SDLC

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Engineering a Software

- Software development life cycles – **build software in stages**

Engineering a Software

- Example – let us try to create a calendar app
  - **Where should we start?**
  - **What should we do?**

One Solution

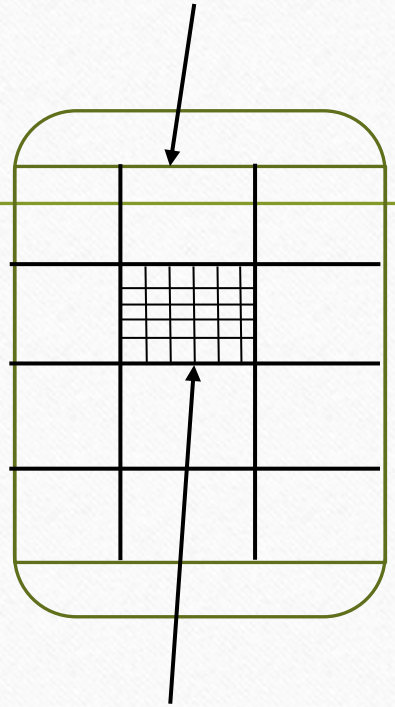
- Create a grid-like structure typically found on a physical calendar
  - Put headings on each cell in the grid (month name)

Engineering a Software

- Create sub-grids in each cell to hold the dates
- Render the entire structure on the screen
- Highlight the current date and month

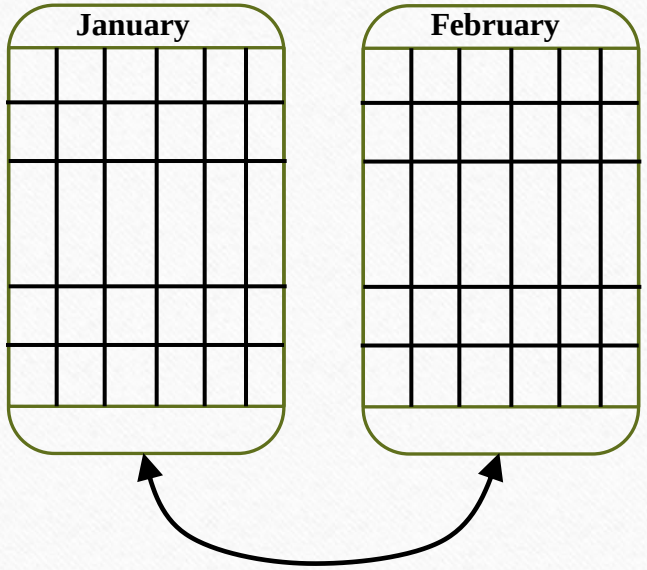
One Design – Everything Visible at Once

A 3×4 grid structure. Each cell holds the dates for a month.



Each cell is sub-divided into a 6×6 sub-grid (to hold maximum 31 dates). The current date is highlighted.

Another Design – Screen Change with Swipe



Each screen displays dates of one month (with the current date highlighted).
Screen changes through tap/swipe

Design Alternatives

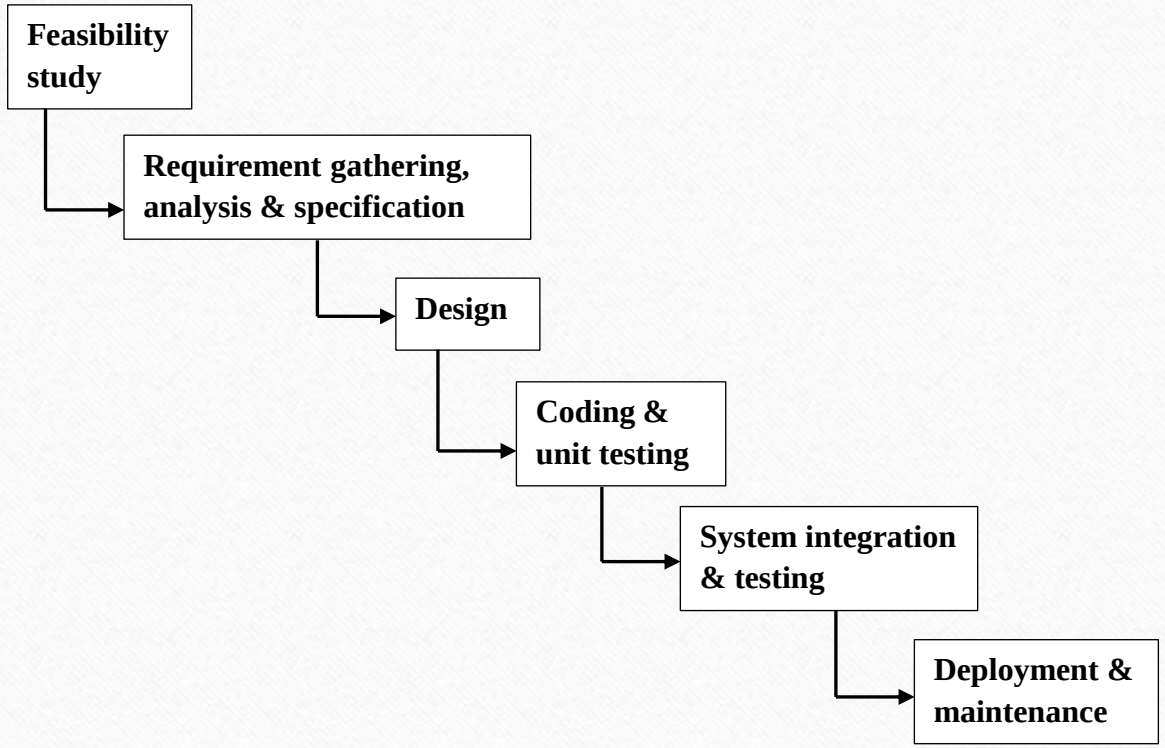
- There can be many possibilities
  - Challenge - how to chose the right one
- Require a systematic approach - SDLCs help

(Classical) Waterfall Model

- Most well-known SDLC model (although rarely used in practice)

Waterfall Model

- 6/7 stages
- Stages depicted as "waterfall" (hence the name)



Problem (Interactive Systems)

- Interactive systems should be designed for the “laymen users” – they should find it “easy to use”

Waterfall Model

- The classical (waterfall) model does not explicitly takes into account this concern – more focus on efficient “system” design

Usability

- We require an explicit **measure** for the "ease of use" concept so that we can include it in the SDLC

"Usability"

Usability: Definitions and Standards

- ISO definition (ISO 9241-210:2009) of usability - “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.”

Usability: Definitions and Standards

- Three crucial aspects in the definition

Usability: Definitions and Standards

- The product is meant to be used by a *specified* group of users
- In other words, a usable product **need not be designed "for all"**

Usability: Definitions and Standards

- The product should allow the users to achieve *specified* set of goals
- **Thus, putting every conceivable features in a product not necessarily leads to a usable product**

Usability: Definitions and Standards

- The product should be designed for *specified* context of usage
- **Clearly, a usable product need not be so for "all" usage scenario**

Usability: Definitions and Standards

- Definition reveals **THREE** measures
  - Effectiveness
  - Efficiency
  - Satisfaction

Usability: Definitions and Standards

- Jacob Nielsen [2012] argued that usability alone cannot make a product “useful”

Usability: Definitions and Standards

- An acceptable product should have **two** quality attributes
- One is **usability** and the other is "**utility**"

Usability: Definitions and Standards

- Nielsen proposed **FIVE** quality components of usability

Usability: Definitions and Standards

- **Learnability**: the "ease" with which a first time (novice) user performs "basic" tasks with the system

Usability: Definitions and Standards

- **Efficiency**: The speed at which the users can complete tasks

Usability: Definitions and Standards

- **Memorability**: The "ease" with which an intermittent user, who returns to use the system occasionally (after some gaps), can reestablish "proficiency"

Usability: Definitions and Standards

- **Errors**: The rate at which the users make errors, the "severity" of those errors and "ease" with which the users can recover from errors

Usability: Definitions and Standards

- **Satisfaction**: How pleasant is it to use the design

Usability: Definitions and Standards

- Utility refers to the "functionality" that the design is supposed to serve
  - Measure of the extent to which design supports the "functional needs" (the features) of the users

Usability: Definitions and Standards

- “Effectiveness” (in ISO definition) might be mapped to “utility” (in Nielsen’s framework)

Usability: Definitions and Standards

- The ISO definition therefore provided only two measures for usability: the efficiency and satisfaction

Usability: Definitions and Standards

- The five components of usability **offer a more precise measure** - we shall make use of these components in the subsequent lectures

User-Centered Design

- Term coined by Shneiderman (1986)
- Objective - **to design products that increase usability**

User-Centered Design

- Indicates **active/passive involvement** of users in the design life cycle

User-Centered Design

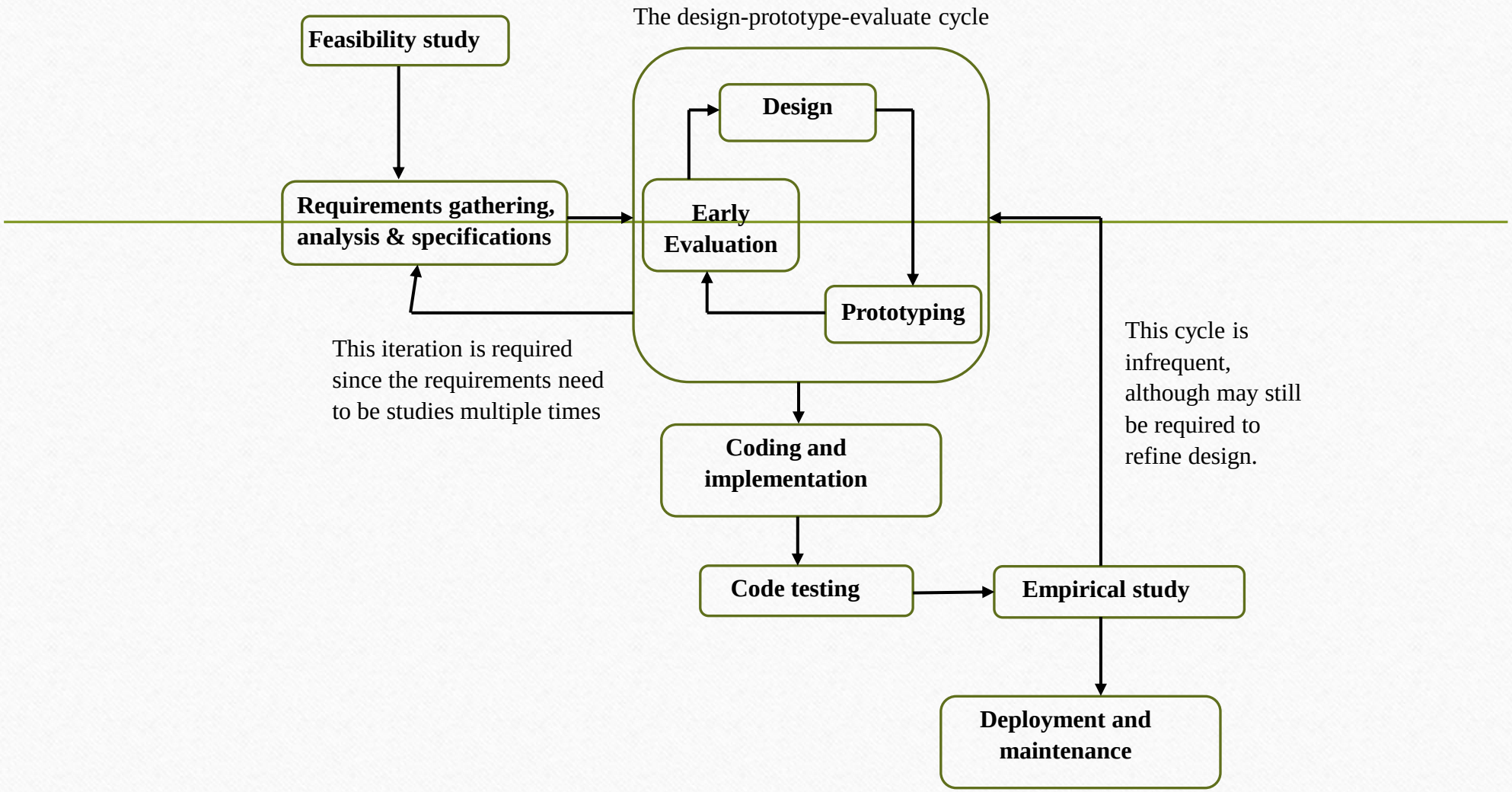
- Related terms
  - “Cooperative design” [Greenbaum and Kyng, 1992]
  - “Participatory design” [Schular and Namioka, 1993]
  - “Contextual design” [Beyer and Holtzblatt, 1997]

User-Centered Design

- ISO in its standards prefers to use the term "human-centered design"

UCD & Iterative Life Cycle

- In order to implement UCD, we require highly iterative life cycle
  - Iteration between stages to account for user feedback


The design-prototype-evaluate cycle
Feasibility study
Requirements gathering, analysis & specifications
Design
Early Evaluation
Prototyping
This iteration is required since the requirements need to be studies multiple times
Coding and implementation
Code testing
Empirical study
This cycle is infrequent, although may still be required to refine design.
Deployment and maintenance

Reference

- **Bhattacharya, S**. (July, 2019). Human-Computer Interaction: User-Centric Computing for Design, McGraw-Hill India (Chapter 2**)**
- NPTEL course on user-centric computing for human-computer interaction (lec 4)