Improving reading experience in digital newspapers

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Abstract

Reading news on mobile devices has during the past decade transcended into an everyday activity, which induce greater demands on design and presentation of news. Several researchers have examined essential components in the area of digital newspapers, despite this, there are few newspapers that have switched to a reader-friendly format.

The objective of this thesis is to evaluate how the reading experience in digital newspapers can be improved by abandoning the traditional structure of today’s printed newspapers. Based on numerous tests and studies, as well as support from literature, a set of guidelines has been produced as a result of this thesis.

The design guidelines contain recommendations for optimal line size, typeface, point size, appearance, functionality, placement, recognition factor and packaging. To ensure quality, all guidelines were validated in order to prove that the reading experience had increased. An evaluation was performed that attempted to determine that.

The statistic result of this thesis showed a significant difference in both reading speed and the subjective experience. However no significant difference could be seen regarding the reading comprehension. The conclusions made was that structure and design of content can influence both reading speed and reading experience.

All design guidelines can be used as guidance when developing templates for digital newspapers.
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Chapter 1

Introduction

The newspaper medium came into existence more than 500 years ago, making it one of the oldest forms of mass media. Printed media dominated the market for several decades and publishing empires were at their peak from 1890 to 1920, this period is considered to be the golden age for printed media [2]. Newspapers have been improved and adapted as technology has evolved and reading news is now an everyday activity. However, the newspaper industry has encountered several competing industries and markets during the past century. Such competitors arose at the birth of broadcast radio and television where new technology was utilized to conquer new markets [3, 2]. Despite several setbacks the newspaper industry is still ongoing but it has reached a limit where major changes and improvements are necessary for the survival of the industry.

The evolution of the newspaper medium is always one step behind the evolution of technology. It requires time, knowledge and resources to continuously keep up with the evolution of technology and since these three components are often lacking, problems arise. In today’s society, tablets and smartphones are a part of everyday life. News editors (equivalent to newspaper companies) have followed the evolution of technology by making their newspapers available online [3], however, the content has not been adapted to fit this new medium. Therefore the newspaper has the same format and layout as the printed version [4], implicating that the digital newspaper appears like a screenshot of the printed newspaper, which is neither user-friendly nor satisfying for the user.

A more user-friendly design requires improved usability, by which we can achieve better reading experience. Usability is assessed based on five quality components developed by Nielsen [5] and defined as learnability, efficiency, memorability, errors and satisfaction. Reading experience can be defined in several ways and definitions varies from how you experience what you read to a common experience that includes multiple people. In our case, we define reading experience as an experience based on three factors: (1) the reader should understand the content and (2) absorb the content at a reasonable time and (3) the reader should perceive reading as appealing and satisfying.

1.1 Textalk

This thesis has been conducted at Textalk, a company established in Gothenburg. Since the late 1980s, Textalk\footnote{http://www.textalk.se} has been world leading in technology solutions for visually impaired.
Today they are also known as Sweden’s leading e-commerce provider and for their well established consulting. They have developed several of Sweden’s most revolutionary web and IT projects, among them Sweden’s first online newspaper.

Textalk provides a set of tools where customers without technical expertise can easily launch web shops, payment systems, surveys and news sites. Their tools allow customers to create their own unique design. In addition to these tools, Textalk also provides technical consulting services.

1.2 Digital Newspaper

Since written media entered the digital world, several approaches to present news have emerged, which over the years have been evolved and expanded. These approaches defines how news should be visualized, made available and where, when and how they should exist. The approaches can be divided into two categories, web news and digital newspapers. Web news is fast and often shorter news which are frequently and continuously published on a web page (for example VK\textsuperscript{2} or Aftonbladet\textsuperscript{3}). The most common is that the website is updated immediately after an event has occurred and news is thus created. Digital newspapers on the other hand is a collection of news similar to the printed newspaper and consists of news collected over a given time period. Analogous to printed newspapers, digital newspapers is published only once a day or even once a week, depending on the type of newspaper. One of Textalk’s products, called Textalk Weblisher\textsuperscript{4}, is a tool for publishing digital newspapers as flippable PDFs on the web.

1.3 Problem Statement

Today’s newspaper design is designed for print and has been improved for decades to fit printed media. The structure and arrangement of items fit how humans read printed news. Also image and text sizes are designed to be user-friendly and are adapted to maximize the reading experience in printed media. The problem is that this design is optimized to fit the newspapers that humans physically hold and flip through every morning.

When the newspapers were made available online, it was with same format, structure and setup as the already printed newspapers, as you can see in Figure 1.1. This is where we are at today. We are in a world that has not welcomed digital newspapers in a reader-friendly format.

1.4 Aim and Purpose

The objective of this thesis is to evaluate how the reading experience in digital newspapers can be improved by abandoning the traditional structure of today’s printed newspapers.

The purpose of this thesis is to improve the reading experience in digital newspapers by developing a set of guidelines and according to these, a design will be produced in order to test if the reading experience has been improved.

The aim is to develop a set of design guidelines that generates designs that are reader-friendly and intuitive. Reader-friendly\textsuperscript{5} is defined as "easy to read" and "prepared to be

\textsuperscript{2}http://www.vk.se
\textsuperscript{3}http://www.aftonbladet.se
\textsuperscript{4}http://www.textalk.se/weblisher/
\textsuperscript{5}http://dictionary.reference.com/browse/reader-friendly
suited for readers”. The intention is also to improve the reading experience by increasing legibility and improving the layouts itself with the purpose of departing from today’s traditional format of printed media.

1.5 Thesis Outline

The remaining chapters are structured as follows: Chapter 2 introduces a brief presentation of the background and reasons for the emergence of the project. In Chapter 3 the proposed method will be described along with information about the performed evaluations. Chapter 4 presents the design guidelines that are based on user feedback and literature. In Chapter 5 our results are presented and Chapter 6 contains a discussion of our results, limitations and future work. Chapter 7 presents our conclusions and a brief summary and in the end the Bibliography is presented.
Chapter 2

Background

Textalk is world leading in technology solutions for visually impaired and provides a service for elocution. To achieve this Textalk, has a huge customer database containing quantities of newspapers. Content from these newspapers has been extracted in order to be read aloud by an elocutionist. This means that Textalk is holding a large amount of content that they have infinite possibilities to use, in addition to help visually impaired. Through this the idea to adapt newspapers to the digital world were born.

2.1 Textalk Webarch

Textalk Webarch\(^1\) is a tool that automates media extraction (text and images) from both PDF-format and directly from layout applications such as Adobe InDesign\(^2\) and QuarkXPress\(^3\). Webarch first extracts and stores all content in a database and then a small manual intervention where the material is structured needs to be performed. The tool marks up different elements of an article such as heading, introduction, running text, author, image, image text and so on. Furthermore the tool matches elements that belongs to the same article and labels them as dependent of each other.

Webarch is language and format independent and the extracted media can afterwards be returned completely according to optional preferences. With Webarch, media becomes format independent, which creates endless opportunities for feedback and searchable archive services. The digital representation of articles also enables modification of structure, appearance and design.

As mentioned earlier, Webarch was originally developed to make newspapers available for visually impaired and the original purpose was to make content available for reading aloud. New opportunities opened with all content digitized and new advantages were discovered. The most important and most powerful advantage that the digital representation brought was the ability to adapt articles to digital media.

Textalk strives towards a new tool, called Prenly, where newspaper companies can create all their material and Webarch will no longer be necessary. Webarch thus enables development in an early stage when the articles are only available in a PDF-format or in applications such as Adobe InDesign and QuarkXPress. This allows Textalk to show how Prenly works with each newspaper’s individual materials, which is powerful marketing.

\(^1\)http://www.textalk.se/media/webarch/
\(^2\)http://www.adobe.com/se/products/indesign.html
\(^3\)http://www.quark.com/Products/QuarkXPress/
2.2 Vision

Until today digital newspapers have been visualized as flippable images, which is neither user friendly nor suitable for the reader who needs to zoom in and out in order to be able to read any articles (see Figure 1.1 again for visual example). Textalk has a vision to improve the reading experience, but also to change how digital newspapers are used.

2.3 Point of Departure

In order to develop as good a tool as possible, Textalk already has partnerships with a number of newspapers, both large and small. One of these newspapers is Västerbottens-Kuriren\(^4\) (VK) in Umeå. Since late last year an application has been available for the VK e-magazine which uses Textalk Webarch. This is performed to test the application with real users and entails that an operational application existed in the beginning of this thesis and our work began with this application as a starting point.

Textalk’s focus has been on creating a powerful back-end which has led to the tool having a subpar interface. This thesis will guide you through the process of creating a general interactive interface based on design guidelines that can be used by any newspaper company.

\(^4\)http://www.vk.se
Chapter 3

Method

This chapter describes the process of the work which includes what has been done, when, why and how. The chapter also covers all methods used to conduct the thesis, which is mostly methods for different types of user evaluations. Each evaluation is described with questions such as how the evaluation was created, how the evaluation was conducted and what methods and theories that were used.

3.1 Process Structure

This section describes the process of the work as a ten phase process, see Figure 3.1 for a visual illustration of the process structure.

The first phase of the thesis included a literature study. We explored different theories and methods for user testing such as pilot tests, test methods and test structures. As part of phase one, methods for user testing were chosen and more advanced knowledge of the areas were obtained. Read more about evaluation with user involvement in Section 3.2.

The second phase consisted of the creation of user test based on given methods, followed by pilot tests to find errors and ensure quality and purpose. Phase three was user testing of potential users who were not already influenced by the application’s layout and design. Once we knew all presuppositions the next phase, phase four, was to find out what the users wanted. Hence, phase four consisted of a small requirement analysis with focus on users expectations and what users considered themselves wanting. Read more about the chosen method in Section 3.2.3. The fifth phase included an phone interview with the customer service department at VK. Read more about the interview in Section 3.2.4. The sixth phase was the analysis of all results from the tests in phase three, four and five.

In the next phase we developed a set of design guidelines for improved reading experience based on user input and previous research found in literature. Read more about feedback from users and the design guidelines that were created in Chapter 4. The eighth phase was the design phase and a new design was developed iteratively based on our guidelines. Ideas and design components were presented continuously for supervisors and colleagues at Textalk and several design proposals were developed before the final design was selected. Potential users also evaluated the new design as the work proceeded and their feedback was taken into consideration and influenced the outcome of the design in a positive manner.

The ninth phase of this thesis was the evaluation of the reading experience. This evaluation was used to investigate if the new design that was based on our new guidelines conveyed a better reading experience than the original PDFs. The test was conducted using proven
methods and theories found in the literature. Read more about the test and evaluation of the reading experience in Section 3.2.5 and the result in Chapter 5. The last phase, phase ten, was analysis and interpretation of our results, read more about it in Chapter 6.

### 3.2 Evaluation Based on User Involvement

In this section we assemble all methods for evaluation that in one way or another involved users. The section covers pilot test, chosen amount of involved users, different types of conducted evaluations, studies and interviews.

We begin to describe what a pilot test is and how we have used it in our work, continuing with a description of each method used. Every evaluation in this section belongs to either the collection of data phase or the measuring result phase, these two phases can also be described as pre-tests and post-tests. Section 3.2.2, Section 3.2.3 and Section 3.2.4 belongs to the data collection phase. Section 3.2.5 on the other hand is part of the results measuring phase.

#### 3.2.1 Pilot

An important component of user testing is to start with a pilot. A pilot is a small preliminary test with the purpose to identify flaws and evaluate feasibility, time requirement, cost etc. It also aims to improve and optimize the actual test. According to Hulley et al. [6] there are several different usages and ways to perform a pilot. One of the most common ones is to evaluate the design of the test and the duration of the test which is the approach we have followed. Further Hulley et al. also emphasize the importance of conducting a good pilot.
According to Hulley et al. a good pilot requires substantial time and it may be costly, but it can improve subsequent tests if critical flaws is localized.

Barnum [7] explains a pilot as "the test of the test" and emphasizes the importance of it. But Barnum also claims that if the result of the pilot indicate minor changes, it is possible to include the findings from the pilot. For those test this approach held we included parts of the pilot in our final conclusions.

This thesis included several user tests and all of them began with a pilot consisting of one participant. Every pilot inherited methods for user testing from its parent and the parent was the test itself. The pilot therefore followed the same structure as the real test and was performed as if it were the real test.

### 3.2.2 Evaluation of the Current Application

As an early step in the design process, an evaluation of the current application design was made. We decided that user involvement was a necessary requirement in the evaluation because they are the actual end-users. According to Niranjanamurthy et al [8], one advantage of usability testing is, among others, a opportunity to discover real demands and tasks of the user early in the process and another advantage is the opportunity to increase user productivity. Niranjanamurthy et al also claim that usability testing can provide well defined evidence for design recommendations. Usability testing generally involves setting a series of tasks for users to solve and noting any problems they encounter. The purpose of usability testing is to identify flaws, issues and problems within the application. Screenshots of the application can be seen in Figure 3.2.

We developed a user test based on the Think Aloud method, a method introduced by Lewis [9] in Task-centered User Interface Design: A Practical Introduction. The methods on the other hand were developed based on techniques introduced by Ericsson and Simon [10] in Protocol Analysis: Verbal Reports as Data.

Think Aloud is a method that requires participants to talk aloud while performing a task [11]. In this way they reflect on their task in real time instead of doing it afterwards. The participant is asked to say what he or she thinks, sees, performs and feels. In the article The Think Aloud Method: A Guide to User Interface Design, Monique et al. [12] wrote: "it generates direct data on the ongoing thought processes during task performance", which is exactly what we want to. According to Branch [13] the Think Aloud method provide data about the behavioral, cognitive, and affective processes. We chose this method to identify and analyse behavior which in our case was how users used the application. When participants described all their thoughts we could identify problem areas and design issues. Lewis [11] summarizes the Think Aloud method as a two-step process. The first step includes the actual Think Aloud section and is a part of problem solving. Participants receive a task with a purpose to solve. The researcher should avoid interference as long as the participant is thinking aloud. If silence appears for several seconds, the researcher is allowed to encourage the participant to think aloud. Once the think aloud process is finished, the method continues with step two. Step two includes follow-up questions that intend to clarify vagueness that may have emerged. Lewis also mention that such questions can help those who have difficulties with thinking aloud while problem solving.

In addition to the Think Aloud method the test is also designed with support from a semi-structured interview. Wilson [14] describes this interview technique as a combination of a structured interview and a unstructured interview. Semi-structured interviews has predefined questions, like a structured interview, but an open-end exploration, similar to an unstructured interview. Wilson also explains that this interview approach often follows
Chapter 3. Method

Figure 3.2: Screenshots of Västerbottens-Kuriren's digital newspaper, issue from February 9, 2015.
3.2. Evaluation Based on User Involvement

Figure 3.3: Description of the three evaluations performed before developing the design guidelines.

- Evaluation of the Current Application
  - Researcher
  - Questioning and observing
  - Participants
  - Using while thinking aloud
  - VK

- Behavior, Expectation and Demand
  - Researcher
  - Questioning and recording
  - Participants
  - Anwering questions about behavior, expectation and demand
  - Random people

- Interview Regarding the Current Application
  - Researcher
  - Questioning and recording
  - Employee at VK Customer Service Department
  - Receives comments from real users

At the beginning of the test, we introduced both the application and what our mission was to the participant, as Wilson suggested. We also informed the participant that the application is developed by Textalk and that our work was to improve the design. We set a series of tasks that we assigned to the participants and asked them to verbalise their thoughts and feelings according to the Think Aloud method mentioned above. The Think Aloud method must be applied during the entire test. Every action was concluded with a few follow-up questions.

As mentioned above, the test was partly designed as a semi-structured interview because we did not know how the participant would behaved, therefore we had to be prepared to ask different questions at different times. The participant was allowed to take initiatives outside the action assigned to them because we wanted the test to simulate reality as much as possible. The tasks could therefore be performed in different orders depending on the participant itself. See Figure 3.3 for a visual illustration.

There is an ongoing debate in usability circles about how many test participants that you
need. According to Krug [15] five test subjects is enough to find 85 percent of the problems. However Krug suggests an alternative approach in his book Rocket Surgery Made Easy: The Do-it Yourself Guide to Finding and Fixing Usability Problems. An approach that aims to uncover as many problems as you can fix yourself. By following this approach, a limitation of our study occurs, but it is a limitation we partly have chosen because of time constraints and also to narrow down the thesis.

Krug points out some important reasons why three test participants is enough when following the do-it-yourself approach. The first one is that the first three participants will most likely encounter the most substantial problems with your design. Secondly, it is easier to find participants and it is also less time consuming. The third reason which also is the most vital one, is that it is much more important to do more rounds of testing than few rounds with many participants. We followed the do-it-yourself approach when we performed the evaluation of the current application.

We did a pilot with one participant and then the real evaluation consisted of three participants. Because the pilot showed that no major changes needed to be made we included our findings from that test. All tests were performed individually in a quiet environment, only in the company of a supervisor. Each test lasted about an hour, including the introduction and the five tasks (see Appendix A) that were included in the test.

3.2.3 Lean Usability Testing: Behavior, Expectation and Demand

Gothelf and Seiden [16] emphasize the importance of figuring out what we are making before we start. In order to know what we are making, we have to figure out what the users want. Lean User Testing is a methodology defined by Erik Olofsson, Lead UX at Aftonbladet, and is based on Lean UX [16]. Lean User Testing is a suitable method if you demand a quick and easy user test that involves many users who answers few questions. One of the core mainstay is the importance of one narrow question to investigate. We have used a type of Lean User Testing named Guerrilla Usability Testing [17]. Guerrilla Usability Testing is a method where all participants are randomly selected in a public place without prior warning, none of the participants are recruited in advance. The advantages of this method is that it is quick and easy to perform, in addition it is relatively inexpensive. Furthermore, results from the test can be fed into the process almost immediately. One difficulty with this method is to find participants who are willing to participate. Another challenge is to formulate questions that are open and clear without being complicated and extensive.

Simon [17] defines a number of advice to take into account before using Guerrilla Usability Testing. Some advices is also important to have in consideration during the test. Explain what is going on, be ethical and make it casual is three examples of hints from Simon. Simon also points out the importance not leading the participant, nor make them believe that they are doing it wrong.

We have modified the method to fit our purpose and task. Guerrilla Usability Testing usually aims to evaluate a specific application chosen by the researcher. In our case we wanted to ask participants how they read news and thus also let them show us. In the case where participants did not have a preferred news application, we only asked questions regarding behavior, expectation and demand. The evaluations were carried out on ten participants during daytime in the center of Gothenburg. See Figure 3.3 for a visual illustration.

The following questions were included in our test:

• How do you read news today?
3.2. Evaluation Based on User Involvement

- When do you read news?
- Where do you read news?
- What do you demand of your digital newspaper?
- What is reading experience to you?

3.2.4 Interview Regarding the Current Application

As a part of information gathering we performed a phone interview with the intention to learn more about the current situation. We wanted to inform ourselves of concerns and preferences from real users. The interviewee was Sofia Persson at VKs customer service department in Umeå and the interview was therefore conducted as a phone interview because of the geographical reasons. See Figure 3.3 for a visual illustration.

We have followed recommendations from Wilson [18] while conducting the interview. Wilson states several essential recommendations but we have chose to use those that were most appropriate for our purpose. We have developed a questionnaire that we followed during the interview. Before the interview an introduction containing an explanation about our work and the purpose with the interview were sent by mail to the interviewee. The interview was recorded in order to avoid losing any response. Wilson also recommended that one should not jump into the questions right away, but instead begin with an introduction to make the interviewee feel comfortable.

A phone interview is, according to Wilson, less expensive and less time consuming than a face-to-face interview, which in our case were used to our advantage. Wilson claim that a phone interview is generally conducted as a structured or semi-structured interview. In our case we have chosen a more unstructured approach with a topic and a benchmark. The following questions acted as a benchmark for the interview:

- What reactions have you received from your customers?
- What do customers appreciate regarding the application?
- Which concerns do the customers have concerning the application?

3.2.5 Evaluation of the Reading Experience

At this point we have developed a set of design guidelines based on our results from the evaluation of the current application design, lean usability testing and the interview regarding the current application and in addition theory from the literature. In addition, a design has been developed which is based on the guidelines. In order to validate these guidelines and prove that the reading experience had increased we performed a final evaluation. The evaluation attempted to measure and determine whether the reading experience had been improved. To determine this we once again involved users in our evaluation. We measured two important factors: readability (depends on reading speed along with reading comprehension) and internal assessment of the experience.

Readability

Rayner [19] defines readability as the reading speed with maintained understanding. Rayner also claims that no conclusions can be made based on the reading speed alone. A person
can read a text quickly without understanding the text and to avoid that the participants rushes through the articles, we performed a test of reading comprehension.

Reading comprehension is defined as the ability to read, process and understand the meaning of a text. According to Bråten [20], reading comprehension comprehends both the ability to understand the meaning of the text (what the author wants to convey) and the ability to anchor information with prior knowledge and experience. Comprehension is an important part of a reading process, only when words mean something the content becomes meaningful. The National Agency for Education [21] describe two main types of reading comprehension and they also define two types of questions to evaluate them. The first one is localization of information (so-called L-question) and is described as reading comprehension where the response, with some reformulation, can be localized directly in the text. The other one is interpretation and/or integration of information (so-called TI-question), and is described as reading comprehension where the response is built into the context of the text and therefore the information must be interpreted and integrated. L-questions and TI-questions have been produced for each article in our evaluation and was used primarily to ensure the quality of the collected data.

We used the readability index [22] (LIX) to calculate level of difficulty. This was made in order to chose texts for testing with the same level of difficulty. By using the readability index, one can compare the number of words per text and the amount of long words per text and thus get a fairer result than without the index.

After participants finished reading an article they had to put it away in order to answer six questions regarding the article. The intention was not to evaluate the participants’ memory or judge them by skill, no reading comprehension was only to ensure the quality of readability which includes reading speed.

Reading speed is calculated based on words per minute (wpm). The method used for calculating wpm is the number of words in the text divided with the execution time (also known as the time spent reading the text). By comparing wpm instead of time consumption, we can easily compare articles with different length, which is to our advantage.

However, we have chosen three articles to read from Textalk Weblisher\(^1\) (a PDF online) and three articles to read at Prenly (our adapted application). We are calling these two groups Weblisher and Prenly. Each group consisted of the following three types of articles:

- Long article with two sub-article, approximately 762-855 words, LIX 51-52. See Figure 3.4a and Figure 3.4b.
- Short article, approximately 329-336 words, LIX 38-41. See Figure 3.4c and Figure 3.4d.
- Medium article with fact box, approximately 536-598 words, LIX 40-42. See Figure 3.4e and Figure 3.4f.

Each article corresponds to an equal article in the other group in terms of word range and value from the readability index.

**Internal Assessment of the Experience**

Boije and Gustafsson [23] performed a similar evaluation. Their study was a collection of several tests, among them they evaluated eye movements while reading, reading speed and

\(^1\)http://weblisher.textalk.se/demo/2015/20150519-1/?page=1&mode=50&noConflict=1
3.2. Evaluation Based on User Involvement

(a) Long article with two sub-article in Weblisher

(b) Long article with two sub-article at Prenly

(c) Short article in Weblisher

(d) Short article at Prenly

(e) Medium article with fact box in Weblisher

(f) Medium article with fact box at Prenly

Figure 3.4: Screenshots of all articles used in the evaluation, three from Weblisher and three from Prenly
the subjective reading experience. Our evaluation was partly inspired by their evaluation, especially their study on reading experience.

We have chosen to use Boije and Gustafsson’s form regarding reading experience in its original shape apart from that we have added three more questions to the questionnaire. The questionnaire contains questions concerning degree of difficulty, efficiency, reading comprehension, comfortableness, naturalness, concentration etc (see Appendix B). We have added questions about design, satisfaction and accessibility. Each question was assessed based on a discrete scale where low (1) was the worst and high (10) was the best. All questions were calculated separately in order to determine which parts that differed.

To collect data we created a form containing all the necessary components (reading speed, reading comprehension and reading experience). The form was assigned to the participants after they have read an article. Four participants participated in the evaluation. For each participant approximately one hour was allocated, during this time we introduced the background of the project, why we performed the test and in addition the participants were informed that we measured reading speed and that they would have to answer questions on reading comprehension after they finished reading. The evaluation was performed individually in a quiet environment with participants who were between 18 and 60 years old and had good reading habits.
Chapter 4

Design Guidelines: Improved Reading Experience

This chapter covers all design guidelines that have been developed during this thesis. All guidelines are described in detail with support from literature, user evaluations and interviews.

4.1 Alignment and Paragraphs

According to our first user test, the evaluation of the current application, there was a common concern among all participants (see Section 3.2.2 for a description of the method and Figure 4.1 for a summary of all comments from participants). They felt that the large amounts of white spaces in the template were a waste of space. One reason for poorly utilized space is the alignment of text. Lines are not filled at their maximum causing areas of white unused spaces.

One part of the solution is changing the alignment of text from unjustified to justified. Unjustified text is the same as left-justified text, and has a ragged-right. With justified text all of the lines are of equal length (as here), which decrease white spaces and utilizes the full width of the line. Justified text is obtained by varying spacing between words but also by using hyphenation when breaking lines at the end of each row. Important to keep in mind when using justified text is therefore hyphenation. Proper hyphenation affects the readability in a substantial manner and is also important in order to get your message across according to Strizver [24].

Burns et al. [25] claims that legibility studies have found that there is no distinguishable difference in legibility between unjustified text and justified text. Legibility is in this case measured with respect to reading speed and comprehension. Miles [26] supports Burns et al. claim with the explanation that there is no evidence to suggest that unjustified alignment is any more or less readable than justified text.

One of the characteristics of justified text is the impression and similarity to printed newspaper. According to Howard Bear [27] readers may be more familiar to justified alignment when reading news, because it is the most common way in printed newspapers. Howard Bear also claim that readers may think left-aligned text in newspapers looks odd or even unpleasant. Howard Bear concludes by pointing out that one should choose the type of alignment that fits the intended design most properly. Even more important is to choose
In addition to text alignment, separation of paragraphs also affects the amount of white areas. However, according to Hartley and Burnhill [28] paragraphs should be separated with white space rather than indentation. Hartley and Burnhill argue that white space more readily illustrates the underlying structure of the text, in particular when short paragraphs are involved.

### 4.2 Optimal Line Size

One must not forget the importance of readability because it refers to the ease with which a text can be read but also how easy the text can be understood by its reader [29]. Having the correct amount of characters on each line effects the readability of the content. In Readability: The Optimal Line Length Holst [30] write: "It shouldn’t merely be your design that dictates the width of your text, it should also be a matter of legibility" and because of that we have taken line length into consideration. According to Ruder [31], the optimal line length consists of 50 to 60 characters, including spaces.

If a line is too long it makes it harder for the reader who has to strain their eyes more to focus on the text. Furthermore, long lines makes it difficult to keep track of which line you currently reading, particularly in large blocks of text. If a line is too short on the other hand the reader’s eyes have to travel back and forth too often giving the reader a hard time. In addition this breaks the reader’s rhythm. Short lines also tend to cause stress which causes the reader to jump lines before they are finished reading them and thereby potential skipping important words.

According to Ruder [31] the reader is focused at the beginning of every line. This
focus gradually decreases over the duration of the line. Ruder also claim that the reader’s subconscious mind is stimulated when jumping between lines, if it does not happen to often. These two statement confirm that the optimal line length is neither too long nor too short.

In order to substantiate this claim, Strizver [32] writes in the article "Line Length & Column Width" that 9 to 12 words is a optimal line length. 9 to 12 words approximately correspond to 50 to 60 characters as Ruder advocates. Number of words recommended depends on the typeface, the point size and the average word length, besides how long each word is and the text size. Strizver also mentions the importance of an optimal line length and confirms Ruder’s statements about too long and too narrow lines.

Furthermore Strizver points out the differences in line length between unjustified text and justified text. 9 to 12 words per line holds for unjustified text. In our case we have chosen to use justified text which means 12 to 15 words compose the optimal line. The reason behind this is to avoid to much hyphenations, to much with spaces and uneven word spacing. According to Bringhurst [33] anything between 45 and 75 characters is considered to be an acceptable line length. Bringhurst also states that the 66-character line is widely regarded as ideal.

Common for all articles mentioned above is the range from 50 to 60 characters per line. However this range does not include the ideal 66-character line. Supported by the articles above, we have decided to use a range between 60 to 70 for tablets. Number of characters per line for mobile devices will be considerably less and must be adapted to the width of the device. However tablets, is wider than the line length in the majority of cases and therefore, it should instead occur margins alongside the text.

The optimal line is not only determined by its length but also by its height. Ascenders and descenders are the vertical strokes that rise above and below the body of a character. These vertical strokes also affect the line height. By using the Golden Ratio Typography Calculator [34], line height can easily be calculated. For example a 20 px large text should have a line height of 30 px according to the calculator [34].

4.3 Typeface and Point Size

Typefaces can be divided into two subgroups named serifs and sans serif (see Figure 4.2 for visual illustration). Serifs are the small finishing strokes at the end of each character. One example of a serif typeface is the typeface in this thesis. Sans serif typefaces on the other hand do not have these finishing strokes at the end.

Kingery and Furuta [35] performed a study with the intention to investigate whether there is a difference in legibility between typefaces. They came to the conclusion that there
Figure 4.3: Comments from participants that participated in our study on behavior, expectation and demand.

is a difference but not due to the presence of serifs. Tullis et al. [36] came to the same conclusion when performing a study on typefaces and point sizes. However, Tullis et al. found out that there is a difference in point sizes. One finding they made were that serifs are preferred in larger point sizes, without being too large.

Furthermore, Moriarty and Scheiner [37] claim that there is no difference in the use of serif or sans serif in terms of reading speed. Another study performed by Poulton [38] showed no significant difference in rate of comprehension between serif and sans serif typefaces.

Since there appears to be no significant difference in readability between serif and sans serif typefaces, it is vital to choose a typeface on aesthetic grounds. Once again, as in Section 4.1, it is more important to base the decision on the intended message. According to our study on behavior, expectation and demand (see Section 3.2.3 for a description of the method and Figure 4.3 for a summary of all comments), users demand a design more analogous to the traditional printed newspaper. Printed newspapers almost exclusively use a serif typeface, which is a statement supported by Nielsen [39]. Nielsen also claims that people are more accustomed to read long texts with a serif typeface because of the long-established use of serifs in newspapers and other printed media. Nielsen also support our choice to choose a typeface that conveys a specific message.

4.4 Appearance, Functionality and Placement

In a study conducted by Nielsen [1] 232 users were recorded using over a thousand websites. Nielsen concluded that the most common reading pattern adopted the shape of an F. Nielsen explains the pattern as a process consisting of three components. To begin with users read in a horizontal movement, usually in the upper section of the content. Nielsen calls this movement the F’s top bar. Further users proceed a bit down and once again make an horizontal movement that typically is shorter than the first one. Nielsen explains this movement as the F’s lower bar. Finally users continuously moves along the left side of the content in a vertical movement. This movement were assigned as the F’s stem by Nielsen.

Bucher and Schumacher [40] claim that readers main attention goes to the pictures and
then to the text. Their study also indicates that readers try to understand the picture through the text. Furthermore, Wartenberg and Holmqvist [41] found indications that size and positioning of pictures can attract reading. From these findings we have decided that pictures should be positioning at the top of an article. A decision also supported by Nielsen’s findings regarding the F-shaped reading pattern.

Furthermore, according to Harrower [42], if you avoid breaking text with images you will keep readers from having to jump over in addition to follow the text. Concerning this finding we have also decided that no pictures are allowed to break any text and because of that all pictures should be positioned in a slide show at the top. The slide show displays a default picture and by tapping the picture, the picture opens in a viewing mode where the ability to browse is possible if there exists more than one picture. Below the picture, heading, introduction, running text and journalist will follow.

According to the evaluation of the current application (see Section 3.2.2 for a description of the method and Figure 4.1 for a summary of all comments), participants experienced difficulties distinguishing fact boxes and sub-article boxes. One box was clickable and the other one was not, which were considered illogical by several participants. To elevate these concerns we have decided to separate the boxes in both appearance and positioning. All possible fact boxes will be integrated in the text, as you can see in Figure 4.5. By integrating the fact box into the running text we are also solving an issue observed by the participants concerning the white space that arose below the box. With reference to Nielsen’s [1] discovered F-shaped reading pattern we have also decided to position all possible fact boxes aligned with the rest of the content instead of positioning them at the right where they are easily missed. In addition, fact boxes are placed at the end of each article because they contain additional information that is not necessarily collected specifically for the article’s creation. Furthermore, the full-width boxes enable consistency on mobile devices and requires no additional changes. A further advantage of positioning the box below the running text is that the box is allowed to expand vertically without breaking any text.

A sub-article is a follow-up article and is therefore incomprehensible without its parent article. Because of the absence of independence, a sub-article must only exist below its
Figure 4.5: Positioning of elements in an article, a possible layout illustrated with wire-frames.
parent article. Sub-articles are thus only interesting after reading the parent article and should due to that also be promoted at the end of the parent article (see Figure 4.5 for visual explanation). The idea of sub-articles is to make additional reading available at right time, only a click away.

4.5 Recognition Factor: Printed Newspaper

An important part of designing a digital newspaper is to retain the impression of a newspaper. Readers are comfortable and acquaint with printed newspapers and the majority of readers prefer the format of printed newspapers before digital newspapers, which is a finding from our study on behavior, expectation and demand (see Section 3.2.3 for a description of the method and Figure 4.3 for a summary of all comments). Another finding from our study is that participants strongly believe that there is a correlation between a good reading experience and a printed newspaper.

Initial cut-in letter is an enlarged and often decorated first letter in a text and is common in older printed media. We have chosen to begin all running text with a initial cut-in letter to remind the user of printed media. Two other well known styles in printed media, particularly in printed newspapers, are serif typeface (see Section 4.3) and justified alignment (see Section 4.1).

Leckner [3] writes in the article Is the Medium the Message: "Not all of the layout cues of the traditional metaphor can be figuratively applied to the structures of the electronic newspaper, but many can provide a familiar paradigm and improve the effectiveness of the interaction." This strengthens our choice of reintroducing elements from the traditional newspaper to increase the recognition factor and impression and the homely feeling that users are experiencing.

4.6 Packaging: Combine Printed Newspaper and Web News

We have chosen to combine the advantages of printed media with the advantages of digital media in order to achieve a hybrid that represents the best of both worlds. According to participants in our study on behavior, expectation and demand (see Section 3.2.3 for a description of the method and Figure 4.3 for a summary of all comments), impression and style are the advantages of printed media while functionality and behavior are the advantages of digital media. Maintaining the impression and style of the printed media has already been discussed in Section 4.5 and is, as previously mentioned, intended for articles. The impression of printed media embedded in functionality from digital media achieved through a skin similar to the web but with styled content similar to printed media.

Yadamsuren and Erdelez [43] explain that reading news online is a more selective process than it usually is in printed media and that readers increasingly browse for news. Participants in our study on behavior, expectation and demand declared that they appreciate the overview existent in most digital media. Several participants also explained that their reading behavior online is to go back and forth between the overview and the articles. In addition, participants from the evaluation of the current application (see Section 3.2.2 for a description of the method and Figure 4.1 for a summary of all comments) also assured us that they appreciated an overview, which was a part of the old application. Furthermore Sofia Persson at VKs customer service department said in our interview (see Section 3.2.4) that VKs costumers also approved the overview.
The proposed navigation has a start page containing promoted articles which are accessed via clicks. A swipe to the left displays the first section page. A section page contains references to all articles in that section and each article is reached by a click. However, another swipe to the left exposes the first article in the current section. A visual description of the proposed navigation can be seen in Figure 4.6.

Swiping through articles is a functionality inspired by printed media and corresponds to the act of turning a page. Clicking on the other hand is a functionality that derives from digital media which represent a more "in and out" kind of behavior.
Chapter 5

Result

The result of this thesis consists of three parts that all are based on the design guidelines developed and presented in Chapter 4. The first outcome of this thesis is the guidelines themselves, the second one is a design customize for a specific costumer (see Figure 5.1) and the third and measurable one is whether we have improved the reading experience based on the new guidelines. This chapter covers the last two part since the first one, our design guidelines, were presented in the previous chapter.

![Screenshots of Prenly based on our guidelines, these screenshots contains material from VK.](image)

(a) Article with panorama picture  (b) Article with wide-screen picture  (c) Article without picture

(d) Article with fact box  (e) Article with sub-articles  (f) Sub-article flow below the parent article

Figure 5.1: Screenshots of Prenly based on our guidelines, these screenshots contains material from VK.
Figure 5.1 visualizes three different templates, Figure 5.1a illustrates an article with a panorama picture, Figure 5.1b displays an article with a widescreen picture and Figure 5.1c shows an article without a picture.

The panorama template is most suitable for high resolution pictures and where the subject in the picture allows cropping vertically. However, the widescreen template is more suitable if a picture has a lower resolution but still manageable or if the picture motives cover most of the picture area. If the article has no picture or if the picture has too low resolution, the template without a picture is most appropriate.

Figure 5.1d visualizes an article that contains a fact box and both Figure 5.1e and Figure 5.1f illustrates an article with several sub-articles. Both a fact box and a sub-article may include a picture.

5.1 Statistic Result

All data generated by the evaluation of the reading experience (see Section 3.2.5 for a description of the procedure) is calculated via a paired t-test at a service called GraphPad\(^1\). For both Table 5.1 and Table 5.2, N = 12 and confidence interval (CI) = 95%.

The statistic result from the paired t-test showed that by conventional criteria, the difference in words per minute (wpm) was considered to be very statistically significant. The difference in reading speed is in favor for Prenly which has a higher wpm than Weblisher as can be seen in Table 5.1. A higher wpm means more words per minute. However no significant difference can be seen regarding the reading comprehension. Hence participant understood equally much when they read a newspaper in Weblisher as when they read a newspaper in Prenly.

Table 5.1: Time spent reading measured in words per minute and number of correct answers on the reading comprehension test.

<table>
<thead>
<tr>
<th>Time and understanding</th>
<th>Weblisher</th>
<th>Prenly</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean(SD(*))</td>
<td>Mean(SD(*))</td>
<td>Yes/No(**)</td>
</tr>
<tr>
<td>Words per minute</td>
<td>151.65(40.52)</td>
<td>172.09(34.53)</td>
<td>Yes (p = 0.001)</td>
</tr>
<tr>
<td>Reading comprehension questions</td>
<td>4.42(1.08)</td>
<td>4.67(1.37)</td>
<td>No (p = 0.612)</td>
</tr>
</tbody>
</table>

*Standard Deviation
**If the difference between Weblisher and Prenly is significant or not

Furthermore, according to a paired t-test all the questions in the questionnaire concerning the subjective experience had a difference that was considered to be either very or extremely statistically significant (see Table 5.2). From the table it is possible to deduce that the statistical difference is to the advantage of Prenly since all the mean values are higher for the latter. The by far the largest difference is considered by participants to be comfortableness, design experience and accessibility. The smallest difference, which is still very large, is according to participants degree of difficulty, efficiency, stimulation and ardor.

\(^1\)http://graphpad.com
Table 5.2: Result from questionnaire about the subjective experience.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Weblisher Mean(SD*)</th>
<th>Prenly Mean(SD*)</th>
<th>Significant Yes/No** (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of difficulty</td>
<td>5.83(2.33)</td>
<td>9.00(0.95)</td>
<td>Yes (p = 0.0010)</td>
</tr>
<tr>
<td>Efficiency</td>
<td>5.75(1.82)</td>
<td>8.58(1.31)</td>
<td>Yes (p = 0.0022)</td>
</tr>
<tr>
<td>Reading comprehension</td>
<td>5.75(1.60)</td>
<td>8.83(1.03)</td>
<td>Yes (p = 0.0004)</td>
</tr>
<tr>
<td>Stimulation</td>
<td>5.25(1.29)</td>
<td>8.00(1.81)</td>
<td>Yes (p = 0.0051)</td>
</tr>
<tr>
<td>Ardor</td>
<td>5.08(1.31)</td>
<td>7.33(1.67)</td>
<td>Yes (p = 0.0034)</td>
</tr>
<tr>
<td>Comfortableness</td>
<td>4.67(1.83)</td>
<td>8.92(1.00)</td>
<td>Yes (p = 0.0001)</td>
</tr>
<tr>
<td>Naturalness</td>
<td>5.00(2.04)</td>
<td>8.67(1.37)</td>
<td>Yes (p = 0.0005)</td>
</tr>
<tr>
<td>Concentration</td>
<td>5.50(1.57)</td>
<td>8.92(1.24)</td>
<td>Yes (p = 0.0003)</td>
</tr>
<tr>
<td>Design experience</td>
<td>4.33(2.02)</td>
<td>8.67(1.23)</td>
<td>Yes (p = 0.0001)</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>4.83(1.85)</td>
<td>8.92(1.31)</td>
<td>Yes (p = 0.0004)</td>
</tr>
<tr>
<td>Accessibility</td>
<td>4.83(1.64)</td>
<td>9.08(1.16)</td>
<td>Yes (p = 0.0001)</td>
</tr>
</tbody>
</table>

*Standard Deviation

**If the difference between Weblisher and Prenly is significant or not
Chapter 6

Discussion

The design presented and tested in Chapter 5 is based on our design guidelines, however all guidelines are not applied (see Figure 6.1 for visual explanation). The text is not justified due to the absence of a good hyphenation library, and because limited time for our developers there was no time at the present to find one or develop one. One of our other guidelines advocate the use of serif typeface. The design presented in this thesis is a design that after finishing this work went straight to the customer and therefore their opinion has influenced our work. The customer was allowed to decide their own text styles because we wanted the newspaper to represent them and follow their graphic profile. The chosen typefaces was therefore a mixture of serif and sans serif typefaces. A combination of time constraints and demands from the customer implicated that we were unable to complete the entire concept of packaging, only the start page was retained. The basic idea of having an overview per section was dropped for the current customer but will be worked upon for future customers (see Figure 6.2 for an illustration of the intended designs).

Figure 6.1: The green icons represent the design guidelines that was applied to the design, the half green and half red corresponds to the guidelines that was partly used and the red icons illustrates those who were excluded.

It is a difficult process to create questions for reading comprehension and even more
difficult to determine whether the answers are correct or not. Reading comprehension is an area that is constantly being researched and something that teachers are struggling and working with every day. This makes the process even more difficult for an inexpert and inexperienced. Since all questions for reading comprehension has been created by the same person, the amount of errors should most likely be equal for all articles. A reminder for the future is that if resources and time is available one should delegate the question making to an experienced in order to get it as accurate as possible.

Before the test, the participants were informed that their reading speed would be measured and that they would also have to answer reading comprehension questions. The fact that participants knew could have affected their way of reading, perhaps they read more accurate because they wanted to manage the reading comprehension questions. According to De Leeuw and De Leeuw [44] 230-250 words per minute is the average initial speed for the general public. Further, Fry [45] explains that slow readers reach 150 words per minute, our result showed a average reading speed of 151.65 wpm for Weblisher and 172.09 wpm for Prenly. Hence, we can assume that the reading speed was lowered because the participants were aware of the subsequent reading comprehension test. If information about the reading speed and reading comprehension had not been communicated to the participants they had after the first article grasped the concept and possibly changed their approach for the next five articles and thereby the result from the first article had become useless.

All articles in the evaluation of the reading experience (see Section 3.2.5 for a description of the procedure) are taken from VK and since three of the four participants were Gothenburgers there was a lack of interest in the news from Västerbotten. The lack of interest may have lowered both reading speed and reading comprehension but because each participant read articles from both Weblisher and Prenly, both of them should have been influenced equally and therefore the problem is negligible. A solution for the future is to choose news more adapted to the participants, possibly in both geographical terms but also in areas of interest. In our case, we were limited by the content we had available and the content from VK was already ready for use.
6.1 Limitations

We were limited by the amount of time assigned to this thesis but also by the amount of time devoted to the responsible developers. Limited time resulted in a decision-making regarding what to focus on and which parts that were most important. As a consequence of limited time we encountered a trade-off between the number of participant per evaluation and the number of evaluations. We believed it was more valuable to perform many evaluations with few participant, than few evaluations with many users. Gathering as much valuable input as possible with just enough width and depth. The procedure of many test with few users is an approach supported by Krug [15]. Thanks to this approach we have been able to collect data from real users, new non-impacted users and users of other services.

Our work has also partly been effected by customers, newspaper companies, request such as demands and deadlines. Influence from customers must not necessarily be seen as a limitation, in fact it is generally seen as a natural part of the design work [46]. Textalk’s goal is to design and develop a product aligned with the findings in this thesis. The customer who eventually became the target for testing the results of this thesis was not fully committed and on board regarding the concept of packaging. This meant that some parts of the design could not be tested as it was intended to, but Textalk will still work on the idea and introduce it in other newspapers in the future.

Measuring words per minute by letting participant start and stop the timekeeper is a limitation that may have influenced our results. However, all tests were measured with this method, and therefore we can assume that all tests were equally affected.

6.2 Future Work

There are several interesting fields to discover and several upcoming tasks that are build upon this thesis and some of them are stated bellow.

The first and perhaps the most interesting field to evaluate is the use of finger movements on the screen to produce events. Events with the intention of replacing ordinary click actions, or at least offer an alternative interaction, like shortcuts. Movements that could be interesting to evaluate is long tap, double tap, two finger swipe and three finger swipe. Tapworthy by Clark [47] contains interesting reading regarding finger movements. Clark claims that the evolution made us copy behaviors and actions from desktop using when we actually had endless opportunities to change the user interaction entirely. Instead we encounter a challenge of changing an ingrained behavior into a behavior that is actually more natural for humans. Clark [48] exemplifies in a lecture at Frankfurt Kurnit NYC, the natural behavior by mentioning children and their rapid adaptation to the use of touch devices. Children have not yet been colored by the digital world and manipulates therefore touch devices in the same manner as they would manipulate physical devices in the real world, for example, they drag when something should be moved. This behavior is not as naturally on digital devices for a man accustomed to the desktop. Thus to the misuse of natural movements it would be interesting to study it more deeply.

Since articles are extracted from printed newspapers, paragraphs are often short because they are optimized for small columns. The consequence of this is jagged texts with many paragraph breaks. However, several paragraphs contains connected information and can thus to that be merged together. In the future, it would be interesting to examine how merging paragraphs can be carried out and what functionality that is required to determine whether two paragraphs contains similar information.
In the evaluation of the current application it emerged a suggestion that image browsing should be done vertically instead of horizontally, which is the most common way of browsing through images. The reason was that horizontal scrolling is occupied by the act of switching article. This is an interesting thought that absolutely is worth evaluating further in the future.

The outcome of this thesis is one solution of improved reading experience. We believe that it exist an abundance of templates that provides a good reading experience. Work of creating more templates will continue and Textalk desire is to have a large base of templates for customers to choose from. All of these templates should have its characteristics and as good reading experience as possible.

Today the application is a hybrid in which some parts are native while others are web (HTML). In the future, the intention is to make the application consistently native in order to achieve maximum functionality. This allows the use of more advanced animations which in turn can improve interaction and mediate more distinct feedback. Examples of how animation can be used in order to increase understanding is to visualize how, where and what.

Future work in the project at Textalk is to gather newspapers and other written media in one standalone application for reading news, blogs, papers and other media. As mentioned earlier in the thesis Textalk's vision is to create a service that contains all types of information, from international news to social media. The service will target both companies and individuals which in turn may adopt the role of both writer and reader. There is therefore much to explore in many different fields in order to fulfill this vision.
Chapter 7

Conclusions

The goal of this thesis was to investigate how reading experience could be improved by abandoning the structure of printed newspapers. With reference to our statistical results, we can conclude that the reading experience can be improved by adapting the content to digital media with help from our new design guidelines. The statistical results showed that the reading speed and the reading experience has been improved while the reading comprehension was maintained.

7.1 Design Guidelines

The following design guidelines have been developed to improve the reading experience in digital newspapers:

- **Alignment**: Choose an alignment that effectively communicates the intended message and one of the characteristics of justified text is the impression and similarity to printed newspaper. Hence there is no evidence to suggest that unjustified alignment is any more or less readable than justified text.

- **Paragraphs**: It is better to use white space to separate paragraphs than indentation, because white spaces more readily illustrates the underlying structure of the text, in particular when short paragraphs are involved.

- **Line size**: The widely regarded ideal line length consists of 66 character, hence use a range between 60 to 70 characters. If a line is too long it makes it harder for the reader who has to strain their eyes more to focus on the text but if a line is too short the reader’s eyes have to travel back and forth too often giving the reader a hard time.

- **Typeface**: People are more accustomed to read long texts with a serif typeface because of the long-established use of serifs in newspapers and other printed media. Since several studies have shown that there is no significant difference in readability between serif and sans serif typefaces, it is vital to choose a typeface on aesthetic grounds.

- **Appearance and Functionality**: Separate elements of different function via appearance to make it easier for the reader to distinguish between them.

- **Placement**: The most common reading pattern adopt the shape of an F. Readers main attention goes to the pictures and then to the text, therefore, try to place the picture at the top followed by the title and the introduction. Avoid breaking text with
pictures and thereby keep readers from having to jump over in addition to follow the text. Position all expandable boxes below the running text to allow them to expand vertically without breaking any text. Place all the related articles below the main article because they are only interesting after reading the main article and should due to that also be promoted at the end.

Recognition Factor Readers are comfortable and acquaint with printed newspapers and the majority of readers prefer the format of printed newspapers before digital newspapers, therefore, design with purpose to maintaining the impression of a printed newspaper. This can be conveyed with the help of initial cut-in letter, serif typeface and justified text.

Packaging By combining the advantages of printed media with the advantages of digital media it is possible to achieve a hybrid that represents the best of both worlds. Impresssion and style are the advantages of printed media while functionality and behavior are the advantages of digital media. Use a navigation that allows both clicking on articles from an overview and swiping through articles from one to the other.
Chapter 8

Acknowledgements

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References


Appendix A

Tasks: Evaluation of the Current Application

Task 1: Download yesterday’s newspaper, read any article and return to the home page when you are finished.

Task 2: Open an updated newspaper and read the fourth article. This article has a sub-article.

Task 3: Open any newspaper and read a sports article, then open the article in the newspaper view. When you are done, return to the home page.

Task 4: Open any newspaper and read one of the articles that are advertised on the front page, without reading an article you already have read.

Task 5: Open any newspaper and read the last article.
Appendix B

Questionnaire: Reading Experience

1. How did you experience the degree of difficulty when you read this way?
2. How did you experience the efficiency when you read this way?
3. How did you experience the reading comprehension when you read this way?
4. How did you experience the stimulation when you read this way?
5. How did you experience the ardor when you read this way?
6. How did you experience the comfortableness when you read this way?
7. How did you experience the naturalness when you read this way?
8. How did you experience the concentration when you read this way?
9. How did you experience the design experience when you read this way?
10. How did you experience the satisfaction when you read this way?
11. How did you experience the accessibility when you read this way?