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Accessibility and usability evaluation of E-vote prototypes

Note no DART/0X/09

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Date 24. November 2009

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Content

1 Introduction

This document describes results from the second iteration of accessibility and usability tests and evaluation of three e-Voting prototypes. The main goal has been to evaluate the prototypes with regard to accessibility and usability. In this iteration the focus has been to rank the prototypes in terms of accessibility and usability.

2 Summary and conclusions

Concerning the Elmer requirements, Computas has clearly better compliance than the other two, which we consider to be at the same Elmer compliance level. However, the Elmer requirements are mainly intended for electronic forms, and as a consequence, many of these requirements are not considered to be of high significance in an e-voting application.

Concerning the WCAG 2.0 requirements, the prototypes are still far from full compliance, in particular considering their incompleteness in terms of lacking implementation of multimedia content. Despite the prototypes' different layouts and functionalities, the compliance violations are approximately equally severe for all prototypes. As a consequence, all prototypes perform roughly identical, without any clear winner, assuming that all tests are equally important.

Considering the other accessibility and usability requirements, it turns out that there are some differences among the prototypes. In terms of the accumulated credit points Indra outperforms Ergo's prototype with a slight and Computas' prototype with a more substantial margin. However, all prototypes are significantly below the theoretically achievable credit point sum.

ErgoGroup clearly performed best in the user tests and persona tests. Many users liked the ErgoGroup solution because it was very quick and to the point. Computas was liked because of its clear and simplistic layout, while Indra was liked because of the use of party symbols. The main problem with the Indra and Computas prototypes were related to sequence and navigation. However, Computas was totally inaccessible for screen reader users and this is a severe problem.

When adding the results of the user and personas testing, where Ergo turns out to be a clear winner (see the section on usability testing), we can conclude that Ergo's prototype has the best accessibility and usability. We evaluate Indra as number two and Computas as number three.

3 Method

This is results from the second out of two iterations of usability and accessibility testing of the eVoting prototypes. The following three main testing approaches have been performed:

- Technical accessibility tests
- Usability/accessibility tests with persona on three platforms and six browsers.
- Usability/accessibility tests with real users

4 Elmer Requirements

4.1 Page structure

The page headings of Computas are instructive, and they say something about what to do at that page, and correspond to the navigation area to the left. Therefore, Computas conforms better to the Elmer requirements (EL 2.3.1). However, the Computas solution is not accessible for screen reader users.

ErgoGroup and Indra both have some issues with the tab-sequence for screen reader users. They do not have direct links to the content, leading to the user having to perform a number of key presses to get to the main content.

Reading the reading sequence, there were challenges for screen reader users using the Ergo and Indra Ergo solution (EL 2.3.3). It particular, is very cumbersome for them to tab through all the graphical and menu items for every page. Computas were not accessible for screen reader users at all.

None of the solution requires horizontal scrolling when using default text size and screen size. (EL 2.3.7)However, many users may need to increase the text size. When using CTRL+ in the browser this often lead to horizontal scrolling. It is possible to build in more intelligence in the increase function in order to avoid horizontal scrolling for a larger part of the users, e.g. by presenting all the parties below each other in case of using very large fonts. The Elmer requirement of having navigation area to the left (instead of for example at the top) leaves less space to the content and thus may lead to the need for horizontal scrolling.

4.2 Identification labels

This group of requirements is considered as of little relevance for the e-voting applications.

4.3 Tables

Many users liked the presentation of candidates from other parties in two drop down lists in Ergo very well. However, this type of functionality is demanding for screen reader users. To our experience, an average screen reader user will have difficulties with this functionality. This is for OK only for advanced and experienced users. Using open text input field, as in Computas, is not an ideal solution either. The way Indra solved this issue, seemed to work well for many users.

4.4 Figure processing

These requirements are considered as of little relevance for the e-voting applications.

4.5 Conventions and symbol use

The use of party symbols were considered positive by many users in the user tests.

4.6 Pre-filling

These requirements are considered as of little relevance for the e-voting applications.

4.7 Help texts

None of the solutions have implemented user requested help completely according to the Elmer standard.

Computas has some inline help text, but provides more help in the information area. The help in the information area are displayed by default (ie. they are not user requested). They could be improved to the needs of the least skilled form fillers. In general, the help texts should be shorter, more structured and divided into smaller segments (EL 4.2.8 & EL 4.2.). See appendix with for further details from the user tests.

All the help texts in the ErgoGroup and Indra solutions are provided inline. It seems that even though ErgoGroup has the least amount of help texts, users had least problems with this solution (with exception of the validation page). This could reflect that the ErgoGroup solution was perceived as more intuitive by the users. Several of the users did however try to press the “Hjelp til utfyllingen” button, thus indicating that they would have liked to have some more support (EL 4.2.7).

The Indra help texts were a bit confusing, probably because of the order of instruction/help text and labelling of buttons.

In all three solutions, the default text size should have been larger (EL 4.2.9). All solutions have provided a link in upper right corner for more help, but this help text were not implemented (EL 4.2.7)

Conclusion: Computas: 1 point, ErgoGroup: 1 point, Indra: 1 point.

4.8 Error messages and warnings

These requirements are considered as of little relevance for the e-voting applications, but there are some overall comments. The Ergo solution requires user to click “yes/no” radio buttons in order to proceed after selecting party. Many users failed to notice the questions about personal votes and add in from other parties, but most of the users would eventually see the error message and recover.

Screen reader users however had trouble with this error because of the sequences of information presented. First, in order to reach the question they had to tab through all the candidates because the question were in the same section as the table. Often, however, they would skip the last part of the table, and jump to next section. Then they could chose between the back, break and next button, and probably press the next button. Then however, they could not proceed because they were required to answer yes or no question about person votes or candidates from other parties. Then they would tab through all the menus and to the end of the tables, in order to reach the error message (see e.g. Screenshot 5). This trouble is considered as a critical error (see more details in appendix).

Another issue that caused problem was the red warning message in Computas about voting in all elections. Users failed to understand the message.

Conclusion: Computas: 1 point, ErgoGroup: 1 point, Indra: 1 point.

4.9 Concluding messages

Confirmation pages are ok, Validation of ErgoGroup solution are far to complicated.

Conclusion: Computas: 2 point, ErgoGroup: 1 point, Indra: 2 point.

4.10 Elmer conclusions

Computas conforms best to the Elmer requirements, see table for details. Below we elaborate on some of the issues.

5 Description of Technical Testing, Iteration II

The sections below detail the second iteration with testing of the prototypes with regard to the technical requirements put forward in the requirements specification given, in particular WCAG 2.0 and other AU requirements. Here, we comment on the credit points given for a particular test and justify our decision.

5.1 Material received

Three prototypes were delivered by different providers and made available on the Internet. They remained unaltered during the testing period. Each prototype was accompanied by the codes necessary to walk through an entire election process.

The requirements specification was part of the document Evaluation Model [1] provided by the customer.

5.2 Testing setup

This section gives details on the testing setup, while the results are reported on in subsequent sections.

5.3 Scenarios

It is noted that, given the project's timeline and budget, it was impossible to test every combination of election choices, which in turn gives pages with different content. The testing is therefore limited to the scenarios described below.

All scenarios involve an authentication step at the beginning and a check of the election receipts at the end of the election process.

- **Scenario 1: Simple vote without changes in municipality election**
  The user casts a vote in the municipality (kommune) election without any changes.
- **Scenario 2: County vote with person votes**
  The user casts a vote in the county (fylke) election and gives person votes to two candidates, no. 2 and no. 5 on the party list.
- **Scenario 3: New/changed vote in the municipality election with added persons from other list**
  The user has changed his/her mind in the municipality election and votes for another party and also adds names from another party list.

It is noted that, even if the scenarios are identical for all prototypes, the number of pages tested differed with each prototype, due to the technologies involved. To be more specific, there are 2 unique pages for Computas' prototype, 14 unique pages for Ergo's prototype, and 8 unique pages for Indra's prototype.

5.4 Tools

Apart from the tools mentioned below in the sections on each test result, the Web Developer extension version 1.1.8, the Firebug extension version 1.4.5, and the WCAG Contrast Checker 1.1.02 combined with Mozilla Firefox browser version 3.0.15 have been used.

5.5 References

It is referred to the definition of credit points under the section *Aggr. evaluation* in the document *Evaluation Model,* which ranks the points from 0 (worst) to 3 (excellent).

5.6 Testing difficulties

The digital certificate presented by Computas' prototype triggered a security warning in browsers such as Firefox and Opera. It was only possible to proceed by accepting the certificate manually, which complicated automatic testing a bit. The certificate problem has been known from Iteration I as well, and has unfortunately not been fixed.

The size of the 6th page in the 3rd scenario tested with Ergo's prototype was too large for the Achecker tool to process. The same applies to the 3rd page in the 2nd scenario tested with Indra's prototype. Both are the pages where it is possible to choose among all possible candidates. It is recommended to generate smaller pages to enable testing.

6 WCAG 2.0 requirements

The document *Evaluation Model* [1] lays the basis for the testing of WCAG 2.0 [9] success criteria. Under the section *WCAG reqs*, 82 different success criteria are mentioned from all conformance levels, i.e. A, AA, and AAA. Please see this document for a detailed listing of all results.

The WCAG criteria have been tested with the Achecker version 1.0 [10]. Achecker returns the number of detected issues that it can classify as conformance errors with regard to WCAG 2.0, as well as a listing of likely and potential conformance errors which both mandate the examination of a human to decide if the issue means a conformance violation or not. As potential errors can turn out to be either real flaws or no errors at all, we have decided to ignore them in the results. However, the detailed results of each conformance check are part of the final report and can be found attached, see document *achecker_results*. It is stressed that the scope of the results is limited to the conformance of the document tree directly after the initial download has been finished. This does not cover later modifications of the document tree.

We have tested each page of each scenario for entire WCAG 2.0 conformance on all levels, i.e. A, AA, and AAA. The known errors and likely errors (if real errors) found have then been compared to each of the 82 success criteria given. In case of a topic match, we have given the credit points 0 or 1 depending on the error's severity, or credit points 2 otherwise. Comments where appropriate are found inside the results table. In addition, we have conducted parts of the success criteria testing manually.

It is noted that some of the success criteria overlap with a part of testing in section *Other accessibility and usability requirements*.

Concluding, the sum of all credit points is nearly equal for all prototypes. Computas yields 142 accumulated points, Ergo 138 points, and Indra 139 points, while the theoretically maximum credit score is 164 points. Each prototype has a series of errors

in common with the other prototypes, and other flaws which affect the particular prototype only.

To name the most important errors: What we view as a severe error is the extensive use of tables in Computas' prototype. It is also a rather basic error to contain text in images, as done in Ergo's and Indra's prototype. Flaws common to all prototypes are the fixed page structure and a very wide page width. Also, all prototypes have trouble with the proper contrast both with text and images. Also, the keyboard handling can be improved in all prototypes. See the comments column in the results table for a detailed listing of errors.

6.1 Conclusions

Concerning the WCAG 2.0 requirements, the prototypes are still far from full compliance, in particular considering their incompleteness in terms of lacking implementation of multimedia content. Despite the prototypes' different layouts and functionalities, the compliance violations are approximately equally severe for each prototype.

7 Other accessibility & usability requirements

Here, we give the results for the accessibility and usability testing. It is also referred to the document *testing_details_nr_final* for a more detailed listing of the results for each scenario.

7.1 Requirement AU1: “Logical information flow/style”

This section is on testing Requirement AU1. It is also partly on testing Requirement AU2. Accessing a document's logical information flow, the so-called document tree, with assistive technologies should give the same user experience as for users without special needs. To achieve this, it is crucial to be able to access the document tree without any style information.

Cascading style sheets is a technology used to style web documents. The prototype's generated style should be CSS and should conform to CSS 2.1 [5] as the latest version widely recognized by all modern browsers. We have tested the validation of all files of the content type text/css with the validator of the W3C [6]. The validator returns the number of validation errors. Zero validation errors are treated as a pass. The validation has been carried out for all relevant documents downloaded in each scenario, and the maximum value of all results lays the basis for the overall results presented here. The testing of CSS concerns external CSS (embedded via the Link element), embedded CSS (via the Style element), and inline CSS (using the common Style attribute). Also style sheets which are nested by means of the @import syntax are accounted for.

A document should be usable without CSS, i.e. proper fall-back should exist. Viewing a page without style corresponds to browsing with a text based user agents like Lynx.

Computas:

> Fall-back: The prototype is not usable without CSS.
> Validation: All style validates without any error.

Ergo:

> Fall-back: The prototype is usable without CSS with only minor limitations.
> Validation: All style validates without any error.

Indra

> Fall-back: The prototype is usable without CSS with only minor limitations.
> Validation: All style validates without any error.

Concluding, while CSS conformance is handled in a problem-free manner by all solutions, Computas' prototype needs a proper fall-back. The fall-back of Ergo's and Indra's prototype needs to revisited to eliminate some malfunctioning with which it is not possible to succeed with a voting process.

Comments from user testing:
During the user tests we found that Computas were not accessible with screen readers (such as Jaws and Windows Eyes). The coding of links and buttons in the ErgoGroup solution were not consistent. The screen reader user sometimes had to jump between reading mode and display mode in an arbitrary manner. Screen reader users might not know whether to use tab or arrows to get to the next link/ button. Screen reader users were confused regarding what checkbox/radiobutton belongs to which party (Missing label on the box/button).The coding of links and buttons in the Indra solution were not consistent either.

Concluding: Computas credit points: 0, Ergo credit points: 1, Indra credit points: 1.

7.2 Requirement AU 2: “Cross-platform independence”

Cross-platform and cross-platform independence is achieved by following all relevant recommendations/standards, de facto standards, and best practices. With other words, markup and style should validate without any errors, and there should not be any run time errors while interacting with the page. This applies to the validation of HTML and CSS, as well as the execution of JavaScripts. The testing is thus split up into the following subsections.

- HTML, see Section *HTML conformance*,
- CSS, see Section *Logical information flow/style* which also tests Requirement AU1.
- JavaScript, see Section *JavaScript* which also tests Requirement AU13.

Concluding: Computas credit points: 1, Ergo credit points: 1, Indra credit points: 1.

HTML conformance
This test is part of the testing of Requirement AU2.

The prototype's generated markup should be HTML and should conform to HTML 4.01 [7] as the latest version widely recognized by all modern browsers. We have tested the validation of all files of the content type text/html with the validator of the W3C [8]. The validator returns the number of validation errors. Zero validation errors are treated as a pass. The validation has been carried out for each page downloaded in each scenario, and the maximum value of all results lays the basis for the overall results presented here.

Computas

> The HTML validates without any errors at download time. It is noted, though, that heavy use of XMLHttpRequest leads to substantial modifications of the

page after the initial download, the conformance of which cannot be validated with the tools available so far (a DOM validator is needed).

Ergo

The HTML validates without any errors at download time.

Indra

The HTML validates without any errors at download time.

However, using Windows XP, with Mozilla Firefox/3.5.5 the content is presented below the menus in the Indra solution.

Concluding, the generation of HTML 4.01 conformant markup is handled by all prototype in a close to problem-free manner. Computas should be able to document that any of the dynamic document changes introduced after the initial download do not violate the conformance.

7.3 Requirement AU 3: “Change language”

All content, including files offered for download etc., should be available in several languages, and it should be possible to change the current language. The languages which are deemed relevant in this context are (Norwegian) Bokmål, (Norwegian) Nynorsk, English, and Sami.

Computas

Offers the alternatives Bokmål, Nynorsk, and English on the login page, but not later on.

Ergo

Offers the alternatives Bokmål, Nynorsk, Sami, and English only on the login page. Only Bokmål is implemented in this prototype version, including additional files available for download.

Indra

Offers the alternatives Bokmål and English, and only on the login page.

No prototype is complete concerning language support. Only Computas and Indra are able to show that their prototype actually works in several languages as the implementation is incomplete with Ergo's prototype.

Supplementing comments from user tests:
Computas: Default should be Norwegian. The order in which buttons are presented in the beginning is a drawback because screen reader users goes directly to login, and do not discover the change language button which is presented after the login butting. (This also touches upon requirement AU1 about logical information flow).

Ergo Group: Default is Norwegian and since we tested with Norwegian speaking users the language issue did not generate any problems in this solution. However it is an advantage that the Language selection is presented before login button.

Indra: Default should be Norwegian. When starting the application, the user finds the cursor is placed in the field for entering user name. Also in this solution the order in which buttons are presented when tabbing is a problem because screen reader users goes directly to login, and do not discover the change language button/link. (This also

touches upon requirement AU1 about logical information flow). In addition, the Language icon is too small, so several users with no vision impairment did not notice this option either.

Concluding: Computas credit points: 1, Ergo credit points: 0,5, Indra credit points: 1.

7.4 Requirement AU 4 “File attachments formats”

This section is on testing Requirement AU4.

The format of files available for download should meet the format requirements set by Norwegian authorities, the so-called Referansekatalogen [4]. This includes particular version numbers.

As detailed in the Plugins Testing section, only Ergo's prototype offers the download of additional files, which comes in the format PDF.

Computas

PDF: Not applicable.

ODF: Not applicable.

Ergo

PDF: The document available is formatted as PDF version 1.3.

ODF: No ODF is available.

Indra

PDF: Not applicable.

ODF: Not applicable.

Only Ergo's prototype offers additional material for download. The prototype fails the test as the version available is too old, and because no other format like ODF is presented. It is also noted that the PDF, as it is a file format not necessarily handled by the browser, should be marked as such on all pages of concern, including its size. The latter due to responsiveness considerations, see Section *Responsiveness*.

Supplementing comments from user tests:
The information brochure provided by ErgoGroup was commented as very positive by several of our test users. In general, it is important to note that any material presented to the voter, (such as information brochures about electronic voting, information about parties, codes etc.) should comply with this requirement. As such material was very premature, and non-existing for Computas, this type of material has not been evaluated with regard to file formats.

Concluding: Computas credit points: 0, Ergo credit points: 0,5, Indra credit points: 0.

7.5 Requirement AU 5 “Page size”

The size of a page should not exceed a particular value, here set to 200 KB. This to ensure an acceptable user experience in terms of sufficiently short downloads and short responsiveness of the solution.

The size of a page includes all external files with for instance style sheets, scripts, images, and programs such as Java. It does not include files that are downloaded in the background after the initial download. Some files, such as scripts, have been

downloaded in compressed form. The page size has been recorded for each initial page download in each scenario, and the maximum value of all results lays the basis for the overall results presented here.

Computas

The maximum page size is 219 KB and hence above the threshold given.

Ergo

The prototype has only a single page, the size of which is 322 KB and thus above the threshold given. This is the page where new candidates can be added to the user's candidates of choice. All other pages are below the threshold with a substantial margin.

Indra

All prototype pages are below the threshold, even though the prototype makes extensive use of images and icons.

Only Indra's prototype passes the test. Computas' prototype is above the threshold due to the download of a large (in terms of bytes) JavaScript libraries. The page of Ergo's prototype found to be above the threshold owns its size due to the fact that all candidates of all parties are contained in the HTML file downloaded, which results in a relatively large file.

Concluding: Computas credit points: 0, Ergo credit points: 1, Indra credit points: 2.

7.6 Requirement AU 6 “Session independence”

Session (and hereby unit) independence is necessary to provide a system reaction as expected by the user. For other unit independence tests, it is referred to the sections on cross-platform and cross-browser testing.

Computas: The prototype behaves session and unit independent.

Ergo: The prototype behaves session and unit independent.

Indra: The prototype behaves session and unit independent.

All prototypes pass the test.

Concluding: Computas credit points: 2, Ergo credit points: 2, Indra credit points: 2.

7.7 Requirement AU9 “Proper page resolution & fluid web design”

From an accessibility point of view, horizontal scrolling in addition to vertical scrolling should be avoided. Requirement AU7 is therefore tested by measuring the minimum page width for which the horizontal scrollbar is suppressed in the browser. Given the minimum screen resolution of 800x600 pixels, pages with a width exceeding 800 pixels are viewed to have failed the test. The test has been conducted for each page downloaded in each scenario, and the maximum value of all results lays the basis for the overall results presented here.

It is also investigated if the prototype is capable of handling very wide window widths without significant degradation of the quality of user experience.

Apart from the aforementioned, the layout of a page should be fluid in order to adapt to various window widths. This has been tested by letting the user agent display all pages of each scenario with widths ranging from specific for small device screens (240 pixels) up to wider computer screens (1600 pixels).

Computas

Minimum page width: The prototype's minimum page width is 966 pixels and hence above the threshold.

Maximum page width: The prototype has a maximum page width, such that it can be used also with very wide window widths (and hence very wide screens combined with full-screen mode) without problems. The page is placed horizontally in the middle of the window.

Fluid layout: The page layout is static, i.e. not flexible.

Ergo

Minimum page width: The prototype's minimum page width is 1008 pixels and hence above the threshold.

Maximum page width: The prototype has a maximum page width, and the page is placed horizontally to the left of the window.

Fluid layout: The page layout is static, i.e. not flexible.

Indra

Minimum page width: The prototype's minimum page width is 995 pixels and hence above the threshold.

Maximum page width: The prototype has a maximum page width, and the page is placed horizontally in the middle of the window.

Fluid layout: The page layout is static, i.e. not flexible.

Concluding, all prototypes have a minimum page width above 800 pixels and therefore fail the test. Next, none of the prototypes is capable of the required fluid page layout. On the other hand side, all prototypes handle very wide windows well.

Computas credit points: 0, Ergo credit points: 0, Indra credit points: 0.

7.8 Requirement AU8 “Text size and contrast”

It should be possible for the user to change the font size and contrast for a better user experience.

Computas

Font size: It is not possible to change the font size.

Contrast: It is not possible to change the contrast.

Ergo

Font size: It is possible to set the font size to three pre-chosen values.

Contrast: It is not possible to change the contrast.

Indra

Font size: It is possible to set the font size to three pre-chosen values. However, the font size is reset when a new page is loaded, such that the process with setting the desired font size has to be repeated for each new page loaded.

Contrast: It is not possible to change the contrast.

Computas' prototype fails the test entirely. Ergo's prototype passes the font size test but fails the contrast test. Indra's prototype fails the test, partly due to an implementation of poor quality.

Concluding: Computas credit points: 0, Ergo credit points: 1, Indra credit points: 0.

7.9 Requirement AU 9 “Mouse and keyboard input”

It should be possible to use the solution both with a mouse and with a keyboard as input device.

Computas

Mouse: The prototype can be used with a mouse.

Keyboard: The prototype cannot be used with a keyboard in a satisfying manner. This is because the solution does not employ links but rather uses JavaScript events.

Ergo

Mouse: The prototype can be used with a mouse.

Keyboard: The prototype can be used with keyboard controls.

Indra

Mouse: The prototype can be used with a mouse.

Keyboard: The prototype can to be used with keyboard controls.

Concluding, Computas’ prototype fails the test, while the implementation for both Ergo and Indra has potential for improvement.

Comments from user testing: Computas were almost impossible to use with keyboard only, and when using Ergo’s prototype when answering questions with Y/N radio button (the users expect to be able to use “enter-button” but the application expects “space”) A similar problem occurred in the Indra solution when user would select parties.

Concluding: Computas credit points: 0, Ergo credit points: 1, Indra credit points: 1.

7.10 Requirement AU 10 “Font types”

Sans-serif font families like the Tiresias font should be used to increase readability of any text.

Computas

Font families used: *Arial, Unicode MS, sans-serif*

It appears that Computas have removed support for the Tiresias font from their prototype for unknown reasons (since Iteration I).

Ergo

Font families used: *Verdana, Geneva, Tahoma, sans-serif*

Indra

Font families used: *Arial, Helvetica, sans-serif*

Concluding, none of the prototypes has support for the Tiresias font implemented. However, all prototypes make use of font families without serifs, which ensures good readability.

It is noted that Tiresias support can effortlessly be added to all prototypes.

Concluding: Computas credit points: 1, Ergo credit points: 1, Indra credit points: 1.

7.11 Requirement AU 5 “Login and authorization”

Since it is not clear what kind of login and authorization solution than eventually will be implemented, this is not evaluated.

7.12 Requirement AU 12 “Other technologies”

Testing of this requirement has been split into

- applets, see Section *Java/applets*,
- plugins, see Section *Plugins,*
- cookies, see Section *Cookies*,
- framing, see Section *Frames and iframes*, and
- content handling, see Section *Media type, doctype, and rendering mode*.

Technologies other than the ones mentioned in this document do not have to be installed in order to use the respective solution.

Computas credit points: 1, Ergo credit points: 1, Indra credit points: 1.

7.12.1 Java/applets

This test is part of the testing of Requirement AU12.

Java applets are programs which extend the functionality of user agents. As separate programs on their own they are subject to security, accessibility, and usability issues. Text-only browsers like Lynx do not support applets. Apart from this, many users do not have installed Java (or do not have it installed correctly) and other plugins which are necessary to make Java accessible. Next, the Java implementation itself has to be accessible, a right combination of versions of browser, Java, Java accessibility plugin, screen reader and/or other assistive technology is mandatory.

It is further noted that the tools evaluating web technologies cannot assess the accessibility of the Java applet itself.

A proper fall-back for Java should be available.

Computas

The prototype does not deploy applets.

Ergo

The prototype does not deploy applets, in contrast to the prototype in Iteration I.

Indra

The prototype does not deploy applets.

Concluding, Java applets is not a problem with any of the prototypes.

7.12.2 Plugins

This test is part of the testing of Requirement AU12.

Plugins are extensions of a user agent's technical capabilities. They are basically separate programs which are executed on behalf of the user and thus subject to security issues. Some users prefer to have plugins disabled for this very reason. The installation process of plugins is a bit cumbersome, and some plugins are simply not available for all platforms of concern. Not all user agents support plugins. The functionality of a plugin can also be replaced by an external program.

A proper fall-back is appropriate.

Computas

> The prototype does not make use of plugins.

Ergo

> The prototype offers to download PDFs which have to be viewed in a PDF reader plugin.
>
> The prototype also presents an instruction video, which requires the use of a media player plugin such as the Flash Player, depending on the format deployed. The full functionality has not been implemented yet.
>
> Both forms of plugins use can be judged as being of non-interactive nature.

Indra

> The prototype offers to view an instruction video, which requires the use of a media player plugin such as the Flash Player, depending on the format deployed. The full functionality has not been implemented yet.

Concluding, the prototypes do not necessarily need plugins to work properly. The planned video content should be offered in a format specified in the Referansekatalogen [4].

7.12.3 Cookies

This test is part of the testing of Requirement AU12.

HTML cookies are small chunks of text stored at the user agent side. It is a technology which is not supported by all modern user agents, and some users prefer to have it disabled due to privacy reasons.

A proper fall-back is needed.

Computas

> The prototype does not use cookies, and as a consequence it is possible to use the prototype without cookies.

Ergo

> The prototype makes use of cookies, and consequently it is not possible to log on to the prototype without cookies.

Indra

> The prototype makes use of cookies, and consequently it is not possible to log on to the prototype without cookies.

Concluding, only Computas' prototype works without cookies.

7.12.4 Frames and iframes

This test is part of the testing of Requirement AU12.

Frames are often associated with many usability and accessibility issues [2]. Moreover, they have been deprecated in the upcoming HTML 5 [3]. The use of frames should thus be avoided.

Concerning iframes / inline frames, a proper fall-back should be available if they are visible.

Computas

> The prototype avoids the use of frames but makes use of iframes, probably to replace cookies, i.e. for tracking purposes. The iframe's are invisible, though.

Ergo

> The prototype uses neither frames nor iframes.

Indra

> The prototype uses neither frames nor iframes.

Concluding, neither frames nor iframes are used in problematic ways in the prototypes.

7.12.5 Media type, doctype, and rendering mode

This test is part of the testing of Requirement AU12.

The media type is the declaration of a document's content type sent from the server. It should be *text/html* for the highest level of user agent compatibility.

The doctype is the declaration of a document's type included in the document itself. It should be
*<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01//EN" "*http://www.w3.org/TR/html4/DTD/strict.dtd*">* or *<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "*http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd*">*for the highest level of user agent compatibility.

The user agent rendering mode is derived from the media type and the doctype. It should be so-called Standards mode. Quirks mode leads to inconsistently displayed pages in the user agents.

Various browsers have differing doctype switches, i.e. the dependency doctype – rendering mode is browser specific. The reported rendering modes below are the result for Firefox.

Computas

> Media type: *text/html*
> Doctype: *<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">*
> Rendering mode: Quirks mode

Ergo

> Media type: *text/html*
> Doctype: *<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "*http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd*">*
> Rendering mode: Standards mode

Indra

> Media type: *text/html*
> Doctype: *<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"*

"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
Rendering mode: Standards mode

It appears from comments in the markup that Computas intentionally desires Quirks mode.

Concluding, all prototypes are rendered in Standards mode, except for Computas' prototype which can easily be fixed by adding an appropriate document type declaration and adapting style and document tree somewhat.

7.13 Requirement AU 13 “JavaScript”

This section is on testing Requirement AU13 and partly Requirement AU2.

JavaScript is a programming language used to modify the structure and style of web documents, and to provide additional functionality. JavaScript is executed within the context of the browser and hence subject to security issues, which is why some users prefer to navigate the web without it. In addition, some user agents do not support JavaScript. The user agent should not encounter any script errors – neither during compilation time nor run time – during the execution of a JavaScript. Solutions requiring JavaScript are often subject to cross-platform/browser inconsistencies. The number of JavaScript errors has been recorded for each page downloaded in each scenario, and the maximum value of all results lays the basis for the overall results presented here.

A proper fall-back should exists, i.e. the basic functionality of web page should be available without JavaScript.

Moreover, it should be possible to combine JavaScript with the use of assistive technology. In particular, dynamic page modifications should be recognized and signaled to the user.

Computas

Fall-back: The prototype properly shows fall-back information instead of the login page. However, it is not possible to vote without JavaScript.

Errors: No JavaScript errors are encountered with the prototype.

Ergo

Fall-back: The prototype has a fall-back mechanism which gives support information. However, there is room for improvement concerning usability issues with the information given. It should not be possible to get to another page without JavaScript. It is not possible to vote without JavaScript.

Errors: No JavaScript errors are encountered with the prototype.

Indra

Fall-back: The prototype has fall-back mechanisms which allow to vote without JavaScript with some minor functional limitations, i.e. the fall-backs could be improved slightly.

Errors: No JavaScript errors are encountered with the prototype.

Concluding, all prototypes employ scripting in the form of JavaScript. Only Indra's prototype allows to succeed with a vote without JavaScript. All prototypes have fall-backs, of which some have the potential for improvements. No JavaScript execution errors are encountered with any prototype.

Concluding: Computas credit points: 1, Ergo credit points: 1, Indra credit points: 1

7.14 Requirement AU 14 “Responsiveness”

This section is on testing Requirement AU14.

In case the responsiveness exceeds the expectation of the user, e.g. when a large file must be downloaded, the user should be notified of with an appropriate message. Here, the threshold is set to 2 seconds.

We have defined the responsiveness as the delay measured from the moment of a mouse click or keyboard press until the user agent (here: Firefox with the Firebug extension as specified above) has finished processing all relevant files. This includes server requests, server reaction times, downloads, processing of files on the client side (parsing etc.) and rendering.

The response time has been recorded for each page downloaded in each scenario, and the maximum value of all results lays the basis for the overall results presented here. All numbers have to be interpreted with care as they are influenced by the bandwidth of the client's connection. All requests are sent from Norwegian Computing Center's physical location in Oslo.

Computas

> The maximum response time of the prototype is 1.8 seconds and thus below the threshold. A lot of requests are carried out in the background, the duration of which is typically below 20 ms.

Ergo

> The maximum response time of the prototype is nearly 4.5 seconds long and thus significantly above the limit. The reason is browser sniffing and a subsequent redirect during the login, and in case the reason is simply a large file size.
>
> Other than that, the prototype points to the (external) file http://www.regjeringen.no/upload/KRD/Kampanjer/valgportal/stortingsvalg/Brosjyre/valg_BOKMAAL_web.pdf, a PDF and of the size 693 KB. The download of this file may last more than 10 seconds. The file should be marked as such. Activating a download could also trigger a message to the user explaining the situation.

Indra

> The maximum response time of the prototype is approximately 1.5 seconds and hence below the required threshold.

Only Ergo's prototype fails the test.

Concluding: Computas credit points: 2, Ergo credit points: 0, Indra credit points: 2.

7.15 Other findings

Apart from the findings above, it has been found that Computas' prototype uses tables for element alignment, which is viewed as bad markup. Instead, generic elements like div/span should be used in combination with proper styling.

Computas

The responsiveness of the user interface could be improved by loading images used for hovering effects in the background.

With some minimum page widths, the page overflows the available window slightly, i.e. a part of the page is invisible, as no horizontal scrollbar is shown.

The prototype makes use of tables to present non-tabular material.

Ergo

On the *Personstemmer fra andre partilister* page, the textual description should be rephrased.

The responsiveness of the user interface could be improved by loading images used for hovering effects in the background.

With some minimum page widths, the page overflows the available window slightly, i.e. a part of the page is invisible, as no horizontal scrollbar is shown.

Indra

Under the *You have voted for* page, activating the *Back* button proceeds you erroneously to the *Your vote has been recorded* page.

The *Back* button does not always bring you back to the previous page, meaning that some data may be lost depending on the progress of the voting.

A particular icon, http://94.126.241.233/version2/img/parties/part12.gif, is not found and gives an HTML status code 404.

The “0 candidates selected” functionality during adding personal votes does not update with proper values when candidates are selected.

The screen during the process of selection of new candidates is confusing. When adding new candidates; the newly chosen ones will seemingly replace the previously chosen candidates. However, on the confirmation page where the final vote can be checked, the choice of candidates appears to be as desired.

With some minimum page widths, the page overflows the available window slightly, i.e. a part of the page is invisible, as no horizontal scrollbar is shown.

It is also noted that the requirement of Unicode testing has been dropped, in contrast to Iteration I. It appears, though, that the prototypes now all support Unicode, including Ergo's prototype.

7.15.1 Choice of technology combination

This test was not mandated in the requirements specification but is needed to complement the technical evaluation of the solutions of concern.

The server's response header, which we recommend to hide in a production system due to security concerns, revealed the following information.

Computas

Computas' prototype is build as a Java servlet and uses a Sun GlassFish Enterprise Server version 2.1. The system is identical to the one use in Iteration I.

Ergo

Ergo's prototype is built on top of an Apache web server version 2.0.52, which in turn runs on a host machine running the operating system Red Hat. The system is identical to the one use in Iteration I.

Indra

The Indra prototype is implemented by means of PHP version 5.3.0 on top of an Apache web server version 2.2.11. The system has been updated since Iteration I.

Concluding, the prototypes have chosen quite different technologies.

7.15.2 Navigation

This test was not mandated in the requirements specification but is needed to complement the technical evaluation of the solutions of concern.

Navigating forward and backward among pages with the user agent controls (buttons) increases the usability, provided no other navigation measures are available. Navigation is for instance not possible when only parts of a page are loaded by means of JavaScript.

Computas

The user agent controls are not available. Navigation buttons (*Next, Back, Sign, Submit*, etc.) are provided.

Ergo

Forward/backward navigation is possible. Additionally, navigation buttons (*Tilbake, Avbryt, Lukk, Lever*, etc.) are provided.

Indra

Forward/backward navigation is possible. However, input data as marked checkboxes and chosen candidates is lost if the user agent navigation buttons are used. On-page navigation buttons (*Exit, Back, Vote, Give*, etc.) are provided to avoid this. However, *Back* does not work.

Concluding, the lack of availability of user agent controls with the Computas prototype might be confusing to some users. However, a proper fall-back in terms of in-page navigation buttons has been provided. It is unknown if the loss of input data can be avoided in the case of Indra.

7.16 Conclusions

Considering the other accessibility and usability requirements, it turns out that there are some differences among the prototypes. In terms of the accumulated credit points Indra outperforms Ergo's prototype with a slight and Computas' prototype with a more substantial margin. However, all prototypes are significantly below the theoretically achievable credit point sum.

8 Prototype evaluation

8.1 Adherence to functional requirements for the e-voting use case

This requirement has not been evaluated in depth. All prototypes have implemented the main functionality. Computas have has demonstrated both county election municipality election, and referendum in addition. This all in one solution meant,

however, more complexity and thus some confusion for the users (see section about main issues and detailed issues in tables at the end of the document)

8.2 User tests

8.2.1 Test procedure

8.2.1.1 Recruitment

- The users were recruited through NGO's (Norges Blindeforbund, Dysleksiforbundet, CP-foreningen, Funksjonshemmedes Fellesorganisasjon and Senior Centres). The user organisations gave brief information about the aims of the project and the tests. Participants would take part in the accessibility and usability test at their preferred location e.g. at their home, work place, at Senior Center or another suitable location . They were encouraged to use their own or familiar PC and equipment. The participants were given NOK 500,- as compensation for taking part.
- Interested persons could contact Norwegian Computing Center who noted some background information and sent them a more detailed information letter. (About the test procedure, expected endurance, the needed equipment, such as PC, software, telephone, mobile phone, paper, need for magnifiers, etc.)
- Then interested persons were contacted in order to make an appointment.

8.2.1.2 Ethics

The persons conducting the accessibility and usability test were required to adhere to the following ethical guidelines:

- Make sure the user has been informed about the test procedure (se next section) and their rights, especially that s/he could withdraw at any point
- Participants were asked to sign an informed consent that acknowledges that the participation is voluntary, that participation can cease at any time, and that the session will be videotaped (alternatively voice-recorded) but their privacy of identification will be safeguarded. The observer/facilitator would ask the participant if they have any questions.
- Ensure the user anonymity. The performance of any test participant shall not be individually attributable. Individual participant's name should not be used in reference outside the testing session.

8.2.1.3 Information and test procedure

The participants received an overview of the accessibility and usability test procedure:

- The observer/facilitator informed the participants about their rights and told them that they would help the project in evaluating various prototypes.
- The observer/facilitator explained the test context, i.e. there would be 3 potential solutions/ prototypes, and the user would do some tasks and try to comment upon the different solutions and range the solutions.
- The participant's interaction with the prototypes would be observed by the observer (a project member) seated next to the user. The test sessions were videotaped if accepted by the user.
- Participants would answer a few questions about their background (age, gender, occupation, ICT experience, voting experience, impairment, use of assistive technology (AT) with the PC.
- Overview of the test scenarios and tasks (see details below).

Depending on voter experience, the users would be briefed in the voting procedure with regard to casting personal votes and adding candidates from other lists.
Then the test session would start.
As far as possible the observer/facilitator acted as a silent observer, but if necessary s/he would respond to participant's requests for assistance.
Observer/facilitator would try to identify problems, concerns, bugs, and procedural errors and take notes and record participant's actions and comments.
The participants were instructed to provide honest opinions regarding the accessibility and usability of the prototypes.

8.2.2 Test scenario and tasks

We could only test each prototype in a limited time, due to the number of prototypes and the limited time one reasonable can hold each participant. According to our experience one user test should not exceed two hours. In the pilot test in the first iteration, we did three tasks (see technical tests), but found that this were too time consuming and exhausting for the user, so we had to reduce this to two tasks, described below.

8.2.2.1 The overall test scenario (all prototypes).

Each user should repeat the task scenarios below with the three prototypes. The three prototypes were presented to the different users in different order.

- The participant were given an overview of the three prototypes in the actual order for this participant (links from a restricted web-page were the observer/facilitator authenticated herself/himself).
- The observer/facilitator then introduces the prototype, and provides any necessary material (sheets with codes, authentication information etc.)
  - Task 1: Simple vote without changes in county election
    - The user will cast a vote in the county election without any changes. (If county election is not present, the user will do municipality election instead)
  - Task 2: Municipality election with person votes and adding candidates from other parties.
    - The user selects a party
    - The user gives two person votes for candidates in that party (say candidate no 2 and 6)
    - The user adds two name from other party(ies)
- For each prototype the observer/facilitator prepared the test-scenario with necessary material (Necessary information such as usernames, passwords, codes etc.) After both election types had been tested, the participant were asked to comment the prototype.
- After all the prototypes had been tested, the user was asked to rank the prototypes. While ranking the prototypes, the user was encouraged to elaborate on the tasks and to explore the prototypes again. (The participant were also provided with a sheet with screen shots of each prototype as an aid.)

8.2.3 Accessibility and usability metrics

Accessibility and usability metrics refers to user performance measured against specific performance goals necessary to satisfy accessibility and usability

requirements. Scenario completion success rates, adherence to dialog scripts, error rates, and subjective evaluations will be used.

8.2.3.1 Scenario Completion

The scenario is completed when the participant indicates the scenario's goal has been obtained (whether successfully or unsuccessfully), or the participant requests and receives sufficient guidance as to warrant scoring the scenario as a critical error.

8.2.3.2 Critical Errors

Critical errors are deviations at completion from the targets of the scenario. Obtaining or otherwise reporting of the wrong data value due to participant workflow is a critical error. Participants may or may not be aware that the task goal is incorrect or incomplete.

Independent completion of the scenario is a universal goal; help obtained from the observer/facilitator is cause to score the scenario a critical error. Critical errors can also be assigned when the participant initiates (or attempts to initiate) an action that will result in the goal state becoming unobtainable. In general, critical errors are unresolved errors during the process of completing the task or errors that produce an incorrect outcome. A failure in submitting/sending the vote, misunderstandings leading to voting for another party or candidate than one intended, are both characterised as a critical error.

8.2.3.3 Non-critical Errors

Non-critical errors are errors that are recovered from by the participant or, if not detected, do not result in processing problems or unexpected results. Although non-critical errors can be undetected by the participant, when they are detected they are generally frustrating to the participant.

These errors may be procedural, in which the participant does not complete a scenario in the most optimal means (e.g. excessive steps and keystrokes). These errors may also be errors of confusion (e.g. initially selecting the wrong function, using a user-interface control incorrectly such as attempting to edit an un-editable field).

Noncritical errors can always be recovered from during the process of completing the scenario. Exploratory behaviour, such as opening and looking through the menu options is not recorded as error.

8.2.3.4 Subjective Evaluations

Subjective evaluations regarding ease of use and satisfaction were collected through a brief discussion and comparison of the prototypes.

8.2.4 Participants

Below is an overview of the different persona and users that have tested the three prototypes.

UserID	Age	Sex	Impairment/use of AT	ICT-experience: (Inexp.) 1 – 5 (expert)	Education: Primary, Secondary, Tertiary	Voting experience: Simple/ Advanced)	Prototype rank		
							Compu-tas	Ergo-Group	Indra
KB1	60-70	M	Wheelchair user with dexterity problems, no AT connected to the PC	4	Tertiary	Simple	2	1	3
KB2	50-60	F	Wheelchair user. Slight movement in one hand. Using head mouse with screen keyboard (Wivik).	4	Secondary	Advanced	2	1	3
KB3	50-60	F	Dyslectic, no AT	3	Primary	Advanced	3	2	1
KB4	40-50	F	Blind, uses Braille, Jaws, and text-> speech.	3 - 4	Secondary	Simple	2	1	3
KB5	30-40	F	Hearing impaired user, sometimes using headset with radio transmitter to hearing aid	4 - 5	Tertiary	Advanced	2	1	3
IS1	70-80	M	Vision impairment (weak)	5 Expert		Advanced	1	2	3
IS2	<20	F	Dyslectic	3		Simple	3	2	1
IS3	80-90	M	Hearing impairment	2		Advanced	1	2	3
IS4	50-60	M	Vision impairment (strong), magnifying program (zoomtext)	5		Advanced	2	1	3
IS5	20-30	M	Hearing impairment	5		Advanced	1	3	2
OB1	20-30	F	Low vision/ZoomText 2.5 enlargement; inverted colors	3-4	Secondary	Advanced	2	1	3
OB2	40-50	F	Blind/WindowsEyes screen reader with synthetic speech (primary) and Braille display (secondary)	4	Tertiary	Advanced.	2	1	3
OB3	30-40	M	Deaf/ -	4	Tertiary	Advanced	2	1	3
OB4	30-40	M	Muscle disorder leading to muscle weakness in whole body/-	4	Tertiary	Advanced	1	2	3

OB5	60-70	M	Cerebral palsy and hard of hearing/hearing aid	2	Secondary	Simple.	2	2	1
KW1	40-50	M	Blind, using elinks browser (0.13 development versjon), screen reader BRLTTY and Braille at Linux Ferura 11. Using IE8, + Windows eyes (v.711) at windowXP	5 Expert	Tertiary	Advanced	3	1	2
TW2	50-60	F	Low Vision/Normally uses ZoomText, but not in test	3	Primary	Simple	2	2	1

15 user tests, two walkthroughs at the e-voting reference meeting, and 6 tests with personas have been conducted. We have made an effort to cover broad user groups with regard to ability/disability, age, gender, ICT experience and voting experience. All users have been Norwegian. One persona was foreign. The persona tests have been conducted in three platforms (Microsoft, Linux, and Mac) and with different browsers (IE, Chrome, Firefox, Safari, Opera and Lynx). The order in which the prototypes have been presented for each participant/persona have been varied.

8.3 Ranking of prototypes by the users

A couple of users only chose the prototype they thought were the best, and did not want to differentiate between their preferred solutions for second and third spot. Overall the tendencies among the users are clear:

Out of the 17 users

- 9 ranked ErgoGroup best, 4 ranked Computas best, and 4 ranked Indra best,
- 10 ranked Computas as number two, 7 ranked ErgoGroup as number two, and 2 ranked Indra as number two,
- 11 ranked Indra as number three, 3 ranked Computas as number three and 1 ranked ErgoGroup as number three.

8.4 Main results of the user and persona tests

Below is a summary of main issues fore each prototype. Following is a section with a table of usability and accessibility issues from the persona and user tests for each prototype. Sometimes there is a reference to a screen shot number. These numbers refers to a power point handout with screenshots from each prototype (numbers in lower right corner for each slide). These handouts are added as appendices.

8.4.1 Computas main issues

Problems/weaknesses:

- Critical problems using screen reader (Windows Eyes, Jaws). Content appears not to expose itself to screen reader.
- With magnification there is need for a lot of vertical and horizontal scrolling.
- Confusing with English as default language.
- The starting screen with several ballots on one screen appears to confuse several of the users.
- Most users would prefer to have complete list of add ins from other parties on screen as opposed to having to type in letter in name and getting relevant candidates appearing.
- The summary page with several vote buttons is confusing.
- Reconsider Submit ballots button. Difficult to spot on the bottom of the screen.
- Next button is very discrete and plain looking. Moreover, it is difficult to discover this button when magnifying the screen, because the button then will be below the screen, and because it is a lot of space above it, users might not scroll enough downwards.
- Small font size, and to much and dense text in the information area

Positive elements:

- Clear and distinct layout

8.4.2 ErgoGroup main issues

Problems/weaknesses:

- Questions about adding personal votes and add ins from other parties are often missed because they are placed at bottom of list of names. Needs to be addressed.
- No error message when party only picked and omitting candidate when adding add in from different party.
- Place navigation buttons closer together.
- Small font size and poor contrasts.
- Issue with screen reader (Windows Eyes, Jaws).
    - When checking ballot it is difficult to know which candidates one has given personal votes. Syntax used must be made clearer. Screen reader reads out that candidates box is inactive when it is in fact checked.

- User needs to go through all candidate names in party list to get to the next screen elements. Very irritating and cumbersome.
- For screen reader users, combining two drop down lists are challenging. According to our experience, one cannot expect the majority of screen reader users to master this functionality.
- Preferable with candidate names in one column rather than two.

Positive elements:

- Many users expressed that the logic and flow was easy to understand.
- Many users liked the drop down lists of candidates from other parties

8.4.3 Indra main issues

Problems/weaknesses:

- Confusing with English as default language.
- Several users found interface somewhat messy. It was difficult to understand what buttons to press and they got a bit lost while scrolling down.
- Several participants expressed concern that they thought the voting process was very quick, and that they were not entirely sure what they had voted for or they had trust issues because the process was so quick.
- Difficult to understand how to add add ins from other parties.
- The button named Delete is ambiguous. Does it mean to delete someone from the candidate list showing personal votes above or candidates from other parties shown below button?
- It is possible to complete election using the Lynx web browser, but some critical issues needs to be resolved in terms of adding candidates from other parties as well as the wording of the final steps. There appears to be a bug in the current solution which means that after you have confirmed your selection you can not alter this.
- Some users thought they were finished before they had pressed the final “Stemme” button, probably because of the ambiguous message in the heading.
- For screen reader (Windows Eyes):
  - The screen elements for add ins appears not to be exposed for screen reader, or it is very cumbersome to gain access to the necessary information.
  - Buttons in interface are in Norwegian, but synthetic speech reads out in English.
  - Difficult to know which party one has voted for due to placement of radio buttons. Should according to user be placed after each party.
  - Difficulties making selections – user expects to press Enter for selection, but has to press Space bar.

Positive elements:

- Users liked the use of party symbols,
- Some users liked the way of expanding party lists very well

8.5 General comments all prototypes

- Informants are in general positive towards e-voting.
- E-voting can strengthen democracy as it makes elections more accessible for more people.
- Disabled persons favour e-voting also because the voter does not depend on others assistance in order to be able to vote
- The main problem or disadvantage that many see in e-voting is concerns related to privacy, anonymity and trust.
- The voter can be unduly influenced by others, e.g. others in the family, but these problems are outweighed by the advantages
- Video instruction recommended by several informants
- Norwegian must be default language

8.6 Comparing and discussion of the three prototypes

- All solutions should have larger default font size.
- Several informants appreciate the use of party logos (icons) as applied in the Indra prototype. Especially dyslectic persons find this appealing
- Those who preferred Ergo argued that this prototype was easier to understand and use than the others
- Those who preferred Indra emphasized the use of party logos as a central argument because the other prototype missed this feature
- The validation code offered by Computas was seen as more user friendly than the solutions in the other prototypes
- The Computas way of selecting additional candidates was by several seen as more demanding than the others
- The Indra solution was by several experienced as confusing because the user was presented with too many options at the same time/same page.
- The Computas additional option about referendum was experienced as distracting by some informants.

8.7 Conclusion user and persona tests.

The ErgoGroup clearly had best usability and accessibility. Computas and Indra were quite close for many user groups, but since Computas has some severe accessibility issues, especially for screen reader users, but also for keyboard only users, it is ranked as number three.

9 Abbreviations

W3C	WWW Consortium
DTD	document type definition
HTML	Hyper-Text Markup Language
PHP	Hypertext Preprocessor
WCAG	Web Content Accessibility Guidelines
XHTML	extensible Hyper-Text Markup Language

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11 Detailed accessibility and usability issues from persona and user tests

11.1 Computas

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Computas comments
WXp Pro/IE8	OB2	0	Accessibility	C	This prototype contains numerous critical issues so that the tests was aborted after 45 minutes. The main issue is that the solution seemed to be coded in a way that makes it impossible for the screen reader WindoesEyes to gain access to the information on the screen. When it gets access to information this is lacking and seemingly non-useful for meaningful use of the solution.
Windows XP 2007, IE 8	KW1	0	Accessibility	C	The solution uses frames, not accessible either with elinks at Linux or Windows eyes at windows XP.
Linux Ferura 11, with elinks browser (0.13 development versjon) and screen reader BRLTTY + Braille hardware.	KW1	0	Accessibility	C	The solution uses frames, not accessible either with elinks at Linux or Windows eyes at windows XP.
Windows XP 2007, IE 8	KB4	0	Accessibility	C	Not accessible with jaws screen reader.
Ubuntu v. 9.04, Lynx 2-8-7	Exp	0	Accessibility	C	Lynx does not support JavaScript.
WXP, IE8	TW2	0	Page structure, enter candidate names	C	For task two, user got very confused. She attributed it to the fact that she had never done this task when she votes normally, but observer believe it

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Computas comments
					has a bit to do with the system as well. The main cause is the blank line for adding additional names. Essentially, trying to find names of people in other parties can result in the person voting for a different party.
WXP, IE8	TW2	0,4	Language	C	The site is in English by default, she just went on logging in until she got confused by all the terms in English when having to do the voting. She had to log out and I had to go back and choose *bokmål*.
WXP, IE8	TW2	2	Page structure, Horizontal scrolling	C	Due to the zoom level, it was necessary to scroll to see the buttons for choosing language, so it wasn't obvious that she had to change them.
	PE	2	Paging and order, Page structure, Navigation area,	C	She does not see any next button, must ask for help
WXp Home/IE7	OB5	5	Other elements	C	Believes he has completed voted when selects Blank vote. Advised by evaluator to read instructions. Appears to understand. Chooses a party to vote for but does not seem to understand that he needs to click on Next. Searches for different ways to navigate and to move on.
	PE	6	Page structure, Navigation area,	C	The Next button is too small
WXP, IE8	TW2	8	Information area, Help texts	C	The text explaining to push the "Legg til Kandidater" button is split between two lines (Legg til and then Kandidater). This resulted in her looking for a "Legg til" button and then concentrated on the "Kommunestyrevalg" buttons on the left. Hitting "slengere" several times. Eventually, she asked for help and when I pointed out the button, she noticed the text and complained about the split. She said that it could also be in bold text.
Windows XP 2007, IE 7	KB5	9	Page structure, enter candidate names	C	Entering names for candidates are not good enough. Would be able to see the whole party-list with the candidate position, number, names etc.
WXp IE7	IS4	9	Page structure, enter candidate names	C	Proper lists of candidates are strongly recommended, not a good solution to write a name yourself. Many don,t remember the names on the lists
WXP, IE8	TW2	9	Page structure, enter candidate names	C	The blank line is confusing. The user actually went back to the party selection and then chose a different party to see the list of members there. When doing this, she unknowingly changing the party she was voting for. In the summary section, she eventually saw this and jumped back to the beginning and started from scratch.
XP. IE8	TW2	9	Page structure,	C	When typing in the name, a suggestion shows, but she did nothing to

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Computas comments
			enter candidate names		confirm the suggestion, she just clicked on next, so the name was not added (at least according to the summary).
WXp Home/IE7	OB5	11	Other elements	C	Does not spot Submit ballot on the bottom of the screen. Needs to be pointed out to him. Does not seem to understand that he needs to click on this to complete voting process.
Windows XP 2007, IE 8	KB2	11	Paging and order, Page structure, One topic per page	C	User is confused by county and municipality election. User presses the "STEM" button for municipality election when she is really trying to vote for county. Goes into a new loop, starting at page with title "Velg ønsket parti" (Screenshot no 5). Thinks she has to vote for another party... (this she might have done so easilty because of the test situation, but still, this is very confusing…)
Windows XP 2007, IE 7	KB5	12	Error messages and warnings,	C	User did not understand that she would loose the votes if she did not vote in all the elections again. User thinks the text in the red warning must be repeated at the beginning. One might forget to re-vote for all the ballots.
WXp Home/IE7	OB5	6, 8, 9	Other elements	C	Is instructed to add candidates from other parties, but seems to misunderstand and end up on Select Party screen. Tries to select party, and despite receiving instructions he does not seem to understand how to add candidates from other lists. Did not complete this task.
WXp Home/IE7	OB5	5, 11	Navigation area	C?	After selecting party clicks on Your ballots and not Next. Vote is apparently registered and user is satisfied that he has completed ballot. Not sure if this is critical as vote appears to be registered.
WXp Home/IE7	OB5	NA	General	N	User appears to be uncertain what to do and seeks guidance/assistance throughout process.
WXP Pro, Opera 10.	OB1	General	General layout	N	Messy layout. Do not find elements where expected
WXp Pro/Firefox 3.5	OB4	0		N	No issues or problems. Reported only positive aspects.
Windows XP, professional, IE 8	KB1	0	General	N	Overall impression is that this was quite easy.
WXP, IE8	TW2	0	Page structure Convention and symbol use, fonts, sizes, colors	N	For task one, she felt that it was easy to find the buttons. However, she suggested that buttons like "Logout," "Log In," and "Quit" could be a different color (for example red for these and black for the others); this would allow for good contrast.

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Computas comments
Windows XP 2007, IE 7	KB5	0	Page structure, Fonts, sizes, colors,	N	Standard (default) text is very small, even for her which is relatively young and has no vision impairment.
Windows XP 2007, IE 7	KB5	0	Page structure, Conventions and symbol use	N	The highlighting of the choice, by boxing yes or no when voted in "folkeavstemming" is good and clear.
Windows XP 2007, IE 7	KB5	0	Page structure, Conventions and symbol use	N	Positive that the layout is clean and clear.
Windows XP 2007, IE 7	KB5	0	Paging and order, Page structure, Navigation area, Help texts	N	User thinks it is confusing that there are two navigation opportunities, eg. The navigation menu and next button. Sometimes she did not understand which button to press. "Poenget er at du skal ha fulle valgmuligheter når det gjelder valg av parti og personer, men du trenger da ikke all verdens av valgmuligheter når det gjelder navigasjon og bruk av programmet. Det blir bare ekstra forvirrende"
	PE	2	Help texts	N	The text size is too small for her
Windows XP, professional, IE 8	KB1	2	Language	N	User logged on without changing the language to Norwegian. Norwegian should be default.
	PE	2	Language	N	Does not see that language can be selected, therefore pushes on the English version
Windows XP 2007, IE 8	KB2	4	AU11 Login and authorization	N	Should have been a separate login for each election.
Windows XP 2007, IE 8	KB3	4	AU11 Login and authorization	N	Should have been possible to log in separately for each election.
WXP Pro, Opera 10.	OB1	4	Information area	N	Due to enlargement of screen – needs to look for elements. Would like instructions/information on top of screen.
	PE	4	Page structure, Navigation area, Help texts	N	Unclear what to do
WXp /IE7	IS5	5,0	Information area	N	More space in the information to improve readability.
	PE	5	Information area	N	Where shall I start here?

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Computas comments
WXP/IE/	IS3	5	Page structure, Grouping fields together	N	"Blank stemme" should be different from the others
Windows XP, professional, IE 8	KB1	5	Page structure, sizes	N	User thought the buttons were too big. This went at the cost of overview. Did not find the next button at first (because it was below the screen), but after some time he understood that he had to scroll down.
WXp Pro/IE7	OB3	5 etc.	The information area	N	More space in the information to improve readability.
WXp/IE6	IS1	6 etc	Help texts, Information area	N	Help should be provided more "just-in-time", when the problems occur.
WXp/IE6	IS1	6	Page structure, Convention and symbol use, sizes	N	The Next button is too small
WXP, IE8	TW2	6	Page structure, Conventions and symbol use	N	The next button was a little too far down; she had to scroll to see it. She was concerned that older users may not know enough to scroll down to see the button.
WXP, IE8	TW2	7		N	It's not possible to copy the names from the other ballots. She had to write them down on paper by hand.
	PE	7	Page structure,	N	She does not understand what to do because she does not remember the name of any candidate
Windows XP 2007, IE 7	KB5	7,8, 0	Page structure, Information area	N	User thinks it should have been clearer separation between instructions and information. She feels that sometimes instructions are in the box to the right, and sometimes the instructions are jammed between heading and input area (eg. The text in screenshot 7: "Hvis du ønsker….." and screenshot 8 "I kommunestyrevalg er det mulig….") The text should have been more prominent, larger and may be above the box with party name).
Windows XP 2007, IE 7	KB5	8, 0	Information area, Help texts Fonts, sizes, colors,	N	User thinks the text in the text boxes (information area) to the right is too small and too dense. Should have been more air and space between sentences and/or sections.
WXp/IE6	IS2	9	Help text, Navigation area	N	What does "slengere" actually mean,
WXP Pro, Opera 10.	OB1	9	Other elements	N	Would like to have list of all candidates from other parties on screen as opposed to having to type in letter in name to get limited list.
WXP Pro, Opera 10.	OB1	9	Other elements	N	The whole list of additional candidates became highlighted when moving mouse over list.

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Computas comments
WXp Pro/IE7	OB3	9	Other elements	N	Would like list of the candidates from the other parties and not just the names of candidates irrespective of party based on which letter that is typed in.
Windows XP 2007, IE 8	KB3	9	Page structure, enter candidate names	N	User thinks it is a bit cumbersome and inconvenient to write in the candidate name. Would like to select the name from a list. Would like to see the party lists and select from them. As dyslectic it is difficult to write the names correctly.
Windows XP 2007, IE 7	KB5	10	Help texts, Information area	N	Help text not helpful
Windows XP 2007, IE 7	KB5	10	Information area, Help text, Paging and order, Navigation area	N	User is confused, should she follow the help text in information area and press "Gå til "Dine stemmesedler"? Why does it say "Gå **tilbake** til: Dine stemmesedler" above this button? Is this equivalent with pressing "Forrige" - or when should she press the Next button? Very confusing.
Windows XP 2007, IE 7	KB5	10	Page structure, Conventions and symbol use, fonts, sizes	N	The candidate from other party is displayed with too small text. Difficult to discover.
WXP/IE/	IS3	11	Help texts, Information area	N	It is not clear for the user what to do
	PE	11	Information area	N	It is not clear for the user what to do
WXp Home/IE7	OB5	11	Other elements	N	User becomes confused by all the different ballots, and Clicks on Referendum by mistake. Needs to be told that this is not going to be tested. Not critical in a strict sense, but
Windows XP 2007, IE 8	KB2	11	Paging and page order, Page structure, One topic per page	N	Should only show the election you have been working with. Confusing with the other voting buttons.
Windows XP 2007, IE 7	KB5	13	General	N	The last page is very good and clear.
WXP Pro, Opera 10.	OB1	13	Other	N	Due to enlargement the whole screen appeared to go blank (black due to inverted colors) after ballot was signed. User needed to scroll vertically and horizontally to find screen elements and to access information/content.
WXp /IE7	IS2	8, 9	Help texts,	N	Does not know what a personal vote actually is

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Computas comments
WXp Pro/IE7	OB3	8, 9	The information area	N	Would like information of what a personal vote is, and what it means to add a candidate from a different party.

11.2 ErgoGroup

Platform, Browser	UserID	Screen-shot number	Category	Critical/ Not critical	ErgoGroup Comments
WXp Home/IE7	OB5	NA	General	C	User appears to be uncertain what to do and seeks guidance/assistance throughout process.
Windows XP 2007, IE 7	KB5	General	Help/information	C	The voting card is far to complicated. Too many pages, no explanation.
Linux Ferura 11, with elinks browser (0.13 development versjon) and screen reader BRLTTY + Braille hardware.	KW1	0	Accessibility	C	Were only able to read the first page. The solution is not accessible with a text based browser(e-links), the application requires too much java-scrip support.
Ubuntu v. 9.04, Lynx 2-8-7	Exp	0	Accessibility	C	Lynx does not support JavaScript.
WXp /IE7	IS4	0	Page structure, Convention and symbol use, fonts, sizes	C	The contrasts and colours should be improved
XP, IE	TW2	2	Page structure, Convention and symbol use, fonts, sizes	C	User first thought the text was too small. It took a lot of prompting for her to find the three different sized A's. She initially mistook them for a logo
Windows XP 2007, IE 8	KB4	5	Accessibility, Paging and page order, Page structure,	C	In order to avoid reading through all the menus all the time, user skips to the end and goes back-words. She presses next, and does not discover the J/N question about giving person votes or not (T1). After some tips from observer she finds this question, presses N and expects to be taken further. After some trial/error she finds out that she has to tab forward to the "gå videre" button again. Thinks it is extremely "omstendelig" that she

Platform, Browser	UserID	Screen-shot number	Category	Critical/ Not critical	ErgoGroup Comments
					have to press both No and then “Gå videre”.
Xp Pro/IE8	OB2	5	Other elements	C	Does not spot question about adding personal votes. Presses Continue. Does not spot message about having to complete question about personal votes. Needs assistance. Suggest that this element is made into a discrete step and has its own screen, i.e. not listed just after list of candidates.
WXp Home/IE7	OB5	8	Other elements	C	Wants to add candidates from other parties. Adds party, but no candidates. Presses Continue. Comes to Confirmation page. Appears not to notice that no other candidates are added. No error message.
Windows XP 2007, IE 8	KB4	9	Accessibility, Conventions and symbol use, checkbox	C	The checked candidates do not appear as checked on the Braille reader (why is that?), but it is read as checked with text-to-speech. However, this information is read after the candidate names, birth and places. When a visually impaired person skims a list, they would usually read the beginning of each line. The checked information should therefore be read right after the candidate number, and before the candidate's name.
WXp Home/IE7	OB5	5, 7	Other elements	C	Presses Continue. Does not pick up that he needs answer question regarding adding personal vote. Does not see/pick up on error message to answer above mentioned question. Becomes stuck. Evaluator points out that he needs to answer question. Same issue with adding candidates from other parties.
Windows XP 2007, IE 7	KB5	10, 11, 12	Concluding messages, validation	C	User thinks the validation page is far too complicated. First the word “validering” is too complicated. One cannot assume that this is a word in the vocabulary of ordinary people, especially not among hearing impaired. She stopped up, and did not know how to proceed, did not get any help from the help texts. Did not understand what the point was. Became uncertain whether she really had voted, if it was necessary, if she had done anything wrong. This must be significantly simplified and clear explanation must follow.
Xp Pro/IE8	OB2	9	Other elements	C/N	Issue with screen reader. When checking ballot it is difficult to know which candidates one has given personal votes. Syntax used must be made clearer. Screen reader reads out that candidates box is inactive when it is in fact checked.
Windows XP 2007, IE 8	KB4	General	Accessibility	N	For some reason the user gets double text-to-speech as the “word”-voice goes on top of the general windows-voice –very annoying. The user have no idea why this is so, but it has happened in other web-pages as well. Is

Platform, Browser	UserI D	Screen-shot number	Category	Critical/ Not critical	ErgoGroup Comments
					it related to the page coding?
Windows XP 2007, IE 8	KW1	General	Accessibility	N	User has to go through all the menu items, including alternative texts for graphic elements on each page. This is very time-consuming and annoying. The application should have a “go to content”- link at the top.
Windows XP 2007, IE 8	KB4	General	Accessibility, Page structure,	N	The Jaws command to jump to next heading did not work when she was at the beginning of each page.
Windows XP 2007, IE 8	KB4	General	Accessibility, Page structure,	N	User has to go through all the menu items, including alternative texts for graphic elements on each page. This is very time-consuming and annoying. Why does not the application have a “go to content”- link at the beginning?
Windows XP 2007, IE 8	KW1	General	Accessibility, Validation,	N	The voter card information should be accessible (ie. In electronic format) for the blind, if not, it will not be possible to check the control code.
WXp Pro/IE7	OB3	NA	Help texts	N	Would like to have support videos in sign language.and with captions
Windows XP 2007, IE 7	KB5	General	Help/information	N	Positive with brochure, however the point should be it must show the voting process on the net, not ordinary voting.
Windows XP 2007, IE 7	KB5	General	Help/information, video	N	Positive with video
XP, IE	TW2	General	Page structure, Convention and symbol use, colors	N	She doesn’t like the orange color.
XP, IE	TW2	General	Page structure, Convention and symbol use,	N	The text “Gå Videre” is a little “non-standard.” “Neste” is used normally.
Windows XP 2007, IE 7	KB5	General	Page structure, Convention and symbol use, sizes	N	Should have been larger text size by default
Windows XP 2007, IE 7	KB5	General	Page structure, Convention and symbol use, sizes	N	Likes the colours and button sizes.
Windows XP, professional, IE 8	KB1	General	Paging and page order, Page structure,	N	Very easy, a bit easier to use than the two other. The composition of the screen was more logical than the two others. He liked the top line that showed where he was.
Windows XP, professional,	KB1	General	Paging and page order, Navigation	N	Think this solution is very logical for people with little ICT experience.

Platform, Browser	UserI D	Screen-shot number	Category	Critical/ Not critical	ErgoGroup Comments
IE 8					
Windows XP 2007, IE 8	KB2	General	Paging and page order, Page structure,	N	Very easy to use, most logical. Easy to understand to logic.
Windows XP 2007, IE 8	KB3	General	Paging and page order, Page structure,	N	Very easy to use, easy, especially if you do not what to give any person votes or candidates from other parties.
Windows XP 2007, IE 8	KB3	General	Paging and page order, Page structure,	N	Not very easy if you what to give any person votes or candidates from other parties.
Windows XP 2007, IE 7	KB5	General	Paging and page order, Page structure,	N	Liked the top-meny very well
Windows XP 2007, IE 8	KB2	2	Accessibility Help/information, video	N	Should be text explanation button next to the video (blind people might not be interested in video). This text must be readable with text to speech, likewise the brochure.
XP, IE	TW2	2	Help/information, video	N	She felt the video was not so important, or at least didn't need to be in the middle of the instructions.
XP, IE	TW2	2	Language	N	User also seemed to have a problem with the language and initially was confused which one was selected.
	PE	2	Other elements	N	The first page has too much text and seems a bit confusing for him.
	PE	2	Other elements	N	It is not clear to him if he is suosed to look at the video or just skip it. Is the video perhaps needed in order to be properly informed?
XP, IE	TW2	2	Page structure, Convention and symbol use,	N	She also felt that "Avbryt" should be all the way over on the left and the "Gå Videre" could be in the center or near the text that explains that it should be pressed.
XP, IE	TW2	2	Page structure, Convention and symbol use, fonts, color, contrast	N	The contrast was not good on the buttons, it should not be dark grey on gray
XP, IE	TW2	2	Page structure, Convention and symbol use, fonts, color, contrast	N	The text, "For å avgi din stemme, vennligst velge knappen…," user felt that it should be in another background color, or followed directly after "Gjennomgang av stemmegivningen."
WXP/IE7	IS5	2	Paging and page order, Page structure,	N	Too much information on the first page
	PE	4	Help function	N	The contrasts and use of colour makes it difficult to see
WXp Home/IE7	OB5	4	Navigation area	N	Tries to navigate by clicking on navigation banners on top of the screen. Realises after a while that this does not work.
WXP Pro,	OB1	4	Other elements	N	Parties were listed in different order when voting for second time.

Platform, Browser	UserI D	Screen-shot number	Category	Critical/ Not critical	ErgoGroup Comments
Opera 10.					Confusing.
XP, IE	TW2	4	Page structure, Convention and symbol use,	N	Did not like the header at the top of the page, felt it could disappear.
WXP/IE/	IS4	4	Page structure, Convention and symbol use, fonts, sizes	N	The text below the parties is too small
Windows XP 2007, IE 8	KW1	5	Accessibility, Page structure,	N	Confusing that the candidates for one party are listed as two separate lists. The break into two columns should be controlled by CSS and not in HTML.
WXP Pro, Opera 10.	OB1	5	Navigation	N	Would like navigation buttons “Back”, “Cancel” and “Continue” placed closer together.
WXP Pro, Opera 10.	OB1	5	Other elements	N	Would like all candidate names in one column – not split in two.
WXP Pro, Opera 10.	OB1	5	Other elements	N	Would like to be able to give personal votes straight away to candidates when list of candidates first appear after choosing party – suggests to omit question of adding personal votes to have fewer steps.
Xp Pro/IE8	OB2	5	Other elements	N	Needs to go through all candidate names in party list to get to the next screen elements. Very irritating and cumbersome.
WXp Pro/IE7	OB3	5	Other elements	N	Would like to have all candidates listed in one column
WXp /IE7	IS5	5	Page structure, tables	N	Would like to have all candidates listed in one column
XP, IE	TW2	5	Paging and page order, Page structure, tables	N	Liked the “bread cumb” trail and thought that the list of candidates was easy to read.
	PE	6	Information area	N	What is “personlige stemmmer”. It is not clear to the user what the conceps stand for. Is “personlige stemmer” and “personstemmer” the same thing or what?
Windows XP, professional, IE 8	KB1	6	Paging and page order, Navigation	N	Pressed the “Bekreft valg” button at the top menu. Nothing happens and the user tries again. After some time he scrolles down and presses the “Gå videre” button.
Windows XP 2007, IE 8	KW1	7	Input, combobox	N	Use of combination box is very difficult for screen-reader + Braille users. This should be considered as advanced functionality. The average blind user would not necessarily be able to use this functionality.
XP, IE	TW2	7	Paging and page order, Page structure,	N	user chose “Ja” to add candidates, but when observer reminded her that user didn’t need to do that for this task, user didn’t choose “nei,” but

Platform, Browser	UserI D	Screen-shot number	Category	Critical/ Not critical	ErgoGroup Comments
			Navigation		instead went back to choose a party.
WXP/IE/	IS2	8	Help/information	N	Language/spelling errors in the text at the top.
WXp /IE7	IS1	8	Help/information	N	Misses information about how many can be added in total
WXp /IE7	IS4	8	Information area	N	The predefined fields for names are too long
Windows XP 2007, IE 8	KB3	8	Page structure, tables	N	Thinks the solution with drop down boxes for selecting candidates from other parties is OK.
Windows XP, professional, IE 8	KB1	9	Concluding messages, validation	N	Thinks the validation code will be very confusing to people, especially for people that are not advanced users. Thinks the Indra solution with four digit party code check is better.
Windows XP, professional, IE 8	KB1	9	Concluding messages, validation	N	Thinks the validation code will be confusing to people.
WXP Pro, Opera 10.	OB1	9	Other elements	N	Would like all checked boxes to be green to signify completed.
Windows XP 2007, IE 8	KW1	9	Output, checkbox	N	User is not able to read what checked candidates are checked. Althoug they appear as checked on the screen, they do not appear as checked on the Braille reader.
WXP/IE/	IS1	9	Page structure, tables, Convention and symbol use, checkboxes	N	Buttons beside persons are not necessary information, only need information about those you have chosen
Windows XP 2007, IE 8	KB2	10	Paging and page order, Concluding messages, validation	N	User thinks she has finished when arriving at 10. Do not take notice of the validation code before the observer asks about it. This is confusing.
WXp Pro/Firefox 3.5	OB4	5, 7	Other elements	N	The question of adding personal votes and the questions of adding candidates from other parties “disappears” somewhat under the list of party candidates. User suggests to have these as separate steps with single screens.
	PE	5	Navigation	N/C	The “gå videre” button is to far to the right
WXp /IE7	IS4	5	Paging and page order, Page structure, Navigation	N/C	The “gå videre” button is to far to the right, a problem that occurs when the screen is enlarged for persons with vision impairments

11.3 Indra

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Indra comments
Ubuntu v. 9.04, Lynx 2-8-7	Exp	NA	Other elements	C	When adding candidates from other parties – if one chooses a party by pressing enter, the whole list of all parties is reloaded and the prior selection of personal votes is blanked out.
Ubuntu v. 9.04, Lynx 2-8-7	Exp	NA	Other elements	C	After confirming party and candidates – can review choices, but at end get the choice of “votefile” and “returnparties”. Must be clearer what the different choices mean. Irrespective of what is pressed – the vote is cast and final screen appears confirming that vote has been cast.
Linux Ferura 11, with elinks browser (0.13 development versjon) and screen reader BRLTTY + Braille hardware.	KW1	0	Accessibility	C	Were only able to read the first page. The solution is not accessible with a text based browser(e-links), the application requires too much java-scrip support.
XP, IE	TW2	2	Language	C	The language is English by default, it had to be changed to be Norwegian.
Xp Pro/IE8	OB2	3	Other elements	C	Voted for one party, but another shows as selected – does not get information about this. Unsure which party she has voted for.
XP, IE	TW2	3	Page structure, Navigation, Convention and symbol use	C	She was not sure initially which button she should choose between (“Avgi en personlig stemme” and “Stemme”). She got it with some help, but was initially confused
WXp Home/IE7	OB5	4	Other elements	C	Does not find button to Add candidates from other parties. Is not aware that he needs to scroll downwards as button is not visible on the screen. Is stuck and does not know what to do. Told by evaluator to scroll.
WXp Home/IE7	OB5	4	Other elements	C	Does not understand which button to press to add candidates from other parties. Is stuck. Evaluator needs to tell him to press Add candidates.
Xp Pro/IE8	OB2	4, 5	Other elements	C	User had great difficulties getting the screen reader to gain access to the

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Indra comments
					elements containing the list of parties and their candidates when wanting to add candidates from other lists. Took many tries and a lot of effort and was difficult to navigate and unstable. Also having big problems getting access to candidates. After user kept trying for a long time tester aborted.
Xp Pro/IE8	OB2	Several		N	Buttons are in Norwegian, but synthetic speech is in English
Windows XP 2007, IE 8	KW1	General	Accessibility	N	User has to go through all the menu items, including alternative texts for graphic elements on each page. This is very time-consuming and annoying. Why does not the application have a “go to content”- link at the beginning?
WXP Pro, Opera 10.	OB1	General	General layout	N	Messy layout. A lot of scrolling and searching in interface.
Windows XP 2007, IE 8	KB4	General	Language	N	Alternative text is in English, even though Norwegian version is chosen.
WXp /IE7	IS2	PP2	Language	N	Norwegian should be default language
Windows XP 2007, IE 8	KW1	General	Language	N	Alternative text is in English, even though Norwegian version is chosen.
WXP	IS5		Other	N	The solution is too “glossy”, need a more neutral and serious approach for voting
Ubuntu v. 9.04, Lynx 2-8-7	Exp	NA	Other elements	N	When adding add ins – need to scan through all candidates from all parties.
Windows XP 2007, IE 8	KB3	General	Paging and page order, Page structure,	N	User liked this solution, very easy to follow the sequence, specially when not adding candidates.
WXp /IE7	IS1		Paging and page order, Bug?	N	A bug: pushing the Back button in the end leads to “Slutt”
WXP Pro, Opera 10.	OB1	1	General	N	Critical to why default language was set to English.
Xp Pro/IE8	OB2	2		N	Difficulties changing language. Problem locating correct link.
XP, IE	TW2	2	AU11 Login and authorization	N	She liked the frame for the username and password. It was big and easy to read
WXp /IE7	IS3	2	Convention and symbol use	N	Party symbols should be avoided, they favourizes the parties with a symbol
XP, IE	TW2	2	Convention and symbol	N	The background picture put her in good humor.

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Indra comments
			use		
WXp Pro/IE7	OB3	2	General	N	Drop the nature photo.
	PE	2	Navigation area	N	She likes the party symbols, but is not sure where to begin
XP, IE	TW2	3	Convention and symbol use	N	User liked the logos of the different parties being included on the ballot. It made it easy for here to recognize and added to the overall contrast on the page.
WXp Pro/IE7	OB3	3	Navigation	N	The buttons Personal vote and Vote are too close together.
	PE	3	Navigation	N	Don't understand the dfference between "give a personal vote" and "vote"
	PE	3 etc	Navigation area	N	The navigation area is too blurred and not well designed
Xp Pro/IE8	OB2	3	Other elements	N	Not sure if radio button is before or after party. As a consequence it is difficult to know which party she votes for or have voted for when reviewing. Prefers party first and radio button after name.
Xp Pro/IE8	OB2	3	Other elements	N	When returning to list of parties the sequence is altered. User finds this confusing.
WXp /IE7	IS2	3	Page structure, Navigation, Convention and symbol use	N	Don't understand the dfference between "personlig stemme og "stem"
WXP	IS5	3	Page structure, Navigation, Convention and symbol use	N	The navigation area is too blurred and not well designed
XP, IE	TW2	3	Page structure, Navigation, Convention and symbol use, colors, contrasts	N	The frame on the left side that shows the progress needs to have better contrast.
WXp /IE7	IS1	3	Page structure, randomisation	N	Randomised party presentation is OK, but when the voting has started is should not be changed any more
XP, IE	TW2	4	Convention and symbol use, fonts, sizes, colors	N	There was no bold font or anything to indicate the candidates that would get two votes if they were voted for *forhådskumulerte stemmer*
	PE	4	Help	N	She wants to get a larger text but cannot find out how to do that, because the text at the top right is too small for her
	PE	4	Help	N	She wants help but cannot find help because the fonts are too small for

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Indra comments
					her
XP, IE	TW2	4	Help texts	N	User felt that the text at the bottom of the list of candidates, “Du kan avgi stemme på opptil 14 kandidater fra andre…” should be split up into multiple lines. One for each command that should happen. She also felt that the phrasing of the sentence was a little heavy.
	PE	4	Information area	N	She finds the text too small
Xp Pro/IE8	OB2	4	Other elements	N	Names for candidates are read out twice by screen reader/synthetic voice. Consistent in all candidate lists.
WXp Pro/Firefox 3.5	OB4	4	Other elements	N	The button Delete is ambiguous. Does it mean delete someone from the list above candidates from other parties.
	PE	5	Information area	N	She is not sure what to do. The information at the top is too small for her
WXP Pro, Opera 10.	OB1	5	Other elements	N	Adding candidates from other lists. Due to use of ZoomText the expanding list for each party “bounces” around on the screen and confuses user and may lead to lose of cursor focus.
WXp Pro/IE7	OB3	5	Other elements	N	User finds the system with adding candidates from other parties confusing. The parties and the candidates are too split up. Cumbersome and confusing with multiple buttons which may be interpreted in several ways.
Windows XP, professional, IE 8	KB1	5	Page structure,	N	User is a bit confused by how to add candidates. User has dexterity problems and hits a button unintentional. He looses track of where he is. He wonders whether the “Legge til kandidater” button relates to candidates he has already checked on the list of the selected party, or if it relates to adding candidates from other lists. The labeling of the buttons is a bit confusing too. “Legg til liste” has to do with adding candidates from other parties. When he has added candidates from another party he is a bit uncertain whether he should chose “legge til kandidater” or “bekrefte”.
Windows XP 2007, IE 8	KB2	5	Page structure,	N	The text about adding candidates from other lists were confusing. Not logical sequence.
Windows XP 2007, IE 8	KB4	5	Page structure,	N	Adding candidates from other lists were difficult.
WXp /IE7	IS4	5	Page structure, Navigation, Convention and symbol use	N	The logic concerning adding candidates is confusing because which button to use is confusing

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Indra comments
Windows XP, professional, IE 8	KB1	5	Paging and page order, Page structure, Navigation	N	User tries to press menu ”Valgfritt trinn” but nothing happens.
XP, IE	TW2	6	Accessibility, Convention and symbol use, colors, contrasts	N	The added names have a checkbox next to them, but they are unchecked. It’s hard to know if the person is actually voted for
XP, IE	TW2	6	Help texts	N	The text is the same as it was in 4, it would be better if it had changed to indicate what she should do after she had added the candidates
XP, IE	TW2	6	Page structure, Navigation, Convention and symbol use, colors, contrasts	N	User was unsure which button to press, “Legg til Kandidater” or “Bekreft”
XP, IE	TW2	7	Convention and symbol use, heading	N	User was confused by the text “Du har avgitt din stemme på” and the button at the bottom that says “Stemme.” She assumed that she had already voted, she suggest text like “Bekreft” or “Valg” for the button text instead.
WXp Pro/IE7	OB3	7	General	N	Completed too quickly – user expressed the feeling that he was not able to confirm selection. “The process seemed too easy”.
	PE	7	Information area	N	She is confused about the choices presented for her
Windows XP 2007, IE 8	KW1	7	Labelling	N	The labeling of links/buttons are not logical. The text “Du har avgitt stemme på..”. Indicates that you are finished, while there is still more to do.
WXp Pro/Firefox 3.5	OB4	7	Other elements	N	Unsure if he has voted or not. It states on top the screen that he has voted, but still there is a green button which says Vote in the bottom right corner. Confusing.
Windows XP 2007, IE 7	KB5	7	Paging and order, user control.	N	Should be possible to double check what you have done by going back and forth in the application. This seemed not to be possible in Indra, at least not when at 7
Windows XP, professional, IE 8	KB1	8	Accessibility, Concluding messages, validation	N	User comments that the when is finished, there should be a voice message instructing on how to check that the party code is correct according to the voting letter.
Windows XP, professional, IE 8	KB1	8	Concluding messages, validation	N	User likes the four digit code verification of selected party.

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	Indra comments
XP, IE	TW2	8	Convention and symbol use, labelling	N	User thought “Avslutt” might be better button text than “Gå ut”
Windows XP, professional, IE 8	KB1	8	Paging and page order, Page structure,	N	Voting without any changes to the ballot is very easy.
Windows XP, professional, IE 8	KB1	8	Paging and page order, Page structure,	N	Thought that this solution requires more experience from the user. Thought the screen had too much information. This may be confusing.
WXP Pro, Opera 10.	OB1	5, 6	Other elements	N	User finds the way adding candidates from other parties is designed is very confusing.
WXP Pro, Opera 10.	OB1	7, 8	General	N	The user expressed that the process was so quick that she was not entirely sure who she had voted for. Was not comfortable with that.
WXp Home/IE7	OB5	4	Other elements	N/C	Appears to believe that by checking the boxes next to candidates from his preferred party this will delete them from the list. Is told several by evaluator that checking boxes means to add preference to the candidates, but this appears not to be comprehended by user.
WXp Home/IE7	OB5	4	Other elements	N/C	Tries to press Delete. Appears to think that this will delete the personal votes that he has given.
Xp Pro/IE8	OB2	3, 4	Other elements	N/C	User points out that it is inconsistent when she has to use Enter and when she has to use Space to execute selections of party and candidates. She expects to press Enter for selection, but has to press Space bar.

11.4 Voting/E-voting in general

Possible categories:

Platform, Browser	User ID	Screen-shot number	Category	Critical/ Not critical	E-voting in general, not related to any of the solutions
Windows XP, professional, IE 8	KB1	General	Accessibility		"Travelling and access will not be any barrier with e-valg."
	OB1	General	Accessibility		Finds it cumbersome to give person votes. Prefers to vote the conventional way. Would like for vision impaired persons to be able to vote electronically.
	OB4	General	Accessibility		Has had some difficulties in voting in the conventional way
Windows XP 2007, IE 8	KB3	General	Accessibility		Thinks more people will bother to vote if something like this will be accessible.
Windows XP 2007, IE 7	KB5	General	Accessibility		Thinks there should be a "set-up" page in the beginning, giving you an explicit opportunity to choose text-size, contrasts, language etc. see eg. www.ldo.no
Windows XP 2007, IE 8	KB4	General	Autonomy		The user is very positive towards e-valg, both before and after trying the prototypes (even though one of the solutions was inaccessible). The main advantage is that she would like to be independent on others. Has experienced that it is difficult to orientate her in a school or other building that she is not aquatinted with and therefore needs an assistant to be able to do public election. She also mentions that she preferred to go to the pre-election because the officials then have more time to read the information material to her.
Windows XP, professional, IE 8	KB1	General	Changes to the ballot		Respondent has seldom done changes to the ballots in a traditional voting setting (personvotes/candidates from other lists) because he thinks it has very little effect. A big advantage with e-valg is that one may study the parties in a calm and quiet environment ("ro og mak"). He believes that we may see an increase in changes to the ballots with e-valg compared to traditional valg because it will be easier, and because you will be able to

					use more time.
Windows XP, professional, IE 8	KB1	General	Election turnout		Respondent very positive towards e-valg. He thinks this will increase the number of voters, both young and elderly, disable and persons in a caring home.
Windows XP 2007, IE 7	KB5	General	Help information		It is even more important with clear information and a simple (not-complicated) solution because you have less opportunity of human assistance when voting online.
Windows XP 2007, IE 7	KB5	General	Help information		Should be an initial page explaining all the steps, what you should do.
Windows XP 2007, IE 7	KB5	General	Help information		The brochure should show the online process, not the process in traditional voting.
Windows XP 2007, IE 7	KB5	General	Help information		User think it is extremely important to offer chat functionality, especially this is important for hearing impaired users. Preferably one should have live chat (That is – being able to chat with a real "valg funksjonær", while FAQ chat like EVA at SAS, or Anna at IKEA is also valuable.
Windows XP 2007, IE 7	KB5	General	Help information		Very important to have an instruction video, with caption and sign language.
WXp /IE7	IS5	General	Help information, guidance		It is important to provide information and guidance in advance, here Ergo's solution is exemplary.
Windows XP 2007, IE 8	KW1	General	Language		Default language for the prototype must be Norwegian.
Windows XP 2007, IE 8	KB2	General	Language		Norwegian should be default
WXp /IE7	IS5	General	Privacy		Det kan være problematisk med e-valg pga personvern. F eks kan det være lett å finne ut/se over skulderen når man stemmer hjemme. Man greier ikke å gjenskape skikkelig hemmelige valg.
Windows XP 2007, IE 8	KB3	General	Privacy		User is very positive towards e-valg. The only thing he worries about whether the vote will be completely anonymous. Would it be possible for anyone to find your vote through tracking of the IP-address or something?
WXp /IE7	IS 3	General	Take seriously		"Syns folk bør anstrenge seg når de skal velge, kan være litt for lettvint dersom de bare kan sitte i stua og stemme"
Windows XP 2007, IE 8	KB3	General	Text size		All the prototypes have small text. For dyslectic people it is important to have large and easy to read text. Dysleksiforbundet is suggesting Arial 14.
WXp /IE7	IS5	General	Trust, security		Can these e-voting solutions really be trusted?
Windows XP, professional, IE 8	KB1	General	Unduly influence		The possibility of voting as many times as you want to may or may not solve the problem of unduly influence. You may be forced to vote at the election day. …
Windows XP,	KB1	General	Unduly influence		The respondent thinks the disadvantage with e-valg is the danger of

professional, IE 8					influence from other persons, but he think the advantages outweighs the disadvantages.
WXp/IE7	IS2	General	Usability		Recommend a touch screen solution
WXp/IE7	IS4	General	Usability		Should avoid scrolling, in particular horizontal scrolling
Windows XP 2007, IE 7	KB5	General	Usability		Too many choices in ways of navigating are just distracting, not necessary. It complicates the program, and the consequence may be that you do not dare to attempt to give any person votes of fear of spoiling the ballot.
	OB5	General	Usability		Would like to be able be alter ballot independently.
Windows XP 2007, IE 7	KB5	General	Usability, user control		Should be possible to double check what you have done by going back and forth in the application. This seemed not to be possible in Indra, at least not when at 7
Windows XP 2007, IE 8	KW1	General	Validation		The voter card information should be accessible (ie. In electronic format) for the blind, if not, it will not be possible to check the control code.
Windows XP 2007, IE 8	KB3	General	Verification		In a real setting, the user said, he probably would not have bothered about the evaluation and control codes.
Windows XP, professional, IE 8	KB1	General	Video		The electronic election should be open at least a month
Windows XP, professional, IE 8	KB1	General	Video		Thinks video instructions will be essential
Windows XP 2007, IE 8	KB2	General	Video		Very important with video explanation. The voting brochures should be possible to read with text to speech.
Windows XP 2007, IE 8	KB3	General	Video		Very important with video explanation. The voting brochures should be possible to read with text to speech.