Lecture 1: Introduction

- Management
  - Five functions: lead, organise, plan, implement and control
  - Responsible for human, material and financial resources

- Project
  - It has a specific purpose
  - Temporary (start and finish)
  - It is unique (new product, service – if not it is an operation) (in/tangible)
  - Constraints: time, cost and quality
  - It involves risk
  - Involves collaboration
  - A program is a higher level group of projects targeted at a common goal

- Project Management
  - The application of knowledge, skills, tools and techniques to project activities to meet project requirements (PMBOK)
  - History
    - Pyramids, Roman aqueducts, Great Wall of China, WW1, Polaris missile program (created PERT), now sophisticated software tools
  - Models
    - Plan – implement – monitor and control – evaluate (cyclic)
  - Lifecycle
    - 4 phases

- Reasons for Project failure
  - Unclear expectations
  - Poor communication (project team, stakeholders, internal and external)
  - Lack of top management support
  - Poor project manager/lack of focal point
  - Project not strategically aligned with business
  - Inadequate planning, lack of resources

Lecture 2 – Organisational Strategy

- Organisational Strategy/ Strategic management process
  - 1. Review and define the organisational mission
    - “This is why we exist”
    - A broad declaration of the basic, unique purpose and scope of operations
    - Also related to marketing
    - SWOT analysis
      - Strengths and weaknesses (internal)
      - Opportunities and threats (external)
  - 2. Set long range goals and objectives
    - At a strategic, tactical or operational level ie long term, medium term and everyday
    - SMART: Specific, measurable, assignable, realistic, time related
  - 3. Analyse and formulate strategies to reach objectives: Project portfolio management
    - To ensure projects align with strategic goals
    - Project screening matrix (list projects vs strategic goals, compare quantitatively)
    - Project portfolio matric (return vs technical feasibility)
    - Financial: packback method, net present value
    - Non-financial: increase market share, disadvantage competitors, develop technology etc
  - 4. Implement strategies through projects
    - Compliance project – to survive
    - Operational projects - support current operations
    - Strategic projects - support long term organisational mission
• **Stakeholders**
  - Stakeholder = someone with a vested interest (+ve or –ve) in the outcome of the project
  - E.g. Project manager, team, sponsor, owner, customer, contracts, suppliers
  - Stakeholder management: their interest, what info they need, how to present this info, their environment, their influence
  - Influence of stakeholders decrease with time, however cost of changes increase

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**Lecture 3 - Organisational Structure and Defining the Project Scope**

• **Organisational Structure**
  - The interaction and coordination patterns that management designs to link the tasks of individuals and groups to organisational goals
  - Differentiation is the subdivision into specialised areas
  - Integration is how the subunits interact and support each other to achieve the organisations goals
  - Different structures

<table>
<thead>
<tr>
<th>Structure</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional organisation</td>
<td>1. No change</td>
<td>1. Lack of focus</td>
</tr>
<tr>
<td></td>
<td>2. Flexibility</td>
<td>2. Poor integration</td>
</tr>
<tr>
<td></td>
<td>3. In-depth expertise</td>
<td>3. Slow</td>
</tr>
<tr>
<td></td>
<td>4. Easy post transition authority</td>
<td>4. Lack of ownership</td>
</tr>
<tr>
<td>Project organisation</td>
<td>1. Simple</td>
<td>1. Expensive</td>
</tr>
<tr>
<td>(dedicated team)</td>
<td>2. Fast</td>
<td>2. Internal strife</td>
</tr>
<tr>
<td></td>
<td>3. Cohesive</td>
<td>3. Limited technological expertise</td>
</tr>
<tr>
<td>Matrix organisation</td>
<td>1. Efficient</td>
<td>1. Dysfunctional conflict</td>
</tr>
<tr>
<td></td>
<td>2. Stronger project focus</td>
<td>2. Infighting</td>
</tr>
<tr>
<td></td>
<td>3. Easier post project transition</td>
<td>3. Stressful</td>
</tr>
<tr>
<td></td>
<td>4. Flexible</td>
<td>4. Slow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. High admin costs</td>
</tr>
</tbody>
</table>

- Interface management
  - To ensure rapid, reliable and accurate communication between stakeholders
  - To ensure objectives are supported
  - External and interfaces need to be formally controlled – project manager’s job
  - Tools include reports, change control documents, meetings and minutes, memos, emails etc

• **Project Scope**
  - Describes the project deliverables and the work needed to achieve them
  - Statement (must be clear, communicated and understood by all parties):
    - Objectives
    - Deliverables
    - Milestones
    - Boundaries and constraints (cost, time, quality)
    - Acceptance criteria
    - Identify approvals
  - Milestones and WBS help define scope

• **Milestones**
  - Checkpoints. They are what is to be achieved, not how
  - Should be
    - Understood
    - Logical
    - Overview the project
    - Identify decisions
    - Able to be controlled
    - At an appropriate level
  - Milestone plan links all major milestones and forms a logical network
**Work Breakdown Structure (WBS)**
- The subdivision of work into smaller and smaller elements
- Hierarchical: project, deliverable, sub deliverable, lowest sub deliverable, cost account, work package
- Work packages must have a known duration, able to assign a cost and responsibility

**Uses for WBS**
- The basis of all subsequent planning:
  - Integration of WBS and OBS (organisational)
  - Bottom up estimating
  - Responsibility matrix
  - Scheduling

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**Lecture 4 - Managing Project Cost, Risk and Quality**

**Cost Estimating**
- First determine the need of the estimate, then technique
- Top down (management) based on experience
- Bottom up (work packages estimated in detail, uses WBS)

<table>
<thead>
<tr>
<th>Type</th>
<th>Screening</th>
<th>Feasibility</th>
<th>Budget</th>
<th>Tender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used for</td>
<td>Project initiation, ranking of alternatives</td>
<td>More detailed analysis of the preferred option</td>
<td>Approval</td>
<td>Tender, control</td>
</tr>
<tr>
<td>Timing</td>
<td>Definition phase</td>
<td>Definition phase</td>
<td>Planning phase</td>
<td>Planning phase</td>
</tr>
<tr>
<td>Techniques</td>
<td>Apportioning (assigning percentages to packages), ratio (eg $/m^2$ of bridge)</td>
<td>Historical factoring</td>
<td>Factoring and material takeoff, (eg $/m^3$ concrete)</td>
<td>Full material takeoff, bottom up estimate</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±40%</td>
<td>±25%</td>
<td>±15%</td>
<td>±5%</td>
</tr>
<tr>
<td>Advantages</td>
<td>Quick, only general design info needed</td>
<td>Quick</td>
<td>More accurate</td>
<td>Accurate</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Inaccurate</td>
<td>Inaccurate, some design info needed</td>
<td>Design info needed, time consuming</td>
<td>Detailed info needed, time consuming, expensive</td>
</tr>
</tbody>
</table>

- Direct costs = materials, labour, equipment, subcontractor, site overheads
- Indirect costs = admin office, training, finance, supervision, insurance, utilities etc
- Contingency = percentage to offset risk, higher risk = higher contingency
- Profit
- Estimate becomes budget when you win the tender

**Risk**
- Proactive not reactive
- Risk identification
  - External: top down (market conditions, politics, whether...)
  - Internal: bottom up (assumptions, size, complexity, technology....)
- Risk assessment
  - In terms of likelihood, severity and controllability
  - Tools: Risk severity matrix (likelihood vs impact), PERT, risk inventory/register...
- Risk response
  - Mitigate
  - Avoid
  - Transfer
  - Share
  - Retain
  - Tools: risk management plan, risk response matrix, change requests, performance reports

**Quality**
- Definition
  - 1. Fit for purpose
  - 2. Meets the customer’s requirements
• 3. Meets the specification
• 4. Satisfies the customer

Quality planning
• Identify which quality standards are relevant: statutory, technical, organisational
• Establish quality checklist and baseline

Quality assurance
• Quality audits, change management system
• Get it right the first time

Quality costs
• Prevention: planning, control and audit, safety equipment, insurance...
• Appraisal: inspections, performance testing, reporting results, certificates...
• Failure: repair, scrap, waste, reinspection and testing, defect diagnosis, recall, warranty...

Lecture 5 – Developing a Project Plan

• Scheduling
  o Network diagram and subsequent Gantt chart become the baseline for monitoring time
  o Network shows the logical sequence of activities through a project to its completion

Duration
• Task effort is the time to perform a task, time duration is the time period over which the task is performed
• Estimating
  • Ask the people who do the work, get an objective experts opinion
  • Use historical records (record actual times for use in next job)
  • Use analytical estimates
  • Use accepted performance rates
• Make allowances for
  • Time to get design info
  • Time to get quotes
  • Statutory approvals and inspections
  • Specialist resources
  • Break in/out activities
  • Learning curve

Examples
• With blue sheet
• [http://people.brunel.ac.uk/~mastjjb/jeb/or/netaonmore.html](http://people.brunel.ac.uk/~mastjjb/jeb/or/netaonmore.html)

Lecture 6 – Networks and Pert

• Precedence Networks
  o 4 types of lag: finish to start, start to start, start to finish, finish to finish

• PERT
  o Developed during Polaris Missile program
  o 3 durations obtained using Delphi or other techniques:
    • Pessimistic b (1% chance of doing worse than this)
    • Optimistic a (1% chance of doing worse than this)
    • Most likely m
  o \[ t_e = \frac{(a + 4m + b)}{6} \]
  o \[ \delta^2 = \frac{[(b - a)]^2}{6} \]
  o \[ Z = \frac{(t_s - t_e)}{\sqrt{\text{the sum of the } \delta^2 \text{ of the critical path}}} \]
Where \( t_e \) = weighted average activity time
\( \delta^2 \) = variance
\( Z \) = z score (see table to get probability)
and \( t_s \) = scheduled time (the time we want to see the probability of it finishing within)

• Examples
  o Attached to blue sheet
  o In lecture notes
  o Textbook pg 244