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

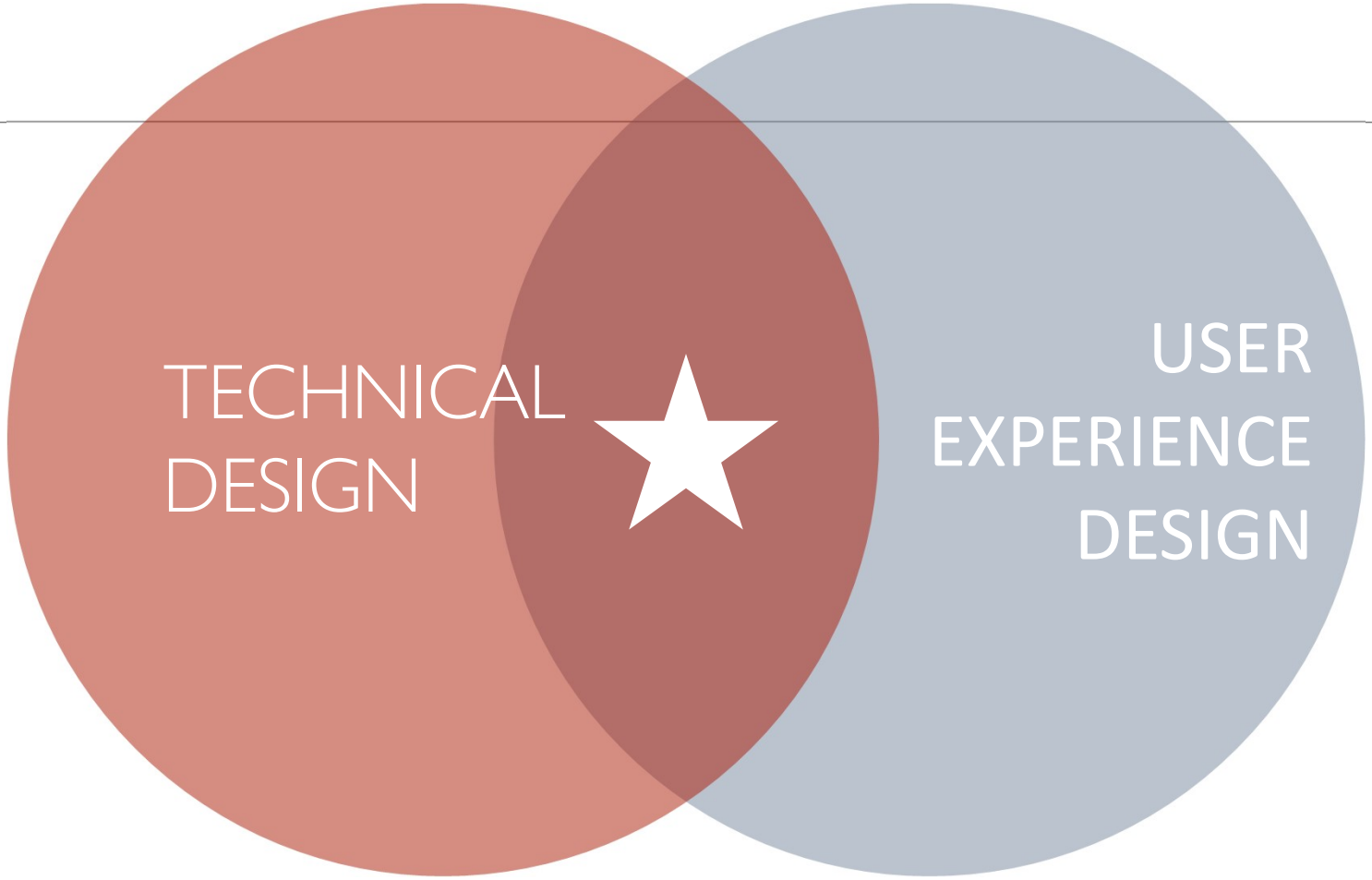
Week-2 Readings

- Landaurer Trouble with computers
- Landaurer (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
USER
EXPERIENCE
DESIGN

Four Principle components of an HCI System

Tool

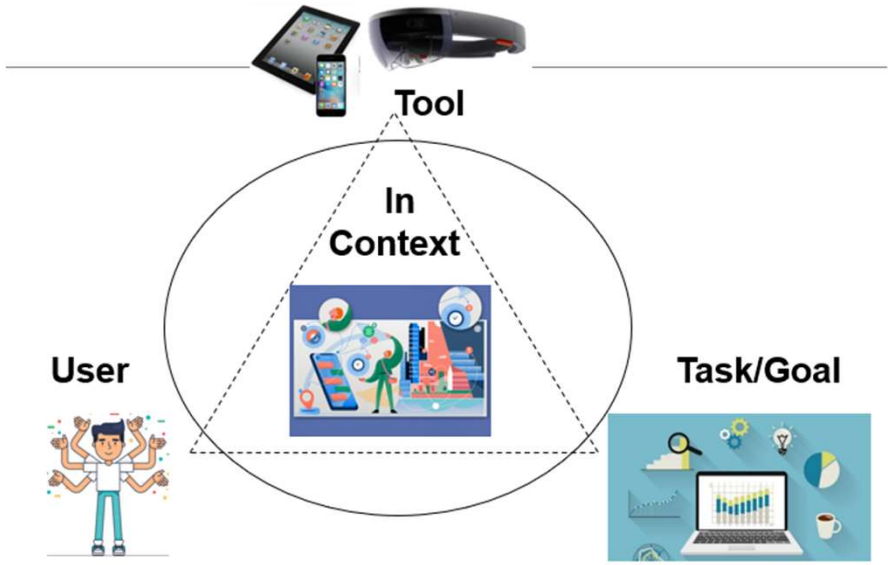
In Context

User

Task/Goal

Lets make an experiment

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



Send me an e-mail

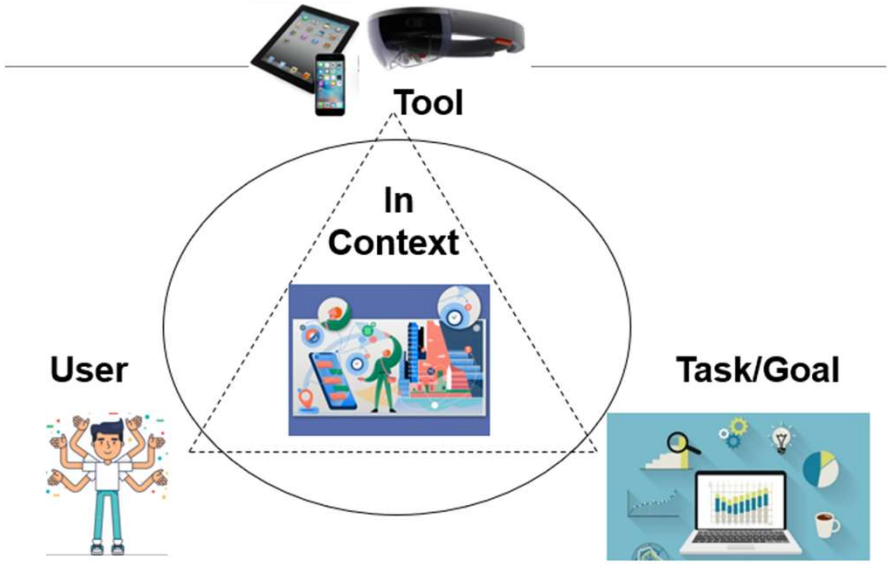
- kursat.cagiltay@sabanciuniv.edu

- Selamlar. Nasılsınız? Bugün hava çok sıcak.

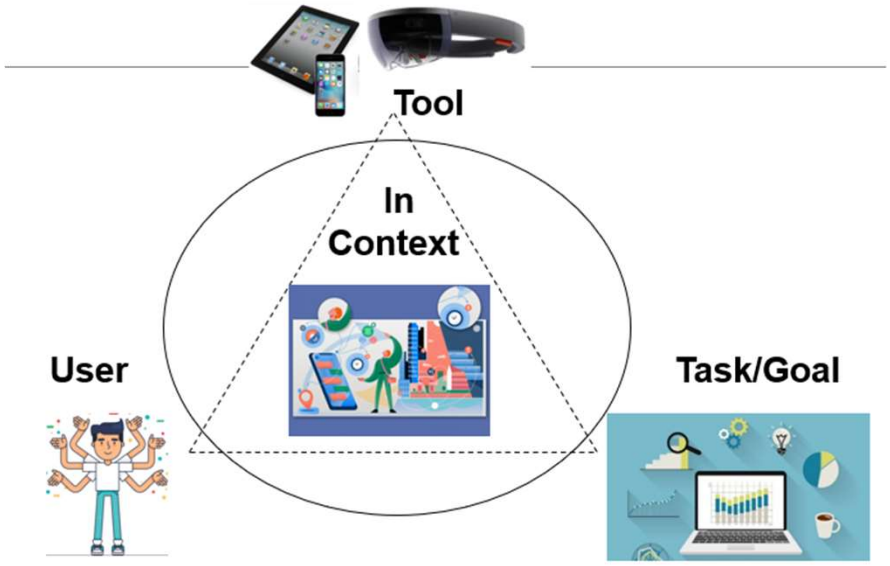
Same test different context-1

- Selamlar. Nasılsınız? Bugün hava çok sıcak.

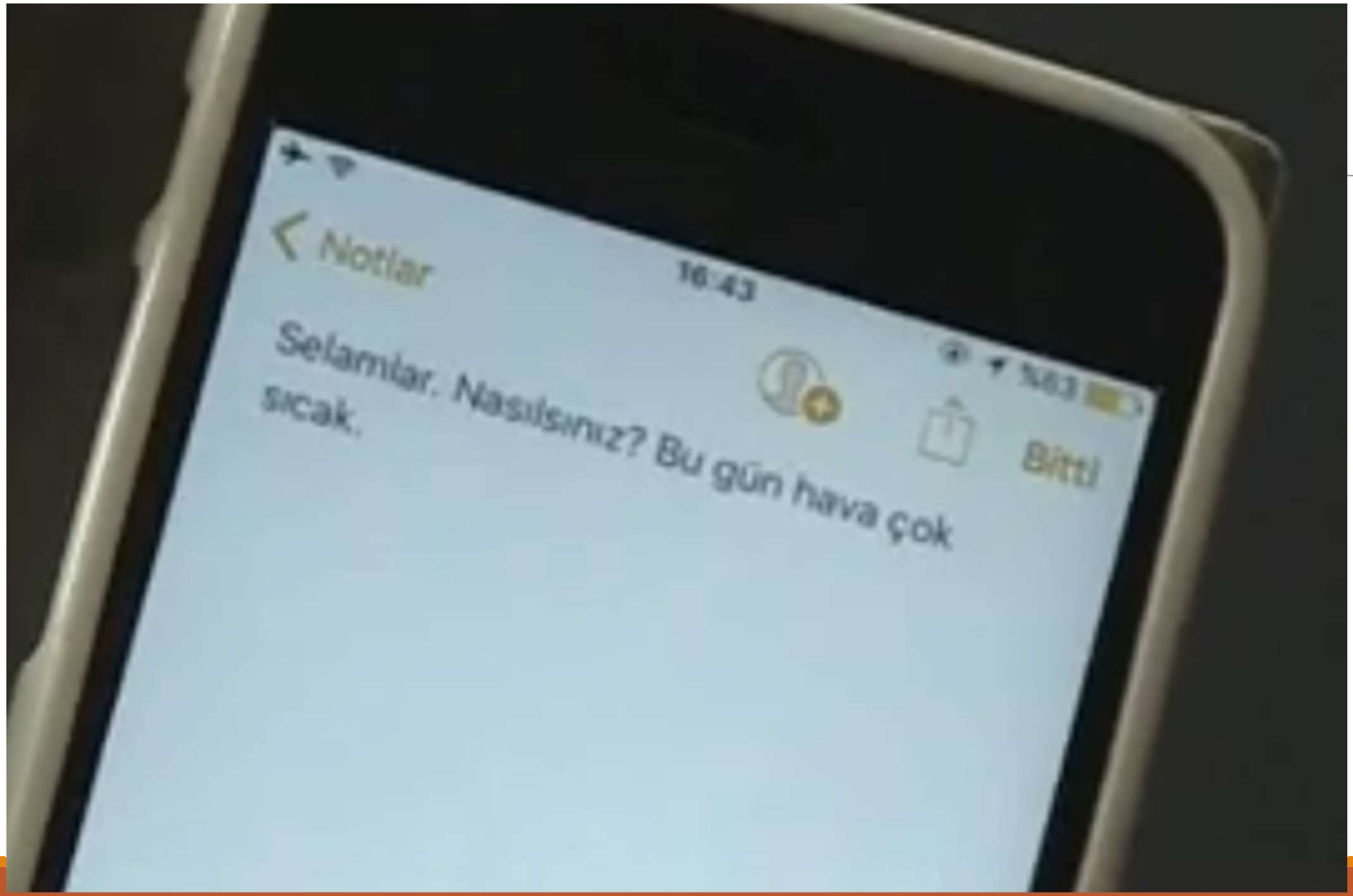
- Time keeper



Same test different ?



For full interview https://youtu.be/JSlSYRK6OdY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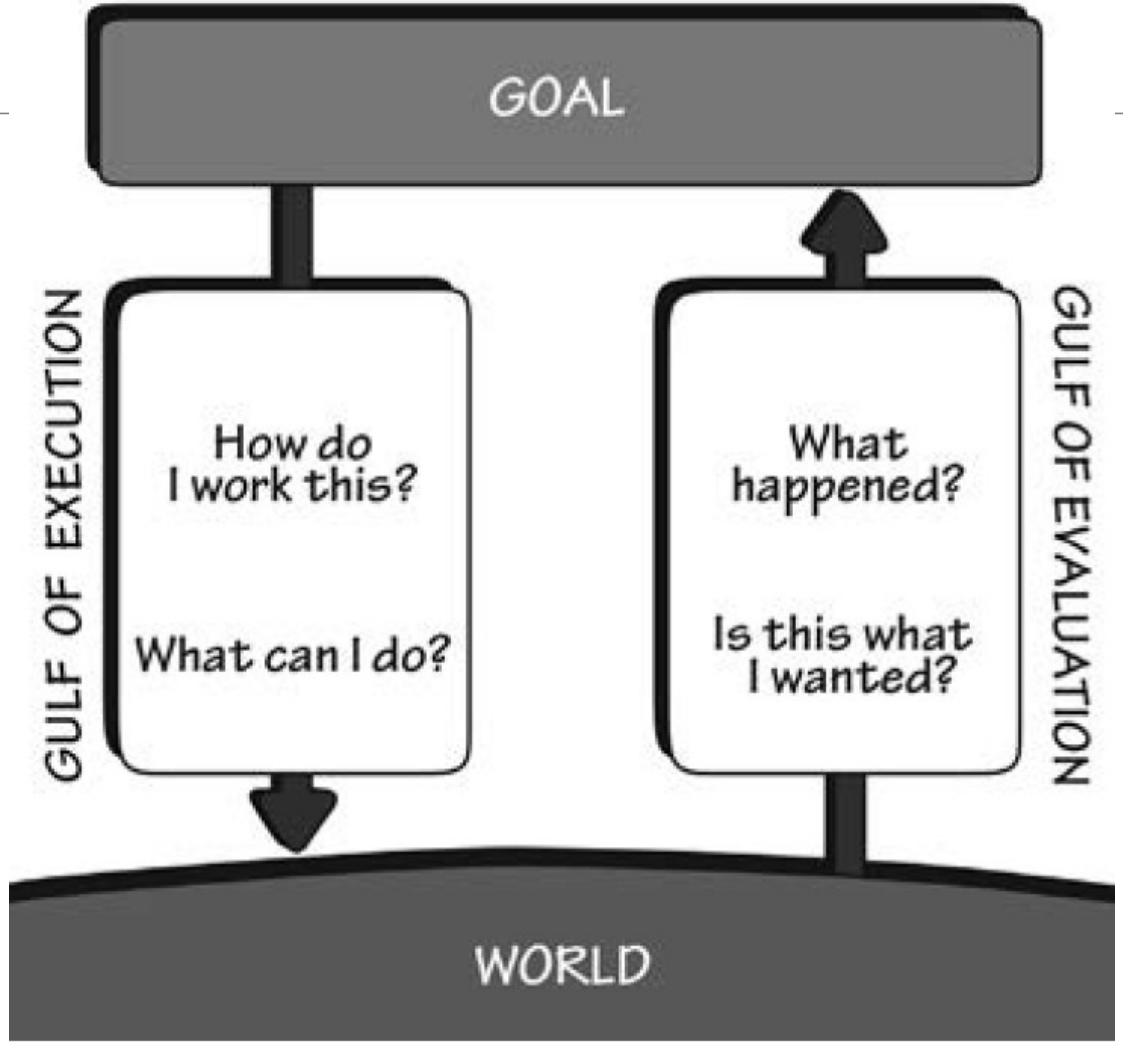
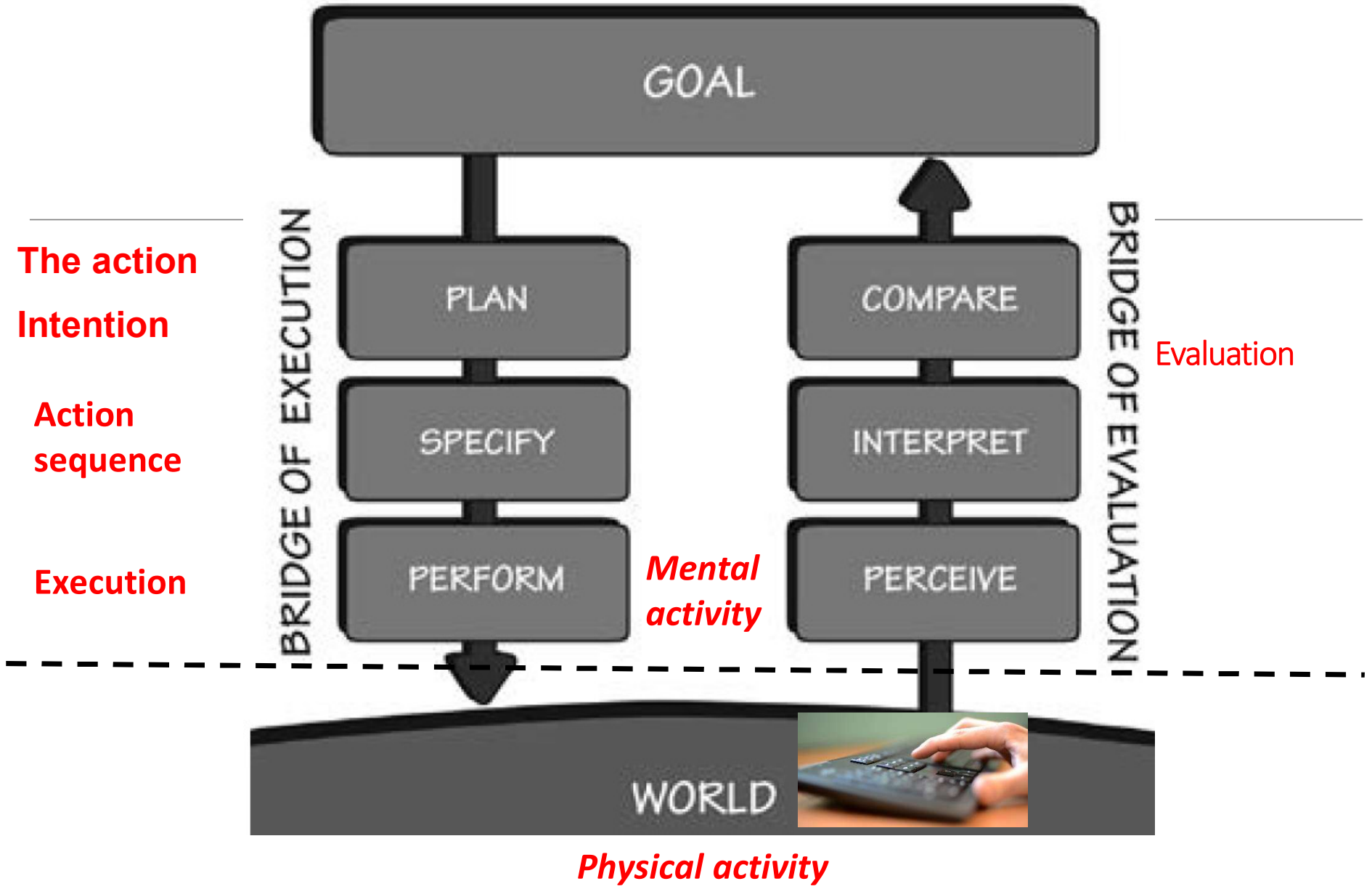
Bitti
Selamlar. Nasılsınız? Bu gün hava çok
sıcak.

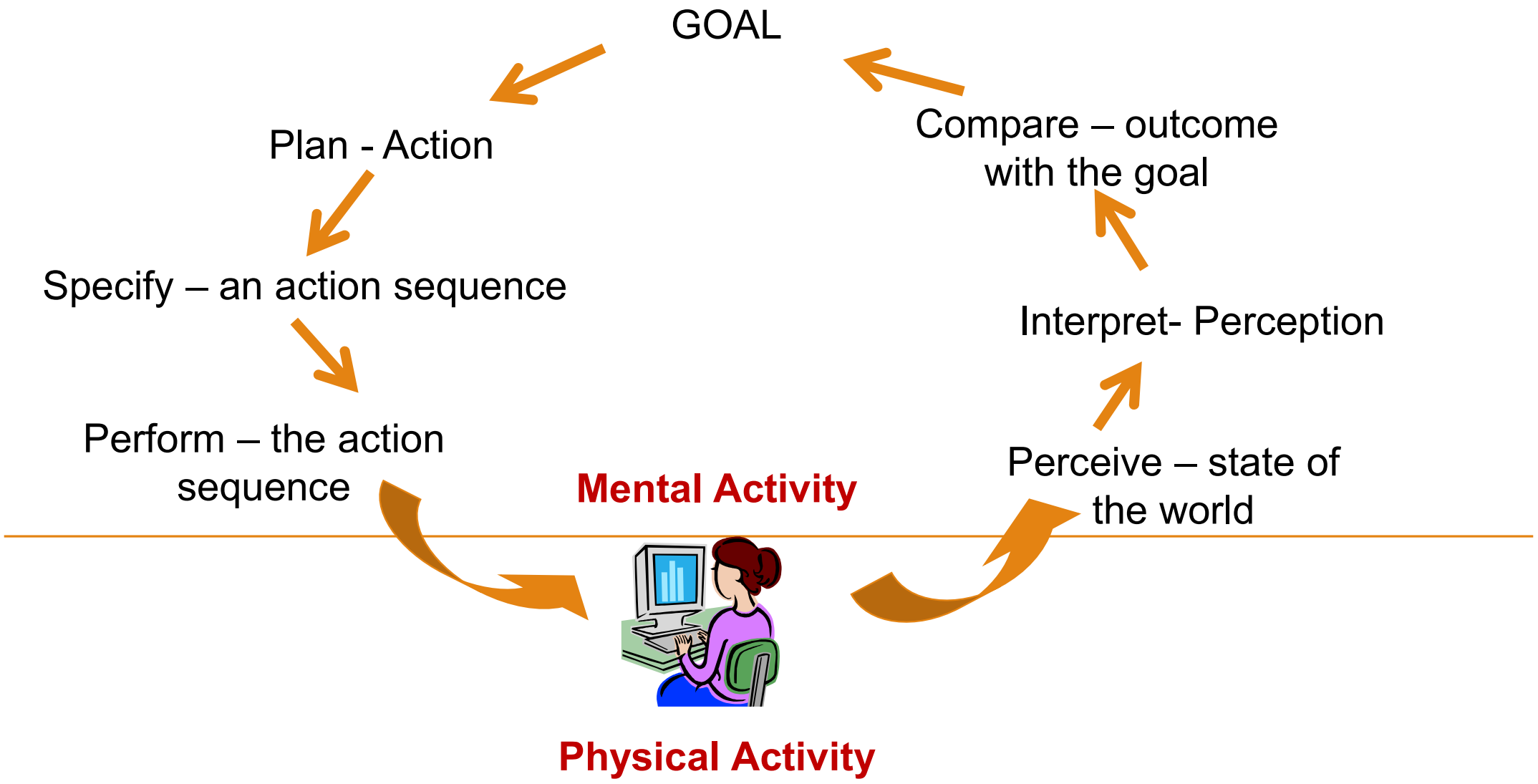
Interaction at high level: Norman's Gulfs



HCI=Bridging the gulfs of execution and evaluation



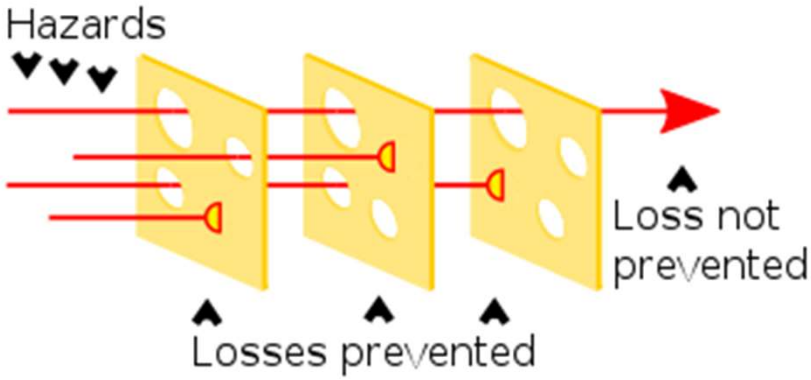
Seven stages of user activities involved in task performance


GOAL
Plan - Action
Specify – an action sequence
Perform – the action sequence
Compare – outcome with the goal
Interpret- Perception
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 couldnt 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 mechanisims 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

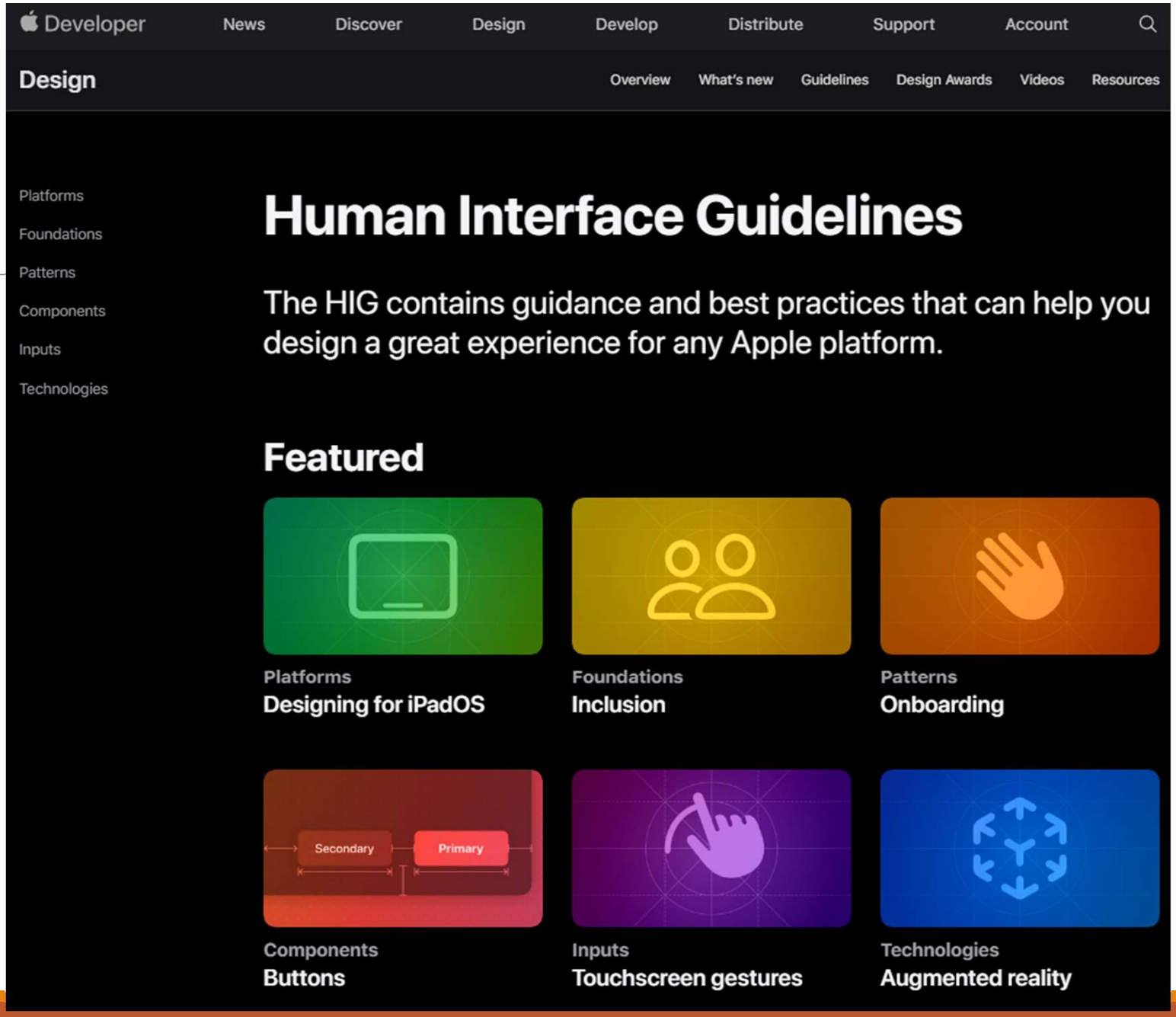
1. Guidelines,
   - Low-level focused advice about good practices
2. Principles,
   - Middle-level strategies or rules to analyze and compare design alternatives
3. Theories
   - High-level widely applicable frameworks

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/

Apple guidelines

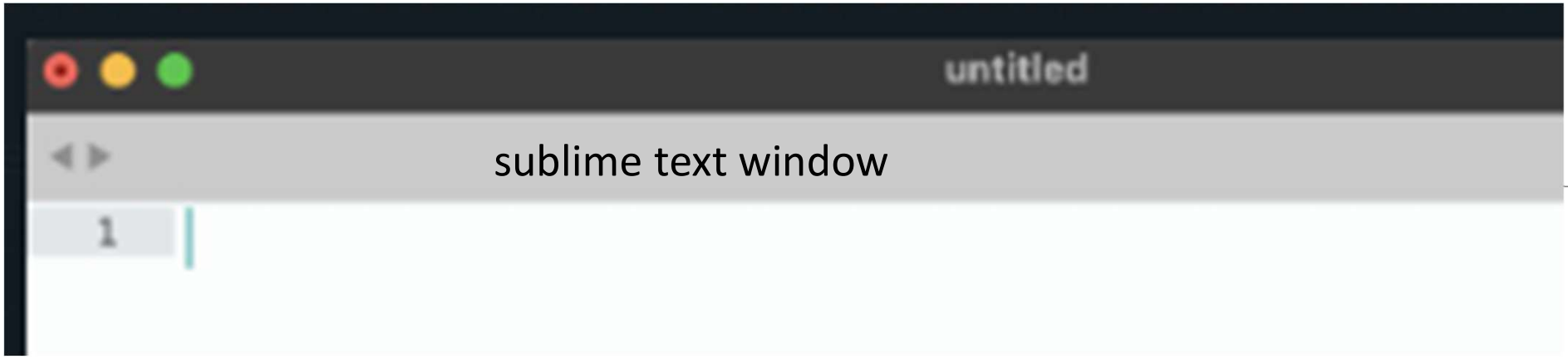
Do use "untitled" for the first new window.

Do not capitalize "Untitled".

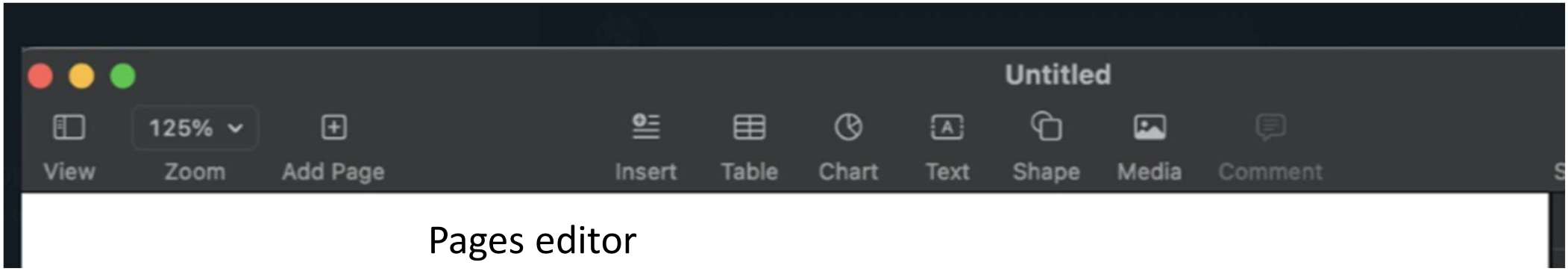
Do not add a number to the first new window.

Do not use additional punctuation.

Do not leave title blank.



sublime text window



Pages editor

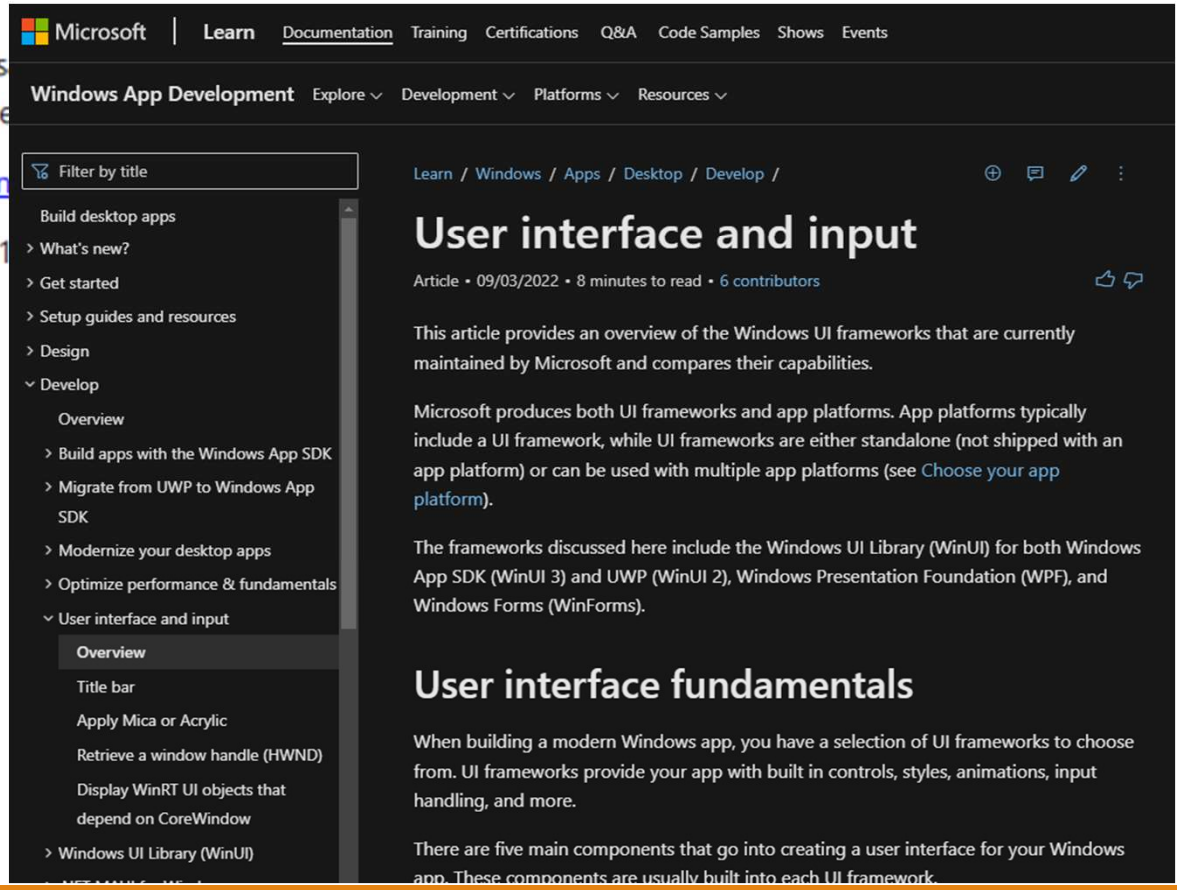
Windows 10

User experience guidelines for Universal Windows Platform (UWP) apps

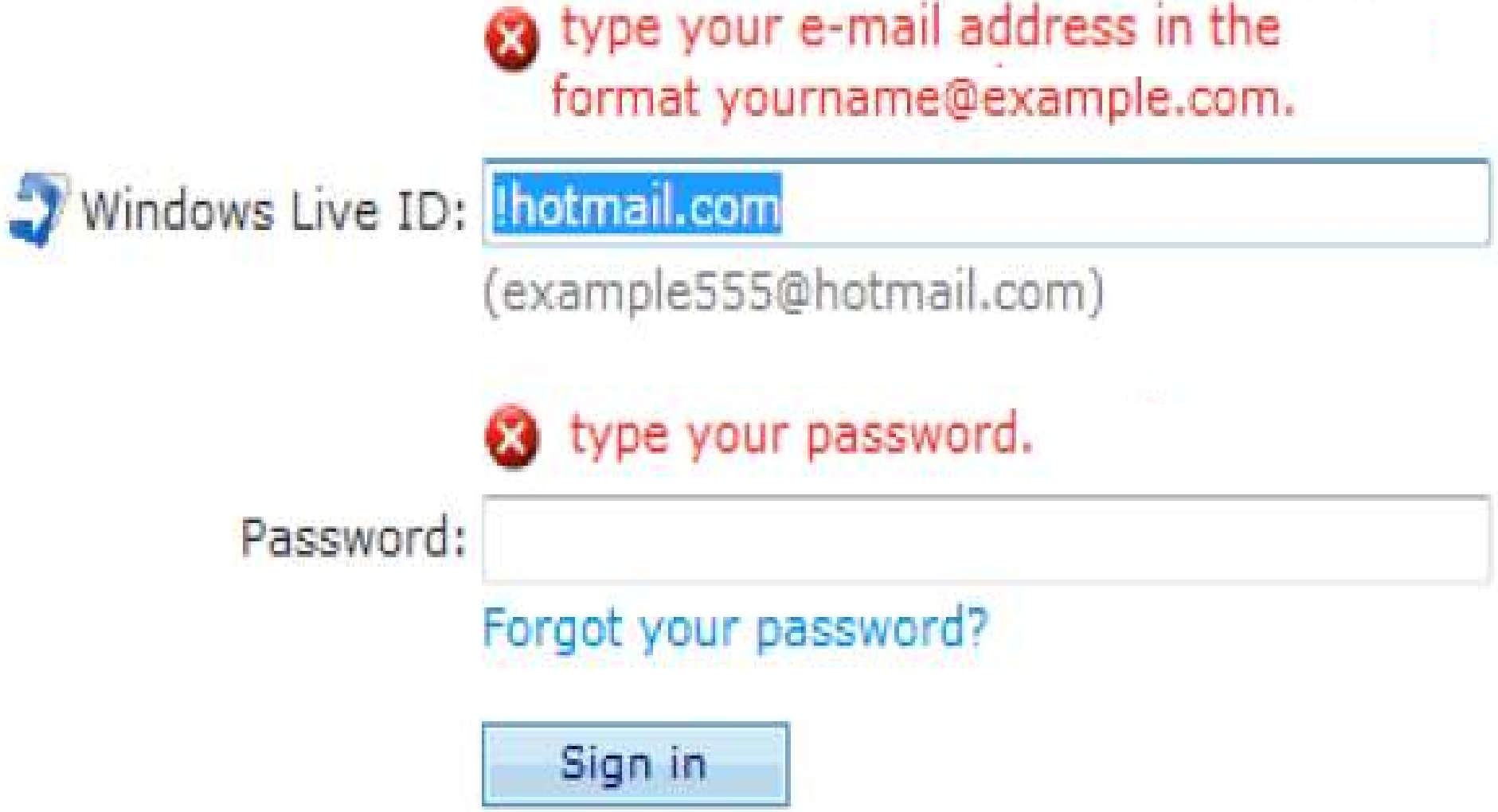
A great app starts with a great user interface. Learn how to design a Univers
that looks fantastic on all Windows 10-based devices, from phones and table

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 1
please download the Windows 8.1 guidelines PDF.



- https://go.microsoft.com/fwlink/p/?LinkId=626098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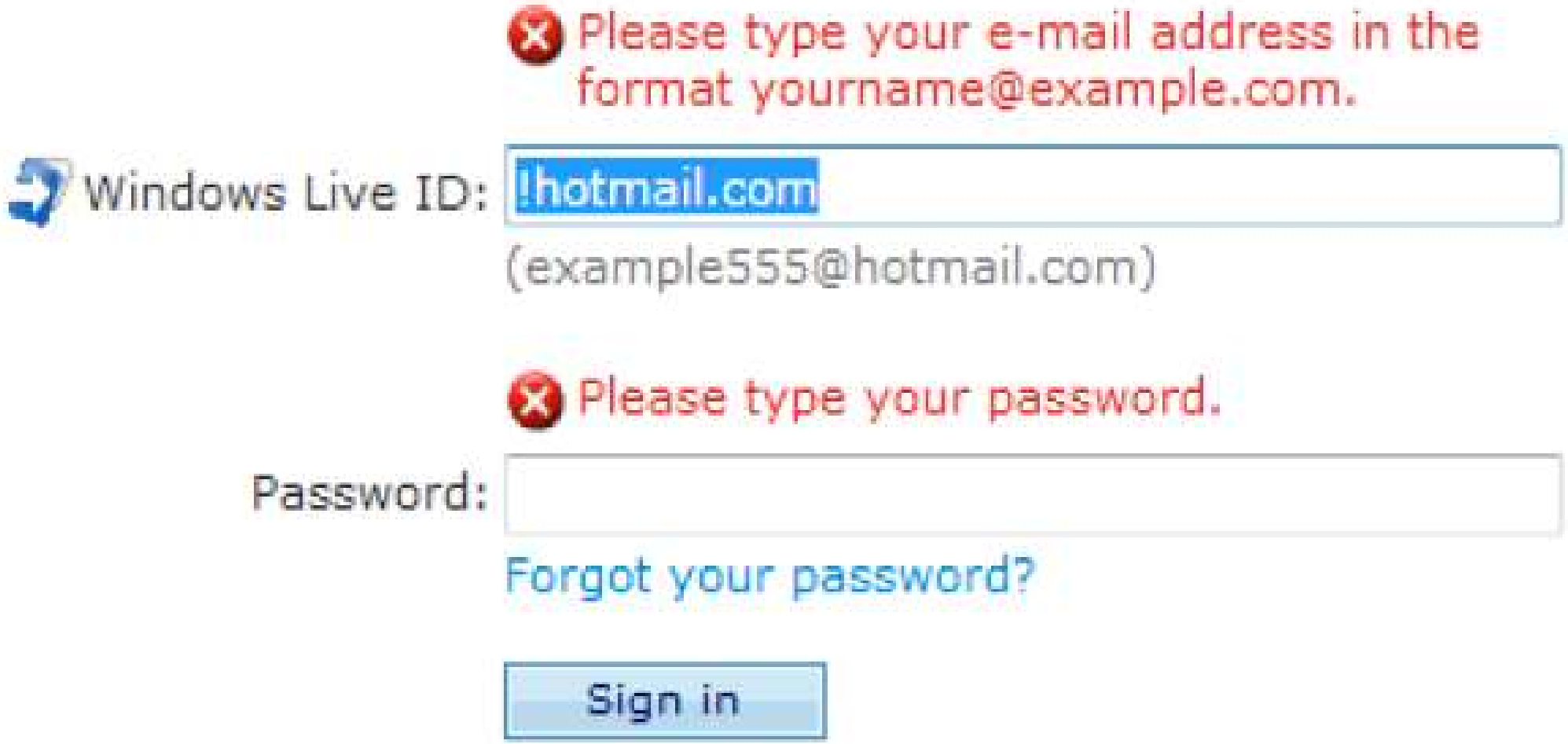
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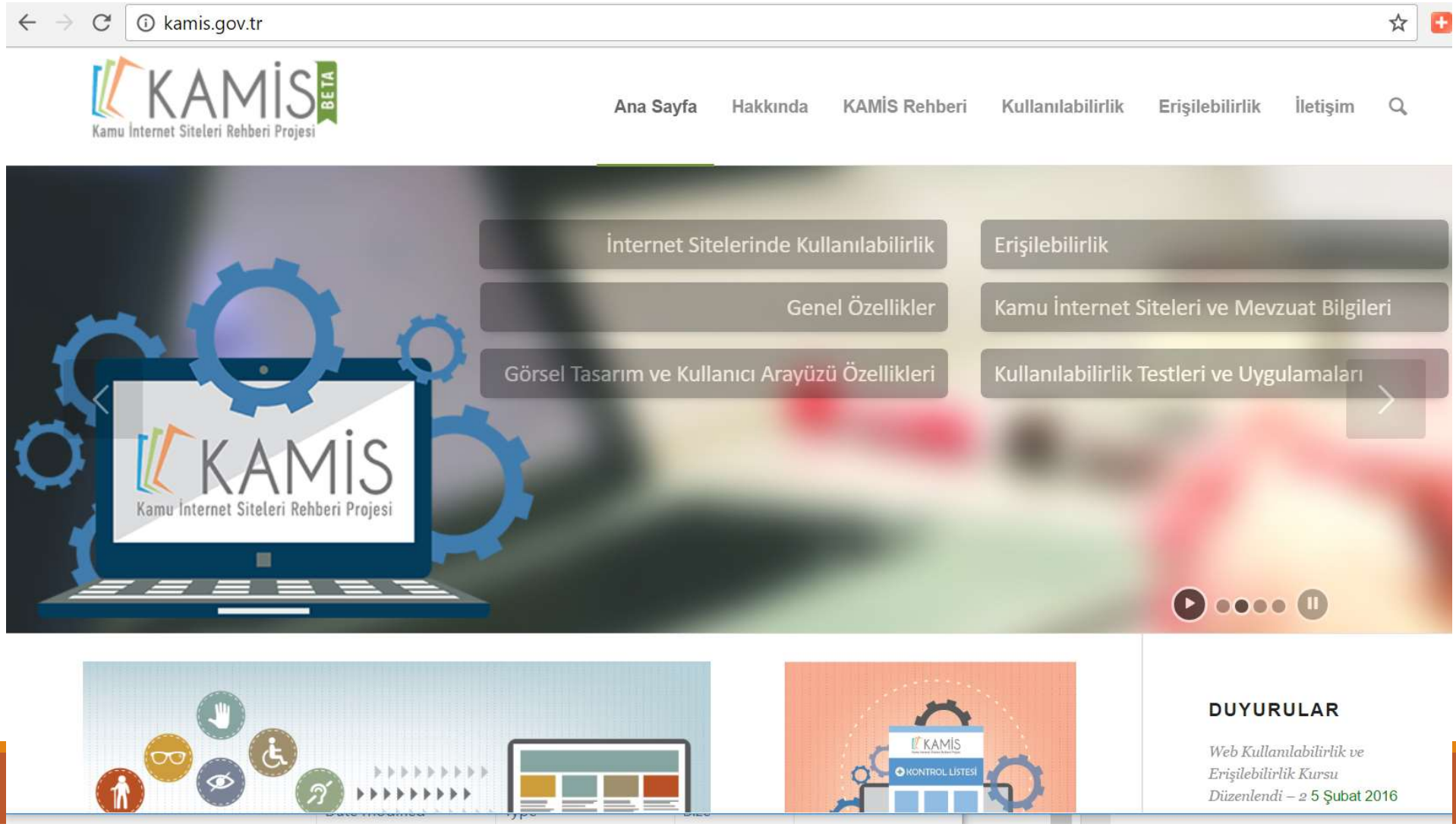
US Government

Turkish Guidelines by TÜBİTAK Kamu Internet siteleri Rehberi KAMİS



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?

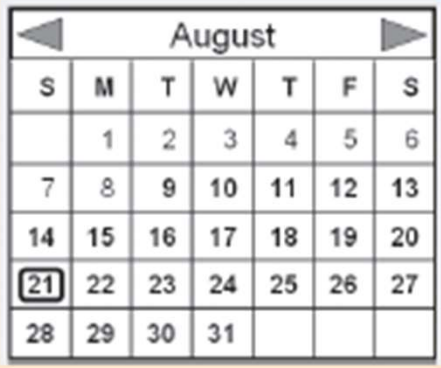
An example of progression toward more direct manipulation: less recall/more recognition, fewer keystrokes/fewer clicks, less capability to make errors, and more visible context.

a. Command line

b. Form fill-in to reduce typing

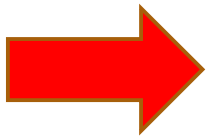
c. Improved form fill-in to clarify and reduce errors

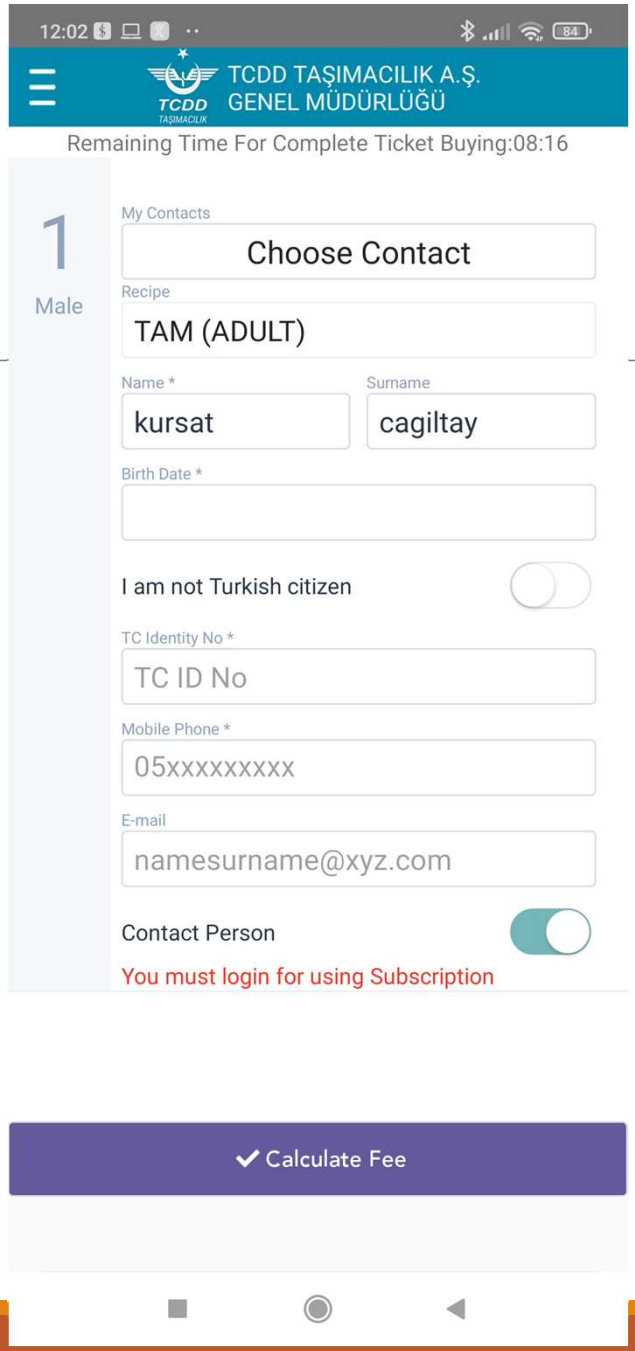
d. Pull-down menus offer meaningful names and eliminate invalid values



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

Birth date

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TC ID No
Mobile Phone *
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E-mail
namesurname@xyz.com
Contact Person
You must login for using Subscription
Calculate Fee

2-General Principles:

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4. The Eight Golden Rules of Interface Design

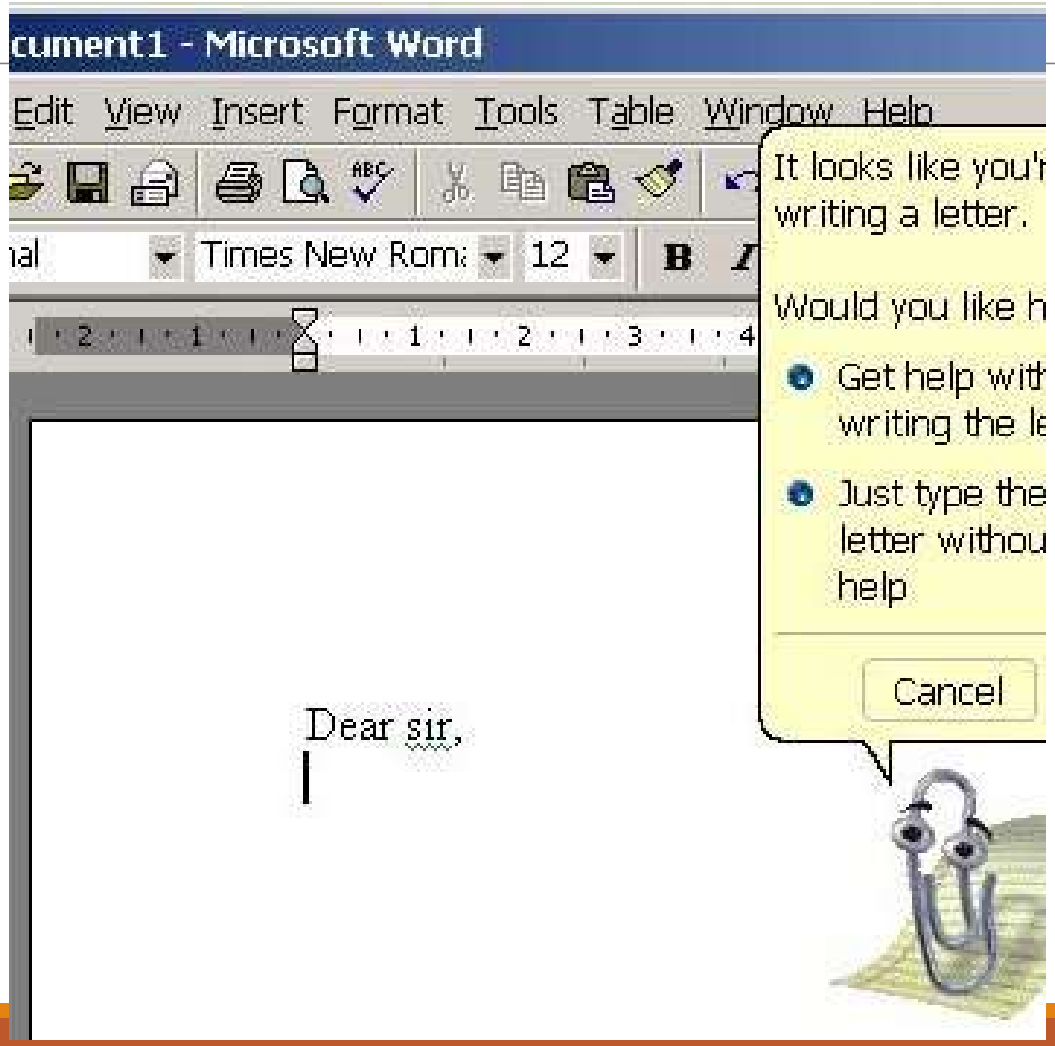
Shneiderman's Eight Golden Rules of Interface Design

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:

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
4. The Eight Golden Rules of Interface Design
5. Prevent errors
6. Ensuring human control while increasing automation

Clippit : Office Assistant



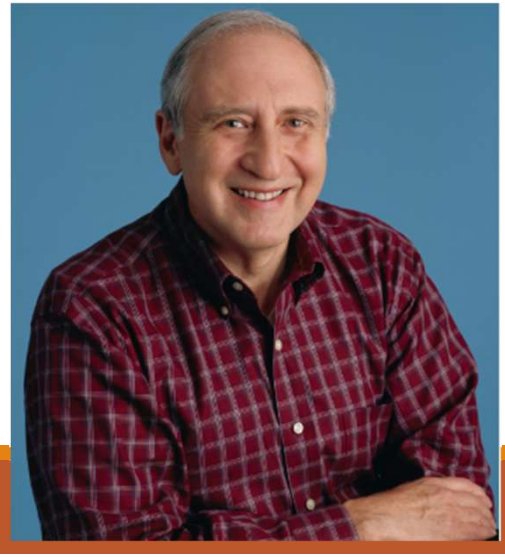
3-Theories: High-level widely applicable frameworks

- **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

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 comparision 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)