

CSE440: Introduction to HCI

Methods for Design, Prototyping and Evaluating User Interaction

Lecture 12:
Heuristic Evaluation

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What we will do today

Inspection-based methods

Heuristic evaluation in practice

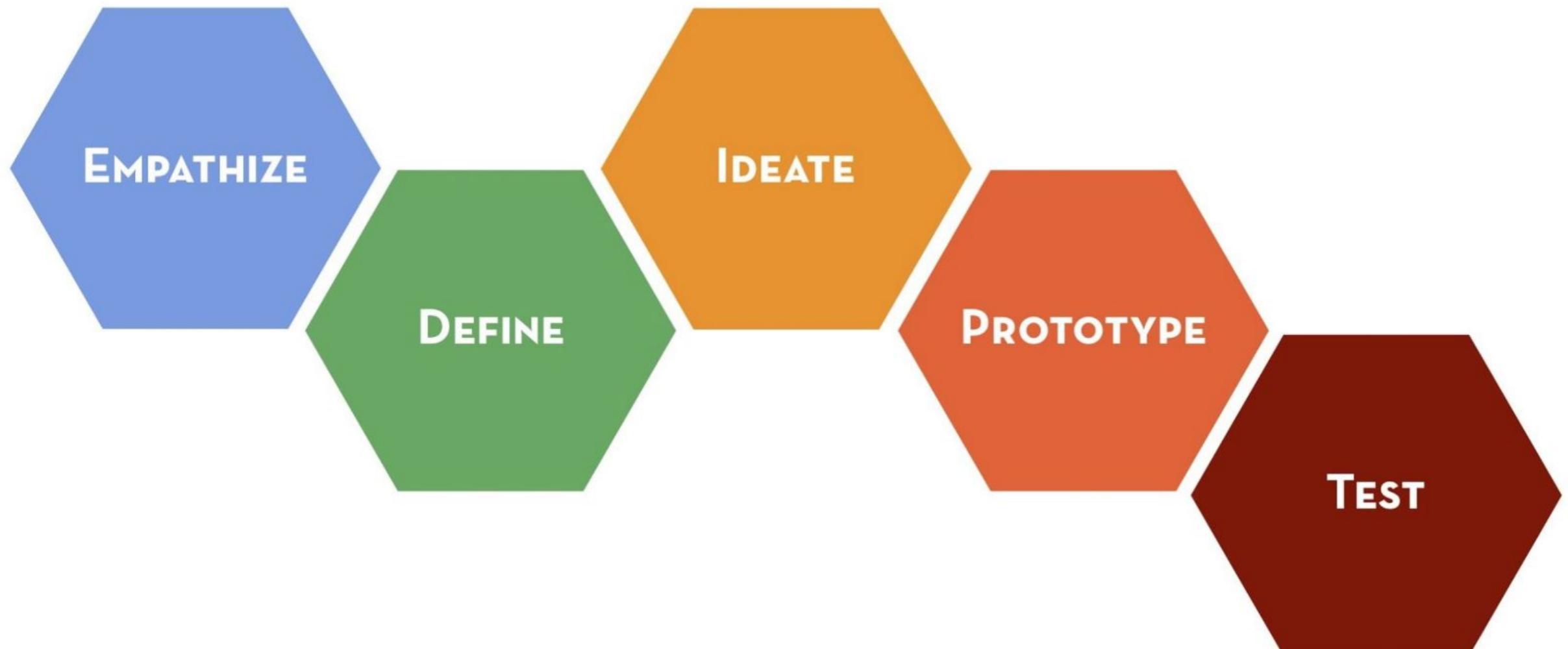
Working on the final design

What we will do today

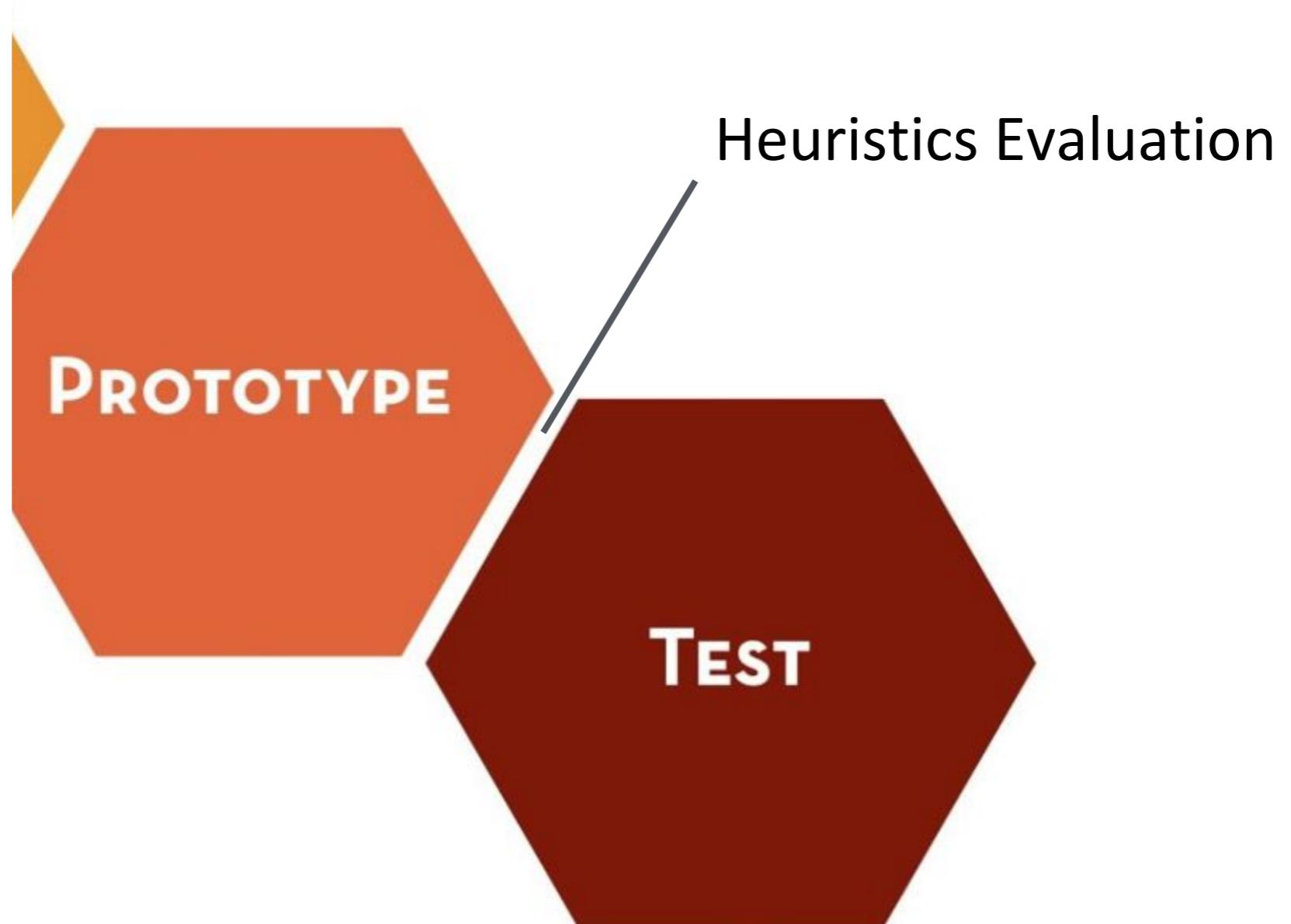
What is a heuristic?



What we will do today



What we will do today



Inspection-Based Methods

We have cut prototyping to its minimum

- Sketches, storyboards, paper prototypes

- Rapid exploration of potential ideas

But we need evaluation to guide improvement

- Evaluation can become relatively slow and expensive

- Study participants can be scarce

- May waste participants on fairly obvious problems

Inspection-Based Methods

Simulate study participants

Instead of actual study participants, use inspection to quickly and cheaply identify likely problems

Inspection methods are rational, not empirical

Heuristic Evaluation

Developed by Jakob Nielsen

Helps find usability problems in a design

Small set of evaluators examine interface

three to five evaluators

independently check compliance with principles

different evaluators will find different problems

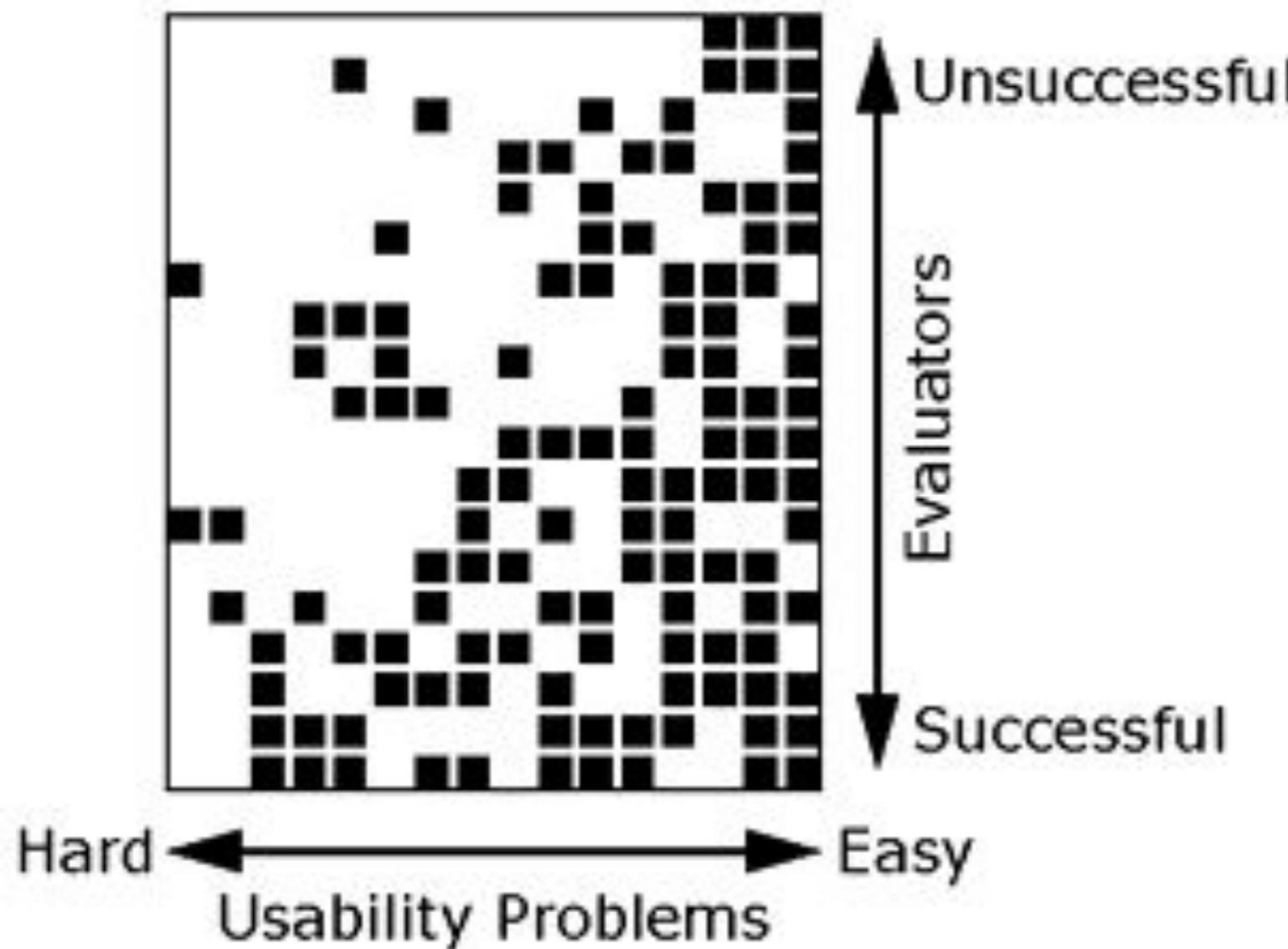
evaluators only communicate afterwards

Can perform on working interfaces or sketches

Why Multiple Evaluators?

Every evaluator doesn't find every problem

Good evaluators find both easy & hard ones



Results of Using Heuristic Evaluation

Discount: benefit-cost ratio of 48

cost was \$10,500 for benefit of \$500,000

how might we calculate this value?

in-house → productivity; open market → sales

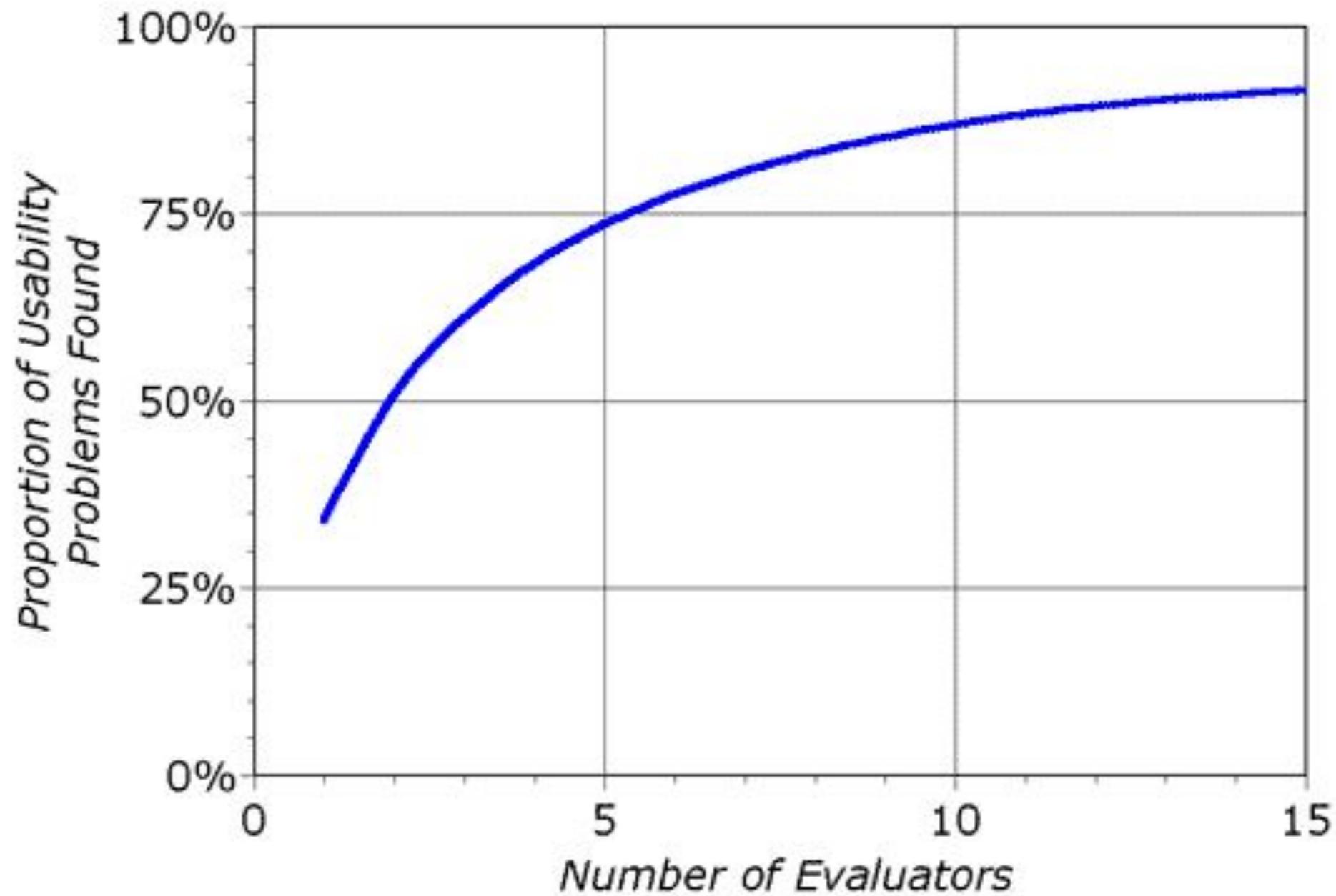
Single evaluator achieves poor results

only finds 35% of usability problems

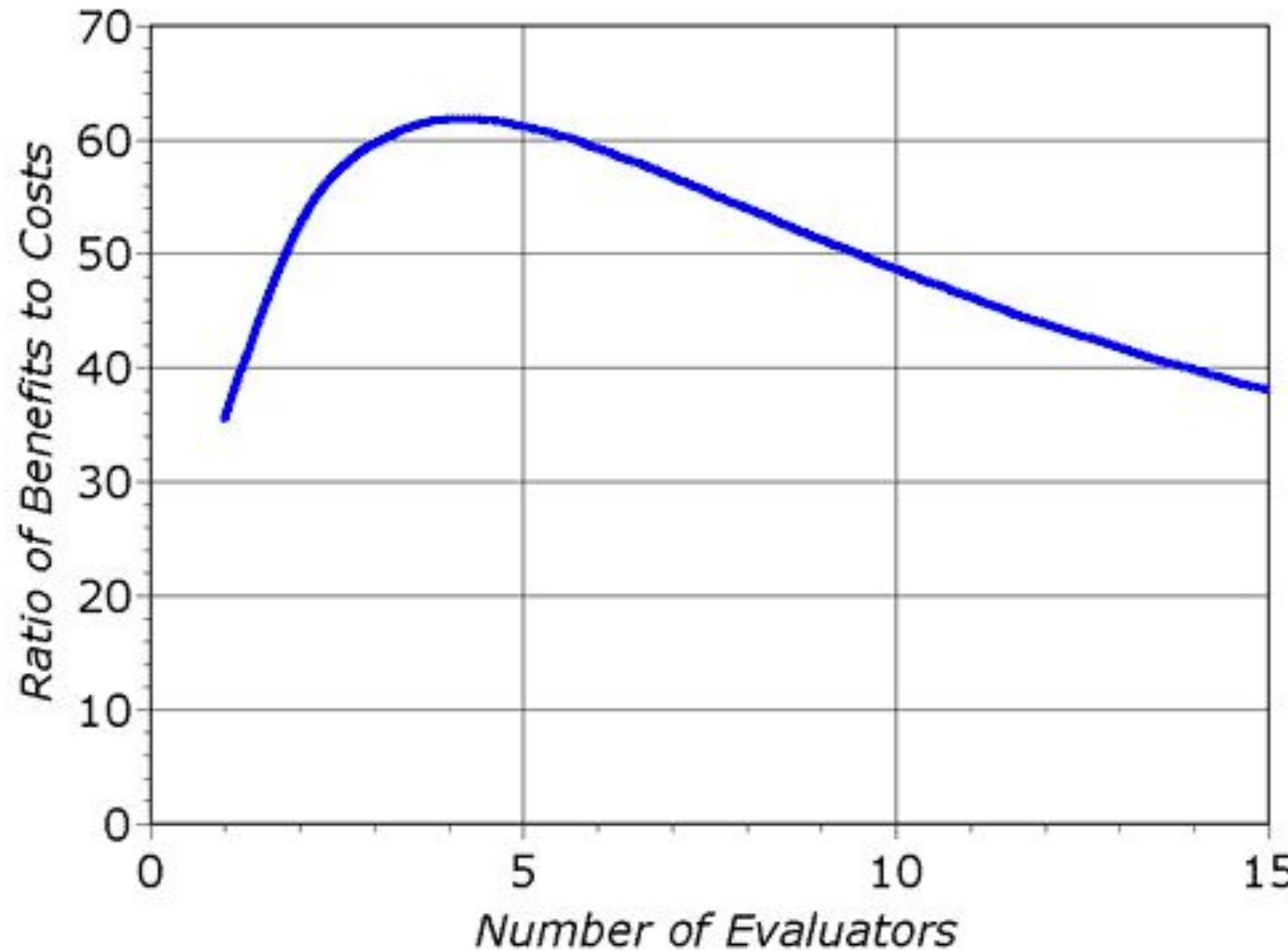
5 evaluators find ~ 75% of usability problems

why not more evaluators?

Number of Evaluators?



Decreasing Returns



Nielsen's 10 Heuristics

Too few unhelpful, too many overwhelming
“Be Good” versus thousands of detailed rules

Nielsen seeks to create a small set

Collects 249 usability problems
Collects 101 usability heuristics
Rates how well each heuristics explains each problem
Factor analysis to identify key heuristics

Nielsen's 10 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 rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help recognize, diagnose, and recover from errors
10. Help and documentation

1. Visibility

Visibility of system status

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

1. Visibility

Visibility of system status

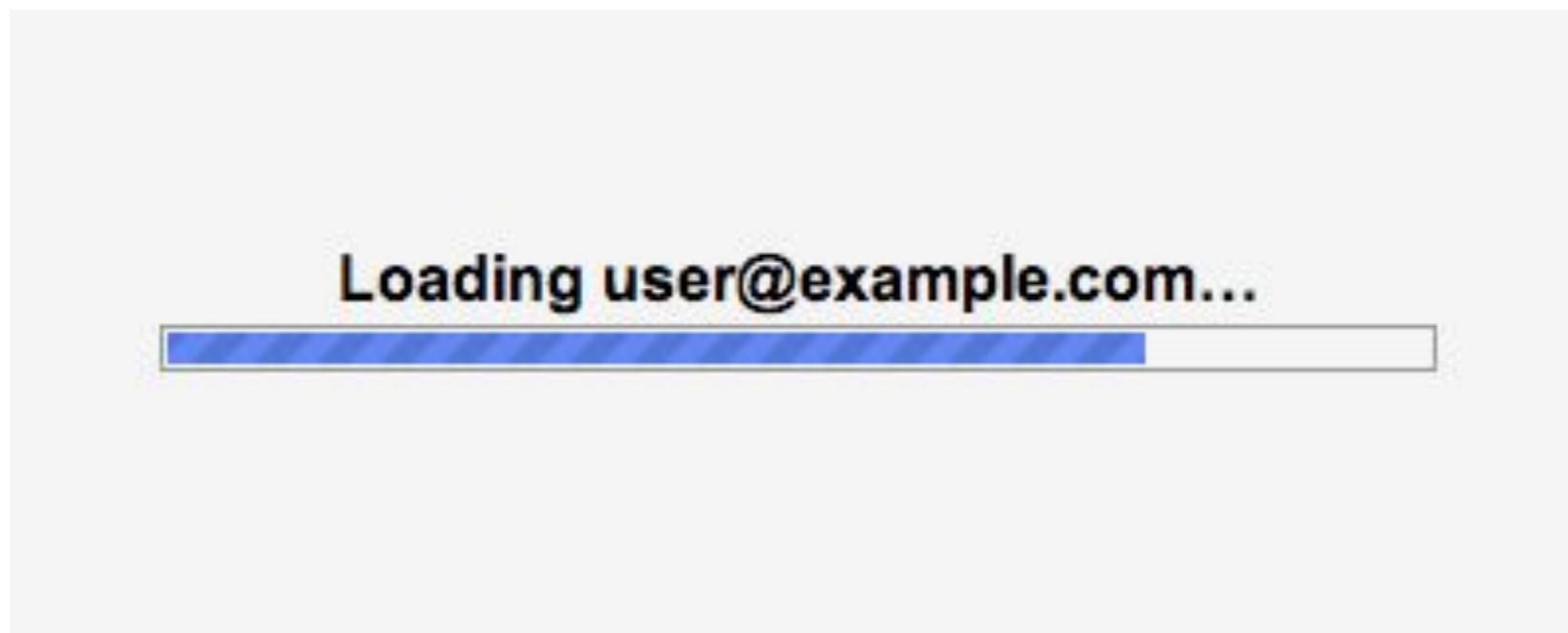
The system should always **keep users informed** about what is going on, through appropriate **feedback** within reasonable time.

Refers to both visibility of system status and use of feedback

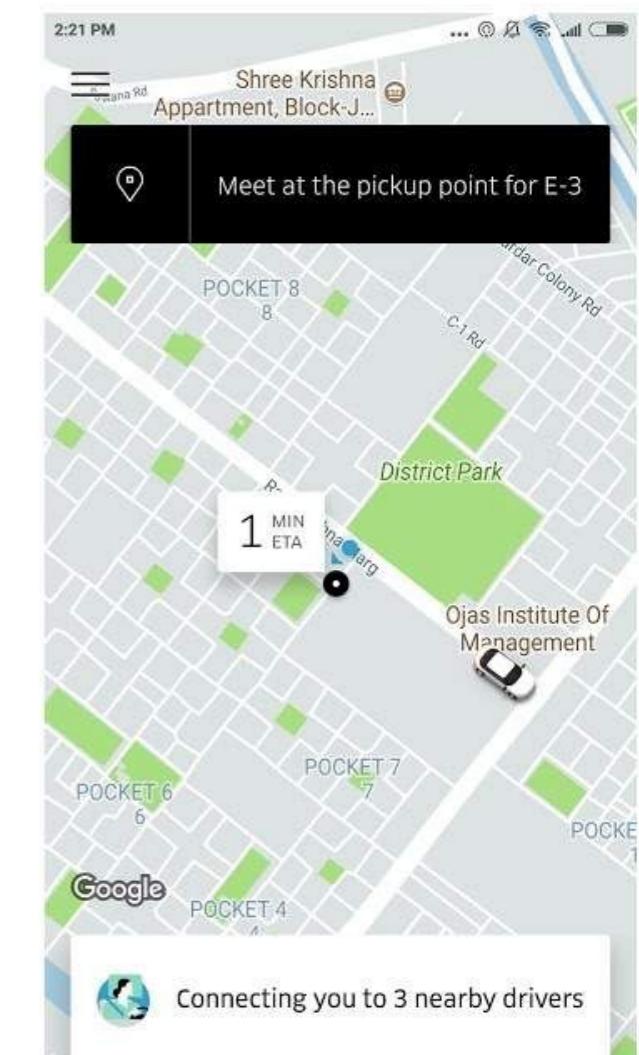
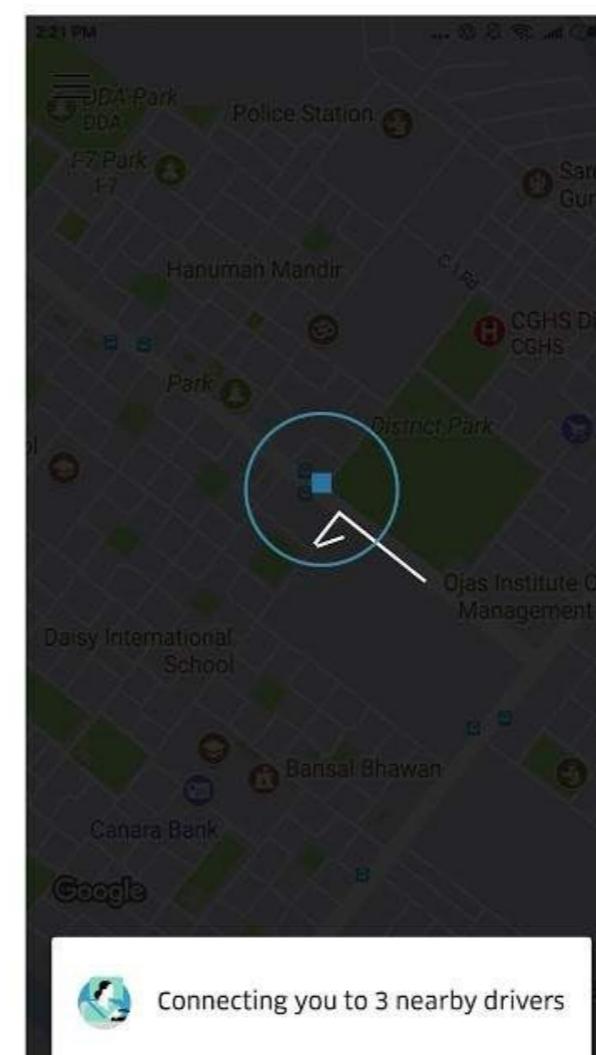
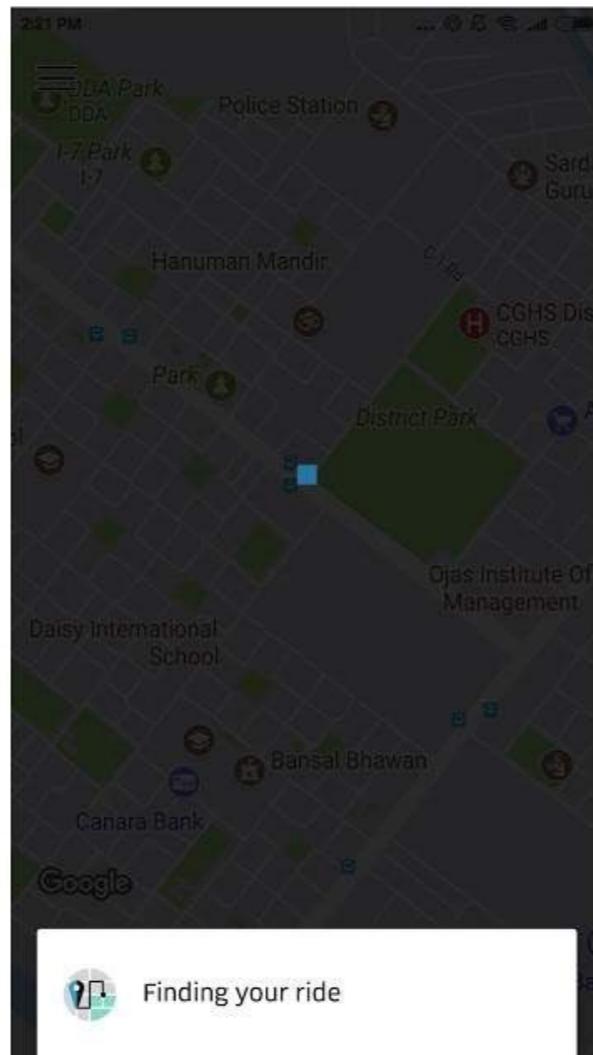
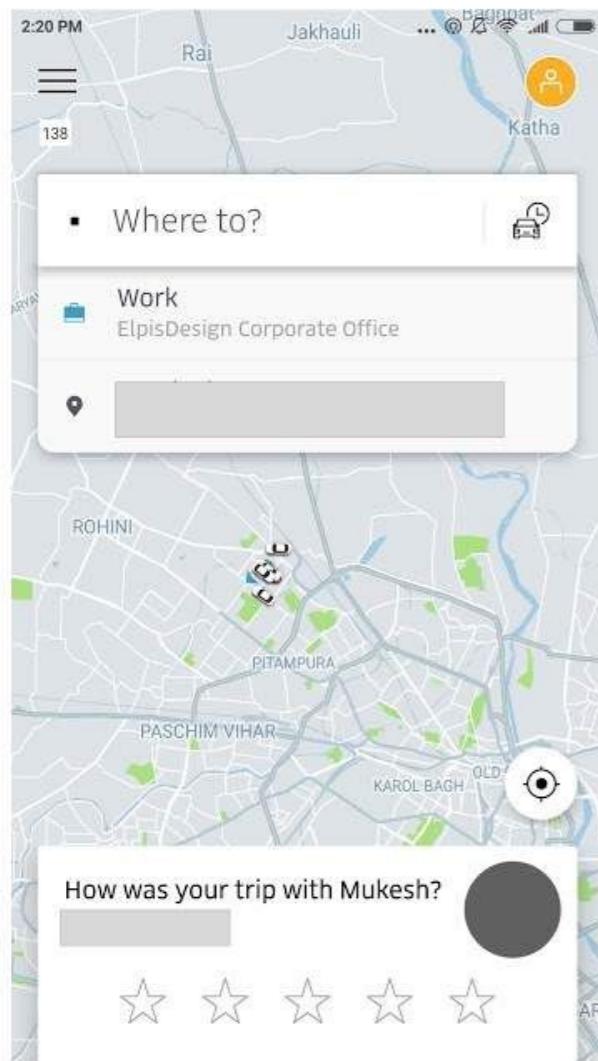
Anytime wondering what state the system is in, or the result of some action, this is a visibility violation.

Heuristics

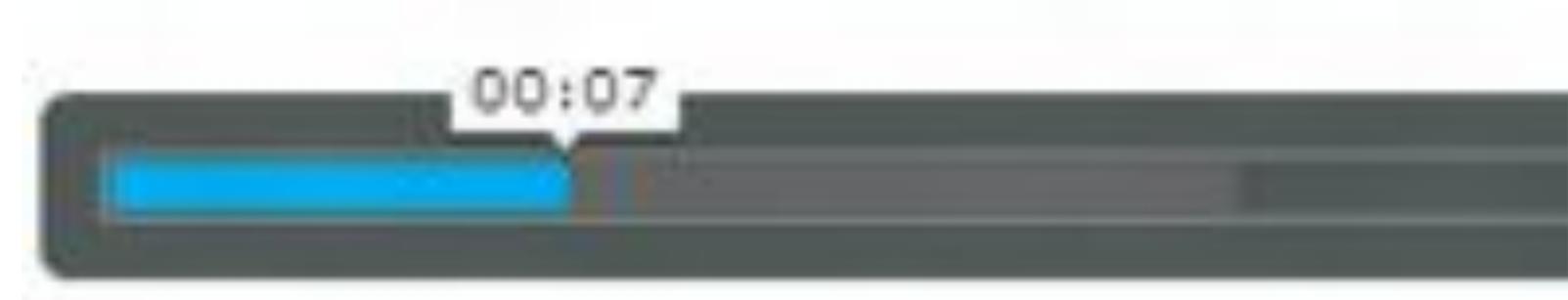
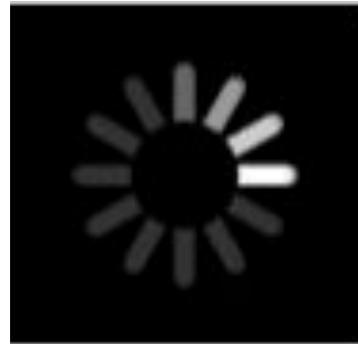
Gmail Progress Indicator



Heuristics



Heuristics



Visibility of system status

pay attention to response time

0.1 sec: no special indicators needed

1.0 sec: user tends to lose track of data

10 sec: maximum duration if user to stay focused on action

longer delays absolutely require percent-done progress bars

2. Real World Match

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. Follow real-world conventions, making information appear in a natural and logical order.

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The system should **speak the users' language**, with words, phrases and concepts **familiar to the user**, rather than **system-oriented terms**. Follow real-world conventions, making information appear in a **natural and logical order**.

Refers to word and language choice, mental model, metaphor, mapping, and sequencing

2. Real World Match



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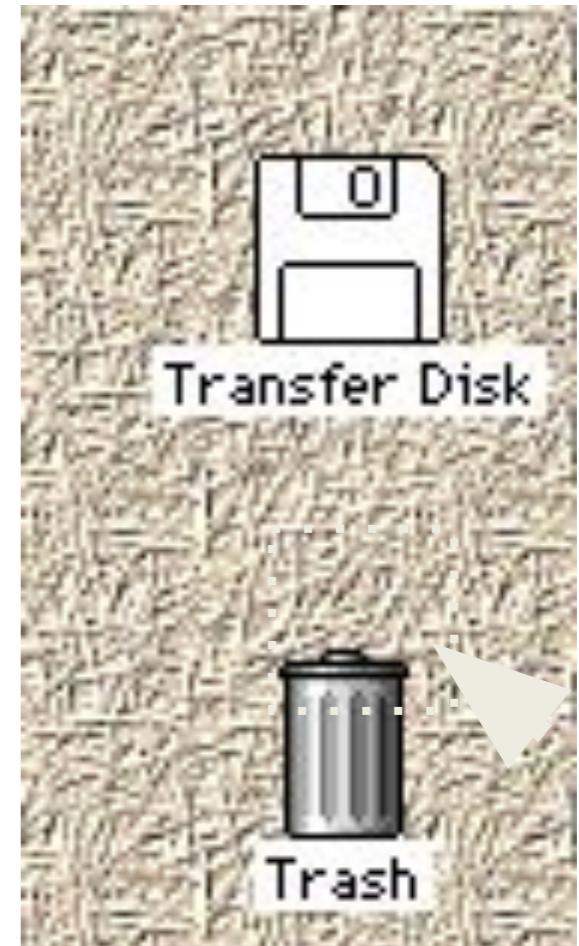
Mac desktop

Dragging disk to trash should delete, not eject it

Match system to real world

Speak the user's language

Follow conventions



3. User in Control

User control and freedom

Users often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue.

Support undo and redo.

3. User in Control

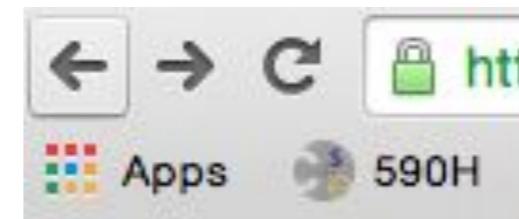
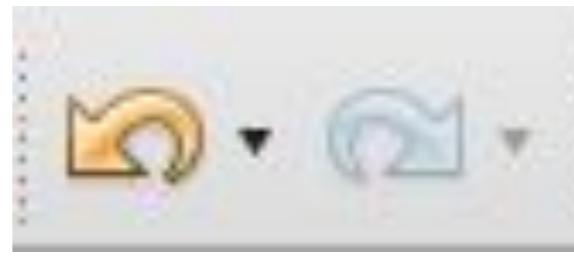
User control and freedom

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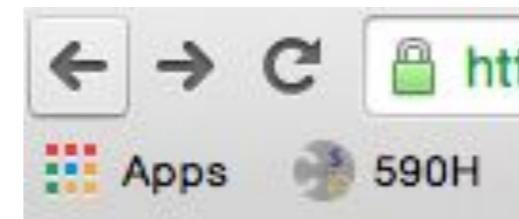
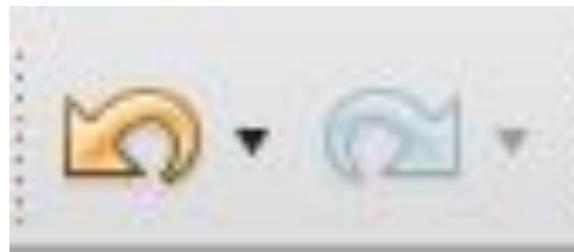
Support undo and redo.

Not just for navigation exits,
but for getting out of any situation or state.

Heuristics



Heuristics



User control & freedom

provide “exits” for mistaken choices, undo, redo
don’t force down fixed paths

Heuristics

Screenshot of the TurboTax Deluxe software interface showing the "Federal Taxes" section.

The top navigation bar includes:

- TurboTax Deluxe logo
- Upgrade
- My Account
- Search
- Contact

The main navigation tabs are:

- < Tax Timeline
- Personal Info
- Federal Taxes (selected)
- State Taxes
- Review
- File

On the left sidebar, there are two status boxes:

- \$1,618 Federal Refund (in progress)
- \$268 CA Refund (in progress)

The central content area shows the "Health Insurance" tab selected under "Federal Taxes".

A large heading asks: "How do you want to enter your 1095-A?"

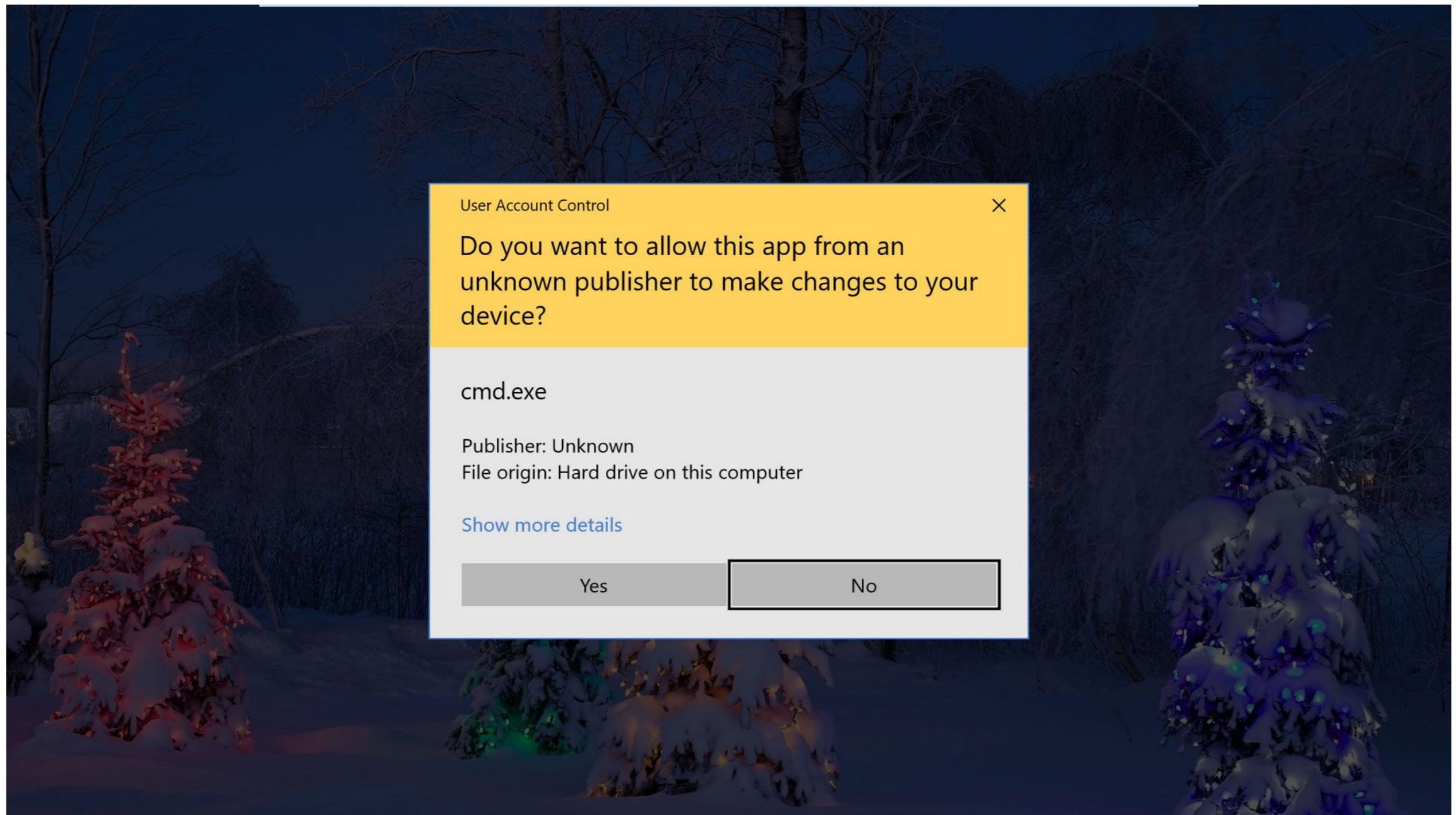
Two options are listed:

- Upload the PDF
 - Choose a file to upload (input field)
 - Browse... (button)
- Type it in

A sample 1095-A form is shown in a circular preview, and a link "View sample form" is provided.

At the bottom, there are navigation links: "< Back" and "Continue".

Heuristics



Heuristics

User control & freedom

provide “exits” for mistaken choices, undo, redo
don’t force down fixed paths

Wizards

must respond to question before going to next
good for beginners, infrequent tasks
not for common tasks

4. Consistency

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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Consistency and standards

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

Follow platform conventions.

Internal consistency is consistency throughout the same product. External consistency is consistency with other products in its class.

Heuristics

The image shows two screenshots of the Spotify mobile application side-by-side, illustrating several user interface design principles:

- Left Screenshot (Songs View):** This view shows a list of songs in the "Songs" section of the library. The interface includes:
 - A sidebar on the left with navigation links: Home, Browse, Radio, Your Library (Made For You, Recently Played, Songs, Albums, Artists, Stations, Videos, Podcasts), Playlists, and New Playlist.
 - A main content area titled "Songs" with a "PAUSE" button.
 - A search bar at the top.
 - A table listing songs with columns for Title, Artist, Album, and Last Played.
 - A large thumbnail for the album "CHVRCHES" with a blue "X" mark over it.
 - A playback control bar at the bottom showing the song "Heaven/Hell" by CHVRCHES, currently at 0:24 of 5:05.
- Right Screenshot (Song Detail View):** This view shows a detailed look at the song "Heaven/Hell" by CHVRCHES.
 - The title "All Songs" is at the top.
 - A green "SHUFFLE PLAY" button is on the right.
 - A "Downloading" section with a toggle switch.
 - Below are cards for each song in the list, each with a play button and three-dot menu icon:
 - Wow.** by Post Malone
 - Heaven/Hell** by CHVRCHES
 - I'm Into You** by Nick Murphy / Chet Faker
 - We Didn't Start the Fire** by Billy Joel
 - Family Tree** by Meadowlark
 - Never No** by Nick Murphy / Chet Faker
 - Duck Shoot** by Rupert Gregson-Williams
 - Empty Room** by Big Wild, Yuna
 - Coming of Age** by Foster The People
 - Home Is A Feeling** by Röyksopp & Daft Punk
 - Consolation** by Clan of Xymox
 - Second Hand Smoke (feat. Lonesome Animals) - Alternate Version** by William Fitzsimmons, Lonesome Animals
 - Eagle Birds** by The Black Keys
 - Dangerous** by Nick Murphy / Chet Faker
 - Main on End** by Alan Silvestri
 - Breathe** by Seeb, Neev
 - My Life - KRANE Remix** by ZHU, Tame Impala, KRANE
 - The Earth Prelude** by Ludovico Einaudi

Heuristics

Consistency & Standards

Heuristics



External Consistency

5. Error Prevention

Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

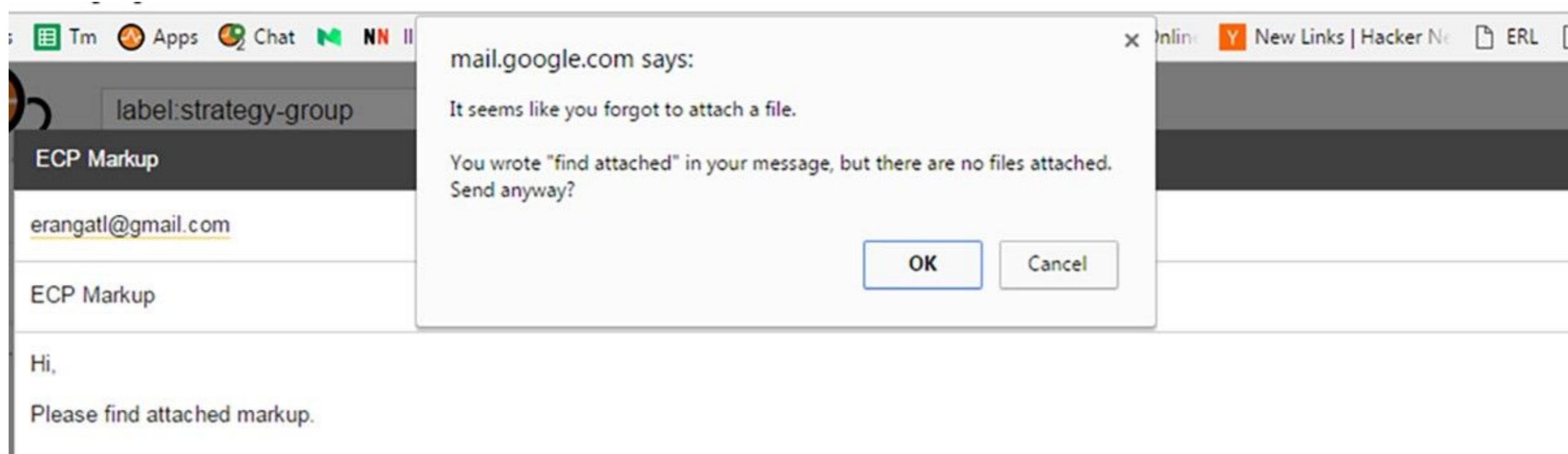
5. Error Prevention

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Try to commit errors and see how they are handled. Could they have been prevented?

5. Error Prevention



Heuristics

.....|



Your password must have:

- 8 or more characters
- Upper & lowercase letters
- At least one number

Strength: strong

Avoid passwords that are easy to guess or used with other websites.

6. Recognition not Recall

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. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

6. Recognition not Recall

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.

Instructions for use of the system should be visible or easily retrievable whenever appropriate.

People should never carry a memory load

6. Recognition not Recall

Addresses visibility of features & information
where to find things

Visibility addresses system status & feedback
what is going on

6. Recognition not Recall

Problems with affordances may go here

hidden affordance: remember where to act

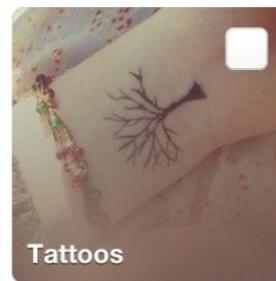
false affordance: remember it is a fake



6. Recognition not Recall

What are you interested in?

Pick whatever catches your eye...you can always fine-tune things later



[Pick more](#)

7. Flexibility and Efficiency

Flexibility and efficiency of use

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users.
Allow users to tailor frequent actions.

7. Flexibility and Efficiency

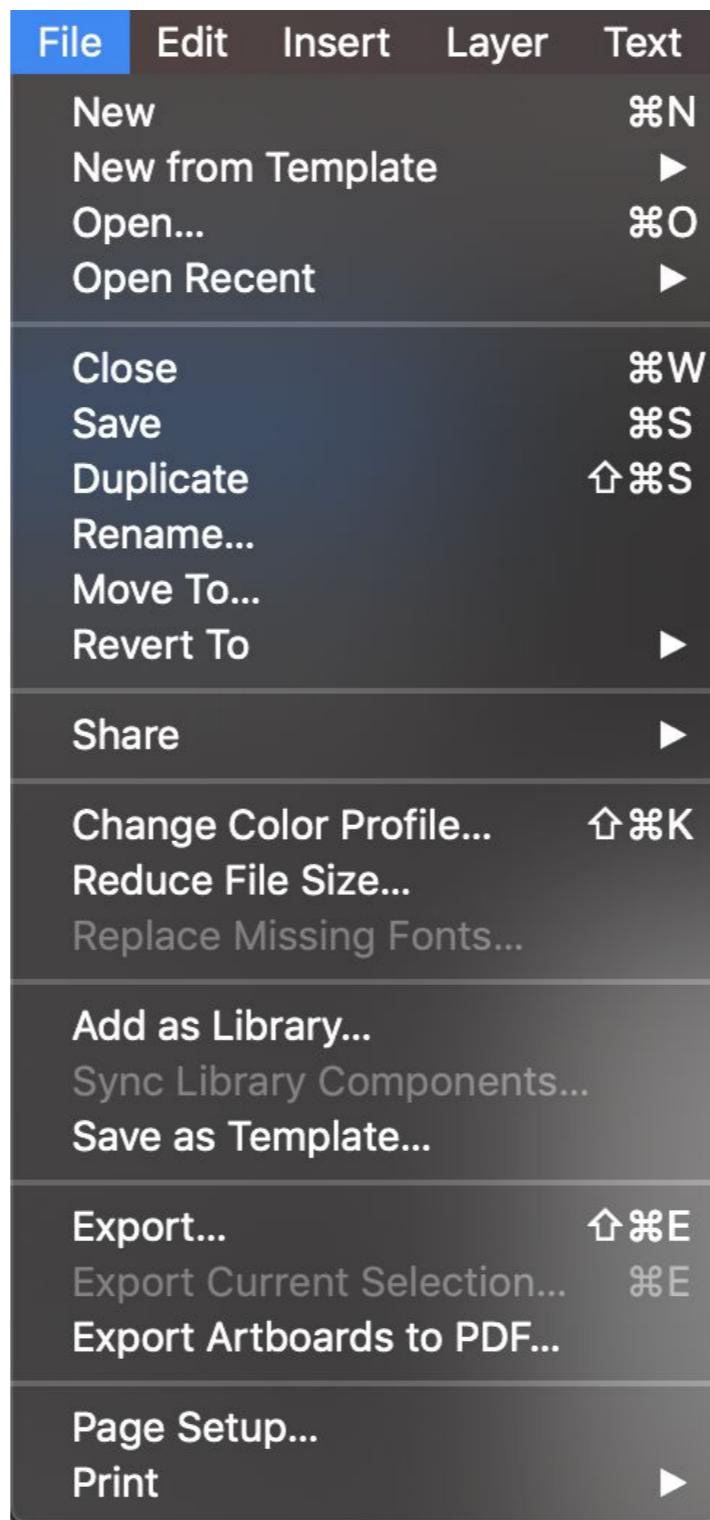
Flexibility and efficiency of use

Accelerators -- unseen by the novice user -- may often **speed up the interaction** for the expert user such that the system can cater to both inexperienced and experienced users.

Allow users to tailor frequent actions.

Concerns anywhere users have repetitive actions that must be done manually. Also concerns allowing multiple ways to do things.

7. Flexibility and Efficiency



7. Flexibility and Efficiency



7. Flexibility and Efficiency

Flexibility and Efficiency of Use

accelerators for experts (e.g., keyboard shortcuts) allow tailoring of frequent actions (e.g., macros)



8. Aesthetic Design

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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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.

Not just about “ugliness”.

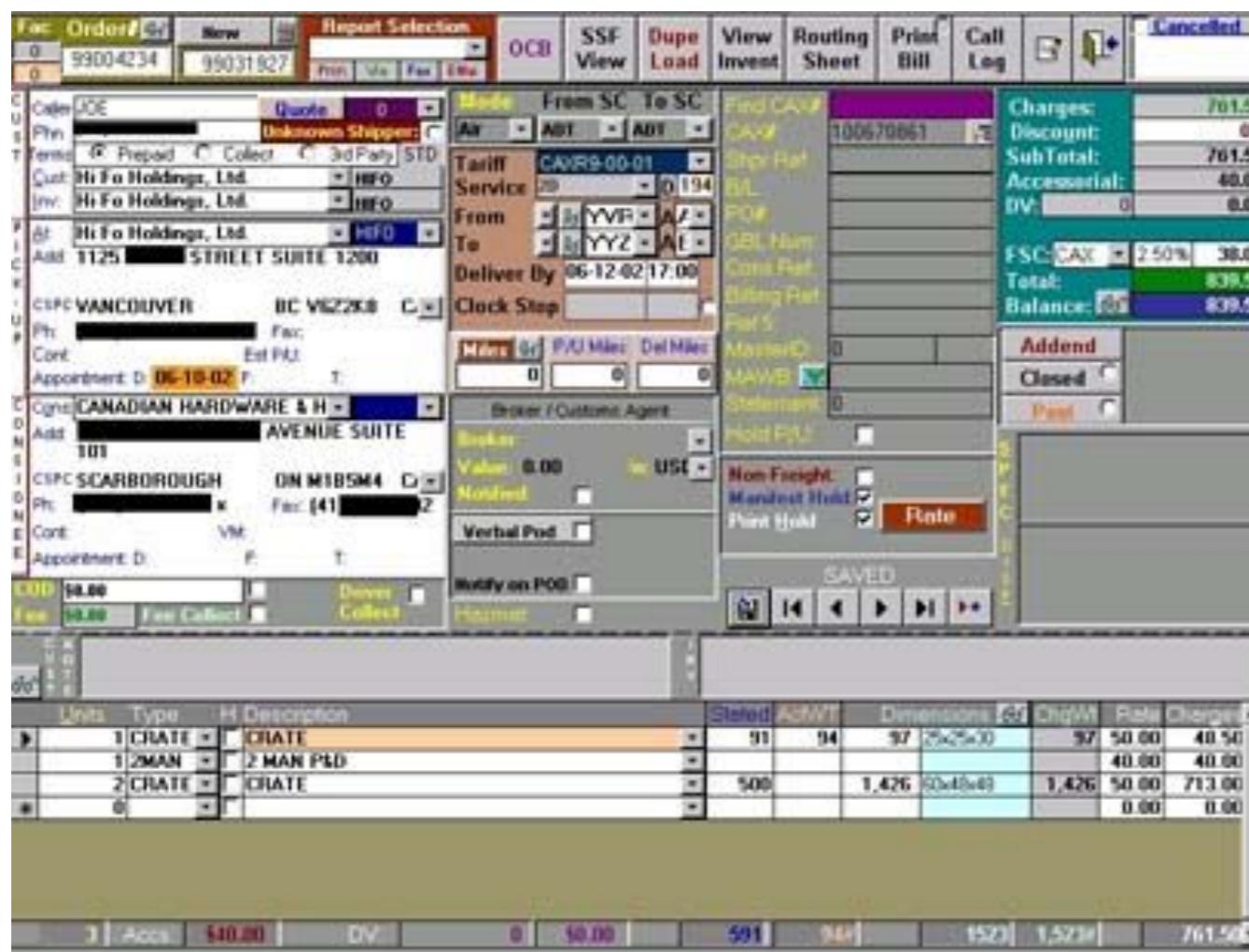
About clutter, overload of visual field, visual noise, distracting animations, and so on.

Heuristics

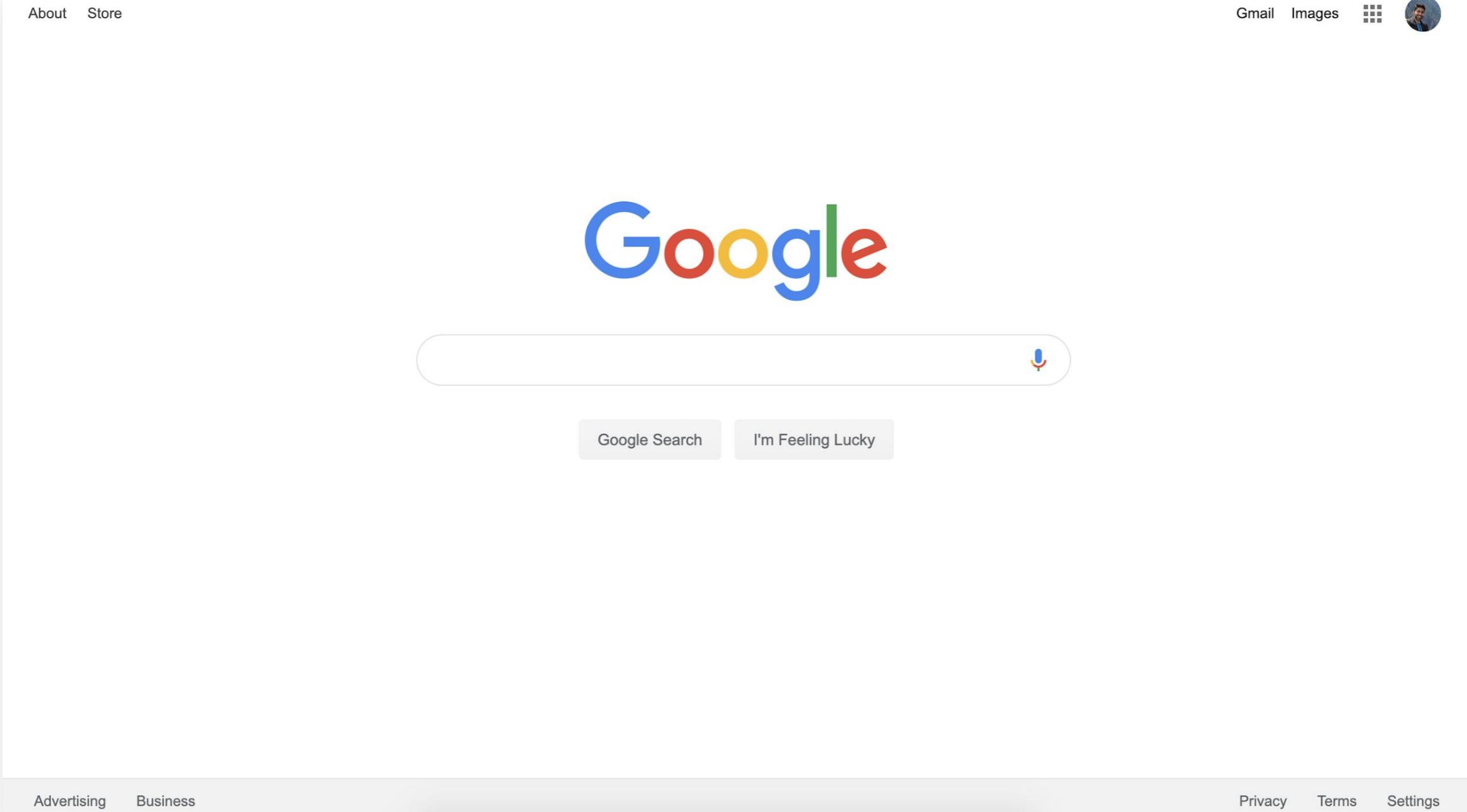
Fac: Order#	Shw:	Report Selection	OCB	SSF View	Dupe Load	View Invent	Routing Sheet	Print Bill	Call Log	Cancel	Cancelled
0 99004234	99031927	From To Fax Email	Air ABT ABT	Find C&F CAIR9-00-01	100570861	Charges: 761.50					
U Col: JOE	S Phn: [REDACTED]	Unknown Shippers	T Term: <input checked="" type="checkbox"/> Prepaid <input type="checkbox"/> Collect <input type="checkbox"/> 3rd Party STD	Tariff: CAIR9-00-01	Ship Ref: 0194	Discount: 0%					
C Quot: Hi Fo Holdings, Ltd.	S Cus: Hi Fo Holdings, Ltd.	I Inv: Hi Fo Holdings, Ltd.	F Sh: Hi Fo Holdings, Ltd.	I Add: 1125 [REDACTED] STREET SUITE 1200	C FSC: CANADIAN HARDWARE & H	SubTotal: 761.50					
U CSC: VANCOUVER	S BC: V6Z2K8	I C: C	U Ph: [REDACTED]	N Add: AVENUE SUITE	J I: CANADIAN HARDWARE & H	Accessorial: 40.00					
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Units Type Description Stated ASWT Dimensions LxWxH CrntWt Pickl Charge											
1 CRATE	CRATE		91	94	97	25x25x30	97	50.00	40.50		
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1 Acc: \$40.00	DV: 0	50.00	591	94	1523	1523	761.50				

Heuristics

Aesthetic & Minimalist design
no irrelevant information in dialogues



Heuristics



9. Error Recovery

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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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**.

Error prevention is about preventing errors before they occur. This is about after they occur.

9. Error Recovery

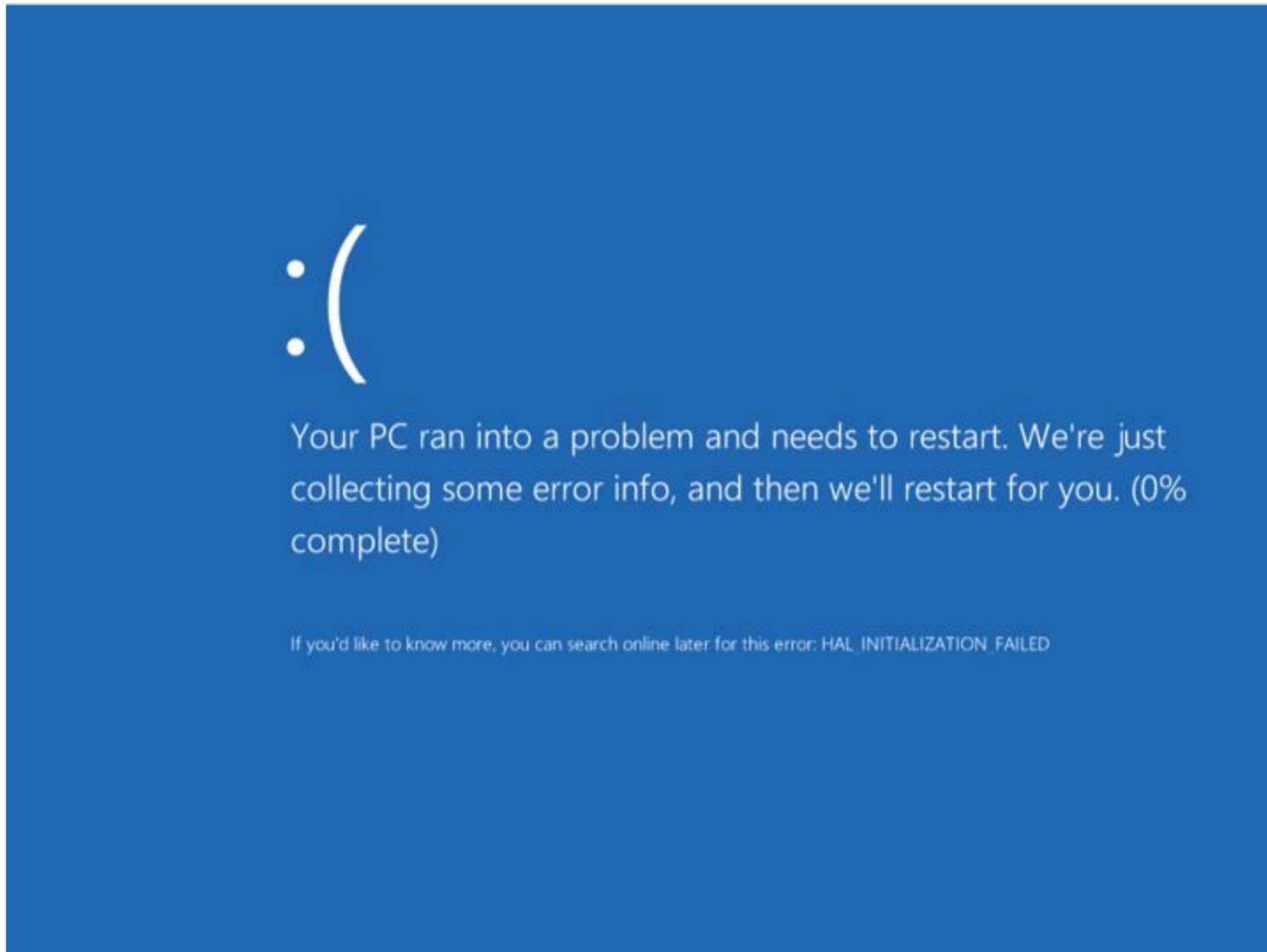
Help recognize, diagnose, & recover from errors

error messages in plain language

precisely indicate the problem

constructively suggest a solution

9. Error Recovery



Help recognize, diagnose, & recover from errors

9. Error Recovery

Overheard in a Lander lounge:

Boi: ACCHHHOOOOOOOO!

Girl: "FOR THE FIFTEENTH TIME, GOD BLESS YOU AND GOD BLESS AMERICA!!!"

1 Comment

Like 44

Leave Page?

You haven't finished your comment yet. Do you want to leave without finishing?

Stay on This Page Leave This Page

+ Join

9. Error Recovery



× Sorry, we couldn't find an account with that username. Can we help you recover your [username?](#)

Username [I forgot](#)

 [Show](#)

Password [I forgot](#)

 [Show](#)

[Log In](#) Stay logged in

[Create an account](#) · [Trouble logging in?](#)



× Sorry, that password isn't right. We can help you [recover your password.](#)

Username [I forgot](#)

 [Show](#)

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10. Help

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information 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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This does not mean that the user must be able to ask for help on every single item.

10. Help

Slackbot
☆ | active | Slackbot

Thursday, April 4th

 **Slackbot** 1:19 PM
Right now anyone in your workspace can invite a new member. If you'd like, you can restrict that to just administrators.
[Only allow administrators to invite](#)
Okay, only admins can invite new members.

Abhinav Yadav 1:28 AM
 how to change settings?

 **Slackbot** 1:28 AM
I searched for that on our Help Center. Perhaps these articles will help:

- [Change a member's email address](#)
- [Guide to single sign-on settings](#)
- [Customize message and file retention policies](#)

Abhinav Yadav 1:28 AM
 how can I disable snooze?

 **Slackbot** 1:28 AM
I searched for that on our Help Center. Perhaps these articles will help:

- [Pause notifications with Do Not Disturb](#)
- [Guide to Slack notifications](#)
- [Remove single sign-on](#)

Abhinav Yadav 1:29 AM
 what is love?

 **Slackbot** 1:29 AM
I'm sorry, I don't understand! Sometimes I have an easier time with a few simple keywords.
Or you can head to our wonderful [Help Center](#) for more assistance!

+ Message Slackbot @ ☺

Heuristic Evaluation Process

Evaluators go through interface several times

inspect various dialogue elements

compare with list of usability principles

Usability principles

Nielsen's "heuristics"

supplementary list of category-specific heuristics
(competitive analysis or testing existing products)

Use violations to redesign/fix problems

Examples

Can't copy info from one window to another

violates “Minimize memory load” (H6)

fix: allow copying

Typography uses different fonts in 3 dialog boxes

violates “Consistency and standards” (H4)

slows users down

probably wouldn't be found by usability testing

fix: pick a single format for entire interface

Phases of Heuristic Evaluation

1) Pre-evaluation training

give expert evaluators needed
domain knowledge & information on the scenario

2) Evaluation

individuals evaluate interface & make lists of problems

3) Severity rating

determine how severe each problem is

4) Aggregation

group meets & aggregates problems (w/ ratings)

5) Debriefing

discuss the outcome with design team

How to Perform Evaluation

At least two passes for each evaluator

first to get feel for flow and scope of system

second to focus on specific elements

If system is walk-up-and-use or evaluators are domain experts, no assistance needed

otherwise might supply evaluators with scenarios

Each evaluator produces list of problems

explain why with reference to heuristic

be specific & list each problem separately

Example Heuristic Violation

1. [H4 Consistency]

The interface used the string "Save" on the first screen for saving the user's file, but used the string "Write file" on the second screen. Users may be confused by this different terminology for the same function.

How to Perform Heuristic Evaluation

Why separate listings for each violation?

- risk of repeating problematic aspect

- may not be possible to fix all problems

Where problems may be found

- single location in interface

- two or more locations that need to be compared

- problem with overall structure of interface

- something that is missing

 - common problem with paper prototypes

 - (sometimes features are implied by design documents and just haven't been "implemented" – relax on those)

Severity Rating

Used to allocate resources to fix problems

Estimates of need for more usability efforts

Combination of

frequency

impact

persistence (one time or repeating)

Should be calculated after all evaluations are in

Should be done independently by all judges

Severity Rating

- 0 - Do not agree this is a problem.
- 1 - Usability blemish. Mild annoyance or cosmetic problem. Easily avoidable.
- 2 - Minor usability problem. Annoying, misleading, unclear, confusing. Can be avoided or easily learned. May occur only once.
- 3 - Major usability problem. Prevents users from completing tasks. Highly confusing or unclear. Difficult to avoid. Likely to occur more than once.
- 4 - Critical usability problem. Users will not be able to accomplish their goals. Users may quit using system all together.

Example Heuristic Violation

1. [H4 Consistency] [Severity 3]

The interface used the string "Save" on the first screen for saving the user's file, but used the string "Write file" on the second screen. Users may be confused by this different terminology for the same function.

Debriefing

Conduct with evaluators, observers, and development team members

Discuss general characteristics of interface

Suggest potential improvements to address major usability problems

Development team rates how hard to fix

Make it a brainstorming session

Fixability Scores

- 1 - Nearly impossible to fix. Requires massive re-engineering or use of new technology. Solution not known or understood at all.
- 2 - Difficult to fix. Redesign and re-engineering required. Significant code changes. Solution identifiable but details not fully understood.
- 3 - Easy to fix. Minimal redesign and straightforward code changes. Solution known and understood.
- 4 - Trivial to fix. Textual changes and cosmetic changes. Minor code tweaking.

Example Heuristic Violation

1. [H4 Consistency] [Severity 3] [Fix 3]

The interface used the string "Save" on the first screen for saving the user's file, but used the string "Write file" on the second screen. Users may be confused by this different terminology for the same function.

Fix: Change second screen to "Save".

Ask us something!

Finalizing the Design

Select one design and two tasks:

- Why this design and these tasks?
(Designs can be combined if necessary)
- What makes the design better suited to the people for whom you are targeting your design?
- Why are these tasks more compelling than the others?

Working Time