

# Human Computer Interaction

## CS449 – CS549

Week 10

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### Usability Methods – cont.

KÜRSAT ÇAĞILTAY

# Today

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- Self Reported Metrics
- A/B Testing
- Wizard of Oz Technique



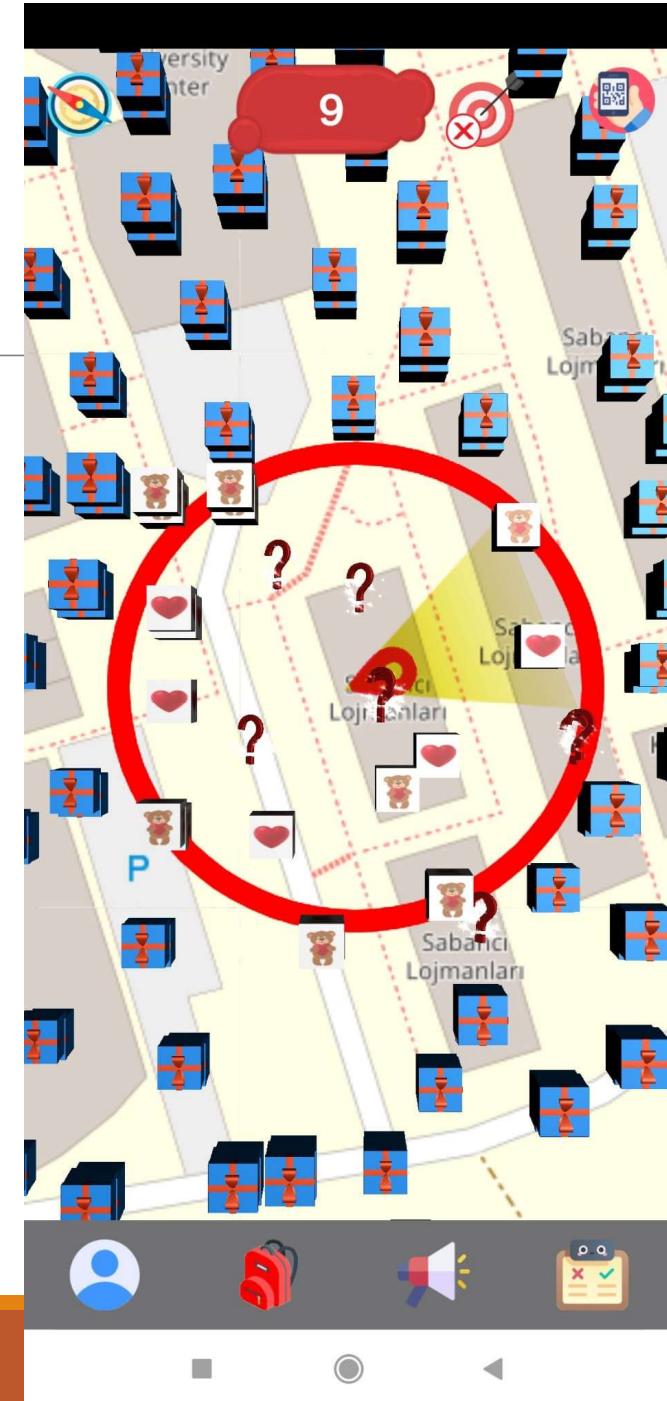
# Reminder: Term Projects

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- If you do not have a term project team yet, please see me after the class...
- If you get my approval for your project topic, please add it to the form

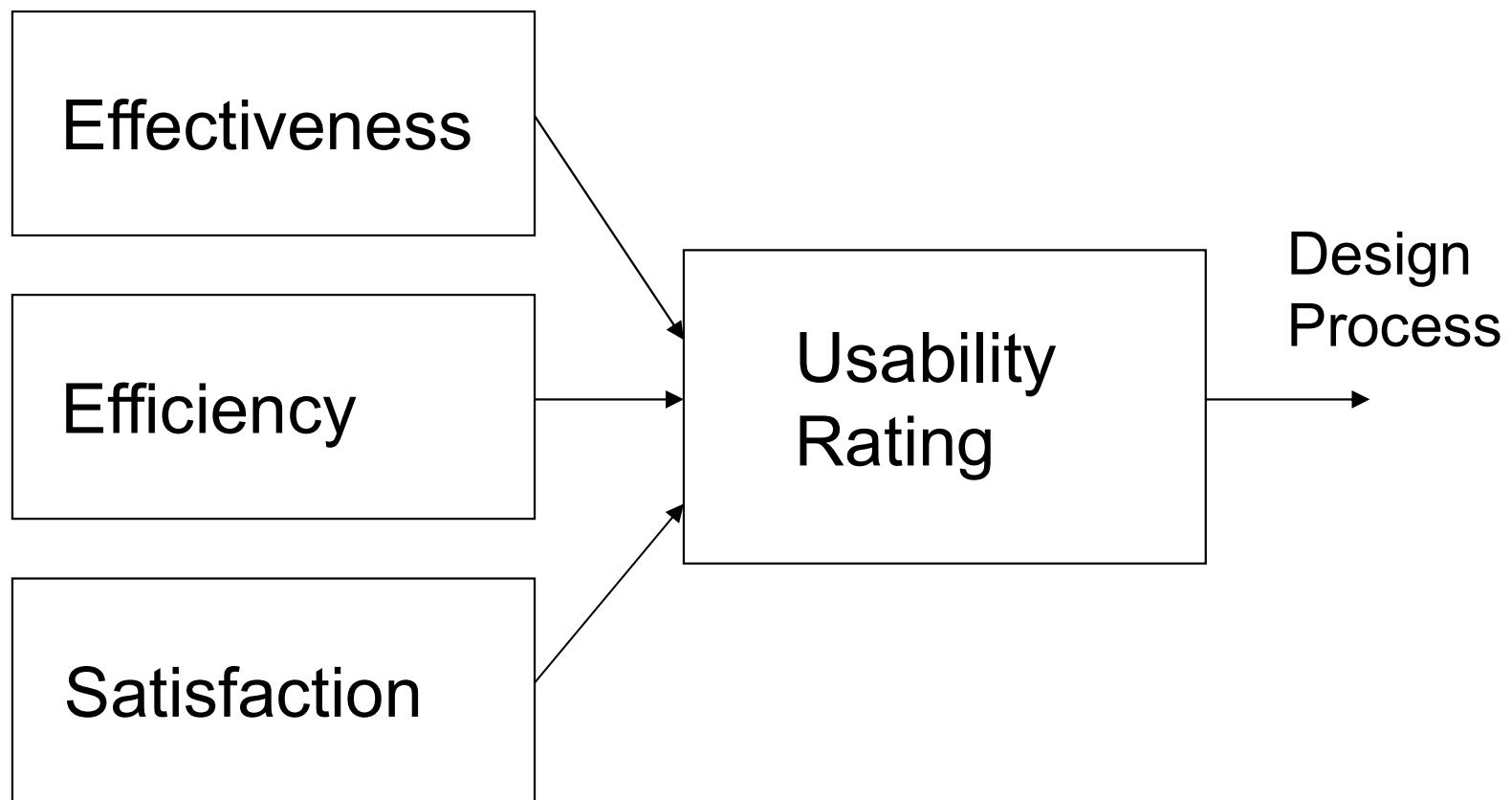
CS449\_549 Term Project Groups

# Assignment due Tuesday

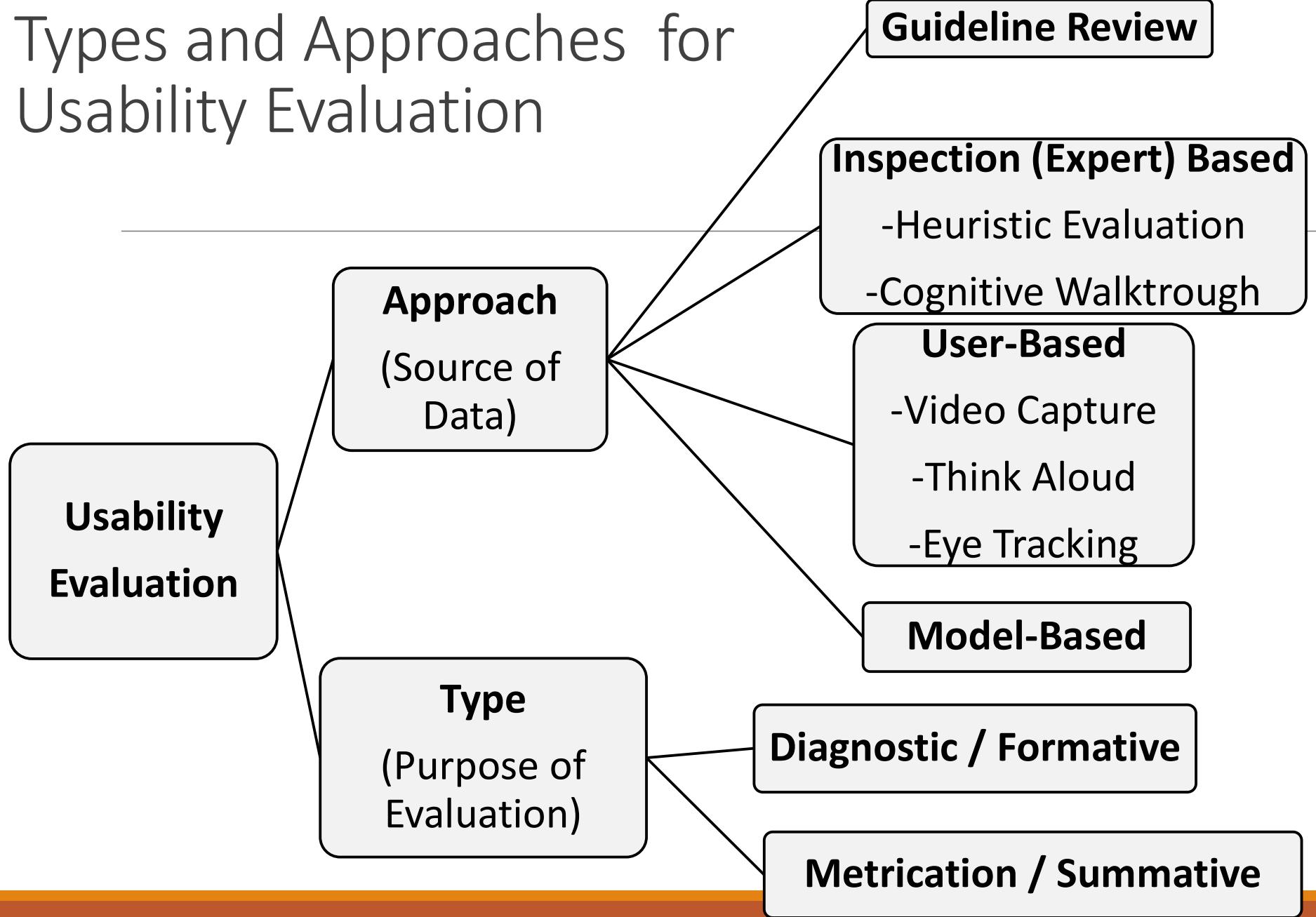


# Determinants of usability rating

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# Types and Approaches for Usability Evaluation



# Evaluation Type

Formative Evaluation



Project timeline: Analysis, Design... >>>

Summative  
Evaluation

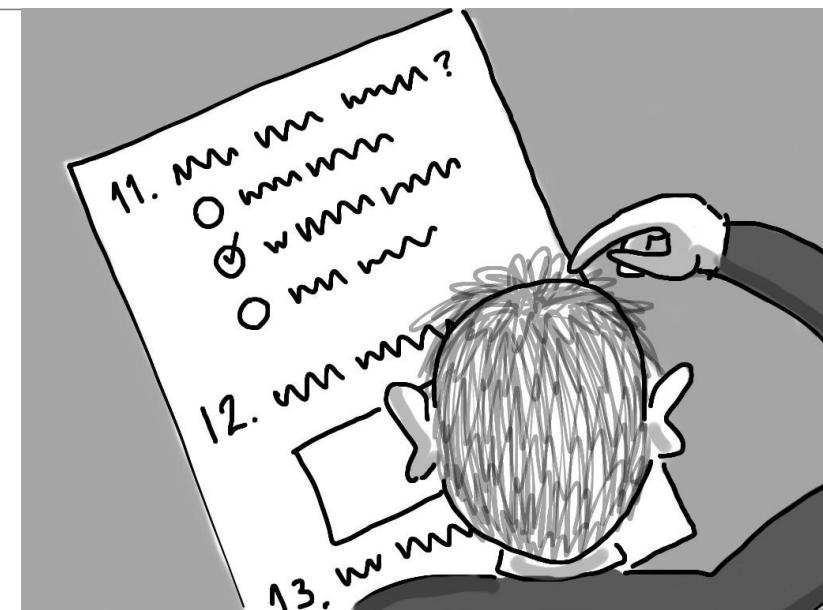
Final product



# Many Faces of Usability



+



# Self Reported Metrics (See Ch6)

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- Asking the participants to tell their experience
- Subjective data and preference data
- Gives users' perception of the system and their interaction with it
- How the users feel about the system
- Satisfaction data

# Rating Scales-1: Five-point- Likert

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1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

- Some researchers prefer to use 7 scale
- Avoid using «very, extremely, absolutely»
  - “This website is absolutely beautiful”

# Rating Scales-2: Semantic Differential

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Weak	o	o	o	o	o	o	o	Strong
Ugly	o	o	o	o	o	o	o	Beautiful
Cool	o	o	o	o	o	o	o	Warm
Amateur	o	o	o	o	o	o	o	Professional

- Use words that are truly opposites
- 5 or 7 points

# Self Reported Metrics - When

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- after each task (post-task ratings) and/or
- at the end of the entire session (poststudy ratings).

# Post Session Self Reported Ratings

(See Ch6)

---

## 1. System Usability Scale (SUS)

- Developed by John Brooke at Digital Equipment Corporation
- 10 questions, Likert scale
- Free, Turkish&English

## 2. Questionnaire for User Interface Satisfaction (QUIS)

- Developed in Human–Computer Interaction Laboratory (HCIL) at the University of Maryland
- 27 questions, Semantic differential scale
- Licensed for commercial use, Turkish&English

# System Usability Scale (SUS)

Strongly  
agree

Strongly  
disagree

+ I think that I would like to use this system frequently.	<input type="checkbox"/>				
- I found the system unnecessarily complex.	<input type="checkbox"/>				
+ I thought the system was easy to use.	<input type="checkbox"/>				
- I think that I would need the support of a technical person to be able to use this system.	<input type="checkbox"/>				
+ I found the various functions in this system were well integrated.	<input type="checkbox"/>				
- I thought there was too much inconsistency in this system.	<input type="checkbox"/>				
+ I would imagine that most people would learn to use this system very quickly.	<input type="checkbox"/>				
- I found the system very cumbersome/awkward to use.	<input type="checkbox"/>				
+ I felt very confident using the system.	<input type="checkbox"/>				
- I needed to learn a lot of things before I could get going with this system.	<input type="checkbox"/>				

# System Usability Scale

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- One of the most widely used tools for assessing the perceived usability of a system or product
- Half the statements are worded positively and half are worded negatively
- Item's score range from 0 to 4.
- For items 1, 3, 5, 7, and 9, the score contribution is the scale position minus 1. (positive items)
- For items 2, 4, 6, 8, and 10, the contribution is 5 minus the scale position. (negative items)
- Multiply the sum of the scores by 2.5 to obtain the overall SUS score.

# Example

	Strongly disagree				Strongly agree	
1. I think that I would like to use this system frequently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4
2. I found the system unnecessarily complex	<input type="checkbox"/>	5				
3. I thought the system was easy to use	<input type="checkbox"/>	5				
4. I think that I would need the support of a technical person to be able to use this system	<input type="checkbox"/>	5				
5. I found the various functions in this system were well integrated	<input type="checkbox"/>	5				
6. I thought there was too much inconsistency in this system	<input type="checkbox"/>	5				
7. I would imagine that most people would learn to use this system very quickly	<input type="checkbox"/>	5				
8. I found the system very cumbersome to use	<input type="checkbox"/>	5				
9. I felt very confident using the system	<input type="checkbox"/>	5				
10. I needed to learn a lot of things before I could get going with this system	<input type="checkbox"/>	5				

# Example

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> 4
2. I found the system unnecessarily complex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> 1	<input type="checkbox"/>
3. I thought the system was easy to use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I think that I would need the support of a technical person to be able to use this system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 5
5. I found the various functions in this system were well integrated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I thought there was too much inconsistency in this system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 5
7. I would imagine that most people would learn to use this system very quickly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I found the system very cumbersome to use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 5
9. I felt very confident using the system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I needed to learn a lot of things before I could get going with this system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 5

# Example

	Strongly disagree					Strongly agree	
1. I think that I would like to use this system frequently						✓	4
2. I found the system unnecessarily complex					✓		1
3. I thought the system was easy to use	✓						1
4. I think that I would need the support of a technical person to be able to use this system							
5. I found the various functions in this system were well integrated							
6. I thought there was too much inconsistency in this system							
7. I would imagine that most people would learn to use this system very quickly							
8. I found the system very cumbersome to use							
9. I felt very confident using the system							
10. I needed to learn a lot of things before I could get going with this system							



# Example

1. I think that I would like to use this system frequently
2. I found the system unnecessarily complex
3. I thought the system was easy to use
4. I think that I would need the support of a technical person to be able to use this system
5. I found the various functions in this system were well integrated
6. I thought there was too much inconsistency in this system
7. I would imagine that most people would learn to use this system very quickly
8. I found the system very cumbersome to use
9. I felt very confident using the system
10. I needed to learn a lot of things before I could get going with this system

					Strongly disagree	Strongly agree					
										✓	4
					1	2	3	4	5		
										✓	1
										✓	1
						✓					1
					✓						4
					1	2	3	4	5		
					✓						1
					1	2	3	4	5		2
						✓					1
					1	2	3	4	5		1
						✓					1
					1	2	3	4	5		4
						✓					3

Total = 22

SUS Score =  $22 * 2.5 = 55$

# Interpretation of SUS scores

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- <50: Not acceptable
- 50–70: Marginal
- >70: Acceptable

# Post Session Ratings

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- System Usability Scale (SUS)
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  - 10 questions, Likert scale
  - Free
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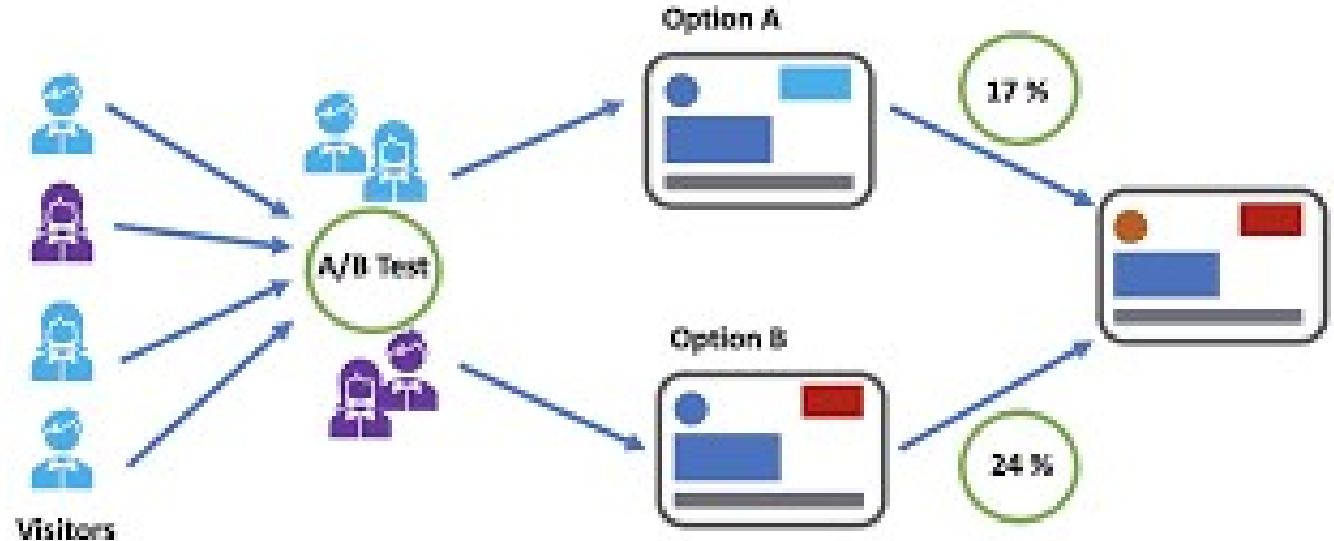
OVERALL REACTION TO THE SOFTWARE	0	1	2	3	4	5	6	7	8	9	NA
1. <input type="checkbox"/>	terrible	<input type="radio"/>	wonderful	<input type="radio"/>							
2. <input type="checkbox"/>	difficult	<input type="radio"/>	easy	<input type="radio"/>							
3. <input type="checkbox"/>	frustrating	<input type="radio"/>	satisfying	<input type="radio"/>							
4. <input type="checkbox"/>	inadequate power	<input type="radio"/>	adequate power	<input type="radio"/>							
5. <input type="checkbox"/>	dull	<input type="radio"/>	stimulating	<input type="radio"/>							
6. <input type="checkbox"/>	rigid	<input type="radio"/>	flexible	<input type="radio"/>							
SCREEN	0	1	2	3	4	5	6	7	8	9	NA
7. Reading characters on the screen <input type="checkbox"/>	hard	<input type="radio"/>	easy	<input type="radio"/>							
8. Highlighting simplifies task <input type="checkbox"/>	not at all	<input type="radio"/>	very much	<input type="radio"/>							
9. Organization of information <input type="checkbox"/>	confusing	<input type="radio"/>	very clear	<input type="radio"/>							
10. Sequence of screens <input type="checkbox"/>	confusing	<input type="radio"/>	very clear	<input type="radio"/>							
TERMINOLOGY AND SYSTEM INFORMATION	0	1	2	3	4	5	6	7	8	9	NA
11. Use of terms throughout system <input type="checkbox"/>	inconsistent	<input type="radio"/>	consistent	<input type="radio"/>							
12. Terminology related to task <input type="checkbox"/>	never	<input type="radio"/>	always	<input type="radio"/>							
13. Position of messages on screen <input type="checkbox"/>	inconsistent	<input type="radio"/>	consistent	<input type="radio"/>							
14. Prompts for input <input type="checkbox"/>	confusing	<input type="radio"/>	clear	<input type="radio"/>							
15. Computer informs about its progress <input type="checkbox"/>	never	<input type="radio"/>	always	<input type="radio"/>							
16. Error messages <input type="checkbox"/>	unhelpful	<input type="radio"/>	helpful	<input type="radio"/>							
LEARNING	0	1	2	3	4	5	6	7	8	9	NA
17. Learning to operate the system <input type="checkbox"/>	difficult	<input type="radio"/>	easy	<input type="radio"/>							
18. Exploring new features by trial and error <input type="checkbox"/>	difficult	<input type="radio"/>	easy	<input type="radio"/>							
19. Remembering names and use of commands <input type="checkbox"/>	difficult	<input type="radio"/>	easy	<input type="radio"/>							
20. Performing tasks is straightforward <input type="checkbox"/>	never	<input type="radio"/>	always	<input type="radio"/>							
21. Help messages on the screen <input type="checkbox"/>	unhelpful	<input type="radio"/>	helpful	<input type="radio"/>							
22. Supplemental reference materials <input type="checkbox"/>	confusing	<input type="radio"/>	clear	<input type="radio"/>							
SYSTEM CAPABILITIES	0	1	2	3	4	5	6	7	8	9	NA
23. System speed <input type="checkbox"/>	too slow	<input type="radio"/>	fast enough	<input type="radio"/>							
24. System reliability <input type="checkbox"/>	unreliable	<input type="radio"/>	reliable	<input type="radio"/>							
25. System tends to be <input type="checkbox"/>	noisy	<input type="radio"/>	quiet	<input type="radio"/>							
26. Correcting your mistakes <input type="checkbox"/>	difficult	<input type="radio"/>	easy	<input type="radio"/>							
27. Designed for all levels of users <input type="checkbox"/>	never	<input type="radio"/>	always	<input type="radio"/>							

Figure 6.10 QUIS, developed by the HCIL at the University of Maryland. Commercial use requires a license from the Office of Technology Commercialization at the University of Maryland.

# Comparision of Design Alternatives

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# A/B testing



- Unleash two different versions of a design to users and see which performs the best.
- Show different page versions to different visitors.
- Major Types:
  - A and B are directly competing designs
  - A is the current design and control condition, B experimental, to prove itself

# A/B testing benefits

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- Measures actual behavior of users in real-world conditions
- Measure very small performance differences with high statistical significance
- Resolve trade-offs between conflicting guidelines or qualitative usability findings
- It's cheap

# A/B testing Limitations

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- Used for projects that have one clear, all-important goal
  - It must be measurable by computer, by counting user actions
  - For many sites, goals are not measurable via user actions
- Only works for fully implemented designs
- you don't know why you get the measured results.
- you also have no idea whether other changes might bring even bigger improvements (color, wording, etc.)
- A/B testing provides data only on the element you're testing

# Minor change: 17.63% conversion uplift

Ben Sim Only Phones Student discount Customer service Waar ben je nu op zoek? Log in Ik Ben

Phones > Apple iPhone 8 64GB

✓ Super fast 4G internet speed ✓ Free number porting ✓ Reliable T-Mobile network ✓ Free monthly bundle change

**Apple iPhone 8 64GB** ● Directly available

Your subscription applies throughout the EU (not in Switzerland) ⓘ

**Subscription** ⓘ

1000 MB	100 min / SMS	7.00
1000 MB	300 min / SMS	8.00
1000 MB	Unlimited min / sms	9.00
<b>3000 MB</b>	<b>100 min / SMS</b>	<b>7.50</b>
3000 MB	300 min / SMS	8.50
3000 MB	Unlimited min / sms	9.50
5000 MB	100 min / SMS	MOST CHOSEN 9.00
5000 MB	300 min / SMS	10.00
5000 MB	Unlimited min / sms	11.00
7000 MB	100 min / SMS	12.00
7000 MB	300 min / SMS	13.00
7000 MB	Unlimited min / sms	14.00

Number portability prices ⓘ

**Internet speed** ⓘ

**your order**

Monthly 24 months

Subscription	7.50
100 min / SMS	3000 MB
Device 24 months	26.00
<b>Total per month</b>	<b>33.50</b>
After 24 months you pay 7.50 a month	

Single payment

Apple iPhone 8 64GB, space gray	0.00
Home copy tax on first invoice ⓘ	5.69
Connection costs on the first invoice ⓘ	20.00
<b>Total one-off</b>	<b>25.69</b>

**Order now** ➔

You always have 14 days to change your order

Ben Sim Only Phones Student discount Customer service Waar ben je nu op zoek? Log in Ik Ben

Phones > Apple iPhone 8 64GB

✓ Super fast 4G internet speed ✓ Free number porting ✓ Reliable T-Mobile network ✓ Free monthly bundle change

**Apple iPhone 8 64GB** ● Directly available

Your subscription applies throughout the EU (not in Switzerland) ⓘ

**Phone color**

Silver	Directly available
Gold	Available March 11th
<b>Space Gray</b>	<b>Directly available</b>

**Subscription** ⓘ

Number portability prices ⓘ

**your order**

Monthly 24 months

Subscription	7.50
100 min / SMS	3000 MB
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Home copy tax on first invoice ⓘ	5.69
Connection costs on the first invoice ⓘ	20.00
<b>Total one-off</b>	<b>25.69</b>

**Order now** ➔

You always have 14 days to change your order

# Ubisoft: Conversion from 38% to 50%

**STEP 01  
CHOOSE EDITION**

STANDARD EDITION | DELUXE EDITION | GOLD EDITION | SEASON PASS | STARTER EDITION

Buy Now

STEP 01  
CHOOSE EDITION

GOLD EDITION

STANDARD EDITION | DELUXE EDITION | SEASON PASS | STARTER EDITION

Buy Now

SELECT CONSOLE

PC DOWNLOAD | PS4 | XBOX ONE

STEP 02  
CHOOSE CONSOLE

STEP 03  
ORDER NOW

PLACE YOUR ORDER

**STEP 01  
CHOOSE EDITION  
(SELECT ONE)**

STANDARD EDITION | DELUXE EDITION

GOLD EDITION | SEASON PASS

STARTER EDITION

**STEP 02  
SELECT CONSOLE**

PC DOWNLOAD | PS4 | XBOX ONE

**STEP 03  
ORDER NOW**

PLACE YOUR ORDER

Buy For Honor Now!  
Now available on PS4, Xbox One & PC

FOR HONOR

STEP 01  
CHOOSE EDITION  
(SELECT ONE)

STANDARD EDITION | DELUXE EDITION

GOLD EDITION | SEASON PASS

STARTER EDITION

STEP 02  
SELECT CONSOLE

PC DOWNLOAD | PS4 | XBOX ONE

STEP 03  
ORDER NOW

PLACE YOUR ORDER



ZALORA

Collection Pencil Wrap Dress

HKD 279.00

Sophistication comes easy with ZALORA COLLECTION - this gorgeous pencil dress flaunts a flattering silhouette with a lovely wrap design and textured finish.

✓ Delivered

see more ▾

Delivery above \$150\*

Free

30 Days Return

Free

Cash On Delivery

Yes

DELIVERED IN

5 - 7 working days

12.3%  
increase in its  
checkout rate



ZALORA

Collection Pencil Wrap Dress

HKD 299.00 & FREE Returns

Sophistication comes easy with ZALORA COLLECTION - this gorgeous pencil dress flaunts a flattering silhouette with a lovely wrap design and textured finish.

✓ Delivered

see more ▾

Delivery above \$150\*

Free

30 Days Return

Free

Cash On Delivery

Yes

DELIVERED IN

5 - 7 working days



ZALORA

Collection Pencil Wrap Dress

HKD 279.00

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✓ Delivered

see more ▾

Free Delivery above \$150\*

Yes

Free 30 Days Return

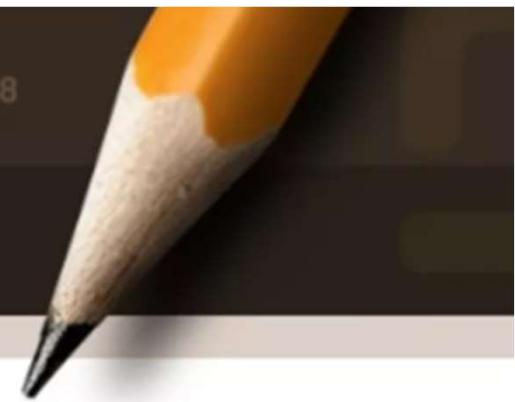
Yes

Cash On Delivery

Yes

DELIVERED IN

5 - 7 working days



## Goodbye, Google

20 mar 2009

Today is my last day at Google.

tagged: [design](#), [google](#)

I started working in-house at Google [almost three years ago](#). I built a team from scratch. I was fortunate to hire a team of a very talented designers. We introduced Visual Design as a discipline to Google. And we produced amazing work together. I'm very proud of my team, and I wish them well. They have a lot of challenging work ahead. But for me, it's time to move on.

[previous item](#)

 [Bring Down IE 6](#)

16 mar 2009

[next item](#)

 [Hello, Twitter](#)

31 mar 2009



“Unfortunately for me, there was one small problem I didn't see back then.”

## Doug Bowman on Design at Google

“

Yes, it's true that a team at Google couldn't decide between two blues, so they're testing 41 shades between each blue to see which one performs better. I had a recent debate over whether a border should be 3, 4 or 5 pixels wide, and was asked to prove my case. **I can't operate in an environment like that.**



# 41 Shades of Blue Test



Gmail

link color

Google Search

41 Bucket Split Test: ~2.5% of users each got a shade for 2 weeks.

## Doug Bowman on Design at Google

“

When a company is filled with engineers, it turns to engineering to solve problems. Reduce each decision to a simple logic problem. Remove all subjectivity and just look at the data. Data in your favor? Ok, launch it. Data shows negative effects? Back to the drawing board. **And that data eventually becomes a crutch for every decision, paralyzing the company and preventing it from making any daring design decisions.**

# Conversational User Experience-CUX

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- Voice Assistants
- Companion Robots
- AI driven experiences



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# The test of guy from Niğde with Siri



# Wizard of Oz: Test the future!

- A method of testing a system that does not exist
  - The voice editor, by IBM (1984)



What the user sees



The Wizard

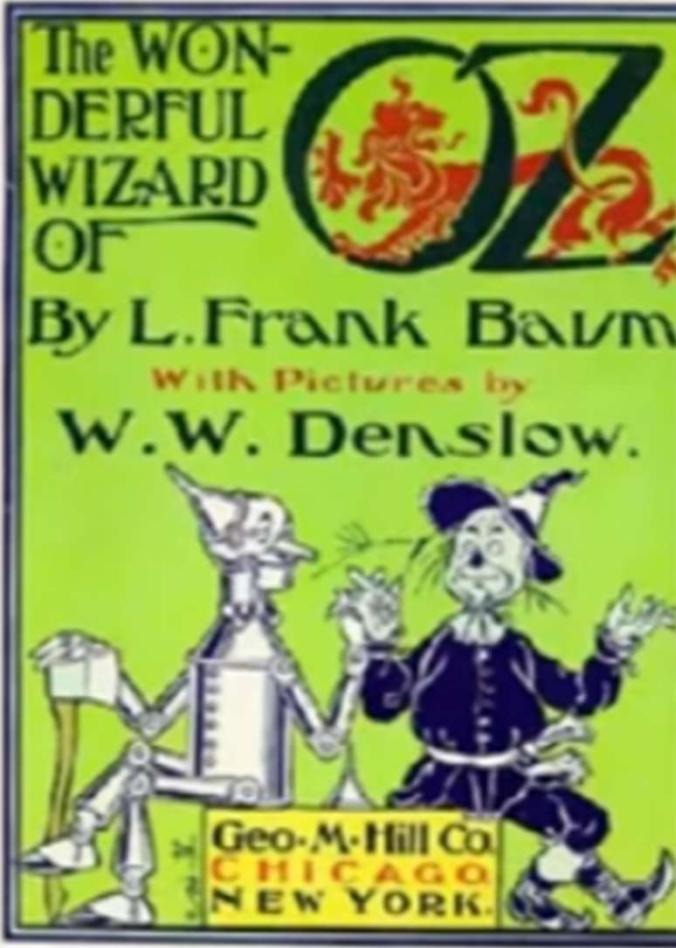
A close-up photograph of a person's hand holding an Amazon Echo smart speaker. The device is cylindrical with a light gray, textured fabric cover. The word "amazon" is printed in lowercase letters near the bottom. The background is blurred, showing what appears to be a window with a view of greenery.

How would you  
build a prototype?

In a day?

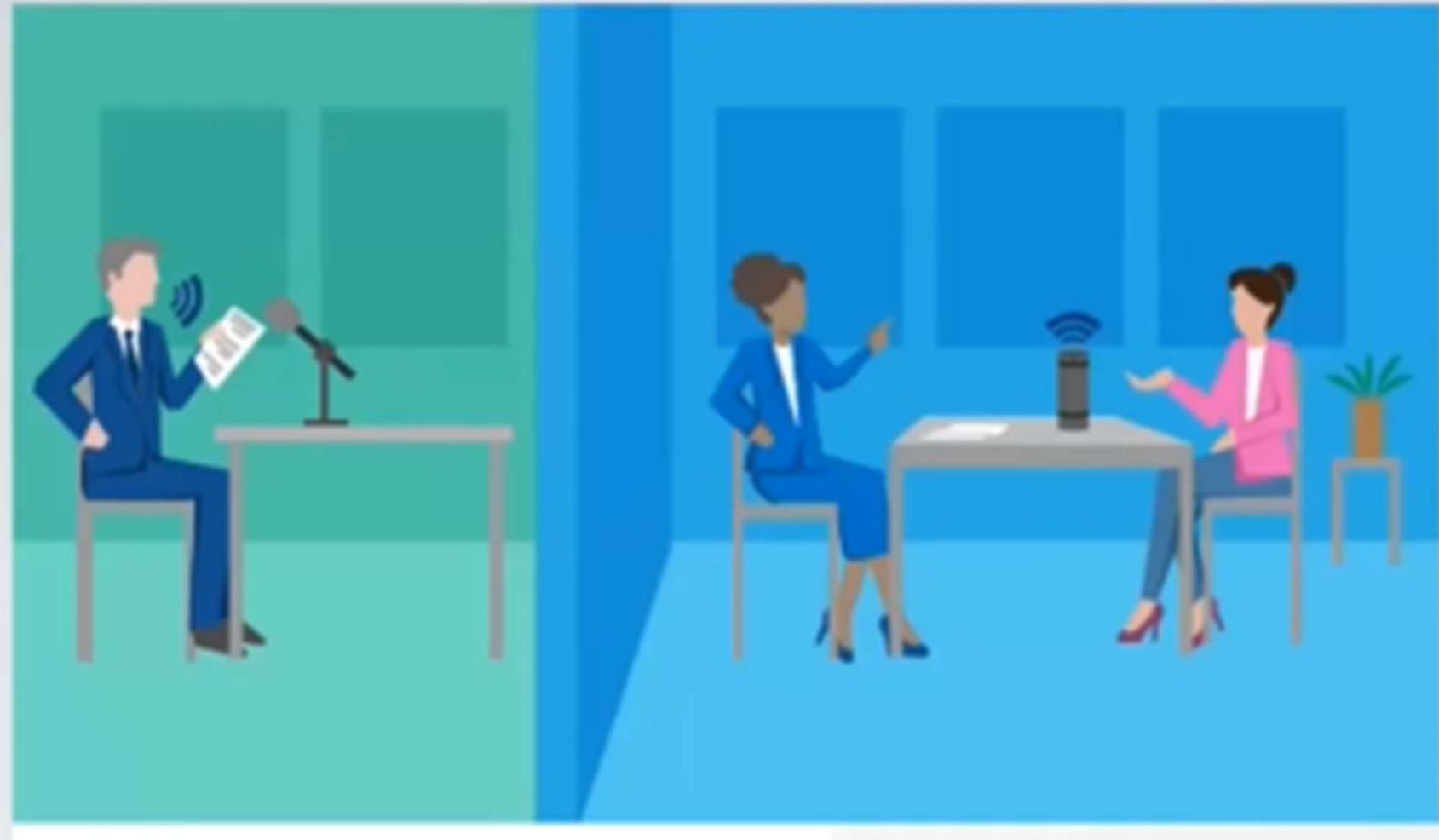
In an hour?

In a week?



- «Pay no attention to the man behind the curtain»
- Curtain is replaced by a computer

## Wizard of Oz



- A human «wizard» simulates the system's intelligence/behavior

# Testing The Design With Users: WoZ

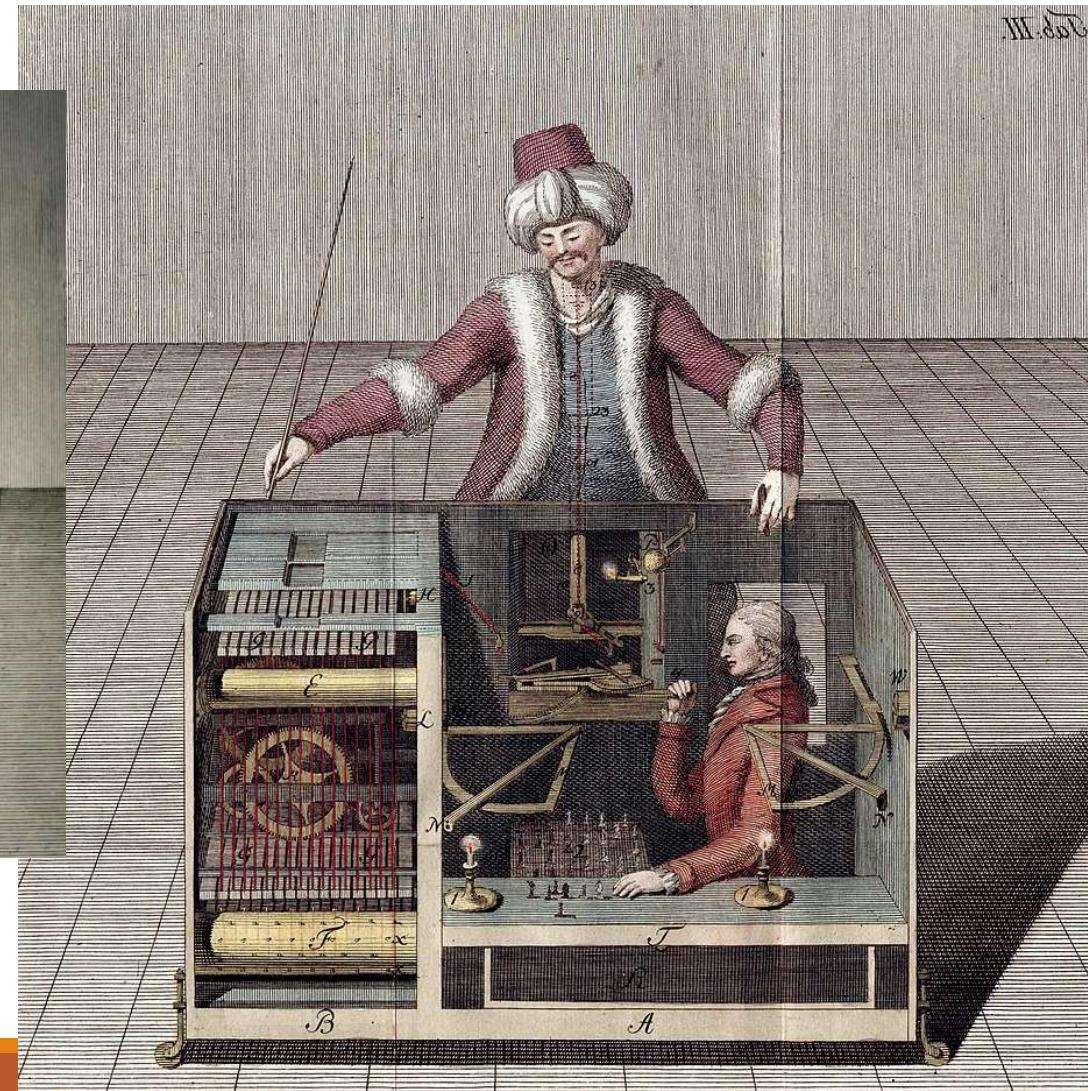
---

- Rapid-prototyping method for systems costly to build or requiring new technology
- Experimenter/Wizard plays pre-recorded sound files
- Choose real users
- Choose tasks that reflect potential real tasks
- Use mockups (low-fidelity prototypes) and prototypes

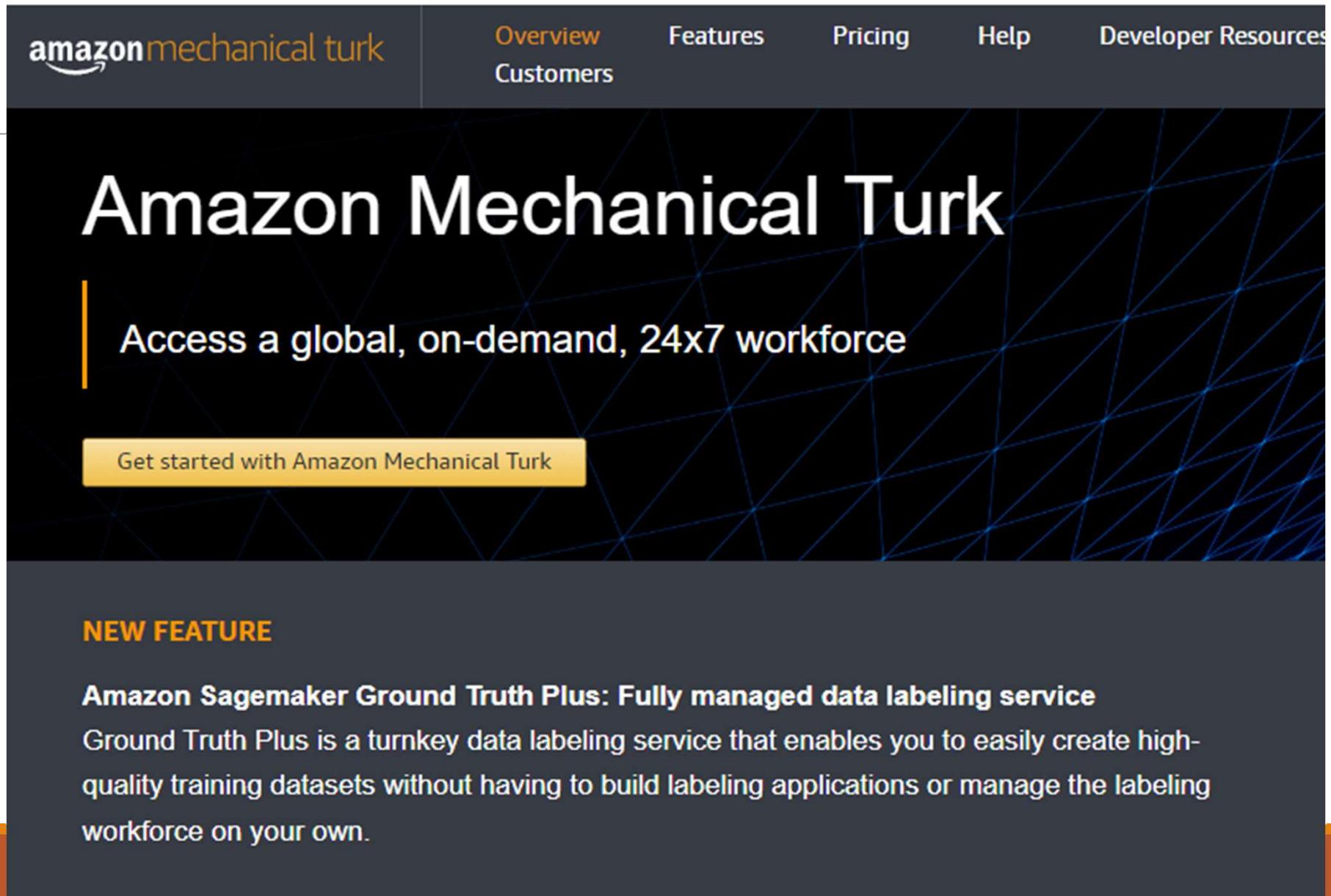
# Wizard of Oz Technique

- + Make an interactive application without (much) code
- + Get feedback from users
  - Hi-fidelity: users think it's more real
  - Low-fidelity: suggest changes
- +Fast, cheap, iterative prototypes
- +Creating multiple variations
- +More real than paper prototypes
- +Places the user to the center
- +Designers learn by playing wizard
- - may simulate technologies that do not exist
- - Wizards need training
- - Performance depend on the operator
- -Playing the wizard can be exhausting
- -Some features are hard/impossible to simulate

# Mechanical Turk



# mturk.com



The screenshot shows the homepage of mturk.com. At the top, there is a dark navigation bar with the "amazon mechanical turk" logo on the left and links for "Overview", "Features", "Pricing", "Help", and "Developer Resources". Below the navigation bar, the main title "Amazon Mechanical Turk" is displayed in large white text against a dark background with a network-like pattern. A call-to-action button labeled "Get started with Amazon Mechanical Turk" is visible. In the lower section, there is a "NEW FEATURE" section about "Amazon Sagemaker Ground Truth Plus: Fully managed data labeling service", which is described as a turnkey service for creating high-quality training datasets.

amazon mechanical turk

Overview  
Customers

Features

Pricing

Help

Developer Resources

# Amazon Mechanical Turk

Access a global, on-demand, 24x7 workforce

Get started with Amazon Mechanical Turk

**NEW FEATURE**

**Amazon Sagemaker Ground Truth Plus: Fully managed data labeling service**

Ground Truth Plus is a turnkey data labeling service that enables you to easily create high-quality training datasets without having to build labeling applications or manage the labeling workforce on your own.

# Term paper - structure

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- Empirical
  - Gather data on an HCI topic
- Title

Abstract

Introduction

Method

Results

Discussion

Conclusion

References

# Abstract

---

- A one paragraph summary
  - A statement on objective/purpose of the investigation
  - Description of participants
  - Brief description of what participants did
  - Summary of findings

# Introduction

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- Lit review
  - Background & rationale (previous research, what they found, what they identify as possible issues/questions)
  - Use: Web od Science, EBSCO, ScienceDirect, Scholar etc.
- Statement of purpose
  - “The current study was conducted to evaluate the effect of X on Y” .... or ..... “to find out what are the factors that lead to Z” or “to determine the relationship between A and B..”

# Method

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- Enough detail for a reader to replicate
- Who participated (number, characteristics, volunteer or randomly selected)
- What materials were employed (systems, questionnaires - design, validity and reliability)
- What data was collected (dependent variables i.e. scores, ratings, responses)
- What were participants required to do (where, who, sequence of events - include instructions & tasks)

# Results

---

- How have the data been treated?
- Text and graphs
- Quantitative: Statistics - descriptive/inferential
- Qualitative: SUS/QUIS, Verbal feedback
- Summarize the results

# Discussion

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- Interpretation-
  - what do the results mean in terms of your original question
  - why do you think they turned out like this
- Compare & Contrast your findings with literature
- Critique your study (limitations) and recommend improvements
- Suggestions for further research

# Conclusion

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- So, what?
- What we learned from your study

# Independent and dependent variables

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- Independent (Input)- what the experimenter does to the subject e.g. exposed to an interface, training, mental model, or selected by age or gender
- Dependent (Output) - any behavior/performance/attitude of the subject which is measured as the 'outcome' e.g. scores on a test, type of knowledge

# Credibility of the study

---

- Definition of the construct being measured
- Congruence between method & question
- Measurement
  - Bias: instruction & instrument (wording), administering
  - Reliability (stable/decision consistency)
    - consistency: e.g. adequate sample size to determine consensus
  - Validity

# PILOT your method !!!

---

- Try your method before capturing data for real.....
  - Ask friends to answer your survey, take your test, perform your experiment etc.
  - look for issues that confuse them (or you!) - modify accordingly

# Statistics (if you choose quantitative approach)

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- Descriptive/Inferential
  - Mean (median, mode)
  - Range
  - Standard deviation
  - Run tests if you are comfortable
- Provide tabulated raw data if possible, (put in appendices if large)

# Common pitfalls

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- Rambling, unfocused style
  - Keep a question in mind as you write
- All claims and opinions, no evidence
  - Cite literature that supports your argument
- Misses relevant topics from class
  - Try to see how the readings and lectures fit
- **NO PLAGIARISM !!** 

# Eye Tracking Technology

- Usability
- Interaction



- 120 Hertz
- Desktop



- Glasses
- 100 Hertz
- Real time data collection



# Reminder: Term Projects

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- If you do not have a term project team yet, please see me after the class...
- If you get my approval for your project topic please add it to the form

CS449\_549 Term Project Groups