Human-Computer Interaction 2

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Chapter 2: Web Interfaces 2

- Development Process
- Web Usability
- Web Accessibility
Website Development Process

1. Site definition and planning
2. Information architecture & content inventory
3. Site design
4. Site construction
5. Testing
6. Site marketing
7. Tracking, evaluation, and maintenance

» Modern approaches are more flexible & agile
Web concept

• Identify starting point
  – As-is analysis
  – SWOT
  – Benchmark

• Define goals
  – Short, medium, long term
  – Target group

• Specify main message
  – Main purpose
  – Benefit for users of target group

• Create design brief
  – Storyboard, structure, visitor path
  – Layout basics, sample screen designs
  – Text concepts, text samples
Web concept (2)

• Content creation and update
  • How is content created & updated?
  • Which interfaces are available?

• Technical requirements and infrastructure
  • Server, programming, database
  • Network
  • End user side

• Marketing issues
  • Search engine strategy
  • Advertisement

• Success measure
  • E.g., number of users, sales, support requests

• Project management issues
  • Project plan, timing, milestones, dependencies
  • Budget
  • Migration strategy (development to operation)
Planning a Website

• Identify goals, objectives, users, …

• Target **audience**
  – Usually multiple groups

• Describe briefly the main **purpose** of the site
  – About one paragraph

• Outline the main **objectives** of the site
  – If possible, 5 or less …

• Specify the **information** that will be provided on the site

• Define **success criteria** for the site
Site definition - SWOT Analysis

• General approach, not only for web site

• Assess factors in a competitive environment
  – External factors (market, competitors)
  – Internal factors (within the organization)

• Find out about
  – Strengths (internal)
  – Weaknesses (internal)
  – Opportunities (external)
  – Threats (external)
SWOT Analysis for Web Sites

• **Strengths**
  – What strength does a web presence have?

• **Weaknesses**
  – What disadvantages are created by a web presence?
  – Which information cannot be mapped to the web?

• **Opportunities**
  – What new opportunities are there for the client because of the website?

• **Threats**
  – What risks will the client face due to the web presence?
## SWOT Analysis

<table>
<thead>
<tr>
<th>SWOT Analysis</th>
<th>Internal Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strengths</td>
</tr>
<tr>
<td><strong>Ext. Analysis</strong></td>
<td>Opportunities</td>
</tr>
<tr>
<td></td>
<td>Threats</td>
</tr>
</tbody>
</table>
Structure / Information Architecture

- Structure the information that will be available
  - Categorize information
  - Identify dependencies in the information

- Relate navigation to the structure of the information

- Organization patterns
  - Linear
  - Linear with options
  - Linear with alternatives
  - ...
  - Circular
  - Hierarchically
  - Linked
Content inventory & reference wireframes

• Content inventory:
  • Identification of site elements:
    E.g., Site navigation, logo, date & location, social media links, utility links, login area, footer, recent activities, introductory text, tables, …

• Content reference wireframe:
  • Denote where which content is/was located

http://de.slideshare.net/pkattera/design-process-for-responsive-web-design
Design Processes

• Example of a traditional approach

http://viljamis.com/blog/2012/responsive-workflow/
Modern approaches?

- Problems with waterfall model?
- ISO 9241:210?!
Design Processes

- Recent approaches

http://viljamis.com/blog/2012/responsive-workflow/
Design Processes

• Recent approaches

http://de.slideshare.net/pkattera/design-process-for-responsive-web-design
Create a Basic Design

• Identify the main categories of pages

• Create a design for each of these categories
  – What is on the page (content, navigation, ads, …)
  – Where are elements on the page
  – How to deal with different screen sizes?
  – „Mobile first“ strategy?

• Consider
  – The information architecture
  – The navigation structure
Typical page categories

- Homepage
- Information pages („the content“)
- Sitemap
- „What’s new?“ pages
- Search functionality / Index
- Contact & feedback
- FAQ
- Error pages

http://www.webstyleguide.com/
Text Design

• Write down (=design) all contents of a page as text → Potential input from content inventory
• Often underrated: Content is most important → Reason why people visit!

• Plain text or HTML without styles
• Allows to verify order of content
• Also: That’s how screen readers will read the page

• Not necessarily the final draft, may be refined

http://viljamis.com/blog/2012/responsive-workflow/
# Text Design

## RESPONSIVE DESIGN

I believe that all content on the web should be accessible to anyone using any kind of device to access the internet.

Read more →

## WHO AM I

I’m a UI/Web Designer and Developer from Finland who works with the wonderful people at Kisko Labs. I’ve been designing web sites for over a decade.

## LATEST FROM BLOG

Grids in design are kind of like the scales in music. They give you a way to anchor your layout elements and typography to a certain rhythm.

http://viljamis.com/blog/2012/responsive-workflow/
Sketch

- Initial drafts
- Rapid concept development
- Basic composition / Layout
- Wireframes

http://www.eightyonedesign.co.uk/images/blog/graphic-design-process-web.jpg
Prototype

• HTML / CSS
• Real content
• Prototype early!
  – See how layout responds to different viewports
  – Discuss early with client & react to problems

http://viljamis.com/blog/2012/responsive-workflow/
Visual Design

- Before & after prototyping
- Actual design
- Typography

- Tools: Browser, Photoshop, Fireworks, GIMP, …

http://viljamis.com/blog/2012/responsive-workflow/
Quick Tour: Basic Design Guidelines (1)

• Text
  – Scannable
  – Highlight keywords
  – Headings & subheadings
  – Bulleted lists
  – Structure & white space

• Writing
  – Inverted pyramid (conclusion at the beginning)
  – Shorter texts than for printed material (e.g., 50%)
  – User’s language

• Graphics
  – Use where appropriate
  – Consider size
  – Alternative text (→ accessibility)
Quick Tour: Basic Design Guidelines (2)

• Navigation
  – Consistent control over the whole site
  – Keep browser functions intact (back, forward)
  – Text menus

• Context
  – Sitemap
  – Context of page within site
  – Previous / next
  – Navigation: Table of contents, breadcrumbs

• Links
  – What the web is all about
  – No dead end pages
Web Typography

• Books: up to 2400 dpi
• Typical screens
  – Early computers: 72-96 dpi
  – Today: 100-200 dpi
  – Smartphones: up to 600 dpi
• Things to consider
  – Size
  – Contrast, color
  – Whitespace
  – Hierarchy
  – Typeface
    • Few commonly installed fonts
    • Alternative: web fonts (e.g., FontSquirrel, Typekit)

http://webdesign.tutsplus.com/articles/typography-basics-for-developers--webdesign-14025
http://ilovetypography.com/2008/02/28/a-guide-to-web-typography/
Rules of Thumb for Text Layout

• Good indicator: 45 to 75 characters per line
• Increase line spacing
• Separate paragraphs by at least an empty line
• Use easily readable, screen-optimized typefaces
• Specify alternatives using CSS
• DON’T USE CAPITALS ONLY
• Details about web typography: http://webtypography.net/

• Responsive layouts:
  – Media queries to adjust length of line, e.g.,
    • increase font size
    • decrease padding of container (or both)
  – http://www.elliotjaystocks.com/blog/responsive-web-web-0ypography/
About Text and Links

• Be short and precise
• Page titles should include important information (used in bookmarks & by search engines)
• Think global - worldwide visitors
• Useful link texts (no „click here“)
• Maybe useful:
  – Navigation links
  – Content base links
  – External links
• Links in written paragraphs: might counterproductive as they invite to leave while reading...
Test & Discuss

• Testing early and repeatedly saves time & money
• Test…
  – in simulated environments
  – on different (actual) devices
  – with different browsers
  – with users

• Discuss potential designs
  – With your customer
  – Show actual HTML prototypes

http://viljamis.com/blog/2012/responsive-workflow/
Site Construction & Testing

Typical results

• Finished HTML, JS, CSS templates
• Navigation structure
• Graphic design, illustrations, photography
• Proof-read content
• Technology selection
• Content migration plan
• CMS framework
• …

➡ Test & verify everything

• Visual appearance
• Technical implementation (e.g., https://validator.w3.org/)
Site Marketing

• Advertisements
  – Print media
  – Radio & TV
  – Search engines (AdWords, Bing Ads, …)

• Business cards, bills, mailings, manuals, packaging

• Press releases, posters, billboards, …
Maintenance, Tracking, and Evaluation

• Maintenance
  – Keep server running
  – Load balancing
  – Backups
  – Updates
  – Intrusion detection

• Tracking / Web Analytics

• Evaluation
  – Interpret collected data
  – Relate to
    • Defined web site goals
    • Web usability measures
Chapter 2: Web Interfaces 2

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- Web Usability
  - Basics
  - Usability Evaluation
  - Errors
- Web Accessibility
What is web usability?

• ... not a single issue!

• Main characteristics
  – related to general usability:
    • Effort for learning
    • Effectiveness and efficiency of use
    • Recall / Memorability
    • Accuracy / error frequency and severity
    • Satisfaction
    • Emotional response
What is web usability?

It is concerned with:

• Functionality
• Operation and control
• Navigation
• Language
• Feedback
• Consistency
• Error prevention
• Visual clarity
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Goals of Usability Evaluation

• Understand what people really do on a website

• Verify if users find the „red routes“

• Identify areas for improvement
Usability in Web Projects

• During all project phases
  – Analysis & planning
    • E.g., interviews, focus groups, personas, use cases
  – Concept & design
    • E.g., prototypes, card sorting, tree testing, usability tests
  – Implementation
    • E.g., expert analysis, (remote) usability tests
  – Live system / improvement
    • E.g, web analytics / user tracking, surveys, (remote) usability tests
Usability Methods for the Web

- Interviews
- Focus groups
- Personas
- Use cases
- Prototypes

See MMI1
Usability Methods for the Web (2)

• Card sorting
  – Which information architecture do users prefer?
    • Prepare cards with all elements
    • Let users organize them
  – e.g., http://www.usability.gov/how-to-and-tools/methods/card-sorting.html

• Tree testing
  – Evaluate effectiveness of existing information architectures
  – Do users find items in page hierarchy?
  – Basis: stripped-down version of sitemap
  – Tasks: Click through to complete certain tasks
  – e.g., https://www.optimalworkshop.com/treejack.htm
Usability Methods for the Web (3)

• Usability tests
  – On „critical questions“, e.g.,
    • How long does it take to find the address
    • How long does it take to buy the license key
    • Do they find feature XY
    • Which products do they sell?
  – Lab or remote tests

• Analyse user behavior / user tracking
  – Web analytics
  – Advance tracking
  – Eye gaze
  – Emotional response

• Expert evaluation
  – Heuristic evaluation (Nielsen), checklists
  – Task oriented: cognitive walkthrough

• Accessibility analysis
User Tracking / Web Analytics

• Automated analysis:
  – Webserver logfiles
  – Self-hosted tools / plug-ins, e.g., Piwik ([www.piwik.org](http://www.piwik.org))
  – External providers (e.g., Google Analytics, eTracker, …)

• Collect usage behavior, e.g.,
  – Duration of a visit
  – Page views, path of the visit, click map
  – Bounce rate
  – Referrer (search engines - keywords!, other pages, direct access)
  – Visitor details: Location, language, technical details
Web Analytics

Screenshots from http://demo.piwik.org/
Web Analytics

- From Internal Pages:
  - forum.piwik.org/list.php?2: 15%
  - forum.piwik.org/list.php?15: 7.8%
  - forum.piwik.org/login.php: 5.5%
  - forum.piwik.org/list.php?9: 4.7%
  - forum.piwik.org/read.php?2,829: 3.1%
  - Others: 64%

- To Internal Pages:
  - forum.piwik.org/list.php?2: 41%
  - forum.piwik.org/list.php?15: 16%
  - forum.piwik.org/list.php?9: 8.4%
  - forum.piwik.org/login.php: 4.2%
  - forum.piwik.org/login.php: 4%
  - Others: 26%

- Incoming traffic:
  - 128 from internal pages
  - 1 from internal searches
  - 42 from search engines
  - 349 from websites
  - 0 from campaigns
  - 180 direct entries

- Outgoing traffic:
  - 379 to internal pages
  - 106 internal searches
  - 0 downloads
  - 87 outlinks
  - 286 exits

- 33 page reloads
Web Analytics

Conversions overview by type of visit

Goals by Referrers
- Referrer Type
  - Keywords
  - Websites
  - Search Engines
  - Campaigns

Goals engagement
- Visits to Conversion
- Days to Conversion

Goals by User location
- Country
- Continent
- Region
- City

Goals by User attribute
- Visits by Server Time
- Custom Variables

Goals by Campaign
- Name
- Keyword
- Source
- Medium
- Content
- Source - Medium
Advanced Tracking

• Online (live) tracking of user behavior
  – Mouse movement
  – Form entry / keystrokes
  – Scrolling
  – Clicks / Page visits

• Analyse usage
  – Full session replay
  – Heatmaps:
    Clicks, movements, scrolls, attention
  – But: Be aware of interpretation, e.g., no useful correlation between mouse movement & gaze pattern
    http://www.simpleusability.com/beinspired/2011/01/mouse-eye-tracking-how-useful-is-it/

• „In the wild“ experiment
  – Track ordinary page visitors
  – Natural setting for „participants“
  – Privacy?!

http://www.actualinsights.com/2013/5-mouse-tracking-tools
Eye-Tracking

- Visualizations, e.g.,
  - Heatmaps
  - Scan paths
  - Parallel scan paths
- Lab experiment
  - Artificial setting
  - Time to conduct experiment
  - Costs
  - Number of participants?
- What do people look at: Gaze behavior
  - Interpretation: Engagement / Confusion? Both?!
Emotional Response

• „Neuromarketing“

• Brain-computer interfaces (BCI) / EEG
  – Measure brain waves
  – Try to infer details about emotional state:
    • Excitement
    • Engagement
    • Meditation
    • Frustration

• Other physiological measurements to infer arousal, e.g.,
  – Skin conductance
  – Heart rate (variability)

• Rather novel technologies, keep in mind regarding accuracy & interpretation
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Errors, Mistakes, Problems

• There are many existing web design mistake lists
  – Use to avoid problems
  – Provide basis for checklists
  – Evaluate usability

• Missing content
• Network errors
• Coding errors
• Broken links

• e.g., http://www.entrepreneur.com/article/234129
Top 10 Mistakes: Web Design (2011)

1. Bad search
2. PDF files for online reading
3. Not changing color for visited links
4. Non-scannable text
5. Fixed font size
6. Page titles with low search engine visibility
7. Anything that looks like an advertisement
8. Violating design conventions
9. Opening new browser windows
10. Not answering user’s questions

http://www.nngroup.com/articles/top-10-mistakes-web-design/
How to Avoid Design Errors?

• Understand the Web
  – Why are people using the Web?
  – Why do people choose one site over another?
  – How do people access web pages?

• Site purpose

• Structured design & development process

• Web style guides

• Keep usability principles in mind
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Accessibility & Universal Design

• Why is it an issue?
• Types of disabilities
• Design principles
• Assistive technologies
• Accessible guidelines and tools
Why is Accessibility Important?

• United States (2010):
  – 56.7 million people (18.7 % of the population) had some level of disability
  – 38.3 million people (12.6 %) had a severe disability
  – 12.3 million people needed some personal assistance for daily living

  From http://www.census.gov/prod/2012pubs/p70-131.pdf

• Germany (2013):
  – 10.2 million people (13 % of the population) had some level of disability
  – 7.5 million people (9.4 %) had a severe disability

  From https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/Gesundheit/Behinderte/BehinderteMenschen.html
... why is it important?

Germany (2011)

- Disabilities occur more frequently with increasing age
- 75'000 blind people
- 351'000 with any visual impairment or blind
- 290'000 hard of hearing or deaf
- 977'000 with motor deficiencies (movement & control of body parts)

[Source](https://www.destatis.de/DE/Publikationen/Themen/BehinderteMenschen/Schwerbehinderte21051011904.pdf?__blob=publicationFile)
... why is it important?

• Robbing / loosing clients
• Legal obligations
• Ethically and morally correct
• No support can lead to bad PR
• Being accessible can win loyalty and trust
• It is not difficult to include accessibility
• It also helps other target groups:
  – E.g., mobile users
  – Search engines (-> Optimization!)

• Do not implement as add-on but from the beginning!

With content from:
http://www.webdesignerdepot.com/2015/04/8-reasons-to-embrace-website-accessibility/
Legal Obligations

• In Germany:
  – Act on Equal Opportunities of Disabled People
    (Behindertengleichstellungsgesetz, BGG, 2001)
    http://www.gesetze-im-internet.de/bgg/
    • Prohibition of discrimination
    • Accessibility
  – Verordnung nach § 11 BGG - Verordnung zur Schaffung
    barrierefreier Informationstechnik (BITV 2.0)
    http://www.gesetze-im-internet.de/bitv_2_0
  » Required by law (Germany)
    • Since 2003/12/31 for information target at impaired people
    • Since 2005/12/31 for general information
    • At least for public institutions

• Similar in other countries (e.g., USA: Section 504 / 508)
Types of Disabilities

• Visual disabilities
  – Blindness
  – Low vision
  – Lack of color perception

• Hearing disabilities
  – Hard of hearing
  – Deafness

• Physical disabilities (e.g., limited strength, reach or manipulation, tremor, lack of sensation)

• Speech disabilities (e.g., reading disabilities, thinking, remembering, sequencing disabilities)

• Language, learning, or cognitive disabilities

• Other disabilities and combinations

From https://kb.wisc.edu/helpdesk/page.php?id=1158 / Section 508
Blindness

- User cannot see visual content
  - Pictures, diagrams, icons, videos, etc.

- Users may use screen reader to get information
  - No quick page scanning
  - Linear navigation through text / content

- Solution:
  - Provide structure to text for easy navigation
  - Add alternative text or audio descriptions to images/videos
  - Follow standards for max. compatibility with screen readers

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar
Low Vision

• Many types
  – Poor vision quality
  – Partially occluded vision
  – Narrow field of view

• Very common in seniors

• Low-contrast text difficult to read

• Solutions:

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Low Vision

• Many types
  – Poor vision quality
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• Very common in seniors
• Low-contrast text difficult to read

• Solutions:
  – Allow font resizing
  – Allow color schemes to be changes
  – Add text or audio descriptions to images/videos

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Lack of Color Perception

• Inability to distinguish between certain colors
• 10% of male population
• Often problems with red and green

• Solutions
  – Allow color schemes to be changed
  – Do not differentiate on hue alone
    • Saturation
    • Value
    • Shape

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar
Hearing Impairment

• User cannot hear audio content

• Easy to test for
  – Turn speakers off!

• Solution:
  – Provide captions for all audio content

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar
Impaired Motor Skills

• Difficulty to use mouse, keyboard, or touch
  – Inaccuracy while pointing
  – Slow input
  – Use of specialized input devices

• Solutions
  – Do not require precise clicking
  – Allow alternate input methods
    • Keyboard
    • Voice
    • Mouse

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar
Cognitive Disabilities

• Many types
  – Learning disabilities
  – Attention deficit disorder
  – Memory impairments
  – Impairments of intelligence

• Users may have difficulty focusing on or processing information

• Solutions
  – Clear, simple design
  – Simple navigation
  – Simple language
  – Avoid distracting elements (video, navigation)
Universal Design Principles

• Equitable use
  – The design is useful and marketable to people with diverse disabilities

• Flexibility in use
  – The design accommodates a wide range of individual preferences

• Simple and intuitive use
  – Use of the design is easy to understand, regardless of the user’s knowledge, language skills, or current concentration level

• Perceptible information
  – The design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar
Universal Design Principles

• Tolerance for error
  – The design minimizes hazard and the adverse consequences of accidental or unintended actions

• Low physical effort
  – The design can be used efficiently and comfortably and with a minimum of fatigue

• Size and space for approach and use
  – Approximate size and space is provided for approach, reach, manipulation, and use, regardless of user’s body size, posture, or mobility

Adapted from: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar
Assistive Technology - Visual Impairments

• Screen readers
  – Software that reads screen content (varying speeds)
  – Provides navigation
  – Integrates with application software or operating system
  – VoiceOver (OS X and iOS), http://www.apple.com/accessibility/osx/voiceover/
  – Google TalkBack (Android), https://support.google.com/talkback/

• Braille displays
  – Use with screen reader
  – Refreshable Braille cells - tactile monitor
  – Still quite expensive
  – Rather slow compared to speech
Assistive Technology - Input

• Speech input / voice control
  – Software to input text and commands
  – Communication via audio files instead of text messages

• Eye gaze and facial impressions as input
Accessibility Guidelines & Tools

• WAI - W3C Web accessibility initiative
  – Web Content Accessibility Guidelines (WCAG)
    • http://www.w3.org/WAI/intro/wcag, http://www.w3.org/TR/WCAG20
    • How to make content more accessible, different levels
  - Accessible Rich Internet Applications Suite (WAI-ARIA)
    • http://www.w3.org/WAI/intro/aria.php, http://www.w3.org/TR/wai-aria/
    • How to make web applications and dynamic content (AJAX, JavaScript, HTML, …) more accessible

• BITV Test (Germany)
  – http://www.bitvtest.eu/bitv_test/intro/overview.html

• https://www.einfach-fuer-alle.de/
• Examples: http://www.biene-award.de/
WCAG 2.0 Quick Reference List

1.1 **Text Alternatives**: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.

1.2 **Time-based Media**: Provide alternatives for time-based media.

1.3 **Adaptable**: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.

1.4 **Distinguishable**: Make it easier for users to see and hear content including separating foreground from background.

2.1 **Keyboard Accessible**: Make all functionality available from a keyboard.

2.2 **Enough Time**: Provide users enough time to read and use content.

2.3 **Seizures**: Do not design content in a way that is known to cause seizures.

2.4 **Navigable**: Provide ways to help users navigate, find content, and determine where they are.

3.1 **Readable**: Make text content readable and understandable.

3.2 **Predictable**: Make Web pages appear and operate in predictable ways.

3.3 **Input Assistance**: Help users avoid and correct mistakes.

4.1 **Compatible**: Maximize compatibility with current and future user agents, including assistive technologies.