

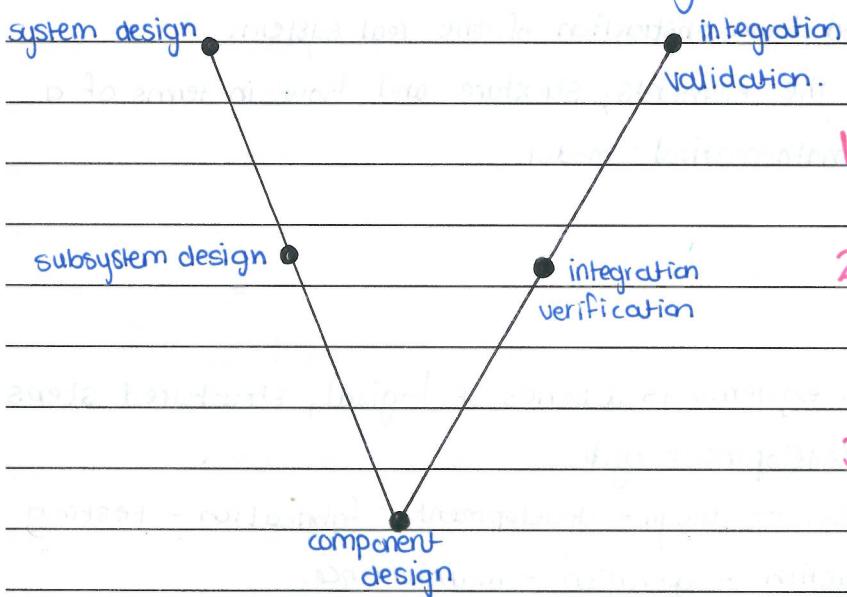
* System Engineering

Science of designing complex systems in their totality to insure that the components and subsystems making up the system are designed, fitted together, checked, operated in the most efficient way.

- Way to bring the whole system into being and to account for its whole life cycle — in operation and decommissioning.

* Dimensions of System engineering:

1. SE is a multifunctional, interdisciplinary concurrent effort
 - needs become the basis for defining system requirements
2. Addresses the systems structure and elements, its functional and physical design
3. Takes into account the way system will be produced, operated maintained and finally disposed of — entire life cycle.

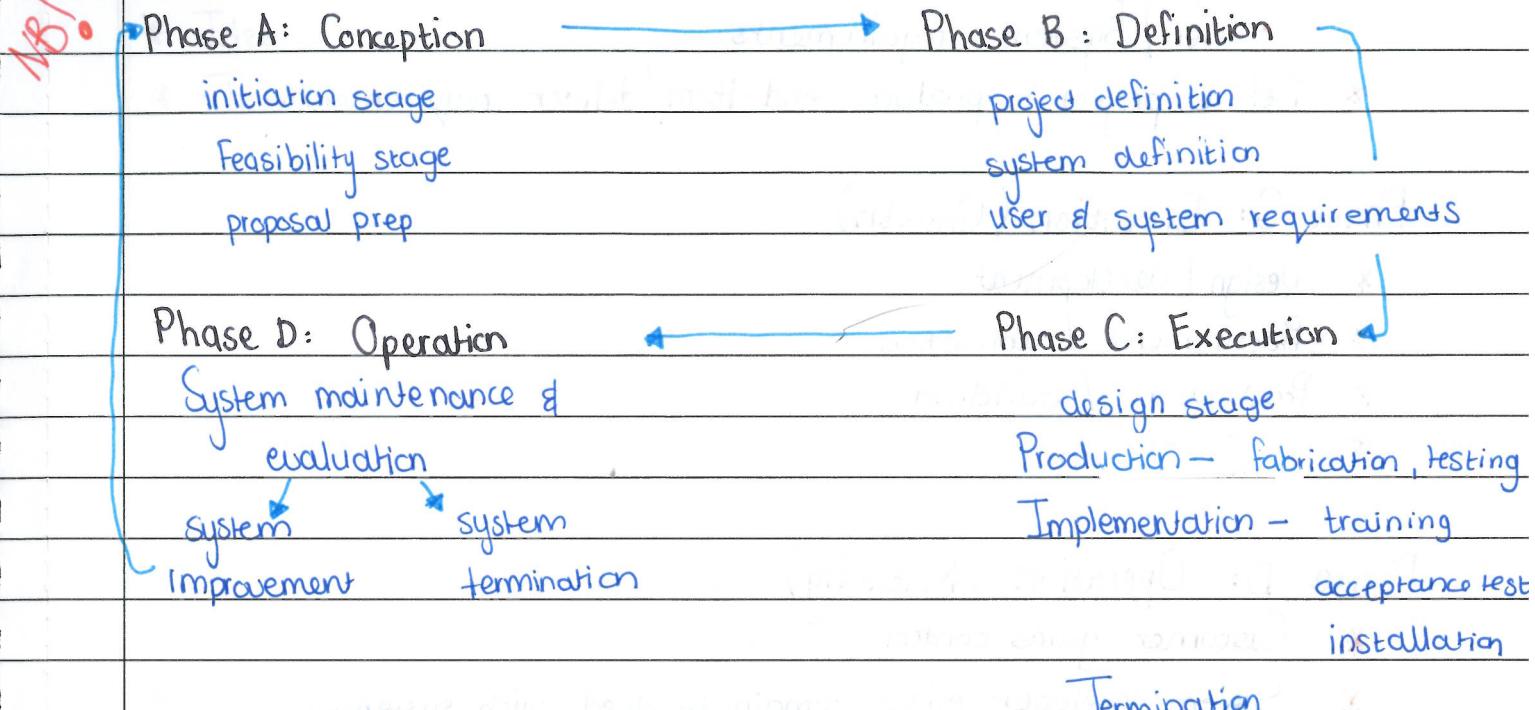


1. top-down analysis of details
(decomposing system into parts)
2. bottom-up synthesis (building up and integrating parts into successively larger parts)
3. evaluation (results = requirements)

3 System development Cycle and Project Conception

- Human made system termination is not inevitable.
- System kept alive through enhancement/replacement
- Every human made system begins as a project and ends as another project

System development Cycle:



Key Actors in SDC:

* Client

- Pays, his needs to be met

* User / Customer

- operates / beneficiary of project.

* System development Organization (SDO)

- party performs work for customer
- developer, contractor, consultant

Customer and Developer are usually separate organization / units

L.S.A. Developer: → Designer

→ Contractor

System development Cycle (Phases):

Phase A: Conception

- * perceived need or problem
- * initial screening or feasibility study
- * proposal
- * Concept approval / rejection

Phase B: Definition (Birth)

- * Specify requirements in detail
 - User / System requirements
- * Define project to produce end-item/deliver requirements.

Phase C: Execution (Growth)

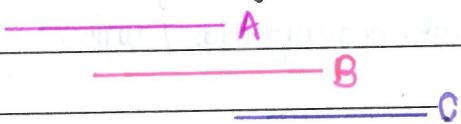
- * Design / development
- * Procurement / fabrication
- * Production / building
- * Installation

Phase D: Operation (Maturity)

- * Customer gains control
- * System developer might remain involved with system:
 - Maintenance
 - Evaluation
 - Enhancement
 - Replacement

Project life Span : Variation

Fast-tracking:



Phases overlap so work in successive

phases happen simultaneous

Pro: shorten project life span

Con: increase risk of mistakes

Phase A: Conception



1. Initiation
2. RFPI's
3. Feasibility
4. Need Analysis
5. Proposal preparation
6. Proposal evaluation
7. Contracting

1. Initiation

* Idea is developed based on a perceived problem & need

* Investigate if the idea has merit

→ Data Sources

- interviews
 - background research
 - documentation
- } done by the customer

→ Focus of initial investigation

- Symptoms, need, problems
- Objectives
- Preliminary alternatives
- People and groups affected.

* Customers decision to proceed.

2. RFP - Request for Proposal

* If the customer decides to proceed with idea, the next step to contact an SDC (developer) this is initiated by RFP

Purpose:

- describe the customers need, problem or idea
- Solicit suggestion / solution from SDC
- Inform SDC how to respond to RFP

* Contents:

a. Statement of Work (SOW)

- Description of problem, need or general type of solutions
- Scope of work to be performed
 - work to be included/excluded
 - work restrictions
 - criteria of acceptance for deliverables
- Requirements for results / end-items
 - specifications and standards
 - how results will be measured
 - expected completion date

Typo

- cost constraints.

b. Proposal Requirements

- Conditions placed on proposal
 - proposal contents / format
 - data requirements
 - sample forms to include
 - submission deadline.
- Uniform appearance

c. Contractual Provisions

- Type of contract to be awarded
 - Fixed price → Incentive
 - Cost plus → Special considerations

d. Additional Information/Data

- name of contact person for requesting additional data
- technical information to support SOW

* 3. Feasibility Study

- Study considers "feasibility" of the idea, proposed work given proposed benefits and constrained resources
- Justifies the idea or proposed solution.

1. Gain full understanding of the users need and current situation

2. Document current situation

- diagrams showing inputs/outputs/elements/attributes
- summarizes all info collected.

3. Devise alternative solutions

4. Analyze alternatives

- models to assess alternatives ability to meet objectives

5. include solution in proposal, technical section

6. Feasibility might include environmental impact

- Environmental impact →
- * summary of proposed development
 - * description of existing site
 - * Potential impacts * quality of air / soil
 - fisheries and sensitive organisms
 - Scenic resources
 - heritage / historical resources
 - * adverse impacts

* 5. Proposal *

* Contents:

1. Executive Summary

- more personal
- briefly state contractor's experience
- draw attention to unique features, price, and contractor's ability
- identify contact person

2. Technical Section (Statement of Work)

- Scope of work and planned approach
- based on the WBS, includes major phase, key tasks, milestones
- schedule of end item delivery
- describes benefits to demonstrate needs will be satisfied
- discusses problems / limitations

3. Cost payment section

- breakdown of projected hours, plus the billing hours
- contractual agreement and payment method

4. Legal Section

- contains anticipated, possible problems and provisions for contingency

5. Management / Qualification Section

- background of contractor organization, related to experience achievement and financial responsibility
- Organization of management. Resumes of personnel.

6 Customer review of proposal

→ Customer evaluates:

- Cost
- Benefits
- Success Likelihood
- Contractor Reputation
- Narrow the list

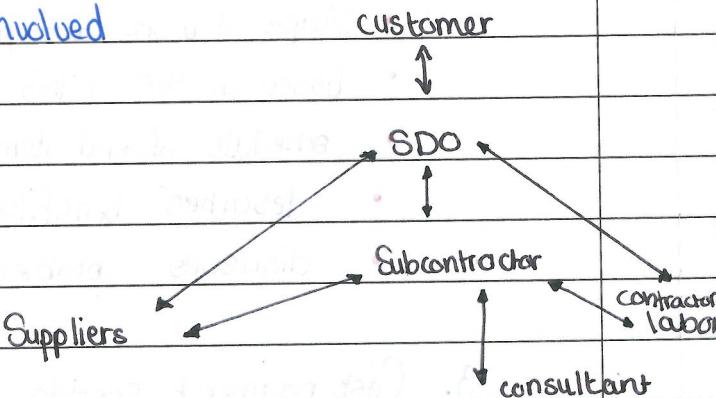
Proposals left after others have been discarded goes to negotiation.

Negotiating

- Customer and SDO meet to
 - Clarify terms (common understanding)
 - Reach agreement on schedule, price

- Ideally the would-be PM involved
 - Terms of contract
 - Customers situation
 - Competition

7 Contracting



- Agreement for one party (SDO) to do work (project) for another (customer)
- SDO is also a customer that contracts work to other parties
- SDO may only be needed to hire/manage resources
- Project team consists of numerous organizations held together by a contract