Chapter 4

Requirements Gathering and Analysis

Review

- Software engineering is a discipline that integrates process, methods, and tools for the development of computer software.
- Depending on the type of development project(s) they may be undertaking, organizations use the discipline provided by these frameworks to successfully achieve project goals.
- Any process model goes through:
  - Requirements definition
  - Requirement analysis
  - Preliminary design
  - Detailed design
  - Coding
  - Testing
  - Integration
  - Operations and maintenance
- The software process models can be broadly categorized into Linear process models and Evolutionary software process models.

Objectives

- *Describe the process of System Analysis*

- *Explain how a Feasibility Study is undertaken*

- *Describe the scope and activities of the Requirements phase of SDLC*

- *Explain the process of Requirements Gathering*

- *Discuss the process of Analysis Modeling*

- *Explain the rationale behind Essential Model*

Introduction

- The Software Development Life cycle starts with the 'Problem definition'.

- The 'Problem Definition' is the phase where a client's problem is identified and understood.

- After this, starts the 'system development' phase.

- A 'system' is a collection of inter-related components that work together to achieve some purpose.

System Analysis

- The specification of what the system is required to do

- Carried out with following objectives:
  - Identification and analysis of customer needs
  - System evaluation for feasibility
  - Performing economic and technical analysis
  - Allocating functions to manpower, database, hardware, software and other system elements
  - Establishing cost and schedule constraints
  - Creating a system definition that forms a foundation for all subsequent development activities

Feasibility Study

- A study conducted to find out whether the proposed system will be:
  - ◆ Possible
  - ◆ Affordable
  - ◆ Acceptable

Feasibility Study – When?

- A feasibility study is conducted to understand the issues that face a project before the project is undertaken.

Feasibility Study – Phases

- Need Analysis

- Economic Feasibility

- Technical Feasibility

- Legal Feasibility

- Evaluation of Alternatives

Need Analysis

- Seeking background information on the organization

- Understanding current issues to be tackled

- Understanding the user profile

Economic Feasibility

- An exercise in calculating cost-benefit analysis

- When benefits outweigh the cost, a system is feasible to implement

- Concerned with
  - Procurement Costs
  - Start-up Costs
  - Project Costs
  - Ongoing / Recurring costs

Technical Feasibility

- Helps in understanding what level and kind of technology is needed for a system

- Concerned with
  - Different technologies involved in the proposed system
  - Existing technology levels within the organization
  - The level of expertise to use the suggested technology

Legal Feasibility

- Entails
  - Copyright violations for systems that have to be developed for the open market
  - Framing of the contract for large systems
  - Violation of terms

- Aspects
  - Not required for all systems
  - legal experts needed

Evaluation of Alternatives

- Includes an evaluation of alternative approaches to the development of a system

- The option with the lowest cost and maximum returns is considered the most feasible option
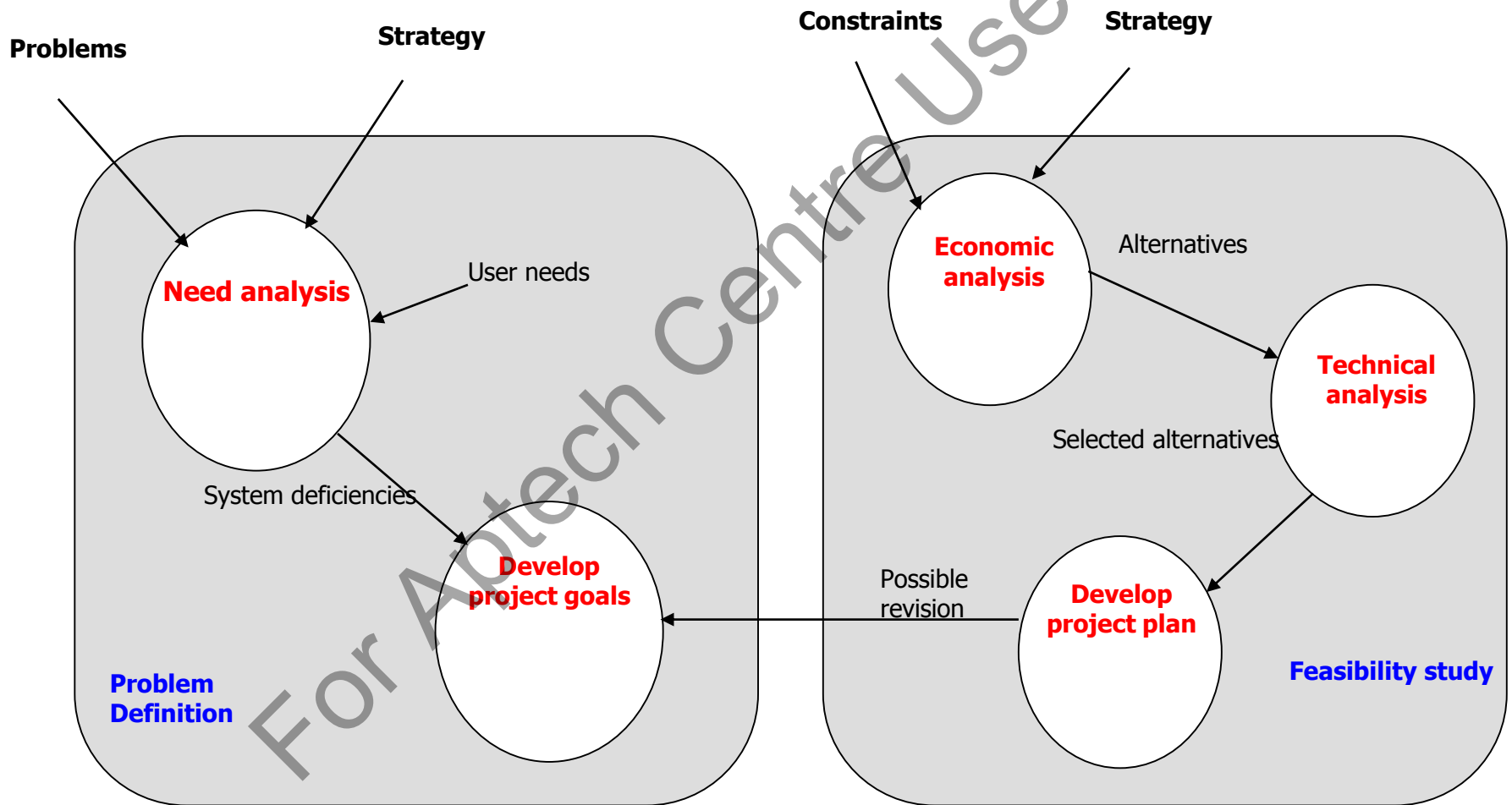
Feasibility studies - Outcome

- A feasibility report that
  - Summarizes the findings of the feasibility study
  - Presents the management with various implementation options
  - Each option is presented along with its costs and benefits and also the constraints of implementing the option

Feasibility studies - Purpose

- Provides
  - The senior management of an organization the with economic justification
  - Implementation constraints for having a new system in place

- An important input to the management to give the go-on / no-go decision for a project

Feasibility Study

Problems   **Strategy**   **Constraints**   **Strategy**

Need analysis

User needs

System deficiencies

Develop project goals

Problem Definition

Economic analysis

Alternatives

Technical analysis

Selected alternatives

Possible revision

Develop project plan

Feasibility study

Project Proposal

- Objectives
  - Indication of first-cut calendar schedules for the project
  - Description of application areas for dealing with identified problems
  - Phase wise demarcation of activities
  - Outlining hardware, software, manpower costs
  - Identification of training needs
  - Calculation of total costs of the project
  - Enumeration of the expected benefits

Requirements analysis

- Detailed investigation
  - The process of understanding the working of the current system in detail

- Analysis or determination of system requirements

  - The process of determining the requirements of the new system

Requirements Specifications Document

- The contents of the RSD are
  - Functional and performance requirements of a system
  - Input-Output formats
  - Design constraints

- Detailed investigation
  - The process of understanding the working of the current system in detail

- Analysis or determination of system requirements
  - The process of determining the requirements of the new system
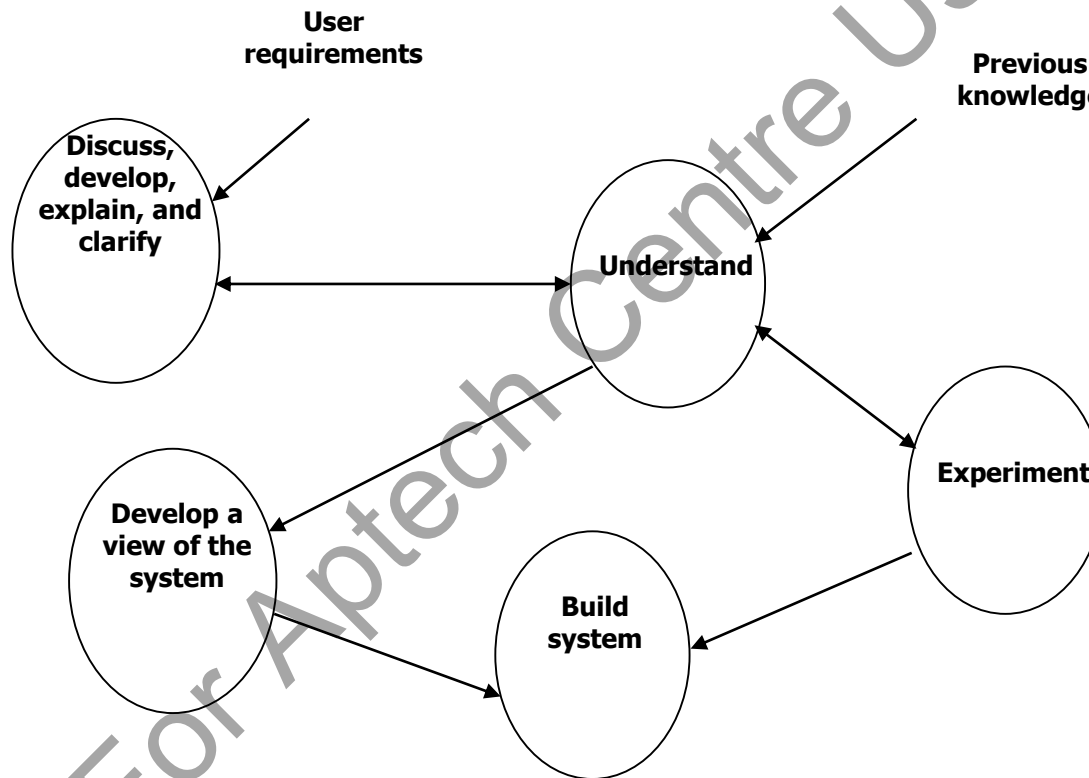
Gathering Requirements

- Interviews

- Questionnaires

- Record Reviews

- Observation

- Facilitated Application Specification Techniques (FAST)

- Quality Function Deployment (QFD)

Analysis of Requirements Gathering

- Understand the Information Domain of the problem

- The expected system functionality needs to be identified

- The model to be built, to depict system information, functionality and behavior must be identified

- The model must be partitioned so as to expose the details in a layered manner

- The analysis process should move from essential information representation to complete system implementation in user environment

Analysis of Requirements Gathering Contd...

User requirements

Previous knowledge

Discuss, develop, explain, and clarify

Understand

Experiment

Develop a view of the system

Build system

Analysis models

- Structured Analysis

- Object-oriented Analysis

Essential Model

- Consists of
  - Environmental Model
  - Behavioral Model

Environmental Model

Outside Environment of the system

Inside Environment of the system
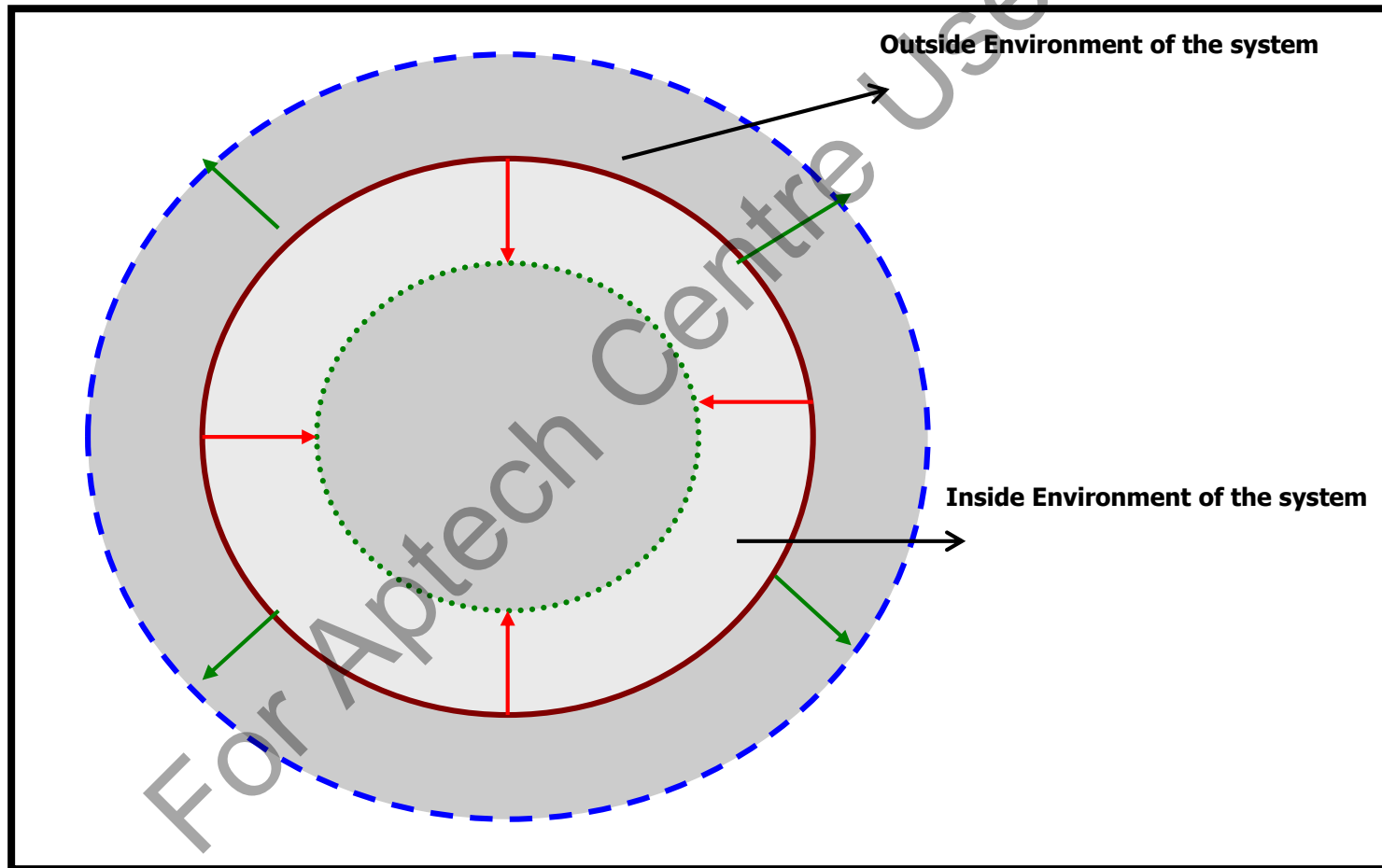
Environmental Model Contd...

- Tools
  - Statement of Purpose
  - Context Diagram
  - Event List

Behavioral Model

- Defines
  - The internal functioning of the proposed system
  - The inter-relationships between the various entities of the proposed system
  - Data used in the proposed system

Behavioral Model Contd…

- Tools
    - Data flow diagrams
    - Entity relationship diagrams
    - Data dictionary
    - Process specifications

Summary

- A System is a collection of interrelated components that work together to achieve some common objective and System Analysis is the specification of what the system is required to do.

- A Feasibility Study is conducted to find out whether the proposed system are:
  - Possible – to build it with the given technology and resources
  - Affordable – given the time and cost constraints of the organization
  - Acceptable – for use by the eventual users of the system

- A feasibility study is not justified for projects where benefits out-weigh costs, technical risks are not high, and there are no alternatives to be suggested.

- The different aspects related to Feasibility Study are: Need Analysis, Economic Feasibility, Technical Feasibility, Legal Feasibility, and Evaluation of Alternatives.

Summary Contd...

- Project Proposal is the document that is prepared from the feasibility report, which outlines the characteristics of a system and gives first-cut calendar schedule.

- Once the problem is analyzed and the essentials understood, the requirements must be specified in the Requirement Specification Document.

- Requirements Gathering involves conducting a preliminary meeting with the client to understand and analyze his needs.

- A software model must be capable of modeling the information that software transforms, its functions and behaviors.

- OOA helps to create a precise and concise model of the problem in terms of real world objects.

- Structured Analysis is a set of techniques and graphical tools that allow us to develop system specifications that are easily understandable by the user.

Summary Contd...

- A dataflow diagram is a pictorial representation of a system's functions. Functions form part of various processes that are executed for a system.
- Two components of the Essential Model are:
    - Environmental Model
    - Behavioral Model
- Project sizing refers to estimating the size and complexity of a project.
- Effort estimation refers to estimation of the amount of human effort required to do the project.
- The project size can be measured by using the Program Complexity Method.
- The most commonly used measure of source code program length is the number of lines of code.
- Function Points measure size in terms of the amount of functionality in a system.
- COCOMO can be used to estimate the development effort involved in a project.