

Human Computer Interaction

CS449 – CS549

Week 4

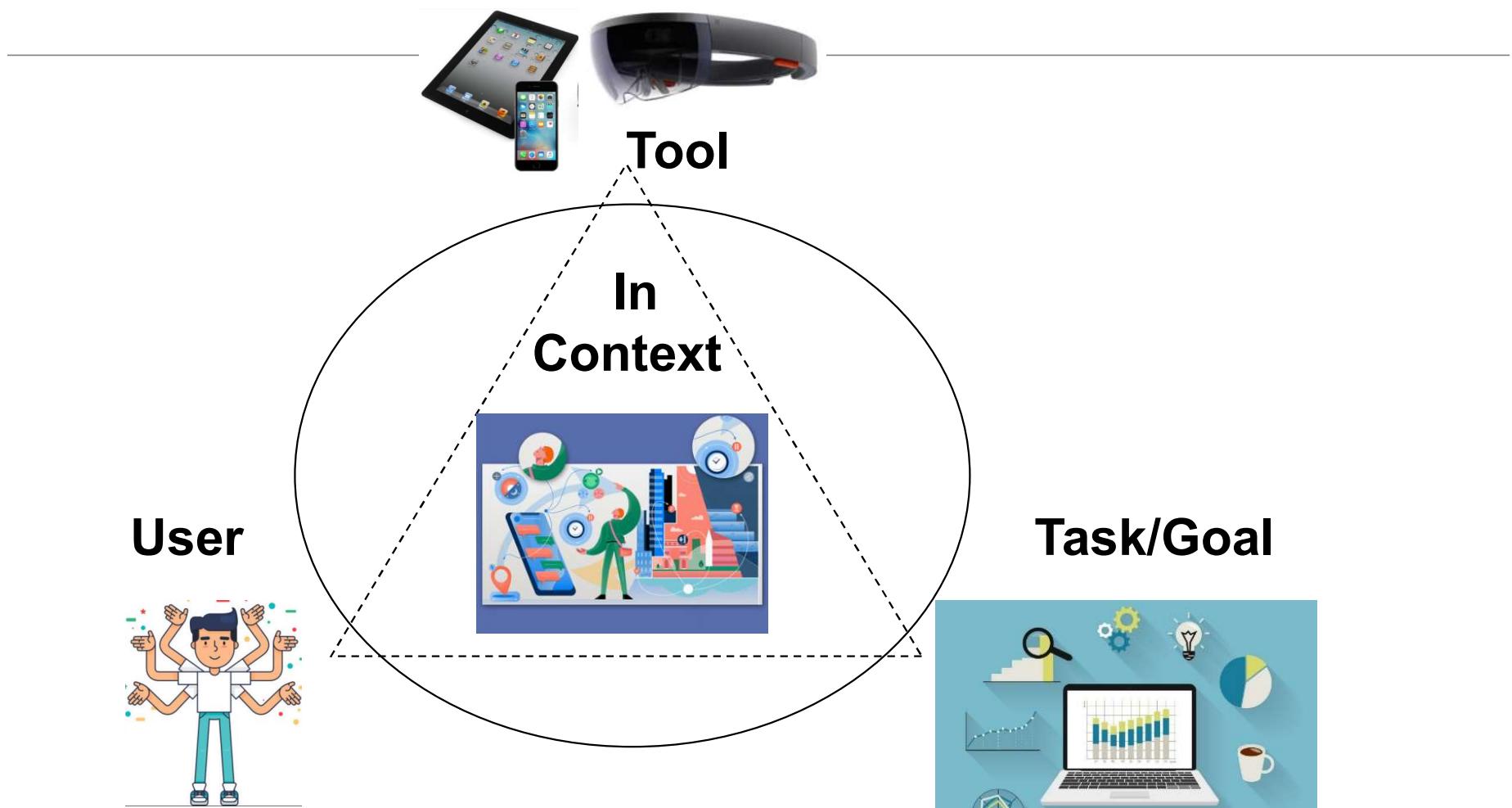
Usability & Usability Engineering

KÜRSAT ÇAĞILTAY

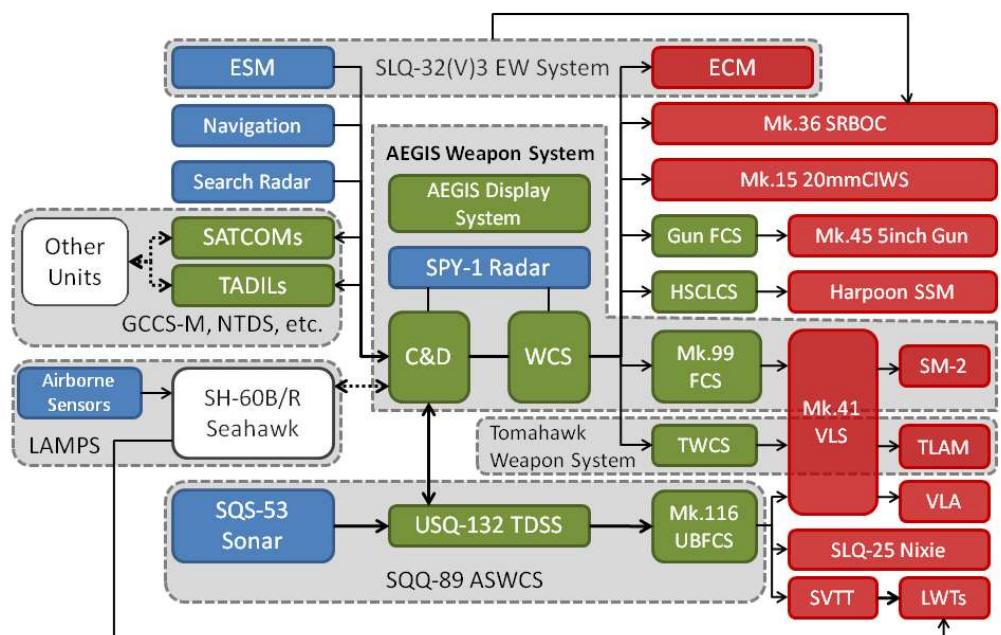
Today

- Usability Constructs
- Informal Definitions of Usability
- Formal Definition of Usability

Four Principle components of an HCI System



Deadly Interaction Design



Deadly Interaction Design :

- USS Vincennes in Persian gulf (1988)
 - Receives ambiguous information regarding approaching aircraft
 - Crew found it difficult to ascertain whether plane was ascending or descending
 - Quick decision had to be made
 - Iranian passenger airline shot down, 290 dead
- <https://youtu.be/M14H14ckWj8>



https://en.wikipedia.org/wiki/Aegis_Combat_System#System_problems

Track of IRANAIR Flight 655

Times noted are Persian Gulf Standard

IRAN

56 00E

27 00N

Track based on data
from USS Vincennes

QESHM
(IRAN)

Floating parts
of wreckage

0951:10

0952:42

0953:22

0954:22
0954:43
0956:05

45°

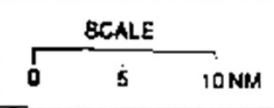
MOBET

USS SIDES

Strait of Hormuz

USS MONTGOMERY

USS VINCENNES
0954:43



Track of Iran Air Flight 655 (Map by James Burnett)

Deadly Design problem:

- In ships control room, three huge screens showing all the planes in the air—but they don't show a flight's speed, range and altitude.
- An operator must summon that information manually, and it appears on a tiny 12-inch screen
- This lead to faulty identification

«ineffective user interface design caused poor integration with the crisis management human processes» (AEGIS Combat system)



Lessons Learned

- NATO STANAG 4586 standard was developed after this accident

SCIENTIFIC
AMERICAN

Sub

TECHNOLOGY

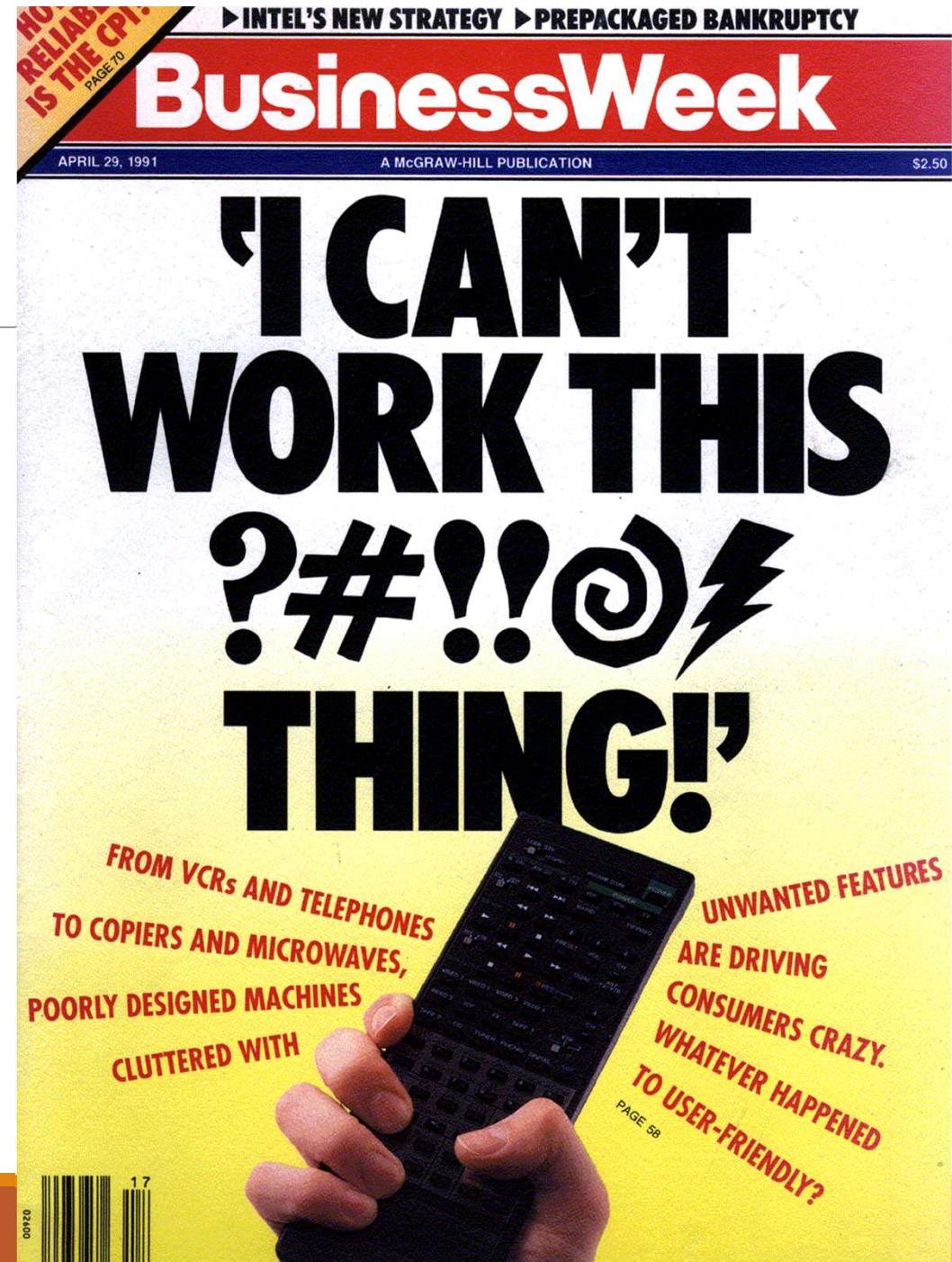
5 of the Worst User-Interface Disasters

Why your intelligence has nothing to do with using technology

.....
By David Pogue on April 1, 2016

Business Week

- "I can't work this ?#!!@ thing!"
- Cover Story,
- April 29, 1991
- User-Friendly?



What is a good interface?

- General sources of advice:
 - Style guides
 - Company standards (e.g. Apple, MS, IBM)
 - Design guidelines
 - General principles of ‘good’ design
 - Empirical evidence
 - Findings from user studies

What is usability?

Usability Engineering

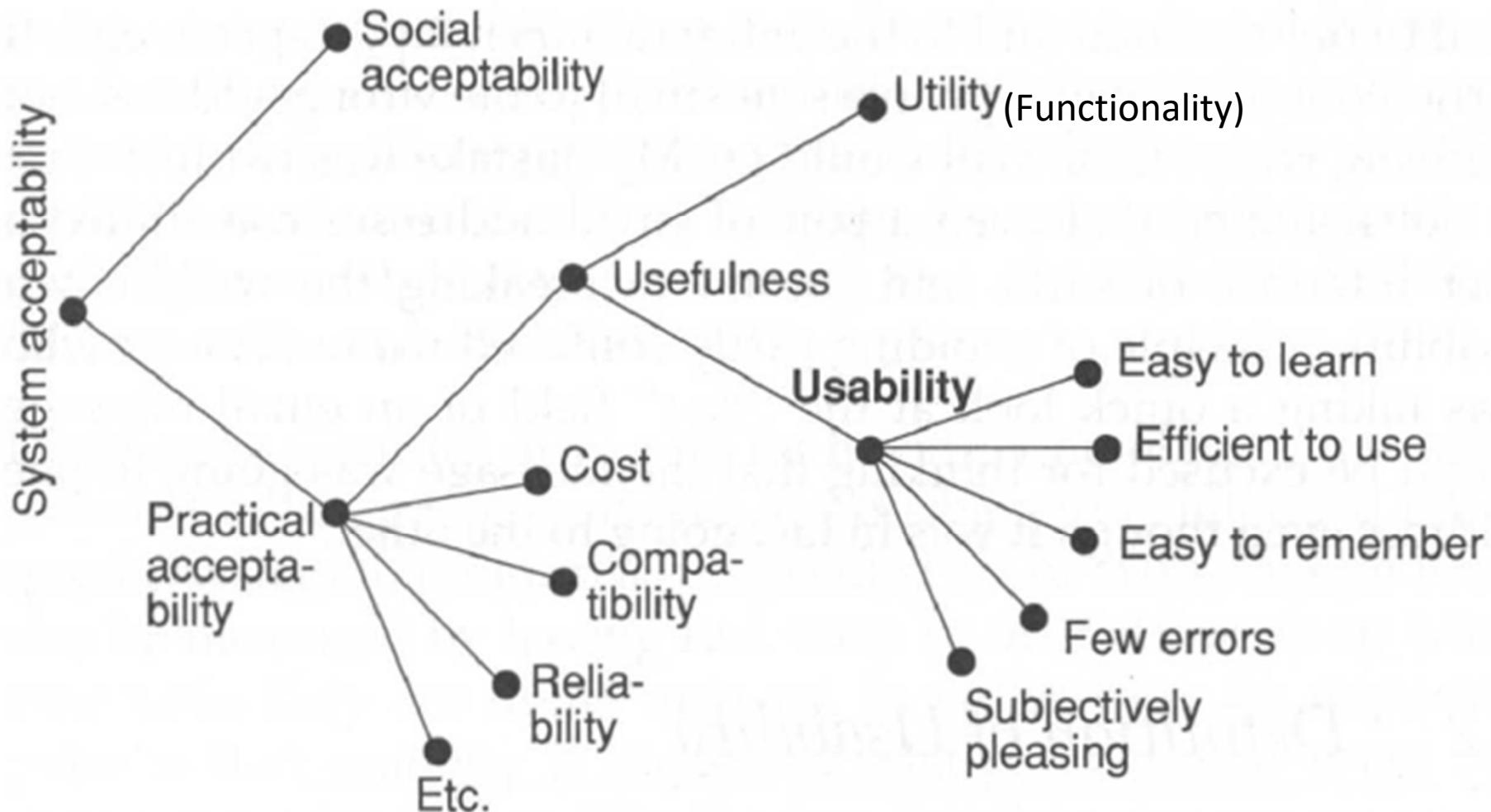
- Civil Engineer
 - Design, construction, and maintenance
 - Better Living
 - Efficient, Effective, Satisfactory
 - With Scientific principles
- Usability Engineer
 - Design, develop, and maintenance
 - Better Interaction
 - Efficient, Effective, Satisfactory
 - With Scientific principles



Usability Engineering

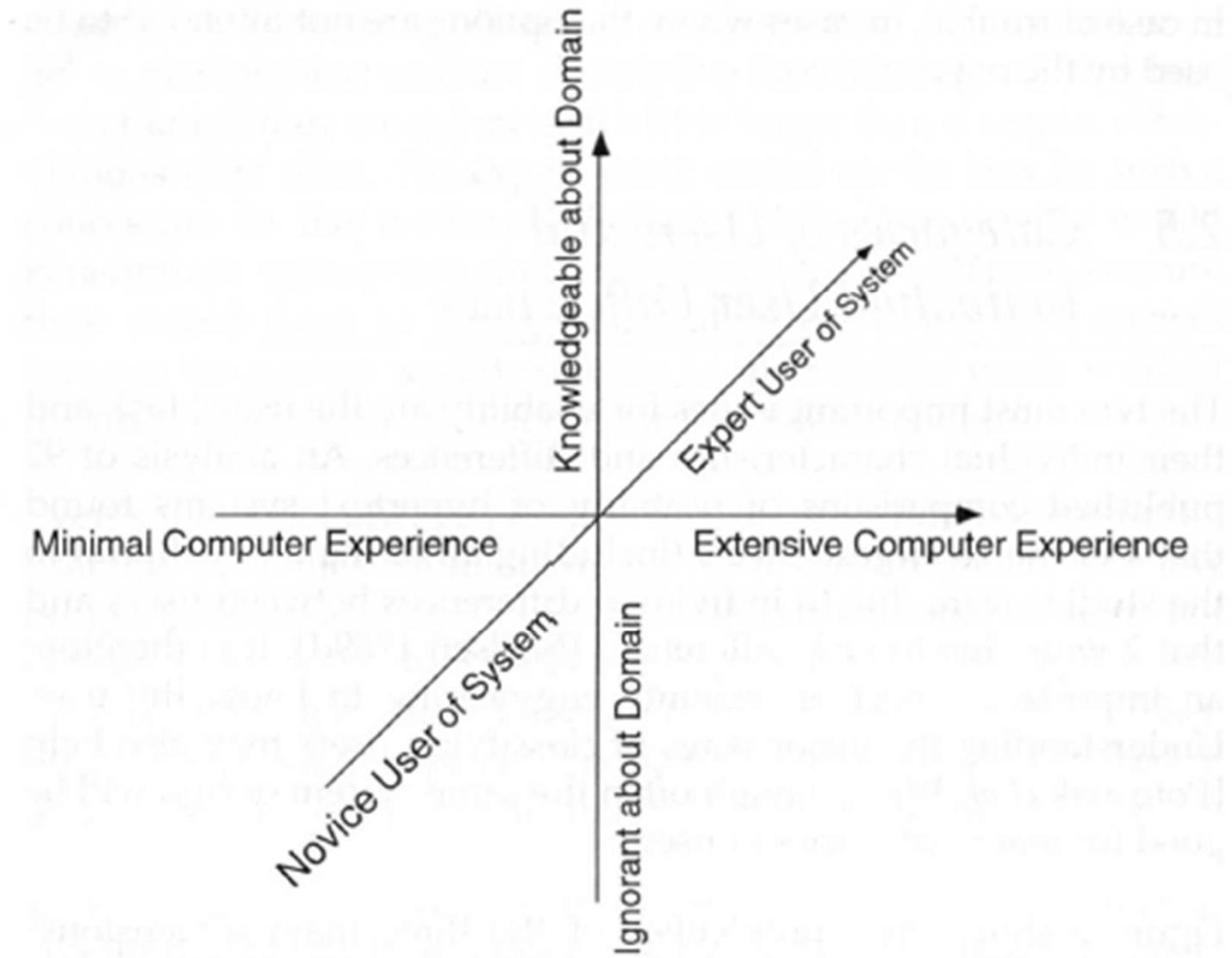
- It is an engineering *process*
- is well established and applies equally to all user interface/interaction designs.
- Each project is different,
- but the activities needed to arrive at a good result are fairly constant.

It is not just an interface (Nielsen)

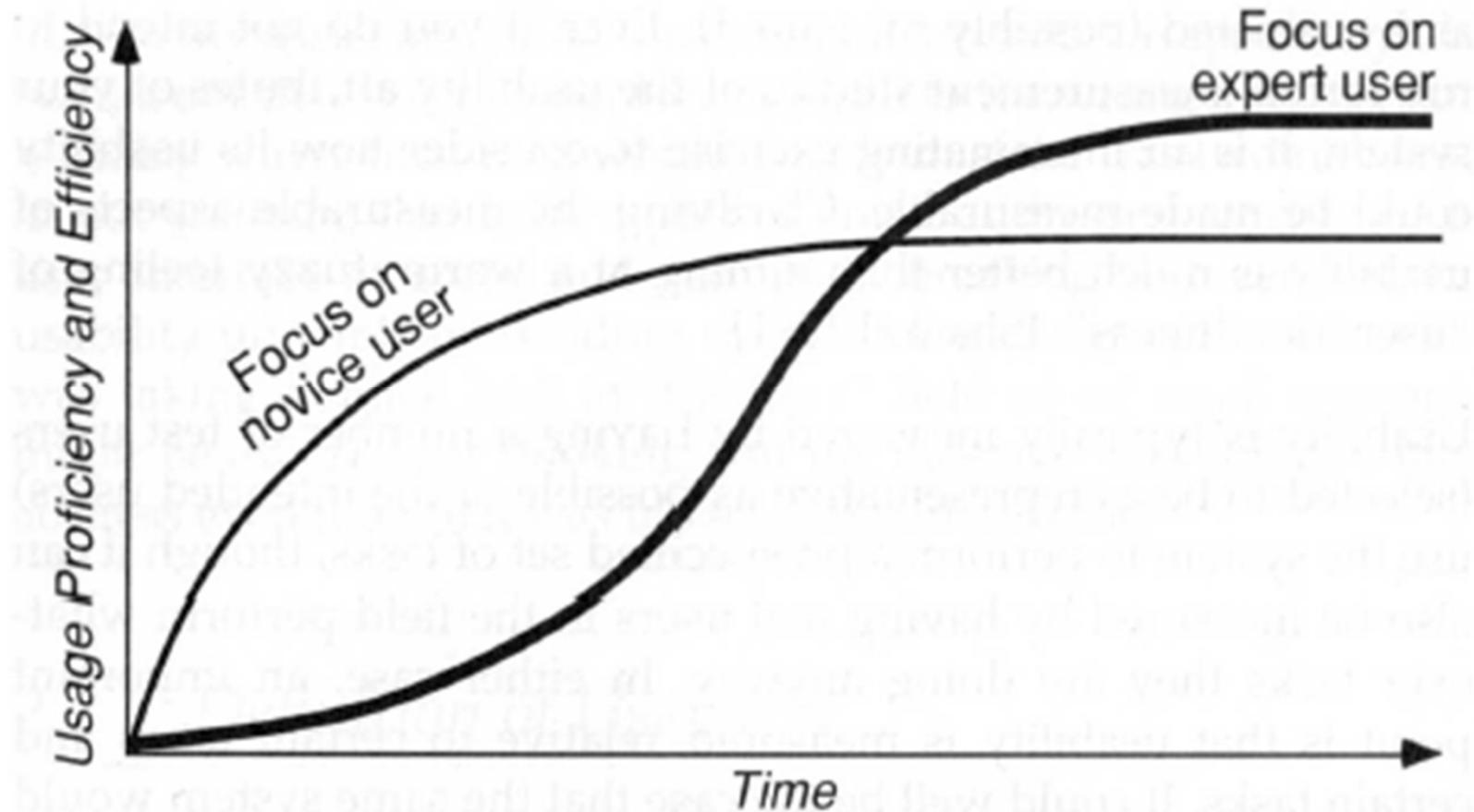


Users' Experience Dimensions

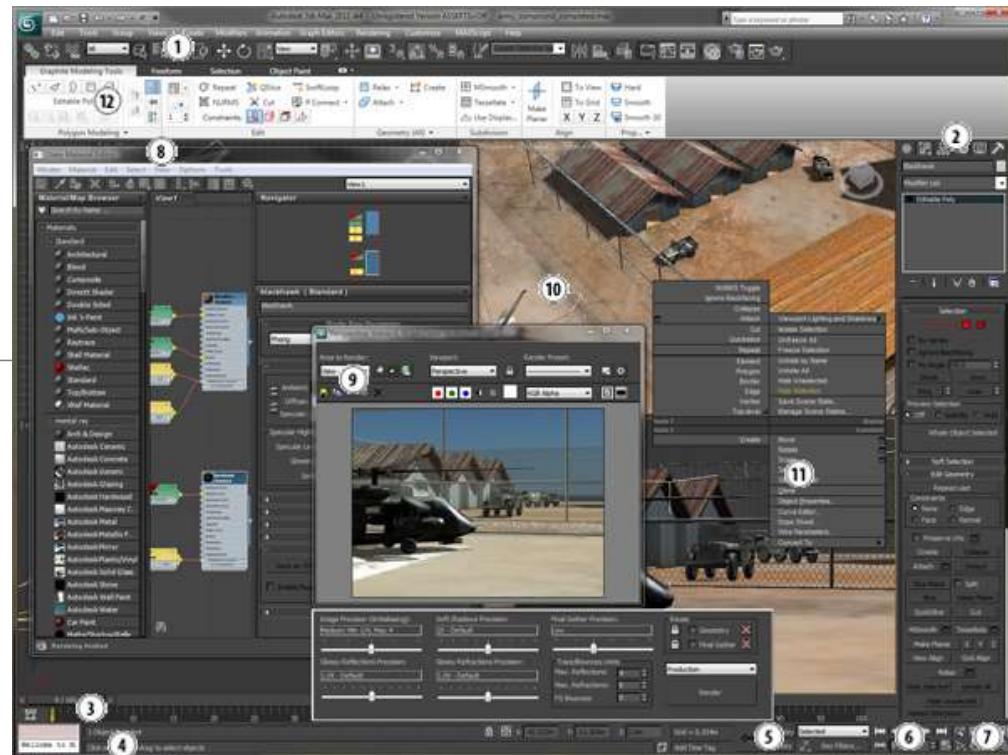
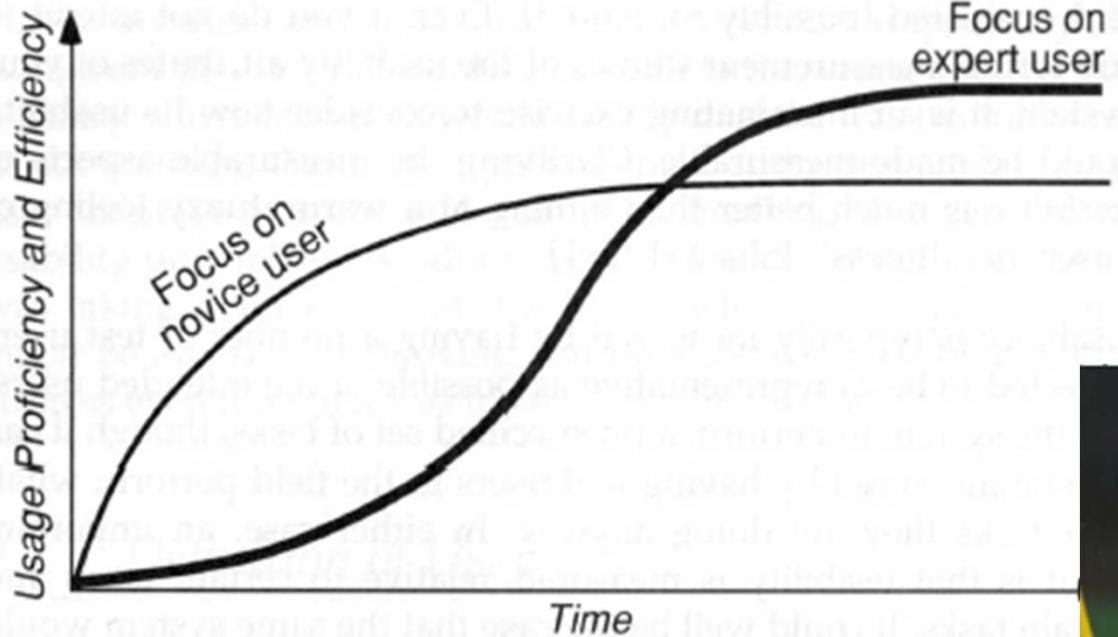
- Computer Experience
- Understanding Task
- Expertise in System



Learning curves are different



istanbulcard vs 3DS Max?



istanbulkart

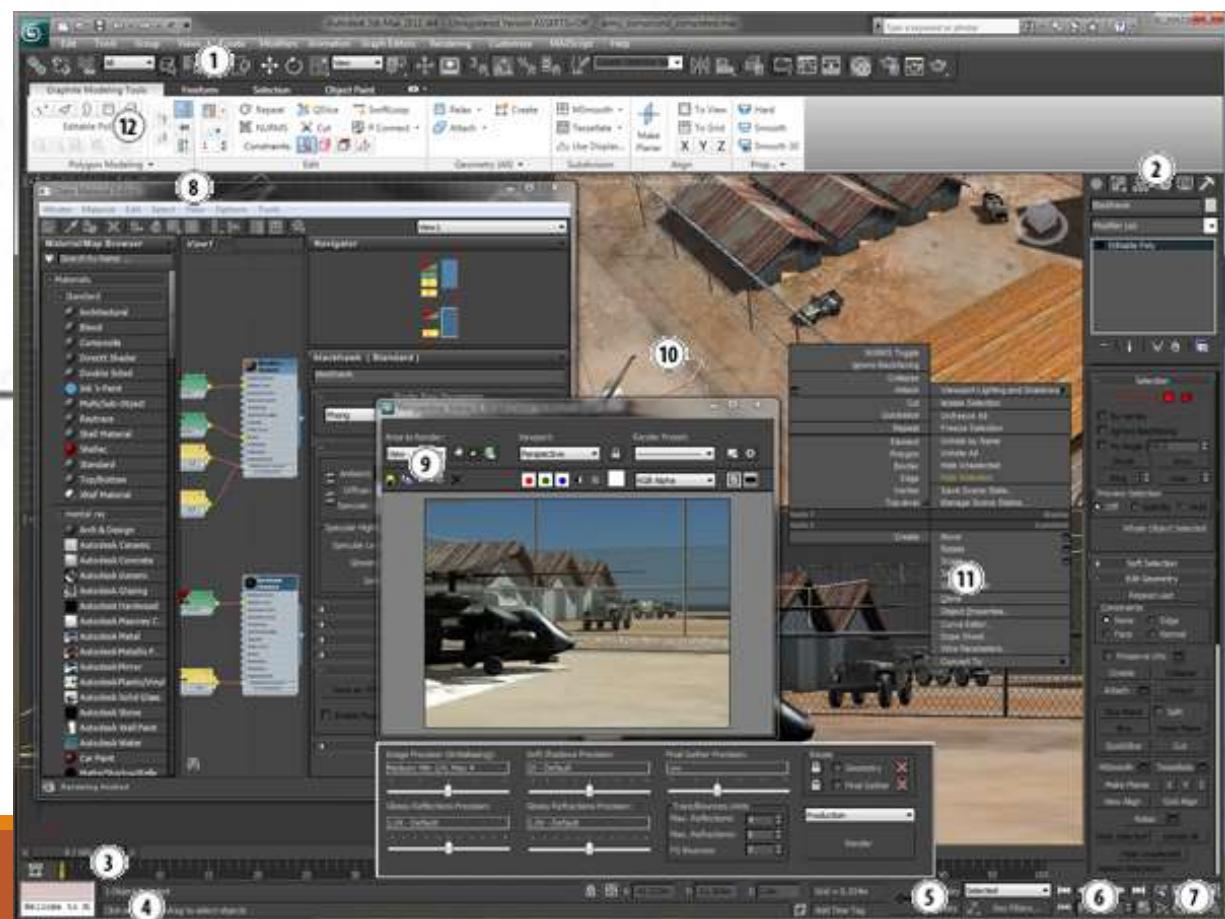
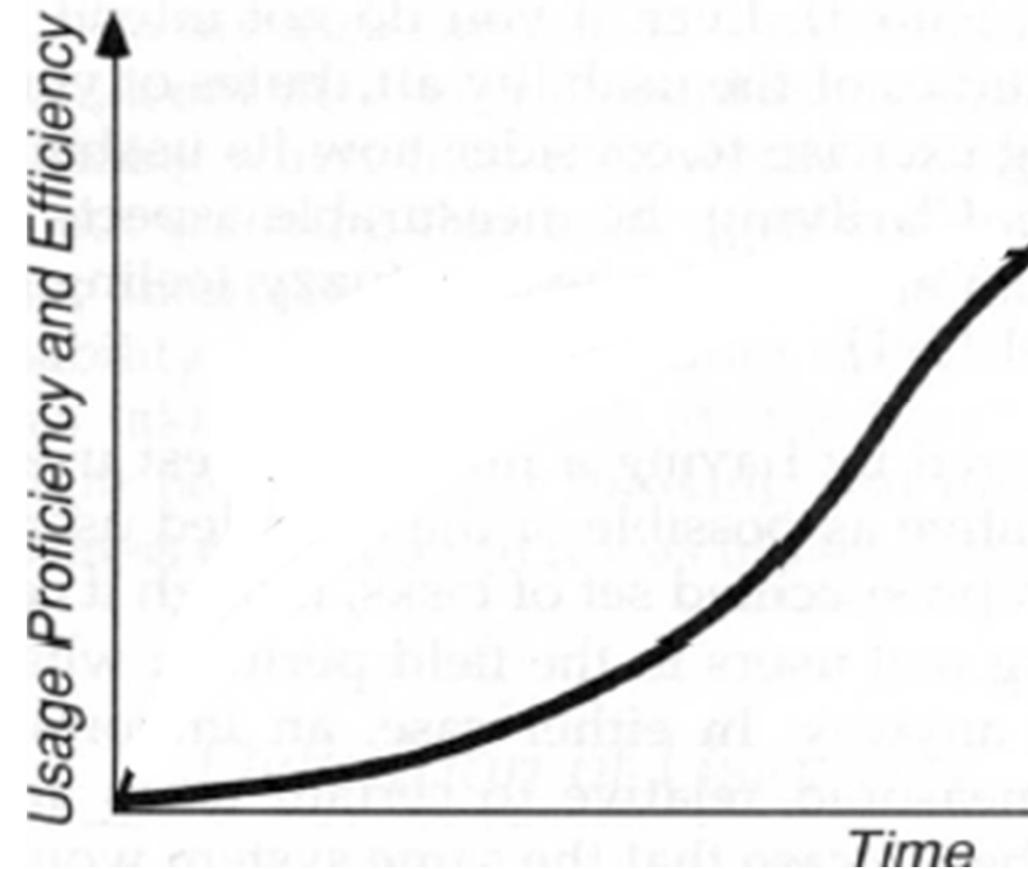
Usage Proficiency and Efficiency

*Focus on
novice user*

Time



**Focus on
expert user**



Usability

- Defining usability
 - Semantic, Feature and Operational
- Usability engineering
 - criteria
 - contextual variables

Any Web Developer?

An Example

- ISTANBUL CHAMBER OF COMMERCE
- SOFTITO PROJECT CORPORATE WEBSITE
- SOFTWARE DEVELOPMENT SERVICE
- TECHNICAL SPECIFICATION



2022

https://www.ito.org.tr/documents/Duyurular/2023_dokumanlar/softto-projes-kurumsal-web-stes-hzmet-dar-sartnames.pdf

- 3.3.** Ziyaretçi ve kullanıcılarla kullanım kolaylığı sağlanması, kullanıcı deneyimi sunan zengin web sitesinin oluşturulması,
- 3.4.** Performansı ile kullanıcıların istenen bilgiye hızlı ve kolay şekilde ulaşmasının sağlanması,
- 3.5.** Sadelikten ödün vermeden özgün tasarımlar ile kullanıcı deneyiminin oluşturulmasıdır.

3.3 ensure «ease of use»

3.4 enabling users to access the desired information «quickly and easily»

3.5 Creating user experience with «original designs» without sacrificing «simplicity»

6.2. Web Sitesinin Tasarımı, Üretime, Geliştirilmesi

Teknik Kriterler

- Kullanıcı dostu ve güncel tasarım trendlerine uygun bir tasarıma sahip olması,
 - Gerektiğinde İTO'nun da siteye müdahale edebilmesini sağlayabilecek kullanıcı ara yüzü ve CMS sisteminin var olması, kullanımı kolay bir yönetim paneli oluşturulması,
-
- To have a «user-friendly» and a design in line with current design trends
 - Creation of an «easy-to-use» admin panel

SABANCI ÜNİVERSİTESİ

ÖNYÜZ YAZILIM

TEKNİK ŞARTNAME

Madde 4. İşin Tanımı ve Yüklenicinin Sorumlulukları

Kullanıcı deneyimi tasarımı (UX) ve görsel tasarım (UI)

1. Sabancı Üniversitesi Web Sitesinin, stratejik hedefleri ile uyumlu kullanıcı deneyimini en öncelikli seviyede tutan tasarım trendlerine uygun olarak yeniden tasarlanması
2. YÜKLENİCİ, ön yüzü mobil ve tablet cihazlar ile uyumlu olarak geliştirecektir.

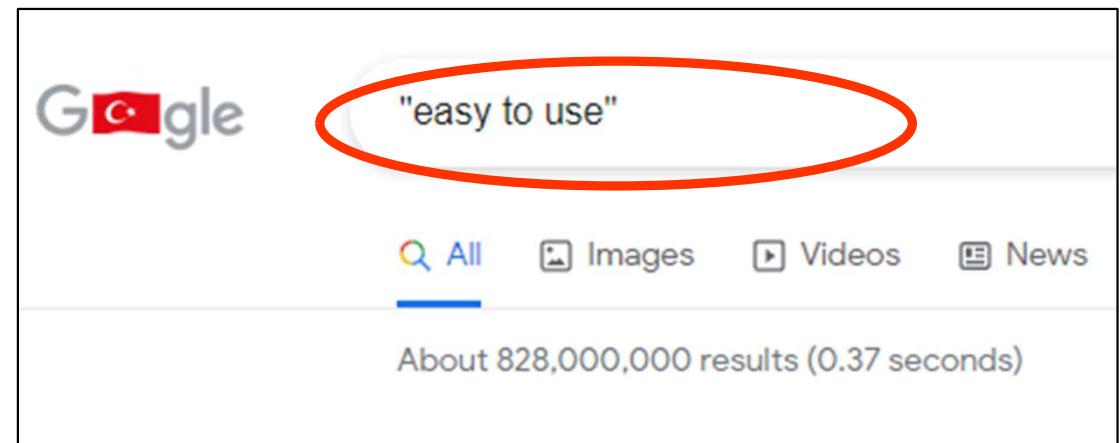
What is usability?

- Semantic definitions
 - ‘user-friendliness’?
 - ‘ease-of-use’?
 - ‘ease-of-learning’?
 - ‘transparency’
 - ‘intuitive to use’

Semantic definitions

- Usable means 'easy to use'...

So what does 'ease of use' mean?



Semantic definitions tend to circularity
No aid for design purposes
(Remember ITO document)

Feature Base Definition

- Can we define usability by features?
 - Windows, icons, menu, pointer (WIMP)?
 - Graphical user interfaces are usable?
 - A usable interface is based on style guide recommendations?
 - Meets Shneiderman's or Nielsen's principles of design?

Attribution Fallacy (misconception)

- The attribution fallacy suggests usability is a quality of an interface that is determined by the presence or absence of specific interface features.
- This attribution leads to an over-reliance on guidelines and prescriptive rules for design



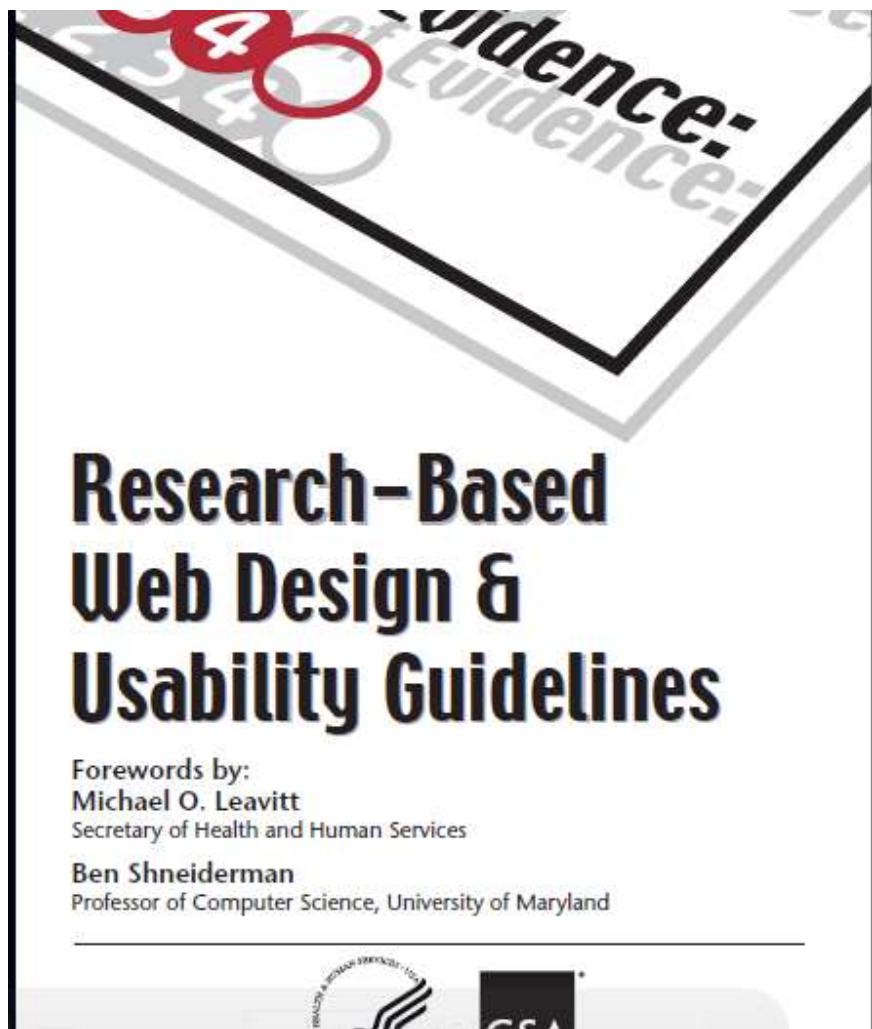
Usability is NOT a feature

- “The presence of these graphical elements **does not** guarantee good application design: that depends on you”

Opening remarks in:
Open Look Graphical User Interface Application Design Style Guide
SUN Microsystems, 1990

Can we say NOTHING about features?

- We can generalize within contexts
- There are many guidelines which work for MOST users MOST of the time
 - e.g., background color and reading speed
 - e.g., speed of selection and use of input device
 - e.g., broad menus more efficient than deep



<http://usability.gov/guidelines/index.html>

<http://www.kakis.gov.tr>



But we cannot define usability
reliably on these

So what is usability?

- Need a definition that is:
 - explanatory
 - defines the construct meaningfully
 - unambiguous
 - is not open to multiple interpretations
 - has utility for design
 - can inform designers and drive user-centered design process

Definition by Experts (Shackel, 1991)

- Usability refers to an application’s “capability (in human functional terms) to be used
 - easily and effectively
 - by the specified range of users,
 - given specified training and support, to
 - fulfill the specified range of tasks
 - within the specified range of environmental scenarios”

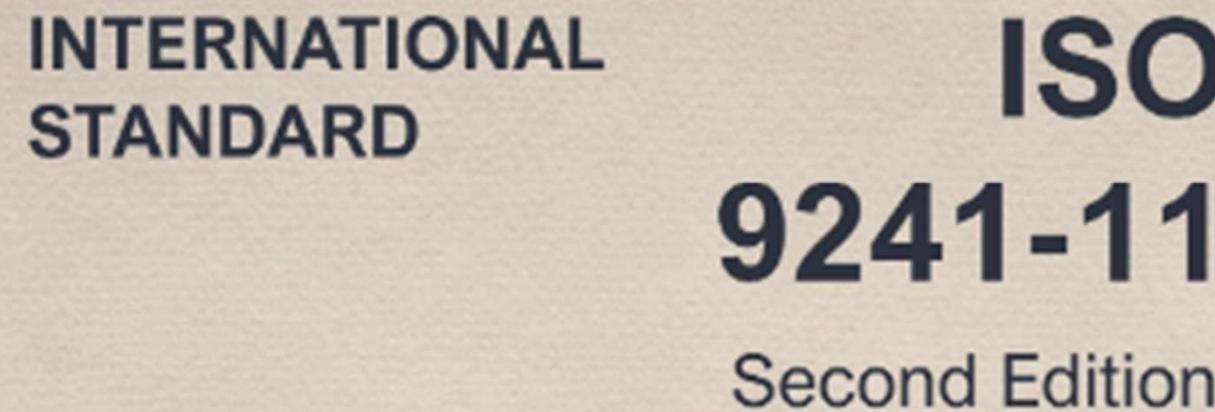
Definition by Experts (Nielsen)

- *Learnability*: easy to learn - rapidly start getting work done.
- *Efficiency*: once the user has learned the system, a high level of productivity
- *Memorability*: easy to remember, without having to learn everything all over again.
- *Errors*: users make few errors - easily recover from them. No catastrophic errors
- *Satisfaction*: users are subjectively satisfied when using it



Universal Definition ISO 9241-11

International
Organization
for
Standardization



Usability:
Definition and concepts

Operational definition - Universal

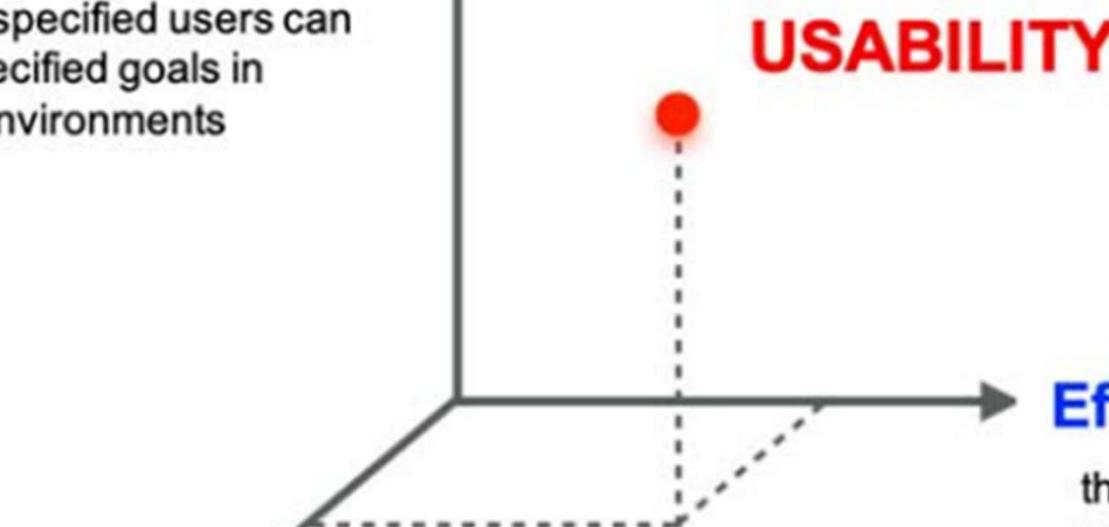
- Usability (of an application) refers to the effectiveness, efficiency, and satisfaction with which specified users can achieve specified goals in particular environments

ISO Ergonomics requirements, ISO 9241 part 11: Guidance on usability specification and measures.

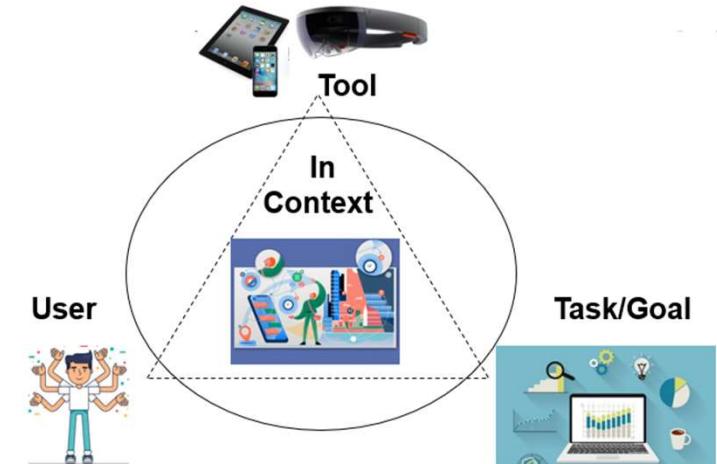
Effectiveness
the accuracy and completeness with which specified users can achieve specified goals in particular environments

Satisfaction

the comfort and acceptability of the work system to its users and other people affected by its use



USABILITY

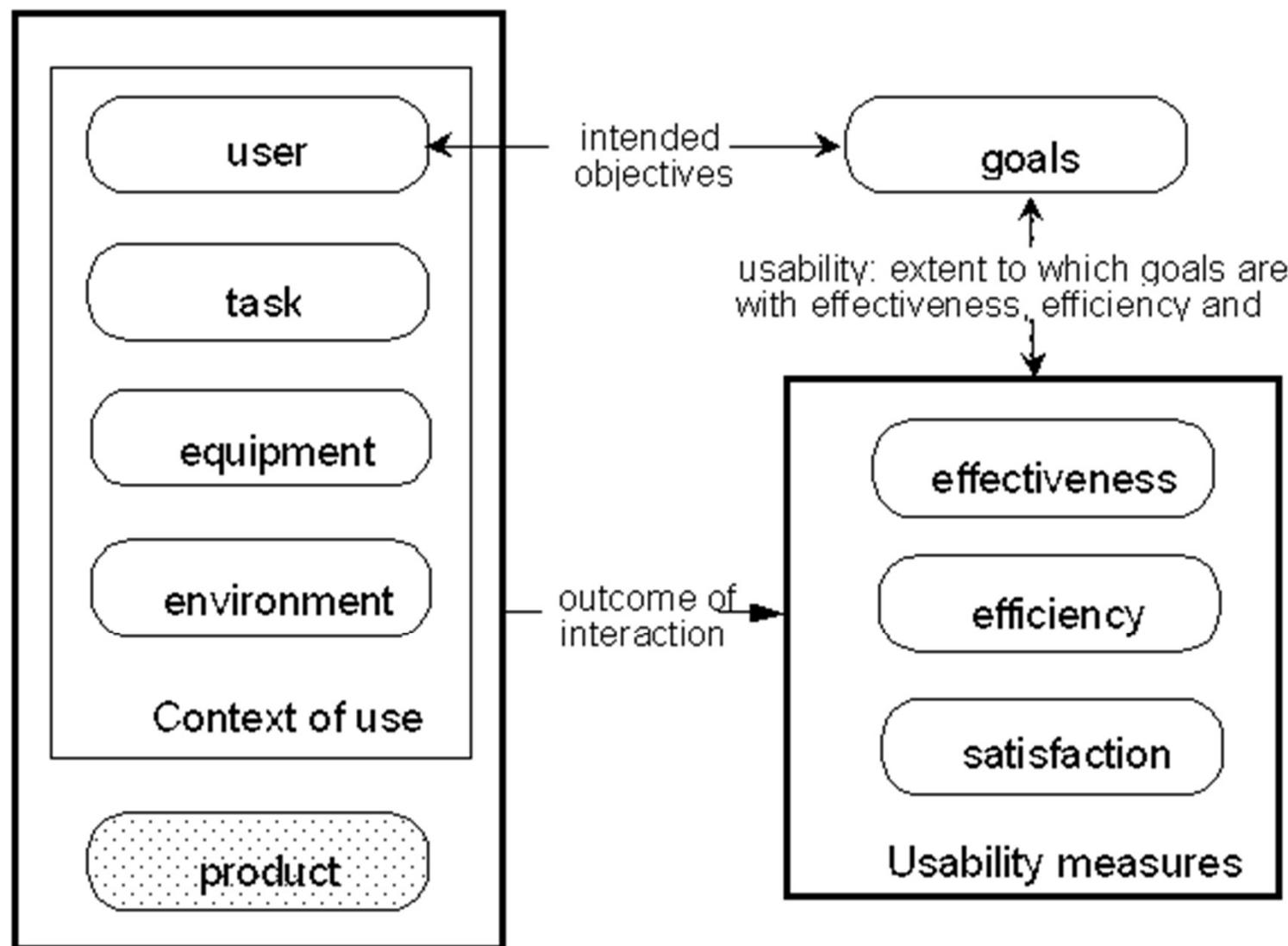


Efficiency

the resources expended in relation to the accuracy and completeness of goals achieved

ISO 9241:2018

Usability Framework (ISO 9241-11)



Effectiveness (etkililik)

- The extent to which users can achieve their task goals.
- Effectiveness measures the degree of accuracy and/or completion

e.g., if desired task goal is to locate information on a web site then:

Effectiveness= success of user in locating the correct data



turkiye.gov.tr
Devlet Hizmetleri

Merhaba, size nasıl yardım edebilirim?

Hızlı Çözüm



Giriş Yap →

e-Devlet Kapısı ile bilgi ve belgelerinize tek noktadan ulaşabilir, başvuru işlemlerinizi hızla gerçekleştirebilirsiniz



e-Hizmetler

Sorgulama, Başvuru ve Ödeme hizmetleri.



Kurumlar

Resmi kurumların hizmetleri ve iletişim bilgileri.



Belediyeler

Belediyelerin iletişim bilgileri ve sundukları hizmetler.



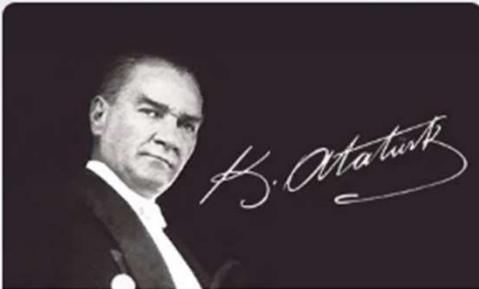
Firmalar

Şirketlerdeki fatura ve abonelik bilgilerinize erişin.



Üniversiteler

Üniversitelerin sundukları hizmetler.



ATAM

Atatürk Araştırma Merkezi Başkanlığı İnternet sitesini ziyaret edin.

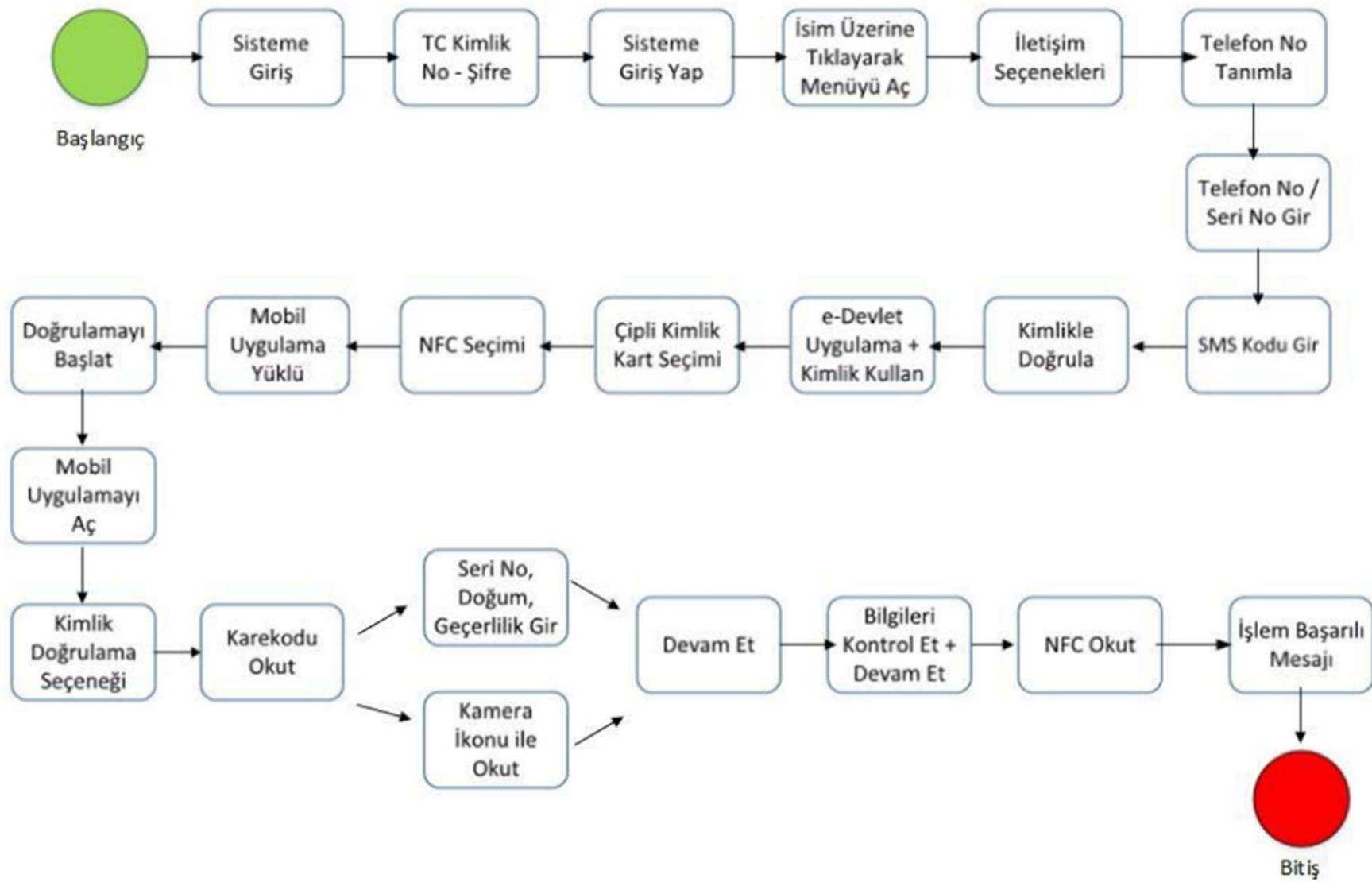


Hesap Güvenliğini Artırın

İki Aşamalı Giriş özelliğini açarak hesabınızı daha güvenli hale getirin.

İki Aşamalı Giriş

Görev 3: Çipli Kimlik Kart ile Telefon Numarası Doğrulama



Resim 6 – Çipli Kimlik Kartı ile e-Devlet Kapısı Web Sitesi Üzerinden Telefon Numarası Doğrulama Adımları

Effectiveness can be a scale or an absolute value

- If the outcome is ALL or NOTHING then effectiveness is an absolute value
 - User either locates info or does not...
- If outcome can be graded, (user can be partially right) then effectiveness should be measured as a scale
 - As a %, or a score from 1 (poor) to 5 (complete)
- Scale should be determined by evaluator in conjunction with developers and users

Quality?

- Some tasks do not have a definitive correct answer:
 - creative production (writing, design)
 - information retrieval
 - data analysis
 - management
 - Making a purchase.....
- Effectiveness alone misses something...

Efficiency

(verimlilik)

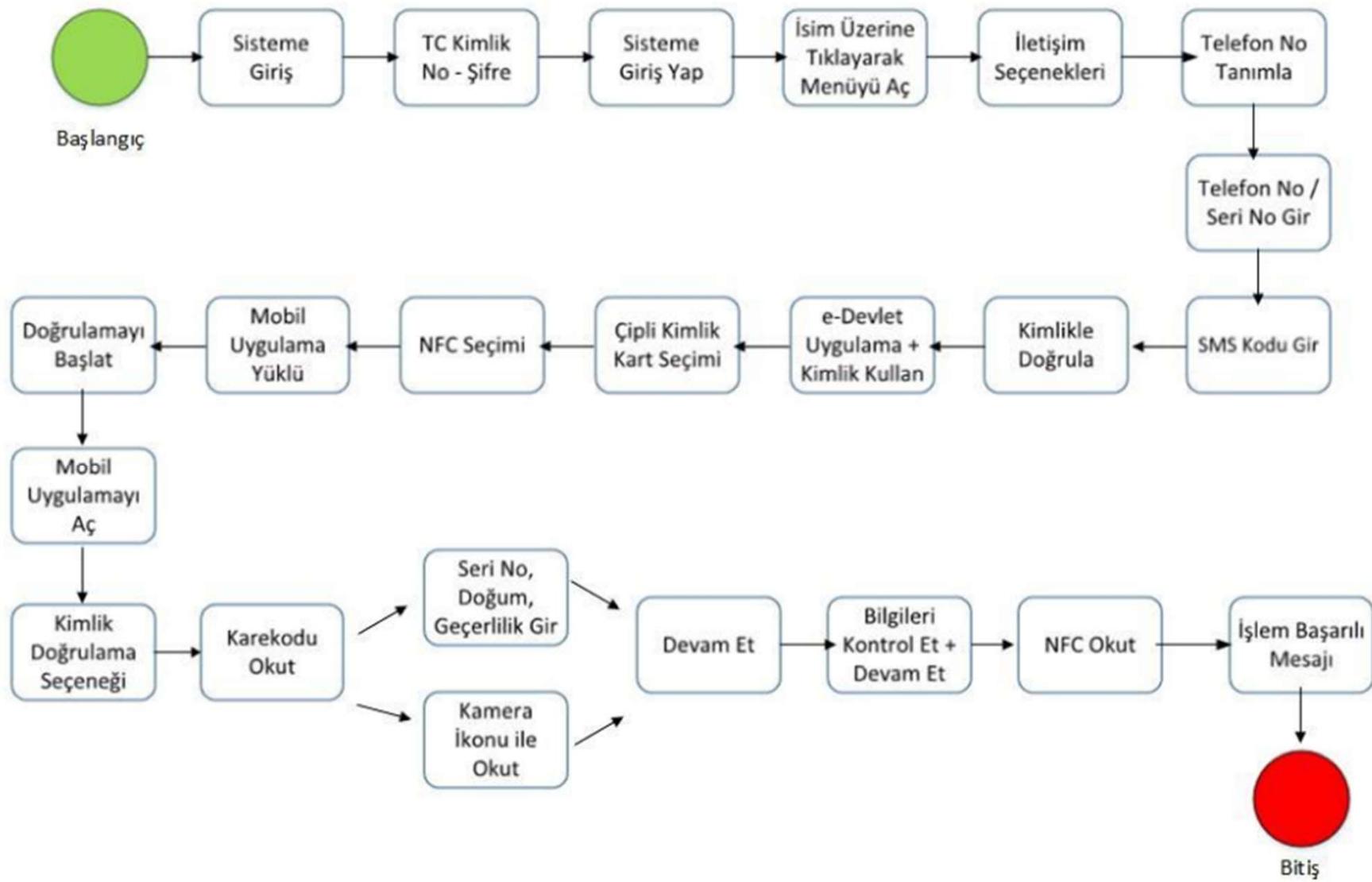
- Measures resources used to perform task
 - i.e., time, effort, cost,
- In case of Web site use, efficiency might equal time taken to complete a task or the navigation path followed etc.

Efficiency of using a redesigned web site

- Time taken to complete task
 - Compared across tasks, across users or against a benchmark score
- Number of steps taken
- Number of deviations from ideal path

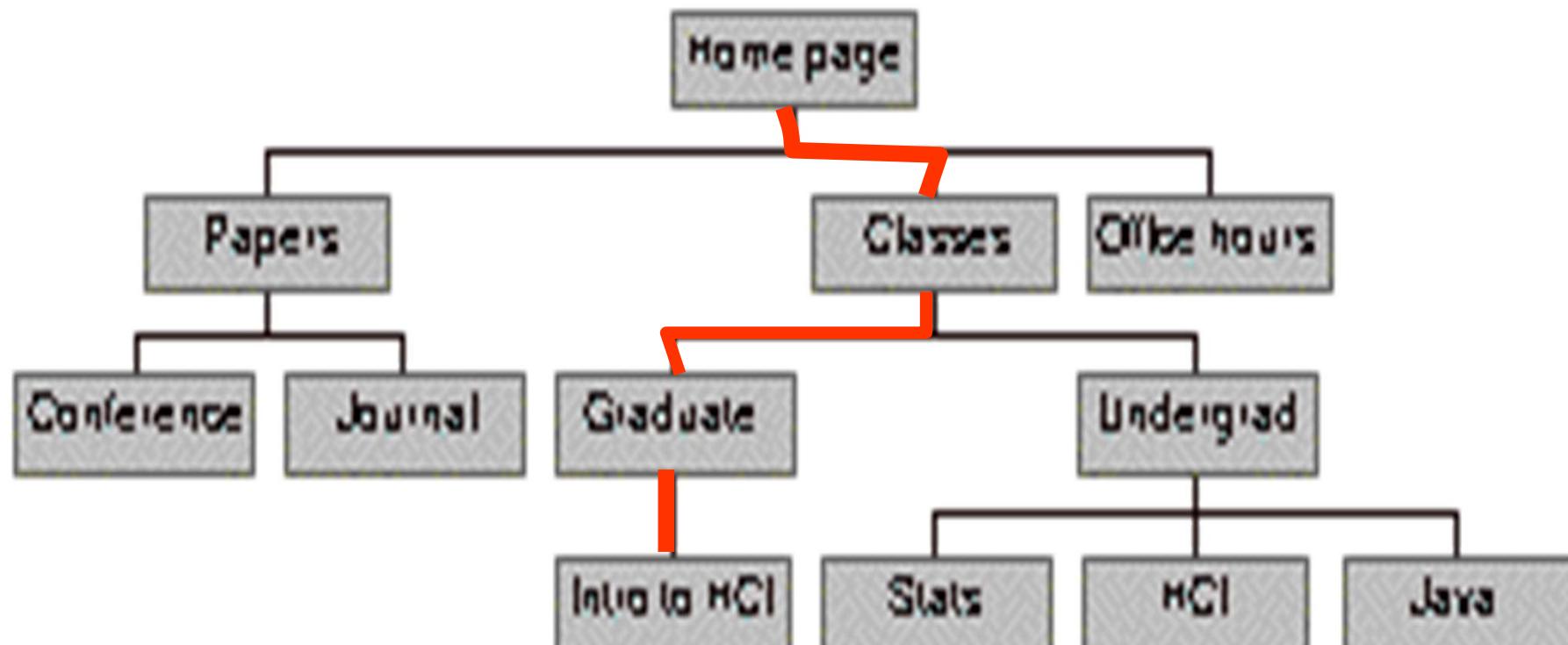
Such variables are frequently highly positively correlated - but they needn't be.

Görev 3: Çipli Kimlik Kart ile Telefon Numarası Doğrulama



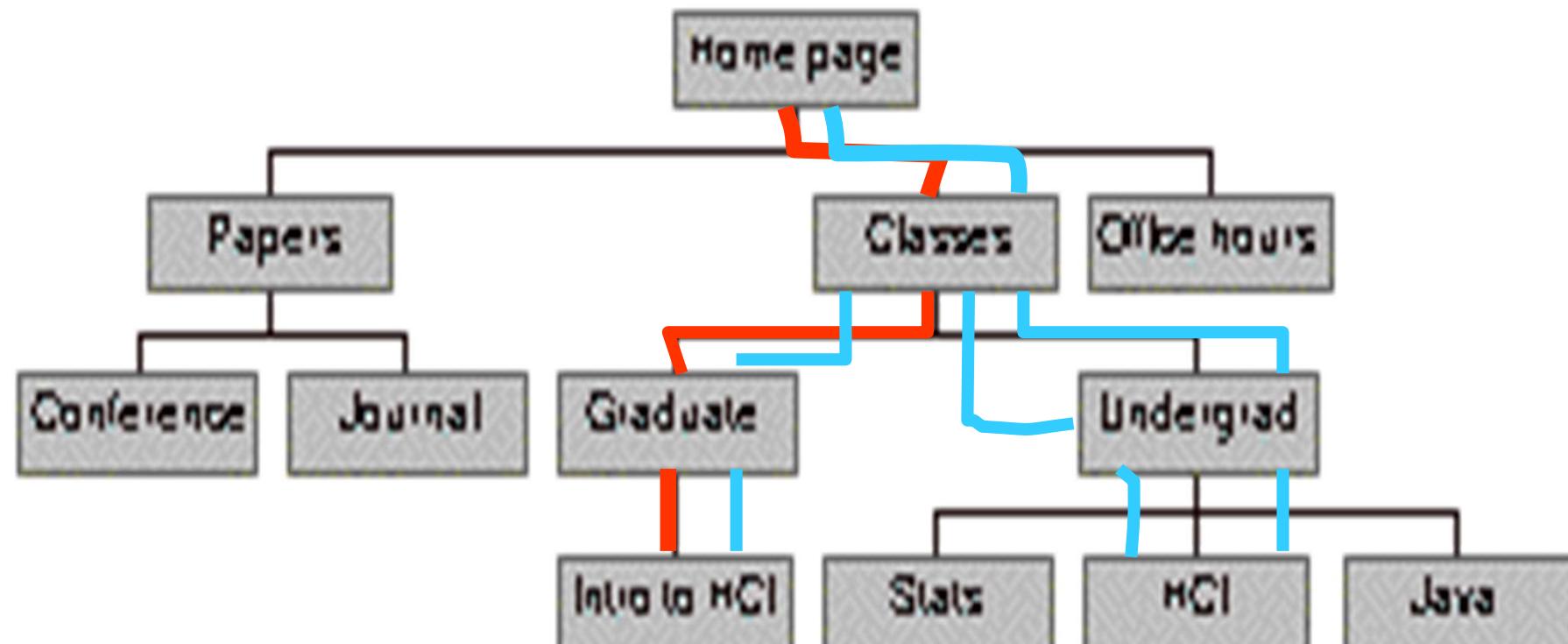
Resim 6 – Çipli Kimlik Kartı ile e-Devlet Kapısı Web Sitesi Üzerinden Telefon Numarası Doğrulama Adımları

Efficiency in path analysis



Ideal path: 3 steps

Efficiency in path analysis



Actual to ideal user navigation - 7:3 steps

But is it efficiency that users want?

- The push to efficiency is symptomatic of an engineering-oriented approach
 - Who determines efficiency?
 - Are path deviations always inefficient?
 - Is time equally weighted by user, designer or owner?
- Suggests a need for negotiation beyond typical usability tests

Satisfaction (Affect)

- Measures the affective reaction (likes, dislikes, attitudinal response) of users to the application
- Assumed to be influenced but not the same as effectiveness or efficiency e.g.,
 - 2 applications with equal effectiveness, and efficiency, may not be equally satisfying to use
 - or What users like might not be what they need!

Basis for satisfaction?

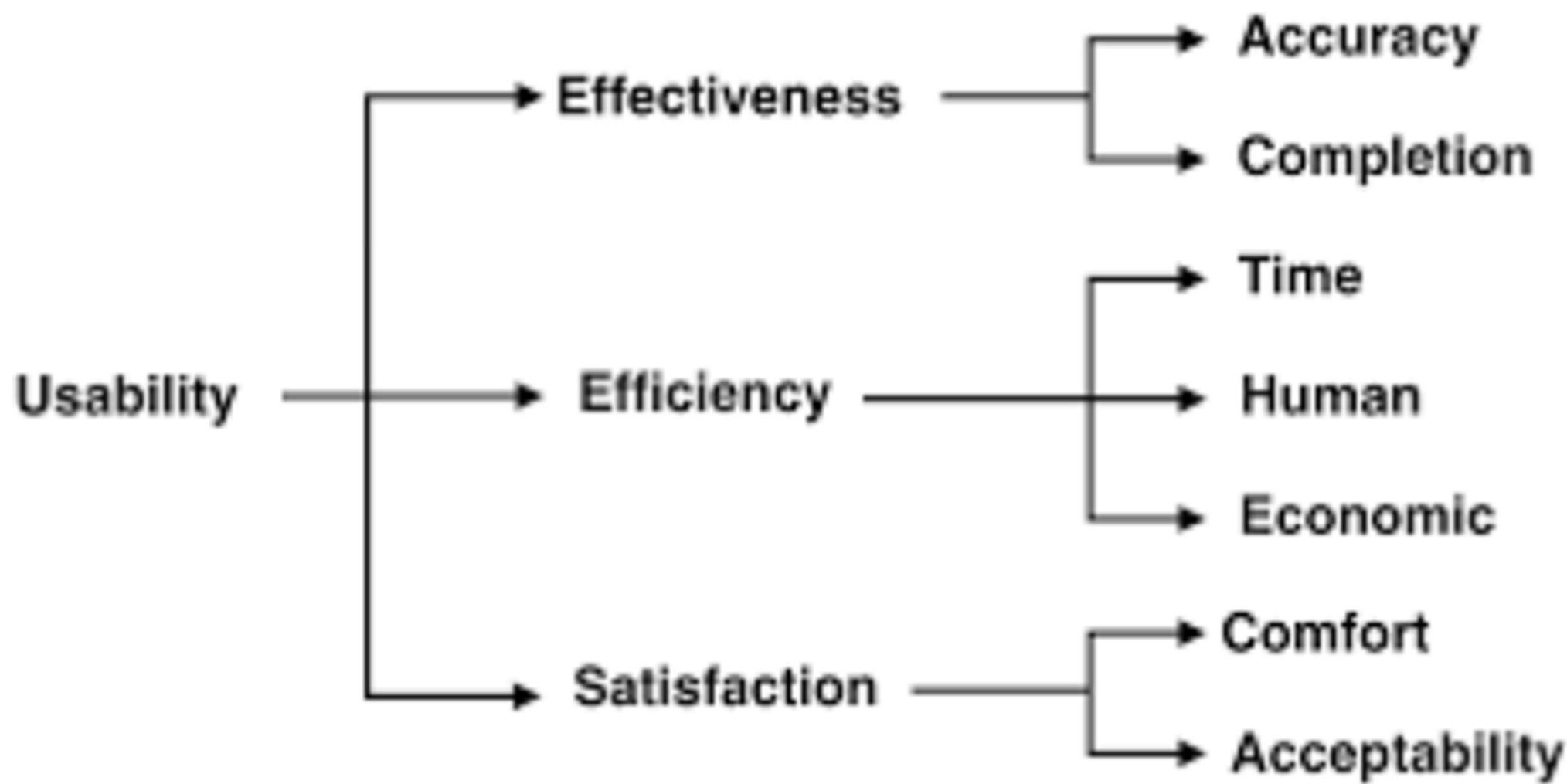
- Positively influenced by effectiveness and efficiency
- Also
 - Personal experience with other technologies?
 - Working style?
 - Manner of introduction?
 - Personality of user?
 - Aesthetics of product?

Satisfaction is important

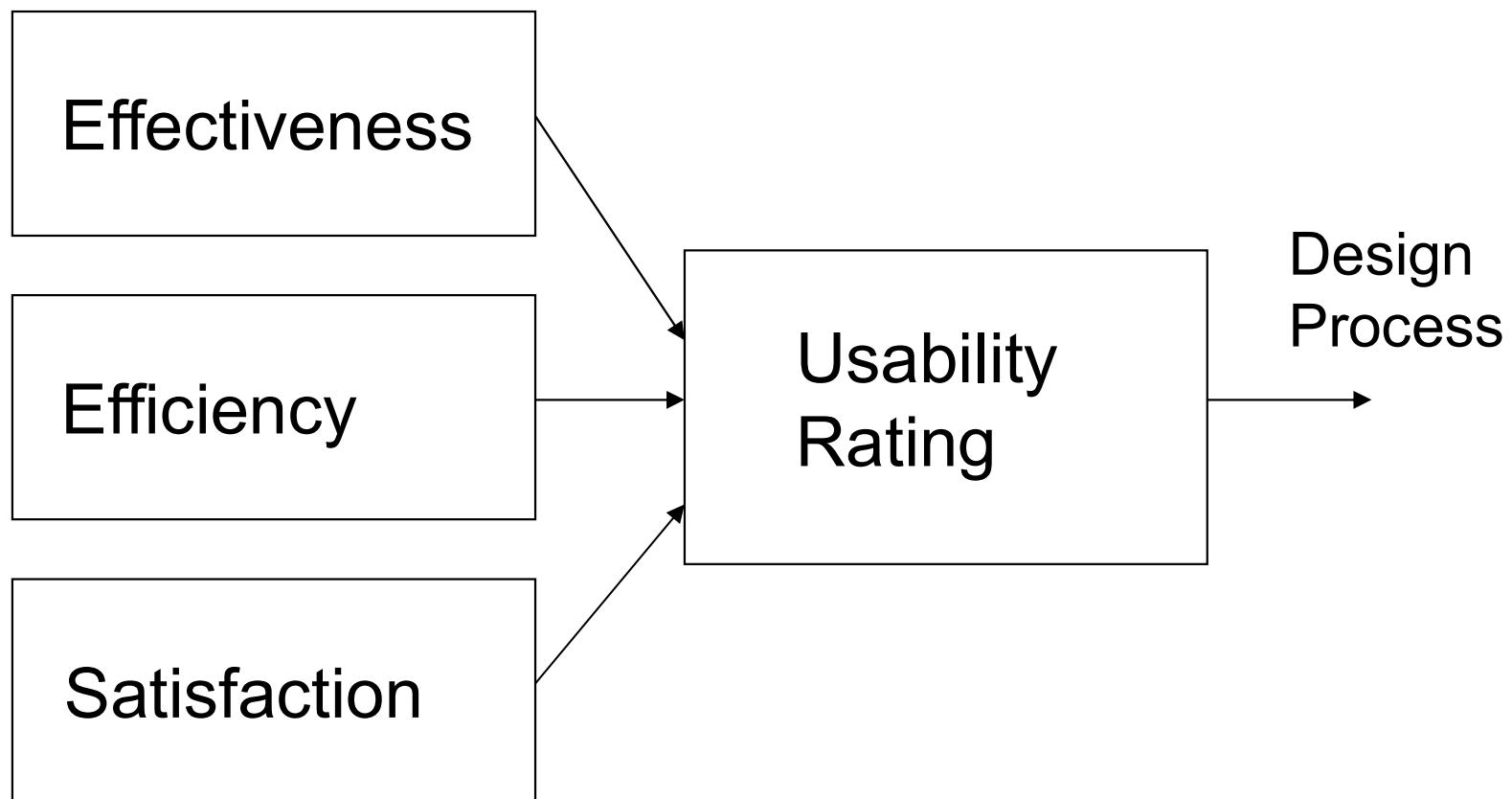
- Good usability studies recognize this

But satisfaction is not enough....

- People often like what they don't use well
- What about empowerment, challenge etc?



Determinants of usability rating



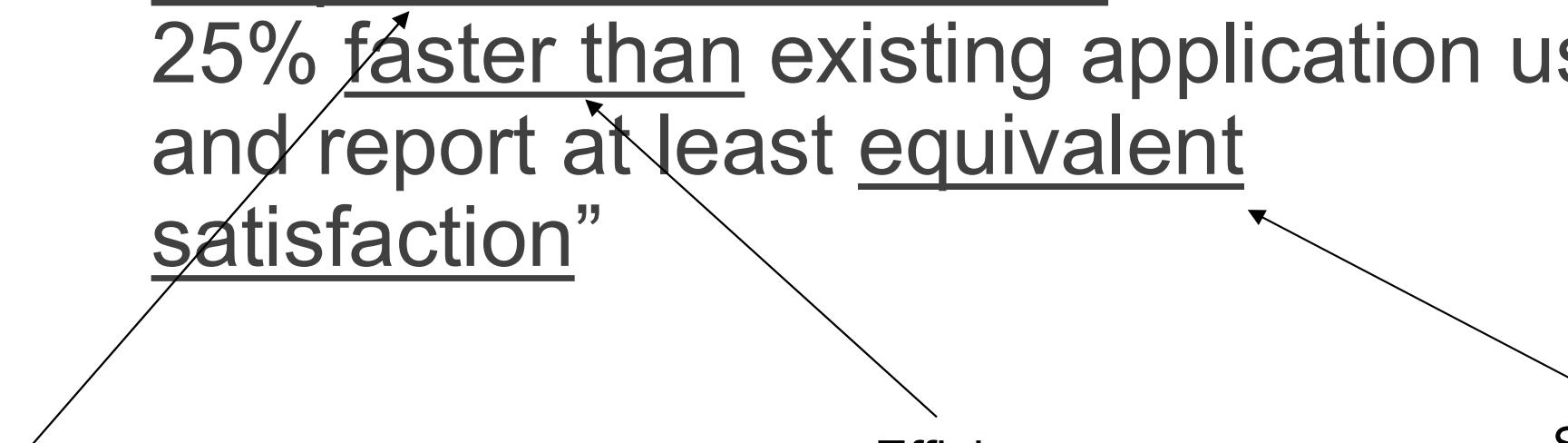
Setting usability criteria

- “Product X is usable to the extent that 70% of users, with no additional training, can perform all tasks with 95% accuracy, 25% faster than existing application use, and report at least equivalent satisfaction”

Effectiveness

Efficiency

Satisfaction



Or.....

- “Product X is usable to the extent that 80% of users, with 2 days training, can perform 90% of routine tasks with >90% accuracy, as efficiently as with the existing application, and report increases in satisfaction”

Instead of....

- “Product X is usable”
(meaningless statement for HCI)
 - Kullanıcı dostu ve güncel tasarım trendlerine uygun bir tasarıma sahip olması,
- “This new application is more usable than the old application”
(begs the question... “More usable in what sense? And for whom? And where?”)

Or

- Product Y is usable to the extent that 3/4 of users, after 20 mins of training, can perform all tasks with 100% accuracy, in 2 minutes (or less) per task, and report mean satisfaction levels of 4 on a 5 pt scale.

ISO 9241-11

Efficiency

Effectiveness

Satisfaction

Jacob Nielsen

Efficiency

Learnability

Memorability

Errors / Safety

Satisfaction

Strengths of Usability Engineering

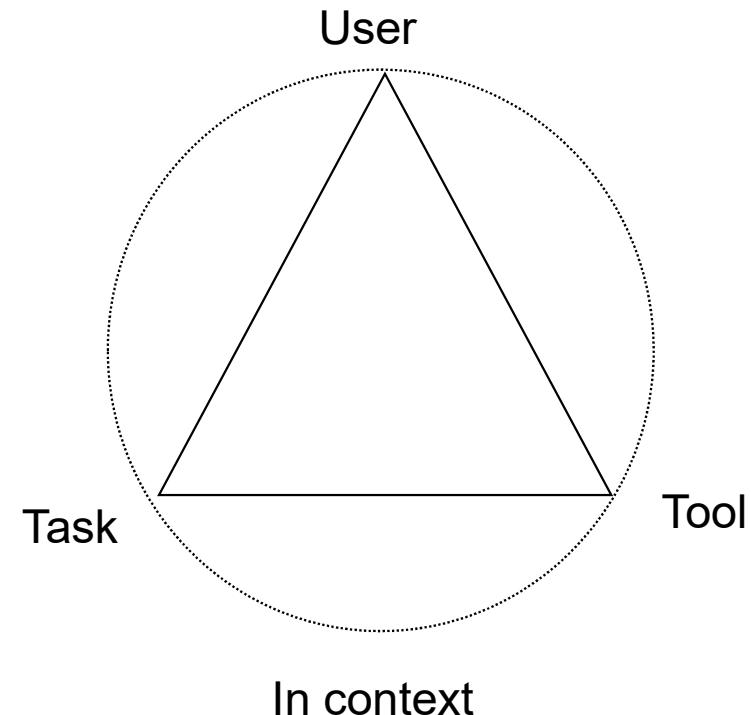
- Directly coupled to tasks
- Supports iterative design process
- Not tied to one interface style
- Supports trade-offs

Weaknesses of Usability Engineering

- Criteria are dynamic, not fixed
- Usability is thus contextually determined
 - and that requires analytic skill....
 - but causes generalization difficult
- Criteria do not determine re-design advice
- Usability does not fully determine use

How are criteria derived?

- User analysis
- Task analysis
- Situation analysis



Assignment-2 - Fitts' Law

- Find design problem(s) that can be measured by Fitts' Law and propose a solution
- Report:
 1. Problem Definition –How is the design problem related with Fitts' law?
 2. Calculate the Difficulty Index (DI) of the design problem.
 3. How to eliminate the problem from the application. Use Figma prototyping tool, revise the design, calculate new DI
 4. References

Week-5 Beyond usability engineering

Understanding the user (part 1) Human Cognition



Week-5 The Human, Ch1 - Human Computer Interaction, Dix et.al



Week-5 (Focus on Section 2.1) The Psychology of Human Computer Interaction - Ch2

No Class on Friday

- Work on your assignments ☺