BAIT3153 Software and Project Management (SPM)

Project Management Concepts

Chapter 1

Table of Contents

1.1 Introduction to Project Management

- What is a Project?
- Characteristics of Projects
- What is Management?
- Software vs Other Types of Projects
- Triple Constraints in Projects

What is a Project?

1.1 Introduction to Project Management

- "A specific plan or design"
- "A planned undertaking"
- "A large undertaking"

Characteristics of Projects

1.1 Introduction to Project Management

- Non-routine

- Planning is required

- Specific objectives to be met

- Pre-determined time span

- Work is carried out for someone, i.e. clients

- Involves several specialisms

- Involves several phases

- Resources constraints is common

What is Management?

1.1 Introduction to Project Management

- **Planning** - deciding what to be done (Project Initiation Document [PID] needs to be created)

- **Organising** - making arrangement

- **Staffing** - select personnel

- **Directing** - give instructions

- **Monitoring** - check on progress

- **Controlling** - remedy hold-ups

- **Innovating** - coming up with new solutions

Software vs Other Types of Projects

1.1 Introduction to Project Management

- **Invisibility** – with software, progress is not immediately visible compared to building a bridge

- **Conformity** – software developers have to conform to the requirements of human clients instead of physical laws

- **Complexity** – per dollar, software products contain more complexity than other engineered artefacts

- **Flexibility** – since software can be changed, it can be a strength but also poses challenges
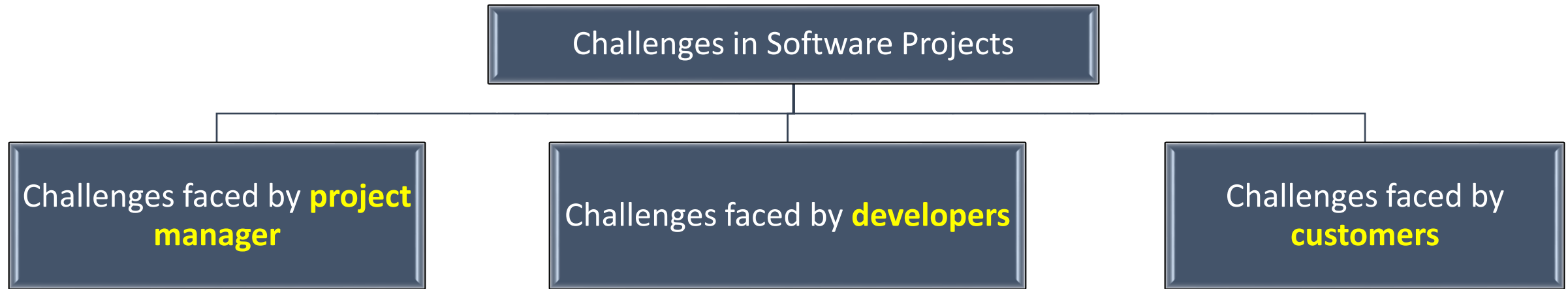
Triple Constraints in Projects

1.1 Introduction to Project Management

- Project managers need to face 3 major constraints (triple constraints):
  - **Schedule (Time)**
  - **Budget (Cost)**
  - **Quality**

- Project managers' mantra:

  To develop the system on time, within budget and to the required quality

Challenges in Software Projects

Challenges faced by **project manager**

- Poor estimates and plans
- Lack of quality standards and measures
- Lack of guidance about making organisational decisions
- Lack of techniques to make progress visible
- Poor role definition – who does what?
- Incorrect success criteria

Challenges faced by **developers**

- Inadequate specification of work
- Management ignorance of IT
- Lack of knowledge of application area
- Lack of standards
- Lack of up-to-date documentations
- Preceding activities not completed on time
- Narrow scope of technical expertise
- Changing user requirement
- Deadline pressure
- Lack of training
- Lack of communication

Challenges faced by **customers**

- The software project is behind schedule
- The developed software is non-functional or does not fulfil the present needs of the organization
- The cost of the project has exceeded its allotted budget

9

1.2 Project Life Cycle

- Generic Project Process Model
- Project Life Cycle Processes
- RFP and Proposals

Generic Project Process Model

1.2 Project Life Cycle

The project life cycle typically consists of 4 stages:
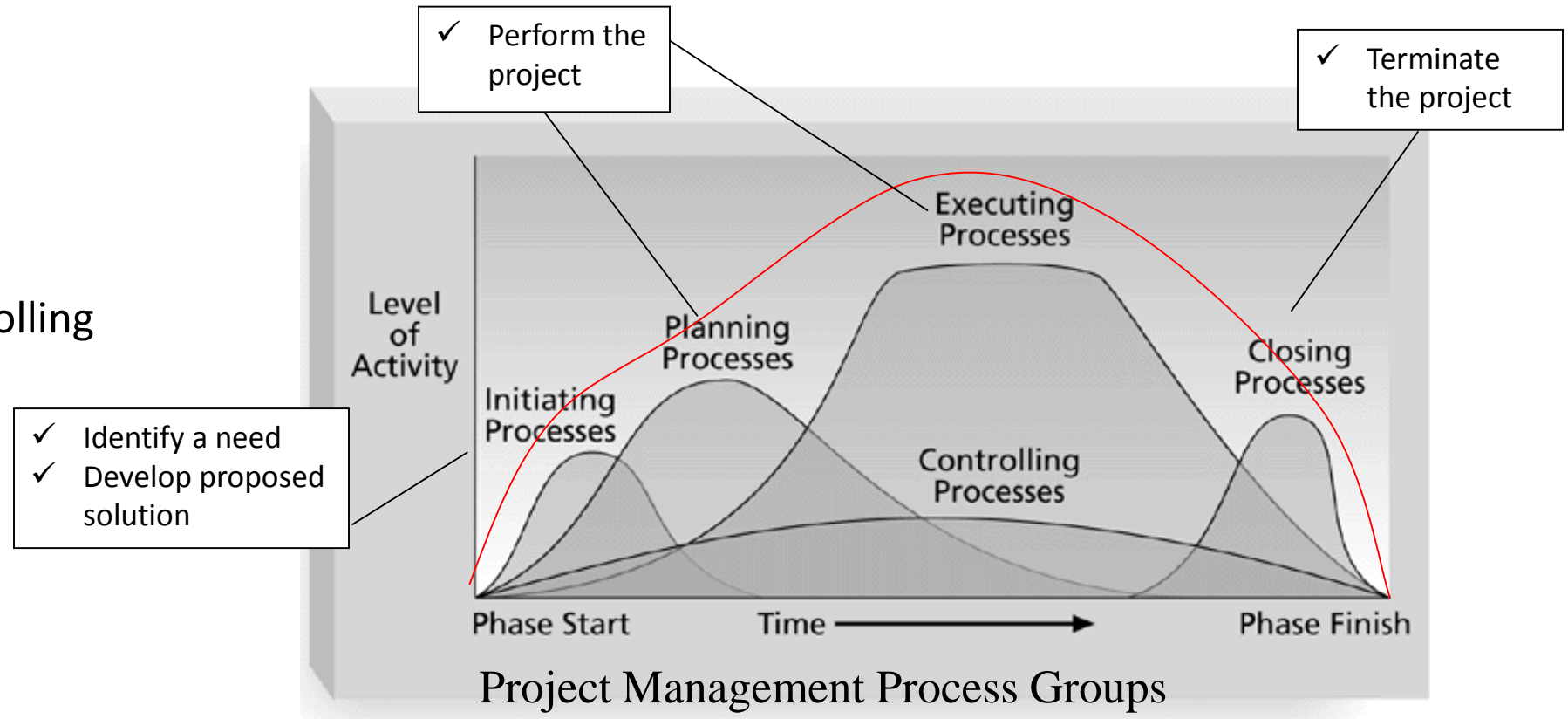
- Identify a need
- Develop proposed solution
- Perform the project
- Terminate the project

Effort

Identify a Need

Develop proposed solution

Perform the project

Terminate the project

RFP *Proposal* *SDLC*

Time
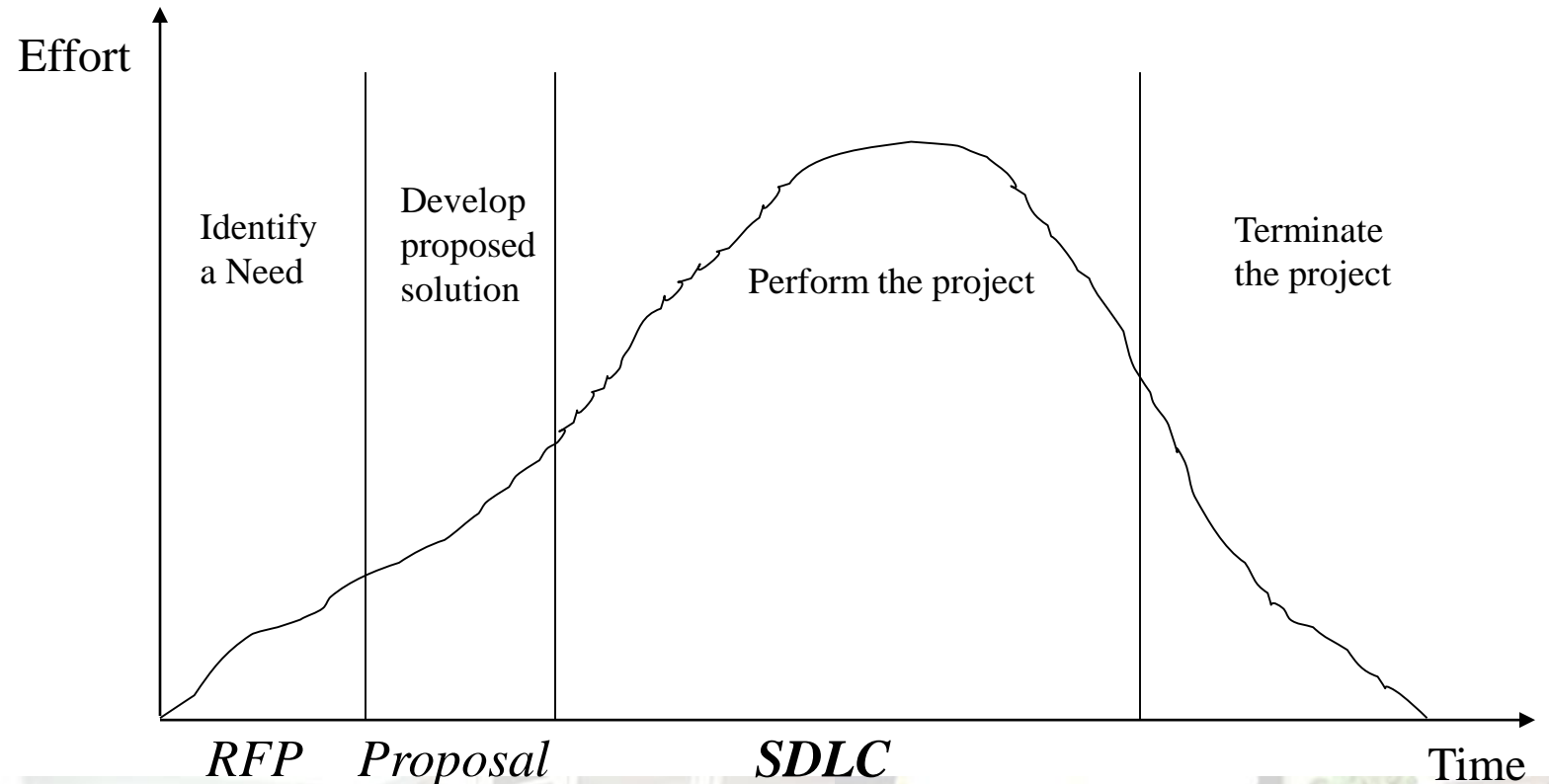
Project Life Cycle Processes

1.2 Project Life Cycle

(a) Initiating Processes

(b) Planning Processes

(c) Executing Processes

(d) Monitoring & Controlling Processes

(e) Closing Processes

- ✓ Perform the project
- ✓ Terminate the project
- ✓ Identify a need
- ✓ Develop proposed solution

Level of Activity

Initiating Processes

Planning Processes

Executing Processes

Controlling Processes

Closing Processes

Phase Start — Time — Phase Finish

Project Management Process Groups

Note: Project planning is iterative and must be continually reviewed.

12

(a) Initiating

Project Life Cycle Processes

- A kick-off meeting is held to establish the customer requirements, goals, needs, and expected benefits.

- followed by one or two more meetings to further define and streamline the project requirements.

- Output: Project Charter

  Note: a project charter is a formal project authorization which documents the shared understanding of a project's scope, development and objectives, while also defining the roles and responsibilities of each party involved. (https://thedigitalprojectmanager.com/project-charter/)

(b) Planning

Project Life Cycle Processes

- Once the requirements are in place, the Project Management Plan (PMP) is created and kept up-to-date as the project progresses.

- PMP contains sufficient details to monitor and exercise control over the project execution e.g. milestones, schedules, project team members, and all other project related data.

- In maintenance projects, the detailed schedule is dynamically updated as and when maintenance requests are received and delivered.

14
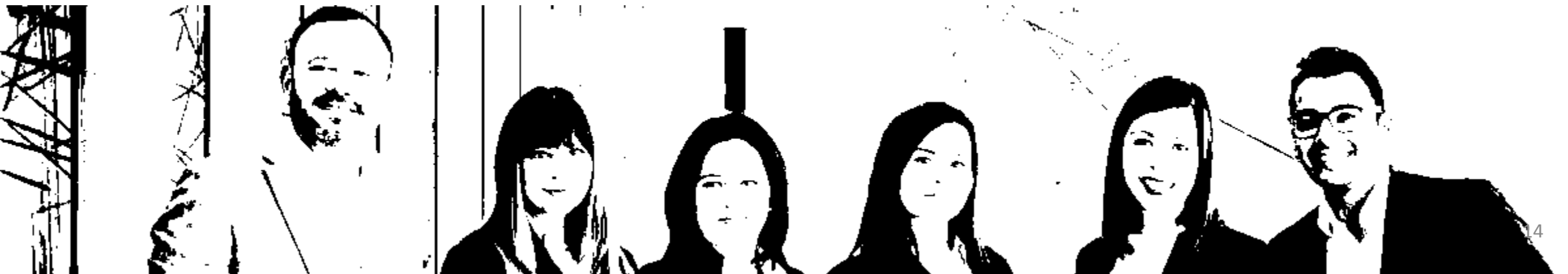
(c) Executing

Project Life Cycle Processes

- Once the plan is in place, the project execution begins.

- The Project Manager evaluates adherence to the project planning process and the work products and services of the process to the applicable requirements, objectives, and standards, and addresses noncompliance.

- By ensuring adherence to the plan, information will be available to accurately identify issues and problems in their early stages and minimize risks.

- Output: work results

(d) Monitoring & Controlling

Project Life Cycle Processes

- During the project execution, the Project Manager monitors the progress against the plan to identify issues in a timely manner.
- For this, the Project Manager gathers the information needed, analyzes it and identifies deviations that are significant.
- Corrective actions are identified for all issues and tracked to closure. This may include re-planning and establishing new agreements.
- Output: overall health of project

(e) Closing

- When the project is completed the Project Manager gathers the project related data and documents.

- The Project Manager prepares a Project Closure Report and hands over the project-related work products, documents, records, and the Project Closure Report to the Quality Assurance Specialist.

Request for Proposal & Proposals

1.2 Project Life Cycle

- Request for Proposal (RFP) is a procurement document used to request proposals from prospective vendors of products or services.
- If you were a customer, how would you evaluate the proposals received from software houses?
- Criteria for evaluation may include:
  - Approach towards project
  - Experience of the software house
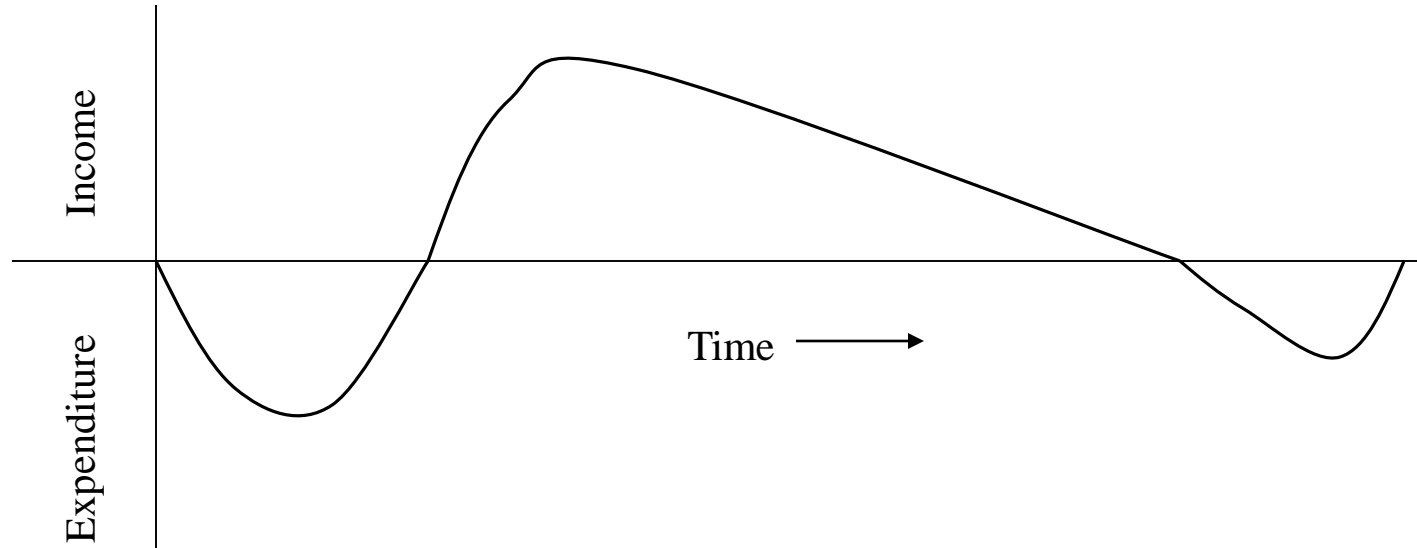 - Price
  - Schedule
  - Etc.

1.3 Project Appraisal and Evaluation

- Introduction
- Cost & Benefit Analysis
- Net Profit
- Payback Period
- Return on Investment (ROI)
- Net Present Value (NPV)

Introduction

Typical PLC cash flow

- Products generate negative cash flow during development
- Positive cash flow during operating life
- Decommissioning cost at the end of product's life

Cost & Benefit Analysis

- A comparative assessment of all the benefits you anticipate from the project and all the costs required to introduce the project, perform it and support the changes resulting from it.

- Helps you to
  - o Decide whether to undertake a project or decide which of several projects to undertake.
  - o Frame appropriate project objectives.
  - o Develop appropriate before and after measures of project success.
  - o Prepare estimates of the resources required to perform the project work.

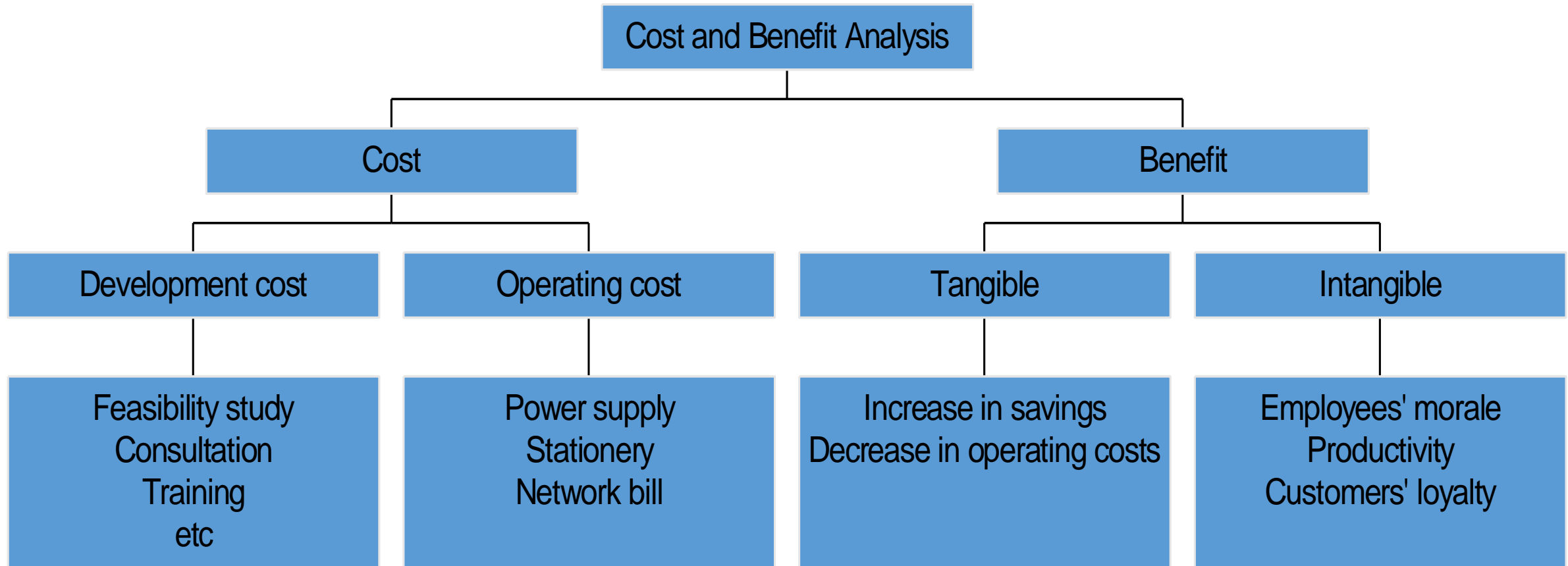# Project Benefits

- Anticipated benefits may be expressed in monetary equivalents (e.g., reduced operating costs or increased revenue)

- For benefits that may not be expressed in monetary terms, consider associated benefits. E.g., if your project is to improve staff morale, associated benefits may include reduced turnover, increased productivity, fewer absences and fewer formal grievances.

Cost & Benefit Analysis - Examples

```
                        Cost and Benefit Analysis
                                    |
              ┌─────────────────────┴─────────────────────┐
            Cost                                        Benefit
              |                                            |
      ┌───────┴───────┐                          ┌─────────┴─────────┐
Development cost  Operating cost              Tangible          Intangible
      |                │                          |                  |
Feasibility study  Power supply          Increase in savings   Employees' morale
Consultation       Stationery            Decrease in           Productivity
Training           Network bill          operating costs       Customers' loyalty
etc
```

Net Profit

1.3 Project Appraisal and Evaluation

- Net profit is the difference between the total costs and the total income over the life of the project.

Year	Project 1	Project 2	Project 3	Project 4
0	-100,000	-1,000,000	-100,000	-120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000
Net Profit	**50,000**	**100,000**	**50,000**	**75,000**

Table 1.1 Four project cash flow projections – figures are end of year totals (RM)

Net Profit

1.3 Project Appraisal and Evaluation

- Advantages
  - Simple and intuitive.

- Disadvantages
  - Do not consider risk
    - E.g. although Project 2 returns greatest net profit but inherent risks are not identified.
  - Do not consider the timing of the cash flows.
    - E.g. Project 1 & 3 has equal net profit but are both projects equally preferable?
      - o Project 1 has bulk of income occurs late in the life of project. However, having to wait for a return has disadvantage that the investment must be funded for longer.
      - o Project 3 returns a steady income throughout its life.
      - o Thus, both projects are not equally preferable.

Payback Period

1.3 Project Appraisal and Evaluation

- The time taken to **break even or pay back** the initial investment.

- Normally project with the **shortest payback** period will be chosen on the basis that an organization will wish to minimize the time that a project is 'in debt'.

- Subtract each individual annual cash inflow from the initial cash outflow, until the payback period has been achieved.

Payback Period

1.3 Project Appraisal and Evaluation

Year	Project 1	Project 2	Project 3	Project 4
0	-100,000	-1,000,000	-100,000	-120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	**30,000**	30,000
5	**100,000**	**300,000**	30,000	**75,000**
Net Profit	50,000	100,000	50,000	75,000

Table 1.2 Four project cash flow projections – figures are end of year totals (RM)

- Considering the payback periods, Project 3 has the shortest payback period.
- However, Project 2 and Project 4 are more profitable than Project 3.

27

Payback Period

1.3 Project Appraisal and Evaluation

Advantages:

- Simple to calculate
- Not particularly sensitive to small forecasting errors.

Disadvantages:

- Ignores the overall profitability of the project – in fact, totally ignores any income (or expenditure) once the project has broken even.
- E.g. the payback period for Project 3 is after year 3 compared to Project 2 (year 5), Project 4 (year 4). However, Project 2 and Project 4 are more profitable than Project 3.

Return on Investment (ROI)

1.3 Project Appraisal and Evaluation

- Also known as the Accounting Rate of Return (ARR)
- Provides a way of comparing the net profitability to the investment required.
- Formula:

$$\text{ROI} = \frac{\text{average annual profit}}{\text{total investment}} \times 100$$

Return on Investment (ROI)

1.3 Project Appraisal and Evaluation

Year	Project 1	Project 2	Project 3	Project 4
0	-100,000	-1,000,000	-100,000	-120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000
Net Profit	50,000	100,000	50,000	75,000
ROI	?	?	?	?

Table 1.3 Four project cash flow projections – figures are end of year totals (RM)

ROI calculation:

Project 1

ROI = $\frac{50,000}{100,000}$ x 100 = 10%

Project 2

ROI = $\frac{100,000}{1,000,000}$ x 100 = 2%

Return on Investment (ROI)

1.3 Project Appraisal and Evaluation

Year	Project 1	Project 2	Project 3	Project 4
0	-100,000	-1,000,000	-100,000	-120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000
Net Profit	50,000	100,000	50,000	75,000
ROI	**10%**	**2%**	**10%**	**12.5%**

Table 1.3 Four project cash flow projections – figures are end of year totals (RM)

Which is the most worthwhile?

Return on Investment (ROI)

1.3 Project Appraisal and Evaluation

Advantages:

- Simple and easy to calculate measure of return on capital
- Considers the timing by averaging the net profit over the number of years.

Disadvantages:

- Takes no account of the timing of the cash flows.
- This rate of return bears no relationship to the interest rates offered or charged by banks (or any other normal interest rate) since it takes no account of the timing of the cash flows or of the compounding of interest.

Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

- Net present value (NPV) is method used to determine the current value of all future cash flows generated by a project, including the initial capital investment.

- Takes into account the profitability of a project and timing of the cash flows that are produced.

- View:
  - Receiving RM100 today is better than having to wait until next year to receive it.
  - Invest the RM100 in a bank today and have RM100 + interest in a year's time
  - So the present value of RM100 in a year's time is RM91
    - Discount rate = 10%

Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

$$\textbf{Present Value} \ = \ \frac{\textbf{Value in year t}}{\textbf{(1 + r)}^{\textbf{t}}}$$

where
- **r** is the discount rate (expressed as a decimal value)
- **t** is the number of years into the future that the cash flow occurs

- The present value of a cash flow may be calculated by multiplying the cash flow by discount factor.
- Difficulty:
  - Which appropriate discount rate to be used?
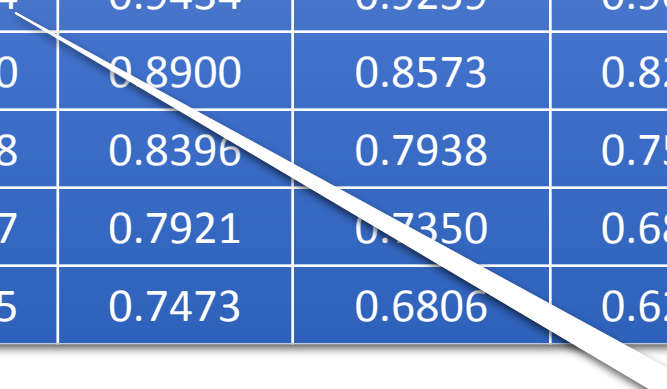
Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

Discount Factor = $1/(1+r)^t$

Year	Discount Rate (%)					
	5	6	8	10	12	15
1	0.9524	0.9434	0.9259	0.9091	0.8929	0.8696
2	0.9070	0.8900	0.8573	0.8264	0.7972	0.7561
3	0.8638	0.8396	0.7938	0.7513	0.7118	0.6575
4	0.8227	0.7921	0.7350	0.6830	0.6355	0.5718
5	0.7835	0.7473	0.6806	0.6209	0.5674	0.4972

$1/(1+0.05)^1$

Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

Year	Project 1 Cash Flow (RM)	Discount Factor @ 10%	Discounted Cash Flow
0	-100,000	1.0000	-100,000
1	10,000	0.9091	9,091
2	10,000	0.8264	8,264
3	10,000	0.7513	7,513
4	20,000	0.6830	13,660
5	100,000	0.6209	62,090
Net Profit	RM50,000		**NPV: RM618**

Applying the discount factors to project

Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

Exercise
1. Using a 10% discount rate, calculate the NPV for Project 3.
2. Based on the NPVs, decide whether Project 1 or Project 2 is more beneficial to pursue.

Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

Year	Project 3 Cash Flow (RM)	Discount Factor @ 10%	Discounted Cash Flow
0	-100,000	1.0000	-100,000
1	30,000	0.9091	27,273
2	30,000	0.8264	24,792
3	30,000	0.7513	22,539
4	30,000	0.6830	20,490
5	30,000	0.6209	18,627
Net Profit	50,000		**NPV: RM13,721**

Applying the discount factors to project

Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

- The discount rate can be thought of as a target rate of return.

- If, for example, we set a target rate of return of 15% we would reject any project that did not display a positive NPV using a 15% discount rate.

Weighted Scoring Model

1.3 Project Appraisal and Evaluation

- Provides an organized process for selecting projects based on many criterions.
- Weights are assigned to each criterion based on importance.
- NPV, ROI can become one of criterions.

Criteria	Weight (%)	Project 1	Project 2	Project 3
Support business objectives	10%	80	90	50
Availability of resources	10%	70	70	50
Strong sponsor & customer support	10%	70	90	50
Low risk	5%	50	50	50
High probability of success	15%	90	90	50
NPV	50%	80	90	50
Weighted Project Scores	100%	78	86	50

Weighted Project Scores for Project 2: (10% * 90) + (10% * 70) + (10% * 90) + (5% * 50) + (15% * 90) + (50% * 90) = **86.**

40

Net Present Value (NPV)

1.3 Project Appraisal and Evaluation

Year	Project 2 Cash Flow (RM)	Discount Factor @ 10%	Discounted Cash Flow
0	-1,000,000	1.0000	-1,000,000
1	200,000	0.9091	181,820
2	200,000	0.8264	165,280
3	200,000	0.7513	150,260
4	200,000	0.6830	136,600
5	300,000	0.6209	186,270
Net Profit	100,000		NPV: **-179,770**

Applying the discount factors to project

ROI, Payback Period, NPV

1.3 Project Appraisal and Evaluation

Discount rate	8%					
Assume the project is completed in Year 0			Year			
	0	1	2	3	Total	
Costs	140,000	40,000	40,000	40,000		
Discount factor	1	0.93	0.86	0.79		
Discounted costs	**140,000**	**37,200**	**34,400**	**31,600**	**243,200**	
Benefits	0	200,000	200,000	200,000		
Discount factor	1	0.93	0.86	0.79		
Discounted benefits	**0**	**186,000**	**172,000**	**158,000**	**516,000**	
Discounted benefits - costs	(140,000)	148,800	137,600	126,400	**272,800**	←NPV
Cumulative benefits - costs	(140,000)	8,800	146,400	272,800		
		↑				
ROI ⟶	112%					
	Payback In Year 1					

Exercise: Using a discount rate of 9%, calculate the NPV and ROI for Project B.

Project B	Year 0	Year 1	Year 2	Year 3	Total
Costs	100,000	60,000	60,000	50,000	
Discount Factor					
Discounted Costs	100,000				
Benefits	0	80,000	90,000	180,000	
Discount Factor					
Discounted Benefits	0				
Discounted benefits – costs	(100,000)				
Cumulative benefits - costs	(100,000)				
ROI					

43

Discount Rate: 9%					
Project B	Year 0	Year 1	Year 2	Year 3	Total
Costs	100,000	60,000	60,000	50,000	
Discount Factor	1	0.9174	0.8417	0.7722	
Discounted Costs	100,000	55,044	50,502	38,610	244,156
Benefits	0	80,000	90,000	180,000	
Discount Factor	1	0.9174	0.8417	0.7722	
Discounted Benefits	0	73,392	75,753	138,996	288,141
Discounted benefits – costs	(100,000)	18,348	25,251	100,386	**43,985 →NPV**
Cumulative benefits - costs	(100,000)	(81,652)	(56,401)	43,985	
ROI:	(43,985/244,156) X 100% = 18.02%			Payback in year 3	

1.4 Knowledge & Attributes of a Project Manager (PM)

- Knowledge of a PM
- Attributes of a PM

Knowledge of a PM

1.4 Knowledge & Attributes of a Project Manager

Ten Knowledge Areas

	Initiating	Planning	Executing	M&C	Closing
Integration	Develop Project Charter	Develop PM Plan	Direct & Manage Project Work	• M&C Project Work • Perform Integrated Change Control	Close Project or Phase
Scope		• Plan Scope Management • Collect Requirements • Define Scope • Create WBS		• Validate Scope • Control Scope	
Time		• Plan Schedule Management • Define Activities • Sequence Activities • Estimate Activity Resources • Estimate Activity Durations • Develop Schedule		Control Schedule	
Cost		• Plan Cost Management • Estimate Costs • Determine Budget		Control Costs	
Quality		Plan Quality Management	Perform Quality Assurance	Control Quality	
HR		Plan HR Management	• Acquire Project Team • Develop Project Team • Manage Project Team		
Communications		Plan Communications Management	Manage Communications	Control Communications	
Risk		• Plan Risk Management • Identify Risks • Perform Qualitative Risk Analysis • Perform Quantitative Risk Analysis • Plan Risk Responses		Control risks	
Procurement		Plan Procurement Management	Conduct Procurements	Control Procurements	Close Procurements
Stakeholder	Identify Stakeholders	Plan Stakeholder Management	Manage Stakeholder Expectation	Control Stakeholder Engagement	

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

- Includes processes involved in defining and controlling what work is or is not included in a project.

- ensures that the project team and stakeholders have the same understanding of deliverable (products) and what processes the project team will use to produce them.

- 6 main processes:
  1. Plan scope management
  2. Collect requirements
  3. Define scope
  4. Create WBS
  5. Validate scope
  6. Control scope

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan scope management | 2. Collect requirements | 3. Define scope | 4. Create WBS | 5. Validate scope | 6. Control scope |

1. Plan scope management

- Create a scope management plan that documents how the project scope will be defined, validated, and controlled.
- Key benefit: provides guidance and direction on how scope will be managed throughout the project.

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan scope management | 2. Collect requirements | 3. Define scope | 4. Create WBS | 5. Validate scope | 6. Control scope |

2. Collect Requirements

- Define and document the features and functions of the products to be produced during the project as well as the processes used for creating them.

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan scope management	2. Collect requirements	3. Define scope	4. Create WBS	5. Validate scope	6. Control scope

3. Define Scope
- Review the project charter, requirements documents, and organizational process assets to create a scope statement, adding more information as requirements are developed and change requests are approved.

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan scope management | 2. Collect requirements | 3. Define scope | 4. Create WBS | 5. Validate scope | 6. Control scope |

4. Create Work Breakdown Structure (WBS)

- Subdivide the major project deliverables into smaller, more manageable components.
- Depict as a hierarchy of activities.
- Can be organized around project products, project phase, or using the project management process groups.
- Guideline: breakdown the work until each task can be performed by one person within 8-80 hours.

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

Sample intranet project WBS organized by phase in tabular form

1.0 Concept
    1.1 Evaluate current systems
    1.2 Define requirements
        1.2.1 Define user requirements
        1.2.2 Define content requirements
        1.2.3 Define system requirements
        1.2.4 Define server owner requirements
    1.3 Define specific functionality
    1.4 Define risks and risk management approach
    1.5 Develop project plan
    1.6 Brief Web development team
2.0 Web site design
3.0 Web site development
4.0 Roll out
5.0 Support

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan scope management | 2. Collect requirements | 3. Define scope | 4. Create WBS | 5. Validate scope | 6. Control scope |

5. Validate Scope

- Formalize acceptance of the project deliverables by stakeholders, e.g. customer, sponsor for the project.
- If not acceptable, stakeholder request changes.

Project Scope Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan scope management | 2. Collect requirements | 3. Define scope | 4. Create WBS | 5. Validate scope | 6. Control scope |

6. Control Scope

- Control changes to project scope throughout the life of the project.

Project Time Management

1.4 Knowledge & Attributes of a Project Manager

- 7 main processes:
  1. Plan Schedule Management
  2. Define Activities
  3. Sequence Activities
  4. Estimate Activity Resources
  5. Estimate Activity Durations
  6. Develop Schedule
  7. Control Schedule

Project Time Management

1. Plan Schedule Management	2. Define Activities	3. Sequence Activities	4. Estimate Activity Resources	5. Estimate Activity Durations	6. Develop Schedule	7. Control Schedule

1. Plan Schedule Management

- Establish the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule.

57

Project Time Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Schedule Management	2. Define Activities	3. Sequence Activities	4. Estimate Activity Resources	5. Estimate Activity Durations	6. Develop Schedule	7. Control Schedule

2. Define Activities

- Identify the specific activities (from the WBS) that the project team members and stakeholders must perform to product the project deliverables.
- Outputs: activity list, activity attributes, and milestone list.

Project Time Management
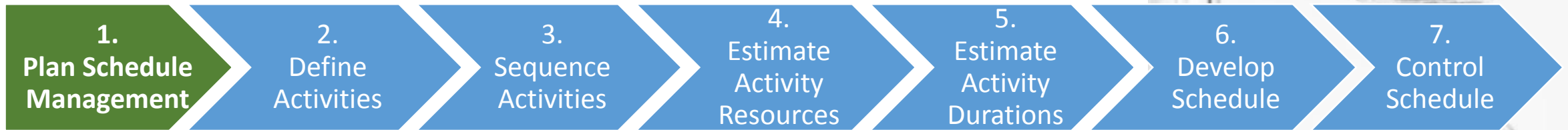
1.4 Knowledge & Attributes of a Project Manager

1. Plan Schedule Management	2. Define Activities	3. Sequence Activities	4. Estimate Activity Resources	5. Estimate Activity Durations	6. Develop Schedule	7. Control Schedule
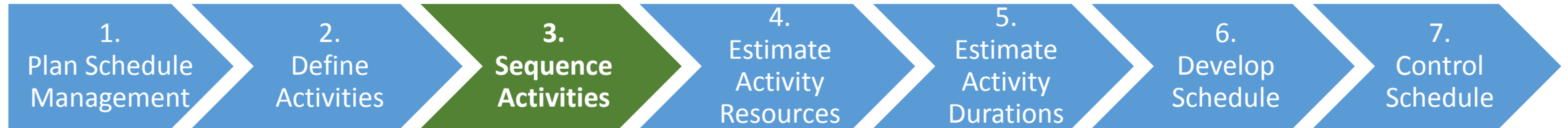
3. Sequence Activities

- Identify and document the relationships between project activities.
- Main outputs: project schedule (Gantt Chart)
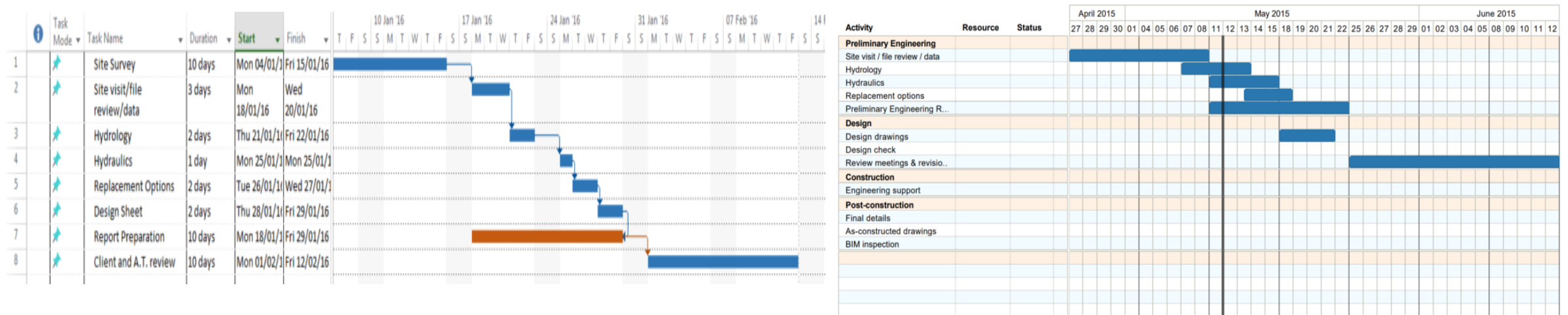
Project Time Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Schedule Management | 2. Define Activities | 3. Sequence Activities | 4. Estimate Activity Resources | 5. Estimate Activity Durations | 6. Develop Schedule | 7. Control Schedule |
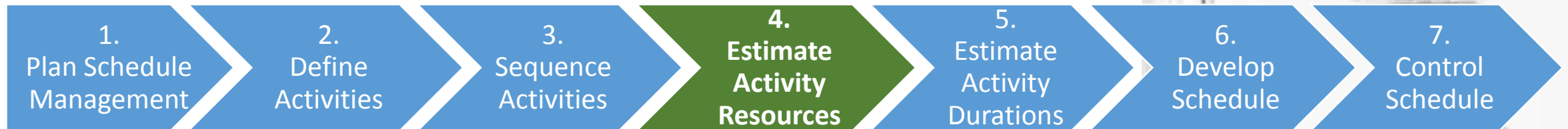
4. Estimate Activity Resources

- Estimate how much resources – people, equipment, and materials – a project team should use to perform activities.
- Outputs: activity resource requirements, resource breakdown structure

Project Time Management

1. Plan Schedule Management	2. Define Activities	3. Sequence Activities	4. Estimate Activity Resources	5. Estimate Activity Durations	6. Develop Schedule	7. Control Schedule
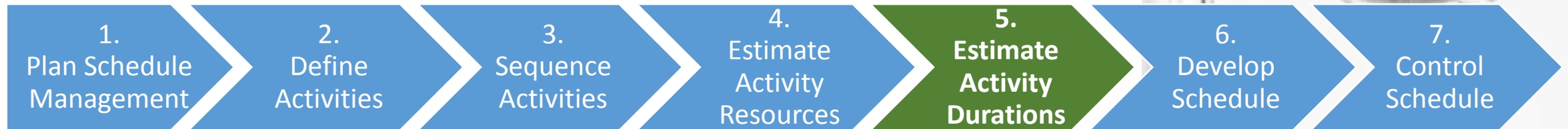
5. Estimate Activity Durations

- Estimate durations needed to complete individual activities.
- Tool and techniques: three-point estimates
- Main outputs: activity duration estimates.

Project Time Management

| 1. Plan Schedule Management | 2. Define Activities | 3. Sequence Activities | 4. Estimate Activity Resources | 5. Estimate Activity Durations | 6. Develop Schedule | 7. Control Schedule |
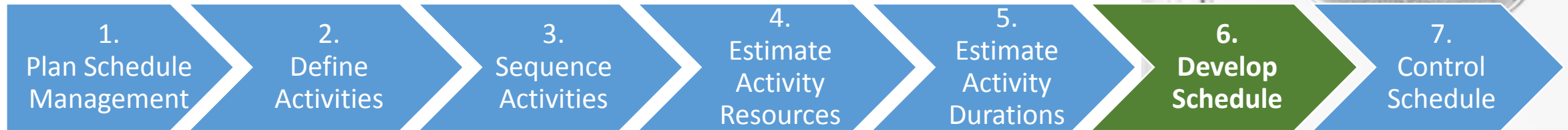
6. Develop Schedule

- Analyze activity sequences, activity resource estimates, and activity duration estimates to create the project schedule.
- Outputs: project schedule, schedule baseline, schedule data, project calendars.

Project Time Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Schedule Management | 2. Define Activities | 3. Sequence Activities | 4. Estimate Activity Resources | 5. Estimate Activity Durations | 6. Develop Schedule | 7. Control Schedule |
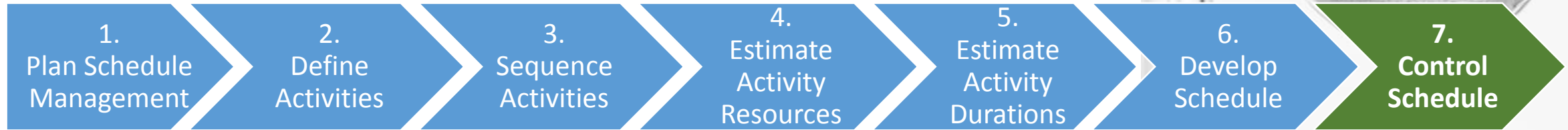
7. Control Schedule

- Control and manage changes to the project schedule.
- Tool and technique: Resource optimization techniques (resource leveling)

Project Cost Management

1.4 Knowledge & Attributes of a Project Manager

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- Includes the processes required to ensure that a project team completes a project within an approved budget.

- 4 processes:
    1. Plan Cost Management
    2. Estimate Cost
    3. Determine Budget
    4. Control Costs

Project Cost Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Cost Management	2. Estimate Cost	3. Determine Budget	4. Control Costs

1. Plan Cost Management

- Establish the policies, procedures, and documentation for planning, managing, expending, and controlling project costs.
- Outputs: cost management plan.

65

Project Cost Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Cost Management	2. **Estimate Cost**	3. Determine Budget	4. Control Costs

2. Estimate Cost

- Develop an approximation or estimation of the costs of the resources (people , equipment, materials, hardware, software) needed to complete a project.
- Outputs: activity cost estimates, basis of estimates

Project Cost Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Cost Management	2. Estimate Cost	3. Determine Budget	4. Control Costs

3. Determine Budget

- Aggregate the estimated costs of individual activities or work packages to establish an authorized cost baseline.
- Main outputs: cost baseline, project funding requirements

Project Cost Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Cost Management	2. Estimate Cost	3. Determine Budget	4. Control Costs

4. Control Costs

- Control changes to the project budget.
- Tool and Technique: Earned Value Management (EVM)
- Main outputs: work performance measurements, cost forecasts.

Project Quality Management

1.4 Knowledge & Attributes of a Project Manager

- To ensure that the project will satisfy the needs for which it was undertaken.

- 3 processes
  1. Plan Quality Management
  2. Perform Quality Assurance
  3. Control Quality
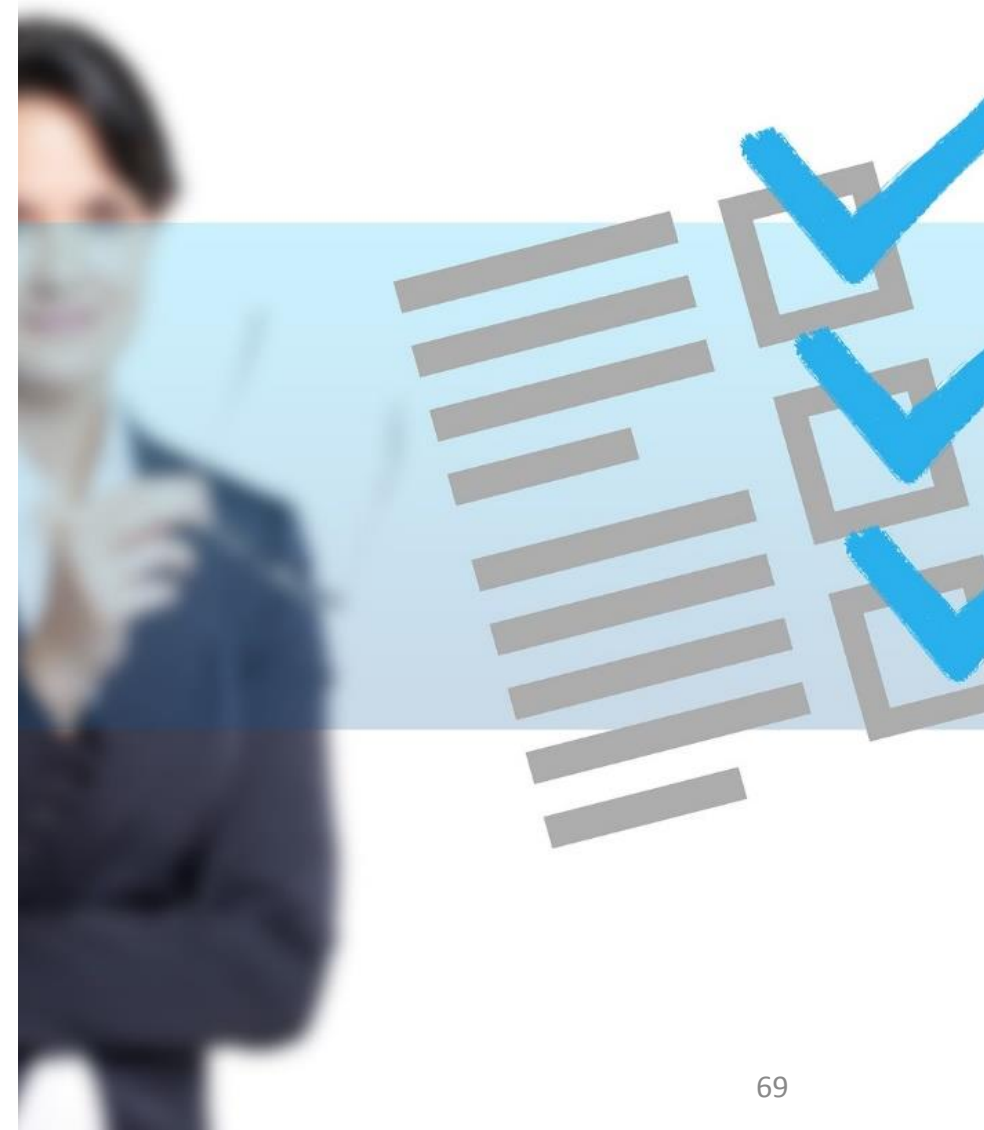
Project Quality Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Quality Management | 2. Perform Quality Assurance | 3. Control Quality |
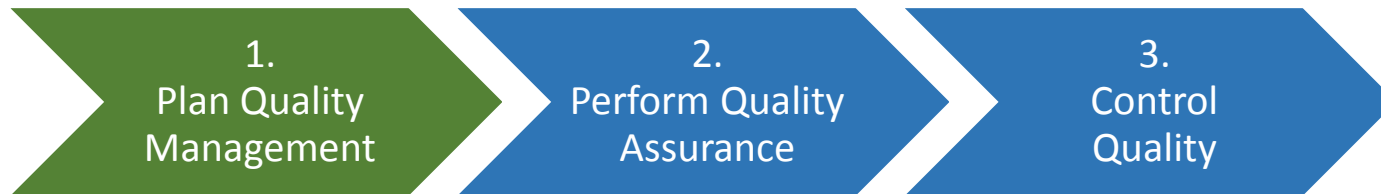
1. Plan Quality Management

- Identify which quality standards are relevant to the project and how to satisfy those standards.
- Quality standards for IT project, e.g. allow the system growth, reasonable response time, the system produces consistent and accurate information.
- Main outputs: quality management plan, quality metrics, quality checklists, process improvement plan.

Note:

metric is a standard of measurement, e.g. failure rates of products produced, availability of goods and services, customer satisfaction ratings.

Project Quality Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Quality Management	2. Perform Quality Assurance	3. Control Quality
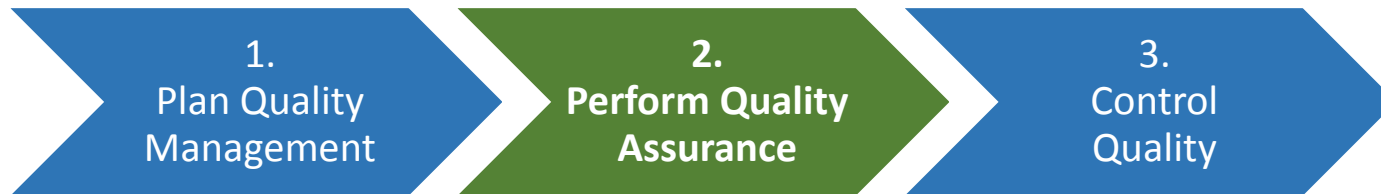
2. Perform Quality Assurance

- Periodically evaluate overall project performance to ensure that the project will satisfy the relevant quality standards.

Project Quality Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Quality Management | 2. Perform Quality Assurance | 3. Control Quality |
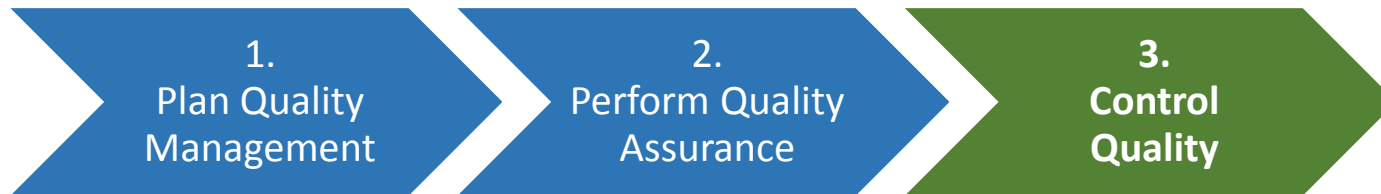
3. Control Quality

- Monitor and record results of executing the quality activities to assess performance and recommend necessary changes.
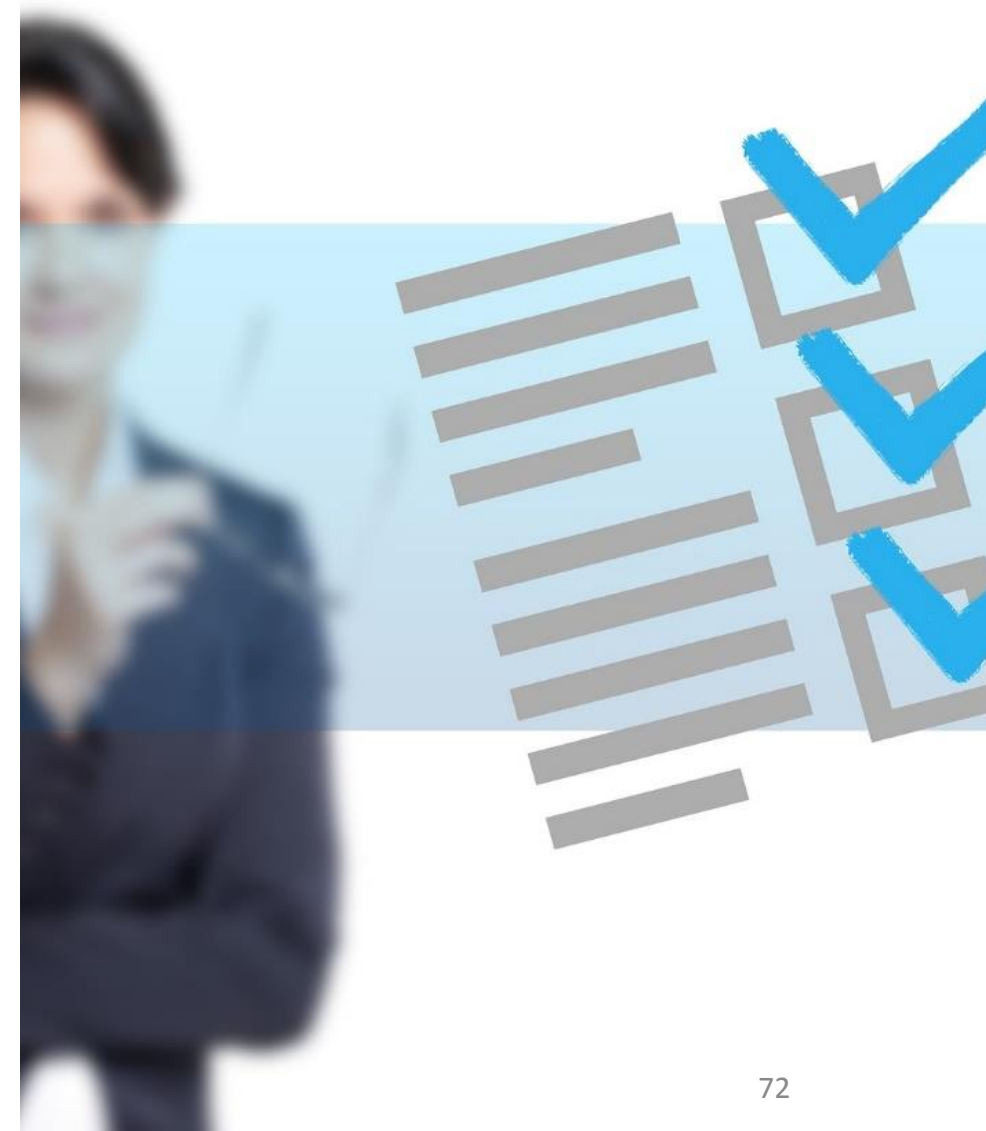
Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

- Includes the processes required to make the most effective use of the people involved in a project.

- Includes all project *stakeholders*: sponsors, customers, project team members, support staff, suppliers supporting the project, etc.

- 4 processes:
    1. Plan HR Management
    2. Acquire Project Team
    3. Develop Project Team
    4. Manage Project Team

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan HR Management | 2. Acquire Project Team | 3. Develop Project Team | 4. Manage Project Team |

1. Plan HR Management
- Identify and document project roles, responsibilities, and reporting relationships.
- Organization structures for managing projects include:
  i.   The Functional Structure
  ii. The Project Structure
  iii. The Matrix Structure
- Output: HR plan

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

Organization structures for managing projects

(i) Functional Organizational Structure

- Functional managers/vice presidents report to the CEO.

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

Organization structures for managing projects

(i) Functional Organizational Structure

Pros

- Clear definition of authority
- Eliminates duplication
- Encourages specialization
- Clear career paths

Cons

- May lack customer orientation
- "Silos" create longer decisions cycles
- Conflicts across functional areas
- Project leaders have little power

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

Organization structures for managing projects

(ii) Project Organizational Structure
- Project managers report to the CEO
- Examples: companies that hire people specifically to work on particular projects such as defense, architectural, engineering, and consulting companies.
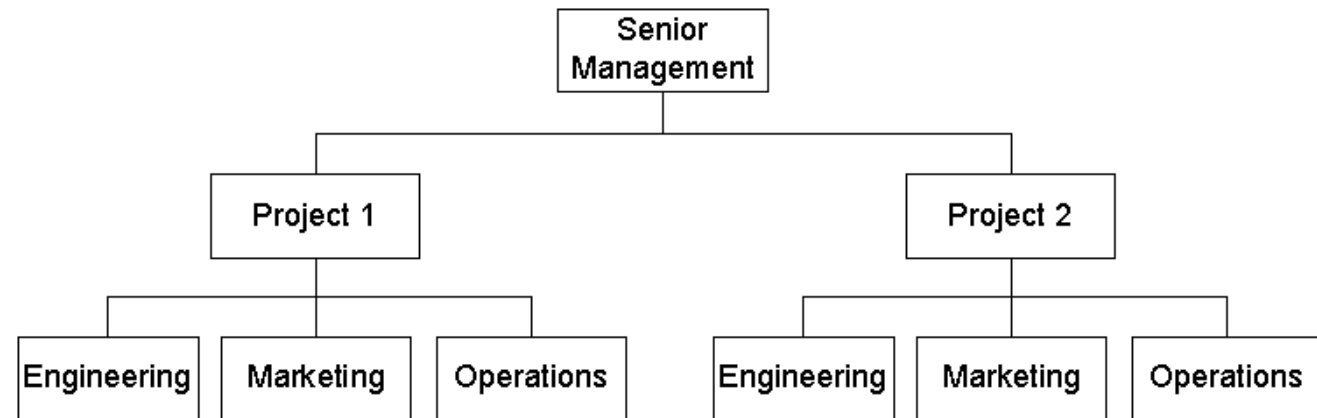
Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

Organization structures for managing projects

(ii) Project Organizational Structure

Pros
- Unity of command
- Highly responsive to project's objectives/ customer needs

Cons
- Duplication of facilities
- Cost inefficiency of resources

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

Organization structures for managing projects

(iii) Matrix Organizational Structure

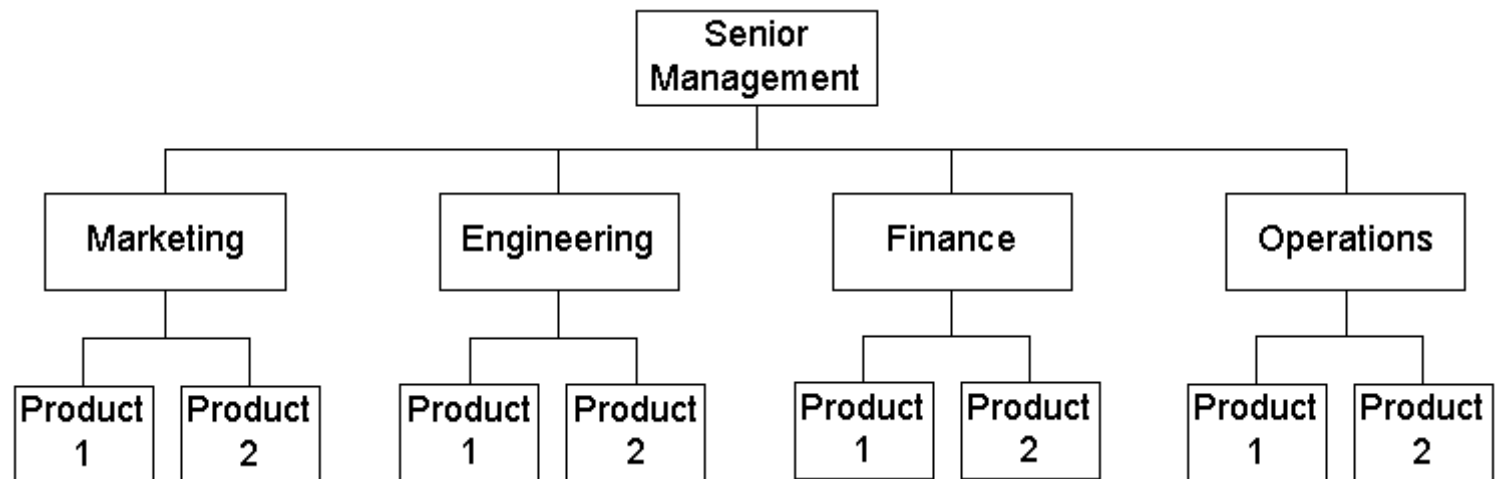Illustration by Wiley, Composition Services Graphics

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

Organization structures for managing projects

(iii) Matrix Organizational Structure

- The middle ground between functional and project structures.

- Personnel often report to both a functional manager and one or more project managers.

- E.g. IT personnel at many companies split their time between two or more projects, but they report to their manager in the IT department.
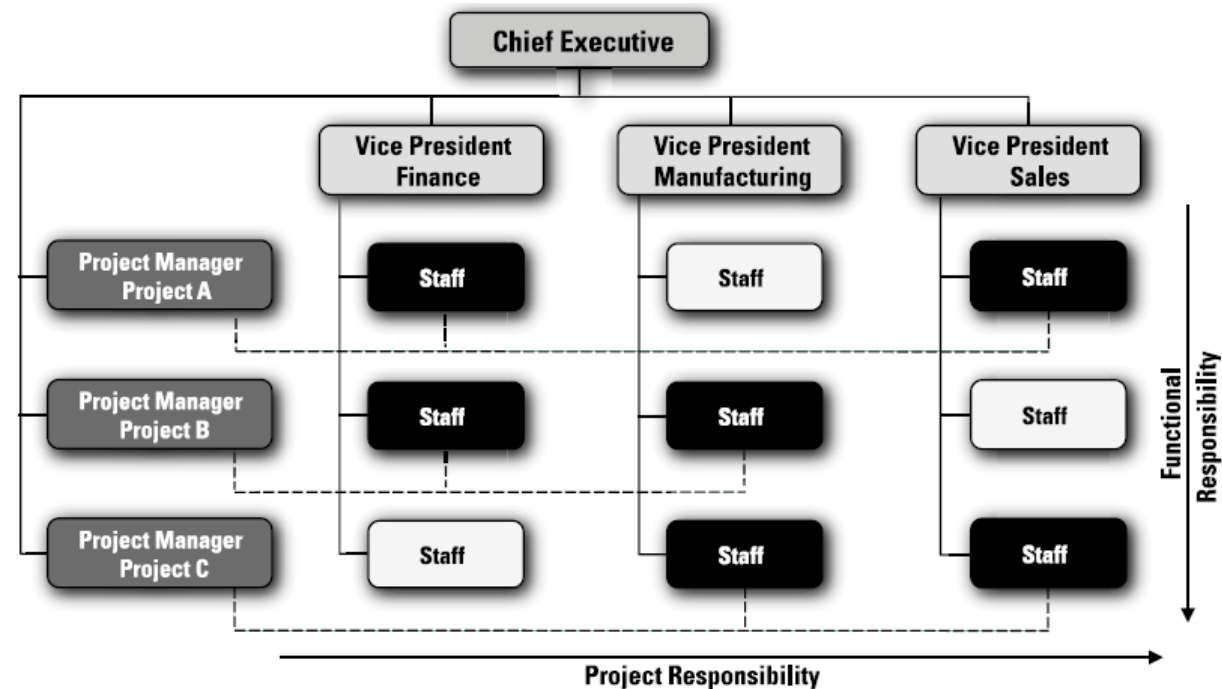
- Project managers have staff from various functional areas working on their projects.

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan HR Management	2. Acquire Project Team	3. Develop Project Team	4. Manage Project Team

2. Acquire Project Team

- Get the needed personnel assigned to and working on the project
- Tool and techniques:
    a. Resource assignment
    b. Resource loading
    c. Resource leveling
- Outputs: project staff assignments, resource calendars.

Tool & techniques for project team acquisition

Resource assignment

To assign particular personnel to their projects or to acquire additional human resources needed to staff the project.
- PM with strong influencing & negotiating skills are often good at getting internal people to work on their projects.
- Main outputs: project staff assignments, resource availability information, updates to the staffing management plan, project team directory.

Resource loading

- Amount of individual resources an existing schedule requires during specific time periods.
- Help PM and individuals to develop schedules.
- Overallocation: more resources than are available are assigned to perform work at a given time. E.g. individual have to work 24 hours a day to meet the allocated schedule.

Resource leveling

- A technique for resolving resource conflicts (overallocation & underallocation).
- Purpose: to create a smoother distribution of resource usage.
- PM examine the PERT chart for areas of slack or float, and to identify resource conflicts.
- E.g. remove overallocations by delaying noncritical tasks, which does not result in an overall schedule delay.
- Therefore, resource leveling aims to minimize period-by-period variations in resource loading by shifting tasks within their slack allowances.

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan HR Management	2. Acquire Project Team	3. Develop Project Team	4. Manage Project Team

3. Develop Project Team

- Build individual and team skills to enhance project performance.
- Main outputs: team performance assessments, enterprise environmental factors updates.
- The Tuckman ladder (a team development model):
  a. Forming
  b. Storing
  c. Norming
  d. Performing
  e. Adjourning

Stages of "Tuckman's Ladder" in Team Building

1

(Forming)

Team acquaints and establishes ground rules Formalities are preserved and members are treated as strangers

2

(Storming)

Members start to communicate their feelings but still view themselves as individuals rather than part of the team. They resist control by group leaders and show hostility

3

(Norming)

people feel part of the team and realize that they can achieve work if they accept other viewpoints.

4

(Performing)

The team works in an open and trusting atmosphere where flexibility is the key and hierarchy is of little importance

5

(Adjourning)

The team conducts an assessment of the year and implements a plan for transitioning roles and recognizing members' contributions

The Tuckman Ladder

Forming
- Members begin to get acquainted: either at the initiation of the team, or as new members are introduced.
- Different members with different expectations
- High level of anxiety, suspicion, hesitant. Members unsure of their roles
- Group begins to establish identity

Storming
- Project objectives are clearer; Members start applying skills to work
- Team members have different opinions as to how the team should operate.
- Conflicts emerge, tension increase; Motivation and morale are low, frustration, anger and hostility may seep in

Norming
- Relationships between members stabilizes; Interpersonal conflicts solved at most part
- Expectation is aligned to reality! Members accepting each other as a team
- Trust begins to develop, greater information sharing, friendship establishes

Performing
- Level of work performance is high; Productivity at its optimum
- Unity in team establishing; Getting work done knowing each other's different attitude and working styles
- Problems are brought up, discussed and then solved

Adjourning
- Adjourning involves dissolution. It entails the termination of roles, the completion of tasks and reduction of dependency.
- The process can be stressful, particularly when the dissolution is unplanned. Some authors describe this stage as "Deforming and Mourning", recognizing the sense of loss sometimes felt by team members.

85

Project Human Resource Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan HR Management	2. Acquire Project Team	3. Develop Project Team	**4. Manage Project Team**

4. Manage Project Team

- Track team member performance, motivating team members, providing timely feedback, resolving issues and conflicts, and coordinating changes to help enhance project performance.

Project Communication Management

1.4 Knowledge & Attributes of a Project Manager

- Ensure timely and appropriate generation, collection, dissemination, storage, and disposition of project information.

- 3 processes:
    1. Plan Communications Management
    2. Manage Communications
    3. Control communications

Project Communication Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Communications Management	→	2. Manage Communications	→	3. Control communications

Description	Frequency	Method	Audience	Owner
Name of the communication	How often it will happen	Method of communication	Who will receive the communication	Who is responsible
Project team meeting	Daily	Meeting	Project team	Project manager
Stakeholder update	Monthly	Email newsletter	Stakeholders	Project manager
Board meeting	Every two weeks	Meeting	Project board	Project manager
Contribution to department newsletter	Quarterly	Section of newsletter	Wider development	Project manager to deliver to department administration

1. Plan Communication Management

- Develop an appropriate approach and plan for project communications based on stakeholder's information needs and requirements, and available organizational assets.

- Key benefit: identifies and documents the approach to communicate most effectively and efficiently with stakeholders.

Project Communication Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Communications Management | 2. Manage Communications | 3. Control communications |

2. Manage Communications

- Create, collect, distribute, store, retrieve, and ultimately dispose project information in accordance to the communication management plan.
- Key benefit: enables an efficient and effective communications flow between project stakeholders.

Project Communication Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Communications Management | 2. Manage Communications | 3. Control communications |

3. Control Communications

- Monitor and control communications throughout the entire project life cycle to ensure the information needs of the project stakeholders are met.
- Key benefit: ensures an optimal information flow among all communication participants, at any moment in time.

Project Risk Management

1.4 Knowledge & Attributes of a Project Manager

- 6 major processes:
    1. Plan Risk Management
    2. Identify Risk
    3. Perform Qualitative Risk Analysis
    4. Perform Quantitative Risk Analysis
    5. Plan Risk Response
    6. Control Risk

Project Risk Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Risk Management | 2. Identify Risk | 3. Perform Qualitative Risk Analysis | 4. Perform Quantitative Risk Analysis | 5. Plan Risk Response | 6. Control Risk |

1. Plan Risk Management

- Decide how to approach and plan the risk management activities for the project.
- By reviewing the project scope statement; cost, schedule, and communications management plans; enterprise environmental factors; and organizational process assets
- Main output: risk management plan

Project Risk Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Risk Management | 2. Identify Risk | 3. Perform Qualitative Risk Analysis | 4. Perform Quantitative Risk Analysis | 5. Plan Risk Response | 6. Control Risk |

2. Identify Risk

- Determine which risks are likely to affect a project and documenting the characteristics of each
- Main output: the start of a risk register

Project Risk Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Risk Management	2. Identify Risk	3. Perform Qualitative Risk Analysis	4. Perform Quantitative Risk Analysis	5. Plan Risk Response	6. Control Risk

3. Perform Qualitative Risk Analysis

- Prioritize risks based on their probability and impact of occurrence.
- After identifying risks, various tools and techniques can be used by project teams to rank risks and update information in the risk register
- Main output: risk register updates.

Project Risk Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Risk Management | 2. Identify Risk | 3. Perform Qualitative Risk Analysis | 4. Perform Quantitative Risk Analysis | 5. Plan Risk Response | 6. Control Risk |

4. Perform Quantitative Risk Analysis

- Numerically estimate the effects of risks on project objectives.
- Main output: risk register updates.

Project Risk Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Risk Management | 2. Identify Risk | 3. Perform Qualitative Risk Analysis | 4. Perform Quantitative Risk Analysis | 5. Plan Risk Response | 6. Control Risk |

5. Plan Risk Responses

- Take steps to enhance opportunities and reduce threats to meeting project objectives.
- Using outputs from the preceding risk management processes, project teams can develop risk response strategies that often result in updates to the risk register, project management plan, and other project documents as well as risk-related contract decisions

Project Risk Management

1.4 Knowledge & Attributes of a Project Manager

1. Plan Risk Management	2. Identify Risk	3. Perform Qualitative Risk Analysis	4. Perform Quantitative Risk Analysis	5. Plan Risk Response	6. Control Risk

6. Control Risk

- Monitor identified and residual risks, identify new risks, carry out risk response plans, and evaluate the effectiveness of risk strategies throughout the life of the project.
- Main outputs: change requests and updates to the risk register.

Project Procurement Management

1.4 Knowledge & Attributes of a Project Manager

- Includes the processes required to acquire goods and services for a project from outside the organization.

- Organizations can be either the buyer or seller of products or services under a contract.

- 4 main processes:
    1. Plan Procurement Management
    2. Conduct Procurement
    3. Control Procurement
    4. Close Procurement

Project Procurement Management

| 1. Plan Procurement Management | 2. Conduct Procurement | 3. Control Procurement | 4. Close Procurement |

1. Plan Procurement Management

- Determine what to procure, when and how

- Decide what to outsource, determine the type of contract, and describe the work for potential sellers.

- Sellers: contractors, suppliers, providers

- Outputs: procurement management plan, statements of work, make-or-buy decisions, procurement documents, source selection criteria, and change requests.

Project Procurement Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Procurement Management | 2. Conduct Procurement | 3. Control Procurement | 4. Close Procurement |

2. Conduct Procurement

- Obtain seller responses, selecting sellers, and awarding contracts.

Project Procurement Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Procurement Management | 2. Conduct Procurement | 3. Control Procurement | 4. Close Procurement |

3. Control Procurement

- Manage relationships with sellers, monitoring contract performance, and making changes as needed.
- Main outputs: procurement documentation

Project Procurement Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Plan Procurement Management | 2. Conduct Procurement | 3. Control Procurement | 4. Close Procurement |

4. Close Procurement

- Completion and settlement of each contract, including resolution of any open items.
- Outputs: closed procurements.

Project Stakeholder Management

1.4 Knowledge & Attributes of a Project Manager

- Includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

- 4 processes:
    1. Identify Stakeholders
    2. Plan Stakeholder Management
    3. Manage Stakeholder Engagement
    4. Control Stakeholder Engagement

Project Stakeholder Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Identify Stakeholders | 2. Plan Stakeholder Management | 3. Manage Stakeholder Engagement | 4. Control Stakeholder Engagement |

1. Identify Stakeholders

- Identify the people, groups, or organizations that could impact or be impacted by a decision, activity, or outcome of the project; and analyze and document relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success.

- Output: stakeholder register.

Project Stakeholder Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Identify Stakeholders | 2. Plan Stakeholder Management | 3. Manage Stakeholder Engagement | 4. Control Stakeholder Engagement |

2. Plan Stakeholder Management

- Develop appropriate management strategies to effectively engage stakeholders throughout the project life cycle, based on the analysis of their needs, interests, and potential impact on project success.

- Output: stakeholder management plan.

Project Stakeholder Management

1.4 Knowledge & Attributes of a Project Manager

| 1. Identify Stakeholders | 2. Plan Stakeholder Management | 3. Manage Stakeholder Engagement | 4. Control Stakeholder Engagement |

3. Manage Stakeholder Engagement

- Communicate the working with stakeholders to meet their needs/expectations, address issues as they occur, and foster appropriate stakeholder engagement in project activities throughout the project life cycle.

- Output: issue log, change requests.

Project Stakeholder Management

1.4 Knowledge & Attributes of a Project Manager

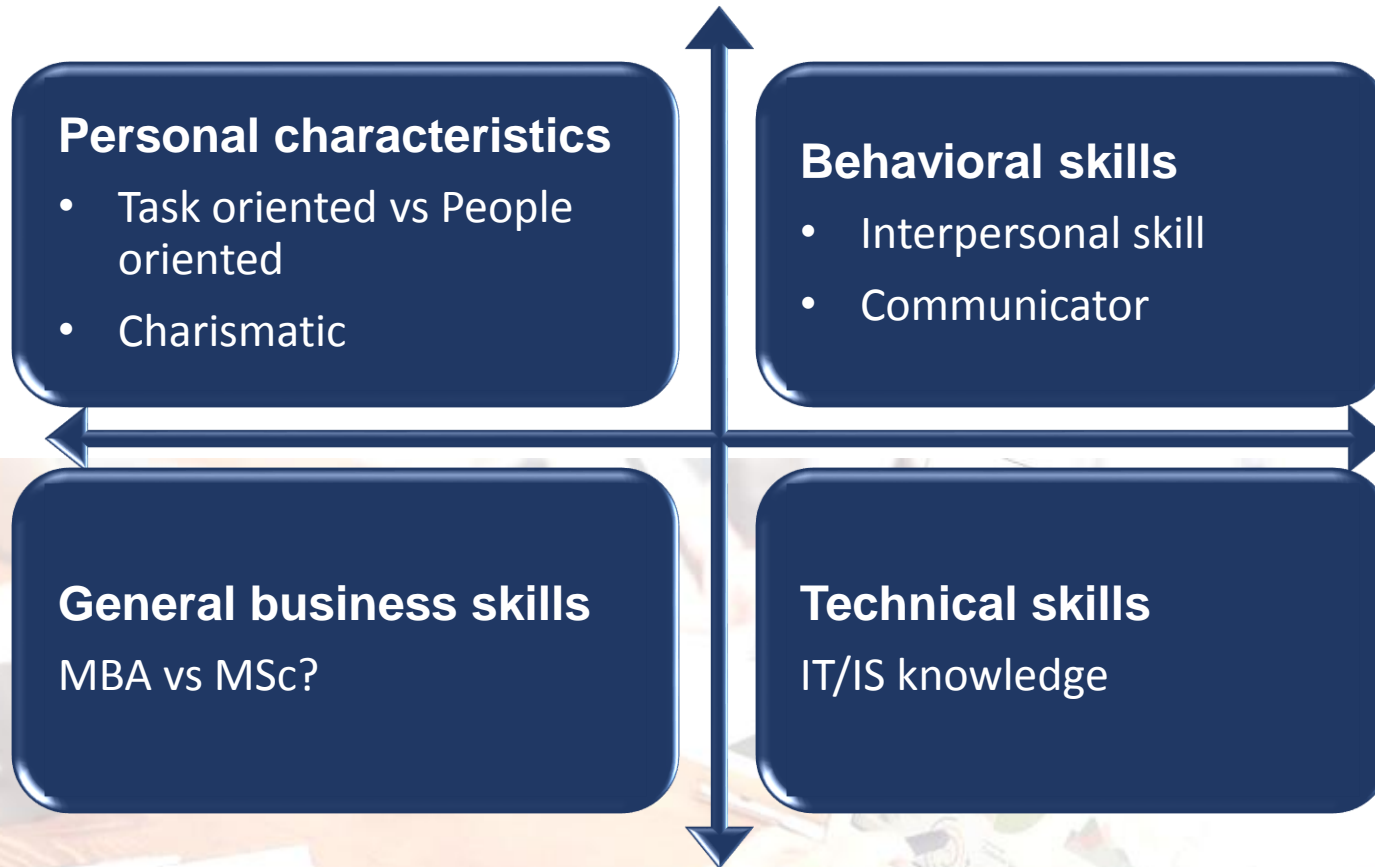| 1. Identify Stakeholders	2. Plan Stakeholder Management	3. Manage Stakeholder Engagement	4. Control Stakeholder Engagement

4. Control Stakeholder Engagement

- Monitoring overall project stakeholder relationships and adjust strategies and plans for engaging stakeholders.

- Output: work performance information.

Attributes of a PM

1.4 Knowledge & Attributes of a Project Manager

Personal characteristics
- Task oriented vs People oriented
- Charismatic

Behavioral skills
- Interpersonal skill
- Communicator

General business skills
MBA vs MSc?

Technical skills
IT/IS knowledge

However… even the perceived best (project) manager is not liked by every single one!

Leading vs Managing
1.4 Knowledge & Attributes of a Project Manager

- The overriding function of management is to provide **order and consistency to organizations**, whereas the primary function of leadership is to produce **change and movement**.

- Leadership can be defined as the process of moving a group(s) in some direction through mostly non-coercive means

- Effective leadership is defined as leadership that produces movement in the long-term best interests of the group(s) (Kotter, 1988).

- Thus, leadership is defined as the ability to influence people toward the attainment of goals
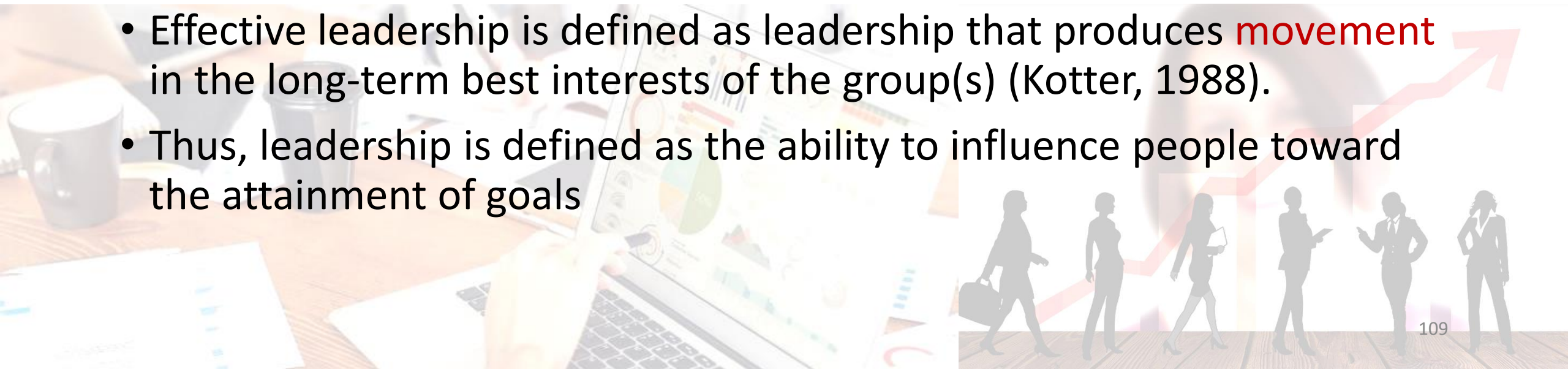
1.4 Project Management Failure

Introduction

Causes of Project Failures

Critical Success Factor (CSF)

Introduction

- Business Objectives
    - A project is a success if the value of benefits exceeds the costs.
    - Value of the benefits is dependent on external factors e.g. number of customers (if more customers buy your new game software, benefits ↑).
    - A PM may control internal factors (e.g. development costs) but might not be able to control external factors.
        - Thus, project objectives still have some bearing on eventual business success.

Introduction

1.4 Project Management Failure

- Project Objectives
  - The targets that the project team is expected to achieve such as: the agreed functionality, to the required level of quality, on time, within budget
  - A project that meet theses targets could fail to meet business case.
    - E.g. a computer game could be delivered on time and within budget, but might then not sell.
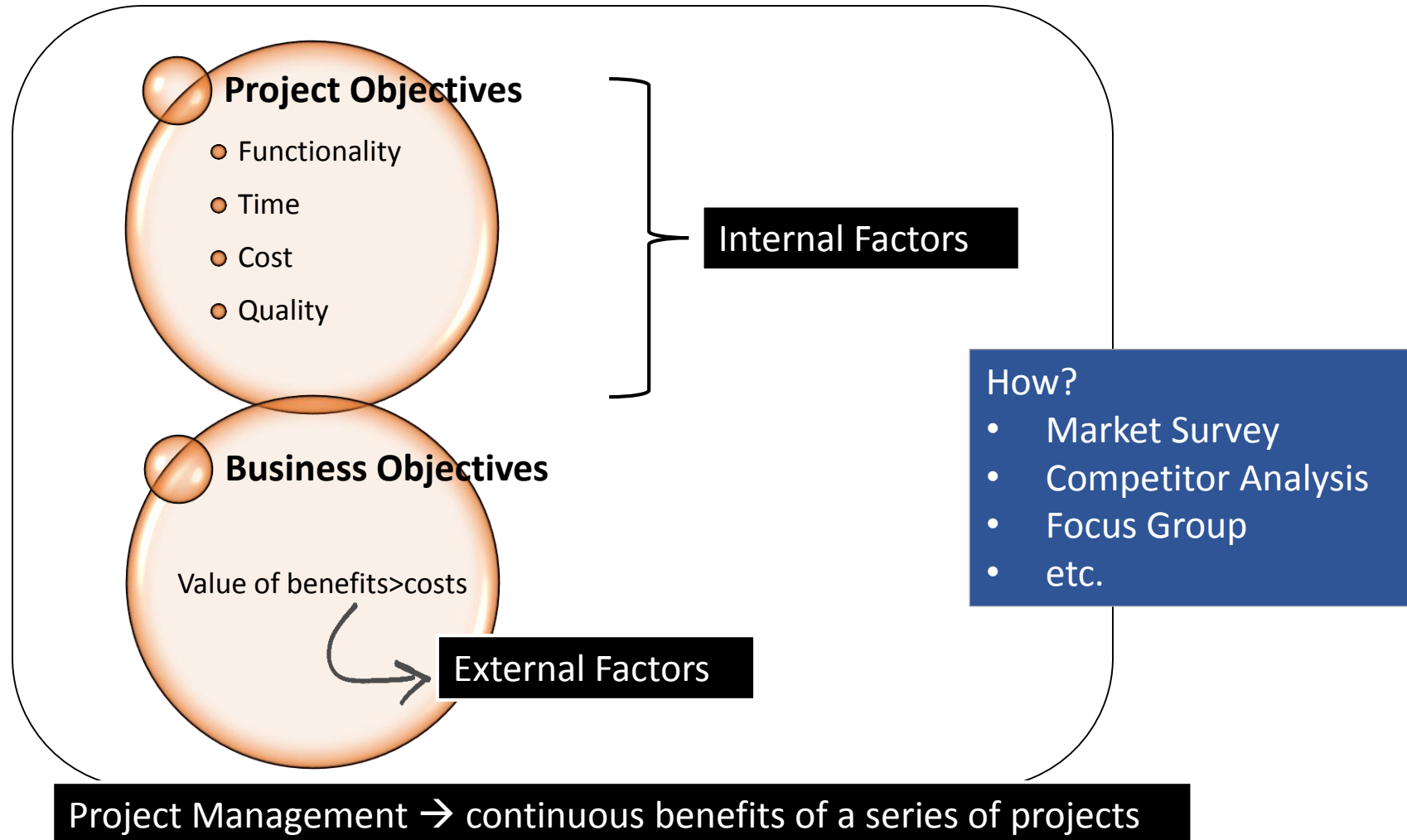
Project Failure vs Business Failure

1.4 Project Management Failure

- Project failure occurs when
  - It does not satisfy the requirement of stakeholders
  - It does not meet the objectives of the project – time, budget, quality
- A project can be successfully delivered but then be a business failure
- On the other hand, a project could be late and over budget (fail to meet project objectives) but its deliverables could generate benefits that outweigh the initial expenditure (business case success).
- The possible gap between project and business concerns can be reduced by having a broader view of projects that includes business issues.
  - E.g. the project management of an e-commerce website could include market surveys, competitor analysis, focus groups, prototyping and evaluation by typical potential users.

Project Failure vs Business Failure

1.4 Project Management Failure

Project Objectives

- Functionality
- Time
- Cost
- Quality

Internal Factors

Business Objectives

Value of benefits>costs

External Factors

How?
- Market Survey
- Competitor Analysis
- Focus Group
- etc.

Project Management → continuous benefits of a series of projects

Causes of Project Failure

1.4 Project Management Failure

_____

- Inadequacies or defects in project management will contribute to project failures.

- Failures in project management may be categorized according to 3 levels:
  a. Level 1 - Failures in the Project Management Context
  b. Level 2 - Failures in the Project Management System
  c. Level 3 - Failures in Planning and Control Processes

Level 1: Failures in the Project Management Context

1.4 Project Management Failure

- Inappropriate "fit" of project organisation to project objectives, project tasks, top management, and environment at large. For example,
  - A game software needs project organizational structure which includes marketing personnel to promote it after accomplished. However, members of the team are assigned to the project without regards to proper skills and experience. Top management also does not yield adequate responsibility or authority to the project manager.

- Use of inappropriate project approaches or models. For example,
  - Prototyping is used in a large and complex system development which cannot capture the user requirements effectively.

- Lack of top management support
  - Lack of support from financial department (no funding from the organization).
  - Lack of support from sales and marketing department (not willing to assign personnel to promote new games software)

Level 2: Failures in the Project Management System

1.4 Project Management Failure

———————

- Traceable to project leadership, philosophy and practice
- Include wrong project manager, neglect of systems approach in the project life cycle, and misuse of project management techniques
- Examples:
  o the project manager is unable to control conflicts
  o Hardware, software, resources and facilities are viewed independently without relation to their overall project objectives – poor resource planning

Level 3: Failures in Planning & Control Processes

1.4 Project Management Failure

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- Include inadequate communication, project planning, poor estimation, scheduling etc. and omission of user involvement

- Examples:
  - Information about scope, objectives, responsibility and acceptance criteria not documented early in the project
  - The behaviour of the project team discourages user involvement

Other factors that contribute to project failure

1.4 Project Management Failure

- Poor team development

- PM too optimistic

- Over-allocation resources

- Organization culture e.g. no team work, no sharing of information between employees

- External factors e.g. government enforce new laws

Critical Success Factors (CSFs)

1.4 Project Management Failure

———————

- A key area where satisfactory performance is required for the organization to achieve its goals
- A means of identifying the tasks and requirements needed for success
- At the lowest level, CSFs become concrete requirements
- A means to prioritize requirements

Summary

1.1 Introduction to Project Management

1.2 Project Life Cycle

1.3 Project Appraisal and Evaluation

1.4 Knowledge and Attributes of a Project Manager

1.5 Project Management Failure