

1 HCI and the Web

1.1 HCI – A Quick Reminder

1.2 Web Technology – A Brief Overview

1.3 Web Usability

1.4 Designing Web Sites for Usability

1.5 Web Accessibility

Literature:

- Jakob Nielsen: Designing Web Usability, New Riders 2000
- Steve Krug: Don't Make Me Think, New Riders 2006 (2nd ed.)
- Shneiderman, Plaisant: Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition)

Jakob Nielsen's Alertbox, October 3, 2005 and update 2007: Top Ten Web Design Mistakes of ...

2005

1. Legibility Problems (small font size, low contrast)
2. Non-Standard Links
3. Flash
4. Content That's Not Written for the Web
5. Bad Search
6. Browser Incompatibility
7. Cumbersome Forms
8. No Contact Information or Other Company Info
9. Frozen Layouts with Fixed Page Widths
10. Inadequate Photo Enlargement

2007

1. Bad Search
2. PDF Files for Online Reading
3. Not Changing the Color of 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 Users' Questions

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

Jakob Nielsen's Alertbox, 2007: Top Ten Web Design Mistakes of 2007

1. Bad Search

- People do not find the information – they leave

2. PDF Files for Online Reading

- People are interrupted and are presented with a different UI, non-navigable

3. Not Changing the Color of Visited Links

- People revisit pages by error, mental load is increased

4. Non-Scannable Text

- People are overwhelmed with boring text – they leave

5. Fixed Font Size

- People's preferences are ignored, harder to read for many – they leave

6. Page Titles With Low Search Engine Visibility

- People do not find the information – they do not arrive at the page

7. Anything That Looks Like an Advertisement

- People have learned to ignore ads – they do not find the information

8. Violating Design Conventions

- People expect something different – they leave

9. Opening New Browser Windows

- People lose control over their browser, back button stops working

10. Not Answering Users' Questions

- People get confused and frustrated - they leave

Find more details at

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

How to assess usability?

- Use potential errors to create a checklist
 - Use expert evaluation and checklist to assess the usability
 - Analyses of use (log files)
 - Heuristic evaluation
 - User studies
-
- See the whole set of techniques of MMI1

Nielsen's Usability Engineering Life Cycle

Pre-Design Phase:

- Conduct a field study on how users work in their environment
- Run a small user test analysis on the old design
- Make a comparative user test on competing web sites

Design Phase:

- Use parallel design to make simple prototypes of different design approaches
- Select the best design from the previous step and develop it further, then do more user testing
- Iterate this design as many times as your time and budget allows
- Almost finish site and do one market test

Post-Design Phase:

- Get statistics and feedback about real use of the web site
- Refresh your web site (minor changes)
- Start planning for the next redesign of the web site

Web Design - See Books

Many books available,

- E.g. Mutz et al. Web Creative
- E.g. Götz, Raster für das Webdesign



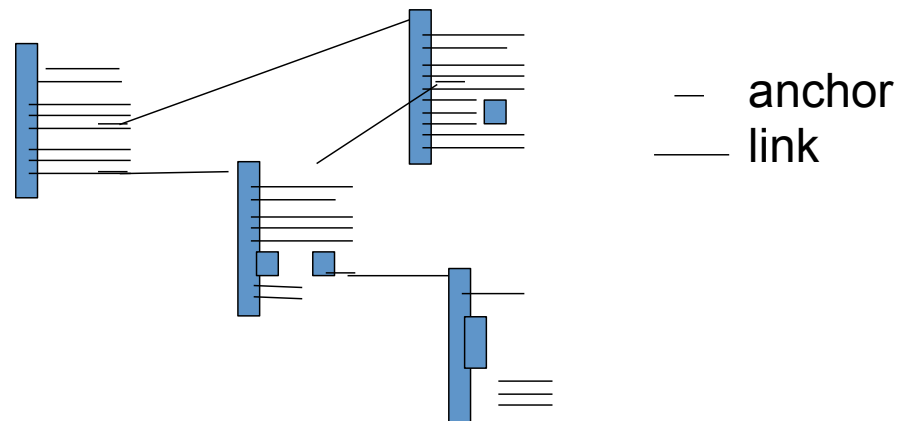
Hypertext Components

Structure

- hypertext document: directed graph

Components

- node: information unit
- anchor: Information chunk within a node, target for a link
- link: connections between nodes



Node

Single media nodes

- only one media type per node

Mixed media nodes

- different media types possible per node
- alternatives, combination

Systems with limited content size

- no internal navigation
- e.g. HyperCard

Systems with unlimited content size

- internal navigation necessary
- e.g. scrolling

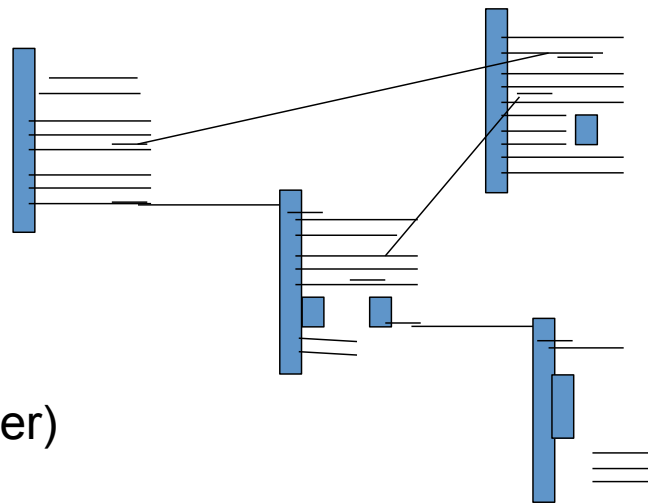
Anchor

Types of anchors

- source anchor
- target anchor

Represented as

- button
- icon
- text (e.g. underlined)
- hidden
- animation (e.g. mouse over)
- ...



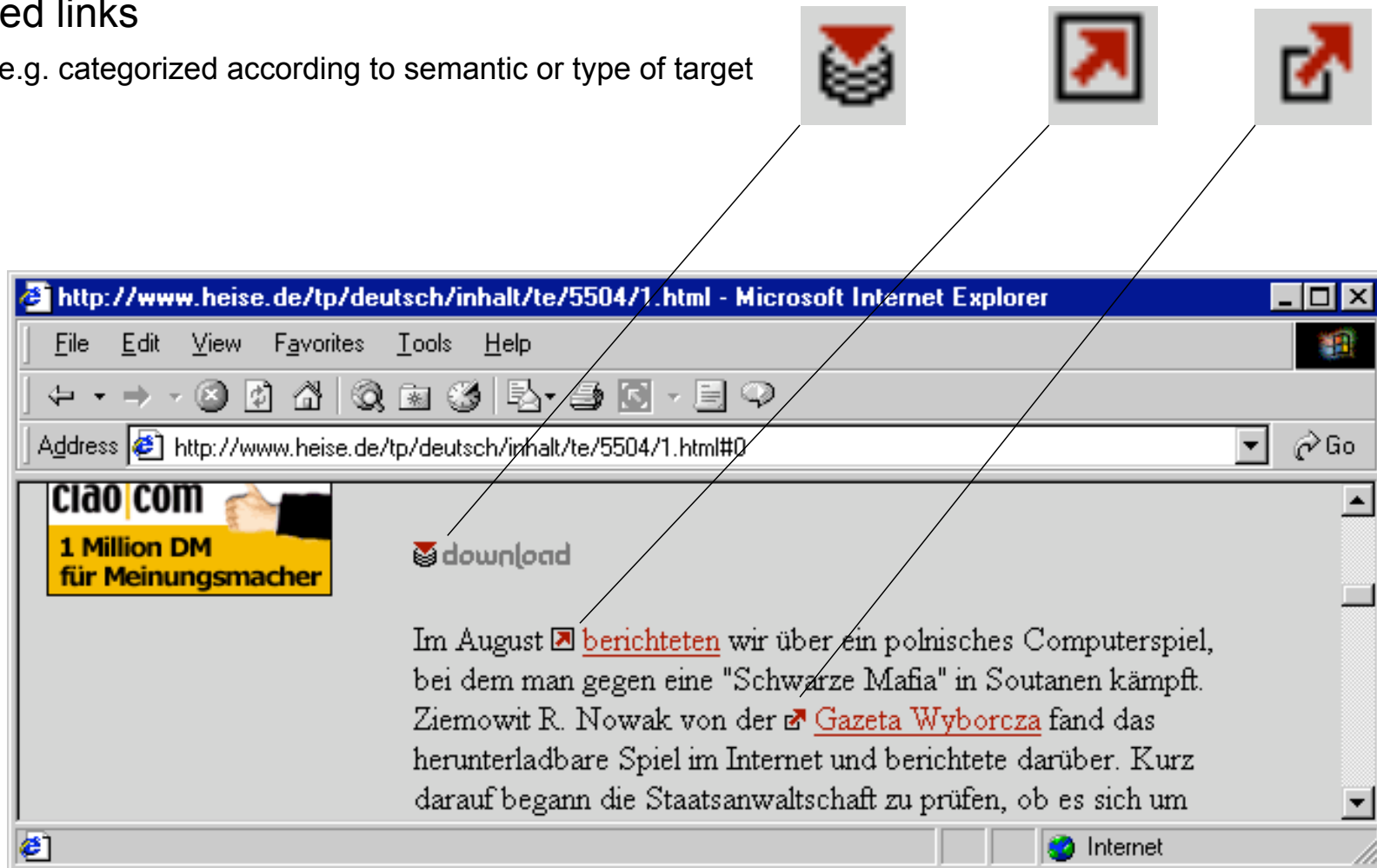
Representation of source anchors as link

Representation of target anchors is often hidden

Links

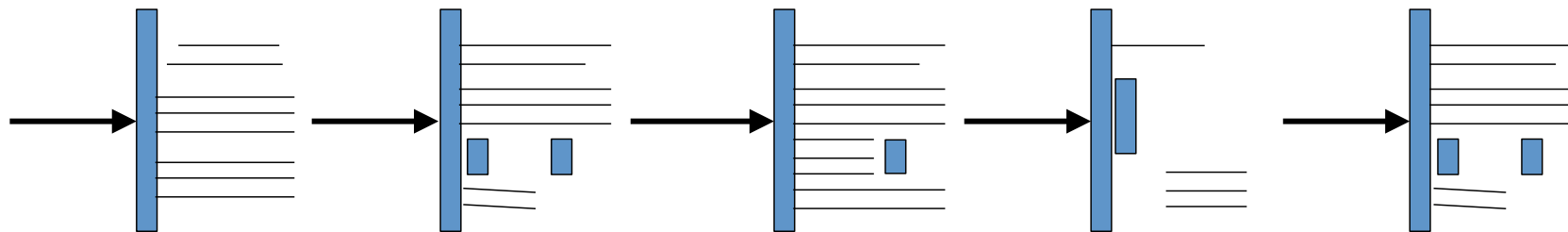
Information content of a link

- simple (untyped) links
- typed links
 - e.g. categorized according to semantic or type of target



Linear Structures I

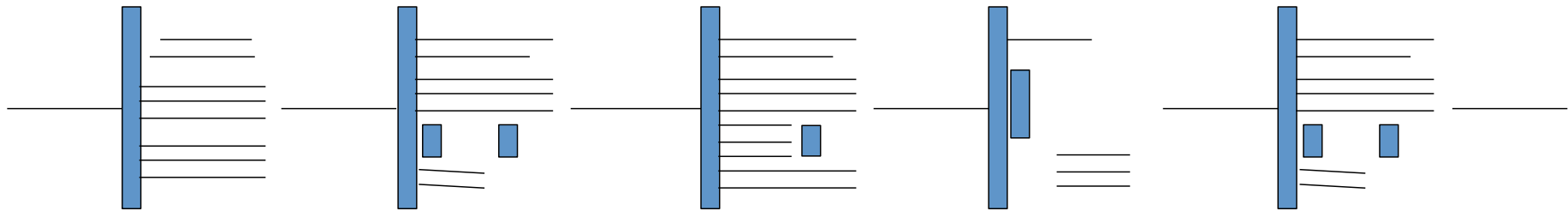
pure linear



strict guidance (**directed**)
little choices for the user
pre-caching possible

Linear Structures II

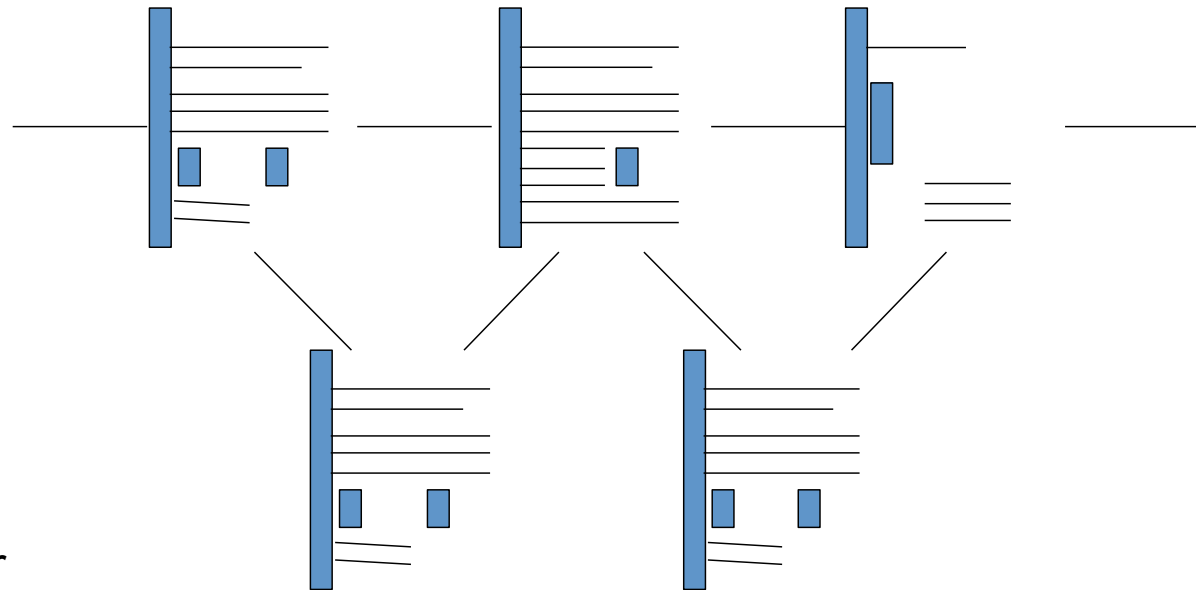
pure linear



strict guidance
little choices for the user
pre-caching possible

Linear Structures III

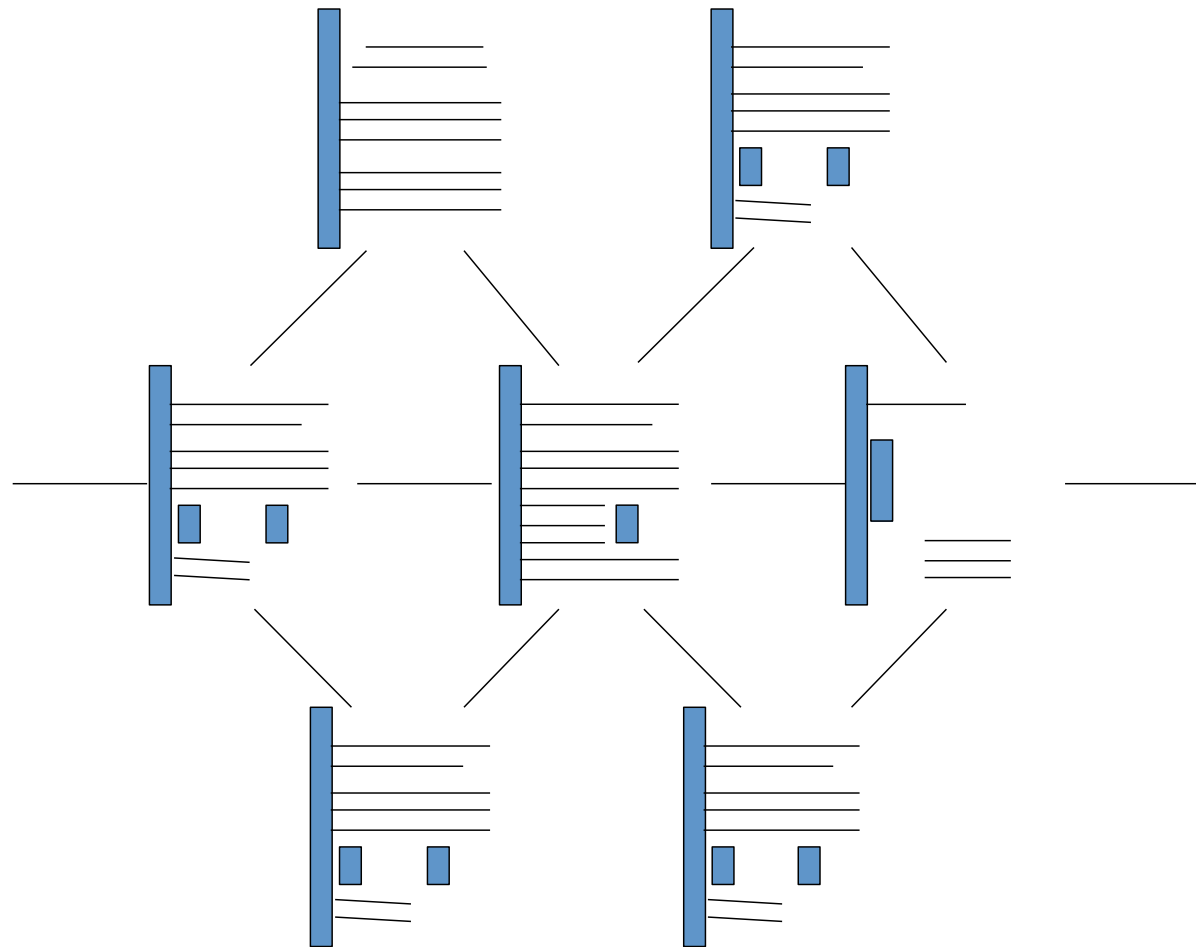
linear with options



guidance
some choices for the user
active interaction
different levels of detail
scenarios: different level of expertise, profiles

Linear Structures IV

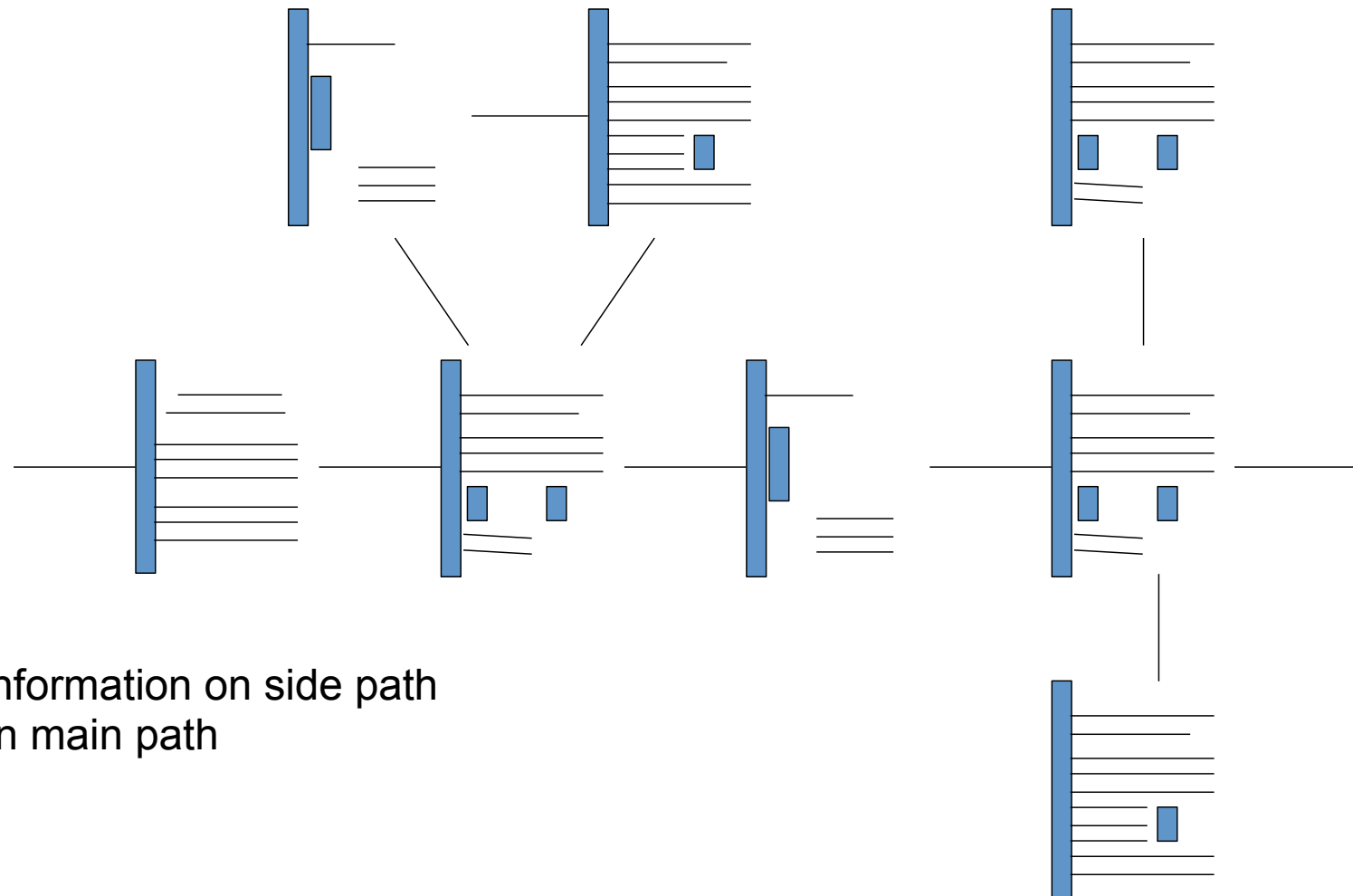
linear with alternatives



guidance
some choices for the
user active interaction
scenarios: questionnaires

Linear Structures V

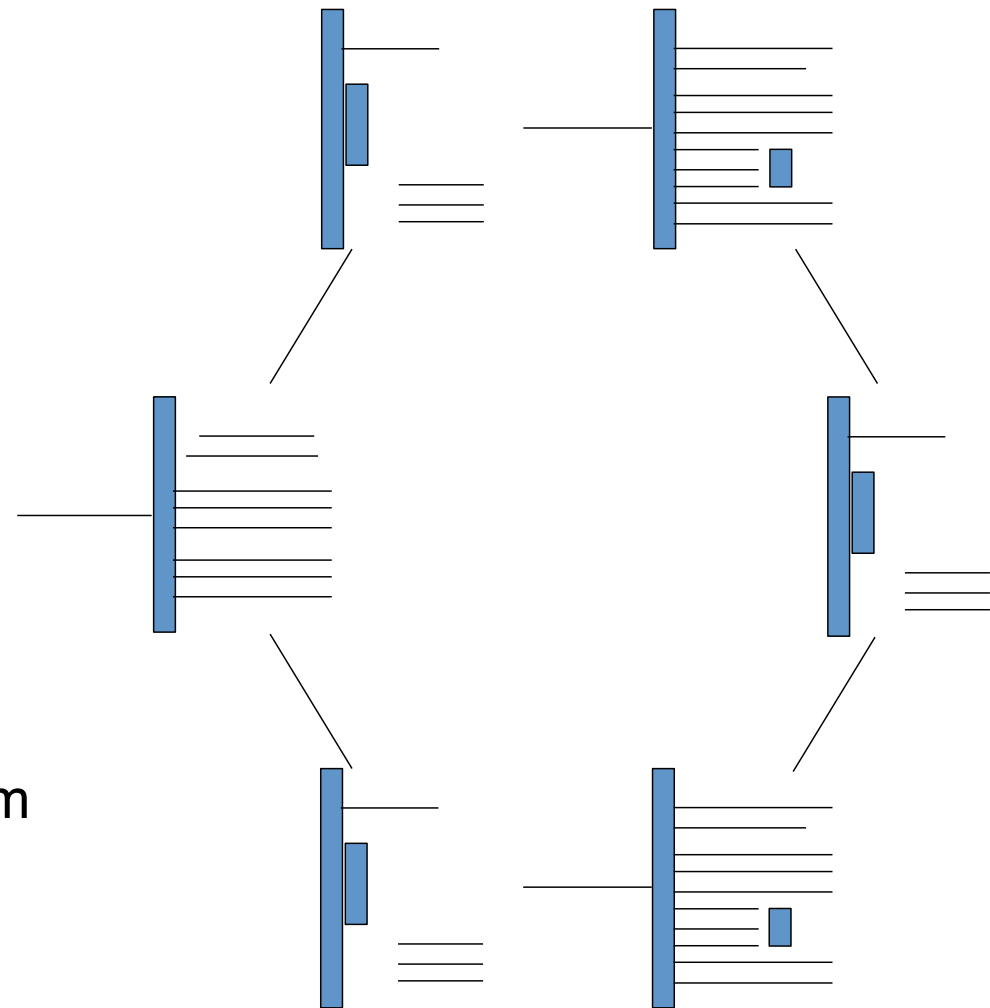
linear with side branches



additional information on side path
guidance on main path

Circular Structure

closed guided path
variants / side paths
entry



E.g. Web Rings
<http://dir.webring.yahoo.com>

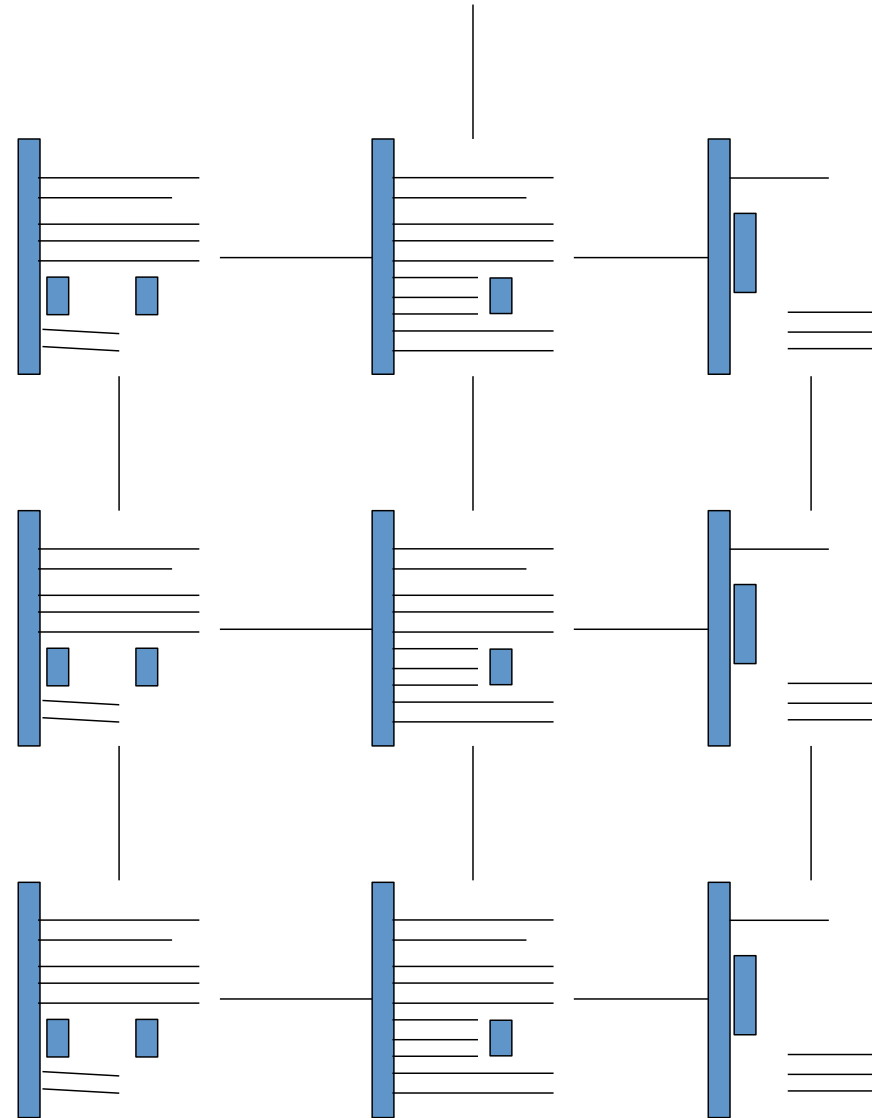
Information Grid

ordered on two
orthogonal criteria

user get a
„feeling of space“

e.g. product catalog

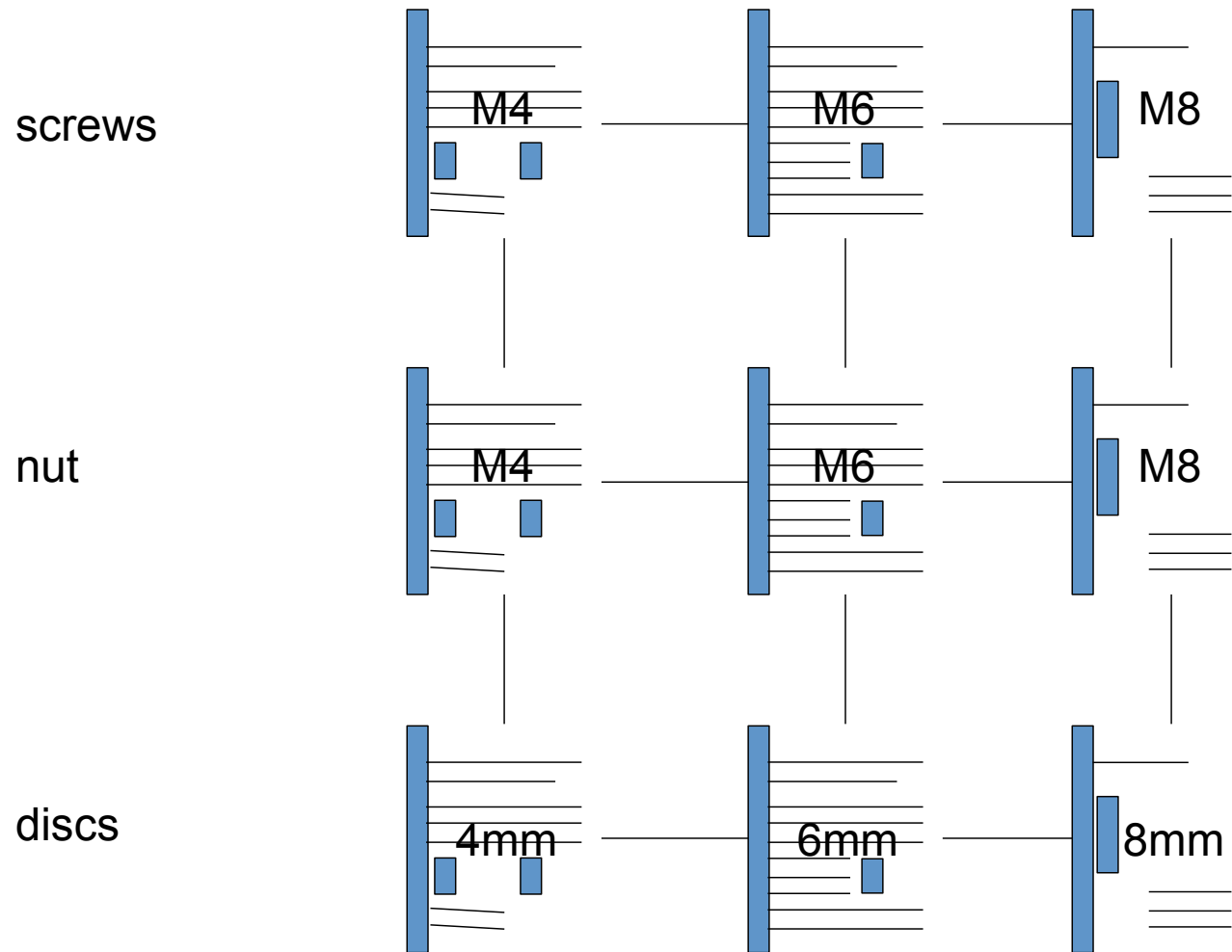
possible for more
dimensions



Example

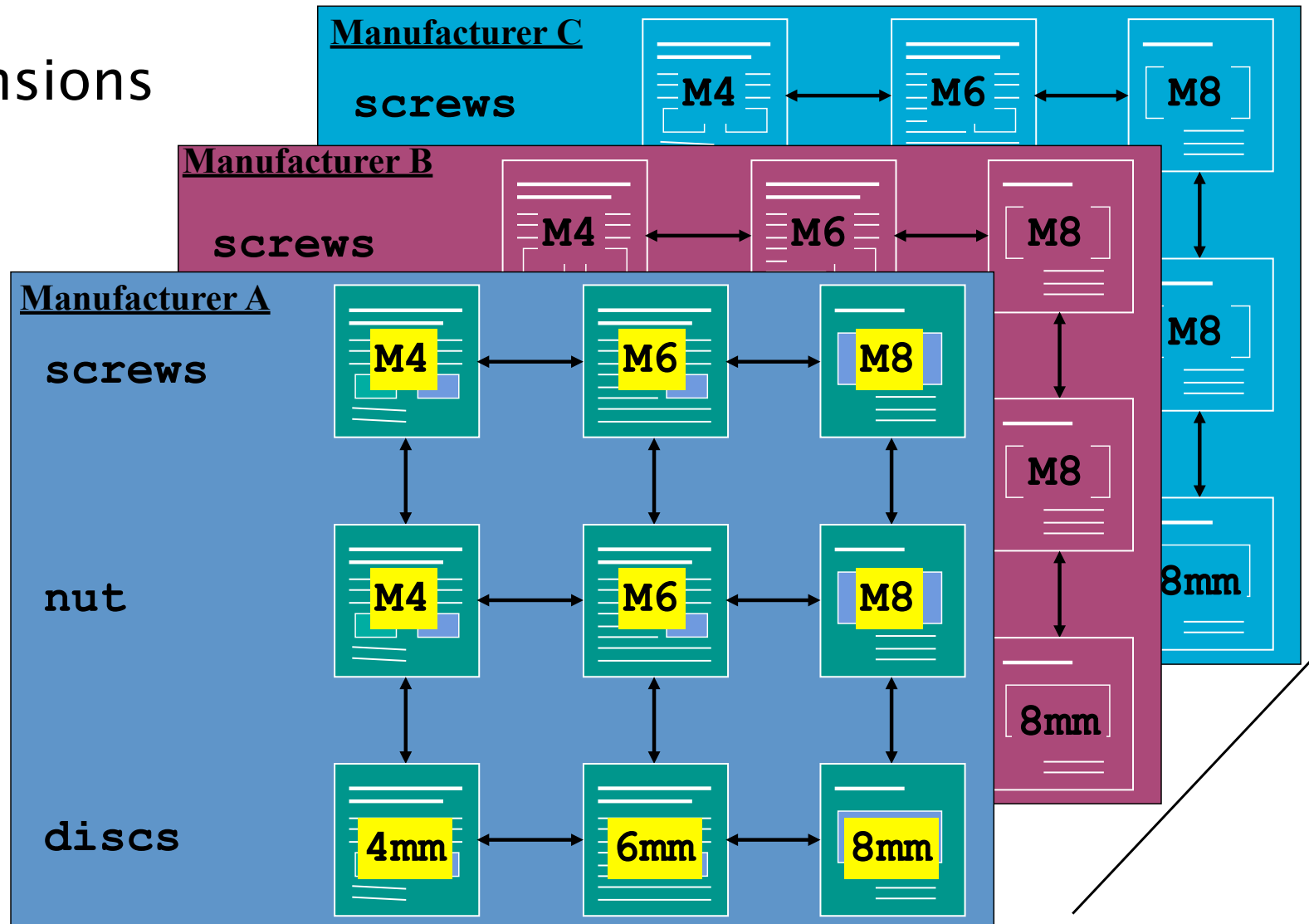
Grid Information Structure I

catalog
2 dimensions



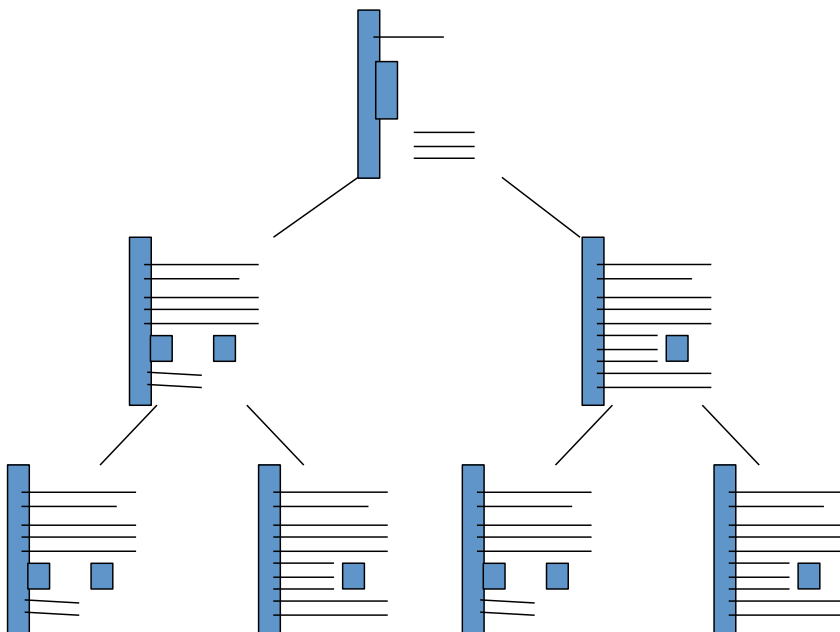
Example

- catalog
3 dimensions



Hierarchical Information Structure

deep hierarchy

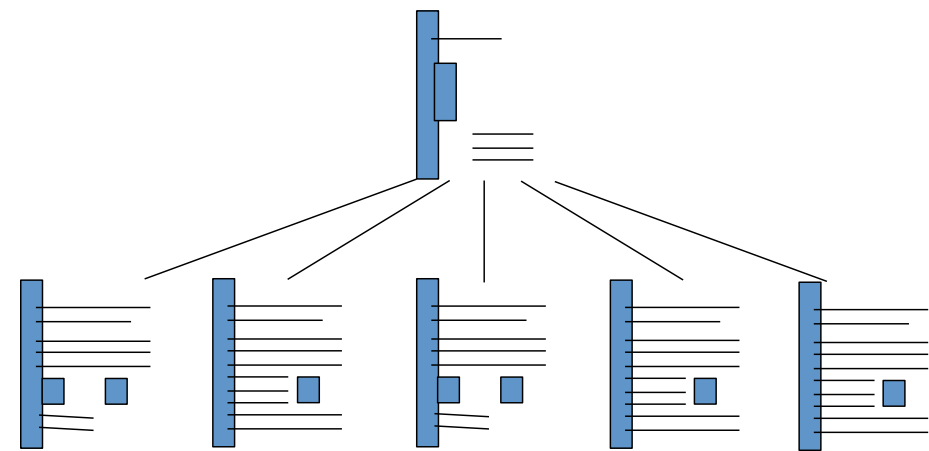


flat hierarchy

Lookup table (A-Z)

6-10 is reasonable

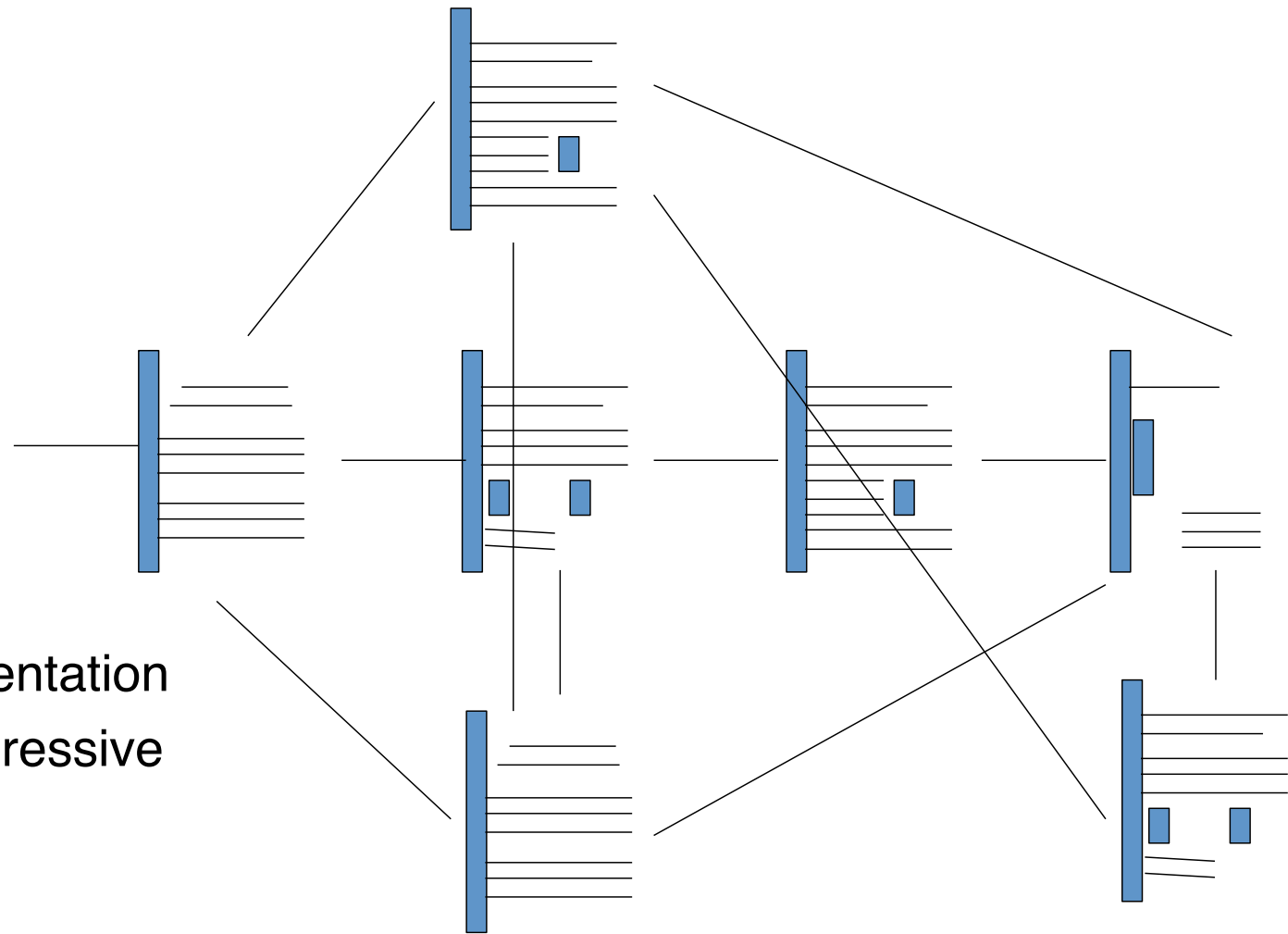
(cognitive psychology)



Linked Information Structures

pure webs

difficult for orientation
extremely expressive



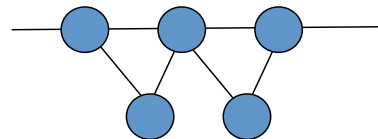
Web Structures

When to use what? - Time to think ...

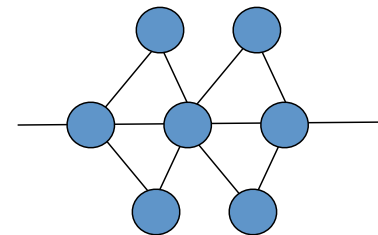
- Pure linear (directed, undirected)



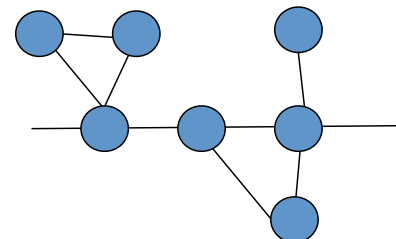
- Linear with options



- Linear with alternatives

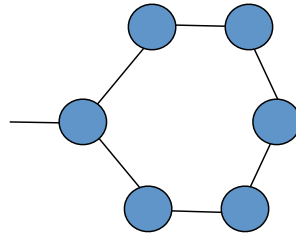


- Linear with side branches

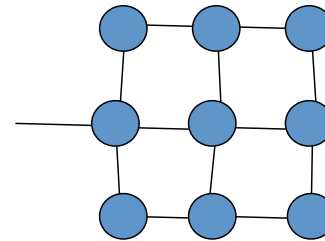


Web Structures

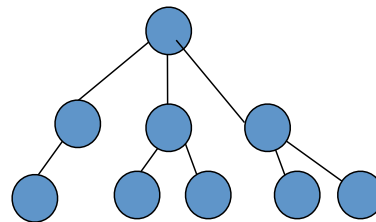
- Circular - closed path



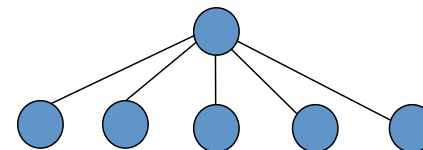
- Information grid



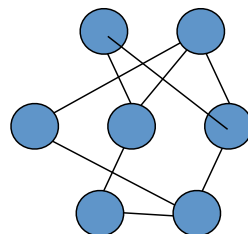
- Hierarchy - deep



- Hierarchy - flat



- Pure webs



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Accessibility & Universal Access

... why is it important?

Figures from the USA

- In 1997, 52.6 million people (19.7 percent of the population) had some level of disability
- 33.0 million (12.3 percent of the population) had a severe disability.
- About 10.1 million individuals (3.8 percent of the population) needed personal assistance
- 2.2 million used a wheelchair.
- Another 6.4 million used some other ambulatory aid such as a cane, crutches, or a walker.
- About 7.7 million individuals have problems reading letters in ordinary newspaper print; of them, 1.8 million were unable to see.
- From <http://www.census.gov/hhes/www/disable/sipp/disab97/asc97.html>

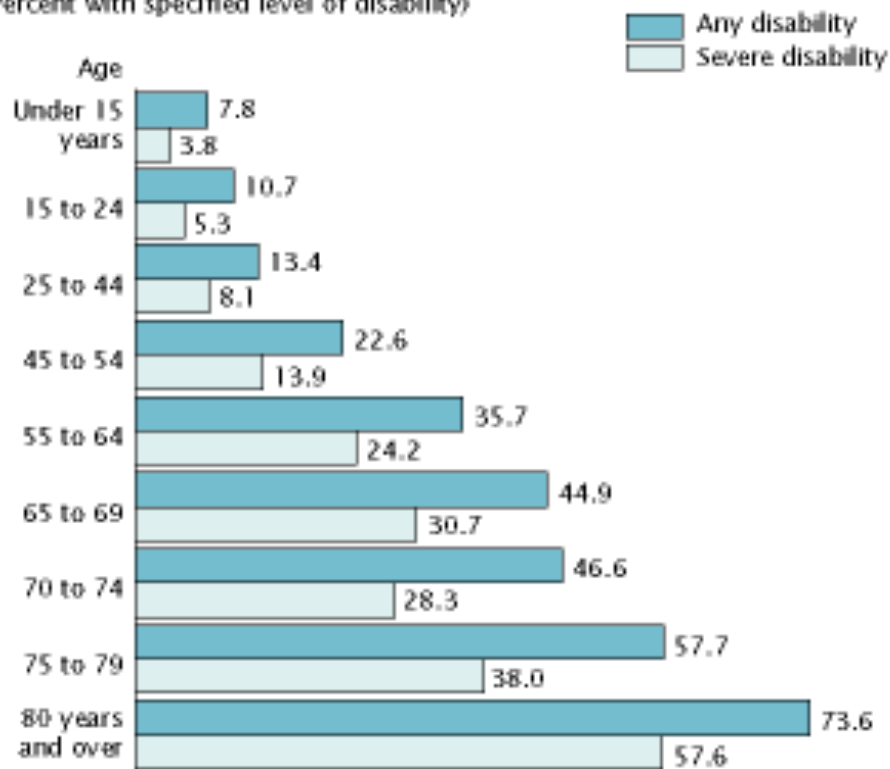
Accessibility & Universal Access

... why is it important?

- From <http://www.census.gov/hhes/www/disable/sipp/disab97/asc97.html>
- And <http://www.census.gov/prod/2008pubs/p70-117.pdf>

Figure 1.
Disability Prevalence by Age : 1997

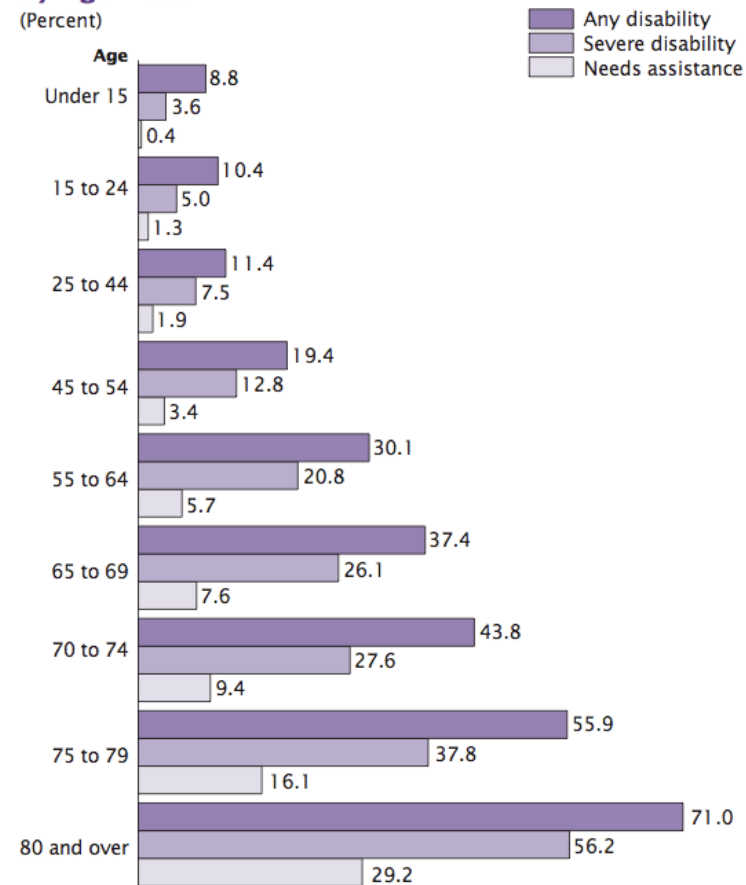
(Percent with specified level of disability)



Source: U.S. Census Bureau, 1996 Survey of Income and Program Participation: August - November 1997.

Figure 2.
Disability Prevalence and the Need for Assistance by Age: 2005

(Percent)



Accessibility & Universal Access

... why is it important?

Figures from Germany

- 155.000 blind people
- 500.000 visually impaired
- 1,1 Million have motor deficiencies (movement and control of body parts)
- 236.000 are hard of hearing or deaf

Assistive technologies

- Use of assistive technologies is widespread in these groups (~30%)
- Large screens and magnified presentation
- Braille Displays
- Text to speech (screen readers)
- Speech input and speech control
- Special keyboards and input devices (if motor control for standard mouse and keyboard is not sufficient)

Accessibility & Universal Access

... why is it important?

| Menschen mit Behinderung | 2001 | 2003 | 2005 |
|--|-----------|-----------|-----------|
| | Anzahl | | |
| Insgesamt | 6 711 797 | 6 638 892 | 6 765 355 |
| männlich | 3 530 018 | 3 485 341 | 3 527 983 |
| weiblich | 3 181 779 | 3 153 551 | 3 237 372 |
| Alter von ... bis unter ... Jahren | | | |
| unter 4 | 15 938 | 15 276 | 14 478 |
| 04 - 06 | 15 026 | 14 885 | 14 611 |
| 06 - 15 | 96 197 | 93 824 | 91 124 |
| 15 - 18 | 37 740 | 40 471 | 41 342 |
| 18 - 25 | 101 247 | 106 209 | 111 722 |
| 25 - 35 | 227 247 | 210 406 | 200 061 |
| 35 - 45 | 464 455 | 476 492 | 468 581 |
| 45 - 55 | 734 219 | 770 516 | 794 660 |
| 55 - 60 | 591 238 | 568 325 | 607 467 |
| 60 - 62 | 390 301 | 319 984 | 282 040 |
| 62 - 65 | 570 797 | 596 952 | 535 298 |
| 65 und mehr | 3 467 392 | 3 425 552 | 3 603 971 |
| Art der Behinderung | | | |
| Körperliche | 4 639 558 | 4 477 147 | 4 445 204 |
| Zerebrale Störungen, geistige- und / oder seelische | 1 097 277 | 1 158 251 | 1 236 115 |
| Sonstige und ungenügend bezeichnete | 974 962 | 1 003 494 | 1 084 036 |

<http://www.sgipt.org/gesko/stat/behind0.htm>

Accessibility - Legal Base

Legal requirements

– In Germany:

- Behindertengleichstellungsgesetz
http://www.behindertenbeauftragte.de/cln_153/nn_1040386/DE/Gleichstellung/Behindertengleichstellungsgesetz/Behindertengleichstellungsgesetz__node.html
- Verordnung zur Schaffung barrierefreier Informationstechnik nach dem Behindertengleichstellungsgesetz (BITV)
<http://www.gesetze-im-internet.de/bitv/BJNR265400002.html>

– USA

- Section 508
<http://www.section508.gov/>

It is required by law (Germany)

- Since 31. December 2005 for general information
- Since 31. December 2003 for information that is targeted at people with disabilities

Types of Disabilities

Visual

- Blindness
- Low vision
- Color blindness

Hearing

Motor skills

Cognitive disability

- Reading disorders
- Attention disorders
- Memory impairments

See, e.g. <http://www.web-accessibility.co.uk/types-of-disability.asp>

Blindness

User cannot see visual content

- Pictures, diagrams, animations, etc.

May use a screen reader to get information

- Cannot scan a page quickly
- Must navigate linearly through text

Solutions

- Provide structure to text for easy navigation
- Add text or audio descriptions to images/video
- Follow standards for maximum compatibility with screen readers

Low vision

Many types

- Poor vision quality
- Partially occluded vision

Very common in seniors

Low-contrast text difficult to read

Solutions

- Allow font resizing
- Allow color schemes to be changed
- Add text or audio descriptions to images/video

Color blindness

Inability to distinguish between certain colors

- Affects 10% of males
- Often have problems with red and green

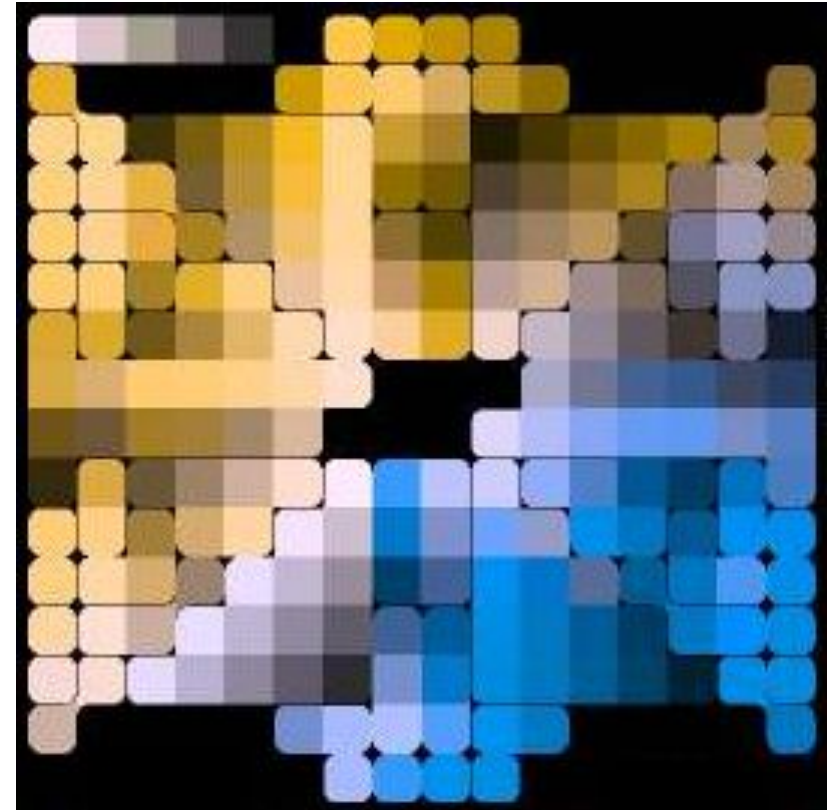
Solutions

- Allow color schemes to be changed
- Don't differentiate on hue alone
 - Saturation
 - Value
 - Shape

Color blindness



What most people see



What color-blind users see

visibone.com

Color blindness



Vischeck

Is this accessible?



Big Fish Games

Better



PopCap Games

Hearing impairment

User cannot hear audio content

This one is easy to test for

- Turn off your speakers!

Solution

- Provide captioning for all audio content

Impaired motor skills

Difficulty using mouse and keyboard

- Inaccuracy while clicking
- Slow input
- May use specialized input device

Solutions

- Do not require precise clicking
- Allow alternate input methods
 - Keyboard
 - Mouse
 - Voice

Cognitive disabilities

Many types

- Learning disabilities
- Attention deficit disorder
- Memory impairments
- Impairments of intelligence

May have difficulty focusing on or processing information

Solutions

- Clear, simple design
- Simple navigation
- Avoid distracting elements (video, navigation)

Universal design principles

Equitable Use

- The design is useful and marketable to people with diverse abilities

Flexibility in Use

- The design accommodates a wide range of individual preferences and abilities

Simple and Intuitive Use

- Use of the design is easy to understand, regardless of the user's experience, 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.

Universal design principles

Tolerance for Error

- The design minimizes hazards 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

- Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility

Assistive Technologies - Screenreader

Software that reads what is on the screen

Provides navigation

Integrates with application software

Example: JAWS

- Includes a software speech synthesizer
- Can output to Braille display
- Demo: http://www.freedomscientific.com/fs_downloads/jaws.asp

Firefox Plugin

- “We created a Firefox extension to help blind people with CAPTCHAs and image translation! It adds a contextual menu item, so just right click on any image and "Send to CAPTCHA Killer". A new window will popup and display the result. This is very beta - but maybe it will help some of you out there”
- <http://www.captchakiller.com/firefox-extension-help-blind-captcha-and-image-translation>

Assistive Technologies

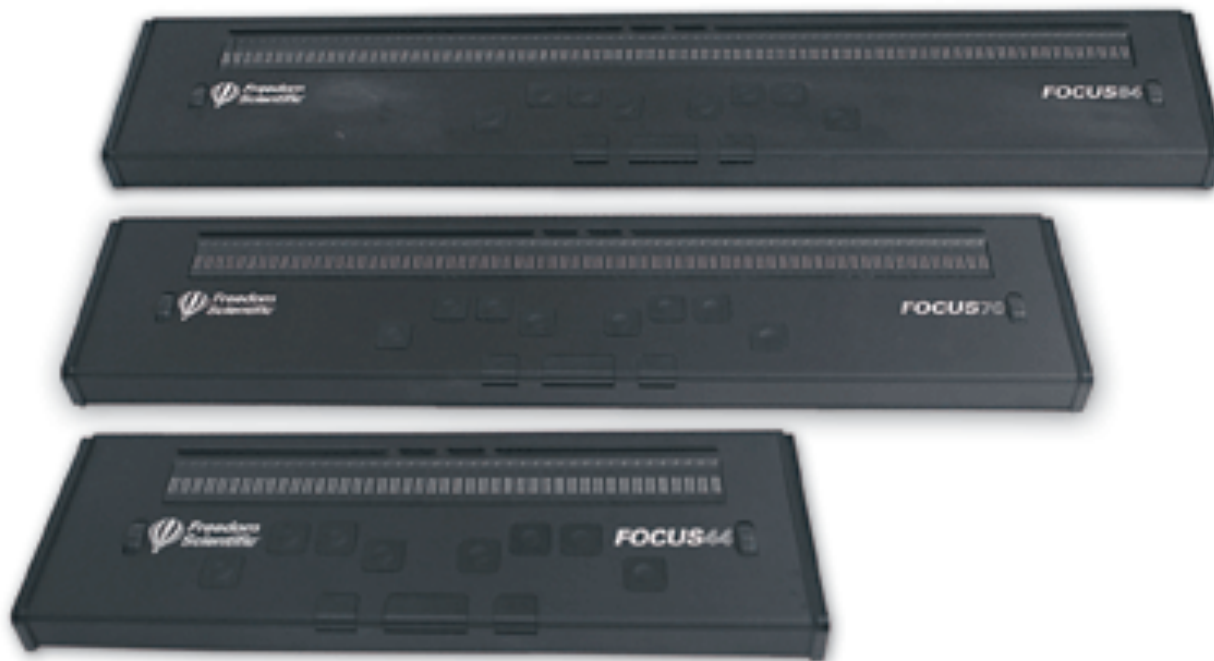
Braille Displays

Used with a JAWS screen reader

Refreshable Braille cells act as a tactile monitor (e.g. 44-, 70- and 84-cells)

Navigation controls are on the display

Quite expensive (> 5000 €)



<http://www.accesstech.ch/>

<http://www.sightandsound.co.uk/>

Assistive Technologies

Braille Printer

E.g. Basic-S Printer

Speed

- 150 PPH (pages per hour) or 39 CPS (characters per second).

Technology

- 6 High quality hardened hammers forming against hardened steel anvils



<http://www.sightandsound.co.uk/>



<http://www.brailler.com/juli2.htm>

Web Accessibility Evaluation

Guidelines available from W3C

<http://www.w3.org/TR/2004/WD-WCAG20-20040311/>

Guidelines are divided into three categories of success criteria:

– Level 1 success criteria:

- do not specify how information is presented
- are reasonably applicable to all Web sites
- some are machine-testable. Others require human judgment. Success criteria that require human testing yield consistent results among multiple testers.

– Level 2 success criteria:

- may require an author to present content in particular ways
- are reasonably applicable to all Web sites
- some are machine-testable. Others require human judgment. Success criteria that require human testing yield consistent results among multiple testers.

– Level 3 success criteria:

- are additional criteria that go beyond Level 1 and 2 that may be applied to make sites accessible to more people with all or particular types of disability

– Conformance

- WCAG 2.0 A, WCAG 2.0 A+, WCAG 2.0 AA, WCAG 2.0 AAA

Quick Tips to make Accessible Web Sites

- Images & animations: Use the alt attribute to describe the function of each visual.
- Image maps. Use the client-side map and text for hotspots.
- Multimedia. Provide captioning and transcripts of audio, and descriptions of video.
- Hypertext links. Use text that makes sense when read out of context. For example, avoid "click here."
- Page organization. Use headings, lists, and consistent structure. Use CSS for layout and style where possible.
- Graphs & charts. Summarize or use the longdesc attribute.
- Scripts, applets, & plug-ins. Provide alternative content in case active features are inaccessible or unsupported.
- Frames. Use the noframes element and meaningful titles.
- Tables. Make line-by-line reading sensible. Summarize.
- Check your work. Validate. Use tools, checklist, and guidelines at <http://www.w3.org/TR/WCAG>

<http://www.w3.org/WAI/References/QuickTips/>

Software to Check Guidelines - Examples

IBM Rational Policy Tester for privacy, quality, and accessibility

<http://www-01.ibm.com/software/rational/offerings/websecurity/webcompliance.html>

<http://achecker.ca/checker/index.php>

(formerly A-prompt: <http://aprompt.snow.utoronto.ca/>)

<http://www.anybrowser.com/>

<http://www.barrierekompass.de/>

<http://validator.w3.org/>

Accessibility Review (Guidelines: [WCAG 2.0 \(Level AA\)](#))

Known Problems (3) **Likely Problems (1)** **Potential Problems (1)**

✘ **Line 3, Column 1:** [Document language not identified.](#)

```
<html>
<head>
  <title>Paul Holleis, Embedded Interaction, Homepage</title>
  <meta http-equiv="cont ...
```

Repair: .

✘ **Line 3, Column 1:** [Document has invalid language code.](#)

```
<html>
<head>
  <title>Paul Holleis, Embedded Interaction, Homepage</title>
  <meta http-equiv="cont ...
```

Repair: Add a valid 2 letter or 3 letter language code as defined in

✘ **Line 13, Column 3:** [frame missing title attribute.](#)