D1.2.1.1.Towards tablet publication heuristics

Improving accessability, usability and user experience with new expert evaluation

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List of Acronyms and Abbreviations

WIMP	Windows, icons, (pull down) menus, pointer – interaction

Executive Summary

This paper proposes a model for new evaluation tool specially designed for tablet publications. The need for a new set of heuristics is three fold. Firstly all old heuristics are built for software which relates to the WIMP (Window, Icon, Menu and Pointer) paradigm while new tablet computers are touch screen devices in which these elements are missing or perform differently. Secondly, traditional heuristics seem to neglect to a large degree important features from tablet publication point of view, namely navigation, readability and affordances. Thirdly, tablets are the fastest expanding consumer products ever.

Relevant parts of the older heuristics were combined to publication and touch screen equivalents and divided into three major groups, accessibility (A), usability (U) and user experience (X). For easiness of use different rule-of-thumbs are accompanied with appropriate hints of what to look for in each case.

Yhteenveto

Tutkimus esittelee uuden heuristisen arviointimallin, joka on kehitetty tablettijulkaisuja varten. Uudelle mallille on kolme perustetta. Ensinnäkin kaikki vanhat arviointiheuristiikat perustuvat ohjelmistoihin jotka ns. WIMP-paradigmaan, jossa tietokoneen käyttö perustuu moni-ikkunointiin, kuvakkeisiin, menuihin ja hiireen, kun uudet tablettitietokoneet pohjaavat kosketusnäyttöön, jossa WIMP-elementtejä ei ole tai niiden toiminta on muuttunut. Toisekseen perinteiset heuristiikat näyttävät tehdyssä vertailussa jättävän vähälle huomiolle tablettijulkaisujen kannalta tärkeitä seikkoja, kuten navigaation, luettavuuden ja visuaaliset toimintaoptiot. Kolmanneksi tabletit ovat historian nopeimmin yleistynyt kulutuselektroniikkalaite.

Merkitsevät osat vanhoista heuristiikoista yhdistettiin julkaisujen ja kosketusnäyttöjen kannalta tärkeisiin muuttujiin ja jaettiin kolmeen eri luokkaan: saavutettavuuteen, käytettävyyteen ja käyttökokemukseen. Käytön helpottamiseksi peukalosääntöjen yhteyteen laadittiin kysymysmuodossa oleva tarkistuslista.

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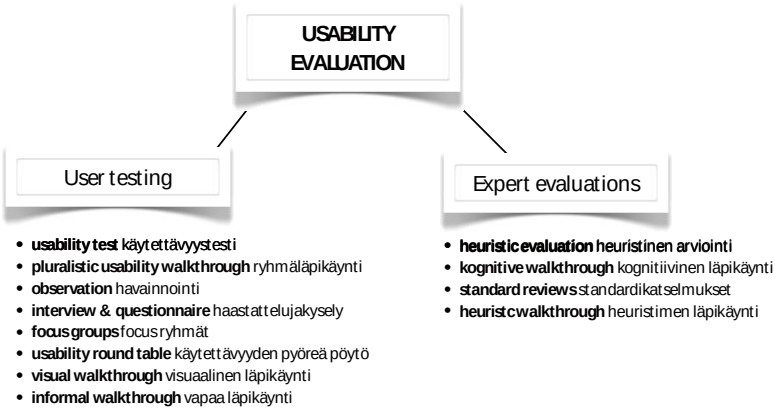
1 Background

Heuristics (from the word "*eureka*") refer to an experience-based technique, where existing information is used to solve the problems and make judgments quickly and efficiently. Common sense and wise guesses are a kind of heuristics, but in ICT heuristics usually refers to a specific set of rules, but not usually very specific such as rulebooks or company specific guidelines.

Heuristics are more like "rule-of-thumb" -kind recognized usability principles, that are used by experts for examining the interface and judging its compliance. Rules give evaluation an ordered and more standardized structure, which makes even some comparisons possible. However, generally heuristics don't aim to provide summative, comparable data but rather create formative knowledge to diminsh problems and achieve better quality.

Heuristics are an estabished part of the usability evaluation, a tradition which can be divided in to two main branches: user testing and expert evaluations (see picture 1)



Picture 1. Two branches of the usability evaluation.

In software development and interface design the best known heuristics are the ones by Jacob Nielsen (1994). The "Nielsen 10 usability heuristics" were originally developed 1990 and revised in 1994 after factor analysis of 249 usability problems. Nielsen´s 10 principles are a general list, like heuristics tend to be, and offers broad categories like "User control and freedom" and "Aesthetic and minimalistic design". Effective use of the heuristics needs expertise and ability to apply rules to different instances. Novices have to have a reference list of what to look for in different cases.

Other heuristics like Donald Norman´s 7 principles (Norman 1988), Shneiderman´s 8 golden rules (Shneiderman and Plaisant 2005), Tognazzini´s (2003) first principles of user interface design are largely overlapping with each other. They basically redefine and reorder the same principles, as is also the case with other less known heuristics like Marlin Brown (1999), Marcus Aaron (1992), Jeff Johnson (2008) and Deborah Stone (2005). Most common heuristic rules are "strive for consistency", the "need for feedback" and "visibility of system status" and "reversibility".

Firstly, problems in these traditional heuristics from tablet magazine and publication point of view lay in their software engineering and WIMP (windows, icons, mouse and pointing device) background. Magazines and publications in tablets are also software, but they do have a fundamentally different background. They rely on a long tradition of journalism, illustration, layout and typography.

Tablets (defined here as touch screen devices with over 6″ display) build on fundamentally different paradigm than WIMP-computers. In iOS and Android world, there is no mouse, nor cursor, no hovering or tool tips in interface, no multi-windowing and very restricted file management. Files are integrated and accessed with programs. This already requires a different approach from traditional heuristics. There is a need for new kinds of heuristics, since publishers and designers of print tradition are confronted with new platforms which is interactive and on the other hand the software back grounded engineers are faced with a new class of print back grounded products – and because the touch screen devices are a novelty to all.

Secondly, the current heuristics have little guidance for necessities like navigation, affordances/perceivability/readability (see comparisons in appendix 1) even though these variables can be seen as quite obvious building blocks of accessibility, usability and user-experience (UX) also in software and webpages. In addition they are traditionally seen as crucial in magazine/newspaper design. In fact Bruce Tognazzini (2003) is the only one who mentions readability (see Appendix 2).

From our experience in eReading testing, there is even a more important place for them in digital books and magazines, where users from print tradition confront the digital version with an expectation that it works like its Gutenbergian equivalent. For example loosing ones place when browsing a digital book or magazine is quite common and greatly affects the feeling towards the product. (Heikkilä 2011)

2 Task

The task for this work package was to create an easy-to-use and valid evaluation tool for specially tablet publication assessment that is useful for publishers, designers and developers.

3 Method

Since there is a smorgasbord of heuristics available for interface design, the most obvious way was to extract valid content for tablet design from traditional well-known heuristics as a base and then add touch-screen and tablet specific content.

We started by comparing existing heuristics to find out common categories and to categorize what is missing. It was challenging to make exact comparisons, because same variables were often present in several categories and were expressed differently. In addition it was quite common that variables were mentioned in explanatory texts under different headlines. So the comparison in Appendix 1 is a tentative one.

The main problem was how to create new content suitable for tablets. We studied papers from various conferences and seminars, determined what kind of interactive features there were in tablet publications (Heikkilä 2012), thereafter filtered expert recommendations from various articles, and also used experiences from usability experiments and method development within Finnish Next Media –project 2010–2012. The new model was tested with products of WSOY, Bonnier, OtavaMedia, Sanoma Magazines and Helsingin Yliopisto 2011–2013. The model was developed with several iterations.

To make heuristics more comprehensible, we divided the model into three categories: accessibility, usability and user experience. Accessibility is understood in this paper as the very basics of usability – not as rigorous accessibility standards for special groups like alternative text for images etc. Accessibility category in this new heuristics model covers all the "entry level" things that make accessing the content possible within the publication. Usability is about how easy and effective the publication is to use, and UX is how pleasant the use is.

CATEGORY					
ACCESSABILITY (A)	Legibility and Readability AI	Guidance A2			
USABILITY (U)	Touch screen ergonomics U1	Perceivability U2 • *Visibility* • *Affordances* • *Natural mapping*	Orientation U3 • *Sense of place* • *Sense of directions* • *Memory load*	Consistency U4	Responsivity U5
USER EXPERIENCE (E)	Flow E1	Interestingness, playfulness, arousal E2	Mood and brand E3	Interactivity E4 • *Interface* • *Social* • *Adaptive* • *Creative*	

Table 1. Categorization and hierarchy of the rules

In order to facilitate ease of use, these heuristics are constructed with rules or claims (roman-text) and questions (in italics) and these "what-to-look-for" questions define the rules better and make them easier to implement.

3.1 Accessibility (A)

3.1.1 Legibility and readability (A1)

Legibility. Legibility is about letter forms and it is determined by the specific typographic traits (Shape, scale, style) affecting recognition of letters and words. Avoid fonts with small x-height and stark contrasts. Choice of typography should fit all screens.[1]

[1] Contrastful fonts like Bodoni and some transitional antiques are specially hard to read on eInk devices with often low contrast and high resolution, since the propriatary rendering of the font can make the thinnest lines vanish.(Heikkilä 2011, 42–43)

What to look for: Is the text big enough? Is the x-height big enough in the chosen typeface? Are line contrasts optimal for the screen? Is the typeface legible and suitable for reading on different screens? Is there excessive use of italics, condensed or non-open letterforms? (Rgd 2010, 5-6; Tognazzini 2003)

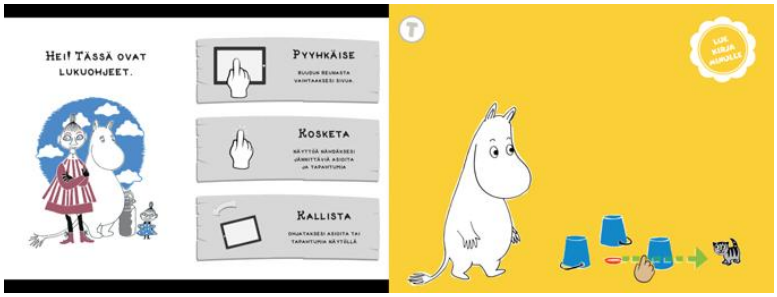
Picture 2. Closed and open form in two different typefaces. The upper typeface (Avant garde) has almost closed circular and geometrical form in letters c and e, creating poor readability in small point sizes, whereas humanistic Scala Sans (bottom) has more difference between characters making them easier recognized.

Readability refers to how letters work together

What to look for? Is the contrast of the text to the background sufficient (>60–70%)? Are colors presented in an accessible way (complementary colors, color blindness) Is the length of the line optimal (40–90 characters)? Is the text spacing and alignment meticulous enough? (Rgd 2010, 7-8)

3.1.2 Guidance (A2)

In tablet publications everything should be so intuitive that no help is required. If basic guidance is needed, it is a good idea to use a transparent guide layer and for publications for special groups such as children use of animation is recommended.



Picture 3. Left: The older Moomin iPad-book (2011) had written instructions on how to proceed. On the right a newer iPad book (2012) starts with an animated guidance.

3.2 Usability (U)

3.2.1 Touch screen ergonomics (U1)

3.2.1 Touch screen ergonomics means design for the fingers, not for the cursor. Touchable minimum size is noticeable bigger than clickable size (Jacob

Nielsen 2010)[2]. One needs to understand the optimal touch-areas (n̄ear fingers when holding a tablet), to avoid hand-obscuration (positioning buttons and navigation like in the web – upper part of the page (Clark 2010, 73).

What to look for: Can you select the interactive parts of the page with fingers without errors? Are the interactive areas positioned ergonomically?

Picture 4. Hand is obscuring the page when touching navigation in upper left corner.

3.2.2 Perceivability (U2)

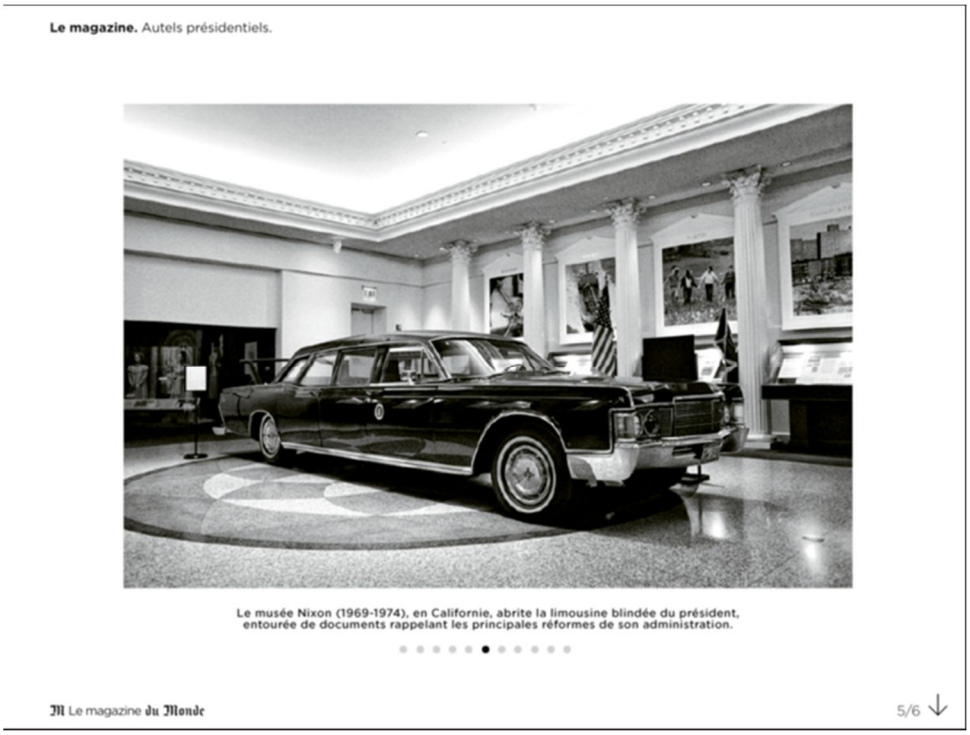
Visibility (invitation to action). Make it clear where to touch. If something is clickable, make it evident, and vice versa. If something is not interactive, don't make it look like it is: there are no tooltips in touch screen -environment. Difference and change in layout get attention; use them with a purpose.

Picture 5. These screens make it quite clear where user should touch by using contrast (darkening the preview picture) and self explanatory affordances.

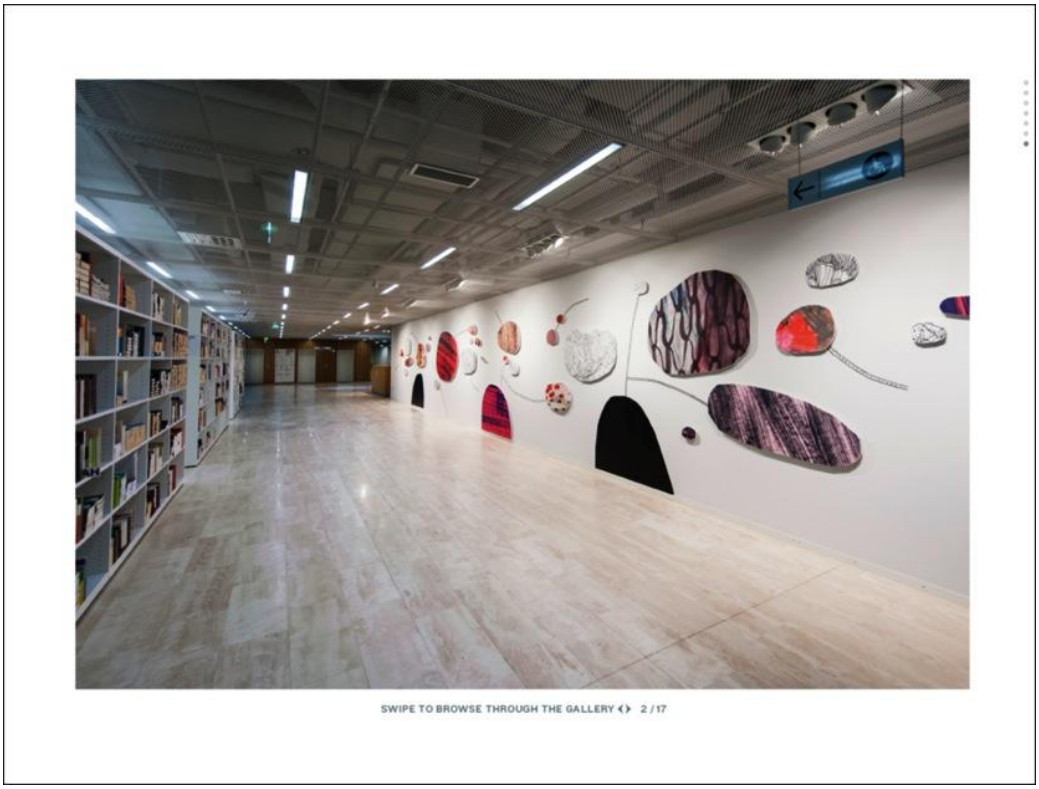
Affordances (alternatives of action). Prefer real world familiar metaphors, existing design patterns and platform conventions[3]. Affordances should be as self-explanatory as possible.

[2] Nielsen refers here to the web pages used in iPad

[3] Jonah Lehrer (2009, 60-61) has concluded that there is neurochemical base for this because we strive to recognize familiar patterns in the world around us and when we do, our brain produces a pleasure-inducing dopamine, and three to four times more, if our finding is unexpected. This is strong argument for using design patterns in interactive design .(see Hannon 2012).



Picture 6. One established design pattern is to describe the amount of the pictures in a gallery for example as dots with active picture indicated with different color. The other is to keep a picture gallery size moderate within the page, since the user needs to be able to swipe easily as well as the page, not only the picture.



Picture 7. Beta-version of Helsinki University Bulletin (HUB) had picture galleries without appropriate margins for convenient page swiping and lacked the convention of navigation dots.

What to look for: Look for pages and instances where affordances of actions are not self-evident. Is there unnecessary "re-invention" of the wheel (in symbols and icons)?

Natural mapping. Make information appear in a natural and logical visual order. Use contrasts and hierarchies. Understand the Gestalt Laws as a basis of human perception of layout. Use natural language, appropriate for the target group.

What to look for: Is it possible to perceive the page hierarchy in one glance? Human eye sees objects in their entirety before perceiving their individual parts, therefore it is good idea to check the layout against known Gestalt Laws. (Law of proximity, law of similarity, law of closure, law of symmetry, law of common fate, law of continuity, law of good gestalt, law of past experience.) See for example (Johnson 2010, 1-24)

Picture 8. iPad version of Il Messaggero 24.11.2012 assigns the same value to every story.

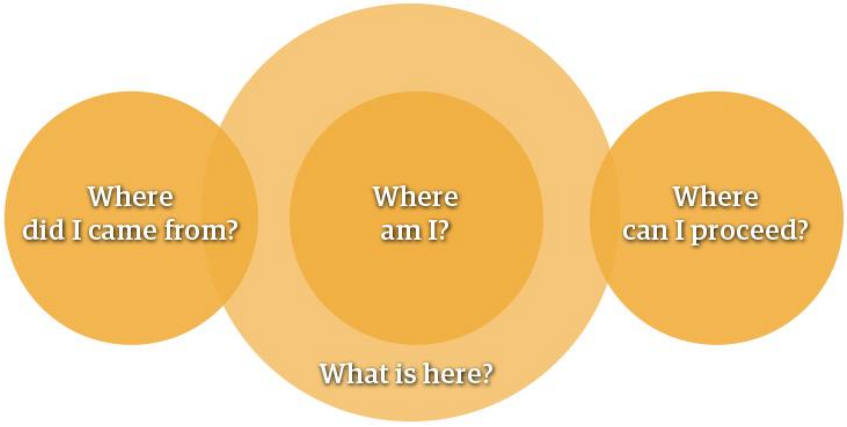
3.2.3 Orientation (U3)

Sense of place. Users must always know where they are in the publication. Visual landmarks create better "browsability".

Picture 9. EestiPäevaleht (8.10.2012) has a navigation bar on top of every page indicating not only the reader's position within the magazine but also the length of the story.

Sense of direction. Users must always know how they can get back, get home, out of the current state, what they can do, where they are and where they can proceed to.

What to look for: Are possible options where to proceed clearly manifested? Does the reader know the length of the story? Is there a possibility to return to the previous state and home? No dead ends. Is it possible to get lost easily? Do we have visually clear and accessible table of contents? Do we easily recognize different sections of the publication?



Picture 10. Positional affordances of the reader in a digital publication

Memory load. Reduce short-term memory load. Represent only the data which is needed. Divide the info into optimal pieces.

3.2.4 Consistency (U4)

Similarity of appearance, location and behavior. Emphasize consistency by making visual cues consistent with each other. User has to be able to apply learning from one instance to another. Follow and know the design patterns & platform conventions.

What to look for: Inconsistencies of action.

3.2.5 Responsivity (U5)

User expects rapid response on interface. Touching should be followed by seemingly immediate display.

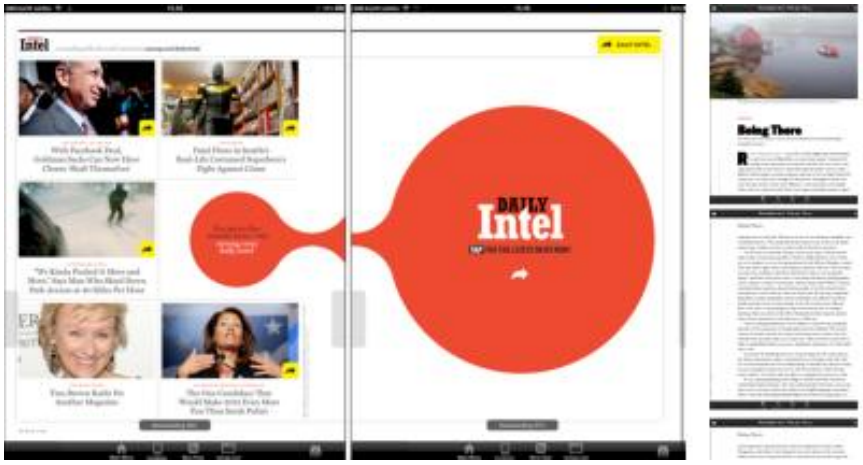
What to look for: Look for delays over 0,2 seconds

3.3 User experience (UX)

3.3.1 Flow (X1)

UX should reflect content and answer to the expectations of the genre of the publication and platform. Do not interrupt reading experiences unnecessarily. Pay attention to the vertical and horizontal flows. Keep it simple and clean.

What to look for: Is the reading experience pleasant? Are the pictures and color usage up to the "DNA" of the publication? Does it retain the wished tonality from start to end? Is the publication confusing or cramped? Does it interrupt the flow ("the story") with unrequested pop ups and sounds, keep it simple. It is not fatal to make bloated and noisy design on large screen computer, but in small touchscreen it is.

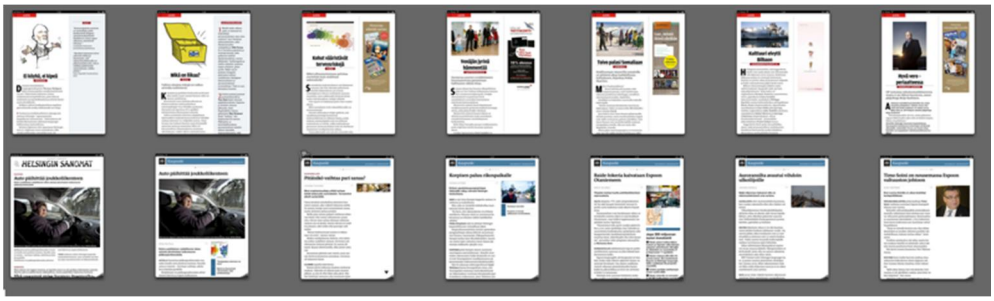


Picture11. Atlantic-magazine (right) has kept the traditional literary and culture magazine -style UX in the iPad. The reading experience is designed for vertical swiping (11/ 2012 iPad issue, vol. 350). On the left the New York Magazine 5.1.2011 with visual flow designed for horizontal swiping).

3.3.2 Interestingness, playfulness, arousal (X2)

Avoid excessive monotony.

What to look for: Is there lack of surprising elements (Garcia 2012, 127), which engage readers (proportional to the genre of publication)? Is there enough variation in the layout template? Consider offering different content with horizontal and vertical modes.



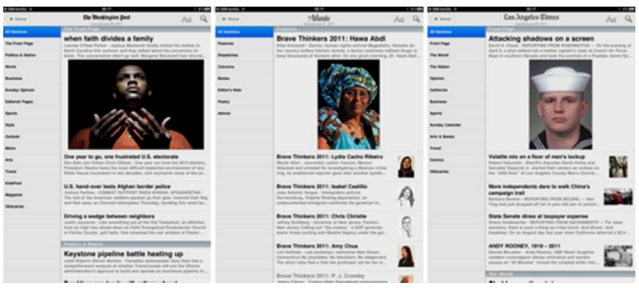
Picture 12. Above Suomen Kuvalehti -magazine with seven successive similar layout pages. Below the main story of Helsingin Sanomat 25.11.2012 and successive stories with an identical template

Picture 13. Cover story of Johnny Depp in Guardian 7.11.11. Dynamic publication can create variation in templates in order to retain interest. Also the Guardian brand image is easily recognizable.

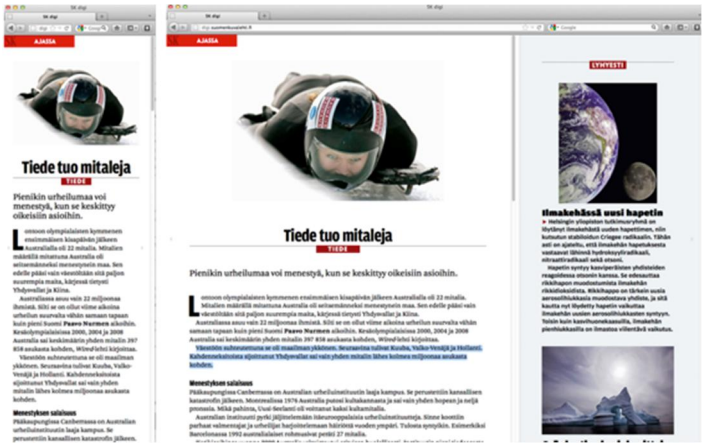
3.3.3 Mood and brand (X3)

Brand image should be visually recognizable, not only in the logo, but in layout, typography and colors as well. Mood of the content should be reflected in layout and in level of interactivity.

What to look for: Is the publication consistent with other members of the product family? Are there enough elements (like typography, color, line elements, boxes, paratexts etc) in publication to be linked to mother publication or brand in general? Is the story type reflected in layout and in the amount of interactivity? For example long literature-like stories call for calm and simple layout with low level of interactivity.



Picture 14. Three famous newspapers have lost their visual brand image in Kindle format (November 2011)



Picture 15. Suomen Kuvalehti -magazine has retained its brand image in digital form. Responsive HTML5 -layout is recognizable as SK because of the line elements, typography, colors and layout familiar from printed magazine. Digi-SK 12.9.2012 opened in Firefox, and is also available as iPhone app.

Picture 16. Very calm mood of story with appropriate low level of interactivity and simple layout in New Yorker, August 2012 issue.

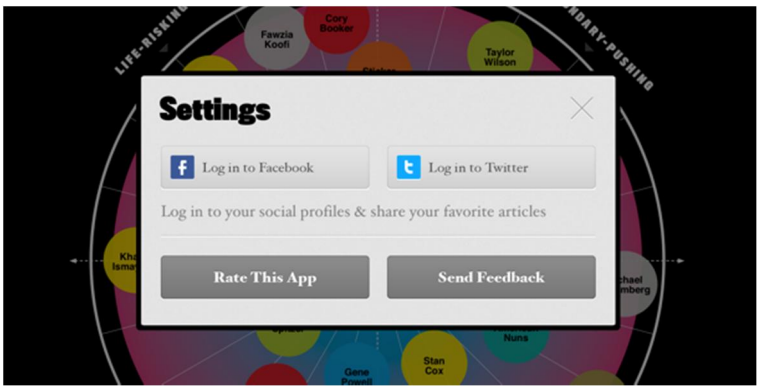
3.3.4 Interactivity (X4):

Interface dimension. *Is there additional, platform specific richness compared to the paper-version?*

Social dimension. *Can I share stories or participate in commenting? Is there possibility for feed back?*

Adaptive dimension. *Can I modify service? Can I take notes or save snippets? Bookmarks?*

Creative dimension. *Can reader participate in creating the content? (Like send reader pictures).*



Picture 15. In The Atlantic (11/2012) social media, rating and feedback to editor are grouped on settings.

3.4 Reporting problems

Known problem of usability reporting is **effectivity** of the report (Krug 2010, 129). It seems to be that large and ample reports are more than often left to gather dust in the shelves.

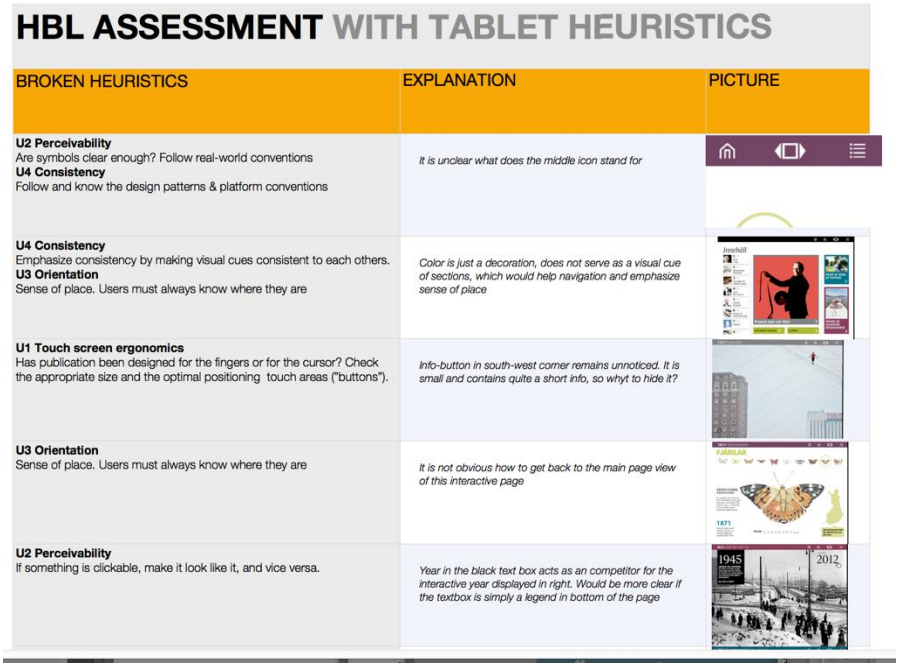
Effective reports should be accessed easily. Table format, which tells the story at one glance is the most appropriate. Table should contain at least four elements: 1) broken heuristics 2) severity 3) explanation and 4) picture of occurrence.

Numbering and lettering broken heuristic (for example U4 consistency) helps the reader to distinguish between accessibility, usability and UX problem.

Severity classification makes it possible for the reader to react first to the most important issues. Severity can be expressed with numbers 1–5, where 1 is problem which prevents use and 5 is a minor problem.

Explanation should be concise and clear and give a picture of the occurrence that help users to pinpoint the problem.

Solutions and positive feedback should be given while presenting the results.



Picture 18. Report on assessment of HBL+, new weekly tablet publication of SKF-media containing best of articles from several newspapers. October 2012. Consistency of icons and not following conventions and design patterns have caught the eye of researcher in the navigation bar on the upper right corner. Loosing sense of place is a serious error detected in page presenting occurrences of different butterflies in Finland

Picture 19. Tablet heuristics at work. Antti Karvanen, student in Publication Design for Emerging Platforms -course in Aalto ARTS 12.3.2013 gives feedback to representatives of the Otava publishing house about found problems in "Tatu ja Patu", an interactive childrens book for iPad.

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APPENDIX 1 Comparison features in well-known user interface design heuristics

Category	Visibility of status	User Control	Consistency	Guidance	Efficiency	Feedback	Mapping/ Navigation	Memory	Simplicity	Aestetics	User language	Percievability	Affordances	Readability	Reversability
Nielsen	x	x	x	x	x	x		X	x	x	x				x
Norman	x		x			x	x								x
Stone	x					x			x				x		
Johnson			x								x				
Tognazzini	x		x		x		x					x		x	
Schneiderman		x	x			x		x							x

APPENDIX 2 Well-known user interface design heuristics

NORMAN (1983A)

Inferences from research

- Mode errors suggest the need for better feedback
- Description errors suggest the need for better system configuration
- Lack of consistency leads to errors
- Capture errors imply the need to avoid overlapping command sequences
- Activation issues suggest the importance of memory reminders
- People will make errors, so make the system insensitive to them Lessons??
- Feedback : The state of the system should be clearly available to the user, ideally in a form that is unambiguous and that makes the set of options readily available so as to avoid mode errors.
- Similarity of response sequences : Different classes of actions should have quite dissimilar command sequences (or menu patterns) so as to avoid capture and description errors.
- Actions should be reversible: As much as possible and where both irreversible and of relatively high consequence, they should be diffi cult to do, thereby preventing unintentional performance.
- Consistency of the system : The system should be consistent in its structure and design of command so as to minimize memory problems in retrieving the operations.

SHNEIDERMAN (1987); SHNEIDERMAN AND PLAISANT (2009)

- Strive for consistency
- Cater to universal usability
- Offer informative feedback
- Design task flows to yield closure
- Prevent errors
- Permit easy reversal of actions
- Make users feel they are in control
- Minimize short-term memory load

NIELSEN AND MOLICH (1990)

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

STONE et al. (2005)

- Visibility : First step to goal should be clear
- Affordance : Control suggests how to use it
- Feedback : Should be clear what happened or is happening
- Simplicity : As simple as possible and task-focused
- Structure : Content organized sensibly
- Consistency : Similarity for predictability
- Tolerance : Prevent errors, help recovery
- Accessibility : Usable by all intended users, despite handicap, access device, or environmental conditions

JOHNSON (2007)

Principle 1 Focus on the users and their tasks, not on the technology

- Understand the users
- Understand the tasks
- Consider the context in which the software will function

Principle 2 Consider function first, presentation later

- Develop a conceptual model

Principle 3 Conform to the users ' view of the task

- Strive for naturalness
- Use users ' vocabulary, not your own
- Keep program internals inside the program
- Find the correct point on the power/complexity tradeoff

Principle 4 Design for the common case

- Make common results easy to achieve
- Two types of " common " : " how many users " vs. " how often "
- Design for core cases; don't sweat " edge " cases

Principle 5 Don't complicate the users ' task

- Don't give users extra problems
- Don't make users reason by elimination

Principle 6 Facilitate learning

- Think " outside-in, " not " inside-out "
- Consistency, consistency, consistency
- Provide a low-risk environment

Principle 7 Deliver information, not just data

● Design displays carefully; get professional help

● The screen belongs to the user

● Preserve display inertia

Principle 8 Design for responsiveness

● Acknowledge user actions instantly

● Let users know when software is busy and when it isn't

● Free users to do other things while waiting

● Animate movement smoothly and clearly

● Allow users to abort lengthy operations they don't want

● Allow users to estimate how much time operations will take

● Try to let users set their own work pace

(Johnson 2010, 175-178)

TOGNAZZINI (2003)

Anticipation

● Try to anticipate the user's wants and needs.

● Give user all information and tools needed for each step.

Autonomy

● The computer, the interface, and the task environment all "belong" to the user.

● Give user control by keeping her informed.

Color Blindness

● When using color use clear, secondary cues.

Consistency

● The most important consistency is consistency with user expectations.

● The importance of strict consistency varies.

● It is just important to be visually inconsistent when things must act differently as it is to be visually consistent when things act the same.

Defaults

● Defaults should be easy to "blow away."

● They should be "intelligent" and responsive.

Efficiency of the User

● Consider user's productivity, not the computer's.

● Keep the user occupied.

● Maximize everyone's efficiency.

● The great efficiency breakthroughs are found in the system architecture.

Explorable Interfaces

● Give user roads & landmarks, but allow exploration.

● Give user stable cues for a sense of "home."

● Allow undo

● Allow a way out.

Fitts's Law

● The time to acquire a target is a function of the distance to and size of the target.

Human Interface Objects

● User's interface objects appear within the user's environment.

● They can be seen, heard, touched, etc.

● They have a standard way of interacting with standard resulting behaviors.

● They should be understandable, self-consistent and stable.

Latency Reduction

● Reduce the user's experience of latency.

● Push latency into the background.

Learnability

● All applications and services have a learning curve.

● Limit trade-offs between usability and learnability.

Metaphors, Use of

● Choose metaphors well to enable the user to grasp the conceptual model.

● Bring metaphors alive by appeal to kinesthesia.

Protect Users' Work

● Ensure that users never lose work, unless completely unavoidable.

Readability

● Text that must be read should have high contrast.

● Use font sizes large enough.

● Don't forget those with special needs.

Track State

Keep track of state.

● Store it for later use.

Visible Navigation

● Avoid invisible navigation.

● Do not prevail upon user to build elaborate mental maps.

(Tognazzini 2003) POIS