MASTER OF COMPUTER SCIENCE/
MASTER OF SCIENCE IN COMPUTER SCIENCE

MCS 4204 –
Software Project Management and Quality Assurance

Project Integration Management

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Project Management Process Groups

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Performing Integration on the Project

- **Integration and execution of strategy**
  - Understand strategic objectives and ensure the alignment of project objectives and results with those of the portfolio, program, and business areas.
- **Integration of processes, knowledge and people**
  - Guide the team to work together to focus on what is really essential at the project level.
- **Integration takes place at three levels:** Process, Cognitive and Context

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Project Integration Management

- It includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.
- Making choices about:
  - resource allocation,
  - balancing competing demands,
  - examining any alternative approaches,
  - tailoring the processes to meet the project objectives,&
  - managing the interdependencies among the Project Management Knowledge Areas.

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Project Integration Management Processes

1. Develop Project Charter
2. Develop Project Management Plan
3. Direct and Manage Project Work
4. Manage Project Knowledge
5. Monitor and Control Project Work
6. Perform Integrated Change Control
7. Close Project or Phase

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Importance of Project Integration Management

- Ensuring that the deliverable due dates of the product, service, or result;
- Aligning project life cycle and the benefits management plan;
- Providing a project management plan to achieve the project objectives;
- Ensuring the creation and the use of the appropriate knowledge to and from the project as necessary;
- Managing the performance and changes of the activities in the project management plan;

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Importance of Project Integration…contd.

- Making integrated decisions regarding key changes impacting the project;
- Measuring and monitoring the project's progress and taking appropriate action to meet project objectives;
- Collecting data on the results achieved, analyzing the data to obtain information, and communicating this information to relevant stakeholders;
- Completing all the work of the project and formally closing each phase, contract, and the project as a whole; and
- Managing phase transitions when necessary.

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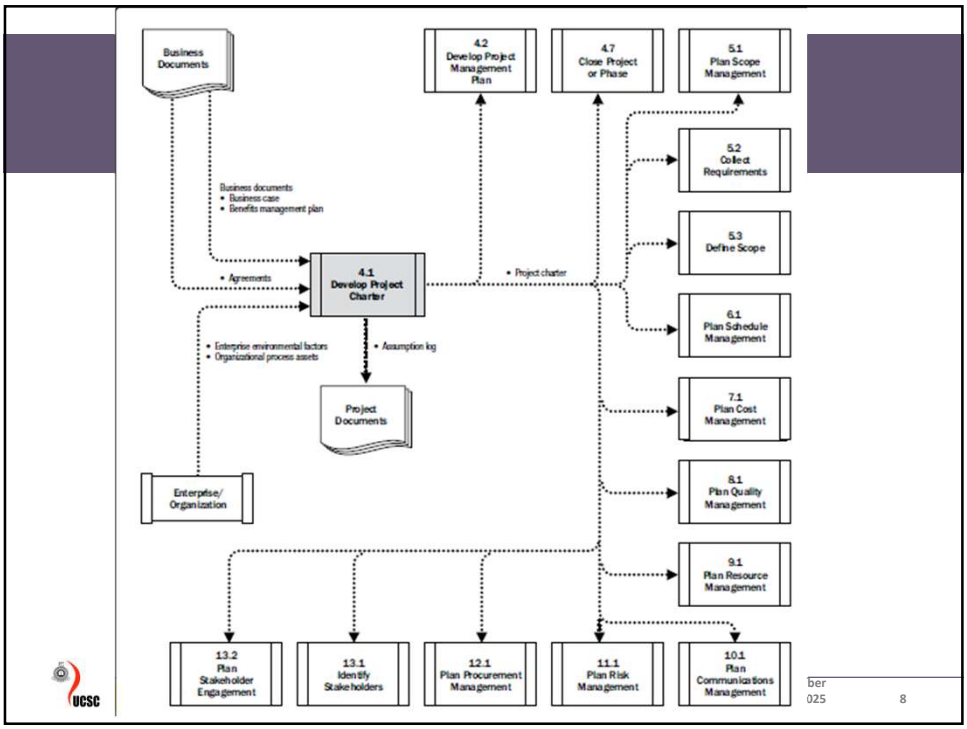

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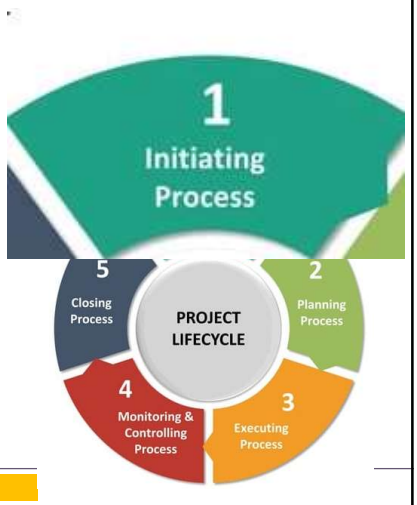
Project Initiation

- Starting a new project or a new phase of an existing project
- Obtaining authorization to start the project/phase



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Objectives of the Initiation phase

- Align the **stakeholders' expectations** with the **project's purpose**
- Provide visibility about the **scope and objectives**, ensuring that project will achieve the expectations
- Set the **vision** of the project—what is needed to be accomplished.
- Create a shared understanding of **success criteria**
- Reduce the overhead of **involvement**
- Improve deliverable acceptance, customer satisfaction, and other stakeholder satisfaction.

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Major Activities of Project Initiation

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Need Assessment

Identifying opportunities, business requirements, or problems that need to be solved.

1. Market Demand
2. Strategic Opportunity/Business Need
3. Customer Request
4. Technological Advance
5. Legal Requirement
6. Environmental Consideration
7. Social Need

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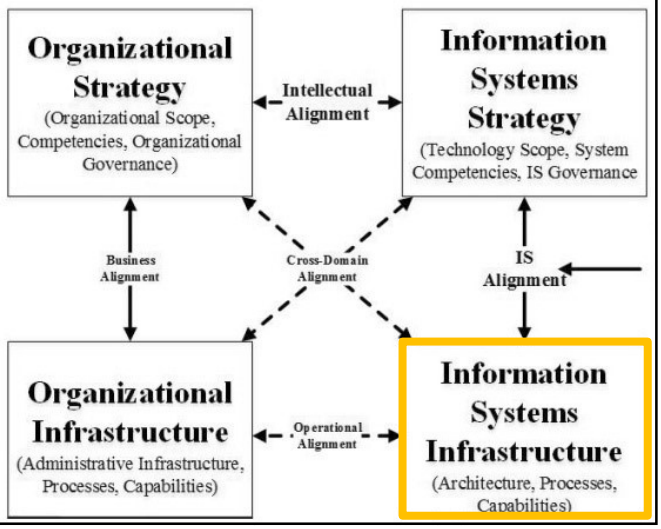
Purpose of Project Evaluation

To find;

- the value a project can offer,
- the benefits it can deliver, and
- how well it aligns with business strategy.



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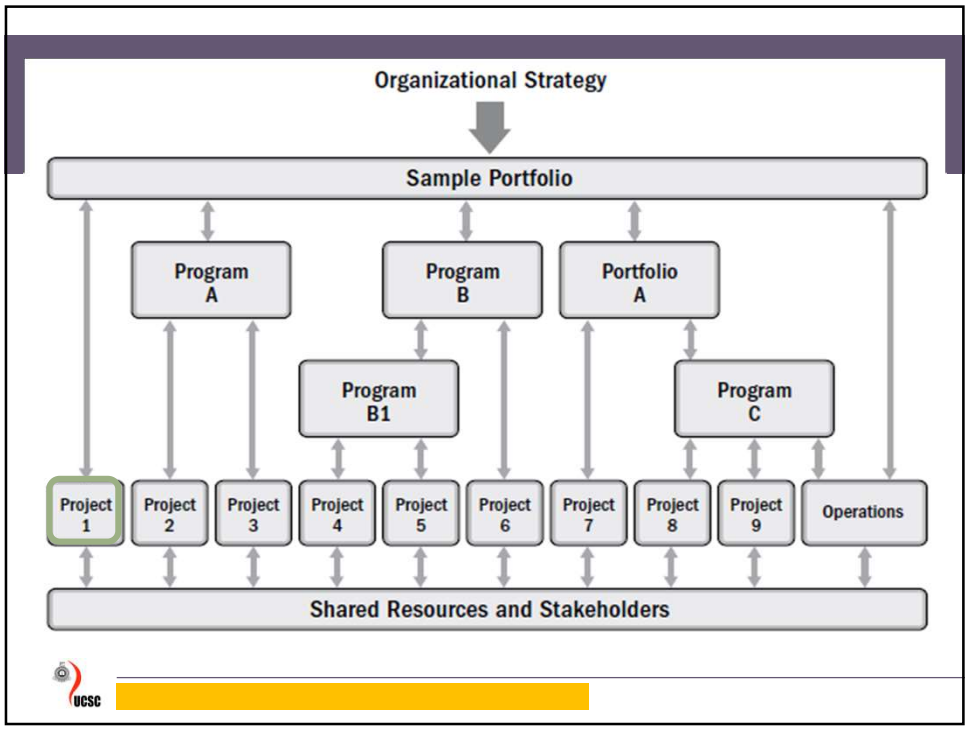

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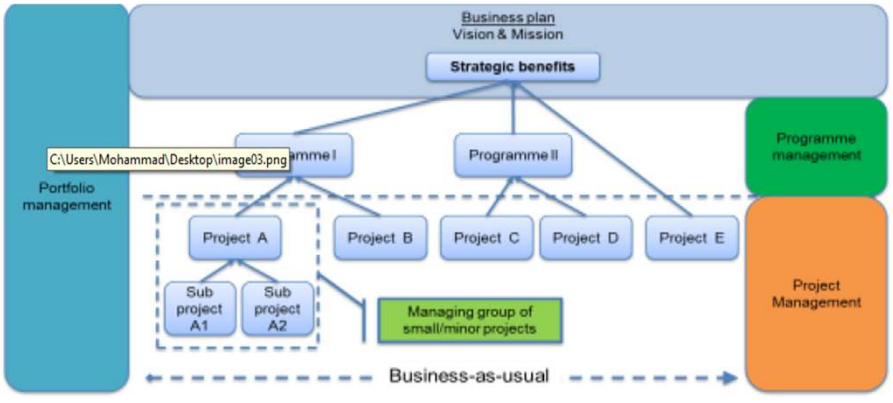
Portfolio Mgt. and Project Mgt.

- Program and project management focus on doing programs and projects the “right” way, and Portfolio management focuses on doing the “right” programs.



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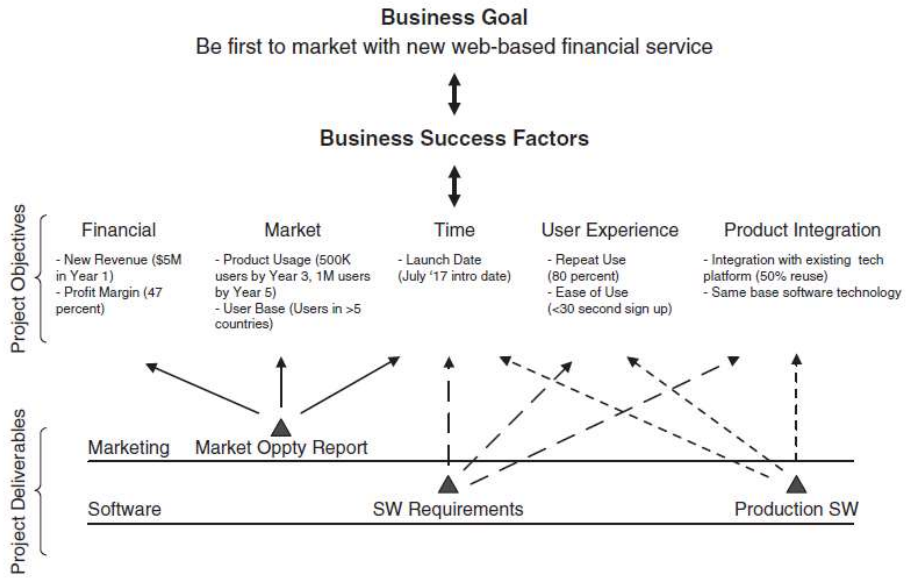
Benefit Map



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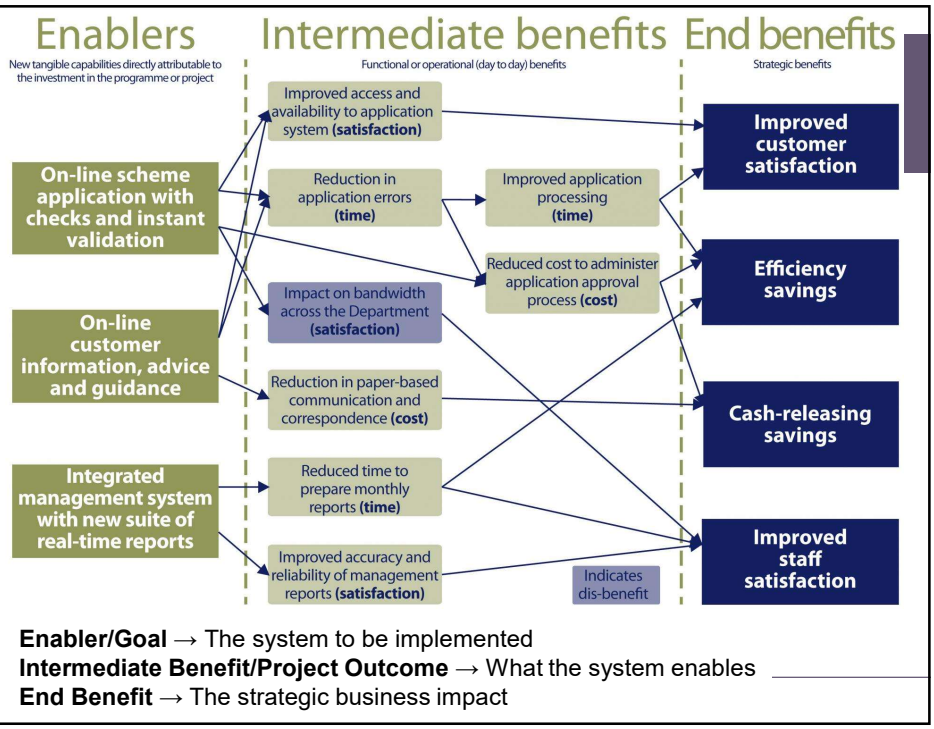

Enabler/Goal → The system to be implemented
Intermediate Benefit/Project Outcome → What the system enables
End Benefit → The strategic business impact

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Steps to Create a Benefit Map

1. Identify the Strategic Business Goals
2. Define the Business Success Factors
3. Identify Project Outcomes
4. Perform the Mapping

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Business Case Document

- **Justifies the start-up** of a project
- Includes a **description** of the **business problem** or opportunity
- Provides the **costs and benefits** of each alternative solution and the recommended solution for approval.
- Justifies **expenditure** on the project
- is **referred to frequently** during the project, to determine whether it is currently on track
- **Success** of the project **is measured** against the ability to meet the objectives defined in the Business Case
- Preparation of a Business Case is critical to the success of the project.

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Business Case Document: List of Content

1. **Introduction and background** to the proposal
2. The **proposed project**
3. **The market**: estimated demand, and likely competitors
4. **Organizational and operational infrastructure**
5. The **benefits**
6. **Outline implementation plan**
7. **Costs**: schedule of expected costs for planned activities
8. The **financial case**: income and costs are analyzed
9. **Risks**: business risks
10. **Management plan**: Project portfolio management

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Feasibility study

- An exercise that involves documenting each of the potential solutions to a particular business problem or opportunity.
- **Purpose:** identify the likelihood of one or more solutions meeting the stated business requirements – to decide whether the solution will deliver the expected outcome
- **Outcome:** a confirmed solution for implementation.

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Assessing Feasibility

Business Analyst Learnings

Technical Feasibility

- Does our current technology (hardware, software & network) support the proposed solution?
- Do we have the technical competence to build the system?
- Can we support and maintain the system when it is in use?

Legal & Regulatory Feasibility

- What restrictions have been introduced by company law, auditors, Government and standards organizations? *What laws must be observed in terms of health & safety, reporting, data protection and working hours?*

Organizational Feasibility

- Is the organization capable of accepting the change involved in managing information and adopting new processes?
- Is the organization capable of accepting the change involved in making decisions? *Can employees make decisions with the information on the system or will they revert to using their intuition?*

Social Feasibility

- Are employees willing to accept changes in work conditions? *Is the attendant charged with taking regular stock counts ready to sit in front of the computer all day running reports?*
- Are employees willing to accept changes in power structure? *Are stakeholders willing to accept that they will no longer be in charge of all or part of a process?*
- Are employees and customers willing to accept changes in relations? *Are suppliers ready and willing to receive orders over an EDI platform?*

Economic Feasibility

- Can we afford the system?
- What economic benefits will the system provide? *Will it improve performance or reduce costs?*

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Feasibility Study Report

- Describes business problem or opportunity
- Documents the business requirements for a solution
- Identifies all of the alternative solutions available
- Reviews each solution to determine its feasibility
- Lists any risks and issues with each solution
- Chooses a preferred solution for implementation
- Documents the results in a feasibility report

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- Continue from here

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Project Assessment and Selection

- Project selection is generally the responsibility of Portfolio Managers, and Steering Committees -in smaller companies, Presidents and Vice-Presidents.
- A high-level assessment of the project to see whether it is worthwhile to proceed with the project.

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Project Assessment

1. **Strategic assessment**
   - To see whether the project will fit in the strategic planning of the whole organization
2. **Technical assessment**
   - To determine whether it is desirable to carry out the development and operation of the software system
3. **Economic assessment**
   - To decide which of the several alternative projects has a better success rate, and a higher turnover

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Strategic Assessment

- Used to assess whether a project **fits in the long-term goal** of the organization
- Evaluates individual projects against the strategic plan or the **overall business objectives**
- carried out by senior management
- **Programme management** - Suitable when managing a set of related projects
- **Portfolio management** - Suitable for strategically assessing, selecting, and prioritizing a broad range of projects and programmes.

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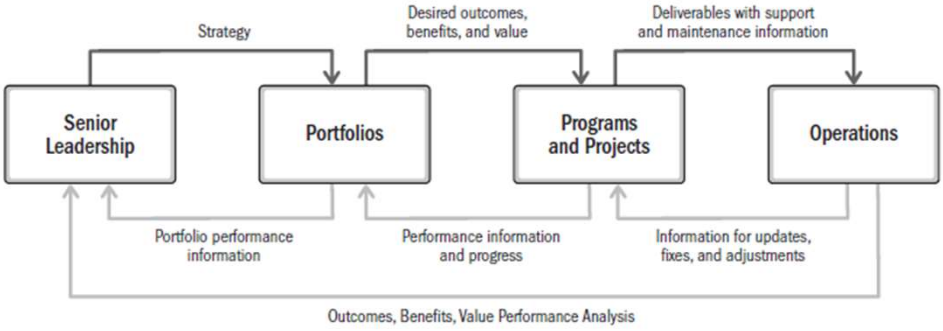
Model of information flow



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QUIZ

"Benefit Map" is a tool used in the project initiation phase. It does NOT help to,

(a) map the organization's business strategy with the benefits to be derived from the project outputs.
(b) match the project deliverables with project objectives.
(c) assure that the user requirements are met at the end of the project.
(d) convince the stakeholders of what benefits the project will bring.
(e) depict the alignment of project deliverables with the expected business goals.

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Technical Assessment

- Identifies **functions** that the software is expected to perform
- Evaluates whether the required functionality can be **achieved with** current or affordable **technologies**
- Considers the **organizational policy** on providing technical infrastructure
- Prepares the **strategic information system plan** (SISP) of the organization
- Identifies **any constraints** imposed by the SISP

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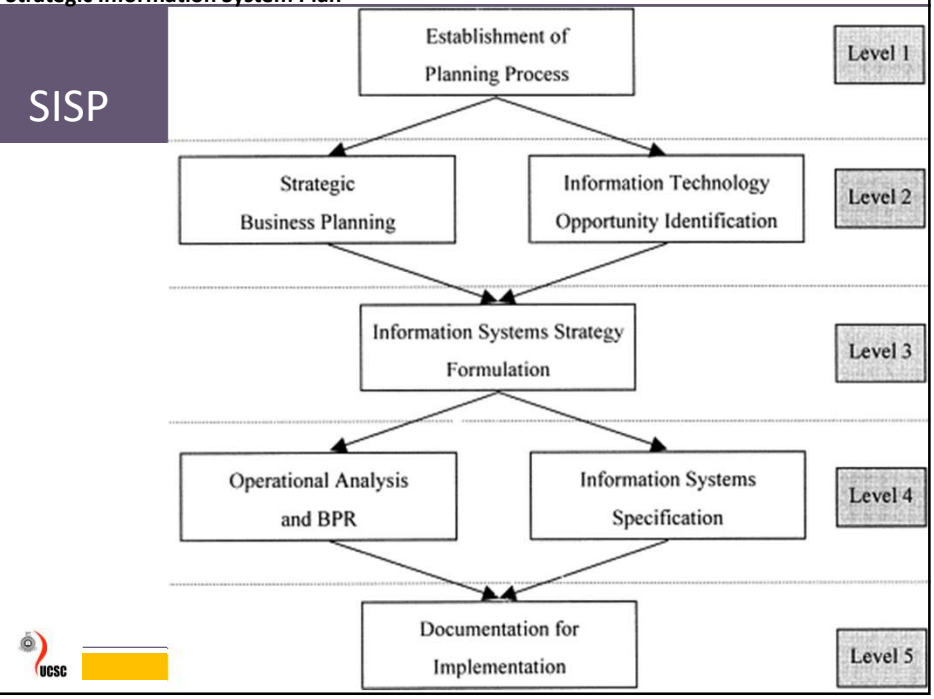
Strategic Information System Plan

SISP



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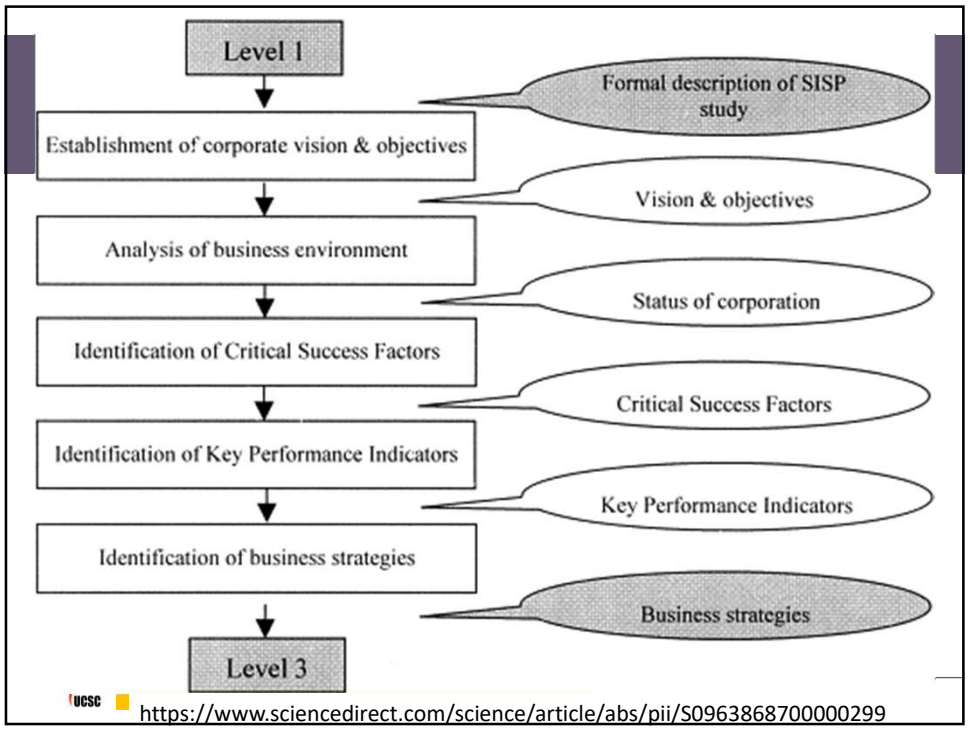

https://www.sciencedirect.com/science/article/abs/pii/S0963868700000299

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Economic Assessment

- Considers whether the project is the **best among other options**
- Prioritizes projects – **can allocate resources more effectively**
- Methods
  - **Cost-benefit analysis -NPV and IRR**
  - **Cash flow forecasting**

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Cost-benefit analysis

- Net benefit = Benefits – Costs
- Costs
  - Development cost – staff payments, infrastructure
  - Set up cost- new infrastructure, staff recruitment and training
  - Operational cost – to operate the system after installation
  - Maintenance cost – for updates or enhancements
- Benefits
  - Quantified and valued – sales income
  - Quantified and but not valued– decrease in # of complains
  - Identified but not easily quantified – public approval of the organization

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Cash Flow Forecasting

- What?
  - Estimation of net profit (cash flow) over time
- Why?
  - Estimated net-benefits over the estimated costs is not sufficient
  - Need detailed estimation of benefits and costs versus time

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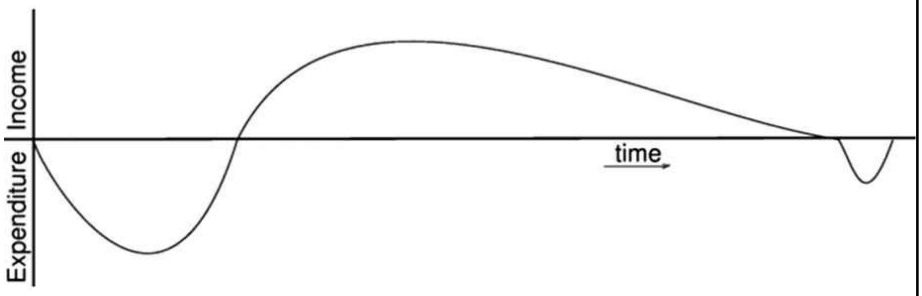
Typical product life cycle cash flow



- Not easy to estimate future cash flows accurately.
- Need to revise the forecast from time to time

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Solutions: Cost-benefit Evaluation Techniques

- Discounted cash flow analysis
- Net present value
- Internal Rate of Return

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Net present value

- Takes into account the profitability of a project and the timing of the cash flows

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

r – discount rate expressed as a decimal value

t – number of years into the future that cash flow occurs

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Net present value …contd.

- Discount rate is the annual rate by which we discount future earning
- e.g., If Discount Rate is 10% and the total return of an investment in a year is Rs.110, the present value of the investment is; 110/(1+(10/100))=110/1.1=100
- Ex1. If Discount Rate is 20% and the total expected return on an investment in a year is Rs.24,000, what would be the present value?

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Activity

If some investment project promises to pay $100 per year for 3 years, at an interest rate of 5%, then what is the present value of that project?

PV= $100/(1.05)+$100/(1.05)^2+$100/(1.05)^3

- **=$272.32**

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Discount factor

$$\frac{1}{(1+r)^t}$$

r = discount rate and t=number of years

- PV of a cash flow (Discounted cash flow)
  = Cash Flow x Discount Factor
- NPV of project = $\sum$ Discounted Cash Flows

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Exercise 2

- Calculate the NPV for each of the project A and B using each of the discount rates 10% and 8%

Year	Project A	Project B
0	-100,000	-100,000
1	10,000	60,000
2	20,000	40,000
3	40,000	30,000
4	100,000	20,000
Net profit		

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Year	Project A – Cash Flows (Rs)	Discount factor at 10%	Discounted Cash Flow	Project B – Cash Flows (Rs)	Discounted Cash Flow
0	-100,000	1	?	-100,000	?
1	10,000	0.9091	?	60,000	?
2	20,000	0.8264	?	40,000	?
3	40,000	0.7513	?	30,000	?
4	100,000	0.6830	?	20,000	?
Net Profit	50,000			50,000	
NPV			?		?

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Year	Project A – Cash Flows (Rs)	Discount factor at 10%	Discounted Cash Flow	Project B – Cash Flows (Rs)	Discounted Cash Flow
0	-100,000	1	-100,000	-100,000	-100,000
1	10,000	0.9091	9,091	60,000	54,546
2	20,000	0.8264	16,528	40,000	33,056
3	40,000	0.7513	30,052	30,000	22,539
4	100,000	0.6830	68,300	20,000	13,660
Net Profit	50,000			50,000	
NPV			23,971		23,801

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Year	Project A – Cash Flows (Rs)	Discount factor at 8%	Discounted Cash Flow	Project B – Cash Flows (Rs)	Discounted Cash Flow
0	-100,000	1	?	-100,000	?
1	10,000	0.9259	?	60,000	?
2	20,000	0.8573	?	40,000	?
3	40,000	0.7938	?	30,000	?
4	100,000	0.7350	?	20,000	?
Net Profit	50,000			50,000	
NPV			?		?

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Year	Project A – Cash Flows (Rs)	Discount factor at 8%	Discounted Cash Flow	Project B – Cash Flows (Rs)	Discounted Cash Flow
0	-100,000	1	-100,000	-100,000	-100,000
1	10,000	0.9259	9,259	60,000	55,554
2	20,000	0.8573	17,146	40,000	34,292
3	40,000	0.7938	31,752	30,000	23,814
4	100,000	0.7350	73,500	20,000	14,700
Net Profit	50,000			50,000	
NPV			31,657		28,360

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Exercise: Find NPV at 6% and 10%

Project	Year 0	Year 1	Year 2	Year 3
A	$1,000	$600	$400	$300
B	$1,000	$300	$500	$600

Which project should be selected?

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Issues with NPV

- Choosing an appropriate discount rate is difficult
- Ensuring that the rankings of projects are not sensitive to small changes in discount rate
- NPV might not be directly comparable with earnings from other investments or the costs of borrowing capital.

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Internal Rate of Return (IRR)

$$NPV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_o$$

- A discount rate results in an NPV of zero
- Estimates the profitability of potential investments
- Can be directly comparable with interest rates.
- Use IRR or XIRR functions in Excel
- Disadvantage –
  - does not indicate the absolute size of the return
  - In some cases, it is possible to find more than one rate of return that will produce a zero NPV.

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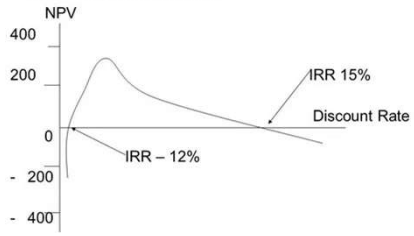
Multiple Rates of Return

- Multiple Rates of Return



- In real life, you would find many projects that have more cash outflows in addition to initial cash outflow. In such cases there may be more than one discount rate that can result in Zero NPV of those projects and there may also be a case where there is no discount rate that will result in zero NPV. So, you can expect strange results when you deal with nonconventional cash flows. But NPV does not have this problem and gives theoretically correct decisions for projects with **non conventional cash flows**. So you should not get upset if you come across projects with non conventional cash flows because NPV rule still apply and you can always go with that.

https://www.capitalbudgetingtechniques.com/multiple-irr/

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Exercise:

1. What are the differences between NPV and IRR?
2. If findings inform that IRR is greater than the market rate of interest (the actual interest rate that is paid on deposits and investments), then should we invest?

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Other Cost-benefit Evaluation Techniques

- Annualized ROI= (average annual profit/investment)x100
- Net profit =Total income – Total costs
- **Benefit-Cost** Ratio (BCR) = (benefit/cost)x100
- Payback period = Time taken to break even
- Decision trees

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Exercise

Calculate the Net Profit, Payback and ROI

Year	Project 1	Project 2	Project 3
0	-100,000	-100,000	-120,000
1	10,000	30,000	30,000
2	10,000	30,000	30,000
3	20,000	30,000	30,000
4	20,000	20,000	25,000
5	100,000	350,000	50,000
Net profit	60,000		
Payback	4.4		
A. ROI	12%		

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Exercise

Calculate the Net Profit, Payback and ROI

Year	Project 1	Project 2	Project 3
0	-100,000	-100,000	-120,000
1	10,000	30,000	30,000
2	10,000	30,000	30,000
3	20,000	30,000	30,000
4	20,000	20,000	25,000
5	100,000	350,000	50,000
Net profit	60,000	360,000	45,000
Payback	4.4	3.5	4.1
A. ROI	12%	72%	9%

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Risk evaluation

- Identify risks and quantify their effects
- Can prepare a risk matrix
  - Prepare a checklist of possible risks
  - Classify risks according to their impact (high[H], medium[M], low[L])
  - Classify risks according to their likelihood (high[H], medium[M], low[L], exceedingly unlikely[–])

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Risk and NPV

- A risk is an uncertainty attached to the future cash flows.
- NPV → present value of a rupee one year later is definitely less than one rupee.
- NPV with risk → A safe rupee is worthier than a risky one.
- There is risk associated with future cash flows.
- High risk → use a high discount rate to calculate NPV

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Risk and Cost-Benefit Analysis

Sales	Annual Sales income (Rs.) -i	Probability- p	Expected Value (Rs) – i*p
High	800,000	0.1	80,000
Medium	650,000	0.6	390,000
Low	100,000	0.3	30,000
Expected Income			500,000

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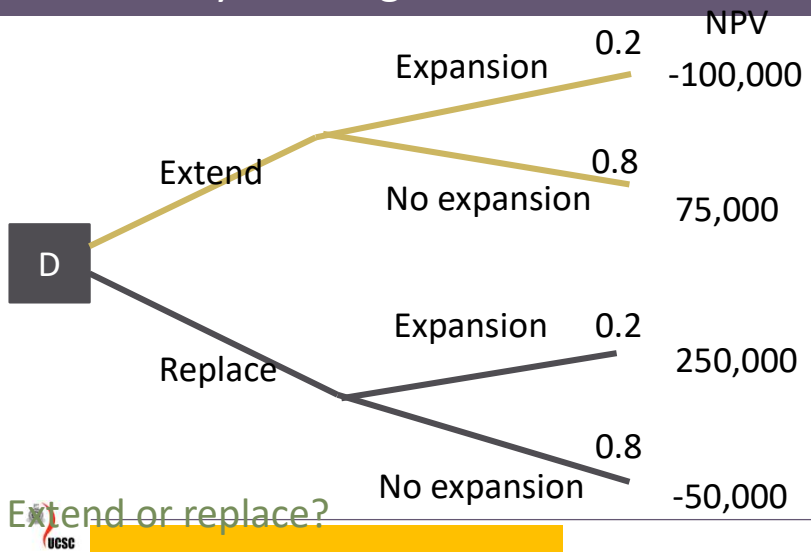
Risk Analysis Using Decision Trees



Extend or replace?

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Initiation: Project charter

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Develop Project Charter

- Projects are initiated by an entity external to the project such as a sponsor, program or project management office (PMO) staff person.
- A project manager is identified and assigned prior to the start of planning.
- Project Charter is the process of developing a document that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.

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Develop Project Charter contd.

- It's like a partnership between the performing organization and the requesting organization.
- The Project Charter is authorized by a sponsor, not the project manager, but he is preferred to be participated in developing it.
- The project charter should be authored by the sponsoring entity (product owner).
- The approval of the project charter formally initiates the project.

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Project Charter Contd.

- Defines the **purpose** (goal and objectives) of the project -**high-level requirements** may be documented
- Decides the **project duration**
- Identifies the **project scope and deliverables**
- Identifies **financial and other resource** requirements
- Identifies the **stakeholders** and defines **their roles** and responsibilities.

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Project Charter includes

1. Project **vision and objectives**
2. **Scope** of the project
3. Project **deliverable**s
4. The list of project **stakeholders** and **their roles** and **responsibilities**
5. **Organizational structure** for the project
6. Project **plan**
7. Any **risks, issues and assumptions**

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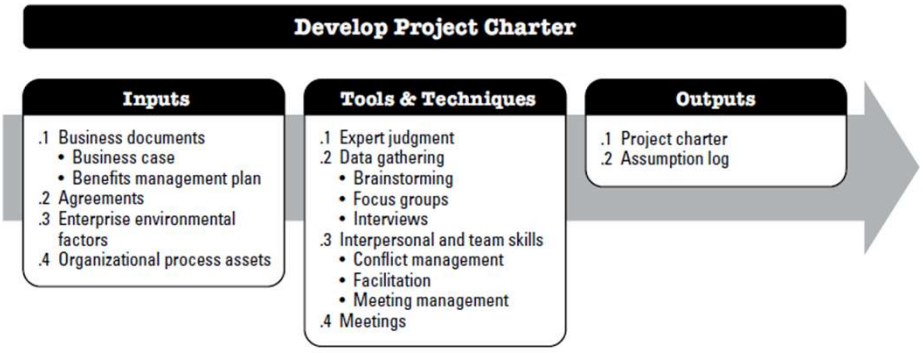
1. Develop Project Charter



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Project Charter : Inputs

Business Case

- The requesting organization or the customer , in the case of external projects, may write the business case . The business case is created as a result of one or more of the following : Market demand, Organizational Need, Customer Request, Technological advance Legal Requirement, Ecological Impacts, Social Need.

Agreements

- Agreements may take the form of contracts, memorandums of understanding (MOUs), service level agreements (SLA), letter of agreements, letters of intent, verbal agreements, email, or other written agreements.

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Project Charter: Tools and Techniques

Expert Judgment

- Obtained through individual consultations, such as one-on-one meetings and interviews. It could also be obtained through a panel format, such as focus groups and surveys.
- Other units within the organization, Consultants, Stakeholders, Professional and technical associations, Industry groups, Subject matter experts, Project Management Office (PMO).

Data Gathering

- Brainstorming
- Focus groups
- Interviews

Interpersonal and Team Skills

- Conflict management.
- Facilitation
- Meeting management

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Project Charter: Outputs

- ❑ Project purpose
- ❑ Measurable project objectives
- ❑ High-level requirements
- ❑ High-level project description and deliverables
- ❑ Overall project risk
- ❑ Summary milestone schedule
- ❑ Preapproved financial resources;
- ❑ Project approval requirements
- ❑ Key Stakeholder list
- ❑ Project exit criteria
- ❑ Assigned project manager, responsibility, and authority level
- ❑ Name and authority of the sponsor or other person(s) authorizing the project charter.

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Project Announcement

- Publicly announce the start of the project
  - Do a press release or a press conference
- Publish sponsorship and ownership
- Formally delegate authority to the project manager
- Commit resources to init

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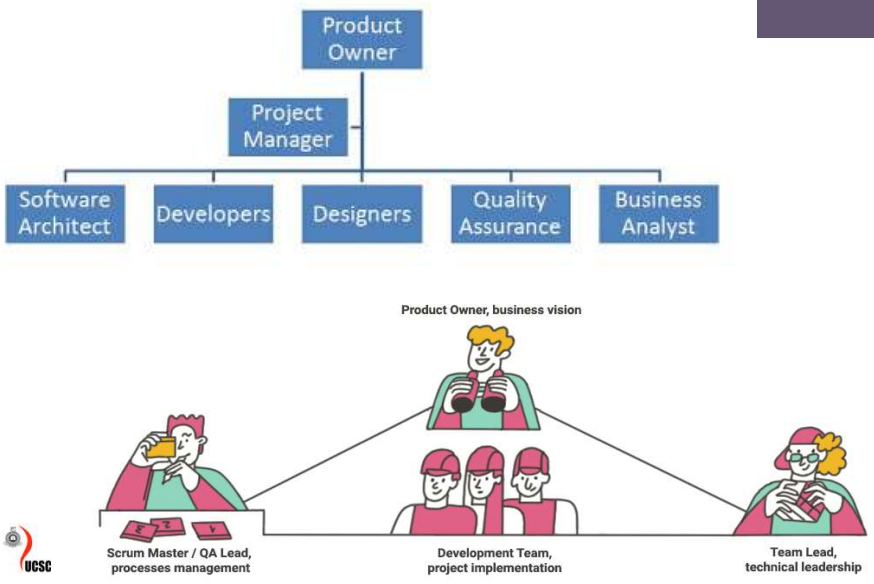
Project Team



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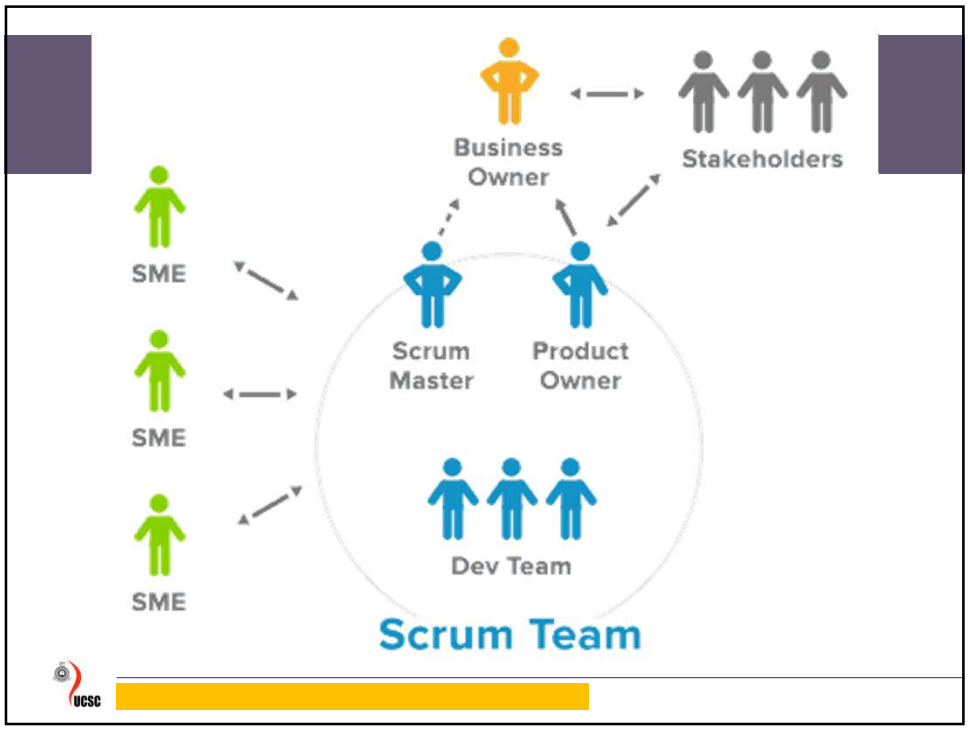

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Project Management Office (PMO)

- Organizing meeting and events
- Resource acquisition and allocation
- Support monitoring and controlling of project
- Disseminate project information
- Communication handling
- Administrative records handling
- Reporting lessons learnt
- Preparing project reports

Staff: PMO manager, administrator/registrar, secretory, assistants…

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ACTIVITY TIME

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1. Which of the following is true related to Project Charter? It;

A. is a project initiation document.
B. explains the importance of the project and how it will succeed.
C. describes how the project is structured and executed.
D. is a report to describe the final evaluation results of the project.
E. is a portfolio reporting all the activities of the project.

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2. The list of major activities that have to be carried out during project initiation includes;

A. develop a business case
B. identify and quantify activity-based risks
C. identify and allocate resources
D. produce ideal activity network
E. project announcement-press release

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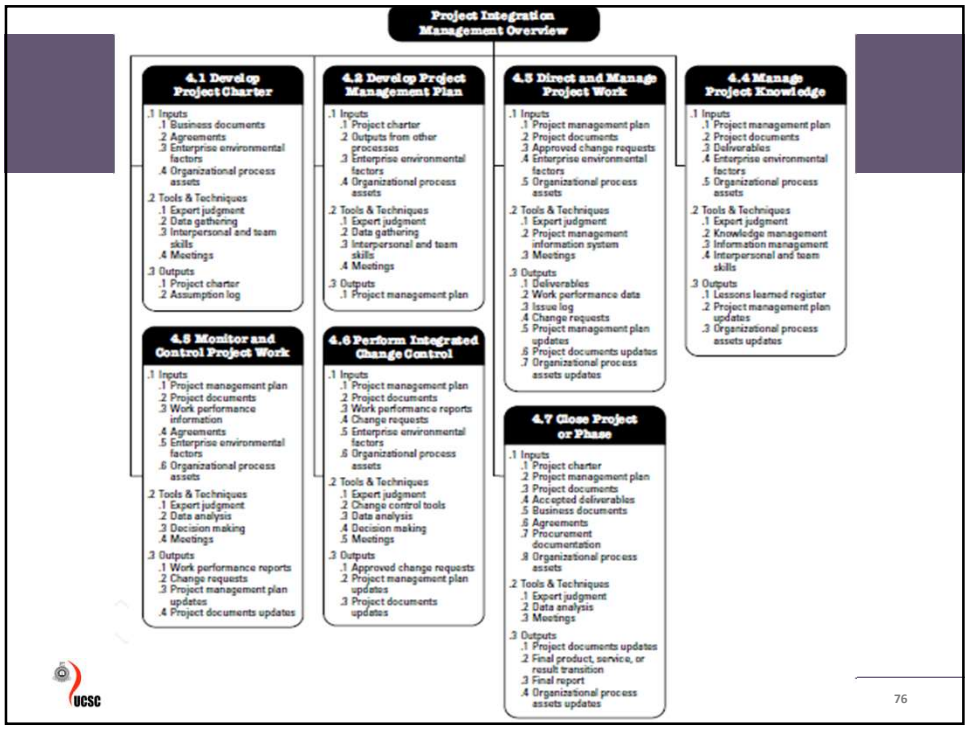

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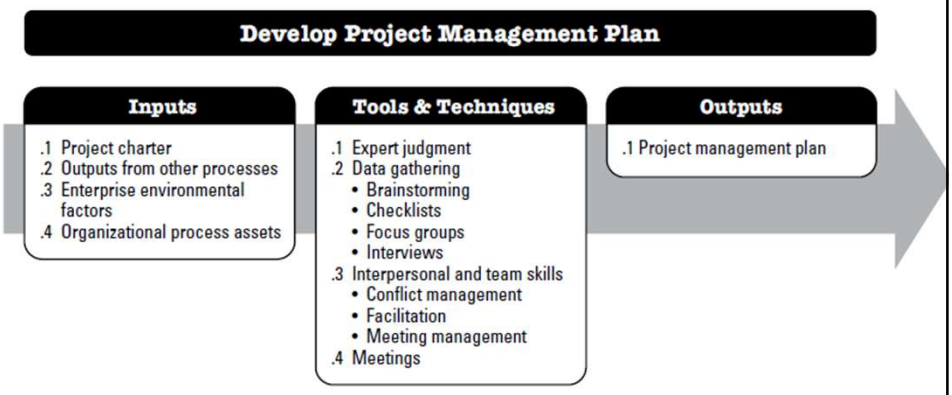
2. Develop Project Management Plan



Define, prepare, and coordinate all plan components and consolidate them into an integrated project management plan.

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Develop Project Management Plan…contd.

- It is the process of defining, preparing, and coordinating all plan components and consolidating them into an integrated project management plan.
- The project management plan defines how the project is executed, monitored and controlled, and closed.

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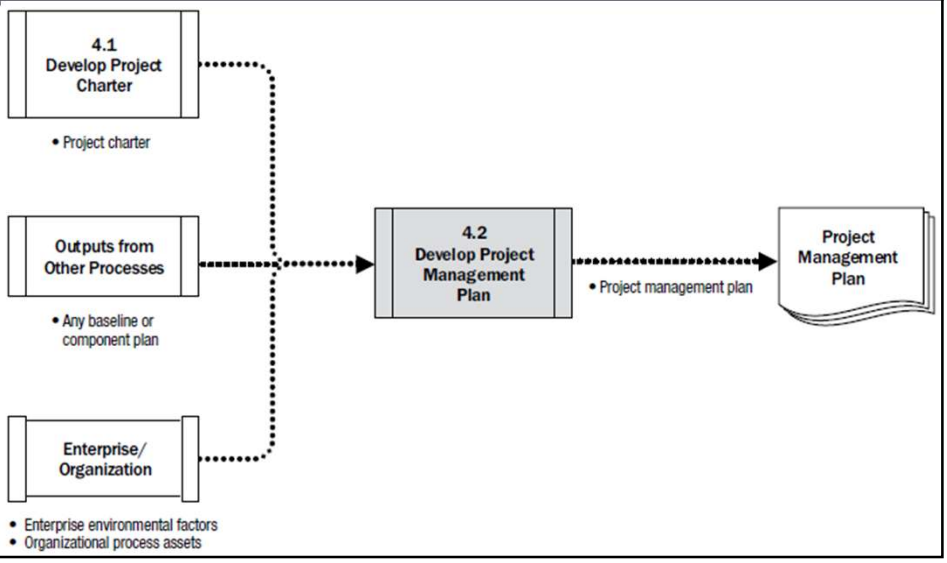
Project Management Plan



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3. Direct and Manage Project Work

Direct and Manage Project Work

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Any component .2 Project documents • Change log • Lessons learned register • Milestone list • Project communications • Project schedule • Requirements traceability matrix • Risk register • Risk report .3 Approved change requests .4 Enterprise environmental factors .5 Organizational process assets	.1 Expert judgment .2 Project management information system .3 Meetings	.1 Deliverables .2 Work performance data .3 Issue log .4 Change requests .5 Project management plan updates • Any component .6 Project documents updates • Activity list • Assumption log • Lessons learned register • Requirements documentation • Risk register • Stakeholder register .7 Organizational process assets updates

The process of leading and performing the work defined in the PMP and implementing approved changes to achieve the project's objectives.

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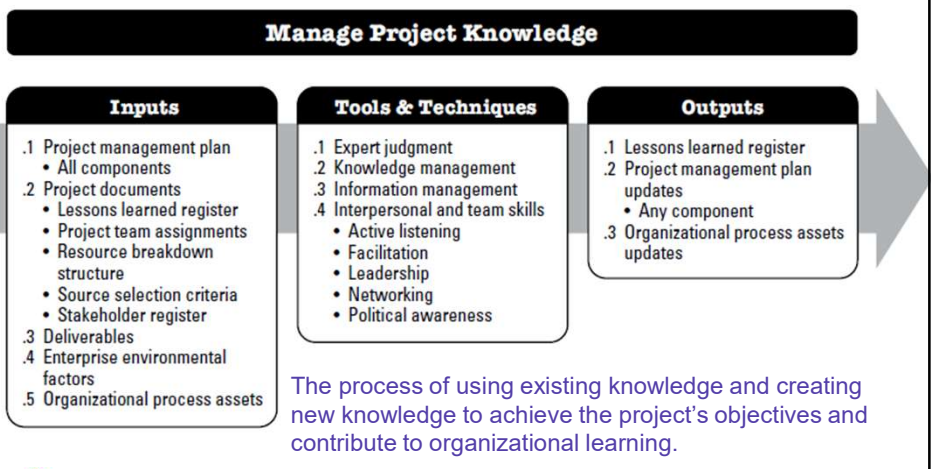
4. Manage Project Knowledge



The process of using existing knowledge and creating new knowledge to achieve the project's objectives and contribute to organizational learning.

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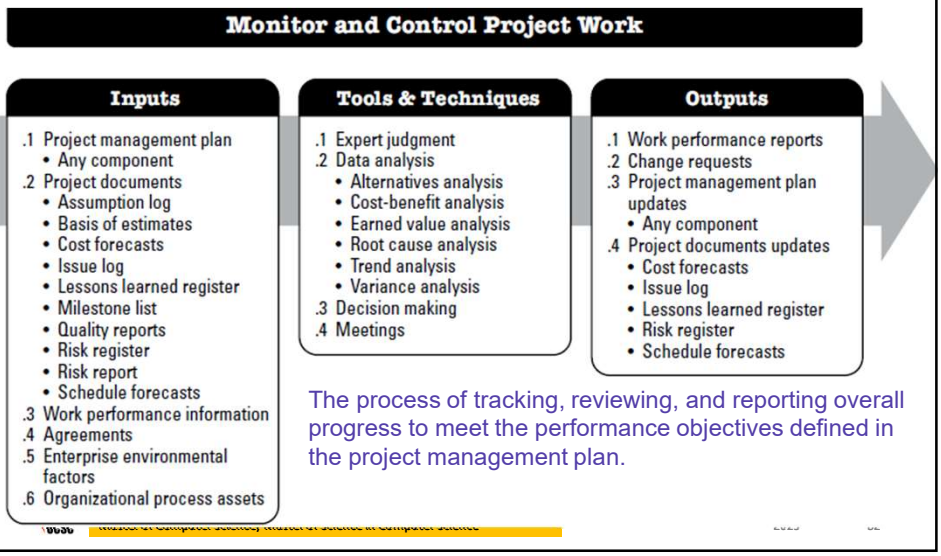
5. Monitor and Control Project Work



The process of tracking, reviewing, and reporting overall progress to meet the performance objectives defined in the project management plan.

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6. Perform Integrated Change Control

Perform Integrated Change Control

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Change management plan • Configuration management plan • Scope baseline • Schedule baseline • Cost baseline .2 Project documents • Basis of estimates • Requirements traceability matrix • Risk report .3 Work performance reports .4 Change requests .5 Enterprise environmental factors .6 Organizational process assets	.1 Expert judgment .2 Change control tools .3 Data analysis • Alternatives analysis • Cost-benefit analysis .4 Decision making • Voting • Autocratic decision making • Multicriteria decision analysis .5 Meetings	.1 Approved change requests .2 Project management plan updates • Any component .3 Project documents updates • Change log

The process of reviewing all change requests; approving changes and managing changes to plans, documents and assets and deliverables.

7. Close Project or Phase

Inputs	Tools & Techniques	Outputs
.1 Project charter .2 Project management plan • All components .3 Project documents • Assumption log • Basis of estimates • Change log • Issue log • Lessons learned register • Milestone list • Project communications • Quality control measurements • Quality reports • Requirements documentation • Risk register • Risk report .4 Accepted deliverables .5 Business documents • Business case • Benefits management plan .6 Agreements .7 Procurement documentation .8 Organizational process assets	.1 Expert judgment .2 Data analysis • Document analysis • Regression analysis • Trend analysis • Variance analysis .3 Meetings	.1 Project documents updates • Lessons learned register .2 Final product, service, or result transition .3 Final report .4 Organizational process assets updates

The process of finalizing all activities for the project, phase, or contract.

END OF TOPIC 2- INTEGRATION MANAGEMENT