

The Design of Interactive Computational Media

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Why Design is Hard?

- The number of things to control has increased dramatically

1950's – 1970's

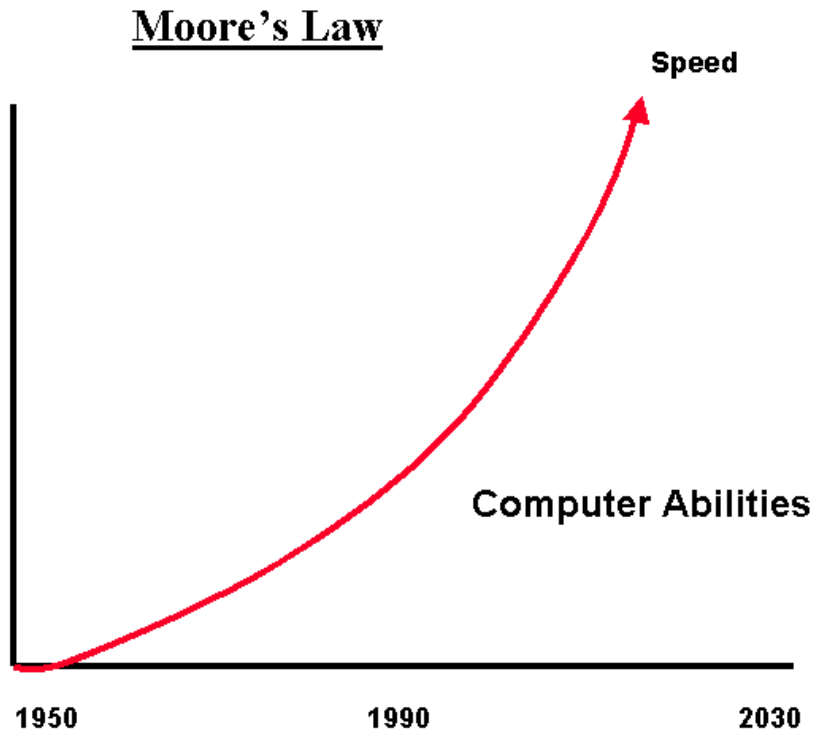


1990's – 2000's



Why Design is Hard?

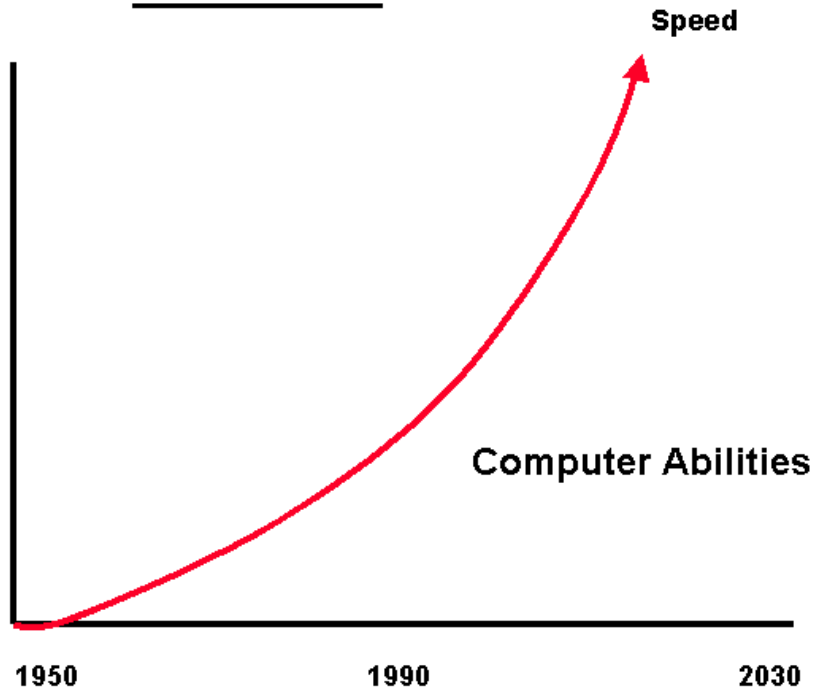
- Difference in rate of evolution!



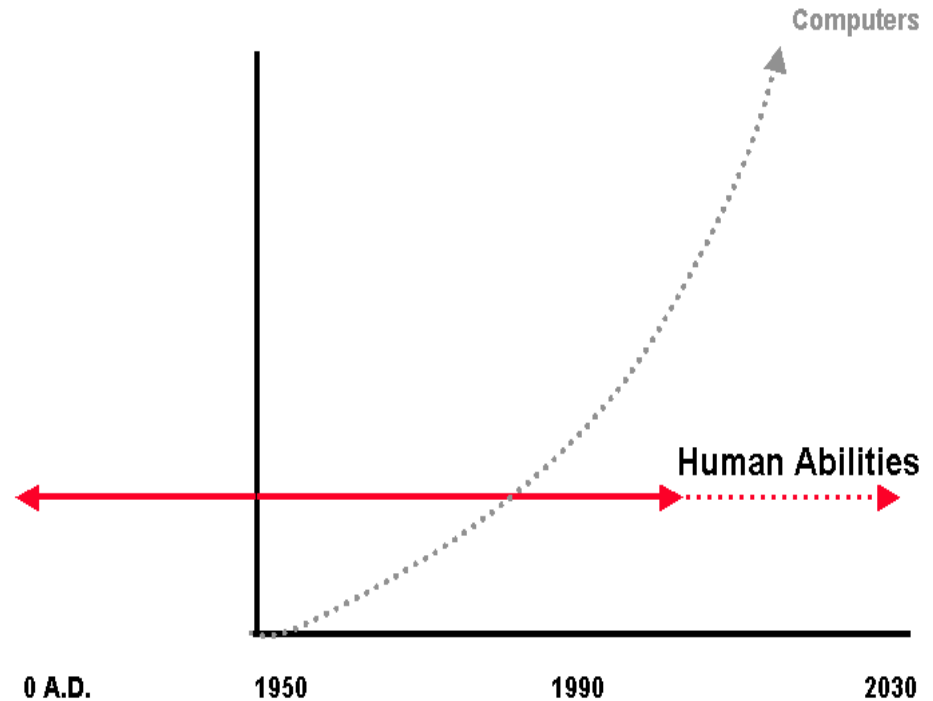
Why Design is Hard?

- Difference in rate of evolution!

Moore's Law



People



Why Design is Hard?

- Marketplace pressures
 - Adding functionality (complexity) now easy and cheap
 - Adding controls/feedback expensive
 - Physical buttons on calculators, microwave ovens
 - Widgets consume screen real estate
 - Design usually requires several iterations before success
 - Product pulled if not immediately successful

Why Design is Hard?

- Limited display capabilities



Why Design is Hard?

- Feedback can be more complex, subtle, and less natural



Is the phone in call forwarding mode?

Why Design is Hard?

- Management often consider cost and appearance over designing with Human Factors in mind



Why Design is Hard?

- Management often consider cost and appearance over designing with Human Factors in mind

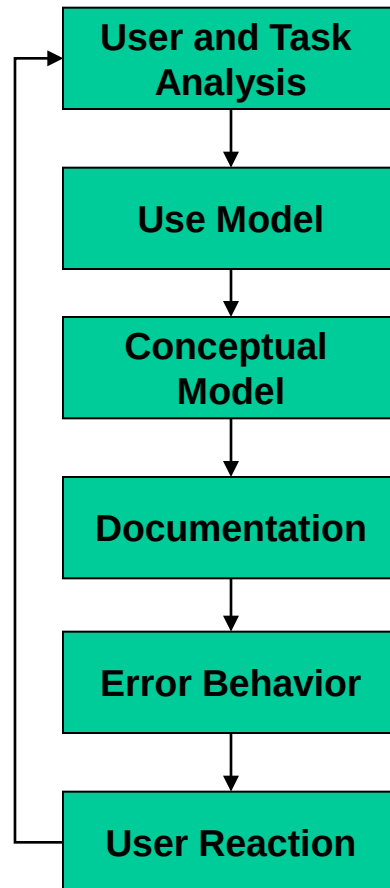


How to approach the Design Problem?

- Methodology
 - A set of working methods used by those who work in a discipline or engage in an inquiry (dictionary.com)
- Guidelines
 - A set of statements by which to determine a course of action (dictionary.com)
- Evaluation Criteria

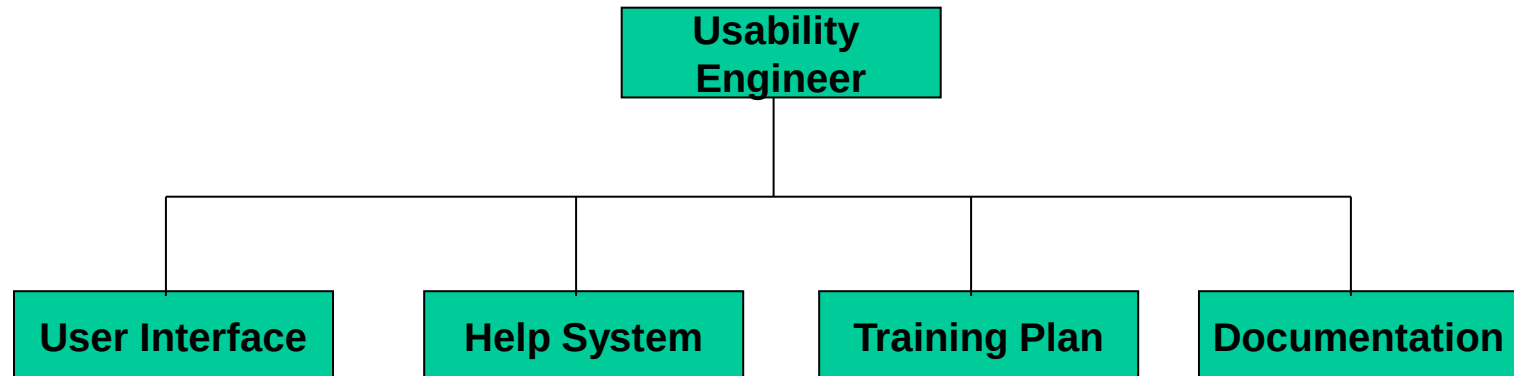
Design methodology: Rubinstein & Hersh

- An early, simple, and attractive design methodology (from human factors department at DEC)



Design methodology: Gould, Boies & Lewis

- Based on the user interface and system design principles of John Gould and his colleagues at IBM Yorktown Heights Research Lab
- Integrated Design Approach
 - All aspects of usability should evolve in parallel, rather than be defined sequentially, and should be under one management.”



Design methodology: Gould, Boies & Lewis

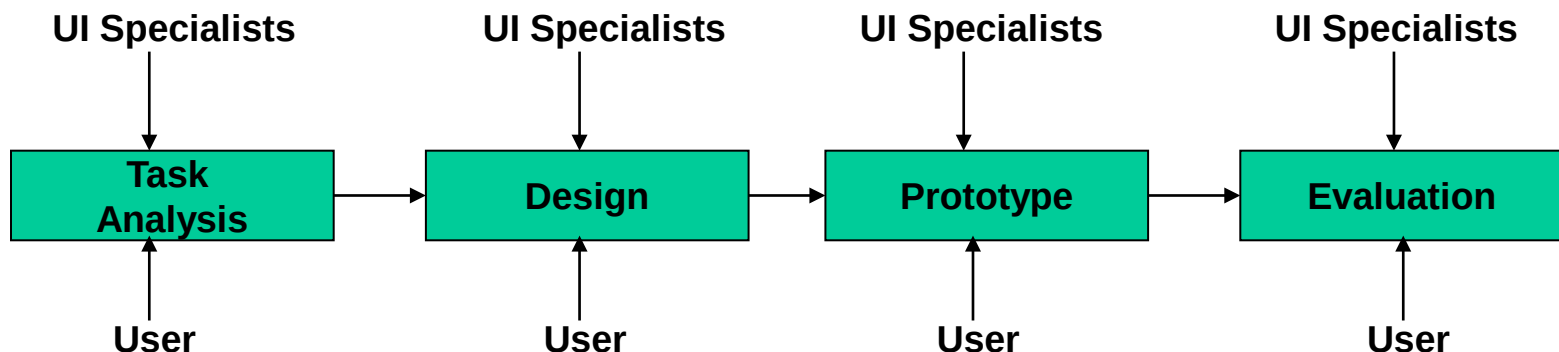
- Strength is in richness of methods
- Methods to carry out early focus on users
 - Talk with users
 - Visit customer locations
 - Observe users working
 - Videotape users working
 - Learn about the work organization
 - Thinking aloud
 - Try it yourself
 - Participative design
 - Expert on design team
 - Task analysis
 - Surveys and questionnaires
 - Testable behavioral target goals

Design methodology: Gould, Boies & Lewis

- Methods to carry out user testing
 - Printed or video scenarios
 - Early user manuals
 - Mock-ups
 - Simulations
 - Early prototyping
 - Early demonstrations
 - Thinking aloud
 - Make videotapes
 - Computer bulletin boards ... and conferencing
 - Formal prototype test
 - Try-to-destroy-it contests
 - Field studies
 - Follow-up studies

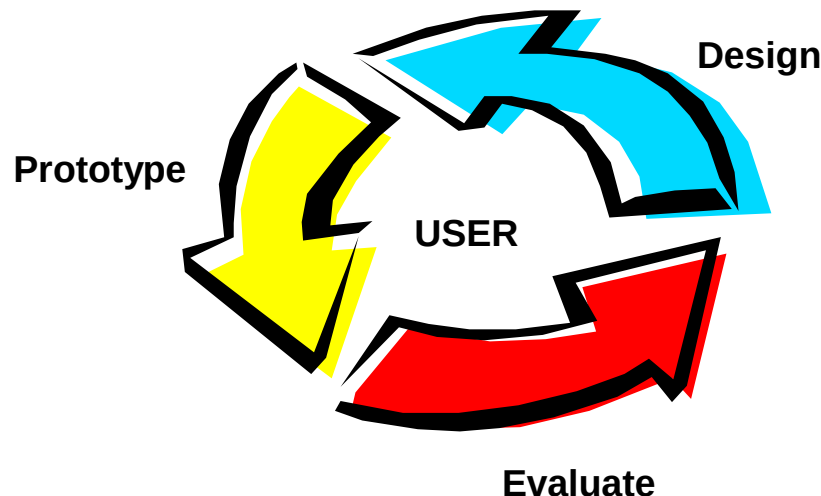
Design methodology: participatory design

- Grew out of work beginning in the early 1970s in Norway
- Users become first class members in the design process
 - active collaborators vs passive participants
- Users considered subject matter experts
 - know all about the work context



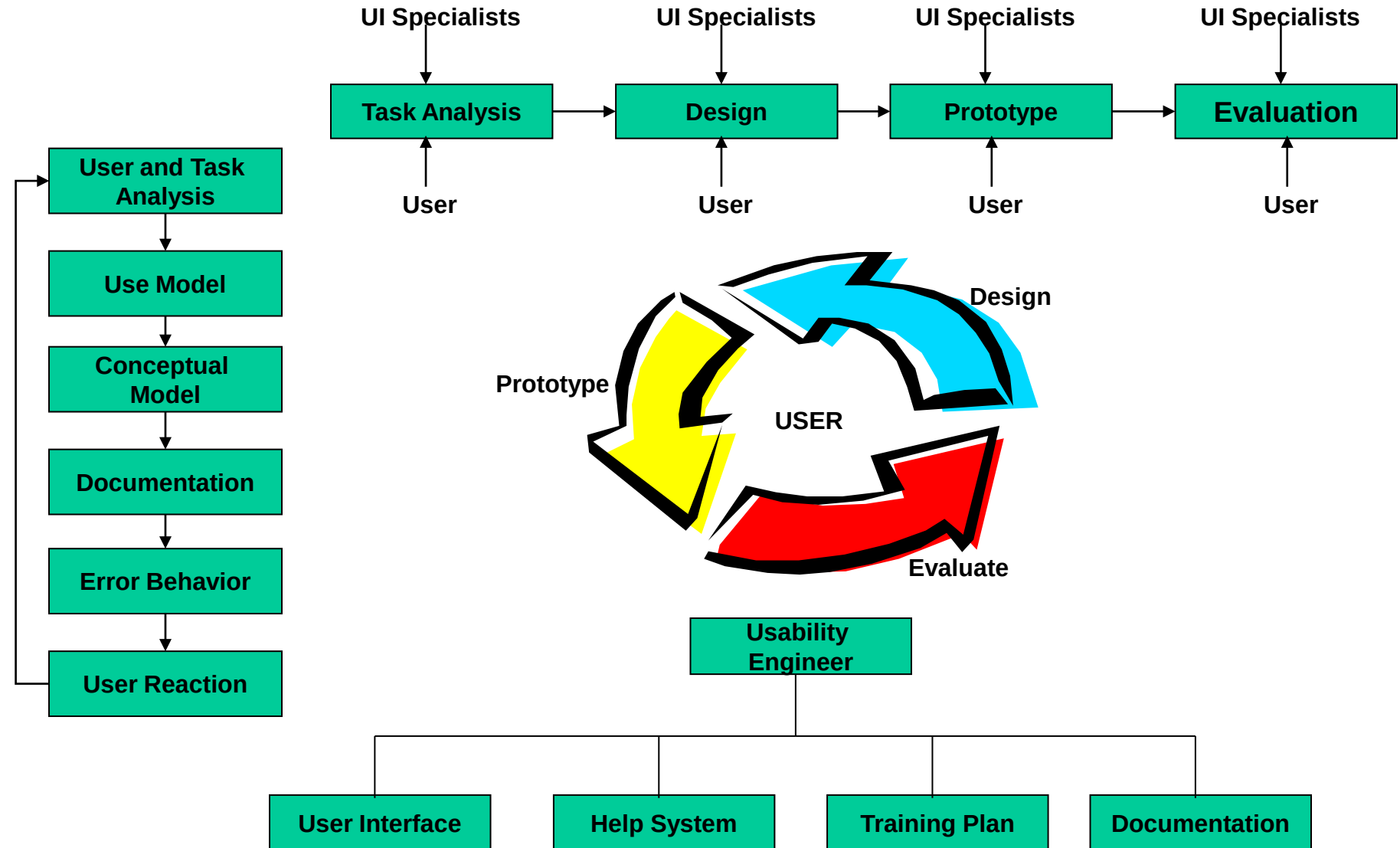
Design methodology: BGBG

- A user-centered, iterative, design philosophy
 - More structured than Rubinstein and Hersch, Gould et al.
 - Not intended as a rigid formula, but as an illustration of a philosophy and as examples of how to proceed
- Design → Prototype → Analyze/evaluate → Redesign → implement system → Analyze/evaluate → Redesign → Revise System → Analyze/evaluate → etc..



Design methodology

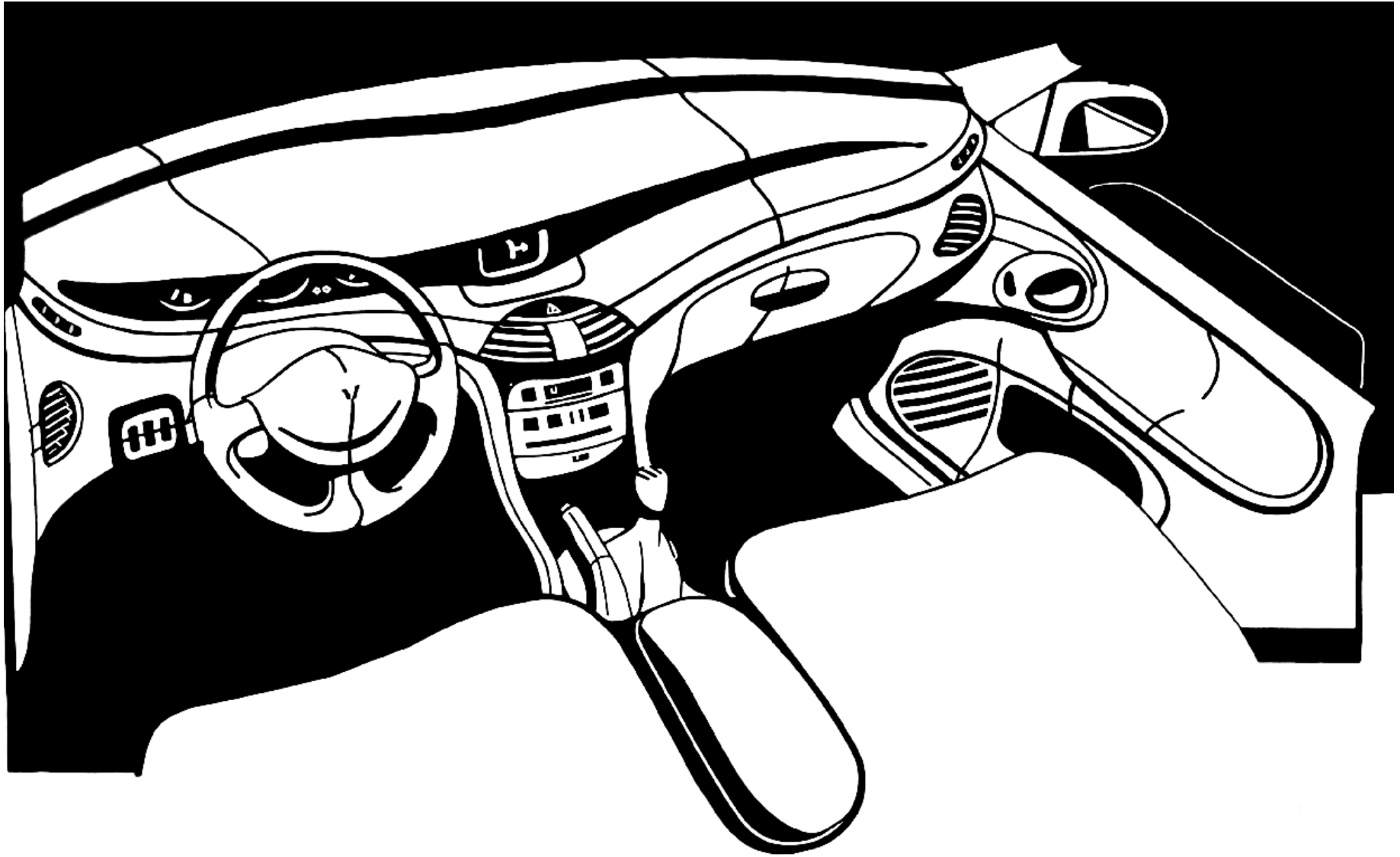
- User-centered vs. user-involved or user-directed



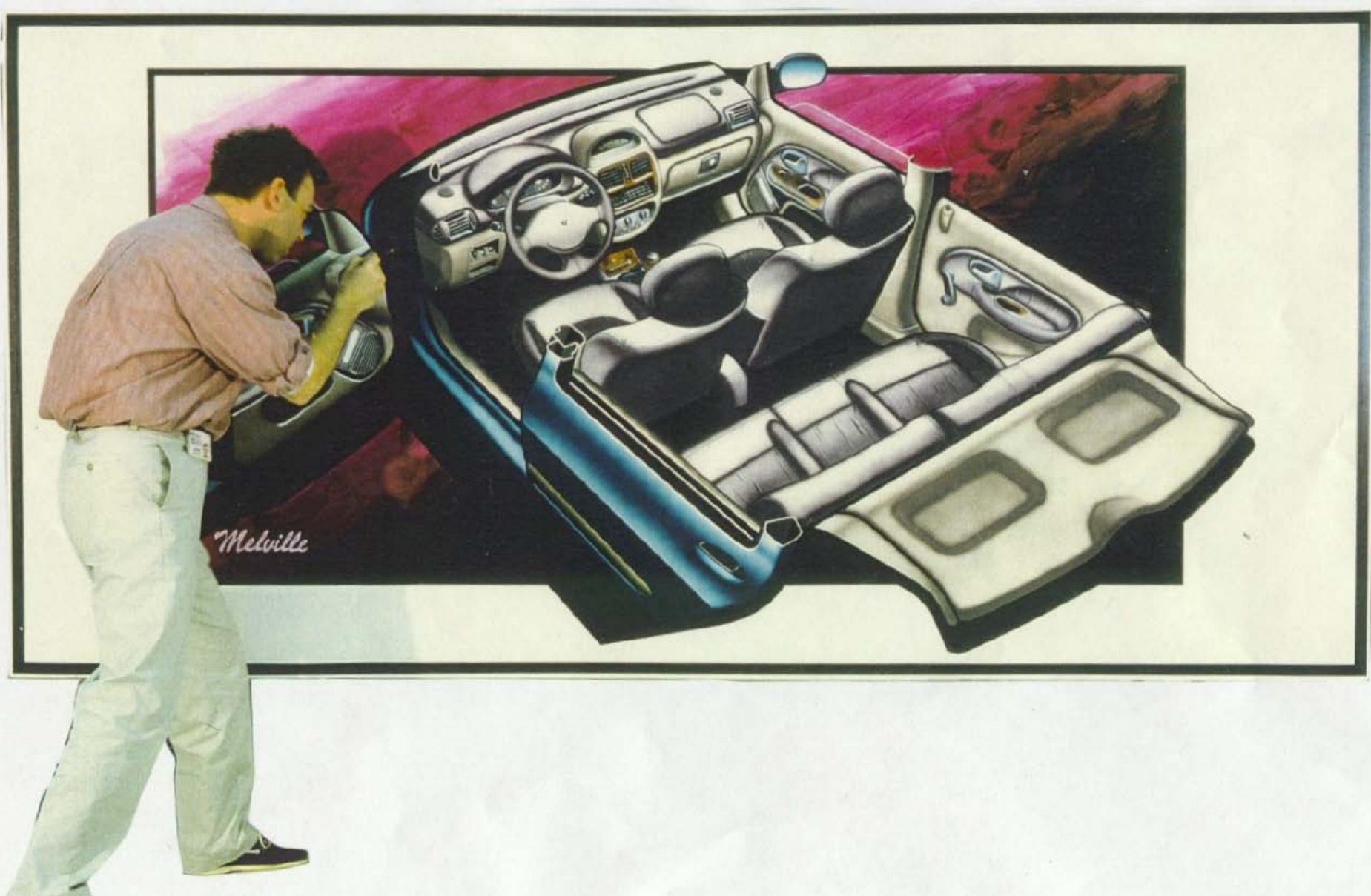
Design Example: Tape Drawing



Design Example: Tape Drawing



Design Example: Tape Drawing



Design Example: Tape Drawing



Design Example: 2D Tape Drawing

video

Design Example: 2D Tape Drawing Evaluation

- Demo at >10 studios: Japan, Europe & U.S.
- ~20 tape artists tried system
 - 1 min instruction. Results superior to system designers with hours of use
 - skill permeated technological limitations
 - use familiar gestures like sighting down a curve
- Ask for 3D version!

Design Example: 3D Tape Drawing

video

Design Example: 3D Tape Drawing Evaluation

- Demo at >10 studios: Japan, Europe & U.S.
- ~20 tape artists tried system
- Ask for more fluid interactions

Design Example: ShapeTape Drawing

video

Design guidelines

- Statements which advise a designer on how to proceed
- Hansen, 1971
 - Know thy user
 - Minimize memorization
 - Optimize operations
 - Engineer for errors
- Rubinstein and Hersh (1984)
 -
 - 2. Separate design from implementation
 -
 - 4. Develop an explicit use model
 -
 - 87. Articulate the evaluation goals
 -
 - 93. Videotape real users

Design guidelines

- *Macintosh Human Interface Guidelines* (Apple Computer, Inc., Addison-Wesley, 1992) “...describes the way to create products that optimize the interaction between people and Macintosh computers”
 - Ch. 1: Human Interface Principles
 - Ch. 2: General Design Considerations
 - Ch. 3: Human Interface Design and the Development Process
 - Ch. 4: Menus
 - Ch. 5: Windows
 - Ch. 6: Dialog Boxes
 - Ch. 7: Controls
 - Ch. 8: Icons
 - Ch. 9: Colour
 - Ch. 10: Behaviours
 - Ch. 11: Language

Design guidelines

- *Tog On Interface* (Bruce “Tog” Tognazzini, Addison-Wesley, 1992), in answering specific questions about user interface design for the Macintosh computer, presents roughly 200 guidelines dealing with, for example:
 - The Design Process
 - Positively Determining System Behaviour
 - Positively Influencing User Perceptions and User Behaviour
 - Promoting Consistency
 - Making the Interface “Visible”
 - Reducing or Eliminating Navigation
 - Dealing with Conceptual Models and the System Image
 - Dealing with Human-Computer Conversation, Vocabulary
 - Dealing with Screen Objects, Menus, Icons, Fonts, Error Msgs
 - User Testing
 - Minimizing Impact of New Releases on Old Users

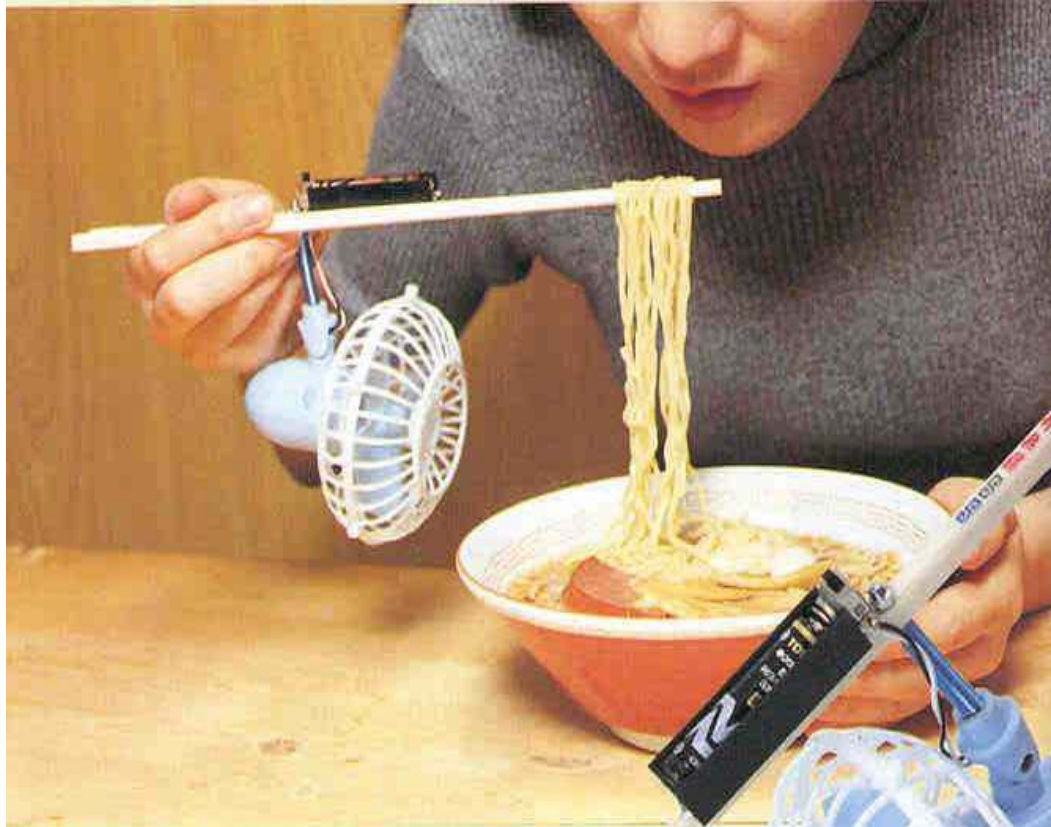
Design guidelines

- Pros of guidelines
 - Stimulate ideas and insights
 - Good checklists giving helpful advice
 - Use in heuristic evaluation (*more about this later*)
- Cons of guidelines
 - Occasionally incorrect
 - Usually vague
 - Sometimes contradictory (need for tradeoffs)
 - Very often not at the appropriate level of specificity
 - Often difficult to apply to real design problems

Design Evaluation: criteria

- Usability
 - Effective to use
 - Efficient to use
 - Safe to use
 - Have good utility
 - Easy to learn
 - Easy to remember
- Usefulness
- User experience
 - Satisfying
 - Fun
 - Enjoyable
 - Entertaining
 - Helpful
 - Motivating
 - Aesthetically pleasing
 - Motivating
 - Rewarding
 - Support creativity
 - Emotionally fulfilling

Usability vs. Usefulness



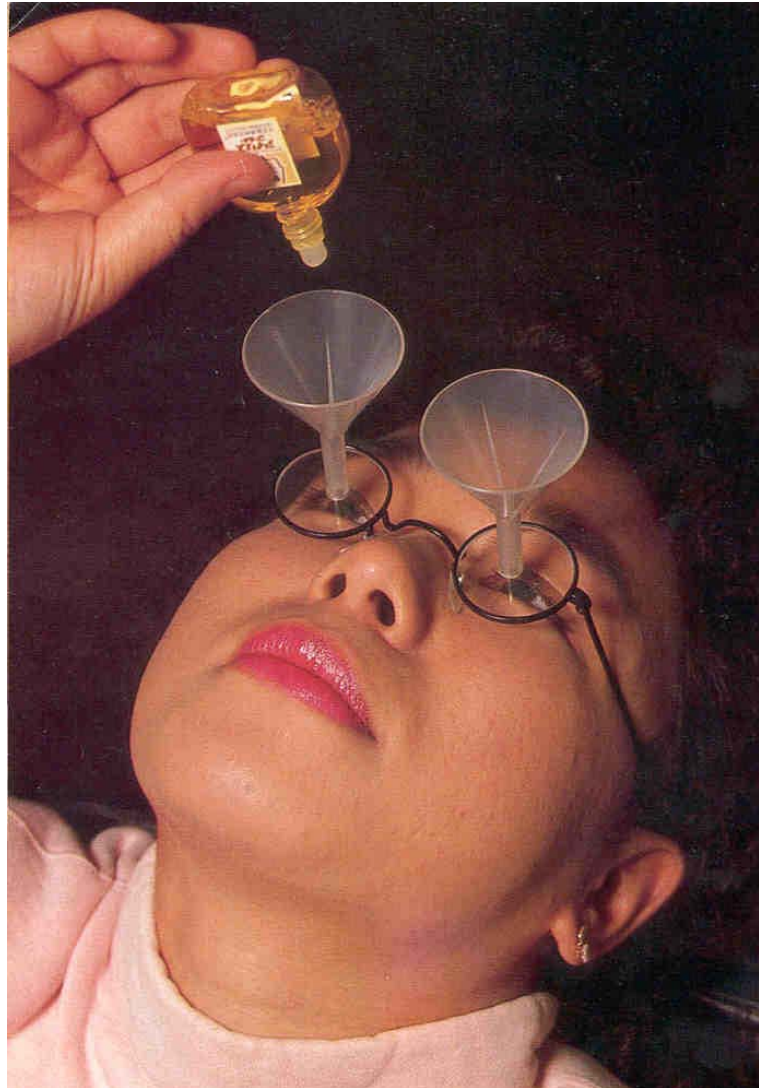
Useful but not usable

Usability vs. Usefulness



Usable but not useful

Usability vs. Usefulness



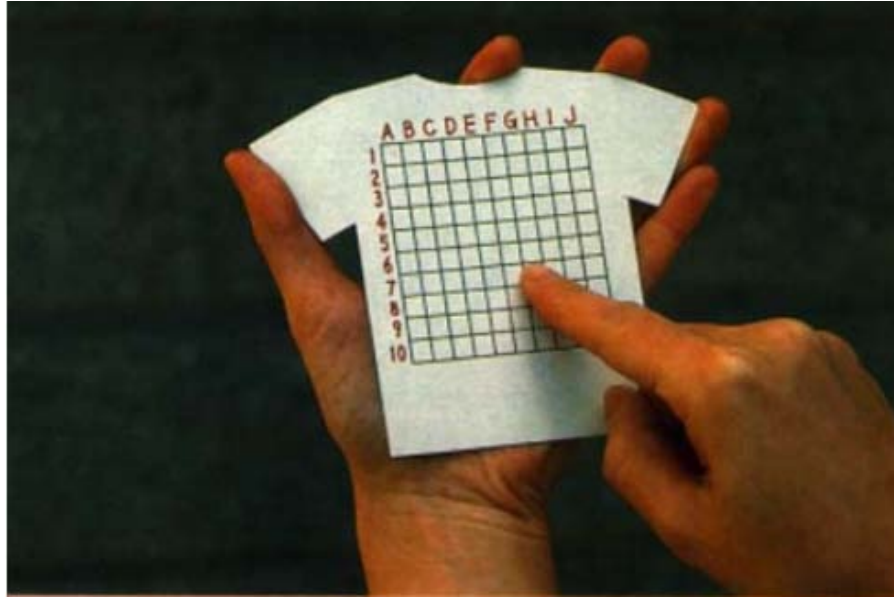
Neither useful nor usable

Usability vs. Usefulness



?

Usability vs. Usefulness



useful and usable

Summing up: thoughts about Design

- Design is conscious, can be done systematically
 - Using our design process, for example
 - Design also requires brainstorming and creative insights
- Design involves a conversation with your users
 - Design keeps human concerns at the center
- Design involves a conversation with your materials
 - Using various kinds of prototyping
- Design involves interaction between these two conversations
 - Design is infinitely improvable, i.e., design must be iterative

Summing up: thoughts about Design

- Design has social consequences
 - Design is a social activity and occurs in a context such as that of an organization or a society
- Design should involves contributions from many disciplines
 - Computer science
 - Domain expertise
 - Behavioural science — psychology, sociology, anthropology
 - Design disciplines — graphic design, industrial design, animation, cinematography, video, music

7 minute break

Advice on Picking a Project Topic

- This is a course in Interactive Media!
- Some cool ideas are not interactive
- You need a user interface that will change and evolve
- Some neat ideas that probably won't work for this:
 - Voice interaction
 - Gesture interaction
 - Audio feedback
 - Intrusive feedback
- You are allowed to include these, but the center should be **a screen that is present for the user.**

Advice on Picking a Project Topic

- You don't have to invent a new wearable! This is not our focus. You can use existing ones..



video

Examples from Last Fall

Vidoes

Typical Group Problems (small sample)

- 30%: Difficulty contacting group members
- 25%: Failure of some to do what they've promised
- 30%: Feeling that you had to take leadership role to get anything done
- 20%: Failure to divide tasks fairly
- 25%: Insufficient brainstorming
- 25%: Misunderstandings due to poor expression / poor listening
- 25%: Difficulty accepting feedback from others
-

Group Formation

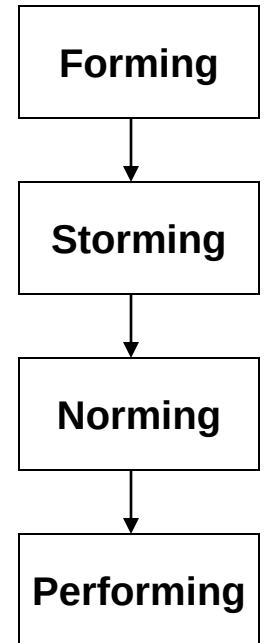
- Group of 4 or 5
- Harnessing complementary skills
 - Writing, research, technology, programming, behavioral science background, art or design background, domain expertise
 - Form includes information on expertise
- Ensuring compatible goals
 - Expectations for the course, e.g., grade
 - Work styles, e.g., slow and steady progress vs. last-minute all-nighters

Group Roles

- Coordinator
- Recorder
- Timekeeper
- Encourager/gatekeeper
- Devil's Advocate!
- Leader

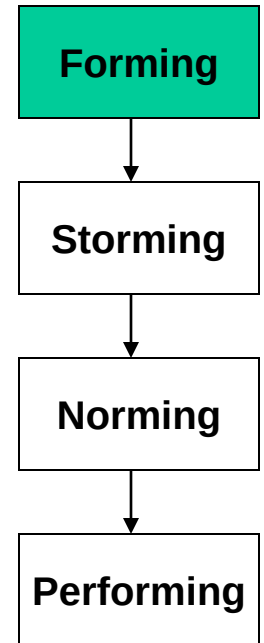
Stages of Team Development

- There are four basic stages in the development of an effective team
- These are all recurring stages
- Awareness by team members of these stages is necessary for the maintenance of good teamwork



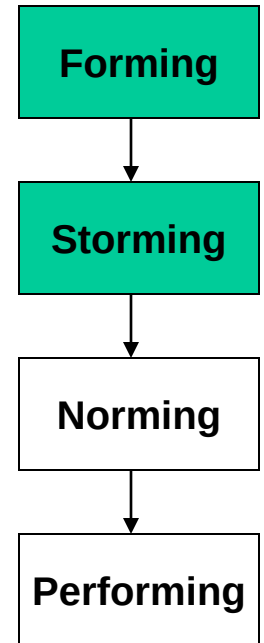
Stages of Team Development: forming

- This is an ORIENTATION stage
- *Major Processes:* introduction and exchange of relevant information; task exploration; identification of commonalties.
- *Characteristics:* tentative interactions; polite discourse; concern about ability to work together.



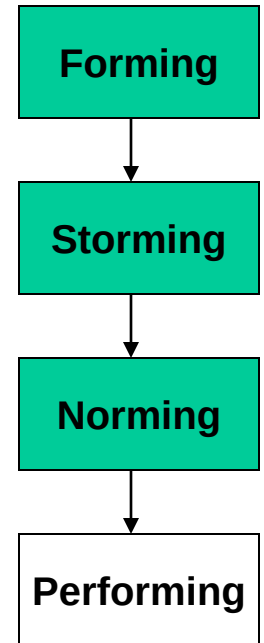
Stages of Team Development: storming

- This is CONFLICT stage
- *Major Processes:* disagreement over procedures; expression of dissatisfaction; emotional responses; resistance.
- *Characteristics:* criticism of people; poor attendance; hostility; polarization; coalition forming.



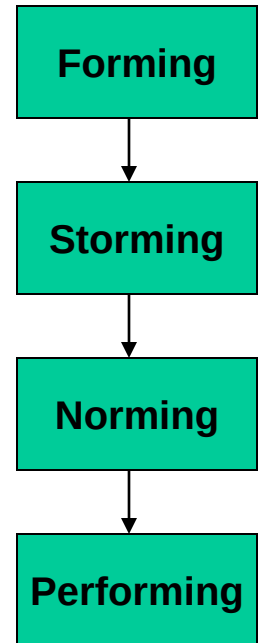
Stages of Team Development: norming

- This is a COHESION phase
- Major Processes: growth of cohesiveness and unity; establishment of roles, standards, and relationships.
- Characteristics: agreement on procedures; reduction in role ambiguity; increased “we-feeling”.



Stages of Team Development: performing

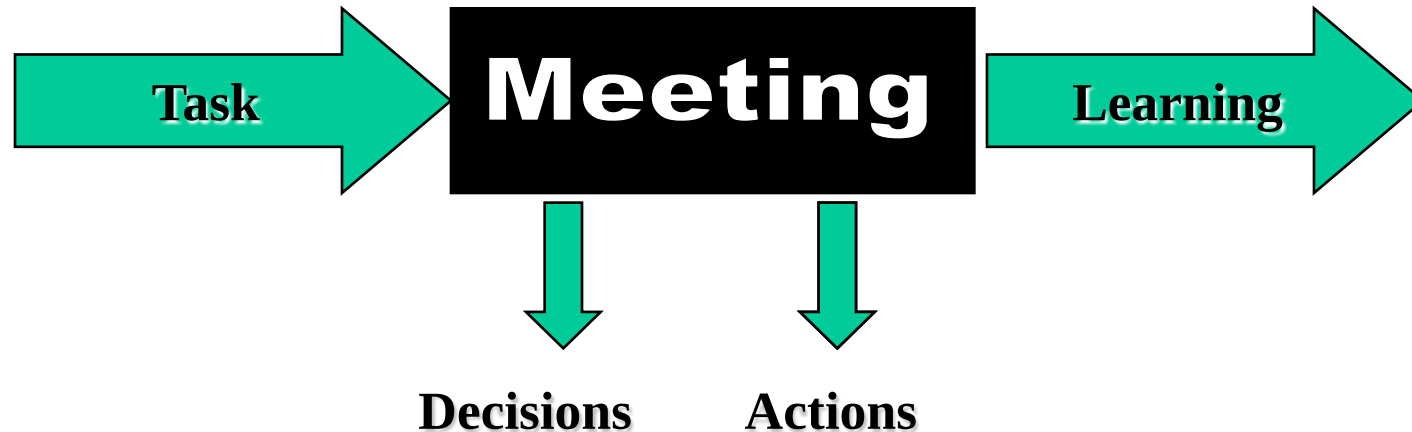
- This is a PERFORMANCE stage
- Major Processes: goal achievement; high task orientation; emphasis on performance and production.
- Characteristics: effective decision making; mutual cooperation.



Meetings

- Contacting people and arranging meetings
 - Form included with Assignment 1b includes complete contact info for all team members
 - Stay in touch
 - Inform team if you need to go out of touch
- Attending meetings
 - All have obligation to attend, unless agreed otherwise
 - Arrange next meeting at current meeting

Effective Team Meeting Model



- Ensure that meetings accomplish something in a reasonable amount of time
- Coordinator must have absolutely clear purpose for the meeting, most communicate this to all

Effective Team Meeting Model

- Keep meetings as brief as possible
- Record results of meetings, follow-up required, and responsibilities
- Leaders and followers ... both OK roles
- If someone screws up, do whatever damage repair is needed and move on

Open Communication

- Making suggestions — no idea too crazy
- Understanding suggestions that aren't clear
 - “I'm not sure I understand could you please explain it again”
 - “Could you draw me a picture?”
 - “So you're saying Do I understand it correctly?”
- Dealing with suggestions that have been ignored
 - “I can see your point but let me repeat my idea perhaps you can tell me why it won't work”
 - “I really won't feel right going ahead with that unless we consider my idea as well”
- More generally, need to deal with interpersonal conflicts

Understanding Interpersonal Conflicts

- What is the other person trying to say?
- What do I not know about this situation?
- Do we still have a shared goal? What is it?
- Are my expectations realistic?
- Am I presenting my concerns clearly? If not, how can I do so?

Resolving Interpersonal Conflicts

- State your opinion or your concerns as clearly and assertively as possible
- For example, if there is a behavior you find problematic:
 - Explain what it is
 - Offer your interpretation of the behavior, giving the other person the benefit of the doubt
 - Explain the consequences of the behavior
 - State your goal clearly, for example, a request to change the behavior
- Problematic behavior can result from many different sources, including “difficult people” and individuals acting as if they were difficult people

Varieties of Difficult People

- The tank
- The sniper
- The grenade
- The know-it-all
- The think-they-know-it-all
- The yes person
- The maybe person
- The nothing person
- The no person
- The whiner

Dealing with Difficult People

- Listen carefully and try to understand
- Process what you've heard and try to reach a deeper understanding
- Assume the best, give the benefit of the doubt
- Formulate your response thoughtfully
- Speak carefully to be understood
- Try to avoid putting people on the defensive

Examples of Defensive Provoking Statements

- You're doing that wrong.
- It's your fault.
- You're an idiot.
- If only you had listened to me in the first place.
- How did you ever make it to third year?
- You should ... (when advice not requested)
- We're going to ... (when other person not consulted)

Defensive Responses

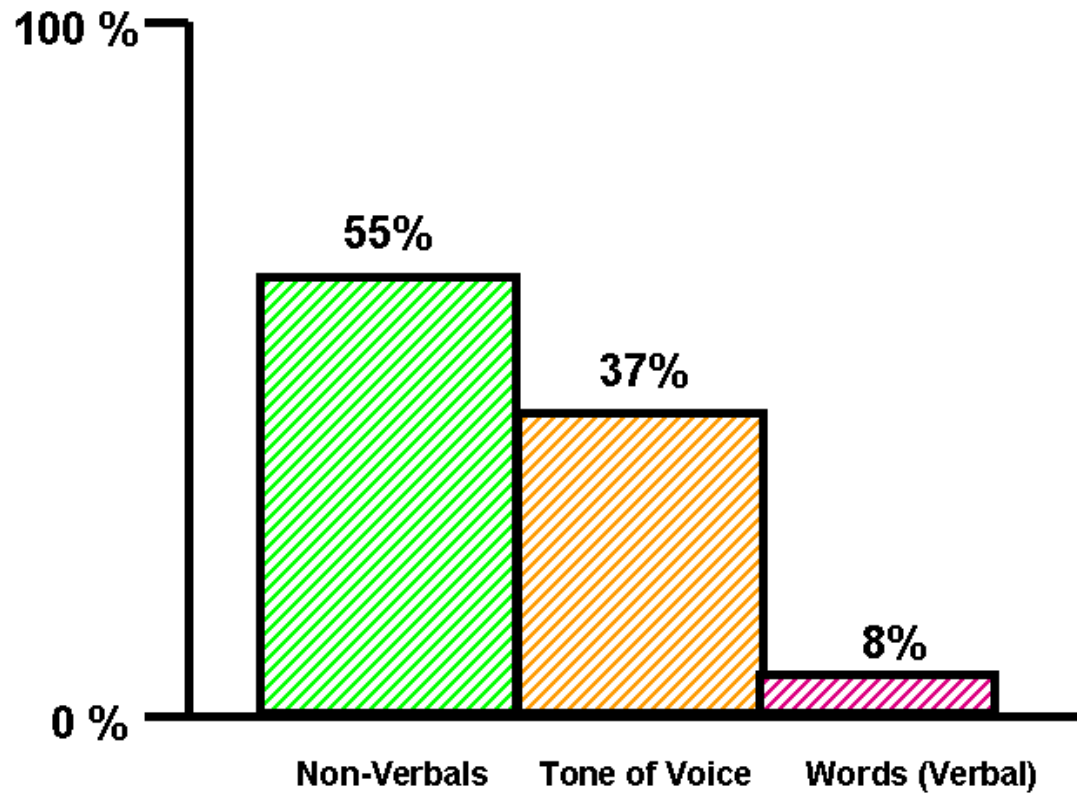
- Quit harassing me.
- It's not my fault.
- It's late because I had three other assignments due.
- I would have done it if you hadn't changed the rules.
- Do it yourself, then.

- Results when this happens
 - First person can get defensive ...
 - Well it's not my fault.
 - But you're always late.
 - As I said, thanks to you we're screwed.
 - A spiral of heightened emotions and negative feelings.

Non-Defensive Responses

- Paraphrase: You wanted this an hour ago, eh?
- Clarify: Are you concerned about content or format?
- Agree: You're right. I've been slow.
- Name the behavior: You're yelling. Do you mean to?
- Bottom line
 - Don't make defense-provoking statements: Name the situation, instead of calling a team member a name
 - If you are attacked, try to respond non-defensively; responding defensively will just make matters worse.

Face to Face Communication



Characteristics of a Good Team Member

- Encourages the development of other team members
- Respects and is tolerant of individual differences
- Acknowledges and works through conflict openly
- Considers and uses new ideas and suggestions from others
- Encourages feedback on own behavior
- Understands and is committed to team objectives.
- Does not engage in win/lose activities with the rest of team
- Has skills in understanding what's going on in the group

Summary: Effective Group Process

- Complementary expertise
- Shared goals and values
- Clear statements of expectations and commitments
- Open and honest communication, especially in times of stress and difficulty
- Agreed-upon method(s) for and commitment to timely decision making
- Recognize conflict and try to deal with it promptly
- Some people will be difficult; you will have to cope
- Defense-provoking statements and defensive responses make matters worse

Administrativa

Individual Presentations