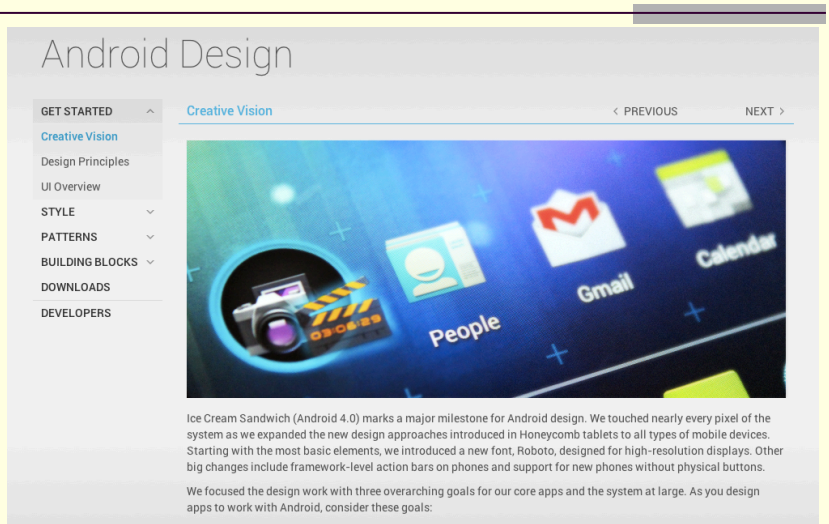
User Interface, User Interaction and Product Design

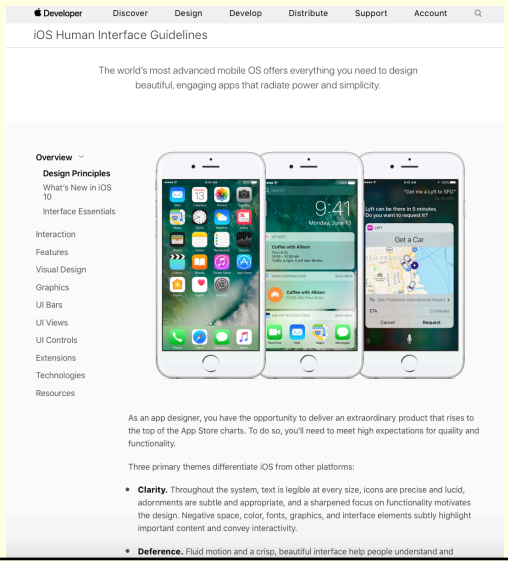
Prof. Giuseppe Riccardi
Dipartimento di Ingegneria e Scienza dell'Informazione
University of Trento
giuseppe.riccardi@unitn.it

UI guidelines in Android



http://developer.android.com/design/

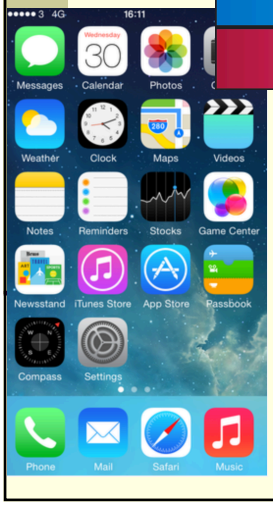
More Resources from iOS world



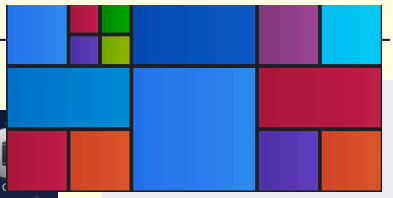
UI Design

Flat Design- Material Design

IOs7



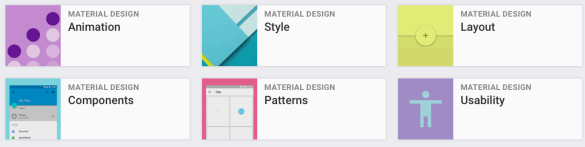
Windows 8



Android

Android uses a new design metaphor inspired by paper and ink that provides a reassuring sense of tactility. Visit the material design site for more resources.

- Introducing material design
- Downloads for designers
- Articles



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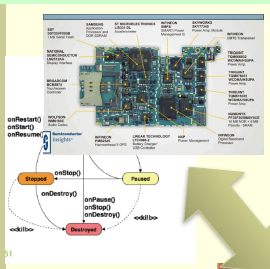
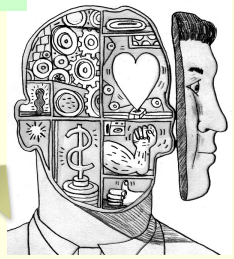
From Sketch to Product to User

Prototype, Design and Development

User





Product

On Terminology

- UI may be implemented via a **Graphical**UI or **Voice**UI or **Multimodal**UI
- That is where it starts!
- That is when the human-machine **interaction** and **experience** can be grounded into actions as simple as:
  - Clicks, Swipes, Gestures, Typing, Spoken Words
  - **In order to accomplish or support a user task ("Compose an email")**
- It applies to designing dyadic interaction as well as more complex n-ary systems.

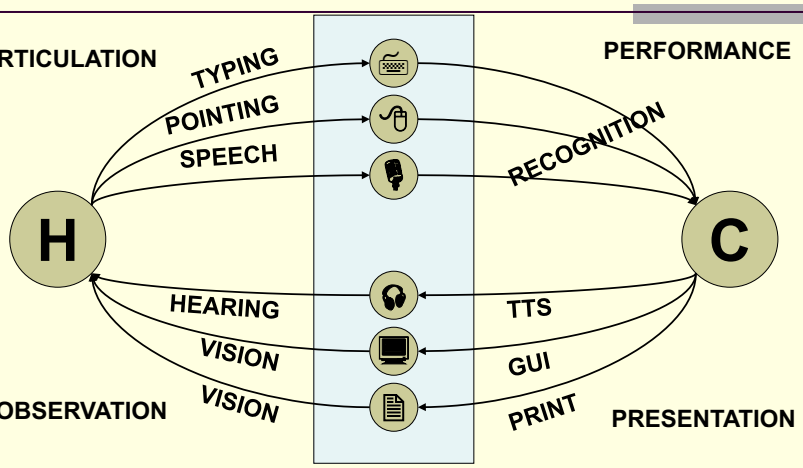
Why User Interface/Interaction Design

- In a typical mid-large SW project the UI designer function should be present
- In small project teams (people < 2-3) might not be available.
- He/She a minority whereas the team is mostly made of programmers/managers
- It is important that programmers know what UI design is about.
  - Better Communicate SW system development team.
- Programmers might turn into UI designers!

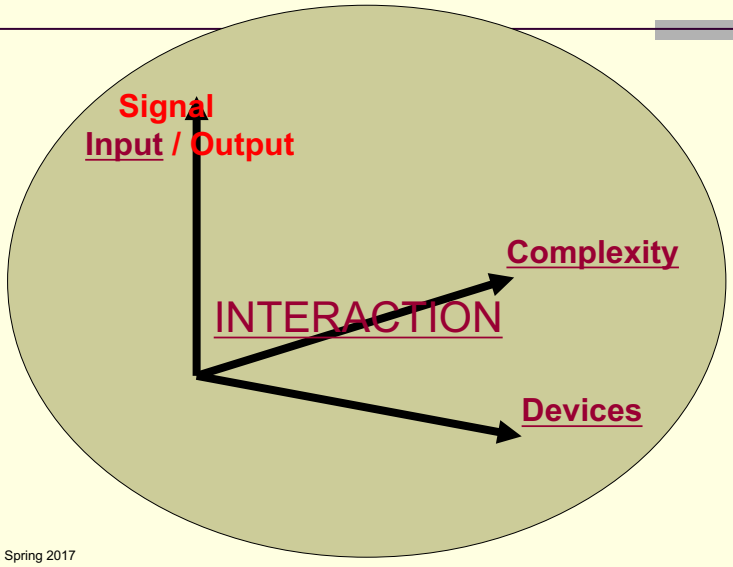
Lecture Plan

- 1st Part
  - User Interface Design
    - Principles (applicable to Human-Machine Interaction Systems)
    - Psychological and Cognitive Motivations
- 2° Part (March 29)
  - User Interaction guidelines
  - App Design Process
  - Examples

Human - Computer Interaction



De-Constructing Communication



Human Computer Interaction

- Device
  - Input Device: Mouse, Keyboard, Joystick, Audio, ..
  - Output: Speakers, Screen (Virtual Reality Goggles)
- Interface
  - WIMP (Windows, Icons, Menus & Pointers) [Xerox '70s]
- Human-Machine Interaction
  - Multimodal (Speech, Text, Gestures, Haptics, Sensors)

HCI Goals

- U^3: Useful & Usable & Used
- Fun
- Esthetics

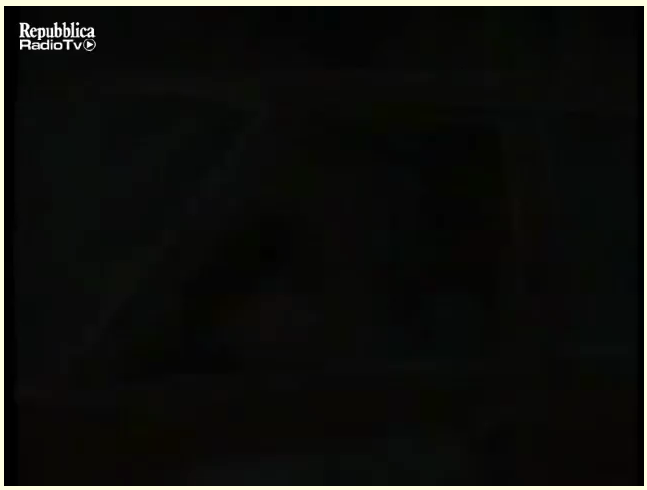
Demo

Mobile Phone 1990

Useful

Usable

Used



User Interface Design

- Educated ART
  - Human Interaction Understanding
  - Creativity and Expression (*Skeumorphims vs Flat design*)
- Based on
  - Science (Cognitive, Psychology)
  - Engineering
- Goal of Designing interactive systems based on requirements
  - SW, HW
  - Interaction System (User, Machine)

Bridge Design and Engineering (0)

- Many solutions to the problem of

" Design and Build a bridge from point A to B, that can carry car/truck traffic, pedestrians, be stable in super-windy conditions, earthquakes etc.."

Bridge Design and Engineering (1)

Bridge Design and Engineering (2)

Artifact may require

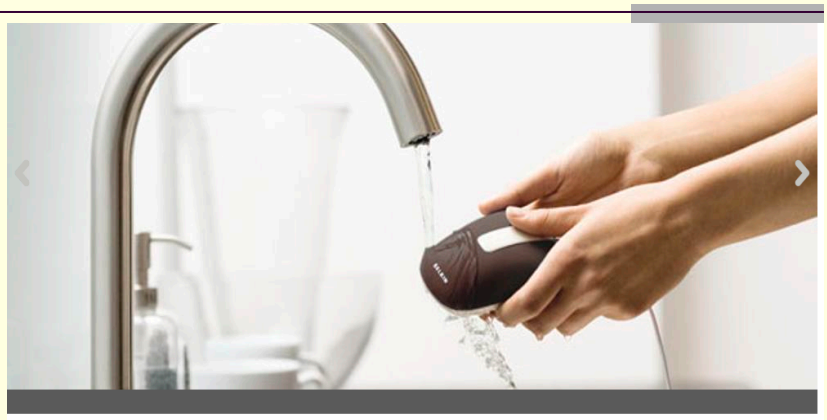
- Engineering (Technology & Systems)
- Science (Cognitive, Psychology..)
- Aesthetics universals
- User/Social acceptance
- The end-product will **be a mix of all** of the above to reach a **point equilibrium == solution**
- **Solution is Not unique!**

Inventing Objects

1963
Hugo Gernsback
Teleyeglasses

The Evolution of the Mouse

1967-2015



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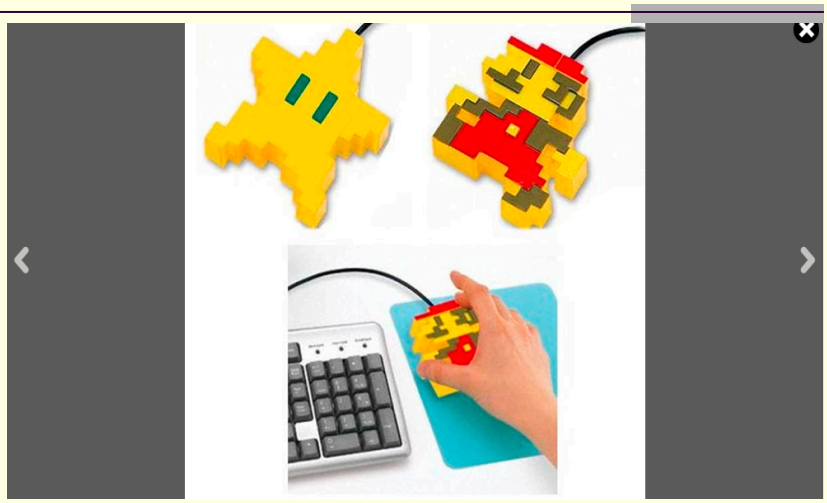
Slide Show

Ormai fuori produzione, il Washable mouse di Belkin poteva essere lavato con acqua senza temere per i circuiti elettronici

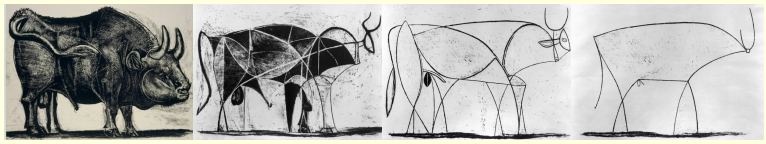
26 / 52

Slide Show



Function ←→Aesthetics

Picasso Bull Images

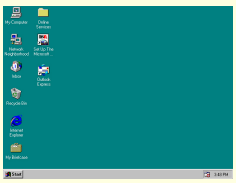


Apple Mouse over time

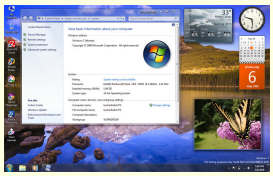
The design of the TV remote

GUI design: Microsoft OS

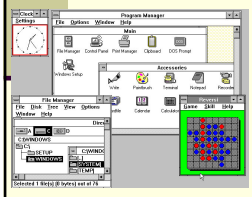
Windows 95



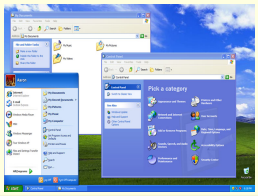
Windows 7



Windows 3.0



Windows XP

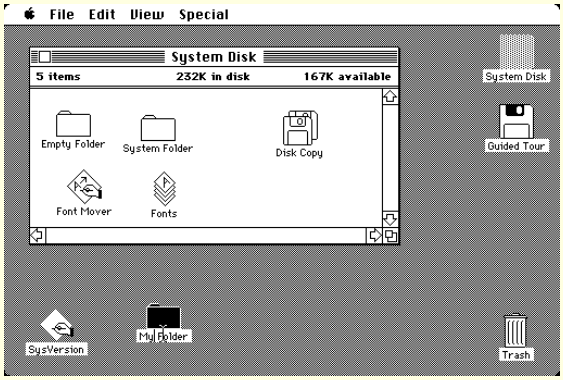


Windows 8

1990 1995 2001 2009 2012

GUI design: Apple OS

1984 - 1.0



1984 1995 2001 2009 2012

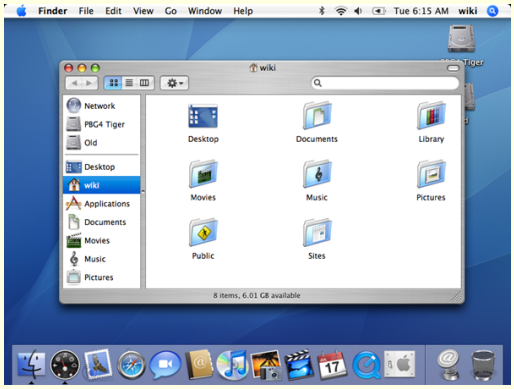
GUI design: Apple OS

1997-8.0

1984 1995 2001 2009 2012

GUI design: Apple OS

2005-10.4



1984 1995 2001 2009 2012

GUI design: Apple OS

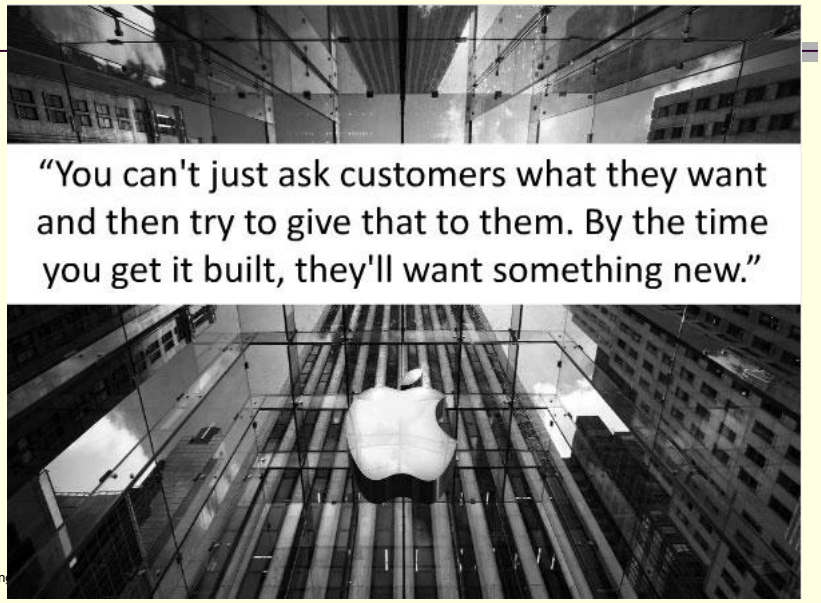
2013 – 10.9

1984 1995 2001 2009 2012

Putting the USERS in the Design of UI

- Engineering of Bridge Building
  - DOES not need people to evaluate the solution!
- In HCI systems, users are part of it.
  - They are needed to study and evaluate
- Usability Testing
  - Limited by the number of users and delay btw prototype and final engineered solution

A word of advice from S. Jobs:



OR Just Ask Your Users/Customers

CNET › Tech Industry › Tell Twitter's CEO what you want from him in 2017

Tell Twitter's CEO what you want from him in 2017

Jack Dorsey puts out an open call for suggestions, using the hashtag #Twitter2017. It seems people are hankering to edit their tweets.

UI Design Principles

- They guide towards optimal equilibrium of requirements
- Do not provide analytical solution
- Should allow to avoid errors in early phases
  - System, User Requirements, Prototyping
- And not to rediscover each time dos and donts
  - "color blindness"
- They may be Ambiguous and Contradictory
- Goal to **UNDERSTAND** the motivations of such principles so to **GUIDED in executive decisions.**

Guidelines – A
(Shneiderman 1987)

- Strive for Consistency
- Cater to Universal Usability
- Offer Informative Feedback
- Design Tasks Flows to yield closure
- Prevent Errors
- Permit Easy Reversal of Actions
- Make Users feel They are in Control
- Minimize Short-Term Memory Load

Guidelines – B
(Nielsen and Molich 1990)

- Consistency and Standards
- Visibility of System Status
- Match between System and Real World
- User Control and Freedom
- Error Prevention
- Flexibility and Efficiency of Use
- Aesthetics and Minimalist Design
- Help Users Recognize, Diagnose and Recover fror Errors
- Provide Online Documentation and Help

Psychological and Cognitive Motivations

- Intro
- Principles (Design Rules)
- Foundations
  - Perception
  - Vision
  - Attention
  - Memory
  - Task Execution

Reference for the lectures : "**Designing with the mind in mind**", Jeff Johnson

What they do come from?

- They are motivated by human cognitive and perception processes
- Science on how people
  - Perceive
  - Learn
  - Remember
  - Reason
  - Ground Intentions into Actions

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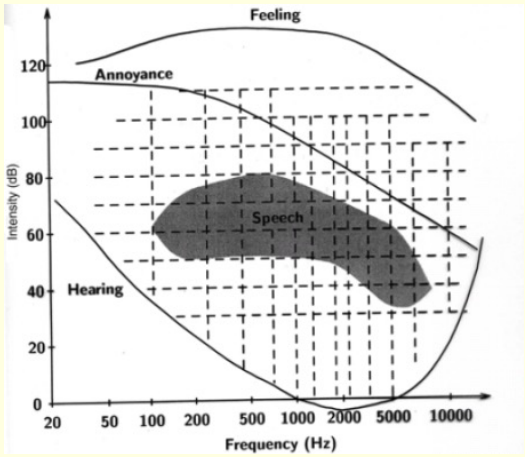
Perception

- Perception is the process of **interpreting** signals being collected by our sense organs into our nervous system.
  - Hearing (Hair Cells),
  - Sight (Retina)
  - Smell (Olfactory Receptors)
  - Taste (Taste buds)
  - Touch (Neural Receptors)

Speech Perception Limits



Perception is biased by

- **Past** : Experience or prior information

"Vision", W. H. Freeman, New York, NY

ATM Transaction

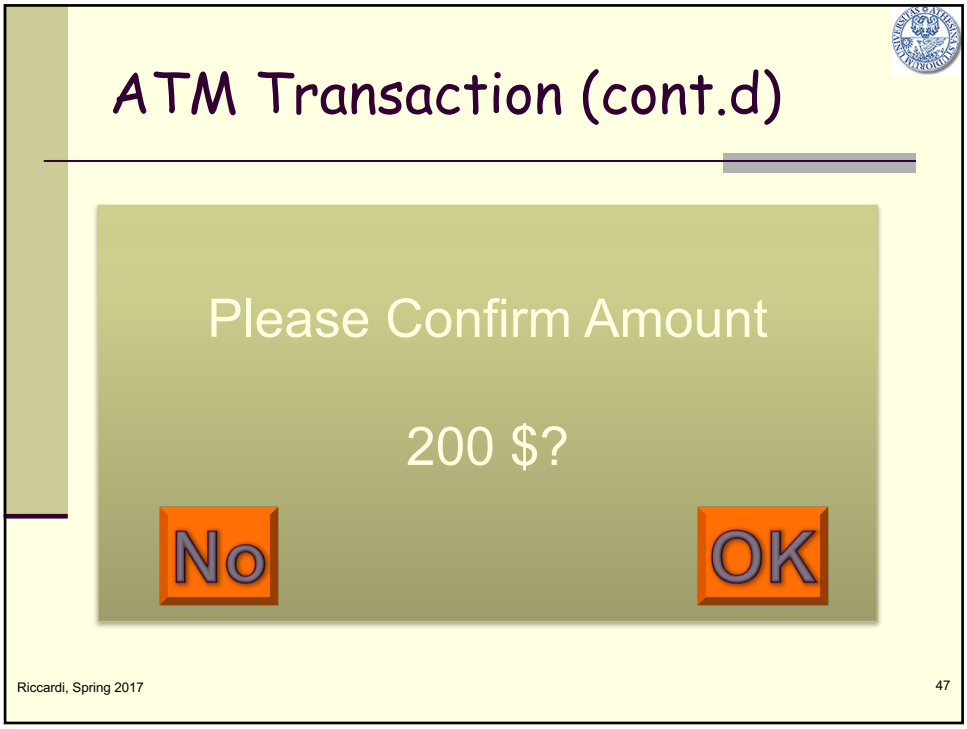
Select Account
Checking 1
Checking 2
…

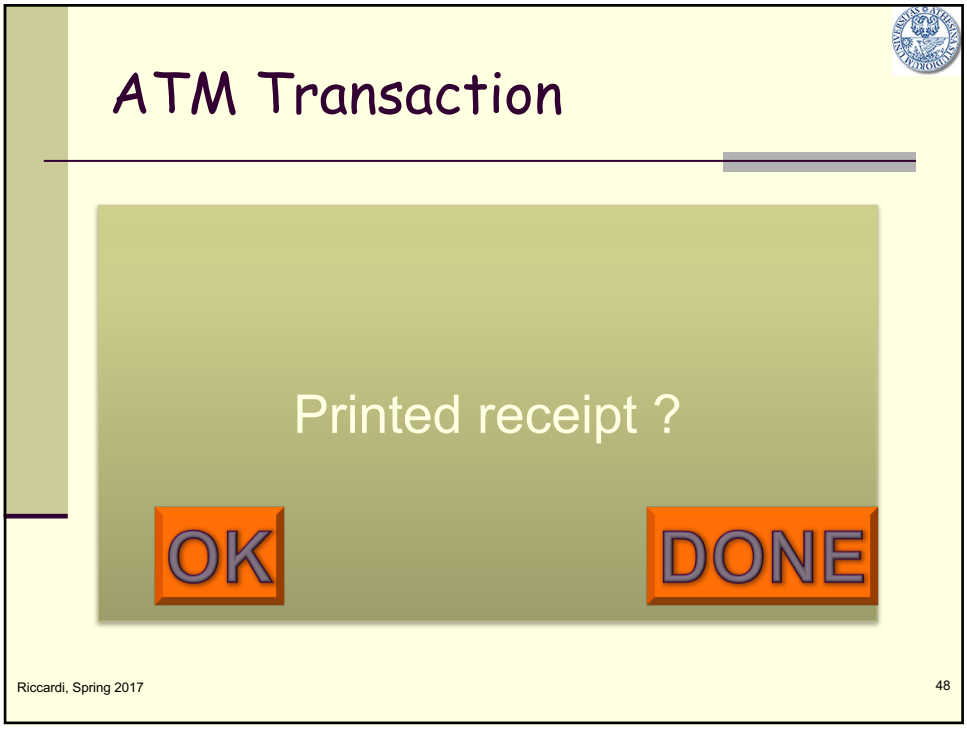
BACK NEXT

ATM Transaction (cont.d)

What would you like to do?
Withdrawal
Transfer
…

BACK NEXT


ATM Transaction (cont.d)
Please Confirm Amount
200 $?
No
OK
Riccardi, Spring 2017
47


ATM Transaction
Printed receipt ?
OK
DONE
Riccardi, Spring 2017
48

Perception is biased by

- **Past** : Experience or prior information
- **Present** : Current Context
  - Also from concurrent signals from different sensorial information (sight & hearing)
  - Influence/Reinforce each other (e.g. lip reading)

Language is Ambiguous

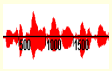
Quanti significati ha la parola banco ?:

- Giorgio e Luca erano compagni di **banco**
  - Senso ➔**Mobile**
- Il direttore del **banco** di Napoli
  - Senso ➔**Istituzione di credito**
- Il nuovo test sara' il **banco** di prova
  - Senso ➔**Test**
- .....**Banco** ottico
- .....

Perception is biased by

- **Past** : Experience or prior information
- **Present** : Current Context
- **Future** : Our Goals
  - Our goals may filter our perception
    - "Look for your red car in the stadium parking lot" → all red cars will pop up!
  - Example of goal oriented information over web
  - Ignoring information ≠ Do not notice information

"Cocktail Party Problem"



Human Speech Recognition → **"yes I would like to make a reservation.. "**

- Human Perception Experiment
- Multiple audio sources
- Humans can "adaptively" **separate** a specific sound source
- Cocktail Party Problem
  - Audio sample 1 source
  - Audio sample 2 source
  - Audio sample 3 source

Influencing where we look

Observing, Measuring and Evaluating

EyeTracker

Influencing where we look

Observing, Measuring and Evaluating

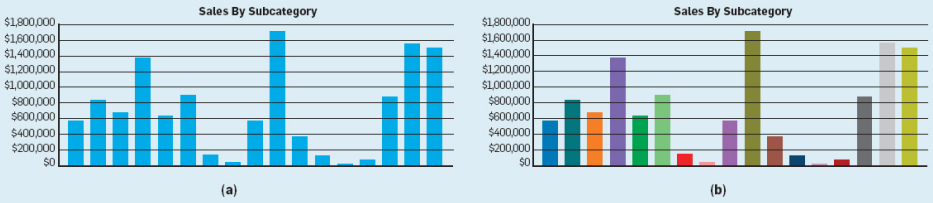
EyeTracker

Influencing where we look

Overuse of Colors

EyeTracker

Observing, Measuring and Evaluating



P. Bera, "How Colors in Business Dashboards Affect Users' Decision Making", Proc. Communications of ACM, **Vol. 59 No. 4, Pages 50-57 ,** April 2016.

Influencing where we look

Overuse of Colors

EyeTracker

Observing, Measuring and Evaluating

Perception

- Perception is biased by prior conditions, experience, expectations.
  - The bias maybe random (not controlled) or managed.
- Not only Bottom-up Processing!
  - Selective Attention Test

Take Away Guidelines

Perception

- **Avoid Ambiguity**
  - Requires effort
- **Be Consistent**
  - Exploit or Take into account users' past experience (e.g. Apple watch) and expectations
- **Understand users' goals**
  - Either be explicit
  - Or Implicitly track them

The Gestalt Theory

Visual Perception

- *Gestalt* = Shape or Figure
- Psychologists proposed in 20th century to explain how visual perception works
- Supported now by neurophysiological experiments
- Descriptive framework
- Support for graphic and user interface design

The Gestalt Theory

Visual Perception

It identifies rules/principles

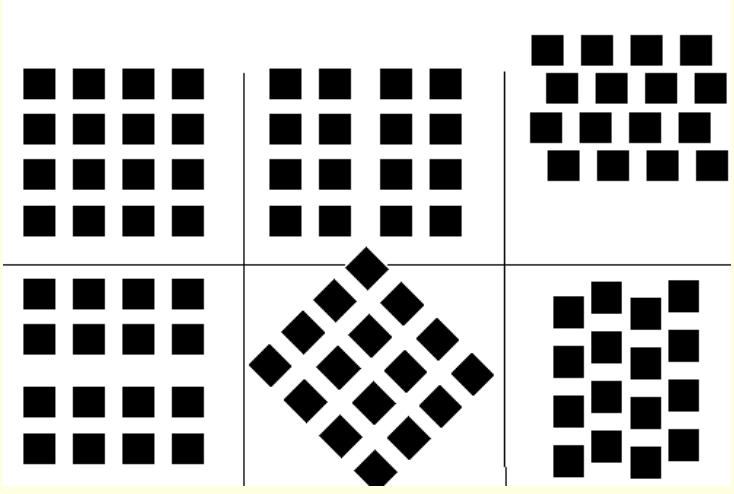
human visual perception

groups tokens together

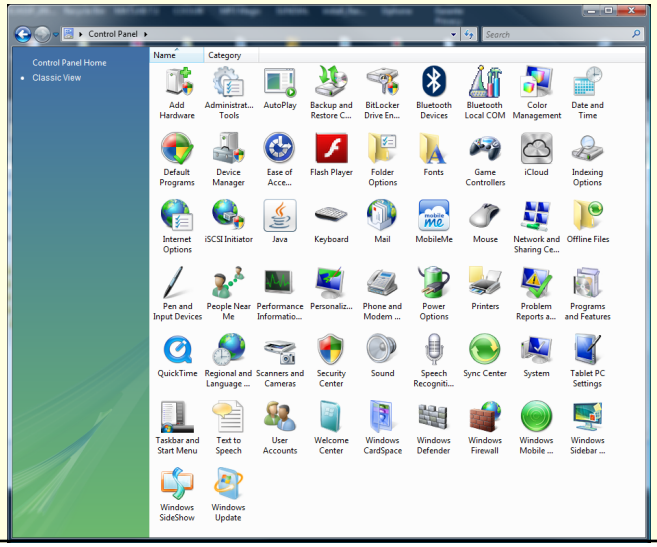
Rules

- Proximity
- Similarity
- Continuity
- Closure
- Symmetry
- Figure/Ground

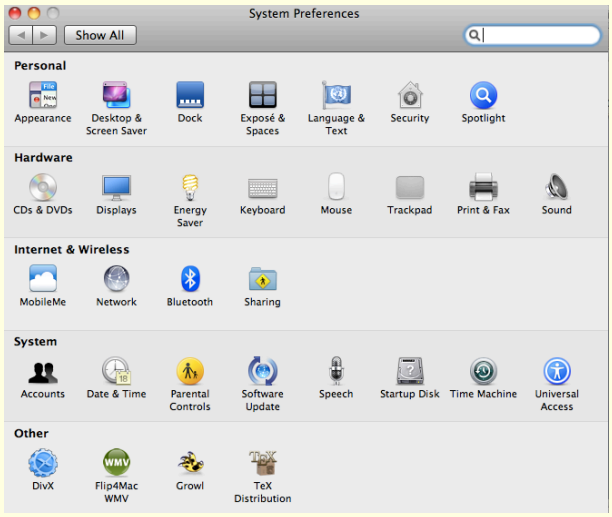
Proximity (1)



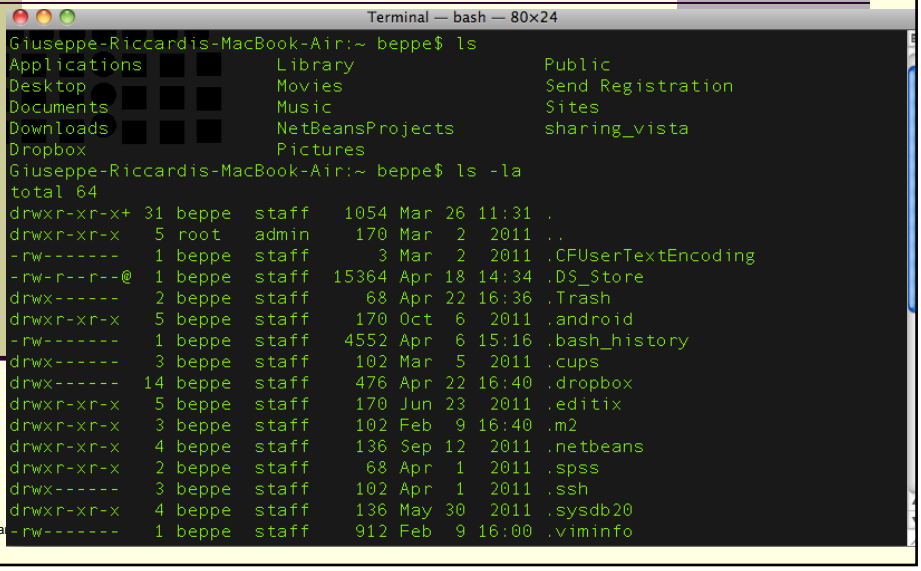
Proximity (2)



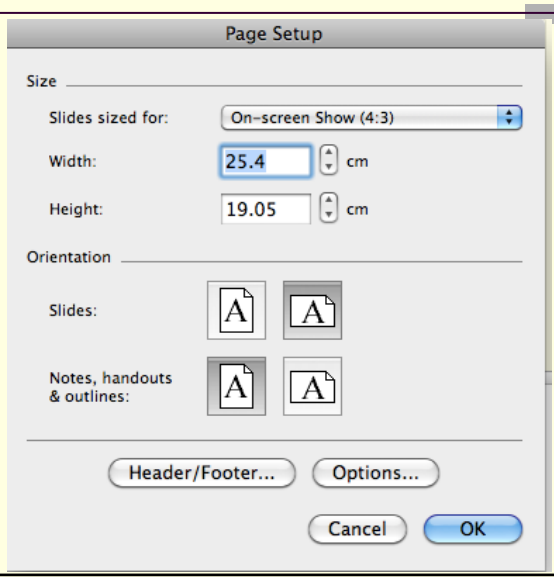
Proximity (3)



Proximity (4)

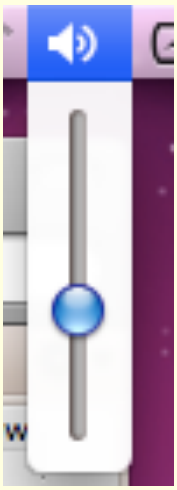


Similarity

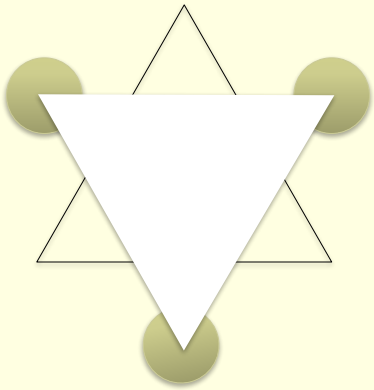


Continuity (1)

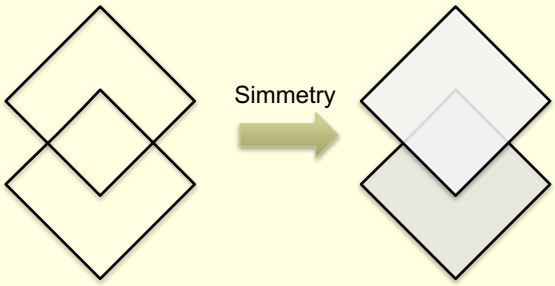
Continuity (2)



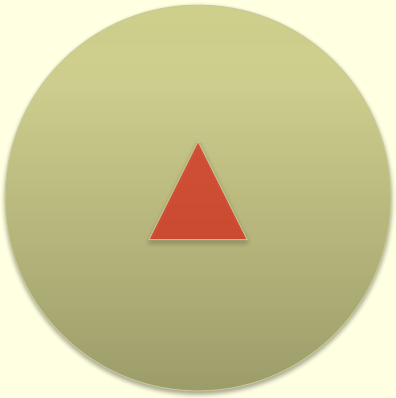
Closure (1)



Simmetry



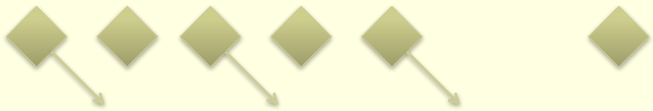
Figure/Ground (1)



Figure/Ground (2)

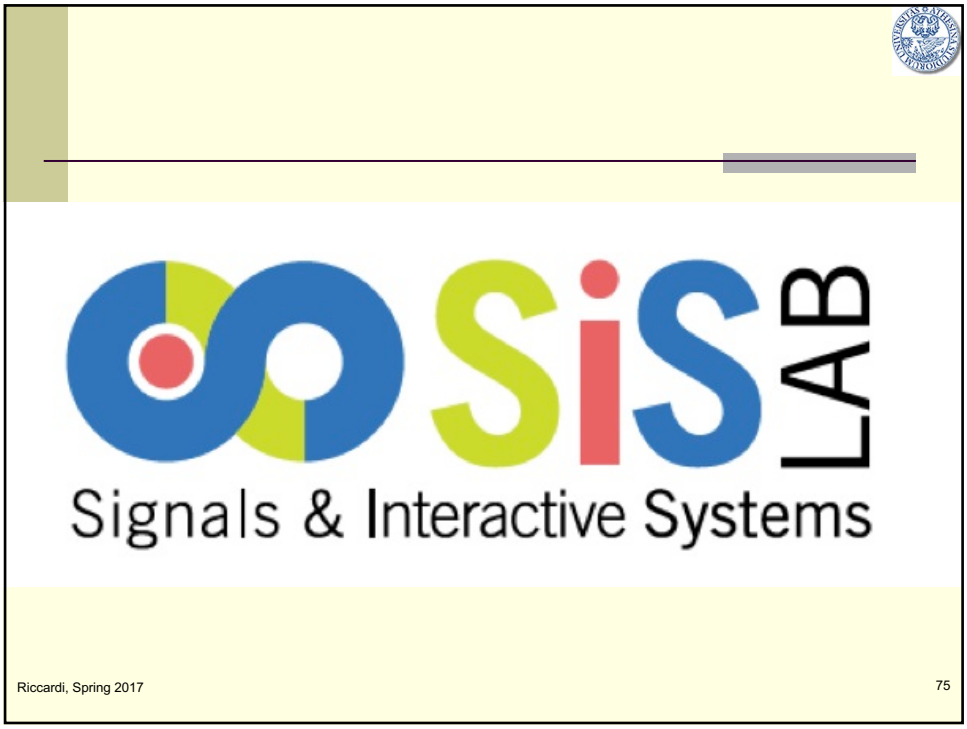
Common Fate

Moving Objects



Closure-Symmetry-Continuity

Cover of “Coherence in Thought and Action” book by Paul Thagard



Guidelines – B

(Nielsen and Molich 1990)

- Consistency and Standards
- Visibility of System Status
- Match between System and Real World
- User Control and Freedom
- Error Prevention
- Flexibility and Efficiency of Use
- Aesthetics and Minimalist Design
- Help Users Recognize, Diagnose and Recover from Errors
- Provide Online Documentation and Help

Products, Services, Systems

- They serve a purpose, a task SOMEBODY may be interested!

What they do come from?

- They are motivated by human cognitive and perception processes
- Science on how people
  - Perceive
  - Learn
  - Remember
  - Reason
  - Ground Intentions into Actions

User Tasks

- A **task** is what a user
  - Does regularly during the day
    - "Drives to work", "Use cash for payments"
  - Does sometimes
    - "Go out for dinner"
  - Does rarely
    - "Buy a gift for his in-laws"
  - May be doing in the future
    - "Gone fishing"
  - **Never thought of doing it**
    - "Optimizing his gas/electric bill with AI"

Learning a Task

- Learning from scratch
- Learning and recalling from experience
  - **Personal** Past experience → Learned Actions are easy to perform

"Stay away from walking over the edge of a cliff"

"Do not execute .exe files received from unknown recipients"

"Facebook is good for making friends" (User 1)

"Facebook is a waste of time" (User 2)

Learning from Experience

Issues

- Learning from experience is in general difficult and requires resources (attention, skills, background)!
- Too much or too little data to learn from or too many conclusions to draw
- Learning from errors may be painful but effective
- Credibility of the experience to learn from
  - Whose experience was that (brother vs friend..)
- (Over) Generalization is used both by humans and machines and can undeniably lead to errors.

Learned actions easy to perform

- Many tasks may be performed routinely
  - "Riding a bike", "Driving a car", "Walking on the sidewalk", "Reading a Newspaper"…
  - For most part of the experience we do not consume any conscious resources (attention or memory) (Schneider & Shiffrin 1977)
    - →We automate how and when to change gears
    - → We have learned from past experience
    - → We pay attention to obstacle avoidance

Examples of Learned vs New Tasks

- "Recite letters of the alphabet A through P"
- "Recite letters of the alphabet from P to A"
- "Drive to work using your normal route"
- "Drive to work an unfamiliar one"
- "Spell out your telephone number"
- "Spell out your telephone number by grouping numbers by four"
- Write and post a letter at the post office
- Write and send an email (users age >50)

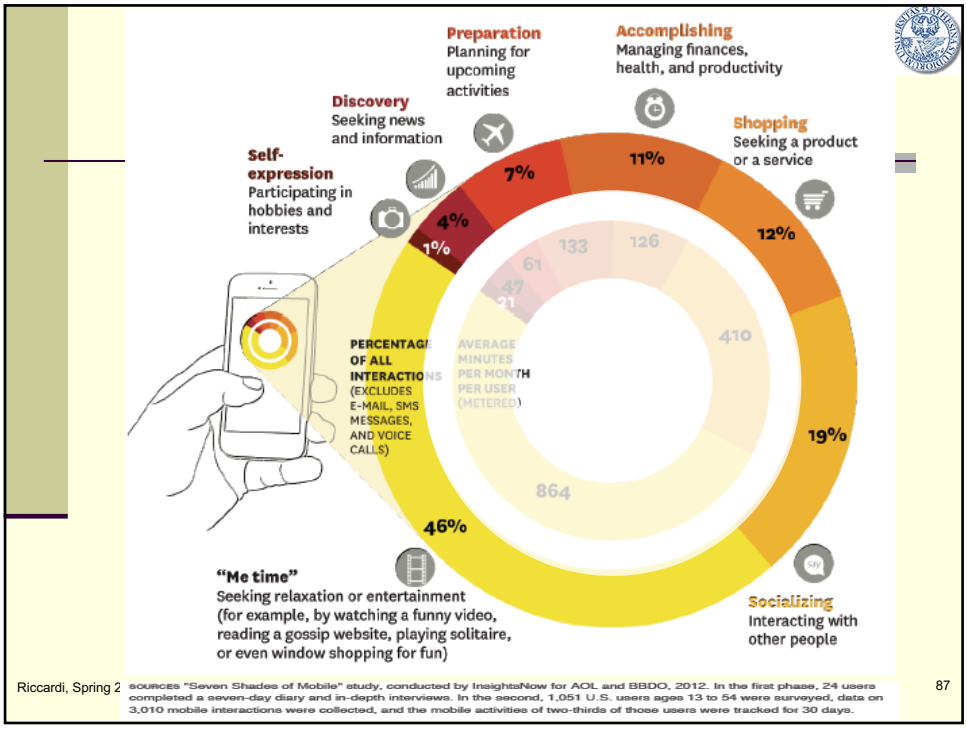
Take Away Guidelines

- Provide System status and Users' progress toward their goal
  - → Relieve attention strain and minimize short-memory
- Guide users to goal
  - →Consider one-time user or repeat-user experience
  - →Expliciting needed information (do not overload either)
- Let Computer do the "math"/"algorithm"
  - "Go the middle of the document"→ Solve it graphically

Putting Together User Interface, User Interaction/Experience

- The production process of an App.
- Conceptualizing
- Designing
- Prototyping
- Refining
- Evaluating
- Your App.

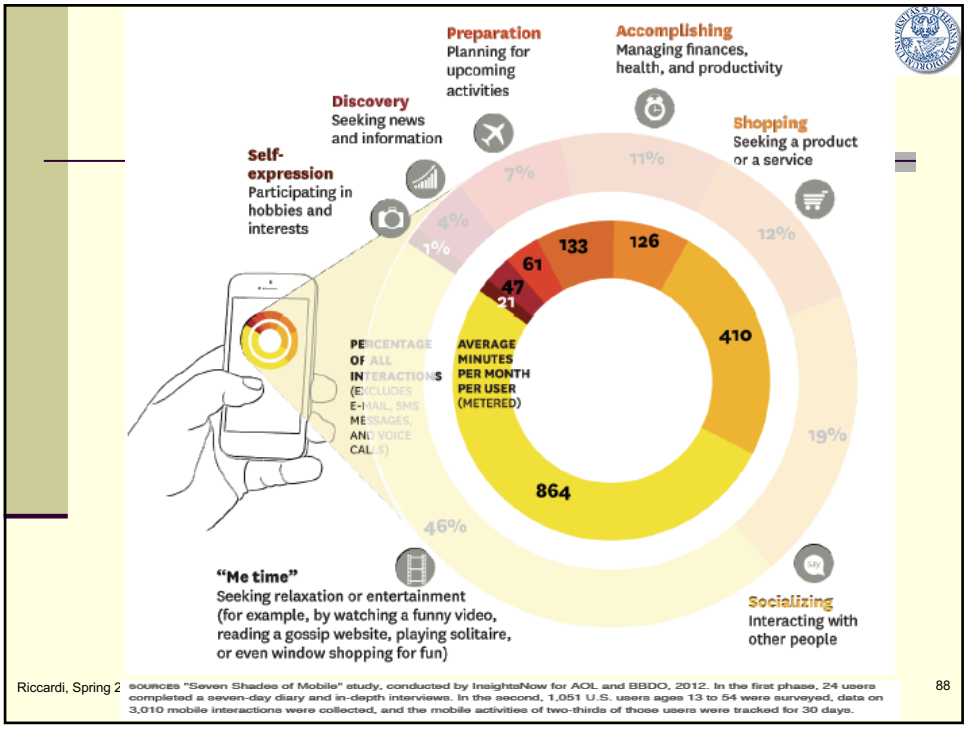
Why People Really use Mobile Phones ?



Riccardi, Spring 2

SOURCES "Seven Shades of Mobile" study, conducted by InsightsNow for AOL and BBDO, 2012. In the first phase, 24 users completed a seven-day diary and in-depth interviews. In the second, 1,051 U.S. users ages 13 to 54 were surveyed, data on 3,010 mobile interactions were collected, and the mobile activities of two-thirds of those users were tracked for 30 days.

87



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12 Myths of Mobile App Design

Over the years (2005 A. Marcus and adapted)

- Users want power and aesthetics. Features are everything
- What we really need is a Swiss army knife
- 3G e!
- Focus grou and ther traditional market analy ls are the best way to dete ine er needs
- If it works in New York, it will work anywhere
- The killer app will be games, --er, no, I mean, nightlife, or gps.... uh...
- Mobile devices will essentially be phones, organizers, or combinations with maybe music/video added on
- The industry is converging on a UI standard
- Highly usable systems are just around the corner
- One g operating system wil domi
- Mobile devices will be free-or nearly free
- Advanced data-oriented services are just around the corner

The App Concept

The story begins

- At the office during a meeting
- At home, with my kids
- On Vacation with my friends
- 24/7
- A teacher with 1-10 grades students in class
- Recruiter on face-to-face interviews

APP concept: Create a Story

I want to easily create a shopping list easily, quickly and share it with my family.

I want my camera to tell me when is the best timing/lighting for me to shoot a picture

I want to check how much exercise while I go to work, do sports and share it with my doctor

I want to plan my next summer vacation in the countryside and select from friends' advices and social websites

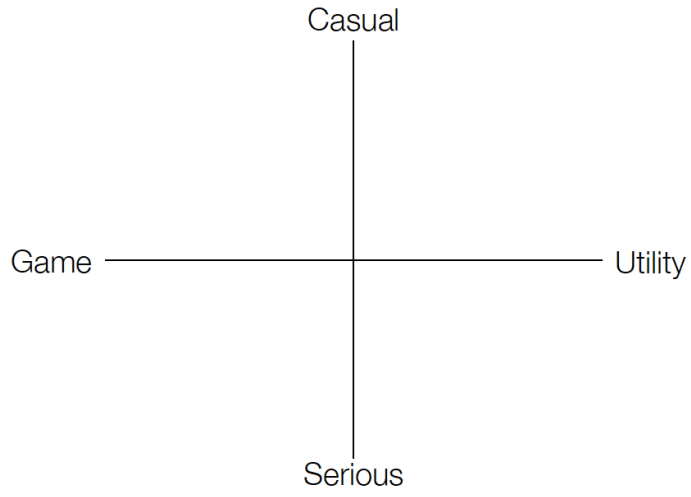
I want to know where is the cheapest gas station wherever I am considering the mileage to reach it.

I want to monitor and improve my mnemonic skills

Extreme Use Cases

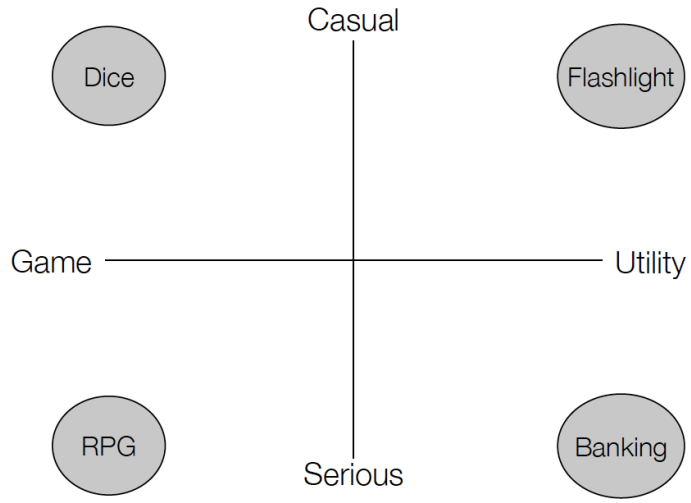
- 60 SECONDS use case
  - Soccer match scores, weather, stock quotes..
- 60 MINUTES use case
  - Video watching, Reading (emails) , Writing (blogs) , making dinner plans..

Extreme Use Cases



From Nathan . Freitas

Extreme Use Cases



From Nathan . Freitas

App Design Process

1. Create an Application Concept-Story
2. Identify Your User-Group
3. List All the Features App may support
4. Filter the Feature List Through the User-Group Definition
5. Review
6. Prototype
7. Iterate
8. EVALUATE (may happen at the end of step 6)

Example

- "Help People Shop for Groceries"
- Features: *CreatingList, GettingRelatedRecipes, GettingCoupons,…*
- Who needs it?: *PennyPinching, Gourmet, BusyMom, Single people*
- Filter the Feature List by choosing target audience: Thrifty People
- Prototype, Iterate
- EVALUATE! : Yourself, Friends, Group of Potential Users

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