

HCI in the software process → (chapter-6)

- \* Verification & validation
- \* Usability engineering
- \* Prototype-प्रैटोटाइप विकास करते समय इसका उपयोग क्या होता है? (एजेंट, difference type question)  
↳ figure draw, point करते समय

Overview:

Software engineering provides a means of understanding the structure of the design process, and that process can be assessed for its effectiveness in interactive system design.

Usability engineering promotes the use of explicit criteria to judge the success of a product in terms of its usability.

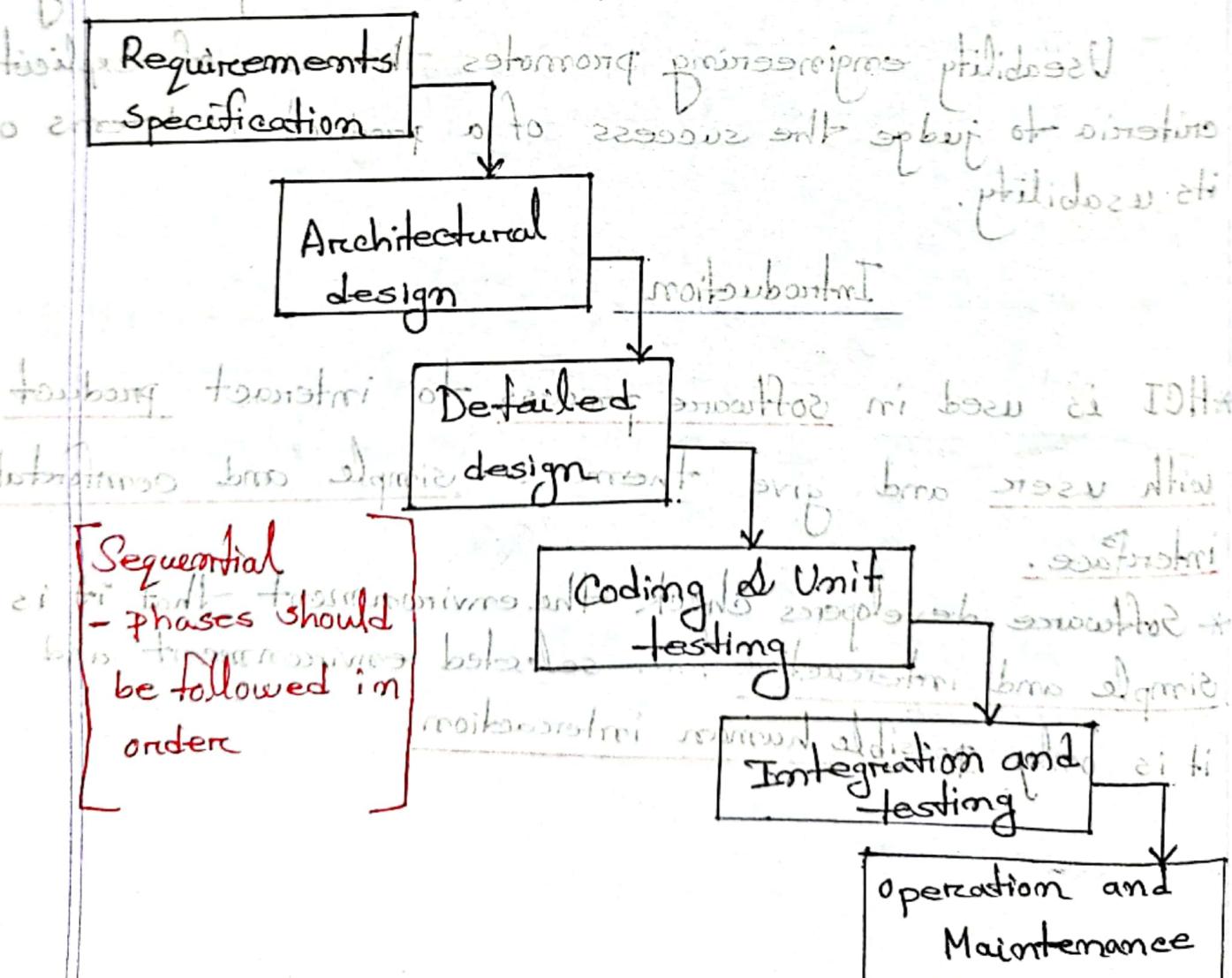
Introduction

- \* HCI is used in software process to interact product with user and give them a simple and comfortable interface.
- \* Software developers check the environment that it is simple and interactive for selected environment and it is only possible human interaction.

- \* Software engineering is the discipline for understanding the software design process or life cycle.
- \* Designing for usability occurs at all stages of the cycle not as a single isolated activity.

Useful = Usability + Utility

### The waterfall model



## Activities in the life cycle

1. Requirements Specification: Designer and customer try capture what the system is expected to provide can be expressed in natural language or more precise languages, documented in a requirement specification document.

2. Architectural Design: High level description of how the system will provide the services required factor system into major components of the system. how they are interrelated needs to satisfy both functional and non-functional requirement.

3. Detailed Design: The system design helps in specifying hardware and system requirements and helps in defining the overall system architecture. Refinement of architectural components and interrelations to identify modules to be implemented separately the refinement is governed by the non functional requirements.

\*Architectural design - a system for component to component  
\*Detailed design - a system for component to component  
\*ERD, DFD, Activity diagram, Use case diagram, Flowchart etc

4. Coding and unit testing: Coding implemented in different computer programming languages.

With inputs from the system design, the system is first developed in small programs called units, which are integrated in the next phase.

Each unit is developed and tested for its functionality, which is referred to as unit testing.

5. Integration and testing: All the units developed in the implementation phase are integrated into a system after testing of each unit.

Post integration the entire system is tested for any faults and failures.

Acceptance testing is with some customers to ensure requirements are met.

6. Operations & Maintenance:

\* There are some issues which come up in the client environment.

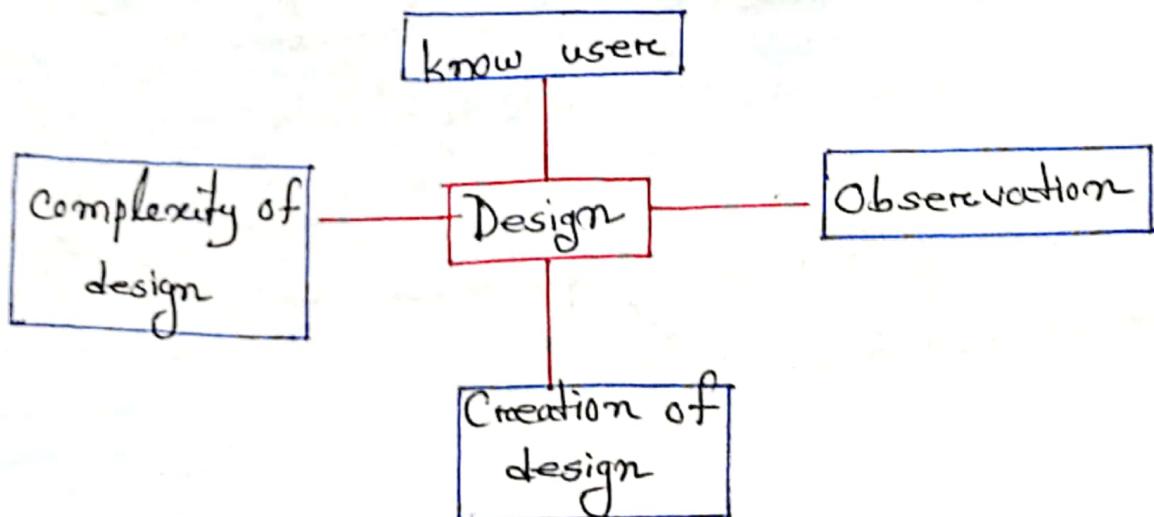
\* To fix those issues, patches are released.

\* Also to enhance the product some better versions are released.

- \* Maintenance is done to deliver these changes in the customer environment.
- \* Maintenance phase provides feedback to all the other phases.

### Advantages of waterfall Model:

- \* Simple and easy to understand and use.
- \* Easy to manage due to the rigidity of the model.
- \* Each phase has specific deliverables and a review process.
- \* Phases are processed and completed one at a time.
- \* Works well for smaller projects where requirements are very well understandable.
- \* Clearly defined stages.
- \* Easy to arrange tasks.
- \* Process and results are well documented.



## Disadvantages of waterfall model:

- \* High amounts of risk and uncertainty
- \* Not good for complex and object oriented project
- \* Poor for long and ongoing projects.
- \* Not suitable for the projects where requirements are often moderate to high risk of changing.
- \* It is difficult to measure progress within stages.
- \* Can not accommodate changing requirements.
- \* Adjusting scope during the life cycle can end a project.



## Validation and verification

→ Throughout the life cycle, the design must be checked to ensure that it both satisfies the high level requirements agreed with the customer and is also complete and internally consistent. These checks are referred to as validation and verification.

- Verification → designing the product right (accuracy)
- Validation → designing the right product.

Example: various activities the customer's requirements are satisfied or not. More subjective exercise.

Verification → Ride sharing app বানাতে এমন ক্ষেত্রে যানামান ফিল্ট উকে login unsuccessful. যাতে functional errors.

Validation → Ride sharing app বানাতে এমন food sharing app বানান।

## Interactive Models

Requirements Specification

Architectural design

Detailed design

Implementation & unit testing

Integration & Testing

Operation and maintenance

feedback

iteration in the waterfall model includes verification and validation

## Usability Engineering

\* User centered design एवं usability engineering  
का अन्तर्विकास का एक अलग अन्तर्विकास है।

User की feedback - प्रयोग के दृष्टि से उपयोग के लिए उपयोग के लिए उपयोग के लिए  
existing design का redesign करके user friendly  
बनाता है। usability engineering एवं Beta testing  
एवं मार्गदर्शक feedback द्वारा समाप्त होता है।

→ Usability engineering demands that specific  
usability measures be made explicit as  
requirements.

## Usability Specification:

Usability attribute / Principle → 6 वर्तमान विधियाँ

usability test - कठोर इम्प्रेस्शन

6 वर्तमान विधि विधि & 4 वर्तमान विधि

Methods: 1) Measuring concept

2) Measuring method

Level: 1) now level

2) worst case

3) planned level

4) best case.

1. Measuring Concept: make the abstract attribute more concrete by describing it in terms of the actual product.
  2. Measuring method: states how the attribute will be measured
  3. Now level: provide the agreed criteria for judging the success of the product, indicates the value for the measurement with the existing system.
  4. Worst case: lowest acceptable measurement for the test.
  5. Planned level: target for the design.
  6. Best case: the best possible measurement given the current state of development tools and technology.
- Example: Usability specification for undo with a VCR.

Attribute → Backward recoverability

Measuring concept → Undo an erroneous programming sequence

Measuring method → Number of user actions to undo current program.

Now level → No current product allows such an undo.

Worst case → ~~কোন প্রোগ্রাম কানার জন্য অত্যন্ত স্টেপ নাই~~ One explicit user action.

Planned level → A maximum of two explicit user actions.

Best case → One cancel option.

## Problems with usability engineering:

\* Usability specification requires level of details that may not be possible early in design.

\* Satisfying a usability specification does not necessarily satisfy usability.

## Iterative design and prototyping:

Iterative design overcomes inherent problem of incomplete requirements.

Prototypes simulate some features of original system.

### → Approaches / Types of prototyping:

1. throw-away → Prototype रखा knowledge - मिले main product बनाये पर्यंत prototype दिसाये करने तक। यह - building पर्यंत prototype.

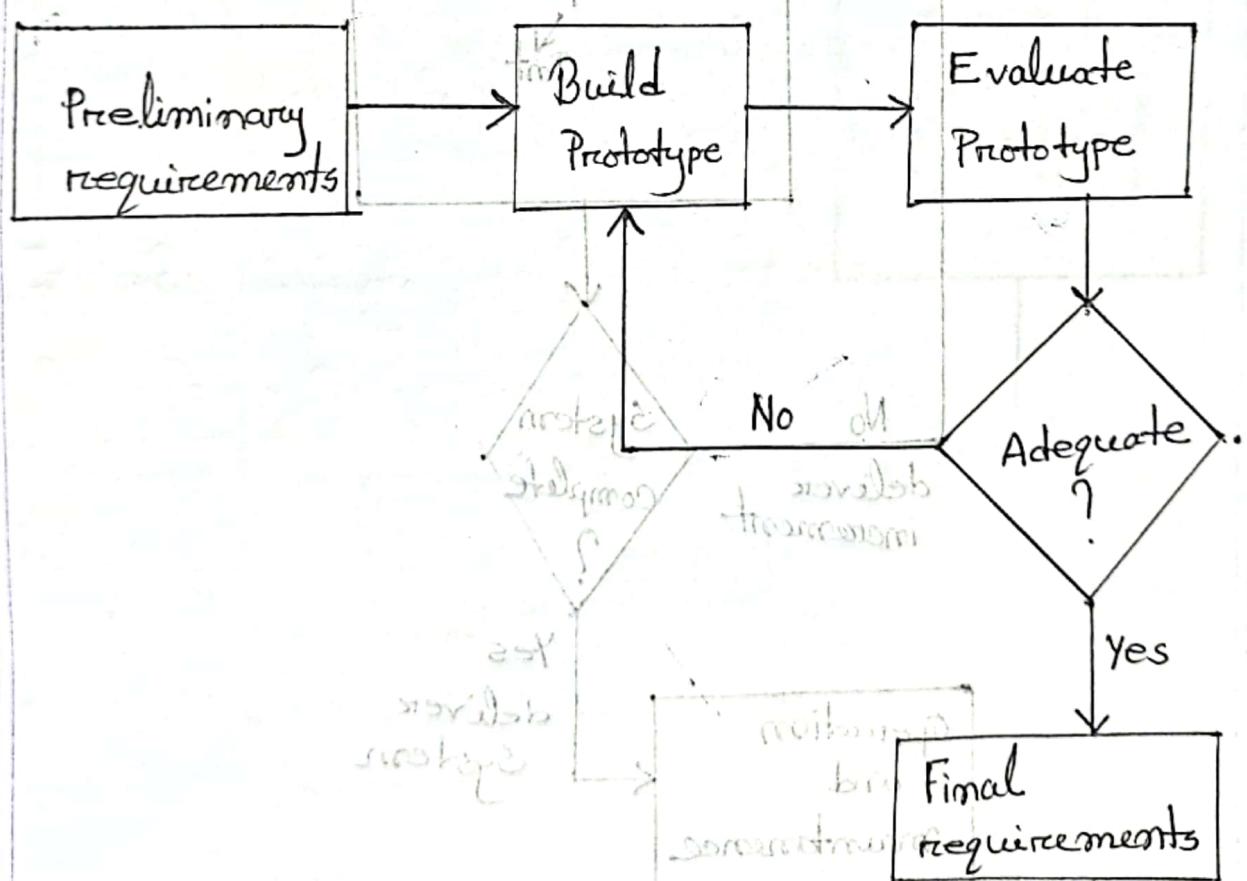
2. Incremental → वह Prototype ना बनाये हों जो होते होते component एवं वर्तमान check करने तक तक बनाये रखा जाए।  
ट्रूमेन्ट: अग्रणी आजाए project बनाये (agile model)

3. Evolutionary → Prototype

ज्ञान वाले द्वारा बनाया जाता है। Prototype का उपर्युक्त main design के साथ Prototype एवं extendible भी आवास रखता है। Handwriting लेट अन्त में इसका उपयोग किया जाता है।

Throw away prototyping

Prototype is built and tested, design knowledge gained is used to build the final product, but the actual prototype is discarded. (Requirement Specification का उपयोग करके इसका उपयोग किया जाता है।)



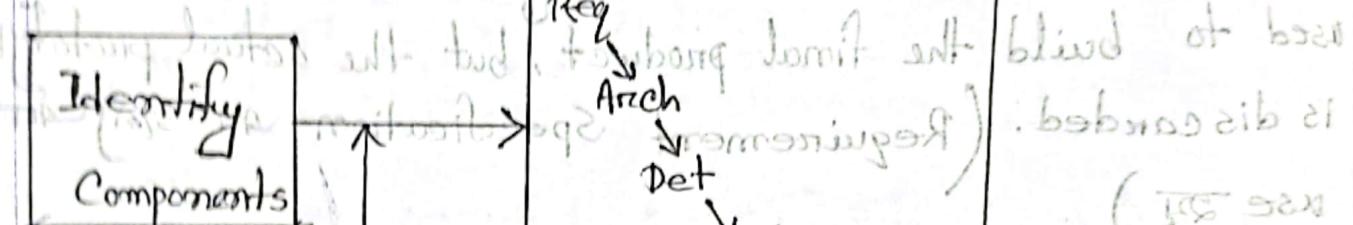
Throw away prototyping within requirement specification.

## Concept Incremental Prototyping

The final product is built as separate components one at a time. The final product is then released as a series of products.

### Designing component/prototype

Design software system into basic components



shoulder  
sophomore

blind  
sophomore

incremental  
development

No off  
deliver  
increment

System  
complete?  
?

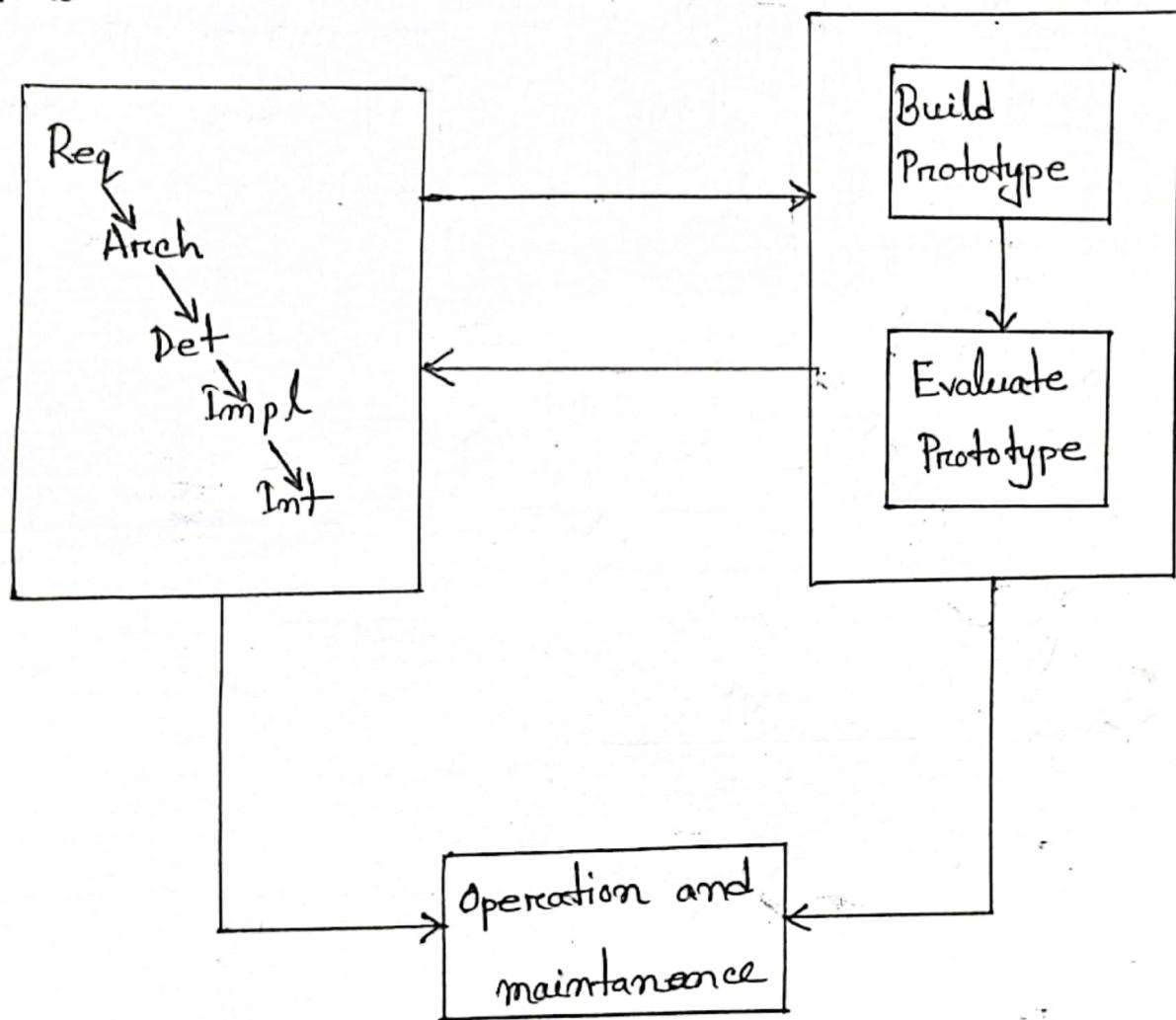
Yes  
deliver  
system

operation  
and  
maintenance

Maintainability - increasing in initial prototyping process world

## EVolutionary Prototyping

The prototype is not discarded and serves as the basis for the next iteration of design, the actual system evolves from a very limited initial version to its final release.



Lecture-02

\* Design rationale (2 techniques)

→ Process oriented  
→ Structure oriented

difference b/w designing soft

\* Special design rationale → Psychological design rationale

Example / Exercise → page 255

Chapter-7

\* Principle

\* types of design rules

↳ standard (important) → scenario based.

\* Principles to support usability (3f) / Design principle

↳ Learability → Predictability, synthesizability, familiarizing

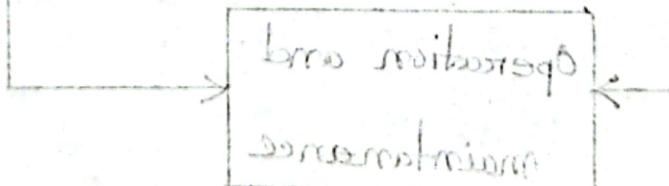
↳ Flexibility → Generativity, Consistency

↳ Robustness → Dialog initiative, Multi-threading,

task migrability, Substitutivity, customisability

Observability, Responsiveness

Recoverability, Task conformance.



## Design Rationale

Design rationale explains why a system is designed in a certain way.

### Types of design rationale (2 type)

#### 1) Process-oriented: emphasizes on historical info

[Design करार आहा अनक step आहे पुढी historical information दें तर design करार आणेव info-एव्ह कमा तरी design कराले आठी Process-oriented] → यान: existing system साठा देखा का.

#### 2) Structure-oriented: emphasizes on the consequences of action. [feedback एव्ह किंवा depend करावा आहेच design के बहुत करू design कराले. आठी structure oriented]

\* Special type of design rationale is psychological design rationale. यान user/designer दें psychology एव्ह किंवा base करू design करा शका. एंद process oriented approach एव्ह घेऊ काढा as previous/historical data एव्ह डितिकू design करा शका.

\* Pdf page- 282 → work exercise द्यावा शके exam आहे

## Chapter - 07 → Design Rules

Types of design rules: *from abstract to concrete*

### 1) Principles

- abstract design rules
- low authority
- high generality

### 2) Standards

- Specific design rules
- high authority
- limited application

### 3) Guidelines

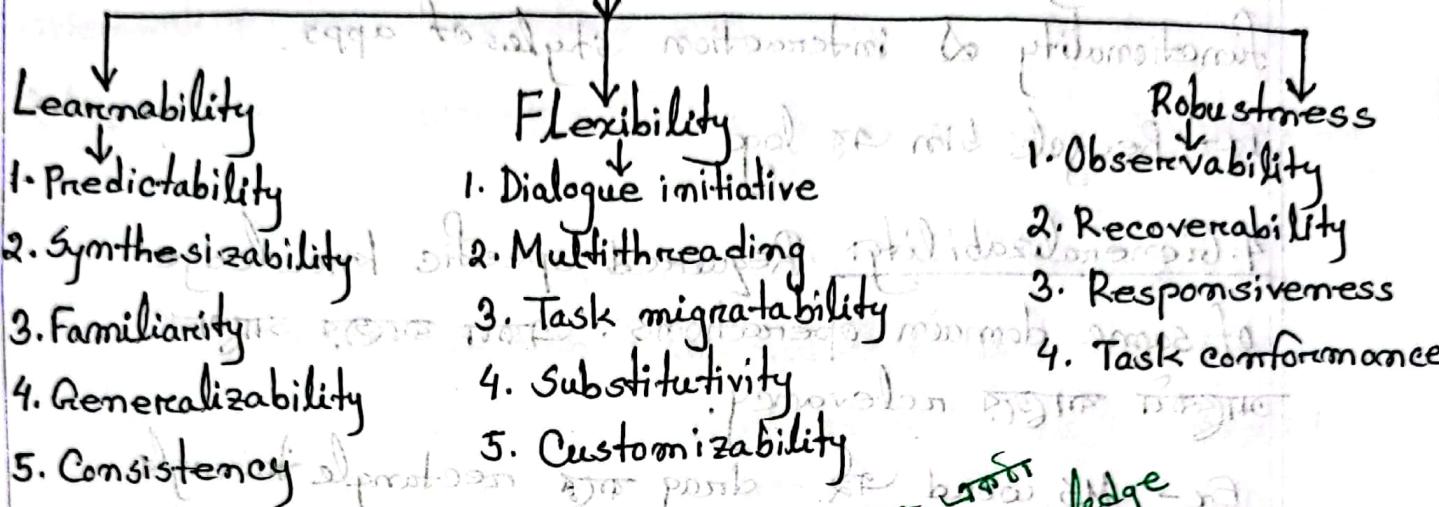
- low authority
- more general application

Design rules → suggest how to increase usability

- use their specific context

The types of design rules show a spectrum from abstract to concrete.

## Design Principles to Support Usability



Learnability → User द्वारा प्रयोग करने की सक्षमता  
System अपने उपयोग के लिए ज्ञान वाहक बनाता है।

1. Predictability: user's ability to envision which operation can be performed next.

[button -> press करने पर ऐसा क्या करना चाहिए जो UI design

द्वारा predict करता है]

2. Synthesizability: मध्यवर्ती file remove करने का drag करने से उत्थन. previous file भी जास्ती होता है आप आपका ना honest review लाइ।

→ User action -> पर ऐसा change होना जो user विराम पाने से कोई change नहीं करता।

Immediate honesty vs. Eventual honesty

notifying the user without requiring any further action from the user

Visually दिखा जाए जा change, new user दें तो उन्हें एक और Problem

Ex - command line interface

3. Familiarity: New users can get familiar with

functionality & interaction styles of apps.

Ex- Recycle bin এর logo

4. Generalizability: Required specific knowledge

of same domain operations. একটি কাজের আন্তর্বর্তী  
অন্তর্বর্তী কাজের relevance.

Ex- MS word এর drag দ্বারা rectangle triangle

আঁকান্ত মেথড.

5. Consistency: It measure through result &

behaviour of system. Every time system

gives same result of same sets of input.

Flexibility → It extends the way a user do  
system exchange info  
(After data আবাস প্রদান কর)

1. Dialog Initiative: All dialogues done by simple  
request & response system.

→ যখন system dialog flow control করে। The  
dialog is called system pre-emptive.

→ যখন user dialog flow control করে।

→ যখন user pre-emptive হল, usually প্রোগ্রাম  
use করা হয়।

2. Multi-threading: ability of system to support user interaction for more than one task at a time.

2 type → i) Concurrency [at a time multiple कार्य करने वाले action allow होते]

Ex: Word document (docx फ़ाइल 3 ताजे खबरें)

ii) Interleaved [multiple file open होते but work on a single task at a time]

[जॉडिक docx open but edit करते होने की क्रमता पाहता होता है]

3. Task Migrability: Transfer execution of task from system to users & decide who is better

→ user के system में ताकि task migrate हो

Ex → Spell checker : Buet → but - buet

4. Substitutivity: Allows equivalent values of input & output to be substituted with each other.

मैमन → 80% शुल्क (A grade फ़ाइल तक तो होता है)

5. Customizability: Supports modifiability of the user interface by user automatic modifications are done.

→ In address book keeping a book - entry

Robustness to provide information &

System goal achieve করার জন্য user রেজিস্ট্রেশন  
একাউন্ট করে দেখা যাবার কাছাকাছি কোটি  
ব্যবহার করতে পারে।

Example → login page

1. Observability: User should be able to evaluate internal features of system & gives proper feedback.

Example → loading এর সময় "please wait" শুনতে

2. Recoverability: To fixed & solved errors & get correct action.

Ex → control 2, recycle bin.

3. Responsiveness: Real system feedbacks on user action.

Example: Print button → click হলে response

ক্লিক করলে button press না হলে cursor ভিত্তি কোর্সর হাতে

ক্লিক করলে button পরে কোর্সর হাতে আসে

4. Task Conformance: task completeness & task accuracy.

→ user ক্লিক করতে চায় - or system support করতে নাকি

Example - abc এ paint করা যাবার possibility না,

Practice Question: Consider a mobile or web application you use familiar with. Now explain how the application follows or violates the principle to support learnability.

### Standards

Standard are set by National or international bodies to ensure compliance with a set of design rules by a large community.

Hardware Standards: For human factors & hardware specifications. understanding এর ভিত্তি পুরোপুরি।  
→ hardware-এ change করা আনন্দ করিবে ৩ costly.  
→ changes করা কঢ়িতে রাখে (standard are stable)

Software Standards: based on theories, science, languages, IDE's, frameworks, libraries of software design  
→ software-এ change করা আরও, flexible & less costly.  
→ change করা কঢ়িতে রাখা নাম্বা (standard are unstable)

Guidelines

It provides detail design specifications & clear instruction to designers and developers. It follow all principles that supports usability.

\* Standard Guidelines rules are standardized

(Guideline प्राविधिक तात्पुरता, सुविधा, प्राप्ति)

### Golden Rules & Heuristics

Any designer following even these simple rules will produce a better system.

(Design rules) प्राविधिक नियम

1) Schneiderman's 8 golden Rules

2) Norman's 7 principles

3) Nielsen's 10 Heuristics

(Heuristic नियम) प्राविधिक नियम

(Heuristic नियम) प्राविधिक नियम

Most important Chapter 7 and this Topic also

Shneiderman's 8 Golden Rules → to help designers solve problems.

1. Strive for Consistency. same কাজের জন্য মুন সিলেক্ট আসে। (like icon)
2. Enable frequent users to use shortcuts. (ctrl + z)
3. Offer informative feedbacks. (button-এ cursor হাতের icon পর ক্লিক করে মাউস)
4. Design dialogs to yield closure. (Grouping of actions, well defined options for the next step) → next button
5. Offer error prevention & (error auto-detect করে, solve করতে হাত দেয়া) simple error handling. (গুরুত্ব) → "Please enter valid email"
6. Permit easy reversal of actions. (More freedom for the user)
7. Support internal locus of control (user এর action control করতে পারে) i.e.
8. Reduce short-term memory load.  
↓  
want to quit?

Clear Structure → windows, dialogs

(Recognition over recall)

← The original process was not copied  
(Slow)  
asimilate. don't see the new. &  
break the old habit if it's right  
you can always ← (if you break  
the old habit it will be  
easier to learn)

next Tuesday)

task structure

## Norman's 7 Principles

1. Familiarity

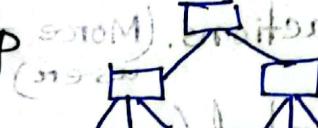
2. Simplify the structure of tasks

(Farmer द्वारा app-में NID, number, email  
प्राप्ति करने की सुविधा आयी थी)

3. Make things visible (Execution and evaluation)

(user ने चाहते हैं system की जांच की तरह उभयन्तरीय प्रक्रिया देखना)

4. Sitemap



5. Exploit the power of constraints, both

natural and artificial.

(guidelines provide करना यह user निखोड़ा तक नहीं)

correct way to complete करना यह नहीं)

(light mood to dark)

6. Design for error (recovery option देना → undo)

7. When all else fails, standardize

(जबकि 6 ने fail करने का market में standard

product copy करा) → usually यहाँ use करते हैं  
वास्तविक अवधारणाओं का  
design करते हैं,

Chapter-09 → Evaluation Techniques

\* Advantage & Disadvantage of evaluating through user participation.

What is evaluation?

tests usability and functionality of system

Goals of evaluation → ① assess extent of system functionality

② assess effect of interface on user

③ identify specific problems.

Evaluating DesignEvaluating design / model:

① Cognitive walkthrough

② Heuristic Evaluation

③ Review-based evaluation.

Evaluation through expert analysis

Cognitive Walkthrough:

- Based on psychology
- It's evaluation using user psychology expert to evaluate learning system,
- analysis goal and knowledge focus
- "Does the design lead the user to generate the correct goal?"

→ Programmers read code ~~line by line~~ step by step

देखाएं & line by line बुझावे expand दर्शाएं यहां  
ताकि बुझा लिया हो system का तौर पर.

◻ For each task walkthrough consider 3 questions

- ① what impact will interaction have on user?
- ② what cognitive processes are required?
- ③ what learning problems may occur?

### Heuristic Evaluation:

→ Performed in design phase, useful for evaluating early design, prototype or early system.

→ Design expert ने अपने & और rules violate किए ना

→ Based on design guidelines.

→ Heuristic evaluation 'debugs' design.

→ System के behaviour predictable नाकि consistent नाकि? feedback दर्शाएं नाकि?

→ If frequent popping up screen जैसा किए नाकि? तो उसके विरोध में एक अलग विवरण दें।

→ If user की वापसी की loop हो जाए तो उसके विवरण दें।

*for�ন্ট model-based evaluation*  
used high level models that predict user performance

### Review-based evaluation

→ based on design rationale.

→ goal to actually fulfil করতে নাকি জুড়ি user এর feedback এর ভিত্তি base হতে দেখি। Expert রা করে বিষ্ণু user রাও participate করতে পারে।

### Evaluating through user participation

#### Merit of evaluating through user participation:

1. It will save time & money

2. We can collect user's experience

#### Demerits:

1. As it is a blackbox testing, user's won't know where exactly is the bug or where to fix it. Different user different opinion, multiple result may occurs.

#### 4 types of evaluation through user participation:

1) Styles of evaluation

2) Empirical methods (Experimental evaluation)

3) Observational techniques

4) Query techniques

# Evaluating Work

## 1. Styles of Evaluation

2 types:

1) Laboratory studies: User are taken out of their normal work environment.

advantage:

- Specialist equipment available
- uninterrupted environment

disadvantage:

- lack of context (real user)
- difficult to observe several users

2) Field studies: This takes the evaluator out into the user's work environment.

advantage:

- natural environment
- context retained (Normal way of working)
- longitudinal studies possible (over time)

Disadvantage:

- Distractions
- Noise

long  
time work  
place's  
(काम का स्थान)  
रखना  
शुल्क

## 2. Empirical method (experimental evaluation)

4 भिन्नी define करते हैं :

1) Participants/Subjects: Participants should be chosen to match the expected user population as closely as possible.

2) Variables: things to modify and measure: 2 types of variable → independent & dependent

3) Hypothesis: It is a prediction of the outcome of an experiment. 2 types of hypothesis → Null or alternative

Null hypothesis: Condition जो कि अंतर नहीं होना difference नहीं होना, यानि negative result का aim is to disprove this.

Alternative hypothesis: Difference agar + positive outcome.

4) Experimental design:

i) observational techniques:

→ Protocol analysis: CCTV-से देखे observe करा

→ Think aloud and co-operative evaluation: Participants ने जो बताए तो उन्होंने observe करा अन्त मालिक प्राप्त किया

→ Automatic protocol analysis: Tools use करता है।

## 11) Query techniques:

→ Interviews

→ Questionnaires

Example: Evaluate how phone use before midnight & bedtime effects sleep pattern.

① Participants → 15-35 years people

② Variables →

Independent variables	Dependent variables
Interface style	Hours of sleep per night
Phone use before sleep	Hours of sleep per night
Sleep quality	Sleep quality

Independent → characteristic changed to produce

different conditions (interface style, number of menu items)

Dependent → characteristics measured in the experiment (time taken, number of errors)

for user interface design

### ③ Hypothesis →

Null Hypothesis	Phone use before sleep doesn't connect with the amount of sleep a person gets.
Alternative Hypothesis	Increasing phone use before sleep leads to a decrease in sleep

### Analysis of data

→ যোগেন্ত্র statistics কুবজ কৃষির আছে কিন্তু কাজ

① look at data

② Save original data

→ যোগেন্ত্র statistical statistical techniques choose ~~যোগেন্ত্র~~ or depend  
করে - ① type of data  
② information requirement

→ Type of data

① Discrete → finite number of values

② Continuous → any value

### 3 types of test / analysis:

- \* Parametric

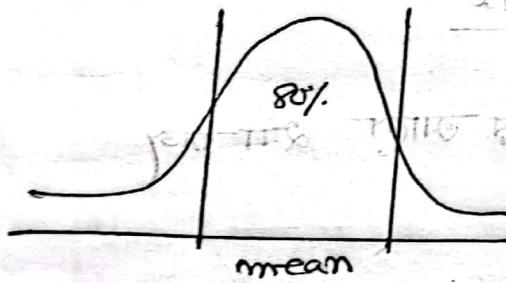
- \* Non-parametric

- \* Contingency table

Parametric: Information about the distribution of

the population is known, More statistical power

→ normal distribution follows



Non parametric: Information about the distribution of a population is unknown. As the parameters

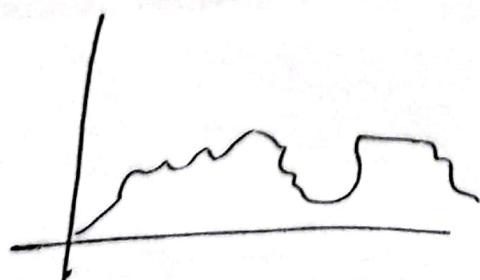
are not known, it is necessary to test

the hypothesis for the population

→ Statistical power less

→ More reliable as individual values

analysis



Contingency table: one way to present data

- Classify data by discrete attributes.
- Count numbers of data items in each group.

মৈমান - আগুন ক্লাসিফি মাথ কর্তৃতা এবং রেজিমেন্ট পর্যায়ে পুরুষ পুরুষ

কাঠ গুচ্ছ পরিষ্কার

\* What information is required for analysis?

- 1. is there a difference?
- 2. how big is the difference?
- 3. how accurate is the estimate?

### Experimental Studies on groups

Single userে উপর গোপনীয় পরীক্ষা

Problems: কাঠ পুরুষ পুরুষ পুরুষ

1) Subject groups: group গুলো বড় ইচ্ছা নাকি দুর্বিশ্বাস, দুর্বিশ্বাস আসা, বড় ইচ্ছা expensive, as অনেক বিশ্বাস মনুষ আবশ্য তার  
settle down আর যেকোনো time সামনে, timetable কষাও দুর্বিশ্বাস।  
So, three or four groups recommended.

2) Choice of task: task যেন cooperative কৃষি, competition  
বনানো সাধু না,

3 types of task:

- ① Creative task → short report
- ② decision games → survival task
- ③ Control task →

3) Data gathering: CCTV द्वारा असरात्के दृश्यांकाना  
उर्फ़ from each perspective record रखते हुए।

Problem:

- Synchronisation
- Sheer volume (अनेक data - उर्फ़ बहुत ज्यादा)

4) Analysis: Product of group  $\rightarrow$  interaction द्वारा  
group - ए अलग ग्रुप्पमध्ये मानव आणि तिंची phyiology वरून  
निष्ठा खाली । Micro-analysis एवढे मानवांनी gaps in word स  
Speech जाणा घेण ।

## Field studies with group

group শুল্ক নিষ্ঠা field study কর্মসূলি প্রক্রিয়াজো

## Question pattern: Decision निति विषय

- 1) Group study নাবি single প্রচৰ
  - 2) Evaluation method কোনটি choose এবং কুন  
কুন্দ,
  - 3) subjective নাবি objective.

diget luçon hode ↔ deel oriband ①  
deel levende ↔ eenige moeders ②  
↔ deel leden ③

## Choosing an Evaluation Method

### ① When in process / stage in development cycle:

- Design stage: involves experts only.
- Implementation: developers need user's participation, reduce cost & time.

### ② Styles of evaluation: Laboratory vs Field

- Laboratory studies are controlled environment for experimental observation.

### ③ How objective: Subjective vs objective.

- Subjectivity techniques: depends on knowledge & expertise.
- Objectivity techniques: depends on particular evaluations.  
variation আসুন না (MCQ type)

### ④ Types of measures:

- Qualitative: subjective technique
- Quantitative: Objective techniques provides quantitative measures.

### ⑤ Information provided / level of information:

- Low level: it includes decisions such as which font is most readable.
- High level: decides is system usable?
- It gathered information using questionnaires & interview techniques.

### ⑥ Level of interference:

→ obtrusive: अंगृहीत interface निर्माण करने का तरीका

→ unobtrusive: यह कहने परिवार की कमी।

## ⑦ Resources available:

→ It includes time, money, equipment, participants & even protocol

Exercises - Chapter 9 important

page- 390 (9.4) type question अपना  
avitoardo en avitoardo : svitido wolt

Chapters      Question

~~7+8~~ → 1 ft (equal BOM) is first written

9 → 1 ft #

Ein mit der Superlative formulierte Lehrzettel ←

affirming existing equivalent rights: Opportunities for

mechanism to bind behavior without help (e)

ci trae figuras en donde coinciden establecimientos y localidad

(daher wäre es sinnvoll, dass die FDP sich für eine solche Form der Verfassungserweiterung ausspricht.)

Wprowadź kompozycję gry na instrumentach klawiszowych

## Lecture - 06

20 December, 2022

Chapter - 10 → Universal Design → Sheet 7 Guru

Chapter - 12 → HCI design model

■ HCI design model used to guide the creation of an interface. (technical guide)

3 Model → 1. Goal and task hierarchies model.  
2. Linguistic model.  
3. Physical and device model.

Goal and task hierarchies model

3 Functionality → 1. Goal

2. Task

3. Actions

Goal: State of system that human wishes to achieve.

Task: Activities or steps required to achieve goals.

(folders open कर, click कर)

Actions: Physical interaction with device.

(mouse use कर)

## Techniques for goal and Task hierarchies:

## ① GMS: Goals, operations, Methods & selection.

what the user wants to achieve

basic actions  
users | foundations  
performs

decomposition  
of a goal  
into subgoals

## Means of choosing between

question  
ব্যাপক  
প্রশ্ন করা

② Cognitive Complex Theory: into subgoals between competing methods  
कठिन prevent रोका अन्य imbuild task.

### ③ Hierarchical Task analysis:

## 1) Signum

1.1) enter email

1.2) enter password

### 1.2.1) Show password

1.2.2) hide password (no display, the logo will be)

1.3) Forget password

(4) Remembers me

1.5) Click -

1.5) Click on login button

1.6) Already have an account

## Example of Goal and Task Hierarchies Model

Question scenario: Sales Report.

Produce report  
gather data

find book names

| do keywords search of names database

- further subgoals

Sift through names and abstracts by hand

- further subgoals

Search sales database

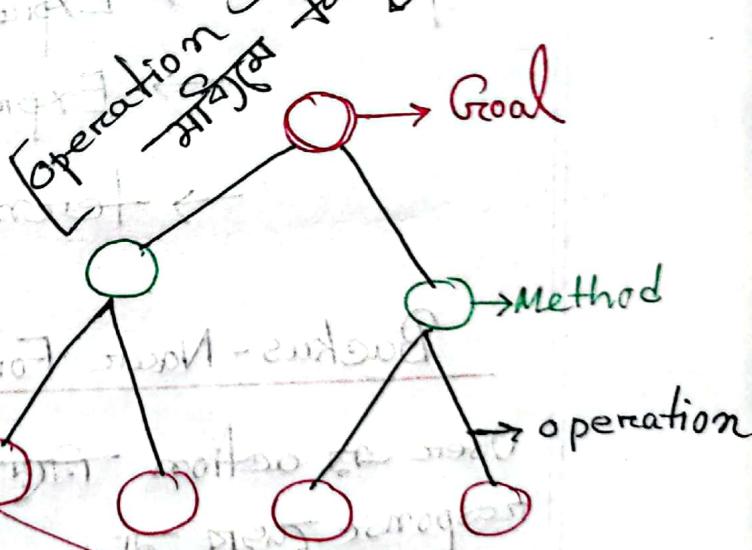
- further subgoals

## Layout tables and histograms

## Further subgoals

Write description

## Further subgoals



Indentation  
Is the most important

## Linguistic Model

Understanding the user's behaviour and cognitive difficulty based on analysis of language between user and system.

It has two types:

1) Backus-Naur Form (BNF)

2) Task-Action Grammar (TAG)

Expression → Expression + term

→ Expression - term

→ term

Backus-Naur Form

User action → নিম্ন কাজ করব  
response দেবেন না।

Terminal → Final expression (আর জ্বলা যাবনা)  
Show upper & lower case letters, click &  
move mouse etc.

Non-terminal: intermediary expression. (Creating input)

Expressions, select mouse & position of mouse etc.

### Example of Backus-Naur-Form

Question: Drawing line in graphical system use BNF.

An expression contains terminal and non-terminals

- Combined in sequence (+) or as alternatives (|)

Draw line ::= Select line + choose points + last point

Select line ::= pos mouse + click mouse

Choose points ::= choose one | choose one + choose points

choose one ::= pos mouse + click mouse

last point ::= pos mouse + DBL click mouse

pos mouse ::= Null | move mouse + pos mouse.

### Physical & device model

Physical & device models represent human motor skills.

It has two types: → 1) Buxton's 3-state model

2) The keystroke Level Model (KLM)

$$9+10 \rightarrow 2\text{fr}$$

$$6+7 \rightarrow 1\text{fr mixed}$$

$$11 \rightarrow 1\text{fr}$$

### Practice:

1) Draw Trapezium

2) Draw square

3) Draw Rectangle

4) Draw parallelogram

Ans see next page in slide 6

elements not more than four vertices and one diagonal

(1) characteristics of triangle not bounded -

triangle total + triangle second + third angle = 180° slide 6

second angle + second angle = 180° slide 6

triangle second + second angle | second angle = 180° slide 6

second angle + second angle = 180° slide 6

second angle 180° + second angle = 180° triangle total

second angle 180° + second angle | 180° = 180° second angle

- take one point to lie on it

not one point lies on other all points lie on it

square state - & condition (one point out rest all)

(MSA) take 3 A lines set integer off &