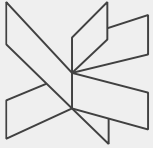


Bring ideas to life
VIA University College



IDX

Interaction Design
Beyond human-computer interaction

Cognitive Aspects
And Social Interaction

THE PSYCHOLOGICAL REVIEW

THE MAGICAL NUMBER SEVEN, PLUS OR MINUS TWO: SOME LIMITS ON OUR CAPACITY FOR PROCESSING INFORMATION ¹

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Harvard University

My problem is that I have been persecuted by an integer. For seven years this number has followed me around, has intruded in my most private data, and has assaulted me from the pages of our judgment. Historical accident, however, has decreed that they should have another name. We now call them experiments on the capacity of people to transmit information. Since these ex-

So how do we think and interact...

2 kinds of cognition

- **Experiential cognition** is a state of mind in which we **perceive, act** and **react** to events around us effectively and effortlessly (Norman, 1993)
- Examples include driving a car, reading a book or discussing
- **Reflective cognition** involves **thinking, comparing** and **decision making**
- Examples include learning, writing – and your tutorial activities

Activity: Find the price for a double room at the Quality Inn in Pennsylvania a

Pennsylvania
Bedford Motel/Hotel: Crinaline Courts
(814) 623-9511 S: \$118 D: \$120
Bedford Motel/Hotel: Holiday Inn
(814) 623-9006 S: \$129 D: \$136
Bedford Motel/Hotel: Midway
(814) 623-8107 S: \$121 D: \$126
Bedford Motel/Hotel: Penn Manor
(814) 623-8177 S: \$119 D: \$125
Bedford Motel/Hotel: Quality Inn
(814) 623-5189 S: \$123 D: \$128
Bedford Motel/Hotel: Terrace
(814) 623-5111 S: \$122 D: \$124
Bradley Motel/Hotel: De Soto
(814) 362-3567 S: \$120 D: \$124
Bradley Motel/Hotel: Holiday House
(814) 362-4511 S: \$122 D: \$125
Bradley Motel/Hotel: Holiday Inn
(814) 362-4501 S: \$132 D: \$140
Breezewood Motel/Hotel: Best Western Plaza
(814) 735-4352 S: \$120 D: \$127
Breezewood Motel/Hotel: Motel 70
(814) 735-4385 S: \$116 D: \$118

Activity: Find the price of a double room at the Holiday Inn in Columbia

South Carolina					
City	Motel/Hotel	Area code	Phone	Rates	
				Single	Double
Charleston	Best Western	803	747-0961	\$126	\$130
Charleston	Days Inn	803	881-1000	\$118	\$124
Charleston	Holiday Inn N	803	744-1621	\$136	\$146
Charleston	Holiday Inn SW	803	556-7100	\$133	\$147
Charleston	Howard Johnsons	803	524-4148	\$131	\$136
Charleston	Ramada Inn	803	774-8281	\$133	\$140
Charleston	Sheraton Inn	803	744-2401	\$134	\$142
Columbia	Best Western	803	796-9400	\$129	\$134
Columbia	Carolina Inn	803	799-8200	\$142	\$148
Columbia	Days Inn	803	736-0000	\$123	\$127
Columbia	Holiday Inn NW	803	794-9440	\$132	\$139
Columbia	Howard Johnsons	803	772-7200	\$125	\$127
Columbia	Quality Inn	803	772-0270	\$134	\$141
Columbia	Ramada Inn	803	796-2700	\$136	\$144
Columbia	Vagabond Inn	803	796-6240	\$127	\$130

Activity

- 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%)?
- 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

Is color contrast good? Find Italian

Black Hills Forest
Cheyenne River
Social Science
South San Jose
Badlands Park
Juvenile Justice

Peters Landing
Public Health
San Bernardino
Moreno Valley
Altamonte Springs
Peach Tree City

Jefferson Farms
Psychophysics
Political Science
Game Schedule
South Addition
Cherry Hills Village

Devlin Hall
Positions
Hubard Hall
Fernadino Beach
Council Bluffs
Classical Lit

Results and Stats
Thousand Oaks
Promotions
North Palermo
Credit Union
Wilner Hall

Highland Park
Manchesney Park
Vallecito Mts.
Rock Falls
Freeport
Slaughter Beach

Creative Writing
Lake Havasu City
Engineering Bldg
Sports Studies
Lakewood Village
Rock Island

Sociology
Greek
Wallace Hall
Concert Tickets
Public Radio FM
Children's Museum

Performing Arts
Italian
Coaches
McKees Rocks
Glenwood Springs
Urban Affairs

Rocky Mountains
Latin
Pleasant Hills
Observatory
Public Affairs
Heskett Center

Deerfield Beach
Arlington Hill
Preview Game
Richland Hills
Experts Guide
Neff Hall

Writing Center
Theater Auditions
Delaware City
Scholarships
Hendricksville
Knights Landing

McLeansboro
Experimental Links
Graduation
Emory Lindquist
Clinton Hall
San Luis Obispo

Brunswick
East Millinocket
Women's Studies
Vacant
News Theatre
Candlewood Isle

Grand Wash Cliffs
Indian Well Valley
Online Courses
Lindquist Hall
Fisk Hall
Los Padres Forest

Modern Literature
Studio Arts
Hughes Complex
Cumberland Flats
Central Village
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?

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

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
 - 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, etc., provide lists of visited URLs, song titles etc., that support recognition memory

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

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

Reading, speaking, and 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

Design implications

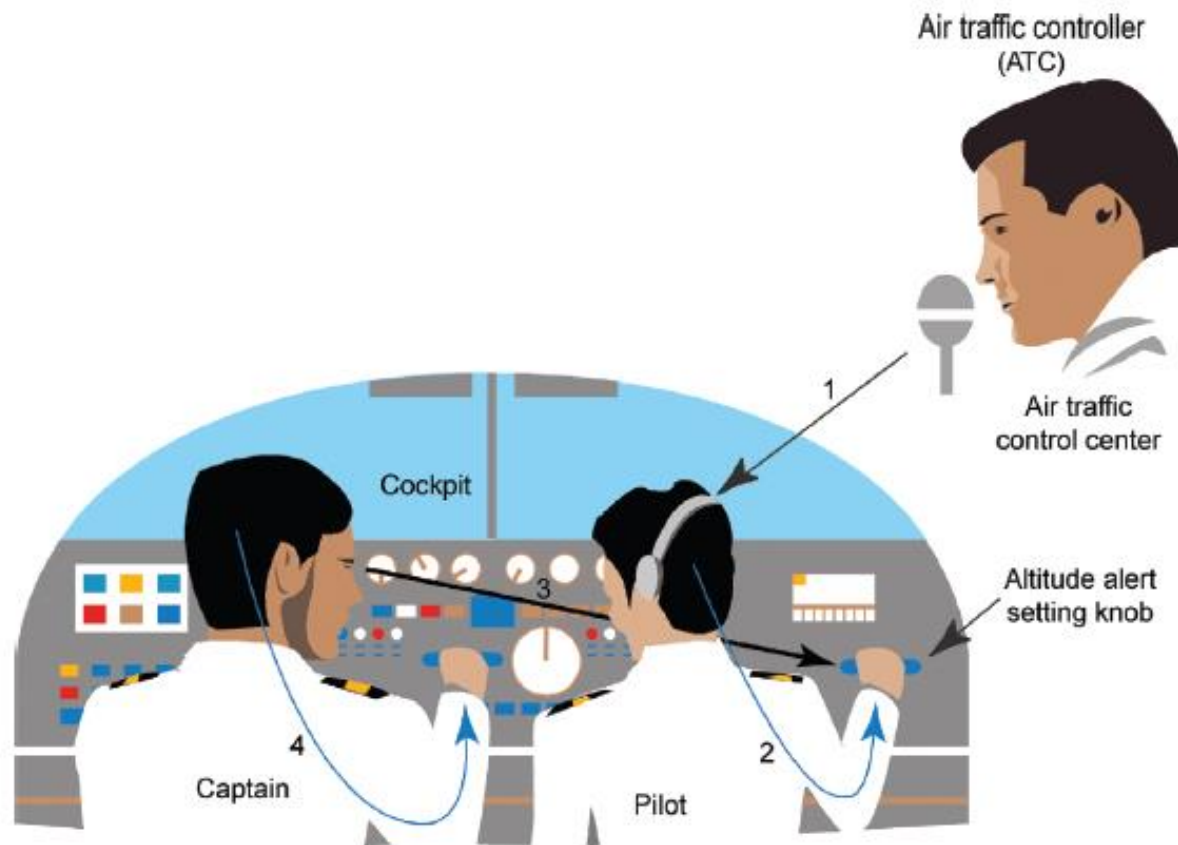
- Speech-based menus and instructions should be short
- Accentuate the intonation of artificially generated speech voices
 - they are harder to understand than human voices
- Provide opportunities for making text large on a screen

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

Heating up a room or oven that is 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 - lot of people hit the button at least twice
 - Why? Think it will make the lights change faster or ensure the elevator arrives!



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)

Figure 3.11 A cognitive system in which information is propagated through different media

Source: Preece, J. and Keller, L. (1994) *Human-Computer Interaction*, Figure 3.5 (p. 70) Addison Wesley, 1994.

Externalizing to reduce memory load

- Diaries, reminders, calendars, notes, shopping lists, to-do lists
 - written to remind us of what to do
- Post-its, piles, 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.
 - $234 \times 456 = ??$
 - $CCXXXIII \times CCCCXXXXXVI = ???$
- Which is easiest and why? Both are identical sums

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

Overview

- Being social
- Face to face conversations
- Remote conversations
- Tele-presence
- Co-presence
- Shareable technologies

Being social

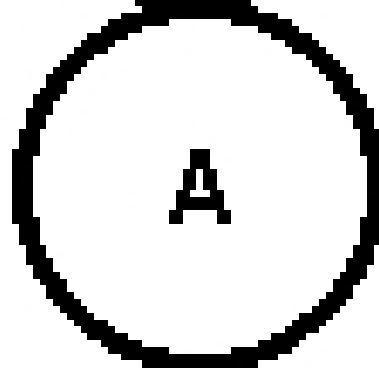
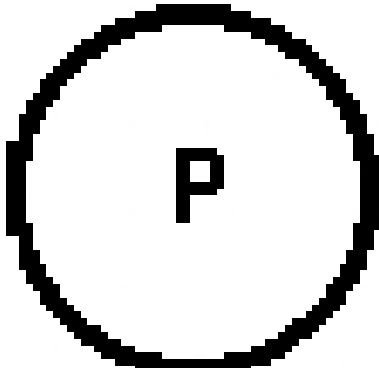
- Are F2F conversations being superseded by our social media interactions?
- How many friends do you have on Facebook, LinkedIn, etc vs real life?
- How much overlap?
- How are the ways we live and interact with one another changing?
- Are the established rules and etiquette still applicable to online and offline?

Conversational rules

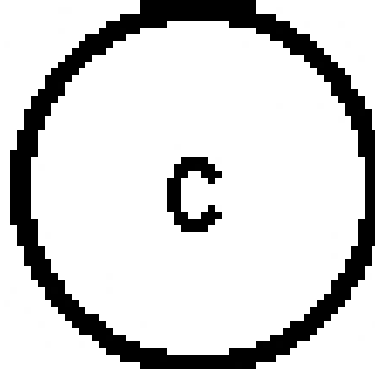
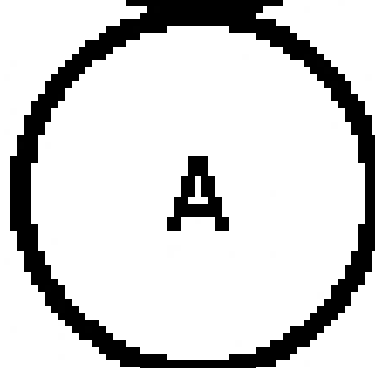
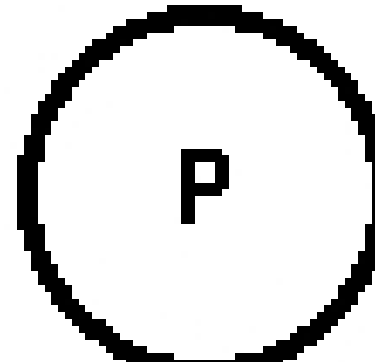
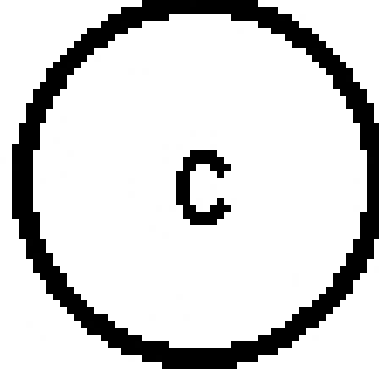
- Turn-taking used to coordinate conversation
 - A: Shall we meet at 8?
 - B: Um, can we meet a bit later?
 - A: Shall we meet at 8?
 - B: Wow, look at him?
 - A: Yes what a funny hairdo!
 - B: Um, can we meet a bit later?
- Back channelling to signal to continue and following
 - Uh-uh, umm, ahh

Transactional Analysis

Nurturing
Or
controlling



Adapted
Or
natural



What happens in social media conversations?

- Do same conversational rules apply?
- Are there more breakdowns?
- How do people repair them for:
 - Phone?
 - email?
 - Instant messaging?
 - texting?
 - Skyping?

Remote conversations

- Much research on how to support conversations when people are 'at a distance' from each other
- Many applications have been developed
 - e.g., email, videoconferencing, videophones, instant messaging, chatrooms
- Do they mimic or move beyond existing ways of conversing?

Videophone



Hypermirror (Morikawa and Maesako, 1998)

- allows people to feel as if they are in the same virtual place even though in physically different spaces

People in different places are superimposed on the same screen to make them appear as if in same space



(woman in white sweater is in a different room to the other three)

Creating personal space in Hypermirror



2) Two in this room are invading the 'virtual' personal space of the other person by appearing to be physically on top of woman in white sweater

3) Two in the room move apart to allow person in other space more 'virtual' personal space

Everyone happy



Sococo – shows who is where and who is meeting with whom



Figure 4.15 Sococo floor plan of a virtual office, showing who is where and who is meeting with whom <https://www.sococo.com/>

Source: Courtesy of Leeann Brumby.

Summary

- Social mechanisms, like turn-taking, conventions, etc., enable us to collaborate and coordinate our activities
- Keeping aware of what others are doing and letting others know what you are doing are important aspects of collaborative working and socialising
- Many technologies systems have been built to support telepresence and co-presence

Exercise

- Invent a new conference app
 - Of course you can find the right speaker – as all the other conference apps
 - And catalogue as well
 - Use the app as an ID of each person so you always can find out, who is standing in front of you
 - Don't forget to think in conversation, socialization and how to present information
 - Maybe some can participate from a distance....