



conceptual design of software

approaches to
improving
design

process



optimize organization & task structure

Taylor (1880s), Toyota JIT (1980s), CMM (1990s), agile (2000s)

“new” activities



brainstorming



user studies



prototypes

style



Dieter Rams, 1958
pocket transistor radio T3



Alfonso Bialetti, 1933
La Moka coffee maker



Henry Hobson Richardson, 1877
Trinity Church, Boston

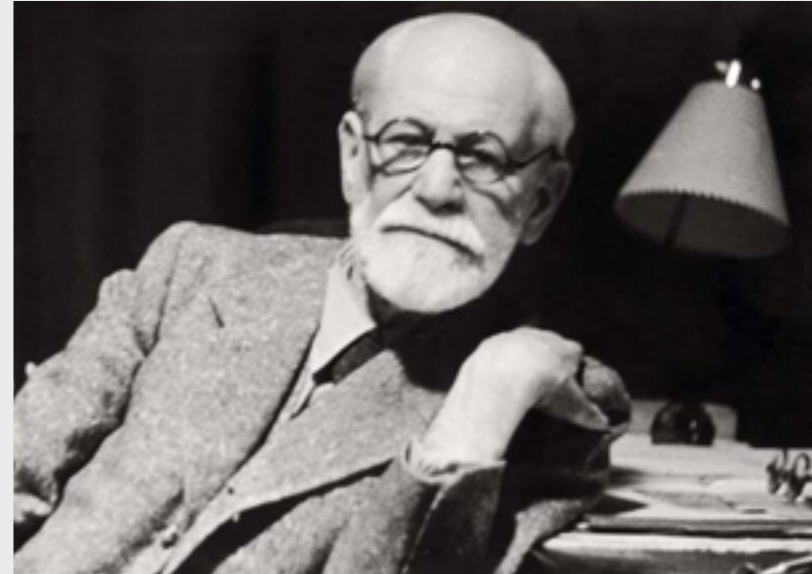


Leica, 1953
M3 rangefinder camera

broadening



anthropology



psychology



art



economics

seeking the
essence

designer vs engineer

	designer	engineer
building	facade, entry flow, access, light	beam, wall structural integrity
software	purpose, concept fitness for purpose	function, datatype decoupling, localization

concepts

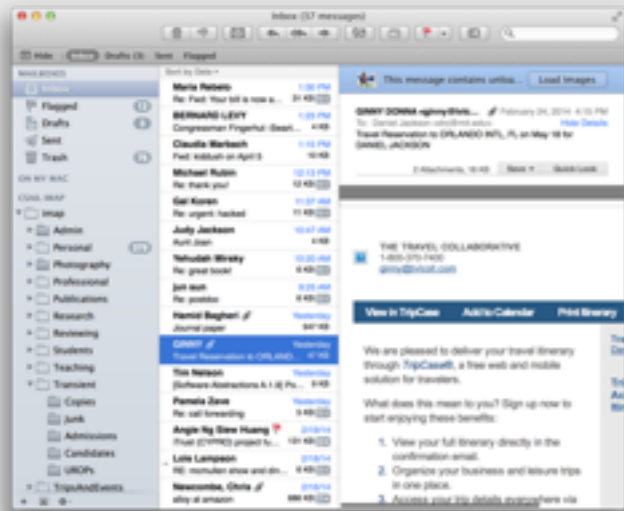
&

software

what characterizes an app?

concepts!

Apple Mail



EmailAddress
Message
Folder or Label

Microsoft Word



Paragraph
Format
Style

Twitter



Tweet
Hashtag
Following

Photoshop



PixelMap
Layer/Mask
Adjustment

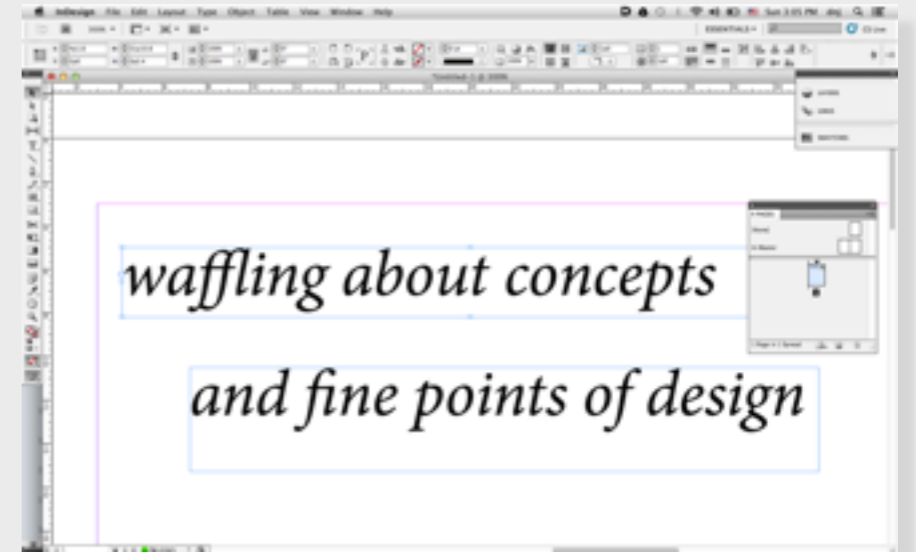
concepts differentiate classes



text editor
line, buffer,
character set



word processor
paragraph,
format, style



desktop publishing app
text flow, link,
page template

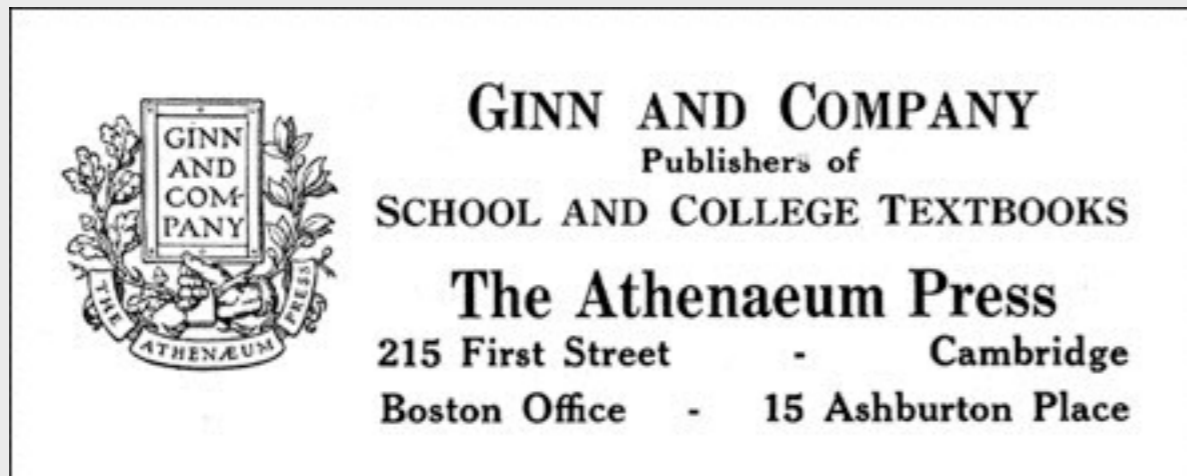


where are Word's concepts from?

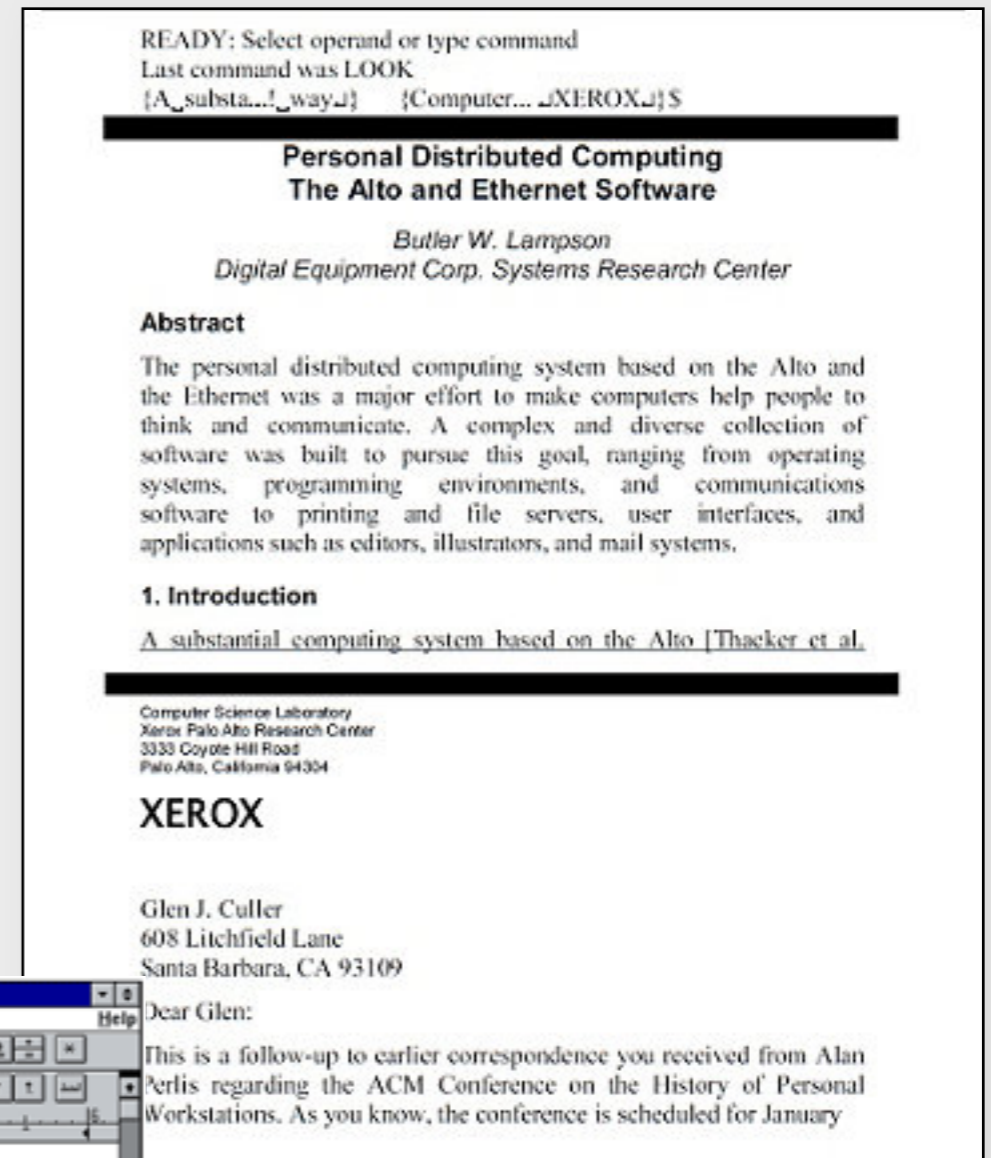


Charles Simonyi: brought key concepts to Word from Xerox PARC

rich concepts have long journeys



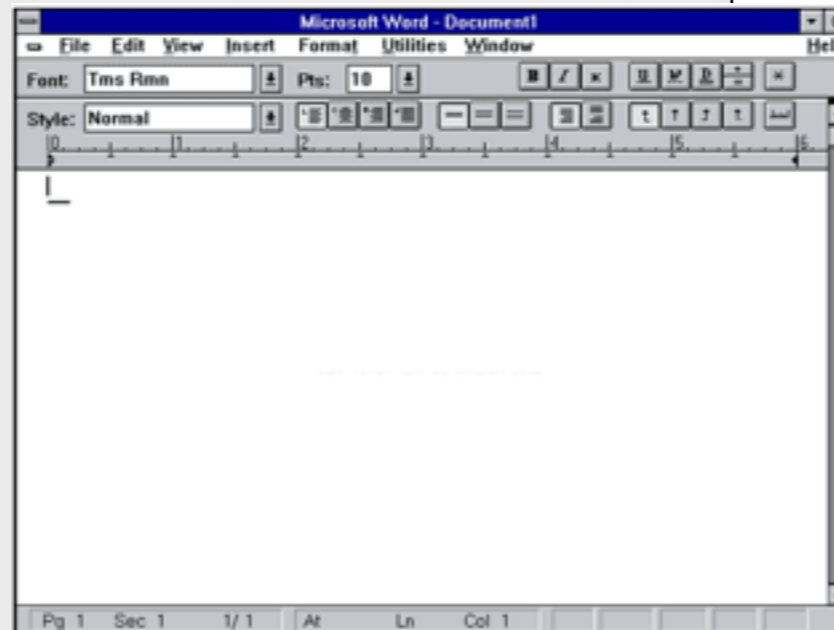
Ginn & Co, since 1868



Bravo, 1974



Apple Pages, 2005



Microsoft Word, 1983

where do concepts come from?

**domain concepts:
exist in problem domain**

photo, movie, song

account, balance

social security number

typeface, ligature

**analogic concepts:
based on known notions**

blog post, email, tweet

desktop, folder, file

layer, mask, stacking

cart, order, item

**synthetic concepts:
invented for software**

friend, follower

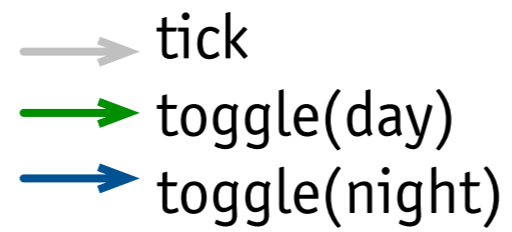
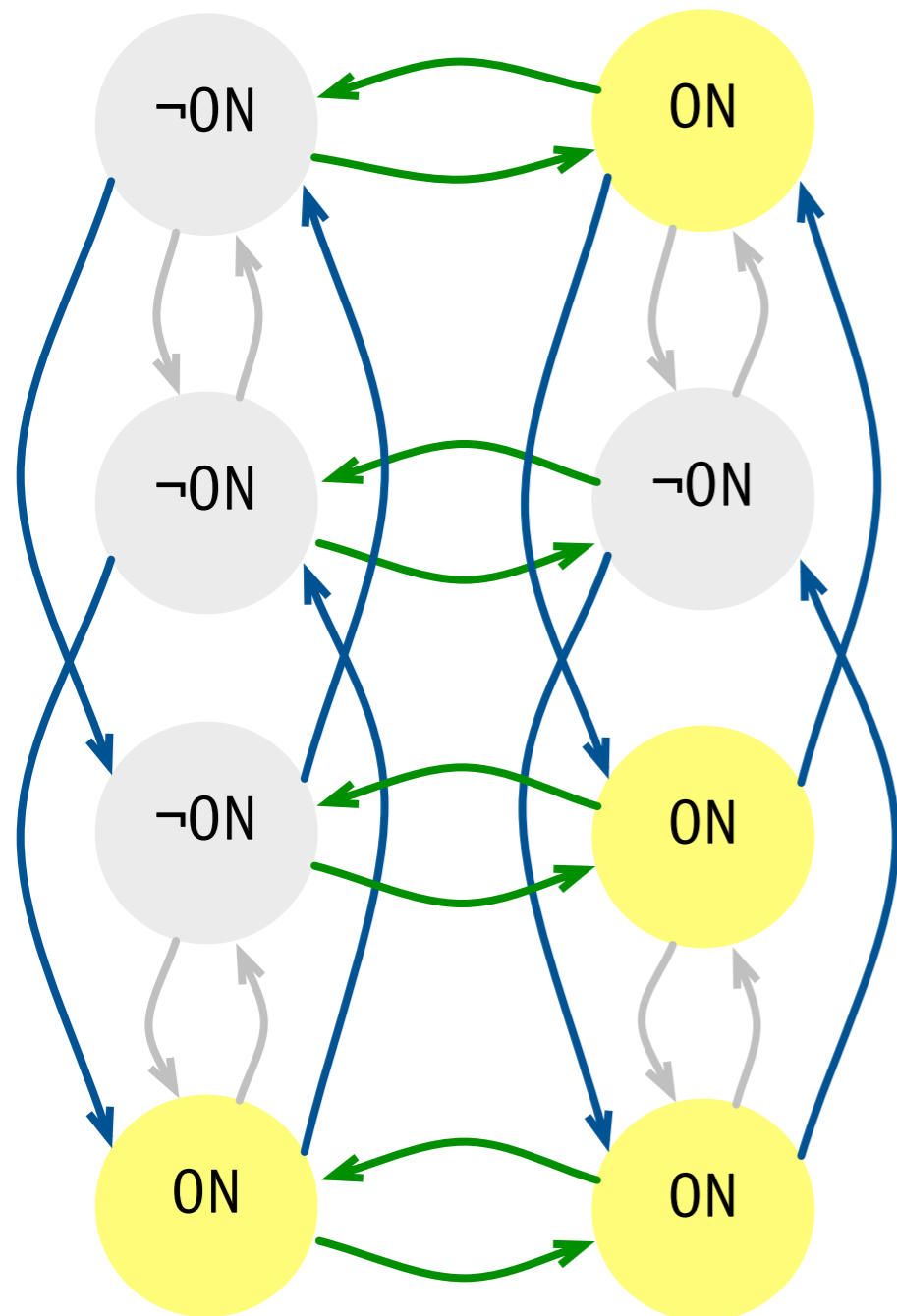
relative reference

selection, buffer

permission, capability

so what exactly
is a concept?

a behavioral model



a conceptual model

on: bool

time: Slot

schedule: set Slot

inv on = (time \in schedule)

tick \triangleq time := next(time)

toggle (s: Slot) \triangleq

if s \notin schedule then schedule := schedule \cup {s}

else schedule := schedule \setminus {s}

concepts as explanatory state

a concept is

part of the internal state

modifiable by user actions

indirectly affecting the external world

examples

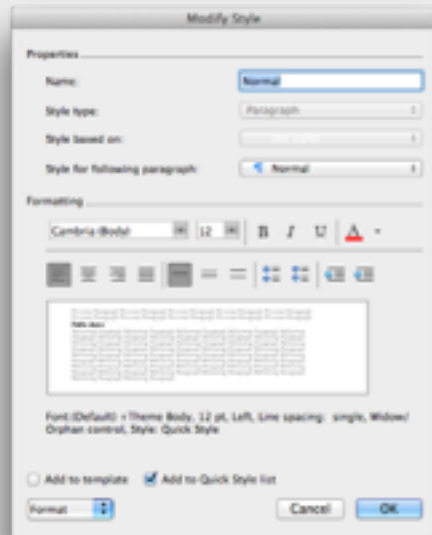
style (Word): affects formatting

tag (Facebook): affects view permission

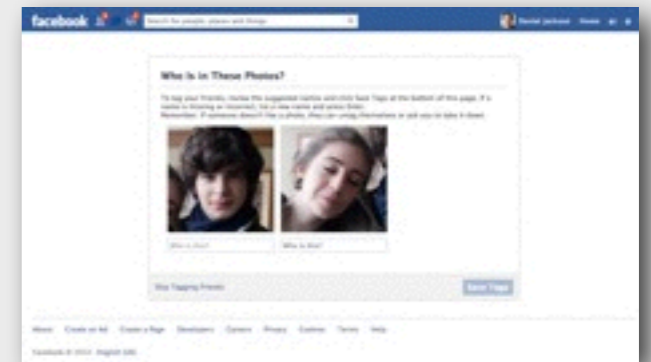
selection (Finder): affects result of delete, move, etc

concept story

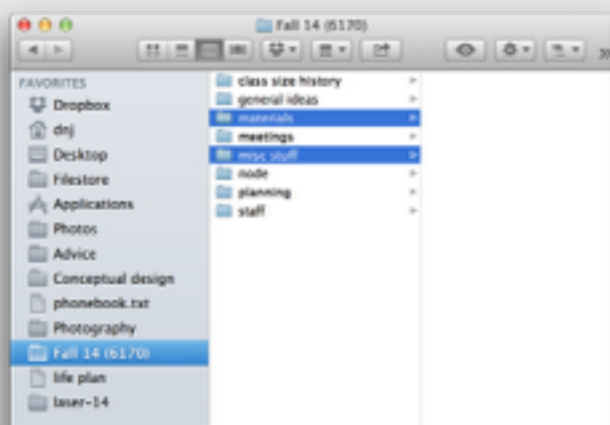
if you use the concept like this, the outcome will be...



“if you change a style’s format, then all paragraphs of that style will change format accordingly”










“if you tag a photo, then all friends of the person tagged will be able to see the photo”



“if you select a file, then pressing delete will move the file to the trash”


exercise:
concepts

what are the key concepts?


facebook      Daniel Jackson Home  

Who Is in These Photos?

To tag your friends, review the suggested names and click **Save Tags** at the bottom of this page. If a name is missing or incorrect, list a new name and press **Enter**.
Remember: If someone doesn't like a photo, they can untag themselves or ask you to take it down.



Who is this?



Who is this?

[Skip Tagging Friends](#) [Save Tags](#)

[About](#) [Create an Ad](#) [Create a Page](#) [Developers](#) [Careers](#) [Privacy](#) [Cookies](#) [Terms](#) [Help](#)

Facebook © 2013 · English (US)

what are the key concepts?

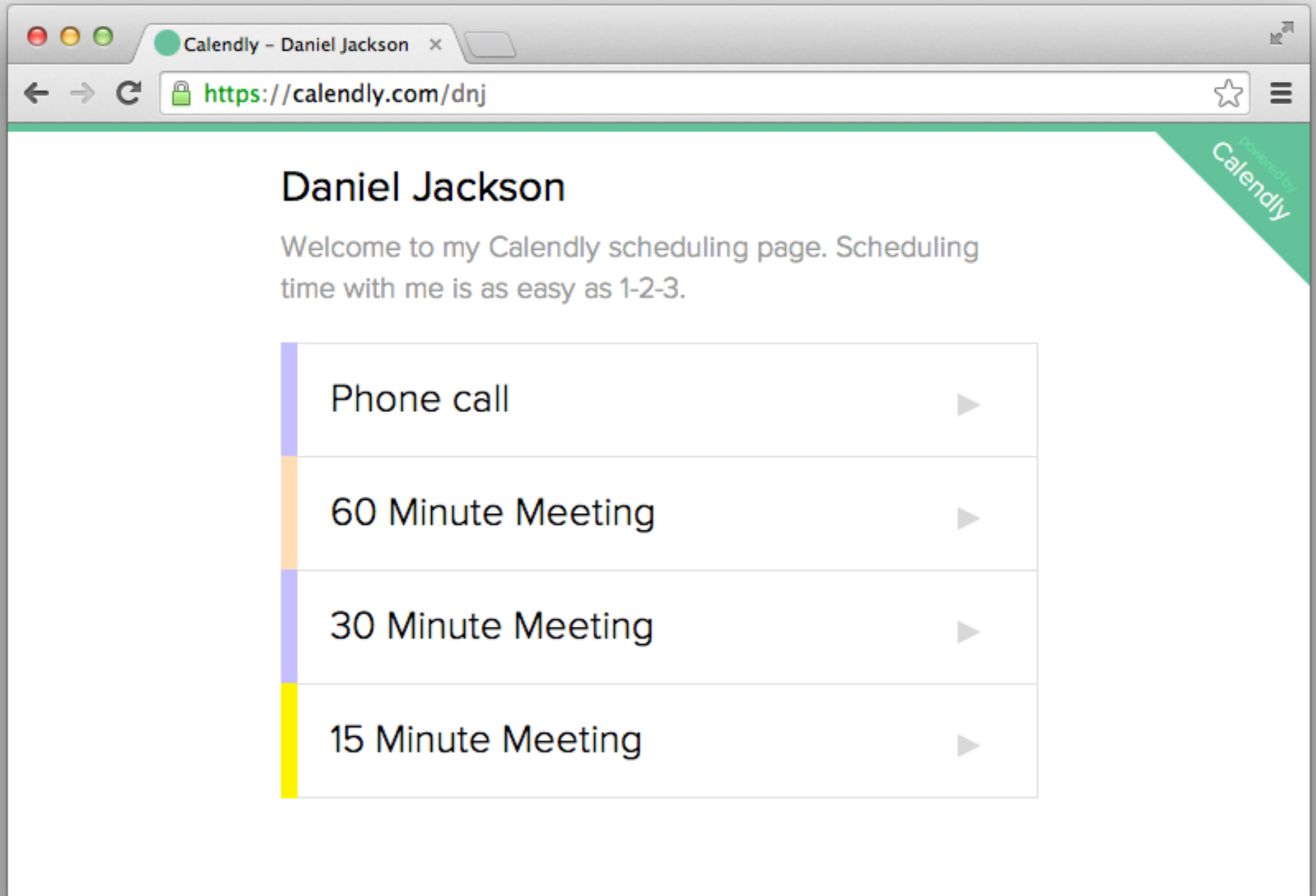
The screenshot displays the Waze live map interface. At the top, the browser address bar shows the URL <https://www.waze.com/livemap>. The Waze logo and navigation links (LIVE MAP, MAJOR EVENTS, SUPPORT, BLOG, ABOUT, Login) are visible in the header.

The main map area shows a route from 32 Vassar St, Cambridge, MA to 150 Pleasant Street, Newton, MA 02459. The route is displayed with three options:

- 1 Commonwealth Ave**: 7.02 miles, 24 min
- 2 I-90 W Mass Pike**: 8.74 miles, 28 min
- 3 Beacon St**: 7.15 miles, 30 min

The map includes various traffic indicators (red and yellow icons) and landmarks such as Mt Auburn Cemetery, Harvard University, and Boston College. The bottom right corner shows the coordinates -71.660, 42.577 and the copyright notice © 2006-2014 Waze Mobile. All Rights Reserved.

what are the key concepts?



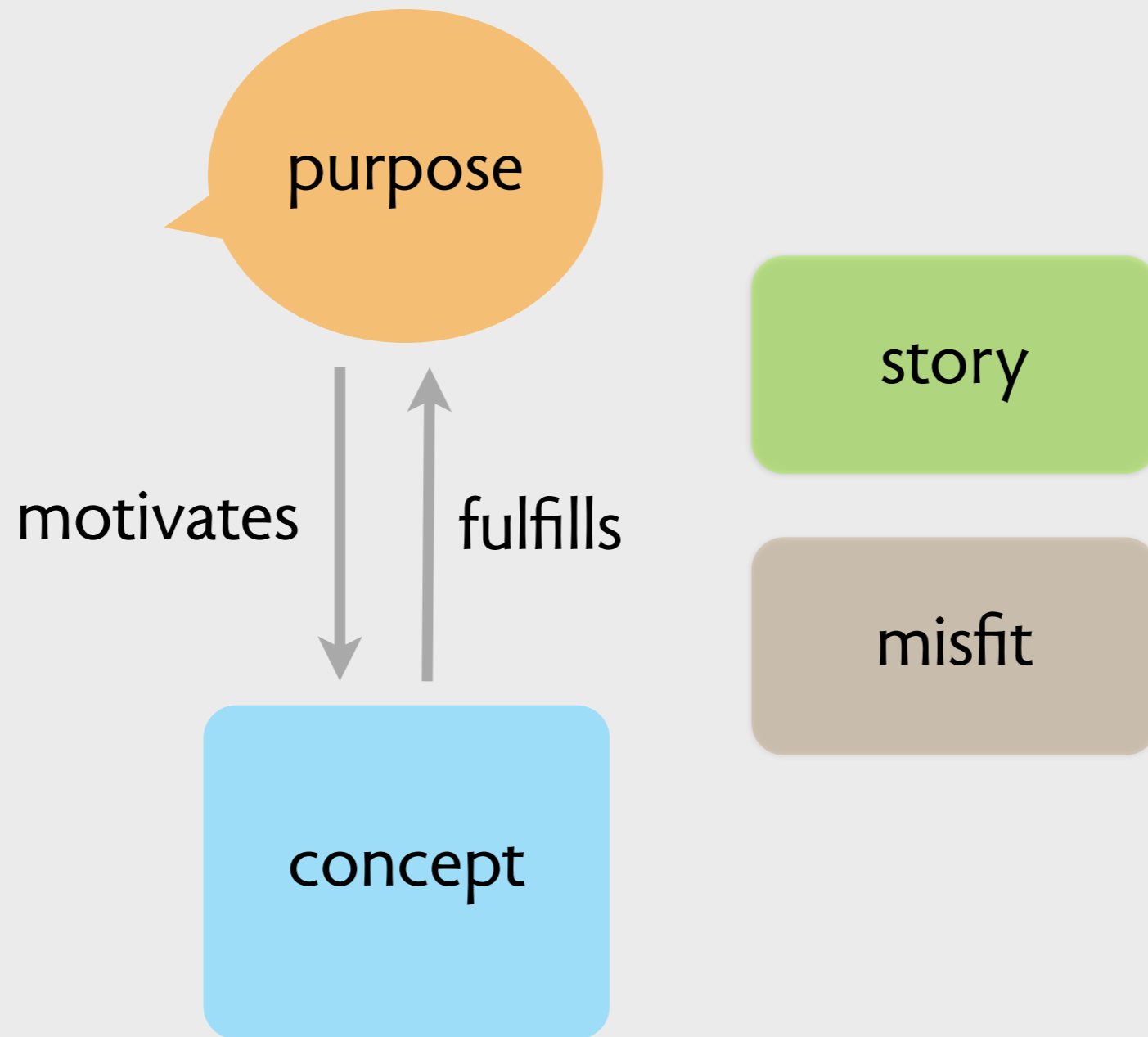
The image shows a browser window with the URL <https://calendly.com/dnj>. The page title is "Daniel Jackson". Below the title, there is a welcome message: "Welcome to my Calendly scheduling page. Scheduling time with me is as easy as 1-2-3." On the right side, there is a green banner that says "powered by Calendly". The main content is a list of four scheduling options, each with a colored vertical bar on the left and a right-pointing arrow on the right:

- Phone call (purple bar)
- 60 Minute Meeting (orange bar)
- 30 Minute Meeting (light purple bar)
- 15 Minute Meeting (yellow bar)

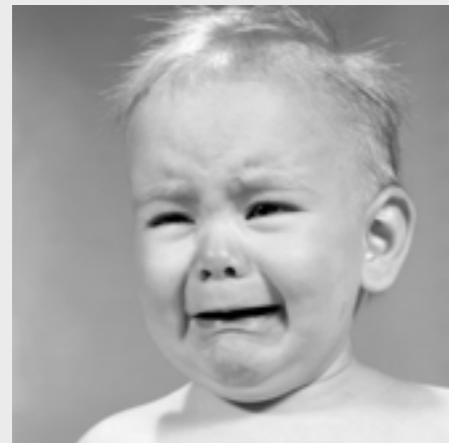
Phone call	▶
60 Minute Meeting	▶
30 Minute Meeting	▶
15 Minute Meeting	▶

purposes

designing for a purpose



an example

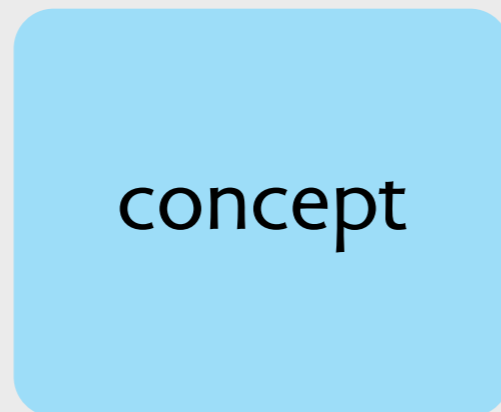


undo deletions



motivates

fulfills



trashcan

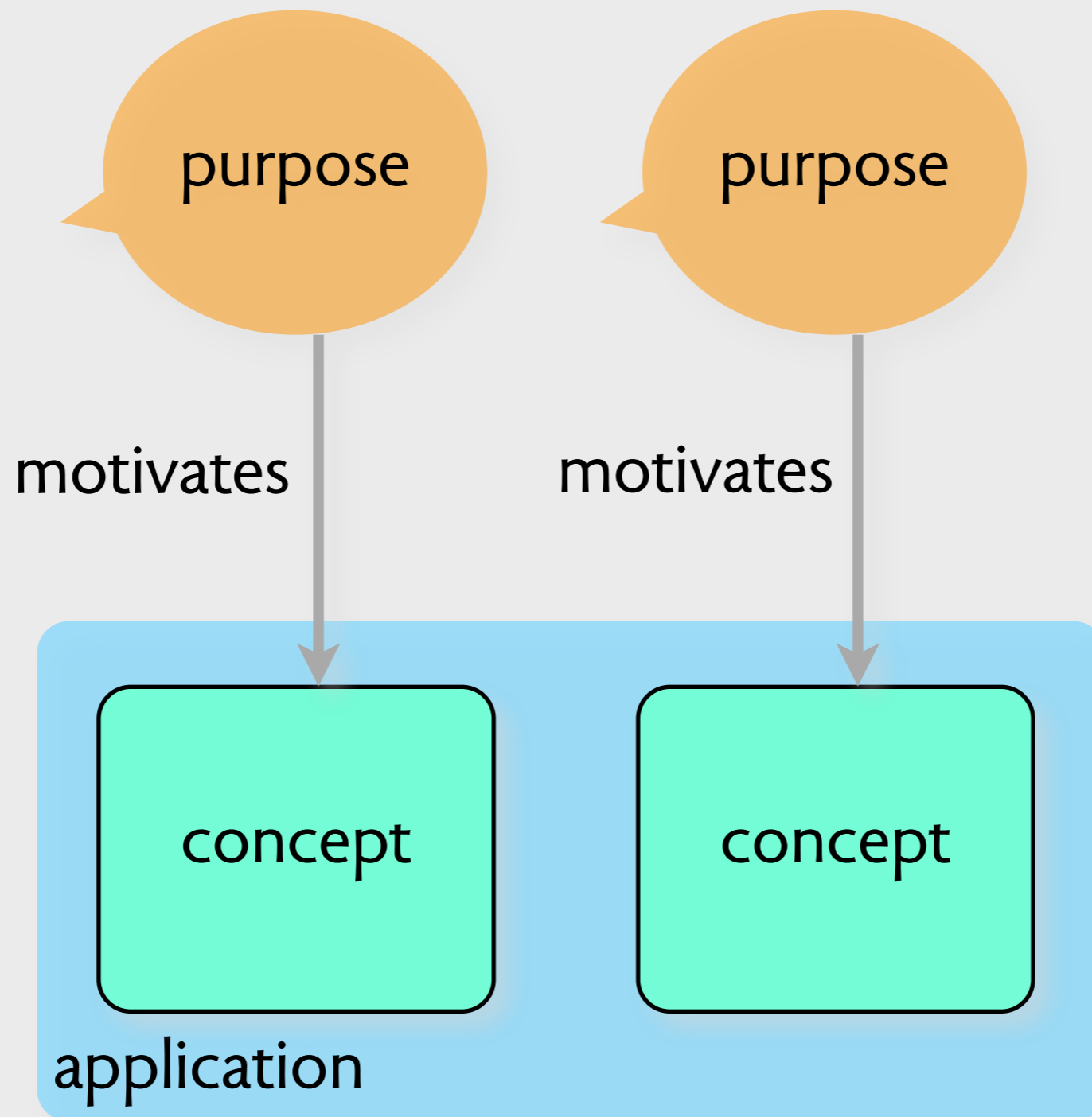
if you select an object and delete it, it will be in the trash; if you empty the trash, it's gone, but if not you can move it out

story

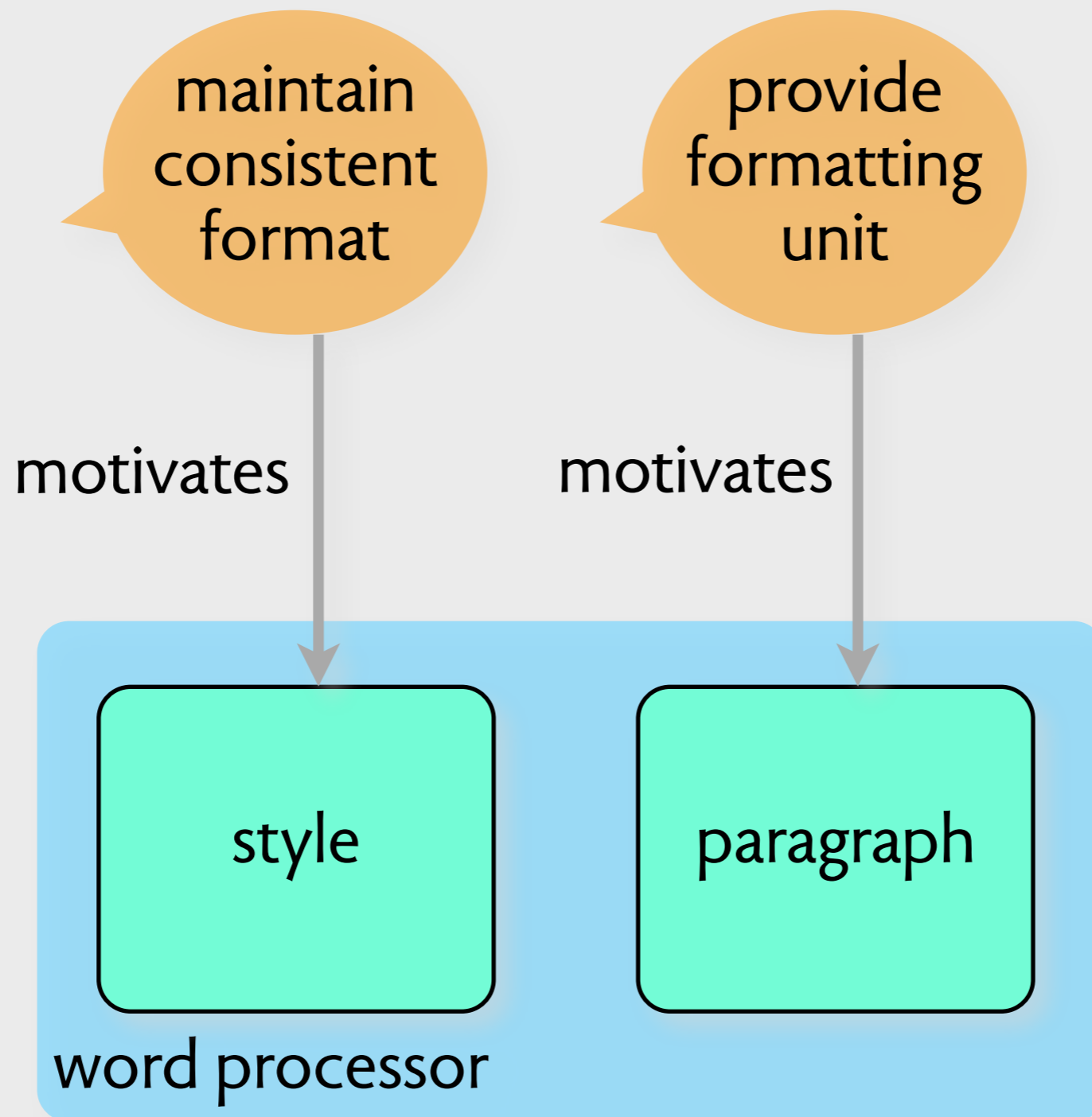
misfit

if there are many objects in the trash, and you delete an object and don't remember it's name, you won't be able to find it again

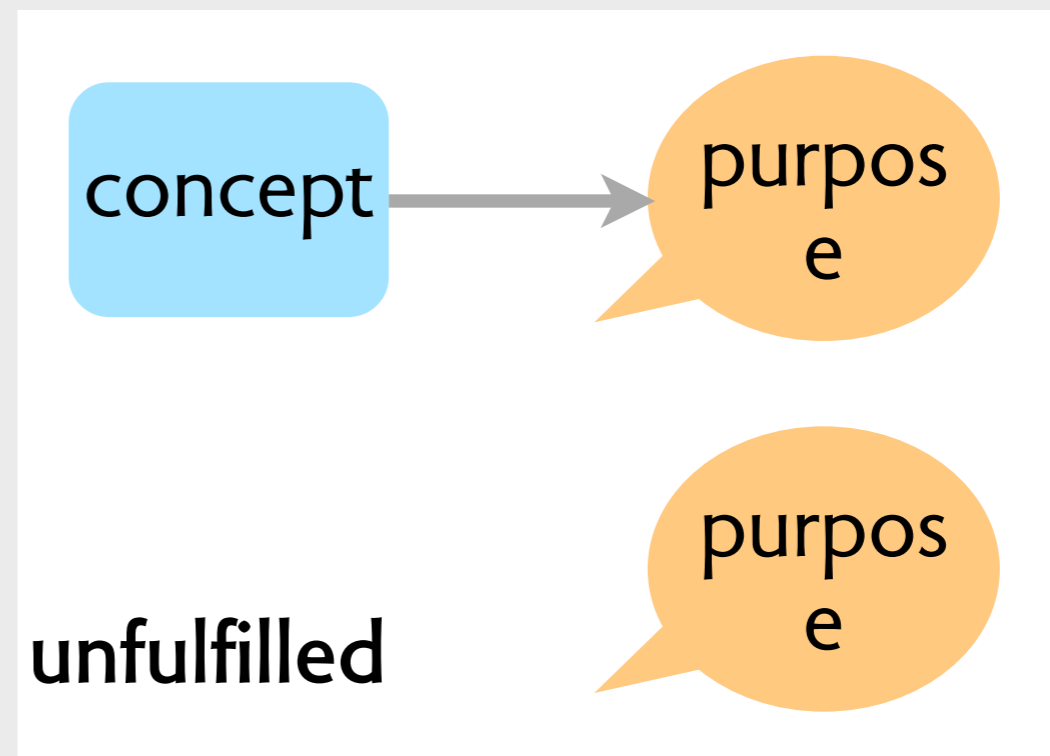
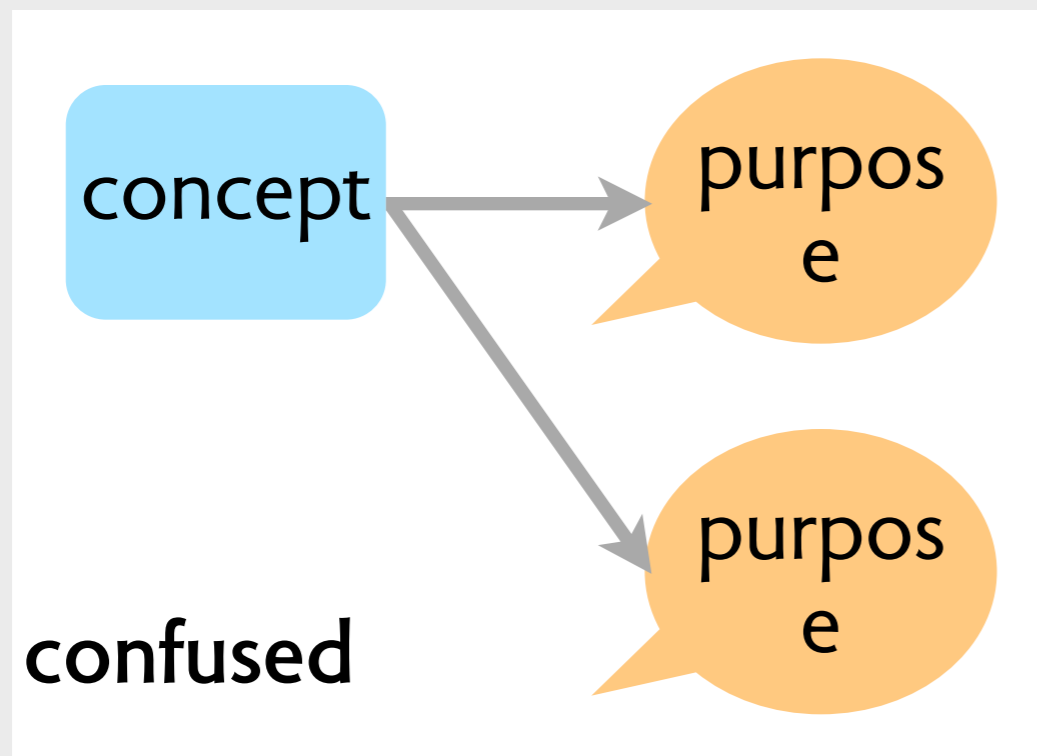
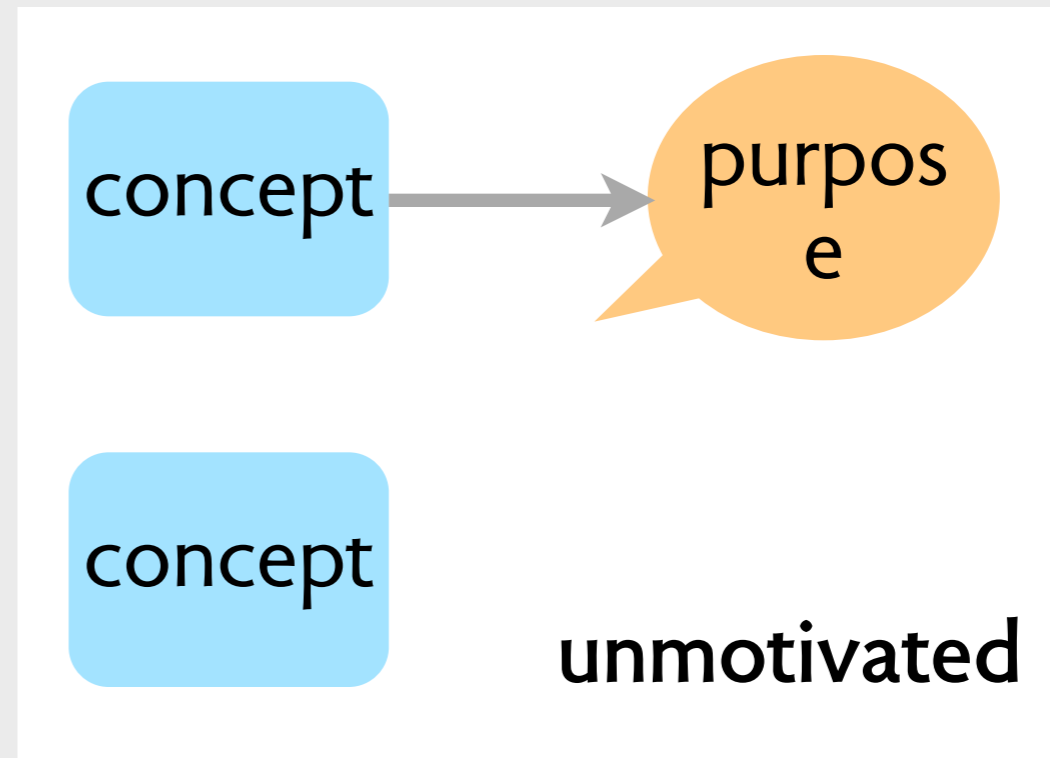
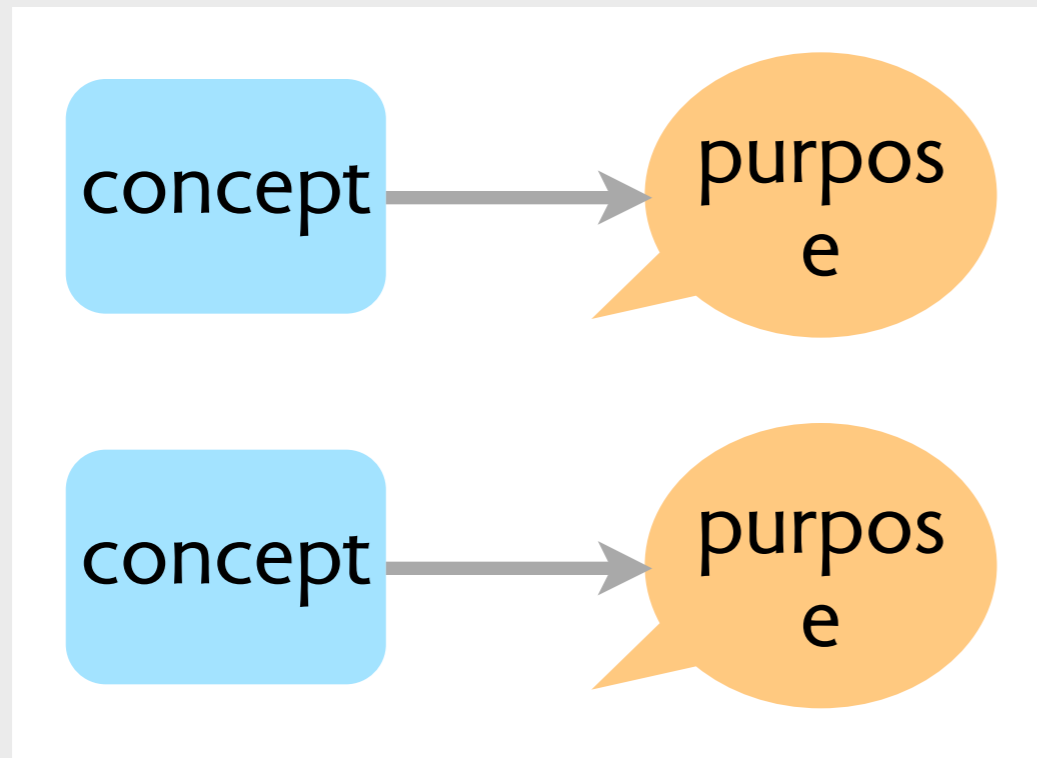
one purpose/concept



example



concept-purpose map



exercise:

purposes

what's the purpose of ...?

these apps?

Dropbox

Photoshop

WhatsApp

these concepts?

tagging (in Facebook)

buffers (in emacs)

relative references (in Excel)

concept

criteria

concept criteria

compelling: clear story, one purpose

controllable: fulfills purpose without interference

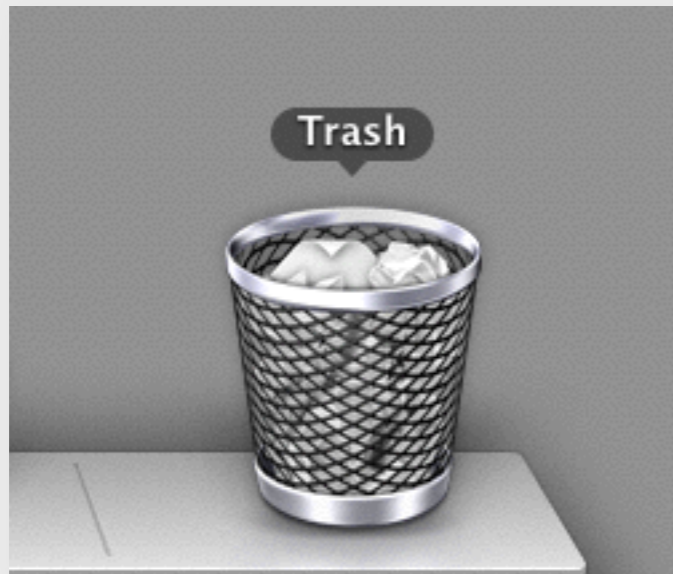
complete: general and uniform over concept's scope

consistent: represented consistently in the user interface

conventional: reuses existing concepts when applicable

compelling

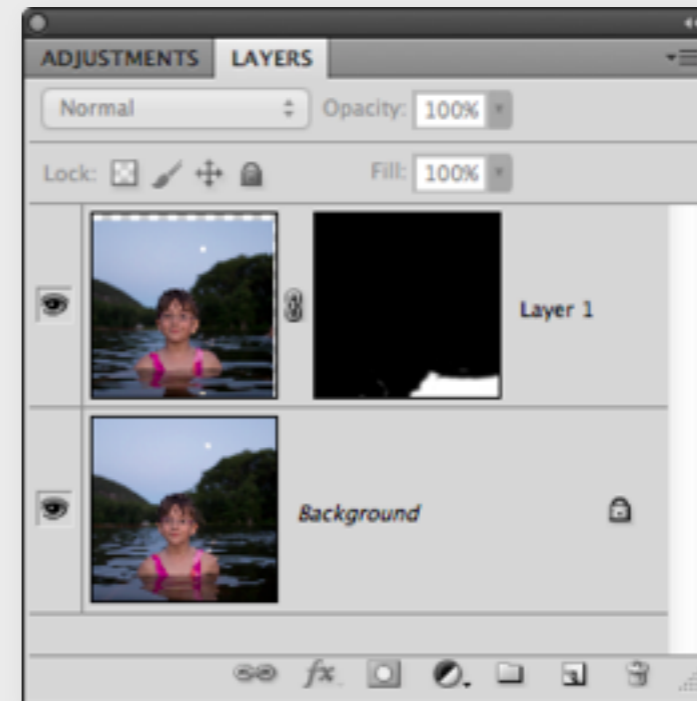
simple story & motivated by one purpose



trash (OS X)

story: delete moves to special folder; emptying it removes contents for good

purpose: allow undo of deletions



layer (Photoshop)

story: resulting pixel map is background map with composition of functions given by layers

purpose: non-destructive edits

faucets



compelling



not compelling

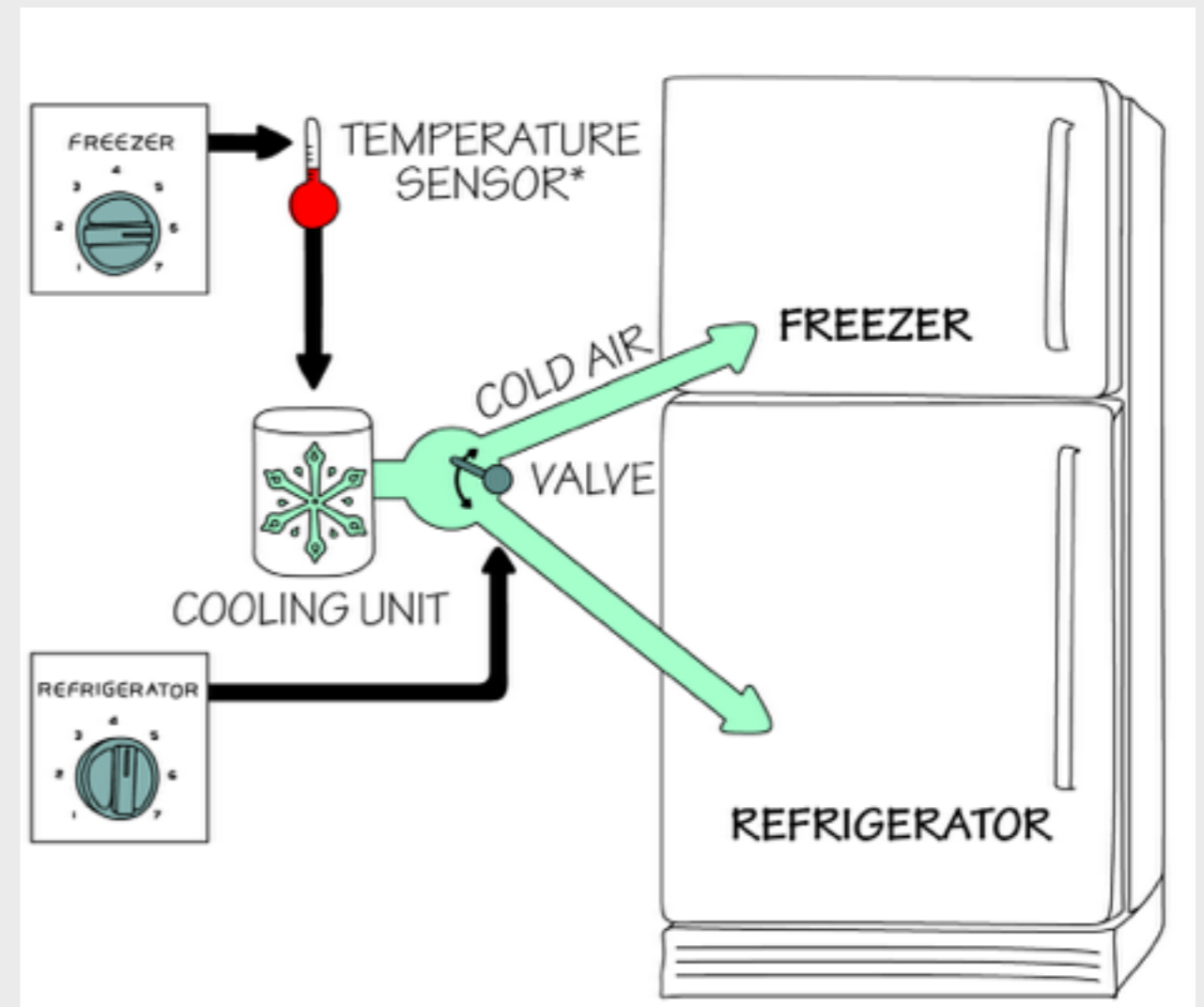
refrigerator controls

Don Norman, Design of Everyday Things, 1988 (2013)

internal mechanism



controls



more unconvincing concepts

no single clear purpose

Git's staging area

JPEG quality and resolution

Gmail's categories (vs labels)

no simple operational principle

CSS's dimensions (inches, pixels)

Tumblr's answers vs comments

serves someone else's purpose

direct flight (legs share flight number)

controllable

fulfills purpose without interference from other concepts



skip slide



make parent



make parent
and skip

skipping and hierarchy do not interfere in Apple Keynote

gmail labels & conversations

from Eunsuk Kang

Eunsuk Kang <eskang@csail.mit.edu>

December 11, 2014 2:27 AM

To: Daniel Jackson <dnj@MIT.EDU> , Santiago Perez De Rosso <sperezde@csail.mit.edu>

[Hide Details](#)

an example of bad coupling in gmail?

[Conceptual Design](#) ↑

Hi Daniel, Santiago,

I am not sure whether this falls into one of the conceptual design issues that you have been analyzing, but here's a little annoyance that I just ran into using labels in Gmail.

This evening, I made two separate reservations with Enterprise (one in Phoenix and another one in Vegas), and the company sent me a confirmation e-mail for each one of them. Usually, I tag travel-related e-mails using a label (e.g. "Vegas Trip 2014") so that I can easily find all the relevant e-mails for a particular trip. Now, the problem is that Gmail automatically grouped the two Enterprise emails into a single conversation. It turns out that in Gmail, a label applied to an e-mail in a conversation is applied to every other e-mail in the same conversation. This means I can't assign separate labels to the two car rentals! Uggh!

(By the way, is it possible to take an e-mail out of a conversation? Either this is impossible or the Gmail UI does not make this easy).

Eunsuk

conversations interfere with labels

aspect ratio fuji x100s



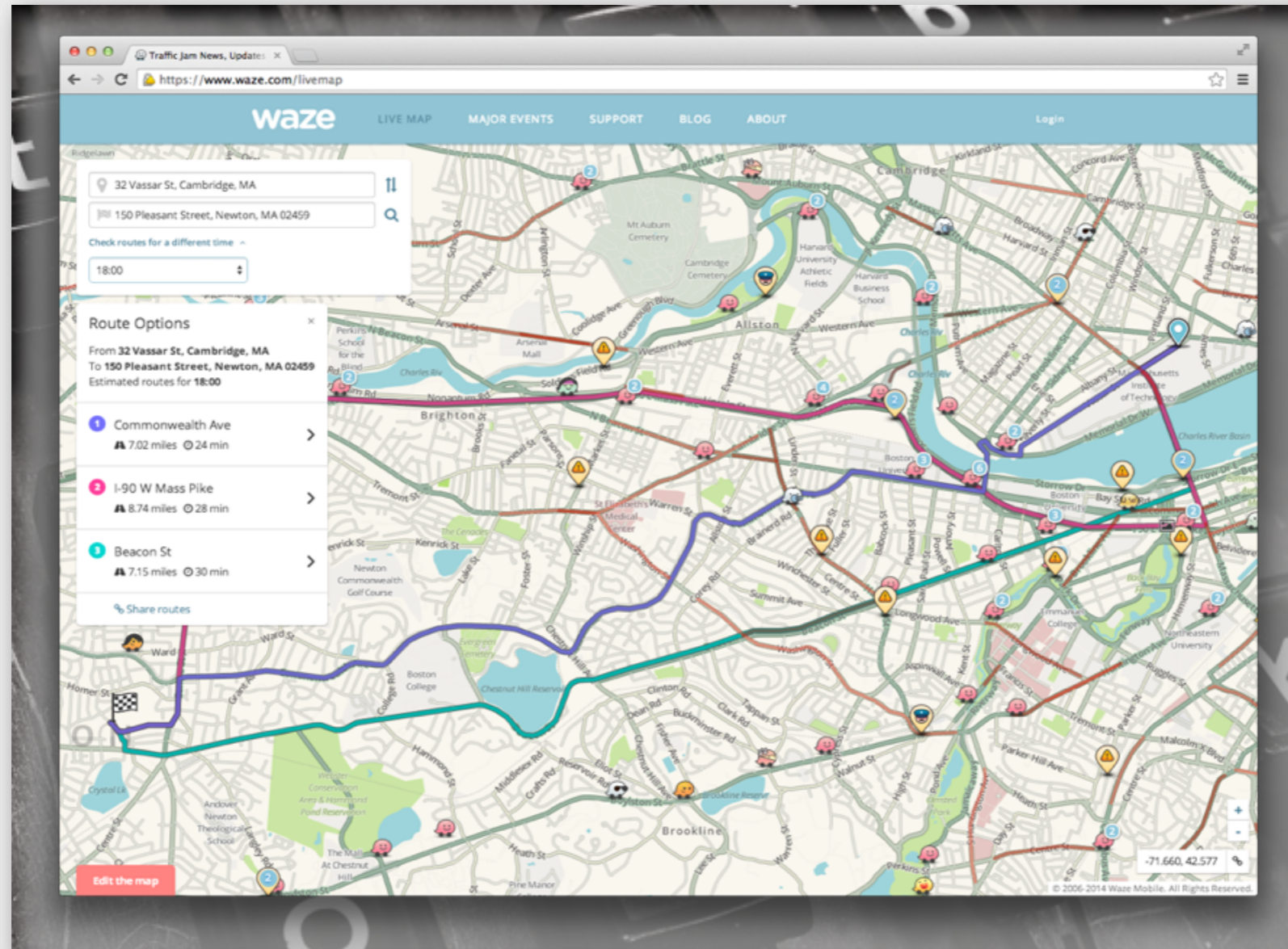
image quality setting



aspect ratio



"image size" setting



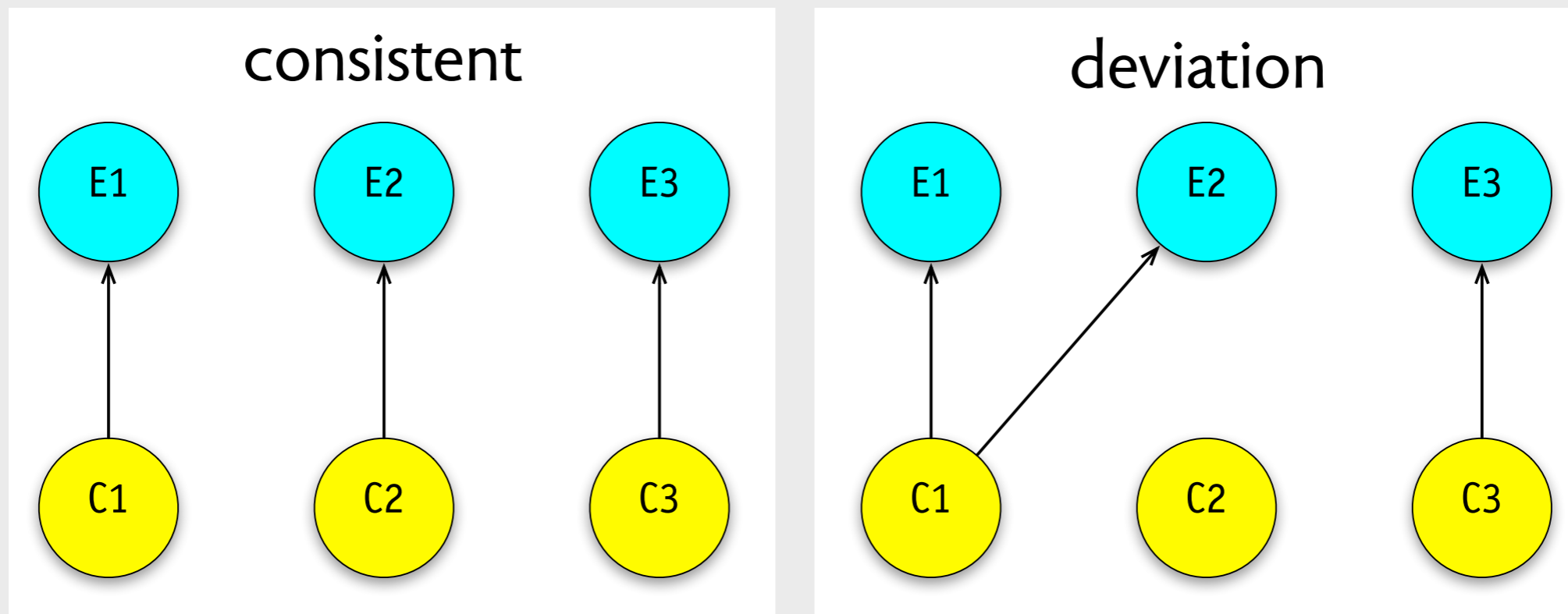
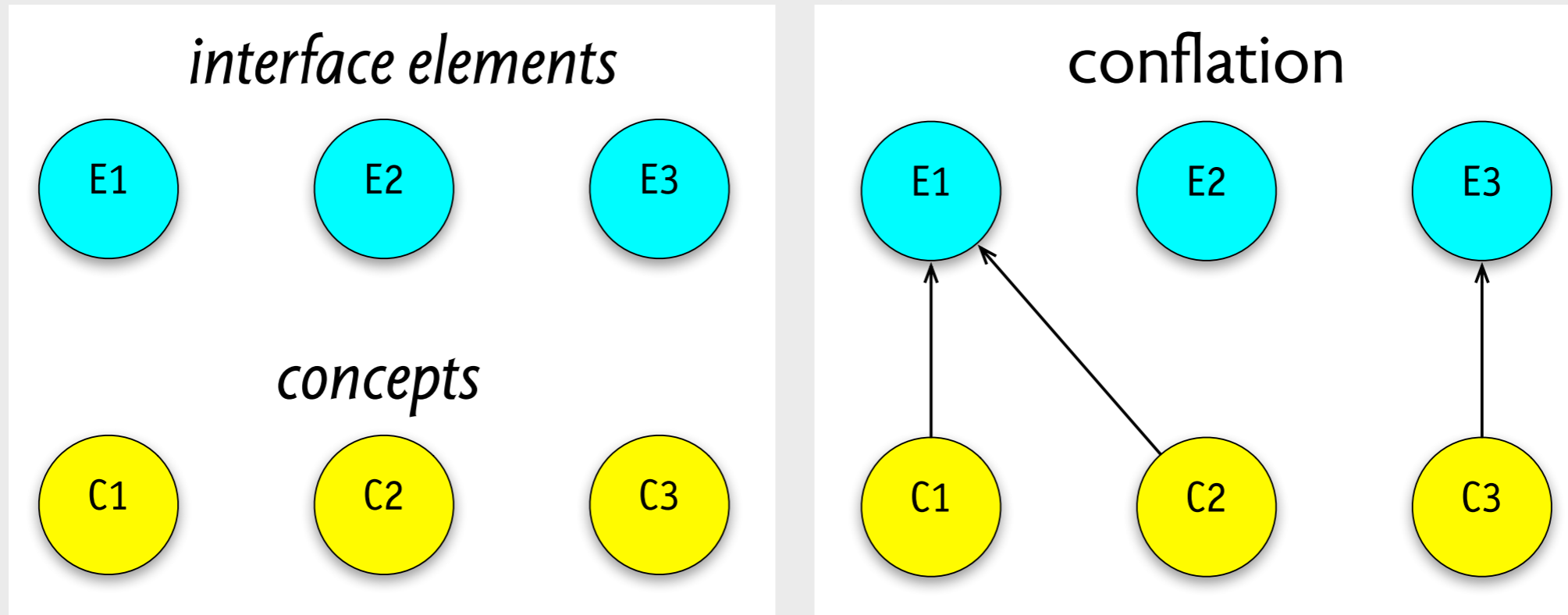
non-standard ratio + RAW?



image quality interferes with image size

consistent

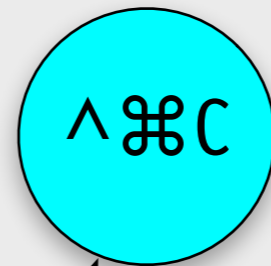
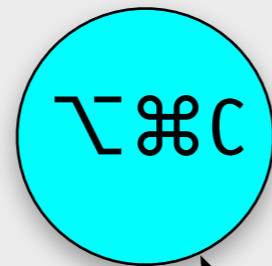
represented consistently in the user interface



deviation in OS X apps

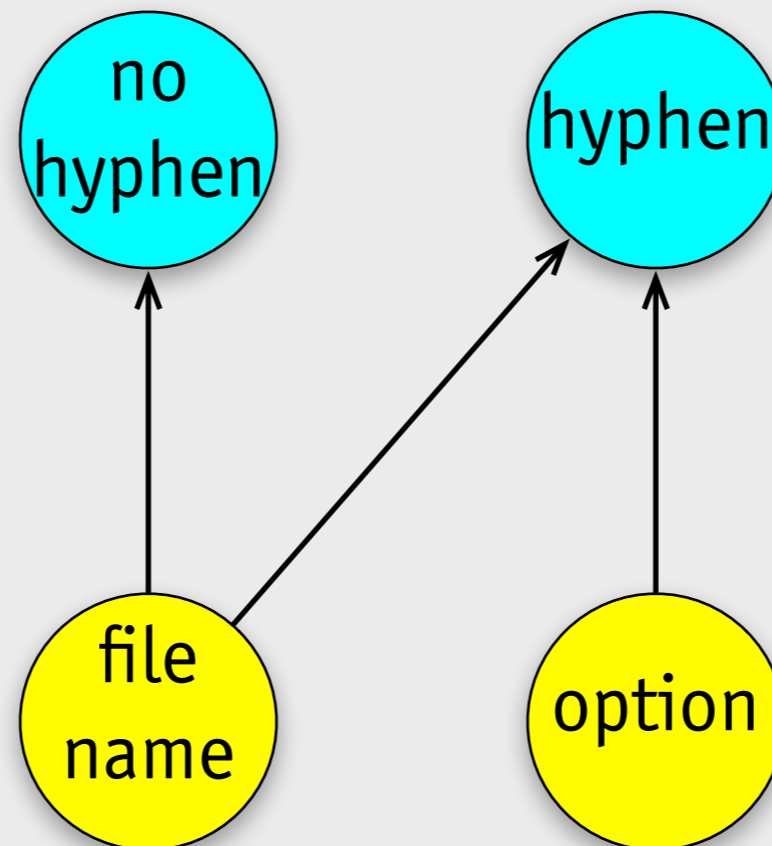
*OmniGraffle:
control key*

*Apple apps:
option key*



conflation in unix

```
> touch readme
> ls
readme
> mv readme -README
> ls
-README
> rm -README
rm: illegal option -- E
usage: rm [-f | -i] [-dPRrvW] file ...
```



a sad dropbox tale

Quora

🔍 Search



Dropbox: [Edit](#)

Someone accidentally deleted thousands of files in my company Dropbox: how can I quickly undelete them? [Edit](#)

[Add Question Details](#)

[Comment](#) · [Share](#) · [Report](#) · [Options](#)

Friends don't let friends delete shared Dropbox items



Christopher Breen
@BodyofBreen

Sep 9, 2013 5:00 AM



Reader Paul Cramblett has a problem with others who just don't know how to share. He writes:

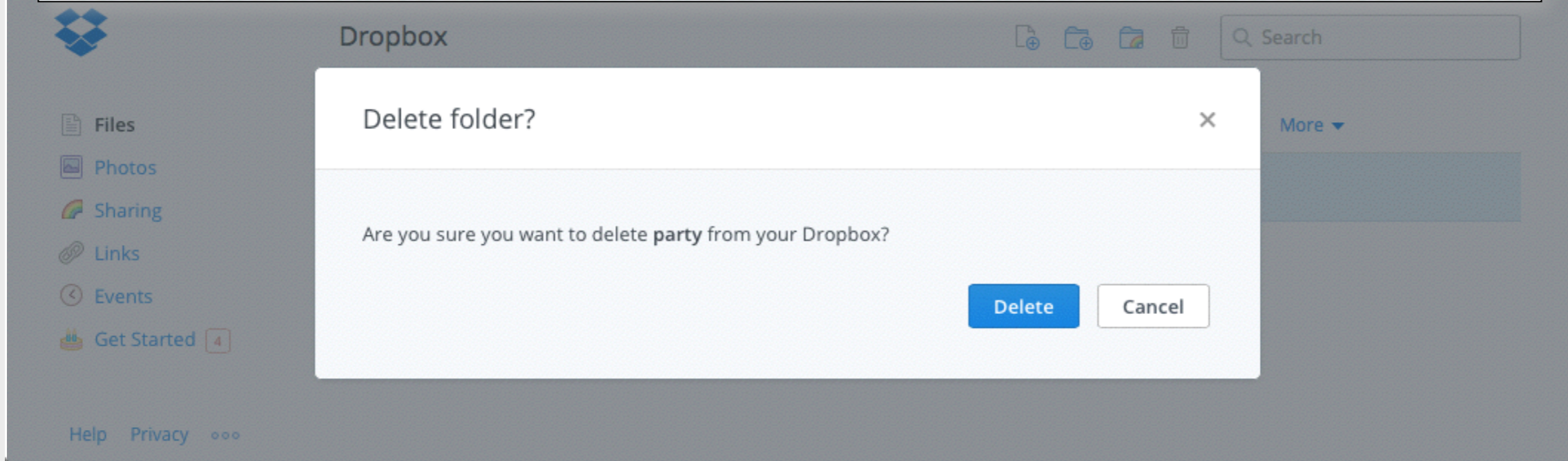
I maintain a Dropbox folder that I use to share files with a select group of friends. I've tried to explain how Dropbox works to these people but someone invariably drags all the files out of the folder, which means they're no longer available to the rest of us. Is there some way to prevent files from being removed by someone who doesn't understand the difference between "copy" and "move"?

alyssa & ben plan a party

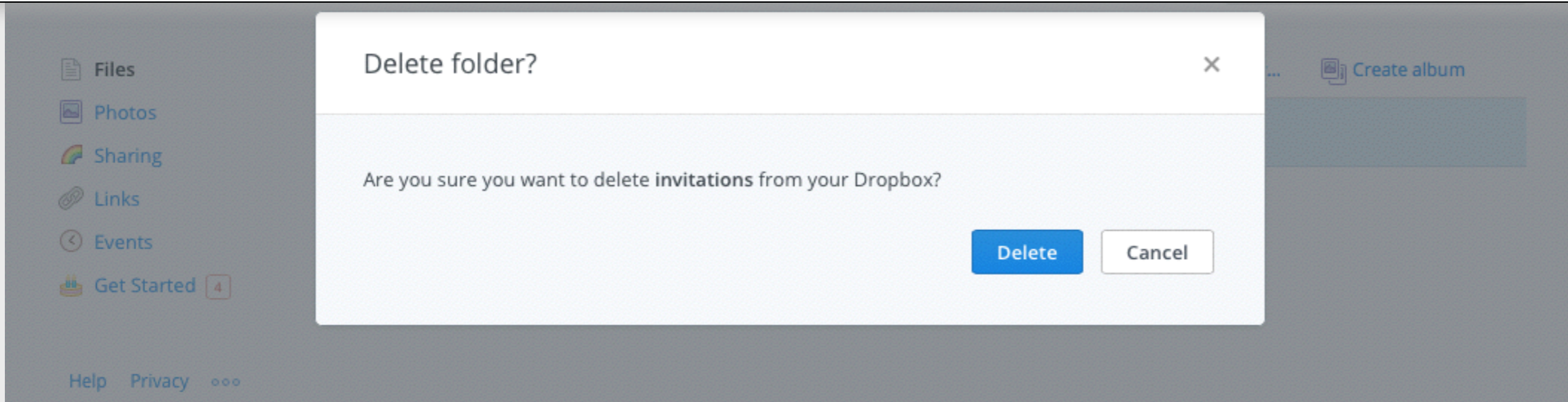
The screenshot shows the Dropbox interface with a 'Share' dialog box open. The dialog is titled 'Share 'party' with others' and has a close button (X) in the top right corner. In the top right of the dialog, there is a checked checkbox labeled 'Allow members to invite others'. Below this, there is a search bar containing the text 'alyssa' and a blue link 'Import contacts' on the right. A search result is displayed in a light blue row, featuring an envelope icon, the name 'Alyssa P. Hacker', and the email address 'dnj+alice@csail.mit.edu'. At the bottom of the dialog, there are two buttons: a blue 'Share folder' button and a white 'Cancel' button with a grey border. The background shows the Dropbox sidebar with 'Files', 'Photos', 'Sharing', 'Links', 'Events', and 'Get Started' (with a red notification badge '2'). The top right of the interface shows 'Get free space!', a notification bell, and the user name 'Ben Bitdiddle'.

alyssa spoils everything

Are you sure you want to delete party from your Dropbox?



Are you sure you want to delete invitations from your Dropbox?

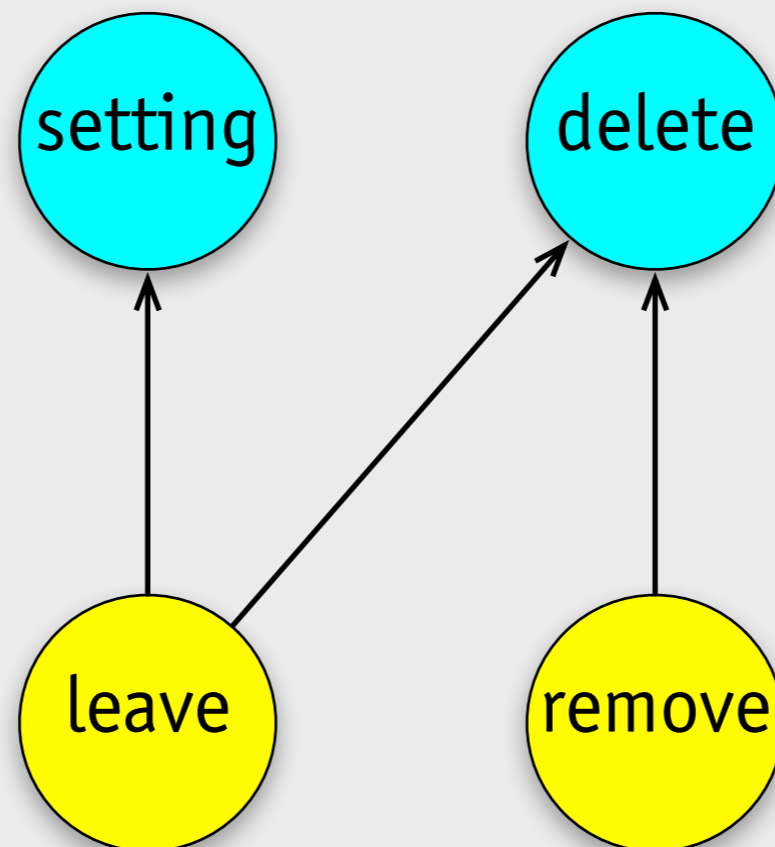


conflation in dropbox

How do I leave a shared folder?

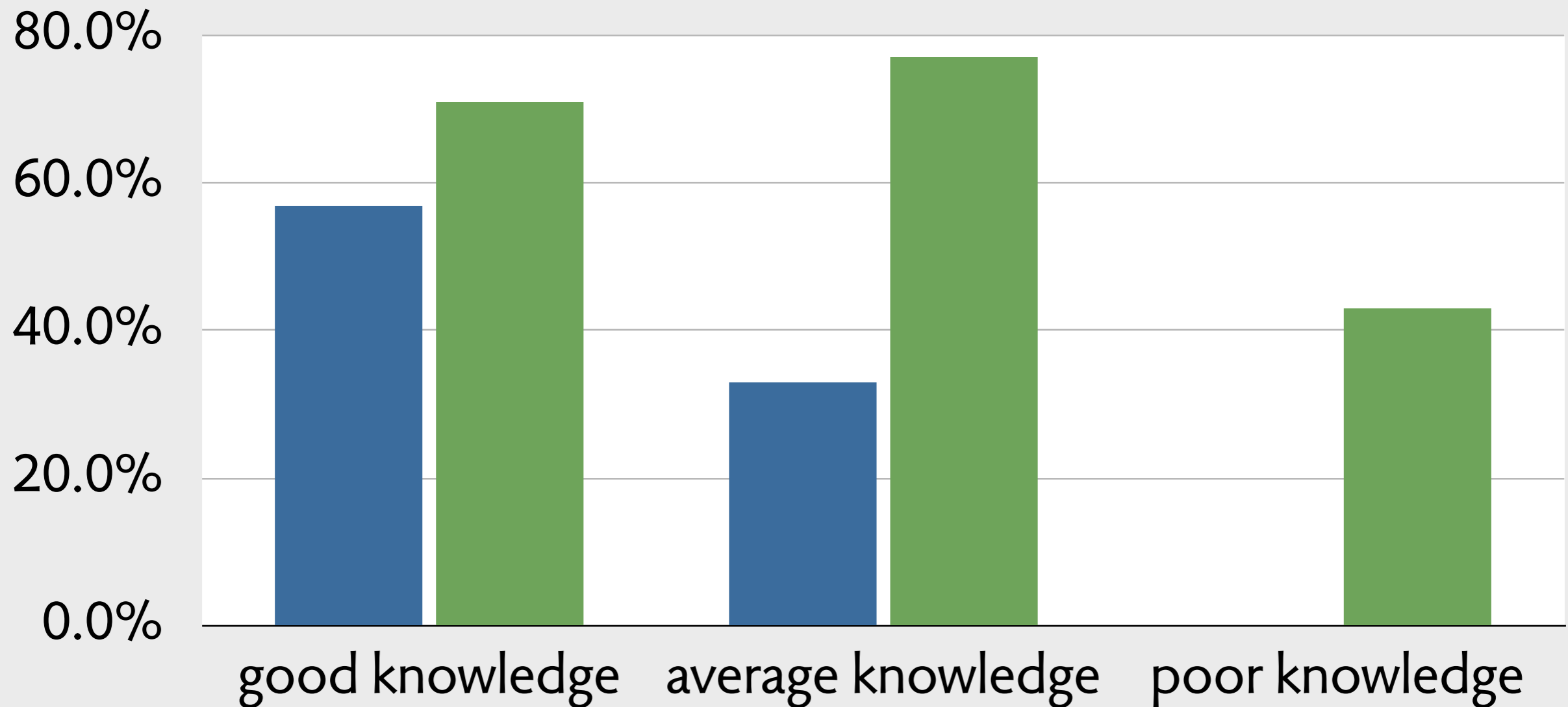
“by changing the folder’s settings or by deleting it”

You can leave a [shared folder](#) at any time by changing the folder's settings on the Dropbox website or deleting it. If you change your mind or leave a folder accidentally, you can [rejoin it](#) later.



small survey of MIT dropbox users

correctly predicting behavior



- delete shared folder results in leaving
- delete shared subfolder removes it

conventional

reuses existing concepts when applicable

concept idioms: across apps

style: separate formatting from element

selection: select objects to apply action to set

subtle issues & their solution

reapply in different context

eg, partial styles

some apps are just cliches

collection of idiomatic concepts

social app = {profile, post, friend, notify}

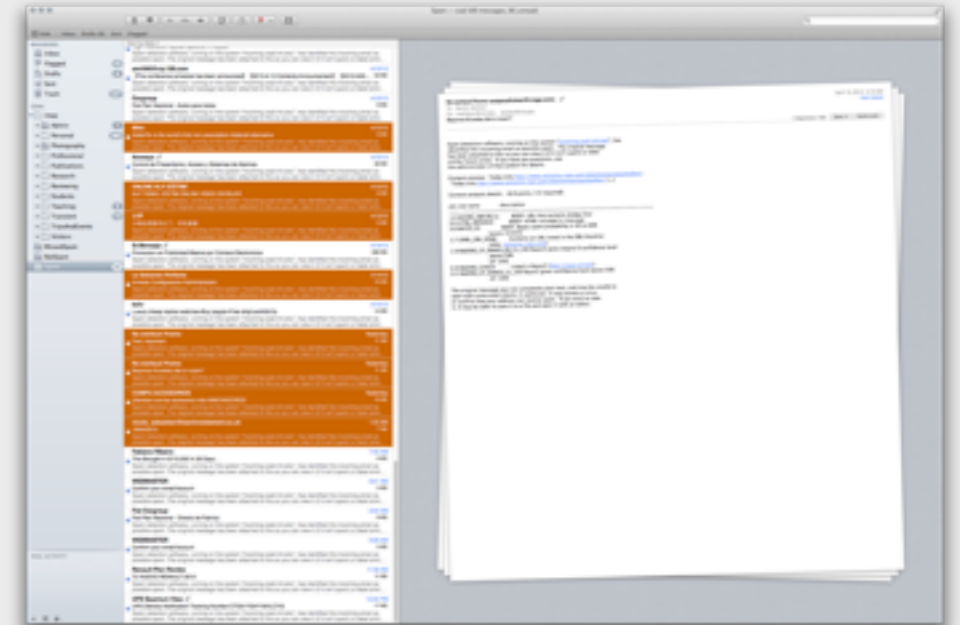
concept idiom selection



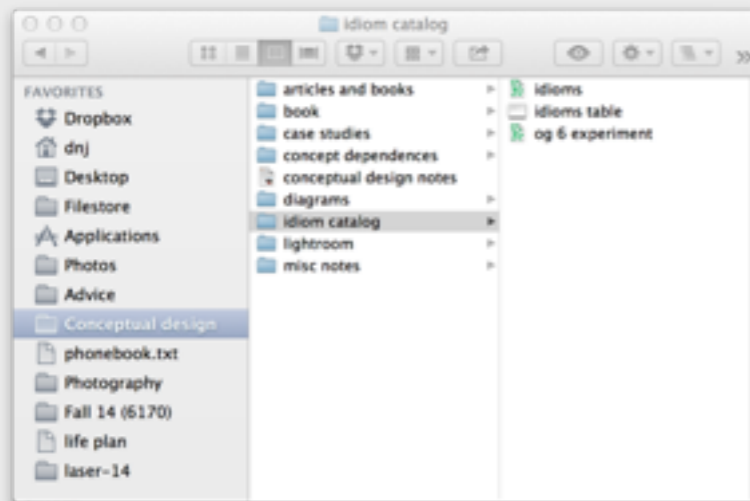
slides in Keynote



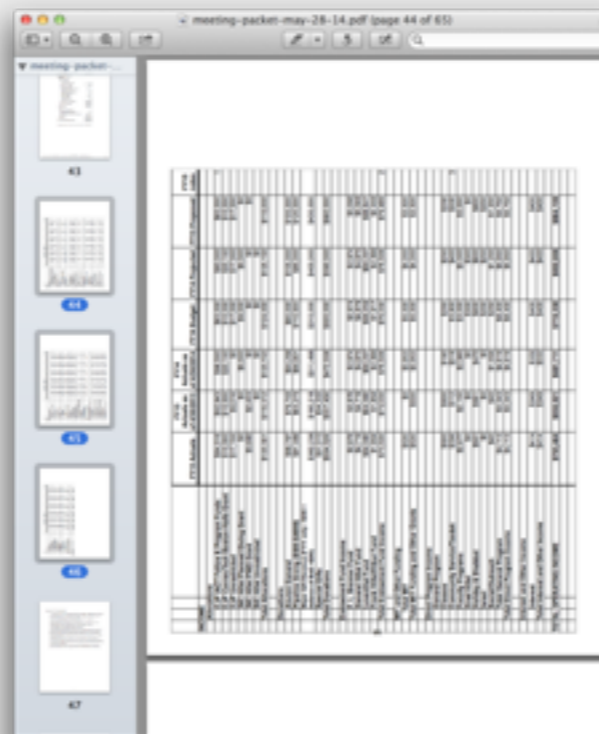
photos in Adobe Lightroom



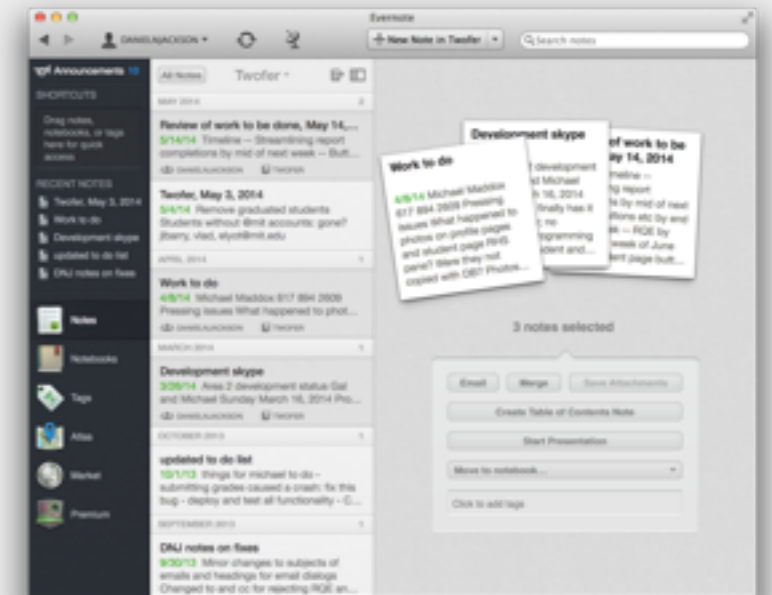
messages in Apple Mail



objects in OS X Finder

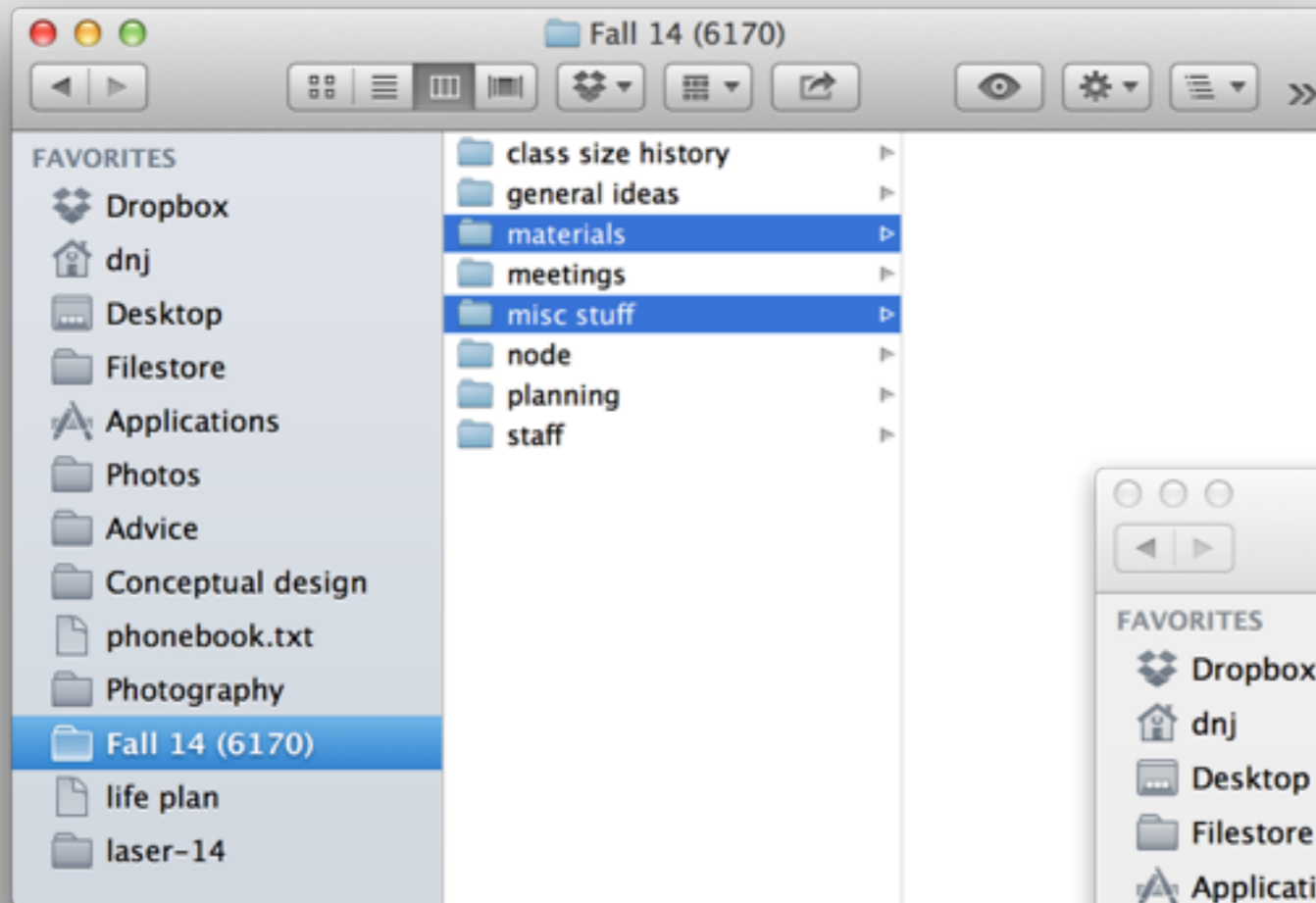


thumbnails in Preview

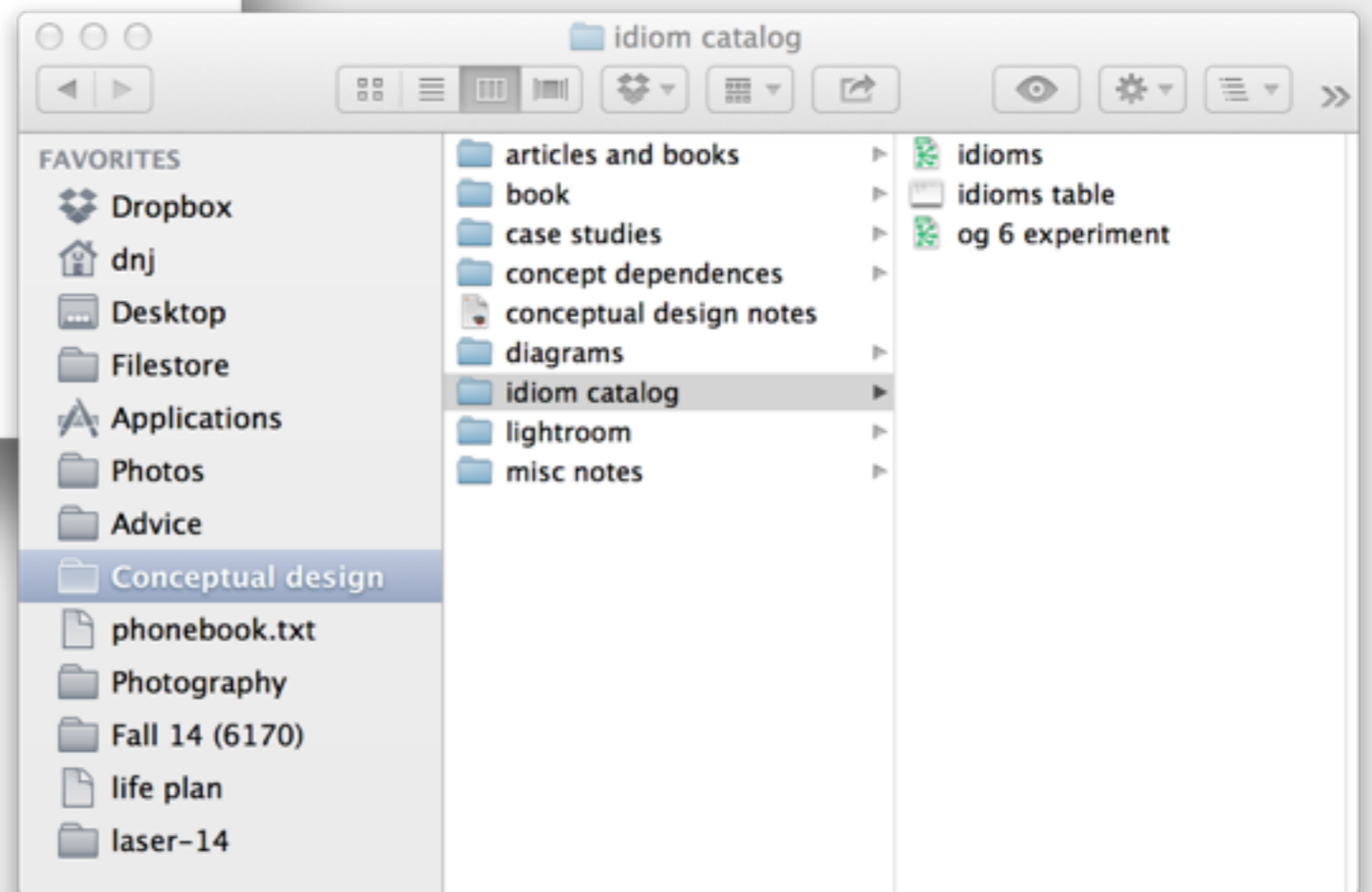


notes in Evernote

subtlety selection scope



subset of selection in scope



subset of selection out of scope

subtlety active element



Adobe Lightroom: brightest thumbnail is the “active photo”

subtlety continuous selection

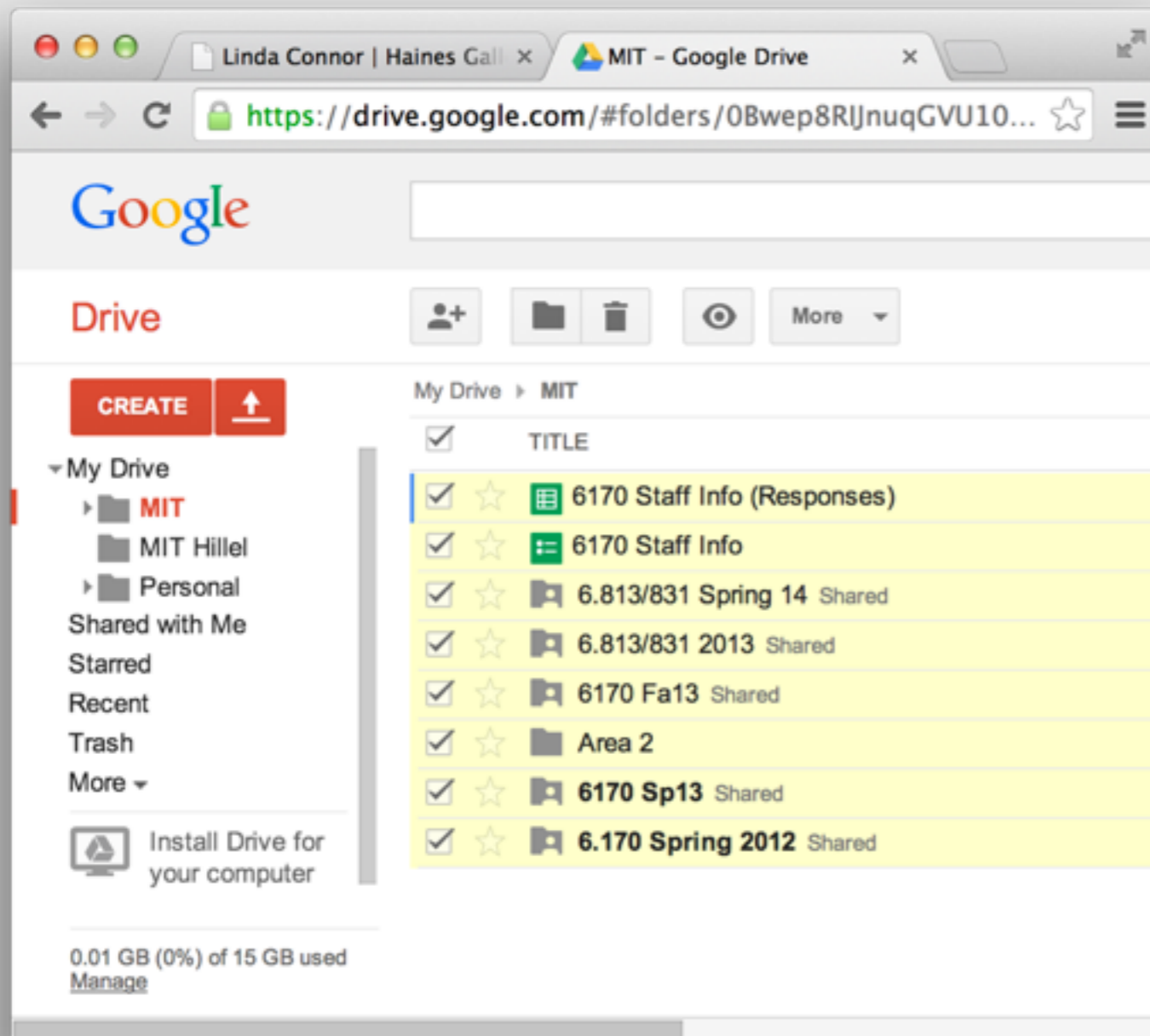


Photoshop: outline shown with "marching ants"

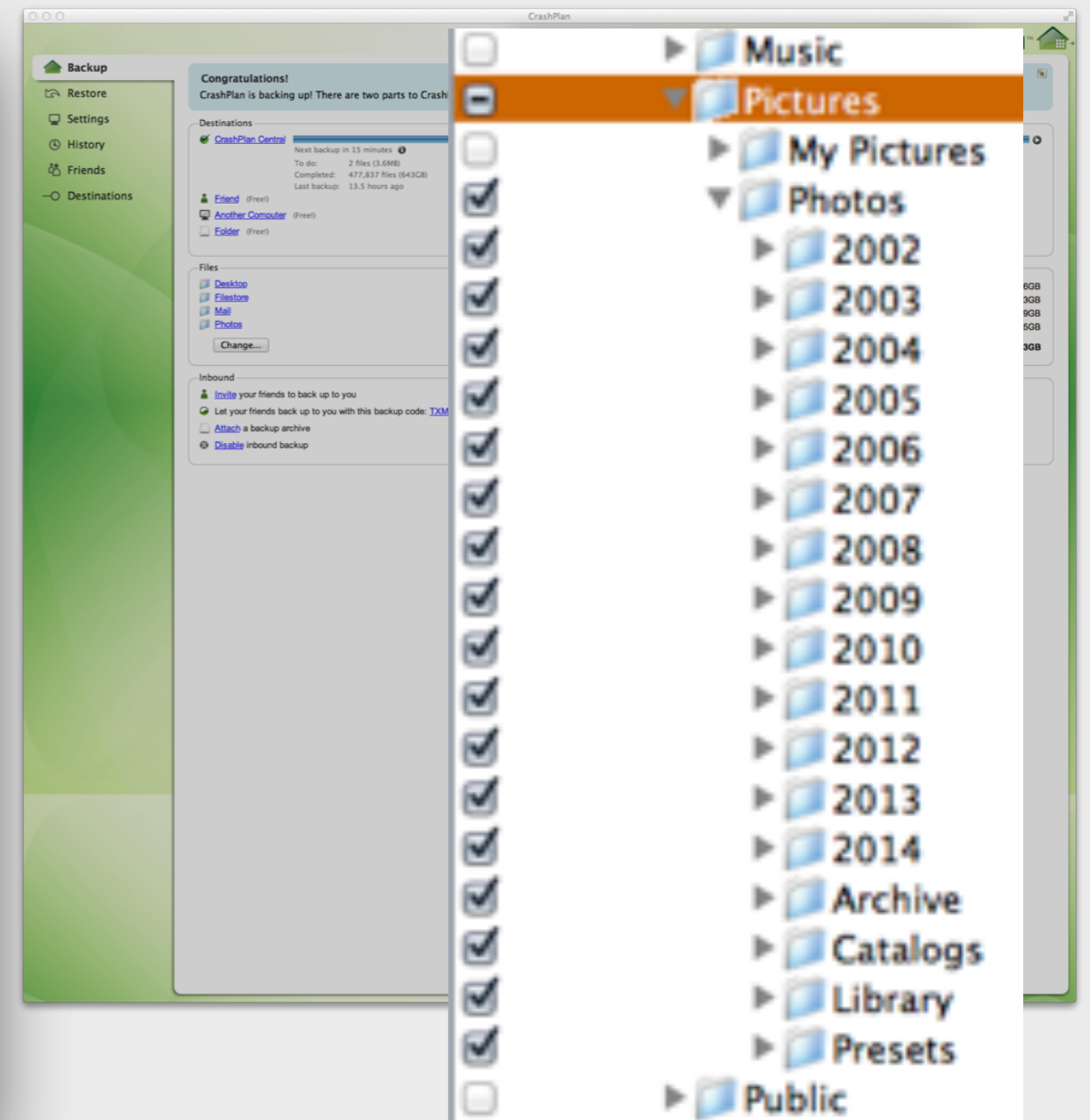


Photoshop: selection shown in Quick Mask mode

subtlety folder selection

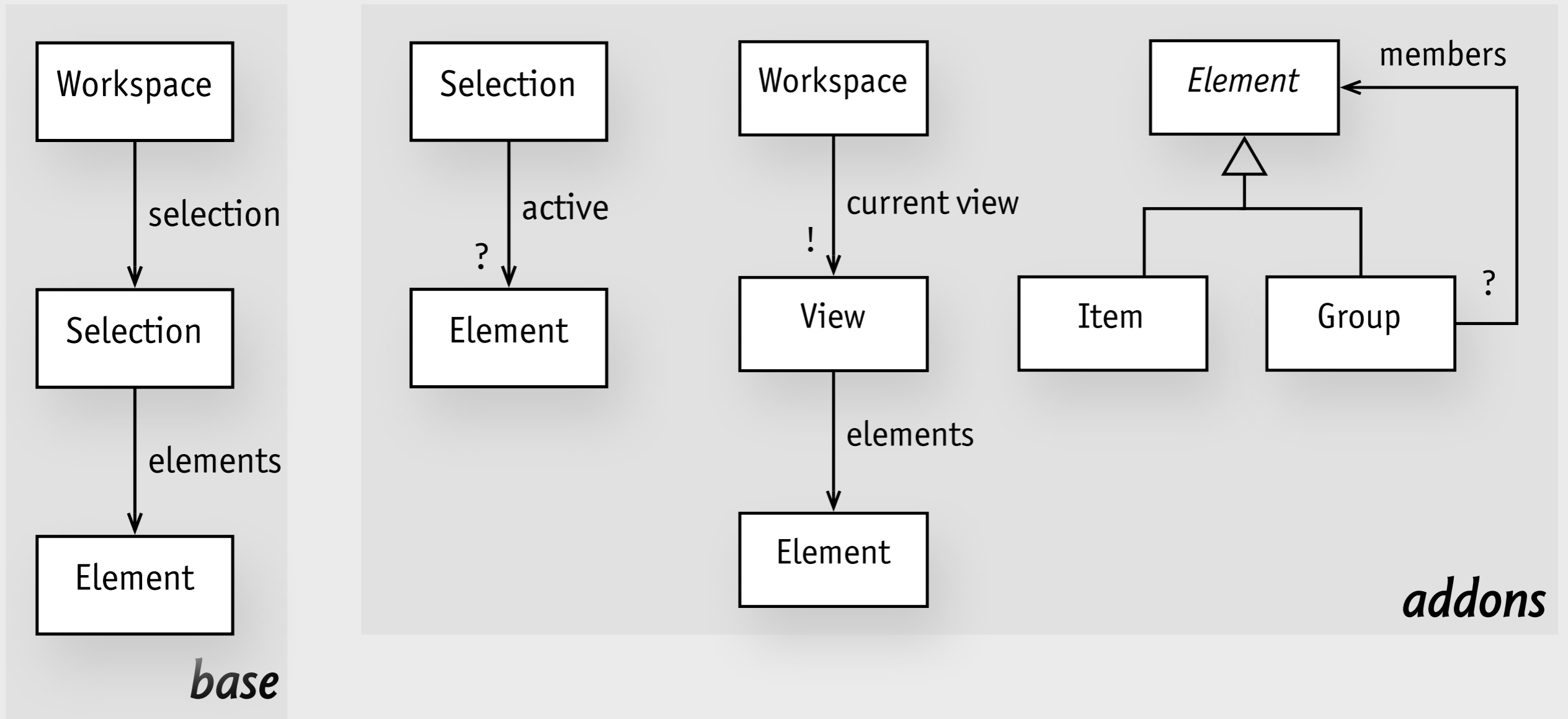


Google Drive: selecting folder = selecting children



CrashPlan: selecting folder = selecting all future children

concept idiom selection



Purposes: apply action in aggregate to many items at once

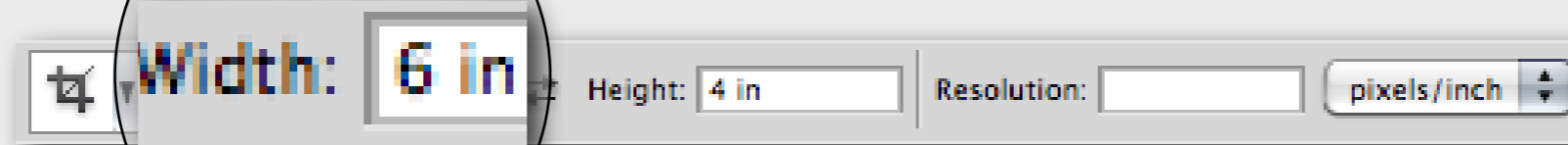
idiom catalog (so far)

<i>instantiate</i>	<i>organize</i>	<i>relate</i>	<i>resource</i>	<i>save</i>	<i>communicate</i>	<i>personalize</i>
stylesheet	selection	friend	access token	history	message	account
master	folder	clique	notification	buffer	posting	karma
stencil	group	invitation	reservation	cursor		OOBA
style buffer	label		REST	sync		rating
	layer		cart	export		status
	stack		subscription			
	alias		purchase order			
	preset		RMA			
	cursor		coupon			
	filter		catalog			
	property					
	metadata					

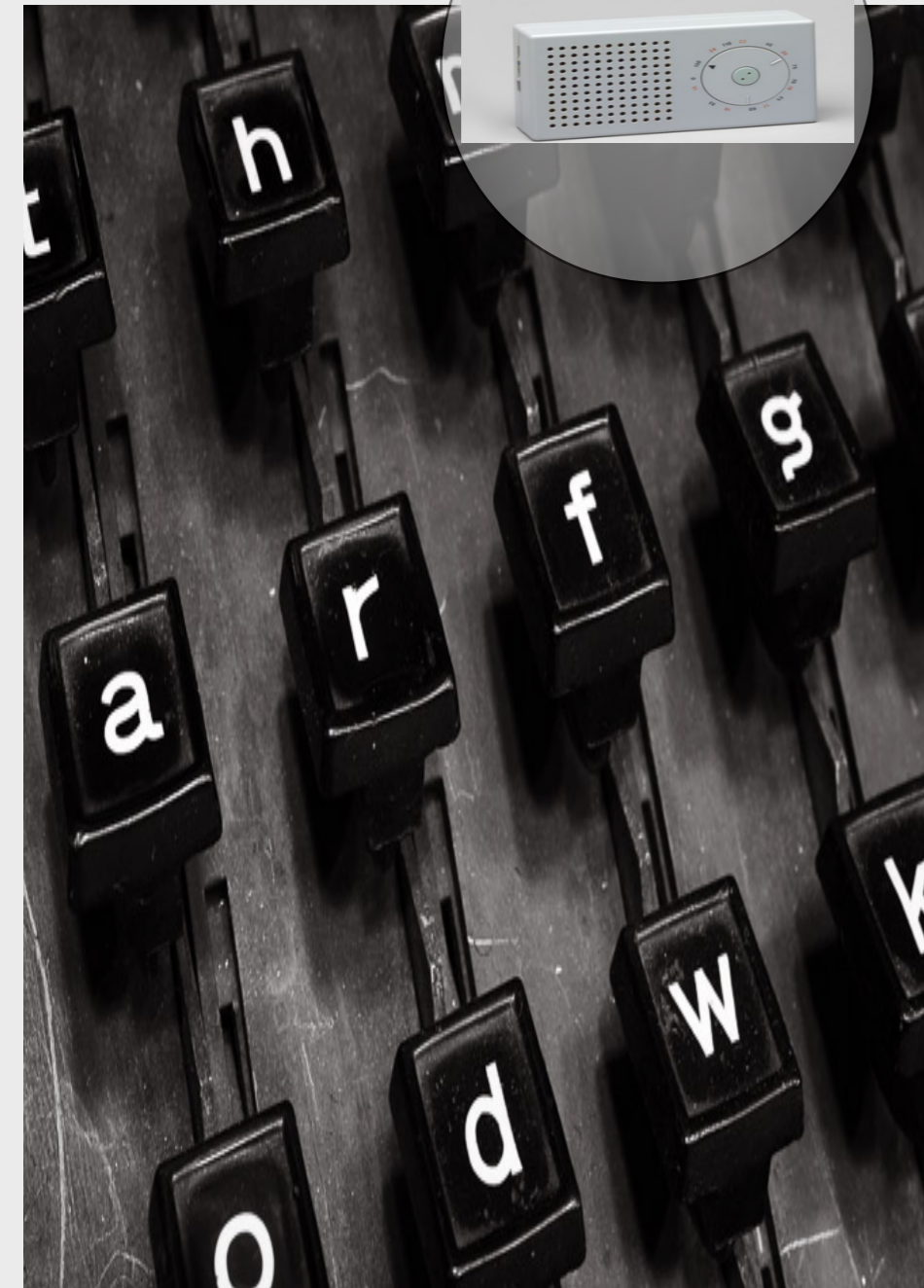
exercise:

criteria

cropping in photoshop

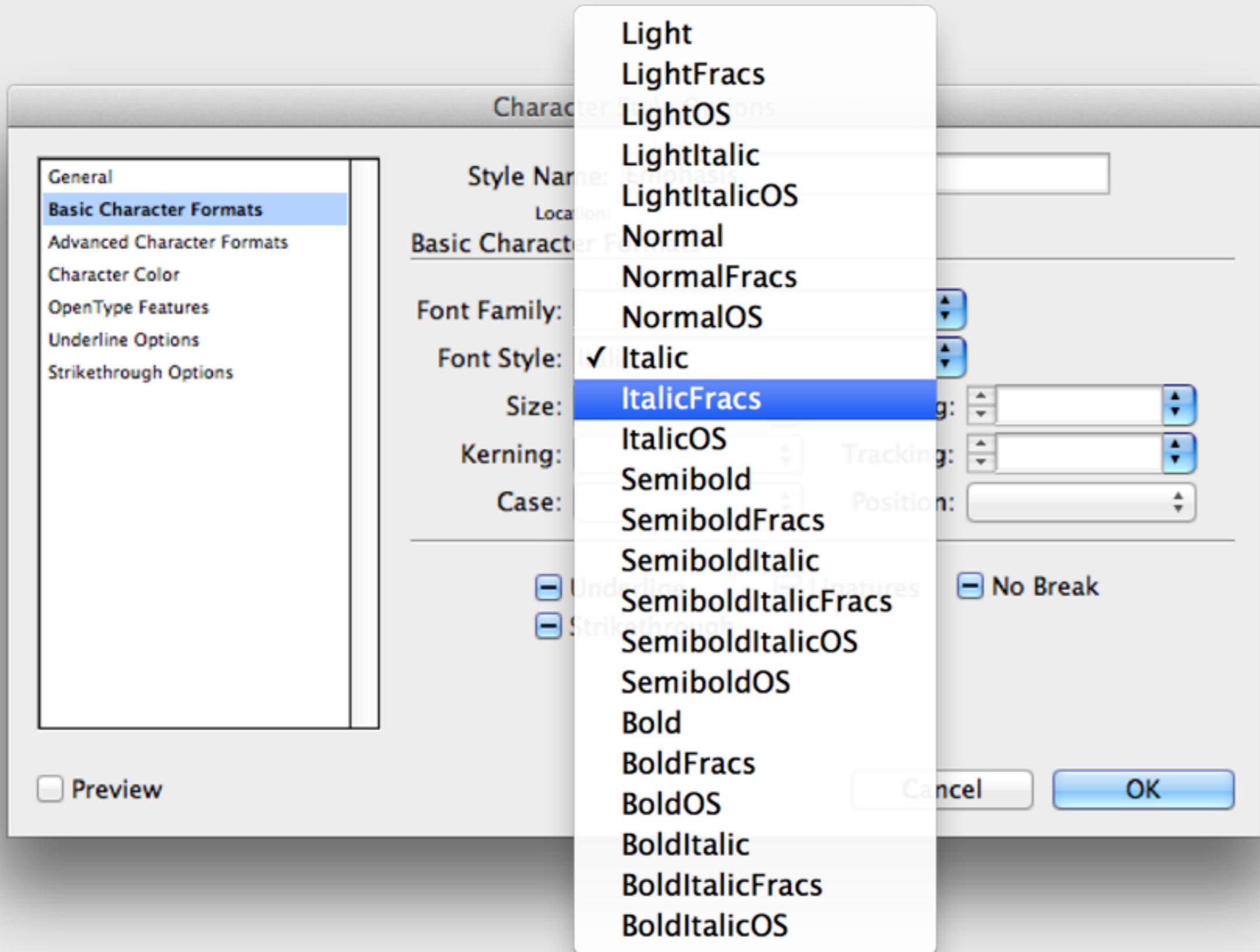


cropping in photoshop (part 2)



what criterion is violated here?

what's the misfit story?



applying to
your project

purpose

what is the purpose of your app?
express it as an advertising slogan:
“track your favorite blogs!”

concepts

what are they?
give them good names
which are conventional? novel?
which are essential?

stories

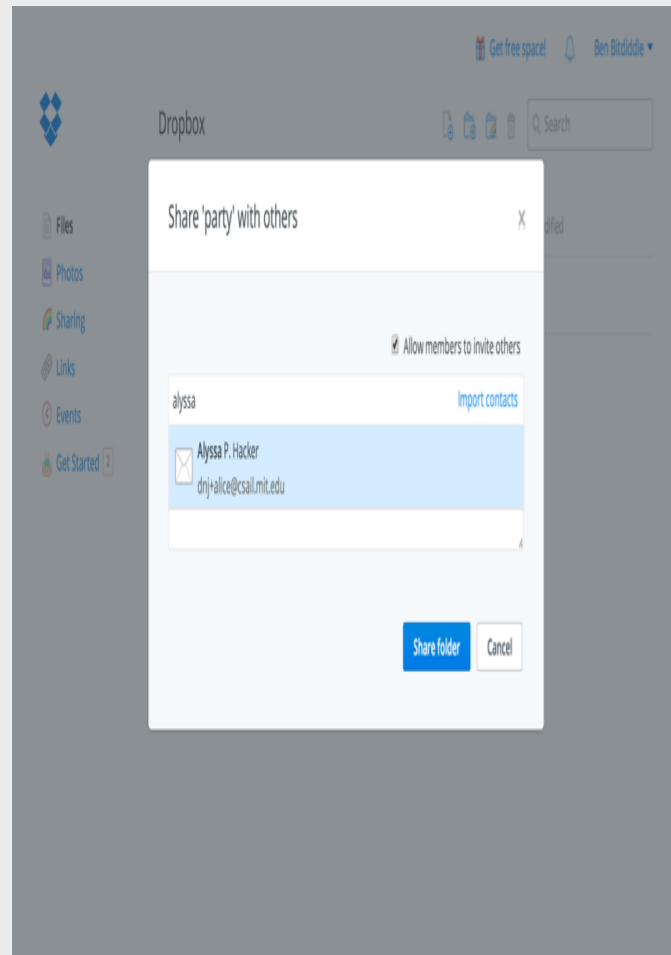
what's the purpose of each concept?
a (tweet-length) story to explain how?

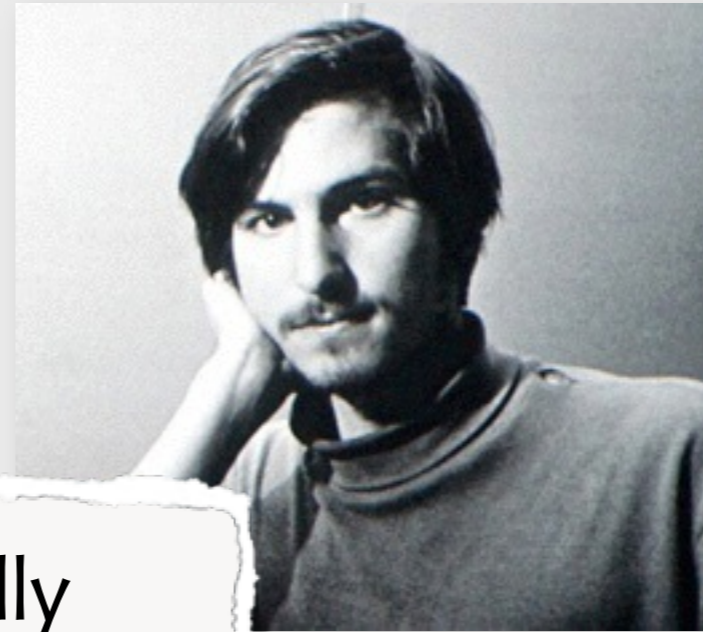
background

mitch kapor on designers

Architects work in the medium of buildings, graphic designers work in paper and other print media, industrial designers on mass-produced manufactured goods, and software designers on software. **The software designer should be the person with overall responsibility for the conception and realization of the program.**

A Software Design Manifesto, 1996





To design something really well, you have to **get it**. You have to really grok what it's all **about**. It takes a passionate commitment to really thoroughly **understand** something, chew it up, not just quickly swallow it. Most people don't take the time to do that.

a metaphor

software design:
smoothing rough & sharp edges
big picture by attention to small details

“That’s quite obsessive, isn’t it?”
Jonathan Ive

<https://www.youtube.com/watch?v=zaLMOSWAwdw>