

Testing Amazon.com's Kindle Wireless Reading Device, Wi-Fi Edition

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Device description

The aim of this semestral work is to test the new Amazon Kindle device which enables to read electronic books in different formats comfortably. The main feature of Kindle is the Electronic Ink technology which proved to be much more easier on the eyes, demands less energy and enables to create print-like text with more clear and sharp letters. In our work we're going to concentrate on the Amazon Kindle Wi-Fi Edition which is equipped with the Wi-Fi adapter and the experimental WebKit-Based browser we would definitely like to test.

You can see the general layout of a device on the picture we successfully grabbed at amazon.com web-site.



Picture 1. Amazon Kindle Wi-Fi Edition

The device comprises a 6" display and a qwerty-like keyboard with a bunch of additional specific buttons which facilitate navigation and effective usage: buttons "Menu", "Home", "Back", arrows to turn pages, arrows to move through the current page, to name a few.

It also has a USB 2.0 Port which enables to upload books to Kindle from PC.

Wi-Fi adapter supports public and private networks with password authentication, we were not able to connect to eduroam network at the university area though because it does not support WPA2 secured networks.

Battery life also might be worth mentioning because a single charge lasts up to a month with standard every day usage. [1]

Description of users

The target audience comprise students at the age of eighteen – twenty five who are proficient in using standard PCs, to be exact:

1. Know how to connect a device to PC via USB port.
2. Know how to work with the File System of both the device and PC and how to transfer files from one folder to another.
3. Are familiar with a concept of a web-browser.
4. Know how to use Google searching facilities.
5. Are acquainted with standardized and wide-spread computer labels such as ones used for "Enter" button or a label for Wi-Fi signal.

Also the typical representative of a target audience is supposed to be able to read in English and is expected to be a newbie in the area of e-book reader devices.

Usability inspection methods

In order to verify the usability of Amazon Kindle and detect possible usability issues we have prepared a set of use cases. Each of the proposed use cases is focused on some specific facility of a device.

Execution of each use case will be performed according to the one of two possible methods: cognitive walkthrough or heuristic evaluation.

Cognitive walkthrough [2] involves one or a group of evaluators inspecting a user interface by going through a set of tasks and evaluate its understandability and ease of learning.

In order to apply this method for usability testing we need to supply strictly defined set of steps for each use case. For every use case the evaluator needs to answer the following question once:

Question 0: What does the user want to achieve?

Then for every consequent step while going through the use case evaluator is asked to answer these three key questions:

Question 1: Will the correct action be evident for user?

Question 2: Will the user connect label of an action with action?

Question 3: Will the user receive a sensible feedback?

One of the presumption for using the cognitive walkthrough is the fact, that evaluator himself knows exactly what he needs to do in each step to achieve the correct result [3].

The output from a cognitive walkthrough is subjective data in form of answers on the three questions mentioned earlier which could help to make some corrections in the interface and improve usability of a device.

Heuristic evaluation [4] is a usability engineering method for finding the usability problems in a user interface design so that they can be attended to as part of an iterative design process. Heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles (the "heuristics").

For our work we will use the well-acclaimed 10 heuristics for user interface design written by Jacob Nielsen [5]:

H1: Visibility of system status

H2: Match between system and the real world

H3: User control and freedom

H4: Consistency and standards

H5: Error prevention

H6: Recognition rather than recall

H7: Flexibility and efficiency of use

H8: Aesthetic and minimalist design

H9: Help users recognize, diagnose, and recover from errors

H10: Help and documentation

Heuristic evaluation is performed by having each individual evaluator inspect the interface alone. During the evaluation session, the evaluator goes through the interface several times and inspects

the various dialogue elements and compares them with a list of recognized usability principles (the heuristics).

The output from using the heuristic evaluation method is a list of usability problems in the interface with references to those usability principles that were violated by the design in each case in the opinion of the evaluator.

Use cases outlines

Use case 1

While reading a book use a dictionary to look up the word “profound” and then return back to reading.

The ability to use dictionary while reading a book from the first moment seemed incredible to us. We think that this facility provides a great support for people trying to learn a foreign language or just read some original literature. The access to dictionary is instantaneous so it's much more convenient than using the paper-back dictionary. More of it, users can upload their own dictionaries if the standard ones (Oxford Dictionary of English & New Oxford American Dictionary) do not make a lot of sense to them. So we suppose that this facility of Kindle will be used quite often. For the test of the given use case we have decided to use the cognitive walkthrough method. Our decision is based on the observation that the use case includes a set of well-defined steps, each of them is unique and has no alternatives.

Use case 2

Upload the book “Brynson – A History of Almost Everything” from the PC, open it in Kindle and go to the location 3258.

This use case was included into our pack of use cases because it covers a couple of heavily used functions of a device, such as uploading the book, opening the book and searching for a specified location in the book. It is highly probable that every user will encounter on this functions on a daily basis so we have to pay attention to this part of Kindle functionality and test it thoroughly. We will need help of our PC for the first part of this use case.

We used cognitive walkthrough to test this use case mostly because of the same reasons as in the previous use case: the sequence of steps is well-defined, there are no alternatives and each step is important in order to achieve the goal.

Use case 3

Connect to the coffeeheaven [6] wireless network, start the browser, load Google main page and search for “amazon kindle” and “praha” then search for Californication series on imdb.com.

This use case is very significant because it utilizes a bunch of the main features of Amazon Kindle Wi-Fi Edition: manipulation with wi-fi such as establishing connection and choosing the network, and one of the experimental features of Kindle – its browser, and finally this use case is pretty natural, because in exactly the same way the real users are expected to search for new books, so the whole impression about Kindle may depend on the usability of the utilities covered by this use case. For the test of this use case we've chosen the heuristic evaluation method, because it contains a lot of small intuitive steps to make the cognitive walkthrough lingering and boring. More of it, there is often a lot of possibilities to achieve the same effect by making different decisions through the use case, so again, the cognitive walkthrough does not seem as a good option. On the other hand,

heuristic evaluation will make a perfect fit here, because it will help us to summarize our experience from all the steps and point out the main problems.

Use case 1. «While reading a book use a dictionary to look up the word “profound” and then return back to reading».

Introduction

[Note: Abbreviations *Q0*, *Q1*, *Q2*, *Q3* refer to the four questions of cognitive walkthrough described in the section “Usability inspection methods”. Letters in parentheses (such as (a) for example) refer to the discovered usability problems which are discussed later in the “Survey of discovered issues” section]

Q0: The user wants to find the translation of a specified word and then continue reading the book.

Initial state: The user reads the book on a specified page and encounters with an unknown word.

Sequence of steps to complete the use case:

1. Select an appropriate word.
2. Press “Enter”.
3. Traverse through the material in the dictionary.
4. Press “Back”.

Final state: The user is back again on the same page and continues to read the book.

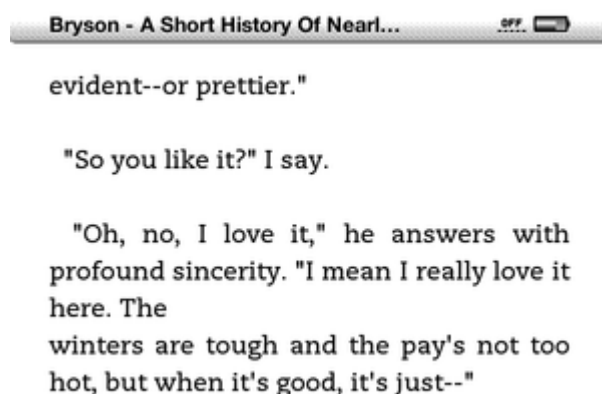
Implementation

Step 1. Select an appropriate word.

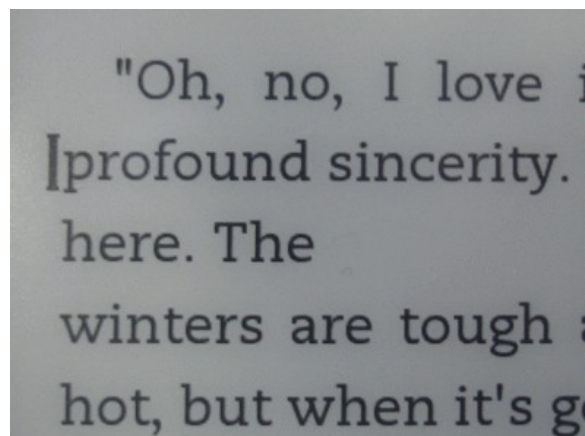
Q1. Yes, the user encounters with unknown word and needs to mark it somehow for further processing.

Q2. No, because the choice of a button to move the cursor on the screen is not evident – there are two pairs of buttons with the same labels “arrow right” and “arrow left” on them. (a)

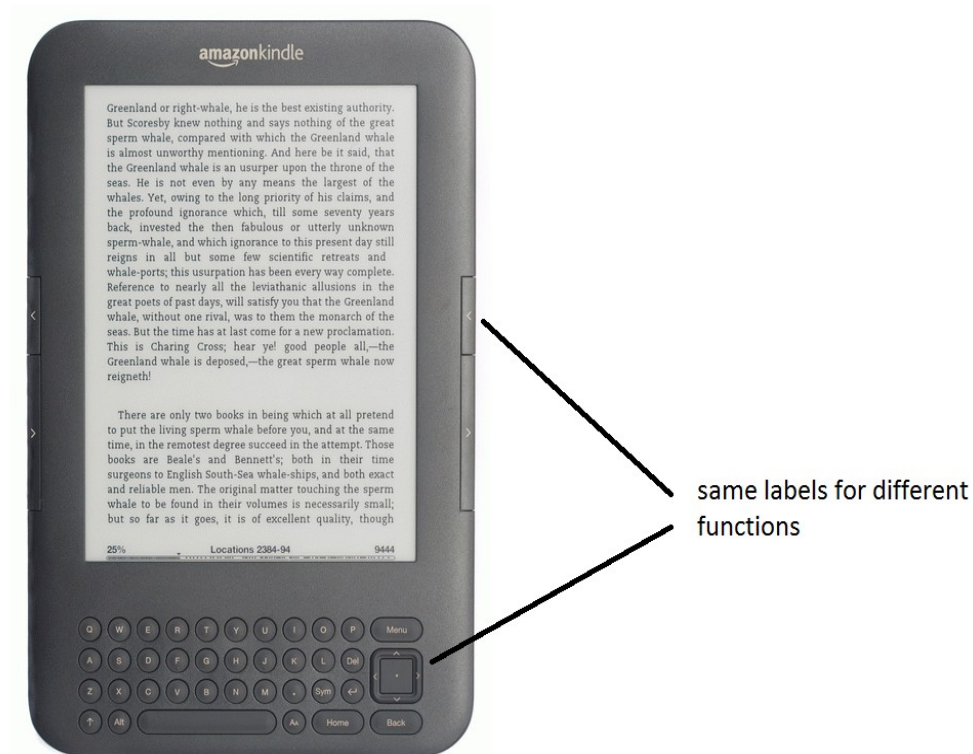
Q3. No, when the cursor is already at the right position, the respective word is not highlighted anyhow and there is no way to find out which word is actually “selected” at the moment. (b)



Picture 2. Initial state – the book page and an unknown word “profound” in the sixth line



Picture 3. Illustration of the fact, that it is not clear which word is selected.



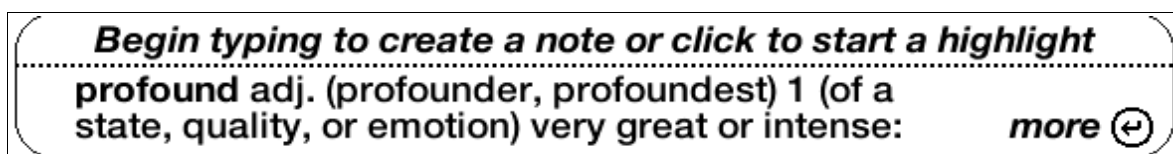
Picture 4. The general view of a Kindle with an illustration of two pairs of buttons with the same label but different functionality. (reason why we said “No” for Q2 in Step 1).

Step 2. Press “Enter”.

Q1. Yes, the user needs to confirm his choice of a word to be translated.

Q2. Yes, because the hint pops up on the screen with the instructions to follow.

Q3. Yes, after confirming the choice the dictionary is opened and the word “profound” is on the first line followed by the translation.



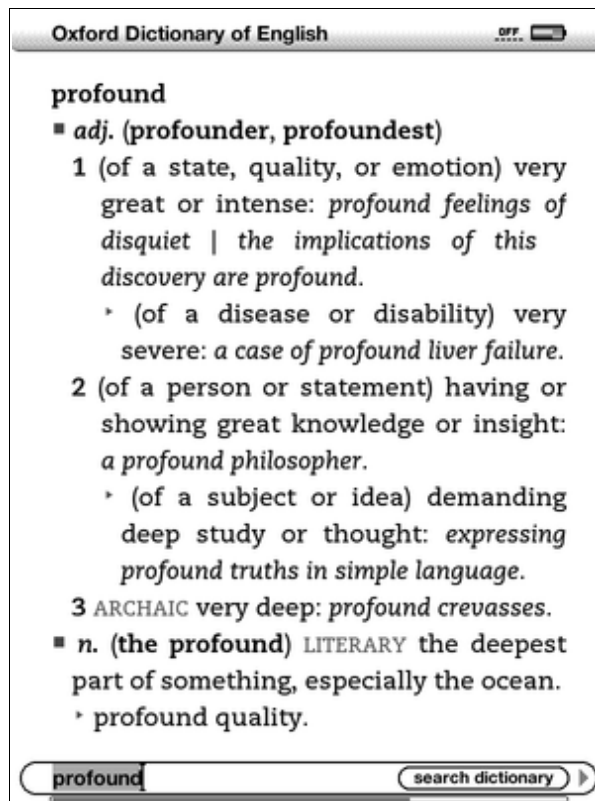
Picture 5. Illustration of a popped up hint with the instructions to follow.

Step 3. Traverse through dictionary to read the translation.

Q1. Yes, the user needs to display the next page of a dictionary to finish reading the translation.

Q2. Yes, because the same buttons are used to turn the pages in both the book's text and in the dictionary. (assuming the user knows how to turn pages while reading a book).

Q3. No, after going to the next page there's no evident marker that we are still reading the translation of a word “profound”. (c)



Picture 6. Illustration of the feedback after *Step 2* is completed. The dictionary is opened.

Step 4. Press “Back”.

Q1. Yes, the user needs to push some button to return to the book.

Q2. Yes, there is the one and only one button labelled “Back” on the entire device.

Q3. No, there is no evident sign that after pressing “Back” we are at the initial position in the book as we were before launching the dictionary. (d)

Summary

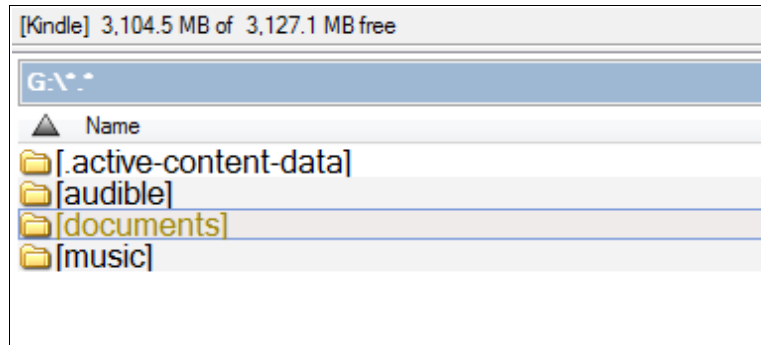
The desire not to clutter up the screen with additional information made it sometimes hard to get the feedback from the system (*Steps 1,3,4*). The problem with identically labelled buttons is really undesirable especially in addition to the poor feedback (*Step 1*, partially *Step 3*). The hint which pops up in *Step 2* after selecting the word is extremely useful, because in other way there would be no evidence for the user that the dictionary is present and working at all.

Use case 2. «Upload the book “Brynson – A History of Almost Everything” from the PC, open it in Kindle and go to the location 3258».

Introduction

Q0: The user wants to upload the book from the PC, then open it via the Kindle interface and jump to the specified location.

Initial state: The Kindle is connected to the computer and its file system is displayed.



Picture 7. Kindle file system. The books must be uploaded in the “Documents” folder.

Sequence of steps to complete the use case:

1. Upload the book to the folder “documents” on Kindle.
2. Go to the “Home” menu where we can choose a book.
3. Open the chosen book.
4. Press “Menu”
5. Choose “Go to”.
6. Enter the location number.
7. Confirm by clicking “location”.

Final state: The user is in the location 3258 of the uploaded book.

Implementation

Step 1. Move the book to the folder “documents” on Kindle.

Q1. Yes, the action is natural – user knows that he needs to upload the book on the device first.

Q2. No, because there are two seemingly suitable folders to upload the book: “documents” and “active-content-data”, and there is no hint where to place the book to make it right. (e)

Q3. No, because after uploading a new book to the Kindle we didn't receive any notification, that the new book was uploaded nor it was somehow highlighted in the list of all books. (f)

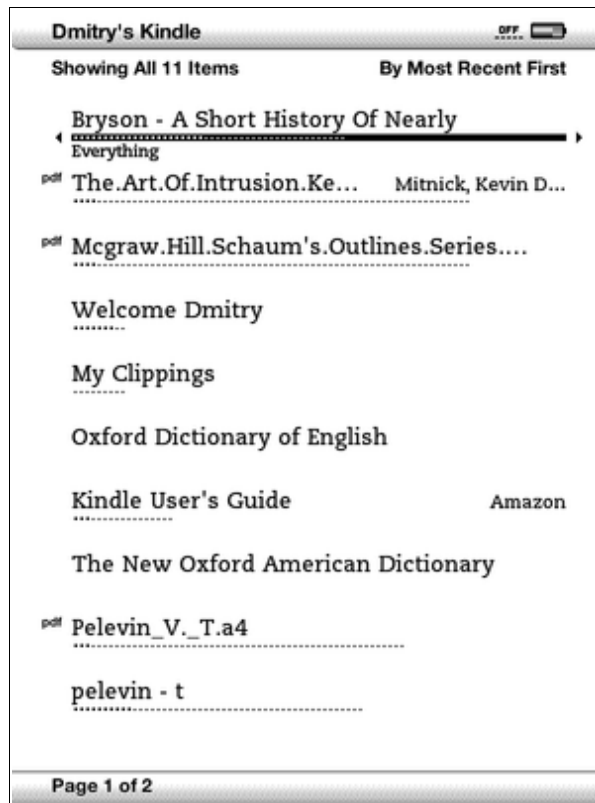
After finishing uploading the book we eject the USB cable from the device and it automatically switches on.

Step 2. Go to “Home” menu to choose a book.

Q1. No, the user has no idea that the books are located in “Home” menu on Kindle, because he actually was uploading them to the folder “documents”. (g)

Q2. Yes, because we have the one and only one button labelled “Home” on the entire device.

Q3. Yes, because the first printed line is “Showing All 11 Items” followed by the list of books.



Picture 8. Kindle “Home” Menu after *Step 2*. The list of all books is displayed here.

Step 3. Open the chosen book.

Q1. Yes, it's evident that now user needs to open the book he has chosen to read.

Q2. No, because there is no hint which button to use to open the book and there are two seemingly suitable buttons on the Kindle device that both mean something close to “enter”. (h)

Q3. Yes, after pressing the right button the text pops up with the title of a book on the first line.



Picture 9. As “Enter” could serve both the button below “Del” and button inside the arrows.



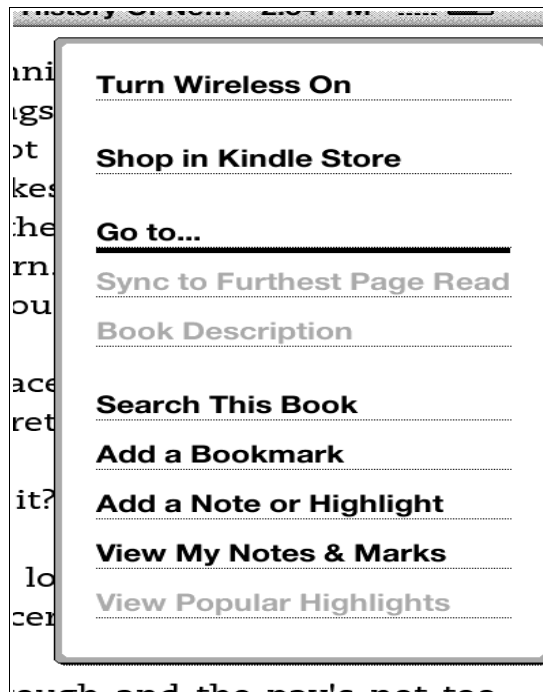
Picture 10. The title of the book pops up after completing *Step 3* at the top of the screen.

Step 4. Press “Menu”.

Q1. Yes, the action is obvious, because that is actually the only place where you can find some tools to work with a book.

Q2. Yes, there is a “Menu” button on a keyboard.

Q3. No, after pressing the button some new text surely pops up, but you can't determine if it's Menu or not (no label of Menu is there). (i)



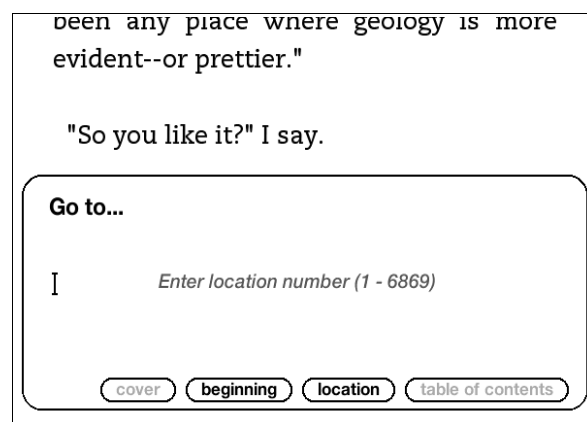
Picture 11. Part of the screen after pressing the “Menu” button in *Step 4*.

Step 5. Choose “Go to”.

Q1. Yes, it's clear, because the initial intent of a user was to *go to* the specified location.

Q2. Yes, the menu option has the clear name “Go to”.

Q3. Yes, because a windows pops up, which is called “Go to...” and there's a hint “Enter location number”



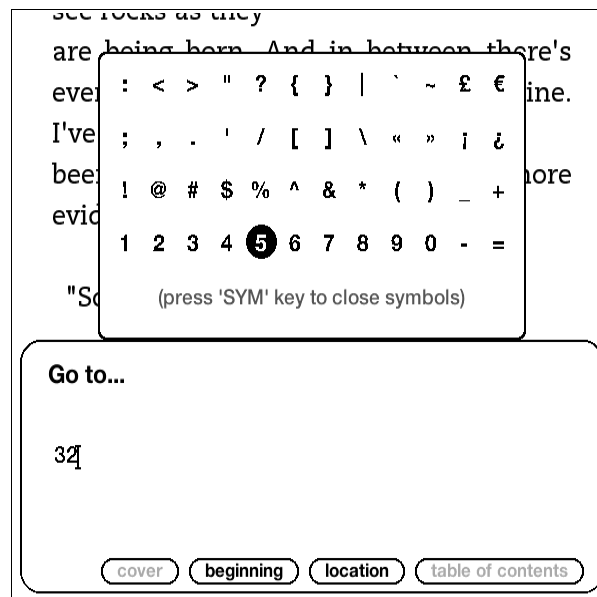
Picture 12. Popped up window after pressing the “Go to” option in *Step 5*.

Step 6. Enter the specified location: location 3258.

Q1. Yes, it's obvious because of a hint.

Q2. Yes, assuming the user knows how to type numbers.

Q3. Yes, the user can see printed numbers on the screen.



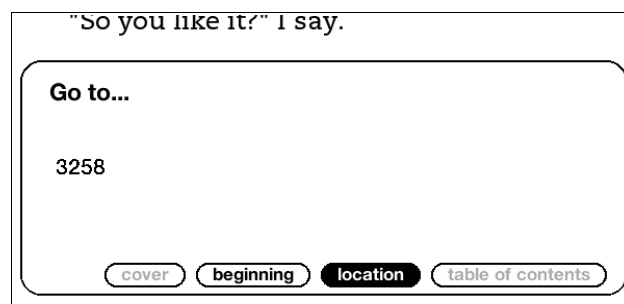
Picture 13. Entering the number of a desired location.

Step 7. Confirm by clicking "location".

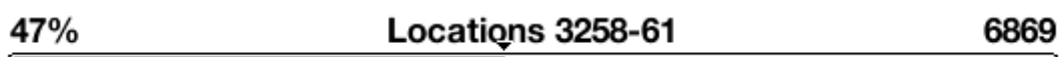
Q1. No, the action is not obvious, because usually in similar situations it is needed to press "enter" but in this case we should choose "location" button. (j)

Q2. Yes, the button has the name "location" on it.

Q3. Yes, we can see the actual location at the bottom of the screen.



Picture 14. Clicking the "location" button.



Picture 15. Location bar at the bottom of the screen after completing the Step 7. The final state.

Summary

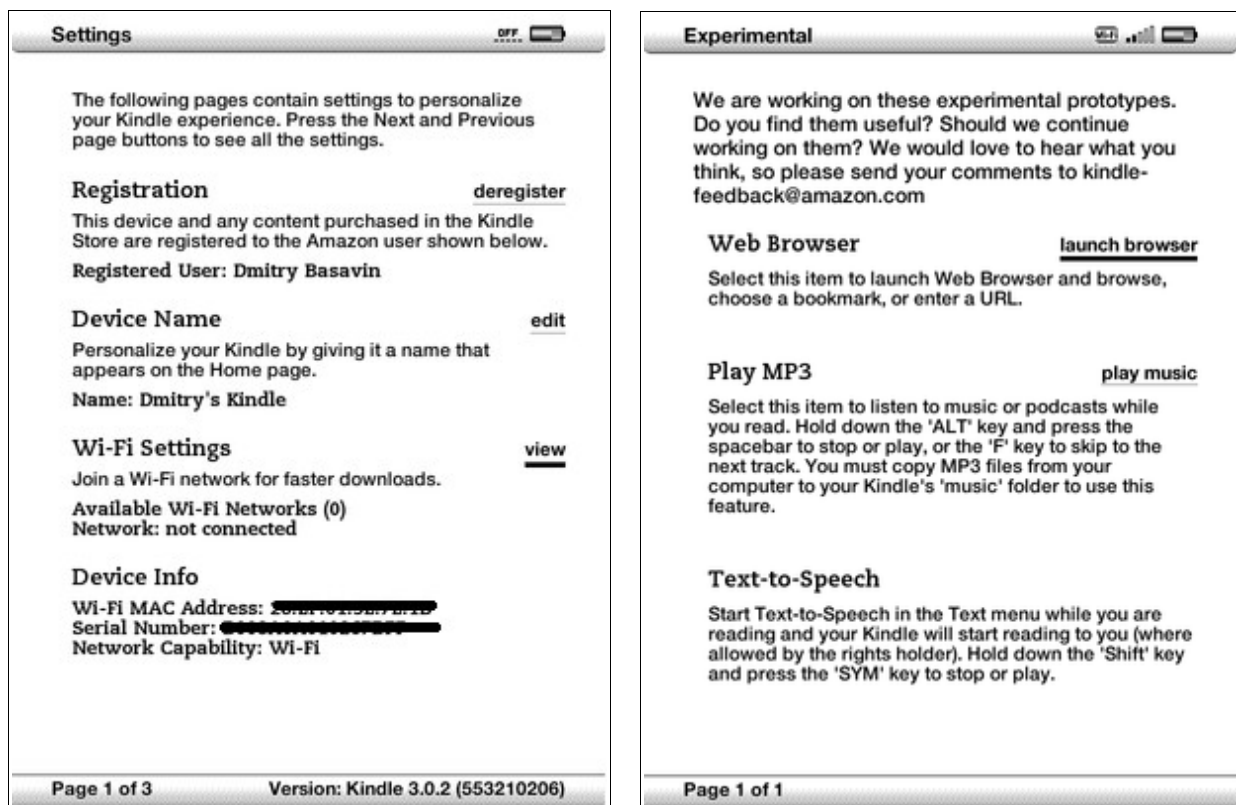
Basically this use case did not reveal any of really bad design decision except may be one with the inconsistency in folder names (*Steps 1, 2*). Another revealed issue is with two pretending-to-be-Enter buttons, pressing each of them results in something different though. And there is usually no documentation or hints available to find out which one to press to get the desired result (*Steps 3, 5*). Another relatively unpleasant thing is the “location” button illustrated on picture 14. It violates the standards of giving names to the buttons and user will probably not understand that he needs to press this button at the moment.

Use case 3. «Connect to the coffeeheaven wireless network, start the browser, load Google main page and search for “amazon kindle” and “praha” then search for Californication series on imdb.com».

For this use case we are going to use the heuristic evaluation with the set of 10 heuristics for user interface design written by Jacob Nielsen (more information can be found in section “Usability inspection methods”).

Found issues

- (a) Wi-Fi network must be chosen from the “Settings” menu. No way to find it out except random browsing and ultimately encountering the needed thing. *Violates: Help and documentation.*
- (b) Browser is launched from the “Experimental” menu. No way to find it out except random browsing and ultimately encountering the needed thing. *Violates: Help and documentation.*



Picture 15, 16. Wi-Fi Networks in “Settings” and web-browser in “Experimental”.

- (c) No shortcuts in the browser. *Violates: Flexibility and efficiency of use.*
- (d) There is no way to go to the bottom of the page instantaneously. *Violates: Flexibility and efficiency of use.*
- (e) The “Home” button does not mean the usual “go to the beginning on the page” but it redirects you to the “Home” folder of Kindle instead. *Violates: Consistency and standards.*
- (f) Two pairs of buttons labelled with the same signs of “arrow left” and “arrow right”, which do different things. *Violates: Consistency and standards.*
- (g) When the wi-fi connection stops working properly, the device doesn't notify the user in the appropriate way – the web pages just do not load any more. *Violates: Help users recognize, diagnose, and recover from errors.*
- (h) Some functions (dictionary or the “Back” button for example) do not work the same way in a browser as while reading the book. *Violates: Consistency and standards.*
- (i) When the page is loading (it might take long sometimes) the system does not notify user about the process. Kindle just stops to respond to the button presses and clicks. *Violates: Visibility of system status.*



Picture 17. General view of Kindle browser after searching for “amazon kindle” on Google.

- (j) Menu which slides down after you place the cursor over its title does not work properly. When a user wants to choose some item in such a menu it just slides up to the initial state and leaves the user frustrated (the situation is illustrated on pictures 18,19). *Violates: Consistency and standards.*

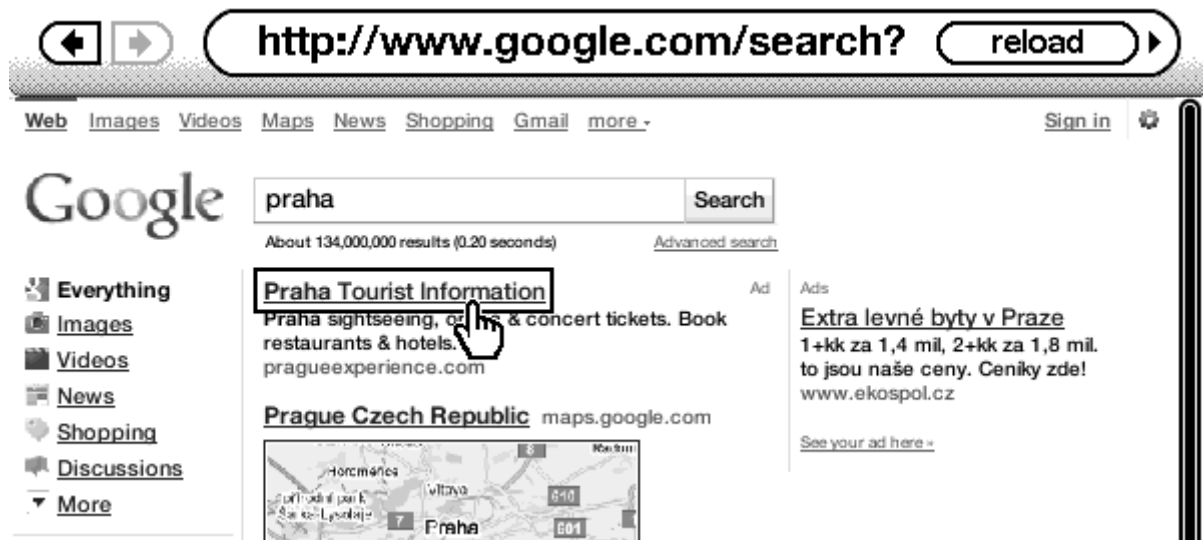


Picture 18. Menu slides down so user “can” choose the item.



Picture 19. Menu slides up to the initial state after user moves the cursor towards the item.

- (k) While moving the cursor in the browser the cursor automatically jumps from one hyperlink to another. So the user can not actually place the cursor to whatever position on the page he wants. Sometimes it can prevent the user from achieving what he wants, as for example with <http://www.habrahabr.ru> service, where you need to place the mouse over the poorly rated comment to make it visible. *Violates: Flexibility and efficiency of use.*
- (l) When a cursor is placed over the hyperlink the system does not give the user any hint where this hyperlink actually leads (illustrated on picture 20). *Violates: Visibility of system status.*



Picture 20. When you place the cursor over the hyperlink the system does not provide you the information where the selected hyperlink actually leads.

Summary

During the heuristic evaluation we have found quite a lot of problems. The most inconvenient are (g), (i) and (j) which should be definitely fixed. Other problems are not so urgent and some of them can be a reasonable trade-off for a minimalistic design. The sufficient number of good documentation or a kind of tips and hint sometimes are really crucial, so the manufacturers should not underestimate their importance.

Survey of discovered issues

How to rate the severity of found issues

In order to rate the usability problems we will use the Severity Ratings for Usability Problems by Jakob Nielsen [7].

According to Nielsen, the severity of a usability problem is a combination of three factors:

- The frequency with which the problem occurs: Is it common or rare?
- The impact of the problem if it occurs: Will it be easy or difficult for the users to overcome?
- The persistence of the problem: Is it a one-time problem that users can overcome once they know about it or will users repeatedly be bothered by the problem?

Based on the answers given to these three questions we are going to rate each usability problem using the following 0 to 4 rating scale [7] :

- **0** = I don't agree that this is a usability problem at all
- **1** = Cosmetic problem only: need not be fixed unless extra time is available on project
- **2** = Minor usability problem: fixing this should be given low priority
- **3** = Major usability problem: important to fix, so should be given high priority
- **4** = Usability catastrophe: imperative to fix this before product can be released

After conducting tests of three use cases we have gathered (a) – (j) problems from the cognitive walkthrough and (a) - (l) from the heuristic evaluation. Now we will rate each problem and propose some decision (without designing the concrete solution).

Cognitive walkthrough discoveries:

(a) Problem: Two pairs of buttons have the same labels.

Decision: Make the labels distinguishable.

Rating: 2.

(b) Problem: The selected word is not highlighted, so the user does not know which word now is selected.

Decision: Highlight the selected word somehow.

Rating: 1.

(c) Problem: The user may not be sure if he is still reading the translation of the chosen word.

Decision: Make the name of a translated word visible during the whole period of time while reading the translation in the dictionary.

Rating: 1.

(d) Problem: The user is not sure if he has returned back to the book out of the dictionary.

Decision: Can somehow notify the user that he has closed the dictionary and now is located in the book at the same place where he was before launching the dictionary.

Rating: 1.

(e) Problem: User does not know the folder he needs to upload books into.

Decision: Make the names of the folders more informative or add some hints.

Rating: 3.

(f) Problem: User may not find the newly uploaded book in the folder containing all the books.

Decision: Highlight the newly uploaded books.

Rating: 1.

(g) Problem: User may not understand that the books are chosen from the “Home” folder on Kindle because he was actually uploading them into the folder named “documents”.

Decision: Give the consistent names to the folders.

Rating: 2.

(h) Problem: There are two buttons “enter” on the device and it is not clear which one to use in some particular situation.

Decision: Create hints.

Rating: 3.

(i) Problem: User may not be aware that he is currently in the “Menu”.

Decision: Add the label somewhere to illustrate that we are actually now in the “Menu”.

Rating: 1.

(j) Problem: User may not associate the name “location” with the action of “going to the specified location”.

Decision: Give the more informative and essential name to the button.

Rating: 1.

Heuristic evaluation discoveries:

(a) Problem: User can access the wi-fi network from the “Settings” menu which is not intuitive.

Decision: Create better documentation or move the wi-fi setting to some other folder.

Rating: 1.

(b) Problem: User can access the browser only from the “Experimental” menu which is not intuitive.

Decision: Create better documentation or move the browser to some other folder.

Rating: 1.

(c) Problem: No shortcuts are available for user.

Decision: Create shortcuts.

Rating: 2.

(d) Problem: User is not able to go to the bottom of the page instantaneously.

Decision: Add shortcuts for better navigation in the big web-pages.

Rating: 2.

(e) Problem: “Home” button does not act as expected.

Decision: Keep the functionality of the buttons unchanged or create appropriate hint to warn the user about the change in behavior.

Rating: 1.

(f) Problem: Two pairs of buttons are equally labeled.

Decision: Make the labels distinguishable.

Rating: 2.

(g) Problem: Poor notification of the user in case of problems with Wi-Fi signal.

Decision: Notify the user somehow.

Rating: 5.

(h) Problem: Pushing the same button leads to different consequences in different contexts.

Decision: Keep the functionality of the buttons unchanged on create appropriate hint to warn the user.

Rating: 3.

(i) Problem: User is poorly informed about the process of page loading.

Decision: Notify the user somehow that the page is still loading.

Rating: 5.

(j) Problem: Sliding menus (probably a lot of other things from JavaScript) does not work as expected.

Decision: Meet the standards of rendering the JS components.

Rating: 5.

(k) Problem: Cursor can't be placed at the arbitrary position on the page.

Decision: Let the user choose how the cursor will behave.

Rating: 4.

(l) Problem: User cannot verify where the hyperlink leads.

Decision: Add some pop up hint or show the relevant information in the footer.

Rating: 3.

Conclusion

During this semestral work we have tested the Amazon Kindle device by both cognitive walkthrough and heuristic evaluation methods. Testing resulted in a bunch of discovered usability issues, some of them severe, others can be explained as the device-specific features or reasonable trade-offs in a chase for minimalistic design and achieving low energy consumption.

Overall impression after testing this device is extremely positive. People at Amazon have created a very good-looking, functional device which lives up the expectations of even a very demanding customer.

References

- [1] <http://www.amazon.com/Kindle-Wireless-Reader-3G-Wifi-Graphite/dp/B002FQJT3Q>
- [2] <http://www.pages.drexel.edu/~zwz22/CognWalk.htm>
- [3] <http://hcibib.org/tcuid/chap-4.html#4-1>
- [4] http://www.useit.com/papers/heuristic/heuristic_evaluation.html
- [5] http://www.useit.com/papers/heuristic/heuristic_list.html
- [6] <http://www.coffeeheaven.cz/>
- [7] <http://www.useit.com/papers/heuristic/severityrating.html>