level processes that cover hundreds of control objectives categorised into four domains:

- Planning and Organisation.
- Acquisition and Implementation.
- Delivery and Support.
- Monitoring and Evaluation.



### **3. Projects Office**

A Project Management Office (PMO) is a group or department within a business, agency or enterprise that defines and maintains standards for project management within the organisation.

The primary goal of a PMO is to achieve benefits from standardising and following project management policies, processes and methods. Over time, a PMO generally will become the source for guidance, documentation, and metrics related to the practices involved in managing and implementing projects within the organisation. A PMO may also get involved in project-related tasks and follow up on project activities through completion. The office may report on project activities, problems and requirements to executive management as a strategic tool in keeping implementers and decision makers moving toward consistent, business or mission focused goals and objectives.

A PMO generally bases its project management principles, practices and processes on some kind of industry standard methodology such as PMBOK or PRINCE2.

#### **3.1 PMO Types**

##### **3.1.1 The project repository**

This model occurs most often in organisations that empower distributed, business centric project ownership, or enterprises with weak central governance. The project office simply serves as a source of information on project methodology and standards. Project Managers continue to report to and are funded by their respective business areas.

##### **3.1.2 The project coach model**

This model assumes a willingness to share some project management practices across business functions and uses the PMO to coordinate the communication. Best practices are documented and shared and project performance is monitored actively. The PMO in this model is a permanent structure with staff and has some supervisory responsibility for all projects.

##### **3.1.3 The enterprise project management office**

This model also assumes a governance process that involves the PMO in all projects, regardless of size, allowing it to assess scope, allocate resources and verify time, budget, risk and impact assumptions before the project is undertaken. Funding is generally a combination of direct, budgeted allocation for baseline services and a fee-for-service charge for others.

## 3.2 PMO roles

### 3.2.1 Programme Manager

A Programme Manager manages several related projects, often with the intention of improving overall performance within the PMO.

The Programme Manager has oversight of the purpose and status of all projects in a Programme and can use this oversight to support project level activity to ensure the overall programme goals are likely to be met, possibly by providing a decision making capacity that cannot be achieved at project level or by providing the Project Manager with a programme perspective when required, or as a sounding board for ideas and approaches to solving project issues that have program impacts.

### 3.2.2 Project Manager

Project Managers within a PMO have the responsibility for the planning, execution, monitoring, control and closing of a project. They manage the implementation of the needs of the client and bridge the gap between the production team and the client. The Project Manager needs full responsibility and the level of authority required to complete a project. If a person does not have high levels of both responsibility and authority then they are better described as a project coordinator. The project Manager requires these three characteristics:

#### **Knowledge**

- Project Management training and an understanding of the area being managed.

#### **Performance**

- Application of Project Management methodology used in the project.

#### **Personal**

- Personal effectiveness, attitude and leadership qualities.

## 4. The PMBOK Project

### 4.1 Initiation

<b>Initiation</b>	<b>Review Inputs to Initiation</b> Review Contract Review Project Statement of Work Review Enterprise Environmental Factors Review Organisational Process Assets <b>Produce Outputs from Initiation</b> Develop Project Charter Develop Preliminary Project Scope Statement
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The purpose of the initiation process group is to provide the necessary project information so that the organisation can commit to begin the later phases of the project. Its primary output will be:

- A project charter.
- Assignment of a Project Manager
- A description of all assumptions and constraints that are known at the time of initiation.

These outputs will be further described in different ways and in greater detail throughout the project. For example, assumptions may become risks that will need to be managed. Constraints may become contractual obligations.

#### 4.1.1 Project Charter

The project charter authorises the start of a project. It provides the Project Manager with the authority to apply organisational resources to project activities. Its purpose is to:

- Assist management to understand what the project will deliver, its business justification, and a high level estimation of the time, cost, and resources required;
- It serves as a commitment by management to dedicate the time and resources necessary to prepare a more detailed, written "Project Plan" for formal funding approval.
- The charter document should be relatively brief, averaging around three to five pages in length.

Too much detail in the charter can detract from a clear, concise, business reason why management should allow a project to go beyond the Initiation phase. There are also many unknowns at this stage that can make detailed time, cost, and resource projects very risky, poor results can contribute to serious cost and schedule overruns later in the project.

### 4.1.2 Preliminary Project Scope Statement

The scope statement should:

- Address the project and deliverable requirements.
- Product requirements.
- Project boundaries.
- Acceptance methods.
- Plan for scope control.

In projects that have many phases, it should also address a method to validate/refine the project scope at the beginning of each phase. This is a preliminary document that will be refined in later stages of the project.

## 4.2 Planning

<b>Planning</b>	<p><b>Scope Management Processes</b></p> <ul style="list-style-type: none"> <li>Perform Scope Planning</li> <li>Complete Scope Definition</li> <li>Create WBS to level of Work Packages</li> </ul> <p><b>Activity Planning</b></p> <ul style="list-style-type: none"> <li>Define Activities</li> <li>Determine Activity Sequence</li> <li>Define Activity Resource Estimates</li> <li>Define Activity Duration Estimates</li> </ul> <p><b>Cost Planning</b></p> <ul style="list-style-type: none"> <li>Develop cost estimates</li> <li>Develop cost budget</li> <li>Complete Quality Plan</li> <li>Complete Human Resource Plan</li> <li>Complete Communications Plan</li> </ul> <p><b>Risk Management Processes</b></p> <ul style="list-style-type: none"> <li>Establish Risk Management Plan</li> <li>Perform Initial Risk Identification</li> <li>Establish Qualitative Risk Analysis Process</li> <li>Establish Quantitative Risk Analysis Process</li> <li>Create Risk Response Planning Process</li> </ul> <p><b>Procurement Management Processes</b></p> <ul style="list-style-type: none"> <li>Plan purchases and acquisitions</li> <li>Plan project contracting</li> <li>Complete Schedule Development</li> </ul>
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### 4.2.1 Develop a Project Plan

A Project Plan is a detailed report indicating the chain of events that need to happen throughout the project. This includes a time-line and clear communication with stakeholders about how the entire project in all its phases will be planned, executed, monitored controlled, and closed.

The Project Manager develops a Project Plan as the main document for controlling the project. The Project Plan is a formal, approved document used to manage and control project execution. It provides a detailed review of:

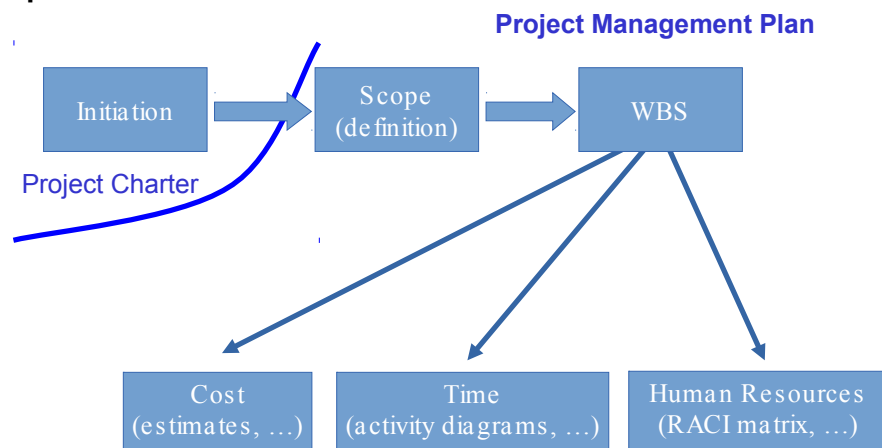
- Project time.
- Cost.
- Scope.
- Resources.
- Risk.

It also documents other controls necessary for management to approve all required funding and staffing. The Project plan will change over time as more accurate information becomes available. As a result change control within the Project Plan is key.

#### 4.2.2 Collect Requirements

Tailoring client/stakeholder needs with the objectives the project requires may necessitate additional adjusting as the project gets under-way. Understanding and documenting all project requirements aids in clarifying expectations.

#### 4.2.3 Define the scope



Scope management is performed by identifying the work that needs to be done and decomposing it into identifiable packages. This is usually a white board type exercise and is done prior to building the project in a Project Management tool that establishes the detailed activity level.



The output from this work is a Project Scope statement.

- Hardware in Data Centres
  - Cork Internet eXchange (CIX)
    - Contact NOC in Cork Internet eXchange
- Servers
  - Remove blanking panels from cabinet
  - Install Server Rails
  - Install Servers on rails
  - Connect Ethernet cables to rack switch
  - Connect dual power leads to A and B power legs
- Access
  - Confirm access from outside CIX to server

Note the noun phrases on the top levels (scope breakdown) and the activities on the lower levels.

#### 4.2.4 Work Breakdown Structure (WBS)

- **Input**
  - Project Scope Statement.
  - Requirements documentation.
  - Organisational process assets.
- **Output**
  - Work Breakdown Structure (WBS).
  - WBS Dictionary.
  - Scope baseline.
- **Project document updates**
  - Tools and Techniques.
  - Decomposition.

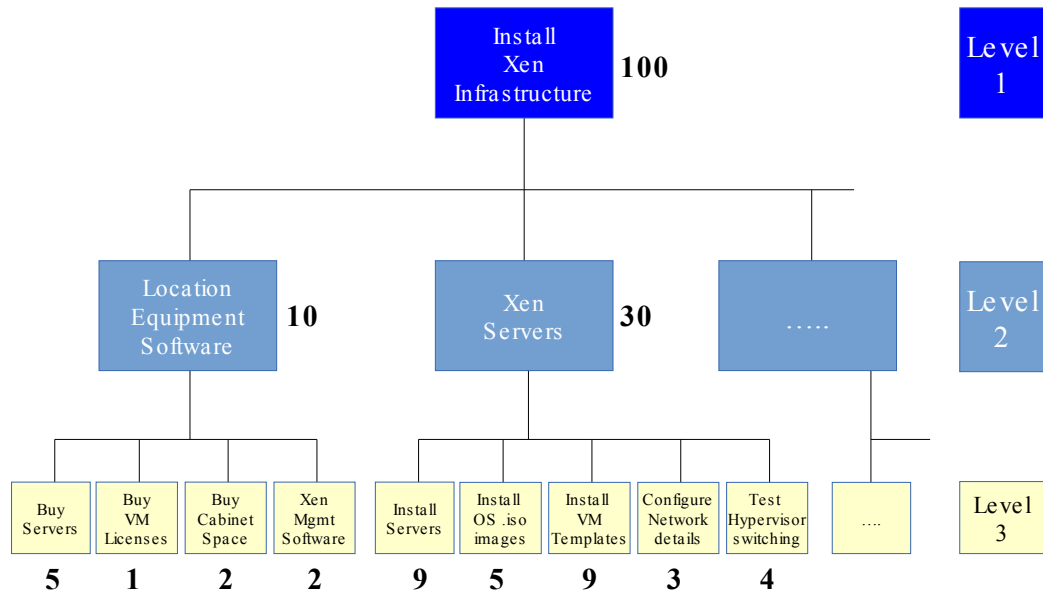
WBS defines the work to be performed in a noun-based structure. It defines "What" will be created but does not define "How". Used as a basis for a number of processes in particular to produce the subsidiary plans of the Project Plan.

The WBS is a deliverable oriented hierarchy of decomposed project components that organises and defines the total scope of the project. The WBS is a representation of the detailed Project Scope statement that specifies the work to be accomplished by the project. The elements comprising the WBS assist the stakeholders in viewing the end product of the project. The work at the lowest level WBS component is estimated, scheduled, and tracked. A WBS is neither a Project Plan, a Schedule, nor a chronological listing. It specifies what will be done, not "how" or "when". A WBS is not necessarily an organisational hierarchy, although it may be used when assigning responsibilities.

## WBS Dictionary

A WBS dictionary is a companion document to the WBS that describes each WBS element. For each WBS element, the WBS dictionary includes a Statement of Work (SoW), a list of associated activities, and a list of milestones. Other information can include the responsible organisation, start and end dates, resources required, an estimate of cost, charge number, contract information, quality requirements, and technical references. WBS elements should be cross referenced as appropriate.

## WBS Example (Subset)



The WBS example above is a subset of a WBS to establish Xen Servers in Data Centres. It is broken down into levels to reduce the work into manageable tasks and these are further subdivided into subtasks that are small enough to permit adequate control and visibility. At level 1, 100 units are allocated representing 100% of the project. At each level this is broken down with each element at each level being allocated a portion of the units from the parent element in the previous level. At each level the sum of all the units should total 100.

## Validate the WBS

Ask the following questions to validate the WBS:

- All major elements been identified at top level?
- Decomposed into measurable components?
- Lower level(s) items necessary? All inclusive?
- Would stakeholders agree WBS is satisfactory?
- Can elements be scheduled, budgeted, and assigned to a unit that will accept responsibility?
- Too much or too little visibility and control ?
- Can status reports be generated at all levels ?

#### 4.2.5 Activity Planning

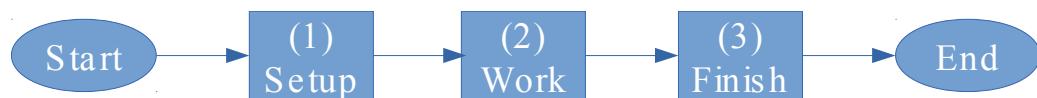
Developing the specific list of actions that will need to be taken to achieve benchmark goals is essential for putting proper teams in place at the right time with the proper resources.

##### Develop Schedule

Scheduling teams to complete work and setting the progress in place with all the details needed to complete the work objectives takes a great deal of coordination with many project constituents and may involve shifting objectives and phase scheduling.

The benefits of a realistic schedule are:

- Framework for managing critical project activities.
- Determines planned start and completion dates.
- Identifies activity and task precedence relationships.
- Aids project team in defining critical communication content.
- Specifies times when staff must be available.
- No surprises.



Activity displayed as a node format with arrows showing relationships and nodes for activities. There are three types of relationship.

- Successor but no predecessor:
  - Activity on node 1.
- Predecessor and successor:
  - Activity on node 2.
- Predecessor but no successor:
  - Activity on node 3.

**Precedence relationships**

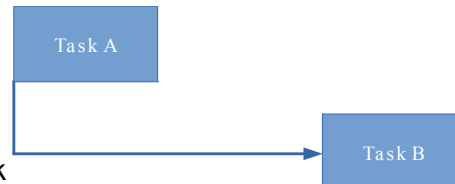
**Finish to Start**



The “from” activity Task A must finish before the “to” activity Task B can start.

**Start to Start**

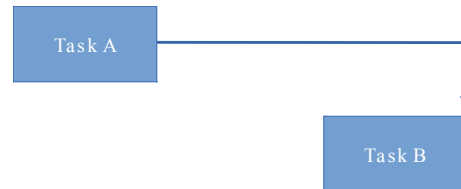
Tasks A and B may start at the same time, but the successor (B) cannot start until the predecessor (A) begins.



The direction of the arrow defines which task is the predecessor and which is the successor.

**Finish to Finish**

Tasks A and B may end at the same time, but the successor (B) cannot finish until the predecessor (A) finishes.

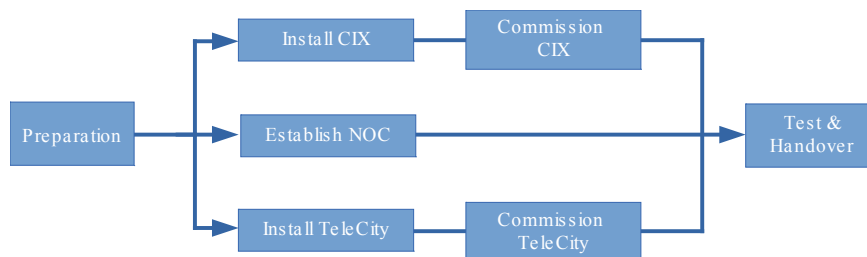


**Start to Finish**

Task A must start before Task B can finish (seldom used).



**Diverging – Converging Activities**



Diverging activity – Single predecessor with multiple successors

Converging activity – Multiple predecessors with a single successor.

## Determine the Critical Path

The Critical Path is the longest necessary path through a network of activities when respecting their interdependencies.

There are two terms related to the Critical Path. These are the terms Forward Pass and Backward Pass. These terms are related to ways of determining the early or late start [forward pass] or early or late finish [backward pass] for an activity.

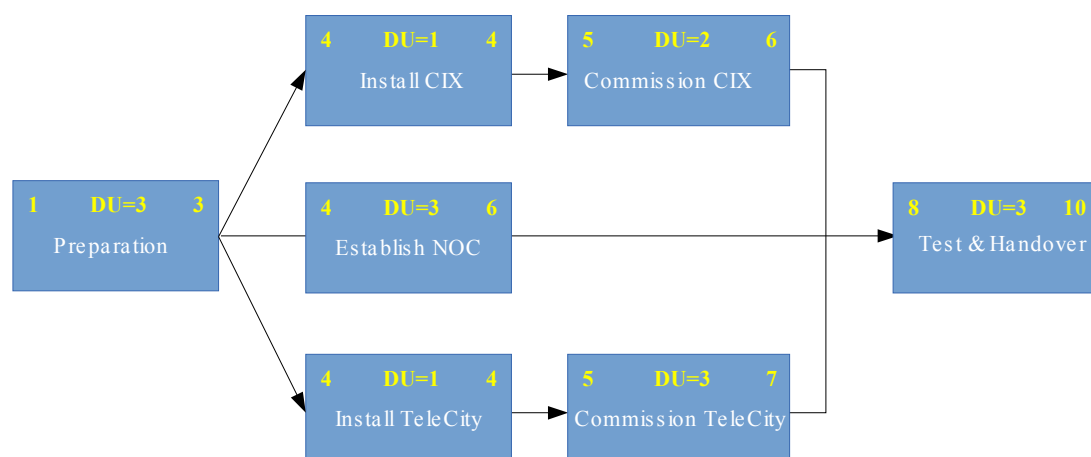
Forward pass is a technique to move forward through a diagram to calculate activity duration. Backward pass is its opposite.

To determine the paths use a Program Evaluation and Review Technique (PERT) tool to layout the activity steps.

### Forward pass calculations

$$EF = ES + DU - 1$$

ES	DU	EF
Task		
LS	FL	LF



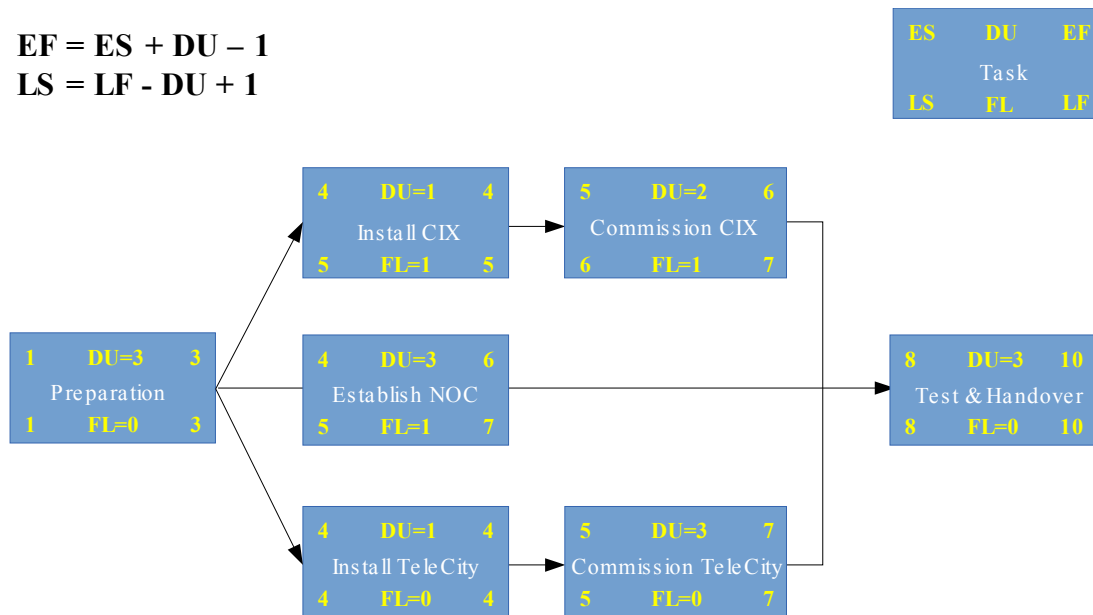
- Early Start Date (ES)
  - Earliest possible point in time an activity can start, based on the network logic and any schedule constraints.
- Duration (DU)
  - Number of work periods, excluding holidays or other nonworking periods, required to complete the activity, expressed as workdays or workweeks.
- Early Finish Date (EF)
  - Earliest possible time the activity can finish.

Starting at the beginning (left) of the network develop ES and EF dates for each task, progressing to end (right-most box) of the network where  $EF = ES + DU - 1$ .

**Backward pass calculations**

$$EF = ES + DU - 1$$

$$LS = LF - DU + 1$$



- Late Start Date (LS)
  - Latest point in time that an activity may begin without delaying that activity's successor.
  - If the activity is on the critical path, the project end date will be affected.
- Float or Slack (FL)
  - Latest point in time a task may be delayed from its earliest start date without delaying the project finish date.
- Late Finish (LF)
  - Latest point in time a task may be completed without delaying that activity's successor. If the activity is on the critical path, the project end date will be affected.

Calculate LS and LF dates by starting at project completion, using finish times and working backwards.

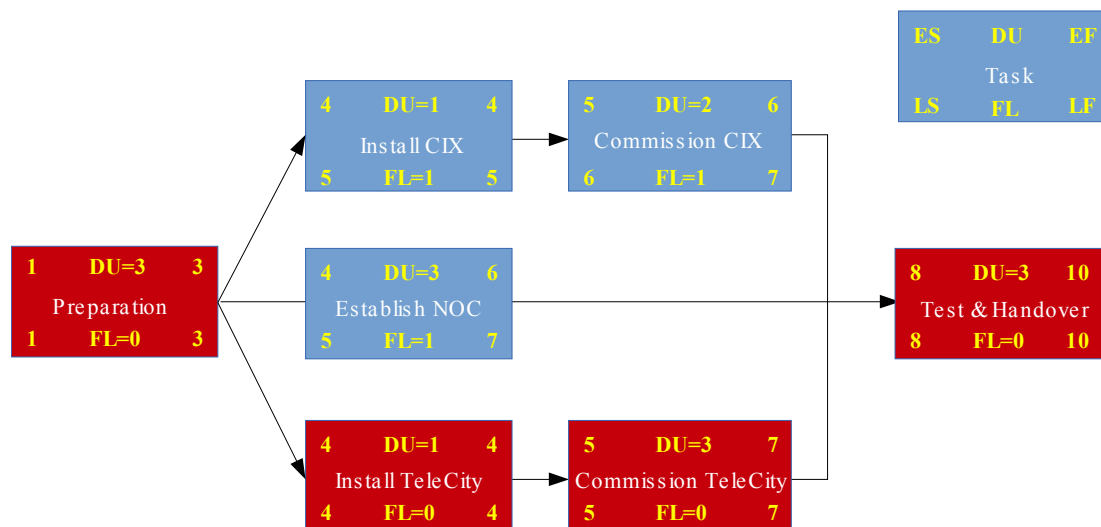
**Forward and backward pass summary table**

Forward and backward pass calculation						
Name	Duration	ES	EF	LS	LF	FL
Preparation	3	1	3	1	3	0
Install CIX	1	4	4	5	5	1
Establish NOC	3	4	6	5	7	1
Install TeleCity	1	4	4	4	4	0
Commission CIX	2	5	6	6	7	1
Commission TeleCity	3	5	7	5	7	0
Test & Handover	3	8	10	8	10	0

**Calculating the Critical Path**

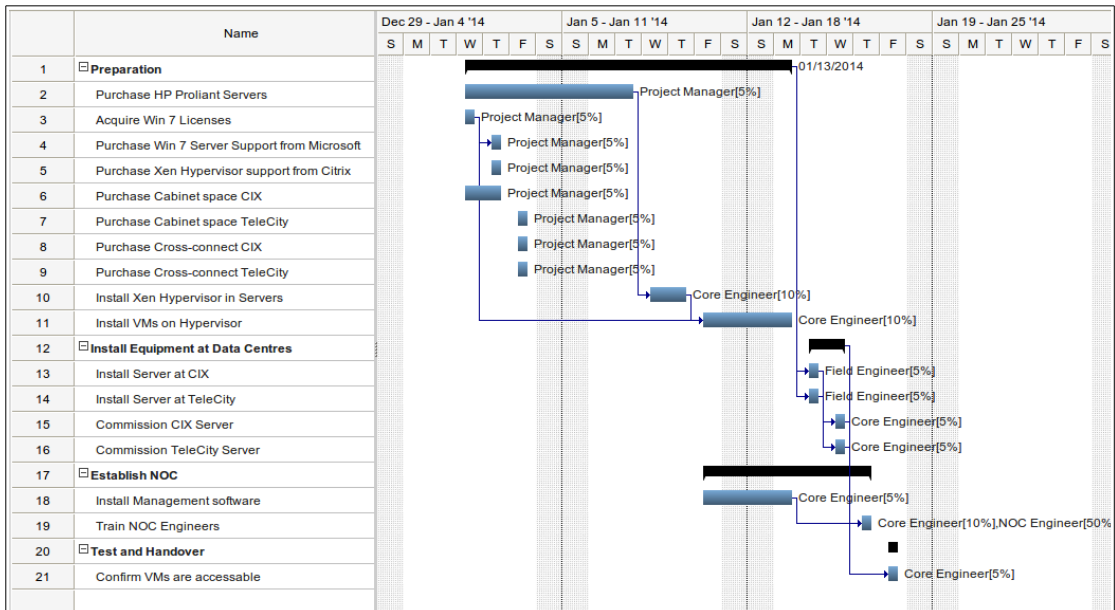
The Critical Path is the longest possible continuous pathway taken from the initial event to the terminal event.

It determines the total calendar time required for the project. Therefore, any time delays along the critical path will delay the reaching of the final event by at least the same amount.



### Scheduling on Gantt Chart

As described earlier the Gantt chart is a useful tool for managing the project. Here is a simple project plan created using Ganttter.





## 4.2.6 Cost Planning

Xen Infrastructure project									
Budget Estimate									
ID	Description	Quantity	Unit Cost	Initial Cost	Recurring Cost/month	Recurring Cost/Year	Total Cost/Yr 1	Total Cost/Yr 2	Total Cost/Yr 3
001	HP Proliant Server	2	€2,500	€5,000			€5,000		
002	Windows Server 7 License	5	€140	€700		€700	€700	€735	€772
003	Data Centre CIX ½ Cabinet	1		€300	€550	€6,600	€6,900	€6,930	€7,277
004	Data Centre CIX ½ Power	1			€35	€420	€420	€441	€463
005	Data Centre CIX ½ Cross-connect	1		€225	€25	€300	€525	€315	€331
006	Data Centre TeleCity ½ Cabinet	1		€500	€750	€9,000	€9,500	€9,450	€9,923
007	Data Centre TeleCity ½ Power	1			€35	€420	€420	€441	€463
008	Data Centre TeleCity ½ Cross-connect	1		€500	€50	€600	€1,100	€630	€662
009	Installation costs (Engineer/day) – CIX	2	€350	€700			€700		
010	Installation costs (Engineer/day) – TeleCity	2	€350	€700			€700		
011	Service costs (Engineer/day)	0.25	€350	€88	€2,661	€31,938	€31,938	€33,534	€35,211
012	HP Support Contract	2	€225			€450	€450	€473	€496
							<b>€58,353</b>	<b>€52,949</b>	<b>€55,596</b>

Assumption: Cost increases at 5%/year

Estimating costs accurately is a skill that comes with experience. Coordinating all estimates needed to complete each phase of a project requires attention to detail.

### Determine Budget

Creating accurate budgets means having the experience to know when to add in allowances for unexpected delays like bad weather, delayed orders, or other details gained through experience with similar projects. At every stage of the Planning Process documentation is necessary, but in the estimating and budgeting areas, Project Managers need to be able to understand the details logically to secure authorisation from related stakeholders.

## 4.2.7 Quality Planning

Factors like risk, cost performance baseline, organisational and environmental factors all affect the potential plan quality. Obviously the goal is to assure the highest possible quality. Assessing the details to secure quality throughout each project phase may involve readjusting programme goals and procedures.

### ***Triple constraint***

The Triple Constraint are the key attributes that must be handled effectively for successful completion and closure of any project to a high quality. A change in any constraint impacts the other constraints.

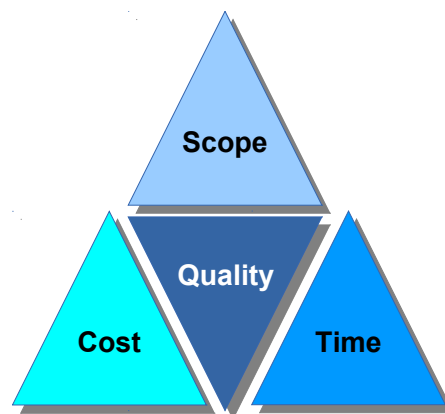
**Time** – Actual time required to produce a deliverable. The amount of time required to produce the deliverable is directly related to the number of requirements that are part of the scope along with the amount of resources allocated to the project (cost).

**Cost** – This is the estimation of the amount of money that will be required to complete the project. Cost itself encompasses various things, such as:

- Resources.
- Labour rates for contractors.
- Risk estimates.
- Bills of materials.

All aspects of the project that have a monetary component are made part of the overall cost structure.

**Scope** – These are the functional elements that, when completed, make up the end deliverable for the project. The scope itself is generally identified up front so as to give the project the best chance of success. Scope can potentially change during the project life-cycle, a concept known as 'scope creep' which has knock-on impacts on the other two constraints, time and cost. The common success measure for the scope aspect of a project is its inherent quality upon delivery.



#### 4.2.8 Human Resource Planning

Having a staffing plan in place that coincides with each phase of the plan and involves all details of creating working teams to support project goals and time-line requirements is imperative. A key tool in this area is the RACI Matrix which describes the participation by various roles in completing tasks or deliverables for a project. It clarifies the roles and responsibilities in cross-functional/departmental projects. The four elements are:

##### Responsible

Those who do the work to achieve the task. There is at least one role with a participation type of responsible, although others can be delegated to assist in the work required.

##### Accountable (also approver or final approving authority)

The one ultimately answerable for the correct and thorough completion of the deliverable or task, and the one who delegates the work to those responsible. In other words, an accountable must sign off (approve) on work that responsible provides. There must be only one accountable specified for each task or deliverable.

##### Consulted

Those whose opinions are sought, typically subject matter experts and with whom there is two-way communication.

##### Informed

Those who are kept up-to-date on progress, often only on completion of the task or deliverable. There is one-way communication with the "Informed" person.

	Project Sponsor	Project Manager	Logistics Manager	Project Engineer	Engineering Team	Service Manager
<b>Prepare Location, Equipment and Software</b>						
Buy Servers	A	R	R			
Buy Licenses for VMs	A	R	R			
Buy space in Data Centres	A	R	R			
Get Xen Management Software		A		R	C	C
<b>Prepare Servers</b>						
Install XenServer	I	A		R		
Install OS .iso images	I	A		R		
Install VM Templates	I	A		R		
Configure network details	I	A		R		
Test image switching between Hypervisors	I	A		R	C	
<b>Install hardware in Data Centres</b>						
Arrange time in each Data Centre	I	A	R			
Install hardware in the racks in Data Centre	I	A		R		
Confirm access to servers from outside	I	A		R	C	
<b>Access and Manage</b>						
Access Servers using Xen Management	I	A		R	C	I
Install VMs as required	I	A		R	C	I
Confirm services	I	A		R	C	I

**4.2.9 Communications Planning**

Communication is a key function of the Project Manager. Changes to project items, progress reports, and budget adjustments are on-going and communication on these within the project team to keep things on track as well as regular briefing of stakeholders are necessary to ensure a successful, high quality outcome of the project. Establishing the expectations around communication supports a positive attitude to the project as a whole.

Communication also involves the creation, collection, distribution, storage, retrieval, and the disposition of project information in accordance to the communications management plan.

**4.2.10 Risk Management Planning**

The function of Risk Management planning is to:

- Identify Risks.
- Perform Qualitative/Quantitative Risk Analysis.
- Plan Risk Responses.

Accurate risk management procedures can save money and time over the length of any project. Documenting the risk management process for a project supports good communication strategies with stakeholders and clients.

**Risk Log**

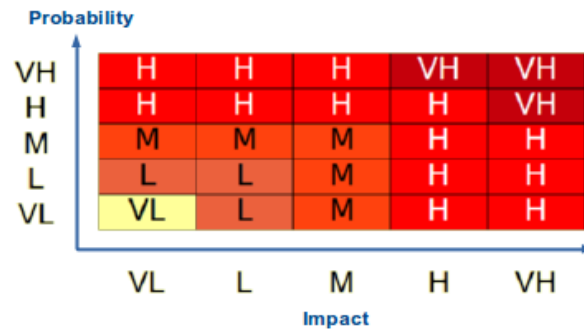
Risks should be logged and reviewed on a regular basis during the project.

< Project title >											RISK LOG		
Summary			Description					Preventative Actions			Contingency Actions		
ID	Date Raised	Raised By	Description of Risk	Description of Impact	Probability Rating	Impact Rating	Priority Rating	Preventative Actions	Action Resource	Action Date	Contingency Actions	Action Resource	Action Date

VL = 'Very Low'
L = 'Low'
M = 'Medium'
H = 'High'
VH = 'Very High'

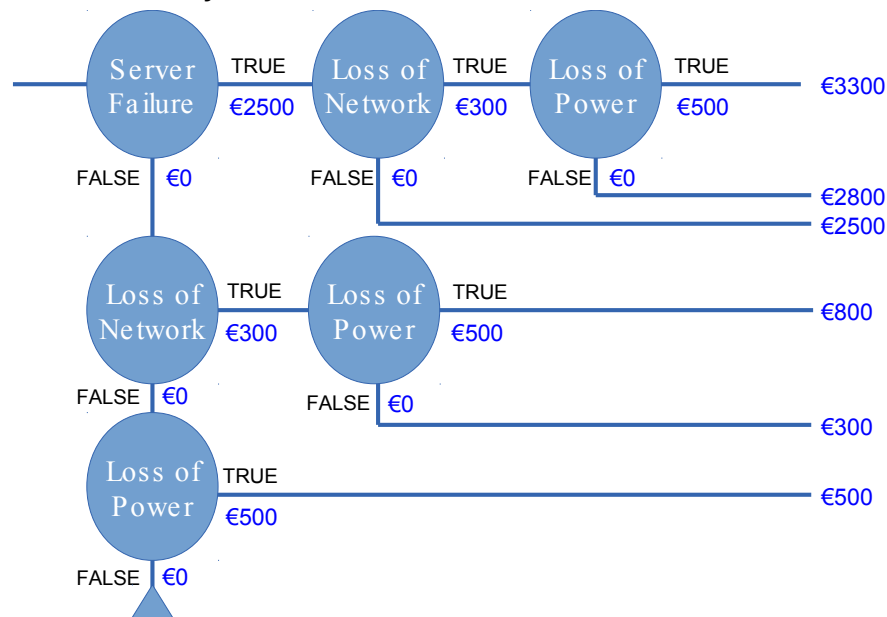
### Qualitative Risk Analysis

Qualitative Risk Analysis consists of using the Probability and Impact Matrix tool (PIM) to prioritise and rank the risks contained in the risk register. By doing this, the Project Manager is able to focus management time and effort on the most important risk areas. In effect, applying the 80/20 rule, 20% of the risks will cause 80% of the threats to the project objectives, hence the need to focus on those.



Each risk is evaluated for its probability and impact using a numbered ranking system Very Low (VL), Low (L), Medium (M), High (H), and Very High (VH). An alternative is to use a 1 to 10 scoring system. Each risk will have the numbers for probability and impact multiplied together to get a priority score so that these can be ranked. Other data could be captured for each risk such as urgency or proximity, and the category (for example hardware, software, commercial, design, and so on).

### Quantitative Risk Analysis



This is quantifying by assigning a value to each quantity. The ranked risks are often performed in terms of time or cost. One such tool for this are decision trees to arrive at a monetary amount for each risk. This value is the extra cost incurred or the time delay in the event the risk is realised.

#### 4.2.11 Procurements Planning

The procurement planning process involves detailed reports indicating decisions related to costs of items necessary to complete a project and deliver effective results. It is linked to the budget and a spreadsheet listing “Estimate” beside “Actual” costs is a useful tool to assess overruns.

#### 4.2.12 Stakeholder Engagement Planning

Stakeholder engagement planning is the process of identifying the people, groups or organisations that could impact or be impacted by a decision, activity or outcome of the project. It also includes process to analyse and document relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success.

By a process of stakeholder engagement the project manager communicates and works with stakeholders to meet their needs and expectations, address issues as they occur, and foster appropriate stakeholder engagement in project activities throughout the project lifecycle.

### 4.3 Execution

<b>Execution</b>	Direct and Manage Project Execution Perform Quality Assurance Acquire, develop and manage Project Team Distribute Information Manage stakeholder expectations
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The execution process is the day to day management of the project implementation. This involves the detailed management of risk and issue responses, corrective and preventative actions, the deliverables themselves plus work performance information.

The management of change requests with regards to utilisation and effectiveness of the quality plan. The negotiation and influence of work to ensure appropriate staff are assigned, mentored to ensure the team performance.

The role also involves conflict resolution and problem solving, procurement's and contracts are negotiated and put in place as necessary.

Organisational process assets are updated as a result of executing the Project Plan.

### Issue Log

< Project title >											ISSUE LOG
Summary			Issue Description			Issue Resolution					
ID	Date Raised	Raised By	Description of Issue	Impact	Priority	Action	Owner	Outcome	Date for Resolution	Resolved Date	

VL = 'Very Low'
L = 'Low'
M = 'Medium'
H = 'High'
VH = 'Very High'

## 4.4 Monitoring and Controlling

<b>Monitoring &amp; Controlling</b>	<ul style="list-style-type: none"> <li>Monitor and control project work</li> <li>Perform integrated change control</li> <li>Verify and control scope</li> <li>Control schedule</li> <li>Control costs</li> <li>Perform quality control</li> <li>Report performance</li> <li>Monitor and control risks</li> <li>Administer procurements</li> </ul>
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The Monitoring and Controlling Processes group consist of those processes required to track and review the progress and performance of a project. These processes also identify any areas in which changes to the plan are required and initiate the corresponding changes.

Additionally large projects often rely on outsourcing to complete tasks, which becomes increasingly difficult to track and monitor as the project grows. It's critical for Project Managers to manage carefully unwieldy projects, particularly those involving outsourced resources.

### 4.4.1 Change Control

A key are in this group is Change Control. Change by its nature tends to have impact on the overall project and this must be managed carefully. Careful "WHAT IF" analysis needs to be performed and the Project Manager should use the assistance of a Change Control Board to ensure that the changes do not have negative and unpredicted impacts.

Changes should be communicated to stakeholders and approval should be sought particularly from key stakeholders before making change. Consider the change in terms of cost, scope and time, a change to any of these has knock-on impacts on the other two, the "Triple Constraint".

Change request forms are the primary project management tool used for requesting any changes to a specific project. The change request form is filled out by the individual who identifies the need for a change and submitted to the project team in accordance with the change control process.

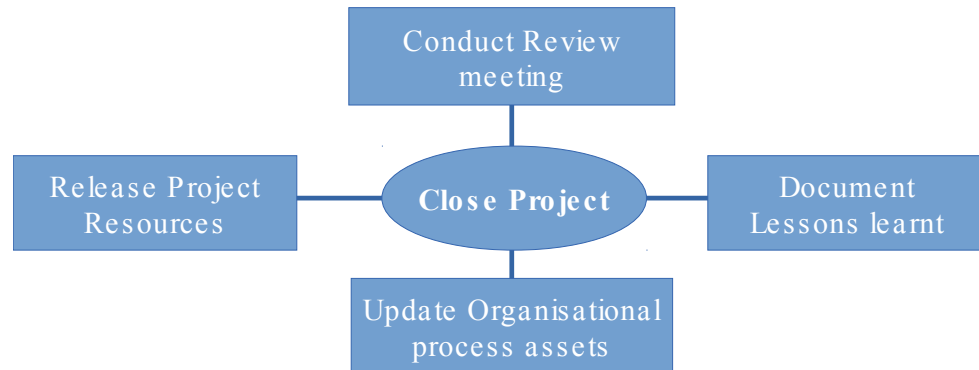
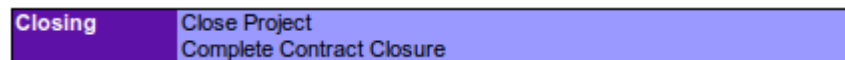


**4.4.2 Change Request Form**

<b>Project:</b>	<b>Date:</b>
<b>Change Requestor:</b>	<b>Change No:</b>
<b>Change Category (Check all that apply):</b> <input type="checkbox"/> Schedule <input type="checkbox"/> Cost <input type="checkbox"/> Scope <input type="checkbox"/> Requirements/Deliverables <input type="checkbox"/> Testing/Quality <input type="checkbox"/> Resources	
<b>Does this Change Affect (Check all that apply):</b> <input type="checkbox"/> Corrective Action <input type="checkbox"/> Preventative Action <input type="checkbox"/> Defect Repair <input type="checkbox"/> Updates <input type="checkbox"/> Other	
<b>Describe the Change Being Requested:</b>	
<b>Describe the Reason for the Change:</b>	
<b>Describe all Alternatives Considered:</b>	
<b>Describe any Technical Changes Required to Implement this Change:</b>	
<b>Describe Risks to be Considered for this Change:</b>	
<b>Estimate Resources and Costs Needed to Implement this Change:</b>	
<b>Describe the Implications to Quality:</b>	
<b>Disposition:</b> <input type="checkbox"/> Approve <input type="checkbox"/> Reject <input type="checkbox"/> Defer	
<b>Justification of Approval, Rejection, or Deferral:</b>	

<b>Change Board Approval:</b>		
<b>Name</b>	<b>Signature</b>	<b>Date</b>

## 4.5 Closing



The outputs of Closing processes are:

- Final Product.
- Service or Result Transition.
- Organisational Process Assets Update.

The last of these outputs is the most complex. It involves capturing all project artefacts, such as the Project Plan, Risk Log, Issue Log, and Stakeholder Register. It includes formal documentation on the completion or termination of the project. The customer or client contract and the customer Acceptance Test Documentation will need to be reviewed to ensure that the goals of the project have been met.

Another key activity that takes place during this process is that lessons learned are identified and documented for future reference.

## 4.6 Mapping PM Process Groups to Knowledge areas

PM Process Groups / Knowledge Area Processes	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring & Controlling Process Group	Closing Process Group
Project Management Integration	Develop Project Charter Develop Prelim Project Scope Statement	Develop Project Management Plan	Direct and Manage Project Execution	Monitor and Control Project Work Integrated Change Control	Close Project
Project Scope Management		Scope Planning Scope Definition Create WBS		Scope Verification Scope Control	
Project Time Management		Activity Definition & Sequencing Resource Estimating Duration Estimating Schedule Development		Schedule Control	
Project Cost Management		Cost Estimating Cost Budgeting		Cost Control	
Project Quality Management		Quality Planning	Perform Quality Assurance	Perform Quality Control	
Project HR Management		Human Resources Planning	Acquire Project Team Develop Project Team	Manage Project Team	
Project Communications Management		Communications Planning	Information Distribution	Performance Reporting Manage Stakeholders	
Project Risk Management		Risk Management Planning Risk Identification Qualitative / Quantitative Risk Analysis Risk Response Planning		Risk Monitoring and Control	
Project Procurement Management		Plan Purchases and Acquisitions Plan Contracting	Request Seller Responses Select Sellers	Contract Administration	Contract Closure
Stakeholder Management	Identify Stakeholders	Create Stakeholder Management Plan	Manage Stakeholder Engagement	Control Stakeholder Engagement	

## 5. Exercise

Using a Project Management tool like Planner, ProjectLibre or Ganttter make a project plan for a the roll-out of a new Operating System and Office Suite in a Medium Sized Business (50 – 100 employees). The project constraints are:

- Once the roll-out starts the implementation should take no more than two weeks.
- Employees cannot be without their computers during office hours.
- 15 employees are not office located.

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