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# Design, User Experience and Usability (DUXU): Tutorial

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TUTORIAL

# DUXU

## Design, User Experience and Usability

13:00 to 17:00pm

July 28, 2016

— Thursday —

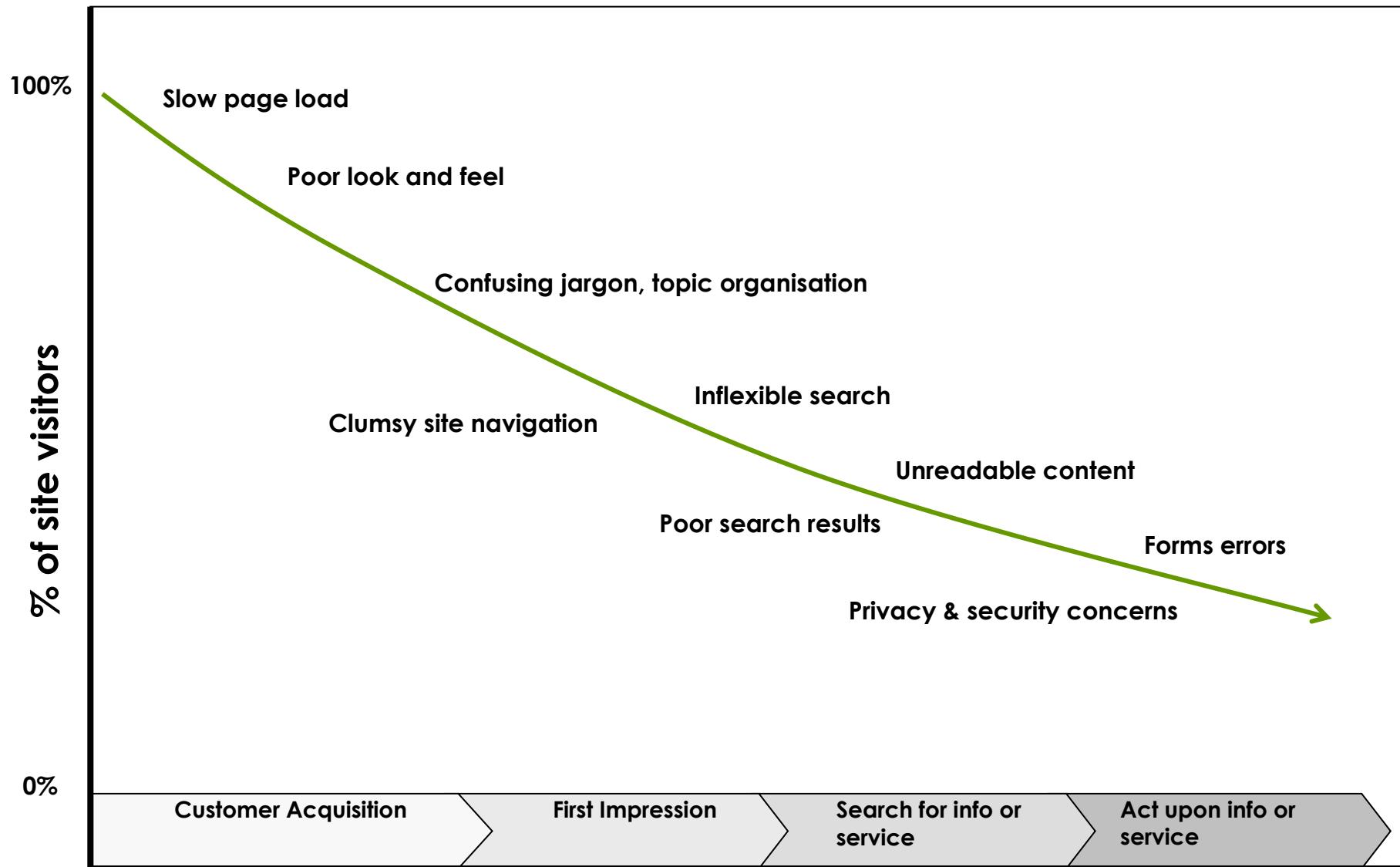
**PRESENTER**

**Dr. Javed Anjum Sheikh**

# Agenda

- Design principles
- User eXperience
- Usability principles

# Designing for Everyone is Impossible



# Flood, Monkey and Fish



Once upon a time there was a great flood,

and involved in this flood were two creatures, **a monkey and a fish.**

The monkey, being agile and experienced, was lucky enough to scramble up a tree and escape the raging waters.

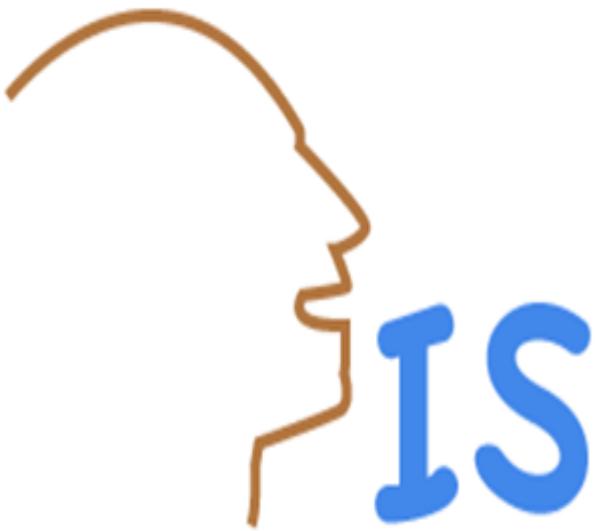
As he looked down from his safe perch, he saw the poor fish struggling against the swift current

With the best of intentions, he reached down and lifted the fish from the water.

**The result was inevitable**

Lynch, Riddick L. (ed.). (1969) The Cross-Cultural Approach to Health Behaviour, Fairleigh Dickinson University Press, New Jersey.

H  
C  
I



# What is HCI?

- It has to do with quality of design from the **user's perspective**
- The study of **interaction** between **people and systems**
- **Designing** interactive products to **support people** in their everyday and working lives

# Interaction Design

- User and Computer together are one system
- We do not only design the computer system
- We design the interaction of
  - humans with computers
  - humans with humans mediated by computers

# Focus on Usability

- People get frustrated and angry about malfunctioning and badly designed computer systems
- People work more efficiently and more safely with well-designed highly usable computer systems
- People want to use computers as tools for play, work, and communication, most of them are not interested in the computer itself
- People do not want to be distracted by the computer while they are doing something

# Focus on Users

- To make computer systems that are highly usable for current and future users
- Different users have different needs
- What do users need?
- Solution: ask users
- Problem: users do not know what they need
- Ergo: Designers need to learn more about users

# Putting Users at the Centre

- Focus on individual people:
  - How do we think?
  - How do we work?
  - How do we behave?
- Focus on the social context:
  - How do we interact?
  - How do we communicate?
  - How do we co-operate?

# Putting Users at the Centre

- Focus on design:
  - How can we use these insights in designing usable systems?
  - How can we ensure that our systems are indeed usable?

# Who will use your Design?

## What do they need to do?

Need to Understand  
User's Experience

# Designing Computer Systems

- What is most important when designing computer systems?
  - Good programming?
  - Functionality of the systems
  - Customer wishes?
  - Usability of the system
  - Flashy GUI-interface

# Good /Bad Design



- is frustrating and costs lives:
- medical devices,
- airplane accidents and
- nuclear disasters
- are just three domains where bad user interfaces and software errors have caused serious injury and many deaths.
- If effective principles for interface design were widely known
- some of these disasters might have been avoided.

## Bad Design

## Good Design

- brings people joy:
- it helps people do things that we care about, and helps us connect people that we care about.
- Good user interfaces can have a tremendous impact on both [the] individual's ability to accomplish things, and societies'.
- Graphical user interfaces help with computing a hundreds of millions of tasks, enabling us to do things like create documents, and share photo and connect with family and find information

# Designing a rubbish bin



- **Must be big**
  - To take all the rubbish
- **Must be small**
  - To avoid blocking the pavement
- **Must be light**
  - So it can be lifted and emptied easily
- **Must be heavy**
  - So it doesn't blow over in a strong wind
- **Must be open on top**
  - So easy to put rubbish in

**Design** involves finding solutions that fit the user, task, and context of use.



**there is  
nothing either  
good or bad,  
but thinking  
makes it so**

<http://image.spreadshirt.com/ii/s/17563543/views/1,width=280,png/there-is-nothing-either-go>

**Hamlet – act II scene II**

the  
PRACTICAL  
side of  
GOOD DESIGN

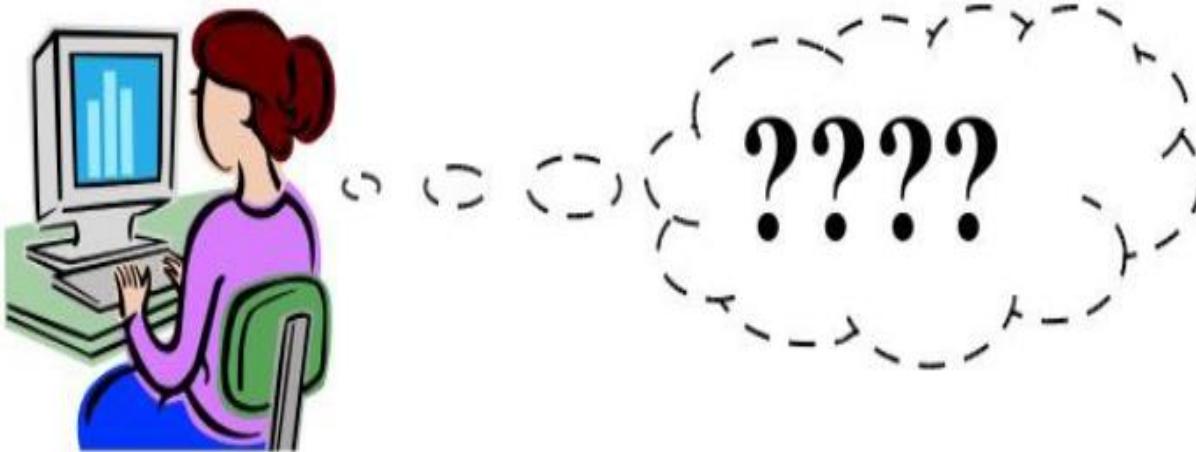
Bad

***bad design is simply  
great imagination  
without wisdom***

- M. Cobanli

EMBRACE THE COMPETITION.

A' DESIGN AWARD & COMPETITION 



# How Do You Evaluate Web Pages?



# Evaluating Web Pages

Navigation

Writing  
Style

Objective

Coverage

---

## Navigation

Is information arranged for clearly & logically easy understanding

Do external links to other sites work

Does it contain information easily downloaded

Is navigation within the site clear & easy

If there are links to other pages, are they to reliable sources?

Does the site contain “broken” links?

## Objective

Is the purpose clearly stated for intended audience

What goals/objectives does this page meet?

How detailed is the information?

## Coverage

Depth & scope of information appropriate

Is information accurate and factual

Do the graphic images enhance the information

Is the information on the site relevant to user needs?

## Writing Style

Is the language used appropriate for intended audience site free of typos and other errors

Is there a date that shows when the site has last been updated?

# Activity 1



YOU GOT  
**30**  
MINUTES

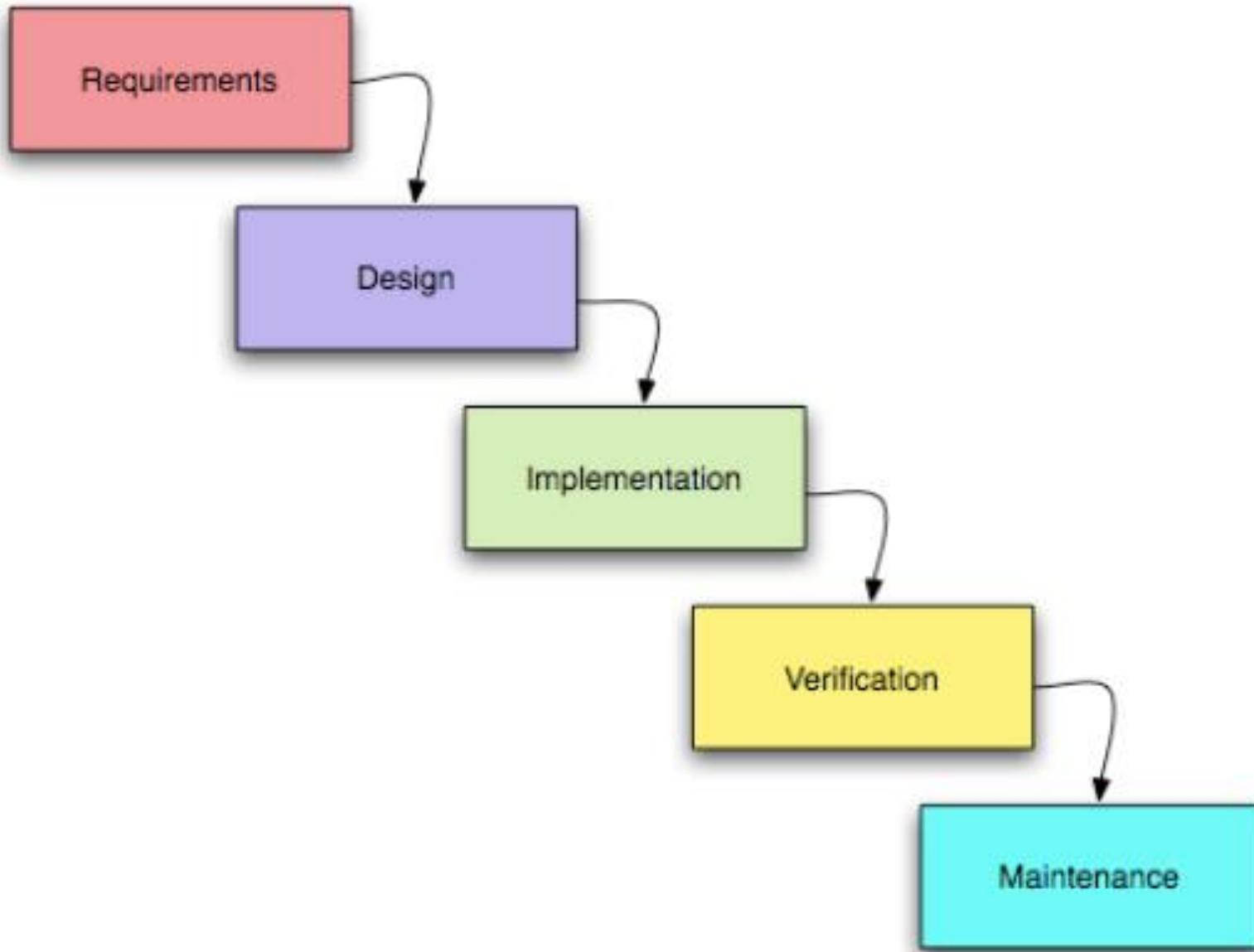
Principles, guidelines and standards help for designing

- Designing for maximum usability
  - the goal of interaction design
- Principles of usability
  - general understanding
- Standards and guidelines
  - direction for design

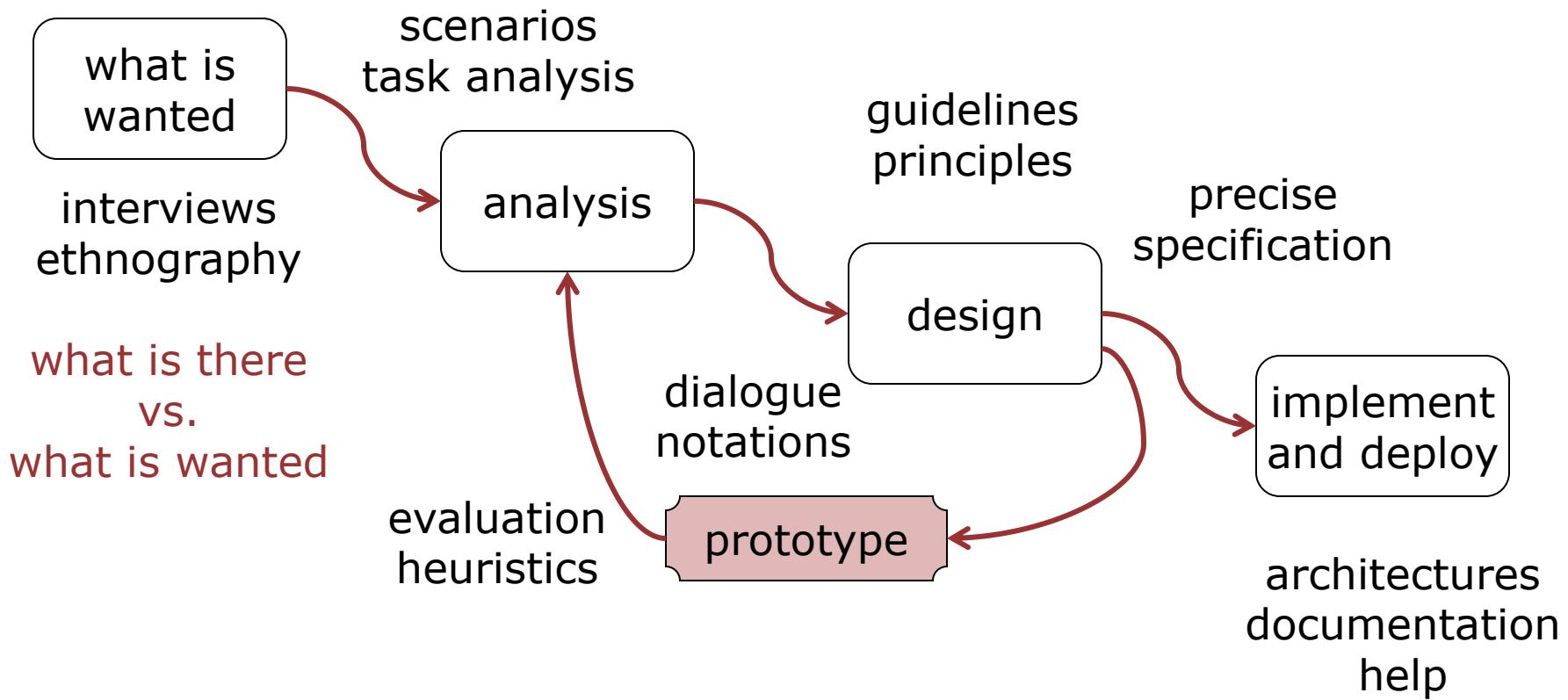
### Usability

- Easy
- Efficient
- Entertaining

One of the aims of good design



# The process of design



# User's Experience

- Interaction with a product, service, or company
  - Functional
  - Emotional
  - Sensorial
  - Social

# Functional

- Able to complete task
  - Find information
  - Submit form
  - Contact someone
  - Purchase item



# Sensorial

- Visual
  - Layout
  - Colors
  - Images
- Auditory
  - Video
  - Music
  - Ads



# Emotional

- Bring their life with them
- Interface
  - Conveys ideas and emotions
  - Sets the tone



# Social

- Interactions with other people
- Social networking
- Help features
- Chat



**Usability**  
is an important **characteristic**  
of what makes a  
**good User Experience**

# Minimize Human Cost

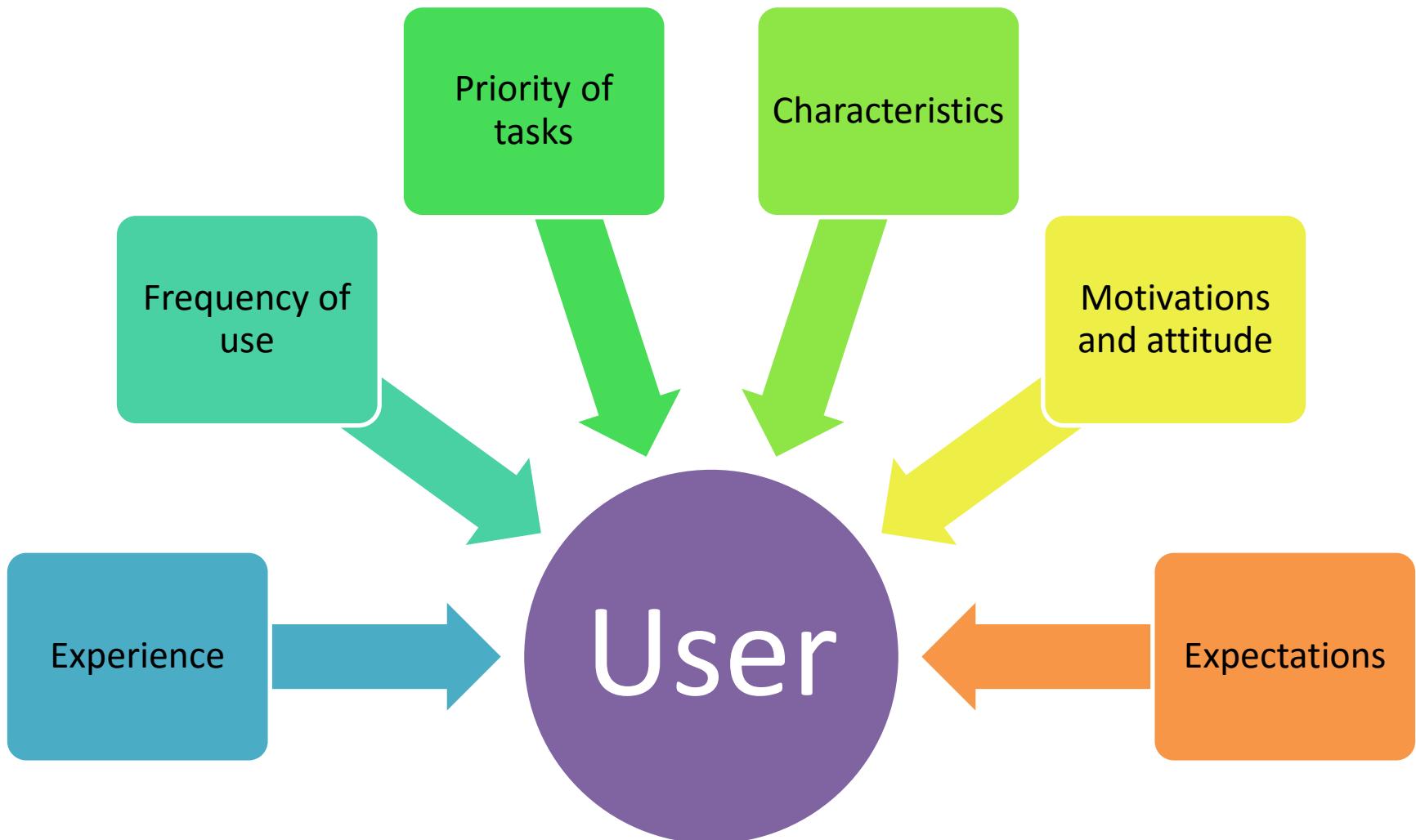
- Tiredness
- Discomfort
- Embarrassment
- Frustration
- Effort



# Benefits of Good User Experience

- Increased Usefulness
- Increased Efficiency (\$\$\$)
- Improved Productivity
  - Fewer Errors
  - Reduced Training Time
  - Improved Acceptance

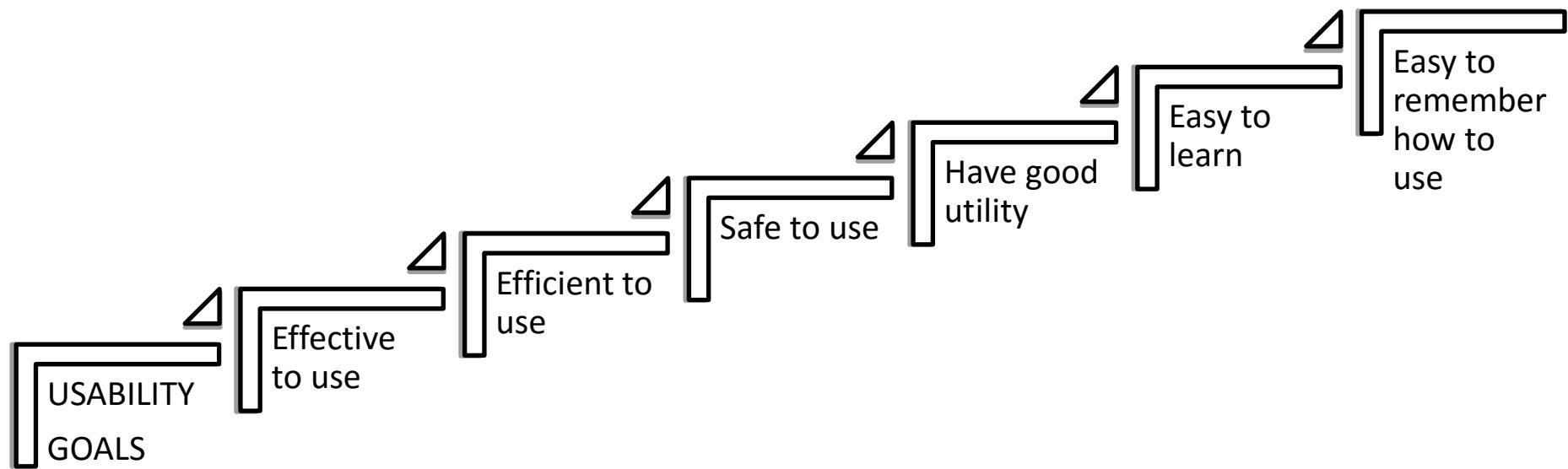
# Same Job Title, May Differ in...



# Who Are the Users?

- How many are there?
- Common complaints?
- Show stoppers?
- Understand:
  - Assumptions and stereotypes
  - Differences between users

# Usability goals



The background image shows a modern building with a glass facade and a large, illuminated spherical structure on top, possibly a sunburst or a similar decorative element. The sky is a clear, pale blue.

“it just makes sense”

“I didn’t need to  
read the manual”

“a joy to use”

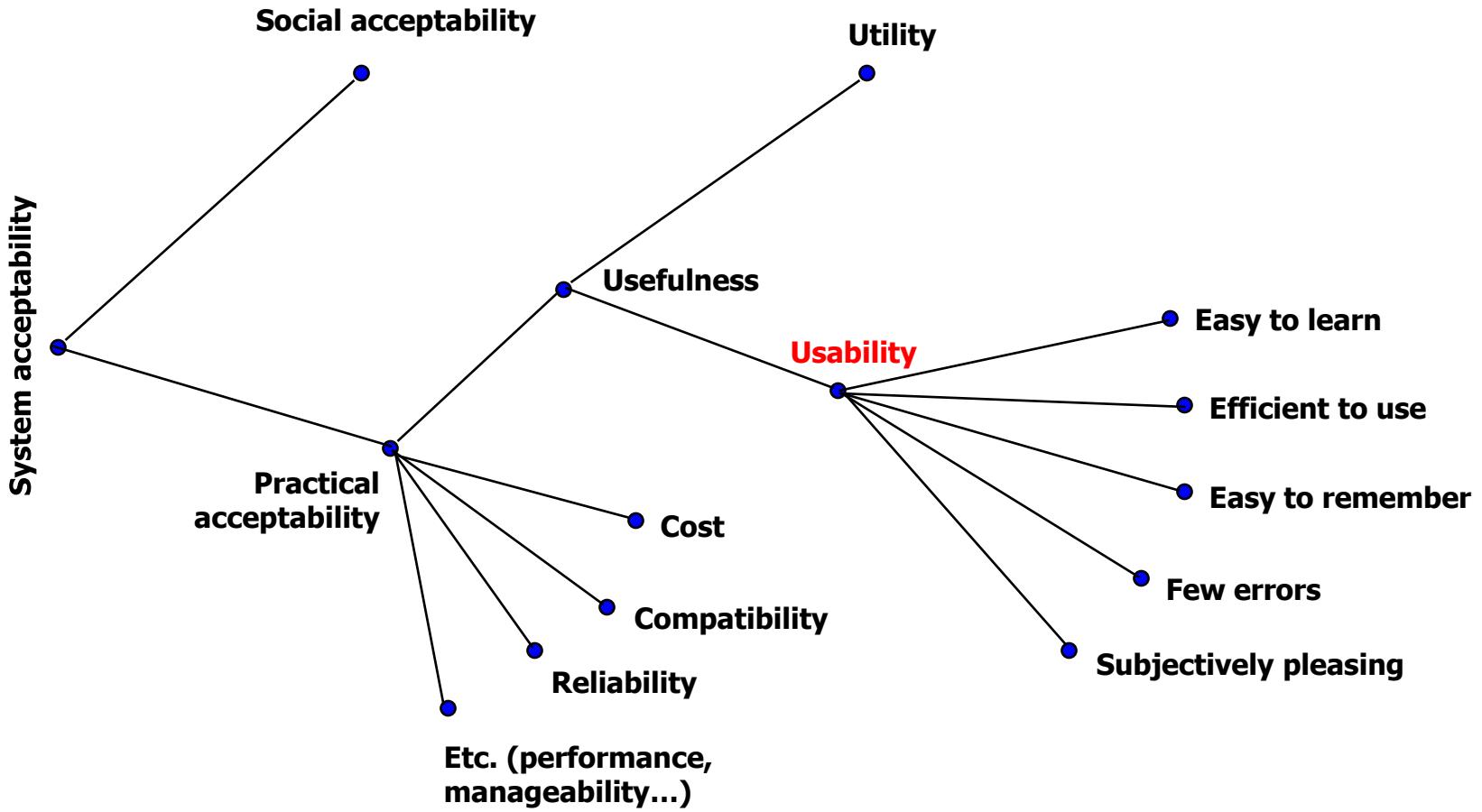
“easy and intuitive”

“everything is where I  
expect it to be”

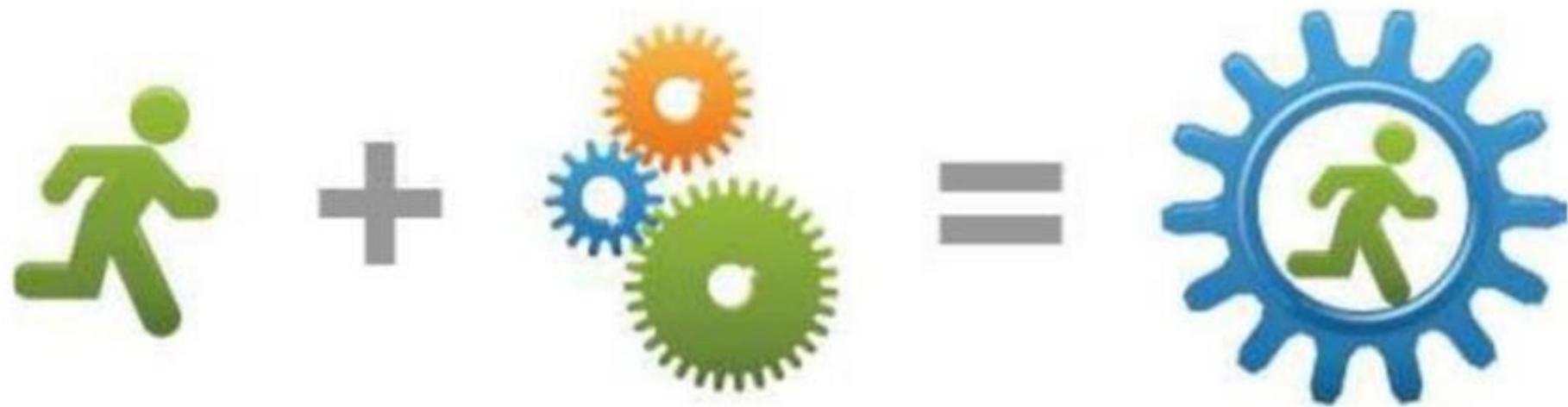
“saves me time”

**What is meant by ‘usability’?**

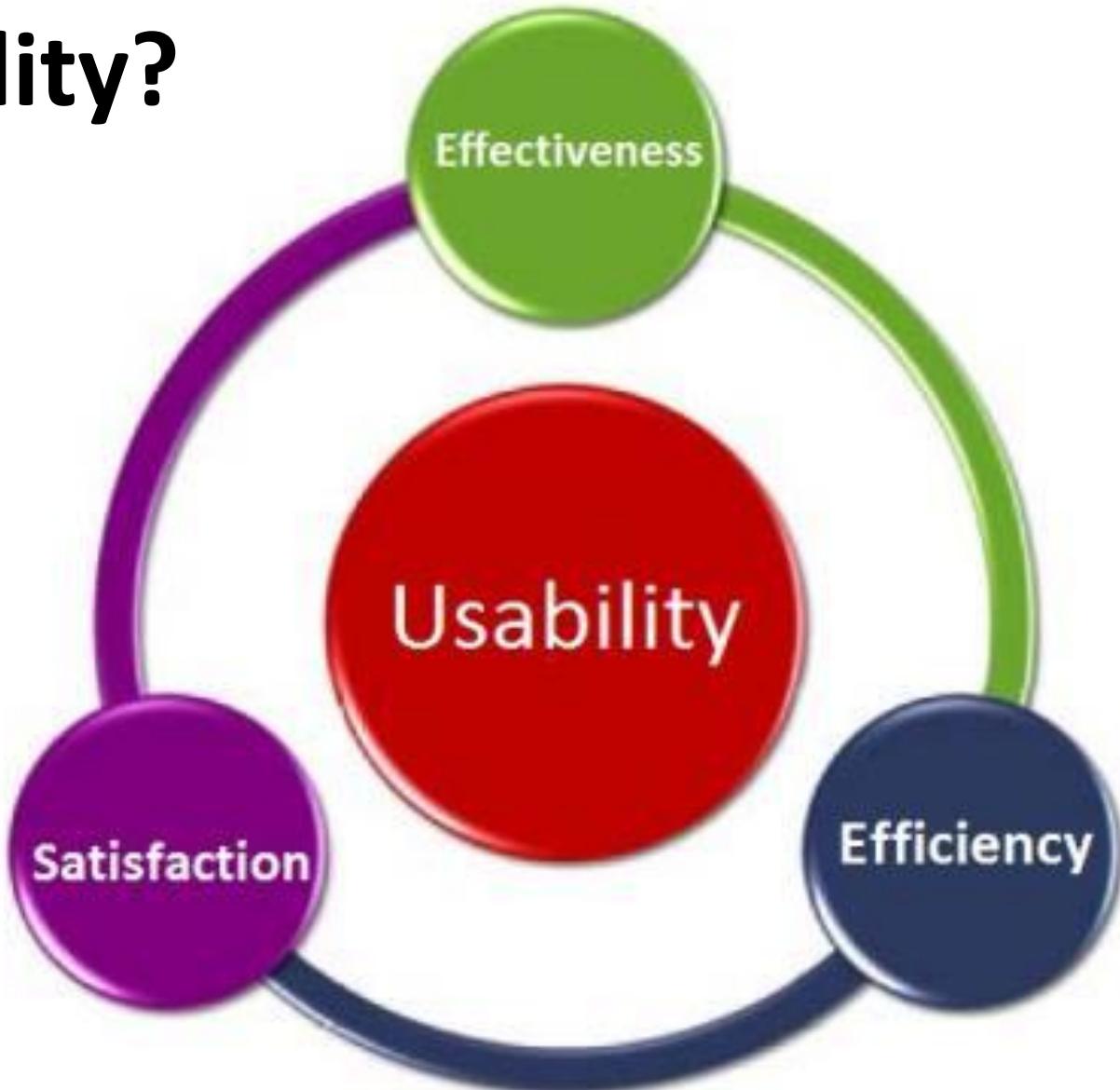
# What is Usability?



**“Usability is the science of making technology work for people.”**



# Usability?



# Benefits of usability

- Increased productivity (for the user)
- Decreased training and support costs
- Increased enrollment (sales and revenues)
- Reduced development time and costs
- Reduced maintenance costs
- Increased customer satisfaction

# Nielsen's Ten Usability Heuristics

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from errors
- Help and documentation

# Galitz's Heuristics

1. Automate unwanted workload
2. Reduce uncertainty
3. Fuse data
4. Present new info with meaningful aid to interpretation
5. Use names that are conceptually related to functions
6. Group data in consistently meaningful ways to reduce search time
7. Limit data-driven tasks
8. Include in displays only info needed by user at a given time
9. Provide multiple coding of data where appropriate
10. Practice judicious redundancy

# Galitz's WWW Heuristics

1. Speak the user's language
2. Be consistent
3. Minimize the user's memory load
4. Build flexible and efficient systems
5. Design aesthetic and minimalist systems
6. Use chunking
7. Provide progressive levels of detail
8. Give navigational feedback
9. Don't lie to the user

Galitz

# Usability principles (Nielsen 2001)



## 1. Visibility of system status

Always keep users informed about what is going on.

Provide appropriate feedback within reasonable time.

Type new password:

\*\*\*\*\*

Six-characters minimum; case sensitive

Password strength:

Strong

picnik



Fluffing clouds....

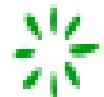
# A FORM

Enter you Phone Number



Awesome, you nailed it!

Upload your image



That's a nice picture! Now it's being uploaded.



mmm... hold on! Saving your valuable information...

**Upload the file** or [Cancel](#)



**Your password has been emailed.**

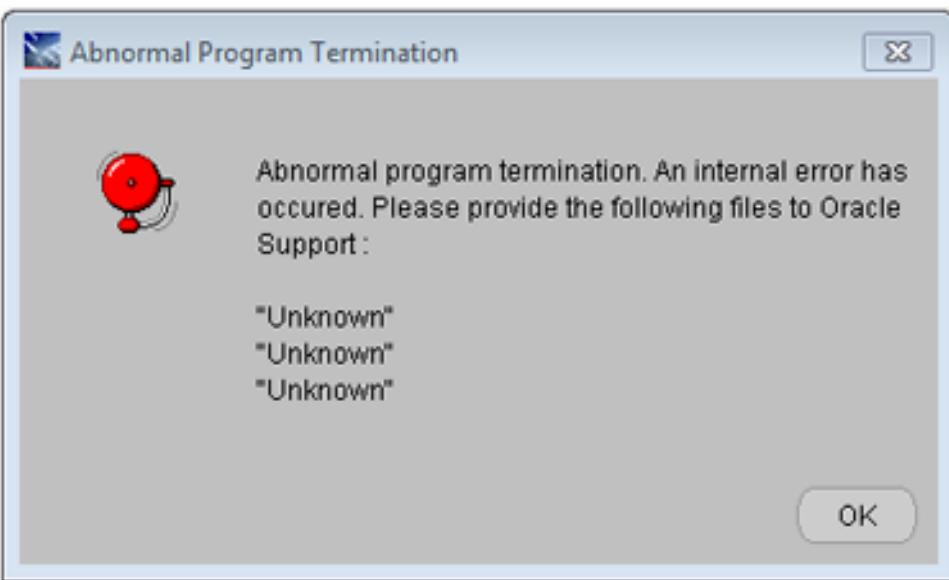
**Theresa Neil sign in**

## 2. Match between system and the real world

Speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms.

Follow real-world conventions, making information appear in a natural and logical order.





OK

Dang!

Something just went snap! But don't worry, we still have all your information so you don't have to re-enter the details.

You can do one of the following:

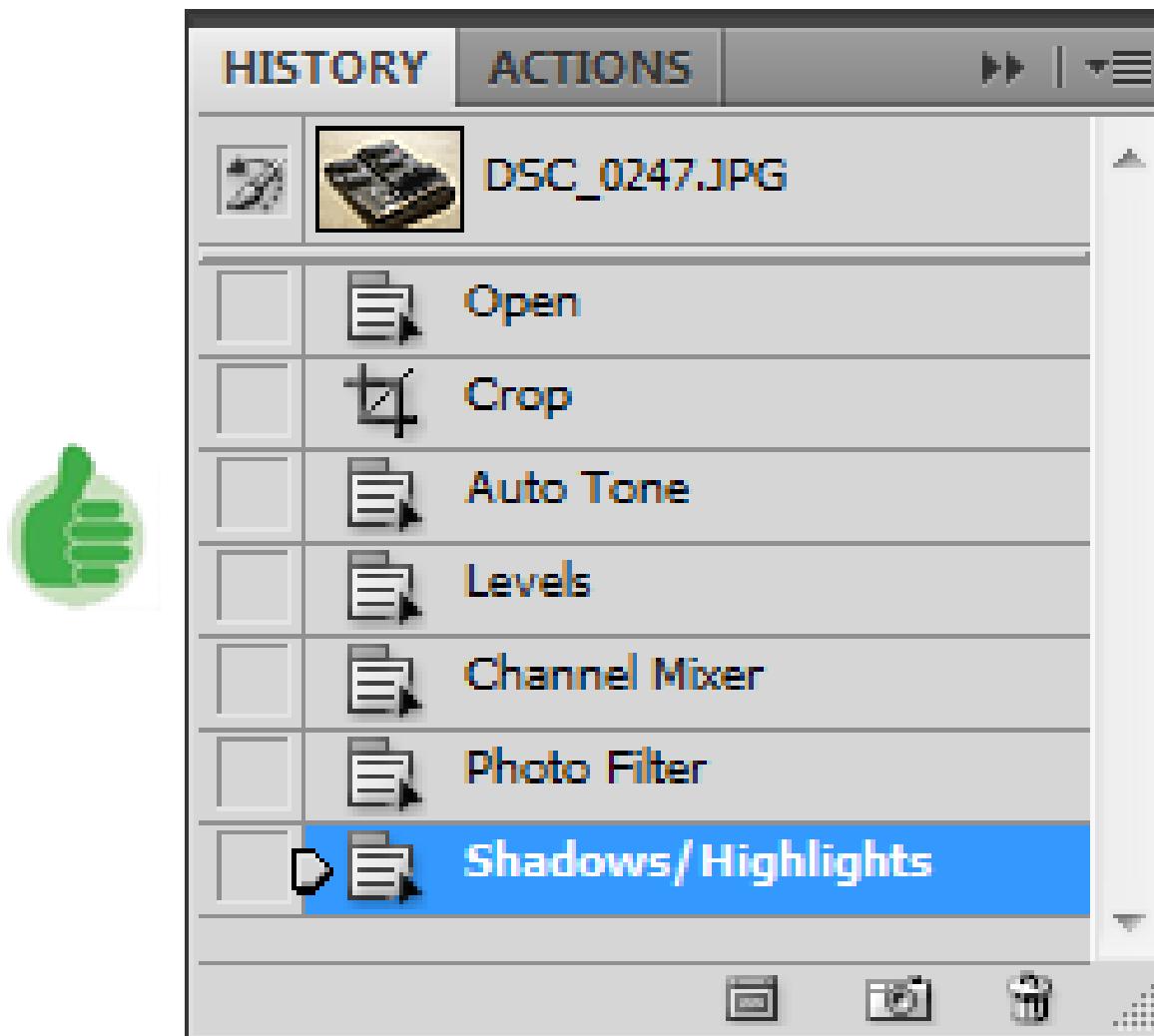
- Try saving again (with crossed fingers)
- Nah! I've changed my mind.

[Learn more about this](#)

### 3. User control and freedom

Users often choose system functions by mistake.

Provide a clearly marked "out" to leave an unwanted state without having to go through an extended dialogue. Support undo and redo.



Hold on right there!

You are about to wipe out the human race  
and cause their extinction on earth. This  
action is not reversible.

Are you sure you want to do this?

You Betcha!

Not Today



7 conversations have been moved to the Trash. [Learn more](#) [Undo](#)

Maximum upload file size: 2MB. After a file has been uploaded, you can add titles and descriptions

DSC\_0231.JPG

Crunching...

## 4. Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing.

Follow platform conventions.

[Inbox \(1731\)](#)

[Starred](#) ★

[Chats](#) 💬

[Sent Mail](#)

[Drafts \(260\)](#)

[All Mail](#)

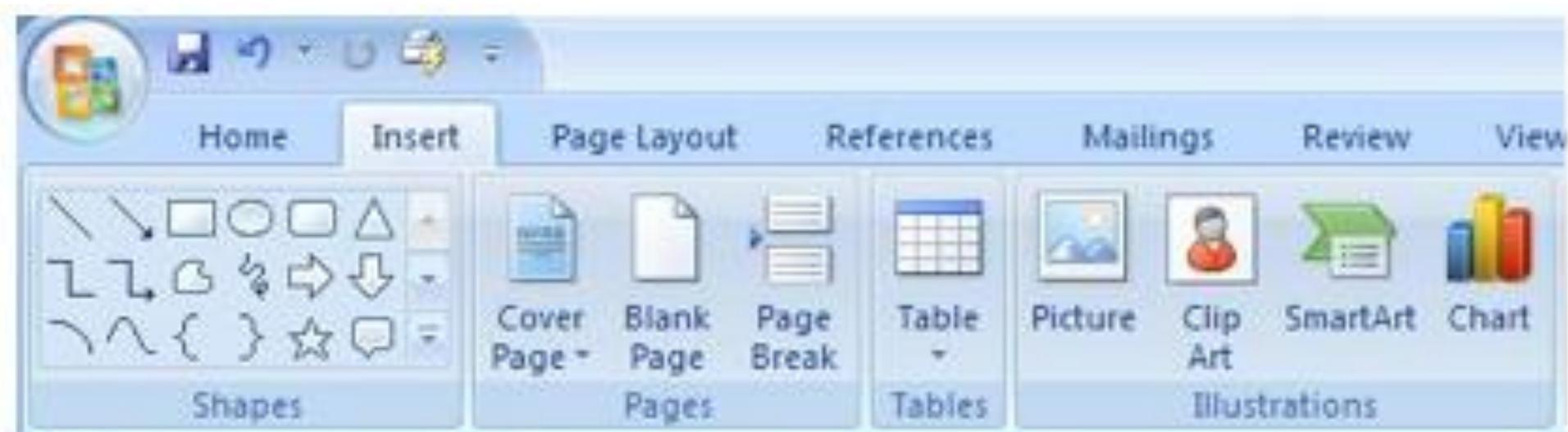
[Spam \(954\)](#)

[Trash](#)

I'm not one to complain,  
but this isn't the same  
meal I had yesterday.

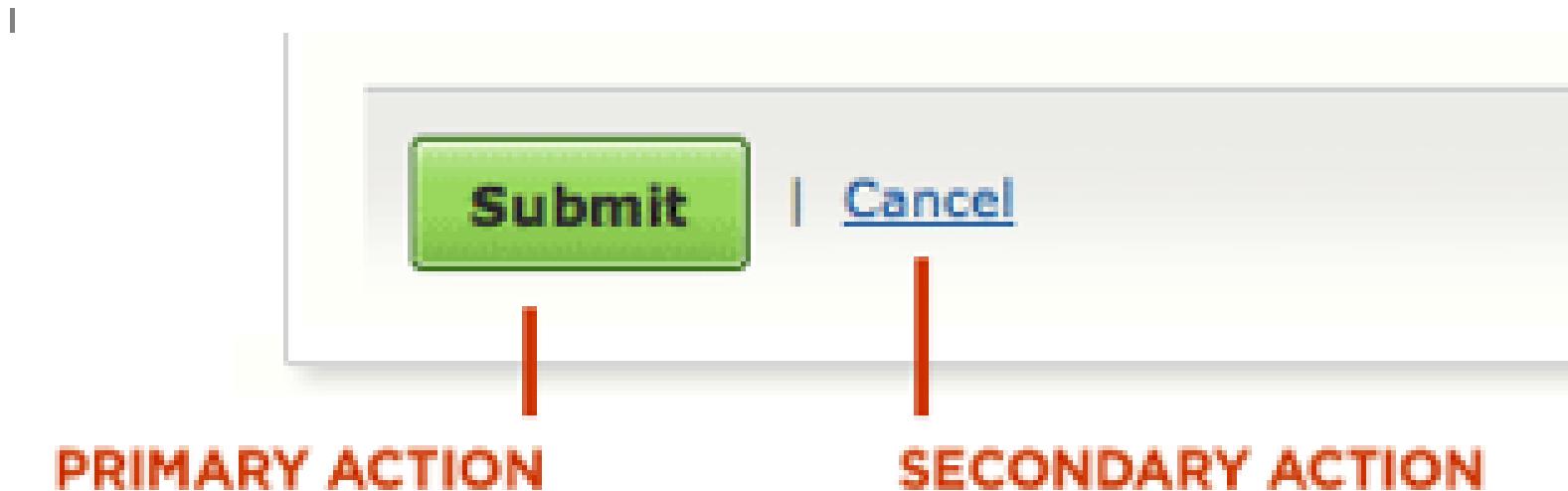






## 5. Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place.



**design**

**design within reach**  
**designer handbags**  
**designer shoes**  
**designer clothes**  
**designer dresses**  
**design sponge**  
**designer**  
**design museum**  
**designers guild**  
**designer jeans**

**6,360,000 results**

**3,430,000 results**

**2,630,000 results**

**3,120,000 results**

**1,110,000 results**

**9,990,000 results**

**285,000,000 results**

**13,600,000 results**

**630,000 results**

**2,010,000 results**

[close](#)

[Advanced Search](#)

[Preferences](#)

[Language Tools](#)

English 

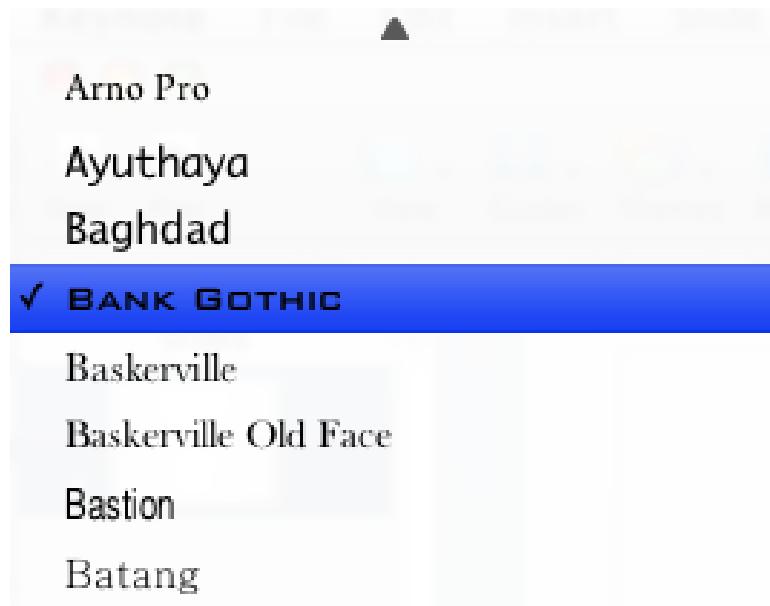


## 6. Recognition rather than recall

Make objects, actions, and options visible.

User should not have to remember information from one part of the dialogue to another.

Instructions for use of the system should be visible or easily retrievable whenever appropriate.



## 7. Flexibility and efficiency of use

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user so that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

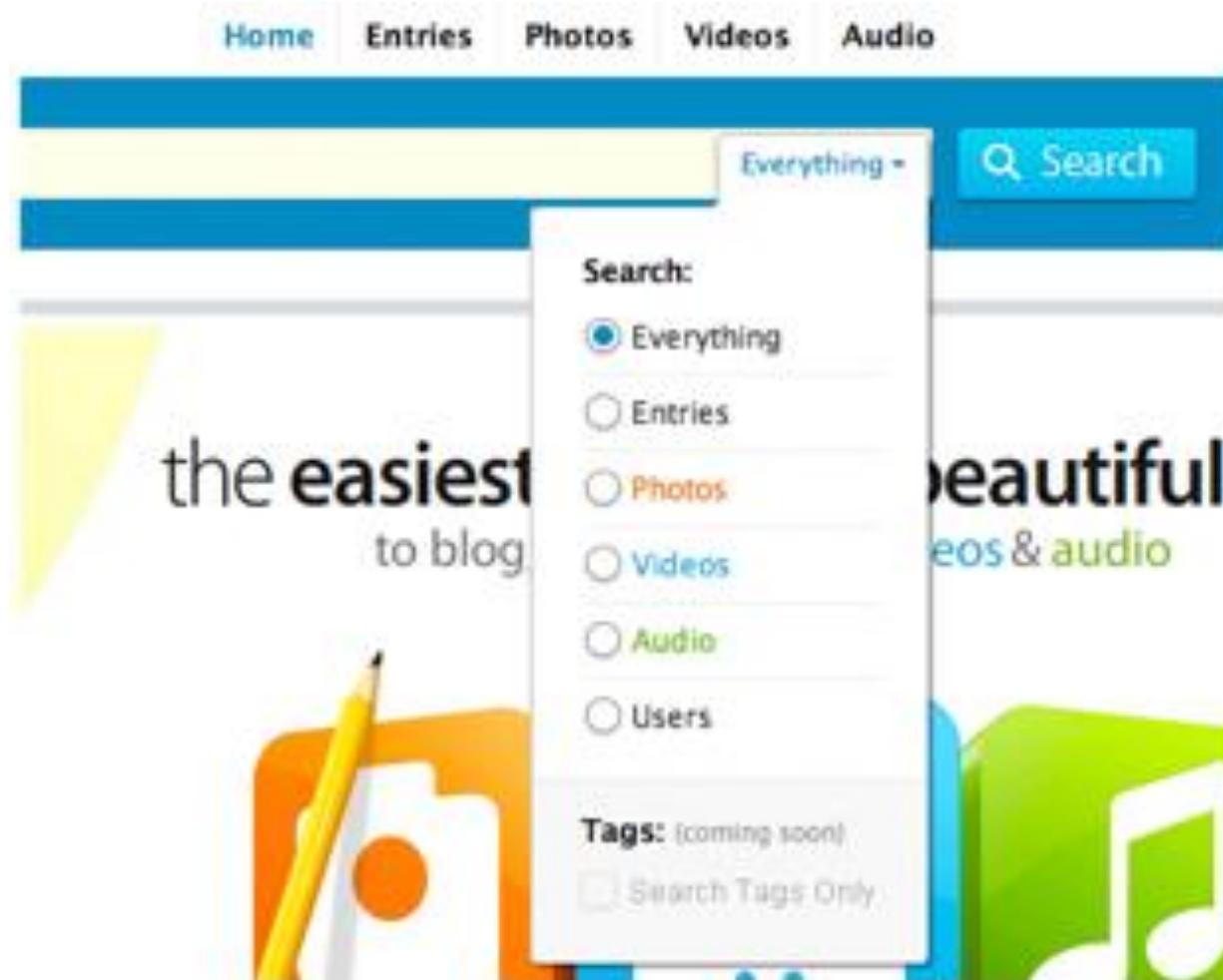
### Common Shortcuts

Add Action	Return
New Window	⌘N
Synchronize with Server	⌃⌘S
Clean Up	⌘K
Planning Mode	⌘1
Context Mode	⌘2
Inbox	⌃⌘1
Quick Entry	⌃Space

*Quick Entry's shortcut can be customized in Preferences*

## 8. Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.



## 9. Help users recognize, diagnose, and recover from errors

Expressed in plain language (no codes)

Precisely indicate the problem

Constructively suggest a solution.

### Or start a new account

Choose a username (no spaces)

bert



bert is already taken. Please choose a different username.

Choose a password

\*\*\*



Passwords must be at least 6 characters and can only contain letters and numbers..

Retype password

Email address (must be valid)

not an email



The email provided does not appear to be valid

Send me occasional Digg updates.

# Server Error in '/' Application.

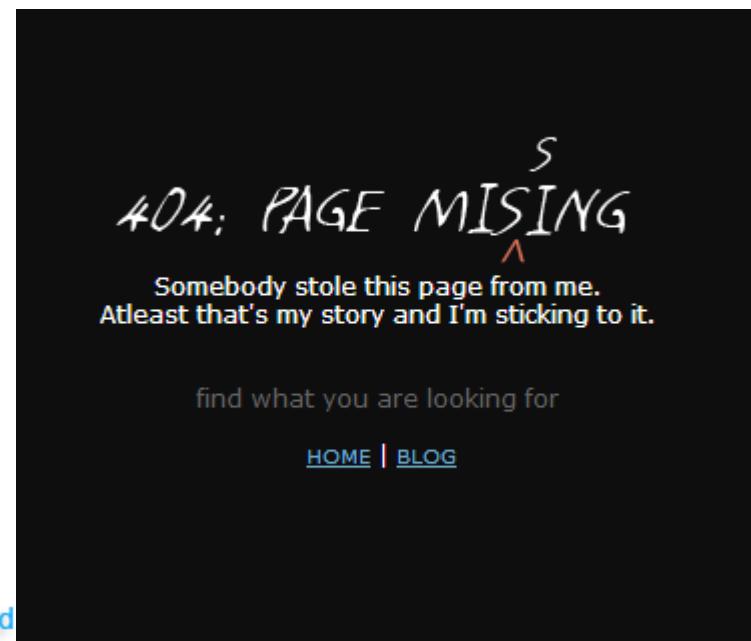
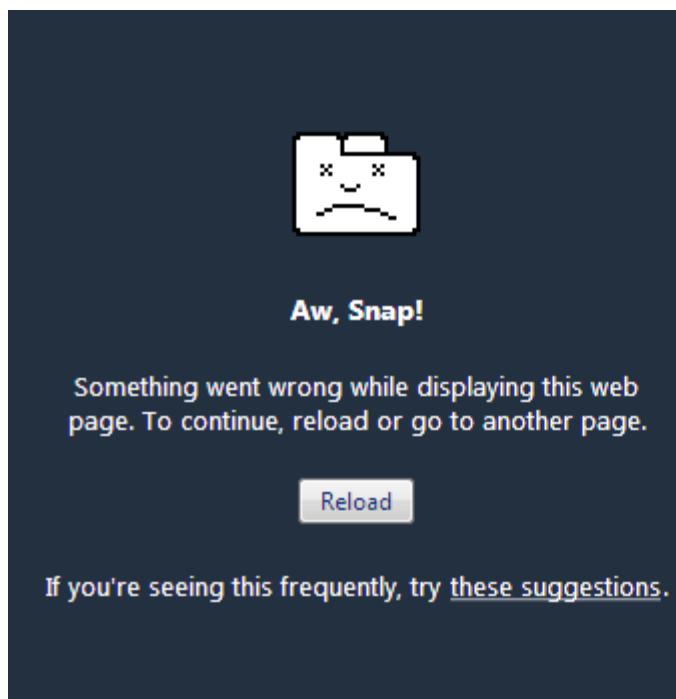
*The resource cannot be found.*

**Description:** HTTP 404. The resource you are looking for (or one of its dependencies) could have been removed, had its name changed, or is temporarily unavailable. Please review the following URL and make sure that it is spelled correctly.

**Requested URL:** [REDACTED]

---

**Version Information:** Microsoft .NET Framework Version:2.0.50727.3634; ASP.NET Version:2.0.50727.3634





## Oh no!

It seems the page you were trying to find on my site isn't around anymore (or at least around here).

[Report it missing using my contact form](#) and I'll see what I can do about it.

Whilst you're here why not check out my [articles listing](#) or [browse my blog](#)? You never know - you may just

## 10. Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation.

Help information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

The image shows a screenshot of a website for "GoodBerry". On the left, there is a testimonial from "Hi I'm Barry" who claims to be helping thousands of business owners save time and grow their online business. Below this, there is a detailed description of the service, mentioning integrated systems for websites, email marketing, and online shopping, automatic customer database growth, and a central console for managing the business. It also highlights a low price of \$19/month and no contracts. On the right side of the screenshot, there is a video player with a large play button and the text "watch the video". Above the video player, there is a dashboard displaying various metrics: 463 leads, 5838 emails sent, and 11 customers. The overall layout is clean and professional, designed to showcase the software's features and benefits.

## New To eBay

If you're just starting out and want to know how eBay works, how to register, and how to buy with confidence, get started [here](#).

## How To Sell

Visit the Seller Information Center for everything you need to know about selling on eBay. Get started [here](#).

Or, attend a [Selling Basics](#) class in your area.

## How To Buy

If you're new to buying on eBay, check out the basics, including searching and paying for items. Get started [here](#).

## Increase Your Sales

Take your eBay sales to the next level with tips about growing your business, opening an eBay Store, and Seller Best Practices—all are available at the Seller Information Center. Get started [here](#).

Or, attend a [Beyond the Basics of Selling](#) class in your area.

Quality:

Normal

Print

?

Undo

Redo

Done!

## Welcome to Picnik Collages!

Making collages from your photos has never been easier.



1 of 8

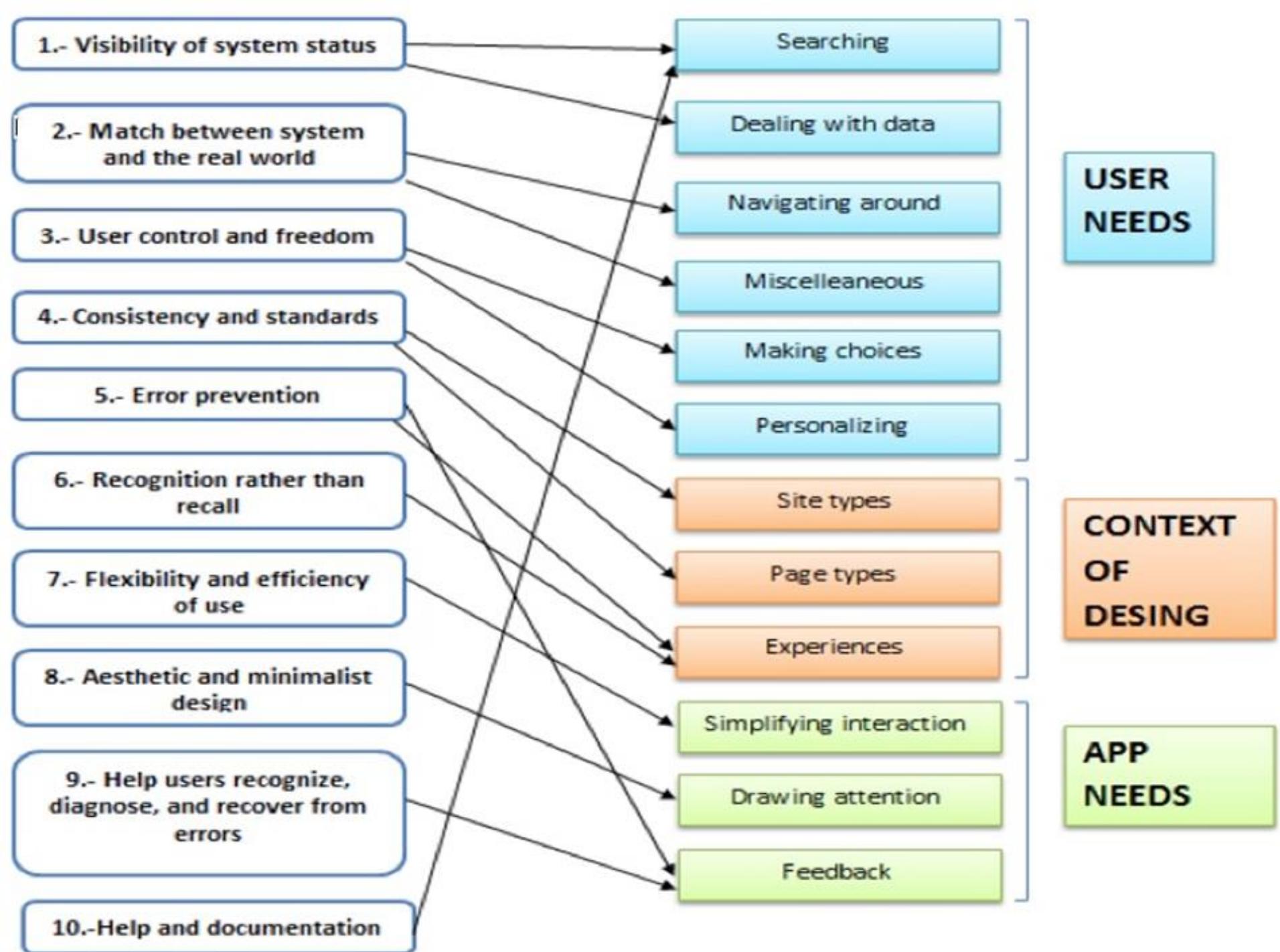
next



We are facing too many problems getting people to understand some of the best features of our product. Do you think you can take a look at it and tell us what we need to be improve?



# Activity 2



“

Usability

is

like oxygen

— you don't notice it until it's missing



— Unknown

WE BELIEVE THIS APPLIES TO ALL DISCIPLINES:

**"IF YOU THINK GOOD DESIGN IS  
EXPENSIVE, YOU SHOULD LOOK  
AT THE COST OF BAD DESIGN"**

DR. RALF SPETH, CEO JAGUAR

# Go to Your Users

- Find out:
  - Goals
  - Tasks
- Share the information with your team

# knowing what to do

- what is active what is passive
  - where do you click
  - where do you type
- consistent style helps
  - e.g. web underlined links
- labels and icons
  - standards for common actions
  - language – bold = current state or action

# Understanding User Context

- To improve usability we need to go beyond the design of interfaces
- We need to understand the **context** in which our **designs** are being used
- We also need to understand how **users** act in this context
  - domain knowledge: knowledge about the context, i.e. about the work environment and the tasks to be carried out

# Identifying Domain Knowledge

- Questions to ask:
  - purpose of the investigation?
  - Types and groups of users of the future system?
  - Constraints?
  - Appropriate techniques?

An interactive information system to help tourists/visitors to *your city*



- What kinds of knowledge might users possess?
- How can this knowledge be useful in the design of the system?



# Activity 3

# Possible Research Methods

- Many different techniques for analysing interaction:
  - Interviews
  - Questionnaires
  - Observation
  - Protocol analysis
  - Experiments
  - Log Files, workshops, Scenarios, etc
- Different methods yield different information about the users' knowledge

# Interviews

To find out what people know about their work – ask them!

- Can be highly flexible and responsive
- Can be more or less structure
- needs some planning in advance



- Can be carried out in context
- Focus of interviews
  - critical incidents
  - scenarios
- Involves audio recording with subsequent transcription and analysis of transcript
- Good for knowledge people are able to articulate
- Bad for expert knowledge and tacit knowledge

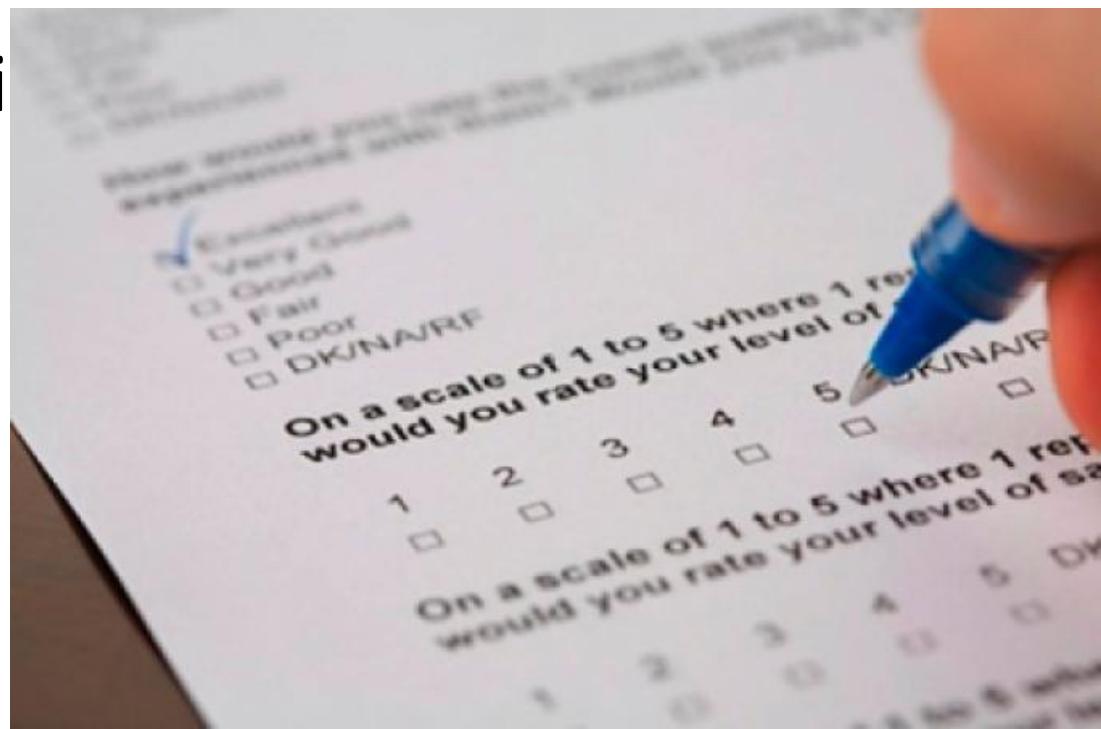
# Structured Interviews

- Examples: Repertory grids, card sorts
- Structured to tap into tacit knowledge
- Indirect probing
- Get knowledge that may not be easily articulated

# Questionnaires

- Often used for evaluating systems, finding out about attitudes and preference, surveying user population
- Fixed and preplanned set of questions
- Not flexible or responsive
- What type of information do you elicit using questionnaires?

- Benefits of questionnaires:
  - Cheap
  - Allow comparison and analysis
  - Cross check and validate other data
- When are they more useful than interviews?
- Do not use for eliciti



# Interview to Discover/Confirm...

- Build on what you've learned:
  - Tasks
  - Attitudes and Opinions
  - Problems
  - Goals
  - Experience level and knowledge
  - Technology

# Styles

- Structured
  - Question 1
  - Question 2
  - Question 3
- Open-ended
- Combination

# Use Scripts

- Memory tool for facilitator
- Don't have to follow
- Promote consistency
  - Questions
  - Order of questions

# Questions

- Quality of questions correlates to quality of answers:
  - Open-ended
  - Unbiased
  - Don't lead or make assumptions
  - Use participant's words

# Facilitation

- Remain passive (body, face)
- Don't confirm or reject answers
- Listen for vocalizations
- Watch non-verbal gestures
- Encourage participant to elaborate
- Ask your question and let them talk



# OBSERVATION



**“Millions saw the apple fall,  
but Newton was the one  
who asked why.”**

-Bernard Baruch

- People are often not good at explaining what they know and what they do
- For finding out what people ACTUALLY DO watch them in their natural environment
- participant observation
- Build up a rich

# Observation

- Tends to be in-depth and looks only at a small number of users
- Good for identifying what people do
- Identifying what knowledge is being user and why
- Time consuming
  - Ethnographic studies make take months, involvement and immersion in the field
  - Discount techniques require less time, e.g. contextual inquiry



# Why Observe?

- Great way to understand your user's situation
  - Find “cheat sheets” and other artifacts.
  - Learn *real* process they use.
  - Number and type of interruptions.
  - Find out more about them as people.

# Sit Back and Watch

- Arrive when they will be doing related tasks.
- Observe for as long as needed:
  - 1/2 hour each - quick repetitive tasks
  - >1 hour for longer processes
  - Stay out of their “space” and don’t interrupt.
  - Take photos and videos.

# Take Detailed Notes

- Write down questions and when they occurred.
- Look for patterns and differences:
  - Style of tasks
  - Order of operations
  - Environment

# Clarify Observations

- After observation ask about:
  - Why they do task?
  - What is their goal?
  - How typical was this process?
  - Parts of the process you found confusing.

# Protocol Analysis

- Allows to identify when and how user knowledge is used in an interaction
- involves observing user activity, making notes and/or video/audio recording
  - common forms of protocol analysis: “**think aloud protocol**”, retrospective protocol.
  - Analyst may prompt the user
  - Recordings are transcribed and coded using a specialise coding scheme
- Not always applicable to all situations

# Protocol Analysis

- Questions to prompt the user:
  - How do you this and that?
  - What are you trying to do?
  - What will happen, if...?
  - What has the computer done now?
  - What does this (message) mean?
  - What did you expect to happen?

# Controlled Experiments

- Always involves formulating a hypothesis
- Carried out under carefully controlled conditions
- Useful for comparing design alternatives and for usability studies
- Not at all useful for exploring the users; domain knowledge

# Comparison

- Interviews
  - Rich source of data; relatively quick to administer; flexible. Focus on what people can talk about
- Questionnaires
  - less rich in data; easy to process and quick to administer, but a lot of work in preparation; allow for large samples; rigid in content; not appropriate for knowledge elicitation

# Comparison

- Observation
  - rich data; time consuming to elicit user knowledge; focus on what people DO; analysis may be complex
- Protocol analysis
  - requires skilled researcher; requires users to talk and act; very useful for eliciting user knowledge; analysis may be complex

# Mixing Techniques

- Each technique has strengths and weaknesses and explores different aspect of the user domain
- Using several techniques can help to build up a richer and more relevant pichture
- Triangulation
  - verifying findings e.g. by using several techniques on the same group of people
  - verifying findings by using same technique on different groups of people

# Card Sorting

- Maximize probability of users finding content
- Explore how people are likely to group items
- Identify content likely to be:
  - Difficult to categorize
  - Difficult to find
  - Misunderstood



Gaffney, Gerry. (2000) What is Card Sorting? Usability Techniques Series, Information & Design.  
<http://www.infodesign.com.au/usabilityresources/design/cardsorting.asp>  
<http://www.flickr.com/photos/richtpt> via <http://creativecommons.org/licenses/by-nc-sa/2.0/>

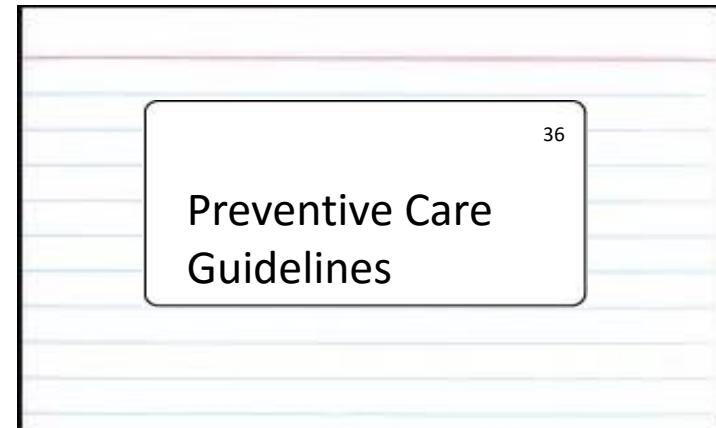
# Benefits of Card Sorting

- Easy and inexpensive
- Use to determine:
  - Order of information
  - Relationships between info
  - Labels for navigation
  - Verify correct audience



# Card Basics

- One title/subject on each card
- Short for quick reading
- Detailed enough to understand
- Supplement - short description on back
- Use printed stickers (~~handwriting~~)
- Practice session first



# Participants

- Representative of users
  - Minimum of 6
  - More participants = more data to analyze
- 
- Allow one hour for 50 items
  - 30 – 100 cards

# Facilitation/Direction

- Shuffle cards
- Ask to:
  - Group items in own way
  - Talk out loud
- Think about:
  - What expect to be together
  - When expect to see

# Grouping Cards

- Ask to
  - Describe groups and name them
  - Describe overall rationale for grouping cards
  - Show best example from groups
  - What was difficult? What was easy?
  - Happy with final outcome?

# Online Tools

- Moderated
- Un-moderated

The screenshot shows a user interface for a moderation tool. On the left, there is a vertical list of items: icecream, tuna, pumpkin, smoked bacon, pumpkin seeds, oats, and pumpkin soup. On the right, there is a main area with a title "drop to create a new category" and a box containing the word "oats". A cursor is hovering over the "oats" box. An orange arrow points from the "oats" box down to another section on the right. This second section has two boxes labeled "Click to name this category": one containing "oats" and another containing "prawns". Below these boxes is a third box containing "fresh salmon".

Drag and drop cards from the list on the left

Place cards together in groups that make sense

Optimal Sort, Optimal Workshop - <http://www.optimalworkshop.com/>

Demo: <https://livedemo.optimalworkshop.com/optimalsort/supermarketdemo>



# How Do I Find Participants?

# Create a Screener

- Guide that helps determine who will participate.
- Ask people to describe, then get details:
  - Highest level of education.
  - Computer activities.
  - Web use.
- People who pass the screener should closely match your user group definition

# Hire a Recruiter

- Allows you to focus on activity.
- Can tell if person will be a good participant.
- May already have a list they can start with.
- Good recruiters:
  - find right participants.
  - give regular updates.
  - take care of directions, confirmations, incentives, etc.

# If You Must Do it Yourself...

- Go where users go and intercept
  - Online user groups
  - Professional organizations
  - Craigslist
- Online tools thru your site:  
<http://ethnio.com>
- Final recruiting by phone.
  - Ask questions that force them to talk.
  - Don't recruit non-talkers.

# Number of Users to Test

- As many as possible (rarely statistically significant)
- Usability Testing Research (in 1990's)
  - 5 from distinct sub-group of the user population will yield 80% of the findings (Nielsen, Virzi, Lewis)
  - Assumes expert has reviewed for obvious issues
- Recommend:
  - Early tests with 8 – 12 users per user group
  - Iterative testing (3 per day, iterate, 3 new users)

# Welcome & Prepare

- Participation will help team and is appreciated.
- Purpose of research.
- Expectations of the participant.
- Sign paperwork:
  - Non-Disclosure Agreement(s)
  - Consent Form

# We're Looking for Patterns

- Identify repetition
- After pattern is found, continuation of study
  - Adds cost
  - Delays reporting
  - Low probability of many new findings

# Update Communications

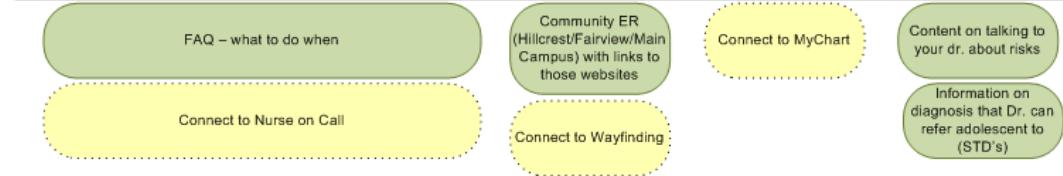
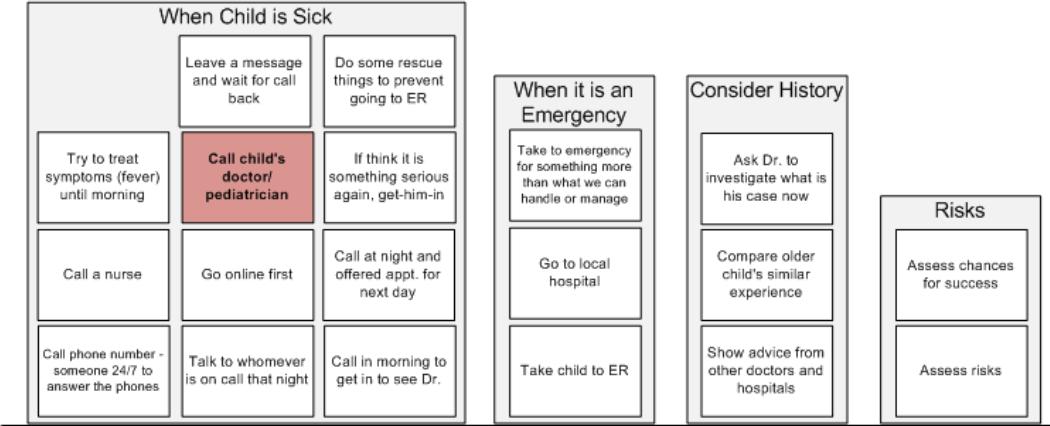
Sam Peterson

Editor, Math Specialist, 5 Years Experience



*Checking my email is tedious and time consuming. I want something that is quick, convenient, and easy for once.*

Call History - Compiled Task Analysis					
Before Scene		After Scene			
<b>Sub Tasks</b>					Jenny returns home from a weekend away.
<b>Scenario</b>					Jenny checks to see if anyone called while she was away.
<b>Considerations/Influencers</b>					Jenny checks to see if anyone left a voicemail message.
<b>Pain-Points</b>					Jenny checks to see if anyone left a voicemail message.
<b>Functionality</b>					Jenny returns to her voicemail.
					Jenny checks for missed calls she needs to return.
					Jenny adds an address to her contacts.
					Out of Jenny's own mobile phone number.



## Technology

- Does personal banking, shopping and email online

## Concerns

- Needs a good tool for tracking all of the assets for each of his projects
- Too much time is spent fixing previous projects instead of working on current ones
- Resigned to having to go back and forth with the publisher a few times to get everything just right

## Goals

- Improve the educational system by making great courses for teachers and students

## Responsibilities

- Manages many different projects at once
- Manages a great group of freelancers allowing him to focus on other things
- Keeps track of many separate assets for each project
- Checks work before passing it on to the publisher



*"I need help keeping track of all of the assets for each of my projects."*

ove the educational  
any he felt that it would  
ork for and the benefits  
training that has been  
nsibilities

# Go to Your Users

- Find out:
  - Goals
  - Tasks
- Share the information with your team

## Case study: Emergency Ambulance Dispatch

- Project to understand decision making in ambulance dispatch and criticise proposals for new technology
- Large, complex and time-critical system
  - many people with different tasks
  - different technical systems
  - outside world
  - emergency calls and normal patient transport
- Combination of techniques to analyse the situation from different angles and validate findings

# Activity 4

# Ambulance dispatch room



# Techniques Used

- Initial interviews
  - open informal interviews with senior management for background information
- Observation
  - notes and video recordings of several sessions
  - later transcription and analysis of the tapes
- Interviews
  - critical incident analysis
  - contextual interviews

# Results

- Controllers posses rich knowledge
  - about the geography
  - about the state of the world
  - about previous incidents
  - about clinical decision making
- Knowledge about computer systems also required
- Fit between technology and domain tasks?

- Context and domain knowledge is important
- It should inform the design
- Many techniques to gather and analyse user knowledge
- Techniques can be used in combination to provide richer data and possibility to cross check

# PART II

✿ progress

# What is usability and user experience?

**“The effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments”**

***ISO 13407 – User Centred Design Process for Interactive Systems***

**Effectiveness** – Can they reach their goals

- find what they are looking for
- do what they want to do?

**Efficiency** – How fast

- number of errors
- amount of effort
- number of steps?

**Satisfaction** – Was it a good/bad experience?

- Do it again?
- Recommend to others?

# Homepages

- Main questions your homepage should answer
  - What site / company is this?
  - What do they have here?
  - What can I do here (what does the site offer)?
  - Where do I start?
  - Why should I be here – and not somewhere else?

# Basic user tendencies:

- Users don't estimate own performance well
- Users change over time
- Are impatient
- See things in their own way
- Seek to minimize cognitive effort

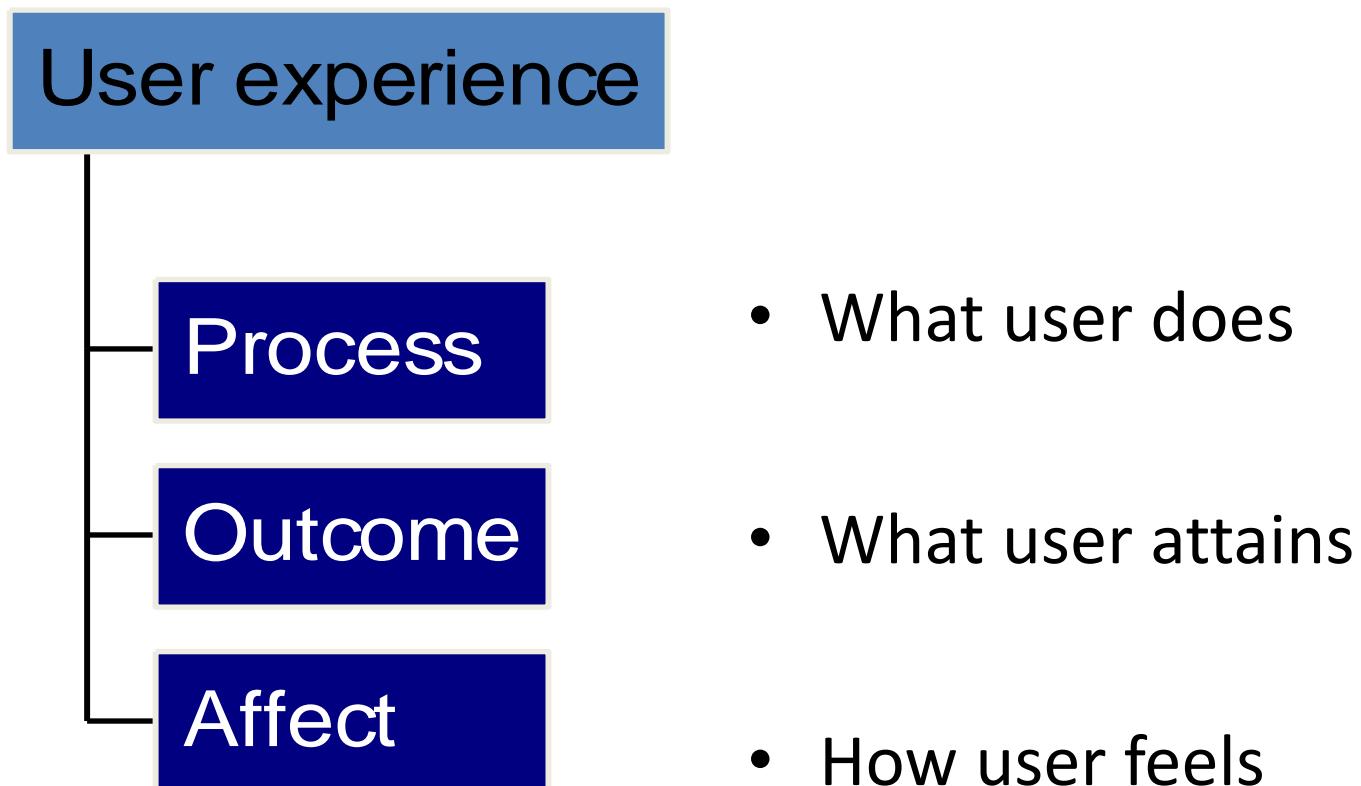
# Usability as a collection of features

- Interface is usable if:
  - Links, search engine, nav bar, back button?
  - Graphical user interfaces (GUI)
  - Based on style guide recommendations?
  - Meets Nielsen's or Shneiderman's principles of design?

# Beyond usability: P-O-A

- User experience can be thought of at three levels:
  - Process
  - Outcome
  - Affect
- Full evaluation needs to cover these bases

# Experiencing IT at 3 levels:



# Process: what the user does

- Navigation paths taken
- Use of back button or links
- Use of menus, help, etc.
- Focus of attention

The emphasis is on tracking the user's moves and attention through the information space

# Outcome: what the user attains

- What constitutes the end of the interaction?
- Purchase made?
- Details submitted?
- Information located?

The emphasis is on observing what it means for a user to feel accomplishment or closure

# Affect: how the user feels

- Beyond satisfaction, we need to know if user feels:
  - Empowered?
  - Annoyed, frustrated?
  - Enriched?
  - Unsure or wary?
  - Confident?
  - Willing to come back?

The emphasis is on identifying what the interaction means for the user

# Biggest user complaints

- Poor content
- Slow loading
- Poor aesthetics
- Unclear menu options
  - Menus with example sub-items much preferred and lead to more efficient use
- Too much clicking and “forced” navigation
- No site map
- Poor search facilities

# Importance of User Interface

- “Most important part of any computer system”
  - “Interface *is* the system for most users”
- Increasingly important
  - GUIs a big improvement over previous approaches
  - Platforms (e.g. Mac/ Microsoft) have style guides
  - 50% of code devoted to interface
- Interface should “disappear” – users can focus on **their task**, not the interface
- Biggest enemy of good interface design is time

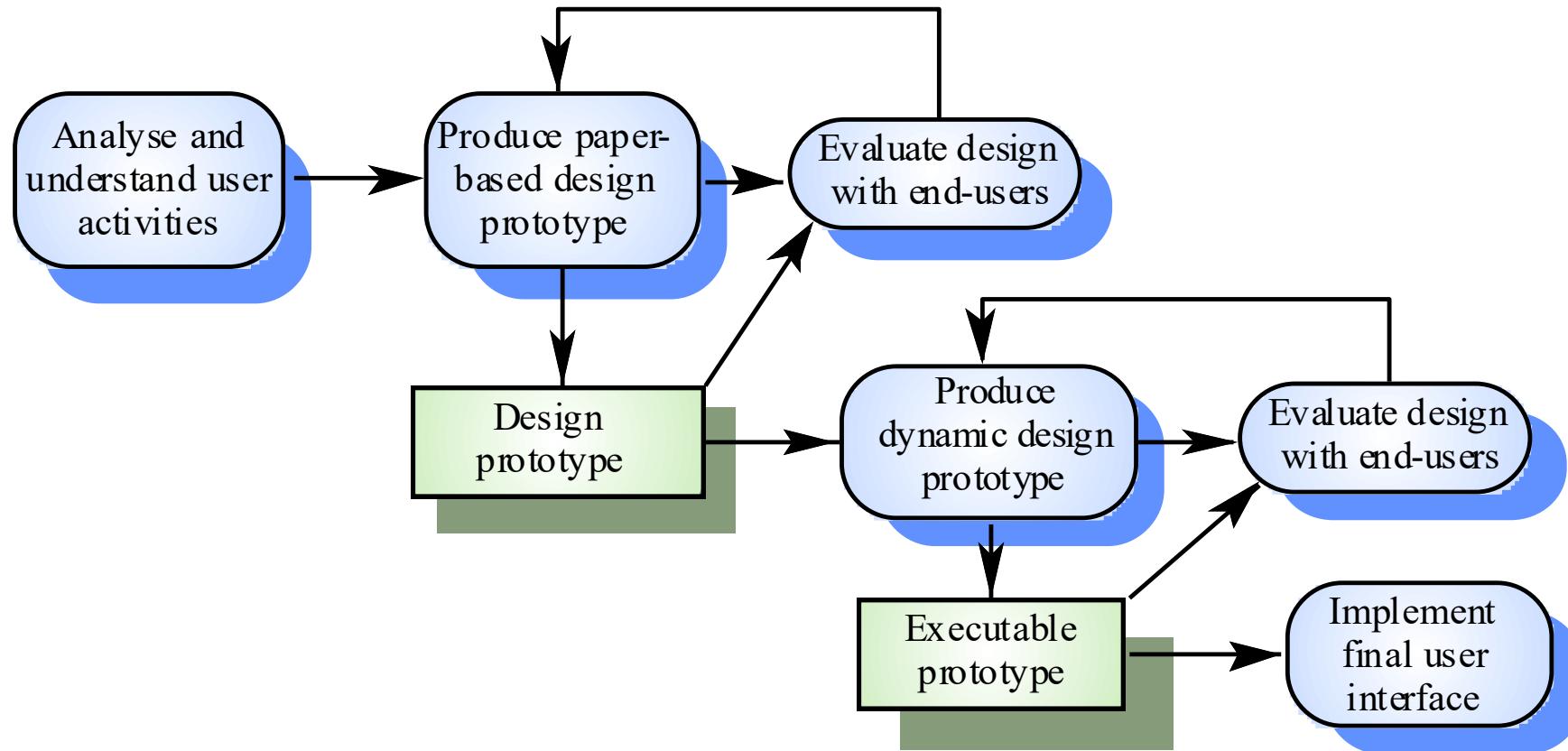
# Benefits of Good Design

- Small improvements can be worth big \$\$\$
  - Book e.g. if users work 1 sec slower on each of 4.8 million screens per year, need almost an extra person
  - Book e.g.s Redesigns have improved productivity 20%, 25%, 40%, 50% ...
  - IBM - \$1 invested in usability returns \$10-\$100
- Interface problems are treated as bugs
  - Pressman - \$1 fix during design, \$10 fix during development, \$100 fix after release
- Big Improvements can establish new products, companies, markets ...
  - the browser was a UI idea – before it, search using gopher etc was tedious.
  - AOL was successful because it was more user friendly than early leader CompuServe.

# User-centred design

- The aim of this chapter is to sensitise software engineers to key issues underlying the design rather than the implementation of user interfaces
- User-centred design is an approach to UI design where the needs of the user are paramount and where the user is involved in the design process
- UI design always involves the development of prototype interfaces

# User interface design process



# UI design principles

- UI design must take account of the needs, experience and capabilities of the system users
- Designers should be aware of people's physical and mental limitations (e.g. limited short-term memory) and should recognise that people make mistakes
- UI design principles underlie interface designs although not all principles are applicable to all designs

# User interface design principles

<u>Principle</u>	<u>Description</u>
User Familiarity	Interface should use terms familiar to users
Consistency	Comparable operations should be started the same way
Minimal Surprise	Users should never be surprised
Recoverability	Users should be able to recover from their errors
User Guidance	Meaningful feedback, context-sensitive help
User Diversity	Should provide for different types of user

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# User-system interaction

- Two problems must be addressed in interactive systems design
  - How should information from the user be provided to the computer system?
  - How should information from the computer system be presented to the user?
- User interaction and information presentation may be integrated through a coherent framework such as a user interface metaphor

# Interaction styles

- Direct manipulation
- Menu selection
- Form fill-in
- Command language
- Natural language

# Direct manipulation advantages

- Users feel in control of the computer and are less likely to be intimidated by it
- Fast and intuitive interaction
- User learning time is relatively short
- Users get immediate feedback on their actions so mistakes can be quickly detected and corrected

# Direct manipulation problems

- The creation of an appropriate information space model (metaphor) for real world tasks and objects can be very difficult
- Given that users have a large information space, what facilities for navigating around that space should be provided?
- Direct manipulation interfaces can be complex to program and make heavy demands on the computer system

# Menu systems

- Users make a selection from a list of possibilities presented to them by the system
- The selection may be made by pointing and clicking with a mouse, using cursor keys or by typing the name of the selection
- May make use of simple-to-use terminals such as touchscreens

# Advantages of menu systems

- Users need not remember command names as they are always presented with a list of valid commands
- Typing effort is minimal
- User errors are trapped by the interface
- Context-dependent help can be provided. The user's context is indicated by the current menu selection

# Problems with menu systems

- Actions which involve logical conjunction (and) or disjunction (or) are awkward to represent
- Menu systems are best suited to presenting a small number of choices. If there are many choices, some menu structuring facility must be used
- Experienced users find menus slower than command language

# Menu System Applications

- Most general purpose systems

# Things to Test

- Conformance with a requirement
- Conformance with guidelines for good design
- Identification of design problems
- Ease of system learning
- Retention of learning over time
- Speed of task completion
- Speed of need fulfillment
- Error rates
- Subjective user satisfaction

# ...System - User Interface Design Goals

- 5 human factors central to community evaluation:
  1. Time to learn
  2. Speed of performance
  3. Rate of errors by users
  4. Retention over time
  5. Subjective satisfaction
- Trade-offs sometimes necessary
- Test all design alternatives using mock-ups

# Objective Measures of Usability

- Effectiveness
  - Speed of performance, # errors (against some standard)
  - Tasks completeable by required pct of target users
- Learnable
  - Time to learn, amount of training and tech support needed (against some standard)
  - Relearning time for intermittent users
- Flexible
- Subjective satisfaction
  - Tiredness, discomfort, frustration, effort required, willingness/eagerness to use system

# Simple evaluation techniques

- Questionnaires for user feedback
- Video recording of system use and subsequent tape evaluation.
- Observation of users at work with system and “thinking aloud” about how they are trying to use system
- Instrumentation of code to collect information about facility use and user errors.
- The provision of a gripe button for on-line user feedback.

# Kinds of Tests

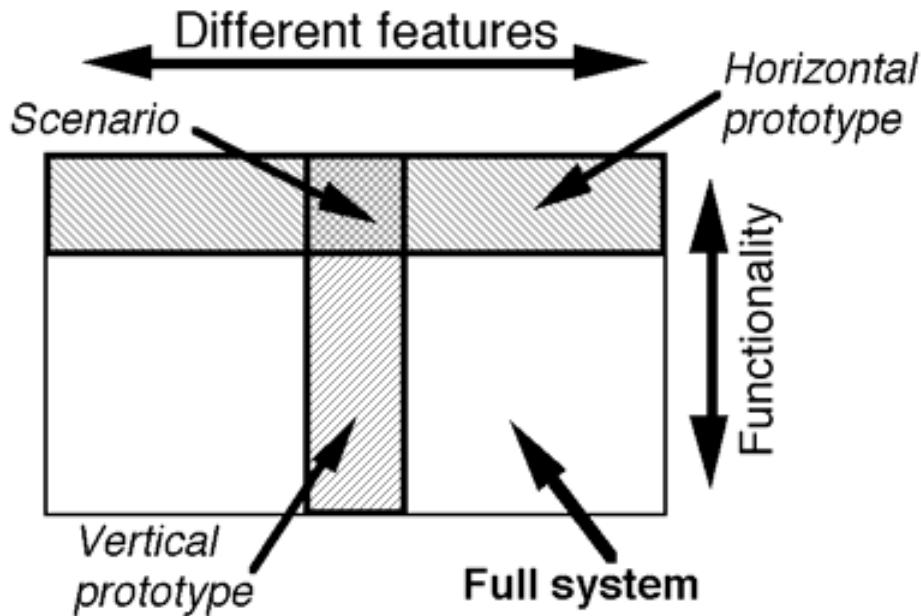
- Guidelines review
- Heuristic evaluation (will be covered last due to extensive coverage)
- Cognitive walkthrough
- Think aloud evaluations
- Usability test
- Classic experiments
- Focus groups

# Elements of Discount Usability Engineering

- Scenarios
- Simplified Thinking Aloud
- Heuristic Evaluation

# Scenarios

- Take prototyping to extreme – reduce functionality AND number of features
- Small, can afford to change frequently
- Get quick and frequent feedback from users
- Compatible with interface design methods



# **Simplified Thinking Aloud**

- Bring in some users, give them tasks, have them think out loud
- Fewer users in user testing

# Heuristic Evaluation

- Context – part of iterative design
- Goal – find usability problems
- Who – small set of evaluators
- How – study interface in detail, compare to small set of principles

# How to Conduct a Heuristic Evaluation

- More than one evaluator to be effective.
- Each evaluator inspects the interface by themselves
- General heuristics may be supplemented
- Results can be oral or written
- Evaluator spends 1-2 hours with interface
- Evaluator goes through interface > 1 time
- Evaluators may follow typical usage scenarios
- Interface can be paper

# **Norman's Four Principles of Good Design**

- State and the action alternatives should be visible
- Should be a good conceptual model with a consistent system image
- Interface should include good mappings that reveal the relationships between stages
- User should receive continuous feedback

# Galitz's Principles of User Interface Design

- To follow ... alphabetically (following book)

# Aesthetically Pleasing

- Meaningful contrast between screen elements
- Create groupings
- Align screen elements and groups
- Provide 3 dimensional representation
- Use color and graphics effectively and simply

# Clarity

- Visual elements
- Functions
- Metaphors
- Words and text

# Compatible

- With the user
- With the task and job
- With the product (past systems)

# Comprehensibility

- User should easily be able to determine:
  - What to look at
  - What to do
  - When to do it
  - Where to do it
  - Why to do it
  - How to do it

# Configurability

- Users should be able to set preferences
- Good Default Settings should be provided for non-tinkerers

# Consistency

- One of Shneiderman's 8 golden rules for interface design
- Similar components should
  - Have similar look
  - Operate similarly
- Same action should always produce the same result
- Function of elements should not change
- Position of standard elements should not change
- Same terminology used for same thing throughout
- Standards and Guidelines increase the odds of consistency

# Control

- User should control the interaction
  - Actions initiated by user
  - Actions performed quickly
  - Actions can be interrupted or stopped, and reversed
- Context maintained is from the user's perspective
- More than one way to do things
- Avoid modes
- Configurable

# Directness

- Provide Direct Manipulation
  - user selects an object, then directly performs an action on it
  - The effect of action on an object should be immediately visible
  - Available alternatives reduces memory load

# Efficiency

- Minimize eye and hand movements
  - Make user actions flow from one to another
  - Don't switch users frequently from keyboard to mouse
- Anticipate users wants and needs whenever possible

# Familiarity

- Use language and concepts familiar to the user
- Keep the interface natural
- Use real world metaphors

# Flexibility

- compatible with the user’s “skills, experience, habits, and preferences, and current conditions”
- Danger: more flexibility increases complexity of system

# Forgiveness

- Prevent errors from occurring when possible
- Tolerate and forgive common and unavoidable human errors
- When an error occurs, provide constructive error messages
- Protect against catastrophic errors

# Predictability

- User should be able to anticipate the flow of the task
- Expectations should be fulfilled

# Recovery

- System should permit:
  - Commands or actions to be abolished or reversed
  - Immediate return to a certain point if difficulties arise
- Users should never lose work due to:
  - An error on their part
  - Hardware, software, or communication problems

# Responsiveness

- Respond rapidly to user requests
- Provide acknowledgement of user actions
- Beginners need more / more informative feedback than experts do

# Simplicity

- Provide as simple an interface as possible
  - Progressive disclosure
  - Defaults
  - Minimize screen alignment points
  - Make common actions simple
  - Provide consistency

# Transparency

- Allow user to focus on the task, not the interface
  - Basic principle of direct manipulation
  - Use user's task vocabulary
  - Design interface based on task analysis

# Trade-offs

- Final Design will always represent a series of trade-offs
- People's requirements always take precedence over technical requirements



**There is no  
magic  
formula –  
you need to  
understand  
what your  
users want**

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# Recommended Readings

