

School of Engineering

Project Management & Engineering Practice
(GENG 5505)

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Project Management & Engineering Practice (GENG5505)

An introduction to sustainability applied to projects & project
management

Project management: An adaptable body of knowledge
(Ch 1)continued

(Week 1b) - Lecture two, 29th February 2024

Definition of project & project management adopted in this course

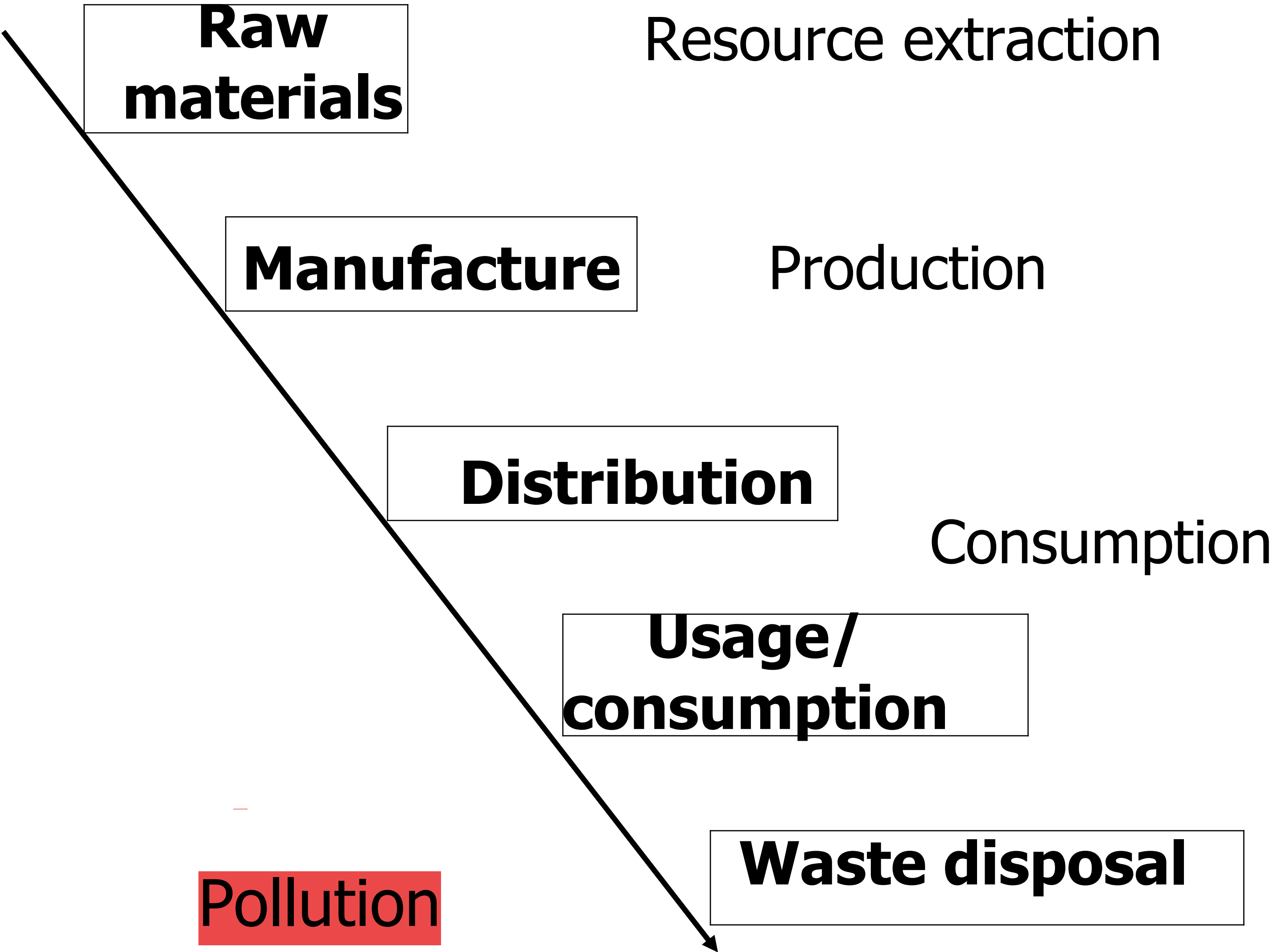
- Hartley's definitions of project & project management (see lecture1 slides 8-9), combined with best project & project management practices & standards consistent with lifecycle thinking & TBL

consistent is

Resource/product Life Cycle Thinking – ‘Cradle to Grave’

(Mont et al, 2007)

this is product
life cycle not
project



Life cycle thinking vs Design: How?

(Van Nes et al, 2005)

► Extend product life cycle through appropriate design to enhance product:

1. Reliability & robustness

2. Reparability

3. Upgradability

4. Variability

5. Attachment

► Should not be technologically complex

► Compatible with existing beliefs

► Highly visible & communicable

► Offer recognisable advantages

But, new sources of advantage through new markets & opportunities (marketing) are needed

Product design importance: Why?

- 70% of total product costs can be saved during design stage;
- Design decisions have significant impact on quantity of resource used & of waste produced during life-cycle;
- Major source of innovation & potential competitive advantage;
- Pressure to adhere from multiple sources (i.e. Governments, lobby groups, etc.).

Other potential benefits of Life Cycle Thinking

- Savings in labour, resources & energy
- Positive image = also potential competitive advantage (consider increased consumer consciousness & power)
- Intellectual property (IP) & long term returns
- In line with (TBL)

.....

* Review some of those companies' website: Do they implement sustainable practices and if so, HOW?

(Ford, Toyota, Woodside, Rio Tinto, Fuji Xerox, Shell and BP)

Lifecycle impact assessment

- ‘An impact is a positive or negative result of an effect of a product, process, and/or activity, including all the social, economic, and environmental consequences and implications’ (Raney, 2006).

Negative impacts can affect:

- The ecosystem and natural resources;
- Human health
- Safety
- Quality of life
- Economics, and
- Society as a whole

Example of: Impact identification for an automobile Adapted from Raney, 2006

Stage 1: Raw material extraction

Processes	Impact
➤ Metal Ore	- Energy use; habitat loss, erosion, etc.
➤ Petroleum	- Spills, liquid waste, foot print, etc.
➤ ...	

Stage 1: Raw material refining

Processes	Impact
➤ Metal	- Safety, CO2, energy use, etc.
➤ Chemical	- Liquid waste, emissions, accidents, etc.
➤ ...	

Stage 2: Materials fabrication

Processes	Impact
➤ Steel	- Emissions, energy, etc.
➤ Aluminum	- CO2, electricity, etc.
➤ Plastics	- Emissions, scrap, etc.
➤ ...	

Stage 2: Parts fabrication

Processes	Impact
➤ Cutting	- Fluids, supplies, etc.
➤ Stamping	- Energy, safety, etc.
➤ Machining	- Fluids, energy, etc.
➤ Cleaning	- Waste water, residues, etc.
➤ ...	

Example of: Impact identification for an automobile continues....

Adapted from Raney, 2006

Stage 3: Production Processes

Impact

- Engines - Energy, accidents, etc.
- Transmission - Energy, accidents, etc.
- Wiring - Copper, insulation, etc.
- ...

Stage 3: Assembly Processes

Impact

- Welding - Fumes, electrodes, etc.
- Painting - Wash water, solid waste, etc.
- Adhesives - Fumes, solid waste, etc.
- Carpeting - Off gassing, solid waste, etc.
- ...

Stage 4: Use & reuse Processes

Impact

- Drive/Use - Safety, energy, emissions, etc.
- Repair - Solid waste, emissions, etc.
- Reuse - Upgrade, refurbish, etc.
- ...

Stage 5: Retirement, recycling & disposal Processes

Impact

- Dismantle - Fluids, used parts, etc.
- Recycling - Energy, logistics, etc.
- Disposal - Treatment, solid waste, etc.
- ...

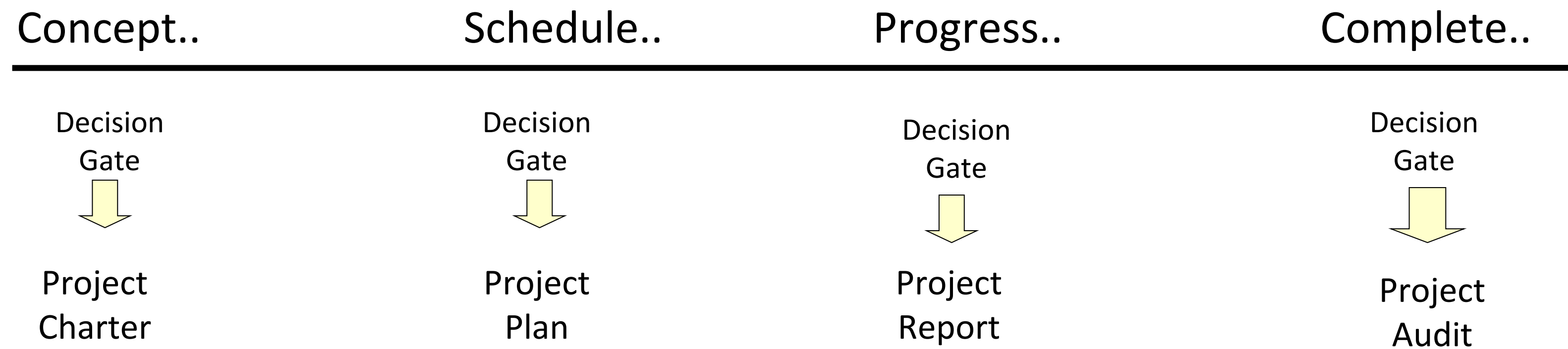
Popular characteristics of projects

- ▶ Unique...
- ▶ Timeframe (S/F)...
- ▶ Stakeholders including client/sponsor...
- ▶ Sequence and deliverables...
- ▶ Team effort...
- ▶ Quality...
- ▶ Schedule...
- ▶ Budget...
- ▶ Complexity...
- ▶ Risk...
- ▶ Contracts

Project Management Lifecycle

<p>Concept stage - (also referred to as initiation, feasibility or stage 1)</p>	<p>Idea stage where the project is conceived. Discussion of preliminary goals, deliverables & strategic vision alignment, problems raised, impact assessment in terms of TBL and life cycle, potential benefits identifies, alternative approaches researched & provisional costing determined</p>
<p>Planning stage - (also referred to as schedule, preparation or stage 2)</p>	<p>Following the decision to proceed in stage 1, al work required is planned & scheduled. Objectives are finalized, resources are assigned, quality is signed off on (include TBL and life cycle guidelines & standards), final costs are approved, the timing agreed & all others administrative matters are determined</p>
<p>Execution stage, including monitoring & controlling - (or implementation, control or stage 3)</p>	<p>The project has commenced during this stage & the emphasis is moved to tracking actual progress using the schedules developed in stage 2 as the comparison point of reference. All work (including TBL & Life Cycle thinking) is monitored, controlled & corrected where necessary with schedules being reviewed, revised & updated as required</p>
<p>Finalization (and evaluation) stage - (or completion, termination, handover, or stage 4)</p>	<p>The project has been completed & the deliverable handed over to the client. Resources are disposed of or reassigned, the project is evaluated, reports are written, & presented & the administration arm of the project is closed</p>

Project management lifecycle...continues



Key project management lifecycle benefits

- Communicates graphical framework of the total project
- Details responsibility
- Prescribes manageable portions
- Identifies control gates
- Flags key decisions
- Nominates milestones & deliverables
- ...

Benefits of successful project management

- Improved accountability
 - Responsibility, visibility & authority assigned
- Improved scope definition *costly if we turn back adjust the scope*
 - Clear to project & stakeholders
- Improved efficiency & effectiveness
 - Effective planning & use of resources, systems & processes
- Improved performance management
 - Measuring achievements against plan
- Improved consistency
 - Use of common terminologies
- Improved transparency of process
 - No surprises
- Improved client/stakeholders satisfaction
 - Deliverables achieve project objectives
-

remember it

Mapping project management competencies

	Concept	Planning	Execution	Finalization/Evaluation
1. Stakeholder	Stakeholder involvement / engagement	Stakeholder involvement / engagement	Stakeholder involvement / engagement	Project finalization report
2. Scope	Scope identification	Scope refinement	Project change control	Project finalization report
3. Time	Provisional forecasts	Schedule development	Schedule control & reporting	Project finalization report
4. Cost	Provisional forecasts	Budget development	Cost control & reporting	Project finalization report
5. Quality	Quality planning	Quality planning & assurance	Quality assurance, control & improvement	Project finalization report
6. HR	Capability determined	Resource assigned	Performance monitored	Reassignment & Project finalization report
7. Procurement & contracts	Procurement planning	Procurement & solicitation planning	Solicitation, source selection, contract administration	Contract close-out Project finalization report
8. Risk	Identification	Identification, assessment, analysis	Management	Evaluation & Project finalization report
9. Communication	Stakeholder identification	Strategy development	Project performance reports	Project finalization report
10. Integration	Strategic alignment	Project plan	Performance report	Project finalization report

remember it

Project life cycle **inputs**

Concept inputs	Planning inputs	Execution inputs	Finalization inputs
<ul style="list-style-type: none">➤ Project selection➤ Problem/opportunity trigger➤ Alternative solutions discussed➤ Consistent with organizational goals➤ Project benefits identified➤ Critical success factors identified➤ Risks identified/Impact assessment➤ Expectations agreed➤ Sponsors located➤ Stakeholders confirmed➤ Explicit decision made to proceed to next stage (resources & time commitment)	<ul style="list-style-type: none">➤ Project variables reviewed & redefined➤ Break down project into activities➤ Schedule developed, revised & base lined➤ Estimate contingency factors➤ Critical path identified➤ Source & assign resources➤ Quality measures in place➤ Procurement specifications finalised➤ Contracts formulated➤ Control measures identified➤ Explicit decision to proceed to next stage (resources & time commitment)	<ul style="list-style-type: none">➤ Ongoing progress review & control➤ Progress status & forecast reports➤ Manage change requests➤ Manage contracts➤ Deal with team issues➤ Corrective &/or reinforcement action➤ Manage escalation issues➤ Manage meetings➤ Control & report progress➤ Explicit decision made to commit more time, resources & money in proceeding to next stage	<ul style="list-style-type: none">➤ Document client acceptance➤ Document project outcome➤ Conduct project evaluation & audit➤ Contract closeout➤ Team & stakeholders debrief➤ Communicate lesson learnt➤ Resources reassigned➤ Retentions certificates & warranties➤ Archiving & recording➤ Celebrate team's success➤ Decision to close out

remember it

Project life cycle outputs

Concept outputs	Planning outputs	Execution outputs	Finalization outputs
<ul style="list-style-type: none">➤ Client brief➤ Business case➤ Feasibility study➤ Risk assessment➤ Scope documentation➤ Stakeholder analysis➤ Budget forecasts➤ Procedures & policies➤ Meeting minutes <p>Approvals</p>	<ul style="list-style-type: none">➤ Stage, task & milestone detail – including duration, sequencing & resources➤ Revised timelines (PERT/Gantt)➤ Revised cash flows & budgets➤ Resource matrix➤ Baseline project schedule <p>Approvals</p>	<ul style="list-style-type: none">➤ Performance standards➤ Inspection & monitoring /testing plan➤ Purchase orders➤ Performance reports➤ Change of scope request➤ Progress claims➤ Corrective action➤ Contracts➤ Revised schedules <p>Approvals</p>	<ul style="list-style-type: none">➤ Handover➤ Acceptance testing➤ Project audit➤ Completion checklist➤ Feedback & evaluation <p>Approvals</p>

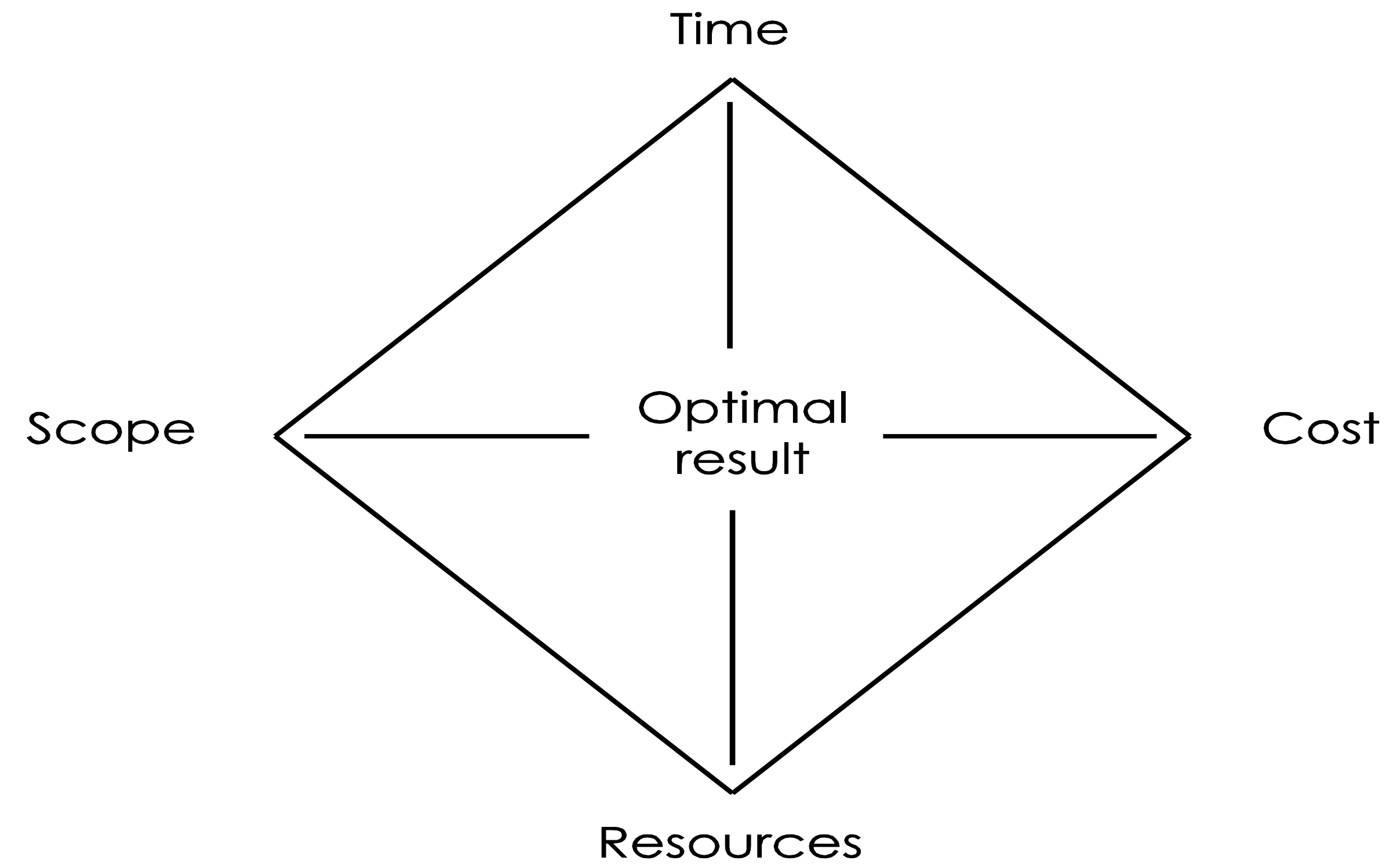
Critical thinking exercise

Review the previous 2 slides – “project life cycle inputs” and “project life cycle outputs” - reflect on HOW the implementation of a TBL approach could add more value to a new project and to its management life cycle

Identifying the project variables/constraints

- **Time**: Provisional timeframe including start, finish & deadline dates
- **Cost**: Provisional budget & associated funding requirement & approvals
- **Scope**: Unambiguous & specific - i.e. deliverables, performance, quality standards, TBL ...). Initial description of output as to enable measurement
- **Resources**: Nominated assignment & commitment of people, materials, equipment, & finance (Unambiguous quality specifications & performance standards to be identified & agreed upon among stakeholders).
- **TBL and life cycle thinking steps**

Consider the potential relationships between these variables with respect to optimizing the project output



Common project failure causes

- ▶ Delivered **over budget** (perhaps even under budget);
- ▶ Delivered **over time** (& again, perhaps under time could be perceived by some as failure);
- ▶ **Client refusal** to accept delivery;
- ▶ Lack of end-user involvement;
- ▶ Not supported by key stakeholders;
- ▶ Poorly understood scope (requirement, specification, etc.);
- ▶ Too many scope variations (changes);
- ▶ Inability to identify, prioritise & manage organisational wide projects (project overload);
- ▶ Poorly lead & managed;
- ▶ Lack of executive management mandate;
- ▶ Lack of senior management support;
- ▶ Lack of project management maturity;
- ▶ Lack of coordinated approach;
- ▶ Lack of formal methodology (process or framework);
- ▶ Lack of sufficient time, funding & skilled resources;
- ▶ Inability to measure, report an adjust performance;
- ▶ Lack of communicated, visible & demonstrated authority.

Common project failure causes continues...

- Functional conflicts between operational & project priorities;
- Lack of honest, transparent accountability;
- Resistance to modify (update, downgrade, delete) original estimates;
- Over-reliance and poor management of external parties;
- Lack of momentum (commitment, energy, enthusiasm...);
- Reliance on reactive & remedial corrective action;
- Un-authorized scope changes (variations)
- Lack of authority to actually stop the project;
- Lack of commitment to the project plan (or worse, a lack of an actual plan);
- No contingency plans in place;
- Lack of organisational capacity (processes, policies etc.);
- Poor management skills (misguided, misinformed & missing in action);
- Poorly defined & communicated roles & responsibilities;
- Not in line with sustainable approaches (i.e. TBL and life cycle thinking)
- ...

Indicators of project success

- All projects are aligned strategically to business operations & organizational vision;
- On time, on budget, on quality specification;
- Demonstrated visibility, authority & accountability (leaders, managers, project managers and project team);
- Client/stakeholders satisfaction;
- Transparent approvals & decision making;
- Skills inventory of all qualified project management personnel;
- Endorsed, communicated & consistently applied methodology;
- Acceptance of the iterative nature of projects (particularly estimates);
- Continued development & refinement of organisational maturity;
- Appropriate and timely review gates;
- 'Real time' performance measurement & reporting systems;
- Evidence of both activity & achievement;
- User friendly project management software (and the pre-requisite training);
- Long-term sustainability (in line with TBL and life cycle thinking);
- ...

Readings week 1

- Labuschagne C. and Brent A, 2005, Sustainable project life cycle management: The need to integrate life cycles in the manufacturing sector, *International Journal of Project Management*, pp 159 – 168
- Van Nes N. and Cramer J., 2005, Influencing product lifetime through product design, Business strategy and the Environment, *Business Strategy*, pp 286 -299
- Mont O. and Bleischwitz R., 2007, Sustainable consumption and resources management in the light of life cycle thinking, *European Environment*, pp 59 – 76
- Garrett P.& Rønde K., 2013, Life cycle assessment of wind power: comprehensive results from a state-of-the-art approach, *International Journal of Life Cycle Assessment*, 18:37-48