OCR Quality Affects Perceived Usefulness of Historical Newspaper Clippings – A User Study

Kimmo Kettunen[1], Heikki Keskustalo[2], Sanna Kumpulainen[2], Tuula Pääkkönen[3] and Juha Rautiainen[3]

[1] *University of Eastern Finland, School of Humanities, Finnish Language and Cultural Research, P.O. Box 111, 80101 Joensuu, Finland*
[2] *Tampere University, Faculty of Information Technology and Communication Sciences, Kalevantie 4, 33014 Tampereen yliopisto, Finland*
[3] *University of Helsinki, The National Library of Finland, Saimaankatu 6, 50100 Mikkeli, Finland*

Abstract

Effects of Optical Character Recognition (OCR) quality on historical information retrieval have so far been studied in data-oriented scenarios regarding the effectiveness of retrieval results. Such studies have either focused on the effects of artificially degraded OCR quality (see, e.g., [1-2]) or utilized test collections containing texts based on authentic low quality OCR data (see, e.g., [3]). In this paper the effects of OCR quality are studied in a user-oriented information retrieval setting. Thirty-two users evaluated subjectively query results of six topics each (out of 30 topics) based on pre-formulated queries using a simulated work task setting. To the best of our knowledge our simulated work task experiment is the first one showing empirically that users' subjective relevance assessments of retrieved documents are affected by a change in the quality of optically read text.

Users of historical newspaper collections have so far commented effects of OCR'ed data quality mainly in impressionistic ways, and controlled user environments for studying effects of OCR quality on users' relevance assessments of the retrieval results have so far been missing. To remedy this The National Library of Finland (NLF) set up an experimental query environment for the contents of one Finnish historical newspaper, *Uusi Suometar* 1869-1918, to be able to compare users' evaluation of search results of two different OCR qualities for digitized newspaper articles. The query interface was able to present the same underlying document for the user based on two alternatives: either based on the lower OCR quality, or based on the higher OCR quality, and the choice was randomized. The users did not know about quality differences in the article texts they evaluated.

The main result of the study is that improved optical character recognition quality affects perceived usefulness of historical newspaper articles significantly. The mean average evaluation score for the improved OCR results was 7.94% higher than the mean average evaluation score of the old OCR results.

Keywords

Interactive information search, evaluation, OCR quality, historical newspapers, query engine, simulated work task

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kimmo.kettunen@uef.fi (K. Kettunen); heikki.keskustalo@tuni.fi (H. Keskustalo); sanna.kumpulainen@tuni.fi (S. Kumpulainen); tuula.paakkonen@helsinki.fi (T. Pääkkönen); juha.rautiainen@helsinki.fi (J. Rautiainen)

0000-0003-2747-1382 (K. Kettunen); 0000-0003-1415-373X (H. Keskustalo); 0000-0002-7016-257X (S. Kumpulainen); 0000-0003-3958-9732 (T. Pääkkönen) ; 0000-0002-5223-9940 (J. Rautiainen)

1. Introduction

Digitized historical newspaper collections have been produced and increasingly used during the last two decades in different parts of the world, and both their usage and demand will increase in the future [4]. Access to these collections is important for different user groups, such as lay persons, teachers, journalists, and professional historians. Contents of the historical newspaper collections are produced using Optical Character Recognition, which has produced results of varying quality in the past. Although effects of OCR quality to search results have been evaluated in different settings, these studies have been performed either with artificially degraded OCR quality [1-2] or in IR laboratory-based experiments with original low quality OCR data [3]. Digital humanists have also evaluated the usability of historical newspaper query environments and commented possible problems caused by low OCR quality [5-6]. Low OCR quality has been also found to affect several activities during interactions with historical newspaper contents [7].

However, the effect of the OCR quality on perceived relevance of query results has not been studied yet. Therefore, we focus on real users in an experimental setting, where different quality OCR texts can be used at the same time and users perform the evaluations in a simulated work task setting. We aim at studying how the quality of OCR affects users' relevance assessment. To study this, we set up an experimental query environment for the contents of one Finnish historical newspaper, Uusi Suometar 1869-1918, with ca. 86 000 pages and ca. 306 M words. The collection includes ca. 1.45 million auto segmented different length articles, which we call *clippings*. The article database consisted of two versions of the same data: one with old, lower quality OCR and one with new, improved OCR.

In the interactive information retrieval experiment we used simulated work tasks [8-9] to trigger more naturalistic information needs. This allows individual test persons to assess the usefulness of the newspaper clippings with respect to their own interpretation. This increases the validity of the assessment. Further, we used graded relevance assessments. However, to increase control and repeatability during experimentation, we used pre-formulated, static queries.

The experimental query environment balloted between two different quality text versions presented for users and the users did not know about quality differences in the texts they evaluated. Thus, we could compare the subjective evaluations of the results. Our research question is whether different quality of the optical character recognition - old versus improved new - affects the perceived usefulness of the newspaper clippings.

2. Related research

Effects of sub-quality optical character recognition to efficiency of information retrieval have been studied earlier in different settings, and the results include both simulations, where quality of the text content has been tampered artificially, and usage of original Optical Character Recognition text. Actual user studies in a controlled query-environment, however, have been so far missing. Early simulated research settings include e.g., Taghva et al. [10], and Kantor and Voorhees [2], later ones Savoy and Naji [11], and Bazzo et al. [1], just to mention a few. The general result of these studies is that worse Optical Character Recognition quality lowers query results clearly. Most clear the effect of worse Optical Character Recognition is with short queries of a few words, where the query engine has less evidence for matching.

Järvelin et al. [3] report results of information retrieval in a laboratory style collection of digitized historical Finnish newspapers. Their collection consisted of 180 468 documents and 84 512 pages of newspapers, for which they had developed 56 search topics with graded relevance assessments. Results of the study show, that low level optical character recognition quality of the collection lowered search results clearly, even if heavy fuzzy-matching methods were used in query expansions to improve the results.

Van Strien et al. [12] suggest caution in trusting retrieval results of optically read text. They show, that both rankings of articles and number of returned articles from the query engine are affected by text quality. Traub et al. [13] show that better data quality decreases so called retrievability bias, which tends to bring certain documents as search result more often than others [14]. Chiron et al. [15] show with respect to the French Gallica collection, that low frequency query words that contain frequent optical character error patterns have a higher risk to result in poor query results.

If we broaden scope and look at research outside information science, digital humanists have also paid attention to the problems of bad optical character recognition in digital historical newspaper collections. Jarlbrink and Snickars [5], for example, show how one digital Swedish newspaper collection, Aftonbladet 1830–1862, '*contains extreme amounts of noise: millions of misinterpreted words generated by OCR, and millions of texts re-edited by the auto-segmentation tool'*. Their main contribution is discussion of low-quality Optical Character Recognition and its effects on using digitized newspapers as research data. Pfanzelter et al. [6] describe user experiences and needs of digital humanities researchers with three digitized newspaper collections: Austrian ANNO (https://anno.onb.ac.at/), Finnish Digi (digi.kansalliskirjasto.fi), and French Gallica (https://gallica.bnf.fr/) and Retronews (https://gallica.bnf.fr/edit/und/retronews-0). Although their main concern in the paper is related to general functionality demands for interfaces of digitized newspaper collections, they report also experiences related to searchability of the collections. One of their general findings is that '*in some cases, the OCR quality is still very low. After identifying some major issues in this regard, the digital humanist team's reliance on (and trust in) some search results was very low'*.

Also, slightly differing opinions have been stated by digital humanities researchers. Strange et al. [16], for example, state that '*The cleaning was thus desirable but not essential'* referring by cleaning to correction of OCR errors in the digitized texts they were studying. Their comment was related to the word level accuracy of the texts – they did not consider a near optimal word level accuracy necessary. In their opinion a ca. 80% accuracy level was enough.

In an interactive information retrieval (IIR) setting simulated work task situations are used to trigger corresponding information needs [8-9]. An IIR setting requires three main facets [8]: i) potential users as test persons ii) application of dynamic and individual information needs and iii) use of multidimensional and dynamic relevance judgements. The interactive approach has the following four main advantages [8, 17]: first, it entails usage of cover-stories, which trigger information needs provoked by simulated work tasks. Second, the setting allows individual test persons to assess the usefulness of the newspaper clippings with respect to their own interpretation. Third, use of graded and multidimensional relevance assessments instead of binary and topical ones facilitates both control and repeatability during experimentation based on static queries. And finally, the setting enables the use of a realistic search interface with actual data.

3. Data and the experimental setting

3.1. Our newspaper data

Our search collection consists of the whole history of Uusi Suometar 1869–1918, ca. 86 000 pages and 306.8 million words [18]. Uusi Suometar was at the time of its publication one of the most important Finnish language newspapers in Finland, where newspapers were published in two languages, Finnish and Swedish. The original (old) optical character recognition for Uusi Suometar was performed using a line of ABBYY FineReader® products. Improved optical character recognition for the whole history of Uusi Suometar was achieved with Tesseract v.3.0.4.01. Improvement to the earlier quality in recognition of words is 15.3% units as a mean over the whole period. On average 83.6% of the words of the newspaper were recognized with automatic morphological analyzers, and the recognition rate varied from ca. 78 to 88% over the 49 years. For the old Optical Character Recognition mean word recognition rate was 68.3% [18]. Even if the improvement in Optical Character Recognition quality is considerable, the improved quality can still be challenging for information retrieval engines, especially with short queries and articles, where the information retrieval engine has less evidence for matching the query words and collection data in the engine's index [3].

Newspaper data at the National Library of Finland was originally scanned and recognized page by page without article structure information besides basic layout of the pages. For this study we used articles that were extracted automatically from the pages of Uusi Suometar using a trained machine learning model with software PIVAJ [19-21]. In the automatic segmentation process the collection of Uusi Suometar was divided into 1 459 068 articles with PIVAJ. The training of the PIVAJ model was based on 168 pages of manually marked newspaper page data that had different number of columns (varying from 3 to 9). Kettunen et al. [21–22] reported success per centages of 67.9, 76.1, and 92.2 for an evaluation data set of 56 pages in three different evaluation scenarios based on Clausner et al. [23] using layout evaluation software from PRImA (https://www.primaresearch.org/).

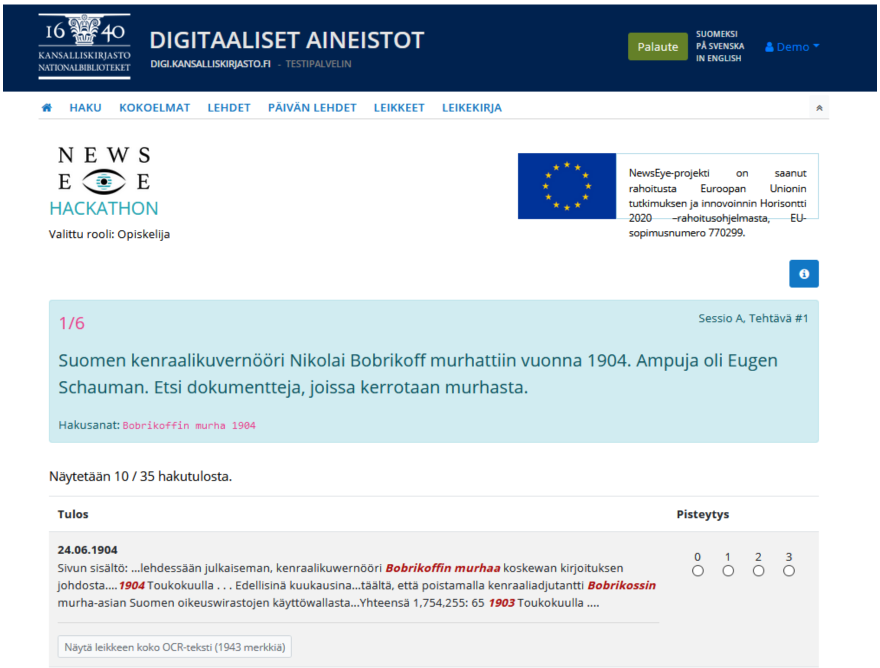
In the article extraction of the whole history of Uusi Suometar article separation is far from optimal, and articles are perhaps best called automatically extracted clippings with varying length. In the search evaluation task, these clippings are documents that users search and evaluate. It should be emphasized, that the article segmentation that was producible for the whole history of Uusi Suometar is experimental and its quality will bring one layer of difficulty to the evaluation of search results. As Jarlbrink and Snickars [5] formulate it, auto segmentation tools create random texts, and borders of text snippets are fuzzy. This feature was informed to the users in the instructions of the search task.

3.2. The search environment

Participants of the evaluation task performed their task using the query engine Elastic search (https://www.elastic.co/), version 7.3.2, which is the background engine of the library's presentation system. Queries were performed in AND mode, where every query term is sought for in the documents. Hits of the search engine shown for the users needed to be at least 500 characters long to avoid very short text passages which would be hard to evaluate. The index of the newspaper collection's database is lemmatized, i.e., it contains base forms of the words, which is crucial as Finnish is a highly inflected language [3]. The articles of the newspapers had been extracted from the pages and stored as clippings. One clipping represented an article, and the search index contained the title and the textual contents of the specific article area taken from the OCR of ALTO XML[1] of the whole page, either from the original OCR page or from the re-OCR'ed page. The size of the original old OCR quality index is 9.82 Gb and the size of the re-OCR'ed index 9.04 Gb. Both indexes contain 1 459 068 clippings.

The query engine searched always for the results of queries in the new optical character recognition version of the database and ranked the results according to these. However, retrieved texts presented for reading were balloted in the two different optically read qualities of the same articles. Users of the query system were not aware of differences in the optical character recognition quality when they used the query environment.

Six pre-formulated queries for search and evaluation were presented for each user in the query form, one at a time. The query form interface is shown in Figure 1.



Valittu rooli: Opiskelija

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1/6

Sessio A, Tehtävä #1

Suomen kenraalikuvernööri Nikolai Bobrikoff murhattiin vuonna 1904. Ampuja oli Eugen Schauman. Etsi dokumentteja, joissa kerrotaan murhasta.

Hakusanat: Bobrikoffin murha 1904

Näytetään 10 / 35 hakutulosta.

Tulos	Pisteytys
24.06.1904 Sivun sisältö: ...lehdessään julkaiseman, kenraalikuwernööri ***Bobrikoffin murhaa*** koskewan kirjoituksen johdosta.... ***1904*** Toukokuulla . . . Edellisinä kuukausina...täältä, että poistamalla kenraaliadjutantti ***Bobrikossin*** murha-asian Suomen oikeuswirastojen käyttöwallasta...Yhteensä 1,754,255: 65 ***1903*** Toukokuulla .... Näytä leikkeen koko OCR-teksti (1943 merkkiä)	0 ○ 1 ○ 2 ○ 3 ○

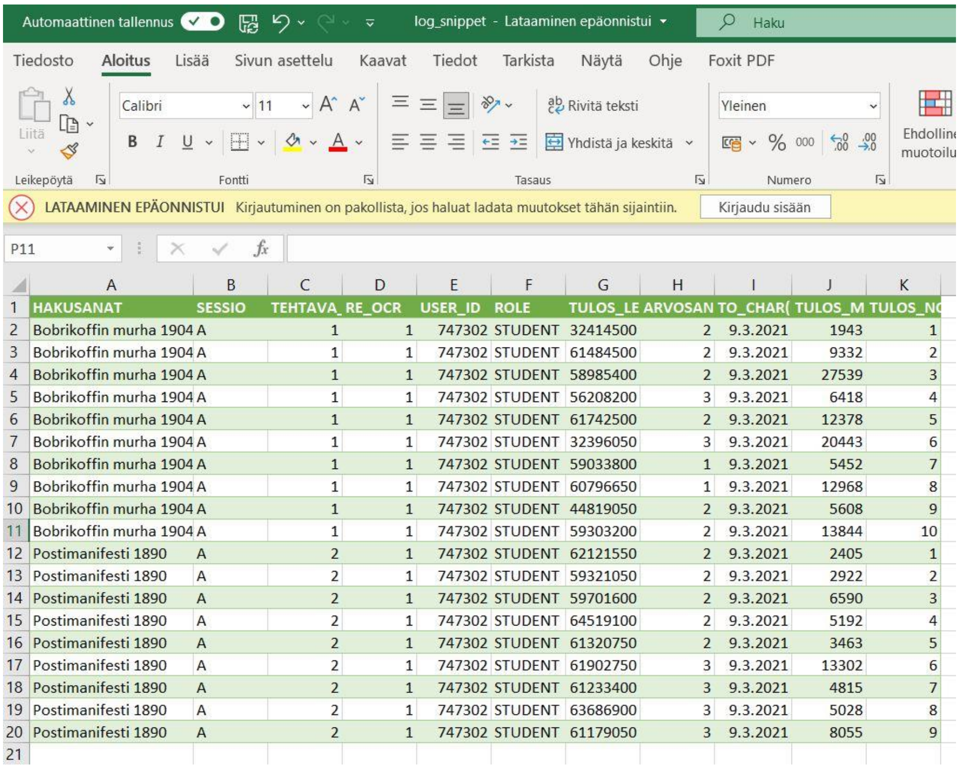
Figure 1: Screenshot of the query interface

[1] https://www.loc.gov/standards/alto/

Figure 1 shows the query interface after a pre-formulated query has been performed and 35 results retrieved, out of which 10 top results are shown for the user for evaluation. Text on the blue background on the top describes the topic and shows the pre-formulated query beneath in pink. The light purple rectangle below shows the beginning of the first query result. Relevance grading buttons 0–3 are on the right side of the rectangle. On the left, underneath the text snippet of the result, is the button for opening the clipping in its whole. The button also shows the character length of the clipping, 1943 characters, bottom line. Matches of the query words are highlighted in the snippet view and in the actual clipping view, which the participants used for evaluating relevance of the clippings.

3.3. Storing of the user session results

The article search and evaluation hackathon users had to log into the presentation system, so that their sessions could be stored. The users had previously agreed that their information is stored, and the log collected as little information about the individual user as possible. The structure of the result database is shown in Figure 2's Excel sheet.



LATAAMINEN EPÄONNISTUI Kirjautuminen on pakollista, jos haluat ladata muutokset tähän sijaintiin.

	A	B	C	D	E	F	G	H	I	J	K
1	HAKUSANAT	SESSIO	TEHTAVA_	RE_OCR	USER_ID	ROLE	TULOS_LE	ARVOSAN	TO_CHAR(	TULOS_M	TULOS_NO
2	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	32414500	2	9.3.2021	1943	1
3	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	61484500	2	9.3.2021	9332	2
4	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	58985400	2	9.3.2021	27539	3
5	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	56208200	3	9.3.2021	6418	4
6	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	61742500	2	9.3.2021	12378	5
7	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	32396050	3	9.3.2021	20443	6
8	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	59033800	1	9.3.2021	5452	7
9	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	60796650	1	9.3.2021	12968	8
10	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	44819050	2	9.3.2021	5608	9
11	Bobrikoffin murha 1904	A	1	1	747302	STUDENT	59303200	2	9.3.2021	13844	10
12	Postimanifesti 1890	A	2	1	747302	STUDENT	62121550	2	9.3.2021	2405	1
13	Postimanifesti 1890	A	2	1	747302	STUDENT	59321050	2	9.3.2021	2922	2
14	Postimanifesti 1890	A	2	1	747302	STUDENT	59701600	2	9.3.2021	6590	3
15	Postimanifesti 1890	A	2	1	747302	STUDENT	64519100	2	9.3.2021	5192	4
16	Postimanifesti 1890	A	2	1	747302	STUDENT	61320750	2	9.3.2021	3463	5
17	Postimanifesti 1890	A	2	1	747302	STUDENT	61902750	3	9.3.2021	13302	6
18	Postimanifesti 1890	A	2	1	747302	STUDENT	61233400	3	9.3.2021	4815	7
19	Postimanifesti 1890	A	2	1	747302	STUDENT	63686900	3	9.3.2021	5028	8
20	Postimanifesti 1890	A	2	1	747302	STUDENT	61179050	3	9.3.2021	8055	9
21											

Figure 2: Screenshot of the query log

The columns in the query log indicate the following data beginning from the left: A) query words B) session information C) number of the topic D) optical character recognition quality in the results (0 for the old and 1 for the new) E) user id F) role of the user (student or teacher) G) id number of the result clipping H) user-given evaluation result on the scale of 0-3 I) date and time of the session J) size of the clipping in characters K) rank (1-10) of the result clipping in the result list.

The interactive information retrieval system balloted the topics for each user, and out of the 32 users' work we got 1861 evaluations. This means that some of the users did not finish all their tasks, as the total number should have been 1920 (6 topics * top-10 evaluations * 32 users).

The clippings the users evaluated were of varying length. We had set a minimum length of 500 characters for the results to be shown for users, but no maximum length. The mean length of the clippings in all the evaluated results was 5467 characters.

3.4. Participants and their instructions

To perform the study, we recruited 32 participants for the evaluation task. The student users for the evaluation task were recruited from the courses *Information Retrieval and Language Technology* and *Information Retrieval Methods* at the Tampere University, Faculty of Information Technology and Communication Sciences. Three teachers of information science also participated in the evaluation task. Choice of the participants was based mainly on the ease of getting a large enough group to perform the tasks. We did not have access to a large enough group of historians with suitable search skills. We collected the information whether the users were students or teachers of information science (cf. Figure 2), but did not collect data about any other user qualities.

The participants were given background information, that their simulated task was to use the information retrieval system of digitized newspaper clippings to write an article about historical events in Finland or around the world during 1869-1918. Participants were given a one-page instruction leaflet which described the information retrieval task. The leaflet described the general idea of the task and retrieval session, gave them the back-grounding simulated work task story, and explained the graded evaluation scale of 0–3. The evaluation instructions advice the participant to consider how well the clipping helps accomplishing the task described in the background story, thus going beyond pure topical relevance assessment. Participants were guided to perform six queries. The queries were pre-formulated to increase control over the research setting and to guarantee the comparison between the users. The queries and the topic selection process are described in Appendix 1. Translations of the background story and the description of the graded relevance scale used in the evaluation task are in Table 1.

Table 1. The background story and evaluation instructions given to the participants

The background story

Imagine that you are writing an article related to topics in history of Finland or world history at the end of 19th century or the beginning of 20th century. Evaluate quality of the clippings you get as search results. Evaluate the quality of each clipping from the viewpoint, how it helps you to proceed with your article writing.

Evaluation of the search results (graded relevance scale of 0-3)

3. The clipping deals with the topic very broadly and its information content corresponds well with the task. The clipping helps well in accomplishing your task.

2. The clipping deals partially with the task or touches it. The content of the clipping helps to some extent in accomplishing your task.

1. The clipping does not deal with the actual topic but helps to find better search terms and to limit the topic somehow. It helps indirectly in accomplishing your task.

0. The clipping is wholly off topic and does not even help to formulate new queries. This clipping brings no benefit in accomplishing your task.

4. Results

Our research question was whether different quality of the optical character recognition (old versus improved new) affects the perceived usefulness of the newspaper clippings. We answer this by averaging the users' evaluation scores for all the evaluation results. On average 3.2 relevance assessments were made per clipping in the old Optical Character Recognition case, and 3.0 assessments in the case of the new improved Optical Character Recognition. Altogether, 961 and 900 assessments (correspondingly) were made in the two OCR qualities. Instead of these 1861 assessments there should have been 1920 assessments (32 users * 6 topics * 10 assessments), but evidently some users did not fully follow the instructions.

Mean averages for the evaluation scores over the whole query set for pre-formulated queries for the old OCR was 1.26 and for the new OCR 1.36. This reveals that the query results benefited from the improved optical character recognition. The mean average evaluation score for the improved OCR query results is 7.94% higher than the mean average score of the old OCR query results. The difference in the effect of Optical Character Recognition quality on the relevance judgements was statistically significant (p=0.002, Wilcoxon's signed rank test [24]), when the relevance of the individual underlying documents was judged based on two possible levels of Optical Character Recognition quality. The difference in the overall effectiveness of retrieval (measured with mean average of cumulated gain among top-10 documents in the case of 30 topics), however, was not statistically significant (p=0.10, Wilcoxon's signed rank test).

Figure 3 shows mean averages for evaluations of the individual queries in the sessions with different quality optical character recognition.

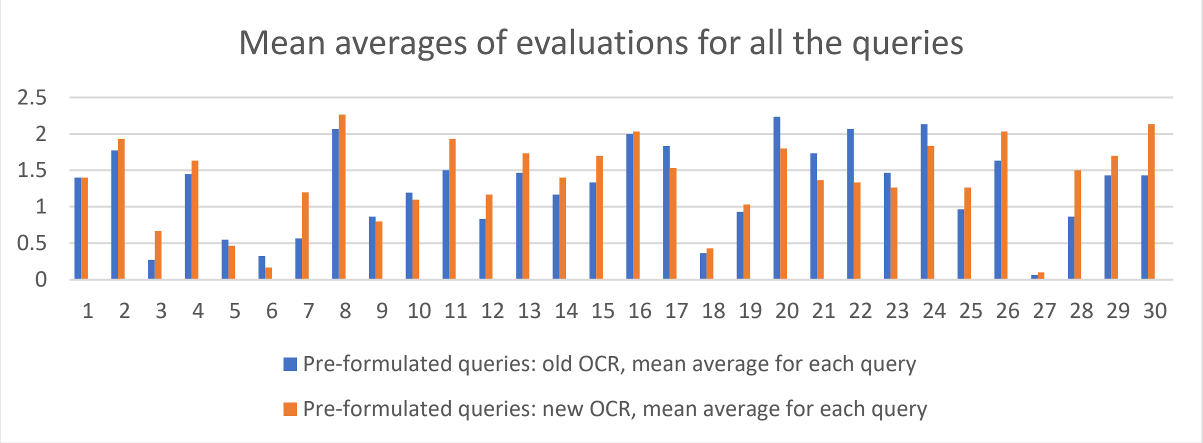


Figure 3: Mean averages of relevance scores for the top-10 clippings retrieved for all topics (N=30): graded relevance scale of 0-3 was used

Seven queries (#8, #16, #20, #22, #24, #26, and #30) got evaluations over relevance grade 2 with either OCR quality. Three queries, #3, #18, and #27, got low evaluations in both qualities. Query #6 got especially low evaluations in the new improved OCR.

Inspection of query-by-query results shows that improved OCR gains better mean evaluation scores in 19 cases out of 30. There is one tie (query #1) and 10 queries, where evaluations of old optical character recognition get better mean evaluation scores. This is depicted in detail in figure 4: the upwards pointing histograms show better mean relevance scores for improved OCR results, the downward pointing histograms show where improved OCR results have gained worse mean relevance scores.

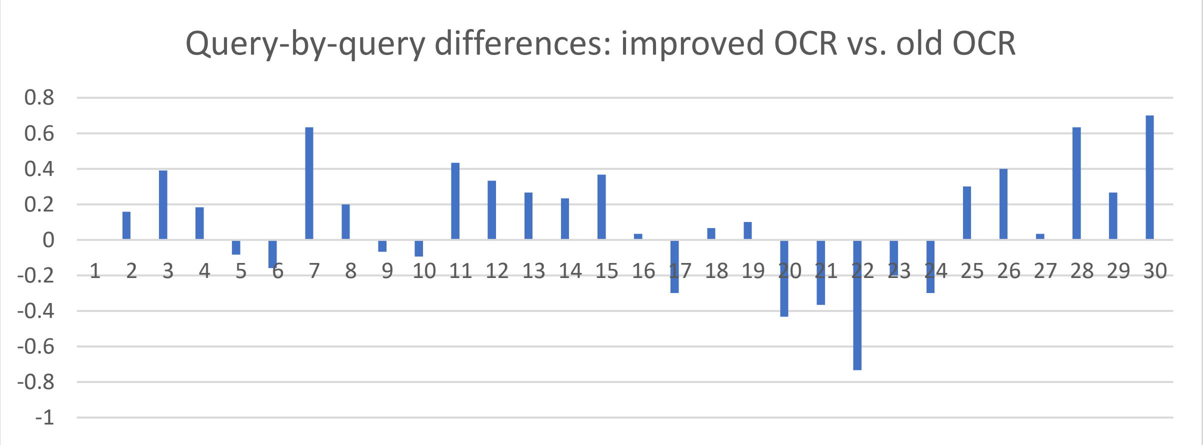


Figure 4: Query-by-query differences of relevance scores' mean averages for the top-10 clippings: graded relevance scale of 0-3 was used

Clearly over half of the query-by-query results with improved OCR were evaluated with higher mean scores than the old OCR results (19/30, 63.3%). One third of the queries got higher mean query-by-query evaluations with the old OCR. In general, the relevance level of the assessments is quite low, the mean being slightly over the lowest relevance level 1. Without closer inspection of the documents, it is not possible to deem, whether the low mean level of relevance assessments is due to the combination of OCR and clipping segmentation quality or due to other reasons.

A few notes with regards to our experiment are in order. First, our query environment implementation for the evaluation of two optically read text qualities is a first version of the system. As such it works well, but experience from user sessions showed that it has features that could be developed. We assumed that the user interface would take care of the number of queries and evaluations each user finished. However, some of the users acted against instructions and did not finish all the queries or evaluations in the sessions – the possibility of a user's premature quitting was not taken care of in the system.

Another possible development issue could be evaluation of the clippings' overall textual and segmentation quality by the users. Our article segmentation for the collection is experimental, and many of the clippings may be quite hard to read due to fuzzy boundaries: the clippings may contain text from adjacent segments, which affects evaluations. The users could also separately estimate the appropriateness of clipping boundaries, and presence of useful contents in the clipping.

5. Discussion and conclusion

To the best of our knowledge this is the first study showing empirically that the subjective relevance assessments of the test persons were affected by a change of quality of the optically read text presented to them. Earlier studies on the effects of Optical Character Recognition quality have been performed in data-oriented settings, using laboratory-style tests and artificially tampered data or they have described subjective experiences of users regarding the effects of Optical Character Recognition quality on their work.

The well-known simulated work task model used in interactive information retrieval [8] has been utilized in this study to answer the question of optical character recognition quality's effect on subjective relevance evaluation of retrieval results in a Finnish historical newspaper collection. We have shown that clear improvement in optical character recognition quality of documents leads to higher mean relevance evaluation scores in a simulated work task scenario. This means that perceived usefulness of historical newspaper clippings increases with better optical character recognition quality. The results imply that data-oriented scenarios of OCR quality effect evaluation should be augmented with more systematic user focused studies. By systemizing user-oriented studies for effects of OCR quality, new insights into the question can be achieved. Already the OCR quality has been found to have some effect on various information activities by causing extra work and some questions are raised amongst digital humanists about the reliability of research results based on the newspaper contents [7]. As we have shown, the simulated work task model offers a suitable paradigm for this kind of experiments.

Limitations of this study include our recruitment of test persons. Students and teachers of information research can be considered as experienced users of search engines, but on the other hand, they are not experts of history. Therefore, their evaluations of the resulting articles might differ from those of a group of historian users. A different group of users, be they historians or not, would evaluate results differently. However, considering the number of user tasks required in this experiment (30 topics), it was not feasible to recruit professional historians to act as test persons.

Although our results were achieved with one language, in one specific collection and with one user group, our method and model are generalizable to any language and can be evaluated with further users and different collections

Our results should be seen both in the context of the research methods necessary to apply in information retrieval and requirements of digital humanities scholars and lay users of the collections. These results bring more weight to both higher quality document need of digital humanists and efforts of improving quality of optical character recognition with new developments in software. Better quality of optically read historical documents should be strived for both for the sake of research and lay users.

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The query environment was implemented by Evident Ltd. (https://evident.fi/).

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Appendix 1. Topic creation and list of the pre-formulated queries

The topics were created using history timelines from two popular history encyclopedias: *Suomen historian pikkujättiläinen* [25] ('A small encyclopedia of Finnish history') and *Maailmanhistorian pikkujättiläinen* [26], ('A small encyclopedia of world history'). After finding suitable topics from the timelines of the encyclopedias, searches to the newspaper data base at digi.kansalliskirjasto.fi were performed to confirm that the database had enough hits related to the topic. During final creation of the query environment many original topics were abandoned, and new ones were created due to too few hits in the final article extraction database. Final topic descriptions were based on Finnish Wikipedia articles related to the topics. The topics cover the time frame of the historical collection of Uusi Suometar, beginning from 1870s and ending in 1918. First mentioned year in the topic descriptions is 1871, last 1918. Topics cover both domestic and foreign news, the share of domestic news being 21, and foreign 9. Demarcation line between foreign and domestic news is not always sharp, some topics could be classified as both. The mean length of the pre-formulated queries is 2.87 words.

ID	Query in Finnish	Rough translation
1	Bobrikoffin murha 1904	Murder of (Nikolai) Bobrikoff in 1904
2	Postimanifesti 1890	Postal manifest in 1890
3	Nuorsuomalaisen puolueen perustaminen vuonna 1894	Founding of the young Finns' party in 1894
4	Helmikuun manifesti 1899	The February manifest in 1899
5	Eduskuntavaalit 1907	Parliamentary elections in 1907
6	Hannes Kolehmainen Tukholman olympialaisissa 1912	Hannes Kolehmainen at the Stockholm Olympics in 1912
7	Maailmansodan rauha 1918	Peace of the WWI in 1918
8	Nansenin matka pohjoisnavalle	Nansen's expedition to the North Pole
9	Lokakuun vallankumous Venäjällä 1917	October revolution in Russia year 1917
10	Saksan keisarikunta 1871	The German Empire 1871
11	Norjan itsenäisyys 1905	Independence of Norway in 1905
12	Tampereen valloitus 1918	Conquest of Tampere in 1918
13	Suomen kuningas Friedrich Karl	Karl Friedrich, the King of Finland
14	Tokoin senaatti 1917	The senate of (Oskari) Tokoi
15	Tukholman olympialaiset 1912	The Olympic games of Stockholm in 1912
16	Maamieskoulu	Agricultural school
17	Laukon torpparilakko	Sharecroppers' strike in Laukko
18	Helsingin valtaus 1918	Occupation of Helsinki in 1918
19	Suomen itsenäisyys 1917	Independence of Finland in 1917
20	Espanjantauti	The Spanish flu
21	Viaporin kapina 1906	Rebellion in Viapori in 1906
22	Laulaja Aino Ackte	Singer Aino Ackte
23	Suomen laulu kuoro	The choir of Finnish song
24	Suomen Naisyhdistys	The Finnish Womens' association
25	Lontoon olympialaiset 1908	London Olympics 1908
26	Raitiotie Helsingissä	Tramway in Helsinki
27	J. L. Runebergin kuolema 1877	Death of J.L. Runeberg in 1877
28	Mannerheim valtionhoitajana 1918	(General) Mannerheim as a regent in 1918
29	Torpparilaki	The sharecropper law
30	Elinkeinovapaus 1879	Freedom of livelihood in 1879