Module 6 ppt2

Embedded Systems

Embedded product development Life cycle

Introduction

- Software development company-SDLC
- Product development company-EDLC
- E.g. Preparation of any food dish
  - Dish selection and Ingredient list
  - Procurement of items in the list
  - Preparation and initial taste testing
  - Serving and final taste testing
- Embedded product development view
  - Father-Overall management(purchase etc)
  - Mother-Developing and testing
  - We –End user /Client

Embedded product development Life cycle

Source: Introduction to Embedded systems by Shibu K V

Embedded product development Life cycle

What is EDLC ?

- EDLC is an ‘Analysis-Design-Implementation based’ standard problem solving approach for Embedded product development
  - Analysis-What product need to be developed
  - Design-Good approach for building it
  - Implementation- To develop it

Embedded product development Life cycle

Why EDLC ?

- Essential in understanding the scope and complexities involved in any embedded product development
- Defines interaction and activities among various groups of product development sector
  - Project management
  - System design and development
  - System testing
  - Release management and quality assurance

Objectives of EDLC

- Ensuring High Quality for products
- Risk minimization and defect prevention through management
- Maximise the productivity

Objectives of EDLC

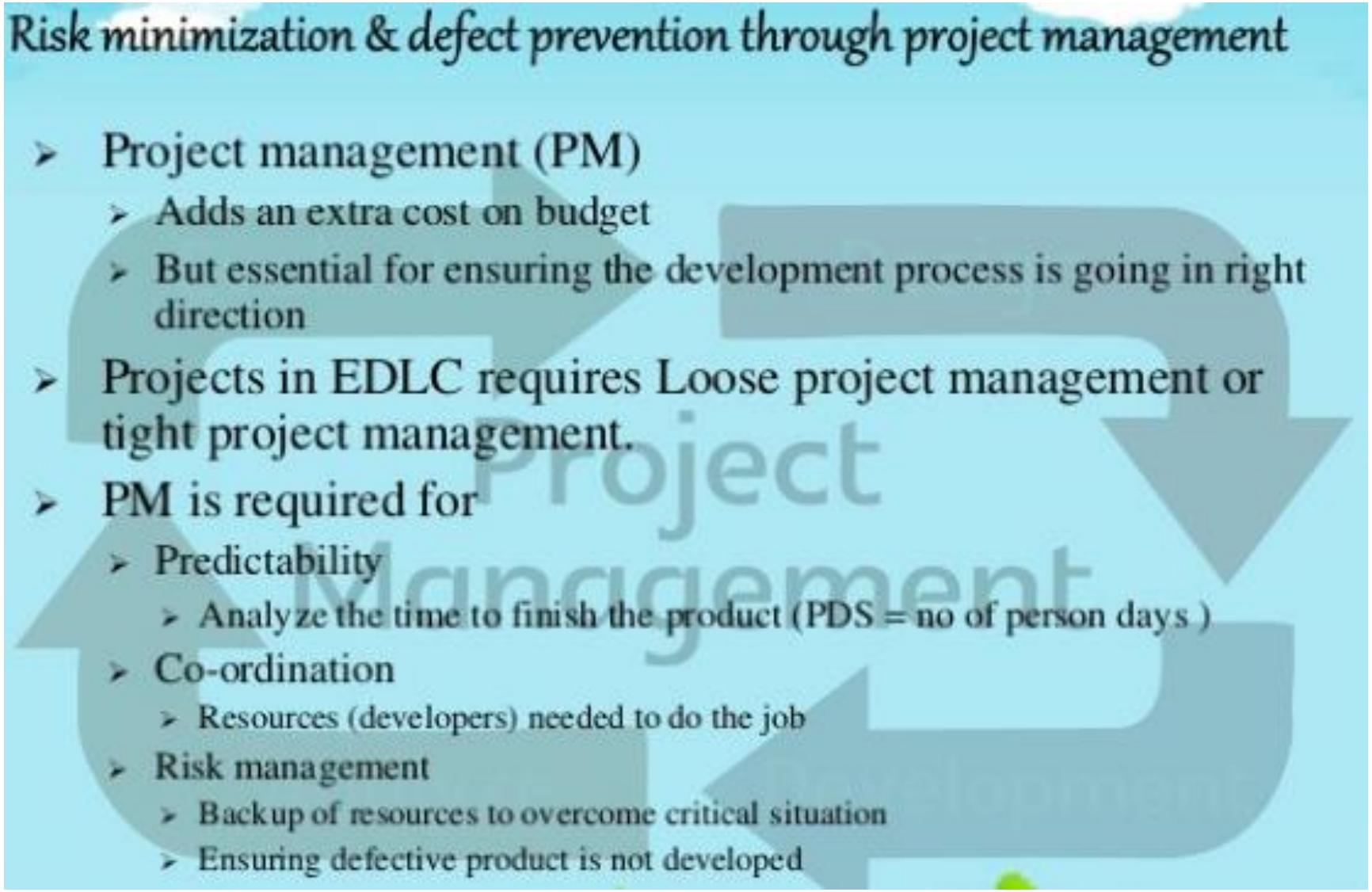
- Aim of any product development is the Marginal benefit
- Marginal benefit = Return on investment
- Product needs to be acceptable by the end user i.e. it has to meet the requirements of the end user in terms of quality, reliability & functionality.
- EDLC helps in ensuring all these requirements by following three objective
  - Ensuring that high quality products are delivered to user
  - Risk minimization and defect prevention in product development through project management
  - Maximize productivity

Embedded product development Life cycle

Ensuring high quality products

- The primary definition of quality in any embedded product development is return on investment achieved by the product.
- In order to survive in market, quality is very important factor to be taken care of while developing the product.
- Qualitative attributes depends on the budget of the product so budget allocation is very important.
- Budget allocation might have done after studying the market, trends & requirements of product, competition .etc.

Embedded product development Life cycle



Embedded product development Life cycle

Increased productivity

- Measure of efficiency as well as ROI

Different ways to improve the productivity are

- Saving the manpower
  - X members – X period
  - X/2 members – X period
- Use of automated tools where ever is required
- Re-usable effort – work which has been done for the previous product can be used if similarities present b/w previous and present product.
- Use of resources with specific set of skills which exactly matches the requirements of the product, which reduces the time in training the resource

Different phases of EDLC

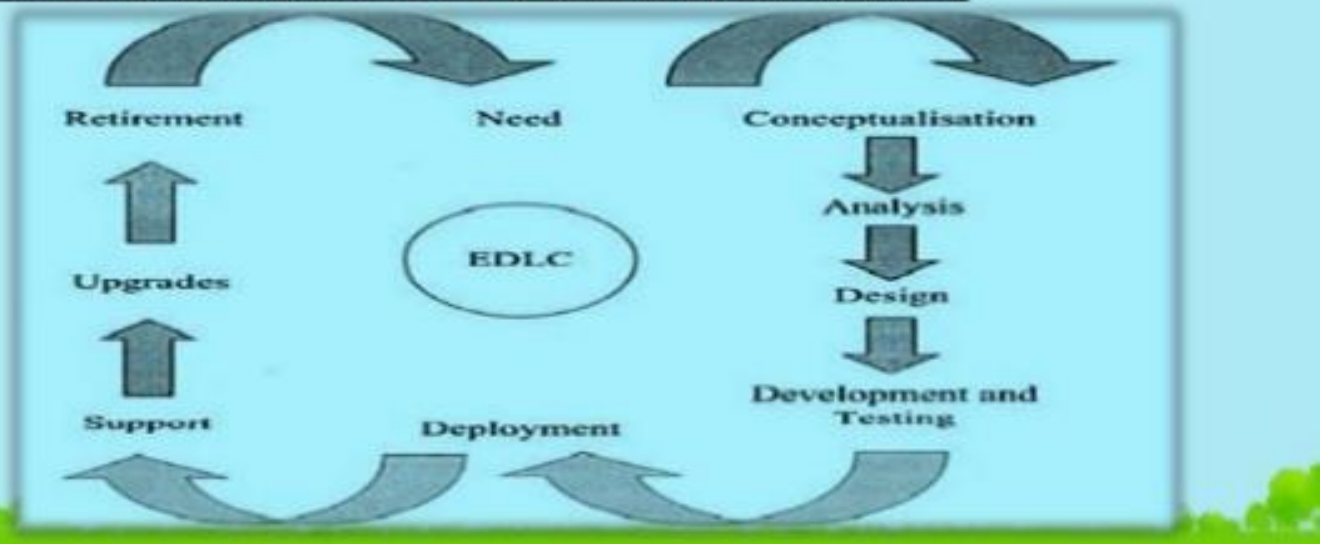
- Need
- Conceptualization
- Analysis
- Design
- Development and Testing

Embedded product development Life cycle

Different phases of edlc

- A life cycle of product development is commonly referred as the "model"
- A simple model contains five phases
  - Requirement analysis
  - Design
  - Development and test
  - Deployment and maintenance
- The no of phases involved in EDLC model depends on the complexity of the product

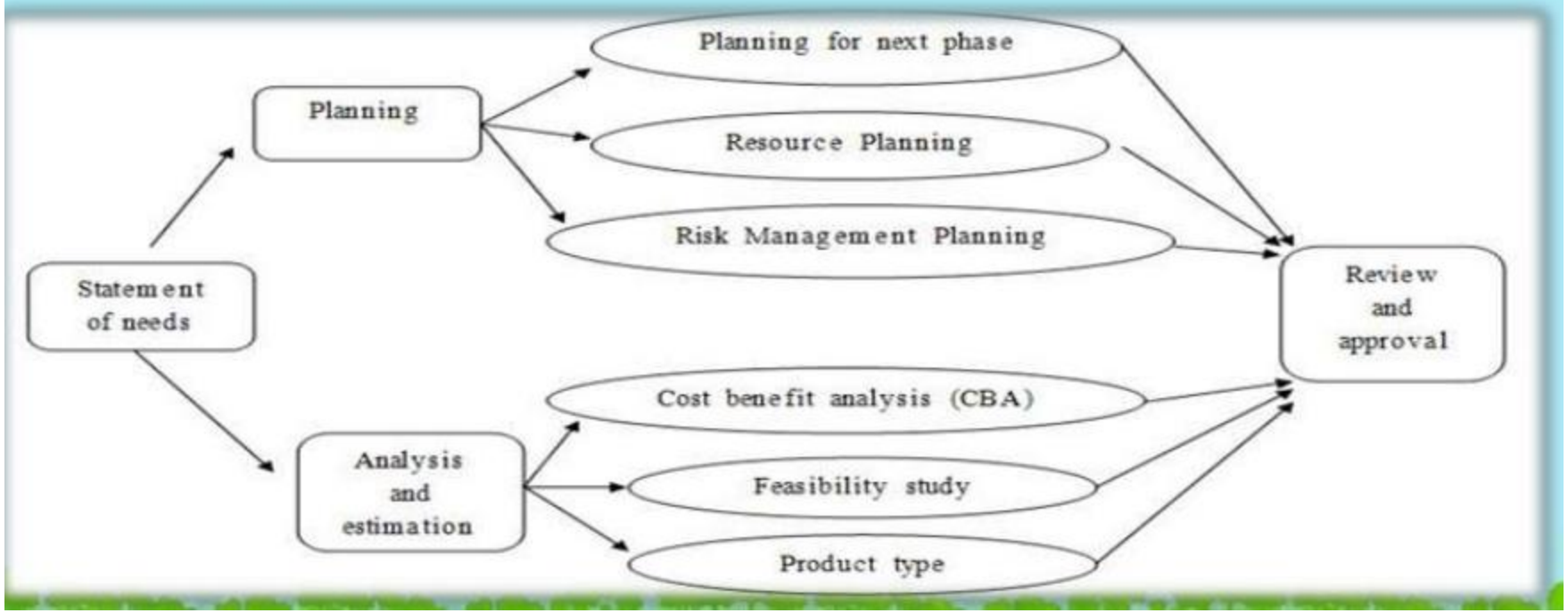
Classic Embedded product development life cycle model

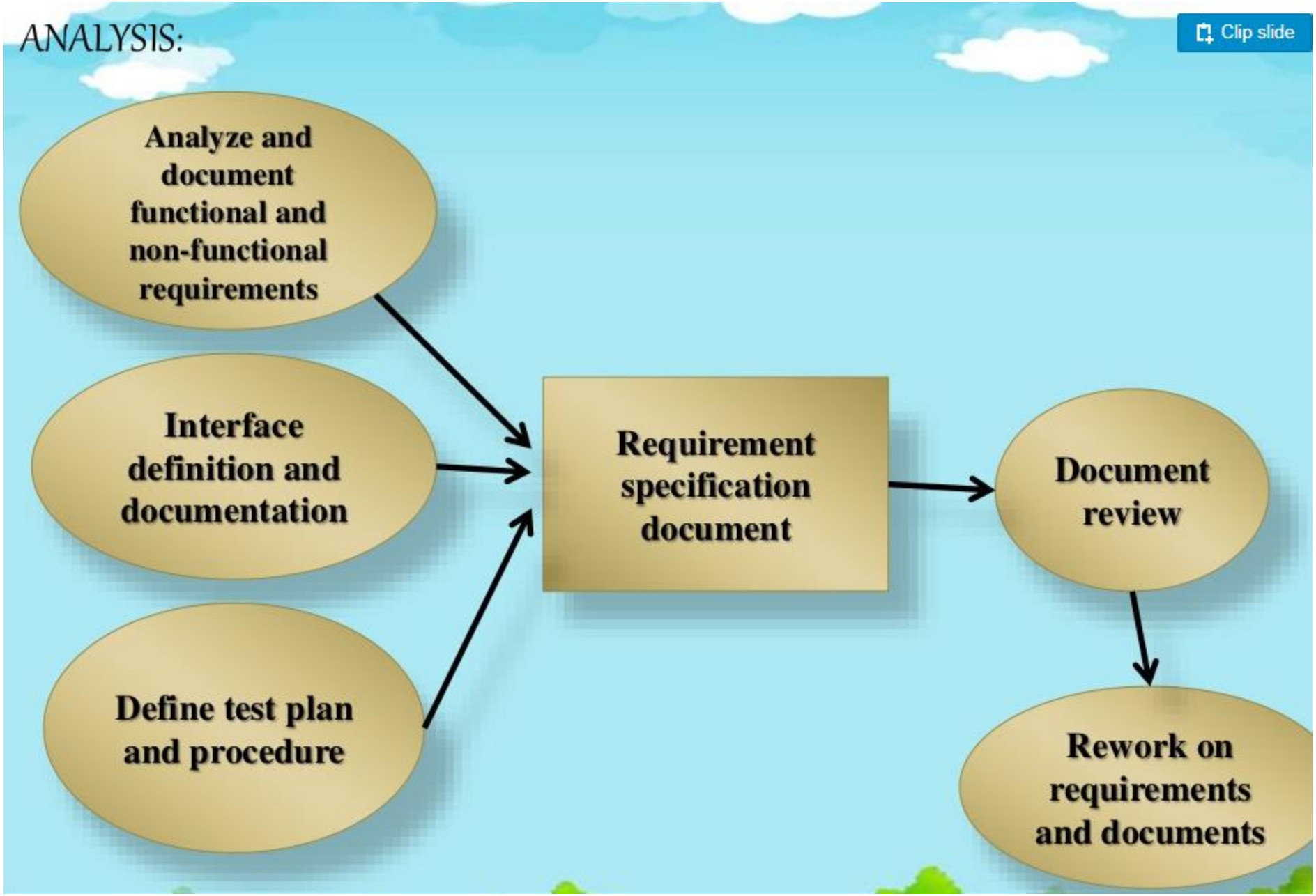


NEED:

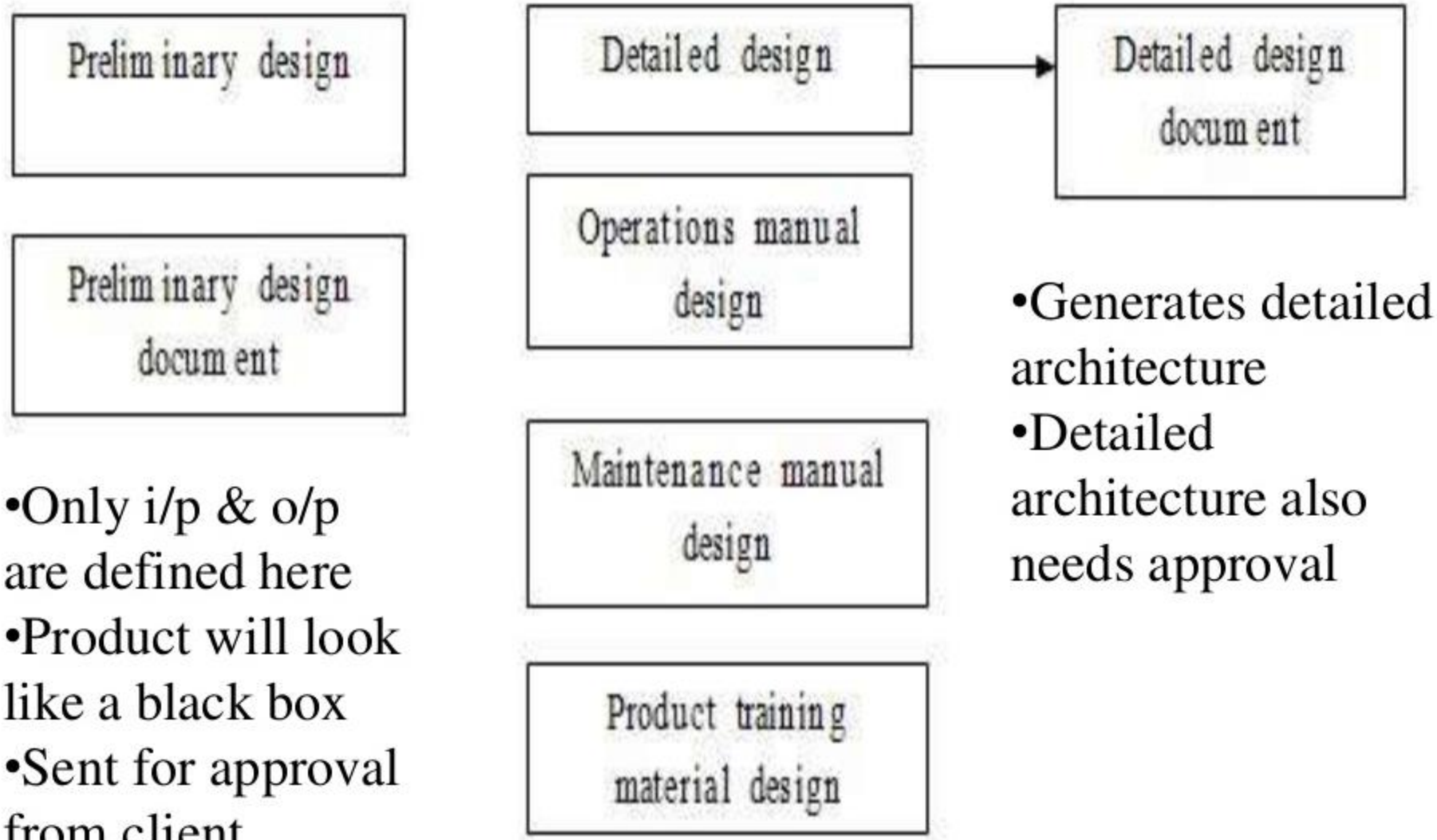
- Any embedded product may evolves as an output of a need.
- Need may come from an individual/from public/from company(generally speaking from an end user/client)
  - New/custom product development
  - Product re-engineering
  - Product maintenance

CONCEPTUALIZATION:




ANALYSIS:
Clip slide
Analyze and document functional and non-functional requirements
Interface definition and documentation
Define test plan and procedure
Requirement specification document
Document review
Rework on requirements and documents

DESIGN: Deals with the entire design of the product taking the requirements into consideration and focuses on how the functionalities can be delivered.



- Only i/p & o/p are defined here
- Product will look like a black box
- Sent for approval from client

- Generates detailed architecture
- Detailed architecture also needs approval

Embedded product development Life cycle

DEVELOPMENT AND TESTING:

- Development phase transforms the design into realizable product
- Design is transformed into hardware and firmware
- Look and feel of the device is very important

Testing phase can be divided into

- Unit testing – independent testing of hardware and firmware
- Integration testing – testing after integrating hardware and firmware
- System testing – testing of whole system on functionality and non-functionality basis
- User acceptance testing – testing of the product against the criteria mentioned by the end-user/client
- Test reports

Embedded product development Life cycle

DEPLOYMENT:

- A process of launching fully functional model into the market

SUPPORT:

- Deals with the operation and maintenance of the product
- Support should be provide to the end user/client to fix the bugs of the product

UPGRADES:

- Releasing of new version for the product which is already exists in the market
- Releasing of major bug fixes.

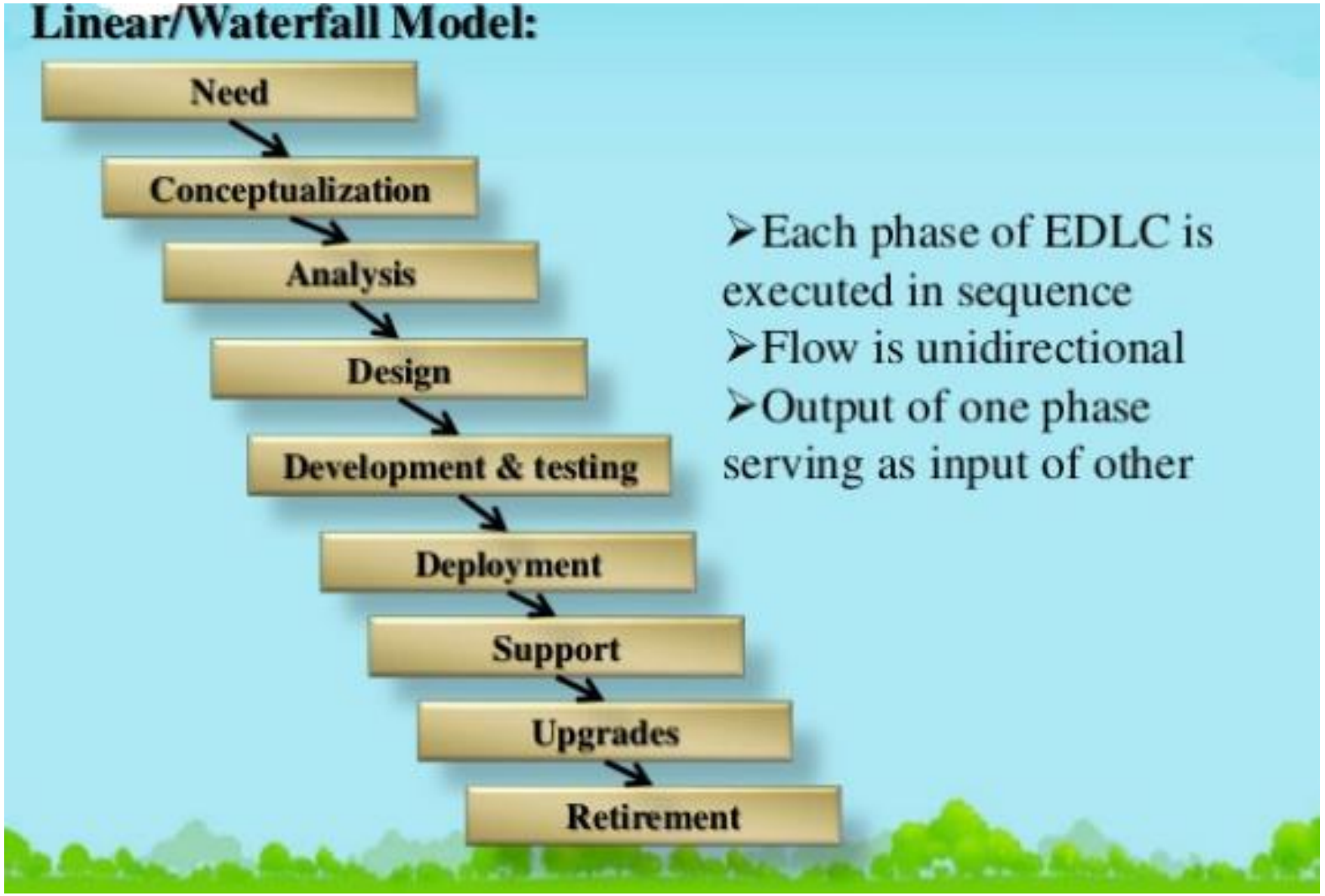
RETIREMENT/DISPOSAL:

- Everything changes, the technology you feel as the most advanced and best today may not be the same tomorrow
- Due to this the product cannot sustain in the market for long
- It has to be disposed on right time before it causes the loss.

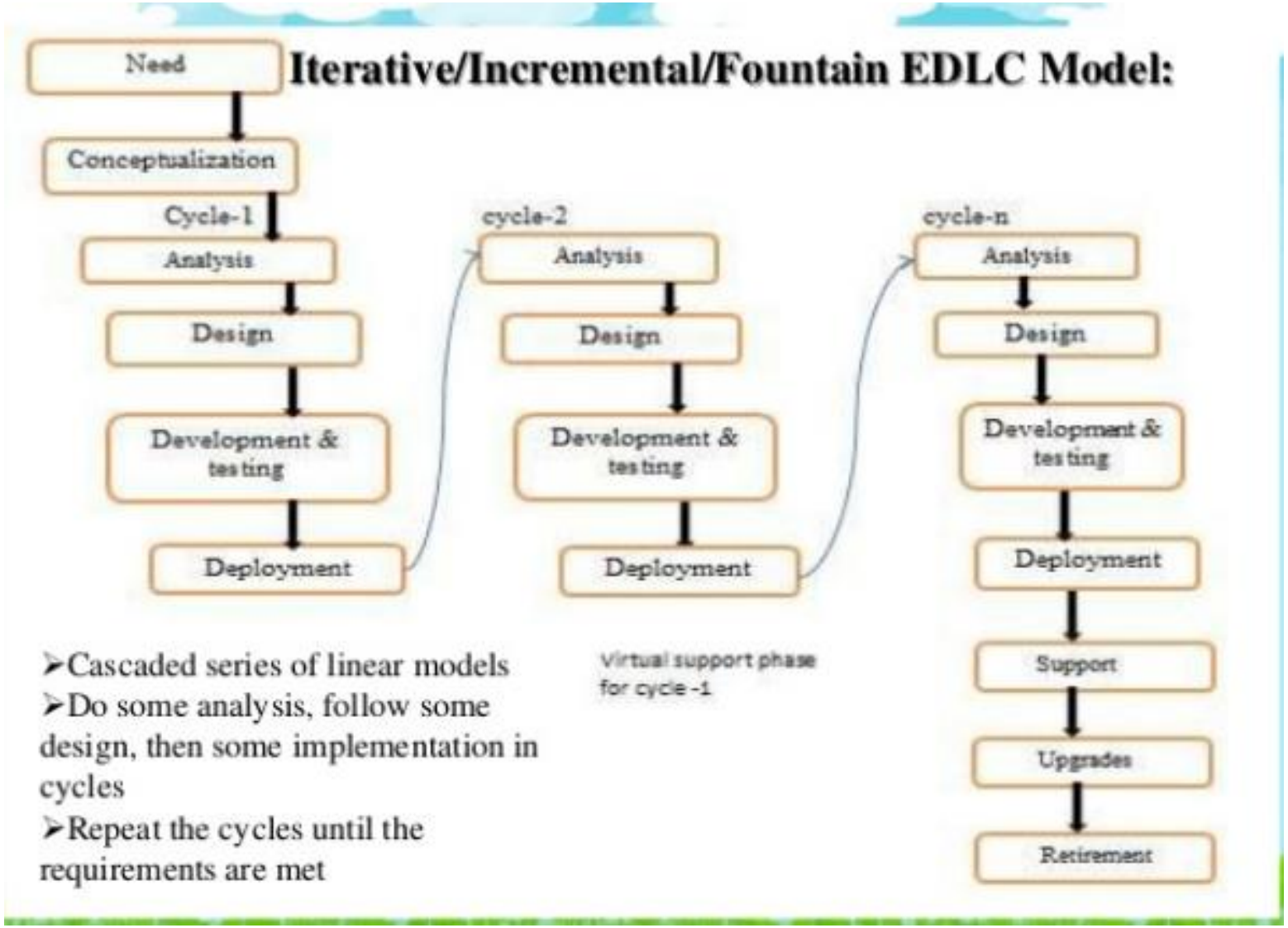
EDLC Approaches(Modeling the EDLC)

- Linear or Waterfall model
- Iterative/Incremental or Fountain Model
- Prototyping/Evolutionary Model
- Spiral Model

Embedded product development Life cycle



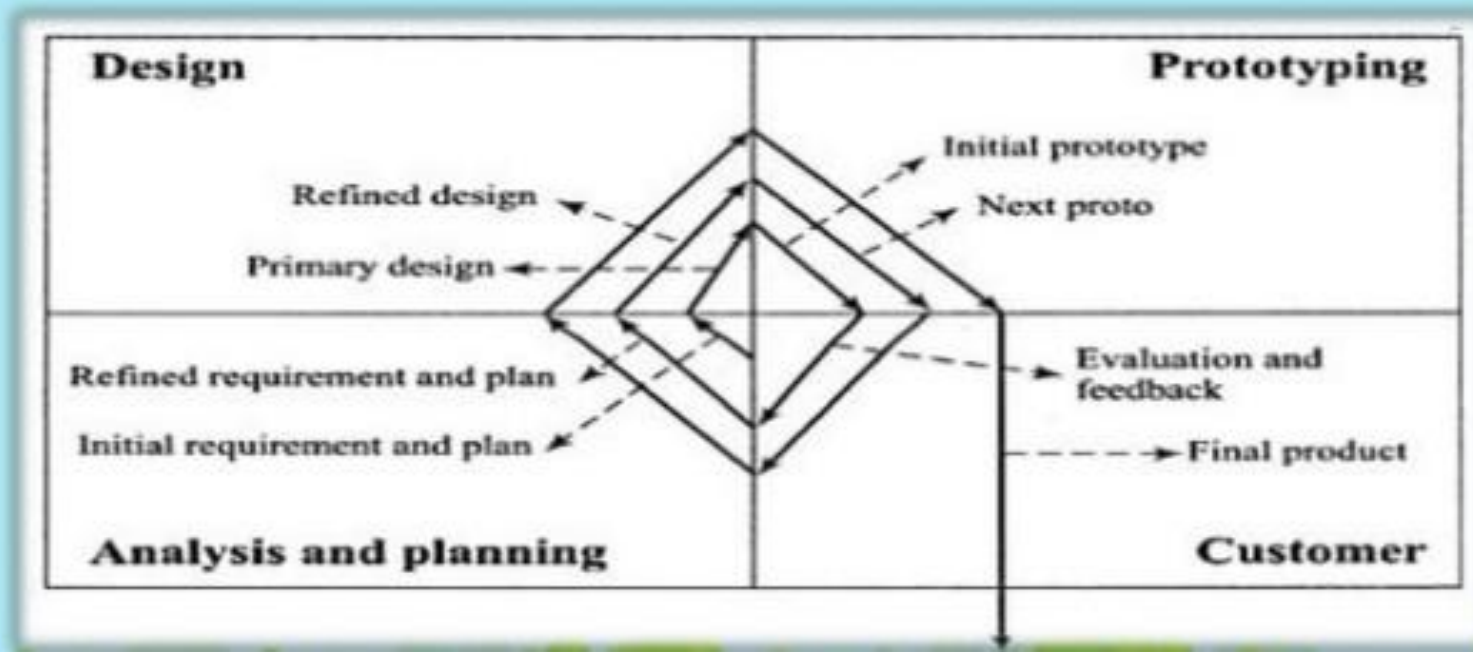
Embedded product development Life cycle



Embedded product development Life cycle

Prototyping/evolutionary model:

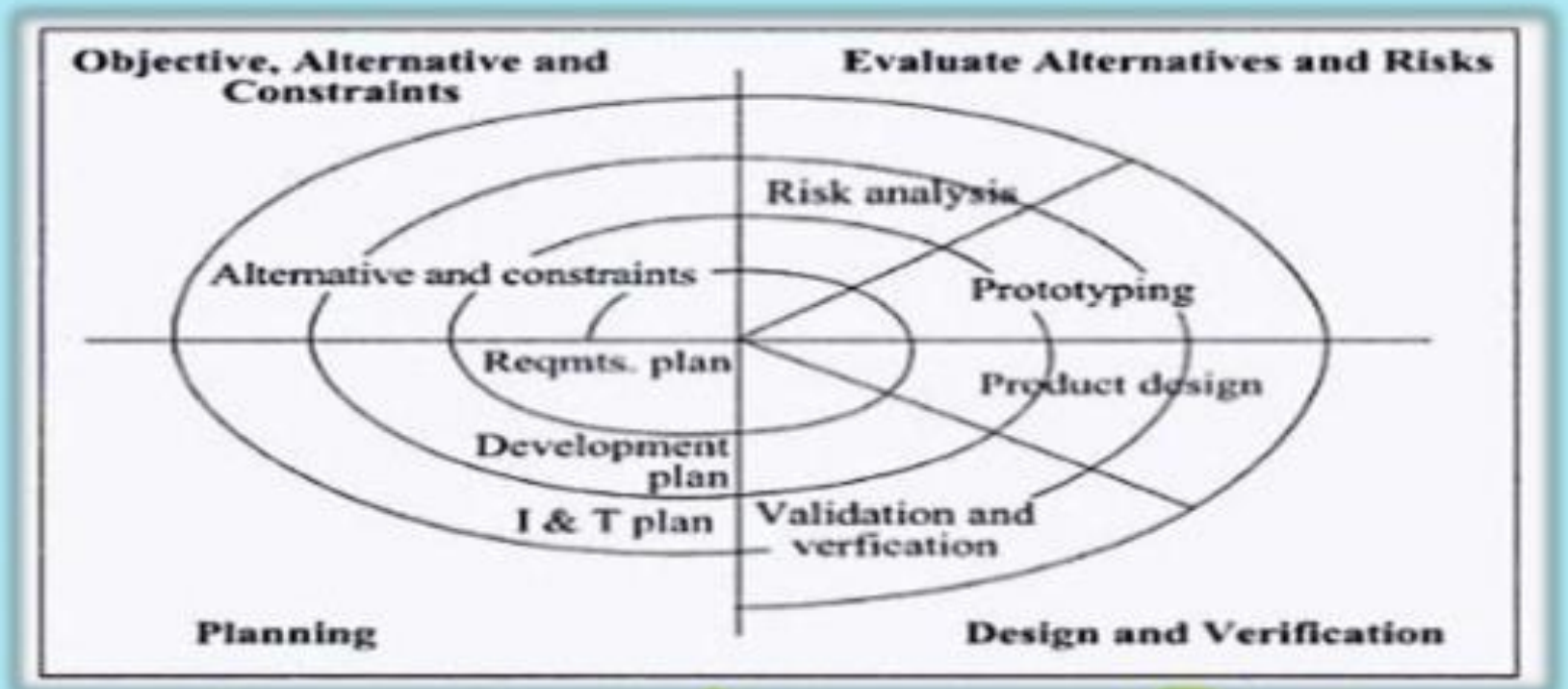
- Similar to iterative model, product is developed in multiple cycles
- The only difference is the model produces more refined prototype of the product at each cycle instead of just adding the functionality at each cycle like in iterative model.



Embedded product development Life cycle

Spiral model:

- Spiral model is best suited for the development of complex embedded products and situations where the requirements are changing from customer side.
- Risk evaluation in each stage helps in reducing risk



Embedded product development Life cycle

Summary

- In order to make the best profit out of product ,development cycle is very important
- To build a reliable product of best quality ,functionality and to release your product in right time EDLC will help us.

Recent trends in embedded computing

- Processor trends
- OS trends
- Development languages trends
- Open source standards, frameworks and alliances

+

Wireless technology

User interface

Automation

Inter-operability

Security etc

Recent trends in embedded computing

Processor trends

- SoC (System on Chip)
- Multi-core processor
- Reconfigurable processors

Recent trends in embedded computing

SoC (System on Chip)

- A SoC is an integrated circuit (IC) that integrates all components of a computer or other electronic items to a single chip
- SoCs are common in mobile electronic market because of their low power consumption.
- Applications of SoCs in setup boxes,portable media players,PDAs etc

E.g. iMX31 SoC from freescale semiconductor

Recent trends in embedded computing

Multi-core processor

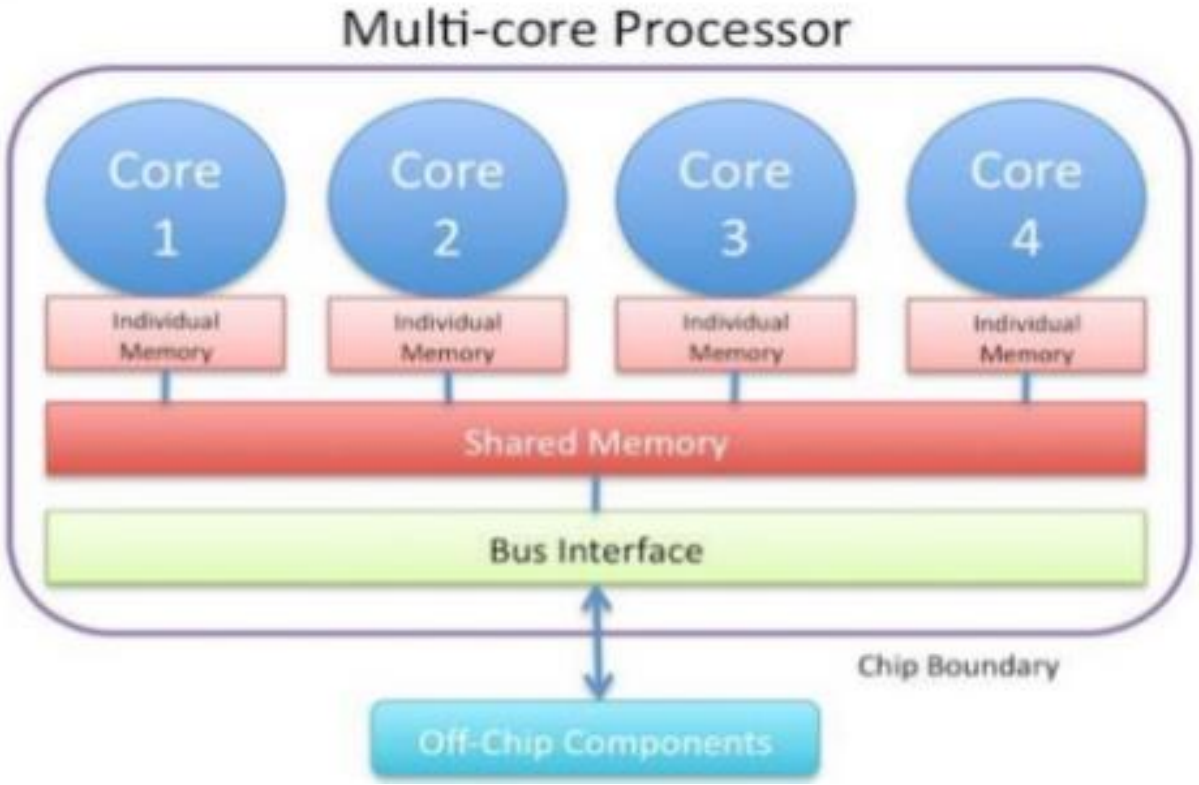
- A Multi-core processor is an IC to which two or more processors have been attached for enhanced performance , reduced power consumption and more efficient simultaneous processing of multiple tasks

E.g. OCTEON™ CN3860 developed by Cavium Networks is supporting 16 MIPS processor cores capable of operating at a clock frequency of 1GHz

Recent trends in embedded computing

Multi-core processor

E.g.



Recent trends in embedded computing

Reconfigurable processor(RSoC)

- A reconfigurable processor is a microprocessor/controller with reconfigurable hardware features
- They contain an array of PEs (programming elements) along with a microprocessor
- PE can be either a computational engine or a memory element

E.g. Field programmable system level Integrated circuit (FPSLIC) from Atmel coorporation .It integrates a 8 bit AVR processor and a dynamically reconfigurable Field Programmable Gate Array (FPGA)

Recent trends in embedded computing

OS Trends

- Microsoft embedded OS product line
- VxWorks
- Embedded linux
  - Ubuntu MID edition

etc

Recent trends in embedded computing

Development languages Trends

- Java
- .NET

Recent trends in embedded computing

Open source standards, frameworks and alliances

- Open Mobile Alliance (OMA)
- Open Handset Alliance (OHA)
- Android
- Openmoko

etc