



BE - Computer Science & Engineering

Subject: Human Computer Interaction

**Prof. Krishnaiah Dayyala
(Krish)**

Class 1(2 periods)

14th Feb , 2025



PE614CS	HUMAN COMPUTER INTERACTION				
Prerequisites	Basics of Computers	L	T	P	C
		3	0	0	3
Evaluation	CIE	40 Marks	SEE	60 Marks	

Course Objectives :

1.	To introduce the concepts of user goals , conceptual models and process of interaction Design.
2.	To study cognitive, social and emotional aspects of interaction.
3.	To learn Data Analysis, Interpretation, and Presentation techniques.
4.	To learn the concepts of prototyping and discovering user requirements.
5.	To introduce the concepts of controlled evaluation and Walk-Throughs.

Course Outcomes : At the end of the course the student will be able to:

1.	Understand the concept of user experience design, interaction types , and frameworks.
2.	Use cognitive frameworks, principles of social interaction in the design of Interfaces.
3.	Gather data and use various quantitative and qualitative analytic techniques.
4.	Design prototypes and Use predictive models and conduct usability testing.
5.	Understand evaluation studies in detail.



UNIT – I

Interaction Design: Introduction, Good and Poor Design, what is Interaction Design, The User Experience, Understanding Users Accessibility and Inclusiveness, Usability and User Experience Goals.

Process of Interaction Design: Introduction, What is Involved in Interaction Design, Practical Issues. **Conceptualizing Interaction:** Introduction, Conceptualizing Interaction, Conceptual Models, Interface Metaphors, Interaction Types, Paradigms, Visions, Theories, Models, and Frameworks.

UNIT – II

Cognitive Aspects: Introduction, What is Cognition, Cognitive Frameworks.

Social Interaction: Introduction, Being Social, Face-to-Face Conversations, Remote Conversations, Co-presence, Social Engagement.

Emotional Interaction: Introduction, Emotions and the User Experience, Expressive Interfaces and Emotional Design, Annoying Interfaces, Affective Computing and Emotional AI, Persuasive Technologies and Behavioural Anthropomorphism Change.

UNIT – III

Interfaces: Introduction, Interface Types, Natural User Interfaces and Beyond, Which Interface.

Data Gathering: Introduction, Five Key Issues, Data Recording, Interviews, Questionnaires, Observation, Choosing and Combining Techniques.

Data Analysis, Interpretation, and Presentation :Introduction, Quantitative and Qualitative, Basic Quantitative Analysis, Basic Qualitative Analysis, Kind of Analytic Framework to Use, Tools to



UNIT – IV

Discovering Requirements: Introduction, Data Gathering for Requirements, Bringing Requirements to Life; Personas and Scenarios, Capturing Interaction with Use Cases. **Design, Prototyping, and Construction:** Introduction, Prototyping, Conceptual Design, Concrete Design, Generating Prototypes, Construction. **Interaction Design in Practice:** Introduction, AgileUX, Design Patterns ,Open Source Resources, Tools for Interaction Design.

UNIT – V

Introducing Evaluation: Introduction, Types of Evaluation, Evaluation Case Studies, Case Studies, Other Issues to Consider in Evaluation.

Evaluation Studies: From Controlled to Natural Settings: Introduction, Usability Testing, Conducting Experiments, Field Studies. **Evaluation: Inspections, Analytics, and Models:** Introduction, Inspections: Heuristic Evaluation and Walk-Throughs, Analytics and A/B Testing, Predictive Models.

References:

1. Helen Sharp, Jennifer Preece, Yvonne Rogers Interaction Design: Beyond Human-Computer Interaction wiley Publishing 5th Edition 2019
2. Jenifer Tidwell, Charles Brewer, Aynne Valencia, Designing Interfaces, O'REILLY 3rd Edition 2020.

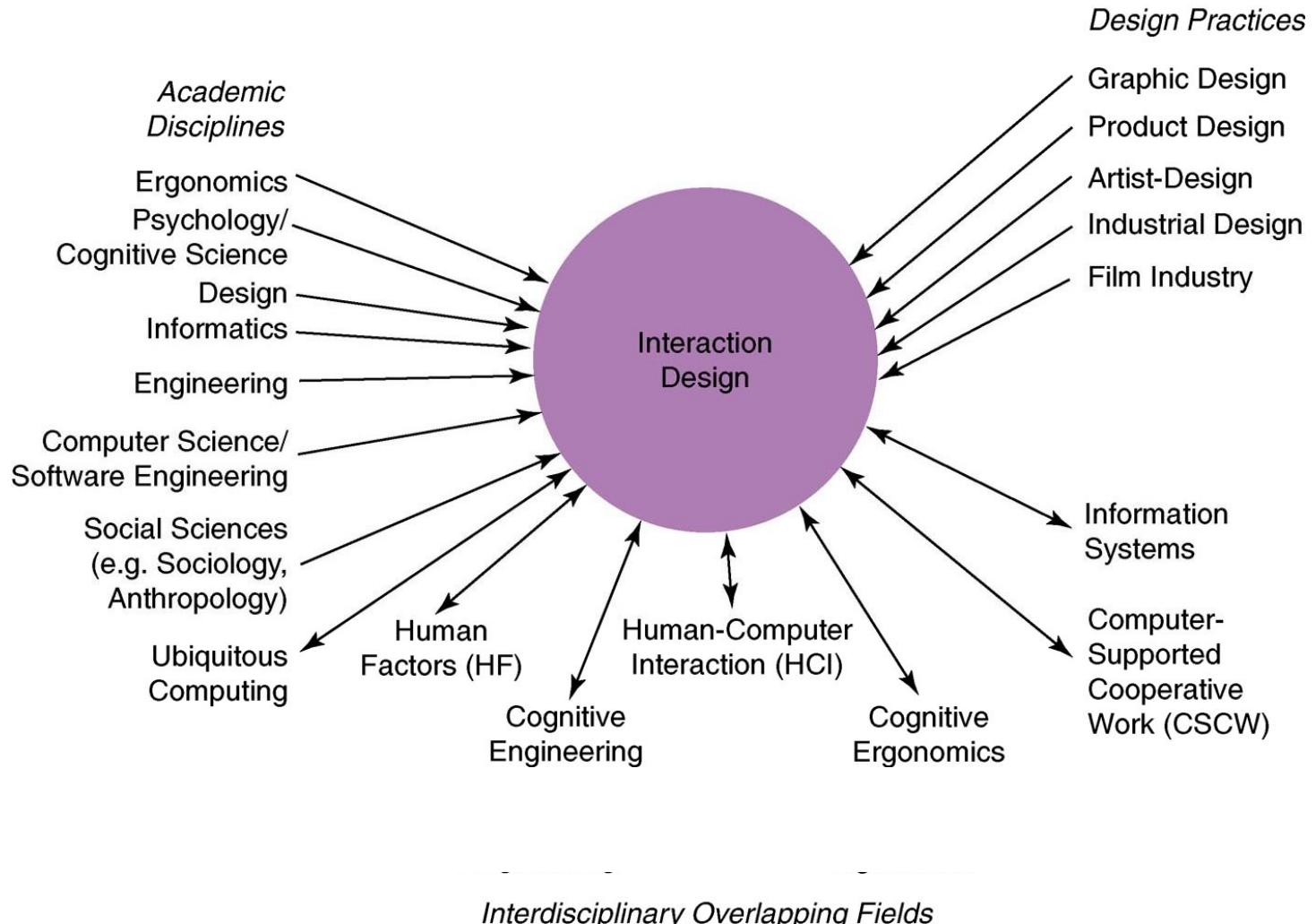
Suggested Readings:

1. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, About Face: The Essentials of Interaction Design Wiley, 4th Edition 2014.
2. Elizabeth Goodman, Mike Kuniavsky, Observing the User Experience, Elsevier 2nd Edition 2012
3. Jesmond Allen, James Chudley,Smashing UX Design,Wiley ,1st Edition 2012.

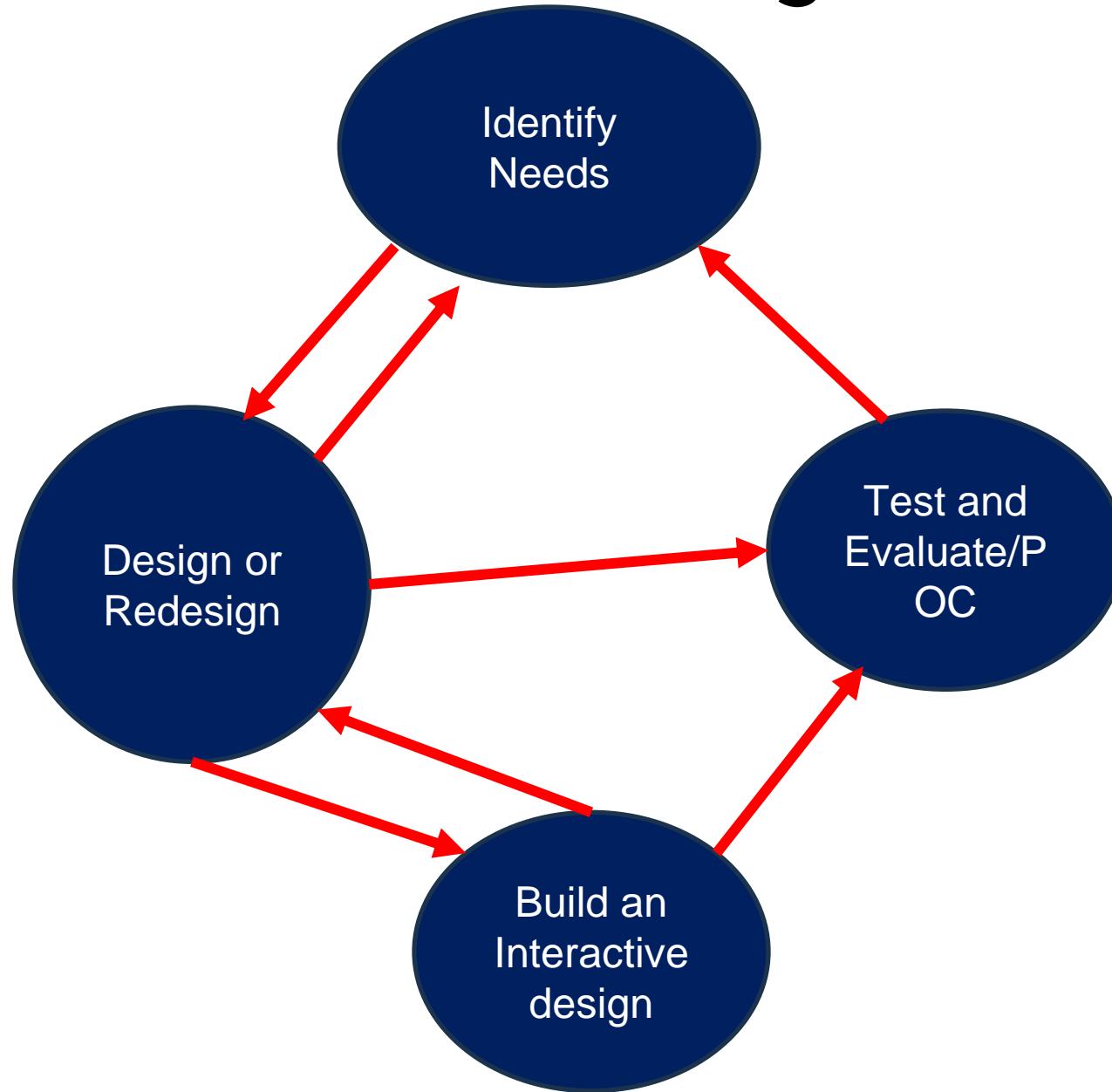


UNIT II

HCI and interaction design



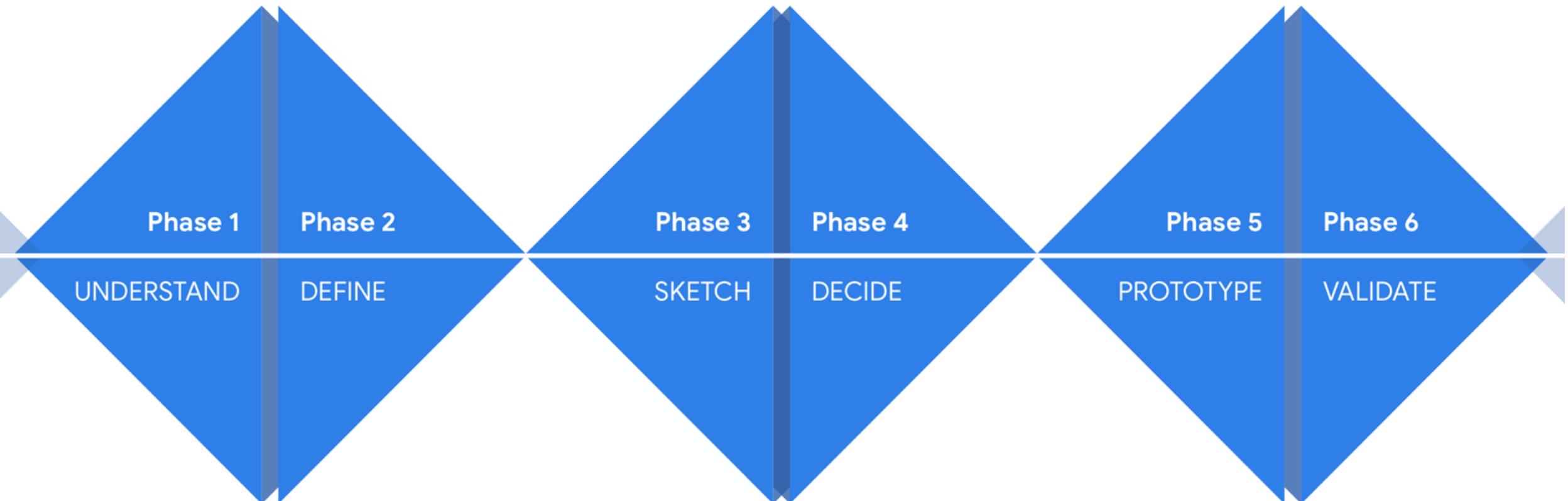
Interaction Design Process



UNIT I- Conceptualizing Interaction



Double diamond framework



UNIT I- Conceptualizing Interaction



In order to produce computer system with good usability;
Developers must attempt to

Understand	Develop	Achieve	Put People 1st
<ul style="list-style-type: none">The factors that determine how people use technology	<ul style="list-style-type: none">Tools and techniques to enable building suitable systems	<ul style="list-style-type: none">Efficient, effective, and safe interaction	<ul style="list-style-type: none">Their needs, capabilities and preferences for conducting various tasks should direct developers in the way that they design systemsPeople should not change their way they use the system to fit with it, instead system should match their requirements

The long term goal:
To design systems that minimize the barrier between the human's cognitive model of what they want to accomplish and the computer's understanding of the user's task



UNIT - II

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Emotional Interaction: Introduction, Emotions and the User Experience, Expressive Interfaces and Emotional Design, Annoying Interfaces, Affective Computing and Emotional AI, Persuasive Technologies and Behavioural Anthropomorphism Change.

- **Cognitive aspects**
 - What is cognition
 - Frameworks
- **Social Interaction**
 - Types of Social Interactions
- **Emotional Interaction**



In Human-Computer Interaction (HCI), "**cognitive aspects**" refer to the mental processes, users engage in when interacting with a computer system, including perception, attention, memory, reasoning, decision-making, and learning, which designers need to consider to create user-friendly interfaces that support these cognitive abilities effectively.



Cognitive aspects in HCI:

Cognitive processes:

- Understanding how users perceive information on the screen, focus their attention, remember relevant details, reason through tasks, make choices, and acquire new skills while interacting with a system are crucial aspects to consider.

Mental models:

- A key concept in cognitive HCI, where designers strive to understand how users mentally represent the system and its functions to design interfaces that align with these mental models.

Information processing theory:

- This theoretical framework helps analyze how users process information from the interface, including limitations in attention span and working memory.



Cognitive Design considerations:

1. Minimize cognitive load:

- Avoid overloading users with too much information on the screen at once.

2. Use familiar patterns:

- Leverage established conventions and design patterns to make the interface intuitive and easier to learn.

3. Provide clear visual cues:

- Guide users with visual elements like color, icons, and typography to help them understand the system and navigate effectively.

4. Support recognition over recall:

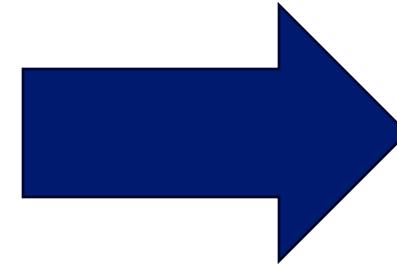
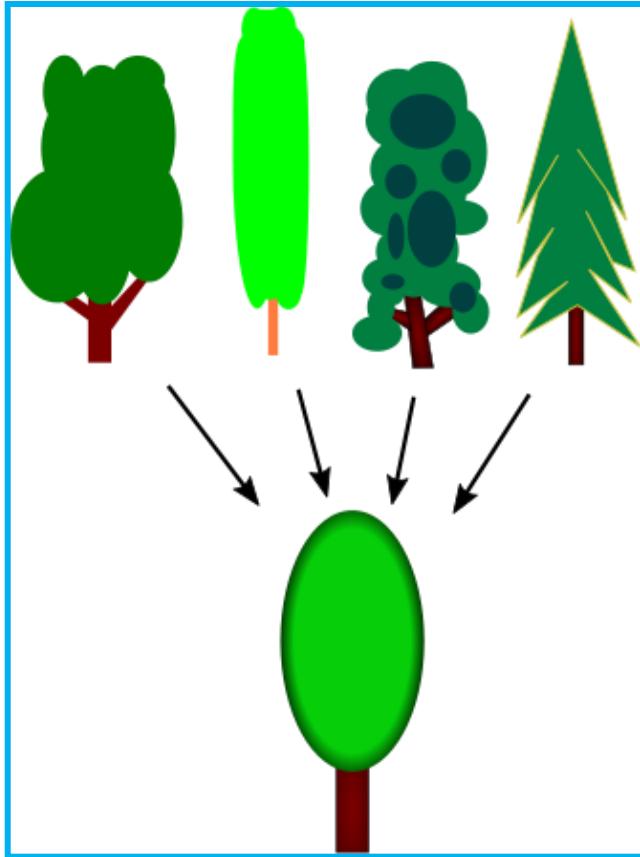
- Design interfaces that allow users to recognize options rather than having to remember complex commands.

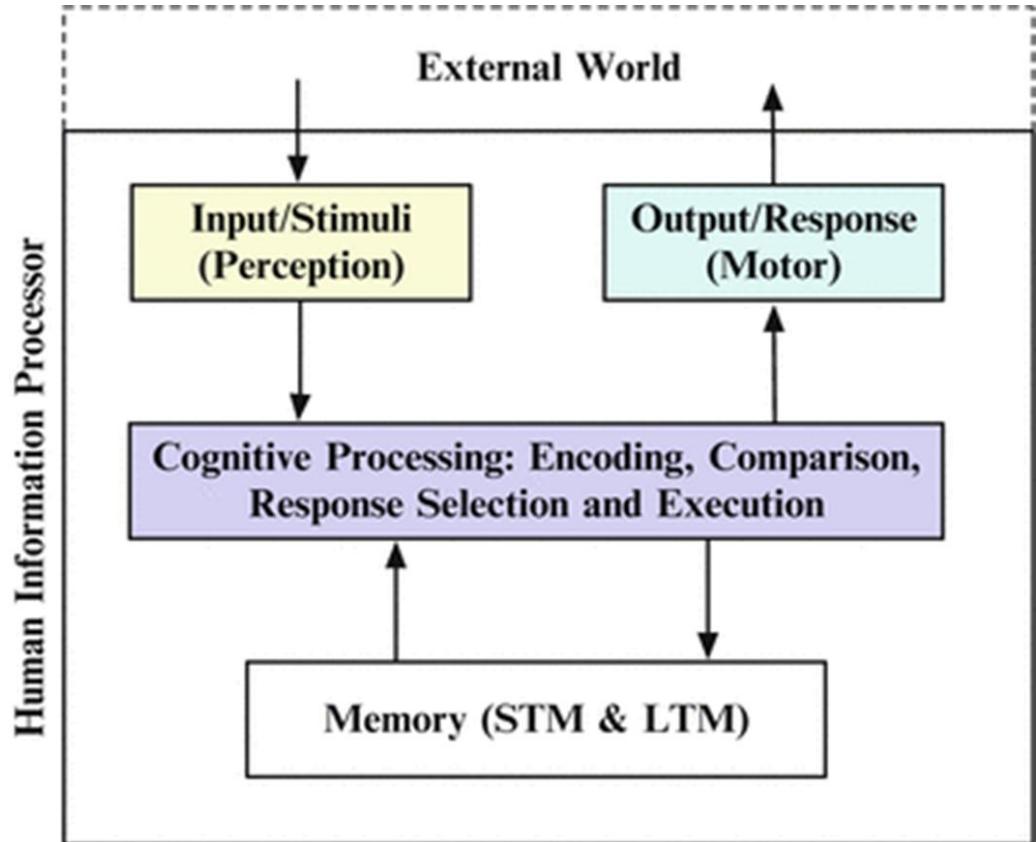
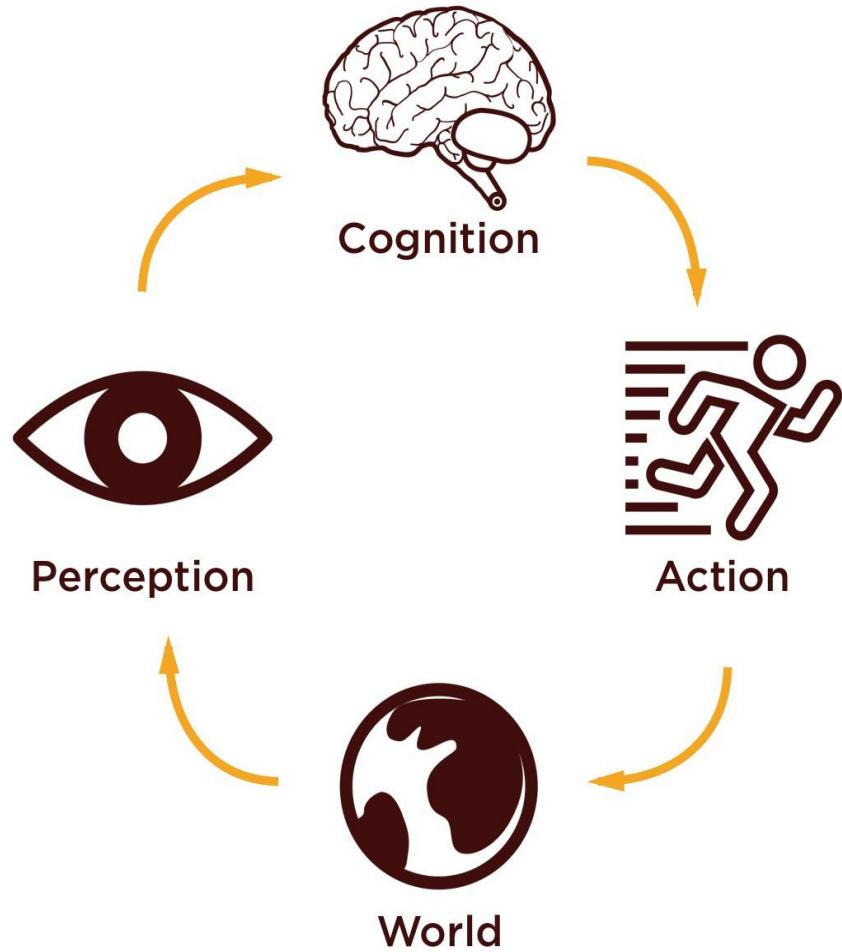


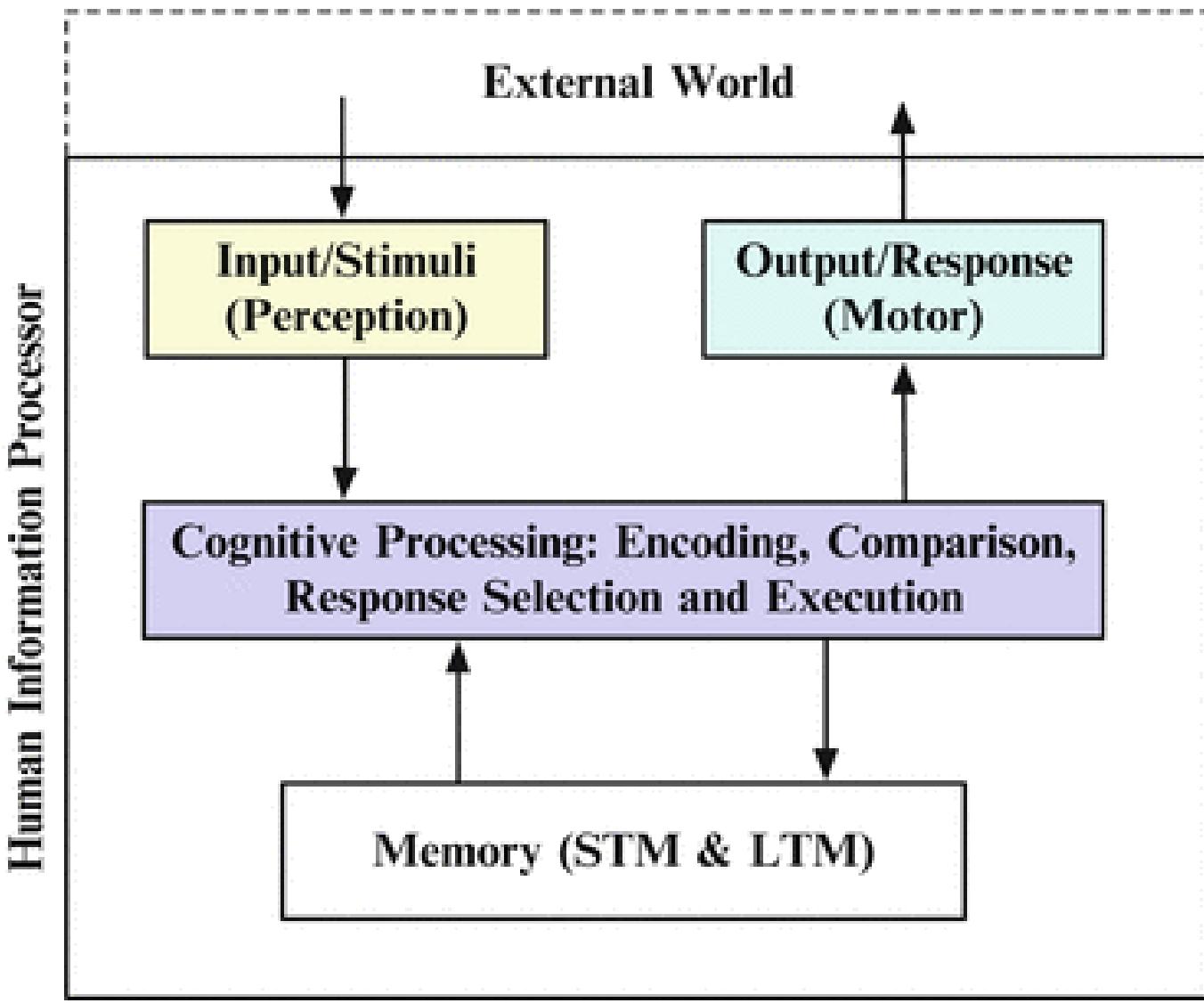
What is Cognition?

- Cognition is the "mental action or process of acquiring knowledge and understanding through thought, experience, and the senses"
- It encompasses all aspects of intellectual functions and processes such as: perception, attention, thought, imagination, intelligence, the formation of knowledge, memory and working memory, judgment and evaluation, reasoning and computation, problem-solving and decision-making, comprehension and production of language.
- Cognitive processes use existing knowledge to discover new knowledge.

UNIT II- HCI Design Aspects









Cognitive processes

Cognition can also be described in terms of cognitive processes

- Attention**
- Perception and recognition**
- Memory**
- Learning**
- Reading, speaking and listening**
- Problem-solving**, planning, reasoning and decision making



Attention

- ▶ Allows us to **focus** on information that is relevant to what we are doing
 - Involves **audio** and/or **visual** senses

- ▶ Information at the interface should be structured to capture users' attention appropriately, e.g. colour, video/sound

Activity:

- ▶ Find the price of a double room at the Holiday Inn in Bradley

Pennsylvania

Bedford Motel/Hotel: Crinaline Courts

(814) 623-9511 S: \$18 D: \$20

Bedford Motel/Hotel: Holiday Inn

(814) 623-9006 S: \$29 D: \$36

Bedford Motel/Hotel: Midway

(814) 623-8107 S: \$21 D: \$26

Bedford Motel/Hotel: Penn Manor

(814) 623-8177 S: \$19 D: \$25

Bedford Motel/Hotel: Quality Inn

(814) 623-5189 S: \$23 D: \$28

Bedford Motel/Hotel: Terrace

(814) 623-5111 S: \$22 D: \$24

Bradley Motel/Hotel: De Soto

(814) 362-3567 S: \$20 D: \$24

Bradley Motel/Hotel: Holiday House

(814) 362-4511 S: \$22 D: \$25

Bradley Motel/Hotel: Holiday Inn

(814) 362-4501 S: \$32 D: \$40

Breezewood Motel/Hotel: Best Western Plaza

(814) 735-4352 S: \$20 D: \$27

Breezewood Motel/Hotel: Motel 70

(814) 735-4385 S: \$16 D: \$18



Activity:

► Find the price for a double room at the Quality Inn in Columbia

South Carolina

City	Motel/Hotel	Area code	Phone	Rates	
				Single	Double
Charleston	Best Western	803	747-0961	\$26	\$30
Charleston	Days Inn	803	881-1000	\$18	\$24
Charleston	Holiday Inn N	803	744-1621	\$36	\$46
Charleston	Holiday Inn SW	803	556-7100	\$33	\$47
Charleston	Howard Johnsons	803	524-4148	\$31	\$36
Charleston	Ramada Inn	803	774-8281	\$33	\$40
Charleston	Sheraton Inn	803	744-2401	\$34	\$42
Columbia	Best Western	803	796-9400	\$29	\$34
Columbia	Carolina Inn	803	799-8200	\$42	\$48
Columbia	Days Inn	803	736-0000	\$23	\$27
Columbia	Holiday Inn NW	803	794-9440	\$32	\$39
Columbia	Howard Johnsons	803	772-7200	\$25	\$27
Columbia	Quality Inn	803	772-0270	\$34	\$41
Columbia	Ramada Inn	803	796-2700	\$36	\$44
Columbia	Vagabond Inn	803	796-6240	\$27	\$30



Results

- ▶ Tullis (1987) found that the two screens produced quite different results
 - 1st screen - took an average of 5.5 seconds to search
 - 2nd screen - took 3.2 seconds to search
- ▶ Why, since both displays have the same density of information (31%)?
 - In the 1st screen the information is bunched up together, making it hard to search
 - In the 2nd screen the characters are grouped into vertical categories of information making it easier



Multitasking and attention

- ▶ Is it possible to perform multiple tasks without one or more of them being detrimentally affected?

- ▶ Ophir et al (2009) compared heavy vs light multitaskers
 - Heavy were more prone to being distracted
 - Heavy multi-taskers are easily distracted and find it difficult to filter irrelevant information



Design implications for attention

- Make information salient when it needs attending to
- Use techniques that make things stand out like colour, ordering, spacing, underlining, sequencing and animation
- Avoid using too much because the software allows it





Perception

- ▶ How information is acquired from the environment and **transformed into experiences**
- ▶ Vision is the most dominant sense
- ▶ Design representations that are readily perceivable, e.g.
- Icons should be easy to distinguish and readable



Which is easiest to read and why?

What is the time?



Design implications

- **Icons** should enable users to readily distinguish their meaning
- **Bordering and spacing** are effective visual ways of grouping information
- **Text** should be legible and distinguishable from the background



Memory

- ▶ Involves first **encoding** and then **retrieving** knowledge
- ▶ We don't remember everything – involves filtering and processing what is attended to
- ▶ Context is important in affecting our memory (i.e. where, when)
- ▶ We **recognize** things much better than being able to **recall** things



Recognition versus recall

- ▶ Command-based interfaces
- ▶ GUIs



Design implications

- ▶ Don't overload users' memories with complicated procedures for carrying out tasks
- ▶ Design interfaces that promote recognition rather than recall
- ▶ Provide users with various ways of encoding information to help them remember
 - e.g. categories, color



Reading, speaking, and listening

- ▶ Many prefer listening to reading
- ▶ Reading can be quicker than speaking or listening
- ▶ Listening requires less cognitive effort than reading or speaking



Applications

- ▶ Speech-recognition systems allow users to interact with them by using spoken commands
 - e.g. Google Voice Search app
- ▶ Speech-output systems use artificially generated speech
 - e.g. ??????
- ▶ Natural-language systems enable users to type in questions and give text-based responses
 - e.g. Ask search engine



Problem-solving, planning, reasoning and decision-making

- ▶ They are all processes involving reflective cognition
 - e.g. thinking about what to do, what the options are, and the consequences
- ▶ Often involves conscious processes, discussion with others (or oneself), and the use of artefacts
 - e.g. maps
- ▶ May involve working through different scenarios and deciding which is best option

Advanced Human Computer Interaction

University College of Engg,
Osmania University





- What is cognition?
- What are users good and bad at?
- Describe how cognition has been applied to design
- Mental Models
- Internals classic theories of cognition
- More recent external theories of cognition



Why do we need to understand users?

- Interacting with technology is cognitive
- Need to take into account cognitive processes involved and cognitive limitations of users
- Provides knowledge about what users can and cannot be expected to do
- Identifies and explains the nature and causes of problems users encounter
- Supply theories, modelling tools, guidance and methods that can lead to the design of better interactive products



- **Attention**
- Perception and recognition
- **Memory**
- Learning
- Reading, speaking and listening
- Problem-solving, planning, reasoning and decision-making



Attention

- Selecting things to concentrate on at a point in time from the mass of stimuli around us
- Allows us to focus on information that is relevant to what we are doing
- Involves audio and/or visual senses
- Focussed and divided attention enables us to be selective in terms of the mass of competing stimuli but limits our ability to keep track of all events
- Information at the interface should be structured to capture users' attention, e.g. use perceptual boundaries (windows), colour, sound and flashing lights



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- Why, since both displays have the same density of information?
- Spacing
 - In the 1st screen the information is bunched up together, making it hard to search
 - In the 2nd screen the characters are grouped into vertical categories of information making it easier



Multitasking and attention

- Is it possible to perform multiple tasks without one or more of them being affected?
- Ophir et al (2009) compared heavy vs light multi-taskers
 - heavy multi-taskers are easily distracted and find it difficult to filter irrelevant information
 - heavy were more prone to being distracted than those who infrequently multitask

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search ID: cwhn1035

**"This project calls for real concentration.
Are you still able to multitask?"**



Design implications for attention

- Make information salient(most noticeable) when it needs attending to
- Use techniques that make things stand out like color, ordering, spacing, underlining, sequencing and animation
- Avoid cluttering the interface with too much information
- Avoid using too much because the software allows it



An example of over-use of graphics

Our Situation

- ◆ State the bad news
- ◆ Be clear, don't try to obscure the situation



Perception

- How information is acquired from the world and transformed into experiences
- Obvious implication is to design representations that are readily perceptible, e.g.
 - Text should be legible (easy to read)
 - Icons should be easy to distinguish and read

Is color contrast good? Find italian



Black Hills Forest	Peters Landing	Jefferson Farms	Devlin Hall
Cheyenne River	Public Health	Psychophysics	Positions
Social Science	San Bernardino	Political Science	Hubard Hall
South San Jose	Moreno Valley	Game Schedule	Fernadino Beach
Badlands Park	Altamonte Springs	South Addison	Council Bluffs
Juvenile Justice	Peach Tree City	Cherry Hills Village	Classical Lit
Results and Stats	Highland Park	Creative Writing	Sociology
Thousand Oaks	Manchesney Park	Lake Havasu City	Greek
Promotions	Vallecito Mts.	Engineering Bldg	Wallace Hall
North Palermo	Rock Falls	Sports Studies	Concert Tickets
Credit Union	Freeport	Lakewood Village	Public Radio FM
Wilner Hall	Slaughter Beach	Rock Island	Children's Museum
Performing Arts	Rocky Mountains	Deerfield Beach	Writing Center
Italian	Latin	Arlington Hill	Theater Auditions
Coaches	Pleasant Hills	Preview Game	Delaware City
McKees Rocks	Observatory	Richland Hills	Scholarships
Glenwood Springs	Public Affairs	Experts Guide	Hendricksville
Urban Affairs	Heskett Center	Neff Hall	Knights Landing
McLeansboro	Brunswick	Grand Wash Cliffs	Modern Literature
Experimental Links	East Millinocket	Indian Well Valley	Studio Arts
Graduation	Women's Studies	Online Courses	Hughes Complex
Emory Lindquist	Vacant	Lindquist Hall	Cumberland Flats
Clinton Hall	News Theatre	Fisk Hall	Central Village
San Luis Obispo	Candlewood Isle	Los Padres Forest	Hoffman Estates



Are borders and white space better? Find french

Webmaster
Russian
Athletics
Go Shockers
Degree Options
Newsletter

Curriculum
Emergency (EMS)
Statistics
Award Documents
Language Center
Future Shockers

Student Life
Accountancy
McKnight Center
Council of Women
Commute
Small Business

Dance
Gerontology
Marketing
College Bylaws
Why Wichita?
Tickets

Geology
Manufacturing
Management
UCATS
Alumni News
Saso

Intercollegiate
Bowling
Wichita Gateway
Transfer Day
Job Openings
Live Radio

Thinker & Movers
Alumni
Foundations
Corbin Center
Jardine Hall
Hugo Wall School

Career Services
Doers & Shockers
Core Values
Grace Wilkie Hall
Strategic Plan
Medical Tech

Educational Map
Physical Plant
Graphic Design
Non Credit Class
Media Relations
Advertising

Beta Alpha Psi
Liberal Arts
Counseling
Biological Science
Duerksen Fine Art
EMT Program

Staff
Aerospace
Choral Dept.
Alberg Hall
French
Spanish

Softball, Men's
McKinley Hall
Email
Dental Hygiene
Tenure
Personnel Policies

English
Graduate Complex
Music Education
Advising Center
Medical School
Levitt Arena

Religion
Art Composition
Physics
Entrepreneurship
Koch Arena
Roster

Parents
Wrestling
Philosophy
Wichita Lyceum
Fairmount Center
Women's Museum

Instrumental
Nursing
Opera
Sports History
Athletic Dept.
Health Plan



Activity

- Weller (2004) found people took less time to locate items for information that was grouped
 - using a border (2nd screen) compared with using color contrast (1st screen)
- Some argue that too much white space on web pages is detrimental to search
 - Makes it hard to find information
- Do you agree?

Which is easiest to read and why?



What is the time?



Design implications

- Icons should enable users to readily *distinguish* their meaning
- Bordering and spacing are effective visual ways of grouping information
- Sounds should be audible and distinguishable
- Speech output should enable users to distinguish between the set of spoken words
- Text should be legible and distinguishable from the background



- Involves first encoding and then retrieving knowledge
- We don't remember everything - involves filtering and processing what is attended to
- Context is important in affecting our memory (i.e. where, when)
- We recognize things much better than being able to recall things



Processing in memory

- Encoding is first stage of memory
 - determines which information is attended to in the environment and how it is interpreted
 - The more attention paid to something...
 - The more it is processed in terms of thinking about it and comparing it with other knowledge...
 - The more likely it is to be remembered
 - e.g. when learning about HCI, it is much better to reflect upon it, carry out exercises, have discussions with others about it, and write notes than just passively read a book, listen to a lecture or watch a video about it



Context is important

- Context affects the extent to which information can be subsequently retrieved
- **Sometimes it can be difficult for people to recall information that was encoded in a different context:**
 - “You are on a train and someone comes up to you and says hello. You don’t recognize him for a few moments but then realize it is one of your neighbors. You are only used to seeing your neighbor in the hallway of your apartment block and seeing him out of context makes him difficult to recognize initially”



Activity

- Try to remember the dates of your grandparents' birthday
- Try to remember the cover of the last two DVDs you bought or rented
- Which was easiest? Why?
- People are very good at remembering visual cues about things
 - e.g. the color of items, the location of objects and marks on an object
- They find it more difficult to learn and remember arbitrary material
 - ²² e.g. birthdays and phone numbers



Recognition versus recall

- Command-based interfaces require users to recall from memory a name from a possible set of 100s
- GUIs provide visually-based options that users need only browse through until they recognize one
- Web browsers, MP3 players, etc., provide lists of visited URLs, song titles etc., that support recognition memory



‘7±2’

- George Miller's (1956) theory of how much information people can remember
- People's immediate memory capacity is very limited
- Many designers think this is useful finding for interaction design
- But...



What some designers get up to...

- Present only 7 options on a menu
- Display only 7 icons on a tool bar
- Have no more than 7 bullets in a list
- Place only 7 items on a pull down menu
- Place only 7 tabs on the top of a website page
 - But this is wrong? Why?





Why?

- Inappropriate application of the theory
- People can scan lists of bullets, tabs, menu items for the one they want
- They don't have to recall them from memory having only briefly heard or seen them
- Sometimes a small number of items is good
- But depends on task and available screen estate



Personal information management

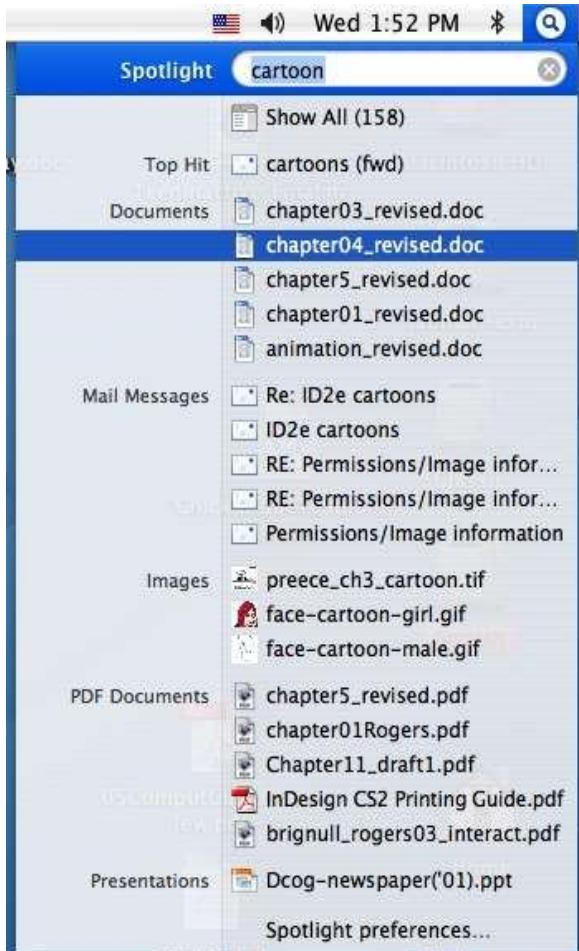
- Personal information management is a growing problem for many users
 - vast numbers of documents, images, music files, video clips, emails, attachments, etc.,
 - where and how to save them all, then remembering what they were called and where to find them again
 - naming most common means of encoding them
 - but can be difficult to remember, especially when have 1000s and 1000s
 - How might such a process be facilitated taking into account people's memory abilities?



management

- Memory involves 2 processes
 - recall-directed and recognition-based scanning
- File management systems should be designed to optimize both kinds of memory processes
 - e.g. Search box and history list
- Help users encode files in richer ways
 - Provide them with ways of saving files using colour, flagging, image, flexible text, time stamping, etc

Is Apple's Spotlight search tool any good?





Memory aids

- SenseCam developed by Microsoft Research Labs
- a wearable device that regularly takes photos without any user intervention while worn
- digital images taken are stored and revisited using special software
- Has been found to improve people's memory, suffering from Alzheimers

SenseCam





Design implications

- Don't overload users' memories with complicated procedures for carrying out tasks
- Design interfaces that promote recognition rather than recall
- Provide users with various ways of encoding information to help them remember
 - e.g. categories, color, flagging, time stamping



Learning

- How to learn to use a computer-based application
- Using a computer-based application to understand a given topic
- People find it hard to learn by following instructions in a manual
 - **prefer to learn by doing**



Design implications

- Speech-based menus and instructions should be short
- Accentuate the intonation(accuracy of pitch) of artificially generated speech voices
 - they are harder to understand than human voices
- Provide opportunities for making text large on a screen



listening

- The ease with which people can read, listen, or speak differs
- Many prefer listening to reading
- Reading can be quicker than speaking or listening
- Listening requires less cognitive effort than reading or speaking
- Dyslexics have difficulties understanding and recognizing written words



Applications

- Speech-recognition systems allow users to interact with them by using spoken commands
 - e.g. Google Voice Search app
- Speech-output systems use artificially generated speech
- e.g. written-text-to-speech systems for the blind
- Natural-language systems enable users to type in questions and give text-based responses
 - e.g. Ask search engine



Design implications

- Design interfaces that encourage exploration
- Design interfaces that constrain and guide learners
- Dynamically linking concepts and representations can facilitate the learning of complex material



Problem-solving, planning, reasoning and decision-making

- All involves reflective cognition
 - e.g. thinking about what to do, what the options are, and the consequences
- Often involves conscious processes, discussion with others (or oneself), and the use of artifacts
 - e.g. maps, books, pen and paper
- May involve working through different scenarios and deciding which is best option



Design implications

- Provide additional information/functions for users who wish to understand more about how to carry out an activity more effectively

- Use simple computational aids to support rapid decision-making and planning for users on the move



- Users develop an understanding of a system through learning about and using it
- Knowledge is sometimes described as a mental model:
 - How to use the system (what to do next)
 - What to do with unfamiliar systems or unexpected situations (how the system works)
- People make inferences using mental models of how to carry out tasks



Mental models

- Craik (1943) described mental models as:
 - internal constructions of some aspect of the external world enabling predictions to be made
- Involves unconscious and conscious processes
 - images and analogies are activated

Everyday reasoning and mental models



- (a) You arrive home on a cold winter's night to a cold house. How do you get the house to warm up as quickly as possible? Set the thermostat to be at its highest or to the desired temperature?

- (b) You arrive home starving hungry. You look in the fridge and find all that is left is an uncooked pizza. You have an electric oven. Do you warm it up to 375 degrees first and then put it in (as specified by the instructions) or turn the oven up higher to try to warm it up quicker?



Heating up a room or oven that thermostat-controlled

- Many people have erroneous mental models
(Kempton, 1996)
- Why?
 - General valve theory, where ‘more is more’ principle is generalised to different settings (e.g. gas pedal, gas cooker, tap, radio volume)
 - Thermostats based on model of on-off switch model

Heating up a room or oven that thermostat-controlled

■ Same is often true for understanding how interactive devices and computers work:

- poor, often incomplete, easily confusable, based on inappropriate analogies and superstition (Norman, 1983)
- e.g. elevators and pedestrian crossings: people hit the button at least twice





■ Write down how an ATM works

- How much money are you allowed to take out?
- If you went to another machine and tried the same what would happen?
- What information is on the strip on your card? How is this used?
- What happens if you enter the wrong number?
- Why are there pauses between the steps of a transaction? What happens if you try to type during them?
- Why does the card stay inside the machine?
- Do you count the money? Why?



- Your mental model
 - How accurate?
 - How similar?
 - How shallow?
- Payne (1991) did a similar study and found that people frequently resort to analogies to explain how they work
- People's accounts greatly varied and were often ad hoc

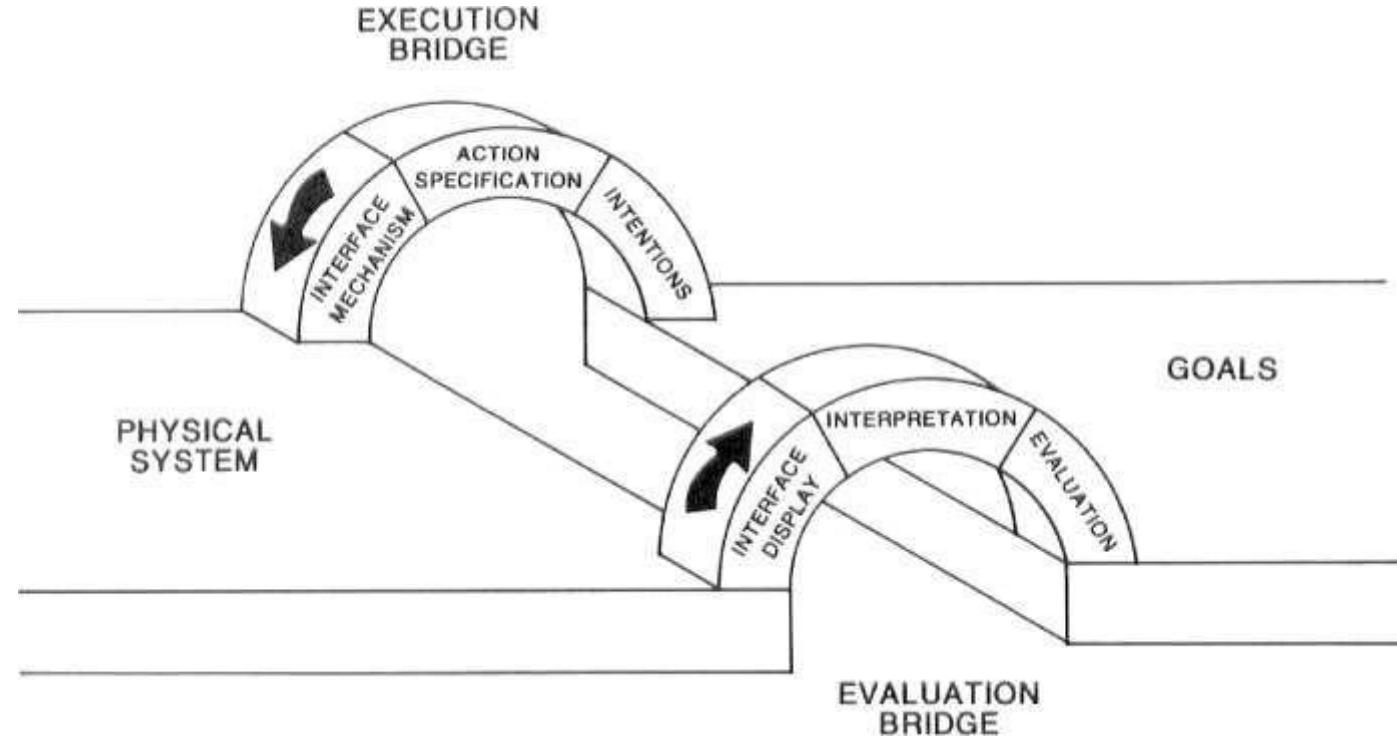


evaluation

- The ‘gulfs’ explicate the gaps that exist between the user and the interface
 - The gulf of execution
 - the distance from the user to the physical system
 - The gulf of evaluation
 - the distance from the physical system to the user
- Bridging the gulfs can reduce cognitive effort required to perform tasks

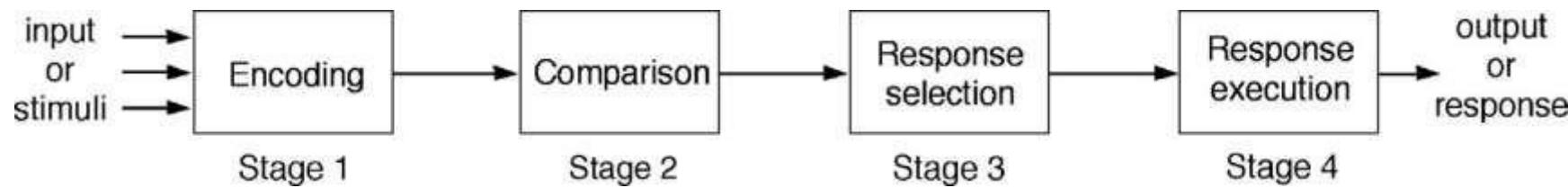


Bridging the gulfs



Information processing

- Conceptualizes human performance in metaphorical terms of information processing stages





(Card et al, 1983)

- Models the information processes of a user interacting with a computer
- Predicts which cognitive processes are involved when a user interacts with a computer
- Enables calculations to be made of how long a user will take to carry out a task



Limitations

- based on modeling mental activities that happen exclusively inside the head

- do not adequately account for how people interact with computers and other devices in real world



External cognition

- Concerned with explaining how we interact with external representations (e.g. maps, notes, diagrams)
- What are the cognitive benefits and what processes involved
- How they extend our cognition
- What computer-based representations can we develop to help even more?



load

- Diaries, reminders, calendars, notes, shopping lists, to-do lists
 - written to remind us of what to do
- Post-its, repiles, marked emails
 - where placed indicates priority of what to do
- External representations:
 - Remind us that we need to do something (e.g. to buy something for mother's day)
 - Remind us of what to do (e.g. buy a card)
 - Remind us when to do something (e.g. send a card by a certain date)



Computational offloading

- When a tool is used in conjunction with an external representation to carry out a computation (e.g. pen and paper)
- Try doing the two sums below (a) in your head, (b) on a piece of paper and c) with a calculator.
 - $234 \times 456 = ??$
- Which is easiest and why? Both are identical sums

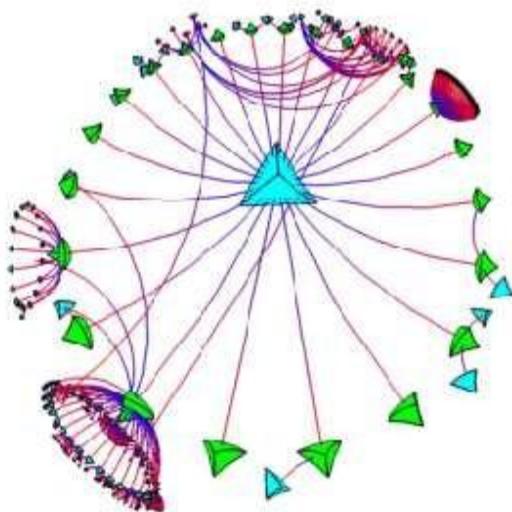


Annotation and cognitive tracing

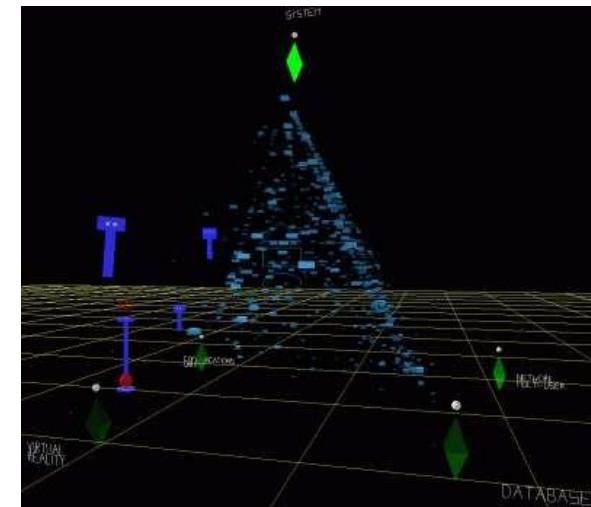
- Annotation involves modifying existing representations through making marks
 - e.g. crossing off, ticking, underlining
- Cognitive tracing involves externally manipulating items into different orders or structures
 - e.g. playing cards

Design implication

- Provide external representations at the interface that reduce memory load and facilitate computational offloading



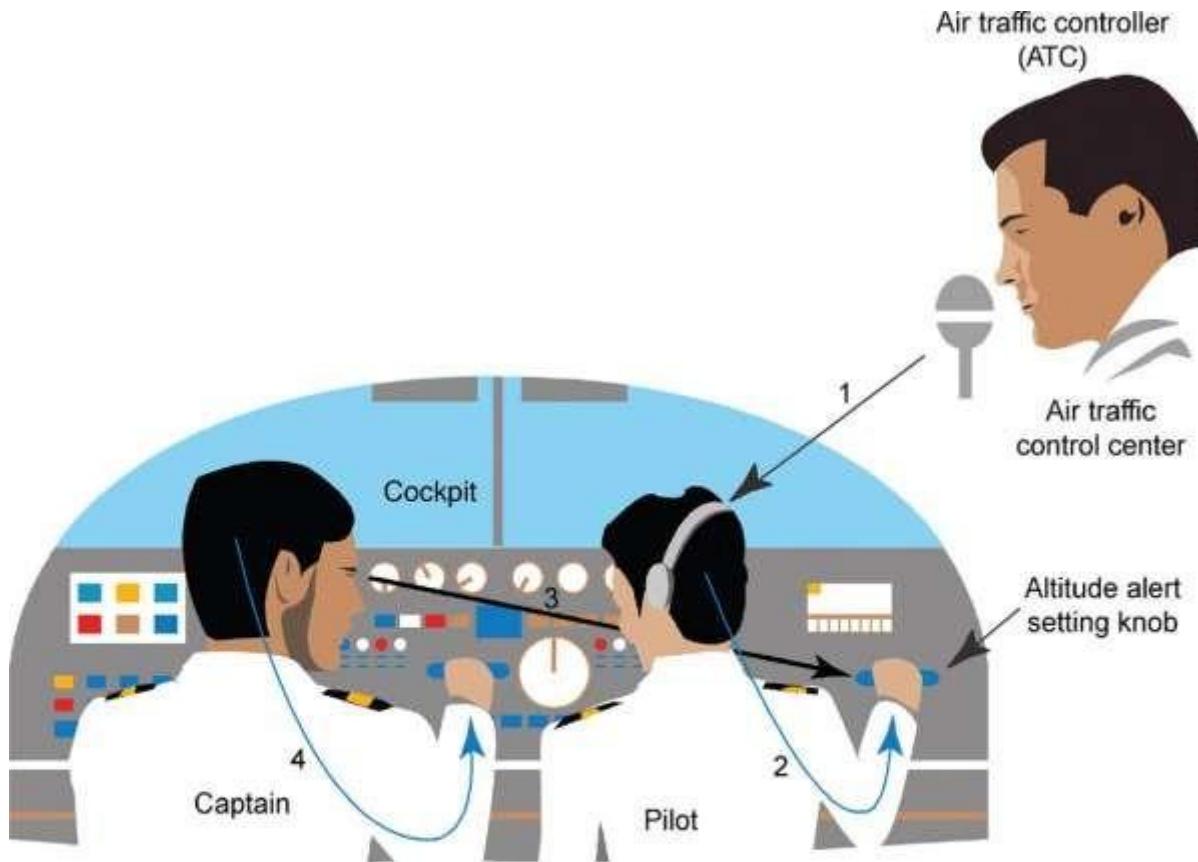
e.g. Information visualizations have been designed to allow people to make sense and rapid decisions about masses of data





Distributed cognition

- Concerned with the nature of cognitive phenomena across individuals, artifacts, and internal and external representations (Hutchins, 1995)
- Describes these in terms of propagation across representational state
- Information is transformed through different media (computers, displays, paper, heads)



Propagation of representational states:

- 1 ATC gives clearance to pilot to fly to higher altitude (verbal)
- 2 Pilot changes altitude meter (mental and physical)
- 3 Captain observes pilot (visual)
- 4 Captain flies to higher altitude (mental and physical)



Summary

- Cognition involves several processes including attention, memory, perception and learning
- The way an interface is designed can greatly affect how well users can perceive, attend, learn and remember how to do their tasks
- Theoretical frameworks, such as mental models and external cognition, provide ways of understanding how and why people interact with products

- This can lead to thinking about how to design better products



17th Mar 2025

“Be deaf to
negative thoughts..
If Your aim is to
reach your goal”



UNIT - II

Cognitive Aspects: Introduction, What is Cognition, Cognitive Frameworks.

Social Interaction: Introduction, Being Social, Face-to-Face Conversations, Remote Conversations, Co-presence, Social Engagement.

Emotional Interaction: Introduction, Emotions and the User Experience, Expressive Interfaces and Emotional Design, Annoying Interfaces, Affective Computing and Emotional AI, Persuasive Technologies and Behavioural Anthropomorphism Change.

- **Cognitive aspects**
 - What is cognition
 - Frameworks
- **Social Interaction**
 - Types of Social Interactions
- **Emotional Interaction**



<https://www.interaction-design.org/join>



24th Mar 2025



1. Cognitive aspects

2. Social Interaction

- Introduction, Being Social
- F2F Communications
- Remote conversations, Co Presence
- Social Engagement

3. Emotional Interaction

- Introduction
- Emotions and User experience
- Expressive interfaces and Emotional design
- Annoying Interfaces
- Affective computing
- Emotional AI and Persuasive technologies

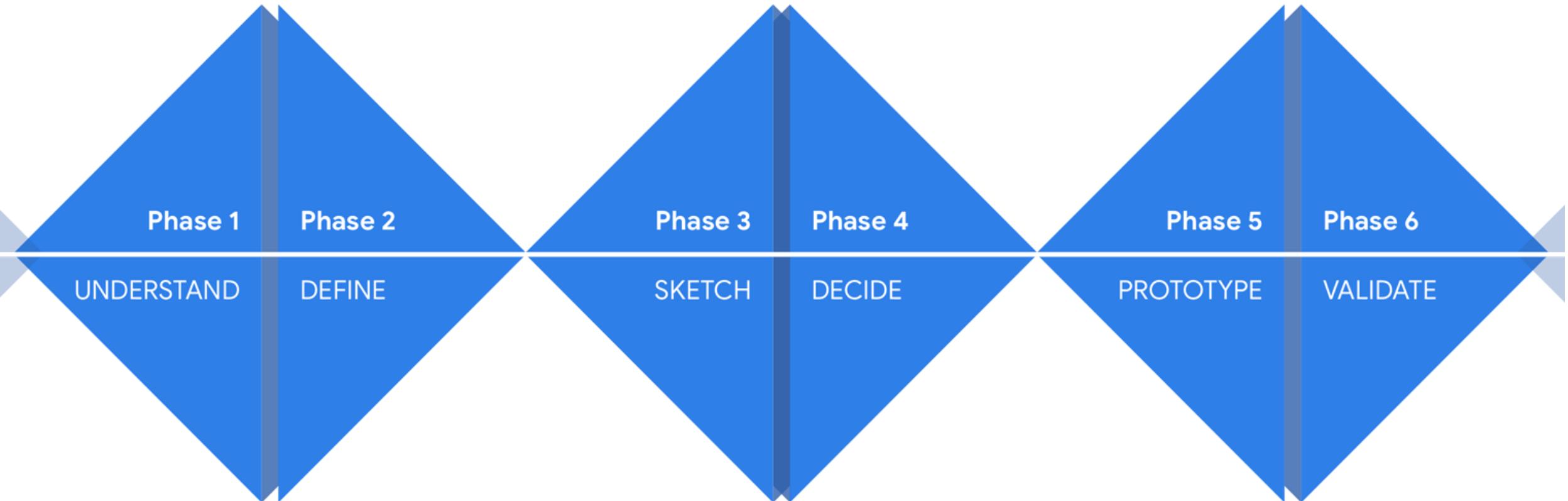


Social Interaction

UNIT II- CHI Design Aspects



Double diamond framework



UNIT II- CHI Design Aspects



In order to produce computer system with good usability;
Developers must attempt to

Understand	Develop	Achieve	Put People 1st
<ul style="list-style-type: none">The factors that determine how people use technology	<ul style="list-style-type: none">Tools and techniques to enable building suitable systems	<ul style="list-style-type: none">Efficient, effective, and safe interaction	<ul style="list-style-type: none">Their needs, capabilities and preferences for conducting various tasks should direct developers in the way that they design systemsPeople should not change their way they use the system to fit with it, instead system should match their requirements

The long term goal:
To design systems that minimize the barrier between the human's cognitive model of what they want to accomplish and the computer's understanding of the user's task



Social interaction in HCI

“To the study of how people interact with each other through technology, analysing the social aspects of human-computer interactions, including how digital platforms influence communication, relationships, and behaviors between users, essentially examining how technology facilitates or modifies social dynamics between individuals.”

UNIT II- CHI Design Aspects



- **Focus on social aspects:**

Unlike traditional HCI which primarily looks at user interface design, social interaction in HCI focuses on how technology impacts social behaviors, like collaboration, community building, and social norms within digital environments.

- **Social media impact:**

Platforms like Facebook, Twitter, and Instagram are prime examples of how technology shapes social interaction, allowing users to connect, share information, and interact with others across distances.

- **Social cues and design:**

Researchers in this area study how to incorporate social cues (like avatars, facial expressions, and gestures) into interfaces to enhance user experience and foster a sense of social presence.

- **Psychological factors:**

Understanding social psychology concepts like group dynamics, social influence, and social identity is crucial to designing technology that supports positive social interactions.

- **Designing collaborative tools:**

Creating software that facilitates teamwork and communication between geographically dispersed teams.

- **Social network analysis:**

- **Impact of AI on social interaction:**

Examining how AI-powered chatbots and virtual assistants influence human communication



Social UX

Social media tools

Ideally should offer support for sharing, filtering and recommending resources of interest

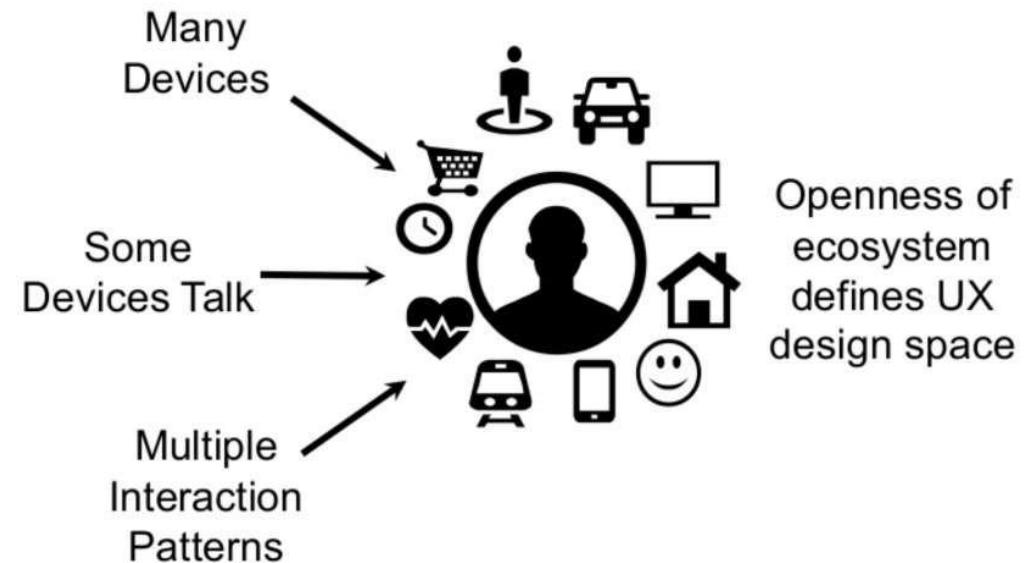
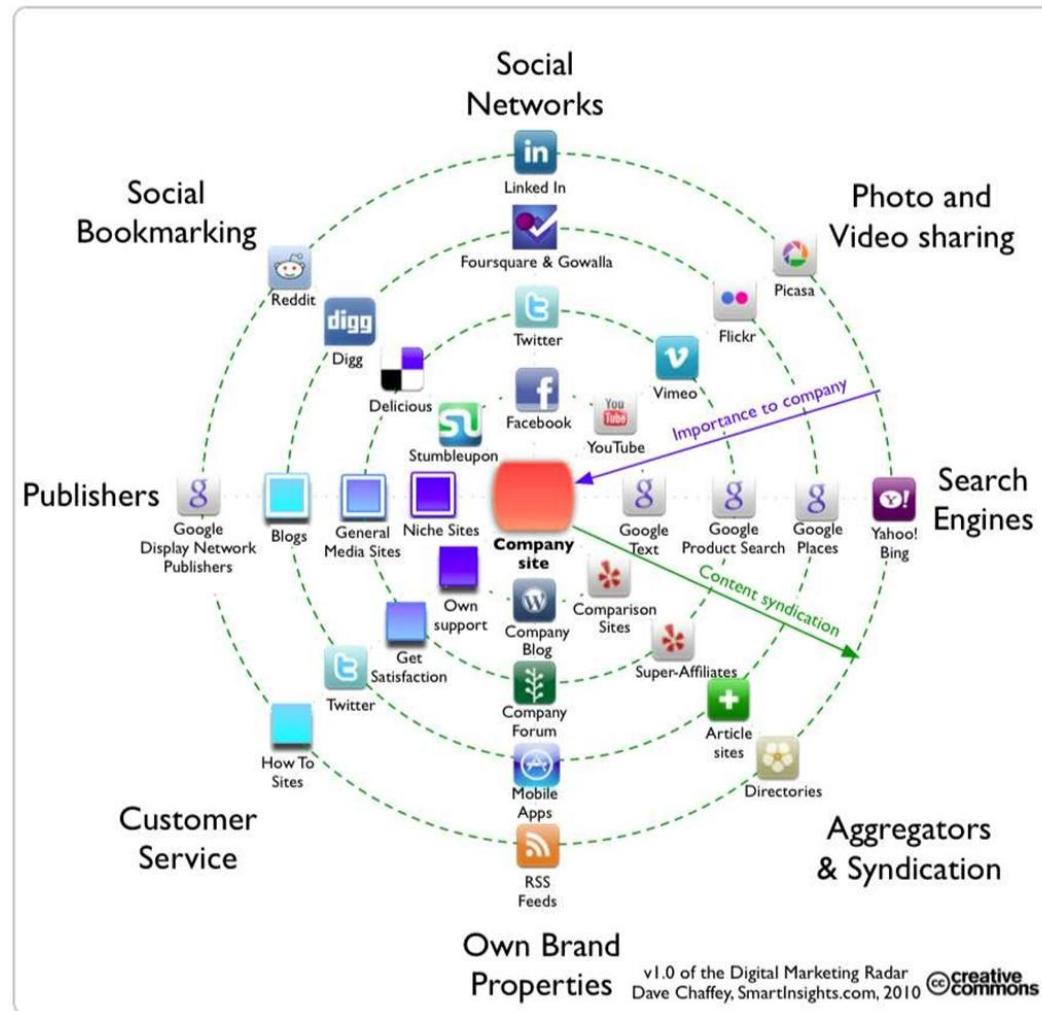




“Be civil to all; sociable to many; familiar with few; friend to one; enemy to none.”

Benjamin Franklin

Social UX – Design Patterns for Social Interaction





Patterns of Human Behavior

Safe exploration

“Let me explore without getting lost or getting into trouble.”

Instant gratification

“I want to accomplish something *now*, not later.”

Satisfying

“This is good enough.

I don’t want to spend more time learning to do it better.”

Incremental construction

“Let me change this. That doesn’t look right; let me change it again. That’s better!”

Habituation

“That gesture works everywhere else; why doesn’t it work here, too?”

Streamlined repetition

“I have to repeat this how many times?”

Keyboard only

“Please don’t make me use the mouse!”



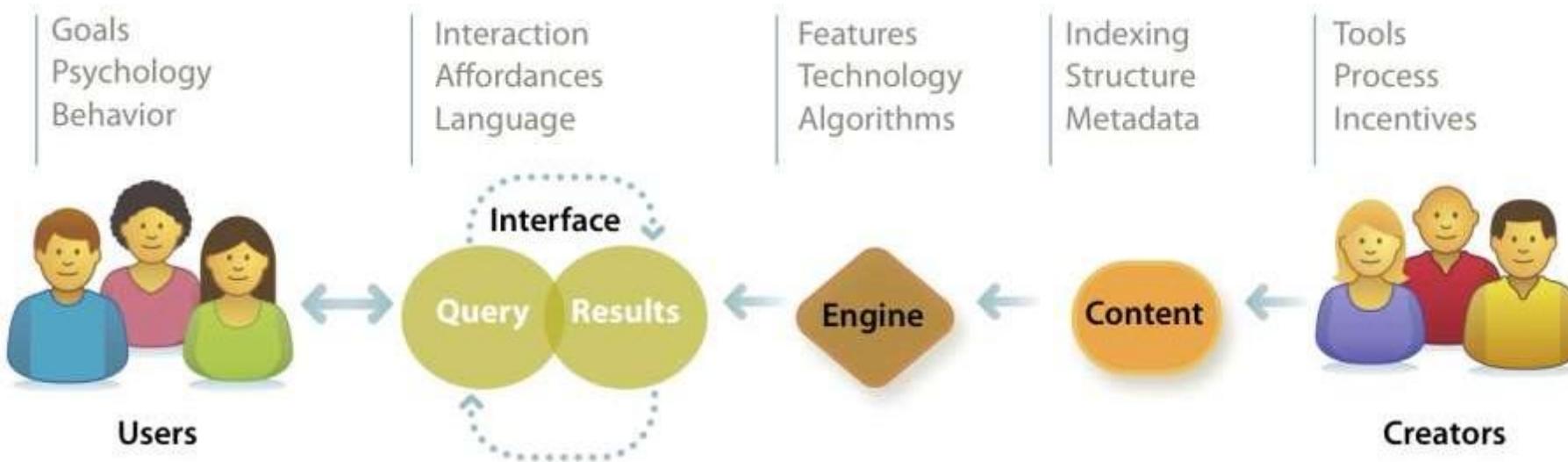
Social UX: Core Principles

Software as a human

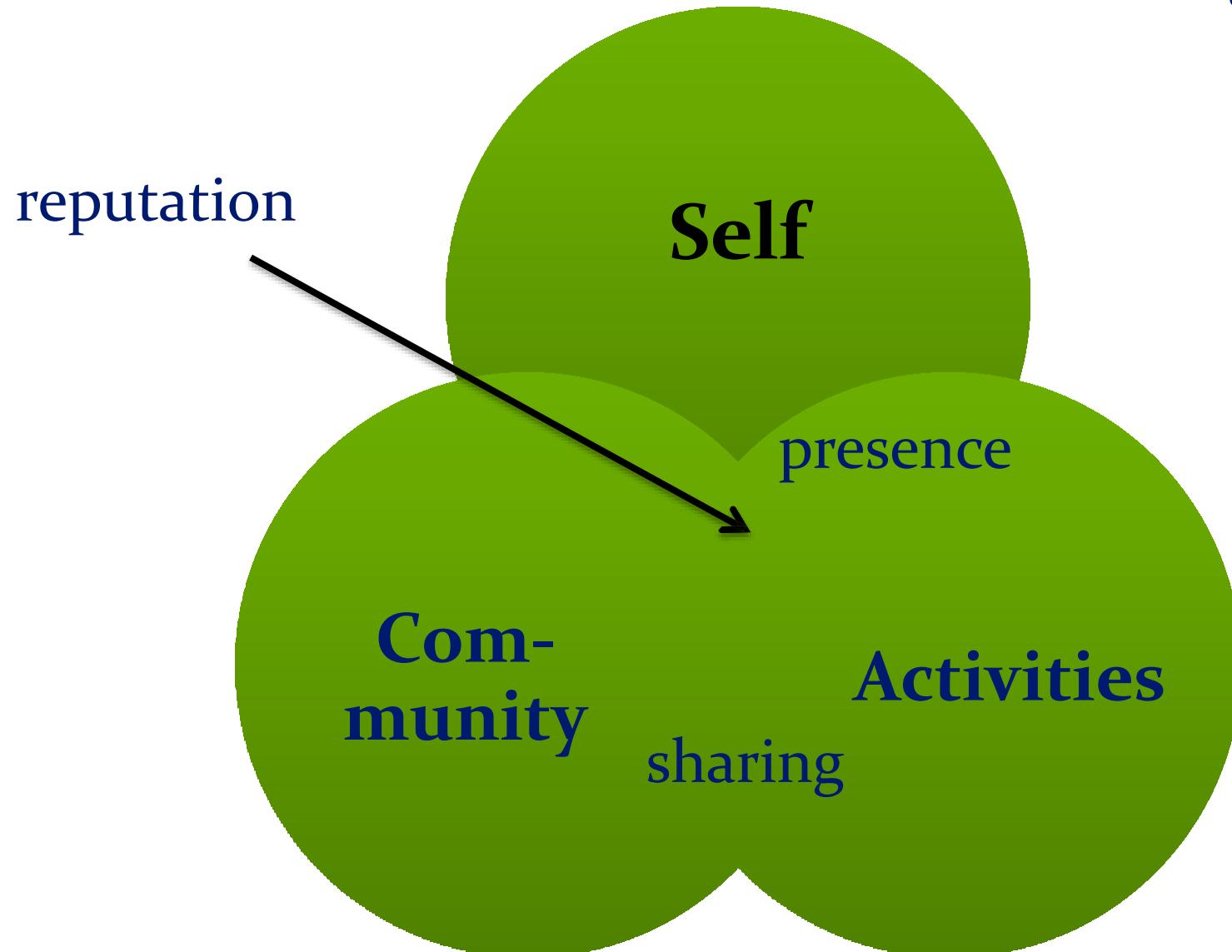
1. Design for Everyone
2. Talk Like a Person
3. Be Open
4. Check Your Ethics
5. Don't Break E-mail!

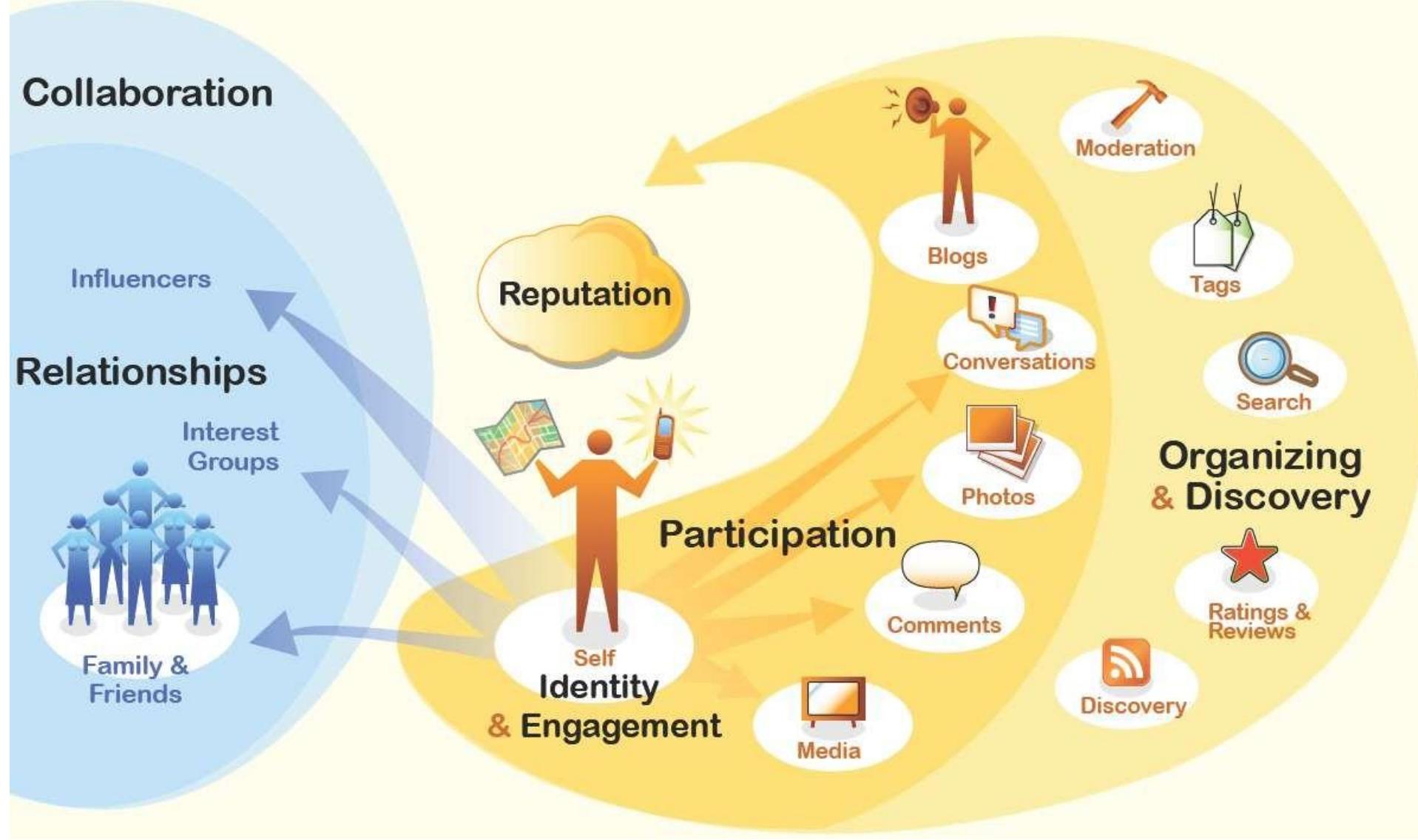


Social UX Patterns



dealing with the interactivity
within a social (Web) application





social media ecosystem (Crumlish & Malone, 2009)

Social Patterns & Best Practices

Principles

section title: Social to the Core

Fundamental Principles

- ➔ [Design for Everyone](#)
 - ▶ [Deliberately Leave Things Incomplete](#)
 - ▶ [Pave the Cowpaths](#)
 - ▶ [Strict vs. Fluid Taxonomies](#)
 - ▶ [Palimpsest](#)
- ➔ [Talk Like a Person](#)
 - ▶ [Conversation](#)
 - ▶ [Self-Deprecating Error Messages](#)
 - ▶ [Ask Questions](#)
 - ▶ [Your vs. My](#)

Activities

section title: Where's the Action?

Collecting

chapter title: Hunters Gather

- ➔ Collecting
 - ▶ [Saving](#)
 - ▶ [Favorites](#)
 - ▶ [Displaying](#)
 - ▶ [Add / Subscribe](#)

Tagging

- ▶ [Tag an Object](#)
- ▶ [Find with Tags](#)
- ▶ [Tag Cloud](#)

5+ Anti-Patterns

- ➔ [The Password Anti-Pattern](#)
- ➔ [Potemkin Village](#) (antipattern)
- ➔ [The Ex-Boyfriend Antipattern](#)
- ➔ [Cargo Cult](#) (antipattern)
- ➔ [Don't Break Email!](#)
- ➔ and sometimes [Leaderboard](#)

Community

section title: One of Us, One of Us

Personal Connections

chapter title: We Need to Talk

- ➔ Relationships
 - ▶ [Relationship terminology](#)

Summary

Human beings are inherently social. People will always need to **collaborate, coordinate, and communicate with one another**, and the diverse range of applications, web-based services, and technologies that have emerged enable them to do so in more extensive and diverse ways.

Key Points

- Social interaction is central to our everyday lives.
- Social mechanisms have evolved in face-to-face & remote contexts to facilitate conversation, coordination, and awareness.
- Talk and the way it is managed are integral to coordinating social interaction.
- Many kinds of technologies have been developed to enable people to communicate remotely with one another.
- Keeping aware of what others are doing and letting others know what you are doing are important aspects of collaboration and socializing.
- Social media has brought about significant changes in the way people keep in touch and manage their social lives.

Following slides are ... more of details

Social UX: Core Principles

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Osmania University



- Design for Everyone
- Talk Like a Person
- Be Open
- Check Your Ethics Don't Break E-mail!

Software as a human



Social UX

Conversation

Adopting a conversational tone

use the language of contemporary speech, not that of textbooks, tax forms, or street signs

Conversation

used for including instructions, errors,

and other messages coming from the system and addressed to the reader, visitor, or member

Ask questions

people naturally have questions and ask them

User engagement

“keep the user’s experience focused on the application”

(Bert Appward, 2012)

Sign-up and registration

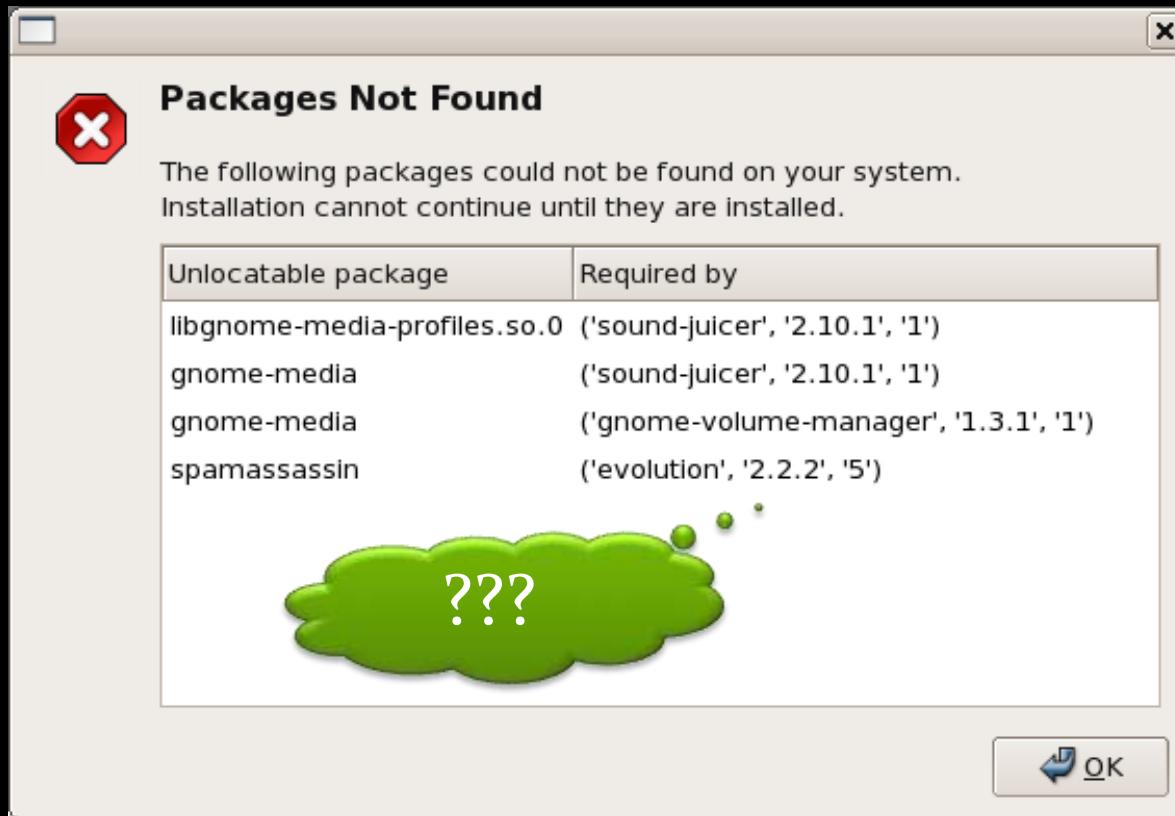
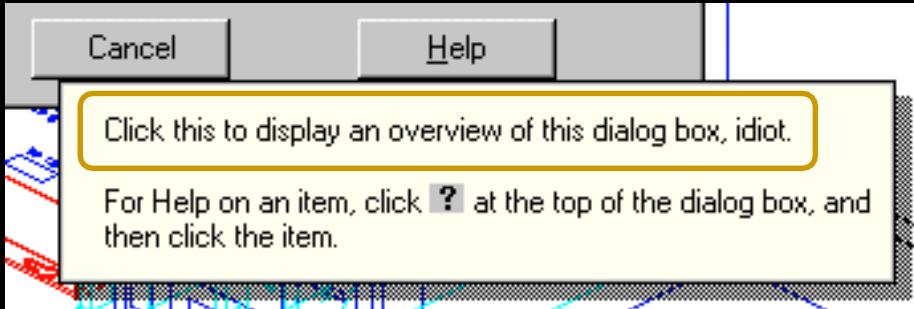
use the pattern when:

require leaving personal or private information, and privacy and security are a concern

Authorize

this pattern could be used when:

user-generated content or data on a given site has the potential to enhance/enable other sites



Your Father

Your Mother

You - Start Here **FREE!**

your first name

your last name

your email

never shared, never spammed

gender male female

Start My Tree!

Got a GEDCOM?

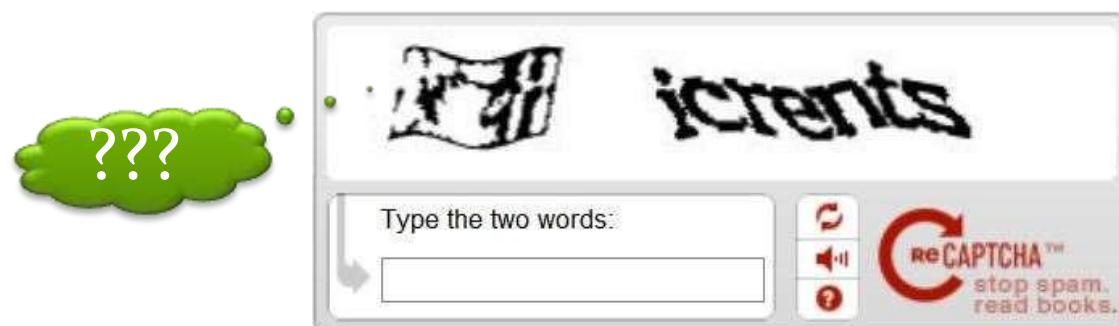
Social UX

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Sign-up and registration

include CAPTCHA-based verification
only if absolutely necessary





OpenStreetMap

The Free Wiki World Map

OpenStreetMap is a free worldwide map, created by people like you.

The data is free to [download](#) and [use](#) under its [open license](#).
[Create a user account](#) to improve the map.

Help

[Help Centre](#)

[Documentation](#)

Community

[Community Blogs](#)

[Foundation](#)

[User Diaries](#)

Data

[Copyright & License](#)

[Export Data](#)

[GPS Traces](#)

[Make a Donation](#)

Login

Don't have an account? [Register now](#)

Email Address or Username:

Password:

[Lost your password?](#)

Remember me

Login

Alternatively, use OpenID to login:



Remember me

Social UX

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Personal dashboard

users want to check in and see status updates from their “friends”, current activity from their social graph, comments from “friends” on recent posts, etc.

Social UX

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Personal dashboard

the personal dashboard is the companion to the profile should co

information and access to activities

that the user wants to participate in on an ongoing basis

- ▶ to encourage repeat usage

uiFaces

[Everybody](#)[Authorized](#)[About](#)[Add Your Face](#)

Avatar Size: 98px



Spacing: 8px



Border Radii: 3px



Container Width: 640px



2,975



990



Social UX

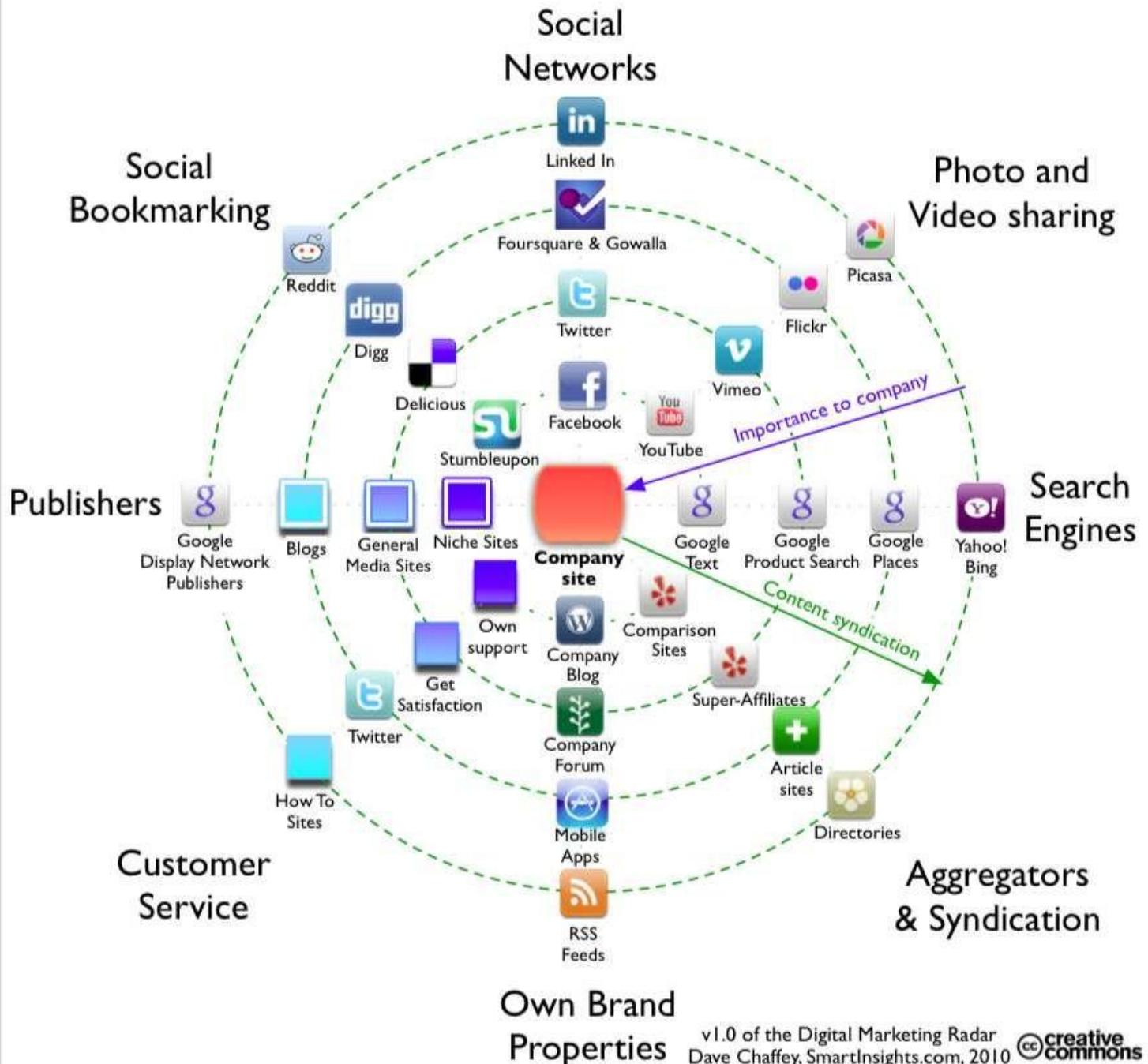
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Online presence

designing a presence UI is to maximize opportunities for users to declare themselves present to one another

online presence management:
publish, display, maintain (update), subscribe to, filter,...



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User reputation

reputation influences behavior

a reputation system involves tracking desirable behavior
and then recognizing it publicly

examples: Klout, Mozilla OpenBadges

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Broadcasting

design patterns concerning blogs:

Blogs: presentation **Blogs: ownership** **Microblogging**

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Feedback

important design (anti)patterns:

Vote to promote Thumbs

up/down ratings

Ratings (Stars or 1—5)

Comments

Reviews Soliciting feedback

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Relationships

important design patterns:

**Find people Adding
friends**

Circles of connections

Publicize Relationships

**Un-friending
Groups**

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Face-to-face meeting

during a public event

allow users to make comments in real-time

e.g., integrating social Web (mobile) applications

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Face-to-face meeting post-event

offer tools to attach photos, presentations,
other resources to the event

Social Patterns & Best Practices

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section title: Social to the Core

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- ▶ Strict vs. Fluid Taxonomies

- ▶ Palimpsest

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- ▶ Conversation

- ▶ Self-Deprecating Error Messages

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→ Potemkin Village (antipattern)

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section title: One of Us, One of Us

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→ Relationships

→ Relationship terminology

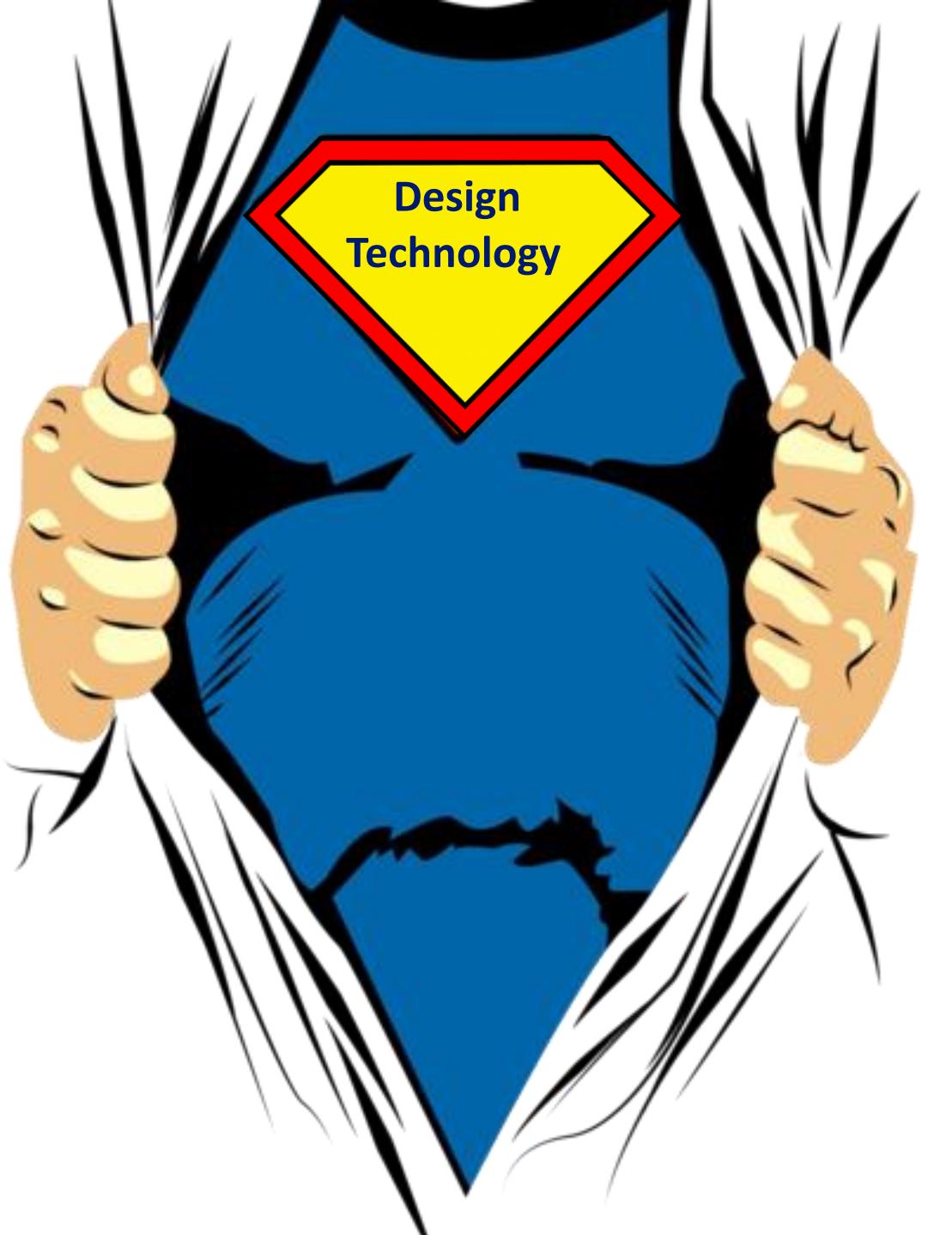


Emotional Interaction



FOCUS

- Emotions & User Experience
- Expressive Interfaces and Emotional Design
- Annoying Interfaces
- Affective Computing and Emotional AI
- Persuasive Technologies and Behavioral Change
- Anthropomorphism



Emotions & User Experience



How do you feel?

Should an interface be designed to try to keep a person happy?





Would you help?

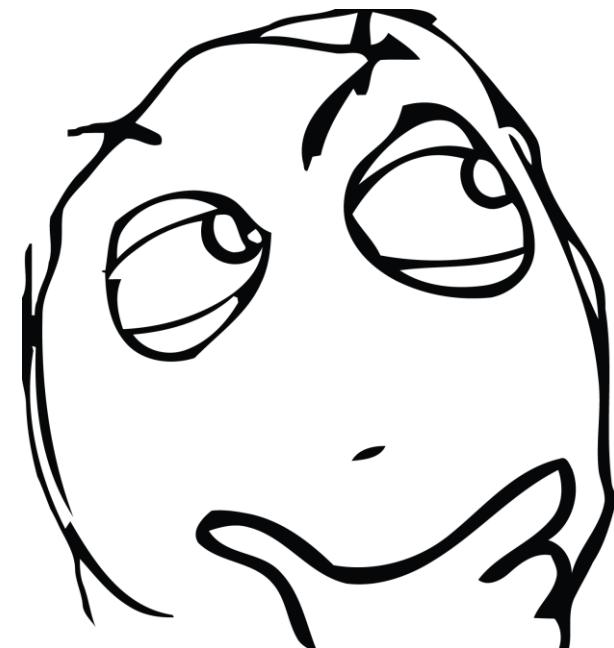


Emotions

Expressions

Behaviors

Physiology



Automatic Emotions

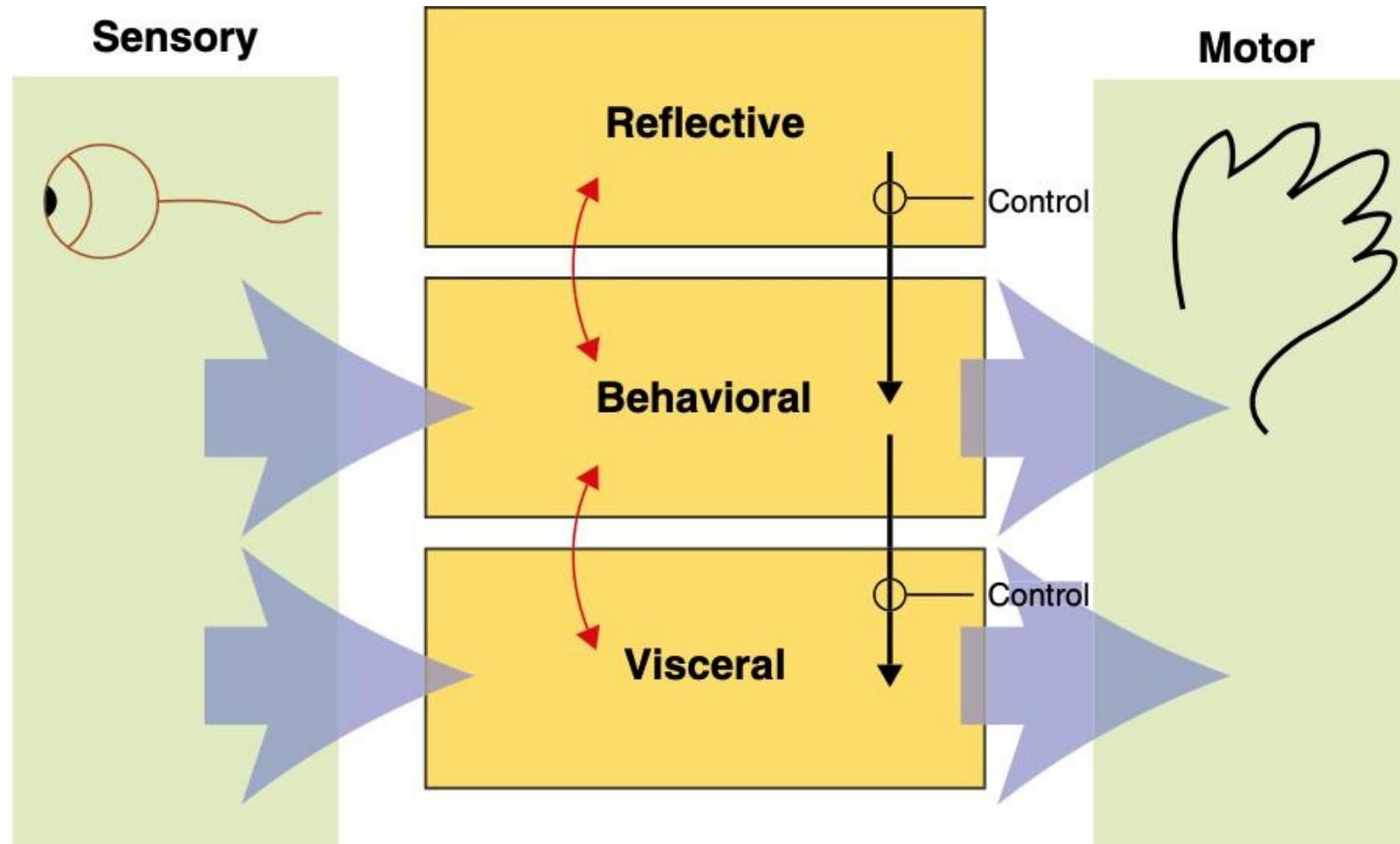
Conscious Emotions



Feel It

Model of emotional design

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Expressive Interfaces & Emotional Design



Create emotional connection

Eliciting certain kinds emotional responses

Classic Mac's icon



Beach ball Mac's

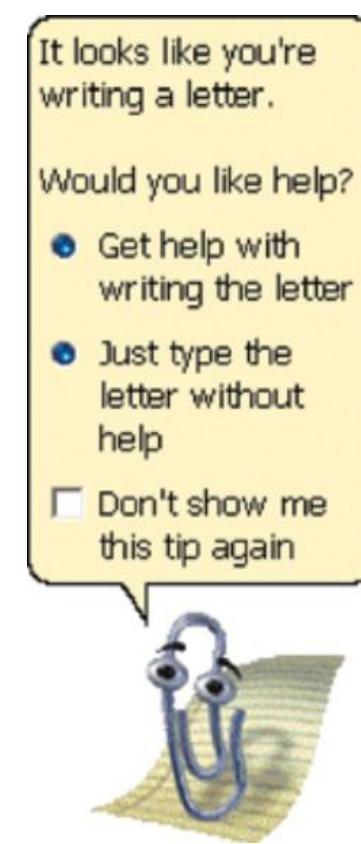


Annoying Interfaces

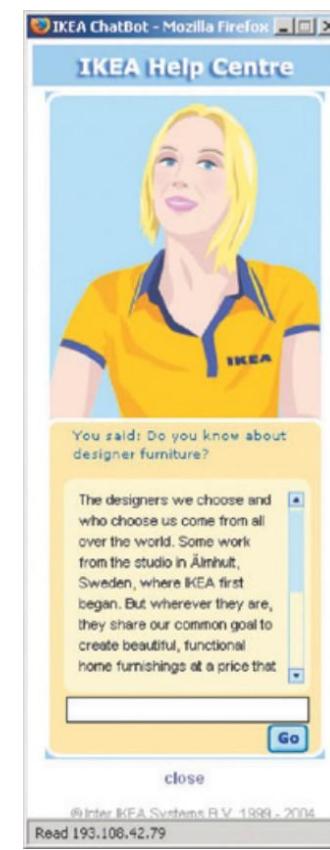
Bob



Clip



Anna



- When an application doesn't work properly or crashes
- When a system doesn't do what the user wants it to do
- When a user's expectations are not met
- When a system does not provide sufficient information to let the user know what to do
- When error messages pop up that are vague or obtuse

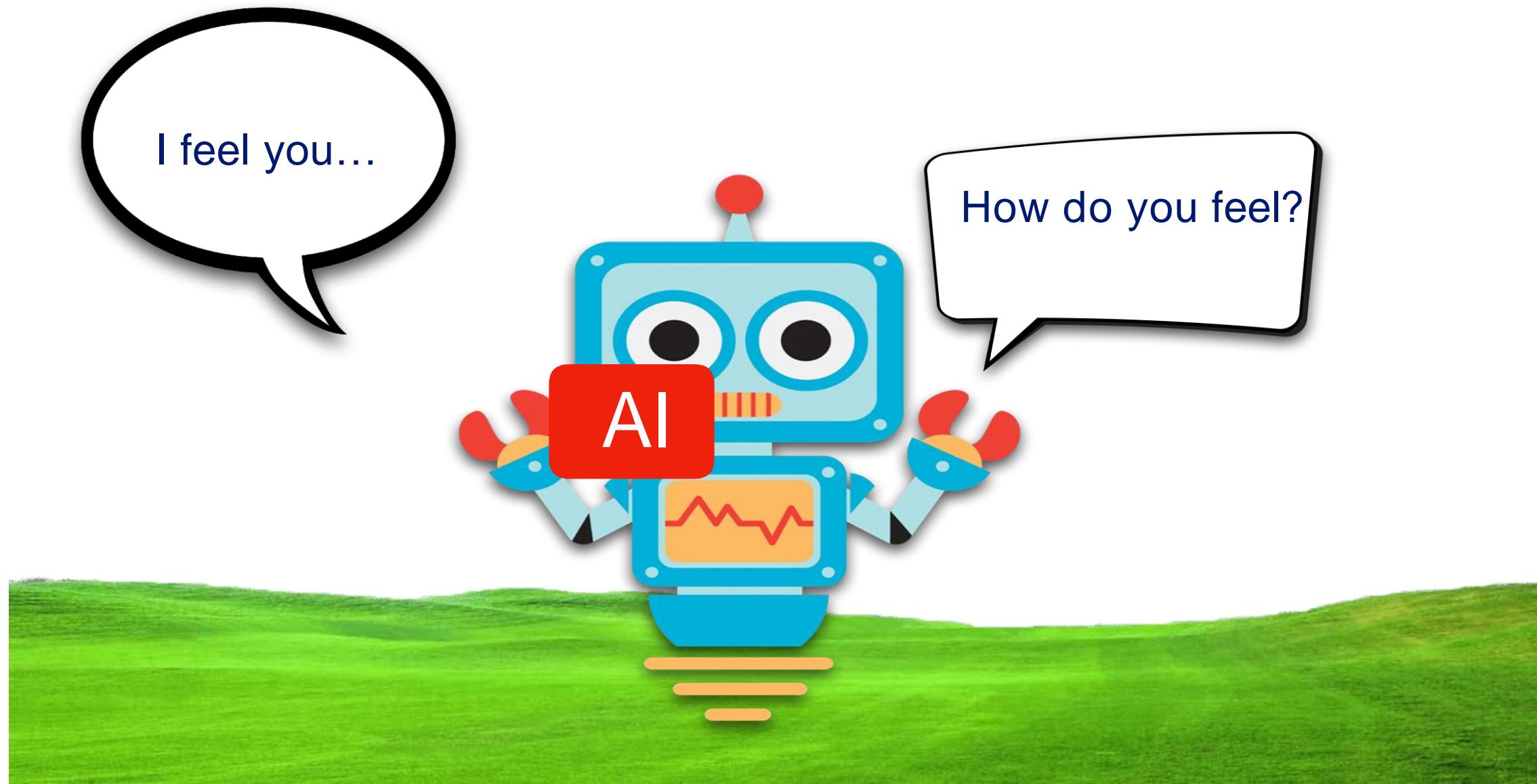




404 Error



Affective Computing & Emotional AI





By Affectiva

- Smiling
- Eye widening
- Brow raising
- Brow furrowing
- Raising a cheek
- Mouth opening
- Upper-lip raising
- Wrinkling of the nose

Persuasive Technologies & Behavioral Change

Nintendo Pokemon



HAPIfork

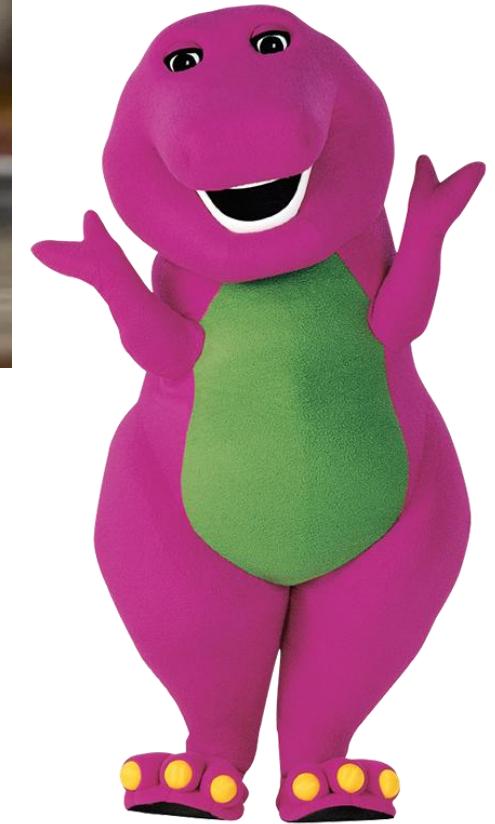




Anthropomorphism

Anthropomorphism is the attribution of **human** traits, emotions, or intentions to non-human entities. It is considered to be an innate tendency of human psychology. **Personification** is the related attribution of human form and characteristics to abstract concepts such as nations, emotions, and natural forces, such as seasons and weather. Both have ancient roots as storytelling and artistic devices, and most cultures have traditional fables with anthropomorphized animals as characters. People have also routinely attributed human emotions and behavioral traits to wild as well as domesticated animals.

Anthropomorphism



Group Exercise

The goal of this activity is to analyze how collaboration, coordination, and communication are supported in online video games involving multiple players.

https://youtu.be/_U2JbFhUPX8.

Answer the following questions.

1. Social issues

- (a) What is the goal of the game?
- (b) What kinds of conversations are supported?
- (c) How is awareness of the others in the game supported?
- (d) What kinds of social protocols and conventions are used?
- (e) What types of awareness information are provided?
- (f) Does the mode of communication and interaction seem natural or awkward?
- (g) How do players coordinate their actions in the game?

2. Interaction design issues

- (a) What form of interaction and communication is supported, for instance, text, audio, and/or video?
- (b) What other visualizations are included? What information do they convey?
- (c) How do users switch between different modes of interaction, for example, exploring and chatting? Is the switch seamless?
- (d) Are there any social phenomena that occur specific to the context of the game that wouldn't happen in face-to-face settings?

3. Design issues

- What other features might you include in the game to improve communication, coordination, and collaboration?