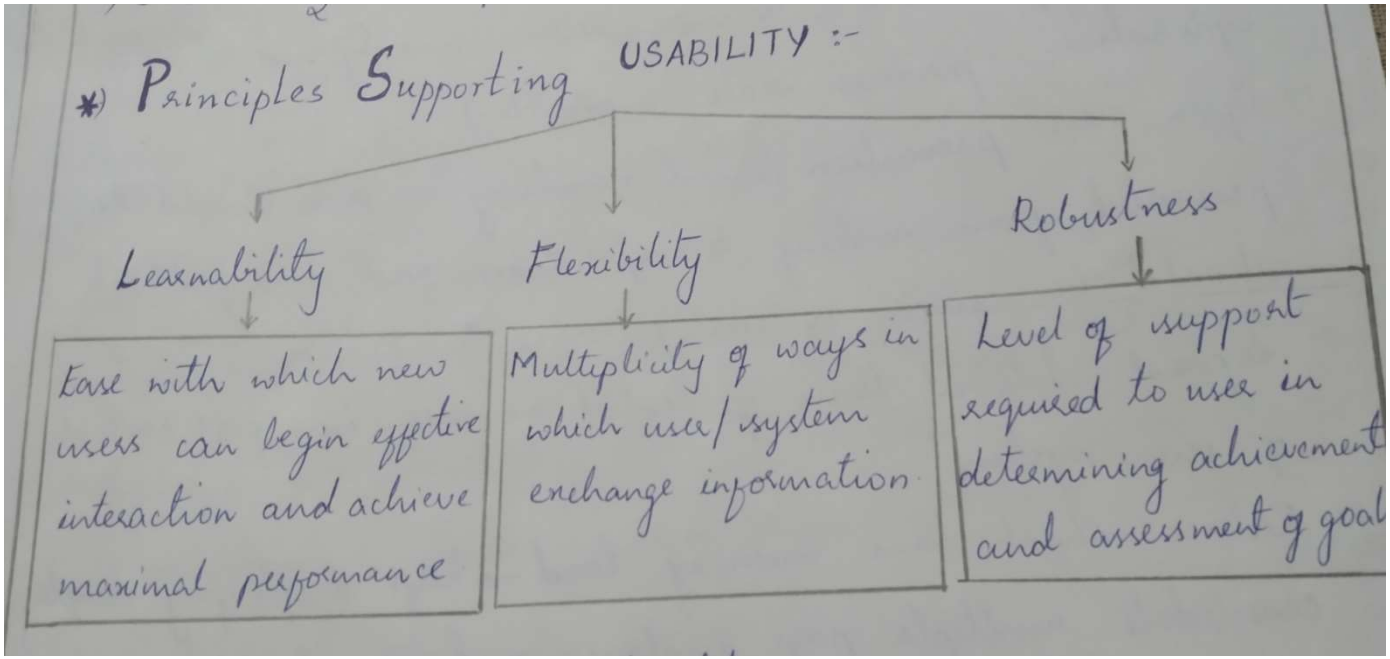
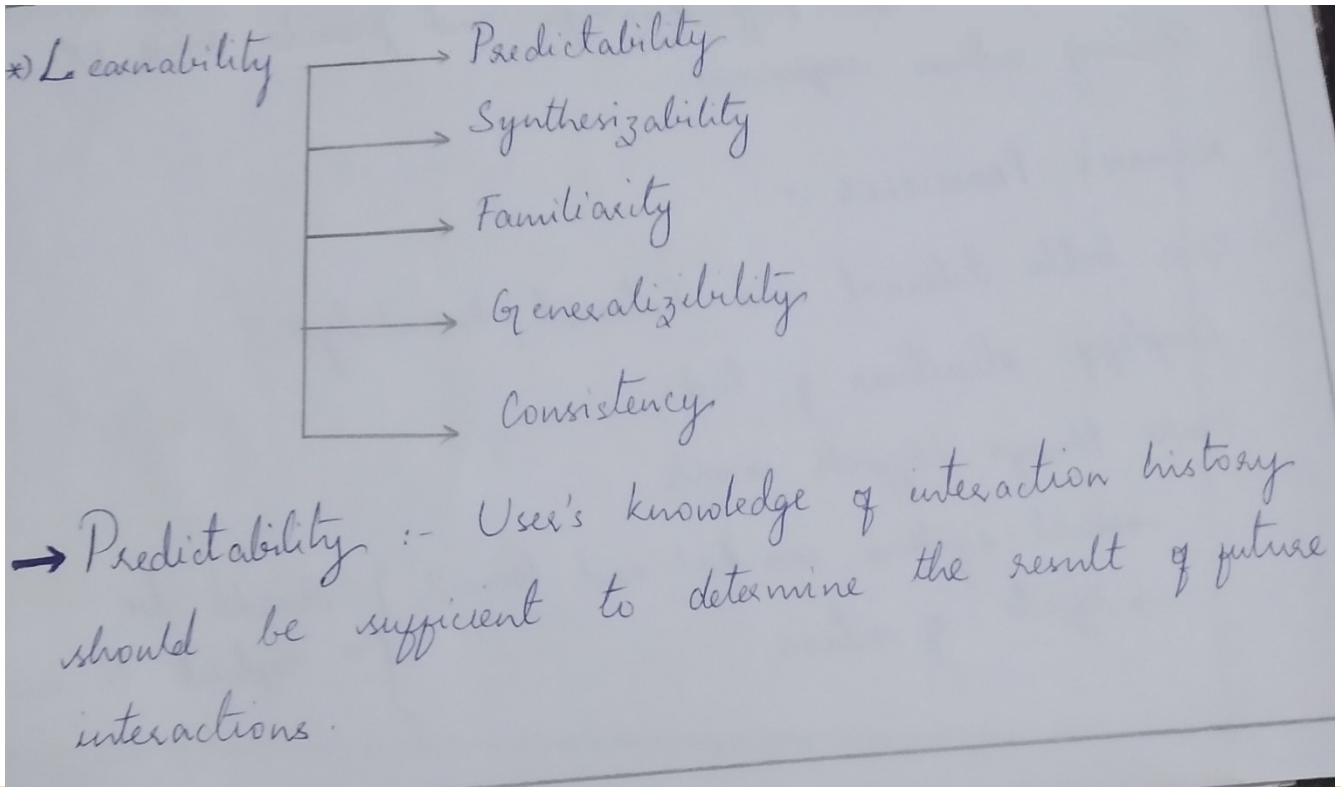
PRINCIPLES SUPPORTING USABILITY

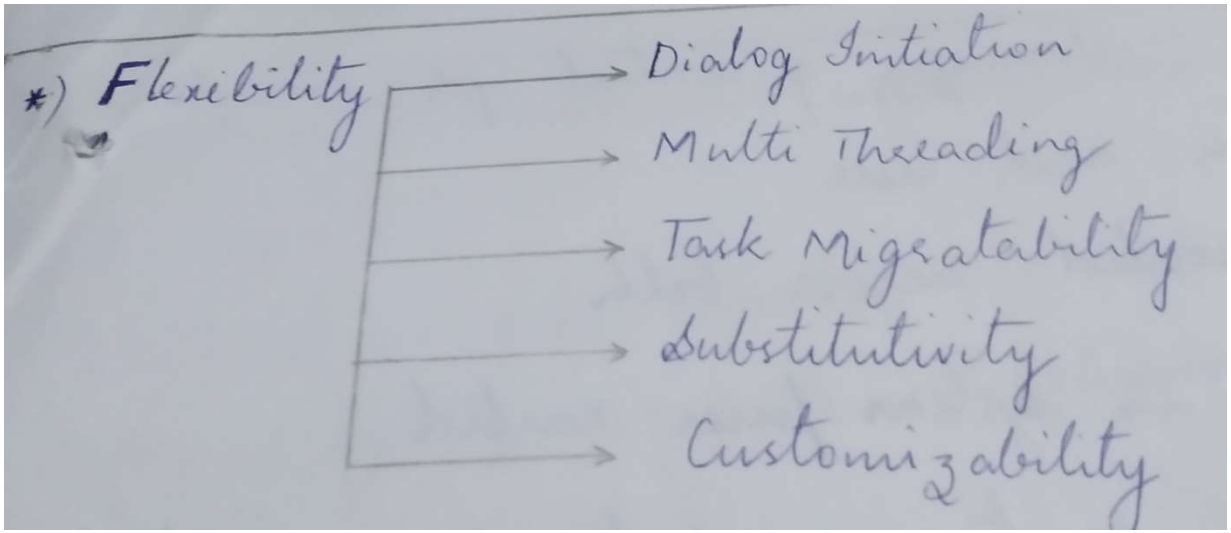
- Usability is a **quality attribute** that assesses how easy user interfaces are to use
- **Learnability**: How easy is it for users to accomplish basic tasks the first time they encounter the design?
- **Efficiency**: Once users have learned the design, how quickly can they perform tasks?
- **Memorability**: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- **Errors**: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- **Satisfaction**: How pleasant is it to use the design?

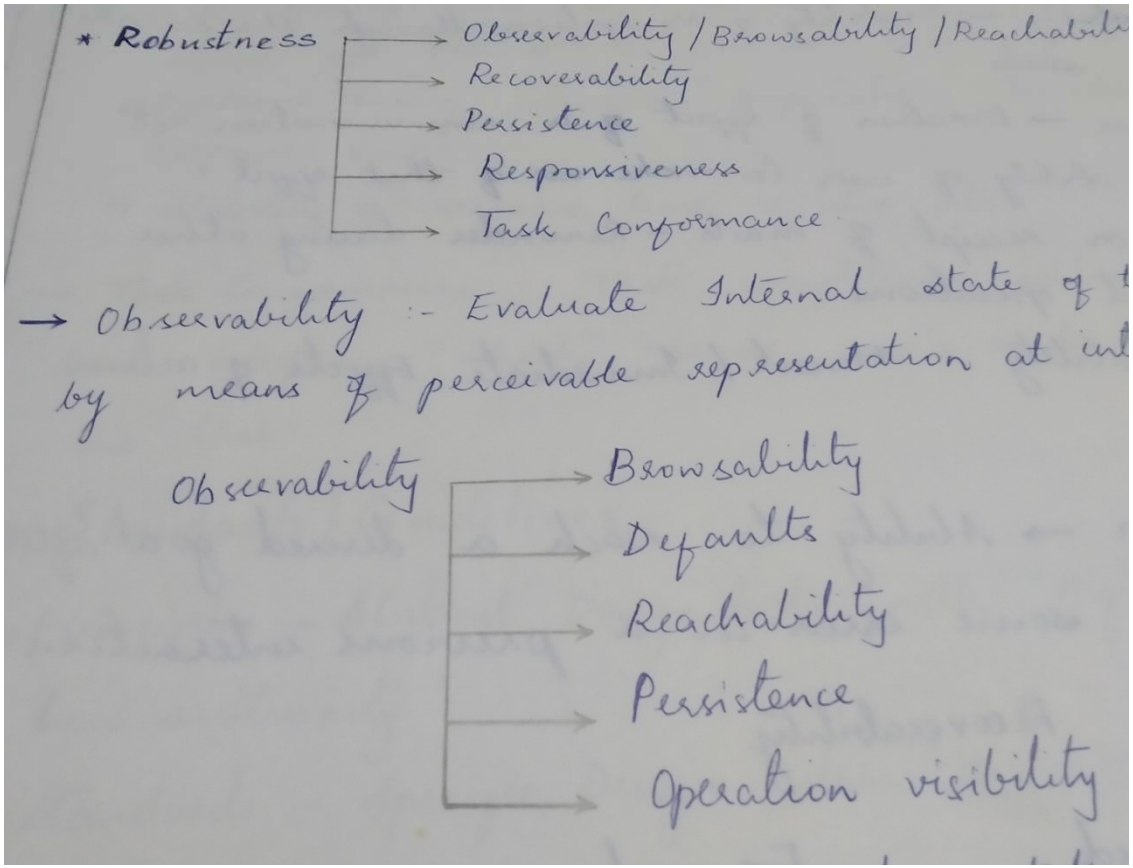
- **Utility** = whether it provides the **features you need**.
- **Usability** = how **easy & pleasant** these features are to use.
- **Useful = usability + utility**.
- 3 contexts of the concept of **use ; useful, usable and used**
- **useful is** one that allows a user to accomplish a task or objective.
- **Usability is about human behavior**
- that are easy to do vs. those that are hard to do."
- Usable is more than "useful" – **ways product will be used** ; **whether it enables the user to do so in a pleasurable, simple (ASAP) and effective manner.**

- Many "useful" products fail to be "usable"
- Door with a handle and push/pull instruction – **useful but a failure on usability front!**
- **USED** - users to use that design or acceptance of product!
- A product may be both useful and usable and still fail to be used
- **Sir Clive -** one-person battery powered and environmentally friendly car – **failure (climate change issue crux)**
- **Segway, a personal vehicle** which allows users to go anywhere on two wheels – **legal issue not bothered at all!**


* Principles Supporting USABILITY :-
Learnability
Flexibility
Robustness
Ease with which new users can begin effective interaction and achieve maximal performance
Multiplicity of ways in which user/system exchange information
Level of support required to user in determining achievement and assessment of goal


* Learnability
Predictability
Synthesizability
Familiarity
Generalizibility
Consistency
→ Predictability :- User's knowledge of interaction history should be sufficient to determine the result of future interactions.


*) Flexibility
Dialog Initiation
Multi Threading
Task Migratability
Substitutivity
Customizability


* Robustness
Observability / Browsability / Reachabili
Recoverability
Persistence
Responsiveness
Task Conformance
→ Observability :- Evaluate Internal state of
by means of perceivable representation at int
Observability
Browsability
Defaults
Reachability
Persistence
Operation visibility

Principles to Support Usability (continued)

Synthesizability :- Ability of the user to assess the effects of past operations on current state

↳ "Honesty" → Ability of user interface to provide an observable / informative account of change

↳ "Immediate" → Notifications can occur without delay ↳ or atleast eventually

eg: Command language / visual desktop interfaces

" file move from one directory to another "

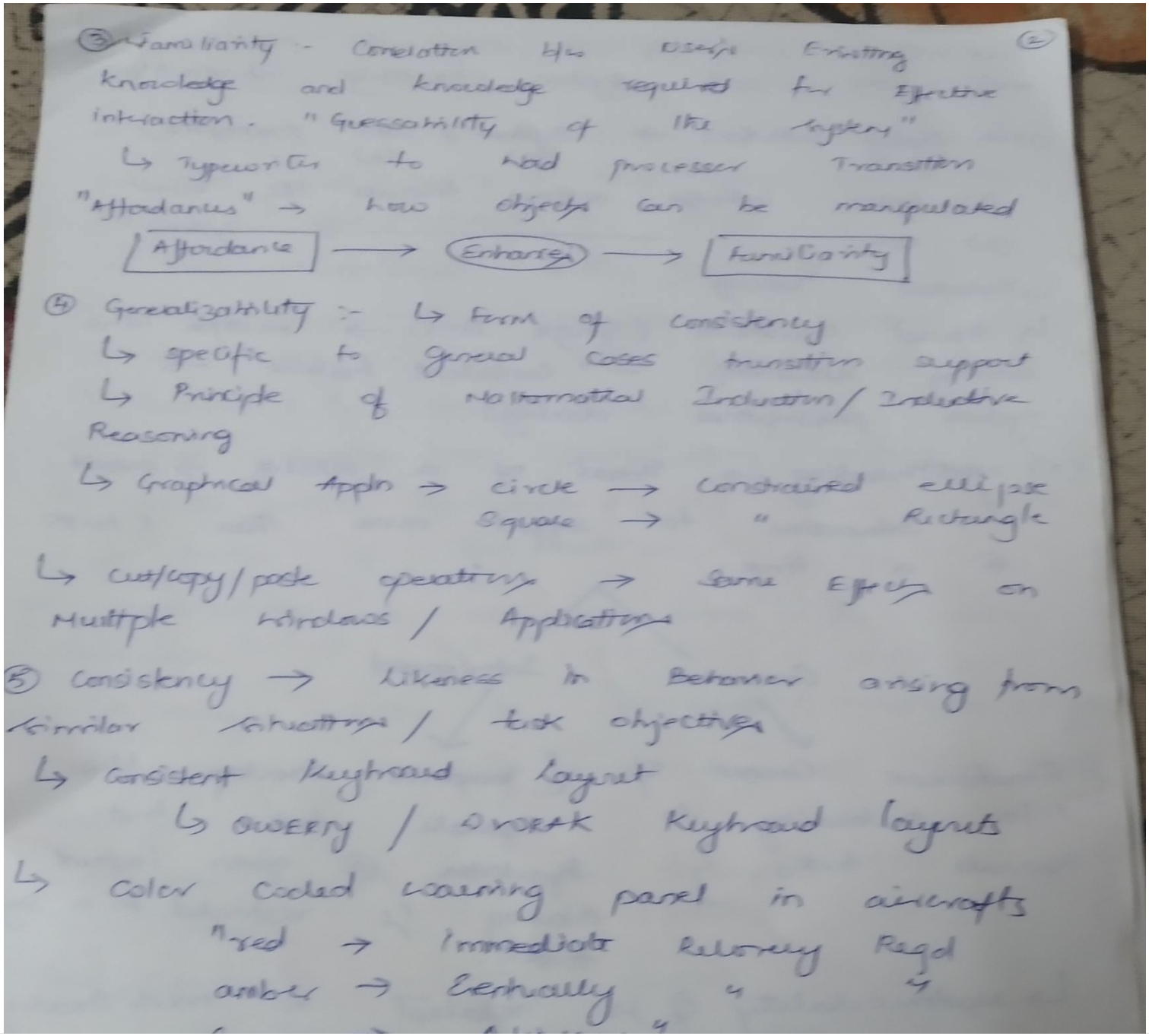
↳ visual setup → Honest → Immediately (Immediately Honest)

↳ Command line → " → Eventually

(Unix) → "mv" command and then "ls" in both directories

↳ Apple Mac m/cs (Earlier versions) → creation of new folder within a folder → visual effects were not immediately honest.

↳ global search / replace fns of word processor

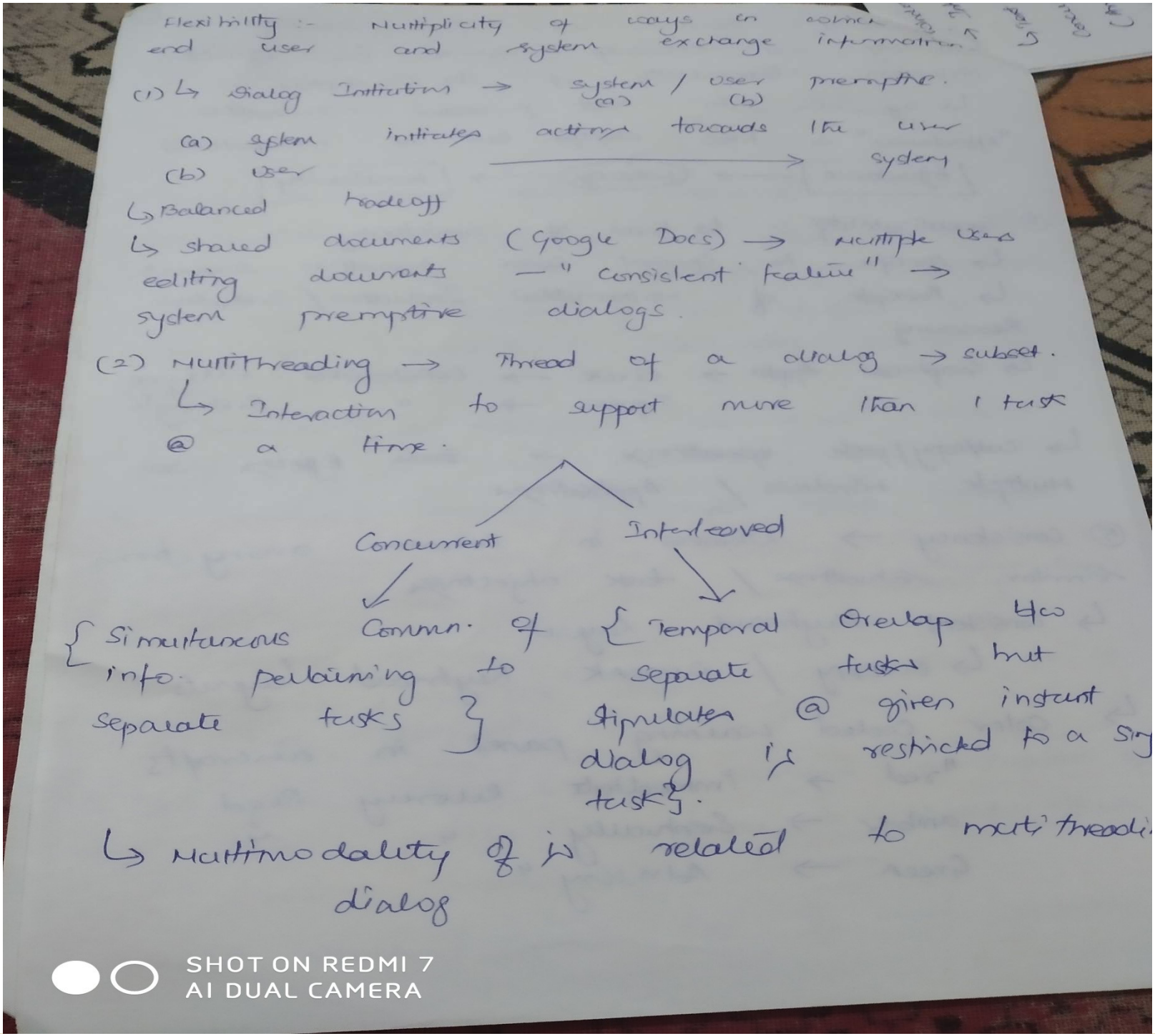


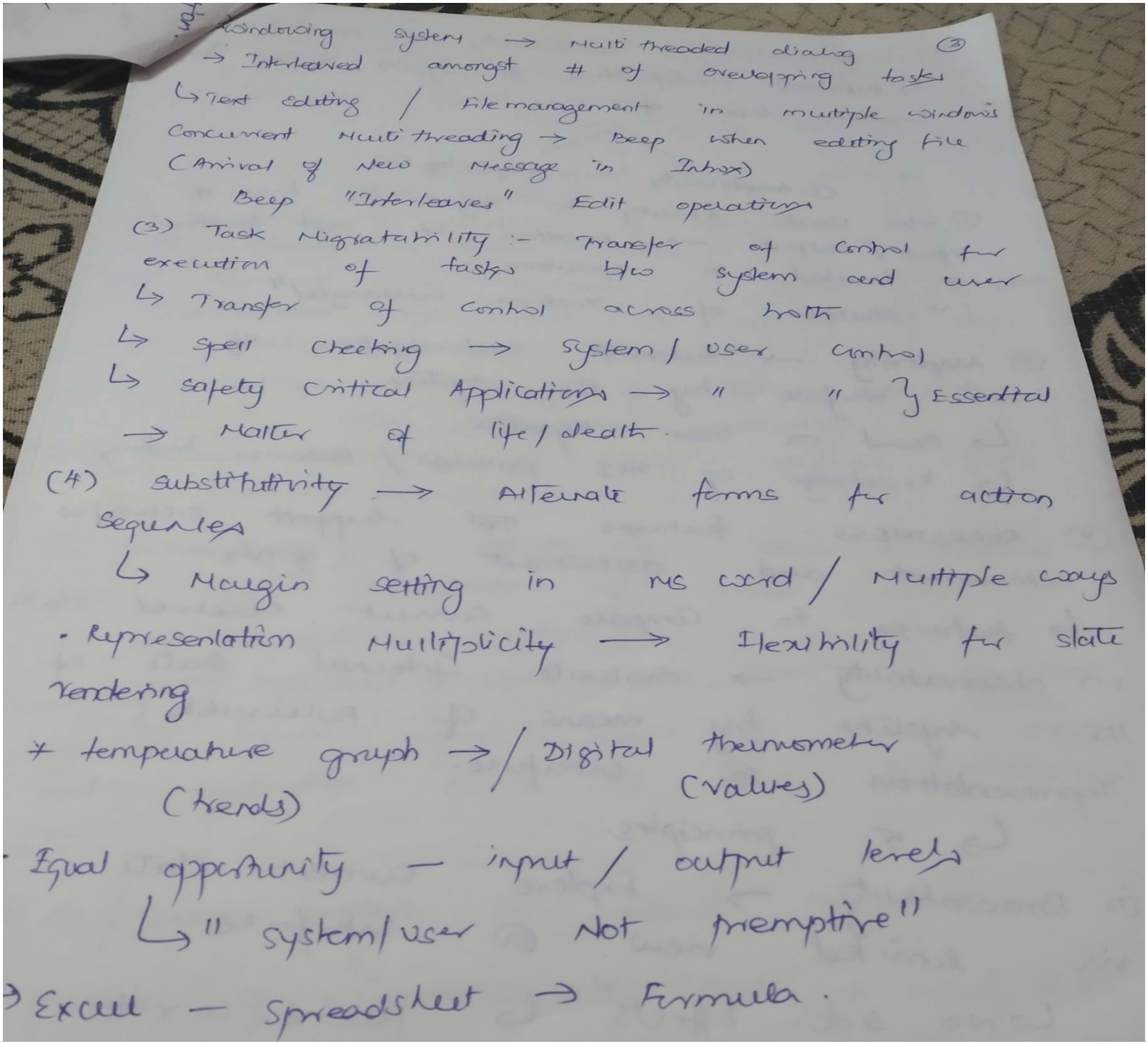
③ Familiarity :- Correlation b/w user's existing knowledge and knowledge required for effective interaction. "Guessability of the system"
↳ Typewriter to word processor transition
"Affordances" → how objects can be manipulated

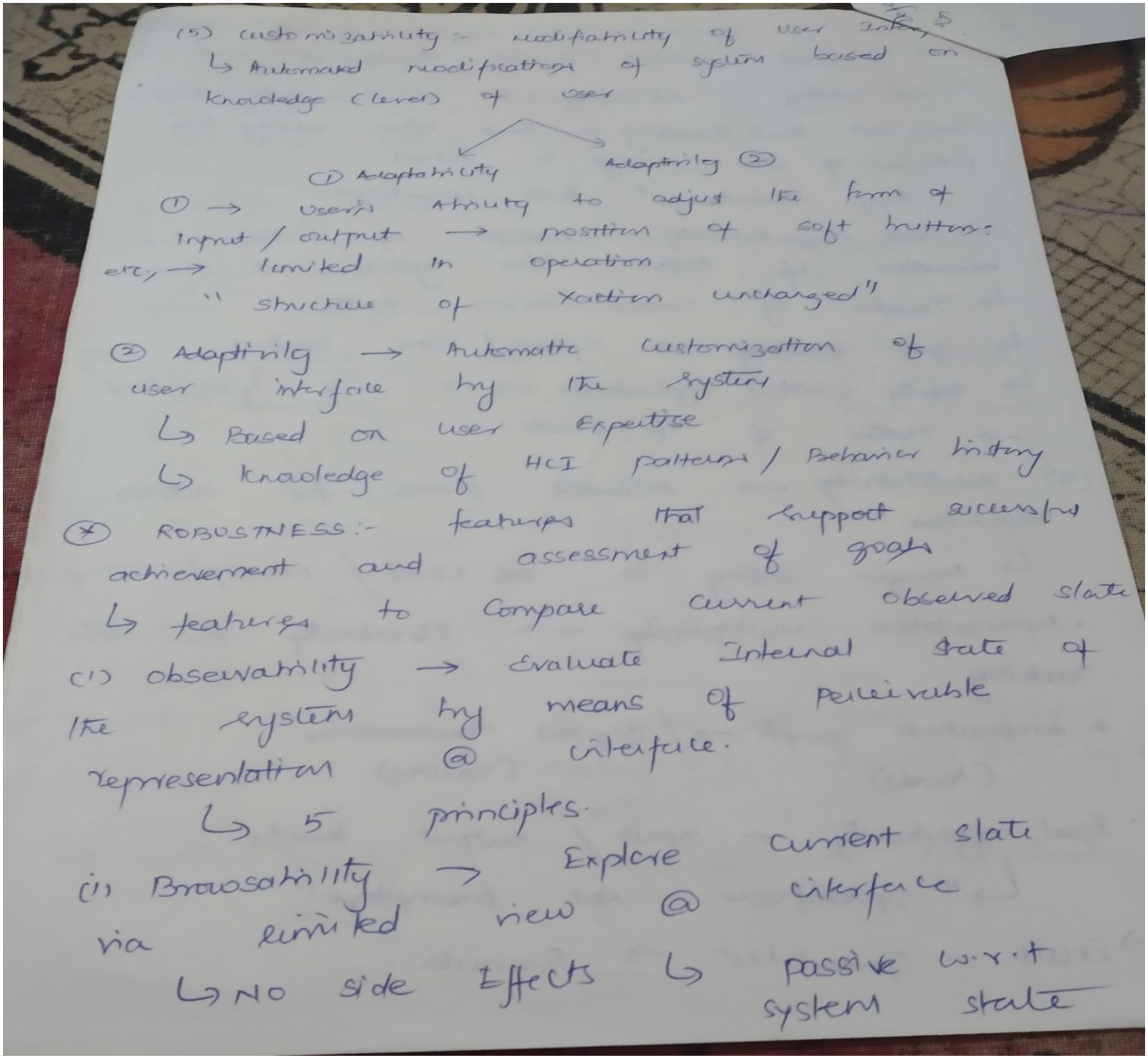
Affordance → Enhances → Familiarity

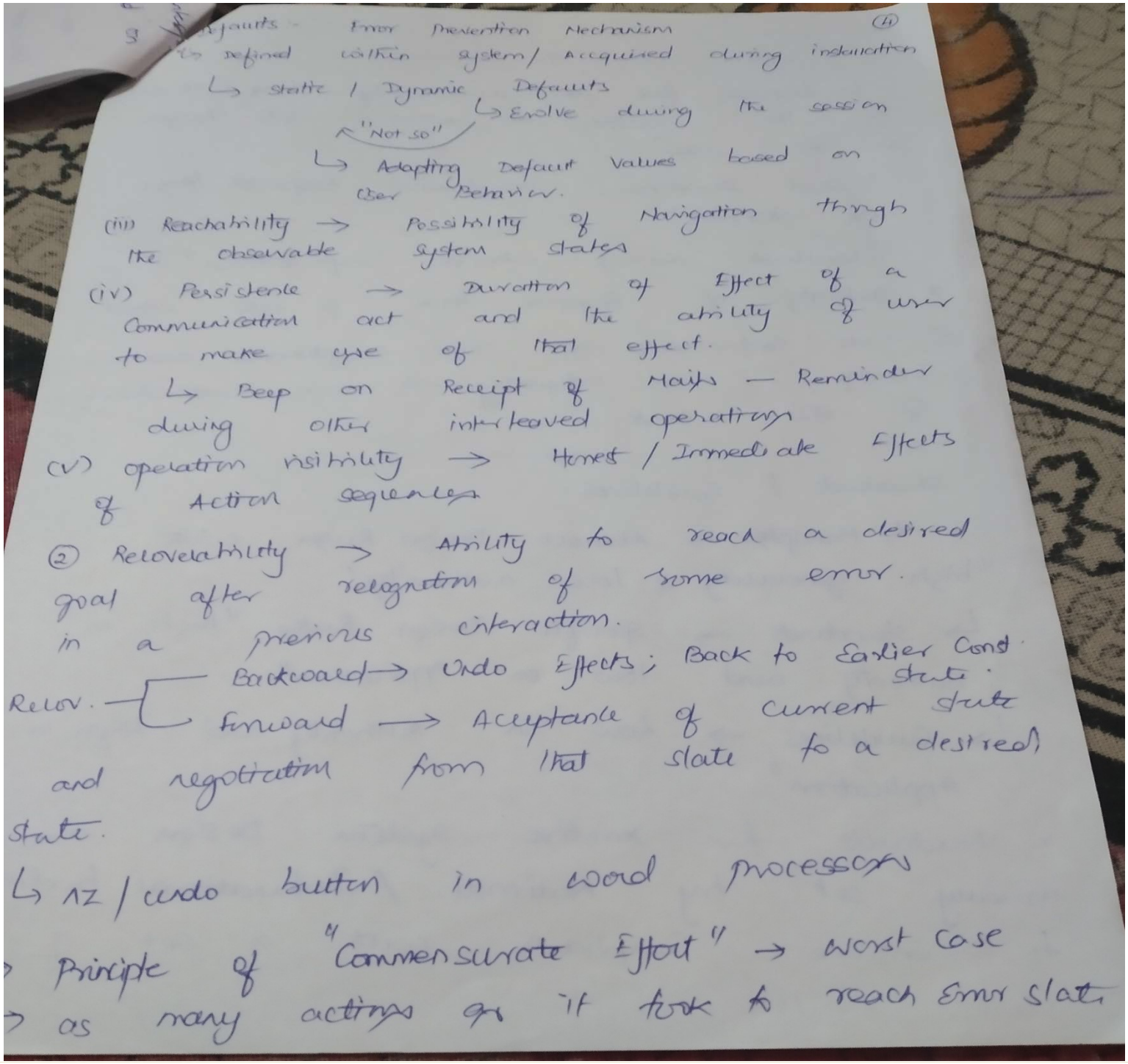
④ Generalizability :- ↳ form of consistency
↳ specific to general cases transition support
↳ Principle of Mathematical Induction / Inductive Reasoning
↳ Graphical Appln → circle → constrained ellipse
Square → " Rectangle
↳ cut/copy/paste operations → same Effects on Multiple windows / Applications

⑤ Consistency → likeness in Behavior arising from similar situations / task objectives
↳ Consistent Keyboard layout
↳ QWERTY / DVORAK Keyboard layouts
↳ Color coded warning panel in aircrafts
"red → Immediate Recovery Req'd
amber → Eventually " "


Flexibility :- Multiplicity of ways in which end user and system exchange information.
(1) ↳ Dialog Initiation → system / user (a) (b) preemptive.
(a) system initiates actions towards the user
(b) user → system
↳ Balanced Trade off
↳ shared documents (Google Docs) → Multiple users editing documents — "Consistent failure" → system preemptive dialogs.
(2) Multithreading → Thread of a dialog → subset.
↳ Interaction to support more than 1 task @ a time.
Concurrent
Interleaved
{ Simultaneous Comm. of info. pertaining to separate tasks }
{ Temporal Overlap Two separate tasks but stimulates @ given instant dialog is restricted to a sing task }.
↳ Multimodality of is related to multi threadi dialog
SHOT ON REDMI 7
AI DUAL CAMERA


Windowing system → Multi threaded dialog ③
→ Interleaved amongst # of overlapping tasks
↳ Text editing / File management in multiple windows
Concurrent Multi threading → Beep when editing file
(Arrival of New Message in Inbox)
Beep "Interleaves" Edit operations
(3) Task Migratability :- Transfer of control for execution of tasks b/w system and user
↳ Transfer of control across both
↳ Spell Checking → System / User control
↳ Safety critical Applications → " " } Essential
→ Matter of life / death.
(4) Substitutivity → Alternate forms for action sequences
↳ Margin setting in MS word / Multiple ways
• Representation Multiplicity → Flexibility for state rendering
* temperature graph → / Digital thermometer
(trends) (values)
• Equal opportunity — input / output levels
↳ " system/user Not preemptive"
→ Excel — Spreadsheet → Formula.


(5) customizability :- modifiability of user
↳ Automated modifications of system based on
knowledge (level) of user
① Adaptability
Adapting ②
① → user's Ability to adjust the form of
input / output → position of soft buttons
etc; → limited in operation
" structure of action unchanged"
② Adapting → Automatic customization of
user interface by the system
↳ Based on user Expertise
↳ knowledge of HCI patterns / Behavior history
③ ROBUSTNESS :- features that support successful
achievement and assessment of goals
↳ features to compare current observed state
(1) observability → Evaluate Internal state of
the system by means of perceivable
representation @ interface.
↳ 5 principles.
(i) Browsability → Explore current state
via limited view @ interface
↳ NO side Effects ↳ passive w.r.t
system state


Defaults - Error Prevention Mechanism
to defined within system / Acquired during installation
↳ static / Dynamic Defaults
↳ Evolve during the session
"Not so"
↳ Adapting Default Values based on User Behaviour.
(iii) Reachability → Possibility of Navigation through the observable system states
(iv) Persistence → Duration of Effect of a Communication act and the ability of user to make use of that effect.
↳ Beep on Receipt of Mails — Reminder during other interleaved operations
(v) operation visibility → Honest / Immediate Effects of Action sequences
② Recoverability → Ability to reach a desired goal after recognition of some error in a previous interaction.
Recov. — Backward → Undo Effects; Back to Earlier Const. state.
forward → Acceptance of current state and negotiation from that state to a desired state.
↳ ^Z / undo button in word processors
Principle of "Commensurate Effort" → worst case
as many actions as it took to reach Error state

③ Responsiveness - Rate of communication between the system and the user

↳ Response time → Duration of time needed by the system to express state changes to the user.

" Short Durations; Instantaneous Response times are desirable"

" Feedback during intensive computations "

* Stability of Response time is also vital.

④ Task Conformance → Task completeness addresses coverage; task adequacy → User's understanding of the task.

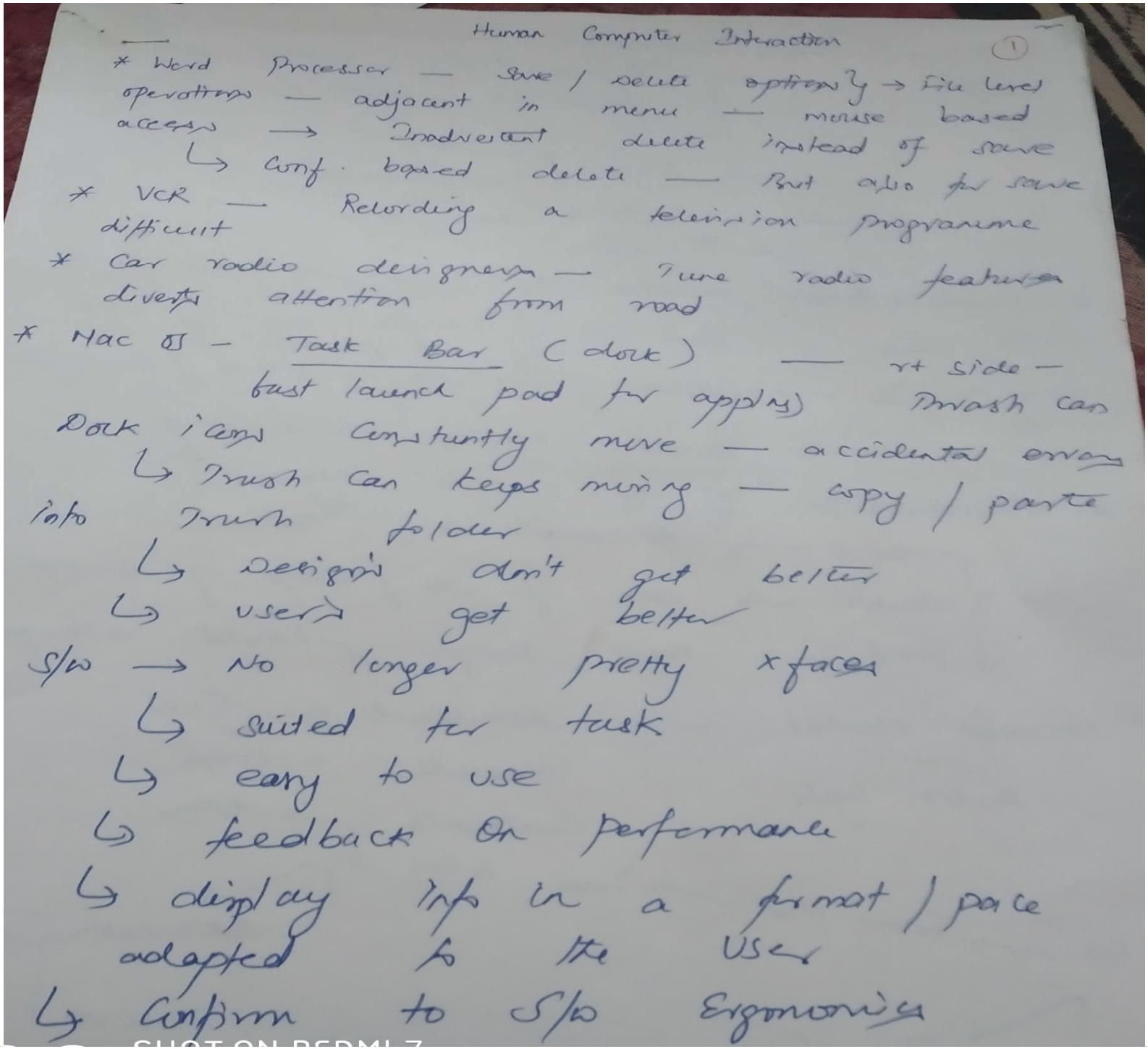
Standards / Guidelines :-

↳ Principles → Abstract Design Rules with "high generality & low authority"

↳ Standards → specific Design Rules "High in Authority and low in Application"

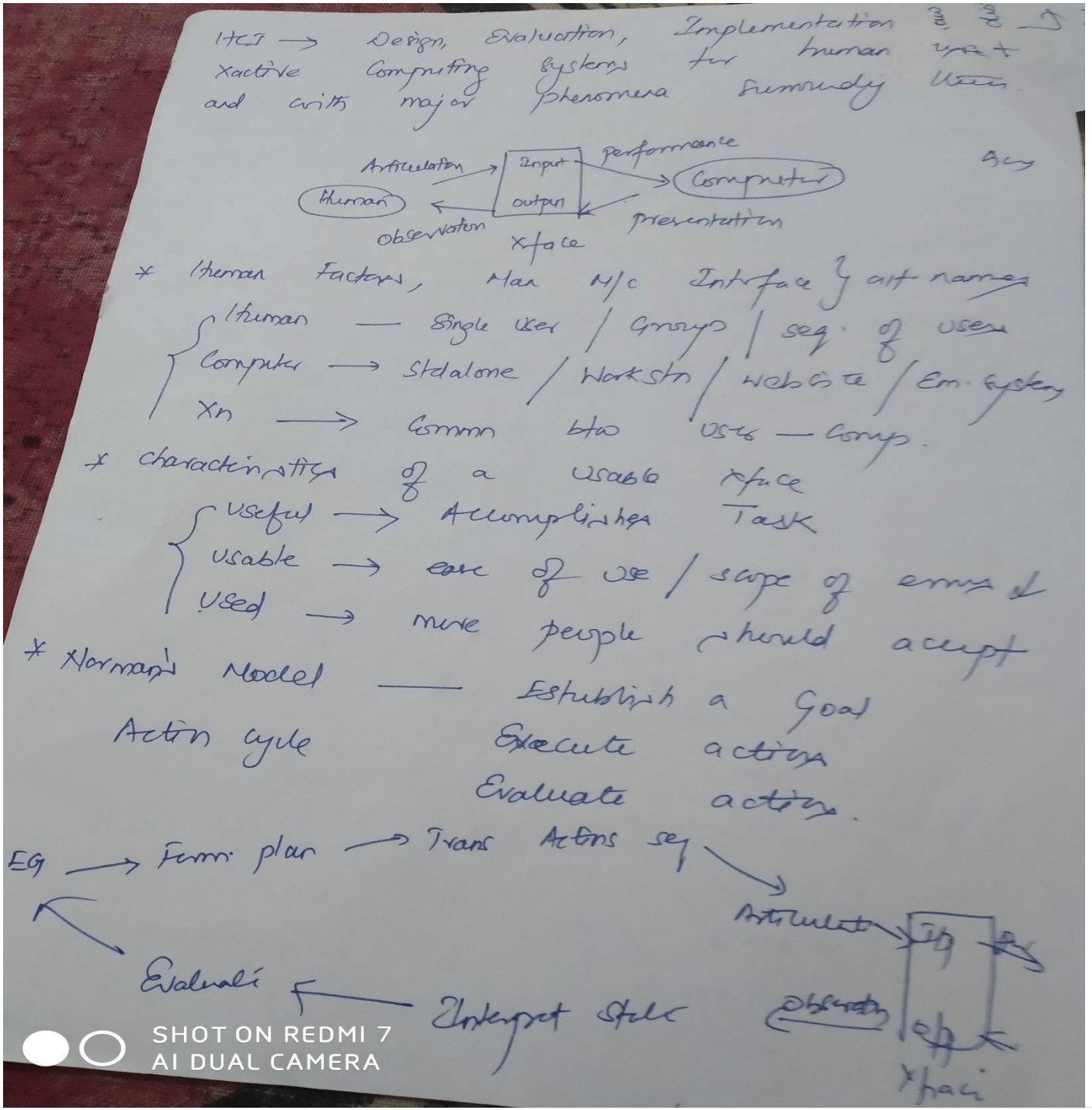
↳ Guidelines → Low in Authority and High in Application".

* Standards for xactive system Design are usually set by National / International bodies to ensure Compliance with a set of design rules



Human Computer Interaction ①

* Word Processor — Save / delete options → file level operations — adjacent in menu — mouse based access → Inadvertent delete instead of save
  ↳ Conf. based delete — But also for save
* VCR — Recording a television programme difficult
* Car radio designers — Tune radio features diverts attention from road
* Mac OS — Task Bar (dock) — rt side — fast launch pad for apps) Trash can
  Dock icons constantly move — accidental errors
  ↳ Trash can keeps moving — copy / paste into Trash folder
  ↳ Designs don't get better
  ↳ users get better
* S/w → No longer pretty x faces
  ↳ suited for task
  ↳ easy to use
  ↳ feedback on performance
  ↳ display info in a format / pace adapted to the user
  ↳ Confirm to S/w Ergonomics



Fitts law → target hit time → fn of target size (4)
+ distance to be moved

↳ Simulation diff sized circles
/ diff colors / 30 { dist / time / dia }.

Memory
- iconic (vision) —— persistence of
- echoic (aural) —— repeat question
- haptic (touch).

Sensory → short term (working).

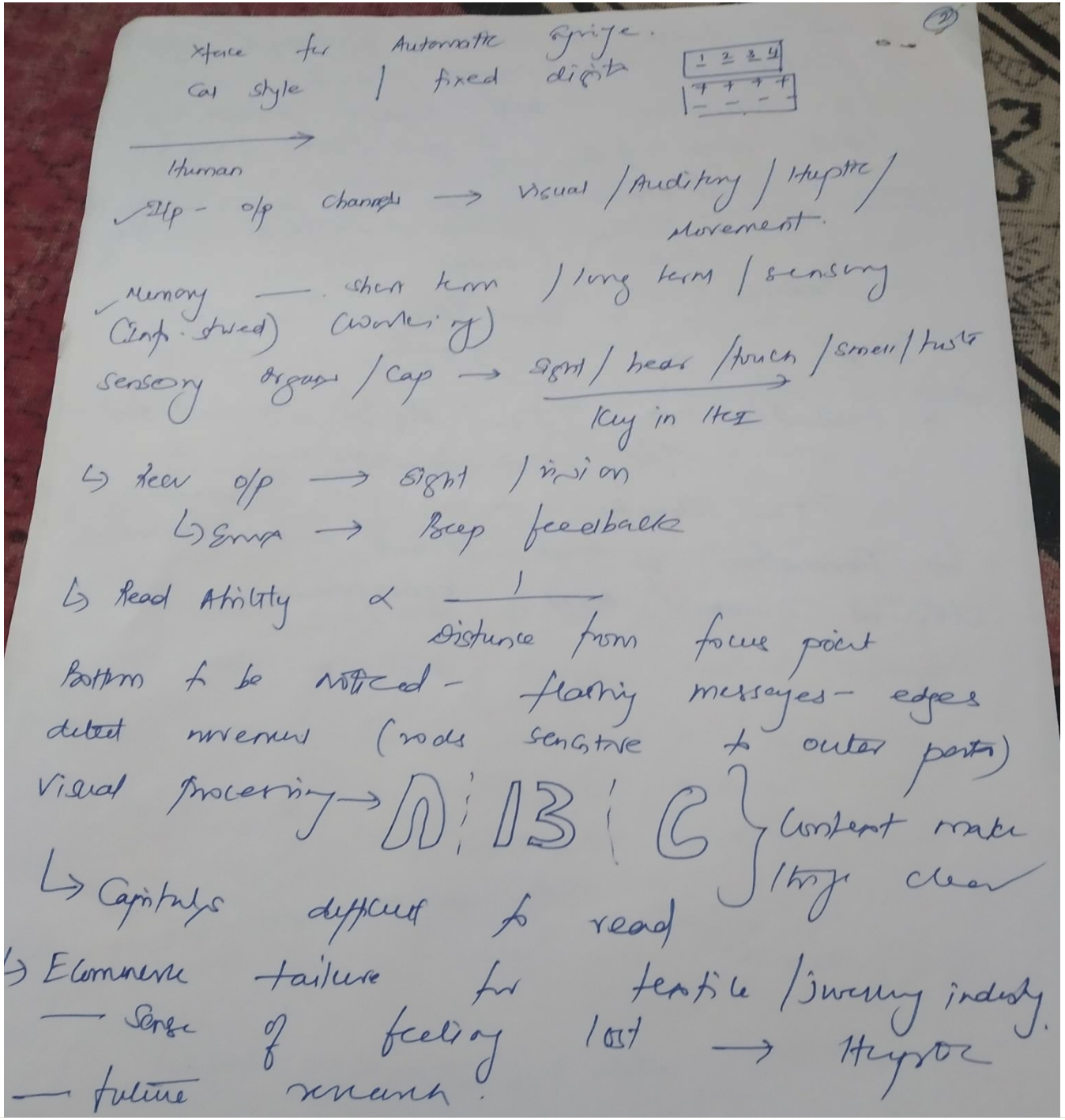
35 × 6 → (35 × 2) × 3 = 210.

* limited → 7 ± 2 digits remember
(digit span) * Menus ?
—— UNIX commands

7 ± 2 chunks.

↳ Formation of a chunk → closure
ATM Example

closure →


Xface for Automatic Syringe.
Car style / fixed digits
1 2 3 4
Human
I/p - o/p channels → Visual / Auditory / Haptic / Movement.
Memory — short term / long term / sensory
(Temp. stored) (working)
sensory organs / cap → sight / hear / touch / smell / taste
key in HCI
↳ Recv o/p → Sight / vision
↳ Error → Beep feedback
↳ Read Ability ∝ 1 / distance from focus point
Bottom to be noticed - flashy messages - edges
detect movement (rods sensitive to outer parts)
Visual processing → A; B; C } Content make large clear
↳ Capitals difficult to read
↳ E commerce failure for textile / jewelry industry.
— Sense of feeling lost → Hyptor
— future research.