

Human Computer Interaction CS449 – CS549

Week 2-2

Interaction: HCI Theories, Frameworks

KÜRŞAT ÇAĞILTAY

Today – Foundational Concepts

- Norman
- Shneiderman
- Guidelines – Principles – Theories
- First Assignment
- Term papers

Week-2 Readings

- Landauer Trouble with computers
- Landauer (1995) Excuses, Ch4, pp. 83-113. Trouble with computers: Usefulness, Usability, and Productivity. MIT Press
- Norman - Design of everyday things
- **Norman, D. (2013). The psychology of everyday actions, Ch.2 pp. 37-122. The design of everyday things. Basic Books.**
- Shneiderman-ch3 Guidelines Principles and Theories
- **Shneiderman, B. et.al. (2016). Guidelines, Principles and Theories. pp. 81-120. Designing the User Interface: Strategies for Effective Human-Computer Interaction, 6th Edition**

Classroom from
my eyes 😊





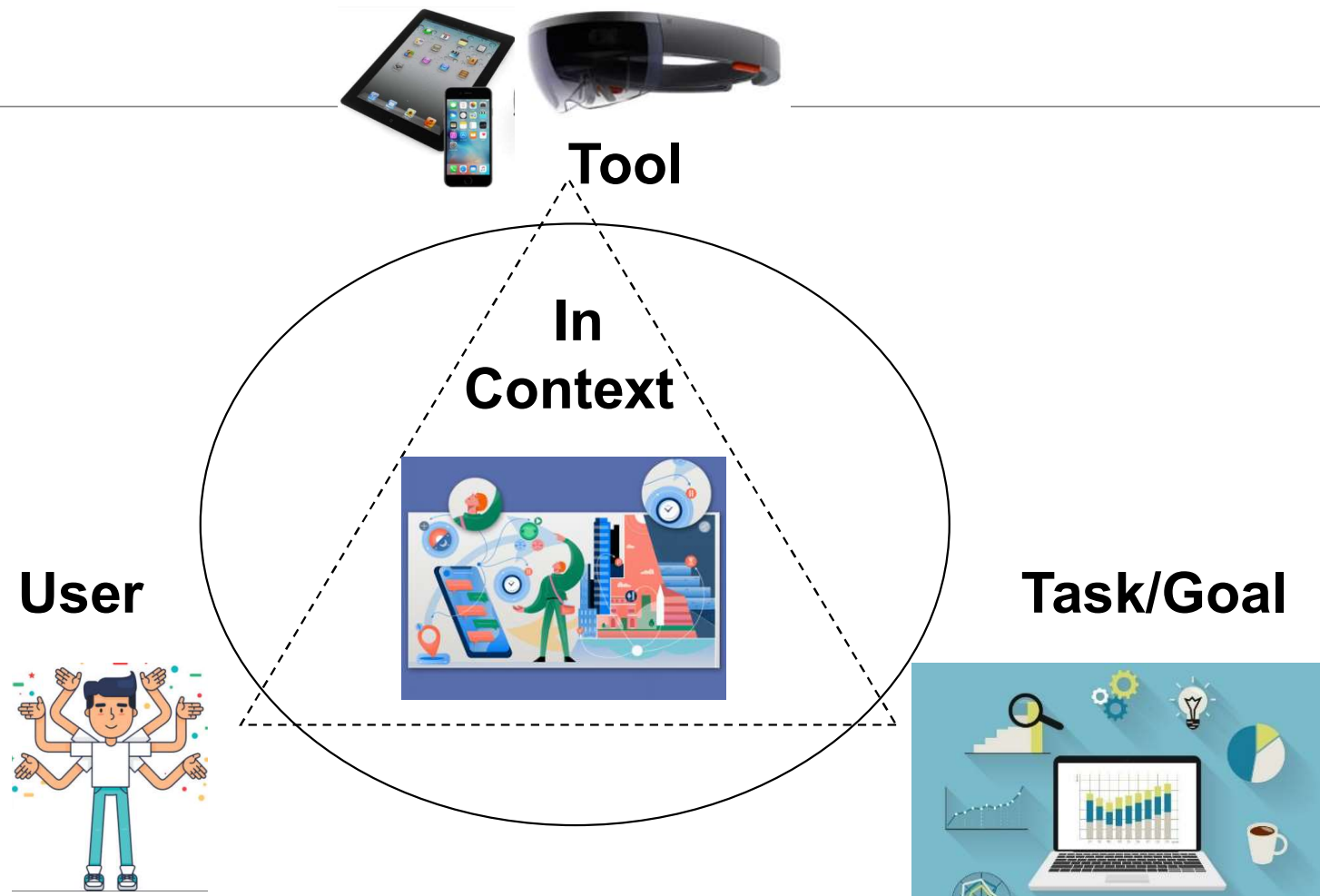


TECHNICAL
DESIGN

A Venn diagram consisting of two overlapping circles. The left circle is a reddish-brown color and contains the text 'TECHNICAL DESIGN'. The right circle is a blue-grey color and contains the text 'USER EXPERIENCE DESIGN'. The intersection of the two circles is a darker shade of the overlapping colors and contains a white five-pointed star. A thin horizontal line passes through the upper part of the circles. At the bottom of the image, there is a solid orange horizontal bar.

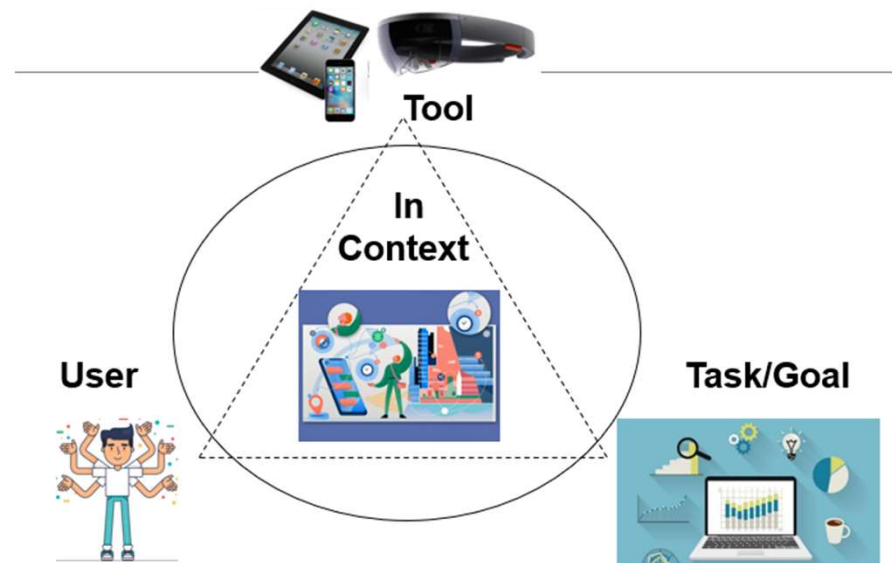
USER
EXPERIENCE
DESIGN

Four Principle components of an HCI System



Lets make an experiment

- Need a Volunteer
- To write and send an e-mail with mobile phone
- Time keeper



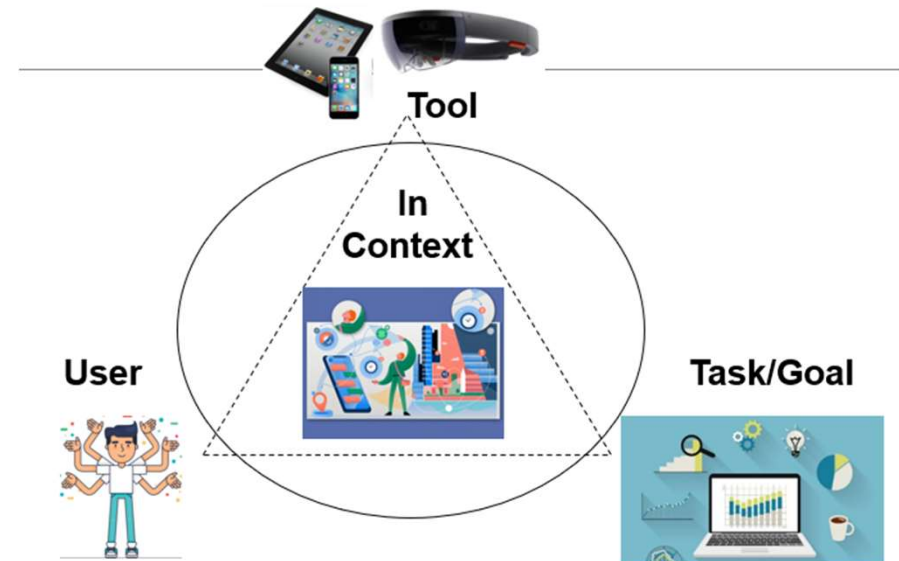
Send me an e-mail

- kursat.cagiltay@sabanciuniv.edu
- Selamlar. Nasılsınız? Bugün hava çok sıcak.

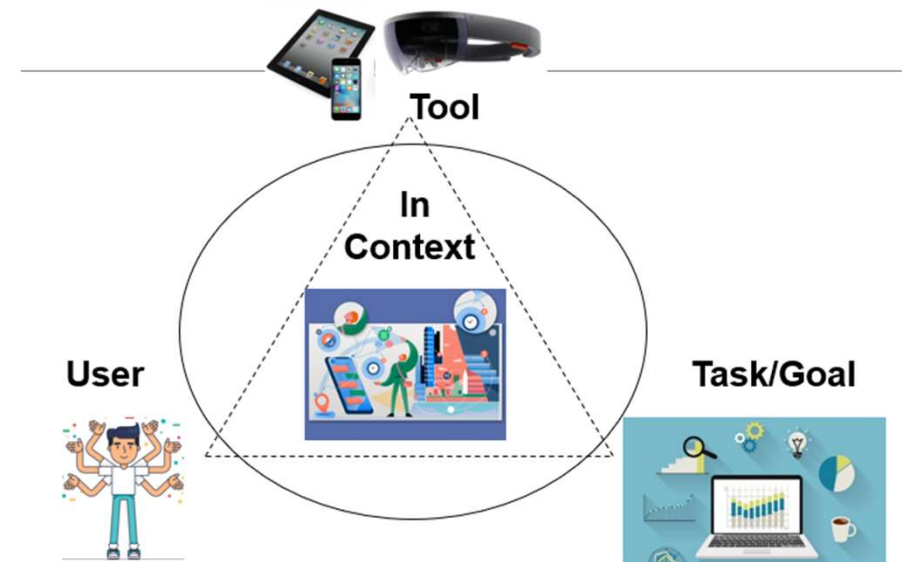
Same test different context-1

- Selamlar. Nasılsınız? Bugün hava çok sıcak.

- Time keeper

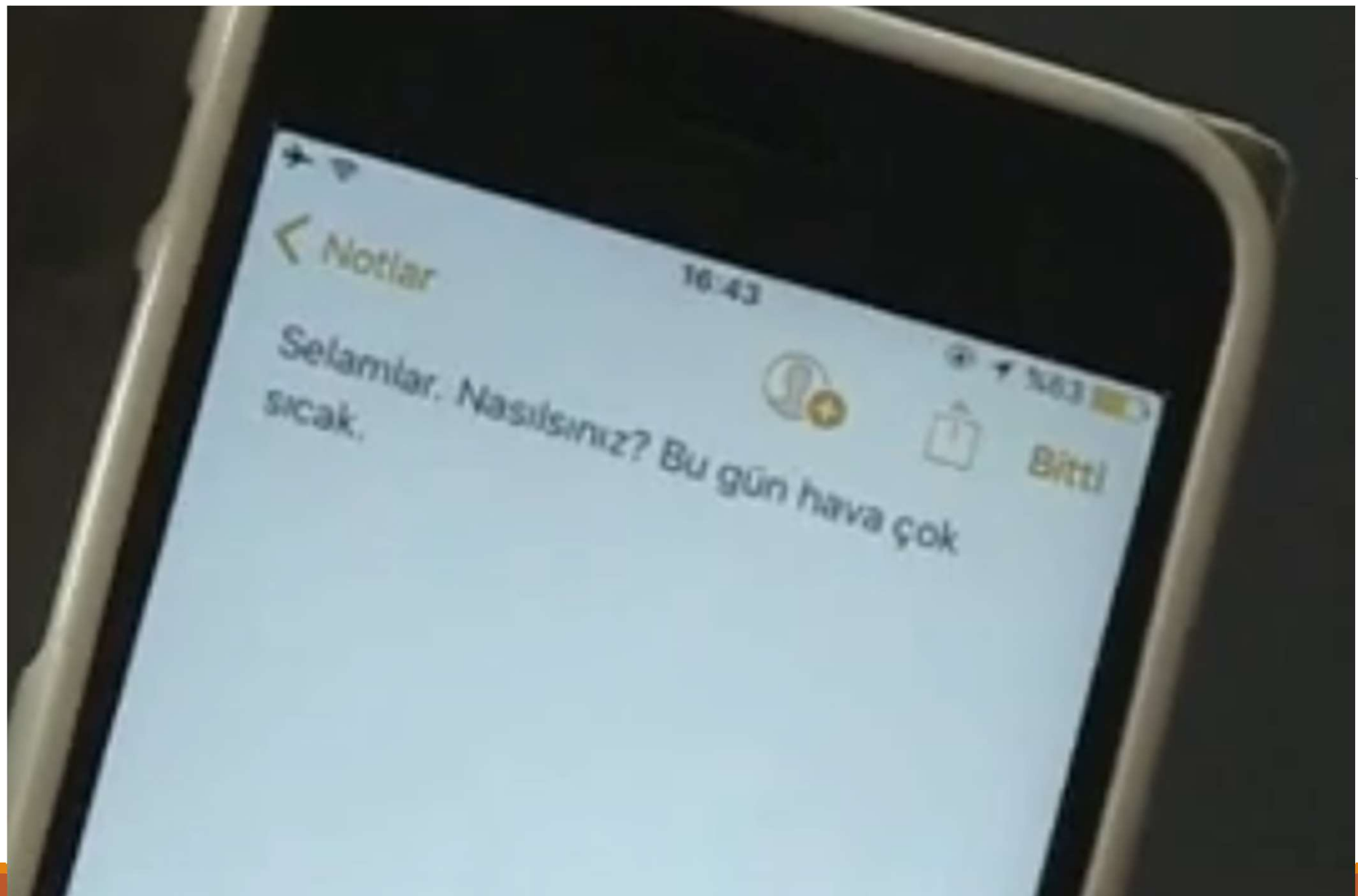


Same test different ?

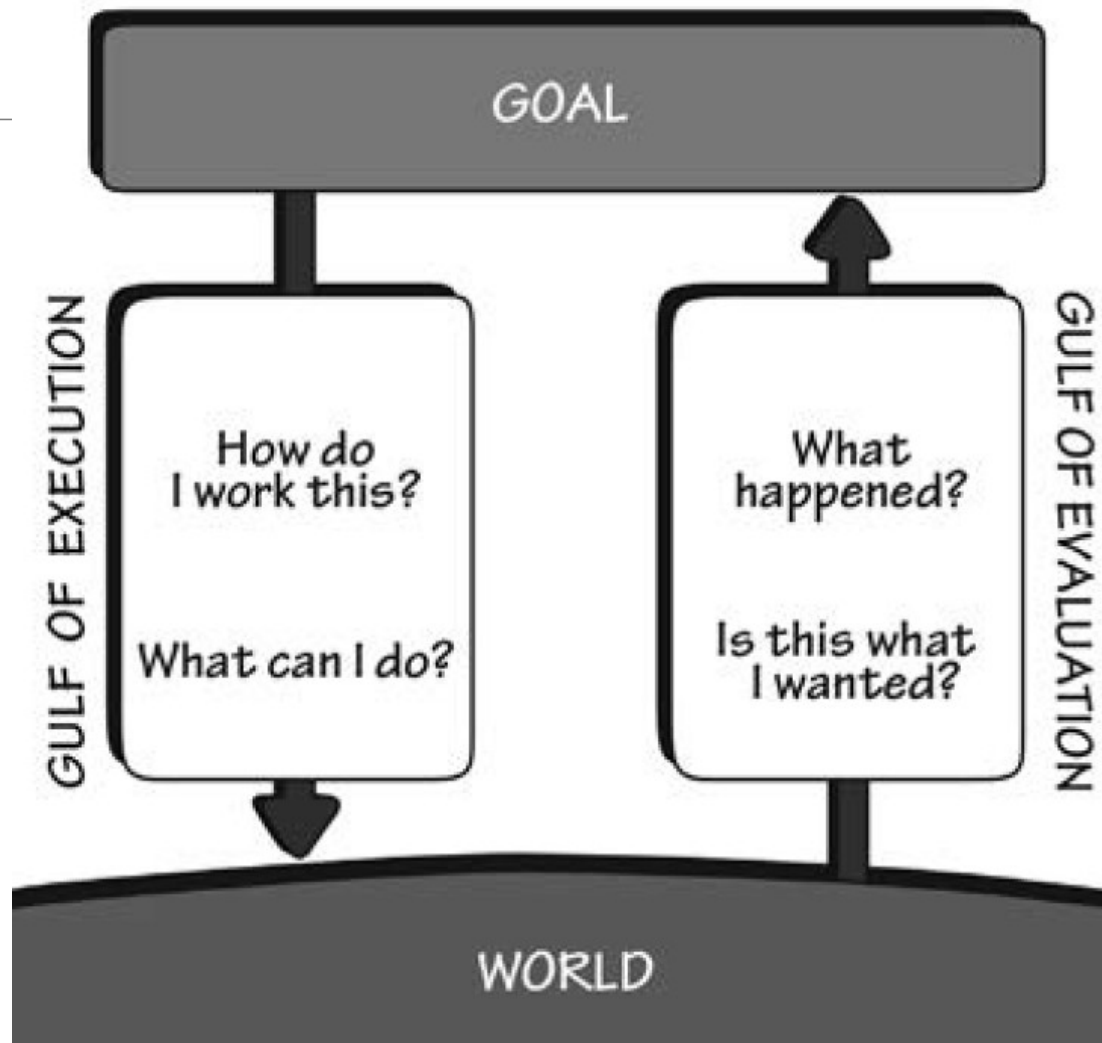




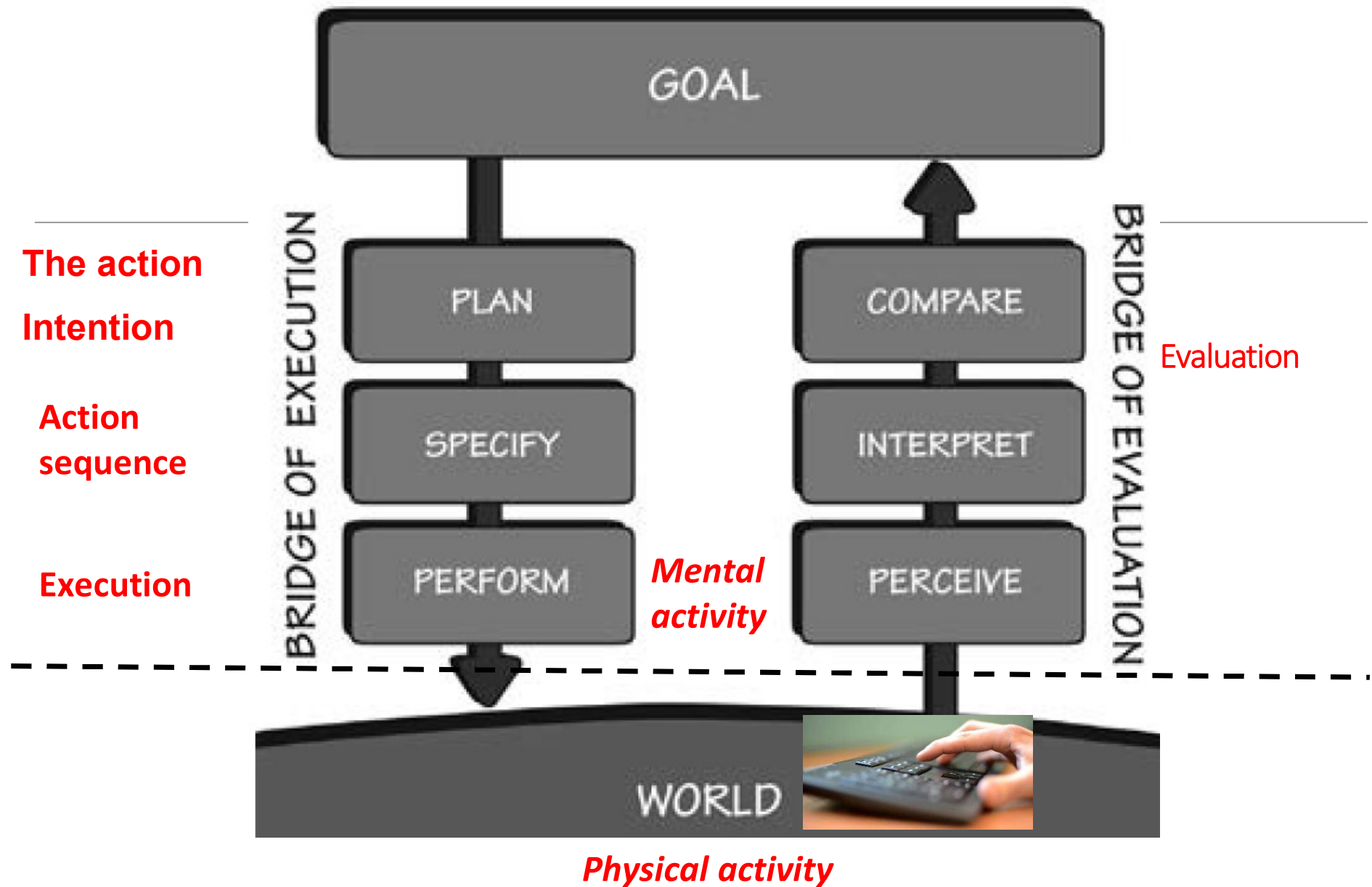
For full interview <https://youtu.be/JSISYRK6OdY>



Interaction at high level: Norman's Gulfs



HCI=Bridging the gulfs of execution and evaluation



Seven stages of user activities involved in task performance

GOAL

Plan - Action

Compare – outcome
with the goal

Specify – an action sequence

Interpret- Perception

Perform – the action
sequence

Perceive – state of
the world

Mental Activity



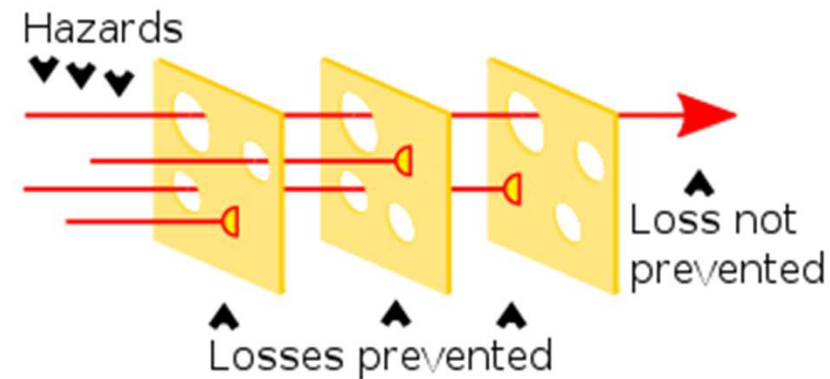
Physical Activity

Using the seven stage model

- Norman suggest you ask: How easily can a user:
 - ▮ Determine the function of the device?
 - ▮ Determine the mapping from intention to physical movement?
 - ▮ Perform the action?
 - ▮ Tell what state the system is in?
 - ▮ Determine mapping from system state to intention?
 - ▮ Tell if the system is in the desired state?

Norman on Interaction

- Error is a natural part of interaction
- We construct a model from fragmentary evidence
- We turn intentions into physical actions and try to interpret the results
- Events trigger our responses
 - we are embedded in a continuous cycle of interaction with the world



Swiss Cheese Model

Interaction and Helplessness

- **Learned helplessness**
 - I tried it, I couldn't use it, I give up!
 - I cannot use a it!
 - Grandma response
- **Taught helplessness**
 - Like your Math class
 - You cannot do it!

Norman's 7 Principles of Good Design

1. **Discoverability** - State and action alternatives should be **Visible**
2. A **good conceptual model** with a consistent system image
3. **Good mappings** for the relationship between stages
4. Continuous **Feedback**
5. **Affordances** – possible interactions between people and the environment (**Low** - **High**)
6. **Signifiers** – what actions are possible and how
7. **Constraints** - physical, logical, semantic, and cultural

Gulf?
Evaluation?
Execution?
Errors?



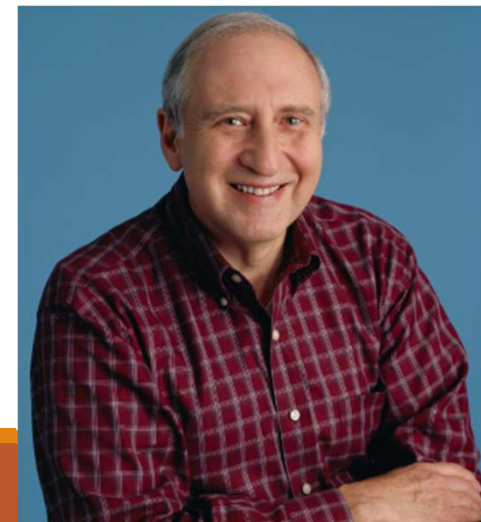
Design Diary Pointer

- **7 stage model and 7 Principles of Good Design are good mechanisms for exploring design issues**
- **Analyze existing designs via the steps and issues they outline**
- **More details about the assignment will be given**

Usability of interactive systems:

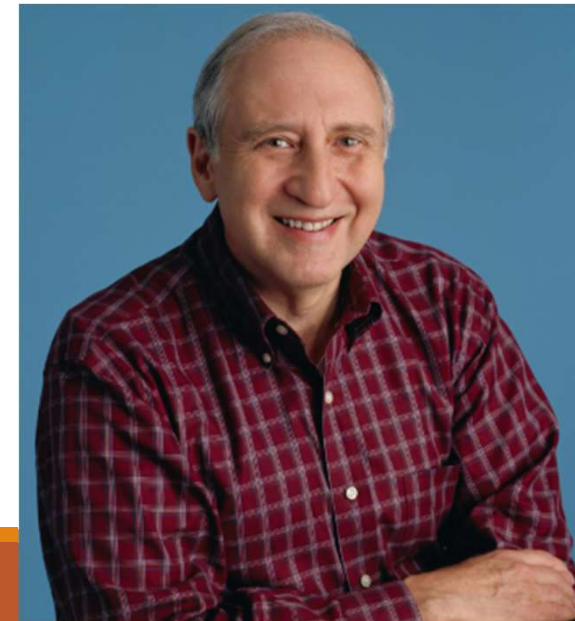
Ben Shneiderman. Reading-4

-
- Shneiderman is called as the father of HCI. University of Maryland Department of Computer Science
 - go beyond vague notions of “user friendliness,” “intuitive”
 - Study evidence-based guidelines
 - Develop principles



Usability of interactive systems: Ben Shneiderman. Ch-1

- Interface should disappear, enabling users to concentrate on their work, exploration, or pleasure.
- They are “in the flow”
- Usability Measures
 1. Time to learn
 2. Speed of performance
 3. Rate of errors by users
 4. Retention over time.
 5. Subjective satisfaction



Usability of interactive systems:

Ben Shneiderman. Ch-3 Guidelines, Principles, Theories

1. Guidelines,

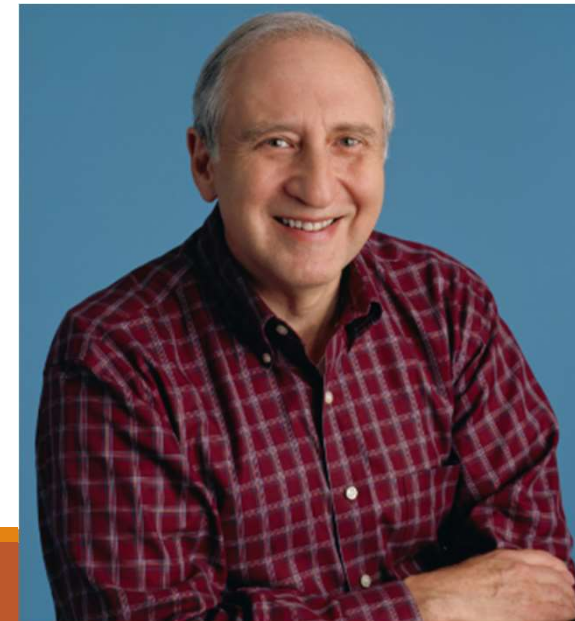
- Low-level focused advice about good practices

2. Principles,

- Middle-level strategies or rules to analyze and compare design alternatives

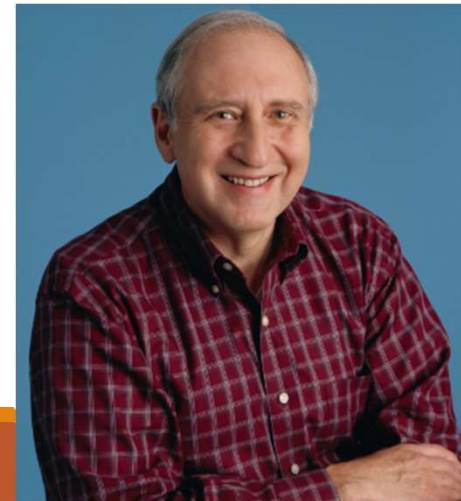
3. Theories

- High-level widely applicable frameworks

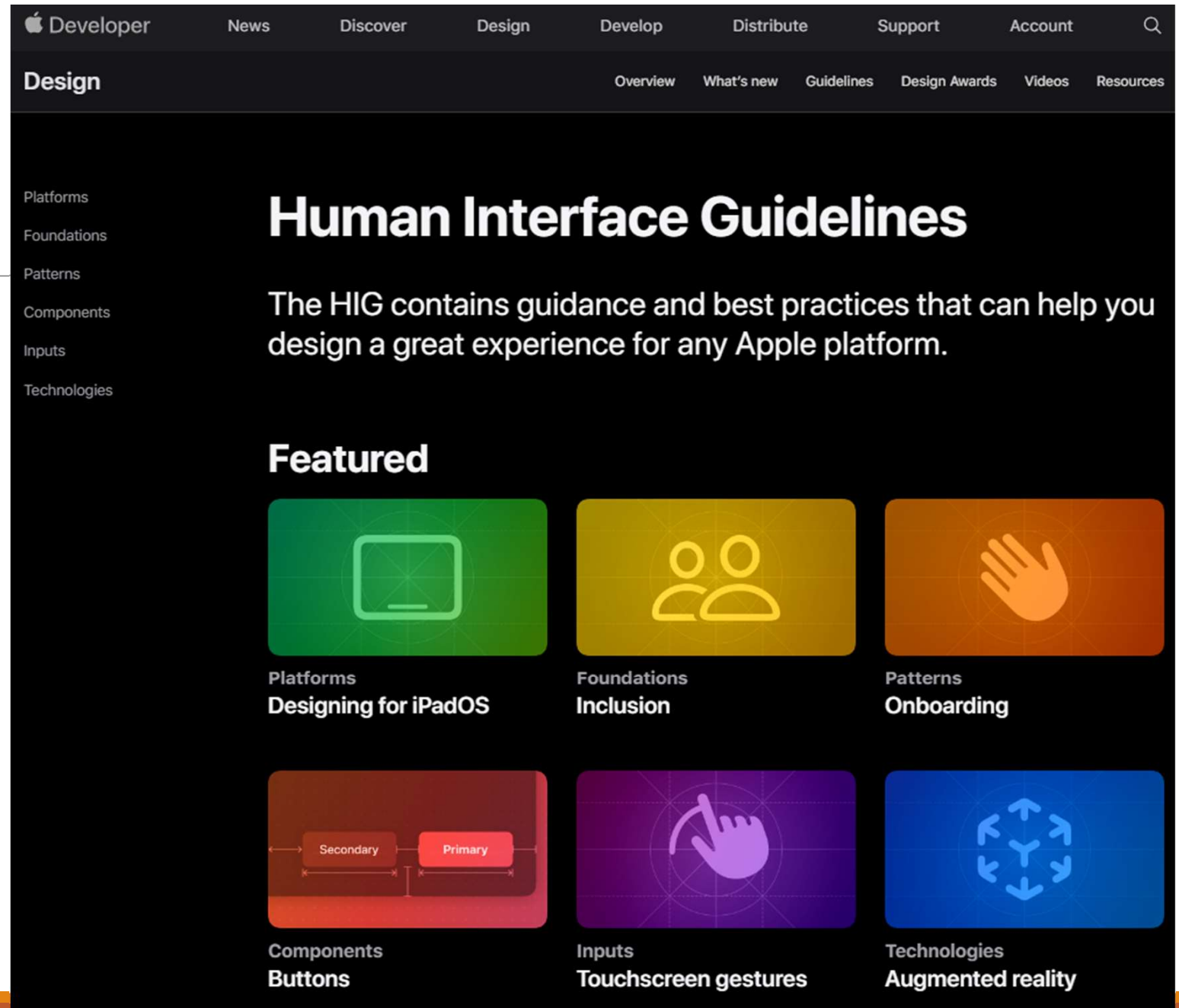


1- Guidelines

- Guidelines : Low-level focused advice about good practices
 - best practices derived from practical experience or
 - empirical studies, with appropriate examples and counter examples
- ☹ guidelines can be too specific, incomplete, hard to apply, and sometimes wrong



Apple



- <https://developer.apple.com/design/human-interface-guidelines/guidelines/overview/> 27

Apple guidelines





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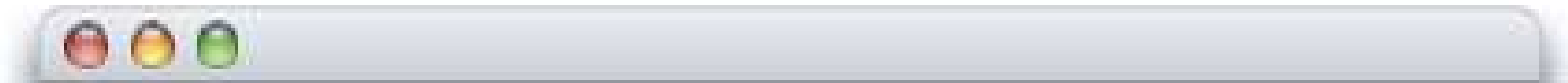
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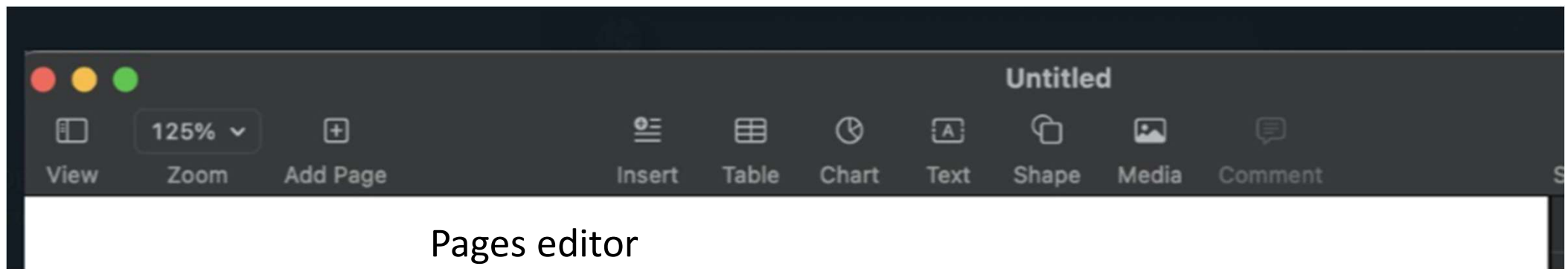
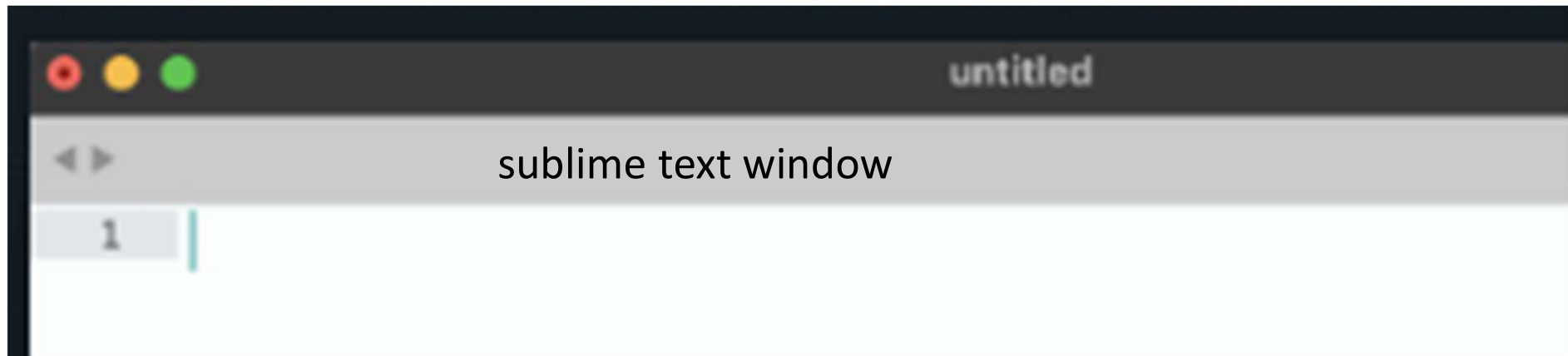
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Do not use additional punctuation.



Do not leave title blank.





User experience guidelines for Universal Windows Platform (UWP) apps

A great app starts with a great user interface. Learn how to design a Universal Windows Platform (UWP) app that looks fantastic on all Windows 10-based devices, from phones and tablets to desktops.

For the online version of these guidelines, see the [Design UWP Apps section](#).

This article contains information that is specific to UWP apps and Windows 10. For more information, please download the [Windows 8.1 guidelines PDF](#).

The screenshot shows the Microsoft Learn website. The top navigation bar includes links for Microsoft, Learn, Documentation, Training, Certifications, Q&A, Code Samples, Shows, and Events. Below this is a breadcrumb trail: Windows App Development > Explore > Development > Platforms > Resources. The main content area is titled 'User interface and input' and includes a sub-header 'User interface fundamentals'. The left sidebar contains a table of contents with links to 'Build desktop apps', 'What's new?', 'Get started', 'Setup guides and resources', 'Design', 'Develop', 'Overview', 'Build apps with the Windows App SDK', 'Migrate from UWP to Windows App SDK', 'Modernize your desktop apps', 'Optimize performance & fundamentals', 'User interface and input', 'Title bar', 'Apply Mica or Acrylic', 'Retrieve a window handle (HWND)', 'Display WinRT UI objects that depend on CoreWindow', and 'Windows UI Library (WinUI)'. The main article text discusses the Windows UI frameworks and compares their capabilities.

Microsoft | Learn | Documentation | Training | Certifications | Q&A | Code Samples | Shows | Events

Windows App Development | Explore | Development | Platforms | Resources

Filter by title

Learn / Windows / Apps / Desktop / Develop /

User interface and input

Article • 09/03/2022 • 8 minutes to read • 6 contributors

This article provides an overview of the Windows UI frameworks that are currently maintained by Microsoft and compares their capabilities.

Microsoft produces both UI frameworks and app platforms. App platforms typically include a UI framework, while UI frameworks are either standalone (not shipped with an app platform) or can be used with multiple app platforms (see [Choose your app platform](#)).

The frameworks discussed here include the Windows UI Library (WinUI) for both Windows App SDK (WinUI 3) and UWP (WinUI 2), Windows Presentation Foundation (WPF), and Windows Forms (WinForms).

User interface fundamentals

When building a modern Windows app, you have a selection of UI frameworks to choose from. UI frameworks provide your app with built in controls, styles, animations, input handling, and more.

There are five main components that go into creating a user interface for your Windows app. These components are usually built into each UI framework.

- <https://go.microsoft.com/fwlink/p/?LinkId=626098>

✖ type your e-mail address in the
format yourname@example.com.



Windows Live ID:

!hotmail.com

(example555@hotmail.com)

✖ type your password.

Password:

[Forgot your password?](#)

Sign in

✖ Please type your e-mail address in the format yourname@example.com.



Windows Live ID:

!hotmail.com

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Password:

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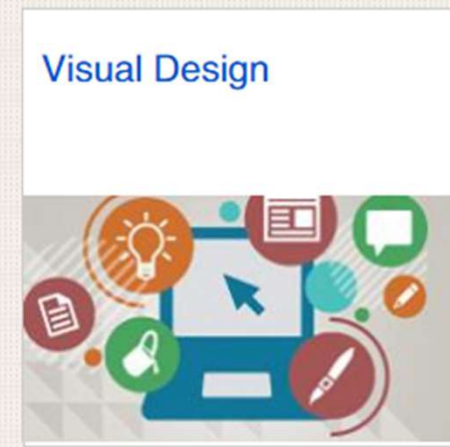
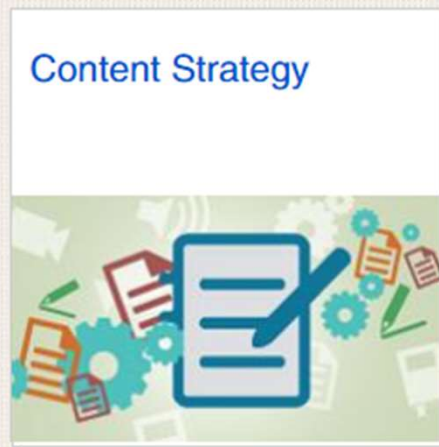
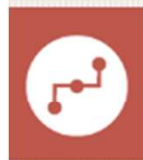
Sign in

US Government

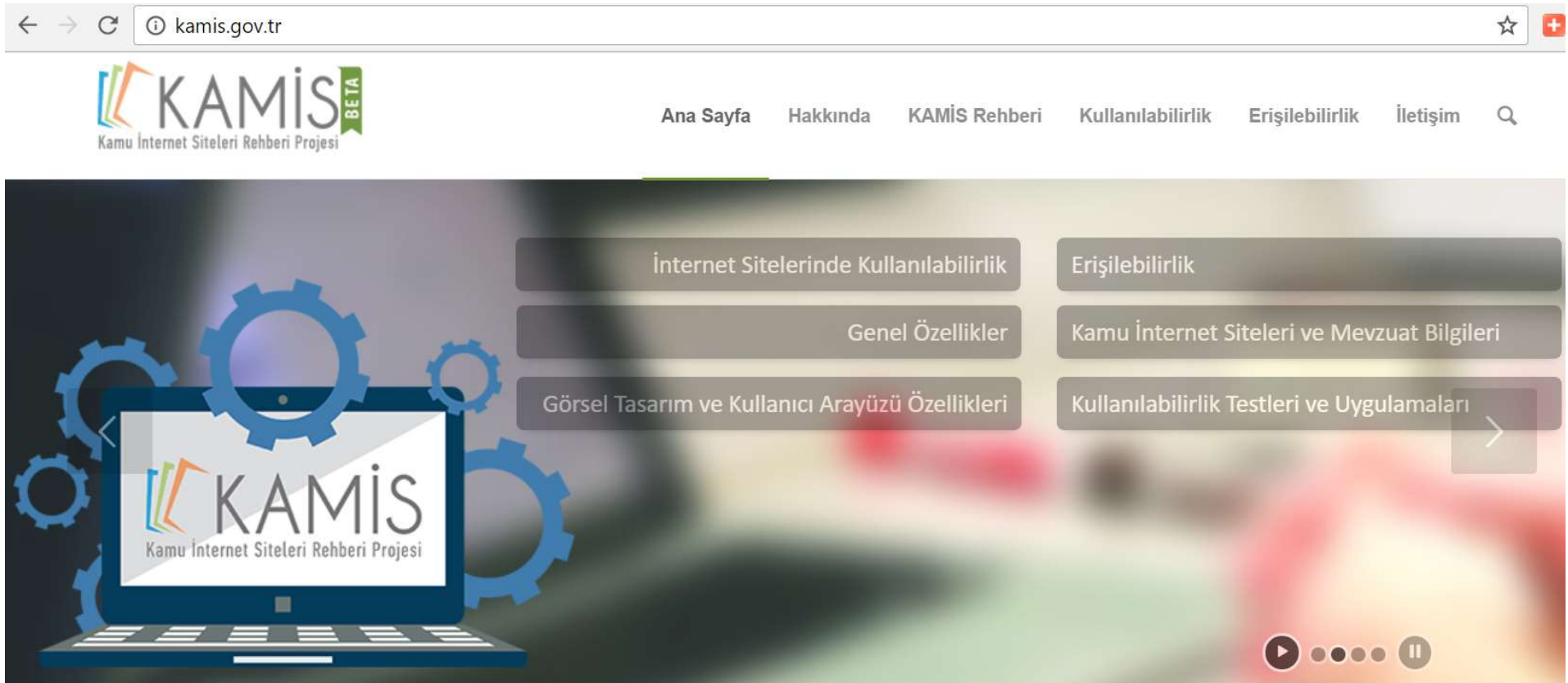
What & Why of Usability

How To & Tools

Get



Turkish Guidelines by TÜBİTAK Kamu İnternet siteleri Rehberi KAMİS



DUYURULAR

Web Kullanılabilirlik ve
Erişilebilirlik Kursu
Düzenlendi – 25 Şubat 2016

General Guidelines

- Navigating the interface
- Organizing the display
- Getting the user's attention
- Facilitating data entry

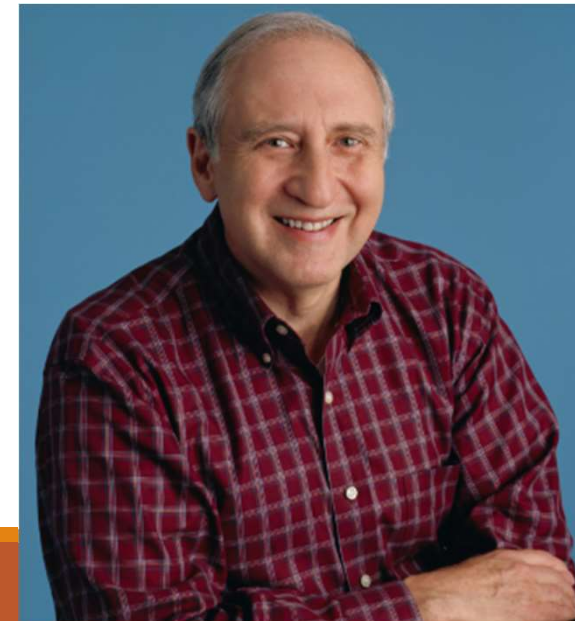
Guidelines?



2- Principles:

Ben Shneiderman. Ch-3 Guidelines, Principles, Theories

-
- Middle-level strategies or rules to analyze and compare design alternatives
 - Principles are more fundamental, widely applicable, and enduring





2-General Principles:

1. Determine users' skill levels: understand the users and the users' tasks – user personas
 - Novice or first-time users
 - Knowledgeable intermittent users
 - Expert frequent users
2. Identify the tasks – Task analysis
3. Choose an interaction style
 - Direct manipulation - Navigation and menu selection - Form fill-in - Command language - Natural language

Which One? How do we decide?

An example of progression toward more direct manipulation: less recall/more recognition, fewer keystrokes/fewer clicks, less capability to make errors, and more visible context.

>MONTH/08;DAY/21

a. Command line

MM/DD 08/21

b. Form fill-in to reduce typing

MM 08 DD 21

c. Improved form fill-in to clarify and reduce errors

Month

JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

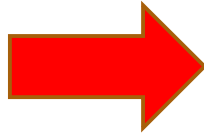
Day 21 ▼

d. Pull-down menus offer meaningful names and eliminate invalid values

August						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

e. 2-D menus to provide context, show valid dates, and enable rapid single selection

Birth date



12:02 100% 84%

TCDD TAŞIMACILIK A.Ş.
GENEL MÜDÜRLÜĞÜ

Remaining Time For Complete Ticket Buying:08:16

1
Male

My Contacts
Choose Contact

Recipe
TAM (ADULT)

Name * Surname
kursat cagiltay

Birth Date *

I am not Turkish citizen ☐

TC Identity No *
TC ID No

Mobile Phone *
05xxxxxxxxx

E-mail
namesurname@xyz.com

Contact Person ☒

You must login for using Subscription

✓ Calculate Fee

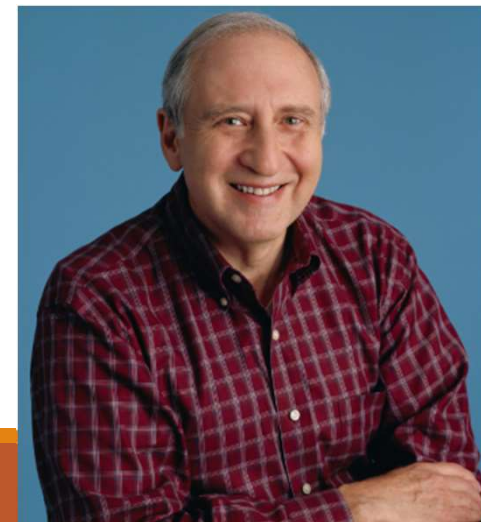


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4. The Eight Golden Rules of Interface Design

Shneiderman's Eight Golden Rules of Interface Design

1. Strive for consistency. ...
2. Seek universal usability. ...
3. Offer informative feedback. ...
4. Design dialogs to yield closure. ...
5. Prevent errors. ...
6. Permit easy reversal of actions. ...
7. Keep users in control. ...
8. Reduce short-term memory load.

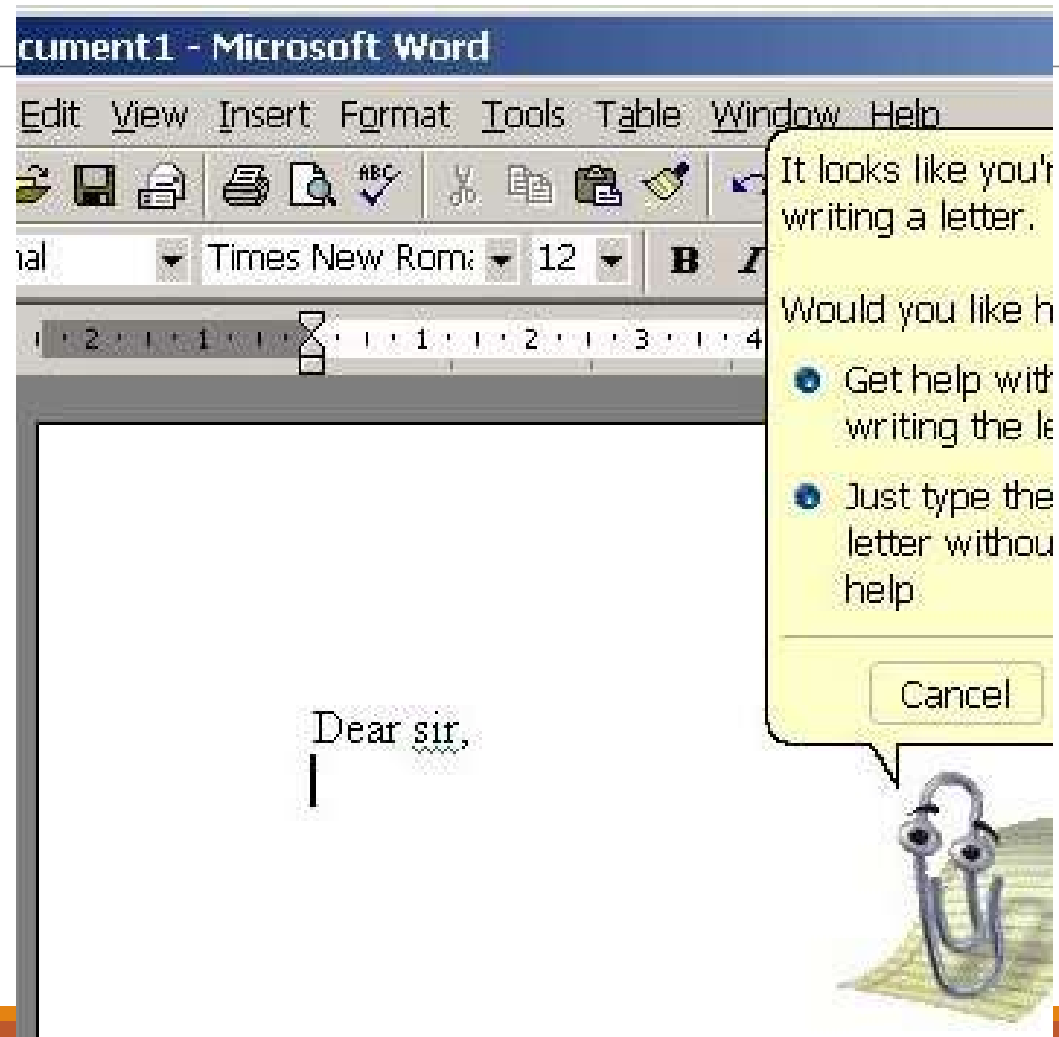


General Principles:



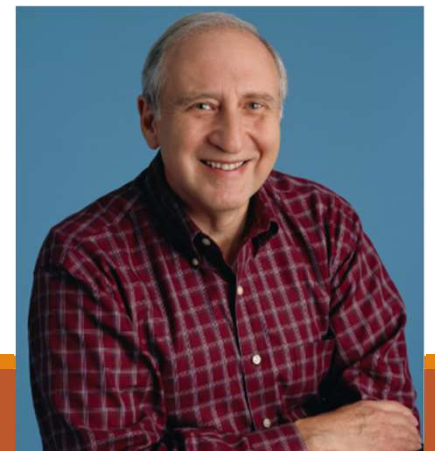
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 - Direct manipulation - Navigation and menu selection - Form fill-in - Command language - Natural language
4. The Eight Golden Rules of Interface Design
5. Prevent errors
6. Ensuring human control while increasing automation

Clippit : Office Assistant



3-Theories: High-level widely applicable frameworks

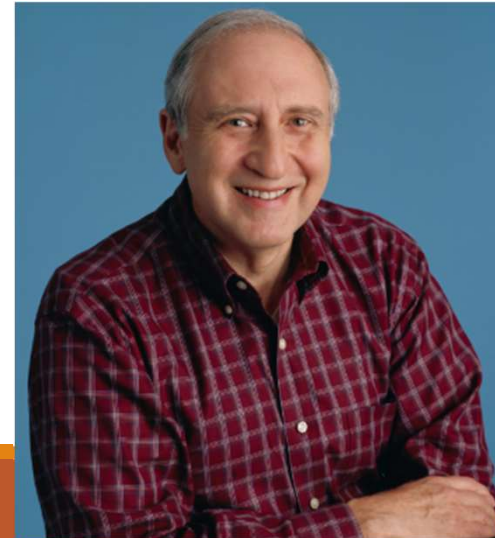
- **Descriptive:** Describes user interfaces and their uses with consistent terminology and taxonomies
- **Explanatory:** Describes sequences of events with causal relationships (e.g. Norman's 7 stages)
- **Prescriptive:** Offers guidelines for designers to make decisions
- **Predictive:** Enables comparison of design alternatives based on numeric predictions of speed or errors.



Theories: High-level widely applicable frameworks

By Human Capacity


- Motor Skill in pointing, clicking, dragging, or other movements
- Perceptual Visual, auditory, tactile, and other human sensory inputs
- Cognitive Problem solving with short- and long-term memory



Norman and Shneiderman

- Based on the user's information processing behavior.
- Norman tries to model the interaction process by dividing it into specific processing levels.
- Shneiderman makes suggestions on how to better design interfaces based on experimental findings.
- Practical and popular solutions to make existing technologies more usable.
- “How to design interaction with computers better so that users with different abilities can use them in the most comfortable way and get the highest performance”.

Assignment-1: Design Diary

- Short (2-4 pages) analyses of a user issue with any interactive service - mobile, desktop or others (e.g. ATMs, kiosks, etc)
 - Describe problem, analyze it in HCI terms, support your arguments with HCI literature
 - Recommend re-design option(s) with Figma RP
- 
- A solid orange horizontal bar spanning the width of the slide at the bottom.

Design Diary Report Evaluation

- Relevance – is it an HCI design issue?
- Description – can the reader foresee the issue clearly?
- Theory – how does this issue relate to the literature on HCI?
- Recommendation – how might the issue be resolved?
- Use Shneiderman, Norman, other resources for each heading.
 - E.g. Is it evaluation or execution problem? Does it violate Shneiderman's Eight Golden Rules? Does it violate Norman's Principles of Good Design

Term Project/Paper

- Empirical/Experimental report
- Generate data, Quantitative/Qualitative– examine the world
- Suitable methodology
- Group work – Suggested group size 3 people
- HCI relevant topic
 - Get my approval before you start working on it
 - Set as early as possible

Sample Term Project Topics

- Effectiveness of a new interaction method – e.g. gestures
- Design and test of menu styles – e.g. Fish eye vs hierarchical
- Redesign and test of Sabancı Univ. Web sites
- E-government, E-business, e-health usability
- SW Engineering methodologies and usability
- Comparision of online banking/shopping systems
- Mobile interactivity (e.g. MySU mobile)
- Children/Elderly, blind/deaf users
- Security vs. Usability (e.g. Two-factor authentication)
- VR, AR studies
- Computer games

Some Previous Term Projects

1. Design and Test of a magnifier application for VR
2. Comparison of cognitive modeling and user performance analysis for touch screen mobile interface design
3. The effect of apologetic error messages users' performance
4. Evaluation of Inputting text methods in RPG for player performance
5. Usability tests (shopping sites, banking services, municipalities, etc.)
6. Design/Test of Mobile application for individuals with intellectual disabilities
7. The role of visual coherence in graphical passwords
8. User study on generative AI technologies (ChatGPT)
9. Developing a Gesture-Based Game to Teach Basic Life Skills
10. Usability comparison of two-factor authentication
11. Multimodal comprehension of language and graphics: Graphs with and without annotations
12. The Influence of a Trolling Game on Perception of Toxic Behavior
13. Usability and Design Aspects of Large Multitouch Interfaces

Readings for Week-3

- Data Entry Comparison Study ***
- Understanding user preferences based on usability and aesthetics before and after actual use, Interacting with Computers
- Research-Based Web Design & Usability Guidelines (Skim)
- User experience guidelines for Universal Windows Platform (UWP) apps (skim)
- Fitt's Law. Chapter in Laws of UX by Jon Yablonski, April 2020. O'Reilly Media (Second assignment)