
Project Management and Building Information Modeling

BSc (Hons) in Construction Management
BSc (Hons) in Civil Engineering Management
Year 4 (2016-2017)

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1 Introduction

What is a Project?

A project is a temporary endeavour to create a unique product, service or result.

- Temporary: it has a start and an end
 - Unique Product, Service or Result
 - Progressive Elaboration
-

Project v. Operational Work

Work can be categorised as either projects or operations, although there may be an overlap. **Shared Characteristics:**

- Performed by people
 - Constrained by resources
 - Planned, executed and controlled
-

Project v. Operational Work

Design of a new car
Manufacture of a car
Design of a building
Construction of a building
Annual Accounts of a building company

Project v. Operational Work

Design of a new car – Project
Manufacture of a car – Operations
Design of a building – Project (overlap?)
Construction of a building – Project (overlap?)
Annual Accounts of a building company – Operations

Sometimes confusion can arise where an organisation makes its way by executing projects. Consider a construction company that is constructing a new building; they do this all of the time, and may be executing numerous similar works, however each construction job remains a project. The competitive advantage that can be leveraged by construction organisations is to streamline the processes that deliver projects.

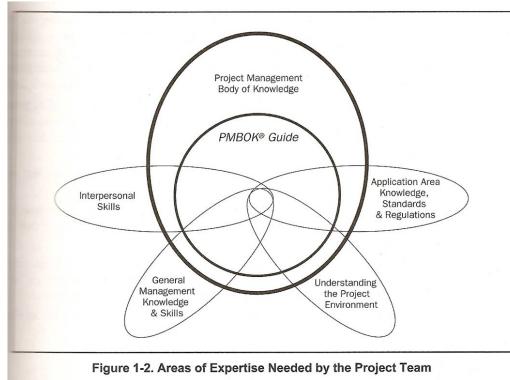


Figure 1-2. Areas of Expertise Needed by the Project Team

Figure 1: Ref: Project Management Institute (2004) *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 3rd Edition; Project Management Institute, ISBN 978-1-930699-45-8

What is Project Management?

Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. **Managing Projects includes:**

- Identifying Requirements
 - Establishing clear **and achievable** objectives
 - Balancing quality, scope, time and cost
 - Adaptation of specs, plans, and approach to meet the requirements of project stakeholders
-

Project Management

Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. **Areas of Expertise:**

- Project Management Body of Knowledge
 - Application Area Knowledge, standards and Regulations (in our case construction)
 - Understanding the Project Environment
 - General Management knowledge and skills
 - Interpersonal Skills
-

Areas of Expertise

Application Area Knowledge

Functional Departments and Supporting Disciplines

- legal, finance, marketing, logistics

Technical Elements

- engineering, etc.

Management Specialization

- contracting, new products, etc.

Industry Groups

- Construction, Financial Services, Automotive, etc.
-

Standards & Regulations

aside

Standard; established by consensus and approved by a recognized body that provides for common and repeated use, rules, guidelines or characteristics for activities or their results aimed at the achievement of the optimum degree of order in a given context

- ANSI, ISO, BS, etc.

Regulations; a government imposed requirement, which specifies product, process or service characteristics, including the applicable administrative provisions, with which compliance is mandatory.

- Building Regs, H&S Regs, etc.
-

Standards & Regulations

aside

- Guidelines, upon general acceptance, often become 'Standards'
 - Standards (or Guidelines) often become Regulations
 - QWERTY keyboard (not efficient)
 - SI 311: Retail Petroleum Licence
 - SI 80 of 2013 bucks this trend
-

Project Environment

Cultural & Social Environment

- How will the project effect people and/or how will people effect the project? *Shell to Sea*

International & Political Environment

- Impact of Local Legislation; Stability of political regime *Do you want to be a contractor in Iraq, Syria, Afghanistan?*

Physical Environment

- Impact on local ecology, geography, historical sites etc.
-

General Management Knowledge & Skills

Financial Management & Accounting Purchasing & Procurement Sales & Marketing Contracts & Commercial Law Logistics & Supply Chain ...

Interpersonal Skills

Effective Communication Influencing the Organisation Leadership Motivation

- self and others

Negotiation & Conflict Management Problem solving

- Skill and judgment, not just authority to make decisions
-

Project Management Body of Knowledge (PMBOK®)

Consists of Ten (10) Knowledge Areas

1. Project Integration Management
 2. Project Scope Management
 3. Project Time Management
 4. Project Cost Management
 5. Project Quality Management
 6. Project Human Resource Management
 7. Project Communications Management
 8. Project Risk Management
 9. Project Procurement Management
 10. Project Stakeholder Management
-

Areas of Expertise

Project Management Context

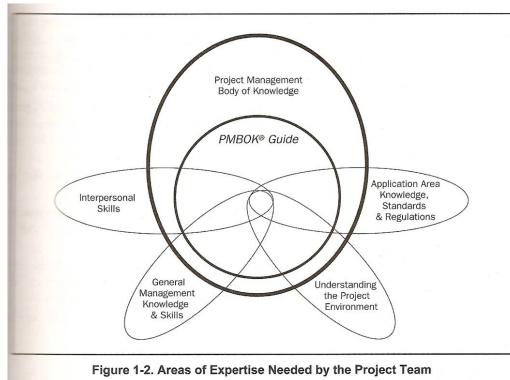


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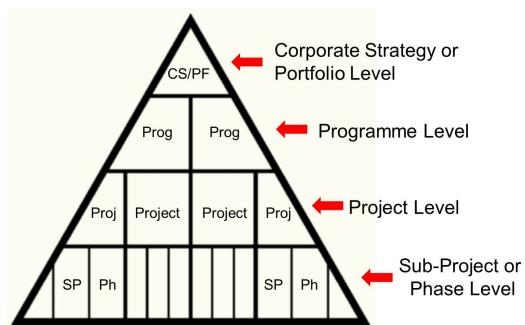


Figure 3: Project Management tends to exist within a larger framework

Project Management Context Portfolio

- Collection of Projects or Programs grouped together to facilitate effective management

Program

- Group of related projects managed in a coordinated way in order to obtain benefits not available from managing individually

Sub-Project

- Projects in their own right, but form part of a larger overall project.
-

Project Management Office (PMO)

Typical of a large construction firm or MNC's Not always in direct control of projects/programs Often concerned with Support and/or Reporting Functions

- Centralised Reporting
 - Standard Policies
 - Training
 - Knowledge Base or Conduit to Specialist Knowledge
 - Development of Standard Tools and Techniques
 - Selection of Software suites...
-

2 Project Life Cycle

Project Life Cycle

Any project can be broken down into several discrete phases. These phases then make up the overall Project Life Cycle. Knowledge of the project life cycle will give an insight into:

- Cash flow projections
- Resource projections
- Stakeholder influence
- Cost of changes
- Etc.

NOT TO BE CONFUSED WITH A PRODUCT LIFE CYCLE...

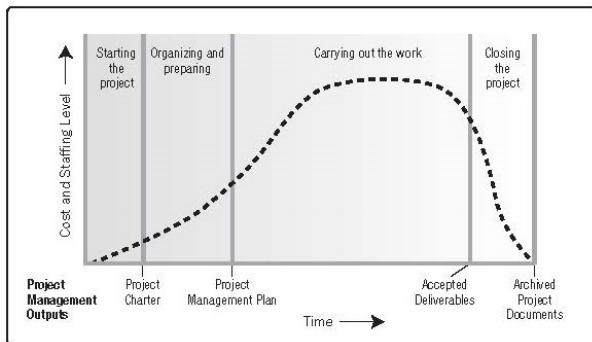


Figure 2-8. Typical Cost and Staffing Levels Across a Generic Project Life Cycle Structure

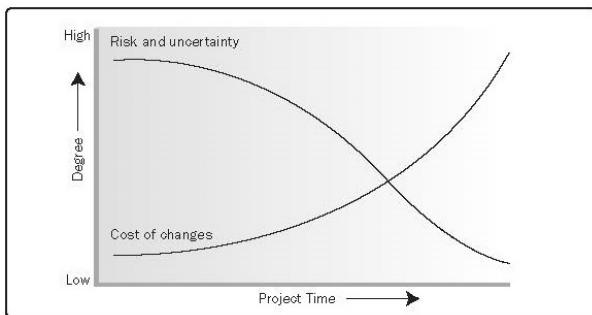


Figure 2-9. Impact of Variable Based on Project Time

Characteristics of the Project Life Cycle

Characteristics of the Project Life Cycle

Characteristics of the Project Phases

Characteristics of the Project Life Cycle Phases Generally Define

- What technical work to undertake in each phase such as Feasibility, Design, Tender, Construction, Handover
- What the deliverables are for each phase i.e Feasibility Report, Design and Tender Specifications, Completed Building or Infrastructure, Taking-Over-Cert.
- Who is involved, such as Finance House, Architects, Consultant Engineers, Contractors, Project Sponsor etc.

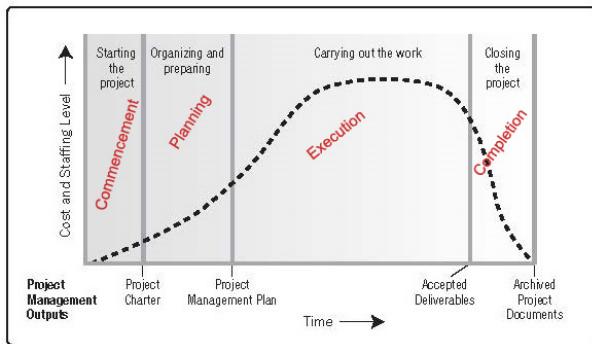


Figure 2-8. Typical Cost and Staffing Levels Across a Generic Project Life Cycle Structure

- How to Control & Improve each phase
-

Characteristics of Project Phases

Phases generally:

- are sequential
 - have specific deliverables
 - may be sub-divided
 - conclude with a review
 - 'proceed to next' or 'kill point'
 - Can be 'fast-tracked'
 - Commencement of next phase before completion of preceding; carries increased risk
 - Formal Phase Completion does not include authorising the next phase commencement
-

Characteristics of Project Phases

General Comments

- Likelihood of Project Completion is low at the start, and increases over the life cycle; even with huge cost overruns
 - Panama Canal, Concorde, Dublin Port Tunnel
 - Decisions made early in the project life-cycle have a profound effect on project costs
 - Costs of Change increase through the project lifecycle
 - Phase completion and/or commencement should be controlled
-

Relevance to Project Planning

- Life Cycle Phasing not intended to 'handcuff' the Project Manager
 - the life-cycle phase approach provides a methodology for uniformity in project planning.
 - allows for the use of standardised checklists, procedures, activities etc.
 - allows for phase control - (project gates)
 - At the end of each phase there is a meeting of the project manager, sponsor, senior management to review the phase completed, and to obtain authorisation to proceed to the next phase.
-

Phase Control - Gating the Project

'end of phase' meeting'

- Work to date is assessed
- Budgets affirmed or updated
- Schedules affirmed or updated
- Decision to proceed or otherwise is made.

Possible Decisions

- Proceed to next phase based on approved funding level
 - Proceed to next with new or modified objectives
 - Postpone approval: More information required; major budget review; etc
 - Terminate Project: Off-ramp, Kill Point
-

Example of Life Cycle & Phasing

Consider a company that has defined the following life-cycle

- Conceptualisation
 - Feasibility
 - Preliminary Planning
 - Detail Planning
 - Execution
 - Commissioning & Handover
-

Example of Life Cycle & Phasing

Procedures for Conceptualisation could include:

- Brainstorming to identify as many solutions to a particular problem as possible
- Describe problem solutions in detail

Procedures for Feasibility could include:

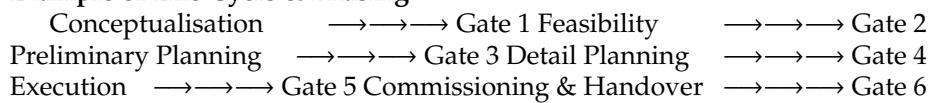
- Evaluation of all alternatives identified above
 - Evaluation of Market Potential
 - Evaluation of Cost Effectiveness
 - Evaluation of Technical Issues
 - Selection of Optimum Solution
 - Preparation of Project Goals and Objectives
 - Prepare Preliminary Cost Estimates and development Plan
-

Example of Life Cycle & Phasing

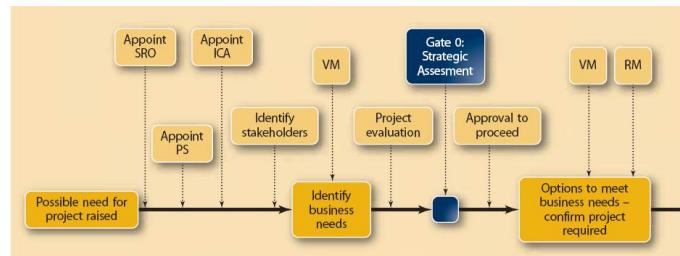
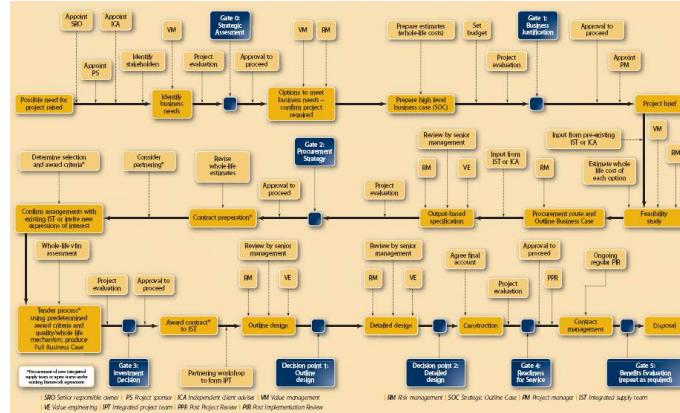
Procedures for Preliminary Planning could include:

- Implementation of Development Plan as derived previously
 - Completion of the Following Elements
 - General Scope of Works
 - Contractors Tasks
 - Performance Requirements
 - Documentation Requirements
 - Risk Assessment
-

Example of Life Cycle & Phasing



Project Procurement Life-Cycle- UK Government

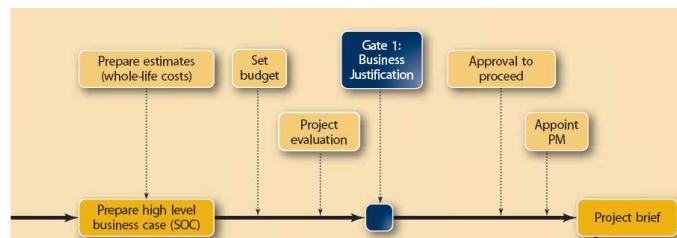


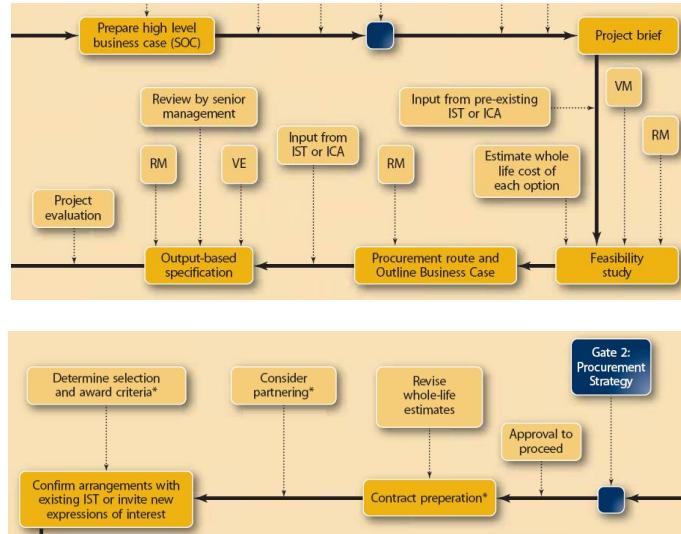
Achieving Excellence in Construction Procurement Guide, Office of Government Commerce, UK

SRO Senior responsible owner

- PS Project sponsor
- ICA Independent client adviser
- VM Value management
- VE Value engineering
- IPT Integrated project team

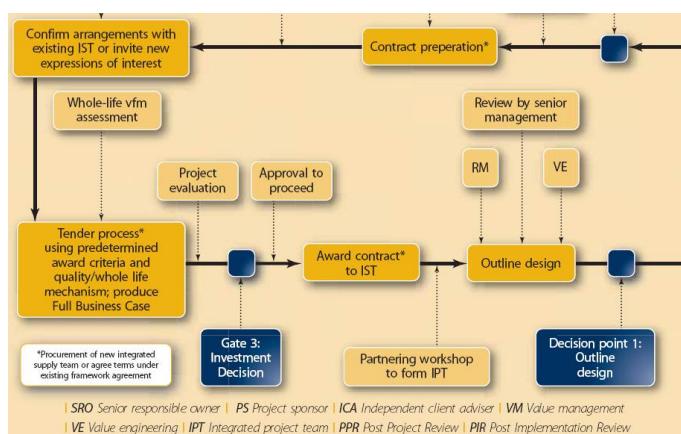
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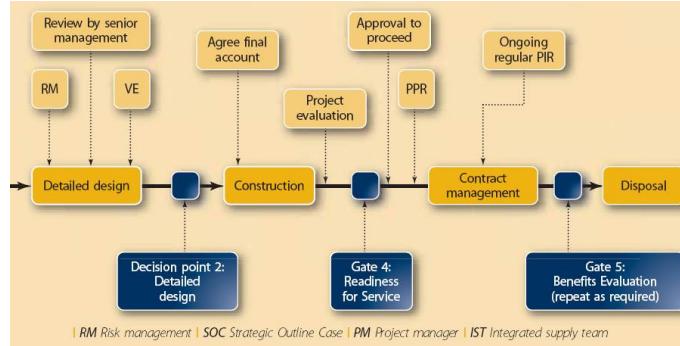




Achieving Excellence in Construction Procurement Guide, Office of Government Commerce, UK

Achieving Excellence in Construction Procurement Guide, Office of Government Commerce, UK





Achieving Excellence in Construction Procurement Guide, Office of Government Commerce, UK

Decision & Motivation Theory - Auctions

English Auction

- Open, Bids start low and increase, Highest Bidder wins, a reserve may be set.

Dutch Auction

- Open, Auctioneer calls high bid and progressively lowers the bid until someone calls mine.
 - Called Dutch because it is commonplace in the Netherlands for flower and produce auctions
 - Dutch Auctions are considered by some as superior to English Auctions. The buyer accepts the goods when the bid reaches a figure he/she is willing to pay. In an English Auction, the winning bidder may get the goods at a price lower than they expected to pay.
-

Decision & Motivation Theory - Auctions

First Price - Sealed Bid

- Closed, Sealed Bids are submitted. Each bidder is only allowed one bid. The bids are later opened and highest wins.
- Bidders tend to submit prices that they are willing to pay based on the value they attach to the item.. Or submit an inflated price to secure the item.

Vickery Auction or 'Second Price Auction'

- Closed, Highest Bidder wins **BUT pays the second highest price!**
- Bidders tend to stay near what they perceive the market value to be.



- Normally Bidders 'shade' their bid; i.e. bid lower than what they perceive the market value to be.
 - Avoids 'Winners Curse'
-

Auction

- The two highest bidders pay. The highest bidder gets the €5
 - Reserve set at 50¢; bid increments to be 10¢ minimum
 - Minimum of 5 bids required before auction is live
-

The Kill Point

Abandoning a project gets more difficult as time progresses. Sometimes abandoning a project is the most pragmatic business decision. So why do stakeholders continue?

- Principle of Irrational Escalation
 - Personally invested
 - Emotion; ego; refuse to admit defeat; reputation; etc.
 - Time; cannot turn back; delivery deadline
 - Money; non-recoverable investment
 - Failure to recognise abandonment as a viable option
-

Case Study - Prescription for Disaster - UK Health Service IT Program

- On Moodle - Read it For Tutorial
 - The British government budgeted close to \$ 12 billion to transform its health-care system with information technology.
 - The result: possibly the biggest and most complex technology project in the world and one that critics, including two Members of Parliament, worry is headed towards disaster.
-

Prescription for Disaster UK Heath Service IT Program

In late September [2006], Accenture, the global management and technology consultancy, announced it was walking away from a \$ 3.73 billion contract as an information-technology services provider on the world's biggest non-military I.T. project, a hugely ambitious and complex attempt to transform England's entire National Health Service through technology. Accenture, which failed to respond to numerous requests for interviews, did not say why it was exiting the National Health Service (NHS) project, but earlier this year it had set aside \$ 450 million to cover potential losses from its work in England. Its exodus represents the latest in a series of setbacks and missteps that have plagued the highly controversial program since its inception.

- Further information available from <http://editthis.info>
-

Case Study for Tutorial

Evaluate the project under the following:

1. Feasibility / Risk
 2. Gate / Kill Points
 3. Subcontractor Management
 4. Contract Structure and Risk
 5. Stakeholder Management
 6. Anything else you feel relevant
-

3 Project Stakeholders

Project Stakeholders

Stakeholders are individuals or organisations that are actively involved in the project, or whose interests may be effected as a result of the project execution or completion. (PMBOK Defn.)

- They may exert influence over the project

Project Management Teams must identify and manage them.

- Cannot ignore them
-

Project Stakeholders

Stakeholders have varying levels of responsibility, authority, and input. These levels can change over the course of the project

- General Population can exert a great influence during the planning stage (Jury's Hotel Dublin)
 - Influence of Population greatly diminished once planning is obtained, however may disrupt progress on other issues, such as noise, dust, traffic etc.
-

Project Stakeholders

Stakeholders are not always easy to identify Failure to Identify Key Stakeholders can have a serious negative effect on a project

- UK NHS IT Project (NPfIT)

Stakeholders can have a **negative or positive** effect on the project

- **Positive Stakeholders** are those who will benefit from the successful outcome of the project
 - Usually easy to identify
 - **Negative Stakeholders** are those who will see negative outcomes from the projects success.
 - A New Hotel Project will have a negative effect on the trade of nearby hotels
 - A new factory may have negative effect on an existing factory's ability to retain workers
-

Project Stakeholders

Positive Stakeholders

- Their interests are best served by helping the project to succeed

Negative Stakeholders

- Their interests are best served by impeding project progress

Ignoring Negative Stakeholders can put an entire project at risk of failure; suspension; financial ruin; or worse.

Project Stakeholders

Key Stakeholders on every Project include:

- **Project manager.** The person responsible for managing the project.
 - **Customer/user.** The person or organization that will use the project's product. There may be multiple layers of customers. For example, the customers for a new pharmaceutical product can include the doctors who prescribe it, the patients who take it and the insurers who pay for it.
 - **Performing organization.** The enterprise whose employees are most directly involved in doing the work of the project.
 - **Project team members.** The group that is performing the work of the project.
-

Project Stakeholders

Key Stakeholders on every Project include:

- **Project management team.** The members of the project team who are directly involved in project management activities.
 - **Sponsor.** The person or group that provides the financial resources, in cash or in kind, for the project.
 - **Influencers.** People or groups that are not directly related to the acquisition or use of the project's product, but due to an individual's position in the customer organization or performing organization, can influence, positively or negatively, the course of the project.
 - **PMO.** If it exists in the performing organization, the PMO can be a stakeholder if it has direct or indirect responsibility for the outcome of the project.
-

Project Stakeholders

Stakeholders can be further categorized into:

- Internal
- External
- Owners
- Investors
- Sellers
- Contractors
- Government agencies

- Lobbying organisations

Stakeholders roles can overlap

- Construction of new fabrication unit for a factory
 - Self Financed (Sponsor); End User; PM Team Members etc.
-

Project Stakeholders

Project Managers must manage stakeholders;

- This is not an easy task as often stakeholders interests oppose each other.

Example: Wind Farms:

- Most people when asked say they agree that wind farms are necessary; green energy etc.
 - Traditionally it was very difficult to obtain PP from local authorities. Legislation had to be enacted to change this. Kerry CC, Slaheny Energy Ltd., March 2003
-

Responsibility of a Project Manager to Stakeholders

Rooted in Ethics and Ethical Behaviour

- Truthful representation of all information
- Full disclosure of all information
- Protection of company-proprietary information
- Responsibility to report violations
- Full disclosure, and in a timely manner of all conflicts of interest
- Ensure that all PM team members comply with the above

Ethical Behaviour may be either voluntary, or imposed by Company Policy.

Many Organisation are now implementing CSR, or Corporate Social Responsibility policies. It is thought that CSR will assist businesses to grow and mature. There are however numerous examples of companies flouting their own CSR policies when put under pressure.

Managing Stakeholders

- Generally, External Stakeholders are not managed by the PMO. PMO's tend to manage internal stakeholders, to a small degree
 - Responsibility for Managing Stakeholders rests firmly with the Project Management Team; and the PM Team stand to lose the most if it is not effective
 - Primary Requirement is Open Communications and Managed Expectations
-

Managing Stakeholders

Managing Expectations:

- **Always** build Contingency into your plans
 - Be ready to offer alternatives/options that continue to meet project objectives
 - **Never** offer an alternative or bow to stakeholder pressure unless you are sure that your (or their) alternative will work
 - Request time to evaluate alternatives
 - If you don't, you run the very real risk of signing up to 'mission impossible' and causing real damage to the trust between parties
 - **Beware** of modifying yours, or others, estimates on time/cost/complexity etc.
 - Estimates are often used as the first point of attack on a plan. i.e. 'You are too conservative here; you can shave a week off that . . .'
-

Project Managers are in a very strong position when it comes to managing expectations. For the most part, stakeholder expectations are guided by what PM's have told them in meetings and reports and other communications. However, constantly trying to please or appease stakeholders generally back-fires.

Managing Stakeholders

Managing Expectations

- Keep it Civilised; keep emotion out of it, and don't take it personally.
 - If you hear comments like '*do what I say or else*' from your boss or project sponsor, then it's time to update your CV
 - You could end up with a project that is out of control; better to keep your reputation intact.
-

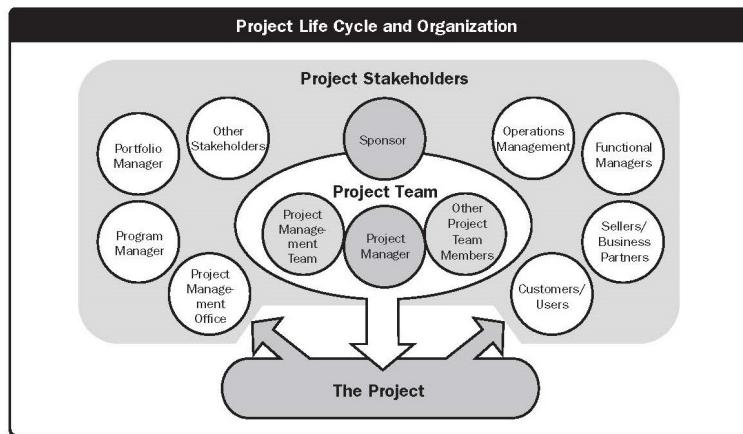


Figure 2-7. The Relationship Between Stakeholders and the Project

The Irish construction is very small, and people talk. Associations with failed projects can have a long term effect on your career. For the most part, this only effects those at on and above the mid management levels. Those lower on the totem pole tend to survive better.

Managing Stakeholders

Giving Commitments At some point you have to give a commitment, **so...**

- Never commit [to a deadline] too early
- Make sure you know what the customer is **expecting**; this is normally based on what you have led them to believe
- Know what elements on your project have no **margin for error**, and make sure that nothing goes wrong with them.
- When giving a commitment, make sure that you can **at least meet it**, and hopefully exceed it.
- If you are going to fail to meet a commitment, make sure you have a **fallback position**.

Anyone with any experience of projects knows that it is not a question of 'if' something will go wrong, it's just a matter of 'when'. The real issue is how you deal with problems when they arise. The best PM's will either have a solution or be working on one. In other words they are managing the situation.

Project Stakeholders

Table 2-1. Influence of Organizational Structures on Projects

Project Characteristics \ Organization Structure	Functional	Matrix			Projectized
		Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's Authority	Little or None	Low	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability	Little or None	Low	Low to Moderate	Moderate to High	High to Almost Total
Who manages the project budget	Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager
Project Manager's Role	Part-time	Part-time	Full-time	Full-time	Full-time
Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time

4 Project Organization

Project Organization

Organisational Influences

Projects are typically part of an organisation that is larger than the project

- HSA is bigger than a new hospital

The maturity of an organisations Project Management Systems can (and normally does) influence the project

- UK procurement example

Key Aspects of these organisations are their:

- Organisational Systems
 - Organisational Cultures and Styles
 - Organisational Structures
-

Organisational Systems

Organisational Systems can be:

- Financial Systems
- Reporting Systems
- Procurement Systems
- IT Systems
- Communications Systems
- Departments

In basic terms, the organisational infrastructure required to support projects

- PMBOK® refers to many of these as **Organisational Process Assets**
-

Table 2-1. Influence of Organizational Structures on Projects

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Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time	

Organisational Systems

Project-based organisations are those whose operations consist primarily of projects **Two categories:**

- Organisations that derive their revenue primarily from performing projects for others under contract
- Organisations that have adopted Management by Projects

Non-Project based organisations often lack the management systems to support projects effectively.

Organisation Cultures and Styles

Cultures and Styles can be

- Shared Values, norms, beliefs and expectations
- Policies and Procedures
- View of Authority Relationships
- Work ethic and work hours

Such as:

- Entrepreneurial Leadership: More likely to take on high risk project
 - Bureaucratic Style: Less likely to take on risk
 - Participative Style: Assists in project communications and ultimately project success
-

Organisational Structure

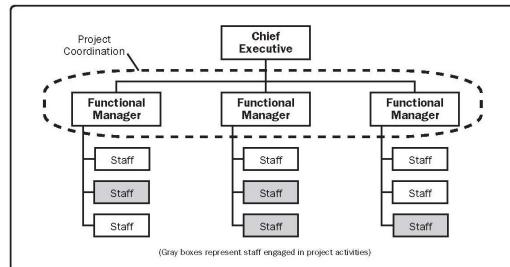


Figure 2-1. Functional Organization

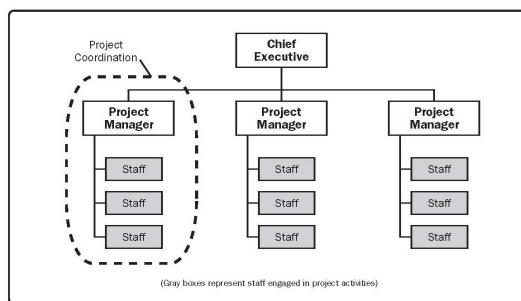


Figure 2-5. Projectized Organization

Organisational Structure

Hierarchy with one clear superior Staff Members grouped by functional speciality Scope for Project Implementation limited Project Manager has to pull from Functional Managers

Organisational Structure

Project Manager in charge of multi-discipline team Project Manager has more control, authority and autonomy

Organisational Structure

Role of PM is that of coordinator and expediter Little Direct Control Similar to Functional organisation

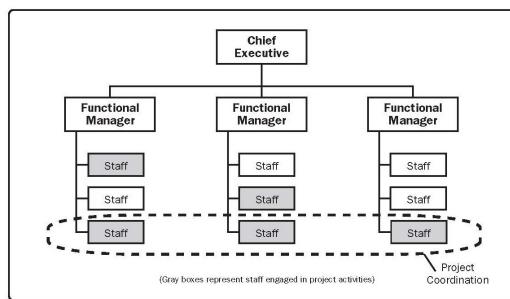


Figure 2-2. Weak Matrix Organization

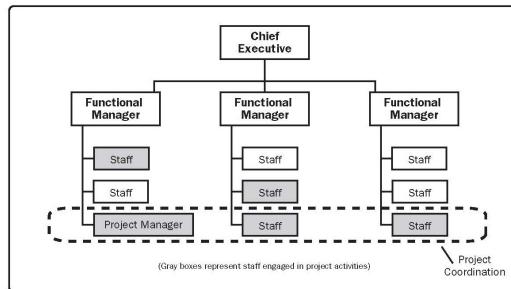


Figure 2-3. Balanced Matrix Organization

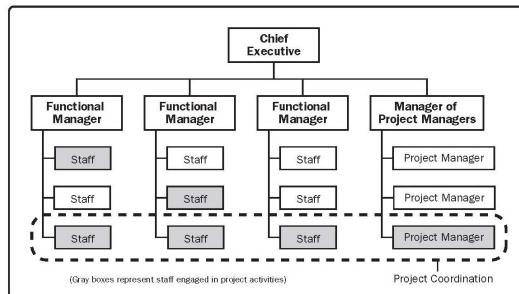


Figure 2-4. Strong Matrix Organization

Organisational Structure

PM reports to a Functional Manager PM has more control, but still relies on functional Managers for resources

Organisational Structure

PM reports to Senior PM Senior PM on a better level to deal with resourcing issues

Organisational Structure

Special Project Team for specific projects

5 Project Management Processes

Project Management

- Up to now we have been 'setting the seen', i.e. looking at what a project is, who is involved, what organisation structures best support projects & project managers, etc.

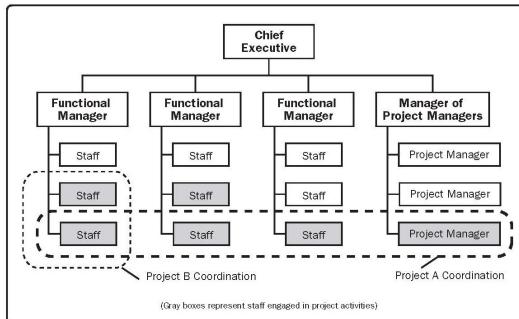


Figure 2-6. Composite Organization

- This lecture presents an overview of the project management processes used in industry.
 - Over the coming weeks & months these areas are going to be presented in detail.
-

Project Management Processes

Project Management is accomplished through **processes**, using PM knowledge, skills, tools and techniques that:

- Receive inputs
 - Generate outputs
-

Project Management Processes

- In order for a project to be successful, the PM team must
 - Select appropriate Processes
 - Use a **defined** approach to adapt specifications and plans to meet project (and/or product) requirements
 - Comply with requirements to meet stakeholders needs, wants and expectations
 - Balance the demands of Scope, Time, Cost, Quality, Resources, and Risk.
-

Project Management Process Groups

There are 5 process groups:

1. Initiating Process Group
2. Planning Process Group

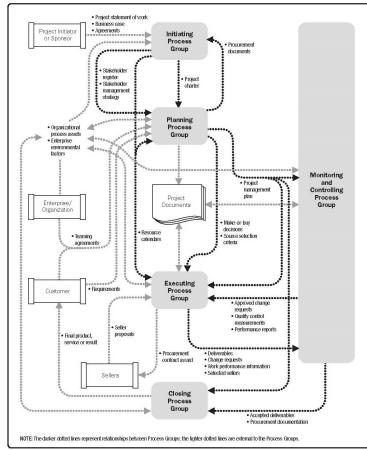


Figure 3-3. Project Management Process Interactions

3. Executing Process Group
4. Monitoring and Controlling Process Group
5. Closing Process Group

PROCESS GROUPS ARE NOT PROJECT PHASES

Project Management Process Groups - Overview

Initiating Process Group

- The Initiating Process Group Consists of the processes that facilitate the formal authorisation to start a new project or phase.
 - Elements are often carried out external to the project scope of control;
 - i.e. before embarking on a project an organisation may document its requirements, evaluate alternatives, and chose one; a project scope statement may also be generated.
 - This can 'blur' the boundary between the original investigation (feasibility study) and the formal initiation of the project
-

Initiating Process Group

Initiating Process Group

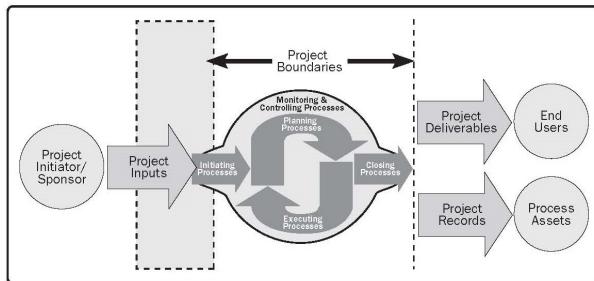


Figure 3-4. Project Boundaries

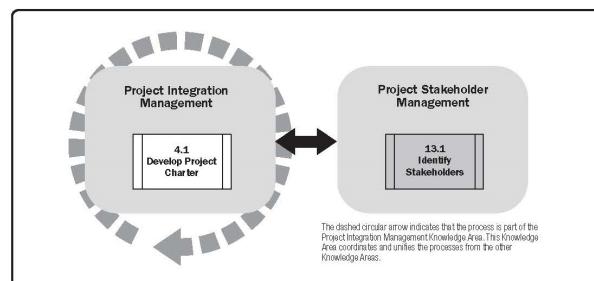


Figure A1-4. Initiating Process Group

Initiating Process Group

- This is the formal commencement of the Project
- Used to validate the assumptions, decisions and constraints previously made and identified (Kill Point?)
- Project Manager is usually appointed at this stage

Initiating Process Group

- Project Charter developed during this process includes information identified in the previous stages
- This Project Charter requires approval and authorisation.
- Approval and Funding are external to the PM Team

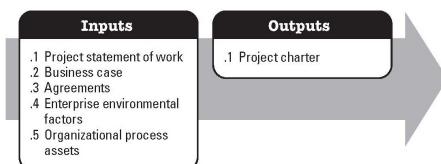


Figure A1-5. Develop Project Charter: Inputs and Outputs

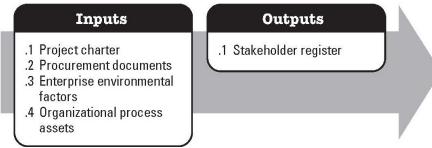
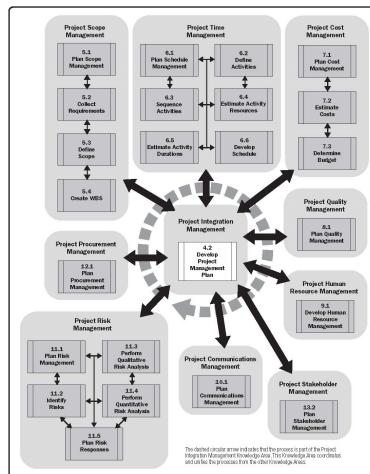


Figure A1-6. Identify Stakeholders: Inputs and Outputs



Initiating Process Group

Identify Stakeholders is the process of identifying all people or organisations impacted by the project and documenting relevant information regarding their interests, involvement, and impact on project success.

Planning Process Group

Planning Process Group

Thought by many to be the most important

- it is vital, but pointless if not integrated into all other aspects of Project Management Process Groups

PP Group is used to develop the PM Plan. These processes identify, define and mature the project scope, cost, and schedule. The PP Group should involve all relevant stakeholders - NPfIT Project failed in this respect. It is an iterative process

- For instance a schedule risk may not be identified until 'activity duration estimating' has been completed

Cannot continue indefinitely; the executing organisation should set a date for completion, dependant on the nature of the project. (General Management Issue)

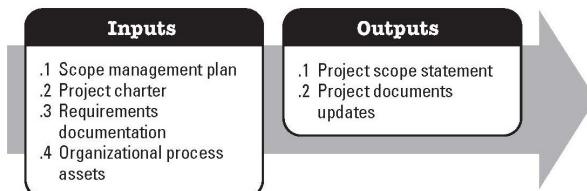


Figure A1-11. Define Scope: Inputs and Outputs

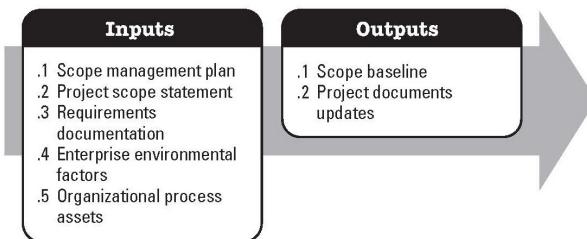


Figure A1-12. Create WBS: Inputs and Outputs

Planning Process Group

Define Scope

Planning Process Group

Create WBS

Planning Process Group

Activity Sequencing

Planning Process Group

Cost Budgeting

Planning Process Group

Risk Identification

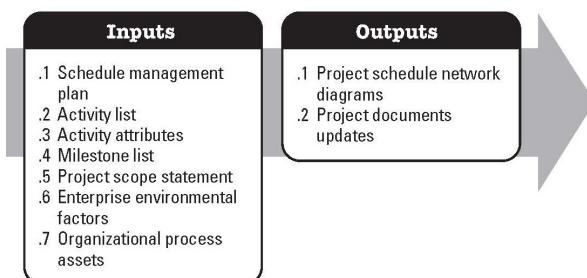


Figure A1-15. Sequence Activities: Inputs and Outputs

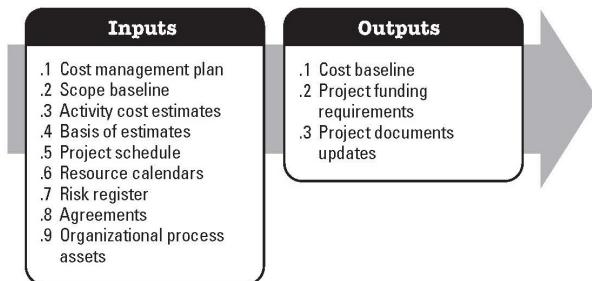


Figure A1-21. Determine Budget: Inputs and Outputs

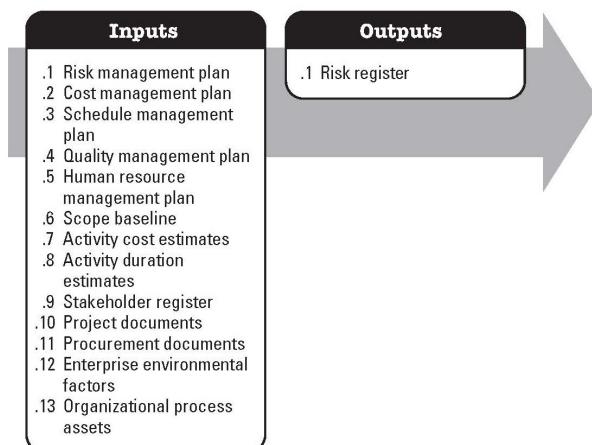


Figure A1-26. Identify Risks: Inputs and Outputs

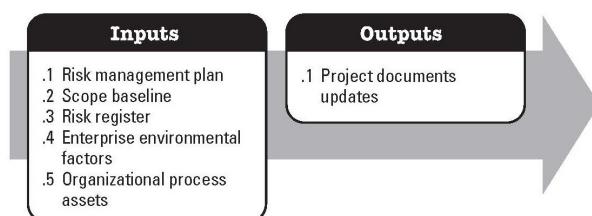


Figure A1-27. Perform Qualitative Risk Analysis: Inputs and Outputs

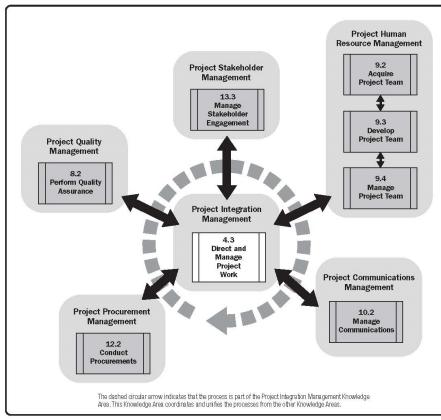


Figure A1-32. Executing Process Group

Planning Process Group

Quantitative Risk Analysis

Executing Process Group

Executing Process Group

- This process group consists of processes used to complete the work defined in the project management plan.
- The Executing P.G. involves coordination of people and resources, as well as integrating and performing the activities in accordance with the PM Plan
- This process group also addresses issues of Scope and change control.
- Normally, execution will cause changes to planning; identify previously unknown risks; etc. Not all changes effect the PM Plan, but usually require analysis
- The vast majority of the Project Budget is expended in performing the Executing Process Group.

Monitoring & Controlling Process Group

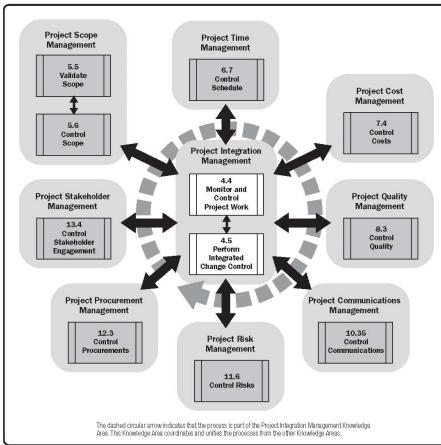


Figure A1-41. Monitoring and Controlling Process Group

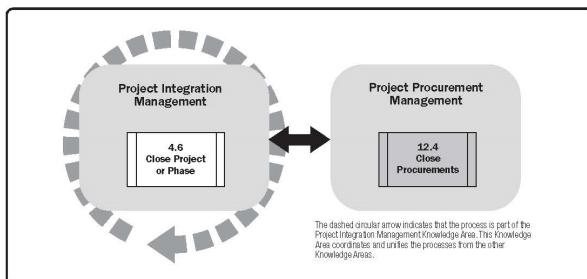


Figure A1-53. Closing Process Group

Monitoring & Controlling Process Group

- The M&C process group consists processes used to **observe** project execution.
 - Used to identify potential problems, corrective actions, and control project execution.
- The output of these processes are compared with the project plan
- Also includes Change Control, Preventative Actions,
- It is a continuous process, providing an insight into the status of the entire project at any given time
- This information may necessitate the modification of the overall project plan.

Closing Process Group

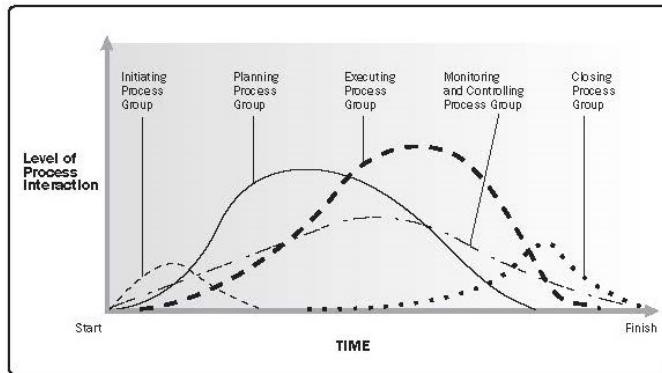


Figure 3-2. Process Groups Interact in a Phase or Project

Closing Process Group

- The closing process group includes processes used to *formally* terminate all activities of a project or project phase
 - When completed, this process group verifies that all processes defined within the other process groups are completed, and formally establishes that the project or project phase is finished.
-

Process Interactions

Process Interactions

- The Process Groups are linked; they are not independent of each other.
 - Generally the output of one process becomes the input of another process
 - Processes Groups are seldom, if ever, discrete events; often overlap with other groups.
 - The level of interaction generally depends on how far the project has progressed.
 - If a project is split into formal phases, these interactions may cross over project phases.
 - Tends to present difficulties when it does.
-

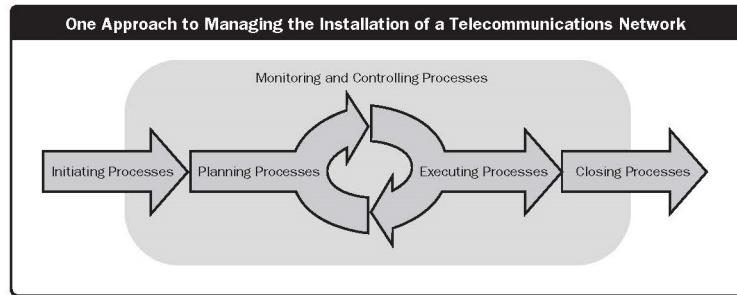


Figure 2-10. Example of a Single-Phase Project



Figure 2-11. Example of a Three-Phase Project

Process Interactions

- Not all processes are required on all projects; not all process interactions are present on all projects
 - The PM team must decide which processes to run and how to run them.
 - (may be governed/dictated by PMO, or Company Protocol)
-

Single Phase Project

Multiphase project

Overlapping Phases

Project Management Process Mapping

- The 5 Process Groups contain a total of 47 Project Management Processes.
- Each Process is shown in the Group in which most of its activity takes place.

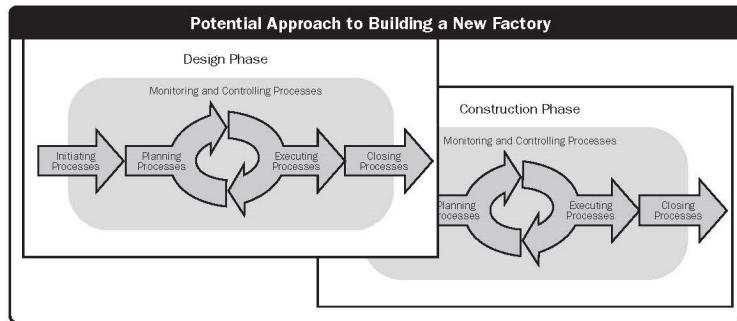


Figure 2-12. Example of a Project with Overlapping Phases

Table 3-1. Project Management Process Group and Knowledge Area Mapping

Knowledge Area	Project Management Process Groups			
	Initiating Process Group	Planning Process Group	Executing Process Group	Closing Process Group
4. Project Initiations Management	4.1 Develop Project Charter	4.2 Develop Project Manager's Plan	4.3 Direct and Manage Project Work	4.4 Plan for and Control Project Work
5. Project Scope Management	5.1 Plan Scope Management	5.2 Define Scope	5.3 Validate Scope	5.4 Control Scope
6. Project Time Management	6.1 Plan Schedule Management	6.2 Define Activities	6.3 Sequence Activities	6.4 Estimate Activities
7. Project Cost Management	7.1 Plan Cost Management	7.2 Determine Costs	7.3 Control Costs	
8. Project Quality Management	8.1 Perform Quality Assurance		8.2 Perform Quality Assurance	8.3 Control Quality
9. Project Human Resource Management	9.1 Plan Human Resource Management	9.2 Acquire Project Team	9.3 Develop Project Team	9.4 Manage Project Team
10. Project Communications Management	10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
11. Project Risk Management	11.1 Identify Risks	11.2 Quantify Risks	11.3 Plan Risk Responses	11.4 Control Risks
12. Project Procurement Management	12.1 Identify Suppliers	12.2 Select Suppliers	12.3 Direct and Manage Project Work	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement

- i.e if a process is undertaken during 'planning' is revisited during 'execution', then it is the same process, not a new one
- **Remember: Not all processes are required on every project**

Project Management Process Mapping

Project Management Process Mapping

Table 3-1. Project Management Process Group and Knowledge Area Mapping

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
5. Project Scope Management	5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS			5.5 Validate Scope 5.6 Control Scope	
6. Project Time Management	6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedules			6.7 Control Schedule	
7. Project Cost Management	7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget			7.4 Control Costs	

Table 3-1. Project Management Process Group and Knowledge Area Mapping

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
8. Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
9. Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
10. Project Communications Management		10.1 Plan Communications	10.2 Manage Communications	10.3 Control Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	