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Rapid Serial Visual Presentation

A qualitative study

Rapid Serie Visuell Presentation
En kvalitativ studie

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Abstract

Rapid Serial Visual Presentation (RSVP) is a concept that changes every day reading into an efficient way of gathering information. Due to this innovative new way of reading, the importance of interaction that allows the user to interact with RSVP in an intuitive manner is needed to help the reader reach its full reading potential. This thesis puts existing RSVP programs to the test with the help of six participants in different ages. Through in-depth interviews with the participants, this thesis presents a possible new way of displaying information and interacting with RSVP. From analysing the results of the in-depth interviews, a prototype is created.

Sammanfattning

Rapid Seruell Visuellt Presentation (RSVP) är ett koncept som har möjligheten att påverka hur en användare konsumerar sin dagliga läsning. Denna metod att läsa skiljer sig från traditionell läsning på så sätt att enbart ett (ibland flera) ord visas i varje bildsekvens i motsats till traditionell läsning då läsaren har full överblick över den statiska texten. Eftersom denna metod att läsa skiljer sig i sådan utsträckning från traditionell läsning så finns det ett behov av att utveckla RSVP till att bli en allt mer intuitiv upplevelse för läsaren. Sex testpersoner intervjuas, varvid resultaten analyseras och utvecklas till en prototyp.

Keywords: RSVP, Rapid Serial Visual Presentation, Interaction, Digital Reading, Screen Based Reading.

Table of Content

Abstract.....	
Sammanfattning.....	
1 Introduction.....	1
1.1 Background.....	1
1.2 Objectives	2
1.2.1 Purpose.....	2
1.2.2 Research questions	2
1.3 Limitation	2
2 Theory.....	3
2.1 Rapid Serial Visual Presentation	3
3 Related work	5
4 Method.....	7
4.1 Qualitative Research.....	7
4.1.1 In-depth Interviews	7
4.1.2 In-depth Interview in practice	8
4.1.3 Choice of Participants, applications and reading material.....	9
4.1.4 Choice of method	9
4.1.5 Research Ethics	10
4.1.6 Limitations to the method.....	10
5 Result	11
5.1 Part one - Bulk reading.....	11
5.2 Part Two - Interest and Focus	12
5.3 Part Three - Interaction and Controllability.....	12
5.4 Part Five – Fictional literature or news articles	13
6 Prototype.....	14
6.1 Features and interaction.....	14
6.2 Choice of design	16
7 Discussion and Analysis	17
7.1 Discussion about results	17
7.1.1 Glanceability	17
7.1.2 Controllability	17
7.1.3 Preference to news articles	18
7.2 Discussion about method.....	18
7.3 Discussion about related work.....	19
8 Conclusion and future work.....	20
8.1 Future work.....	20
8.2 Contribution.....	21
Reference list	22
Appendix 1	23

1 Introduction

This chapter introduces the reader to the purpose and background to this thesis, ending with the two research questions that will dominate this study.

Ever since the turn of the century communications technology has exploded and reading is increasingly done digitally rather than on paper. While this transformation comes with benefits like text availability and being able to store large quantities of text, it also comes with several problems and questions (Riccardi & Di Nocera, 2017).

An answer to problem of how to transition from paper to digital reading might be the use of a dynamic text presentation method called RSVP (Rapid Serial Visual Presentation). RSVP consists of displaying one or more words at a time in sequential order rather than using page- or scroll-based layouts. This is done in order to minimize eye movements generated by traditional reading, thus increasing attentional focus (Benedetto et al., 2015).

1.1 Background

RSVP was introduced in the early 1970's by K.L Forster to study the comprehension and processing of written language. Later, his methods were applied to computer screens and was thought to be potentially superior to static displays. Because of the elimination of eye movement, it was thought that RSVP could give a possible reduction in cognitive load (Castelhano & Muter, 2001).

Since K.L Forsters original design, RSVP has taken new shapes and forms to provide the reader with a more pleasant reading experience while not suffering in reading speed nor reading comprehension.

In the last 50 years many variants of RSVP have been proposed and several studies have been conducted, yet it is still difficult to determine an ideal presentation for RSVP (Riccardi & Di Nocera, 2017). This gives researchers the opportunity to conduct further experimentation to find improved solutions.

The main problem users have experienced while using RSVP has been a sense of the method being unfamiliar and non-intuitive. This is not surprising due to the large amount of time invested in reading spatially presented text and users not being familiar to RSVP (Hedin & Lindgren, 2006).

1.2 Objectives

1.2.1 Purpose

The purpose of this thesis is to investigate how RSVP can be used to better the conditions for everyday reading and consumption of digital reading. This thesis uses the knowledge from previous related research on the topic in order to explore and create three design proposal for RSVP applications (see Chapter 6.8, Figure 4, 5, 6, 7).

1.2.2 Research questions

- How can the interaction with an RSVP application be improved?
- How is the user experience of using RSVP for reading fictional literature and reading news articles?

1.3 Limitation

In this thesis six people of varied age and gender have participated in a qualitative study. To avoid making assumptions about a younger generation having an easier time using—and being more experience with—technology, participants from ages 23 to 65 were chosen, this because of accessibility. There was of desire for the research to have a broad range in age, which the study had. However, studying members of a younger generation's attitudes would also be of interest for further studies.

The number of participants involved in this study is constrained by the choice of method being in-depth interviews and the number of people involved in conducting the research.

2 Theory

This chapter explains the term RSVP as well as the purpose behind it and technology that supports it.

2.1 Rapid Serial Visual Presentation

Using Rapid Serial Visual Presentation (RSVP) minimizes the need of two out of the three distinct visual tasks while reading text presented with a spatial layout, e.g. scroll-based text, (Goldstein et al., 2003): processing information in fixations, performing saccadic eye movements while moving between fixations, and moving to the next line using return sweeps. With RSVP the need for return sweeps and saccadic eye movements are almost removed since the text is displayed one word at a time within a small area (Benedetto et al., 2015; Goldstein et al., 2003).

Although RSVP is generally not the preferred reading method it has shown potential by improving features like: Sentence-oriented processing, Common word duration, Punctuation pauses and Interruption pauses (Castelhano & Muter, 2001), red letter centring, bulk words and glanceability.

- Sentence-oriented processing is a feature which allows the user to take pauses in between sentences and giving the user the possibility to interact with the application and have the previous sentence restarted.
- Common word duration is a feature where short and commonly used words are displayed for a shorter amount of time while longer not so common words are given extra time on the display.
- Punctuation pauses means having an automatically short pause after punctuation.
- Interruption Pauses gives the user the possibility of pausing the text at any given time. By allowing the participant the option to pause during the sentence presentation gives the reader a greater sense of control and less frustration.
- Red letter centring means that the centred letter is coloured (often red). This is a feature that allows the user to focus their attention to the centre of the word, which gives the reader the optimal vision to being able to read the whole word without having to shift focus.
- Bulk of words is a feature which allows the user to read have several words displayed at the time, in contrast to the more common one word per frame method.
- Glanceability means “denoting or relating to information, especially as displayed on an electronic screen, that can be read or understood very quickly and easily” (Oxford Dictionary, n.d.).

Two different applications were used in this thesis to answer the research questions. Spritz (Spritz, n.d.) provide a clean design where the user can, among other features, try the centred red-letter function (See Fig. 1). Spreeder (Spreeder, n.d.) also provides an application for RSVP. It has a clean layout and allows the user to use and choose the amount of word to be displayed at any one time (See Fig. 2). Spreeder was the more suitable application for testing several words at once, the bulk setting. Below a screenshot from both RSVP applications are shown.

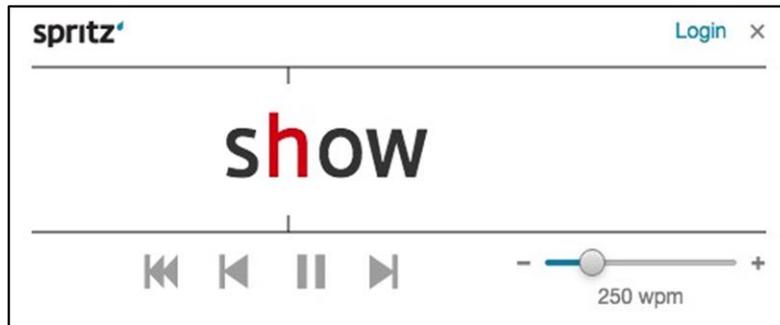


Figure 1

Figure 1: Shows a screenshot of Spritz reading program



Figure 2

Figure 2: Shows a screenshot of Spreeder in bulk setting, displaying more than one word.

3 Related work

This third chapter will examine previous research and studies conducted within the field of RSVP and digital reading. It also shares what the results, mistakes or successes the previous researches have had with this subject.

Since the turn of the century several studies have been conducted on the effects of using RSVP while reading digitally.

In 2001, Castelhana & Muter (2001) did a study of the effects using normal page condition versus different modifications of RSVP on computer screens was performed. The study consisted of two experiments, the first testing how users respond to possible modifications to the RSVP in comparison to a normal page condition and a sentence-by-sentence condition. The second, testing a RSVP with a combination of three modifications in comparison to a plain RSVP and normal page condition. The results revealed that RSVP was the least preferred text presentation in the first experiment. Even with modifications there was no significant impact on the liking, although the pauses between sentences were appreciated. The second experiment resulted in much more appreciation of a modified RSVP as opposed to a plain RSVP, but users still preferred the normal page condition. The modified RSVP seemed to result in better reading comprehension but at a lower reading rate. Although the study does not indicate any users preferring RSVP over the normal page condition, it does reveal that RSVP can be modified to a more appealing form.

A study of mobile learning using RSVP was later done by Hedin and Lindgren (2006). The use of RSVP on mobile phones was, and still is, largely unexplored. Readability and comprehensibility of educational texts on mobile phones were investigated, using RSVP in comparison to scroll based reading. The texts, and their associated multiple-choice questions, used for the study were Reading Comprehension subtests from The Swedish Scholastic Assessment Test, SweSAT. The subjects were exposed to a constant displaying speed of 240 ms and then 150ms per word, giving a maximum speed of 250 words per minute (wpm) and 400 wpm respectively. Both RSVP methods scored better results than the scroll-based methods, making its impact on mobile learning very interesting for further studies. Hedin and Lindgren (2007) went further on studying presentation methods for reading on mobile phones as a larger and more evolved form of the first study. The results of the later study show a significantly better efficiency (measured as comprehensibility multiplied by reading speed in wpm) when using fast-paced RSVP. Although the subjects preferred the scroll-based reading over the RSVP it could be due to the many years of using scroll-based text and lack of RSVP experience.

A study by Benedetto et al. (2015) of the RSVP, using Spritz, questions the scientific evidence of some of their claims. What makes Spritz stand out is their way of using RSVP while highlighting the letter most crucial for the brain to process for understanding the meaning of a word (Benedetto et al.,

2015). The study examined the effects of Spritz-reading versus traditional reading (i.e. left-to-right, top-to-bottom) regarding comprehension, visual fatigue, performance, task load and ocular behaviour.

The results showed better comprehension when using traditional reading. When reading with Spritz, fewer eye blinks were found, potentially increasing the visual fatigue. The results revealed no differences between Spritz and traditional reading regarding the reading speed. As to task load, reading with Spritz was more demanding for the subjects than traditional reading. The ocular behaviour while using Spritz showed fewer fixations and longer durations, triggering less saccades. The developers of Spritz claim it can be effective even with longer texts and that it can be learned in five minutes—without any scientific evidence regarding the statement (Benedetto et al., 2015).

4 Method

This chapter demonstrates the method of qualitative data gathering, more specifically in-depth interviews. During the latter part of the chapter, the method is explained and how it was used in practice during this thesis.

4.1 Qualitative Research

Research is often associated with objective results, or quantitative data. But numbers and statistics describing human activities are subject to interpretation and can be as easily manipulated as textual data. Data gathering simply varies depending on which questions one wishes to answer. Quantitative research is suitable for answering the questions of 'how much' or 'how many' while qualitative research is better suited for questions like what, how and why in rich detail and truly reflects on the complexity of real human situations. In such cases when one wishes to understand human behaviour, design and usability, qualitative methods have developed techniques to help create products that better serve the users' needs (Cooper et al., 2014).

4.1.1 In-depth Interviews

In-depth interviews are one of the main methods of data collection used in qualitative research.

The in-depth interview can be perceived as a conversation. In many ways it is an accurate description, and the in-depth interview resembles a normal conversation. However, it does have some distinct features which separates the in-depth interview from the conversation. The in-depth interview can be characterized as being a 'conversation with a purpose' in which the interview will appear naturalistic while have an objective with clear roles of an interviewer and a participant (Ritchie & Lewis, 2003).

There is a diversity of perspectives regarding in-depth interviews considering to what extent knowledge is constructed in the interview or is a pre-existing phenomenon, and how active or passive the role of the interviewer should be. There is also a diversity of views regarding how structured an interview should be and to what degree the content is being shaped and created by the interviewer. Kvale (1996; cited by Ritchie & Lewis, 2003) proposes two alternative positions on in-depth interviewing. The first model sees knowledge as being given, as described in the metaphor below of a miner who is digging to uncover the hidden truths:

“Knowledge is understood as buried metal and the interviewer is a miner who unearths the valuable metal ... [T]he knowledge is waiting in the subject's interior to be uncovered, uncontaminated by the miner. The interviewer digs nuggets of data or meanings out of a subject's pure experiences, unpolluted by any leading questions” (Kvale, 1996: 3; cited by Ritchie & Lewis, 2003).

In Kvale (1996:3; cited by Ritchie & Lewis, 2003) alternative position, the quest for knowledge is not a hidden truth awaiting to be discovered, but rather something that is created and negotiated. From this perspective, knowledge is reached by letting the interviewer act as a medium where the stories told by the interviewee are developed and interpreted by the interviewer.

“The traveler ... asks questions that lead the subjects to tell their own stories of their lived world, and converses with them in the original Latin meaning of conversation as 'wandering together with'” (Kvale, 1996: 4 emphasis in original; cited by Ritchie & Lewis, 2003).

In this perspective the researcher is seen as an active player in the development of data and meaning. The researcher, as Holstein and Gubrium (1997; cited by Ritchie & Lewis, 2003) writes, is not simply a pipeline through which knowledge is transmitted. Rather, knowledge is constructed in the interview through collaboration between researcher and interviewee. (Ritchie & Lewis, 2003)

While the emphasis on knowledge as something that is created during the interview rises concerns regarding the validity of interview data many researchers still see the interview as meaningful where interviews can: “provide access to the meanings people attribute to their experiences and social worlds. While the interview is itself a symbolic interaction, this does not discount the possibility that knowledge of the social world beyond the interaction can be obtained” (Miller and Glassner, 1997: 100; cited by Ritchie & Lewis, 2003).

4.1.2 In-depth Interview in practice

When starting the test-session, the participants sat down and were told about RSVP and the procedure of the test-session.

Before starting the session—reading with RSVP and asking questions to the participant— the participants were informed of the rules of privacy, i.e. ethics, when being a part of this study regarding RSVP. The participants were informed that notes would be taken during the session, but no names or revealing information would be exposed in the finished version of the thesis.

The initial aim of each individual session with the different participants was to get the participants to feel comfortable using RSVP, meaning that they could play around with the different settings—e.g. speed, amount of words, red indicator in the middle or learn the different physical buttons controlling the RSVP. This was done to create a less serious and stiff environment while at the same time getting familiar with the product in front of them.

The texts that the participants read during the first part of the interview is news articles. This since news articles generally contain more straightforward information than fictional literature—meaning that news

primarily presents facts rather than feelings, thoughts etc. from the journalist. The participants would at this point use mainly the Spritz application but would switch to Spreeder in order to try the bulk setting in order to be presented with several words per frame.

After the participants choose their settings and are pleased with the outcome, they spend additional time reading the articles. The participants can quit the reading session whenever they please. When done with exploring RSVP, the interview begins and the participants are asked questions regarding their reading habits and thoughts on RSVP.

For the second part of the session the six participants are now asked to read fictional literature using RSVP, with their previously made settings. This was done as a way of testing RSVP reading that contained a lot of describing, emotion and thoughts that often needs time to process when reading. When the participants are done with reading, they are asked about their thoughts regarding reading fictional literature with RSVP, as well as how they feel towards possibly using RSVP for future reading.

4.1.3 Choice of Participants, applications and reading material

In the process of gathering data regarding the use of RSVP, it is of importance to create a broad collection of data during the interviews—meaning that a broad spectrum of ages could help to create a versatile based result. The ages range from the youngest being 23 years old and the eldest being 65 years old.

The Spritz application is chosen as the main application for testing RSVP. It was chosen for its clean design, ease of use and having the red-letter function. However, the “bulk reading” was not available, therefore Spreeder was used to test this function.

This thesis asks the research question: “How is the user experience of using RSVP for reading fictional literature and reading news articles?”. Because the research question aims to examine the experience of both news articles and fictional literature, the participants are presented with two texts: One is a news article and the other is a piece from fictional literature. These two texts differentiate in ways of reading. The news article is more information heavy and the fictional text is more dense in detail and description.

4.1.4 Choice of method

Regarding the questions *How interaction between RSVP and the user can be improved* and *What type of media is preferred while using RSVP*, could have multiple answers and vary depending on the user. The same is possible for uncovering personal opinions of what type of media that is being consumed. For this reason, the in-depth interview method was used, as it is a method that allows the interviewer to reach a good understanding of the participants opinions. In case of any unclarity or misunderstanding, this can be uncovered instantaneously. Simply put, the interviewer can get

a deeper understanding of the participants true opinions. Another reason for conducting an in-depth interview is that the method yields rich data filled with enhanced insight, giving the interviewer a deeper understanding of the participants opinions and feelings.

4.1.5 Research Ethics

The interviews and research managed in this thesis follows the ethical standards provided by the Swedish Research Council (2017). The participants are informed about the project before being interviewed as well as volunteering to participate without any constraint. The insights and data gathered from the qualitative interviews are what the chapters *results* and *discussion* are based upon—meaning that it is important to write down the answers given by the participants during the interviews. The participants are informed of their rights regarding privacy and that no names or revealing information is shared in this thesis.

There is a slight imbalance in gender, four women and two men. Gender is not taken into consideration. It is more important to find people in different ages to take part in the interviews to broaden the data—meaning that if all participants were in the ages between 20-25 the results could risk becoming unanimous simply for the reason of them being in the same ages.

4.1.6 Limitations to the method

The reason for this chosen subject has to do with a curiosity and interest in how new reading innovations such as RSVP can be adapted onto readers with varied digital and non-digital reading experience. Whilst the personal interest sparked the idea for this thesis, the insights given in this study are meant as a guidance for future researchers within the field of digital reading and RSVP. The method used is in-depth interviews. The decision was made to limit the reading genres to fictional and news readings, giving the participants a chance to familiarize with RSVP and try to understand why fictional literature and news articles could be suitable for RSVP reading.

The limitations of this thesis are regarding the number of possible participants due to the format of qualitative method and using in-depth. To be able to reach more certain conclusions regarding different ages and their attitudes towards RSVP, a larger number of participants would be needed.

5 Result

In this chapter the reader can take part of the results following the in-depth interviews on RSVP that was conducted.

Before entering the results of this thesis, there is a need to give non-descriptive information about the participant—meaning age, gender of the participants and reading habits—to give a foundation for additional interview questions.

- **Participant A is a 23-year-old female** with no substantial habit of reading news articles, neither digital nor on paper. However, she does read fictional literature—on paper copy—frequently.
- **Participant B is a 23-year-old female** that reads news and other articles digitally. She also has an interest in fictional literature and has tried reading on a tablet but did not enjoy it. She feels that artificial lighting is taking away the charm of fictional reading.
- **Participant C is a 37-year-old female.** She reads the news on her phone but is not a frequent reader. On the occasions of reading fiction, she does not do it digitally.
- **Participant D is a 34-year-old male** that reads both news and fictional literature digitally, on a daily basis.
- **Participant E is a 49-year-old male** with no interest in fictional reading but reads news on a daily basis. He reads the news both from the newspaper and from applications on his smartphone.
- **Participant F is a 65-year-old female** that only reads the news from a newspaper and reads fictional literature on paper copy.

5.1 Part one - Bulk reading

- o **“How did you feel regarding reading a bulk of words per frame in contrast to a single word per frame?”**

Answers from participants showed a strong preference to reading a single word per frame rather than having several words displayed a each given frame. Questions regarding the purpose of bulk-reading was raised, stating that it defeats the purpose of RSVP. In such case, it could be argued, why not display whole sentences or pages? It was also expressed that reading only one word per frame gave a sense of more “efficient reading” and also easier for the reader to know where to focus.

5.2 Part Two - Interest and Focus

- **“Did you feel an interest in reading with RSVP?”**
- **“Was there a sense of time limit on your focus, e.g. after 60 seconds you didn’t follow the text anymore?”**

The participants expressed a curiosity and interest to trying RSVP. The question regarding if there was a sense of losing focus, the participants expressed separate views. While most conveyed that focus was a non-issue, two participants expressed opposing views; one stating that losing focus was an issue while the other claiming that the new technique inspired to stay even more focused. Several participants reported slight discomfort with the current form of RSVP and expressed a desire to have some sort of overview regarding the length of the text.

5.3 Part Three - Interaction and Controllability

- **“How did you experience the controllability?”**
- **“Were there any controls or functions you wish would be added?”**
- **“Did you think any of the controls were unnecessary?”**

In reviewing the responses given by the participant, it is strongly expressed that two of the already existing functions should remain in RSVP, namely the pause function and the possibility to set the words per minute displayed, i.e. speed. These functions give the users a better sense of being in control of the application and in certain ways the text is being presented. The sense of being, or not being in control of the application is one of the major concerns for the user. Partly the concerns raised regard the speed of the text and being able to pause it but also it was expressed and suggested by two users that some sort of improved overview, i.e. glanceability should be provided. Further, the functionality of being able to return to a previous word and jump backwards in the text received split likings. One participant thought it to be a good idea and would use the function, however unintuitive nature of needing to manually click one’s way backwards in the text comes no way near the easy of just shifting one’s attention to a different section of the text, as one naturally would do when reading. Two participants communicated that they would not use the “previous word” function at all, but rather continue without full understanding of what was just read.

5.4 Part Five – Fictional literature or news articles

- **“How did you experience reading fictional literature in contrast to reading news articles?”**

In general, the participants expressed similar views regarding if there is difference between reading fictional literature or new articles. The opinion was that reading news articles had more appeal rather than reading fictional literature. The motivation for this was that when one reads fictional literature it should be a pleasurable experience allowing the reading to take time to process the feelings and beauty of reading. RSVP is seen as too mechanical and not really intended for this type of reading. However, several participants could see possibilities for RSVP when reading news articles. One participant showed a strong disliking to both types of reading.

6 Prototype

This chapter describes the features, design choices and interaction in the created RSVP application.

6.1 Features and interaction

The application is designed as an attempt to improve the RSVP experience for the reader. This is done by improving features from existing RSVP applications and creating new features that could improve the reading experience.

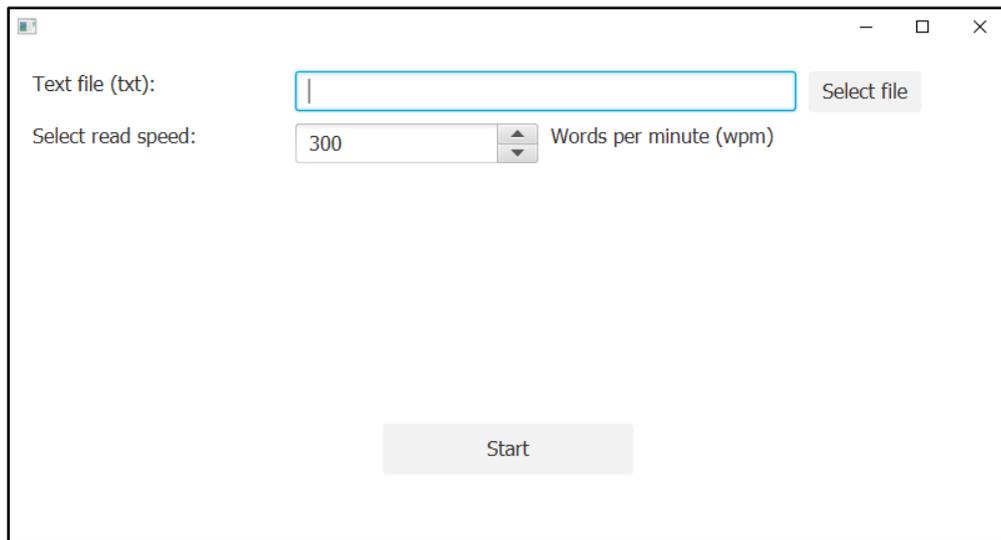


Figure 3: Screenshot of the configuration view.

The first view of the application act as a configuration view containing a button for choosing a text file, selecting preferred reading speed and a button for starting the reading session (See Fig. 3).

The “Select file” button opens a browser on the PC that allows for the user to select a desired text document to read with RSVP. After the user has chosen their text file, they can set their reading speed within a range from 50 up to 700 words per minute (wpm). A Spinner is placed next to the label displaying the reading speed that either increments or decrement the reading speed by 50 wpm per click. When the user has made their choice regarding text and reading speed the next step to take to start the reading experience is to press the “Start” button, which brings the user from the configuration view to the RSVP view. If a file has not been chosen a default file will be loaded to the RSVP session.



Figure 4: Screenshot of the RSVP view.

The second view of the application is the RSVP view where the text file can be read, and adjustments can be made. In the top left corner, the user can see the current reading speed displayed. Under the read speed label is a bar that shows the percentage of how much of the text that has been read. In the top right corner, a “Home” button is placed. In the centre of the window the RSVP text is displayed showing the previous word, the current word and the next word of the text string from the document. To the left and right of the text respectively, are two arrow buttons. Underneath the three words is a “Play/Pause” button and on either side of this are two buttons (“-50 wpm” and “+50 wpm”) that control the reading speed (See Fig. 4).

When clicking on the “Home” button, the user is brought back to the configuration page (See Fig. 3) and can there choose to read another text file and start the RSVP again with a new text.

When the arrow button on the left side is clicked, it moves backward in the text showing words that has been shown. If the arrow button on the right side of the text is clicked, it goes forward in the text showing words that has not yet been shown in the string of text.

When the user clicks on the “Play/Pause” button the text starts, and if the user clicks the button again the text is paused. When the “-50 wpm” button is clicked it goes back in the text and displays previously shown words, and when the “+50 wpm” button is clicked it moves forward in the text showing the words displayed further on in the text string. When either the “+50 wpm” button or the “-50 wpm” button is clicked, the reading speed in the top left corner changes

When the text is done, the percentual bar in the top left corner says “100% of the text read”.

6.2 Choice of design

Colour

In order to eliminate as many distractions as possible, a conservative approach was taken on the design, minimizing the colours and keeping strictly to black, white and grey, with inspiration from traditional reading sources.

Font

The font used in the application is based purely on personal preferences. A font was chosen that had a clean design of the different letters to make it easier to read.

Size

The text size of the speed and percent bar in the RSVP view is decided based upon the size of the RSVP text. A smaller text size is chosen in order not to take attention from the RSVP text. The words from the text files are of different sizes where the current word is slightly bigger in size than the previous and next word. This is done to emphasize that the word in the middle is the word to keep focus on. The size of the buttons is based upon the importance and frequent use of the button.

Placement of buttons

On the configuration page the buttons are mainly on the upper part of the screen whilst the "Start" button is on the lower part of the screen. This is done to distinguish between the configuration page and the RSVP page. On the RSVP page the buttons are placed near their function, meaning that the arrows are near the words because they are programmed to either go backwards or forwards in the text depending on which of the two the user clicks. The "Play/Pause" button and the two speed controlling buttons are placed beneath the words from the text file which derived placement inspiration from the Spritz and Spreeder applications. The "Home" button is placed in the upper left corner as a way to not distract the user and the reading experience. This is not a button that is used during the reading, but instead a button to go back to the first page to change the text file. The majority of "Menu" buttons are in the upper left or right corners of applications, which influenced the design of the application.

7 Discussion and Analysis

This chapter aims to discuss and analyse the results from the in-depth interviews given by the participants.

7.1 Discussion about results

This covers the key insights from the results regarding the two main areas of concern: glanceability and controllability.

7.1.1 Glanceability

Percentage bar

The findings gathered from the exploration points to that the RSVP applications tested are lacking in glanceability and a sense of orientation in the text. This conclusion is derived from the notion that the participants showed a dislike in not knowing how long the text was and where in the text they were currently at. The texts read by the participants aim to uncover the flaws as well as possibilities for further development for RSVP.

The prototype created aims to improve the perceived sense of not having the proper glanceability to get a sense of knowing how far in the text the reader has come. As an attempt to solve this issue a percentage bar is introduced to the prototype. The redesign is made from the wishes of the participants to have an overview of how far they have come in the text. The amount of text read is represented through percent between one and one hundred. The application calculates the length of text and gives the user a constant update of how many percent of the text they have read so far.

Seeing the previous and next word

The participants expressed a wish for improvement of overview in the reading experience. When reading without the assistance of RSVP, the reader is reading with the whole of the text displayed at one time. The previous word and the next word are perceived by the reader and might enhance the reading comprehension. This gave an insight into a feature that would bring a sense of the reading depth, that occurs when reading in a normal setting, into the RSVP reading by showing the previous and next word.

7.1.2 Controllability

Navigate through text

One concern raised during the in-depth interviews was a point regarding navigation, i.e. how one navigates through a text. Under normal page conditions this task is easy, simply look at any given point and read from there. In RSVP however, this is done by clicking back and forward from word to word. This feature is nowhere near as smooth and natural as simply looking at the desired point and leaves a challenging task for designers to solve.

The prototype attempts a solution to this problem by allowing the user to “click” on either a forward button to jump ahead in the text or a backward button to view the previous read words.

Choice of speed

The user has two options on how to manipulate at what rate the text flows. On the configuration view user can chose and initial setting ranging from 50 to 700 words per minute (wpm). Default is set to 300 wpm. In the RSVP view mode the user can increment or decrement the text flow speed by 50 wpm per click.

Bulk reading

Bulk reading was not appreciated as a feature and was therefore not included in this RSVP application.

7.1.3 Preference to news articles

Throughout the interviews all participants expressed a preference to reading new articles over fictional literature. One explanation for this is that the participants did not enjoy reading emotional and expressive content in such a rigid form of reading, as RSVP can be perceived. Another attitude expressed was a feeling of keeping a higher level of concentration while reading RSVP and therefore being more suitable for shorter text rather than longer. This raises an interesting question regarding what types of media or texts are best suited for RSVP. This topic is briefly mentioned in “Future work (See section 6.7 Future work) and worth considering for future research.

7.2 Discussion about method

The choice of method being in-depth interviews has benefits and limitations. The benefits allow the researched a richer description and attitude of the participants. The limitations include problems of drawing any rigid conclusions from the results, i.e. the results rather give indications towards attitudes rather than fact.

Influence on setup

There is a risk that the interviewer is steering the participants and the interview because of the pre-set questions that are being answered. If the participants were able to use RSVP for a longer amount of time, getting used to its functions, this could contribute to a more open set of questions whereas now the participants are unfamiliar with the concept and must be asked the questions to know what they are supposed to look at and criticize. The concern surrounding the risk of the interviewer steering the participants is concern and has been debated among many scholars. See *Chapter 4.1.1* for a brief discussion regarding this issue when gaining knowledge with the use of in-depth interviews.

Number of participants

There is an awareness of knowing that the results shown in this thesis may not reflect society as a whole, meaning that the different ages in participants may be an exception—i.e. the two youngest participants may not be that positive towards RSVP but it does not necessarily mean that other 23 year old's share the same views and feelings. It is unclear whether age is a factor in showing a positive or negative attitude towards RSVP. In order to draw more precise conclusions from each age and gender a larger number of participants would be beneficial, from a research perspective.

Participant follow-up

A problem that might arise when using participants with no prior knowledge of RSVP as a concept and conducting a study that involves the participants only once, is that the results become based on first time impressions. A solution to this problem could be to do follow-up research which could enable the researcher to gather more nuanced results. The continuity could have allowed the participants to see RSVP in a different way, perhaps noticing flaws and possibilities that could only have been recognized through having more experience with RSVP.

7.3 Discussion about related work

In the results found by Castelhana & Muter (2001) the participants of their study as well as mine still prefer the normal page condition over using RSVP. Both studies show that although the participants are more drawn to the normal page conditions there is still a possibility to design RSVP to bridging the gap to a more satisfying natural reading experience.

When researching RSVP, it is often referred to as a speed-reading tool. Reading from the result one can find participants expressing a sense of feeling stressed, which not only raises the question of redesign but also a redefinition of the intent with RSVP being perceived as a tool for increased speed while reading. Proposals that have been made rather suggest types of design which might not focus on increasing speed, but rather improving the design itself for a more natural and intuitive reading experience.

8 Conclusion and future work

The starting point of this thesis was with the aim and curiosity to explore potential of incorporating RSVP into everyday reading. The collected results from the in-depth interviews were analysed. Based on the analysis a prototype was created in order to develop RSVP tools and allow further research on the topic with gained knowledge from this thesis.

The study made in this thesis has contributed to research within the field of RSVP and digital reading. The purpose is to discover new design and interaction opportunities with the help of examining existing RSVP technology and then to create a prototype that can be used to further explore the area of RSVP. The research questions stated are:

1. How can the interaction with an RSVP application be improved?
2. How is the user experience of using RSVP for reading fictional literature and reading news articles?

As seen from the results and insights gathered new features to RSVP could provide a possibility of improving the interaction with RSVP. New features were suggested by the participants, e.g. percentage bar and previous/next word for improved glanceability. In addition to these features a need for improved controllability is suggested, e.g. the ability to navigate through text by clicking on the back and forward arrows and the possibility to control the speed of the text flow.

The study shows a tendency by the participants to prefer reading news articles over fictional literature. This preference is motivated by the participants having a liking toward reading texts that are factual, rather than fictional. The participants explain their position by stating that it is easier and more suitable to read texts that do not include detail and emotion.

8.1 Future work

New and improved features

The prototype created, based on the results from the participants include new and improved features. These can be tested in a new study to verify, disprove and/or add new insights to the functionality of RSVP.

User group

This thesis had a variety of ages and genders when testing and analysing existing RSVP applications but to get a defined answer to how a certain age group and gender responds to RSVP. For future work a researcher could narrow the user group and only examine a specific group, e.g. women between the ages of 18-25 that are students. The number of participants could also be increased to 20-25 people. This could enable more specific

information to be analysed and allow the researcher to draw sharper conclusions of the results.

Technology and context

This study examines and analyses the use of RSVP as a desktop application and with the redesign made in this thesis, it could explore in what form the application could and should be used (i.e. mobile, desktop and smartwatch). The concept has the potential to not only be a desktop program but also function as a mobile or smartwatch application. When using RSVP in the context of a smartwatch, it might not be suitable to read an article but instead use the application for reading text messages (SMS). These two variations of usage could be the subject for future work.

When thinking of context, an interesting group that could be further looked into is commuters, they might have some spare time for reading news and might pick RSVP in preference over a standard newspaper. As mentioned in section 6.1.3, an outcome from the testing indicated a preference towards reading informative texts, e.g. news or research paper, this would need to be tested in future work to determine which genre in text to be read with RSVP.

Societal area of usage

This RSVP application could show to have a beneficial aspect towards society. It could provide a more accessible and existing way of reading news.

It may also serve to be beneficial for people with short attention span because the application could hold the readers focus by constantly flashing new words, in comparison to reading a book where the only change is when turning a page. This is a speculative outcome of the RSVP application and would need to be confirmed by further research and testing.

8.2 Contribution

The results generated in this study has the intent to contribute to the field of digital reading and RSVP by presenting a design proposal. The design proposal is in the form of a desktop prototype with features that builds on the insights and thoughts gathered from the participants. This is because the thesis has investigated research questions which gains knowledge in how to make the transition from traditional page condition to digital reading more natural.

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Appendix 1

- Do you read on a day to day basis? If so, what do you read? Do you consume your literature/news digitally or traditionally (on paper)? Could you describe your reading habits?

Participant A: Participant A Has got no real habits of reading news articles, neither digital nor on paper. However Participant A reads a lot of fictional literature on paper copy. Doesn't know the reason for not reading digitally, she just prefers holding the actual book and being able to turn the pages herself."

Participant B: Participant B almost daily reads news and other articles digitally. Fictional literature on paper copy, has tried reading books on iPad but did not like the feel of it and prefer holding the actual book while reading. Doesn't like reading with artificial lighting that is on iPads, prefers daylight/lamp as source of light when reading.

Participant C: Participant C Reads news on the phone, but is not a frequent news reader. Reads books in paper copy from time to time but never screen based.

Participant D: Participant D basically only reads news, fiction, etc. digitally. Reads on a daily basis.

Participant E: Participant E does not read fiction literature at all. Reads news both on iPhone and the newspaper, 50/50. Often reads the news.

Participant F: Participant F only reads news from a newspaper, almost daily. Reads a lot of literature on paper copy.

- How did you feel regarding reading a bulk of words per frame in contrast to a single word per frame?

Participant A: Only one word per frame. Expressed feeling overwhelmed with so much information given at once.

Participant B: Expressed a preference towards having one word at the time as it felt more natural as it is how one reads texts, one word at a time. Also expressed a sense of wanting to know what word that was just read, the current one and the following word, as this is also how it works when reading a text normally.

Participant C: Participant C felt that two words were manageable but it took more concentration to follow the text and keeping track of two words in each frame. For a more relaxed reading, one word is better.

Participant D: Participant D did not feel that more than one word at a time was necessary, it felt like more “efficient reading” when only seeing one word at a time, because Participant D felt that one could read at a higher speed. It could be a matter of practice in getting used to more than one word, but Participant D did not see the point in having more than one word per frame.

Participant E: Only one word, it becomes too distracting and stressful to focus on two or more words at the same time.

Participant F: One word is a definite answer, two is too much to keep track of. Does not see any use for having more than one-word flashing.

- **Did you feel an interest in reading with RSVP?**
- **Was there a sense of time limit on your focus, i.e. after 30 seconds you didn't follow the text anymore?**

Participant A: Participant A didn't lose focus during either of the texts but said that it had to do with wanting to give the RSVP an honest try. Participant A did not feel like staying focused (gathering the information given in the text) for much longer than 60-90 seconds.

Participant B: Participant B felt focused for a short amount of time, somewhere around a minute. Felt that it was hard to keep focus because Participant B didn't know how long the text would last for, or how much of it that had been read after a certain amount of time.

Participant C: Participant C expresses wishes to know how long the text is—as well as knowing how far Participant C has read—and believes that it would not be an issue with focus. Experienced some feelings of “stress” from not knowing when it was going to end.

Participant D: Participant D did not experience any lack of focus. Participant D enjoys the experiment. Did not experience any time issues.

Participant E: If Participant E had to pick what to use it for it would be to read short articles. Would not like to read longer texts.

Participant F: No real issues with losing focus. But is at the same time not really enjoying reading with RSVP.

- **Is the current layout and interaction with the existing RSVP generators optimal or is there a different route towards creating better interaction and experience with RSVP?**
- **How did you experience the controllability. Were there any controls you wish would be added?**
- **Did you think any of the controls were unnecessary?**

Participant A: The layout seems fine. Participant A likes that there is a pause-button and often uses it because sometimes it feels like it is going too fast. Participant A also slowed down the speed and felt it much more comfortable to read when having a lot of time to read each word.

Participant A also expressed being slow reader and enjoys taking pauses while reading to think about what is being said and letting the “emotion sink in” and sometimes reading the sentence one more to let it sink in more and be better understood.

The controls needed were there. Likes to use the pause-button and previous word. Prefers when one manually can just look to wherever one wants to re-read the wanted part instead of “clicking your way there”. Also, when one wishes to return one must click back where one left, instead of automatically returning and in the analogue case, just look directly there.

Participant B: There is definitely room for improvement, whether that’s finding different features that should be available to the reader like small stuff (colour of the centered letter/line) or bigger ones like how much of the surrounding words should be shown when reading the current word, i.e. should the reader be able to see the next word coming.

A possibility of the words morphing into the next word maybe?

The controllability is fine. Only wants to use the speed control and the pause function. Likes the red word.

Participant C: Thinks that the current solution of layout is suitable, does not have any need to change it. She expressed that the pause button was not something she thought of using at the time but is good to have and to know that it is there, kept the speed at 300 wpm and felt comfortable with it.

Participant D: It is OK to read with but feels that it could be interesting to know what word is coming next, kind of like having a word in front of you with the next word hinting just above. Participant D referenced the credits in the beginning of Star Wars to make me understand.

Participant D likes the controls and tries to go higher and higher in speed. Participant D likes the challenge. Always keeps one finger on the pause button and is fine with sometime missing words as long as the “big picture” is there.

Participant E: Participant E used the option to turn the speed up/down and changed it from 300 wpm to 100 wpm. Participant E did not use pause and said that pausing the text was not necessary when having it at a lower speed.

Felt that the change of words could be “smoother”, i.e. that it’s currently changing words with a mechanical feel. Other than that: pleased with layout. Still preferred being able to choose when to read different parts of a text, i.e. having a whole text and reading it in one’s own pace.

Thinks the controls are fine. But wondered why there was an option to manually go to the next word.

Participant F: Participant F does not have any current propositions regarding interaction. Thinks that the current layout consisting of words overlapping each other is a good layout and is unsure what could be changed because Participant F is not comfortable/familiar with using the current RSVP enough to spot what needs changing. Participant F expressed no need to use the pause button. Participant F did not want the speed to change (kept it at the start speed of 300 wpm) because it felt like a natural reading speed.

- **How did you feel about having the red indicator displayed while reading?**
- **Did you prefer reading with the indicator? Why?**

Participant A: Participant A felt that the red letter/line was very helpful in figuring out RSVP and how to interact with it. Participant A also felt that the red in contrast to the black was a good indicator of where to look.

Participant B: Definitely some sort of centre focus, whether it be colour or some different look that draws attention to the letter in the centre of the word.

Participant C: Participant C was unsure if the red letter/line is necessary when knowing how to use the RSVP, but nonetheless found it helpful during the session.

Participant D: Participant D did not feel that it had to be a red letter/line necessarily, but felt that some indication of where the reader should be looking is probably necessary to maintain focus while reading.

Participant E: Participant E really liked the red letter/line as a focus point for knowing where to look, it helped with “picking up” the words easier.

Participant F: Participant F did not feel any major difference to having the red line/red letter in the middle as a “focus point”. It was good as a starter for getting to know how RSVP works but after having read one text, the red letter/line was not necessary. Participant F had a thought that the red letter/line is probably better for longer reading to help keep one focused.

- How did you experience reading fictional literature in contrast to reading news articles?

Participant A: If Participant A had to choose, it would be shorter articles that she would use RSVP for. Would not use it for fictional literature since the high pace is stripping away the feeling/essence of the text.

Participant B: Since Participant B is not comfortable reading books on the iPad it felt fairly certain that reading longer text via RSVP would not be optimal, but was prepared to give it a try if given a good RSVP app/program to read a book through. Shorter text is quicker and often not packed with a story that contains a lot of details, good for RSVP.

Participant C: From just testing it during our session, Participant C felt that it could be used either way if one aware of the length of the text. Participant C found it hard to keep focused when Participant C didn't know how long one would have to read with RSVP.

Participant D: Participant D felt that the shorter amounts of texts—like the news—are more attractive to use with RSVP as it does not require as much focus for very long. But Participant D added that it is very likely that with some practice and getting used to RSVP, longer texts are a possibility. Practice is the key to RSVP.

Participant E: Participant E will not be reading fictional literature with RSVP. Participant E rarely reads any books at all, and certainly won't read with RSVP in case Participant E were to read fictional literature.

Participant F: Participant F has a long history of reading a lot of fictional literature but does not feel at all comfortable reading fictional literature with RSVP. It “ruins” the reading experience and although it might be a good idea for shorter news articles, it's a bad idea for novels.