IDI – Design Principles

Professors IDI – Dept. Computer Science – UPC

Usability

- Usability: Defined in ISO 9241 standard as
  - The ability in which a product may be used by **specific** users in order to carry out **specific** tasks *effectively, efficiently, and with satisfaction* in a **specific** use environment.
  - **Usability is always referred to a concrete user group and a concrete user application**

Design Principles

Based on the **Bruce Tognazzini** document:

http://asktog.com/atc/principles-of-interaction-design/

- Effective interfaces:
  - Instilling in their users a sense of control
  - Do not concern the user with the inner working of the system,
- Effective applications:
  - Perform a maximum of work while requiring a minimum of information from users.

1. Aesthetics

Fashion should never trump usability

- Aesthetical appearance is appealing
- But design based on fashion will artificially generate obsolescence
- A new fashion should not detract from user-performance

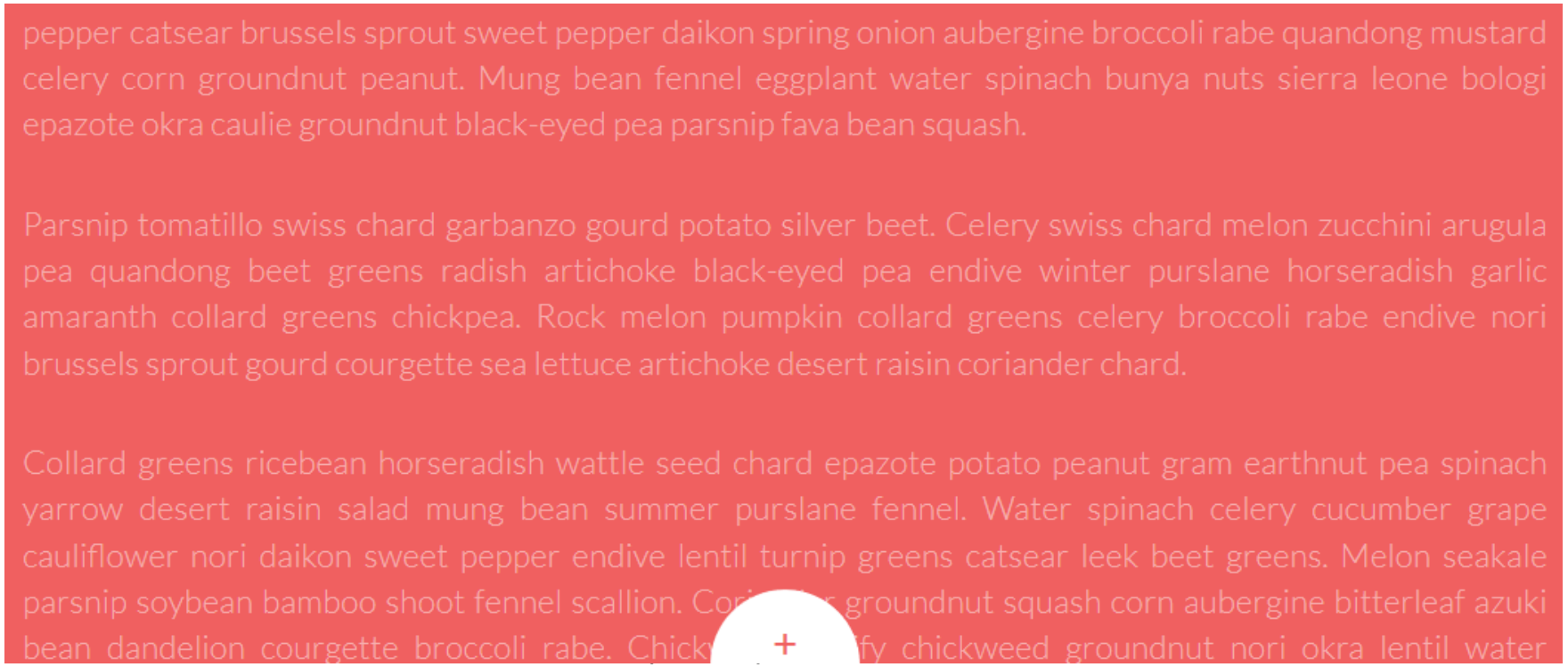
- The current trend of contrast reduction is really painful (see examples)

In any case, user test

1. Aesthetics

Fashion should never trump usability

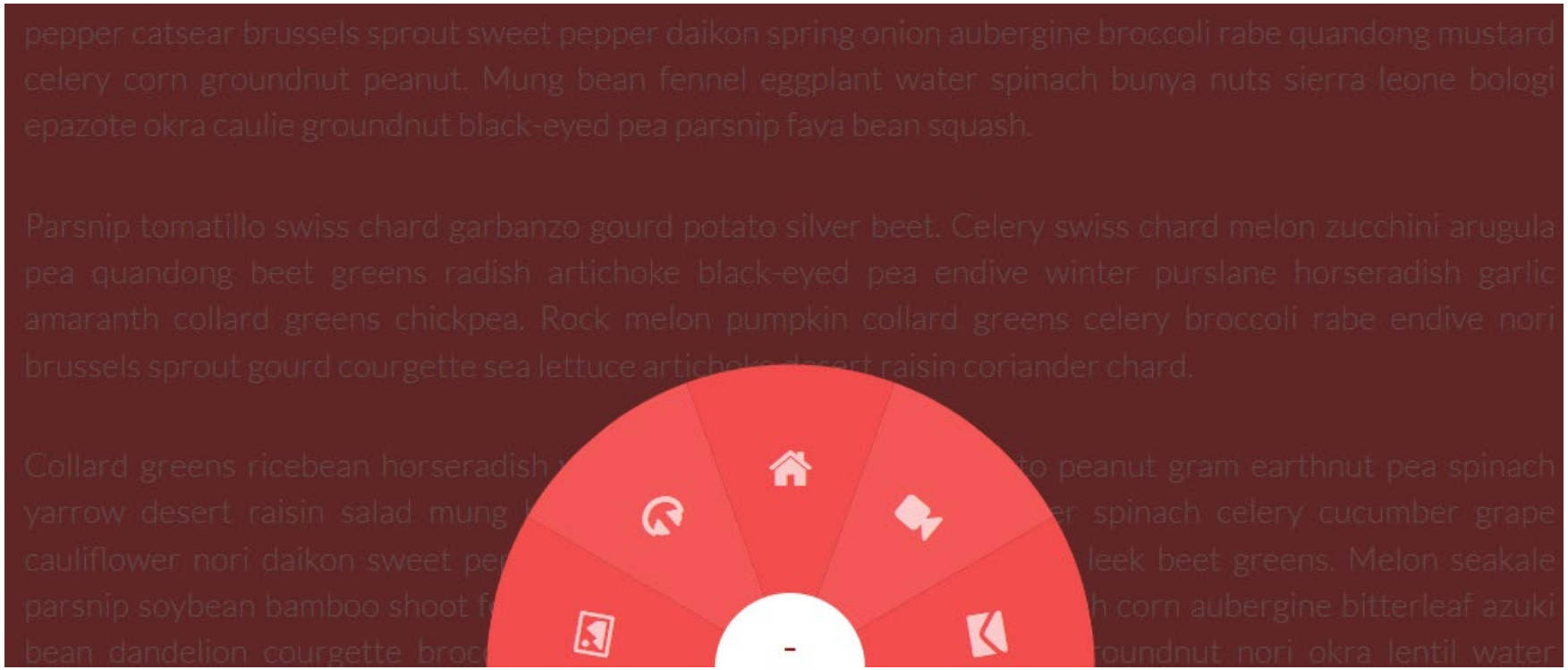
- User knows standard controls. Non-standard controls require cognitive effort and produce errors



1. Aesthetics

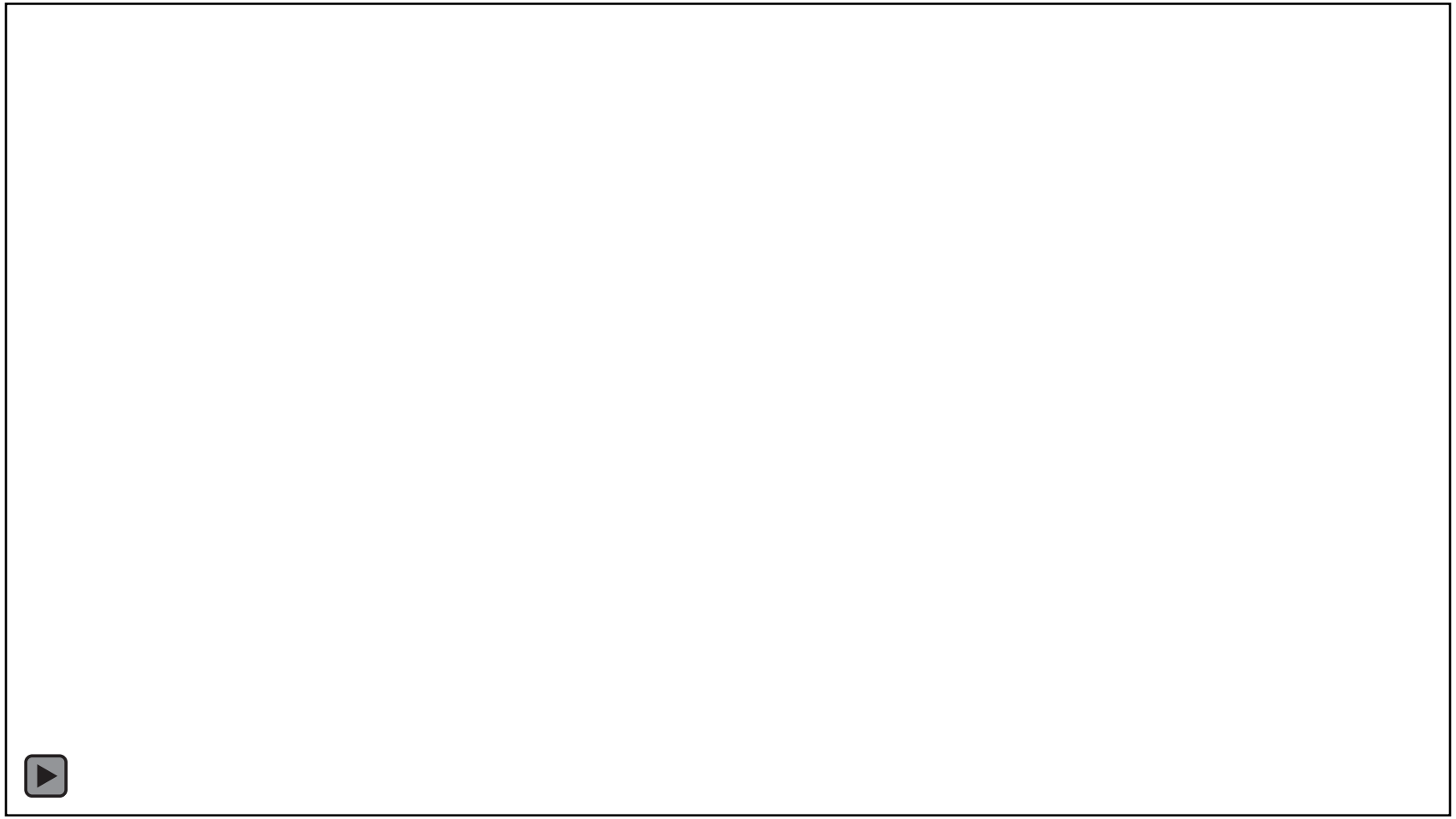
Fashion should never trump usability

- User knows standard controls. Non-standard controls require cognitive effort and produce errors. Who could imagine this?



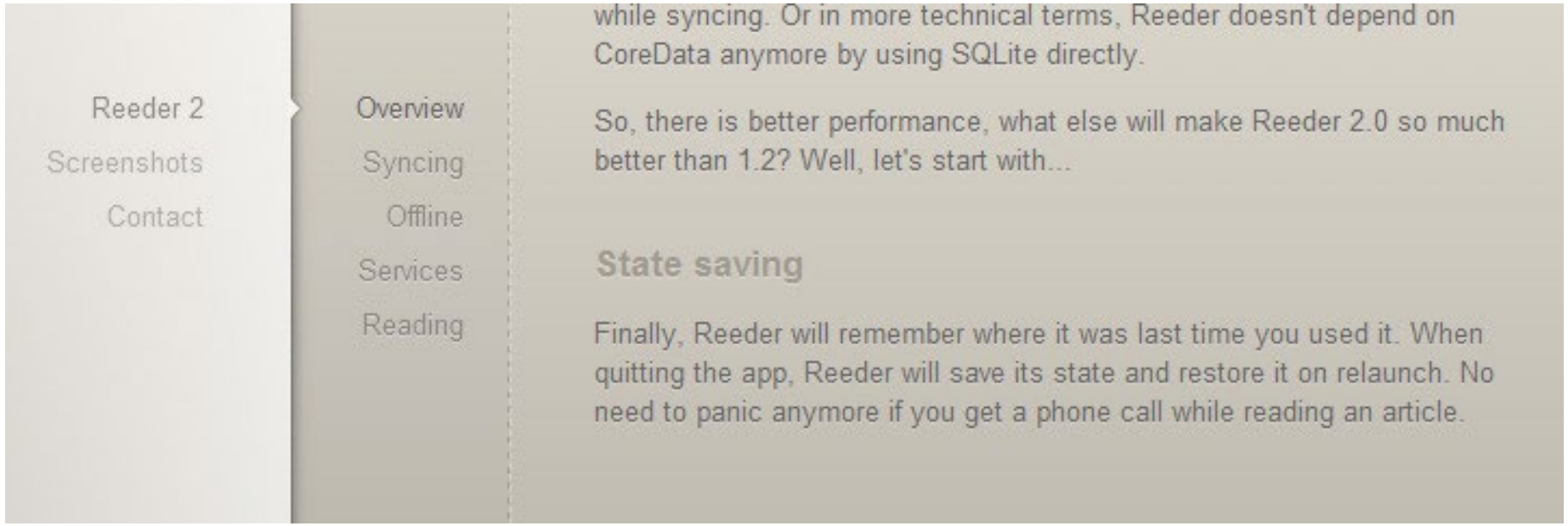
1. Aesthetics

- Fashion (gestures) trumping usability (lack of affordances):



1. Aesthetics. *Contrast*

- Text that must be read should have high contrast:
  - Check contrastrebellion.com/
  - This is unacceptable:



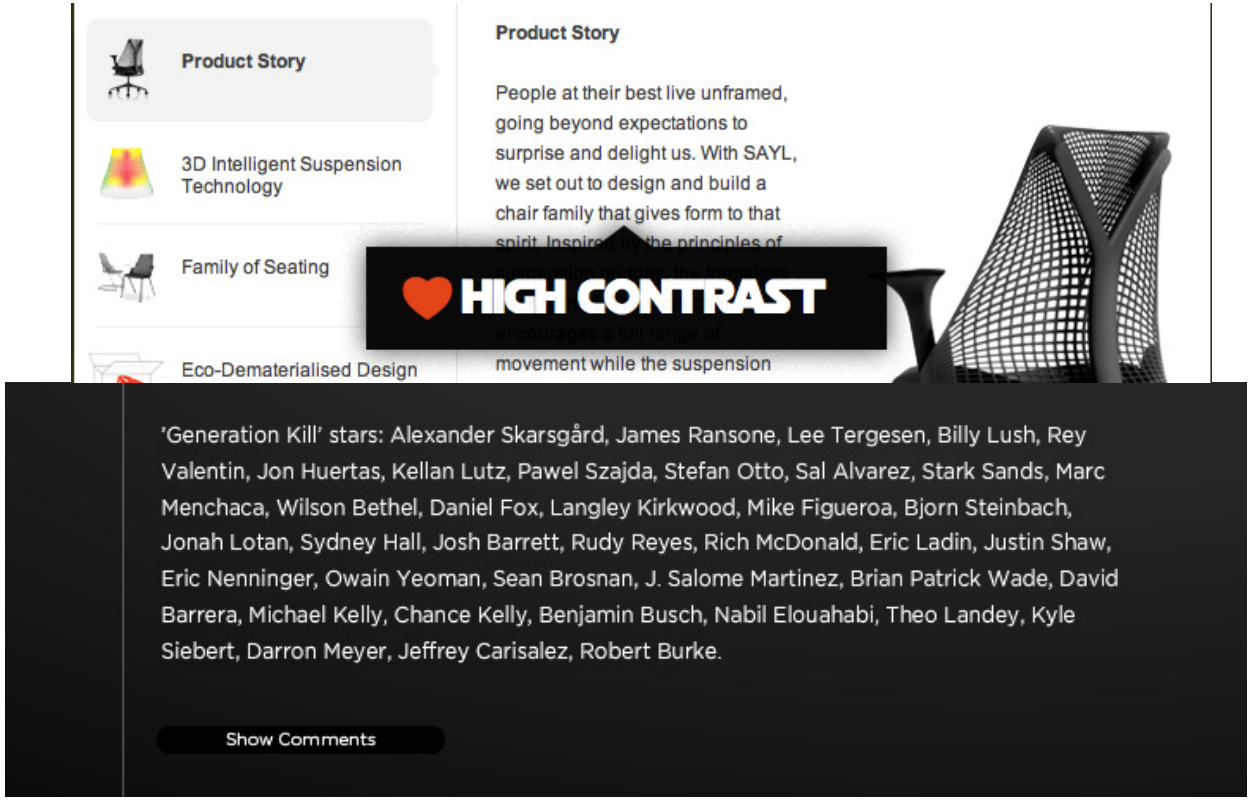
1. Aesthetics. *Contrast*

Text that must be read should have high contrast:

- Favor black text on white or pale yellow backgrounds. Avoid gray backgrounds.
- Use font sizes that are large enough to be readable on standard displays
- Favor particularly large characters for the actual data you intend to display
  - As opposed to labels and instructions.

1. Aesthetics. *Contrast*

- High contrast can be aesthetically pleasant



2. Anticipation

Bring to the user all the information and tools needed for each step of the process

- Should anticipate the user's needs
- Information in place & visible

  (if the user cannot fid it, it will never be used)
- Requires deep understanding of both the task domain and the users
- The penalty may be the complete lost of the user or client

- In any case, user test

2. Anticipation

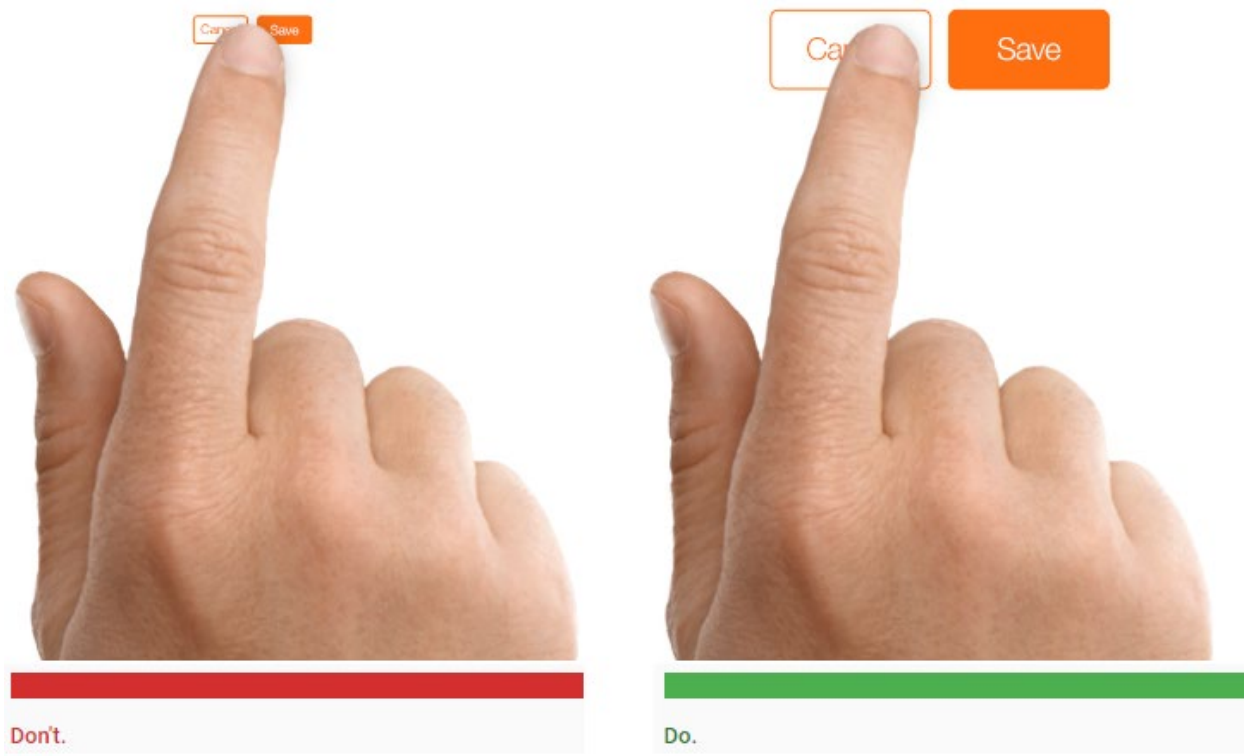
Bring to the user all the information and tools needed for each step of the process

- Anticipate user's needs
  - Put the weather first…

2. Anticipation

Bring to the user all the information and tools needed for each step of the process

- Information visible



2. Anticipation

Bring to the user all the information and tools needed for each step of the process

- Information visible: Pinterest makes Pinit, Send & Love buttons visible **only on hover**

3. Autonomy$_1$

Computer interface, and task environment all "belong" to the user but user-autonomy doesn't mean we abandon rules

- Give users some breathing room
  - e.g. provide a certain degree of customization –desktop-
- Enable the users make their own decisions
  - Otherwise they may feel constrained and frustrated

3. Autonomy$_2$

Keep the user informed

– Autonomy/Control cannot be exerted in the absence of sufficient information

- Provide information on current state, tasks

– Keep the information timely, and accurate

- Progress indicators that are inaccurate are annoying

  E.g. Updated indicator showing a 5' task that turns and hour!!!!
- Lying the user is never a good practice

3. Autonomy$_2$

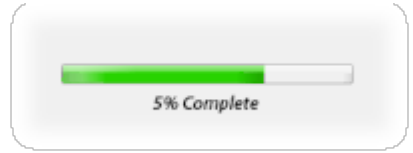
Keep the user informed. Current state

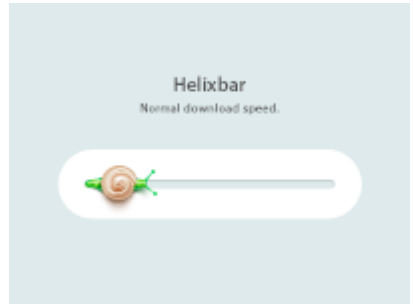
- E.g.: button clicked
  - No feedback means the user will guess
    - Maybe wrong

3. Autonomy$_2$

Keep the user informed. Progress indicators

- Should appear timely and be informative
  - Tasks that require >1seg => cursor busy
  - Tasks that require enough time (>10seg) should show progress indicator
    - Indicate the computer is busy
    - Should estimate time or % of task
    - Tell users what's happening
    - Let the user do another thing





3. Autonomy$_2$

Keep the user informed. Error messages

- Should provide information on the reason for the error
- Should provide a clue on how to act
- Should not be fast enough so that the user cannot read them

4. Color

When using color to convey information in the interface, also use clear, secondary cues

- Approximately 10% males and up to 1% females have some form of color blindness
- With age, people start having vision problems
- Use websites such as http://enably.com/chrometric/ to test
- Use color, but use it wisely

- In any case, use test after aesthetic color changes

5_1. Consistency. *Levels of Consistency*

Must be analyzed in different dimensions

- Levels of consistency
- Induced inconsistency
- Induced continuity
- Consistency with user expectations

5. Consistency

Must be analyzed in different dimensions

- Levels of consistency: Platform consistency, Across suite of products, In-app: in a single app/web, Visible structures, Invisible structures, User behavior
- Induced inconsistency
- Induced continuity
- Consistency with user expectations

5_1. Consistency. *Levels of Consistency*

- Platform consistency
- Across suite of products
- In-app: in a single app/web
- Visible structures
- Invisible structures
- User behavior

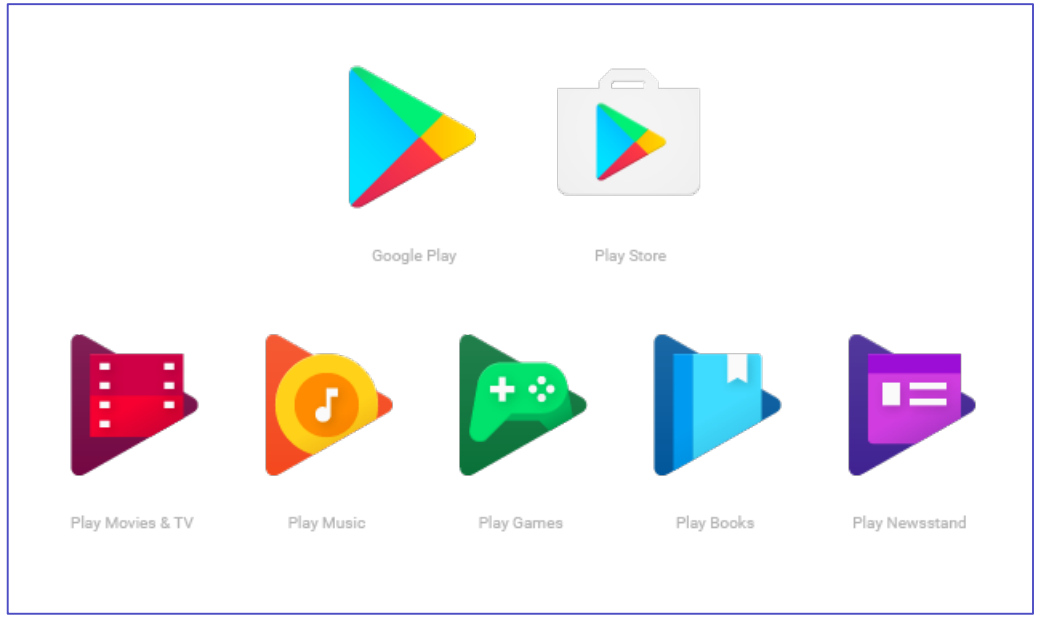
5_1. Consistency. *Levels of Consistency*

- **Platform consistency**
  - Guidelines (e.g. UX Android, iOS…) and *in-house* (same company…)
  - Unwritten rules (assumed by the community)

  - Keep a general *look & feel* across products/services
    - Communicates brand
    - Makes adoption easier

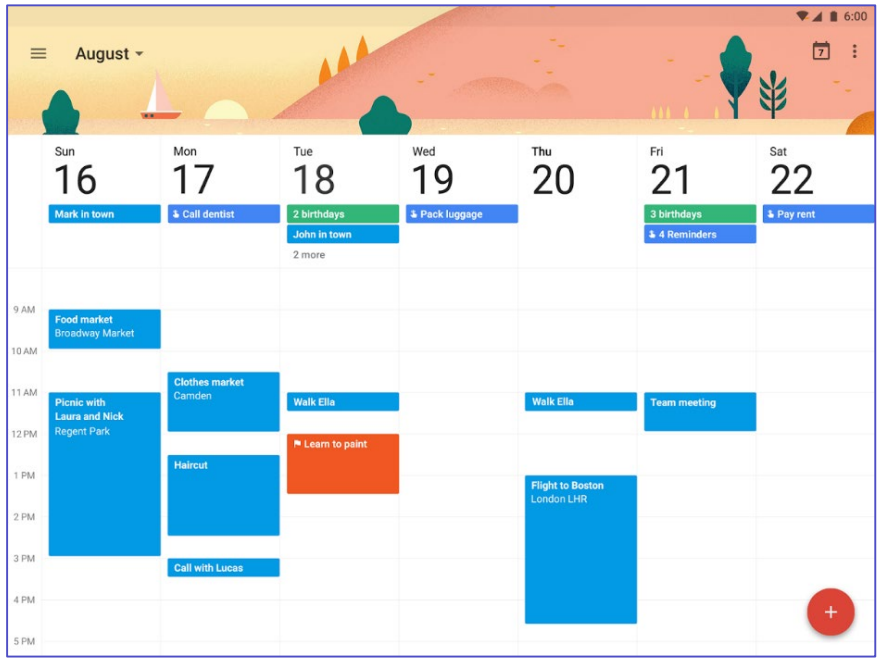
5_1. Consistency. *Levels of Consistency*

- Platform consistency
- **Across suite of products:**
  - Communicates family (e.g. Microsoft Office, Google apps)



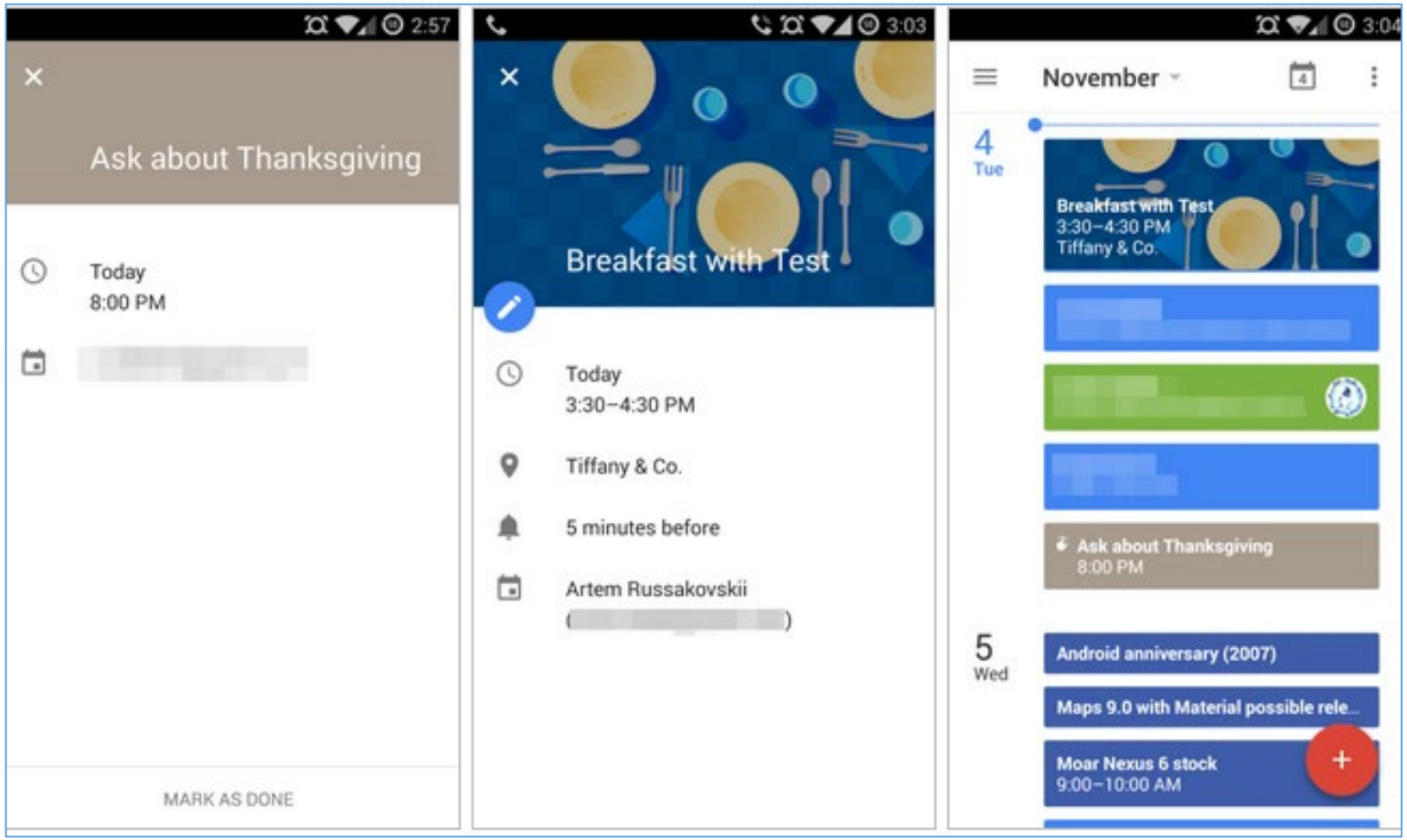
5_1. Consistency. *Levels of Consistency*

- Platform consistence, Across suite of products
- **In-app: in a single app/web**
  - specific look & feel



5_1. Consistency. *Levels of Consistency*

In-app



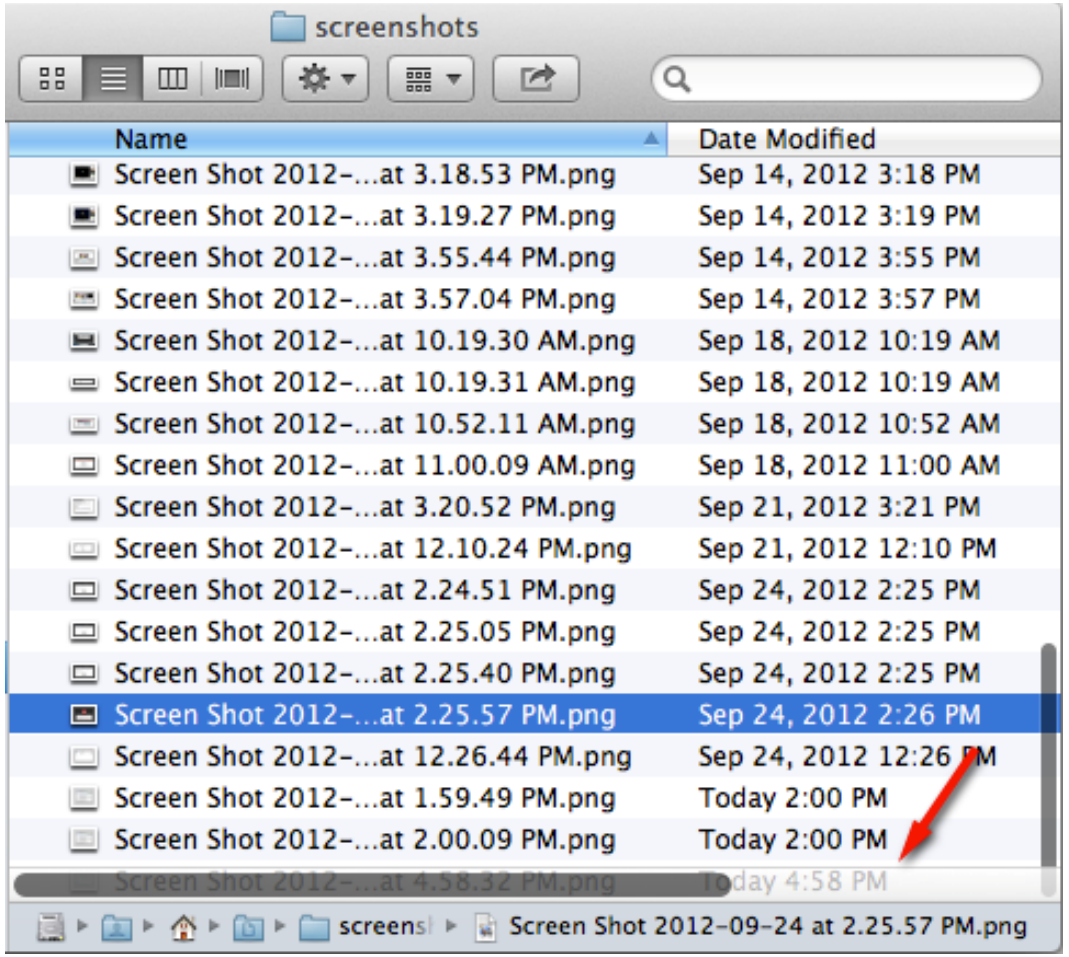
5_1. Consistency. *Levels of Consistency*

- Platform consistence, Across suite of products, In-app
- **Visible structures: Icons, symbols…**
  - The appearance must be strictly controlled
  - Positioning must also be similar
    - Ensures what people learn is valid across the app/webpage
    - Improves learn ability

5_1. Consistency. *Levels of Consistency*

- Platform consistence, Across suite of products, In-app, Visible structures
- **Invisible structures**
  - If implemented, make them strictly consistent everywhere
  - In any case, using invisible structures (hello Microsoft, hello Apple) just makes their use obscure and difficult
    - Expecting the user will google for learning your product features is not the solution

5_1. Consistency. *Levels of Consistency*



5_1. Consistency. *Levels of Consistency*

- Platform consistence, Across suite of products, In-app, Visible structures, Invisible structures
- **Interpretation of the user behavior:**
  - Never change the meaning of a habitual action
    - It is one of the worst things you can do to the user
    - User take a long time to learn things
    - Such actions become subconscious with time
      - E.g. Changing a learnt gesture is extremely frustrating

5_2. Consistency. *Induced inconsistency*

- **<u>Make objects different if they act different</u>**
  - E.g. if the trash can is destroying the document, make it appear different than a trash can
- **If your app/webpage has changed substantially, design can be changed to enforce this fact**
  - Otherwise the user might not notice and continue using the app/webpage the same way (and it might not work)

5_3. Consistency. *Induced continuity*

Over time, strive for continuity, not for consistency

- If your renewed app does a lot of different things and the look and feel is exactly the same, users will use it the same old way

- New versions of products may change big areas (e.g. new features…)
  - Make them slightly different from the previous version
  - Previous knowledge may serve the user to guide their path
    - E.g. maintain the familiar look: same button icons for the things that have not changed…

5_4. Consistency. *With user expectations*

- If users expect something in a certain way, do not force them to learn a new way
  - Even a new button/task may have some user expectations
  - If all the users expect the same, and it is different from what you are offering, go for the path of minimum resistance
  - It doesn't matter how fine a logical argument you can put together for how something should work.

- Unless your new way offers clear advantage

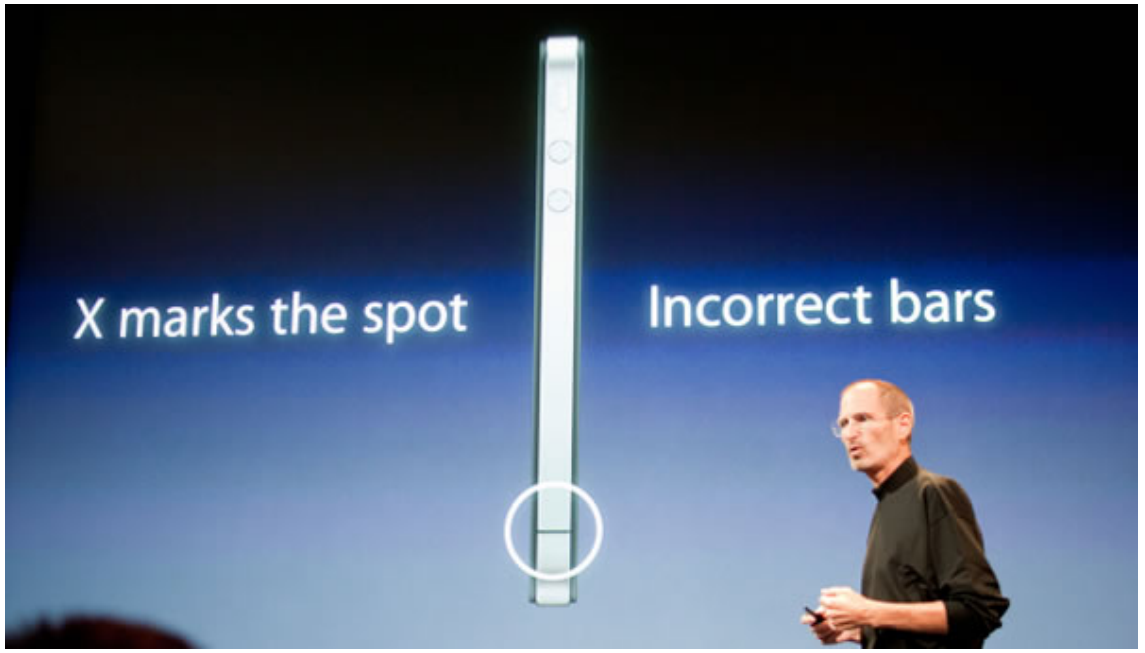
(p.e. Xerox Drag rule)

5_4. Consistency. *With user expectations*

- Recall iPhone 4 death grip. The problem:

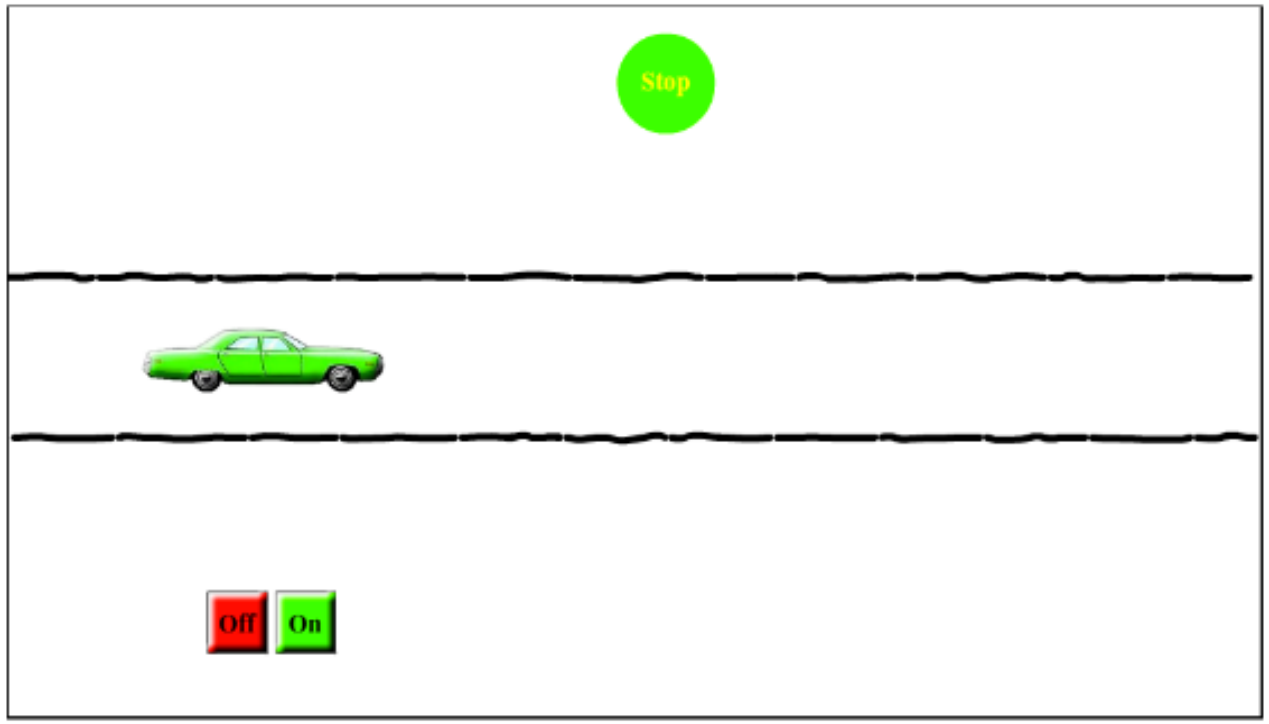
5_4. Consistency. *With user expectations*

- Recall iPhone 4 death grip: The excuse and first solution
  - Issue a fix that increases the bars being shown!!!



5_4. Consistency. *With user expectations*

- Green and red colors have *meaning*
  - Using them inconsistently leads to larger reaction times



6. Default values

- Avoid the cursor appear in unpredictable positions
- Should be easy to rewrite
    - E.g. automatic selection of the default text on a field
- Not all fields require a default value
    - If no clear winner/advantage, do not put a default value at all

7. Discoverability$_1$

- Any attempt to hide complexity will serve to increase it
  - Generating the illusion of simplicity actually does not simplify things
    - E.g. invisible Mac scroll bars
- If the user cannot find it, it does not exist
  - Note the difference between the buyer and the actual user
- Use active discovery: offer (not tested) features to the user
  - Guide people to more advanced features
  - Mention a feature that exists
  - Recall it at intelligently spaced intervals
  - Stop mentioning it once explored or adopted

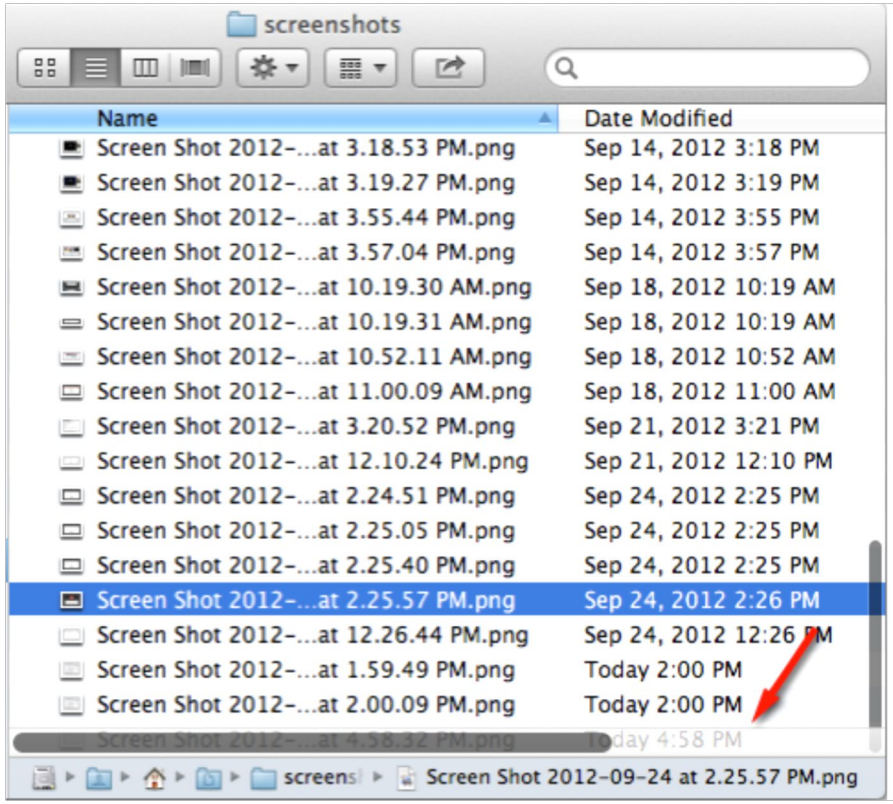
7. Discoverability$_2$

- All controls should be visible and not over the content area
  - Some exception only if space is limited (e.g. smartphones or tablets)
  - Should provide a standard trigger that will expose all controls
    - Don't do this in desktop
  - Communicate your gestural vocabulary with visual diagrams

- User test for discoverability

7. Discoverability$_3$

- Apple example: Invisible scroll bars
  - Scroll bars serve two different purposes:
    - Informing
    - Navigating
  - Making them invisible does not inform the user on the relative position
    - Or where there is more content to be explored
  - Even worse: Apple renders scroll bars over the contents!
    - Making them occlude or prevent their selection



8. Efficiency$_1$

Look at the user's productivity, not the computer's

- Keep the user occupied:
  - Typically the highest expense by far in a business is labor cost
- Maximize every user efficiency
  - Don't improve IT's productivity by pushing work to users
  - Think organization-wise
- The great efficiency breakthroughs in software come from fundamental architecture changes
  - Not in the surface design of the interface

8. Efficiency$_1$

Look at the user's productivity, not the computer's

- Don't ask for the same information twice
  - It is very annoying and unproductive
  - Store it for future use
    - Sometimes not done due to programmers laziness
- Gather the information as needed

8. Efficiency$_1$

Look at the user's productivity, not the computer's

- Provide default values when possible
  - May accelerate interaction
  - May help novice users
  - Provides tips for valid values, formatting
  - Sometimes the answers will be valid in multiple cases
    - Default folder for program installation

8. Efficiency$_2$

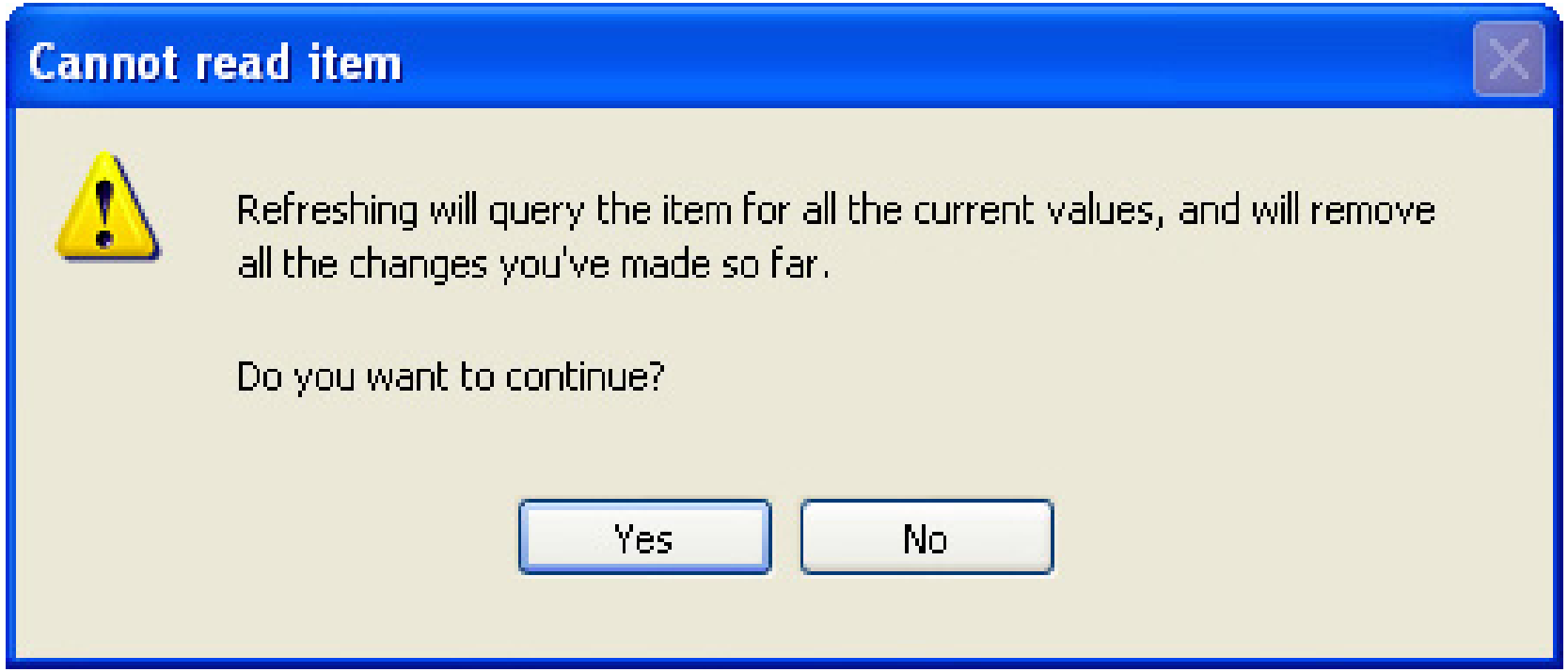
Error messages should actually help

1. Explain what's wrong
2. Tell the user specifically what to do about it
3. Leave open the possibility the message is improperly being generated by a deeper system malfunction

"Error-1264" does not mean anything to the average user

8. Efficiency$_2$

Error messages should actually help



9. Explorable interfaces

Users want to feel free when exploring interfaces

- Two important principles that facilitate exploration are:
  - Make Actions reversible
    - E.g. “Back” in a webpage, cancelling long actions…
    - Promotes exploration
    - Otherwise, a perfect user is a slow user
  - Always allow “Undo”
    - Otherwise you need to confirm everything
      - Again, slow
  - Users should always have an easy way out

10. Fitts's Law

The time to acquire a target is a function of the distance to and the size of the target

- Large objects for important functions
- Small objects for functions you would prefer users not perform

- Reduce the number of targets to acquire
  - Not only their distances

- More on this later…

11. Informing users$_1$

– Keep users informed when they face <u>delay</u>

Expected Delay	Indication
1/2 to 2 seconds	Use animated mouse cursor or other "busy" indicator 
> 2 seconds	Tell them potential length of wait
> 5 seconds	Use an animated progress indicator  Process must end by the time indicator is full!
> 10 seconds	Keep users a) informed & b) entertained
> 15 seconds	Same as >10 plus add at end a noticeable sound & strong visual indication so users know to return

11. Informing users$_2$

– Acknowledge all button clicks by visual clue within 50 ms

– Start making everything faster
  - Eliminate any element of the application that is not helping
  - Be ruthless

– Wearables come with an even higher level of expectation:
  - No one waits to see what time it is
  - Or to see who is calling, what the temperature is outside…

More principles for usability

- Choose metaphors that will enable users to instantly grasp the finest details of the conceptual model

- Try making your concepts visually apparent in the software itself
  - Buttons are pressed, sliders dragged…

- Expand beyond literal interpretation of real-world
  - If a metaphor is holding you back, abandon it

More principles for usability

- Metaphors. iOS browser vs iOS compass

More principles for usability

- Ensure that users never lose their work
  - This principle is all but absolute
  - Users should not lose their work as a result of
    - error on their part,
    - the vagaries of Internet transmission,
    - or any other reason other than the completely unavoidable (e.g. travel sites)

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Bonus track: The case of Apple

- Jonathan Ive (Apple's Chief Design Officer) is a fan of Bauhaus school's Dieter Rams minimalistic design

- Dieter Rams worked for many years for the German company Braun
  - Responsible of many of its simple-to-use and aesthetically pleasant product designs

Bonus track: The case of Apple

Dieter Rams' principles of good design

1. Innovative
2. Makes a product useful: usefulness is essential
3. Aesthetic but well-executed
4. Makes a product understandable
5. Unobtrusive
6. Honest
7. Long-lasting
8. Thorough down to the last detail
9. Environmentally friendly
10. As little design as possible

Bonus track: The case of Apple

- "As little design as possible" is the 10th principle!!!
  - Can be applied **after** the other ones
- Apple has sacrificed most of the qualities of its well-known usable design to this 10th principle

Bonus track: The case of Apple

- Apple has **sacrificed usability** to **aesthetical simplicity:**
  - from "easy-to-use, easy-to-understand" to "no manual included but it is necessary"
    - Tiny unreadable fonts
    - Lack of undo
    - Hiding/removing fundamental features
    - Lack of consistency in mouse/trackpad behavior
    - …
  - Read: https://www.fastcodesign.com/3053406/how-apple-is-giving-design-a-bad-name

Bonus track: The case of Apple

- E.g. Today's iPhones and iPads are a study in visual simplicity.
  - Beautiful fonts (helvetica)
  - A clean appearance, uncluttered by extraneous words, symbols, or menus
    - Thin fonts with little contrast

> 1/2 iOS 7 preview: horrible type. Low foreground/background contrast & lighter weight Helvetica trending illegible.
>
> — Thomas Phinney (@ThomasPhinney) June 13, 2013
>
> 2/2 Existing iOS Helvetica UI font was already anti-legibility. iOS 7 choices could make me run for the hills.
>
> — Thomas Phinney (@ThomasPhinney) June 13, 2013

Bonus track: The case of Apple

- E.g. Today's iPhones and iPads are a study in visual simplicity.
  - Beautiful fonts
  - A clean appearance, uncluttered by extraneous words, symbols, or menus
    - Thin fonts with little contrast
  - So what if many people can't read the text? It's beautiful.
    - People require to use Apple's assistive tool even if they do not have defective vision
    - Turns out that then the fonts are too big in many apps

Bonus track: The case of Apple

E.g. No perceived affordance. iOS examples: UNDO

- Disappeared!
- People complained
  - Then, put undo back in…
  - … if you violently shake your phone or tablet
  - But undo is not universally implemented, and there is no way to know except by shaking
  - Even then, you don't know if you didn't shake properly or undo is not implemented for that particular situation

Bonus track: The case of Apple

No perceived affordance. iOS examples: UNDO

- Disappeared!
  - Sort of now by only shaking the device !!!???
    - Tablet shaking? WTF?
  - Not universally implemented!
- Touch-sensitive screens, especially on relatively small devices, offer multiple opportunities for things to go wrong when an active link or button is accidentally touched

- Back button should be universally available

Bonus track: The case of Apple

- Use of modes:
  - The ultimate in simplicity is a **one-button controller**: very simple, but because it has only a single button, its power is very limited unless the system has modes, e.g.:
    - One click → selection
    - Double click → erase
    - Triple click → undo
    - Long click → redo

Bonus track: The case of Apple

- E.g. mouse in different devices and situations

…zooming on a trackpad involves putting pulling your thumb and one finger together in a pinching motion to make things smaller, or pushing them apart to make things larger.

Double-tapping on the trackpad with two fingers will also *zoom within some apps*, and *repeating the tap will zoom out again*.

This double tap feature also works on the Magic Mouse, just **remember** not to click the top, just tap the middle of the device instead….”

Bonus track: The case of Apple

E.g. No perceived affordance. iOS examples. GESTURES

- The absence of any signals on the screen (signifiers, affordances) makes gestures undiscoverable
  - Swipe up or down, left or right, use one finger or two or three or four or five, or tap once, twice, or three times, or tap long or short?

- Users must memorize these gestures after first being told, "read the manual" (what manual?) or discovering them by accident.

Bonus track: The case of Apple

E.g. Hiding fundamental features

- E.g. the lock rotating screen is difficult to understand:
  - It is grayed or not, but difficult to interpret its meaning
  - Turns out that Apple uses text to say which, but in tiny little letters somewhat removed from the icon itself

- Frequent operations should not require so long to be learnt

Bonus track: The case of Apple

- Other examples:
  - iOS keyboard not showing capitalization
    - The design decision that when a keyboard is in uppercase mode, it should display uppercase letters and, when in lowercase mode, it should display lowercase letters, is so obvious that the failure to provide this simple feedback on the current mode defies all credulity
    - It took Apple 9 versions of the OS to fix it!!!

Bonus track: The case of Apple

- Products that *inspired* Apple

Bonus track: The case of Apple

- Braun products that inspired Apple products

Bonus track: The case of Apple

- Braun products that inspired Apple products

Bonus track: The case of Apple

- Braun products that inspired Apple products

Other UX errors

- Leave the UX for too late:
  - Maximum benefits are achieved when UX introduced early in the development process
- Leave the user feedback for too late:
  - Unfinished versions or prototypes of the product can be tested

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