CCJ-123-DASAR PENGEMBANGAN PERANGKAT LUNAK (PERTEMUAN-6)

Dosen Pengampu :

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Introduction to Project Management

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EFTS/EODI Training Programme

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Course Objectives

- To provide participants with:
  - An awareness of the importance of applying good practice Project Management in projects of any size.
  - An understanding of essential elements, including the Leadership Role of the Project Manager, Project Planning, Risk Management and Stakeholder Engagement.
  - An understanding of the principle elements of design control to be applied within projects at Culham.

Culham Challenges

- "What are the particular technical challenges facing projects at Culham?"
  - Research environment
    - requirements may be hard to define and may change
    - producing one or a few items rather than production line
  - Uncertainties of leading edge R&D $\Rightarrow$
    - solutions may have to be developed, including possibly new technologies
    - 'first of a kind' so planning and estimating is difficult
  - Need to balance the desire to get maximum performance versus achieving acceptable reliability/availability

Culham Challenges

- ■ "What are the particular management challenges facing projects at Culham?"
  - – Requirements hard to define and may evolve
  - – Risk Management (all aspects) crucial but difficult
  - – Cross functional team composition
  - – Competing pressures on resources, e.g. design office
  - – Working with scientific organisations not used to project and QA disciplines $\Rightarrow$ planning may be poor
  - – Collaborative agreements rather than contracts
  - – Political - EC funding requirements
  - – Growing funding pressures due to ITER
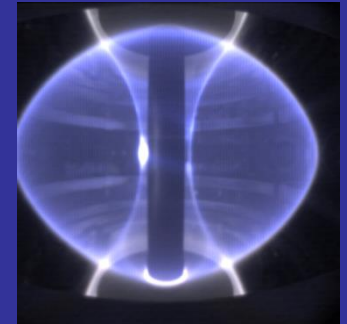
What is a Project?

"Unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including constraints of time, cost, quality and resources"

■ A Project is a planned set of activities
■ A Project has a scope
■ A Project has time, cost, quality and resource constraints

What is Project Management?

- The art of organising, leading, reporting and completing a project through people

What is Project Management?

- A project is a planned undertaking
- A project manager is a person who causes things to happen
- Therefore, project management is causing a planned undertaking to happen.
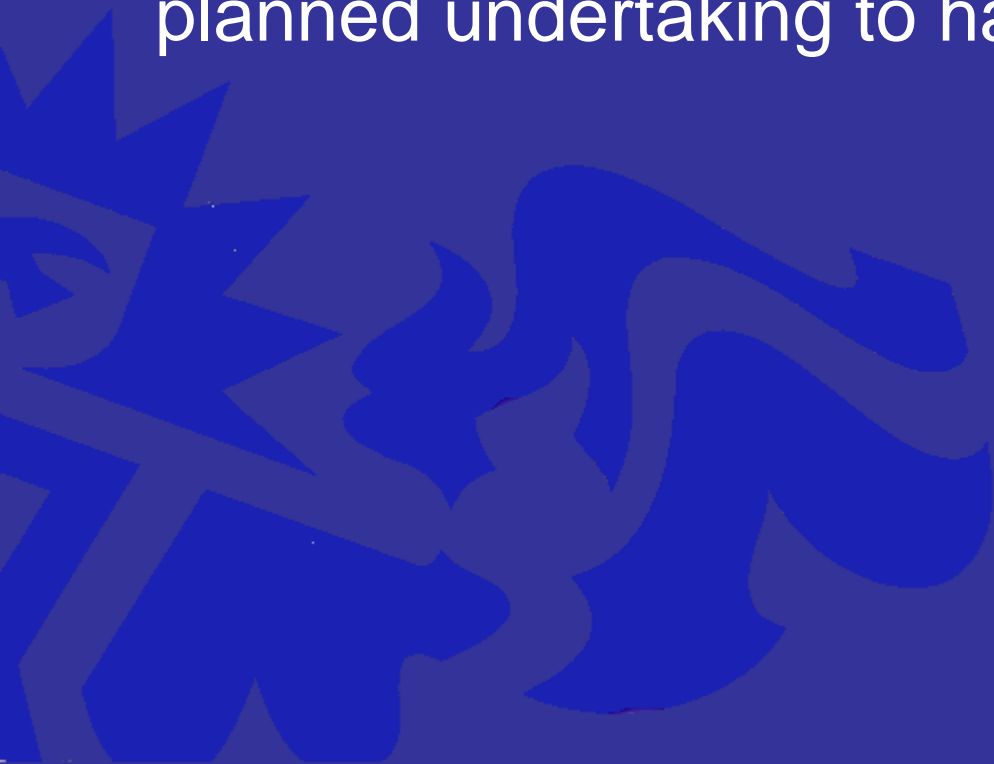
Exercise 1

- Write down three attributes of a good Project Manager

Project Manager Role

■ A Good Project Manager

- – Takes ownership of the whole project
- – Is proactive not reactive
- – Adequately plans the project
- – Is Authoritative (**NOT** Authoritarian)
- – Is Decisive
- – Is a Good Communicator
- – Manages by data and facts not uniformed optimism
- – Leads by example
- – Has sound Judgement
- – Is a Motivator
- – Is Diplomatic
- – Can Delegate
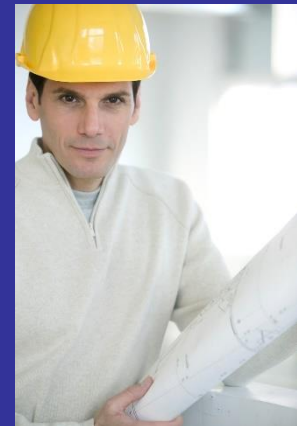
Stakeholder Engagement

Stakeholder

"A person or group of people who have a vested interest in the success of an organization and the environment in which the organization operates"

Exercise 2

- Write down three typical project stakeholders

Exercise 2 - Typical Stakeholders

- Sponsor
- Funding Body
- Customer
- Suppliers
- End User
- HSE/Environmental Agency
- Maintenance Team
- Neighbours/Community/Shareholders
- Fusion Community
- Interfaces

Stakeholder Engagement process

- Identify Stakeholders
- Assess needs
- Define actions
- Establish communication channels
- Gather feedback
- Monitor and review

The Project Process

Gate 0 — Strategic and Budgetary Approval

Gate 1 — Project Justification - Approve Project Definition

Gate 2 — Design Approval - Approval of Final Documents

Gate 3 — Readiness for Manufacture - Approval to place Contract

Undertake Design

Initiate Project

Undertake Tender

Major Project Proposals

Project set-up

Project Definition

Conceptual Design

Scheme Design

Detailed Design

Tender Invitation & Assessment

Prepare Technical Design
Ensure Machine Compatibility   Prepare
Safety Case Modification

Project set-up box:
Appoint Project Sponsor
Assess Project Priority
Assess Budget Implications
Est. Proj. Deliverables and Objectives
Appoint Project Leader
Approve Project Set-up

EFDA/CSU/JOC Management

Conceptual Design box:
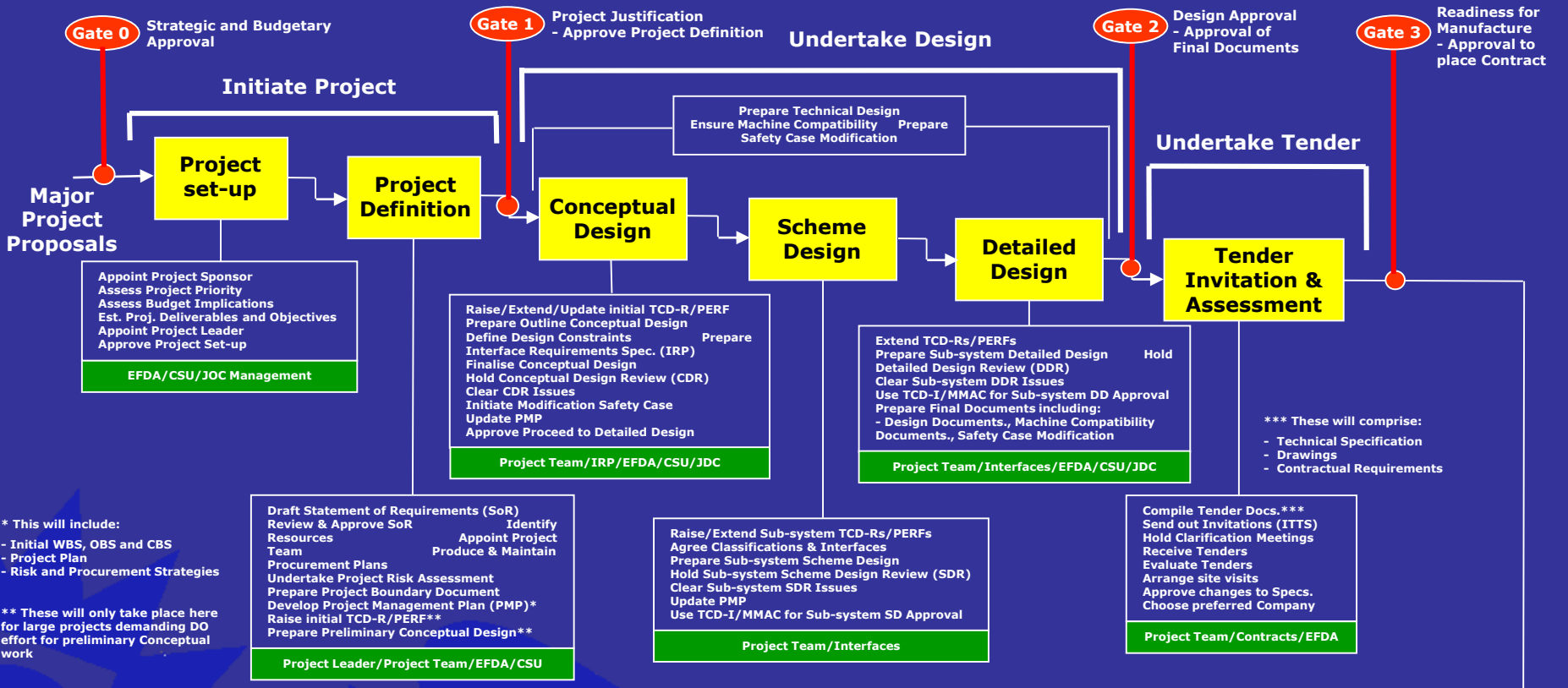Raise/Extend/Update initial TCD-R/PERF
Prepare Outline Conceptual Design
Define Design Constraints   Prepare
Interface Requirements Spec. (IRP)
Finalise Conceptual Design
Hold Conceptual Design Review (CDR)
Clear CDR Issues
Initiate Modification Safety Case
Update PMP
Approve Proceed to Detailed Design

Project Team/IRP/EFDA/CSU/JDC

Detailed Design box:
Extend TCD-Rs/PERFs
Prepare Sub-system Detailed Design   Hold
Detailed Design Review (DDR)
Clear Sub-system DDR Issues
Use TCD-I/MMAC for Sub-system DD Approval
Prepare Final Documents including:
- Design Documents., Machine Compatibility
Documents., Safety Case Modification

Project Team/Interfaces/EFDA/CSU/JDC

*** These will comprise:
- Technical Specification
- Drawings
- Contractual Requirements

* This will include:
- Initial WBS, OBS and CBS
- Project Plan
- Risk and Procurement Strategies

** These will only take place here for large projects demanding DO effort for preliminary Conceptual work   .

Project Definition box:
Draft Statement of Requirements (SoR)
Review & Approve SoR   Identify
Resources   Appoint Project
Team   Produce & Maintain
Procurement Plans
Undertake Project Risk Assessment
Prepare Project Boundary Document
Develop Project Management Plan (PMP)*
Raise initial TCD-R/PERF**
Prepare Preliminary Conceptual Design**

Project Leader/Project Team/EFDA/CSU

Scheme Design box:
Raise/Extend Sub-system TCD-Rs/PERFs
Agree Classifications & Interfaces
Prepare Sub-system Scheme Design
Hold Sub-system Scheme Design Review (SDR)
Clear Sub-system SDR Issues
Update PMP
Use TCD-I/MMAC for Sub-system SD Approval

Project Team/Interfaces

Tender box:
Compile Tender Docs.***
Send out Invitations (ITTS)
Hold Clarification Meetings
Receive Tenders
Evaluate Tenders
Arrange site visits
Approve changes to Specs.
Choose preferred Company

Project Team/Contracts/EFDA

Implement Project

Gate 4 — Readiness for Operation - Acceptance of System

Complete Project

Manufacture Equipment

Install Equipment

Test & Commission

Confirm Completion

Project Review

Note: Overall Project Management and Reporting will be as defined in the Project Management Plan (PMP)

● Gates (Formal Decision Points) See accompanying notes

Manufacture Equipment box:
Raise Contract Documentation
Place Contract
Hold Kick off Meeting (KOM)
Clarify Issues (Quality Plan)
Monitor Progress
Witness key Procedures
Complete Release Note
Approve Complete Package****
Approve Release Note
Pack & Dispatch Equipment

Project Team/Contractor/ICM

Install Equipment box:
Receive Equipment
Pre-test Equipment
Install equipment

Project Team/ICM

Test & Commission box:
Test Equipment against Test Schedule
Commission Complete System

Project Team/ICM/EFDA/CSU

Confirm Completion box:
Confirm Technical Completion
Review Project Records   Complete
Handover Documents   Resolve
Reservations   Obtain
Acceptance of Completed Project

Project Team/EFDA/CSU

Project Review box:
Undertake Post Project Review

Project Team/CSU

**** This includes supporting documentation

Key Points in Project Set-up and Definition

- Create Project Management Plan (PMP)

- Be clear of scope and objectives

- Establish clear statement of what is to be done (WBS)

- Establish Risks to be Managed

- Establish Costs and Durations

- Establish Resources Required

Project management Plan - PMP

■ Master Document for Project

■ Defines the following:-

⇨ Project Objectives, Scope, Deliverables

⇨ Stakeholders (Internal & External)

⇨ Work to be done (WBS)

⇨ Project Organisation and Resources (OBS)

⇨ Project Costings (CBS)

⇨ Project Schedule

⇨ Procurement/Contract Strategy

⇨ Risk Management

⇨ Quality management

⇨ Change Management

Project Planning

Project Planning

- **Adequate planning leads to the correct completion of work**
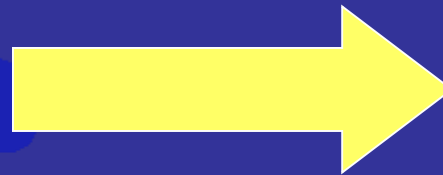
Planning

- Inadequate planning leads to frustration towards the end of the project & poor project performance
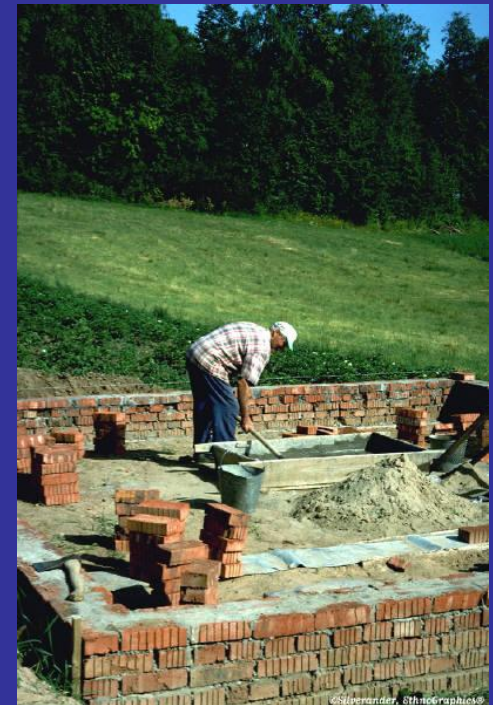
Project Start

Project End

Work Breakdown Structure (WBS)

- The Work Breakdown Structure is the foundation for effective project planning, costing and management.

- It is the most important aspect in setting-up a Project

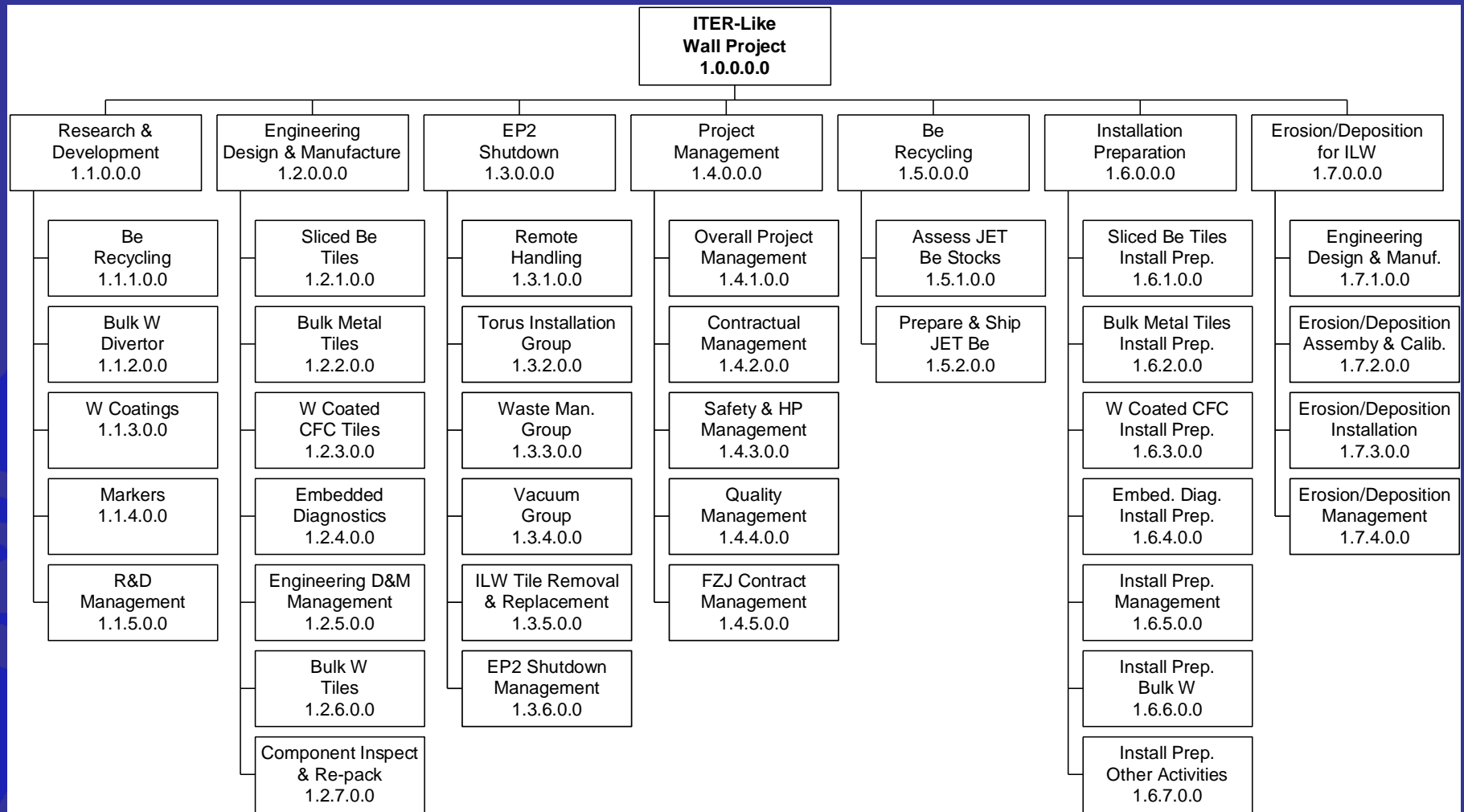- It is the foundation on which everything else builds
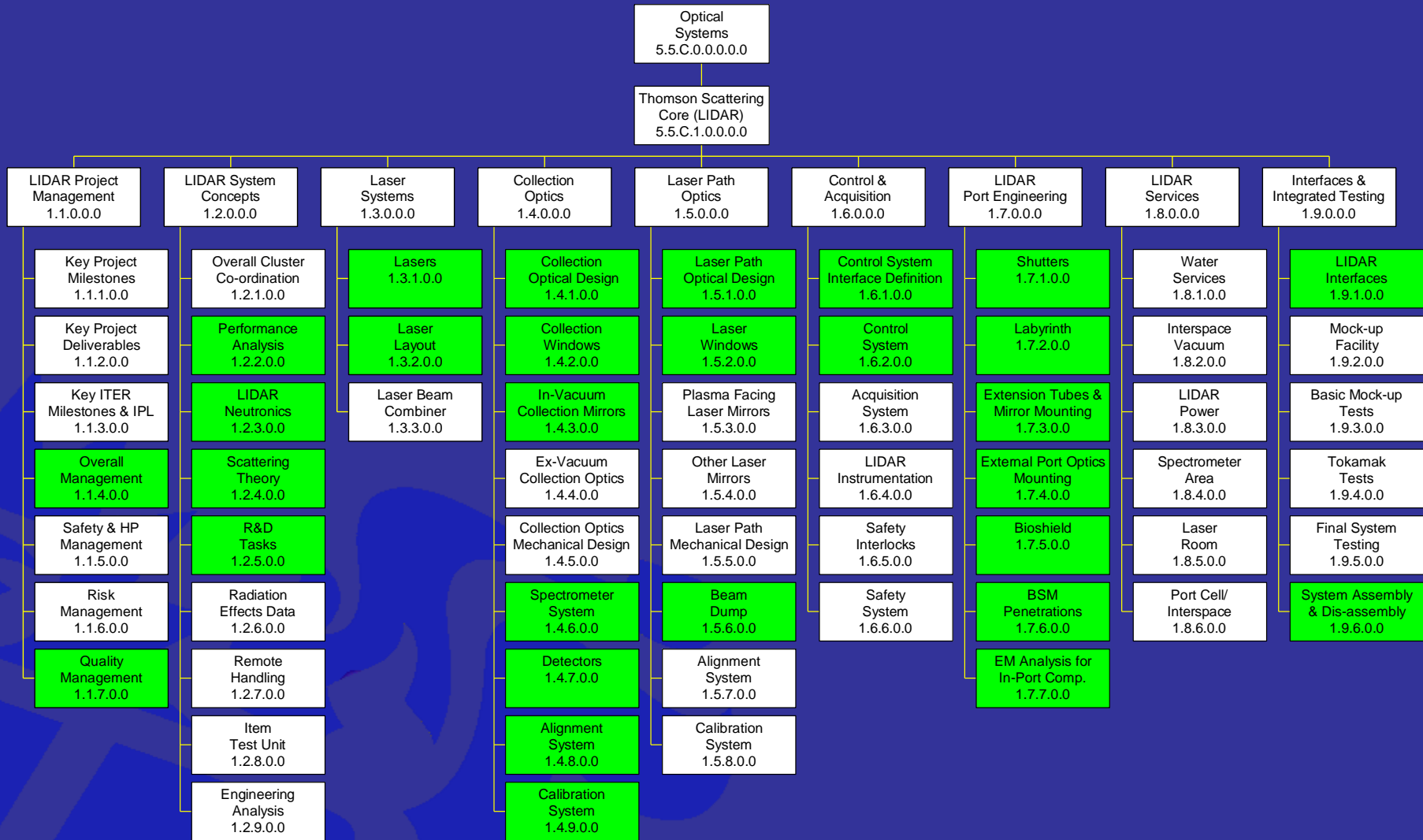
Work Breakdown Structure - Definition

"A Work Breakdown Structure (WBS) is a hierarchical (from general to specific) tree structure of deliverables and tasks that need to be performed to complete a project."

Example WBS - Top Level ILW Project

ITER-Like
Wall Project
1.0.0.0.0

Research & Development 1.1.0.0.0	Engineering Design & Manufacture 1.2.0.0.0	EP2 Shutdown 1.3.0.0.0	Project Management 1.4.0.0.0	Be Recycling 1.5.0.0.0	Installation Preparation 1.6.0.0.0	Erosion/Deposition for ILW 1.7.0.0.0
Be Recycling 1.1.1.0.0	Sliced Be Tiles 1.2.1.0.0	Remote Handling 1.3.1.0.0	Overall Project Management 1.4.1.0.0	Assess JET Be Stocks 1.5.1.0.0	Sliced Be Tiles Install Prep. 1.6.1.0.0	Engineering Design & Manuf. 1.7.1.0.0
Bulk W Divertor 1.1.2.0.0	Bulk Metal Tiles 1.2.2.0.0	Torus Installation Group 1.3.2.0.0	Contractual Management 1.4.2.0.0	Prepare & Ship JET Be 1.5.2.0.0	Bulk Metal Tiles Install Prep. 1.6.2.0.0	Erosion/Deposition Assemby & Calib. 1.7.2.0.0
W Coatings 1.1.3.0.0	W Coated CFC Tiles 1.2.3.0.0	Waste Man. Group 1.3.3.0.0	Safety & HP Management 1.4.3.0.0		W Coated CFC Install Prep. 1.6.3.0.0	Erosion/Deposition Installation 1.7.3.0.0
Markers 1.1.4.0.0	Embedded Diagnostics 1.2.4.0.0	Vacuum Group 1.3.4.0.0	Quality Management 1.4.4.0.0		Embed. Diag. Install Prep. 1.6.4.0.0	Erosion/Deposition Management 1.7.4.0.0
R&D Management 1.1.5.0.0	Engineering D&M Management 1.2.5.0.0	ILW Tile Removal & Replacement 1.3.5.0.0	FZJ Contract Management 1.4.5.0.0		Install Prep. Management 1.6.5.0.0	
	Bulk W Tiles 1.2.6.0.0	EP2 Shutdown Management 1.3.6.0.0			Install Prep. Bulk W 1.6.6.0.0	
	Component Inspect & Re-pack 1.2.7.0.0				Install Prep. Other Activities 1.6.7.0.0	

Example WBS - Top Level TSCL Project

Optical Systems
5.5.C.0.0.0.0.0

Thomson Scattering Core (LIDAR)
5.5.C.1.0.0.0.0

LIDAR Project Management 1.1.0.0.0	LIDAR System Concepts 1.2.0.0.0	Laser Systems 1.3.0.0.0	Collection Optics 1.4.0.0.0	Laser Path Optics 1.5.0.0.0	Control & Acquisition 1.6.0.0.0	LIDAR Port Engineering 1.7.0.0.0	LIDAR Services 1.8.0.0.0	Interfaces & Integrated Testing 1.9.0.0.0
Key Project Milestones 1.1.1.0.0	Overall Cluster Co-ordination 1.2.1.0.0	Lasers 1.3.1.0.0	Collection Optical Design 1.4.1.0.0	Laser Path Optical Design 1.5.1.0.0	Control System Interface Definition 1.6.1.0.0	Shutters 1.7.1.0.0	Water Services 1.8.1.0.0	LIDAR Interfaces 1.9.1.0.0
Key Project Deliverables 1.1.2.0.0	Performance Analysis 1.2.2.0.0	Laser Layout 1.3.2.0.0	Collection Windows 1.4.2.0.0	Laser Windows 1.5.2.0.0	Control System 1.6.2.0.0	Labyrinth 1.7.2.0.0	Interspace Vacuum 1.8.2.0.0	Mock-up Facility 1.9.2.0.0
Key ITER Milestones & IPL 1.1.3.0.0	LIDAR Neutronics 1.2.3.0.0	Laser Beam Combiner 1.3.3.0.0	In-Vacuum Collection Mirrors 1.4.3.0.0	Plasma Facing Laser Mirrors 1.5.3.0.0	Acquisition System 1.6.3.0.0	Extension Tubes & Mirror Mounting 1.7.3.0.0	LIDAR Power 1.8.3.0.0	Basic Mock-up Tests 1.9.3.0.0
Overall Management 1.1.4.0.0	Scattering Theory 1.2.4.0.0		Ex-Vacuum Collection Optics 1.4.4.0.0	Other Laser Mirrors 1.5.4.0.0	LIDAR Instrumentation 1.6.4.0.0	External Port Optics Mounting 1.7.4.0.0	Spectrometer Area 1.8.4.0.0	Tokamak Tests 1.9.4.0.0
Safety & HP Management 1.1.5.0.0	R&D Tasks 1.2.5.0.0		Collection Optics Mechanical Design 1.4.5.0.0	Laser Path Mechanical Design 1.5.5.0.0	Safety Interlocks 1.6.5.0.0	Bioshield 1.7.5.0.0	Laser Room 1.8.5.0.0	Final System Testing 1.9.5.0.0
Risk Management 1.1.6.0.0	Radiation Effects Data 1.2.6.0.0		Spectrometer System 1.4.6.0.0	Beam Dump 1.5.6.0.0	Safety System 1.6.6.0.0	BSM Penetrations 1.7.6.0.0	Port Cell/ Interspace 1.8.6.0.0	System Assembly & Dis-assembly 1.9.6.0.0
Quality Management 1.1.7.0.0	Remote Handling 1.2.7.0.0		Detectors 1.4.7.0.0	Alignment System 1.5.7.0.0		EM Analysis for In-Port Comp. 1.7.7.0.0		
	Item Test Unit 1.2.8.0.0		Alignment System 1.4.8.0.0	Calibration System 1.5.8.0.0				
	Engineering Analysis 1.2.9.0.0		Calibration System 1.4.9.0.0					

Project Planning – WBS (1)

- Lowest Level of WBS is the Work Package (WP)

- WP can be clearly defined allowing package to be costed, scheduled and resourced

- WP contains a list of Tasks to be Performed that form the basis for the Schedule

- WP allows assignment of responsibilities (Work Package Manger, WPM)

Project Planning – WBS (2)

- WBS allows hierarchical build-up of costs and schedule

- Cost and Schedule can be reported at any level of the WBS

- WBS facilitates strong management during project execution (Cost and Schedule control)

- WBS can be used for many other things - Document Management, Risk Management etc.

Project Planning

- A word about Scheduling
  - Schedules (task durations) can have a wide variation
  - There is no unique answer. Rather, there is a statistical variation depending on assumptions
  - Need to understand the basis of scheduling (Most challenging; Most likely; Absolute certainty - bet your life on it!)
  - Most people are very optimistic/naive

Common schedule development

Accuracy of Timescale Estimates
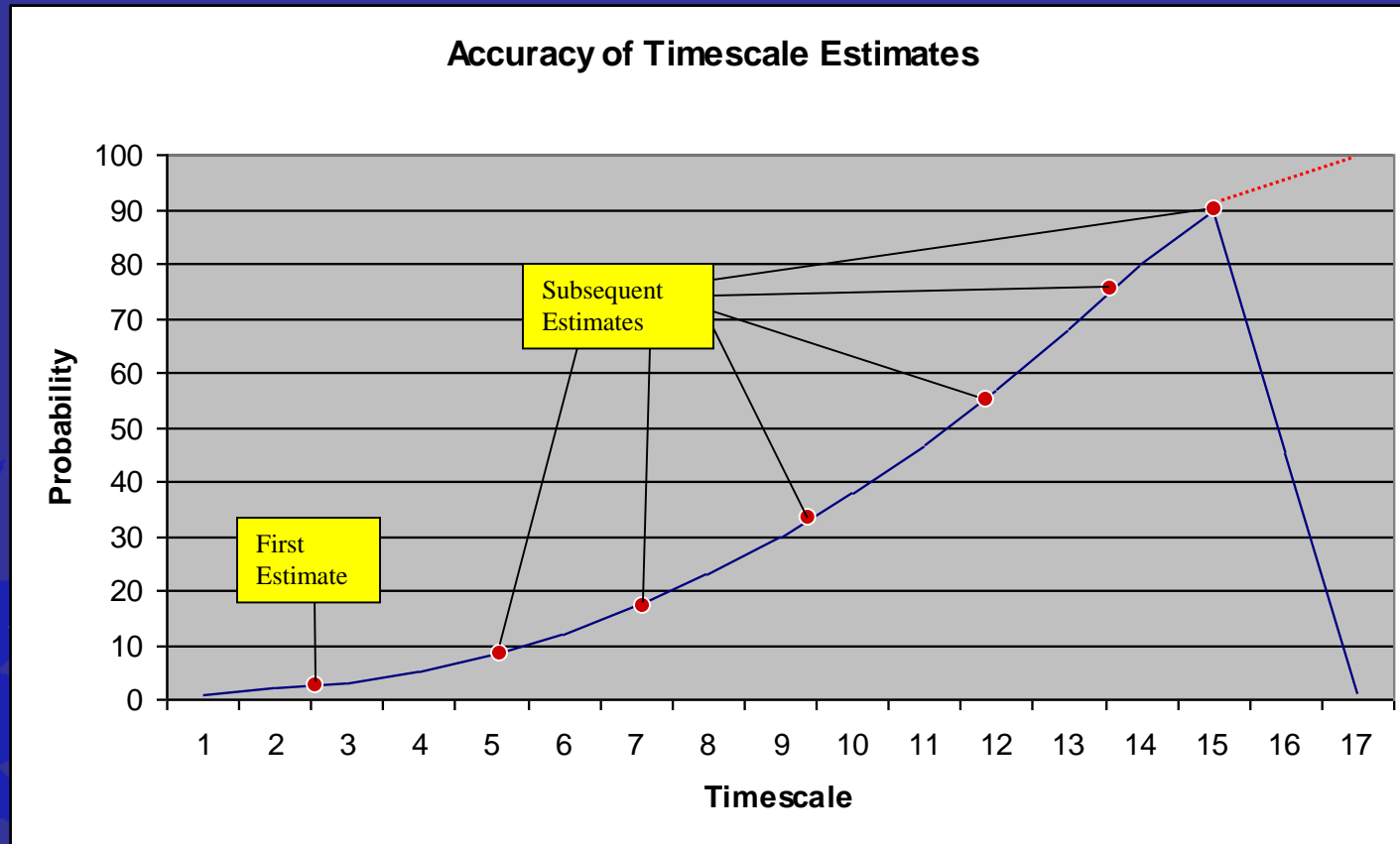
Example WBS for the ITER-Like Wall & TSCL Projects

MJ Kear

ILW WBS

TSCL WBS

ILRH Schedule

Project Planning – Key Points

- Recognise that adequate project planning is essential

- Produce a sound WBS

- Use the framework provided by the Project Management Plan (PMP) template

- Involve the right people

- Allow enough time

- Be systematic

Project Risk Management
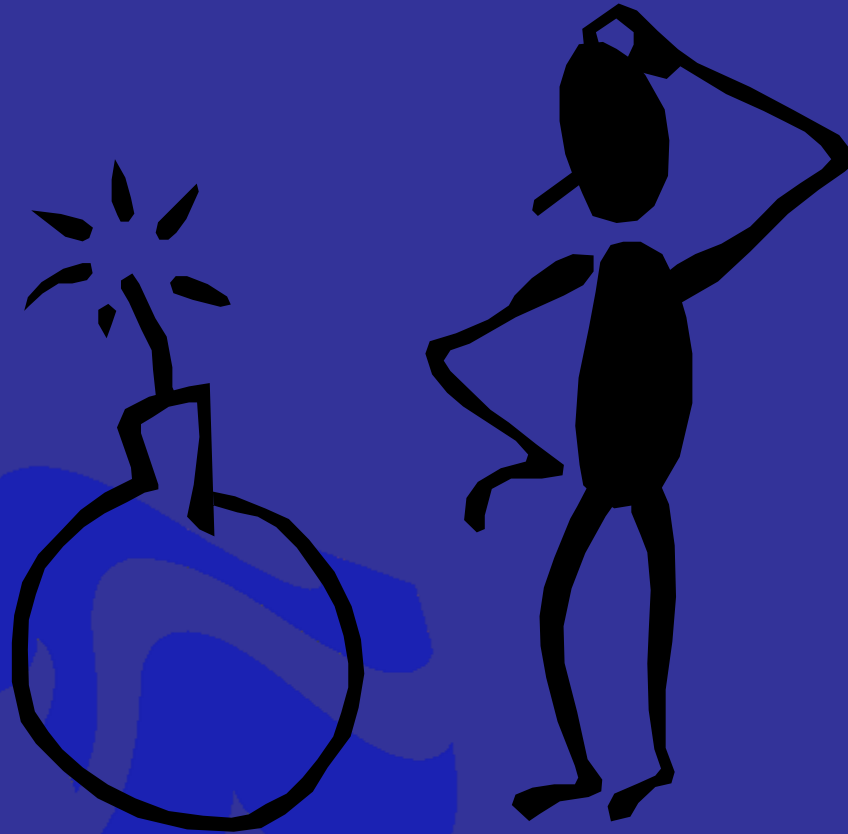
Project Risk – Definition (1)

"Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective"

Project Risk – Definition (2)

"A combination of the probability of a defined threat or opportunity (Likelihood) and the magnitude of the consequences of the occurrence (Impact) defines a Risk Index"

Risk Impact

Threat → Scope → Poor Quality Product

Threat → Schedule → Late Delivery

Threat → Cost → Overspend

- In addition there are health, safety and environmental threats that **<u>must</u>** be managed (CDM Regulations)

Risk Management Process

- Identify Risks
- Assess likelihood and impact
- Rank risks and prioritise
- Define risk management approach & actions
- Implement actions
- Monitor & review

Example Risk Management for the ITER-Like Wall Project

MJ Kear

Microsoft
verPoint Presentat

Risk Management – Key Points

- Make the management of risk integral to the way the project is managed

- Ensure that cost and time contingencies are consistent with identified risks

- Focus on the "significant few" – don't try to manage too many risks

- Be vigilant and proactive

Project Monitoring and Control

Exercise 3

- Write down three typical project control/monitoring activities

Project Monitoring

- Typical Monitoring Activities
  - regular reviews of progress against schedule using WBS as basis (Plan against Baseline)
  - regular review of actual costs (O/P from SAP) against budgeted costs and Earned Value at WBS level
  - regular review of resource loading
  - regular progress meetings with project team
  - regular meetings with contractors
  - production of periodic progress reports
  - risk reviews
  - inspections/ audits

Project Control

- Typical Control Activities
  - assign responsibilities at Work Package level
  - staged authorisation of work to be done
  - staged release of budgets (staged release of WBS(e) numbers)
  - ensure PM has a 'Management Reserve' under his control
  - seek corrective action reports when WPs go 'off track' (overrunning or overspending)
  - release Management Reserve carefully

Project Monitoring and Control Summary

- Monitor against the plan – status regularly
- Take a factual approach to decisions
- Identify management action early
- Check that defined controls are being applied – correct if necessary
- Apply change control

Introduction to Design Management

Design Management

- Design takes place as part of a project
- Design Management is part of Project Management
- Design Management considerations must be included in the PMP

Exercise 4

■ Write down three Design Management Activities

Exercise 4 - Design Management Activities

- Sub-divide Design Stages (CD, SD & DD)
- Sub-divide Tasks (WBS)
- Define Constraints and Interfaces (WPD Summary Sheet)
- Formally Initiate the Design (TCD-R/PERF)
- Ensure Design conforms to H&SE and CDM Requirements
- Hold Design Reviews (Peer review)
- Formally Approve Design (TCD-I/MMAC)

Design Stages

- Conceptual Design
- Scheme Design
- Detailed Design

Conceptual Design Phase

- TCD-R
- Decide Local or TCS route
- Develop Conceptual Design
- Define Constraints & Interfaces
- Carry out Conceptual Design Review
- Initiate Safety Case Modification if required
- Obtain Approval to Proceed to next stage

Scheme and Detailed Design

- Basic considerations and process similar to concept

- Need to ensure that safety & environmental issues receive proper consideration as design develops (CDM Regulations)

Exercise 5

- List who should be invited to a design review
- Write down three issues that should be considered at a design review

Exercise 5 - Design Reviews, Attendance

- Project Leader or nominee (Chairman)
- RO (Work Package Manager)
- Customer
- End User
- Safety and Quality Reps
- All other Relevant Interfaces/Stakeholders
- Other Experts in the area being reviewed

Exercise 5 - Design Reviews, Issues to Consider

- Assumptions and Constraints
- Technical Solutions - Does it meet the Spec?
- Safety, Environment and CDM issues
- Can it be Manufactured/Maintained?
- Actions from previous DRs
- Issues to be resolved (including Timescales)

Safety & Environment

- Need to ensure that safety & environmental issues receive proper consideration as design develops
  - Involve the right people from the start
  - Systematically identify issues – Hazards/Risks, Environmental Aspects & Impacts
  - Carry out rigorous reviews at each design stage
  - Control Design Changes
- MUST take note of CDM Regulations

CDM Regulations

- CDM - Construction (Design & Management)
- Regulations recently updated
- Now must have someone in EACH Project Responsible for CDM
- Currently information is on the Conceptual, Scheme & Detailed Design steps on the Process Maps
- More information will be developed over the coming months

Design Change control

- Needs to be a formal and defined procedure
- New procedure in place CD/P/J008 for JET Facilities

Confirm Completion

- Ensure design records are complete and accurate
- Ensure any outstanding actions or issues are addressed
- Ensure Maintenance Records are produced
- Ensure User Manuals are produced
- Hold a formal Post Project review