User Interface Design

No screens

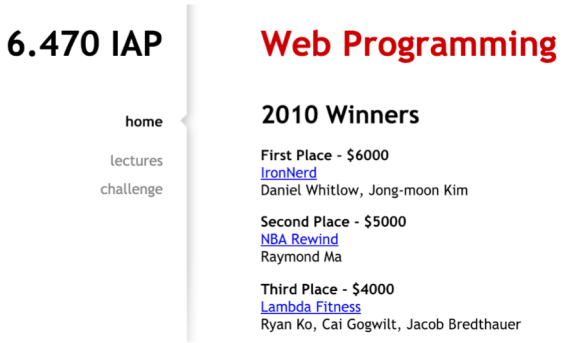
Prof. Lydia Chilton

COMS 4170

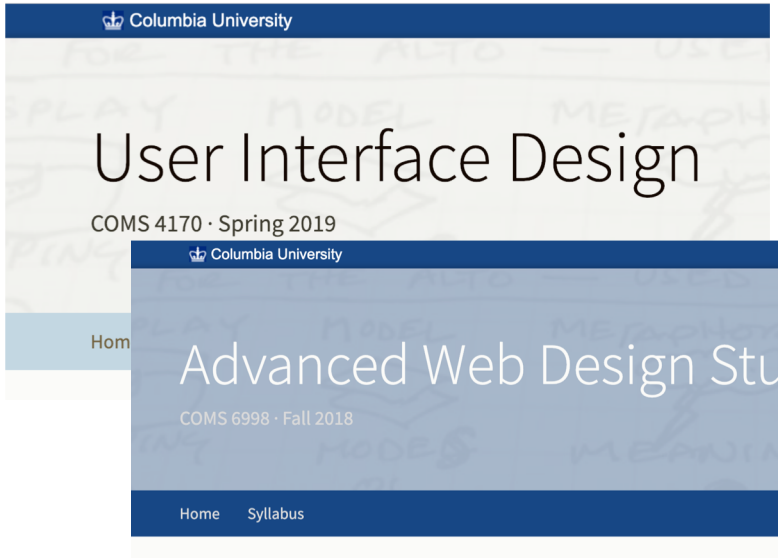
22 January 2020

Say your name

I’ve been teaching Web Dev & UI for 12 years



TA’d AI courses



MIT
2008 - 2010

Univ Washington
2012 - 2013

Stanford
2014 - 2016

Columbia
2017 - now

My goal is to use your time well.

- I want you to understand how design is a useful skill in your life.
- I want to interact with you on an individual basis

- I do not want anyone to be bored, lost, zoned-out, or stalking their ex on Facebook.

No screens.

If you are lost, interact.

4170 Staff

- Prof. Chilton
  - Office hours: Mondays 5:30-6:30 in CEPSR 612
  - Please come to my office hours! Ask me programming questions
- 12 TAs for 2 sections (230 total students)
  - Come to any TA's office hours (regardless of section)
- I hope to learn all of your names. It helps me if you say you name when I call on you.

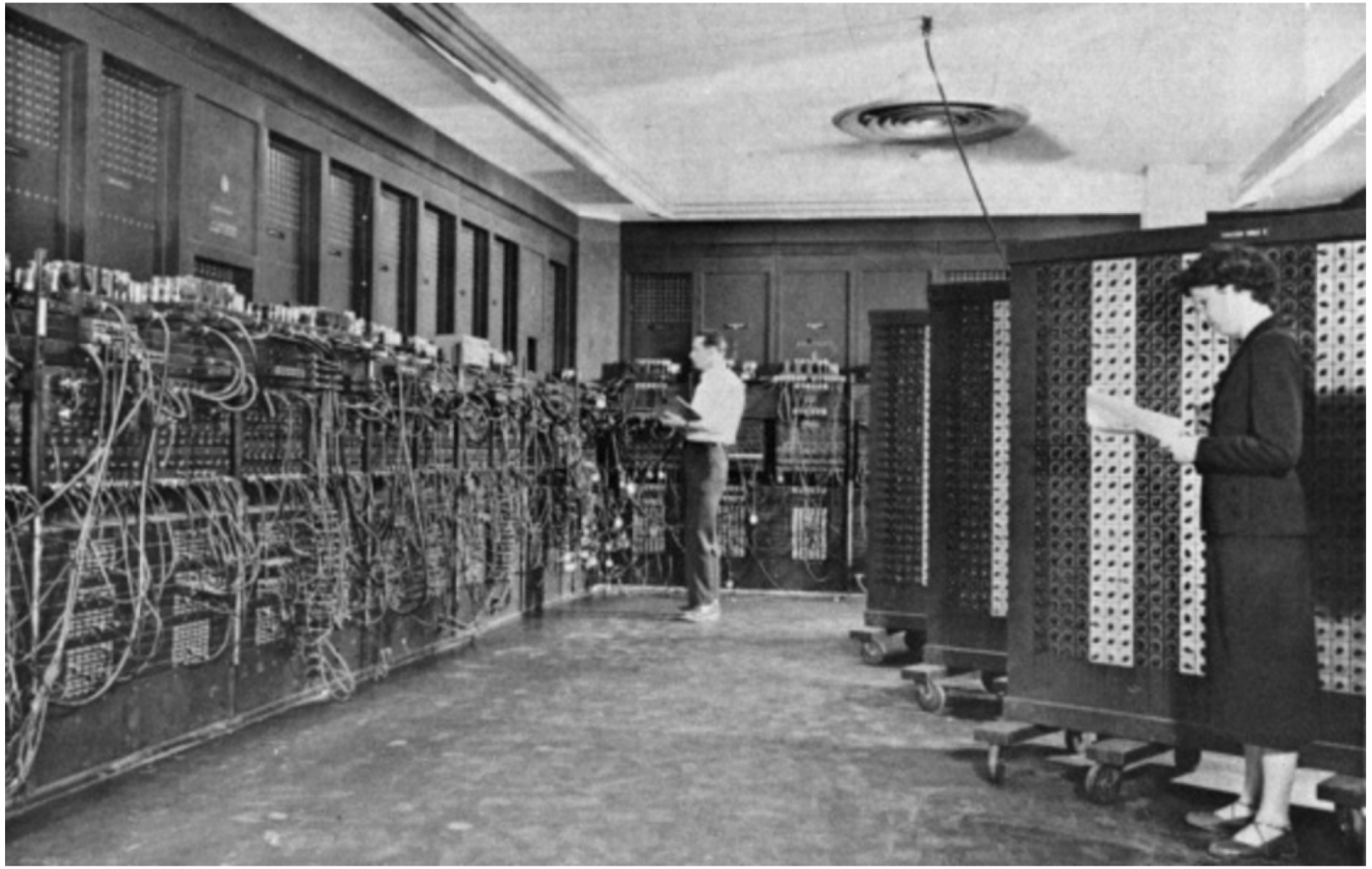
Why are user interfaces important?

1613 – 1940s

Computers: people who performed calculations

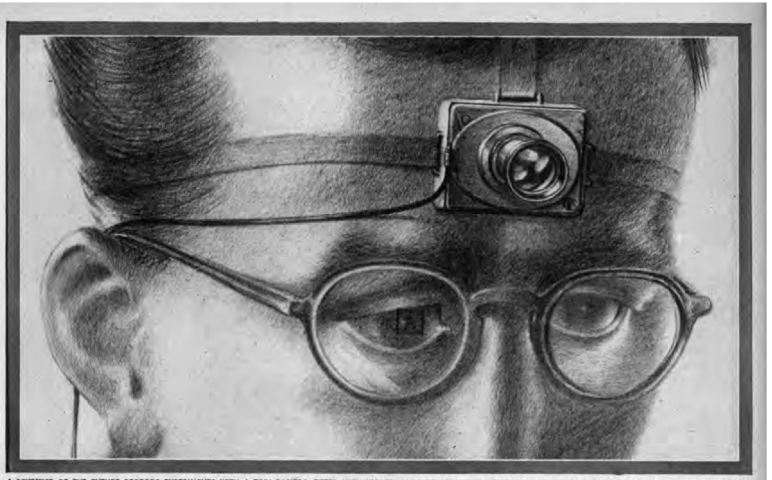
1940s – 1960s

Computers: Tools for Calculation and Symbolic Manipulation



1945

Computers: tools to augment human cognition
Vannevar Bush's vision of computers



A SCIENTIST OF THE FUTURE RECORDS EXPERIMENTS WITH A TINY CAMERA FITTED WITH UNIVERSAL-FOCUS LENS. THE SMALL SQUARE IN THE EYEGLASS AT THE LEFT SIGHTS THE OBJECT

AS WE MAY THINK

A TOP U. S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD IN WHICH MAN-MADE MACHINES WILL START TO THINK

by VANNEVAR BUSH

DIRECTOR OF THE OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

Condensed from the *Atlantic Monthly*, July 1945

This has not been a scientists' war; it has been a war in which all have had a part. The scientists, burying their old professional competition in the demand of a common cause, have shared greatly and learned much. It has been exhilarating to work in effective partnership. What are the scientists to do next?

For the biologists, and particularly for the medical scientists, there can be little indecision, for their war work has hardly required them to leave the old paths. Many indeed have been able to carry on their war research in their familiar peacetime laboratories. Their objectives remain much the same.

It is the physicists who have been thrown most violently off stride, who have left academic pursuits for the making of strange destructive gadgets, who have had to devise new methods for their unanticipated assignments. They have done their part on the devices that made it possible to turn back the enemy. They have worked in combined effort with the physicists of our allies. They have felt within themselves the stir of achievement. They have been part of a great team. Now one asks where they will find objectives worthy of their best.

* * *

There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial.

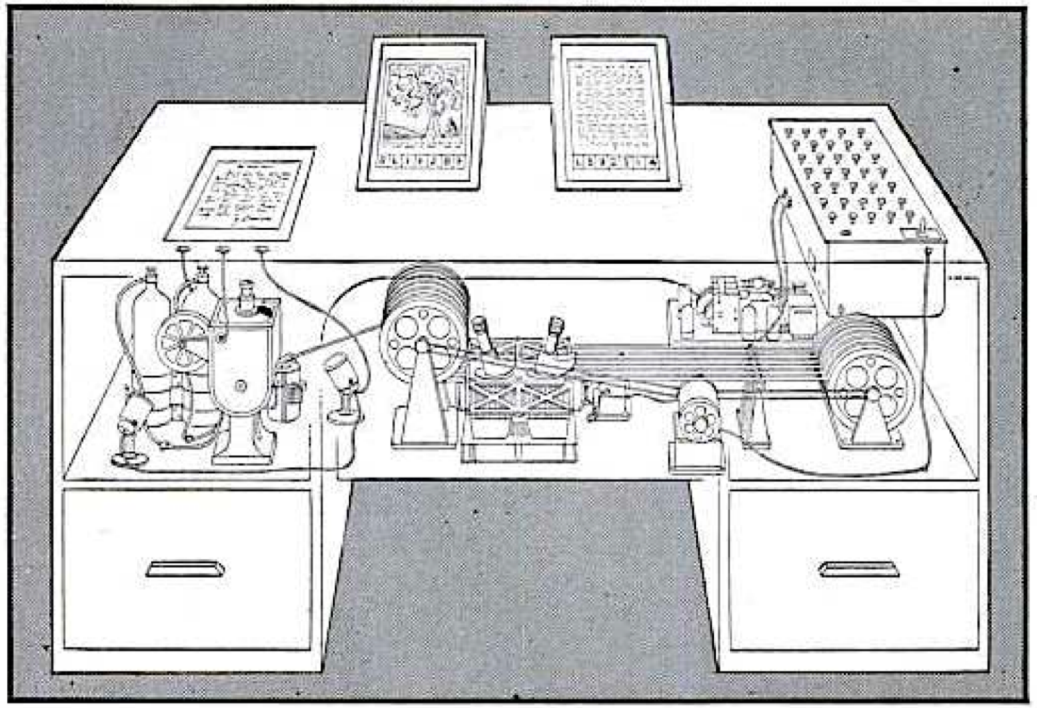
Professionally our methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate for their purpose. If the aggregate time spent in writing scholarly works and in reading them could be evaluated, the ratio between these amounts of time might well be startling. Those who conscientiously attempt to keep abreast of current thought, even in restricted fields, by close and continuous reading might well shy away from an examination calculated to show how much of the previous month's efforts could be produced on call.

Mendel's concept of the laws of genetics was lost to the world for a generation because his publication did not reach the few who were capable of grasping and extending it. This sort of catastrophe is undoubtedly being repeated all about us as truly significant attainments become lost in the mass of the inconsequential.

Publication has been extended far beyond our present ability to make real use of the record. The summation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships.

But there are signs of a change as new and powerful instrumentalities come into use. Photocells capable of seeing things in a physical sense, advanced photography which can record what is seen or even what is not, thermionic tubes capable of controlling potent forces under the guidance of

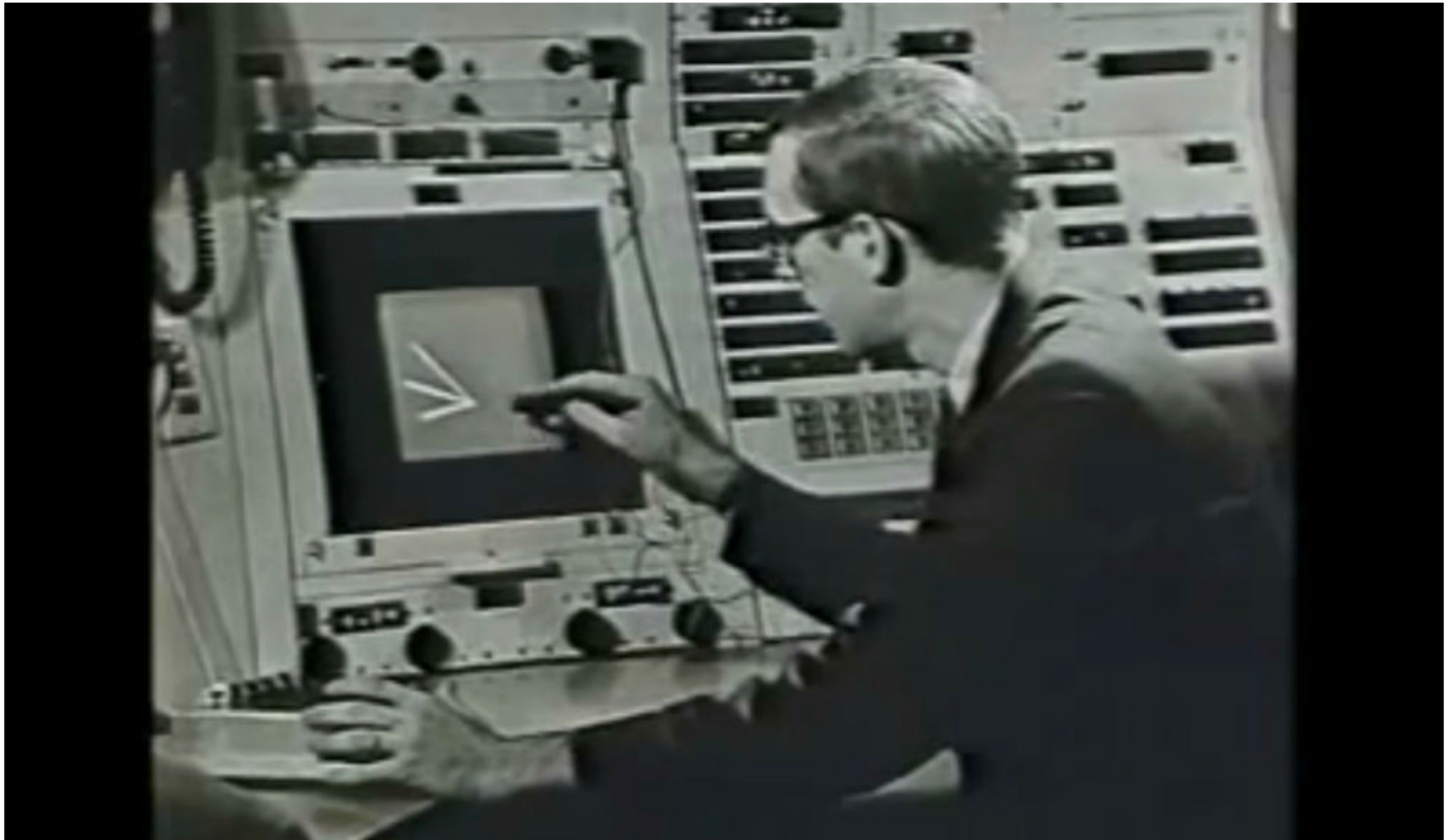
112



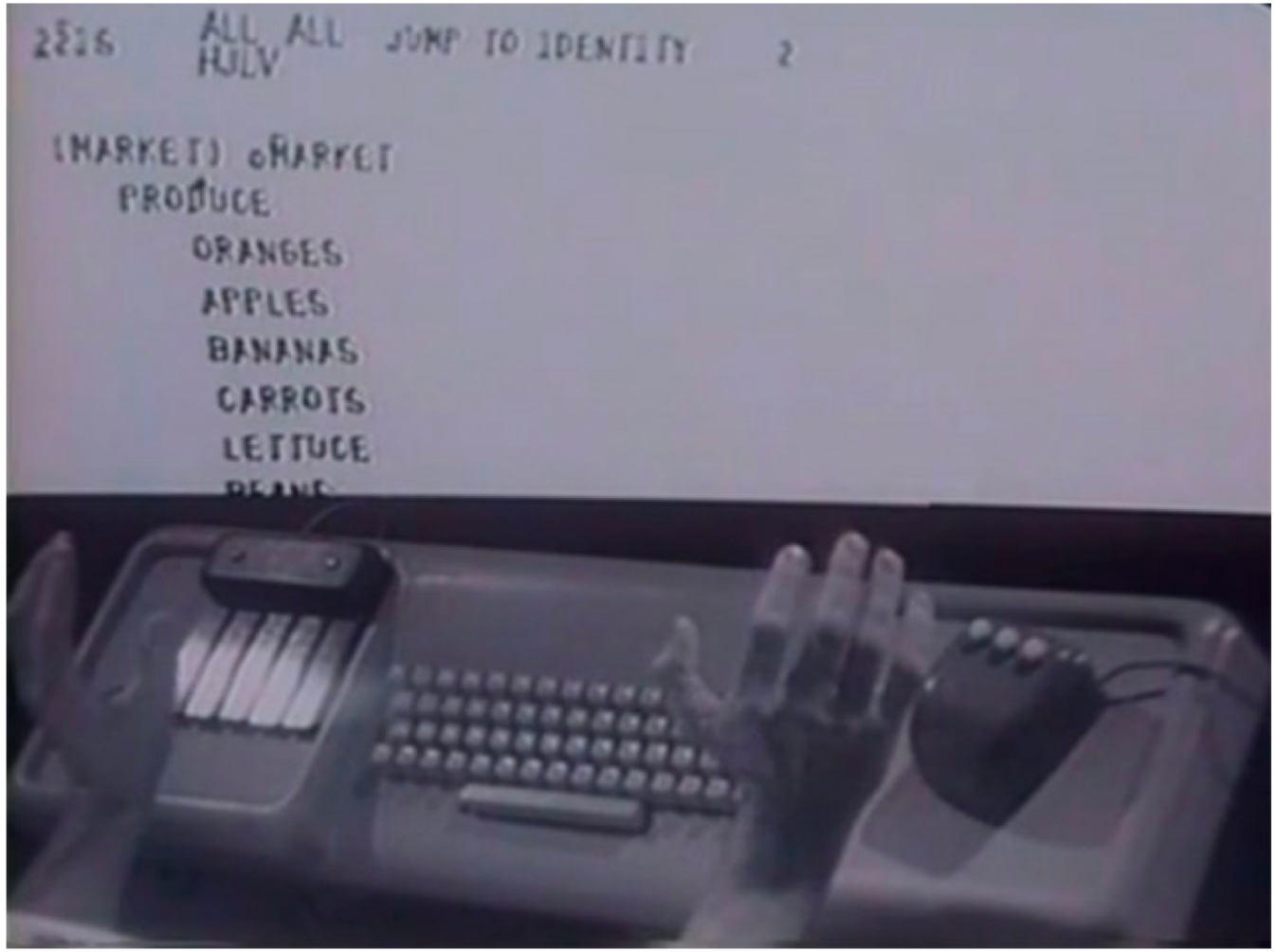
MEMEX in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference.

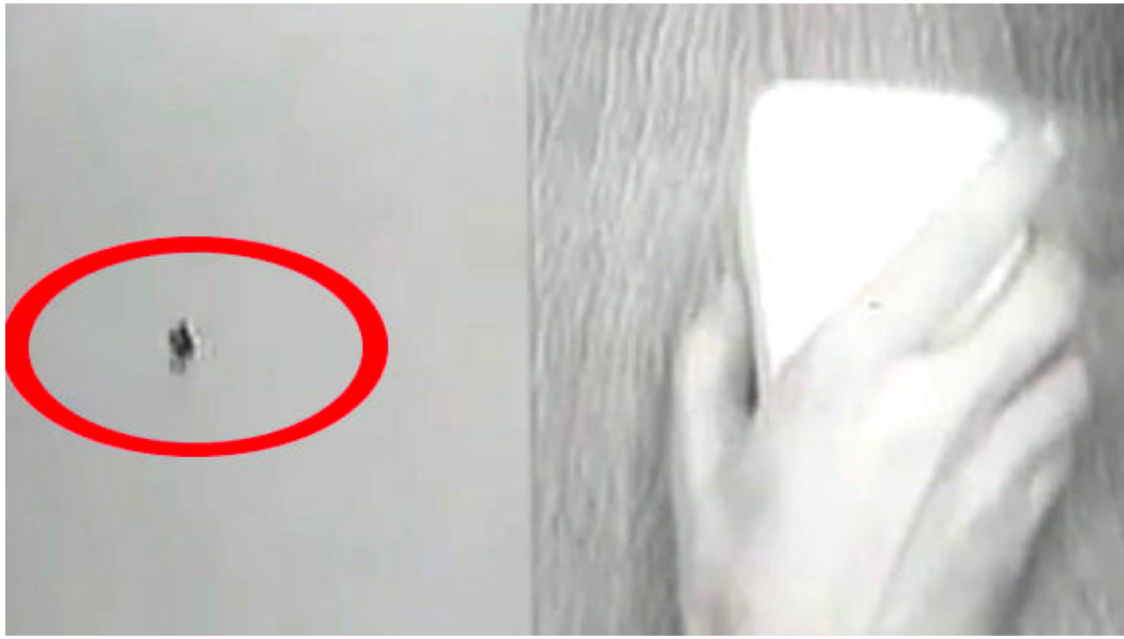
AS WE MAY THINK CONTINUED

1963: First Graphical User Interface
Ivan Sutherland's CAD software, Sketchpad

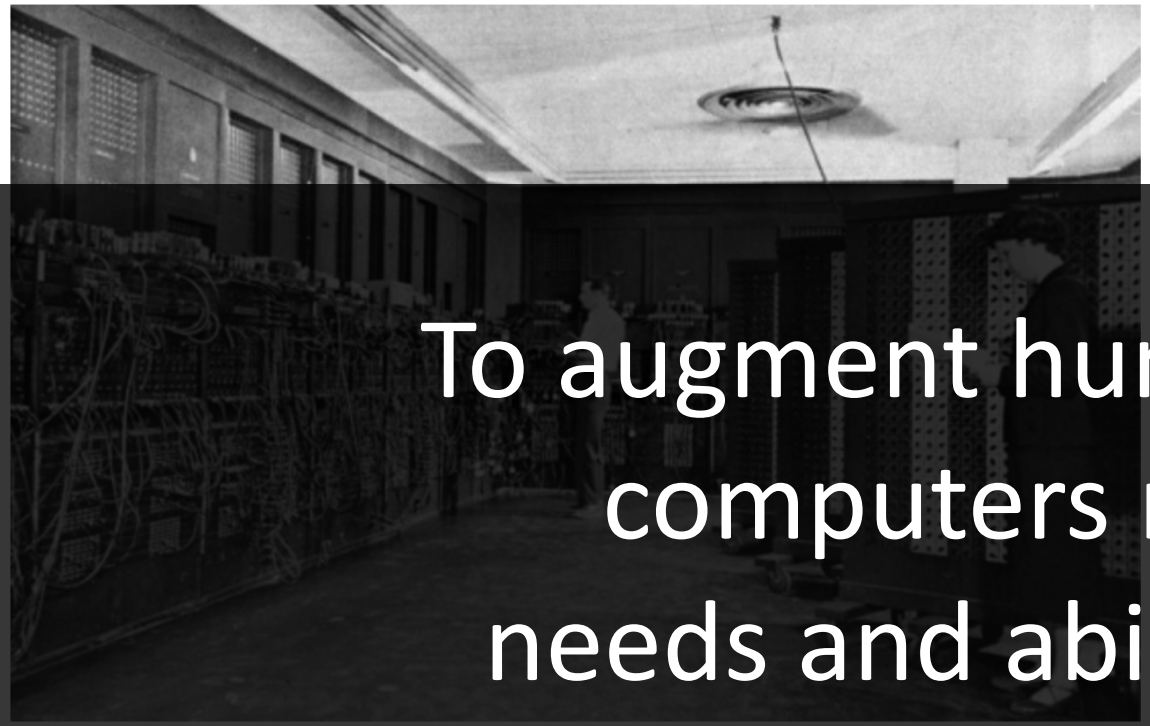


1968: Interaction devices for computer use. Douglas Engelbart's mouse

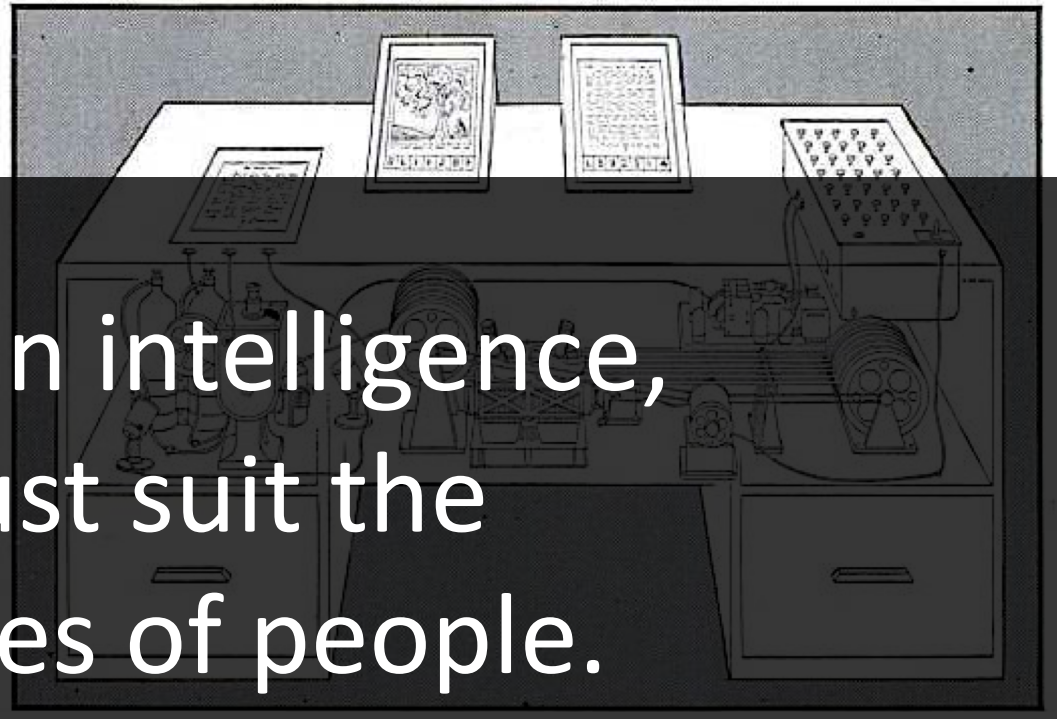




Computers: Tools for calculation.



Computers: Tools to augment human intelligence.



To augment human intelligence,
computers must suit the
needs and abilities of people.

Computer-centric interface

Human-centric interface

The Internet: The Rise of Usability

For physical products, users did not get to experience the usability of the product until **after they bought it**.

For desktop software, users call expensive support centers, but the costs aren't "charged" to the software engineers, so they have **no motivation to ship great UIs.**

On the Web, users experience the usability of a site before they have committed to using it and before they buy it.

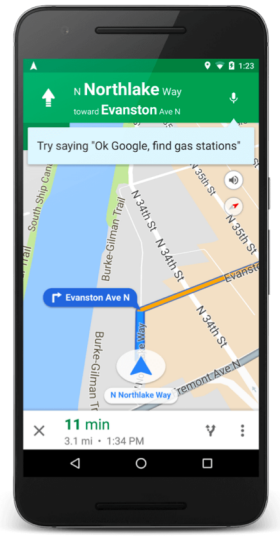
UI is now the primary "selling point" of software

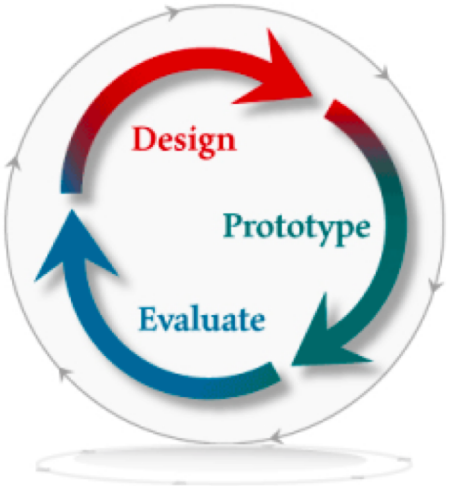
Nielsen, Jakob. *Designing Web Usability: The Practice of Simplicity*. (1999)

Goals of COMS 4170

1. Build websites that suit the **needs and abilities** of users.

2. When the needs and abilities of users are unclear, design systems by **learning from iteration** and experimentation.





Grading: this class is not curved

A >= 90%

90% > **B** >= 80%

80% > **C** >= 70%

70% > **D** >= 60%

60% > **F**

Grade breakdown

- **Weekly Homework: 65%**
  - 13 homework assignments
  - Each homework worth 5% of grade
- **Individual Final Project: 20%**
  - Due May 11th 11:59pm. No late assignment accepted. At all. Not even one minute late.
- **Participation: 15%**
  - Come to every class and speak up
  - Every class is worth ~0.5% of your grade
  - We will drop your two lowest participation grades.
- No final exam

Late Policy for Homework

- Assignments are due Wednesdays at 4pm
  - There is a small grace period, which we will not announce.
  - Assume it is 10 minutes.
- 24 hours late get 10% deducted (Thurs 4pm)
- 48 hours late get 20% deducted (Friday 4pm)
- 72 hours late get 30% deducted (Saturday 4pm)
- 96 hours late get 40% deducted (Sunday 4pm)
- 120 hours late get 40% deducted (Monday 4pm)
- After 4pm Monday, work cannot be accepted because we will discuss solutions in class.
- If you are ill or have other difficulties,
  - **Email Prof Chilton before the due date** to let us know.
  - Provide note from a doctor or advising dean
  - Email me a plan for when you will submit the work
  - It can't be later than 5 days (Monday 4pm)

Participation make up policy for excused absences

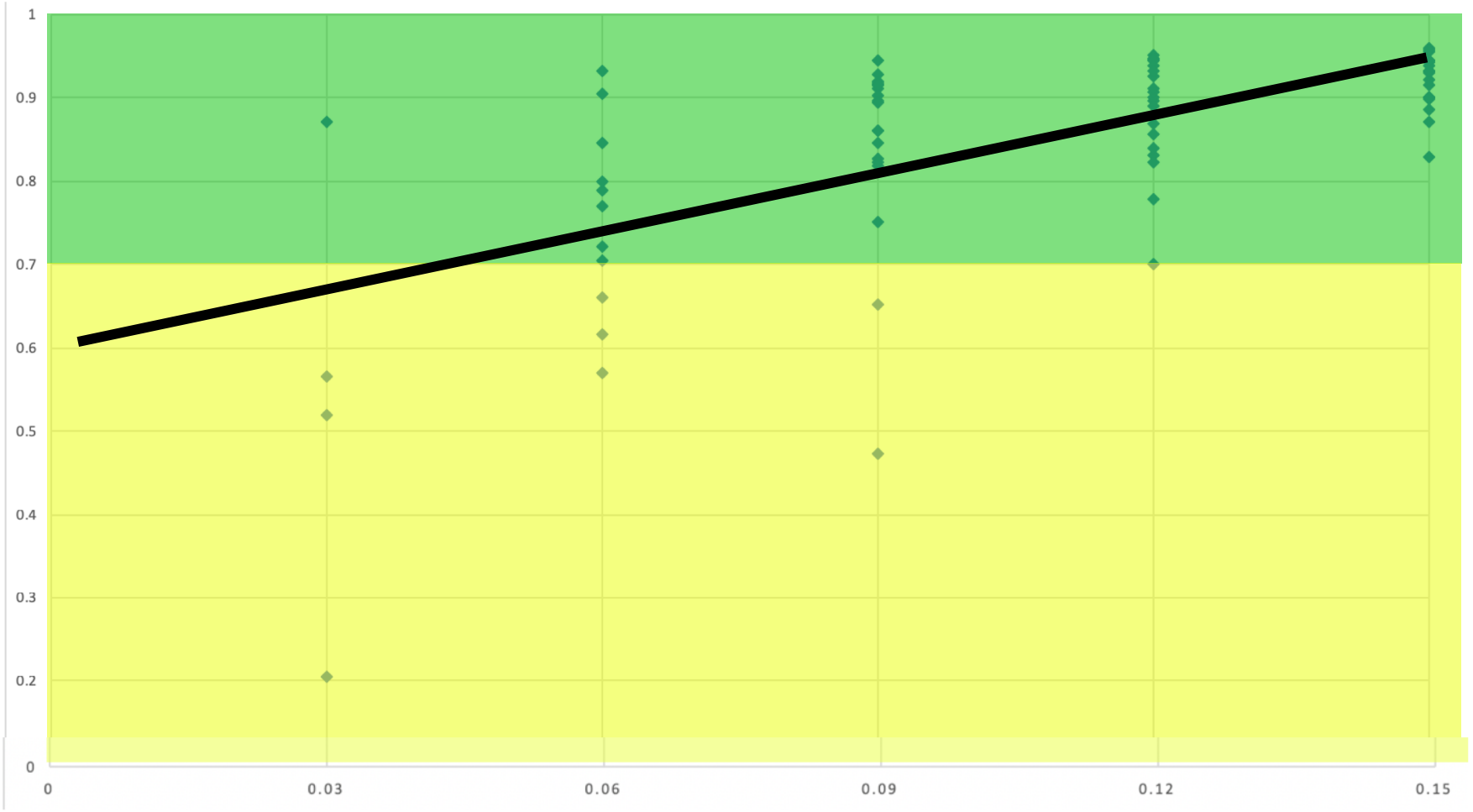
- Email Prof Chilton before the class
- Provide note from a doctor or advising dean
- Watch the video of the class.
- Write a 1-page summary of the key points of the lecture
- Bring it to a staff member during office hours to go over it.

How we measure participation

- Speak up once during class
- After class, we will send out a Google form to log participation.
  - Your uni
  - What you said (just to remind us)
- Due by 6pm after class

Why is participation 15% of my grade?

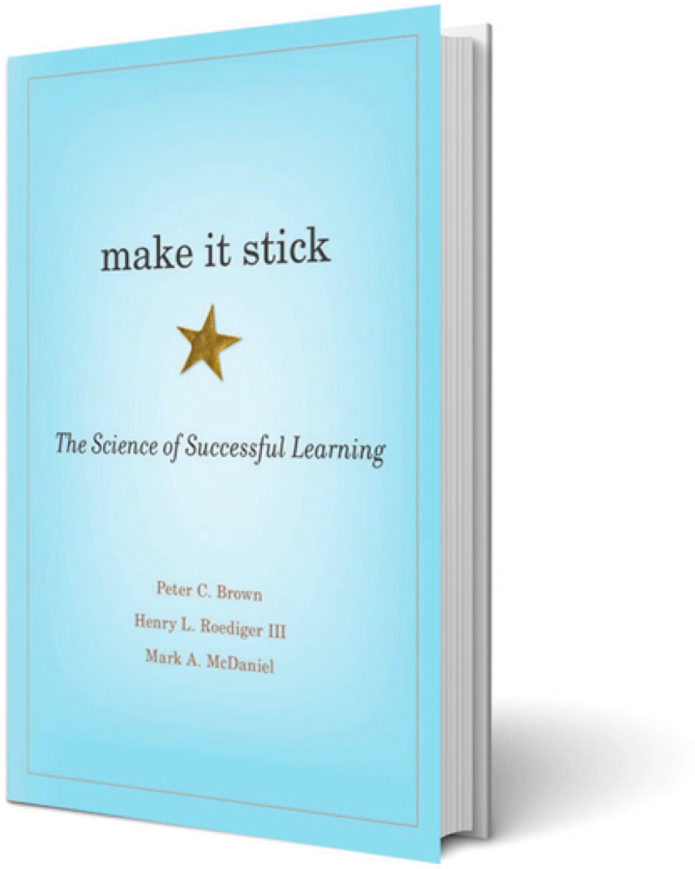
Final Grade
(participation portion omitted)



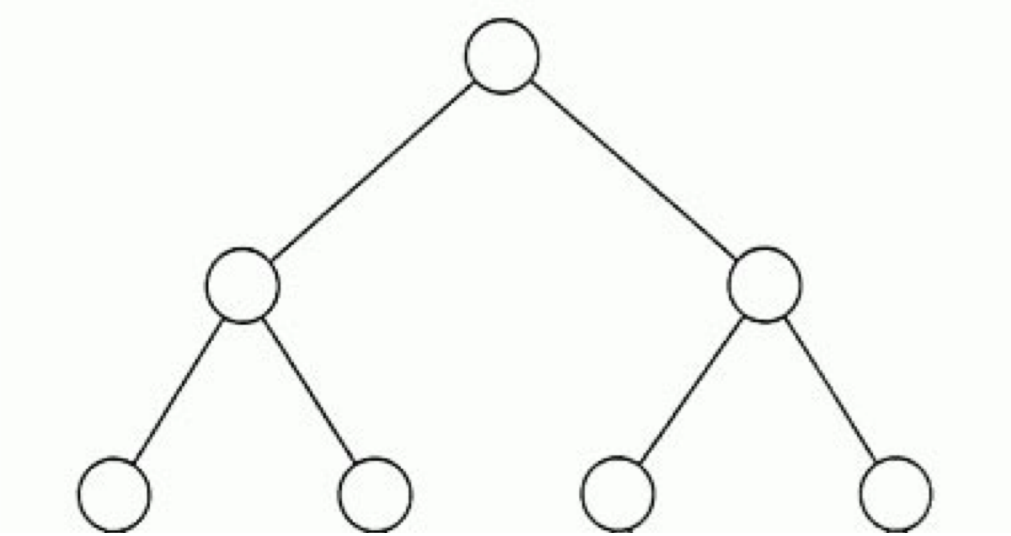
A
B
C
D
F

Participation grade

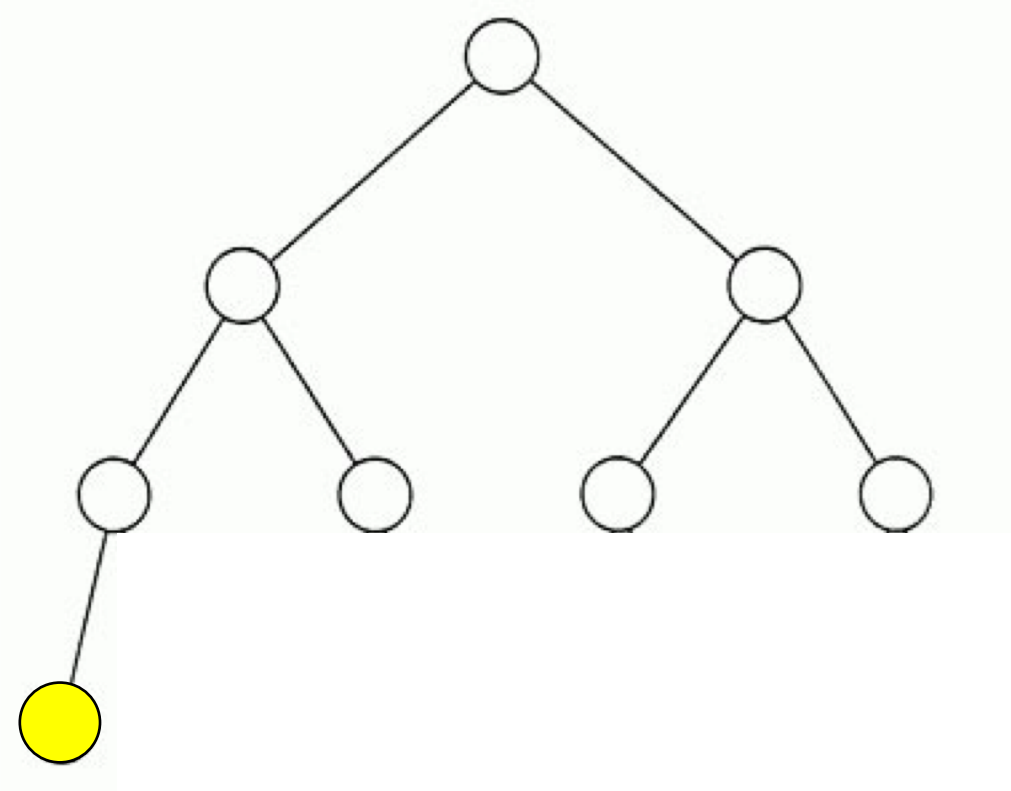
Two reasons why participation affects learning



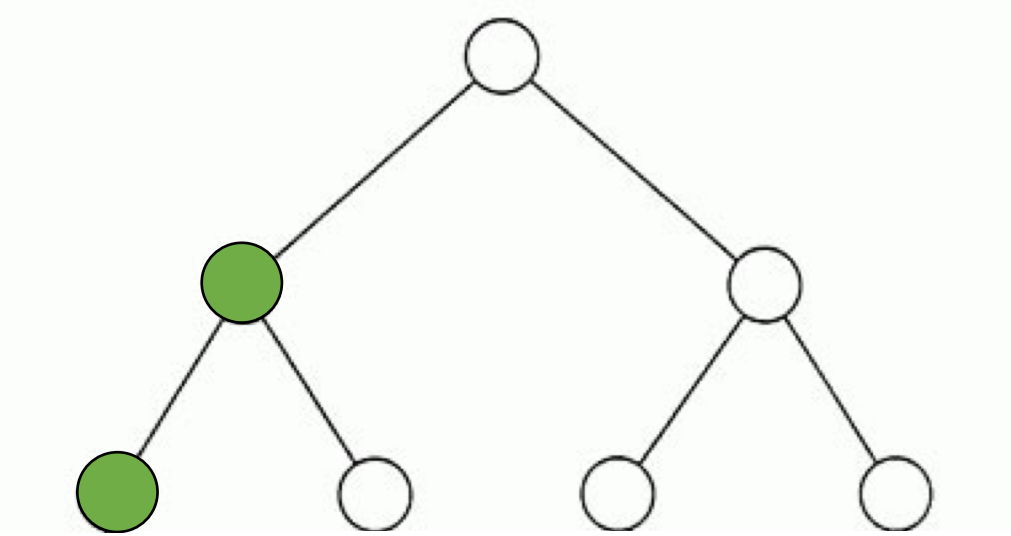
Human memory is tree-structured



New knowledge gets appended to the tree.

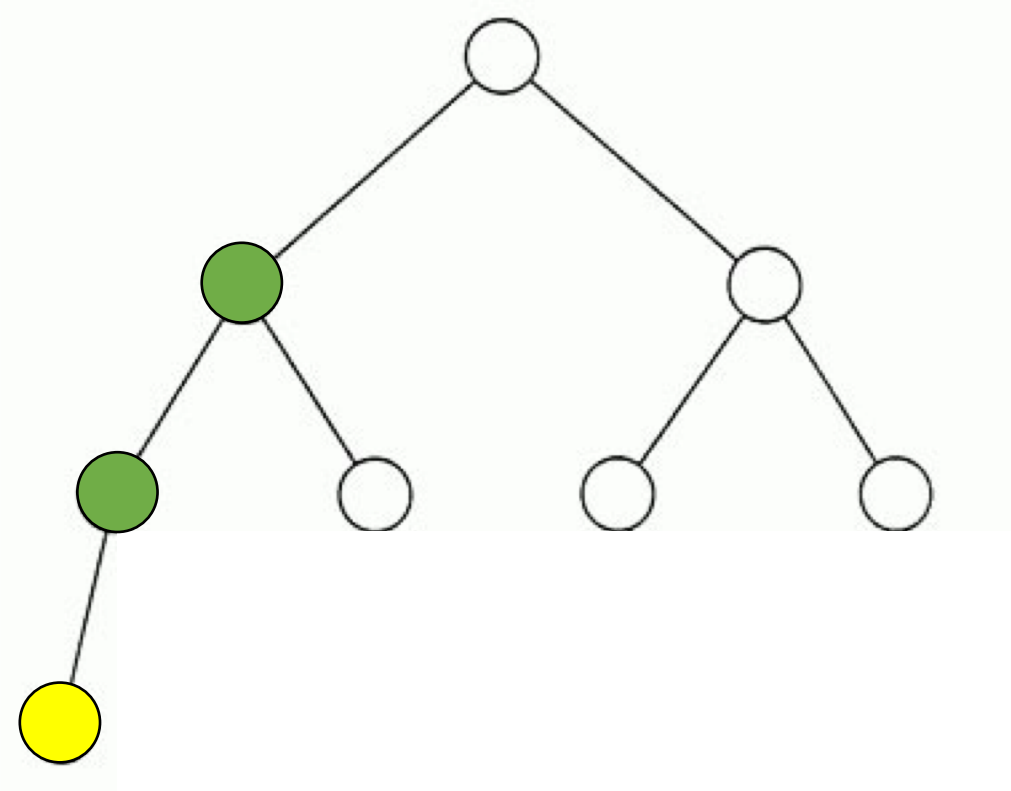


Where does new knowledge get appended?



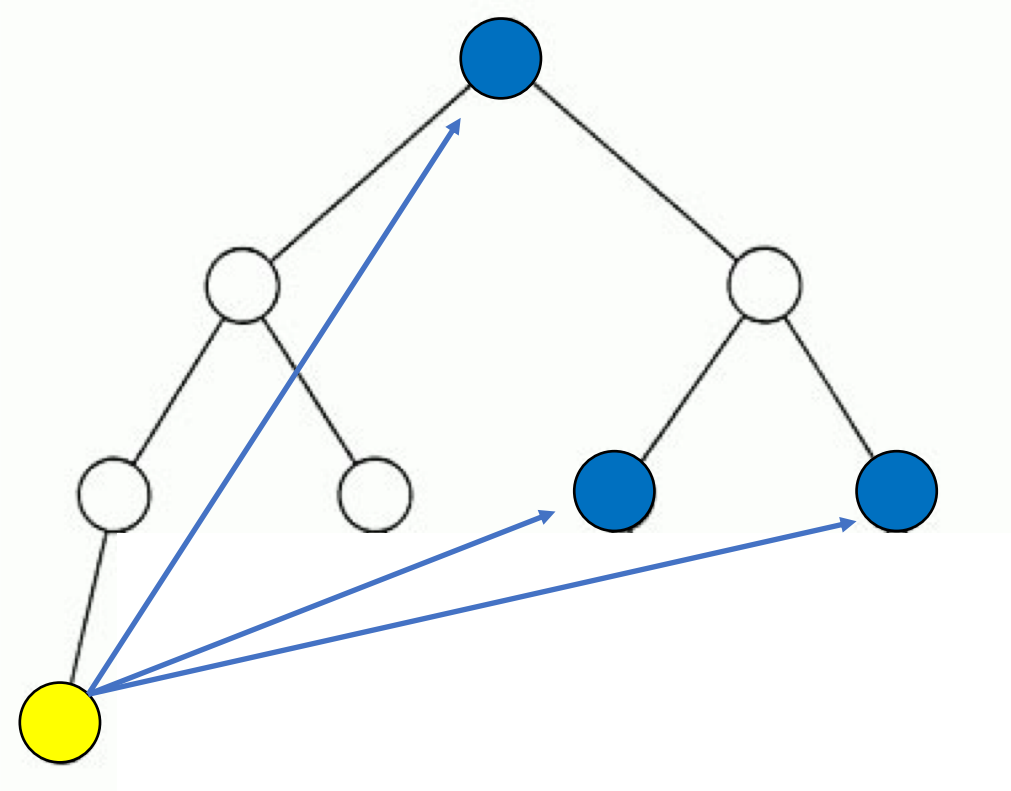
To where nodes of tree are currently active.

1. By guessing about new knowledge before it is presented, you warm up the right place to store it in memory.

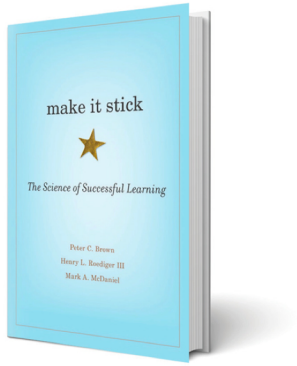


Generation: Guessing before you hear the answer

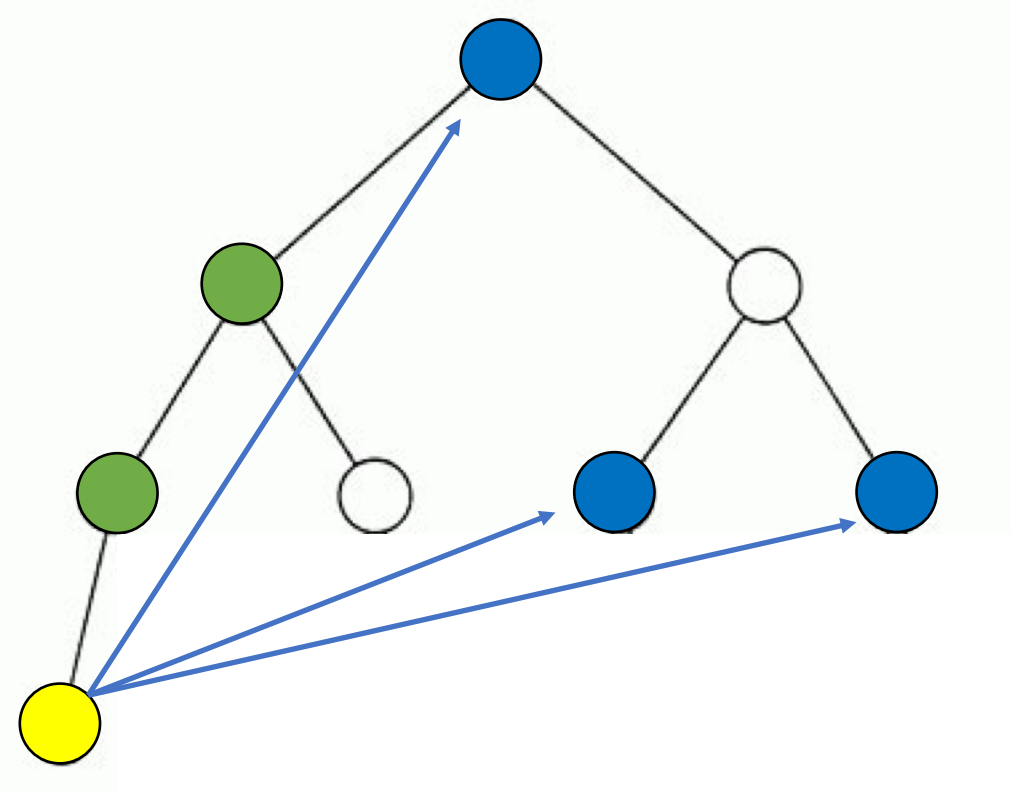
2. Once you hear the new knowledge,
you want to connect it to other knowledge so it will trigger at relevant times.



Elaboration: Relating new knowledge to old topics.



Generation & Elaboration



Guess about the new knowledge.
Must take risks, you will probably be (partially) wrong.

Relate new knowledge to old topics.
This aspect of participation is about providing insights.

Learning from mistakes is good

Tell us about a time that you were wrong about something and learned something from it.

Long answer text

Learning from mistakes is good

Tell us about a time that you were wrong about something and learned something from it.

Long answer text

You are here because you expressed an insight about a time you learned from a mistake.

You were admitted to the this class because you were able to express an insight from a time you made a mistake.

A lesson from a hobby

Early in high school as captain of basketball team I thought I would help the team most by dominating possession of the ball. However, I learned over time that getting teammates more involved created better results, both in terms of winning games and in terms of the team's overall happiness.

Even if one can come up with a solution, it is often the case that someone else has important input, **so working together can help result in a more efficient answer.**

A lesson from work

As Video Intern for Impressive Company, I was tasked with creating original viral content. One of my ideas involved solo dancing in the middle of Times Square. However, upon executing and uploading the video, I realized it fell flat. I realized this wasn't the kind of content our viewers wanted to share on their timelines—it didn't speak to a shared experience.

The video was taken down after five minutes, and I learned to focus **more immediately relatable topics**. This led to the creation of the video captioned "when you LOVE spice," which has me pouring hot sauce on absurd foods such as cereal and kitkats. This video, in comparison, immediately went viral and saw 8 million views.

A lesson from programming

So, I strongly (and I mean strongly) prefer statically-typed languages over dynamically-typed. It just scares me to no ends not knowing how data flows throughout a program until run-time. Therefore, languages like Python sometime annoy me to death. But, recently, I came to realize that was wrong about such a mindset. **I really should not be treating programming as an ideological construct, but more of a practical tool instead.**

All these lessons are from **concrete** examples

In this class, we focus on building concrete examples, and generalizing abstract principles from that. Abstract ideas and principles aren't relatable by themselves.

Let's see some concrete examples of good and bad UI.

Lecture 1:
10 Usability Heuristics

No screens

Prof. Chilton
COMS 4170
22 January 2020

Say your name

1. Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

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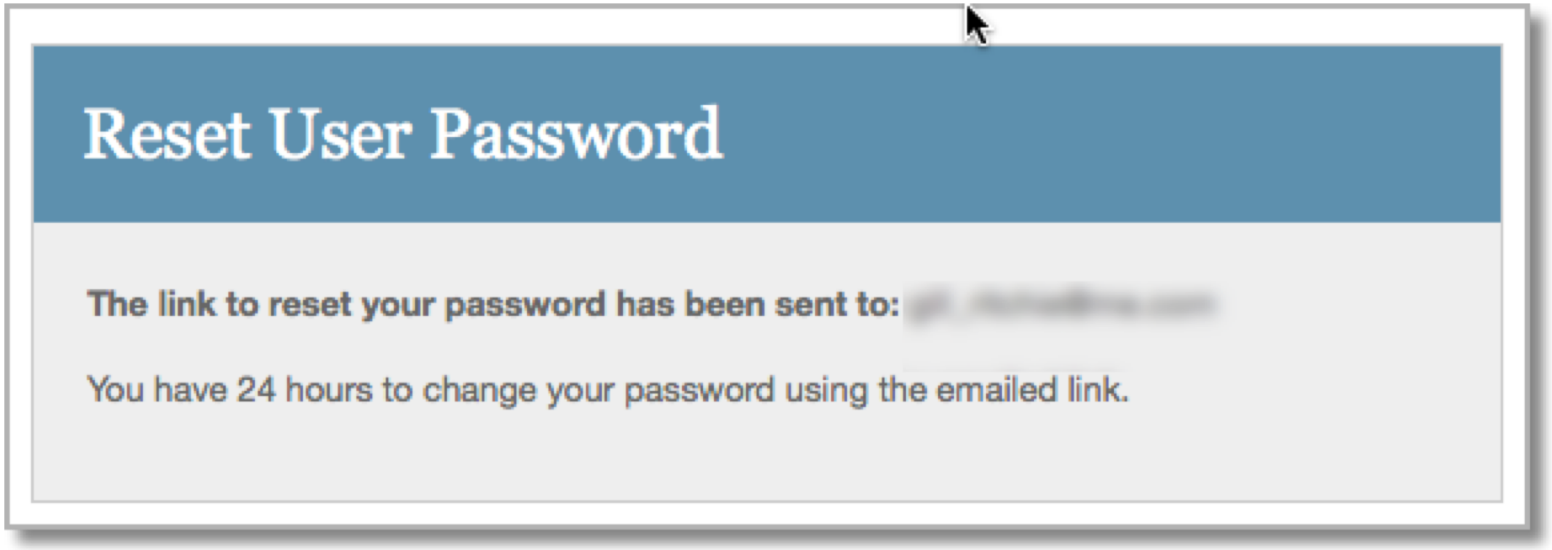
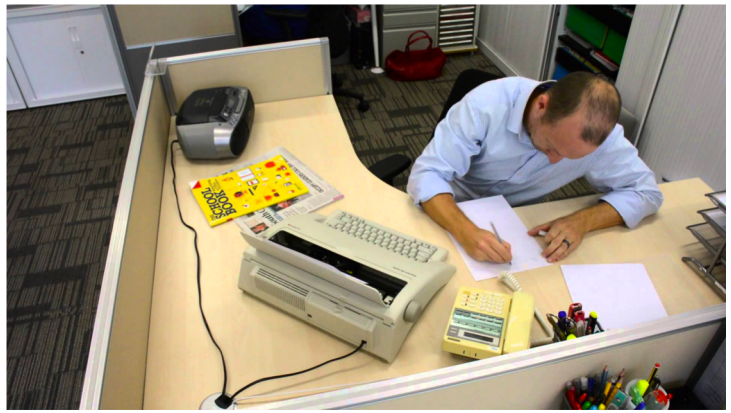


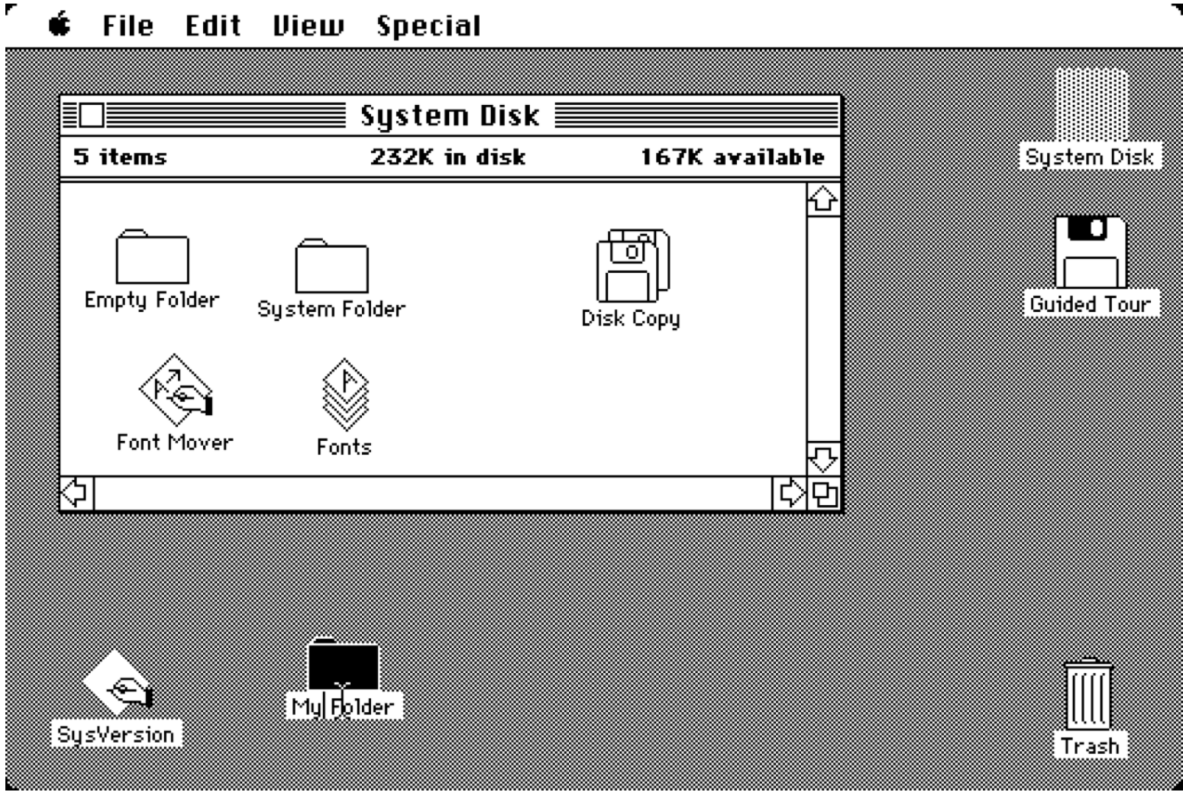
1. Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

2. Match between system and the real world

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms.





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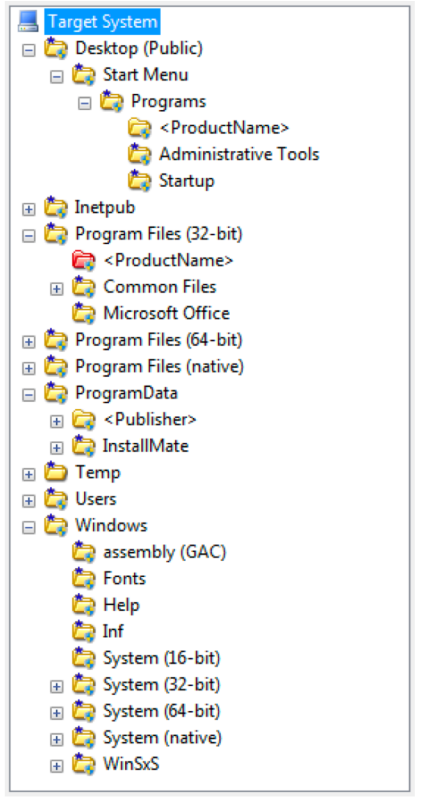

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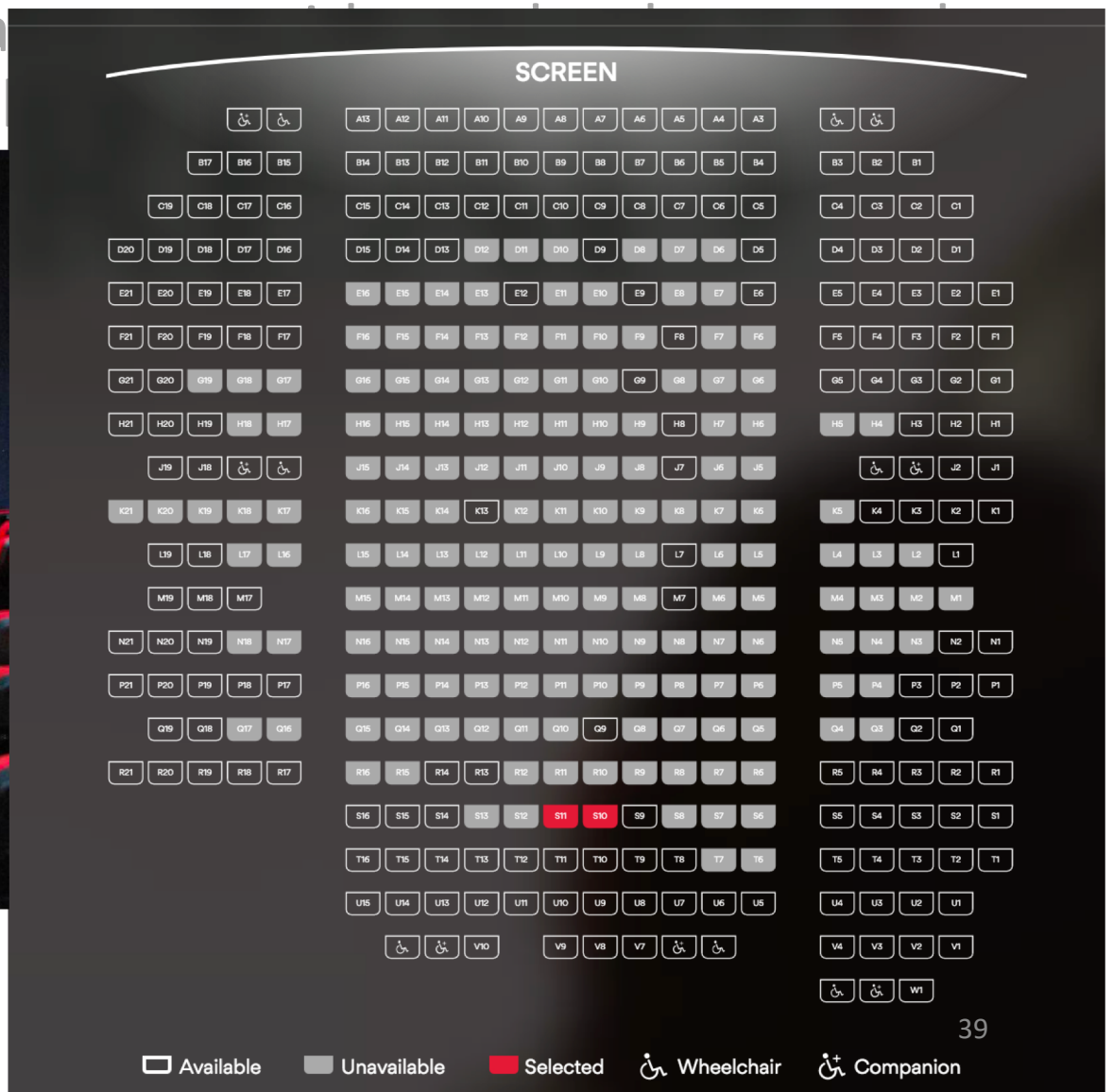

2. Violation: Match between system and the real world

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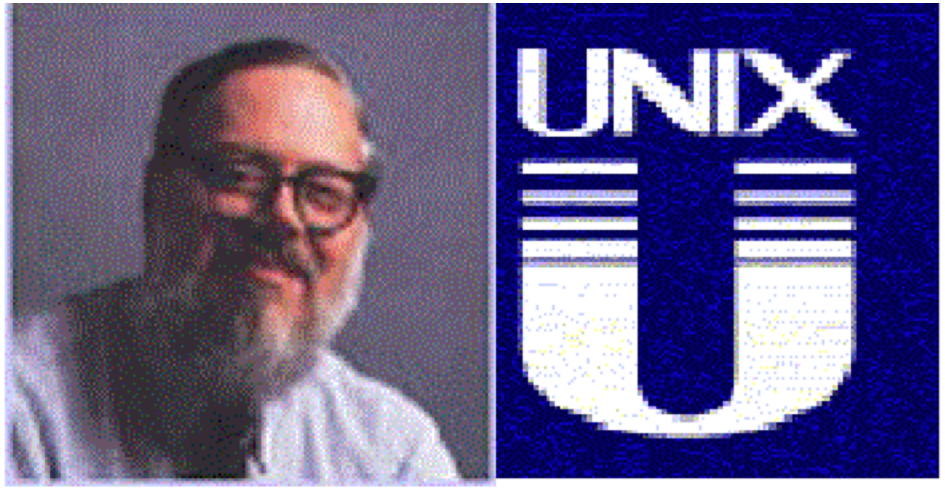


CREAT - create a new file

(Compatible with UNIX System V C)

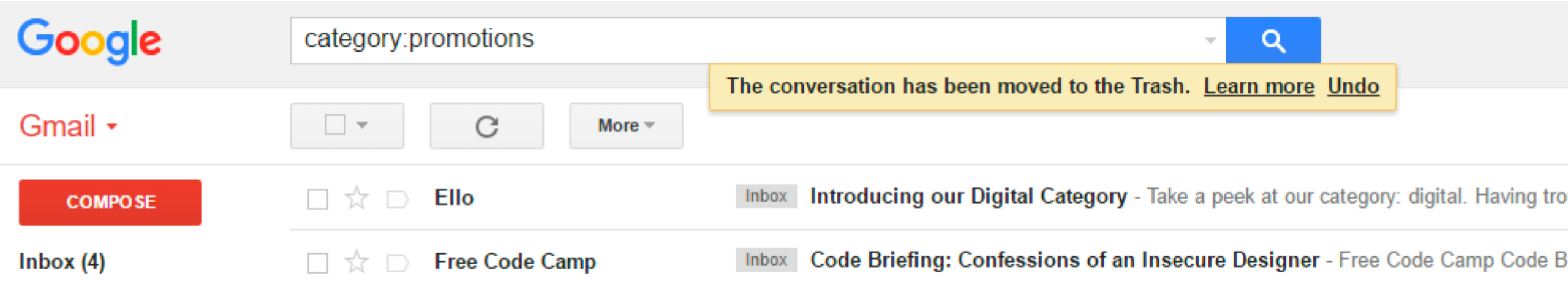
Usage:

```
#include <fildes.h>
fd = creat( name, mode );
```

"I'd spell `creat` with an `e`."

3. User control and freedom (Navigation)

Users often choose system functions by mistake and will need easy ways to fix the mistakes. Support undo and redo.



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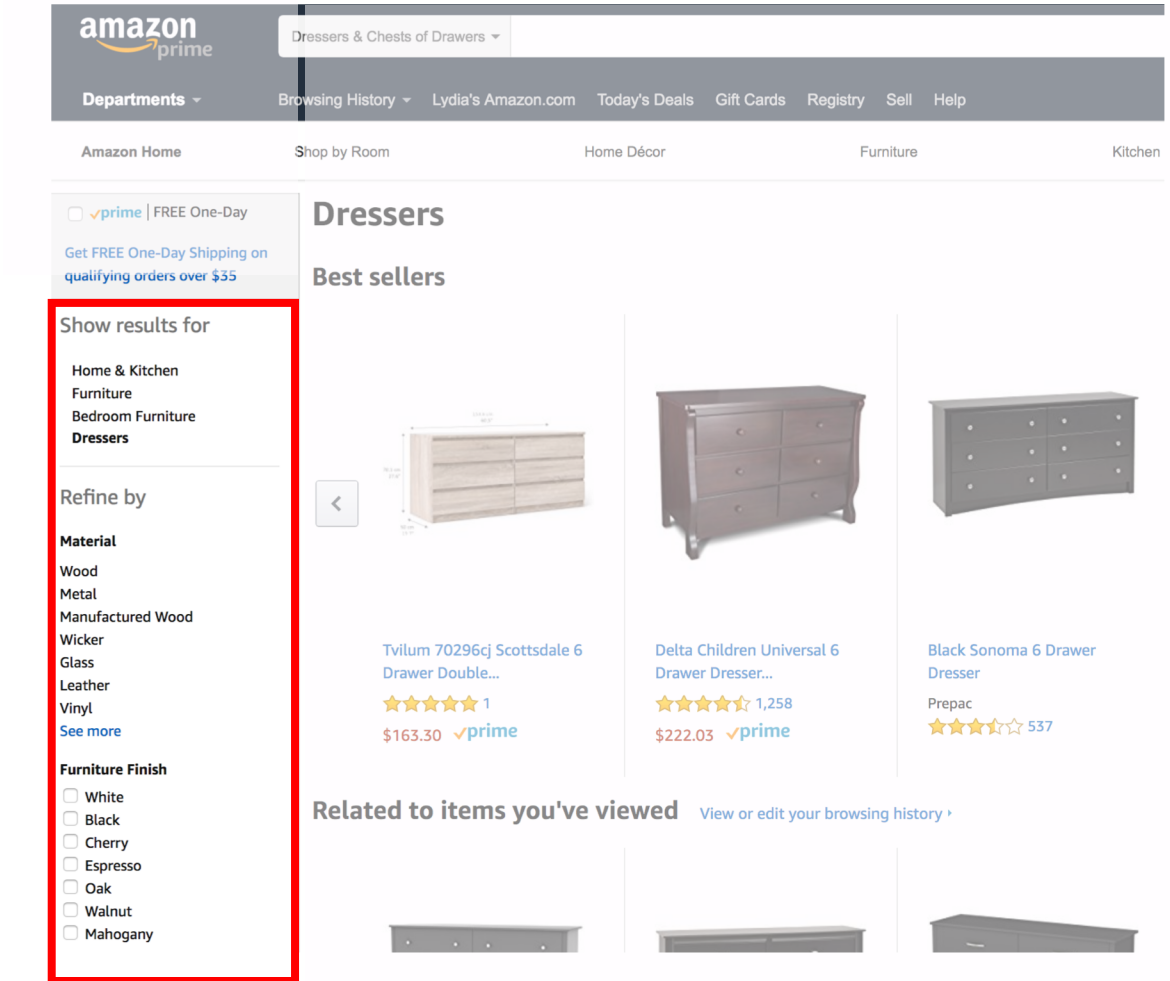
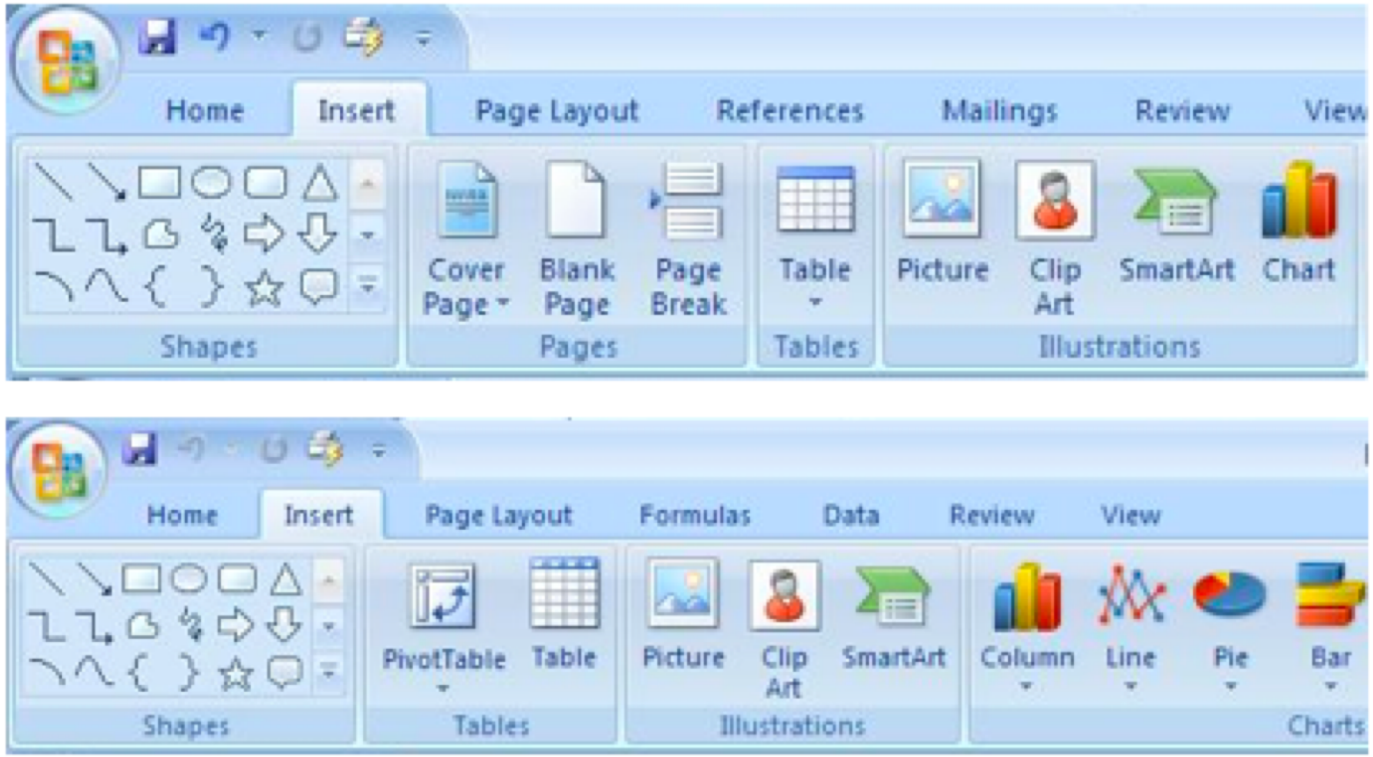


4. Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.



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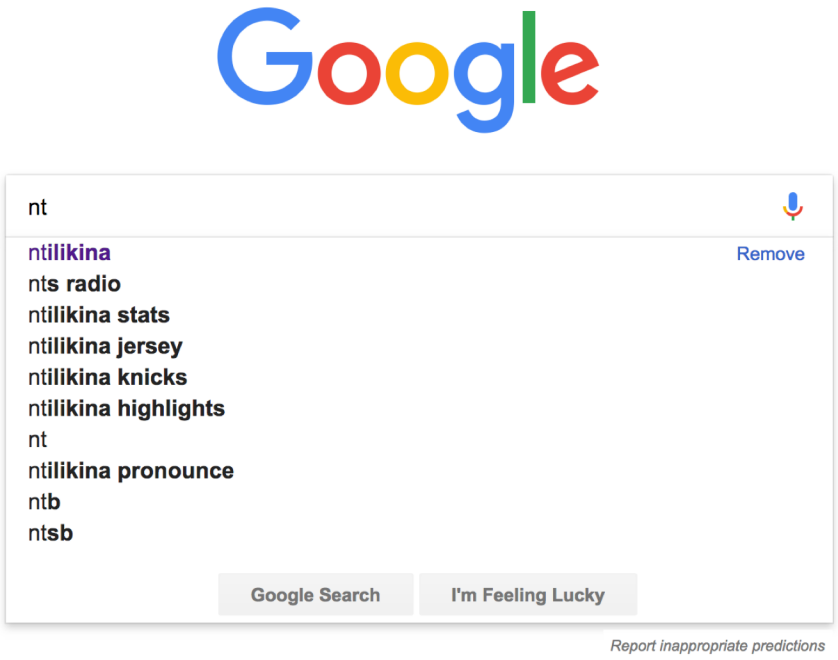
5. Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place.



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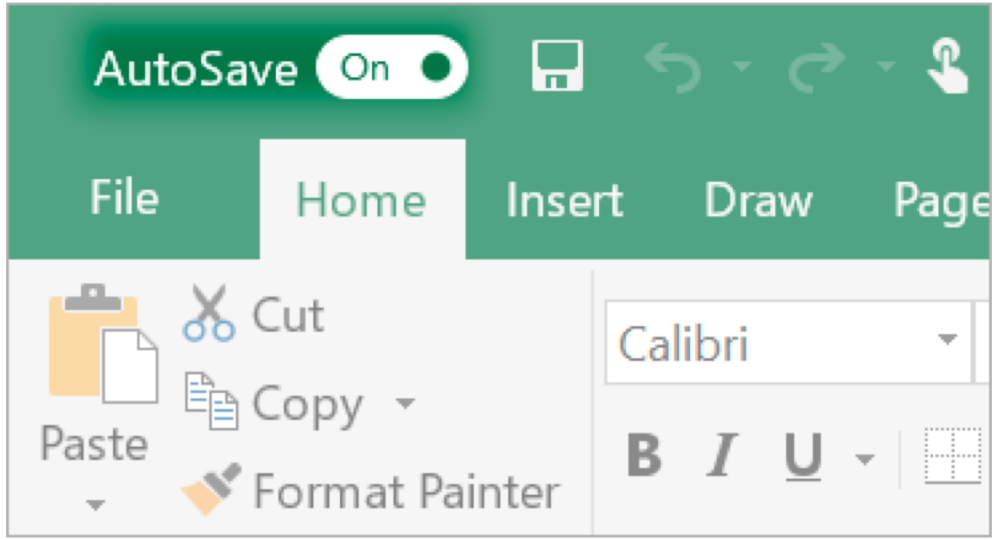

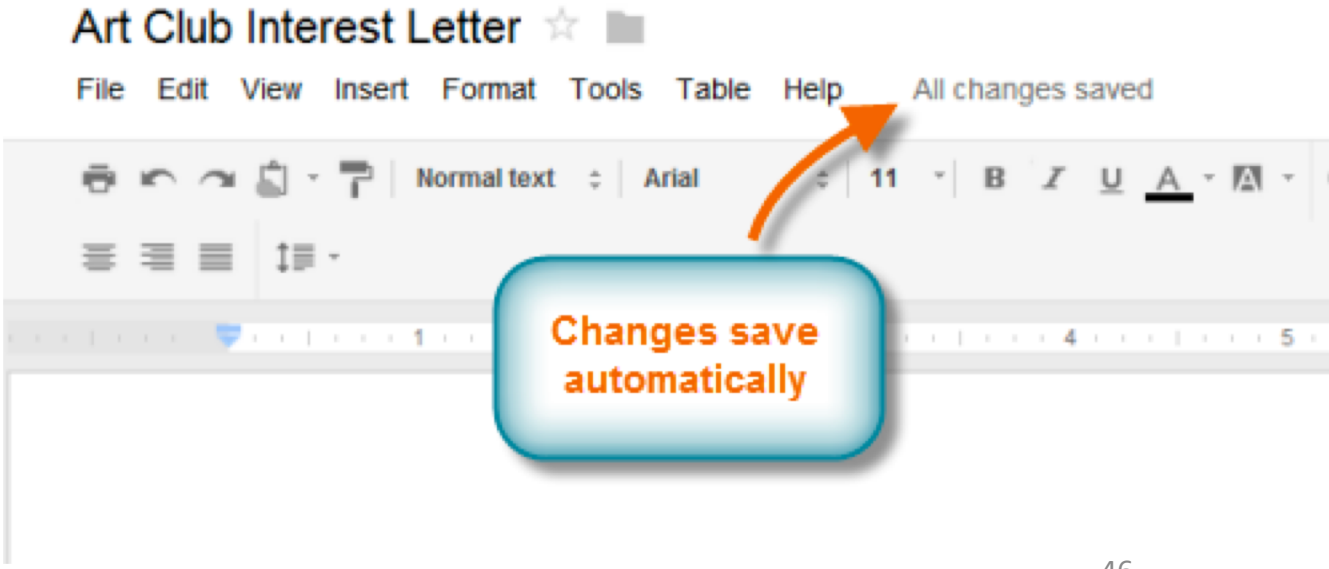

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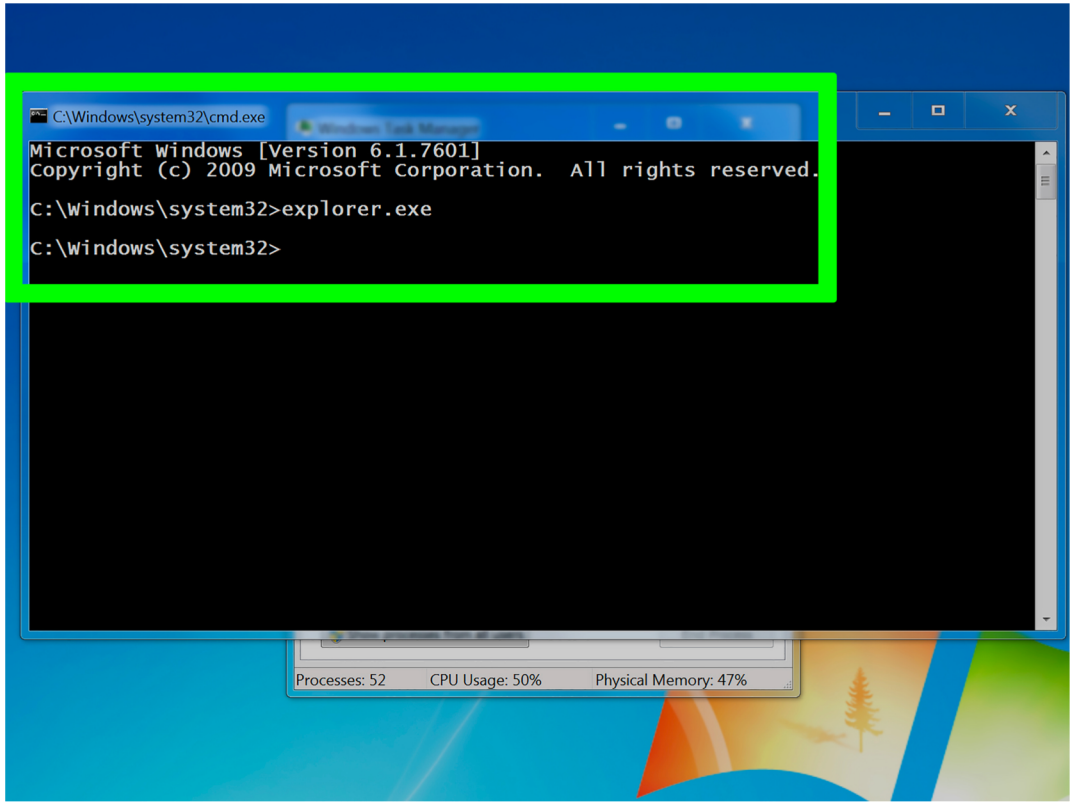
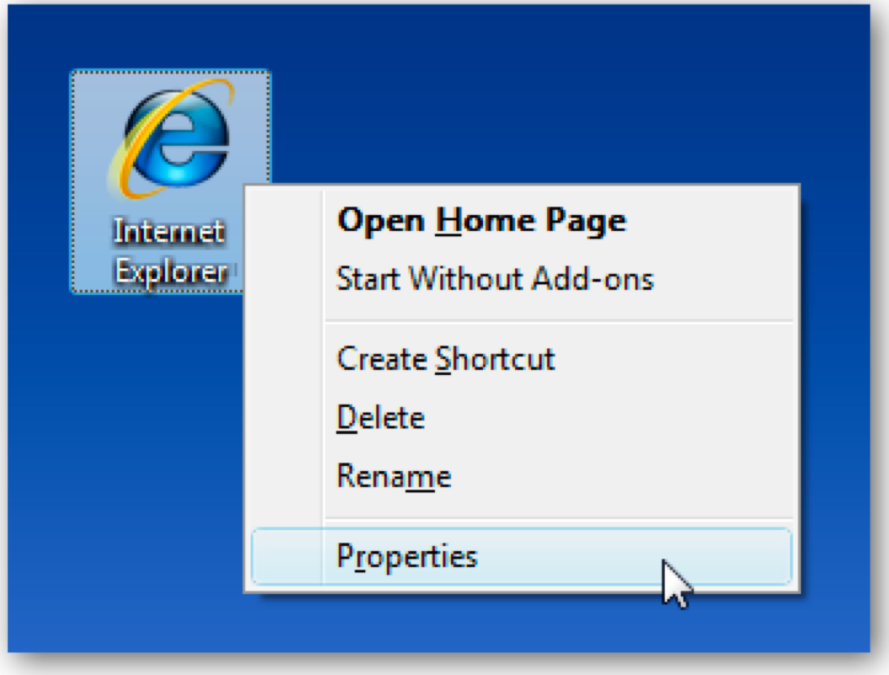
Faculty mailing list
Faculty@lists.cs.columbia.edu
https://lists.cs.columbia.edu/mailman/listinfo/faculty

Click here to Reply, Reply to all, or Forward

6. Recognition rather than recall

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another.





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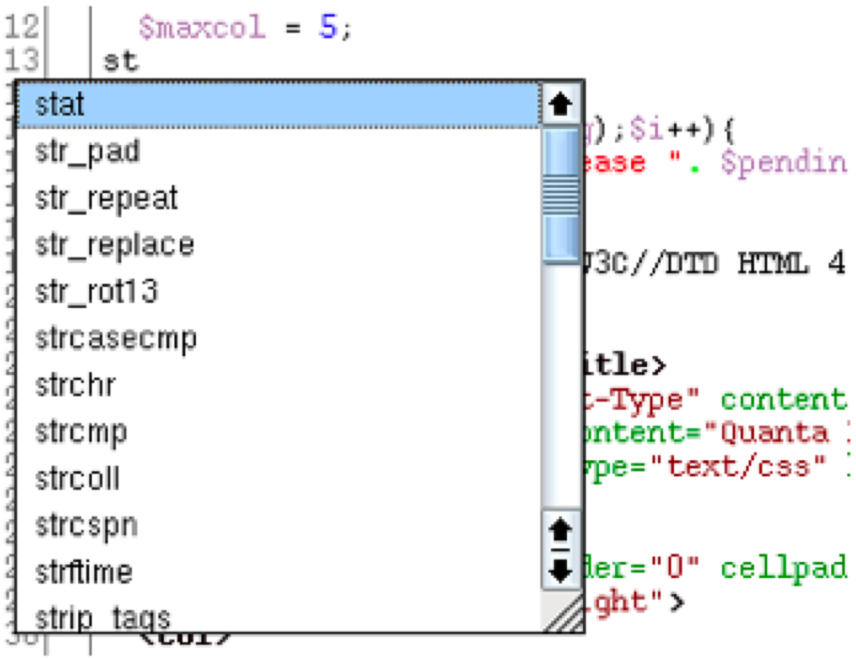
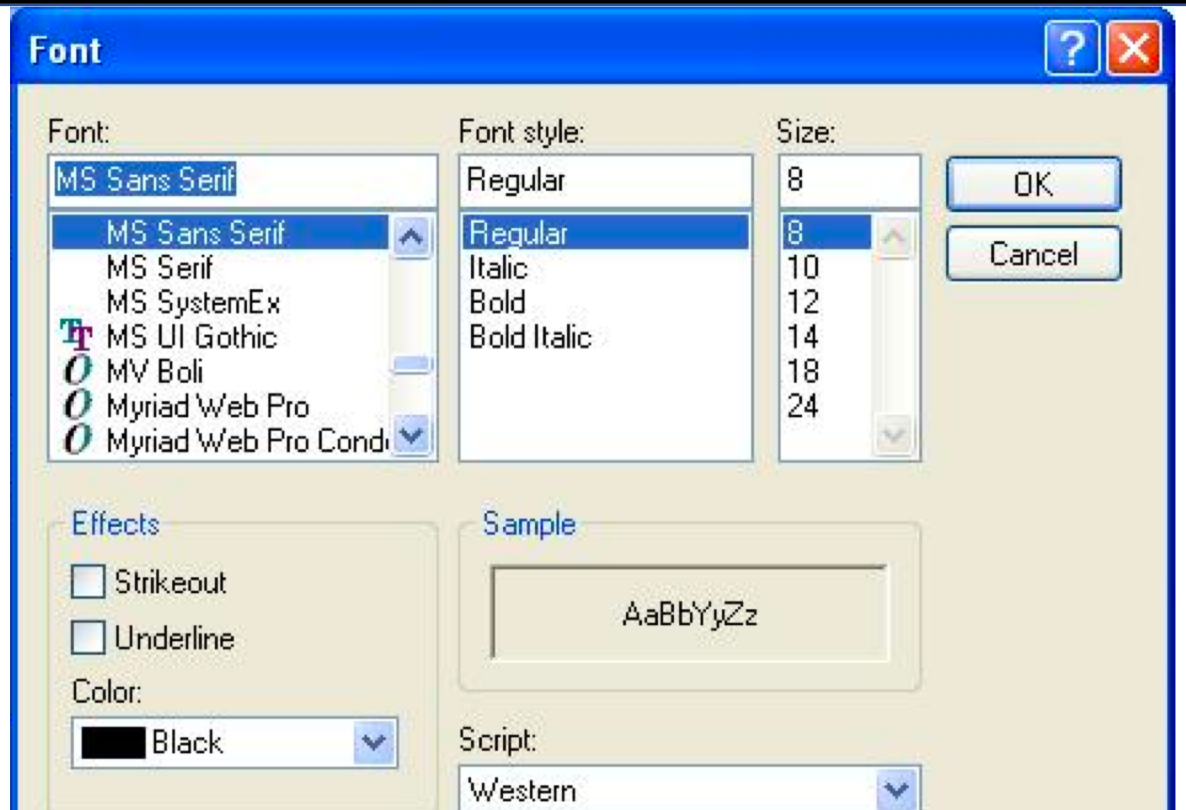
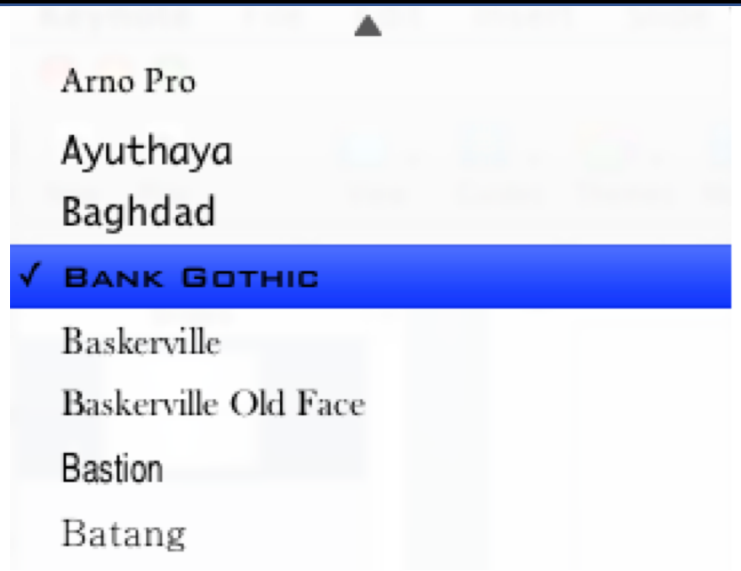


6. Violation: Recognition rather than recall

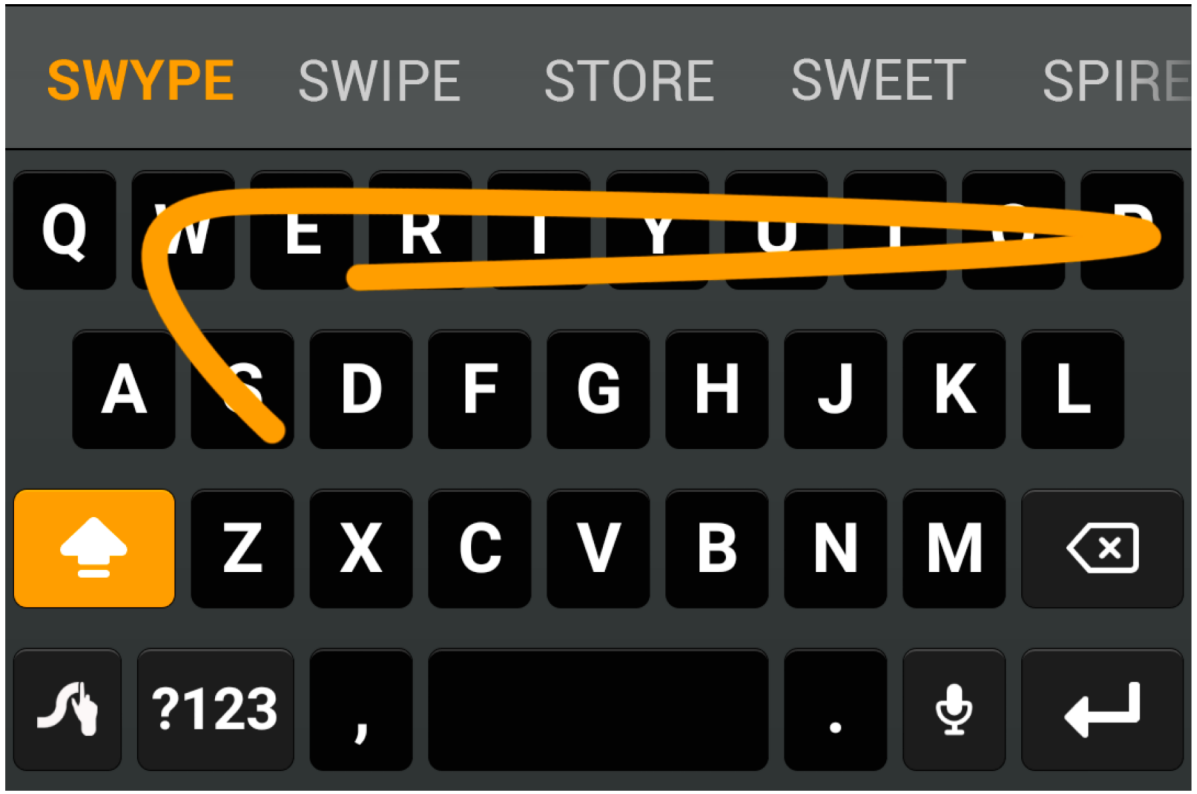
Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another.





7. Flexibility and efficiency of use

Accelerators — unseen by the novice user — may often speed up the interaction for the expert. Allow users to tailor frequent actions.



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Common Shortcuts

Add Action	**Return**
New Window	**⌘N**
Synchronize with Server	**^⌘S**
Clean Up	**⌘K**
Planning Mode	**⌘1**
Context Mode	**⌘2**
Inbox	**⌥⌘1**
Quick Entry	**^⌥Space**

Quick Entry's shortcut can be customized in Preferences

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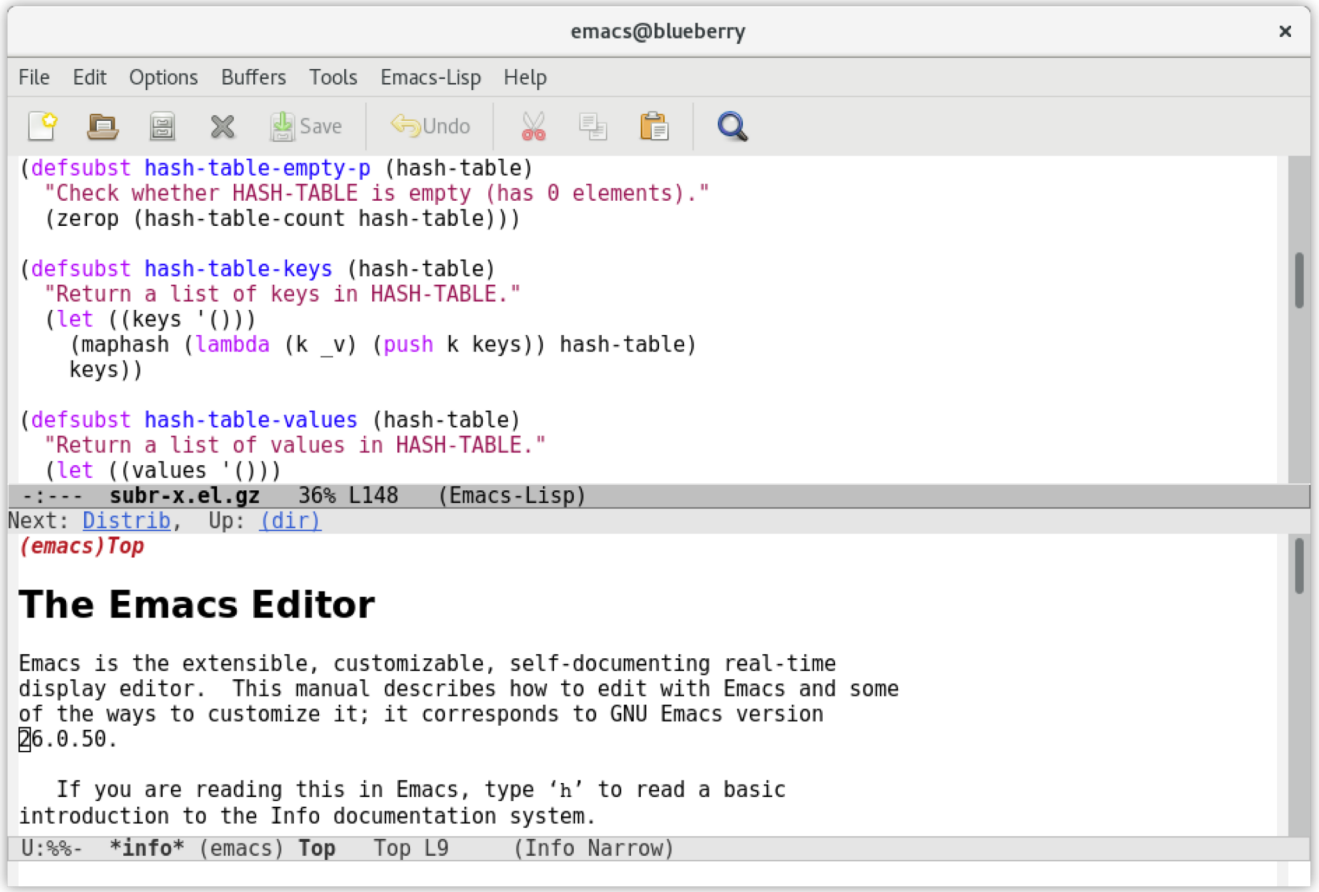

8. Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

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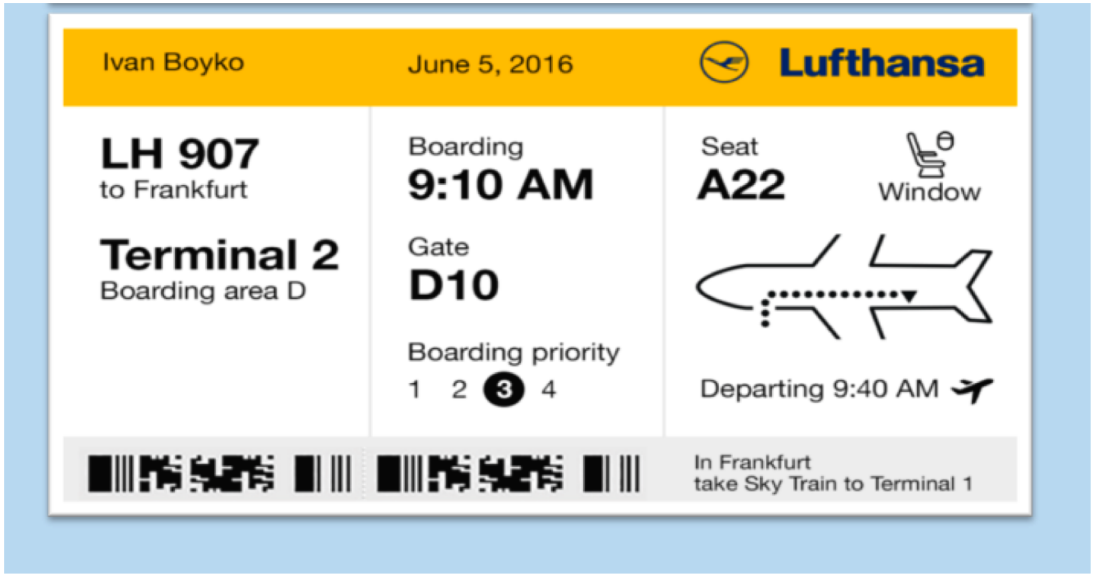
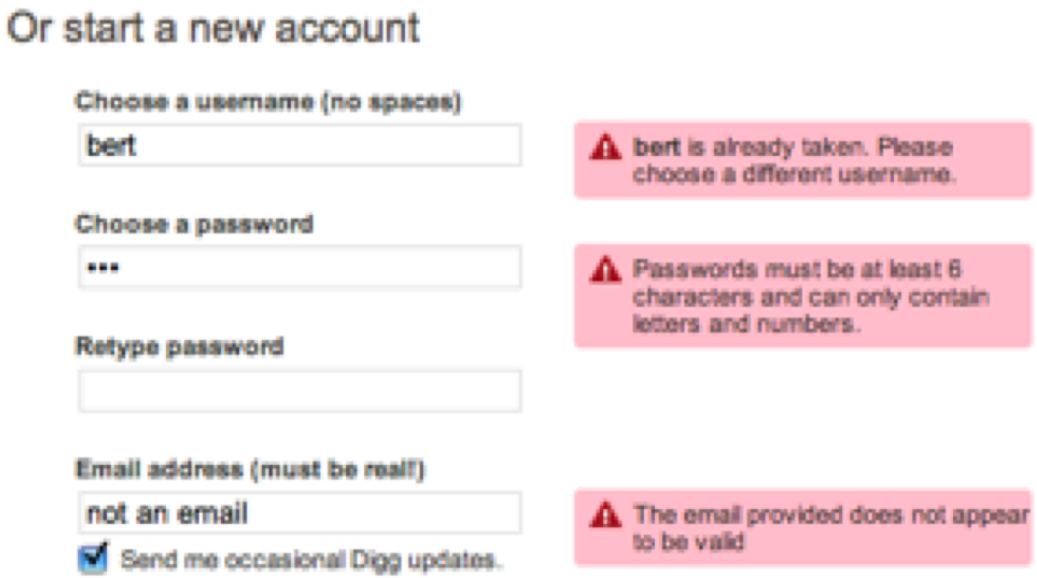


9. Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.



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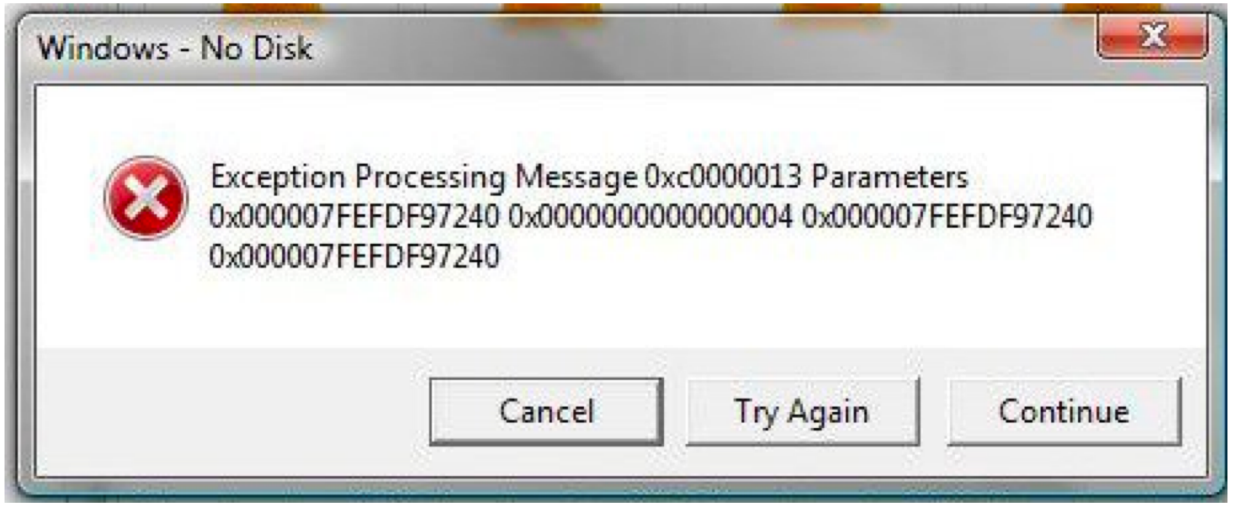
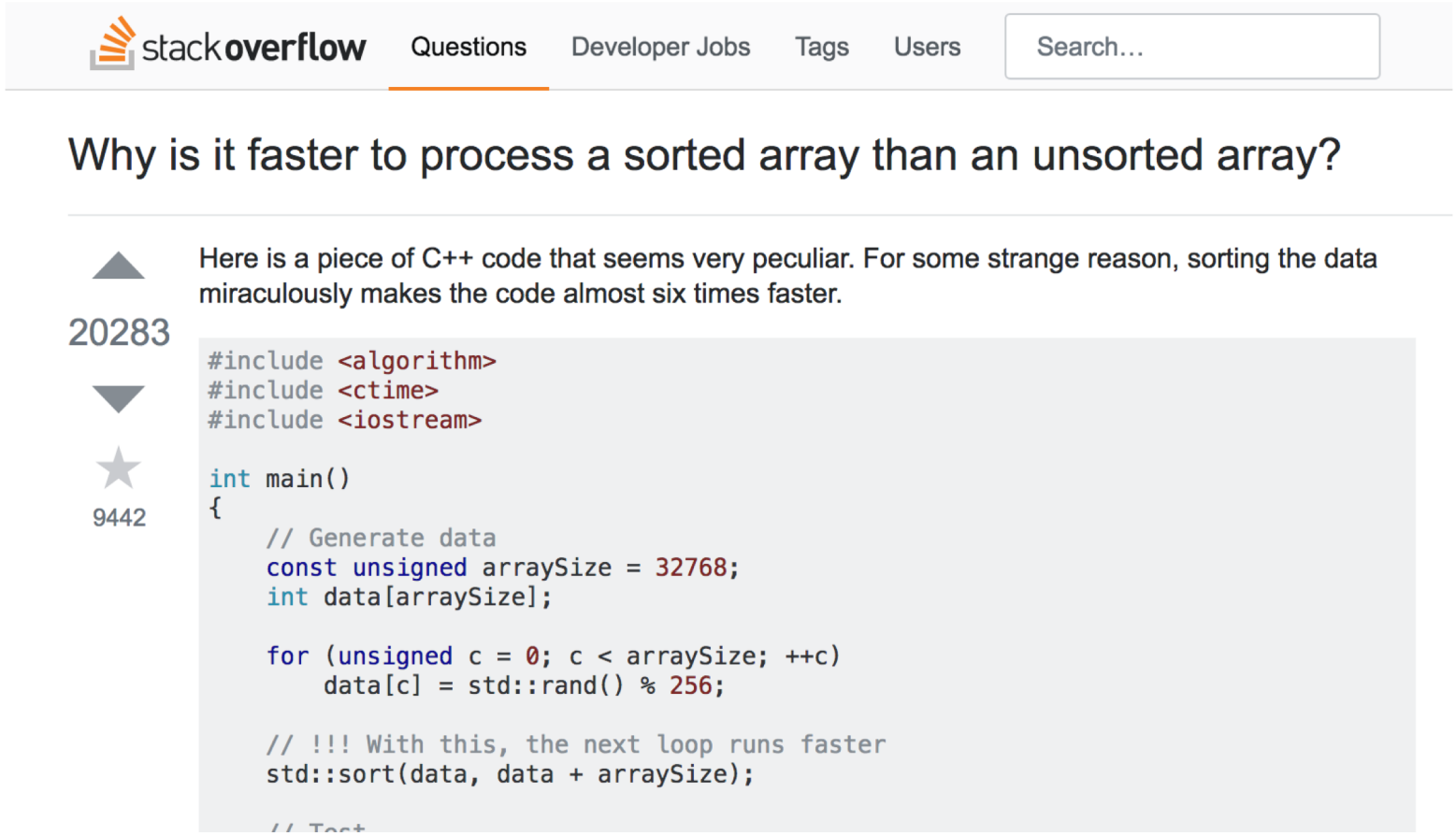


10. Help and documentation

Documentation should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.



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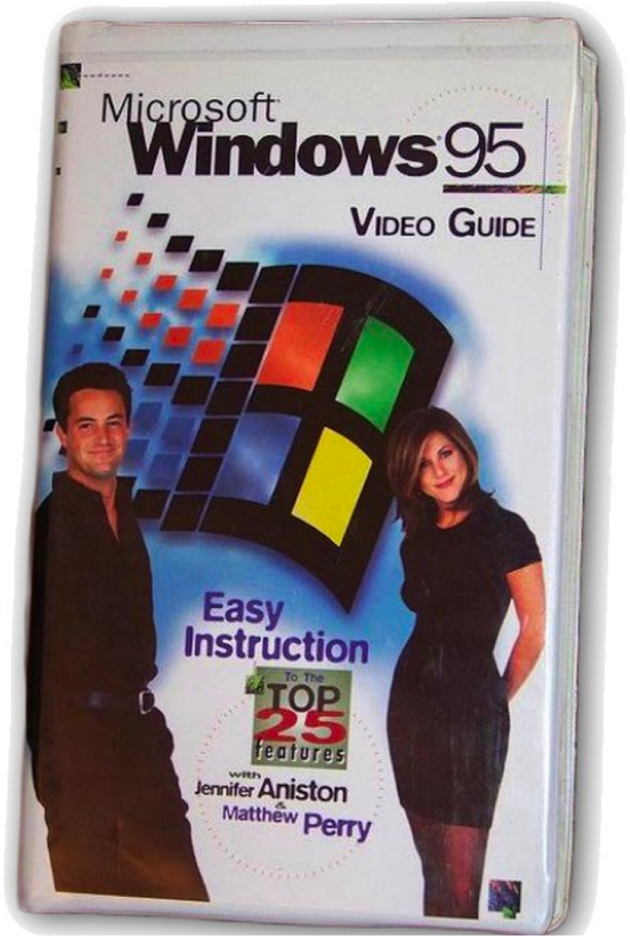

10. Violation: Help and documentation

Nielsen's 10 Usability Heuristics

1. Visibility of system status
2. Match the real world
3. User control and freedom
4. Consistency and Standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Recover from Errors
10. Help and documentation

QUIZ 1 of 3

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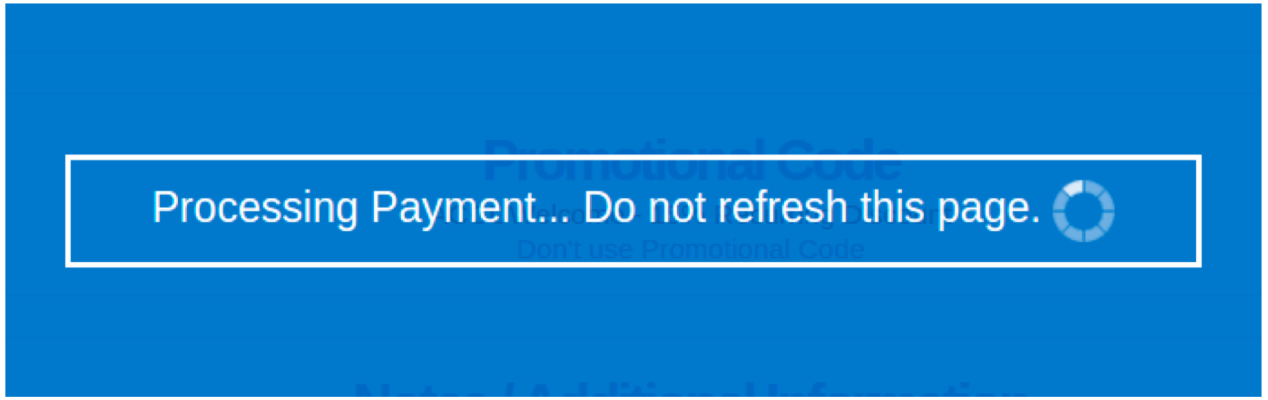

QUIZ 2 of 3

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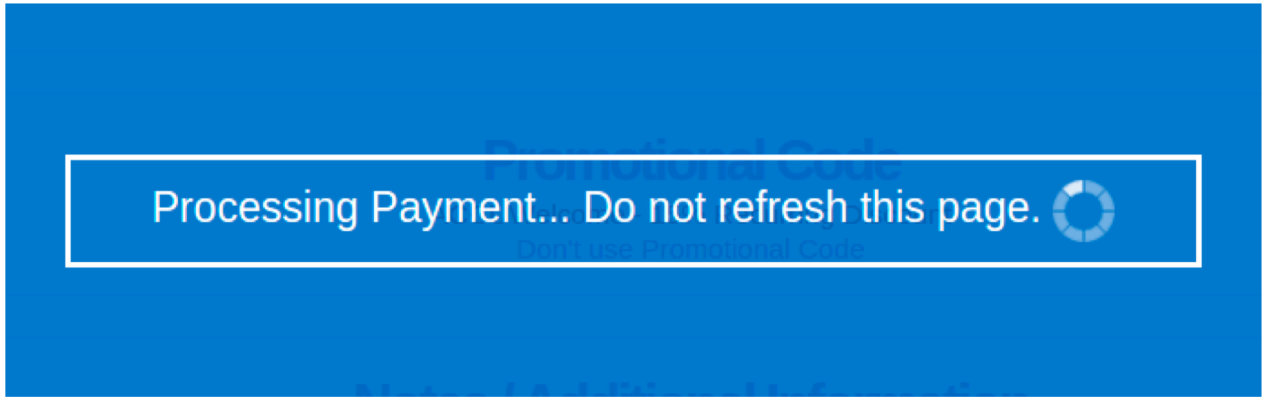

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Homework 1 Part 1

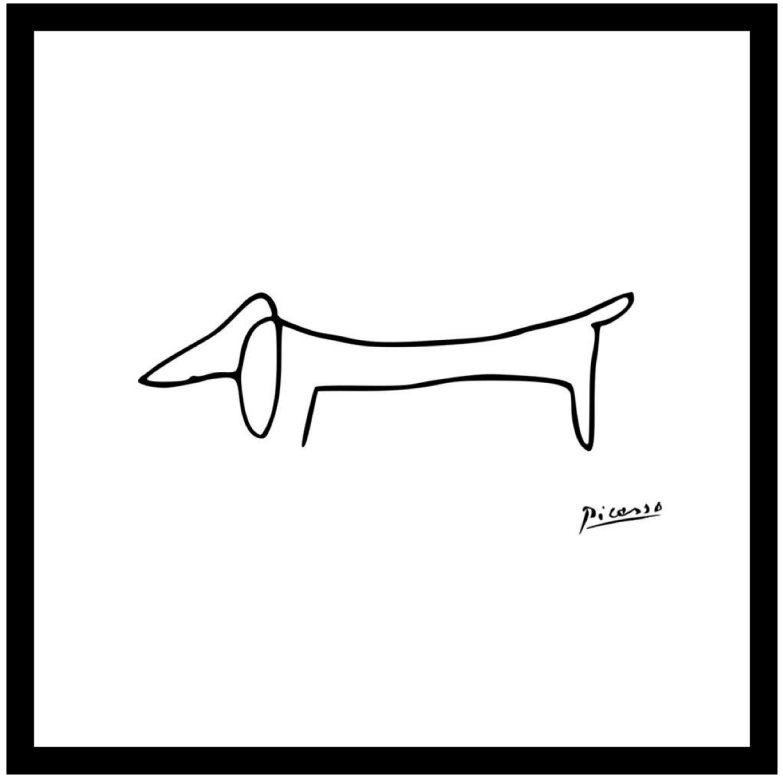
- Due Wednesday Jan 29th @ 4:00 PM.
  - Find **two** examples of web or mobile applications that **positively** exhibit one of the usability heuristics (other than 8. Aesthetic an minimalist design)
  - Find **two** examples of web or mobile applications that **negatively** exhibit one of the usability heuristics (other than 8. Aesthetic an minimalist design)
  - Questions about class policy
  - There is a code part as well – we'll cover that material later.

  - **In this class, Googling for programming syntax is good.**
    - We expect it.
    - If you get an error, the first question we will ask is "Did you Google it?"

Fill out Google Participation form now!

- Linked to from the course webpage

Please don’t underestimate this class



Simple, functional design is deceptively difficult

coms4170.cs.columbia.edu/2020-spring/

Columbia University

User Interface Design

COMS 4170 · Spring 2020

Home Grading Syllabus Piazza

Goals

1. Build websites that suit the needs and abilities of users.
2. When the needs and abilities of users are uncertain, design systems by learning from iteration.

Syllabus

WEEK	MONDAY	WEDNESDAY
1	JANUARY 20 *No class*	JANUARY 22 Participation Form Usability Heuristics Homework 1 out