

ECWM506 Mobile Computing Principles

Lecture 3 - HCI Principles
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Design Principles

- Over the years many principles of good interactive system design have been developed.
- Design principles can be very broad
 - such as ‘make things visible’
- They can be more specific
 - such as ‘provide clearly marked exits’
- There are also good design principles that derive from psychology
 - such as ‘minimize memory load’ (i.e. do not expect people to remember too much).

Design Principles

- Plenty to choose from
- Nielsen's 10 principles
- Norman's rules from Design of Everyday Things
- Shneiderman's eight golden rules
- Mac, Windows guidelines

Principles and Patterns

- The application of design principles has led to established patterns of interaction in certain circumstances
 - such as the ‘undo’ command in a Windows application, or the ‘back’ button on a Web site
 - the greying out of inappropriate options on menus.
- Design principles can
 - guide the designer during the design process
 - can be used to evaluate and critique prototype design ideas.

Principles and Patterns (continued)

- Design principles interact in complex ways, affecting each other, sometimes conflicting with each other and sometimes enhancing each other.
- They help to orientate the designer to key features of good design and sensitize the designer to important issues.

Top level principles

From Don Norman and Jacob Nielsen:

- Systems should be
 - **Learnable**. Principles 1-4 are concerned with access, ease of learning and remembering
 - **Effective**. Principles 5-7 are concerned with ease of use and 8-9 are concerned with safety
 - **Accommodating**. Principles 10-12 are concerned with accommodating differences between people and respecting those differences

Overall view of good design

- Designing interactive systems from a human-centred perspective is about...
- ...helping people access, learn and remember the system...
- ...giving them the sense of being in control, knowing what to do and how to do it...
- ...safely and securely...
- ...in a way that suits them.

Principle 1 - Visibility

- Try to ensure that things are visible so that people can see what functions are available and what the system is currently doing.
- This is an important part of the psychological principle that it is easier to recognize things than to have to recall them.
- If it is not possible to make it visible, make it observable.
- Consider making things ‘visible’ through the use of sound and touch.

The common commands and defaults are made visible



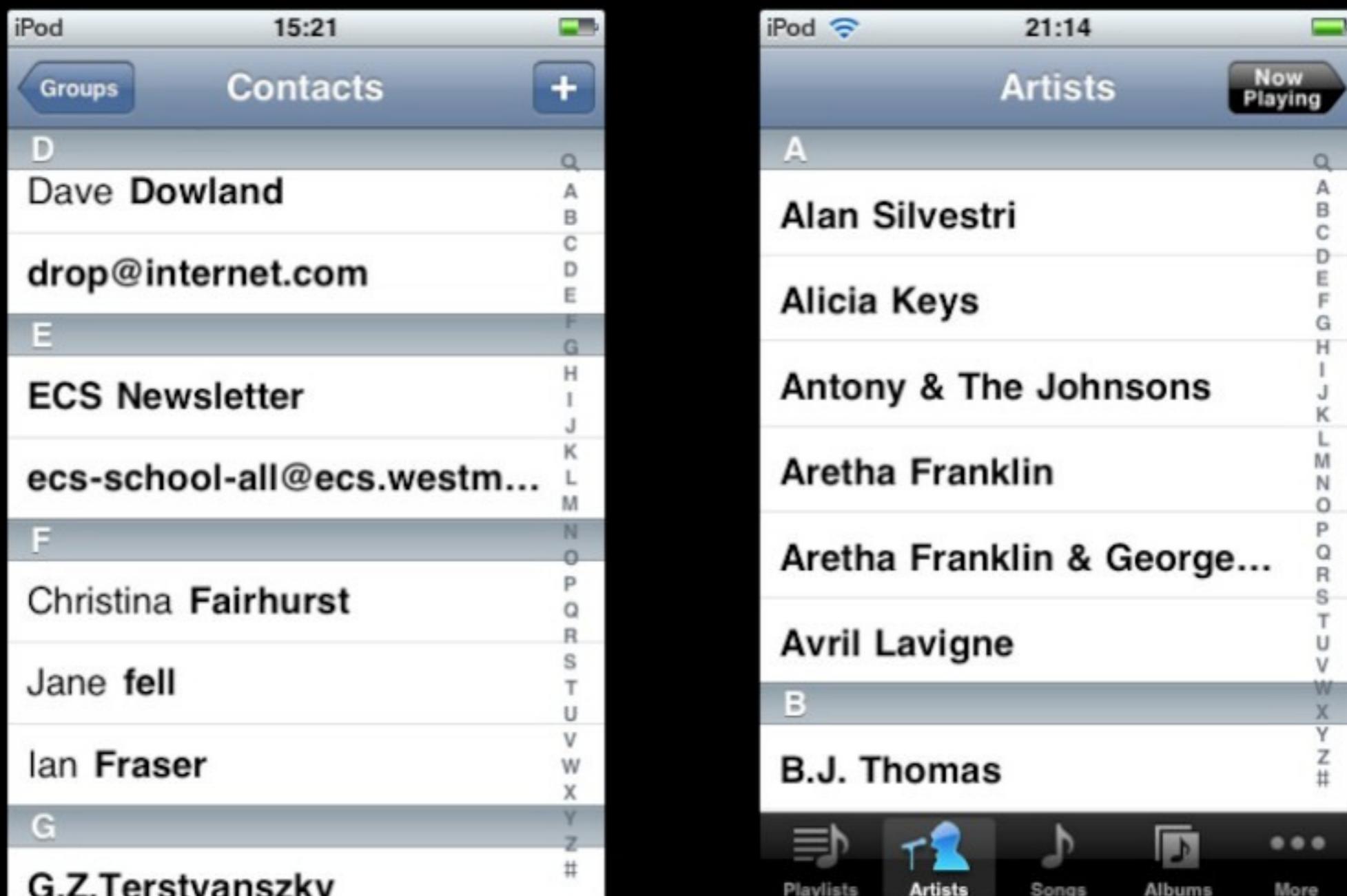
Visibility and sensible grouping makes people aware of other options

Other commands are observable

Principle 2 - Consistency

- Be consistent in the use of design features.
- Be consistent with similar systems and standard ways of working.
- Conceptual consistency is about ensuring the mappings are consistent, that the conceptual model remains clear.
- This involves being consistent both internally to the system and externally as the system relates to things outside of it.
- Physical consistency is ensuring consistent behaviours and consistent use of colours, names, layout and so on.

Consistency



Principle 3 - Familiarity

- Use language and symbols that the intended audience will be familiar with (Speak the user's language!)
- Where this is not possible because the concepts are quite different from those people know about, provide a suitable metaphor to help them transfer similar and related knowledge from a more familiar domain.

Skeuomorphism

Consistency with external world and Familiarity can sometime give rise to perceptual disconnects.

Retain ornamental elements of past, derivative iterations

Mimetic

Principle 4 - Affordance (Expectation)

- Design things so it is clear what they are for;
 - for example make buttons look like buttons so people will press them.
 - Make a slot for inserting a credit card look like a credit card slot!
- Affordance refers to the properties that things have (or are perceived to have) and how these relate to how the things could be used. I prefer to refer to this as **expectation**.
- Buttons afford pressing, chairs afford sitting on and post-it notes afford writing a message on and sticking next to something else.
- Affordances are culturally determined.

Expectation

Recognition rather than recall
Lowers cognitive load

Buttons on media players have affordance - they suggest what they can be used for because we are familiar with similar devices



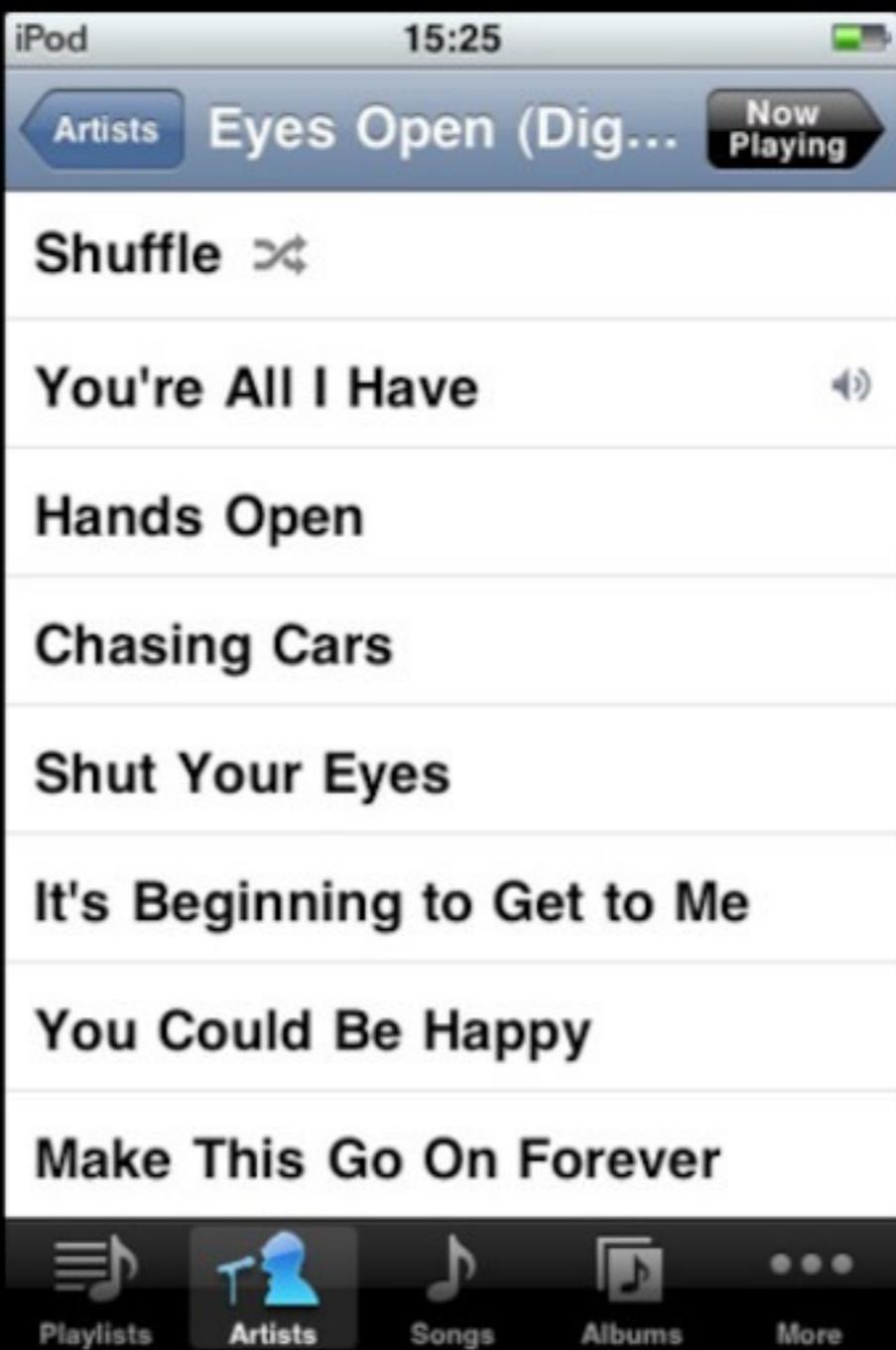
Top level principle of Learnability consists of

- Principle 1 Visibility
- Principle 2 Consistency
- Principle 3 Familiarity
- Principle 4 Affordance

Principle 5 - Navigation

- Provide support to enable people to move around the parts of the system; maps, directional signs and information signs.
- Menus are often used for navigation, signs (labels) indicate where else you can go in the system.

Principle 5 - Navigation



Principle 6 - Control

- Make it clear who or what is in control and allow people to take control.
- Control is enhanced if there is a clear, logical mapping between controls and the effect that they have.
- Also make clear the relationship between what the system does and what will happen in the world outside the system.

Principle 7 - Feedback

- Rapidly feed back information from the system to people so that they know what effect their actions have had.
- Constant and consistent feedback will enhance the feeling of control.

Top - level principle of Effectiveness consists of

- Ease of Use which consists of
 - Principle 5 - Navigation
 - Principle 6 - Control
 - Principle 7 - Feedback
- Safe and Secure which consists of
 - Principle 8 - Recovery
 - Principle 9 - Constraints

Safe and Secure

- Principle 8 - Recovery
 - enable recovery from actions, particularly mistakes and errors, quickly and effectively.
- Principle 9 - Constraints
 - provide constraints so that people do not try to do things that are inappropriate.
 - In particular people should be prevented from making serious errors through properly constraining allowable actions and seeking confirmation of dangerous operations.

Principle 10 - Flexibility

- Allow multiple ways of doing things so as to accommodate users with different levels of experience and interest in the systems.
- Provide people with the opportunity to change the way things look or behave so that they can personalize the system.

Principle 10 - Flexibility



← Customizable keyboards

Demo screen organisation

Demo send image by email

Aesthetics

- Principle 11 - Style
 - designs should be stylish and attractive
 - Is this always true? (Google - Minimalist design)
- Principle 12 - Conviviality
 - Interactive systems should be polite, friendly, and generally pleasant.
 - Nothing ruins the experience of using an interactive system more than an aggressive message or an abrupt interruption.
 - Conviviality also suggests joining in and using interactive technologies to connect and support people.

Polite Software

Is interested in me	is taciturn about its personal problems
Is deferential to me	is well informed
Is forthcoming	is perceptive
Has common sense	is self-confident
Anticipates my needs	stays focused
Is responsive	is fudge-able
Gives instant gratification	is trustworthy

Twelve Principles for good human-centred interactive systems design

- 1. Visibility
- 2. Consistency
- 3. Familiarity
- 4. Affordance
- 5. Navigation
- 6. Control
- 7. Feedback
- 8. Recovery
- 9. Constraints
- 10. Flexibility
- 11. Style
- 12. Conviviality

Mobiles

- A key design feature with mobile technology is the limited screen space.
 - difficult to achieve the design principle of **visibility**
 - Functions have to be tucked away and accessed by multiple levels of menu leading to difficulties of **navigation**.
- There is not room for many buttons so each button has to do a lot of work.
 - This results in the need for different ‘modes’ and this makes it difficult to have clear **control** over the functions.

Mobiles (continued)

- **Feedback** is generally poor and people have to stare into the device to see what is happening (maybe good idea to add sound cues/vibration cues, LEDs)
- There is no **consistency** in the interfaces - even to the point of pressing the right hand or left hand button to answer a call.

Mobiles (continued)

- **Flexibility** is provided to a limited extent
 - e.g. being able to press any key to answer a call, but it is generally not possible to personalize things such as menus.
 - Physically swapping the covers is one way to personalize the device.

Mobiles (continued)

- **Style** is very important and many mobile devices concentrate on the **convivial** nature of the physical interaction (e.g. the size and weight of the device).
- The physical buttons **afford** pressing,
 - there is little in most of the graphical aspects of the interface that afford anything
 - the obscure symbols on many buttons do not easily convey any meaning.
- Those growing up with mobiles might be **familiar** with much of the terminology, and where to find things this is not the case for newcomers.

Ubiquitous Computing

- Computers are becoming increasingly small and pervasive
 - they are now wearable
 - they are increasingly able to communicate with each other autonomously.
- For example, there are toddler beds that detect movement, picture frames that respond to distant events, and fridges that have e-mail.

Guidelines for Ubicomp

- **Visibility** is critical to ensure people know what is connected to what
- **consistency** will only be achieved once certain standards have been evolved.
- the devices must provide good **feedback** so that people do not feel that they have lost **control**.
- How devices will represent suitable **affordances** is a significant design challenge.
- For example if a picture frame can display the status of a baby in a cot, how will we know?

Guidelines for Ubicomp (continued)

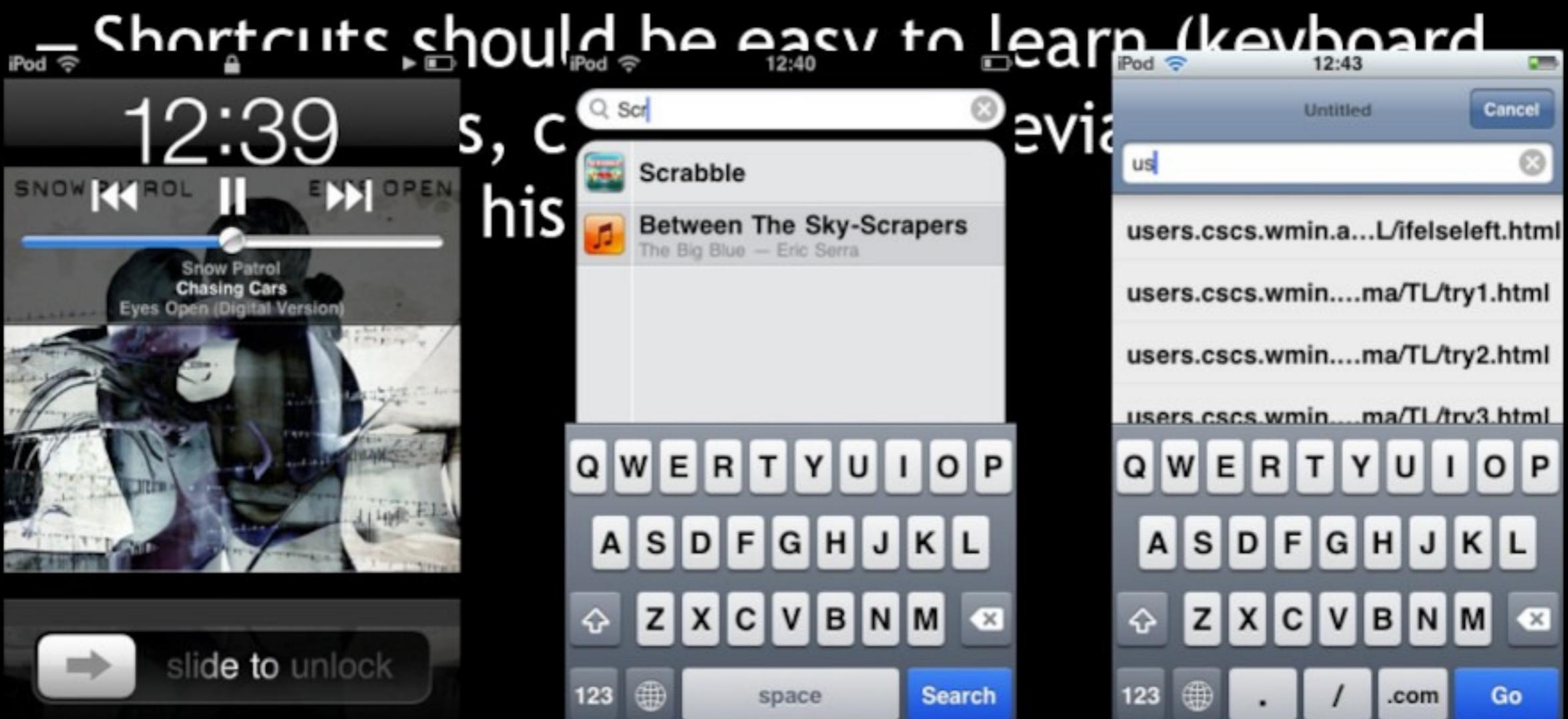
- The proliferation and non-standard nature of these new devices will mean that **familiarity** is very difficult to achieve.
- Security and the ability to **recover** from errors becomes even more important when devices are controlling devices in the home such as heaters.

Eight Golden Rules - Ben Shneiderman

- **1. Strive for consistency**
 - Consistent sequences of actions should be required in similar situations;
 - identical terminology should be used in prompts, menus, and help screens;
 - consistent commands should be employed throughout.

Eight Golden Rules - Ben Shneiderman

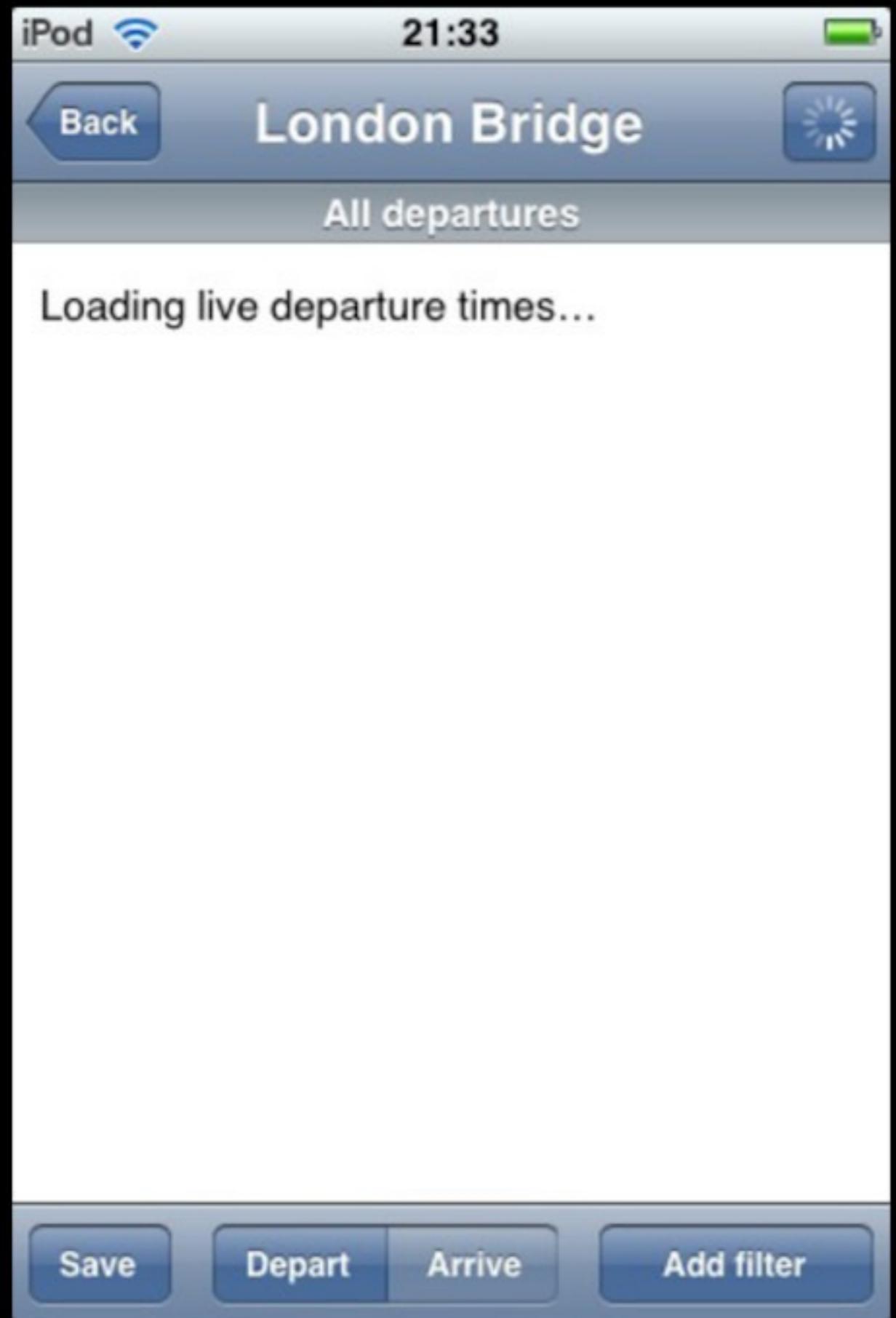
- 2. Enable frequent users to use shortcuts.



Keyboard accelerators
Command abbreviations
Bookmarks
History

Eight Golden Rules - Ben Shneiderman

- **3. Offer informative feedback for every user action**
 - Keep user informed of system state:
 - Cursor change
 - Selection highlight
 - Status bar
 - Don't overdo it...
 - Response time:
 - <0.1 s: seems instantaneous
 - 0.1 - 1 s: user notices, but no feedback is needed
 - 1-5 s: display busy cursor
 - >1-5 s: display progress bar





Warning



Progress bar

Eight Golden Rules - Ben Shneiderman

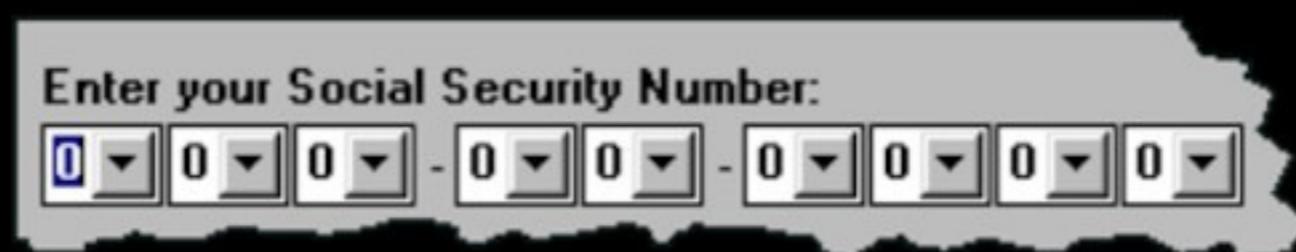
- **4. Design dialogs to yield closure**
 - Sequences of actions should be organized into groups with a beginning, middle, and end.
 - Ex:

Select “Open” on file menu	(beginning)
Complete dialog box	(middle)
Press “Open” button	(end)
 - The informative feedback at the completion of a group of actions gives the operators the satisfaction of accomplishment, a sense of relief, the signal to drop contingency plans and options from their minds
 - It is also an indication that the way is clear to prepare for the next group of actions.

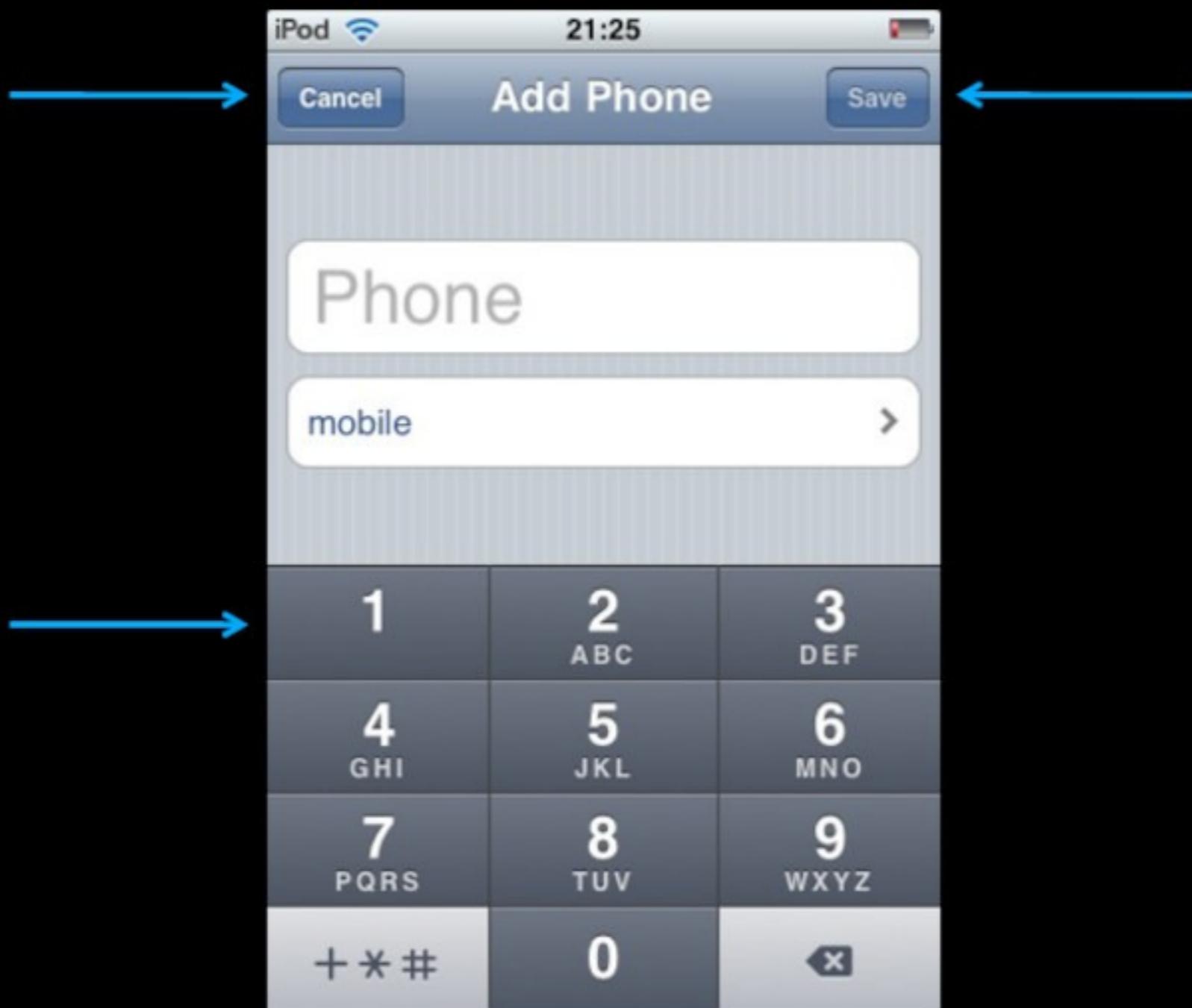
Demo send email

Eight Golden Rules - Ben Shneiderman

- **5. Offer error prevention and simple error handling**
 - Selection is less error-prone than typing
 - But don't overdo it...



- Disable illegal commands (gray-out)
- Keep dangerous commands away from common ones
- In case of mistakes, provide clear and informative instructions to recover from them

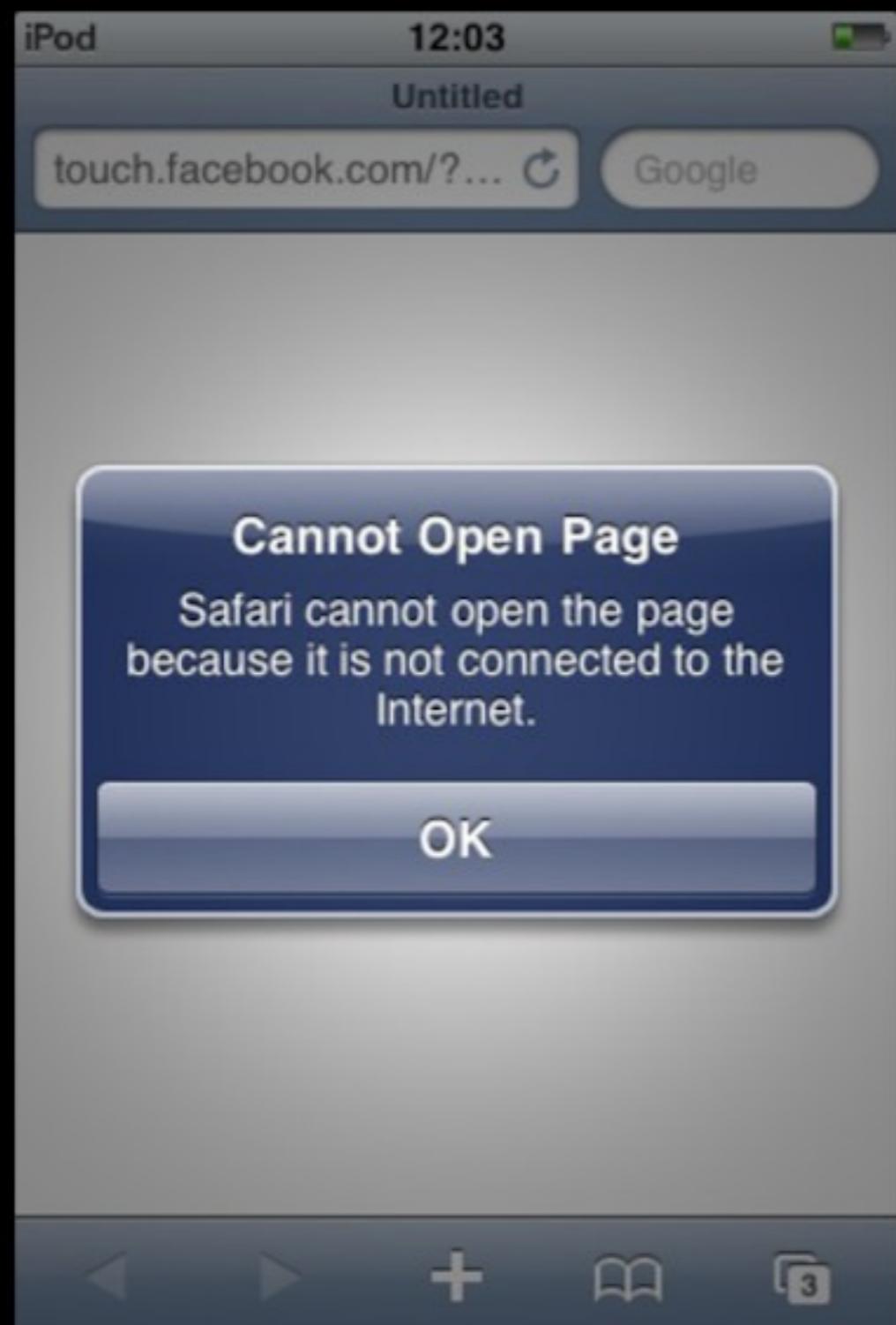


Eight Golden Rules - Ben Shneiderman

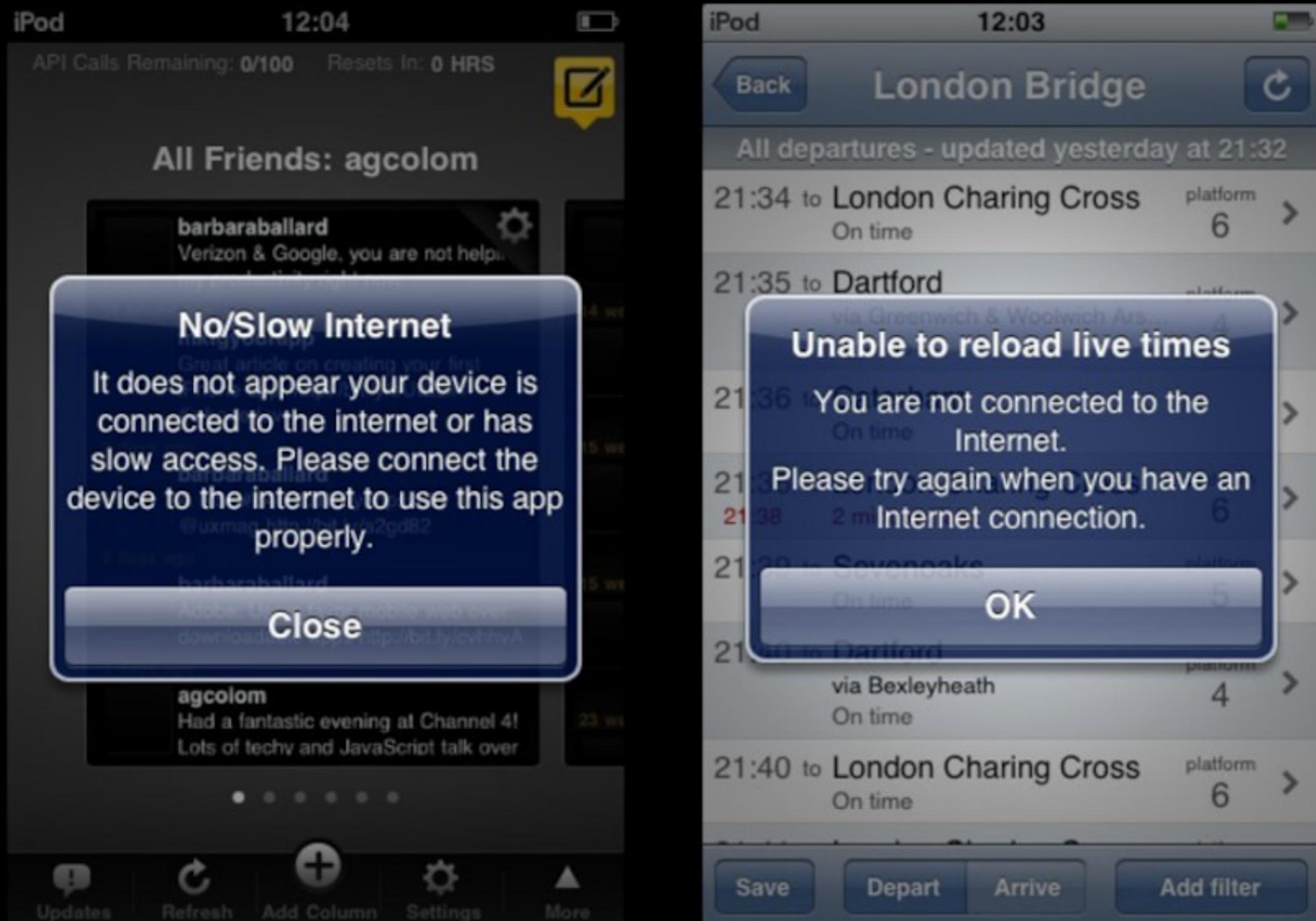
– Error messages

- Be precise: restate user's input
 - Not “cannot open file” but “Cannot open file named paper.doc”
- Give constructive help
 - Why error occurred and how to fix it
- Be polite and non-blaming
 - Not fatal error, not illegal
- Hide technical details until requested

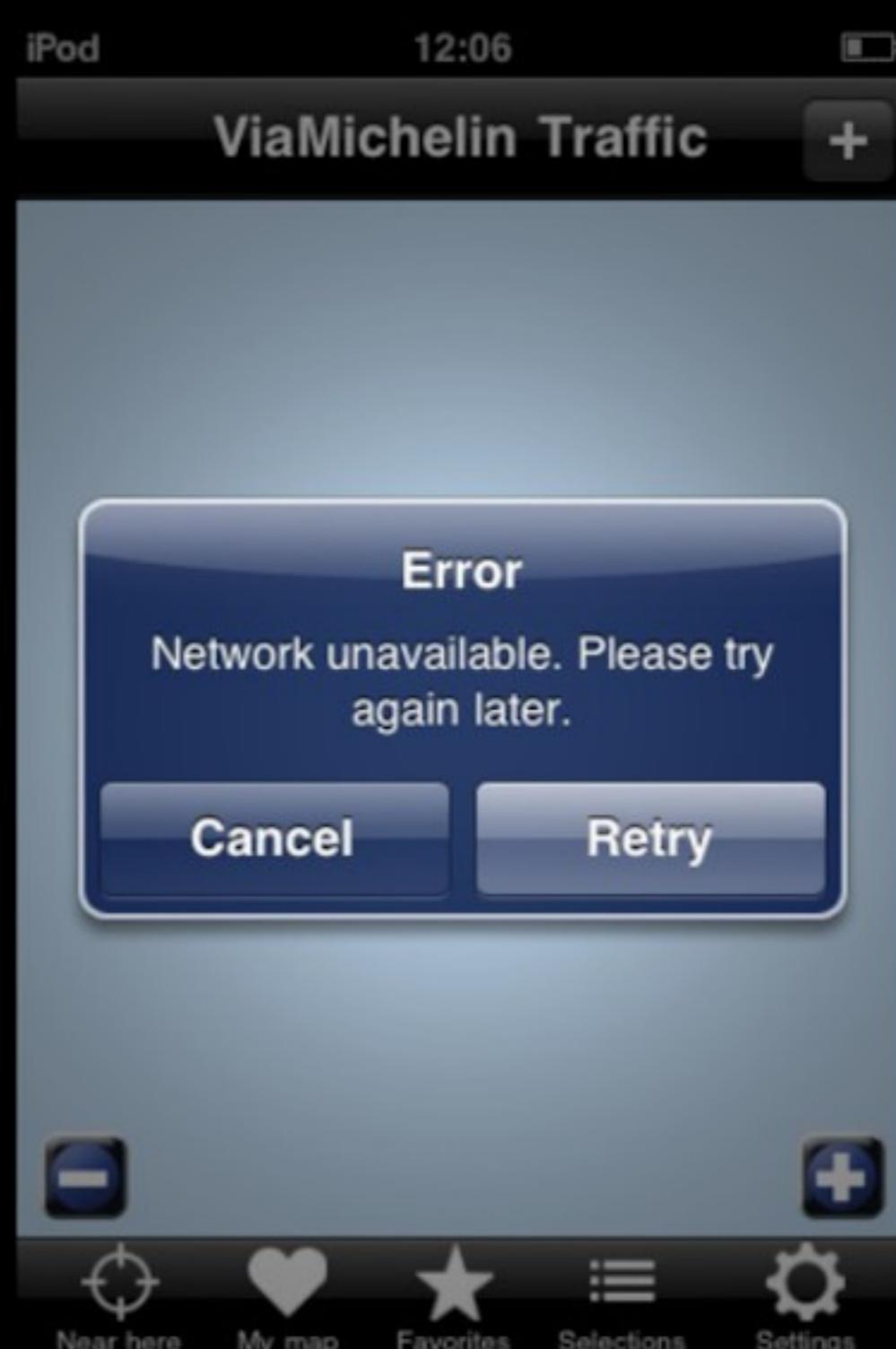
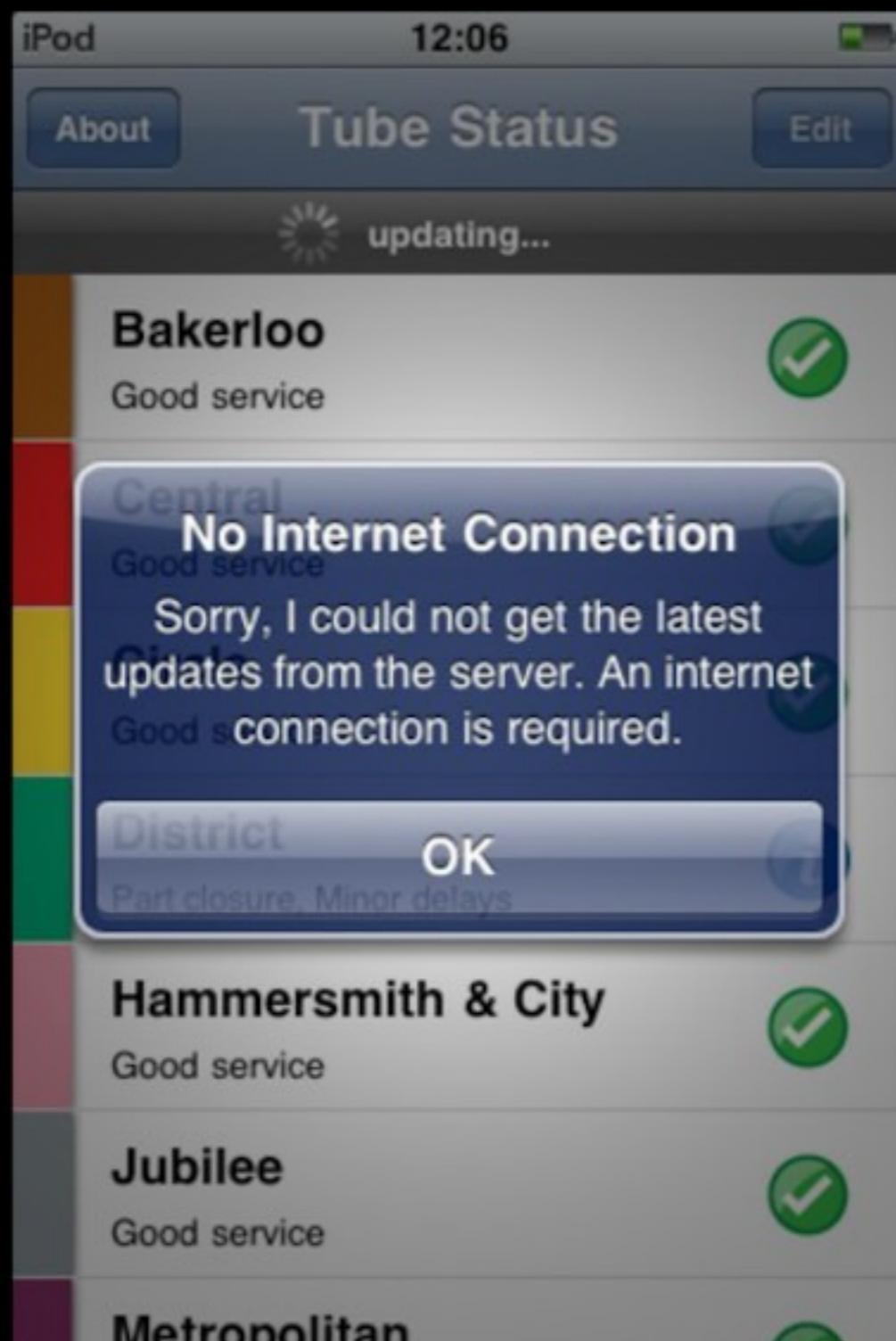
Eight Golden Rules - Ben Shneiderman



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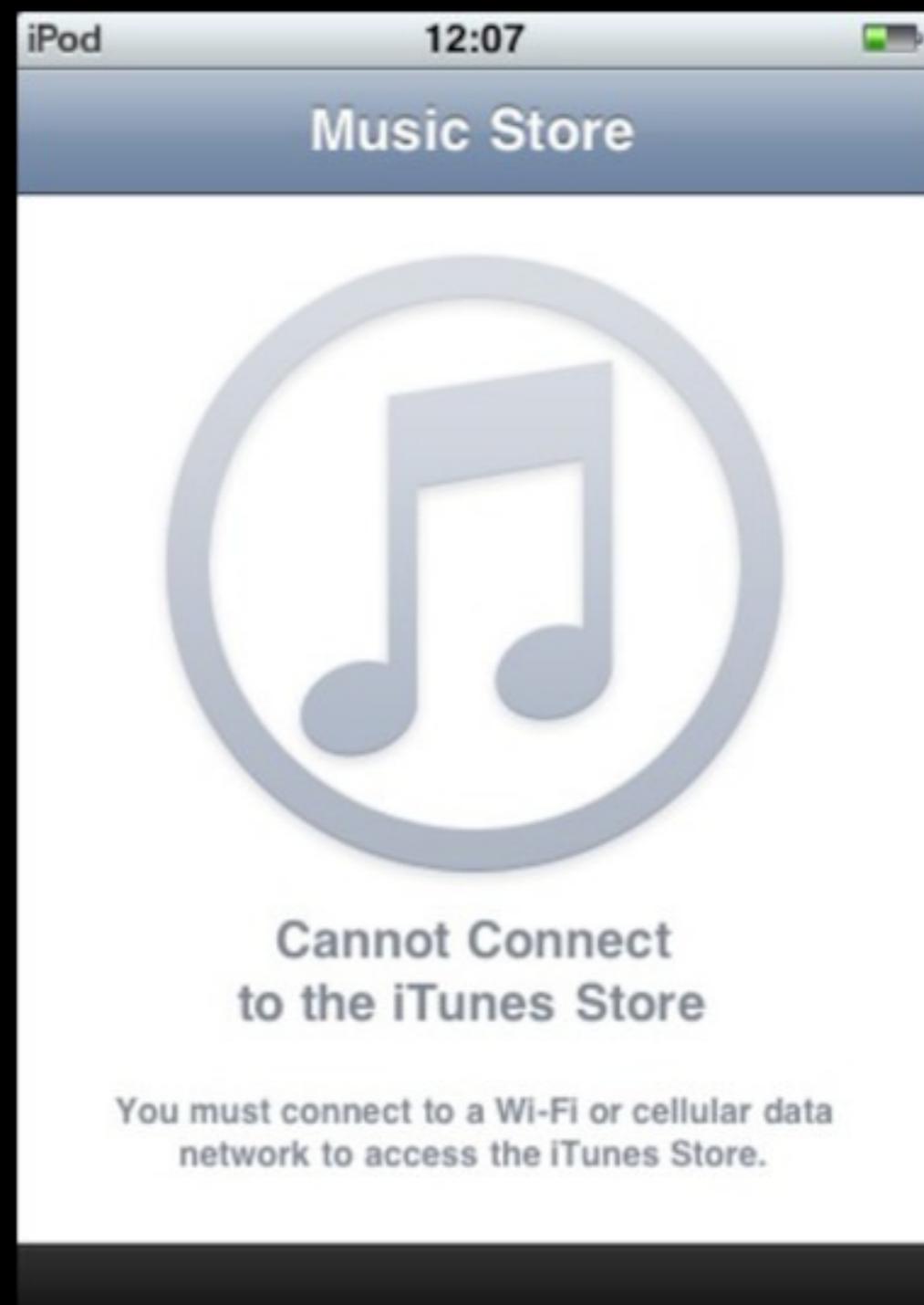
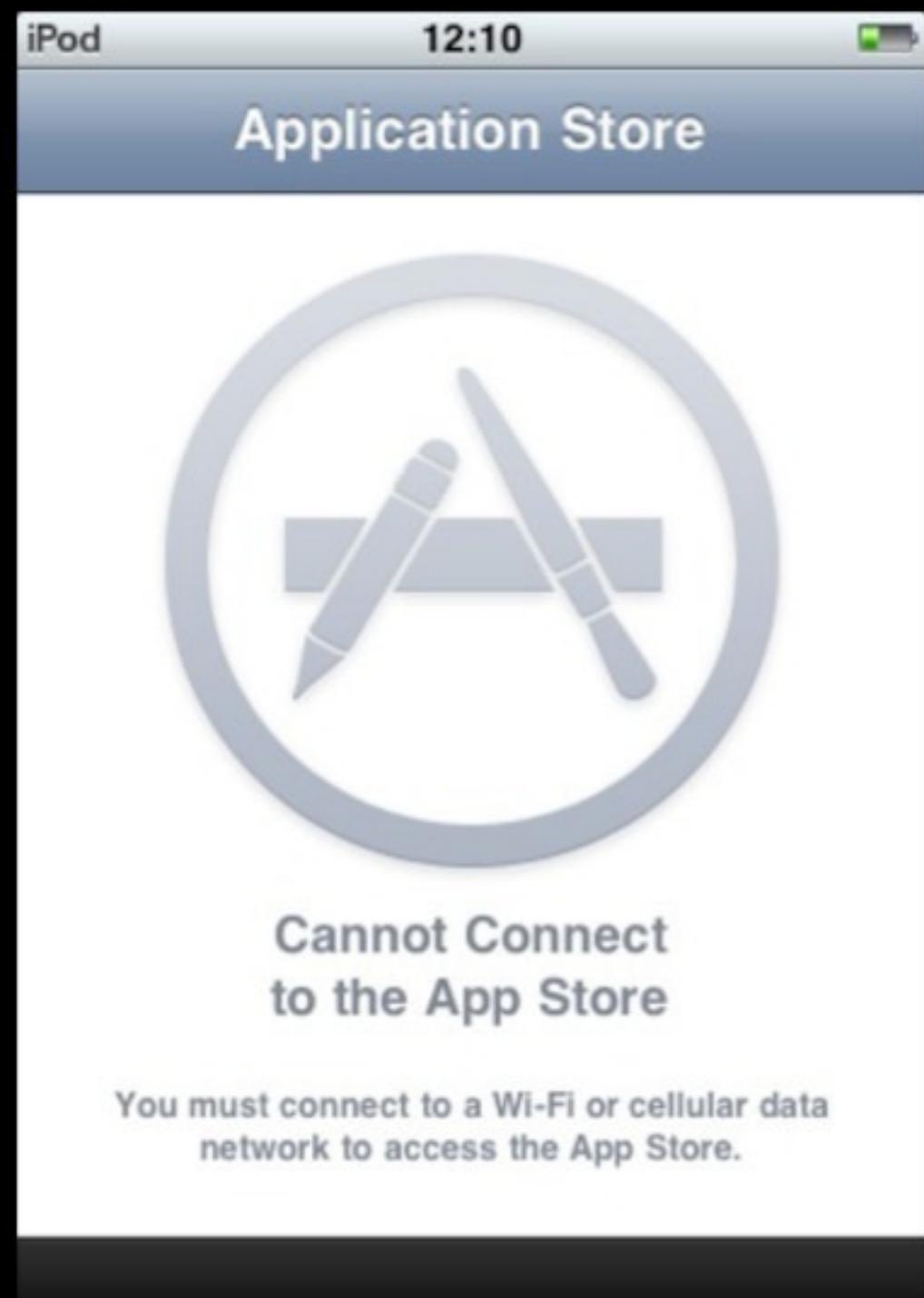
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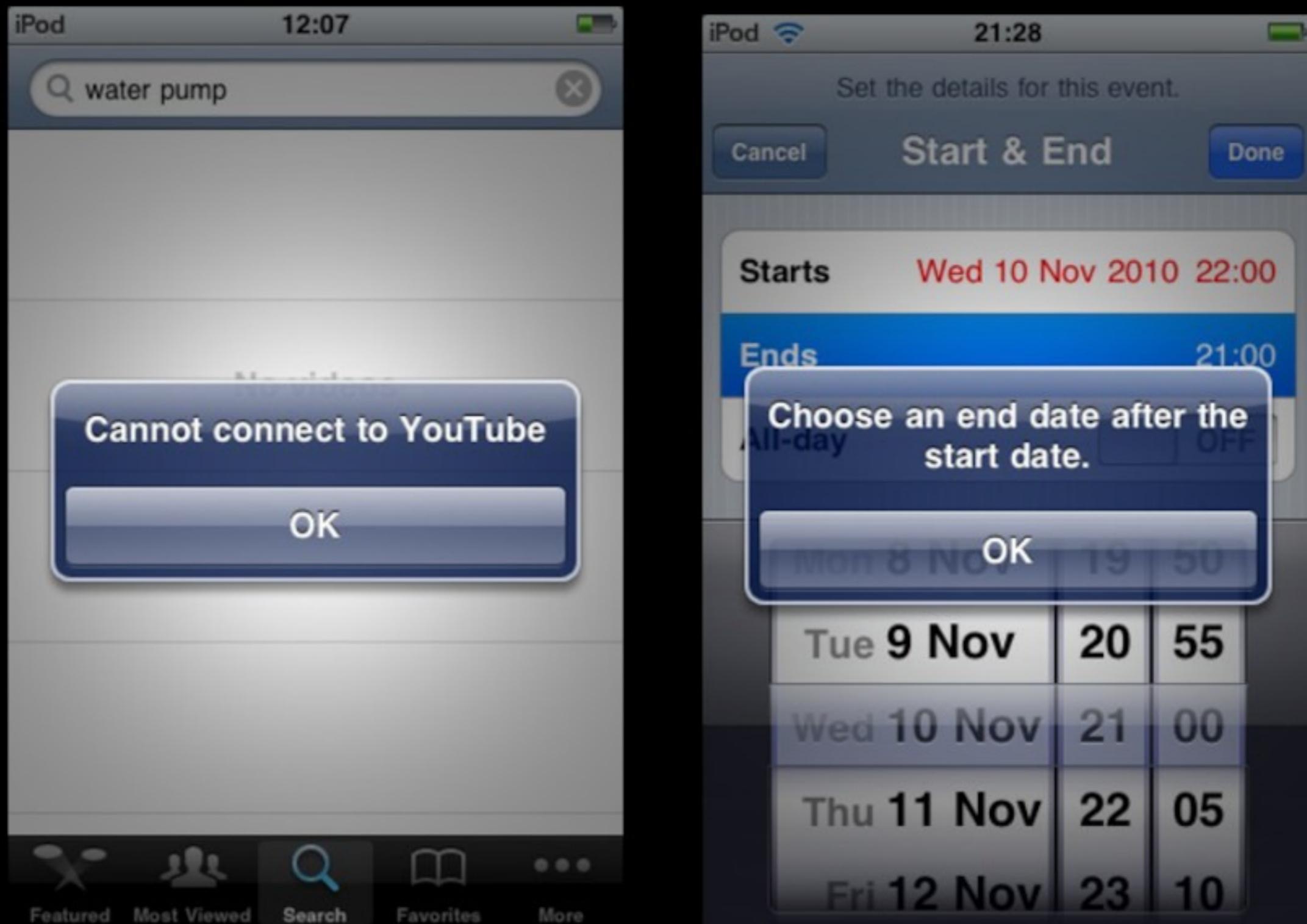
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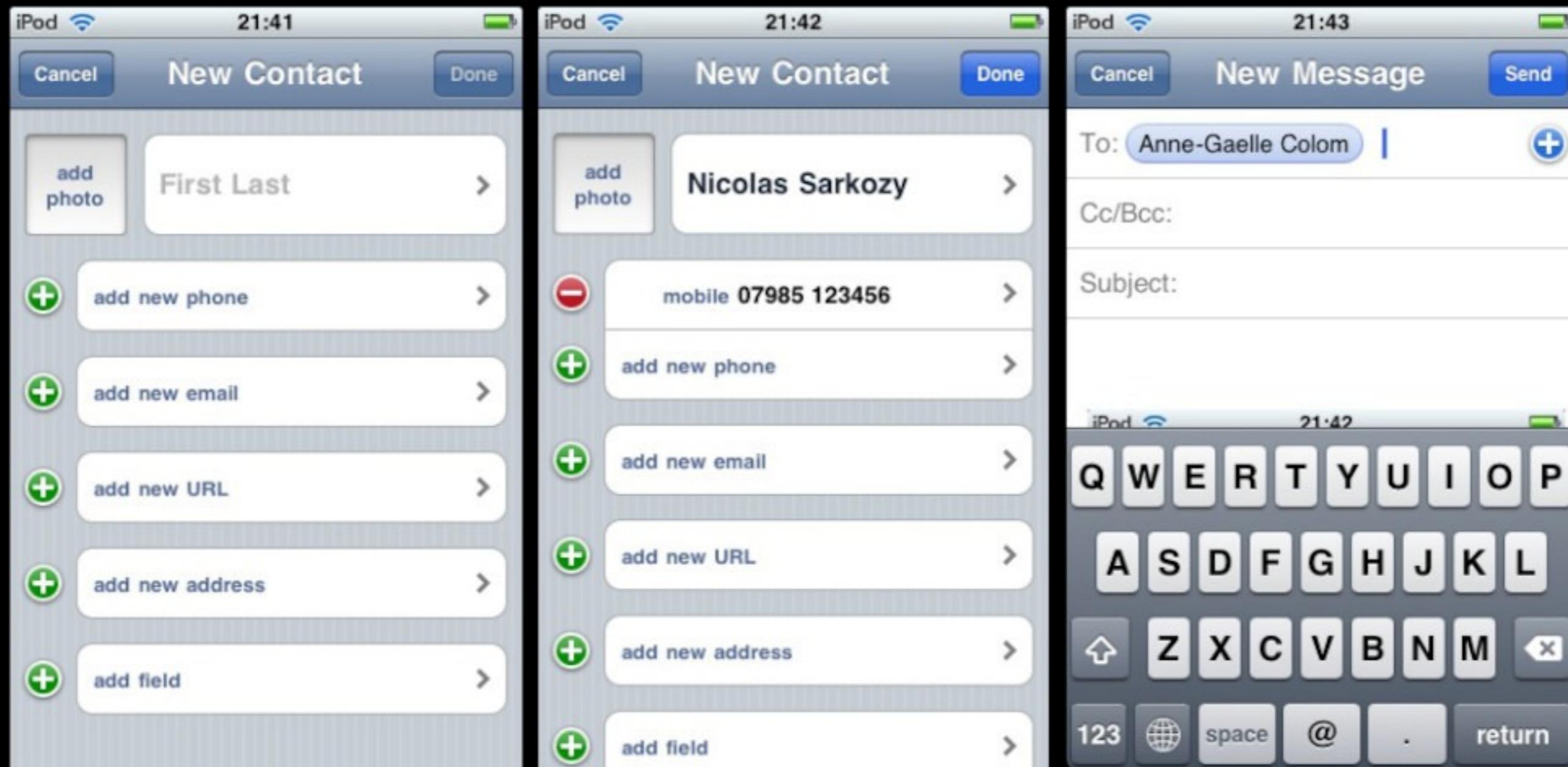


Eight Golden Rules - Ben Shneiderman



Eight Golden Rules - Ben Shneiderman

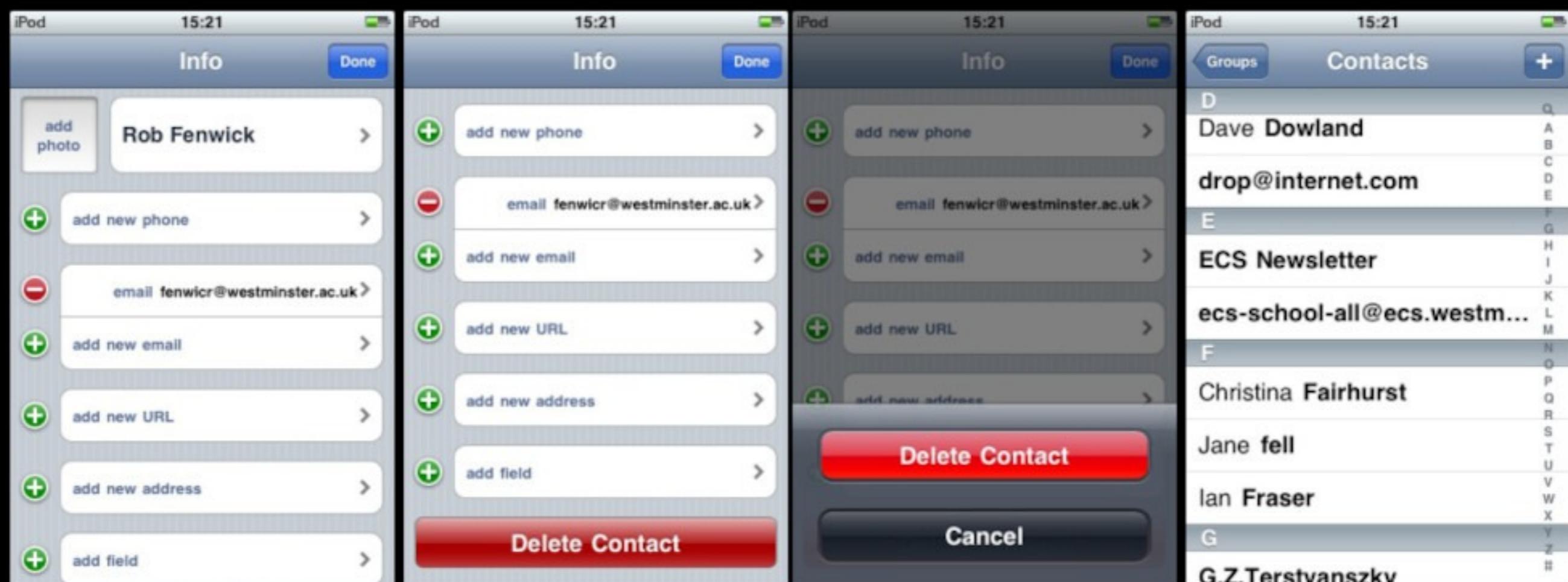
- **6. Permit easy reversal of actions**
 - Relieves anxiety
 - Encourages exploration of unfamiliar options
 - Dimensions of reversibility:
 - a single action,
 - a data entry,
 - a complete group of actions.



Eight Golden Rules - Ben Shneiderman

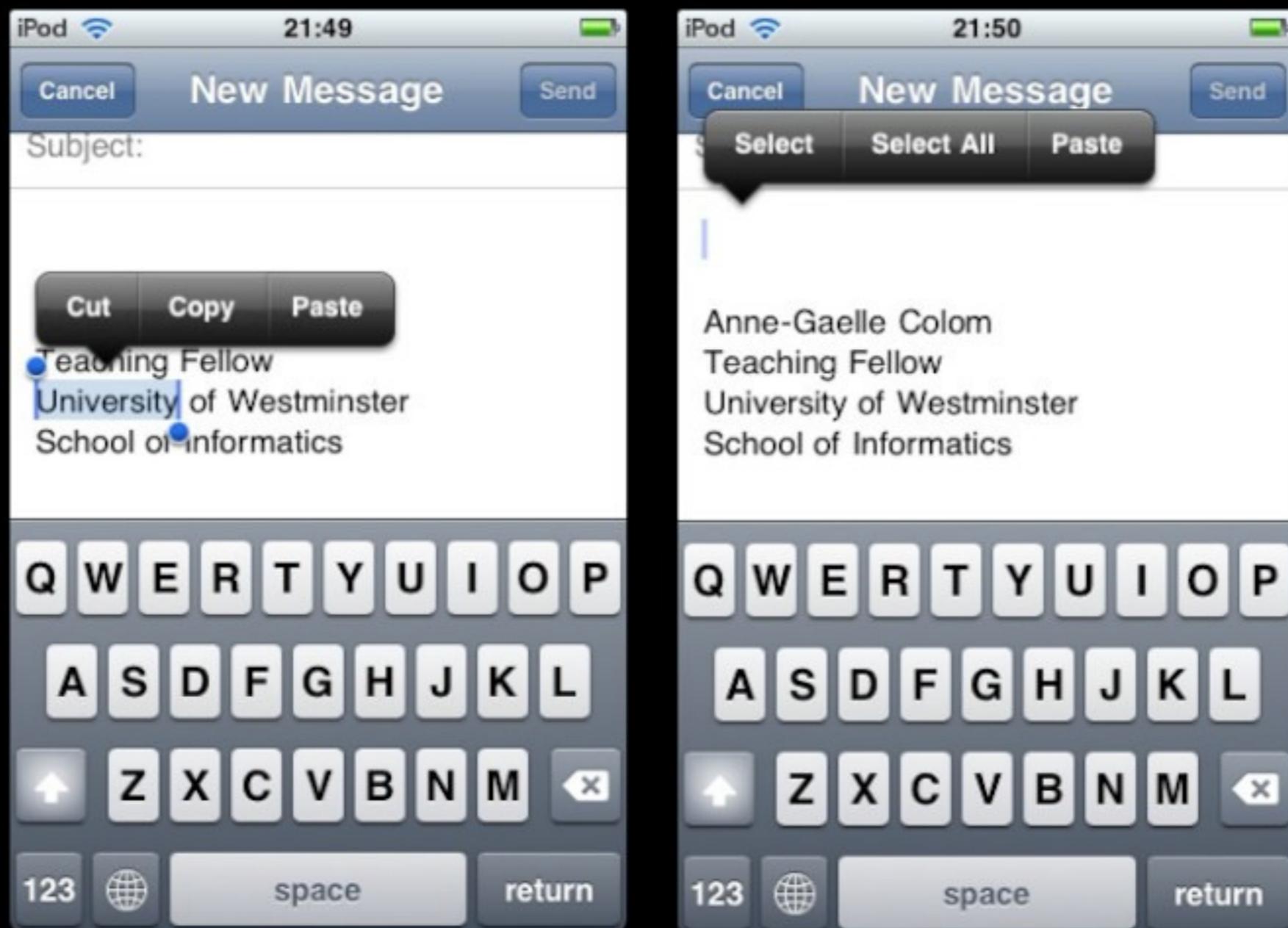
- **7. Support internal locus of control**
 - The user should be in control of the system, which should respond to his actions.
 - Long operations should be cancelable
 - All dialogs should have a cancel button

Eight Golden Rules - Ben Shneiderman



Eight Golden Rules - Ben Shneiderman

- **8. Reduce short-term memory load**
 - Keep displays simple
 - Consolidate multiple-pages display
 - Provide time for learning action sequences
 - Recognition, not recall
 - Use menus, not command languages
 - Use generic commands when possible (Open, Save, Copy, Paste)
 - All needed information should be visible



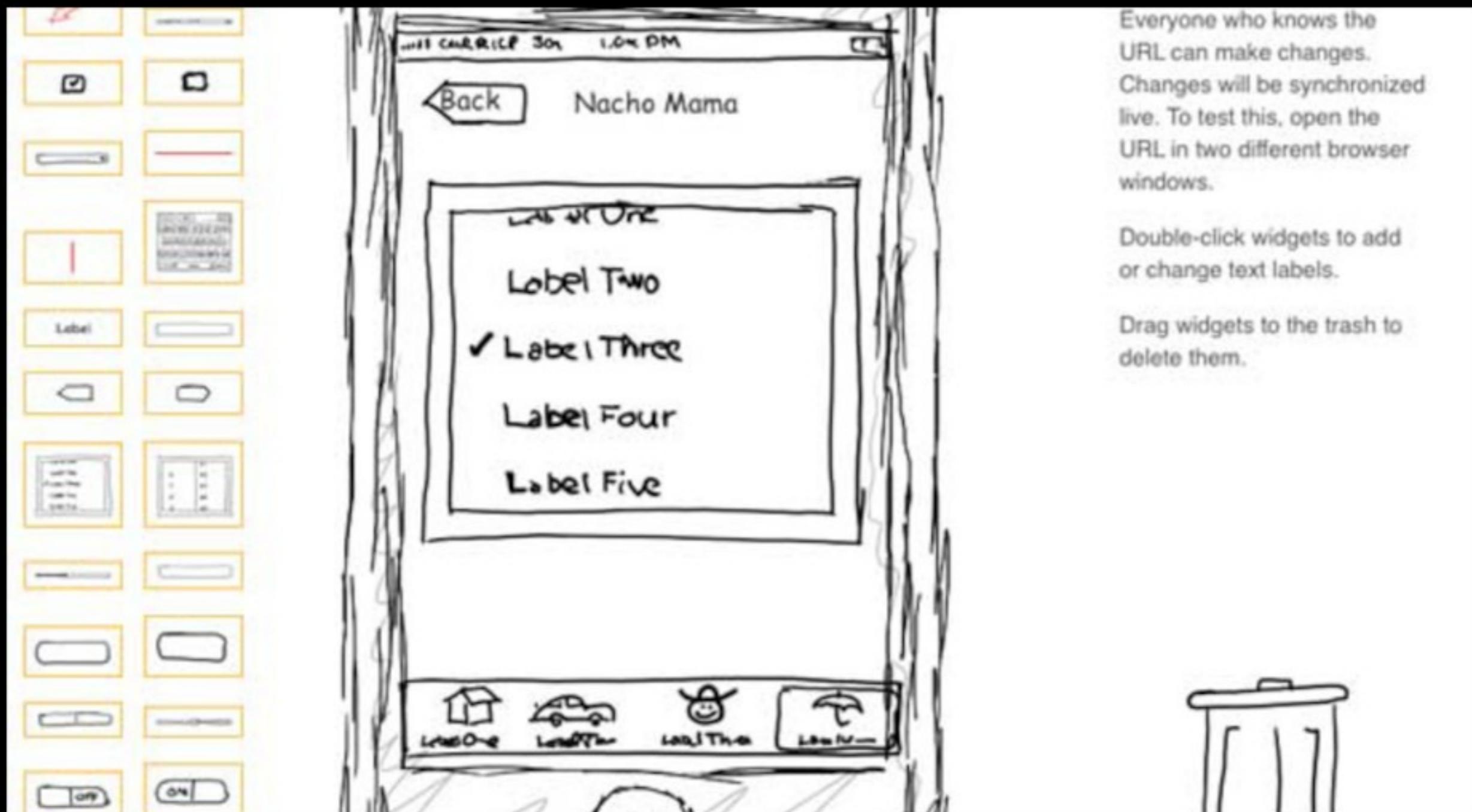
Summary

- Good design is about usability and engagement.
- It is about ensuring systems are accessible to all and that designs are acceptable for the people and contexts in which they will be used.
- Paying attention to design principles leads to good design.

Summary (continued)

- Systems need to be
 - Learnable - through ensuring good visibility, consistency, affordance and familiarity
 - Effective - through providing good navigation, feedback, control, and ensuring good recovery and utilizing constraints
 - Accommodating - through flexibility, style and conviviality

Prototyping tools



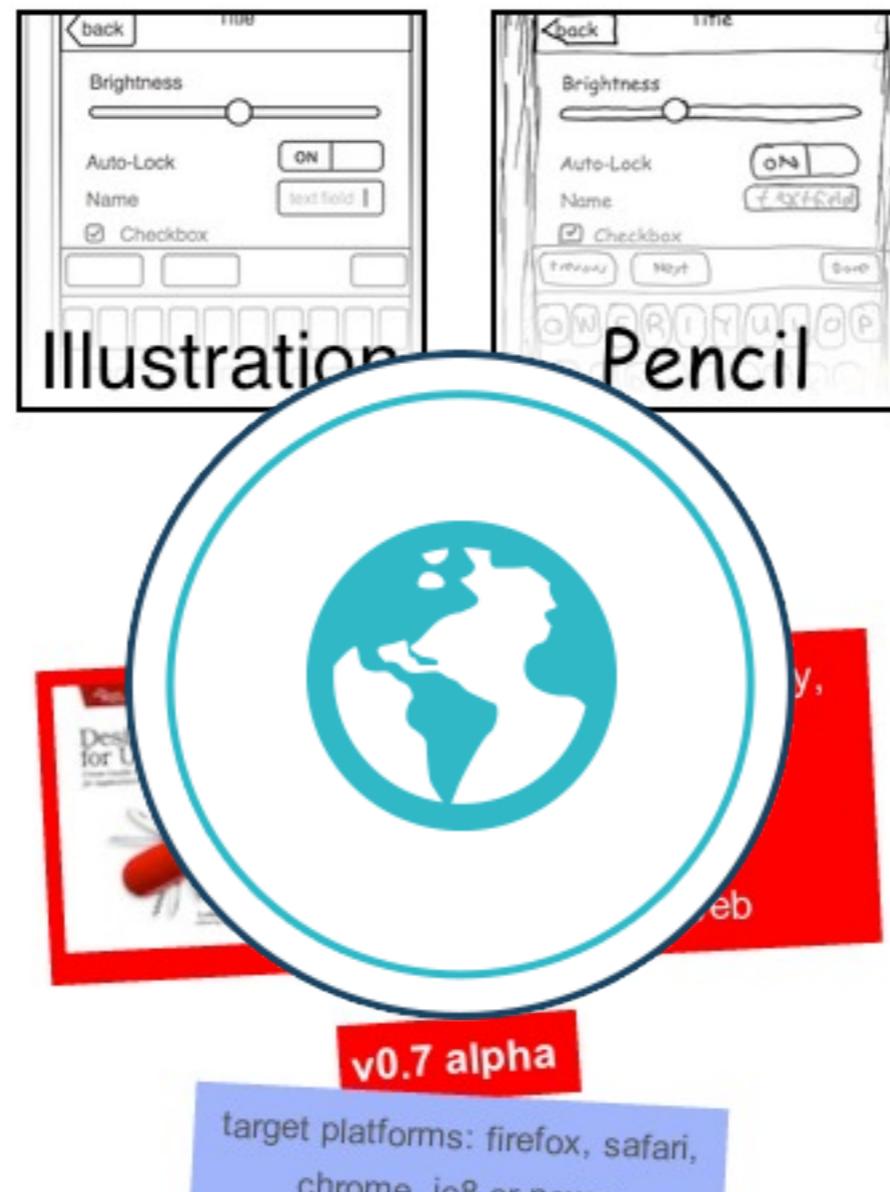
Everyone who knows the URL can make changes. Changes will be synchronized live. To test this, open the URL in two different browser windows.

Double-click widgets to add or change text labels.

Drag widgets to the trash to delete them.

<http://iphonemockup.lkmc.ch/>

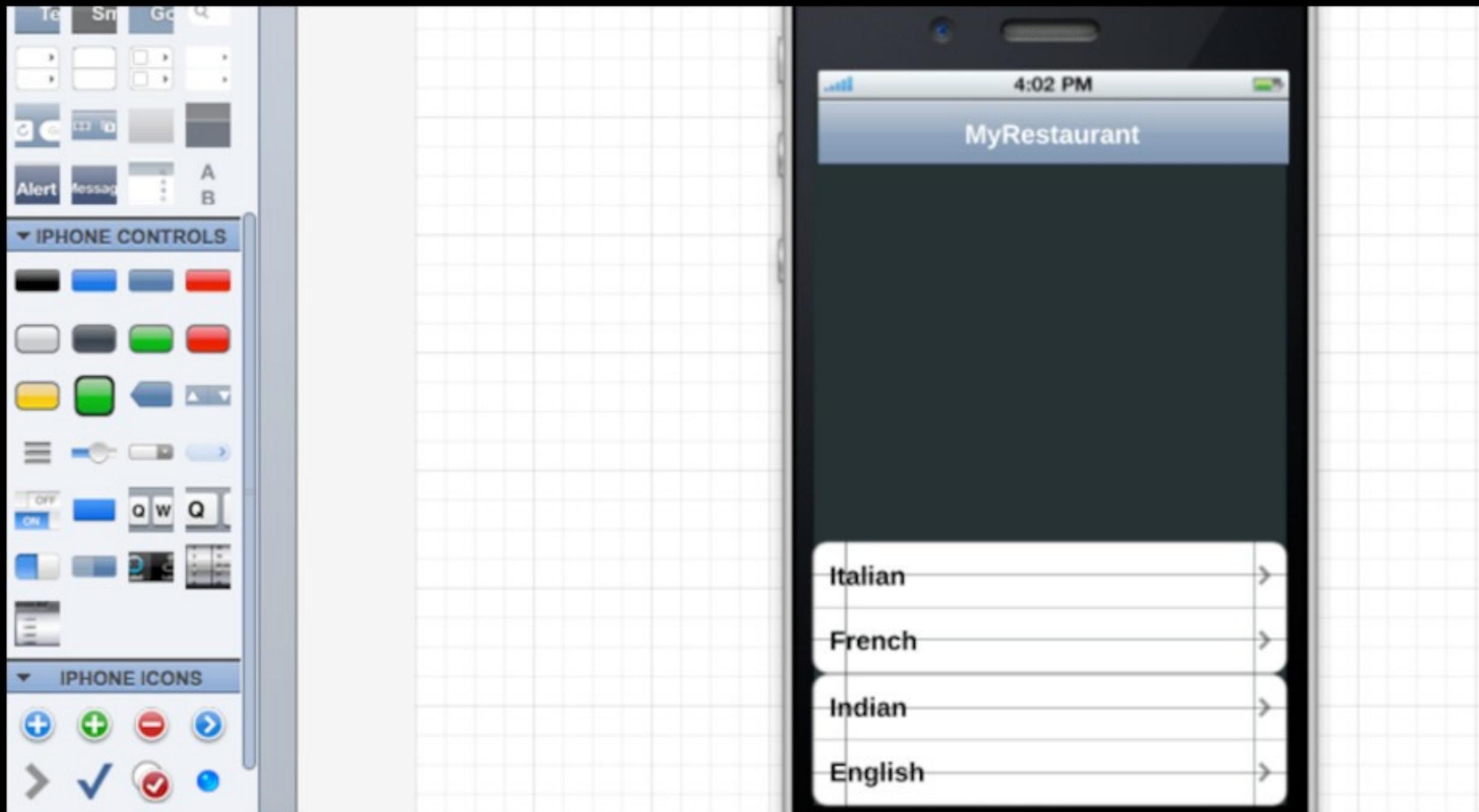
Pick "Illustration" or "Pencil" to create a new iPhone Mockup:



<http://iphonemockup.lkmc.ch/>

Disclaimer: Any creation of a mockup through this website happens at your own risk. Note that your mockups are *not protected in any way* other than by a non-obvious URL. I can not be held responsible if you create a

Prototyping tools



<http://lucidchart.com/>

iOS vs Android

Sandboxed / Swap-out

Apple Apps / All

Lockdown / Widgets

file control / file freedom

iMessage / Open

App notifications / wider notifications

Home button / Home and Back Button

Voice Control / Contextual Information

iOS Interface / reskinning interface

Touch ID / Behind

Flat design / paper layer design

App Store Approval / Open submission

iOS vs Android

centered text/ left align
status bar space and positioning
tab nav / drawer nav
Helvetica / Roboto
flat cards / card shading



<http://lucidchart.com/>

Our flow chart maker works the way you do

Our online diagram application makes it easy to sketch and share professional flowchart diagrams.

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UI Design Basics

Designing for iOS

iOS App Anatomy

Adaptivity and Layout

Starting and Stopping

Navigation

Modal Contexts

Interactivity and Feedback

Animation

Branding

Color and Typography

Icons and Graphics

Terminology and Wording

Integrating with iOS

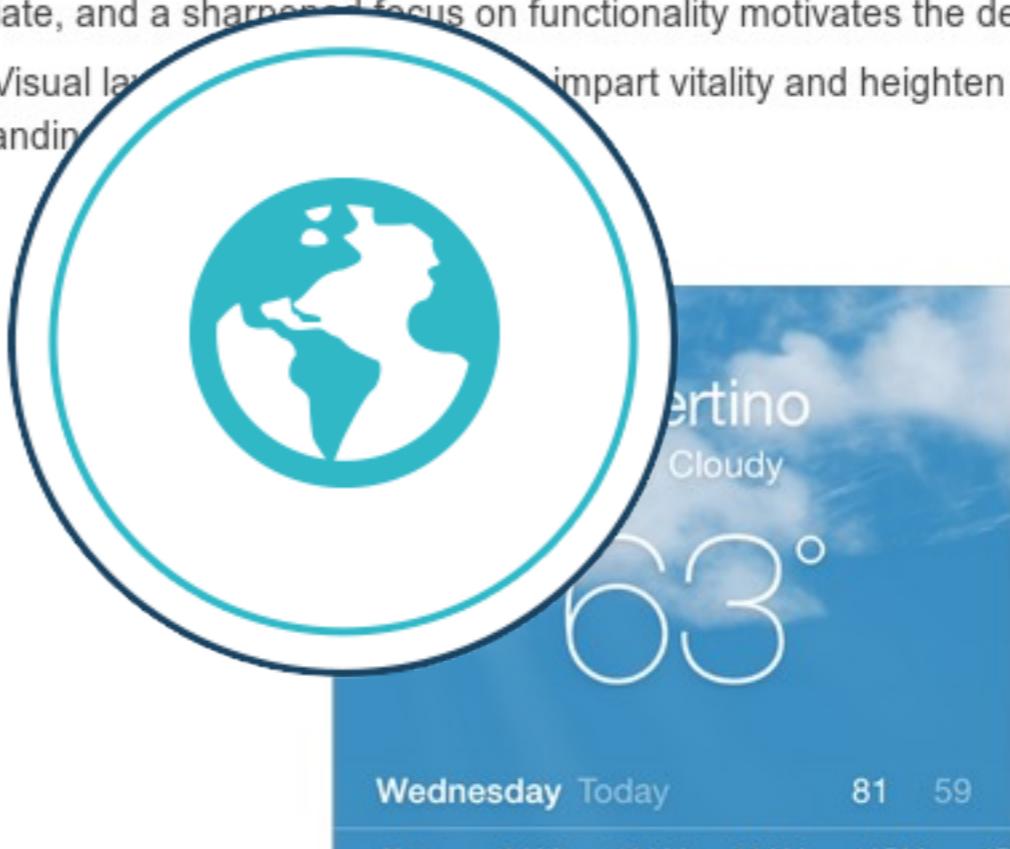
Design Strategies

iOS Technologies

Designing for iOS

iOS embodies the following themes:

- **Deference.** The UI helps people understand and interact with the content, but never competes with it.
- **Clarity.** Text is legible at every size, icons are precise and lucid, adornments are subtle and appropriate, and a sharpened focus on functionality motivates the design.
- **Depth.** Visual layers and interactions impart vitality and heighten people's delight and understanding.



<https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/>

Icon and Image Design

Revision History

Thursday		84	61
Friday		81	57
Saturday		81	59
Sunday		81	59
Monday		82	61

Feedback



Introduction

App Components

App Resources

App Manifest

User Interface

Overview

Layouts

Input Controls

Input Events

Menus

**BLOG ARTICLES**[Say Goodbye to the Menu Button](#)

User Interface

Your app's user interface is everything that the user can see and interact with. Android provides a variety of pre-built UI components such as structured layout objects and UI controls that allow you to build the graphical user interface for your app. Android also provides other UI modules for special interfaces such as dialogs, notifications, and menus.

[OVERVIEW >](#)**TRAINING**[Implementing Effective Navigation](#)

<http://developer.android.com/guide/topics/ui/index.html>

Dialogs

to the action bar in order to promote a consistent Android user experience.

choose appropriate forms of navigation to allow users to effectively and intuitively traverse your content.

Notifications

New Layout Widgets: Space and GridLayout

Designing for Multiple Screens

Toasts

Ice Cream Sandwich (ICS) sports two new widgets

Android powers hundreds of device types with

JAN
27

🕒 Posted 3 years ago

❖ zoom and enhance, the simpsons, tv,

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ABOUT ZOOM AND ENHANCE!

Films and TV shows seem to think we have the magical ability to take a digital video or picture and use the powers of technology to zoom and enhance until the image is clear (particularly when tracking down bad guys). This is a collection of such instances.

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<http://zoomandenhance.tumblr.com/post/41582962944>

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