



Usability

Usability & Utility

continued

Usability

Usable or unusable?

A teapot

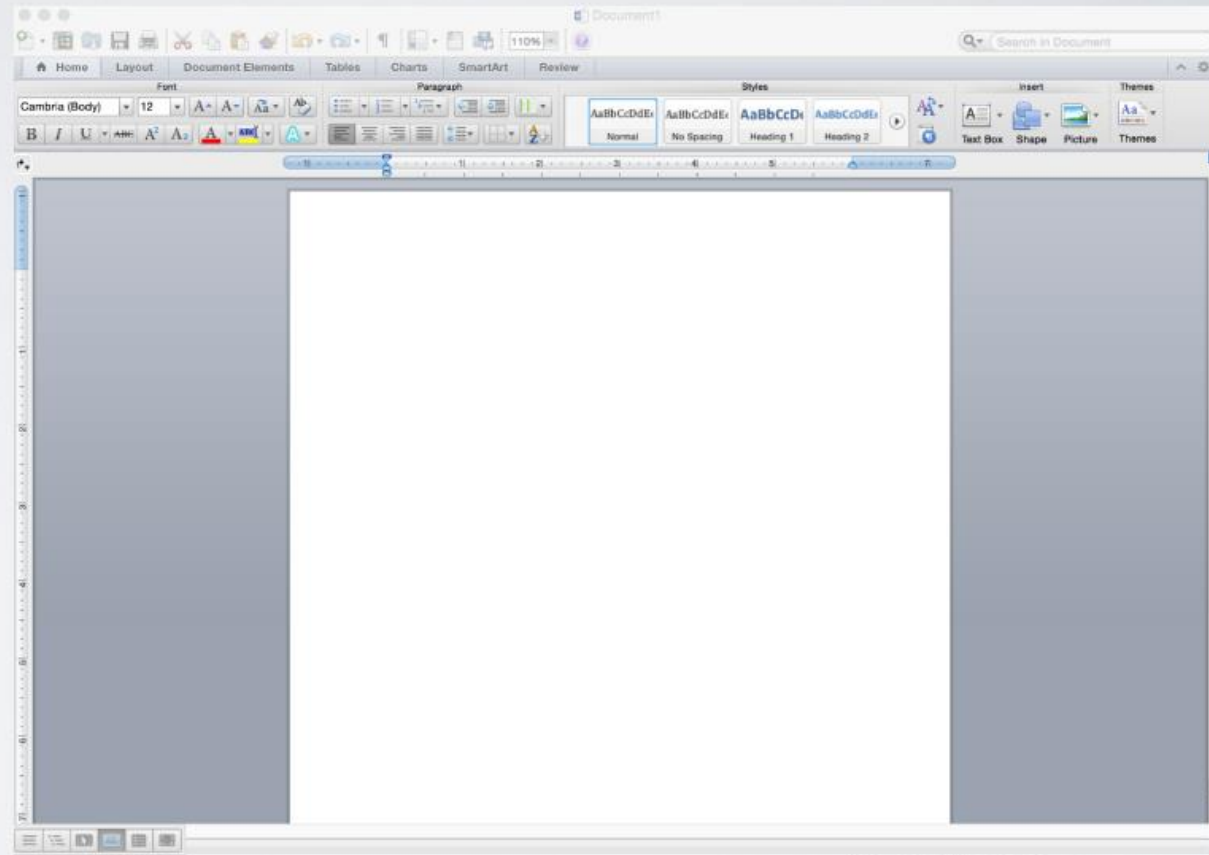


From Don Norman, Emotional Design

Usability

Usable or unusable?

**A word
processor**



Usability

- A property of the relationship between
 - humans with goal-driven tasks
 - an artifact
- The speed and success with which the goals can be accomplished (**task performance**)

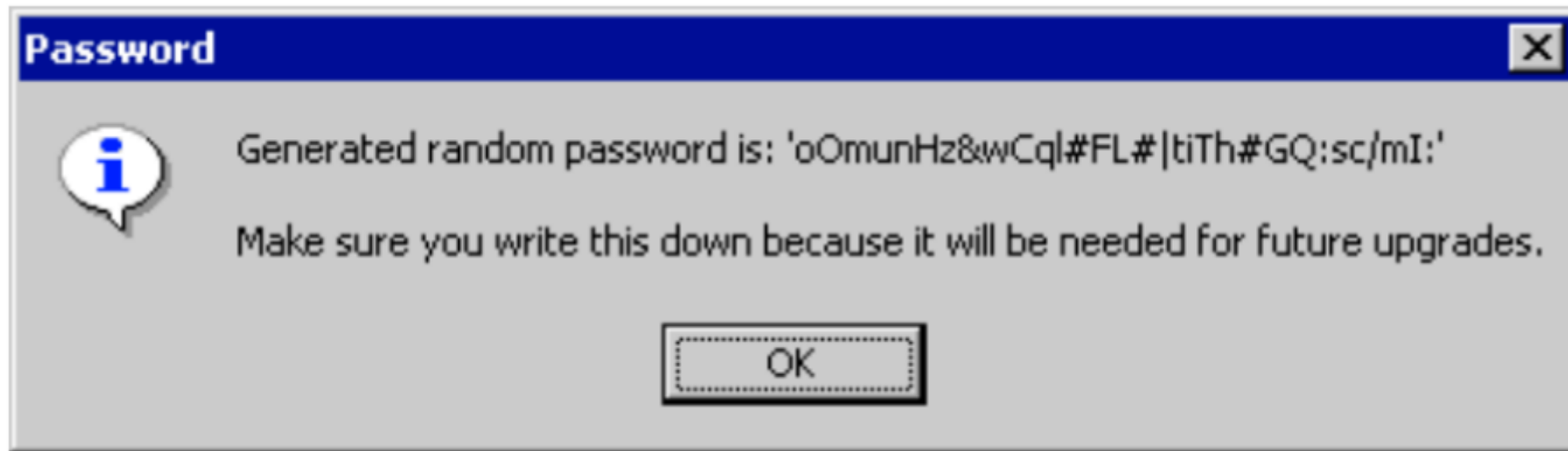
Why study usability?

“The results show that in today's applications, an average of 48% of the code is devoted to the user interface portion.

The average time spent on the user interface portion is 45% during the design phase, 50% during the implementation phase, and 37% during the maintenance phase.”

– Myers & Rosson, CHI'92

Why study usability?



Why study usability?

Life-Threatening Errors

- 1995 American Airlines jet crashed into canyon wall, killing all aboard
- On approach to Rozo airport in Colombia pilot skipped some of the approach procedures
- Pilot typed in “R” and system completed full name of airport to Romeo
- Guidance system executed turn at low altitude to head for Romeo airport
- 9 seconds later plane struck canyon wall
- Is the pilot to blame?

http://en.wikipedia.org/wiki/American_Airlines_Flight_96

Usability characteristics

Characteristics that makes something **usable**?

Some usability characteristics

- ease of use
 - efficiency
- effectiveness
 - learnability
 - retainability
- user satisfaction

Usability & Utility

- **Usability** is a **quality attribute** that assesses how easy user interfaces are to use.
- Defined by **5 quality components**:
 - **Learnability**: How easy is it for users to accomplish basic tasks the first time they encounter the design?
 - **Efficiency**: Once users have learned the design, how quickly can they perform tasks?
 - **Memorability**: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
 - **Errors**: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
 - **Satisfaction**: How pleasant is it to use the design?
- There are many other important quality attributes. A key one is **utility**, which refers to the design's functionality: **Does it do what users need?**
- It matters little that something is easy if it's not what you want.
- It's also no good if the system can hypothetically do what you want, but you can't make it happen because the user interface is too difficult.

Usability evaluation

Usability evaluation

- Given humans with goals and tasks and a new artifact, identify **usability issues** that decrease task performance.
- **Empirical: evaluation study**
Observe humans to identify usability issues that decrease task performance. (ground truth)
- **Analytical: usability principles**
Given humans with goals and tasks and an artifact, assess for conformance to UI principles to identify usability issues that decrease task performance. (approximation of ground truth)

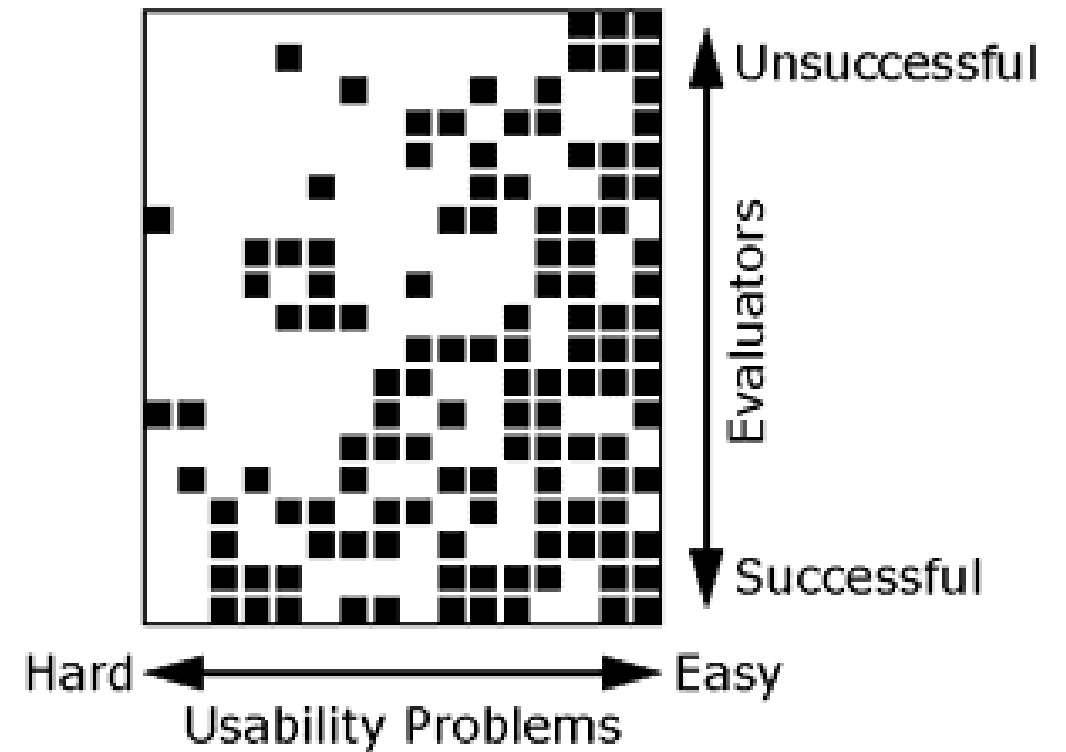
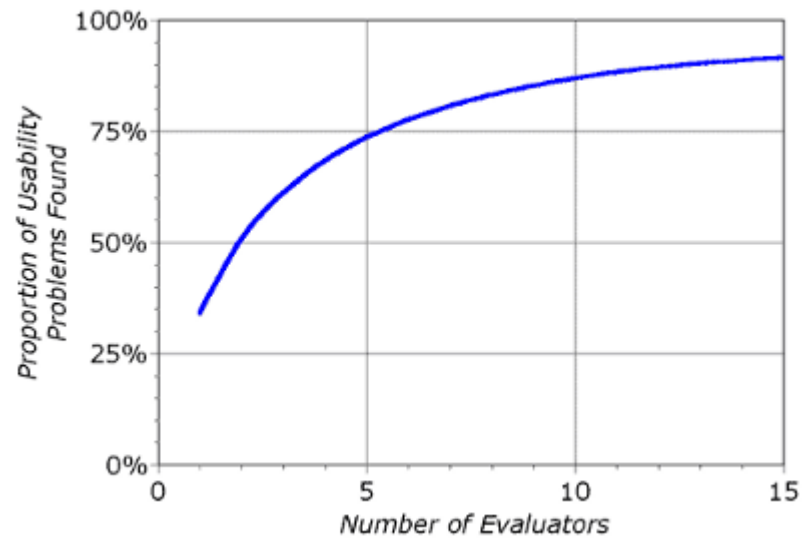
Heuristic usability evaluation

- “Discount usability engineering methods”... Jakob Nielsen
- Involves a small team of evaluators to evaluate an interface based on recognized usability principles
- Heuristics—“rules of thumb”
- Helps find usability problems in a UI design
- Small set (3-5) of evaluators examine UI
 - independently check for compliance with usability principles (“heuristics”)
 - evaluators only communicate afterwards, findings are then aggregated
 - use violations to redesign/fix problems
- Can perform on working UI or on sketches

[10 Usability Heuristics for User Interface Design \(nngroup.com\)](http://nngroup.com) !!!!

Multiple Evaluators

- Every evaluator doesn't find every problem
- Good evaluators find both easy & hard ones



Heuristics

[10 Usability Heuristics for User Interface Design \(nngroup.com\)](https://nngroup.com/articles/ten-usability-heuristics/)

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition vs. recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

Report

- List each of the problem found

problem#. heuristic violated

description of problem, rationale for why you think it violates the heuristic

suggestion to fix

Severity

0 - don't agree that this is a usability problem

1 - cosmetic problem

2 - minor usability problem

3 - major usability problem; important to fix

4 - usability catastrophe; imperative to fix

- Table for Summary of Violations

Report

- Example

H4 Consistency & Standards

The interface used the string “Save” on the first screen for saving the user’s information, but used the string “Store” on the second screen. Users may be confused by this different terminology for the same function.

Fix: Use “Save” on all screens.

Severity: 3

Category	# Viol. (sev 0)	# Viol. (sev 1)	# Viol. (sev 2)	# Viol. (sev 3)	# Viol. (sev 4)	# Viol. (total)
H1: Visibility of Status			1		1	2
H2: Match Sys & World		2		1		3
H3: User Control			1	2	2	5
H4: Consistency		3		1	1	5
H5: Error Prevention			1			1
H6: Recognition not Recall						0
H7: Efficiency of Use		1	1	3		4
H8: Minimalist Design		2				2
H9: Help Users with Errors				1		1
H10: Documentation			1			1
Total Violations by Severity	0	8	5	8	4	25
Note: check your answer for the green box by making sure the sum of the last column is equal to the sum of the last row (not including the green box)						

Ways to use HE

- Early in design process to catch major issues
- When time or resources are not available for empirical usability evaluation

Heuristics pro and cons

Advantages

- “Discount usability engineering”
- Don’t need to identify tasks, activities
- Can identify some fairly obvious fixes
- Can expose problems user testing doesn’t expose
- Provides a language for justifying usability recommendations

Disadvantages

- Un-validated
- Do not employ real users
- Can be error prone
- Better to use usability experts
- Problems unconnected with tasks
- Heuristics may be hard to apply to new technology

Heuristics

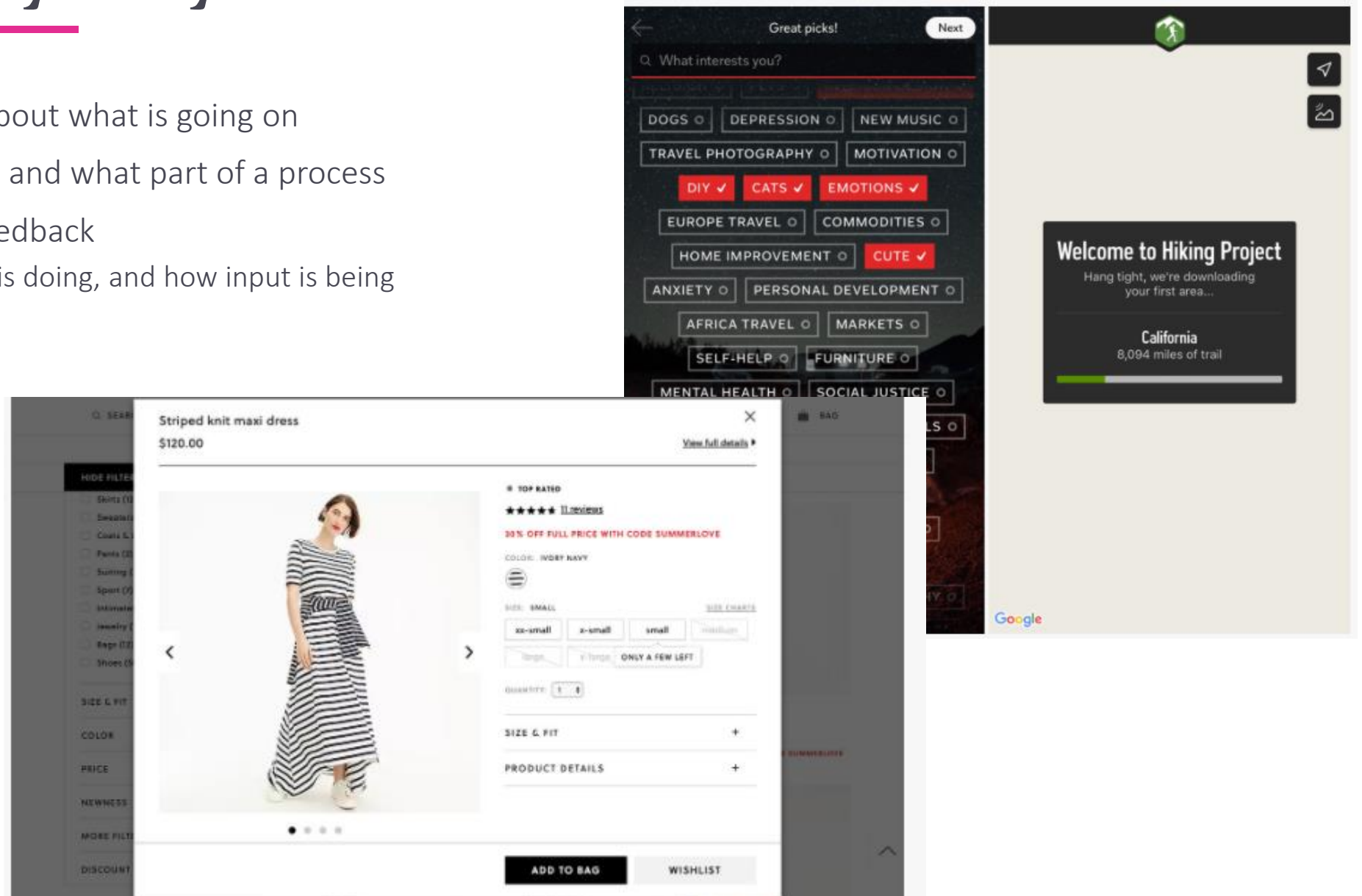
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H1. Visibility of system status

- Keep users informed about what is going on
- What page they are on and what part of a process
- Provide appropriate feedback
 - About what system is doing, and how input is being interpreted
- Examples:
 - progress bar



H2. Match between system and the real world

- Same things look the same, are located in the same place
- Terminology in user's language, not computer terminology
- Error messages and feedback refer to user objects
- Allow full-length names, e.g. "Hit any key to continue"
- Follow real world conventions, e.g. recycle bin, red/green buttons

Mail Server Query

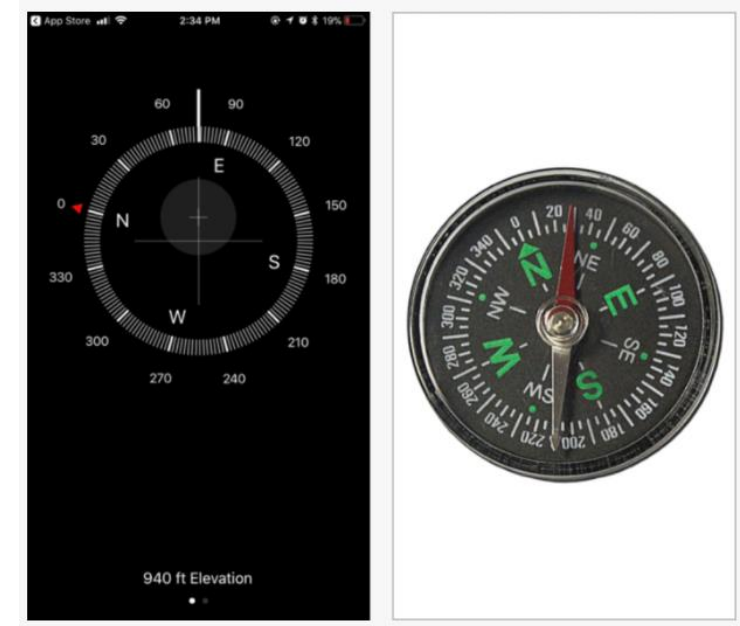
Results for hartson

send: invalid spawn id (6) while executing "send "l \$pid\r"" (file "./genpid_query.pass" line 31)



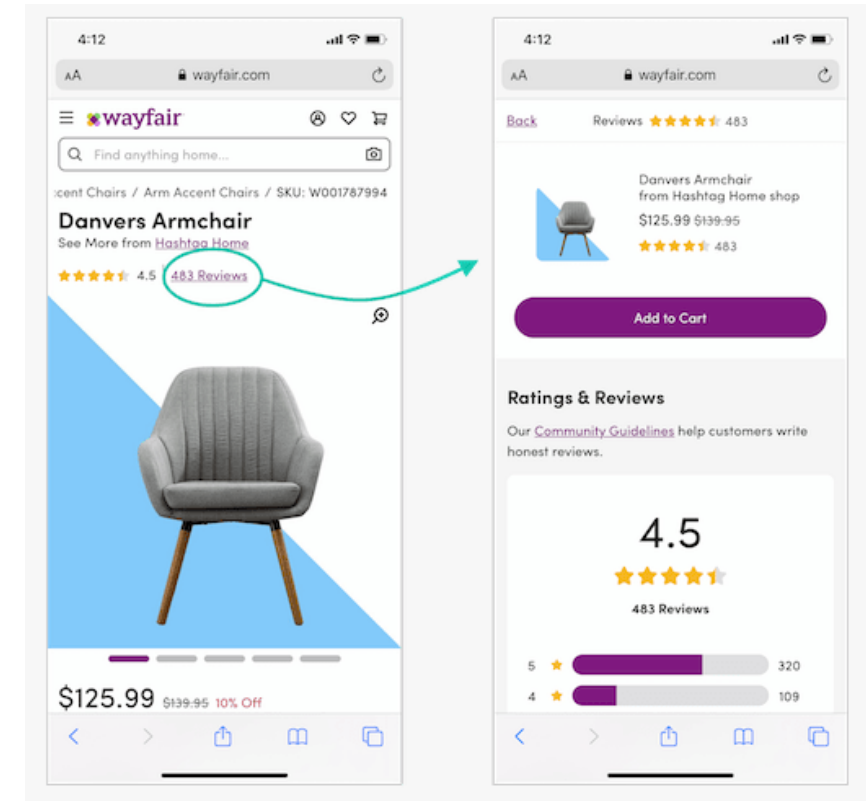
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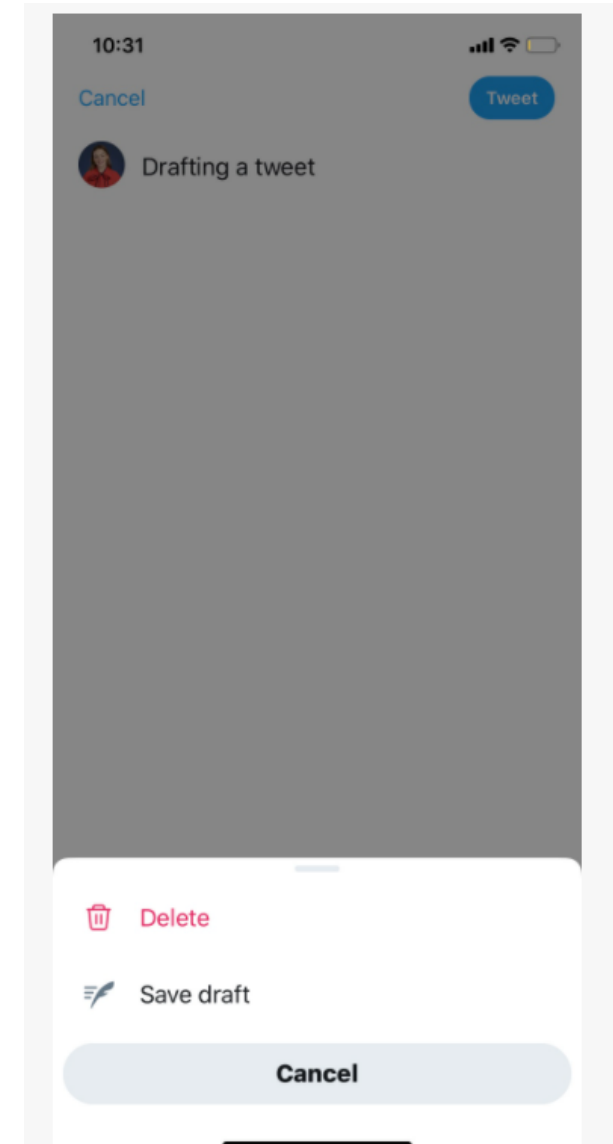
H3. User control and freedom

- Don't force down fixed paths
 - undo/redo, skip some steps
- Users (even experts) will make errors
- Designer cannot anticipate every user path through system
- Easy to abort: Cancel buttons
 - Cancel order, cancel changing a profile
- “Exits” for mistaken choices, undo, redo
 - Web issue: what does “Back” button do?
 - Example: many sites can get confused if use back button



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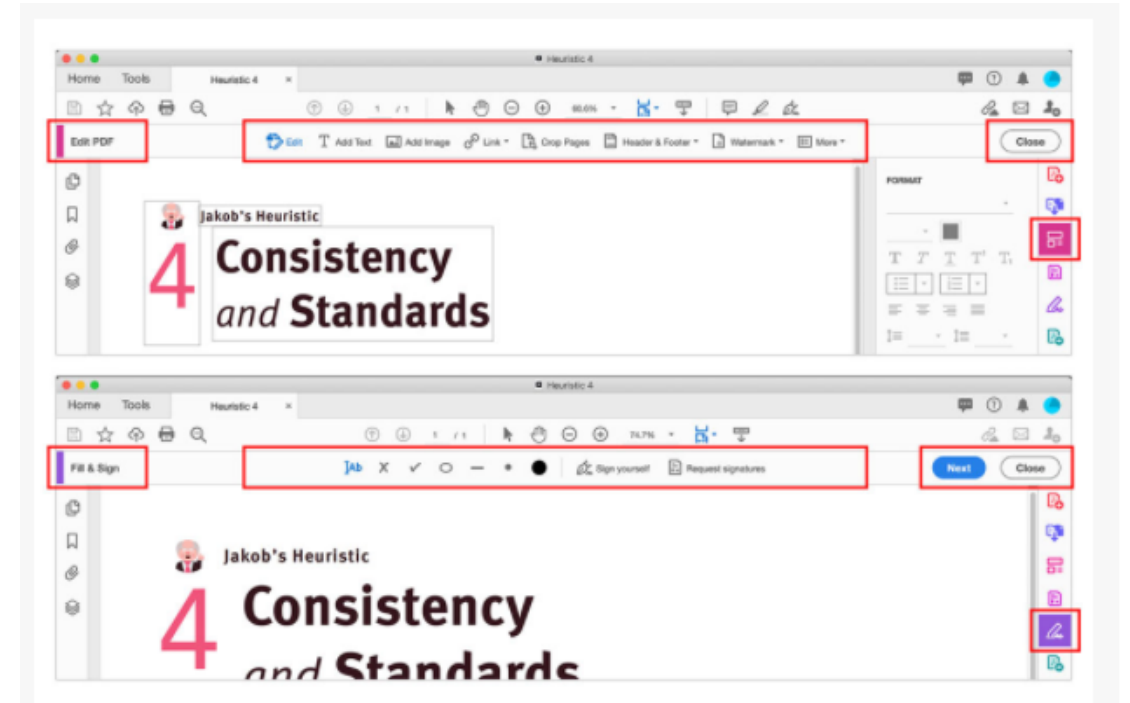
H4. Consistency and standards

Internal standards

- Same command always have the same effect
- Same words, situations, actions, should mean the same thing in similar situations; same things look the same, be located in the same place.
- Different things should be different
- Locations for information, names of commands
- Give the user a mental model of the system
- Size, location, color, wording, function, sequencing, etc.
- Following standards helps
 - Web: use templates or CSS, style guides

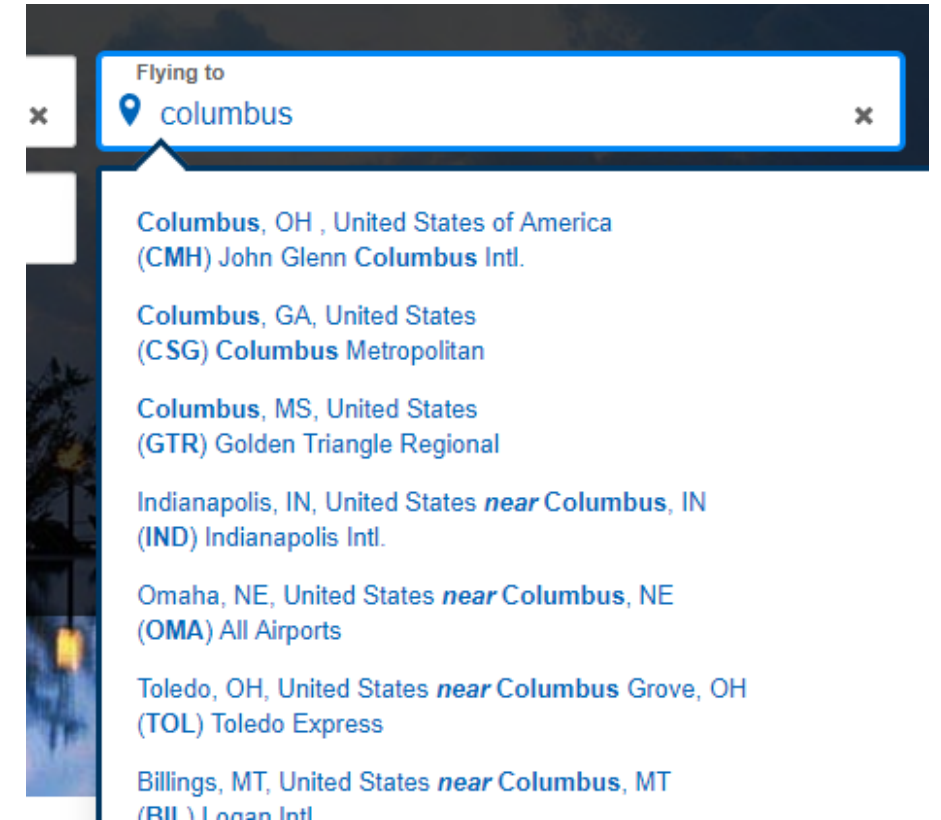
External standards

- Users bring their expectations, the majority of interactions should be consistent with what people expect
 - a standard in navigation design is the homepage link



H5. Error prevention

- Careful design which prevents a problem from occurring in the first place
- Selection rather than entry
 - www.Expedia.com: question, when ambiguous city (e.g. Columbus)
 - Date picker
- Remove or gray-out illegal choices
 - Not common for web pages
- Auto-fill in
- Confirmation
- Avoid modes
 - Definition: same user action has different results
 - Make unavoidable modes visible
 - E.g. Typing "daytime" to a mail program




H6. Recognition rather than recall

- Make objects, actions, options visible or easily retrievable
 - recently used document
- See and pick it, not generate it
- Menus rather than type-in (but short enough)
- Auto-fill in
- Prompts provide format and limits
- Don't require retyping of remembered information

Print

Total: **3 sheets of paper** (5 pages)

[Print](#) [Cancel](#)

Destination  HP Officejet Pro 8600 (...)

[Change...](#)

Pages ☒ All

☐ e.g. 1-5, 8, 11-13

Copies

Layout

Color

Options ☒ Two-sided

[+ More settings](#)


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HP ENVY 13-ad102na Laptop, Intel Core i5, 8GB RAM, 128GB SSD, 13.3", Full HD, Silver

£999.95


★★★★★ 1 Review

More than 10 in stock

☐ 2 years' Added Care for your technology (accidental damage cover)

Add to Basket

2 year guarantee included



Samsung Galaxy Book, Intel Core m3, 4GB RAM, 64GB eMMC, 10.6", Black

£349.00


★★★★★ 13 Reviews

In stock

☐ 2 years' Added Care for your technology (accidental damage cover)

Add to Basket

2 year guarantee included



HP Pavilion 15-bw094na Laptop, AMD A10, 4GB RAM, 128GB SSD, 15.6", Full HD, Grey

£529.95

★★★☆☆ 2 Reviews

More than 10 in stock

☐ 3 years' Added Care for your computing (accidental damage cover)

Add to Basket

3 year guarantee included

Hide services ^

Highlight ☐ differences

3D Ready	NO	Information not available	NO
Accessories Included	Information not available	Keyboard, S-Pen Stylus, S-Pen Holder, S-Pen Accessories 25W Travel Adapter/Data/Charging Cable (USB-to-USB Type-C), Quick Start Guide Card, Tray Ejection Pin	Information not available
Audio Quality ⓘ	Yes	Stereo speakers	Yes
Battery life ⓘ	Up to 14 hours	Up to 10 hours	Up to 11hrs
Bluetooth Enabled ⓘ	Yes	YES	YES
Brand	HP	Samsung	HP
CD/DVD/Blu-ray Drive ⓘ	No	No	Information not available
Camera (front-facing) ⓘ	HP Wide Vision HD Camera with dual array digital microphone	5MP	HP Webcam with integrated digital microphone
Camera (rear-facing) ⓘ	Information not available	No	Information not available

H7. Flexibility and efficiency of use

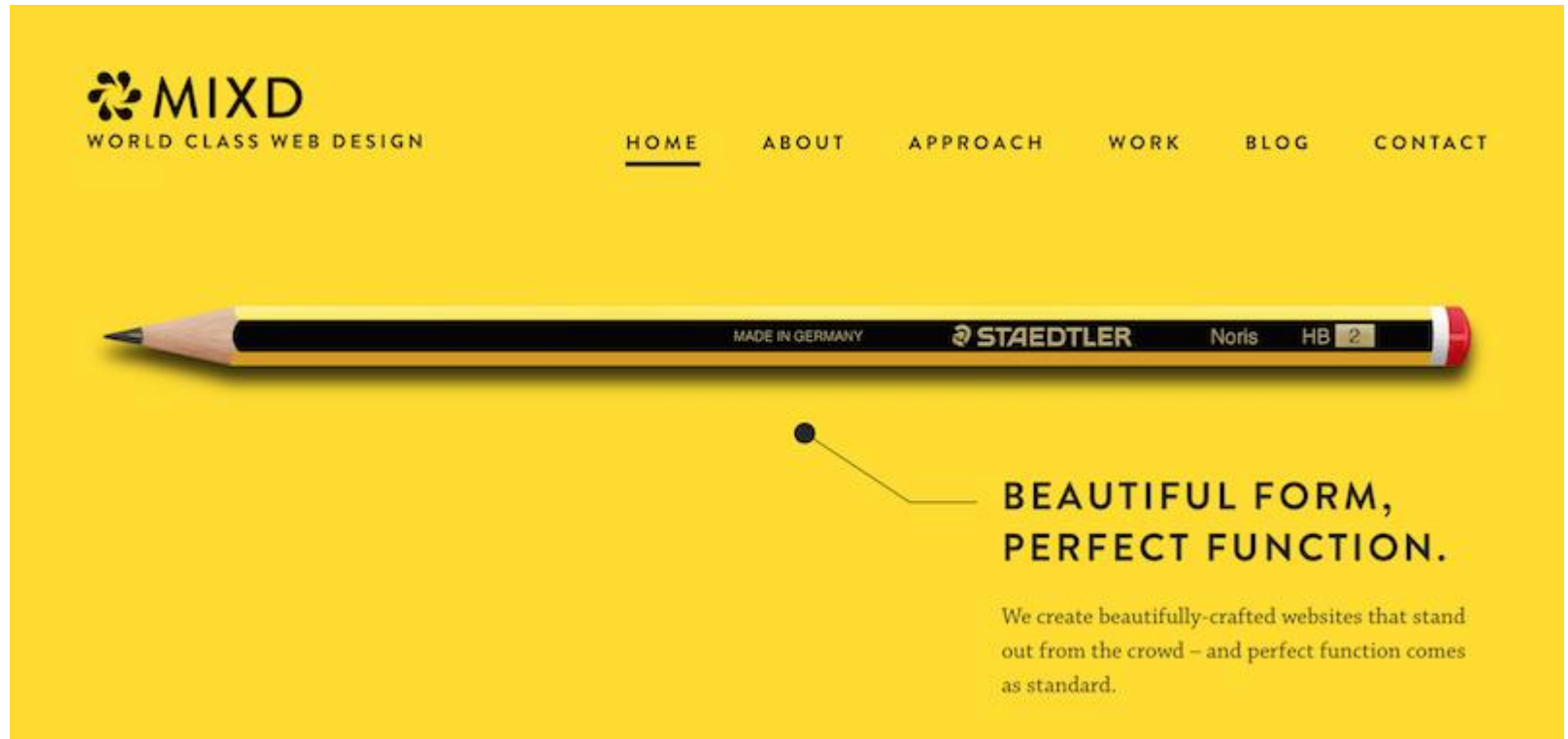
- Accelerators for experts - kb shortcuts,
- Allow users to tailor frequent actions (e.g., macros)
- Provide Shortcuts
- Jump directly to desired location
- Reuse previously entered information - cut/paste
- Good default values

FLEXIBILITY & USABILITY TRADEOFF



H8. Aesthetic and minimalist design

- Interfaces should not contain irrelevant or rarely needed information
- Good Graphic Design and Color Choice
 - Appropriately direct attention
 - Group related objects (alignment, decorations)
 - Balance and white space
 - Few fonts and colors



H8. Aesthetic and minimalist design

- “Less is More”
- Identify what is really needed
- If complex to explain/document, then redesign
- Concise language
- Avoid extraneous pictures and information
 - Fewer options and menu choices
 - Reduces planning time
 - Extra options can confuse users
 - Reduces manual size, etc.

H9. Help users recognize, diagnose, and recover from errors

- Help users when they are in trouble
- Opportunities for users to learn about the system
- Clear language; no codes
- Be precise; Not “syntax error”
- Constructively help the user solve the problem
 - Tell why the error happened and how to fix it
- Be polite and not accusing; positive wording:
 - Not: “FATAL ERROR”, etc.
 - Blame the system, not the user
 - “Unrecognized” vs. “illegal” command
 - No humor or snide comments
- Easy error recovery
- Can have multiple levels of messages
 - E.g. in XXX product, “can't save file” — why not?



H10. Help and Documentation

- Focused on the user's task
- List concrete steps to carry out
- Always available
- Easy to search
- Most people will not read documentation
 - If do, then
 - **First time** product is used, or else
 - **In a panic**, so need information right away
- Iterative design of documentation needed
- Help system is an extra feature to learn
- If need to add help, maybe fix the feature?
- Use documentation writers to help refine the system
- Good quality writing

	Search Success
First query:	51%
Second query:	32%
Third query:	18%