Usability Engineering (Class 1: Jan 4, 2021)

~~Activity A~~

Train : - Navigation & Search
- When train will leave/start

feedbacks are not available

Switching off phones during take off:

different types of ppl

- forget
- do not care
- do not know why (not aware)
- ~~toff~~ follows

so you can either tell them why / remind them (makes user responsible) or be strict and make rule if they do not follow (makes them follow rules)

agency: gives you ownership (owning the action)
↓ a pleasure/sense of control
↓
so if one is aware of act^n & taking that act^n brings is something more than just following rules

→ owning an action is more pleasur-able than just ~~told~~ being told to & then following / doing the act^n

Activity - 1 ← note down issues
Design display & control

Indirect visual display
└ user is understanding ~~the~~ a space by & through a robot

360° display for remote sense of Space
└ as natural as real-time

Display

How should this display be presented to the user

So;

HMD (Head mounted Desktop) (or) Desktop

[BOTH HAVE ADV. & DISAD.]

└ work for short - durat^n so for long, tedious tasks like search & rescue won't work

30-45 min

Cave Experience / HMD
↓ becomes part of body

→ But desktop does not (its 2D)

→ Augmentat^n Reality —

→ Embodied Cognition — Virtual reality through an individual's eyes.
(HCI)

Control

Keyboard/Mouse — restricted

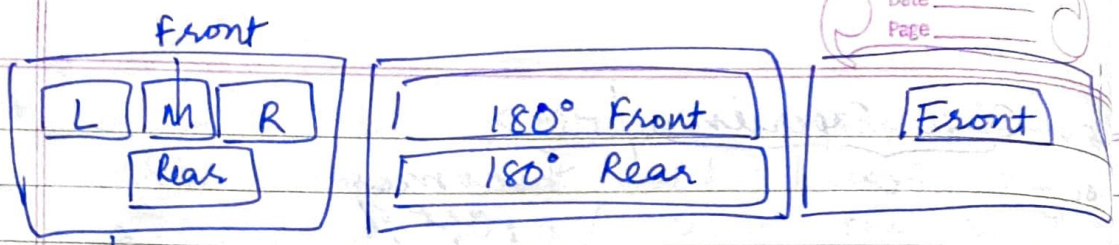
Omni-Mill (treadmill) — VR.

Q "Feedback" in Cognition

WORK DONE

① ~~How~~ accurately Judge direct^n of object in one case ✗

② how well (when we navigate in such an environment) are we able to develop ~~special~~ spatial knowledge of env — layout, objects in env, how objects are related to each other (i.e. Egocentric POV - in spatial cognition)



more like car design

1:13:57

Class 2 : Jan 7 . 2021

Ms. Smriti (Out Systems) — UXEvangelist ☺

UX Design 101

What is UX Design & How it evolves

The Airport Story —

- Elderly spending too much time in toilets & missing flights
- so they built more toilets near gates
- no ₹ sol^n
- approached a Design consultancy which started & undestang the problem — doing user research which showed they went to listen to the announcements as toilets were less noisy

Renting bike story —

- Can unlock only using app
- no reception
- so stuck in forest
- no network in car either so customer service couldn't help

can some rare scenario be foreseen while designing?
- understanding all contexts will help
- in deciding whether some special feature needs to be added — think about repurcusions of not having the feature and being in the rare scenario.

The root cause — did not consider user needs and behaviour

Why?

- Adding Value to Business

QUESTION

Ex Putting restrict^n on user behavior doesn't work well — because people forget.
x because in general restricting the domain of an applicat^n when the problem can be solved — doesn't fare well.

Metrics (UX) —
- Is the user able to complete the task
- Are the components of the task being asked by the user to complete what he wants to do — really necessary for the user to complete the == efficiently?

Increasing Revenue
→ Premium version
→ reduces need for help

Reducing Cost.
→ reduces risk of failure
→ reduce ambiguity by gathering & understanding user requirements

→ minimise documents (moving from waterfall to agile) — if product in intuitive
→ detect & fix usability issues (which ↑es as you go in the development process)

Build a use case

- build brand trust
- more believable than words
  you can show how it helps.

Q Trade off - b/w design & sales?
eg. change design (existing / familiar) to gain/have some kind of ~~ex~~ gain/ publicity

↳ sometimes users have to learn the new design since they are used to the app / until they don't have competition
OR
& user don't use it & company has to revive.

Designers & Developers fail to aid memory — even user is working with limitations.

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Dark patterns in design
- shady things to boost business
(pre-checked ☑ save my card details)

Common UX Myths / Challenges

→ UI ≠ UX
↓
broader

—

Class 3: Jan 11, 2021

Prof. Raghu Reddy

Usability like reliability

"ility" ——— either functional / non-funct"

↓

simplistic

functionality — standard

"given" set of features — standard

PRODUCT

- "good" usability
- "good" features

Customer focus on ① external features

② internal to an extent

any product — external — visible

internal — what is expected is achieved?

↓

answers

→ more features — better product ?

we use 10-15% of features of an app

~~fast~~
~~features~~
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no markings

KNOW THE USER

- "User appropriate"
- learn once, remember forever

- cannot de-alienate design from engg & vice versa

- Is look & feel enough

UEX

Usability – extent to which a product can be used by user to achieve goals efficiently

① Learnability of UI

peak & Plateau

② Efficiency of UI ⇒ need not mean less no. of clicks etc.

↑ ecommerce ✓
security/finance ✗

multiple attributes – conflict each other

generally (efficiency $\propto \frac{1}{\text{complexity}}$)

3. Rate of user error

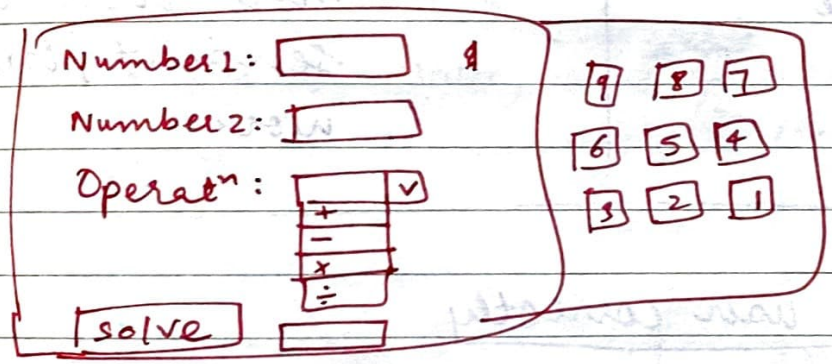
4. Memorability

5. Satisfactn

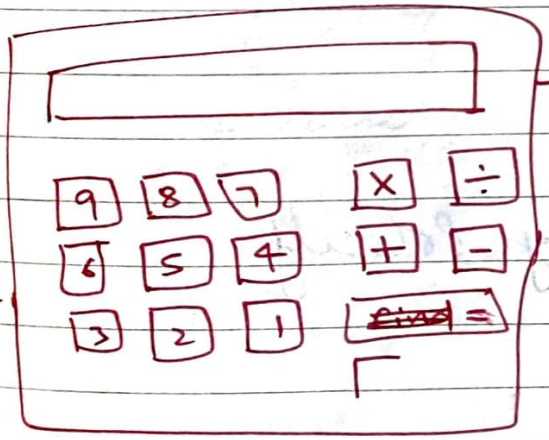
Usability
- effectiveness
- cognitive load

VSABLE INTERFACE

↳ add, sub, multiply, divid — 2 numbers



X



doesn't limit to 2 numbers

Class 4 = 18 Jan

PACMAD model

Usability
- Effectiveness — how well can you engage your user irrespective of scale/size of device
- Cognitive Load

Hand held vs web/PC/Laptop device

Hand held	web/PC/Laptop device
- accessible	- more productivity
- mobile	- more trust & sensitive/imp work

Know the user correctly

Whatsapp Privacy Policy

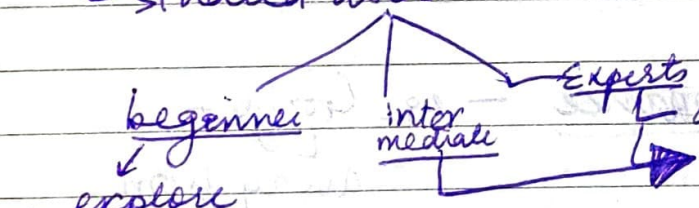
digital Counter } Traditional UI

Design of user Interfaces

① Inside-out design [Traditional]
   ⊏ system/logic first
   ⊏ interface later

② Outside-in design [Traditional]

Facebook
└ studied user



Orkut

dont log in/access but automate their activity

a person whose aware of all features but uses only 1

aware of just 1 & uses it
↓
NOT EXPERT

eg. Developer Tools — codebanks

7±2 Rule

→ STM can hold 7 things at a time

Pilot
└ 300+ tasks at same time

→ Focus these rules mapped to mental model
(user's understanding of how something works)

Cognitive dissonance — eg. Google+
↳ away from mental model

→ UX - should have features that doesn't contradict their beliefs
↓
closeness b/w mental model & feature
↓
similar to what they know or have used

- sometimes changing features is req. if the existing way is inefficient

ED ← 1-2 features ✓
ED ← across system ✗

Class 5 : 21 January

Correlation and Casuality

Correlation
↓
interdependence of variable quantities
↓
when things happen at same time
↓
making relation b/w cause & effect (which may not be spurious)

eg. interdependence b/w features

Casuality
↓
when one thing causes another

eg. use 1 feature & end up using 2 without realising

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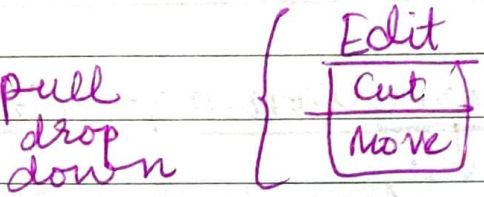
Screen

→ to check mental model. 2 tasks given & given Edit (1 feature)

Cut move

Cut move

pull drop down



Someone who's interacting first time will look for features required / ~~appealing~~ appealing to them.

when you don't know how to perform a particular action, that time ~~who~~ what you do is imp to researchers — and show mental model of users

eg. you'll try to check every feature

eg. Bookmarking

↓ How they search? → decides changes in new versions of UX

How to restore bookmarked

But prior experience can effect the way humans look for req. features — they'd look for features as they've found them on other softwares

80s — web ⟷ change ⟷ mobile

So UX researches conducted studies to understand why people want mobile.
Here ppl might search as they've found in web.

So to some extent it helps
- avoid dissonance
- with new technology

Windows 95 — [Start]

Windows 7 — 

Windows 10 — tablet version ~~windo~~ OS introduced 

So people get influenced by UX researches
↓
people know ⊞ means Start at this location

Errors and Execution

errors of intent and execution

~~errors~~ user doesn't know what to do

knows but did the wrong thing

Schneidermann's Rules

Consistency (1/8)

Shortcuts (2/8)

Feedback (3/8)

└ output should be same, train of events / actions leading to the output may change

click
~~Copy~~-cut
paste
→
drag
x
drop

Yield Closure (4/8)

└ show what's going on

eg. Error box, Progress bar

Error Handling (5/8)

Scaffolding – introduce new knowledge using old knowledge

eg. Show/hide in password
↳ shouldn't alter the original function – maintain security

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UNDO (6/8)

Internal locus of control (7/8)

↳ user should have the choice of which processes to stop

eg. Activity Monitor

↳ The machine shouldn't dictate actions

Short term memory (8/8)

↳ +7/-2 Rule

↳ organising things heirarchly helps ↑ STM

(Apple → Phone 4 in the main bar)

→ Give users a choice – depending on kind of user.

Usability Engineering

Models for UE lifecycle

- Star Lifecycle model
- ISO 13407 model
- UE lifecycle

Activities

① Pre-design
- wireframe design

② Design
- mapping b/w ~~design screen~~
  - done by → Product owner
  - Screen + UX design
  - & requirements

In cycle,
at a stage design is optimal & req. are met

Read these papers

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Research

#1 - Capturing mental model for blind people

Tasks through audio instruction

- 508 Compliance
  - ppl who are visually impaired
    - search by voice

#2 Capturing MM of students

#3 Geriatic users in India (FinTech Mobile Apps)
- Cognitive walkthrough
- automated tool based evaluation

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Class 6 : 25th Jan

Usability Evaluation

Controlled Experiment
- specific task based on which data is collected
- in lab env. set up
- study a feature.

Study generalisability
- Can this be generalised to larger audience

Step 1 = Hypothesis
- eg. login form is expected to work (i.e. give output)

Step 2 = Manipulate independent variable (design)
- ↓ interface, class, task, language, accessibility features

Step 3 = Measure dependent variable
- time
- error
- Satisfactn
- # task done

} Same across indep. variable

Step 4 = Use statistical test to accept/reject the hypothesis

→ controlled experiment for 7
Emerging technology/audience

eg. target audience - kids, old people

Validity — that it is CONTROLLED aspect of these tests/experiment

Internal

causal relationship b/w result/outcome and the independent variable

~~External~~

eg. web - task (a)
app - task (b)

if (a) is done first, the person is already comfortable w the functionality — so (b) will be easier as compared to (a)

this bias doesn't matter

Read from other sources

External

generalisat° to use

so select the participants carefully

all ages
all demographics
etc.

factors impacting internal/external

Formative methods

① Heuristic evaluation :

eg. SUS - software usability scale

② Cognitive Walkthrough :

└ limited to experts in the domain

eg. space simulation, self-driving car
↓
expert driver
↓
can judge outcome
as per industry standards

③ Pluralistic walkthrough

Summative methods

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Usability guidelines

- redirect to mobile version of site, if user access site on mobile phone
- " app

Usability tools

eg. Mobile Friendly Test tool by Google
↳ Read about this.

eg. UMETRIX

Ravi Shankar

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PDCA cycle (Plan-Do-Check-Act Cycle)

└ to effectively implement CHANGE

① Plan

└ smaller steps - less failures

- Core Problem
- Resource needs
- Existing Resources
- Best soln ∈ existing resources
- conditions for plan to be successful
- goals

→ create & maintain open feedback loops enabling to collect enough informat^n before proceeding

② Do

- Take Action
- Apply Everthing planned
- be aware of unpredictable problems (so incorporate plan on a small scale & in a controlled environment.)
- Standardisation → roles & responsibilities assigned to team members

③ Check

- most important stage

- avoid recurring mistakes
- apply continuous improvement
- audit the results
- identify problematic parts & eliminating them

④ Act

- If everything seems perfect, apply the initial plan.
- PDCA will become new standard baseline however, whenever a plan is repeated - it should be improved & revised again

Advantages - fosters teamwork through brainstorming & problem solving
- the repetitive approach helps find & test solutions and improve them through a waste reducing cycle
- includes a mandatory commitment to continuous improvent
- has a ⊕ve impact on productivity & efficiency
- prevents recurring mistakes.

Disadvantages

- takes time
- not appropriate for urgent issues

(★) A process that is normally distributed has 3.4 / million parts outside limits when limits are six-sigma

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Six Sigma Framework (Bill Smith)

- gives tools & techniques to know
  - why the problem is occuring
  - how to eliminate the problem
  - how to improve the process
  - fix further issues

(1) Reduces
- Time
- Defects
- Variability experienced by processes

(2) Defect free 99.9996% of the time
(★) allowing only 3.4 errors / 1 million opportunities
(3) Increases customer loyalty
(4) Improves employee morale

Two methodologies:

① DMAIC	② DMADV
for projects aimed at improving an existing business process	for projects aimed at creating new product/process designs.

DMAIC

① Define (look at process as a whole)
- determine issues faced
- identify opportunities for improvement
- what are customer requirements
- define project goals

Tools: Fishbone, Pareto chart, etc.

② Measure
- determine how process is performing currently in its unaltered state
- collect relevent data of current scenaria
- calculate 'as-is' process capability

eg. no. of cars manufactured in a day,
time taken to assemble a car,
no. of wipers attached in a day,
time taken to attach windshield wipers,
no. of defects detected from each machine,
no. of cars & defects in a day.

③ Analyse
- determine what causes defect & variation
- analyse previous data to verify 'cause-effect' relationship.

④ Improve
- make changes to the current processes and ensure defects are addressed
- using techniques like DoE (design of experiments), mistake proofing, testing
- set up pilot runs to establish process capability.

eg. → replace ~~no~~ faulty machines,
rearrange steps while assembling

⑤ Control

- make regular adjustments to control new processes and future performance.
- Tools = control charts
- this process is repeated until the desired quality level is obtained.

DMADV (also cl. DFSS) – (4.5 sigma +)

① Define

- requirements of customer

based on historical data, industry research & inputs from customers.

- what features are customers more inclined towards.

② Measure

- create specification using customer requirements. This specs helps in defining the product in a measurable method. (measure product capabilities)
- measure risks
- identify characteristics that are Critical To Quality (CTQ)

③ Analyse

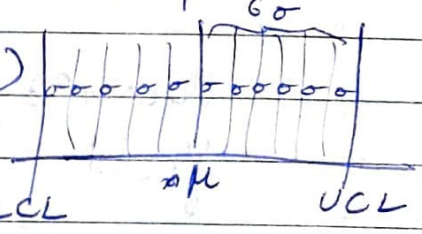
- to design & develop alternatives
- i.e. analyse the product to determine whether there are better ways to achieve desired results.

- areas of improvement are determined and tested.

④ Design
- based on learnings from analyse phase, new process/product is designed
- revisions are made to the model
- the analyse phase is repeated based on the new design
- bring in a focus group & see how they receive it — given their feedback more changes are made

⑤ Verify
- check if end result meets/exceeds the requirements
- set up pilot runs

Six Sigma requires that process operate so that the nearest requirement is at least 6 st. deviations away from process mean

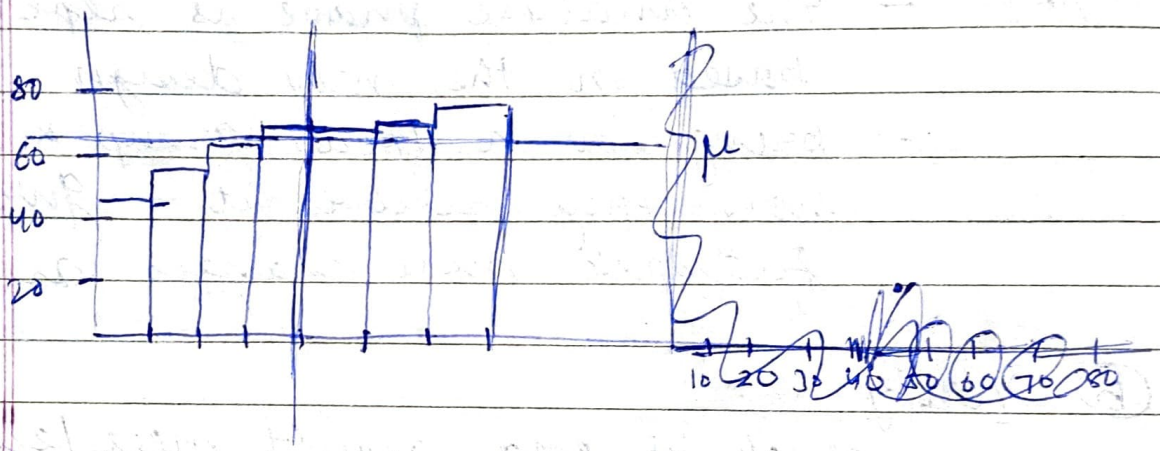


If defects found in testing lie in UCL & LCL — then process in control otherwise needs correction

Case Study : Six Sigma

Bookstore website

1. Current level of satisfaction
2. Improvement opportunities
3. Choose an opportunity
4. Implement it.



$\sigma = 11.3$

$\mu = 65\%$

failure = 35%

350000 10,00,000

$$DPMO = \frac{350000}{}$$

Defects % = 35 %

Yield = 65%

Now look up any of these 3 in Six sigma table to find Sigma level

35 0000 DPMO ~ 1.89 sigma

SNAC Stakeholders, Needs, Alterables, Constraints

Stakeholders : those who will be affected by the policy of the organis

all those who affect the system or get affected

eg. groups, individuals, agencies, customers, their customers

Needs - requirements of stakeholders that are fulfilled by the organisation

Alterables - parameters, event / processes that can be controlled or altered to fulfill the needs of stakeholders.

Constraints - limitations imposed by uncontrollable factors

Step 1 : Descriptive Scenario

Step 2: Screen DS for plurality of parameters which are key elements

KTA – Key thrust Area

Step3: Classify parameters into SNAC.

Step4: Set of stakeholder objectives is derived based on the criteria that each stakeholder objective satisfies one/more needs either by overcoming a constraint or by changing alterable

Step 4 = Analyse & firm up objectives

- Self or cross interaction matrices
  - Indicate extent of interaction between key elements

Eg. Traceability Matrix

Interaction Techniques for Stakeholders

used for/when –
- → conflict resolution
- → dealing sth. ↄ varied perceptions
- → requirement elicitation (etc. in slides)

① Nominal Group Technique

structured method ~~for~~ that encourages contributions from everyone

used when:
- some group members more vocal
- some think better in silence

etc (in slides)

→ It helps in generating alternatives & choosing best option
→ prevents being pressured / influenced
→ encourages creativity and diverse ~~options~~ opinions

Step 1: Present goals
↳ ensure everyone understands the goals

Step 2: Generate Alternatives
- ↳ each group member brainstorms alternative ideas (separately ~~cont~~ discuss)
- ↳ generated on index cards

Step 3: Record alternatives & share ↄ everyone

Step 4 = Consolidate alternatives
- eliminate redundancy
- explain alternatives that ppl don't understand (but don't sell any)

Step 5 = Rank alternatives
- Score ~~each~~ alternatives
- Decide how many to rank
- generally Rank 3-5 alternatives
- most preferred - highest rank/score

Step 6 = Tally votes
- for each alternative in front of the group

Step 7 = Implement idea w most votes ~~or hold more discussion~~ and record the alternatives

(2) Brainstorming

Before session =
- have meeting goals
- invite right ppl (demographic varied)
- quantity not quality
- work w facilitator
- start w icebreaker

(a) → Round Robin Brainstorming
- include everyone
- build off of previous person's idea
- think creatively & differently

(b) Charettee Method
- multiple topics
- easel & topics
- move to next easel
- write clearly

(c) Five Whys
- root cause of an issues
- why this? Why. — 5 whys. ↓ getting to root cause
- check if controllable root cause } quality check

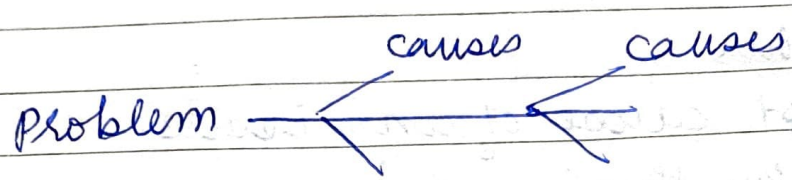
reverse the why into answer

(d) Figure storming
- pick famous ppl
- group ppl
- how they (famous ppl) would answer this problem

(e) Brainstorm Competition
- teams
- idea x time limit
- prize.
- winner — most ideas (quantity)

Problem Solving

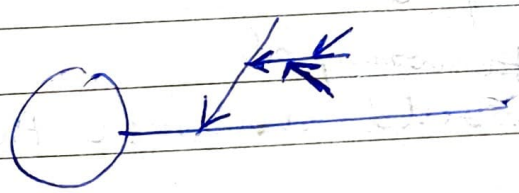
① Fishbone diagram / Ishikawa diagram
- cause & effect diagrams
- reasons for failures, defects etc.



5 Whys Method
- to identify "Root cause"

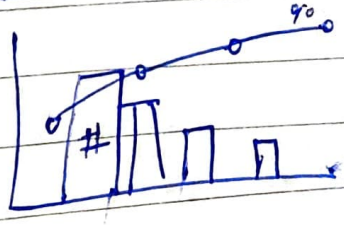
5 Ms, 8 Ps, 4 Ss ← root causes

Step 1 : Problem
Step 2 : Branches – Major Cause (Brainstorming)
Step 3 : Sub branch – Root Cause (using 5 Whys)



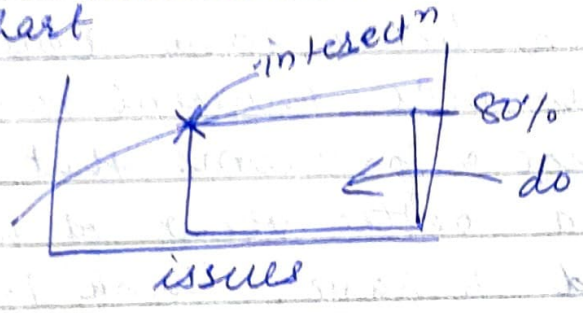
② Pareto Charts – 80/20 rule
- for prioritising

Cause	# of occurences	% cumulative occurences



80% problem ——— 20% issues

① Sort # of occurences or amount in descending
② Get sum of
③ Find Cumulative amount
④ % Cumulative
⑤ Chart
⑥



find intersection point of & target area / issues on left

③ Design Thinking

① Empathise – collect info
② ~~Define~~ – develop understang of users, needs, probles
③

② Define the problem
└ analyse the observations from step 1 & synthesise them in order to define core problems

④
└ helps to gather ideas (for designers)
└ ~~no~~ ~~create~~ define a human-centered problem statement

③ Ideate
└ generate ideas
└ initially quantity matters – get as many ideas in beging itself

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(4) Prototype

- build a scaled-down version or specific feature of the product.
- investigate prototype and either accept/improve/re-examine or reject on the basis of UEX.
- gives a better idea about the constraints inherent to the product & problems that are ⊕nt.
- get a better view of how users would behave, think/feel while interacting ε end product.

(5) Test

- test the complete product using the best solns identified during prototyping phase.

→ Iterative & non-linear nature of design thinking