



User Center Design and Development of Interactive Environments and the WEB

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Univ. of Athens
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Description

- we will study the theory and practice of user-centered design.
- We will cover basic concepts in human-computer interaction, user interface design principles, task and user analysis, interface design methods, user interface evaluation and usability testing.
- Students will be expected to learn how to design, prototype and evaluate user interfaces to interactive information systems and the Web.



Description (cont)

- Hours per week: 3, Wintersemester 2018
- Lecturer: Costas Mourlas
- Type: Interactive classes with lab sessions
- Workload: 39 contact hours (28 hours for lecture&discussion, 9 hours for lab sessions)



Testing

- The course will include several small assignments and a large group project worth 100% of the final grade



Final Project

- Students will work in groups to design an interactive web application using a combination of the main user-centered design methods during the steps of the development life cycle of a product. They will test and evaluate the effectiveness, efficiency, and satisfaction with which users can achieve tasks in the particular functional prototypes of the web application. Students will report their findings in an oral presentation.



The main Objective

- Learn how to design (Web based) interactive systems that are useful, usable, and enjoyable!



Content

• Introduction to Usability

- Usability and the World Wide Web
- Information Architecture for the World Wide Web

• User Centered Design (UCD)

- Human Factors and HCI
- The Process of UCD
- Traditional Lifecycle Model of Systems Development
- New Challenges for Web Development Projects
- User Needs at the Centre of a Lifecycle Model
- The Usability Engineering Life Cycle



Content (cont.)

✦ Usability Aware Design

- Usability Guidelines
- Usability Metrics

✦ User Centered Design Methods

- Task analysis
- Contextual Inquiry
- Card sorting

- Heuristic Evaluation
- Usability Testing
- Participatory design

- Rapid prototyping
- Cognitive Walkthrough

✦ Usability and Accessibility

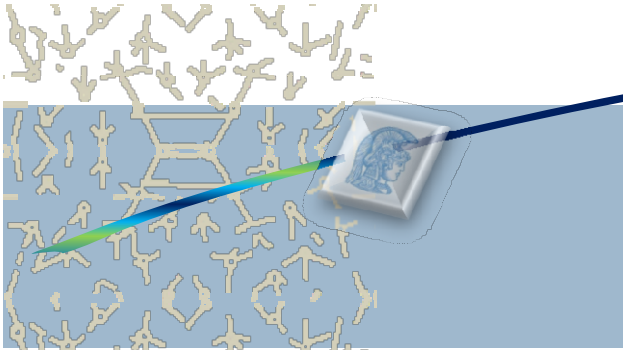


Literature

- I recommend the book

“Web Site Usability Handbook” by Mark Pearrow, Charles River Media; 2nd edition (October 2, 2006).

- Additional readings will be from current literature, available either on the web or via handouts.



National and Kapodistrian University of Athens

Dept. of Communication & Media

You can also
find the
content of the
eclass in the
URL below...

User Centered Design and Development of Interactive Environments and the Web

Spring Semester 2018

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Room:	Room 202		
Office Hours:	Thursdays, 15:00 - 17:00		
	Syllabus	Readings	
LecturePresentations		Group Project	Labs

<http://uranus.media.uoa.gr/lectures/UCD/>



Design

- Technology-driven design

- Technology influences the design of the interface which give the user the functionality and interaction mechanisms of the system

- User-centered design

- User requirements define the functionality of the interface which runs the design of the technology



Goals of interaction design

- Develop usable products
 - Usability means easy to learn, effective to use
- Which also provide an enjoyable experience
- Involve users in the design process
 - User-centred system design



Usability: Definition

• ISO defines usability as

"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."



Usability: Definition (cont)

Usability is composed of:

- **Learnability:** How easy is it for users to accomplish basic tasks?
- **Efficiency:** How quickly can they perform tasks?
- **Memorability:** When users return to the design after a period of not using it, how easily can they re establish proficiency?
- **Errors:** How many errors do users make?
- **Satisfaction:** How pleasant is it to use the design?



Importance of Interaction Design

✦ Poor design can:

- reduce user productivity
- increase learning times
- increase errors
- induce frustration
- lead to system rejection by the user

✦ Poor design is easy, good design is hard!



Good design

• Takes into account:

- Who the users are – **P**eople
- What activities are being carried out - **A**ctivities
- Where the interaction is taking place - **C**ontext
- What technologies are used - **T**echnologies

• User-centric View of Design Problems: **PACT Analysis**



People: variability

Consider range of characteristics of people

- Physiologically

- Age differences, physical abilities

- Psychologically

- Attention, perception, memory

- Forming the right 'mental model'

- Socially and Culturally



Activities

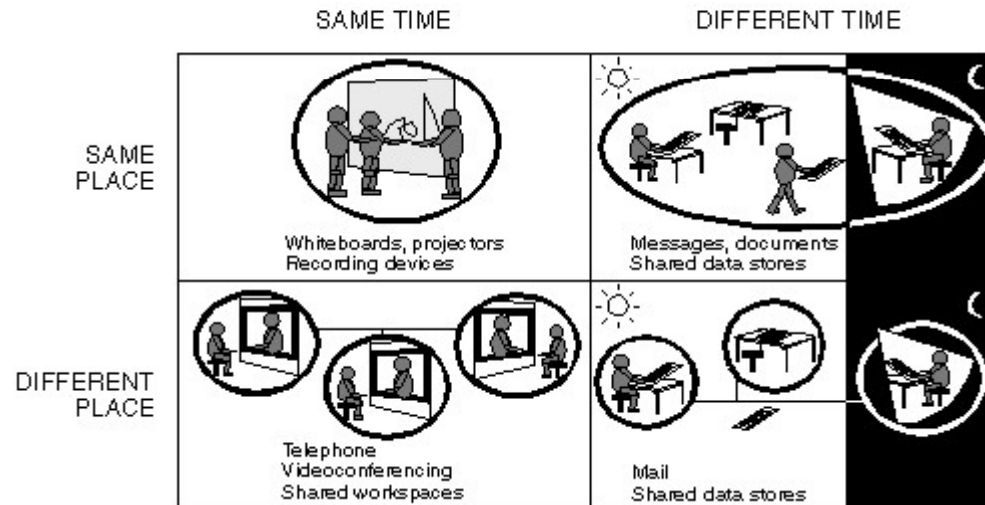
- What is the overall purpose of the activity?
- Temporal aspect
 - Regular or infrequent, Time pressure, Continuous or interruptions, Processing time
- Cooperation (One or more actors)
- Complexity (Well defined or vague?)
- Safety critical
- The nature of the content (text, voice, video)



Context

- Where does the interaction occur?
 - Physical context (Noise, light, time, office, on the move)
 - Social context (Individual activity, group activity, Social norms)
 - Psychological context (Motivation, attitudes, Cognitive demands)

Contexts of Computer Mediated Communication





Technology

✚ Input

- Getting data in; getting commands; security

✚ Output

- video vs. photographs; speech vs. screen

✚ Communication

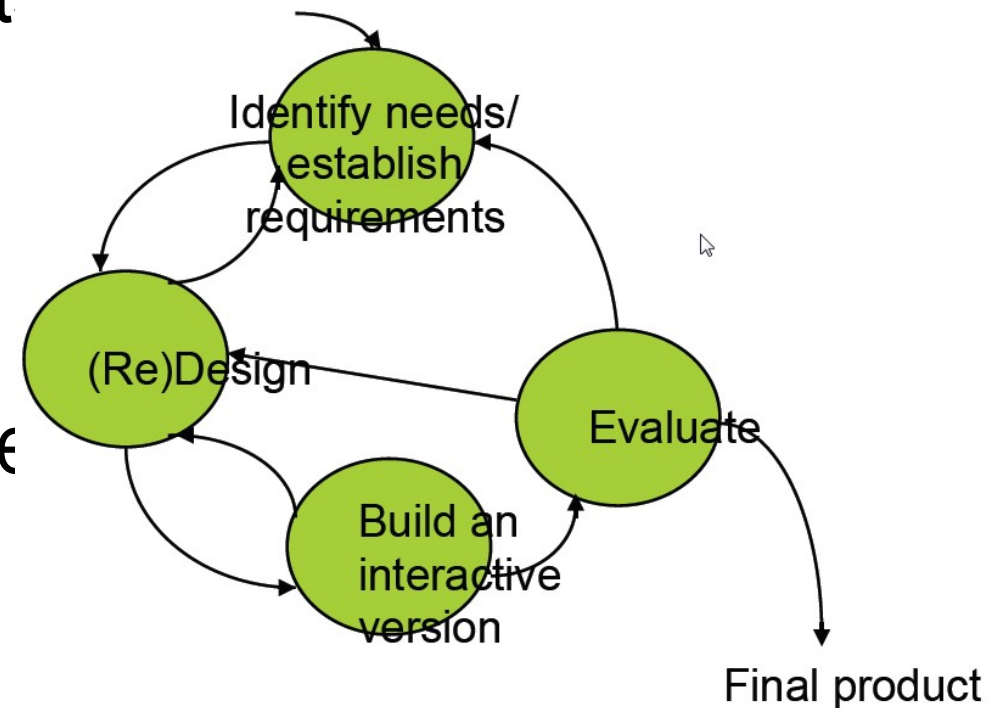
- Between people, between devices, speed,

✚ Content

- What data in the system: a web site is all about content

User-centred design process

1. Identify needs and establish requirements
2. Generate alternative solutions/designs
3. Build interactive prototypes that can be communicated and assessed
4. Evaluating design



User centred design



Key characteristics

- Focus on users early in the design and evaluation of the artefact
- Identify, document and agree specific usability and user experience goals at the beginning of the project
- Iteration is inevitable. Designers never get it right first time

The slide features a decorative background on the left side with a repeating pattern of small, light-colored icons. A blue banner with a white border is positioned at the top, containing the title. A blue curved line starts from the top right of the banner and loops back to the left. A small, square icon with a blue and white design is located on the left side of the banner.

Interactive Design and the Web

- The most interactive applications and services are nowadays Web-based!
- Is it possible to learn how to design web applications and services that are useful, usable and enjoyable?



Introduction to web usability

- The Web have become an integral part of our world
- In early 1990s the primary concern was the technological infrastructure
- Now the challenge is to design Web sites that meet the needs of the users
- Users: customers, employees, students, faculty or people seeking information



The concern of a designer

- The **content** of a web site / web service and
- **Usability** of the web site / web service

Example:

A user will not purchase from an e-commerce web site that

1. Does not offer competitive prices or quick product delivery (CONTENT)
2. Is complicated and frustrating to use (USABILITY)



Why Usability

- Companies focus more on usability as a means to keep their customers satisfied and their companies profitable
- User Centered Design leads to increased site hits, additional e-commerce transactions and satisfied user population



The wrong approach to design

- Web developers follow their own personal preferences
 - What a developer considers “cool” a user might find it annoying
 - Developers’ perceptions and knowledge is usually different from those of the targeted users
 - The only way to know what users want is to get them involved in the site development



Why Focus on the User?

Poor web design means lost revenue.

Examples:

In the late 1990s , IBM Web site was difficult to navigate

- The most used buttons were the search function and the help button

After the redesign the site had the same functionality but:

- Sales increased 400 percent
- Help button decreased 84 percent



Examples (cont.)

- Macy's clothing e-shop made their web site search engine easier to use and the conversion rate (the rate at which site visitors are "converted" into buyers) increased 150 percent



How is the Web Different from Traditional IS?

Traditional IS:

- applications focused on users within organization e.g. Custom payroll system
- Applications for the mass market (word processing)

Web Sites:

- Accessed by various technological envs
- Accessed by different kinds of people (age, computer experience, job, economic status etc.)
- No training for the web applications -> predictability

Traditional Development of IS

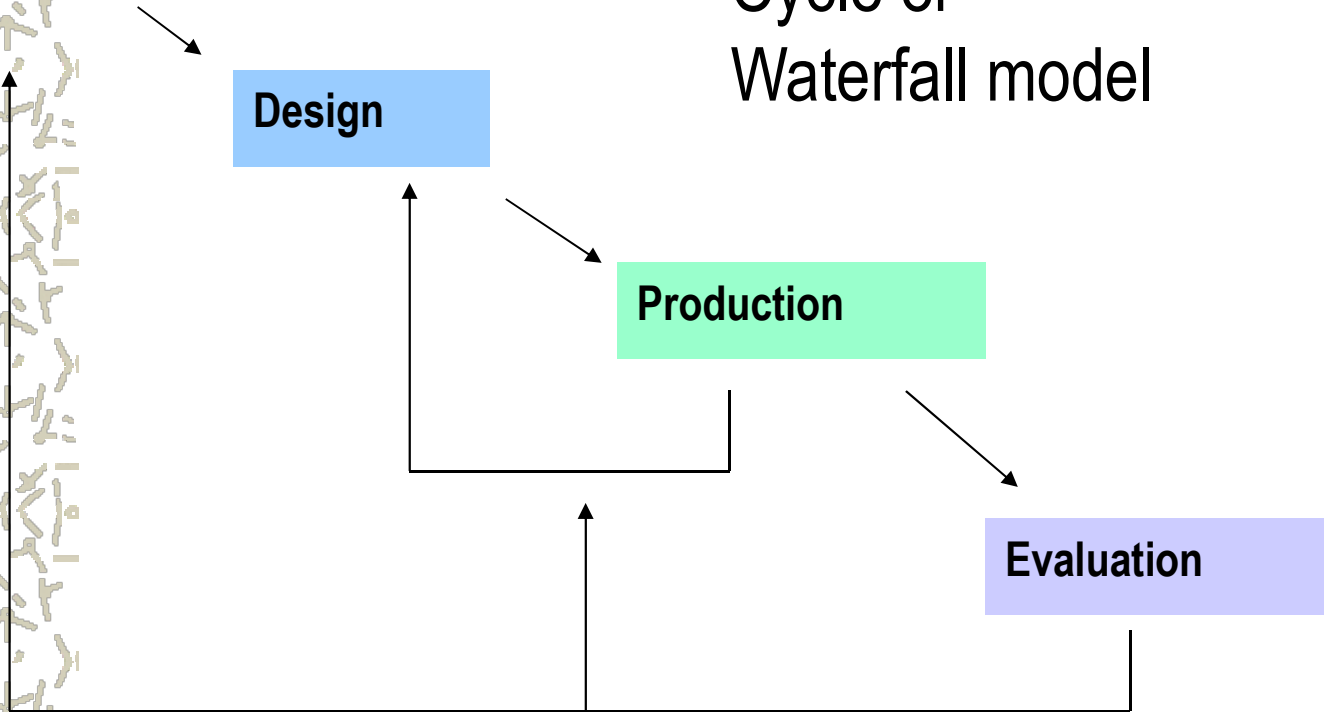
Analysis

Design

Production

Evaluation

Systems Development Life
Cycle or
Waterfall model

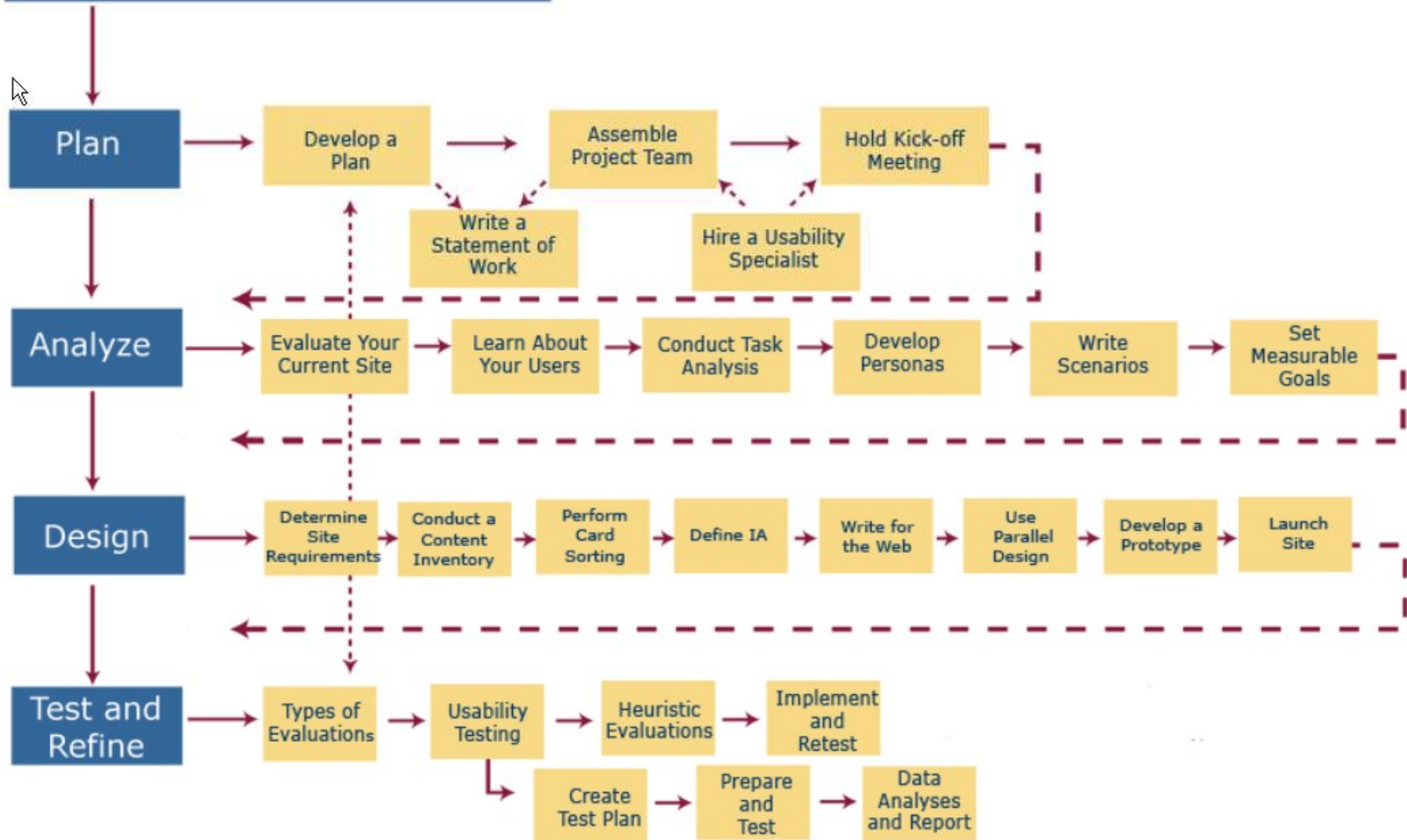




New Challenges in Web Development

- Traditional Systems are designed for daily use and a well defined user population. Users can learn even a confusing interface. Previous experience.
- Web sites may be accessed infrequently and users must figure out immediately how to use the interface. No previous knowledge required otherwise the interface is confusing. Users might visit another web site with no cost in switching. User involvement is extremely important!

Step-by-Step Usability Guide





Using a structured Methodology:

We increase the chance that a web site is easy to use and successful

Define user population

Ignoring your users is a recipe for failure



Which are the different purposes of user involvement ?

1. To understand who the users are
2. To understand what the users want to achieve
3. To understand the types of interfaces the users want
4. To test early prototypes of interfaces
5. To test fully functional interfaces

According to the types of web sites.....



Types of Web Sites

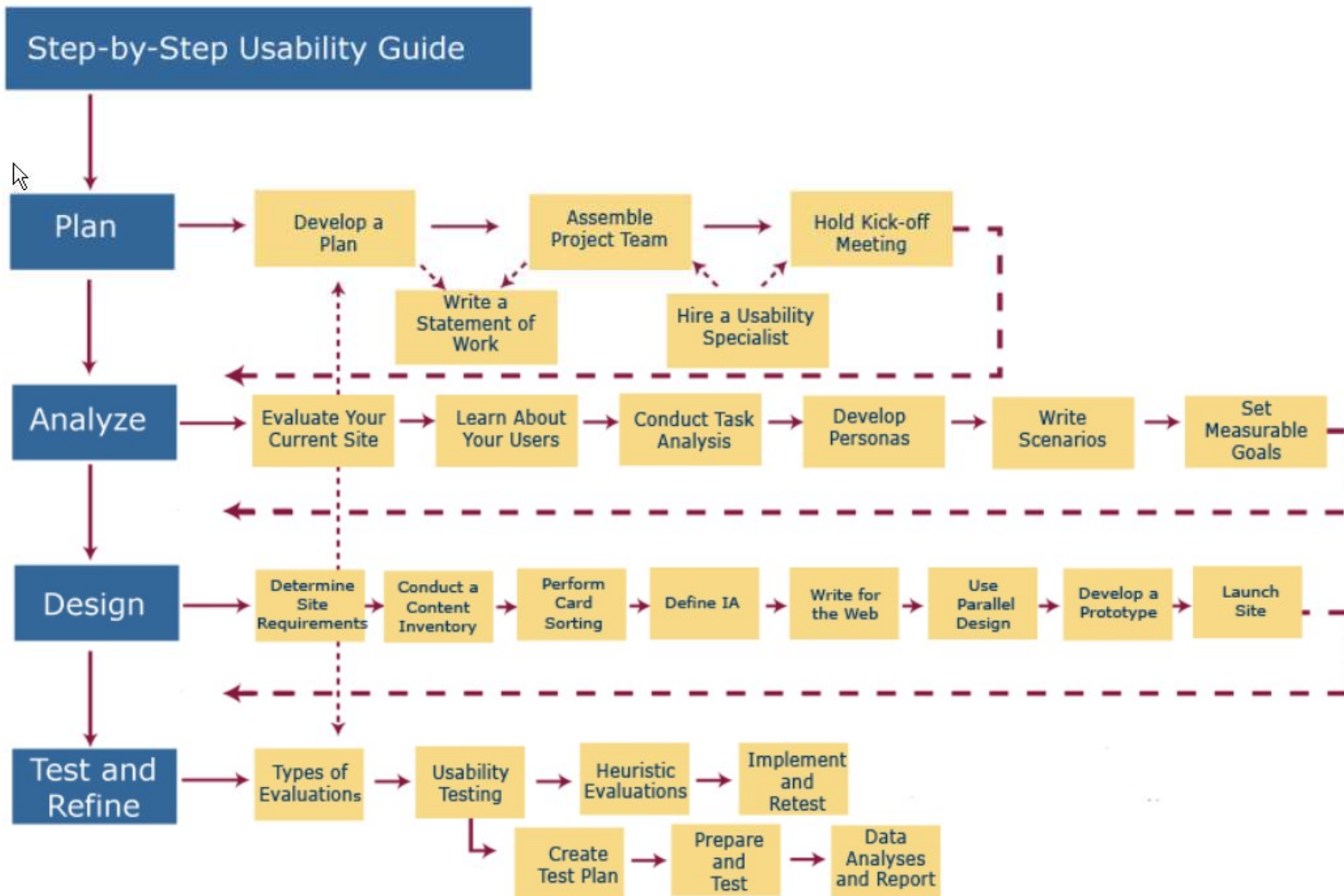
- E-commerce web sites: transactions on products or services. Their goal is profit.
- Informational Sites: Large content. Their goal is to provide information and replace printed materials.
- Entertainment web sites: content for entertainment (audio clips, video clips, etc.). Their goal is to increase ads.



Types of Web Sites

- Community Web Sites. Communication between people. Their goal is high number of subscriptions .
- Intranet web sites (Organizational Information Systems delivered through the web and unavailable to the public). Transaction processing. Their goal is to improve communication and data sharing.

The User-Centered Web Development Life Cycle





Planning: Define the mission of your site and its target population

1. What is the goal of the site?
2. What is expected to do
3. Who the target users of your web site are
 - Geographic area, age, areas of interest, cultural group, etc

You need clear objectives and definition of the target users



User Requirements Analysis

- Technological Characteristics (browser, platform, screen resolution, speed, plugins,..)
- What content and information are they interested in?
- What tasks do they perform using the site?
- Special interests or preferences for the design of a web site
- Domain knowledge or existing terminology
- Computer experience



Create and Modify the Conceptual Design

- Define the data modeling, database scheme and the control flow for the data and processes required
- Define the information architecture and navigation of the content
- Define the Look and Feel of the visual interface (page layout, color schemes)



Create and Modify the Physical Design

- Coding and technical development of the site (HTML, Javascript, FrontPage, Dreamweaver)
- Functionality Testing that the code is correct and any scripts and applets work properly
- Instead of a near to final implementation a (full) functional prototype is preferred.



Perform Web Site Usability Testing

- Testing with both experts and representative users
- Identify major interface flaws
- Determine match between tasks and interface
- Provide feedback on the website, find problems
- Provide suggestions for improvements



Implement and Market your web site

- URL selection and hosting
- The website “goes live”
- Marketing your site (fliers, search engines, etc.)



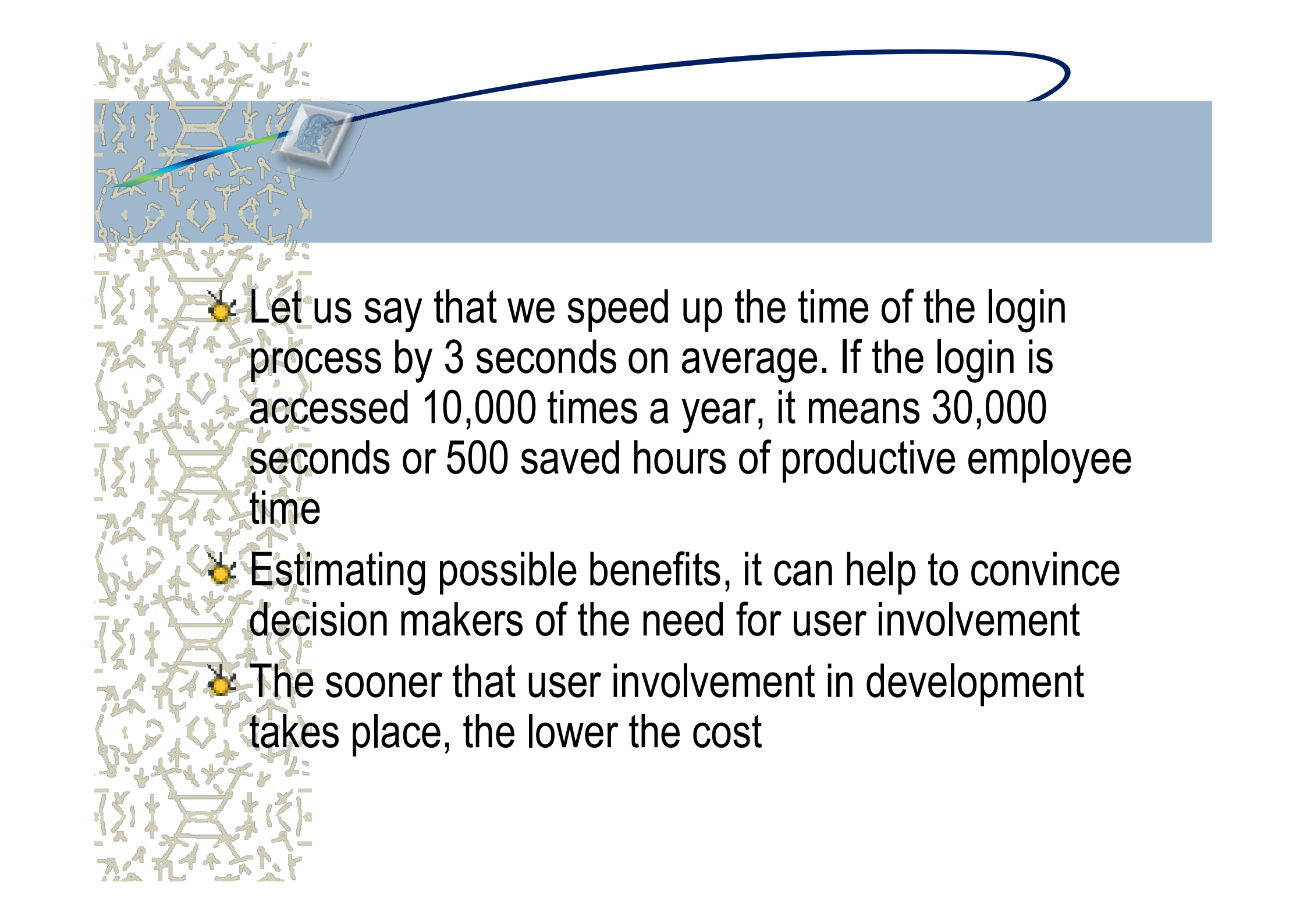
Evaluate and Improve Your Web Site

- Periodic evaluations of the effectiveness should be performed
- User feedback to decide if there is a need for redesign or make improvements
- Content should always kept up-to-date



Cost Justifying User Involvement

- To involve users in the development phase requires time and costs money
- User-centered design improves the quality, appropriateness and effectiveness
- These benefits are hard to measure
- Costs of user involvement are easy to measure
- We need to predict and estimate the future benefits of user involvement

- 
- Let us say that we speed up the time of the login process by 3 seconds on average. If the login is accessed 10,000 times a year, it means 30,000 seconds or 500 saved hours of productive employee time
 - Estimating possible benefits, it can help to convince decision makers of the need for user involvement
 - The sooner that user involvement in development takes place, the lower the cost



Traditional Project Management Techniques?

- Are still appropriate
- Clear Objectives at the beginning
- Estimated timeline and cost
- Specific responsibilities. Specific tasks to specific members of the development team
- All stages of the process should be well documented
- Progress reports



User-Centered Design Example

Pizza ordering system: An example

By Masako Sho from berkeley.edu



Online Pizza Ordering Example

Overview

- Based on the task analysis of pizza ordering and the study of existing food ordering web sites, it is found that users prefer quick and easy access, as well as additional online features when ordering pizza.
- The new online pizza ordering system supports user registration, order modification, online help, and features such as a preview image and calorie calculation.



Online Pizza Ordering Example

- Interviewed three people
- Each has different pizza ordering and Web experience.
 - A. Order pizza often by phone. Use the Web mainly at work.
 - B. Order pizza sometimes by phone. Use the Web mainly from home.
 - C. Never order pizza by phone. Use the Web both at work and home.



Online Pizza Ordering Example

Interview questions:

1. Do you prefer to choose toppings and other options for your pizza by yourself? Or, do you prefer to select one from the restaurant's special combinations?
2. How long do you expect to spend on the Internet in order to place an online order?
3. Do you want to receive confirmation of your order? If so, in what way – via a web page, e-mail message or phone call - ?
4. Do you expect the price to be cheaper for an online order than for a phone order?
5. What if the online order system does not respond to your order submission? Will you try the same order again , call the pizza place, or forget about the pizza?
6. What features would you like to find in an online ordering system? For example, a preview image of your pizza, total calorie calculation for your order, the top ten pizza orders of the week ...?



Online Pizza Ordering Example

Summary of results:

1. Prefer to choose toppings (A)(B)(C)
2. Should not take more than five minutes. I am hungry(A). Save time by registration (B)(C).
3. Confirmation on the web immediately after the submission of order (A)(C). Additional confirmation by phone (B).
4. Just a little bit cheaper (A). Doesn't matter. What matters is the taste (C).
5. Try again if the ordering process won't take time. Order by phone if it takes too long (A). Want to get a free pizza if pizza is not delivered (A). Give up to use the online system and make a phone call (B).
6. Nice to have a preview image (A)(C). Attractive if the calorie chart of the order shows pizza is not actually high in calories as I thought (A).



Online Pizza Ordering Example

Among the suggested new functionalities in the following, first five tasks with an **○** are selected to be included in the new interface and other three with an **✗** are dropped based on the observations and interviews.

new tasks	reason for selection / drop
1 pizza image preview	○ people like to choose their own toppings. nice to show what the pizza looks like.
2 price preview	○ can check the price as toppings and side orders are added. can avoid going back to the menu selection again after checking it out once.
3 view calorie information	○ not necessary but can be displayed with the image
4 order confirmation on the web	○ people prefer to see the confirmation immediately after the order, not later by e-mail or phone
5 user registration	○ can save frequent users time
6 search menu	✗ number of items on the menu is not large. usually there is nothing special to search for.
7 recommendation (top 10 order)	✗ people have their own preferences.
8 compare price	✗ taste counts more than price



Online Pizza Ordering Example

Based on these interviews and observations at a pizza parlor, five main pizza ordering tasks are identified for the existing pizza ordering.

	(at a parlor)	(by phone)
1 Initiate transaction	go to a pizza place	make a phone call
2 Decide what to order	browse menu, look at samples displayed, look at what someone else is eating,	look at menu, ask for recommendation * this can be done before making a phone call
3 Place an order	choose toppings, combinations, side dishes and drinks	choose toppings, combinations, side dishes and drinks
4 Confirm and Pay for the order	if the order is confirmed, pay for it. if not go back to 2 or 3 and repeat.	if the order is confirmed, pay for it. if not go back to 2 or 3 and repeat.
5 Receive the ordered items	receive them at the counter	receive them delivered

The slide features a decorative background with a blue banner at the top. On the left side, there is a pattern of small, stylized human figures in various poses. A small icon of a pizza box is positioned near the top left. A blue oval shape is drawn across the top of the slide, partially overlapping the banner. The main title, "Online Pizza Ordering Example", is centered in the blue banner in a large, dark grey font.

Online Pizza Ordering Example

The following scenarios are created based on the user category introduced in the earlier section, namely frequency of pizza ordering, the method of ordering and the timing of delivery. In the new system, the ordering method can be either with a personal computer or the kiosk.

1 Order from home / Immediate delivery / Frequent user

Bob is a college student who shares a three-bedroom house with his friends at school. One Saturday, Bob and his house mates decide to order a pizza for lunch and watch a college football game. Bob accesses the PRU homepage from his lap top computer. He is a frequent user of the PRU online ordering system and has a user name and password to access the system. He doesn't need to type in his address and credit card information every time he places an order. Since they have already decided to order their favorite extra large PRU Special Combination pizza before accessing the system, Bob chooses the size of the combination pizza under the "pizza" menu. They don't need anything else - a lot of diet cokes are already in the fridge. Bob goes to check out without looking at any other menu items. Confirmation of the order and total price are displayed in the screen. Just in case, he asked his housemates for additional orders. One of them says he wants to eat buffalo wings. Everyone agrees and Bob goes back to the "side dish" menu to add 12pcs wings to his order. After the confirmation of the final order and price, the following message is displayed - "Your order was processed successfully. Pizza will be delivered to your door within 45 minutes."



Online Pizza Ordering Example

2 Order from office / Planned delivery / First time user

Mary needs to order pizzas and sodas for eight people for the lunch meeting next week. Since she has heard about a discount for online orders, she decides to try the PRU online ordering system for the first time. When she accesses the system via the Internet, she is asked to provide her zip code or address of the delivery place. She finds the PRU has a parlor just a few blocks away from her office. After browsing menus with pictures, Mary decides to order one veggie pizza and one with her favorite toppings, pepperoni, onion, mushroom and additional cheese. Then Mary goes to "drink" menu to order four bottles of mineral water and four cans of Pepsi. She checks the total price as she adds items so that it does not go over her budget. When she checks out and confirms her order, she is asked to provide the credit card information. Because she concerns about sending such information over the Internet, she checks FAQ to find out about system security. The FAQ explains how the system works and why it is secure. Mary feels relieved and provides payment and delivery information to the system. After providing the information and receiving the confirmation of her order to deliver pizzas and drinks next week, she is asked if she wants to register with the system. If she registers, she does not need to complete her address information again. She decides to register to the system to save her time on future orders. Mary is also notified that she will receive an e-mail confirmation on the day before the delivery is scheduled.



Online Pizza Ordering Example

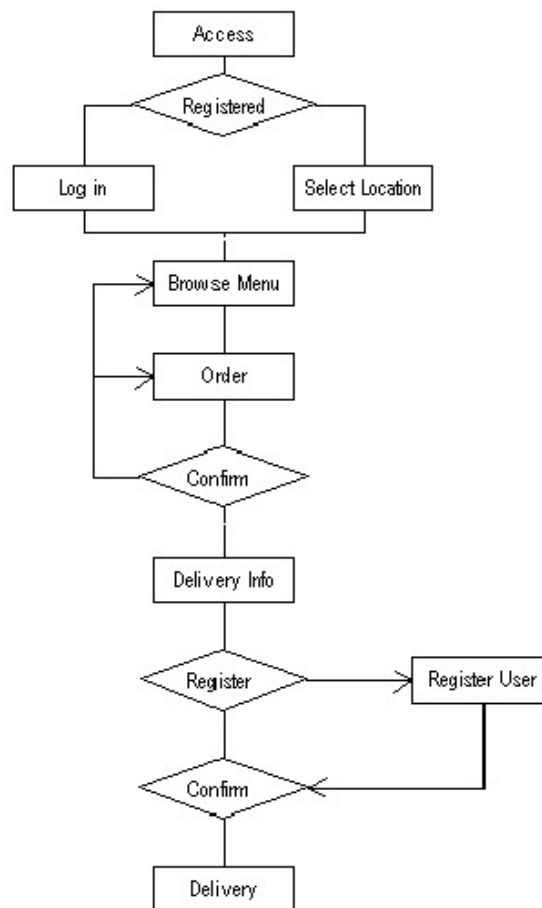
3 Order from kiosk / two-hour late delivery / First time user

After spending a half day in a huge shopping mall one Sunday, Judy and Tom are very tired and decide to go home to relax and order pizza to save cooking time. They find a kiosk that has access to the Internet and accepts pizza order from PRU. Although they sometimes order pizza by phone from PRU, it is the first time for them to use the online ordering system. They know the location of the PRU parlor nearest their home. Tom selects the parlor from the list and goes to "pizza" menu to create their favorite pizza. Tom selects pepperoni, italian sausage and extra cheese. When Judy looks at the preview of the Tom's pizza, she thinks it's unhealthy and asks Tom to add italian tomatos and green peppers and to do without extra cheese. They like checking the total calorie count of the pizza with the preview image. She also asks Tom to order a green salad with fat-free French dressing. After the confirmation of their order, they are asked to provide a delivery time. They find that they have more shopping to do and it will take about an hour to get home. So, Tom requests delivery two-hour later and receives a confirmation of their order and delivery time. They will be able to enjoy their pizza and relax soon after they get home from the mall.

Online Pizza Ordering Example

The new online pizza ordering system for PRU works in the following steps;

*(a..e): related interface images following the flow chart.



- User accesses the system from his/her computer or kiosk
- If the user is registered, logs in with user name and password (a)
- If not, chooses a parlor location (b)

- Browse menu items and place an order (c, d)
- If the user finds that he needs to modify the order at the time of confirmation, he can go back to the previous actions. (e)

- After an order is confirmed, delivery information for the order has to be provided.
- If the user is already registered, his data is displayed automatically.
- If not, he is asked if he would like to register after completing the delivery information.
- The order is delivered after the confirmation of order, price and delivery information

Online Pizza Ordering Example

(a)

FAQ Quit

Registered User:

User Name Password Login

This screenshot shows a web form for registered users. At the top right, there are two buttons labeled 'FAQ' and 'Quit'. Below them is a large rectangular box containing the text 'Registered User:'. Inside this box, there are two input fields: 'User Name' and 'Password'. To the right of the 'Password' field is a 'Login' button.

(b)

FAQ Quit

Non Registered User:
Please specify a place of delivery

Zip Code

Or

Street Address City State

Or

Find nearest PRU location

Start

This screenshot shows a web form for non-registered users. At the top right, there are two buttons labeled 'FAQ' and 'Quit'. Below them is a large rectangular box containing the text 'Non Registered User: Please specify a place of delivery'. There are three options for specifying the delivery location: 1) a 'Zip Code' input field; 2) 'Or' followed by three input fields for 'Street Address', 'City', and 'State'; 3) 'Or' followed by a dropdown menu labeled 'Find nearest PRU location'. A 'Start' button is located at the bottom right of the form area.

Online Pizza Ordering Example

(c)

The screenshot shows a web interface for ordering a pizza. At the top, there are three buttons: "Menu", "FAQ", and "Quit". Below "Menu" is a large "Pizza" section. To the left of this section is a "Side Dish" section with "Add" and "Check out" buttons. The "Pizza" section has a "Preview" button and lists toppings and sizes with checkboxes. At the bottom left, there is a "current" label and a price input field with a dollar sign.

Menu FAQ Quit

Side Dish

Add

Check out

current

\$

Pizza Preview

toppings

pepperoni italian sausage anchovi
 bell pepper tomato mushroom eggplant
.....

size

extra large large medium small

Online Pizza Ordering Example

(d)

The screenshot shows a web browser window with a navigation bar at the top containing three buttons: "Menu", "FAQ", and "Quit". The main content area is titled "Side Dish" and is divided into two sections. The first section is labeled "salad" and contains three radio button options: "[] cesser", "[] green", and "[] potato", followed by a dotted line indicating more options. The second section is labeled "others" and contains two radio button options: "[] buffalo wings (12pcs)" and "[] crispy fried chicken (6pcs)". On the left side of the window, there are two sections: "Pizza" and "Drink", both underlined. Below these are two buttons: "Add" and "Check out". At the bottom left, there is a label "current" above a text input field containing a dollar sign "\$".

Online Pizza Ordering Example

(e)

MenuFAQQuit

Pizza
Side
Dish

Confirm

current
\$ 18.00

Confirm Your Order

You have ordered

item	Qty	Price

pizza extra large		
pepperloni, tomato, mushroom	1	15.00
diet coke	3	3.00

total		18.00



Extended Reading

<http://en.wikipedia.org/wiki/Usability>

http://en.wikipedia.org/wiki/Usability_engineering

http://en.wikipedia.org/wiki/Web_usability



Web Style Guide Online Book

<http://www.webstyleguide.com/wsg3/index.html>



Extended Reading (cont.)

- Top 10 Mistakes in Web Design, J. Nielsen

<http://www.useit.com/alertbox/9605.html>

- Introduction to Usability , J. Nielsen

<http://www.useit.com/alertbox/20030825.html>

- Usability basics with focus on web usability

<http://www.usability.gov/>

- Usability Guidelines Book

http://www.usability.gov/guidelines/guidelines_book.pdf