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News in Motion: A Quantitative Analysis of Incremental News Updates by Flemish Online News Outlets

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ABSTRACT

Online news has rapidly claimed its place in the media landscape, and with it came the practice of incremental news updates being integrated in existing content. Yet, considering this fluid news production, researchers have been struggling with freezing the news flow and capturing the different article versions, implying that incremental news updates form an understudied phenomenon. Therefore, we conduct a large-scale study on the usage of online news updates by applying regular interval content capturing. Using in-house developed software, all 291,666 articles and 197,979 associated updates written by six leading Flemish news outlets in a period of two years (2019–2021) are collected. It is examined how commonly and in what ways updates are applied. Furthermore, a subset of 11,293 articles is manually analyzed to examine the reason(s) for applying updates. Results indicate that updates are commonly applied across all news outlets and topics. 35% of the articles are updated at least once and an updated article is updated 1.94 times on average. Approximately 4.2% of textual changes are made to correct objective or subjective errors, typically without any communication towards the reader. Therefore, we argue that transparency regarding news updates should be enhanced.

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Liquid news; online news; news updates; misinformation; versionality; regular interval content capture; content analysis

Introduction

Since the introduction of the internet, news websites have quickly moved from publishing “shovelware” (i.e., the pdf of the print newspaper) to dynamic production spaces where news is published around the clock and articles are updated frequently. As an example, on April 28, 2020, the Flemish public broadcaster VRT published a news article on its website (vrtnews.be) entitled: “46 killed in tanker terror attack in northern Syria”. The article was updated a first time one hour and 30 min after publication. During this update, a spelling mistake was corrected. Moreover, the order of occurrence of two words within a sentence was changed, without impacting the meaning of the sentence. A second update was performed three hours and 30 min after

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publication. Here, the number of injured people and deaths that was reported on originally (27 and 35 respectively) was updated to “more than 50” and 46. Moreover, information on the injured people was added, saying that “the condition of some of them is very bad”. Finally, the political source claiming that 35 people were killed was not mentioned anymore in the new article. None of these changes were communicated to the readers. This example of immediate and continuous updates to existing content is a perfect illustration of “incremental news updates” (Usher 2018). Although the practice of updating news is as old as the news itself, the arrival of digital technologies has revolutionized spatiality and temporality of news production, allowing for 24/7 updates without any space or time constraints. Updates no longer can be (only) published in new editions, but are integrated in existing content. The original article is replaced by the updated piece containing modifications ranging from minor corrections to further interpretation of news events, often without notifying the reader (Forde, Gutsche, and Pinto 2022; Usher 2018).

Incremental news updates have mainly been studied in the context of breaking or event-driven news, where time pressure urges newsrooms to publish new information in a timely manner, even if not all checks and balances have been set in place yet (Ekström, Ramsälv, and Westlund 2021; Usher 2018). Yet, the shifting temporalities of news production have led to a more substantial change in the product of news (Saltzis 2012). Although it has become common practice to publish drafts and modify articles afterwards, not only in breaking news but also in routine news, research systematically documenting the use of incremental news updates in everyday news reporting is almost inexistent (f.e. Karlsson 2010). Therefore, a first contribution of this paper is to study updates in everyday news reporting. This is vital, since research suggests that audiences are not tolerant towards the “publish first, verify later” strategy (Karlsson, Clerwall, and Nord 2017). As such, the credibility and legitimacy of journalism is at stake, and we need to understand to what extent and how updates are used in online news. In addition, our literature review revealed that most research is based on manually collected data and limited samples (f.e. Forde, Gutsche, and Pinto 2022; Kautsky and Widholm 2008; Widholm 2016). Other scholars have used qualitative research methods such as field observations or interviews with journalists to reconstruct online news production. They study how journalists perceive the consequences of breaking news production on practices, content, trust and credibility (f.e. Ekström, Ramsälv, and Westlund 2021; Usher 2018). Despite the importance of these studies, they also show the limitations of applying traditional social sciences research methods to capture incremental updates. This paper takes advantage of the development of automated ways for capturing online data to study larger samples. In doing so, the second contribution is to study the practice of incremental news updates in a large-scale and comprehensive sample using computational methods so that we can quantify its pervasiveness in contemporary newsrooms.

We used in-house developed software to acquire all articles published by six Flemish news outlets in a two-year period (2019–2021). 291,666 original articles were collected and automatically monitored for 24 h. In that timeframe, we also collected 197,979 updates of articles. Using the data, we investigate how many articles are updated at least once and how those articles are updated. Moreover, a subset consisting of 11,293 articles was analyzed manually to get deeper insight into the update purposes. Before

introducing our methodology and findings, we first give an overview of literature forming the theoretical backbone for our study.

Temporality in News: Balancing Immediateness and Accuracy

Journalism is often described as the first draft of history considering its focus on reporting recent events, which aligns with a heavy investment in the present in terms of “nowness” and “firstness”, rather than the past or the future (Zelizer 2021). Because of this, the news industry is often criticized for its short-sightedness and lack of interest for enduring and long-term processes (Pantti 2018). In this paper we focus on “firstness”, i.e., the emphasis on immediacy and liveness (Ekström, Ramsälv, and Westlund 2021; Usher 2018; Zelizer 2021). “Did we get it first?” is a recurring question in newsrooms worldwide. The challenge to publish the most recent information as fast as possible and before other competitors is considered key to building relations with audiences and establishing a successful enterprise (Usher 2018). New technologies have repeatedly contributed to news cycle acceleration, until the point where time boundaries seem to become meaningless (Bødker and Brügger 2018). In the 24/7 news landscape, we have arrived in a condition of almost real-time coverage with formats as liveblogs, push notifications, news alerts and breaking news (Rom and Reich 2020; Usher 2018). Usher (2014) used the term “ASAP journalism” to refer to the situation where news websites are always “on”, audiences are always present and articles are continuously updated.

The downside of journalism’s adherence to “firstness” as a central news value, is that the journalistic norms to verify facts, be accurate, and provide context more often than ever before get overruled by the pressure to be first (Berkowitz and Liu 2016; Brautović, Maštrapa, and John 2020; Karlsson, 2011; Kovach and Rosenstiel 2010; Widholm 2016; Zelizer 2021). When extreme time pressure and continuous deadlines are present, fundamental questions are raised about journalism’s capacity to fulfill its role in democratic societies as a supplier of reliable information (Rom and Reich 2020). The “around-the-clock” news cycle has led to changes in decision and production processes and eventually in an increase of inaccurate or incomplete information in news reports (Usher 2018). News flashes in Israeli news sites contained significantly more errors during crisis, when 8% of the sentences contained at least one error, compared to 4% in routine flashes, and 1%–2% in regular online items (Rom and Reich 2020). Media have lost their monopoly and risk to become irrelevant if they no longer live up to their own quality standards. In the “post-truth society”, the legitimacy of traditional authorities including news media has received more scrutiny and criticism than ever, and errors have never been more visible to and exposed by audiences (Berkowitz and Liu 2016; Rom and Reich 2020). By publishing inaccurate information, news organizations risk to blow up the relationship with their audiences, which is built on credibility and trust in media’s capacity to provide relevant and reliable information (Brautović, Maštrapa, and John 2020). Indeed, research shows that news consumers’ level of trust in media correlates negatively with error perceptions of these media (Wilner et al. 2022).

Yet, in the digital news landscape, newsrooms have the advantage that errors and inaccuracies can be corrected easily and straight into the original news piece. Whereas rectifications are not a new practice, journalists in the analogue age knew they needed to get their story right before publication. On offline platforms, news is a static product that

needs to be produced within strict deadlines (Fass and Main 2014; Widholm 2016). If any corrections or updates are needed, they should be published in a follow-up story in the news outlet's next edition. In contrast, online news production is characterized by accumulation (Fass and Main 2014), referring to the fact that "compared to the printed newspaper, which was a distinct issue physically separated from the previous day, online newssites are rather to be seen as continuous and overlapping issues" (Bødker and Brügger 2018, 59). As such, digital news production has turned news into a more "fluid" or "liquid" product that can be updated more rapidly and continuously (Bødker and Brügger 2018; Karlsson and Strömbäck 2010; Widholm 2016). Content can be published first and checked for accuracy later. If needed, "incremental news updates" can be made to the original report, which usually disappears as it is replaced by the modified report (Usher 2018). Many online reports today are published as an incomplete "draft". Accuracy is hereby still considered to be a crucial professional norm but one that needs to be reached in a processual approach (Widholm 2016). Nonetheless, as Karlsson and Strömbäck (2010) notice, an important ethical concern can be raised as many news consumers might only read a draft and remain unaware of subsequent versions. In their explorative study, they found that as a selected story unfolded throughout the day, the reporting after consecutive updates became less dramatic, increased in volume as details and sources were added and removed, but it also fell down in prominence on the front page before eventually disappearing. Karlsson, Clerwall, and Nord (2017, 10) point to another important risk of the "publish first-check later" strategy, as their survey of Swedish citizens shows that corrections of small errors are acceptable for the majority of respondents, but corrections of large errors are not. They conclude that "our respondents put great demands on journalists and their performance before news is published". Yet, despite these legitimate concerns, we currently have little evidence of the pervasiveness of incremental news updates in newsrooms, as we will outline in the next section.

The Challenge to Monitor Incremental News Updates

Although online updates have been around for more than two decades, they have long time been understudied, mainly because traditional research methods did not suffice (Karlsson and Strömbäck 2010). The first endeavors were mainly methodological, in trying to develop new methods that allow to capture the continuously changing nature of online news (f.e. Karlsson 2012; Karlsson and Strömbäck 2010; Kautsky and Widholm 2008; Widholm 2016). The resulting approach is to collect a series of screenshots or pdfs to monitor changes in articles or front pages in which each update is considered a unit of analysis (Kautsky and Widholm 2008; Widholm 2016). Kautsky and Widholm (2008, 88) summarize this brilliantly by comparing the online news flow to "an endless meat-loaf of content slowly coming out of the ovens of journalist production on the conveyor-belt of the Internet". Hereby, the saved PDF files are "the slices of meat-loaf that are put on a plate in front of the researcher". The first explorative efforts were based on manual data collection and therefore limited samples, but the amount of studies and sample sizes have started to expand after the introduction of automated ways for capturing online data. Notable in this regard is the NewsDiffs project (Price and Sullivan 2013). During that project, code was written to automatically collect and present incremental news

updates applied to articles written by prominent British and American news outlets. By subsequently analyzing 28,000 collected New York Times articles, it was observed that 44% of the articles was changed at least once and 9% had official corrections. Despite the value of their approach, several challenges remained (f.e. the need for tools to discover interesting changes). A similar programmatic approach for the collection of incremental news updates was suggested by Zamith (2017). However, the contribution of this paper was purely methodological. Both studies form the methodological backbone of our study.

Incremental news updates have been studied mainly in the context of breaking and other event-driven news (f.e. Ekström, Ramsälv, and Westlund 2021; Kautsky and Widholm 2008; Saltzis 2012; Usher 2018), where pressures to get the news out as it happens are maximized (Usher 2018). Additionally, in contrast to routine news coverage, journalists are more confronted with uncertainty when covering unfolding events, thus running a higher risk of reporting facts that later turn out to be untrue. Finally, breaking news is typically presented as important, whereas in many cases the news value is downgraded in follow-up stories or updates (Ekström, Ramsälv, and Westlund 2021). For example, Usher (2018) studied four US metropolitan newspapers who have specialized in breaking news and news updates in an attempt to increase traffic and retain audiences' attention. Their field observations and interviews revealed that as a consequence of this pursuit, many events receive a breaking news status, which would not be the case in offline news, and many journalists too doubt the usefulness of providing constant incremental updates.

It is important to distinguish between different types of updates. The most rudimentary cases are when newsrooms publish short notifications (especially in the case of breaking news) followed by the announcement that more information will follow. This type is very important from a commercial point of view in trying to stay ahead of competitors (Ekström, Ramsälv, and Westlund 2021; Usher 2018). But updates can also be used to make reports more accurate (Saltzis 2012), which is more important from the perspective of democratic news provision and trust in news. More specifically, stories can be modified to correct factual or objective errors, but news events might also be interpreted differently over time which indicates ideological changes or subjective errors (Karlsson, Clerwall, and Nord 2017; Timmerman and Bronselaer, 2022). When news updates are used to correct mistakes and increase accuracy, they provide a form of accountability as “they allow news organizations to demonstrate their acknowledgement of a gaffe—showing that they are, in other words, accountable for their mistakes” (Joseph 2011, 706–707). Karlsson (2012) operationalized inaccuracy in news updates as the manifestation of contradicting statements in terms of the key journalistic questions (what, who, how, when, where and why) in different article versions. He monitored 15 stories in four Swedish news sites and found that most articles had accuracy problems. Journalists can also use “ideological corrections” to change the explanation and meaning that is given to facts. In the case of protests in Portland in July 2020 for example, the journalists' description of the role of law enforcement shifted from “virtuous” to “violent” and vice versa for the protesters (Forde, Gutsche, and Pinto 2022). As Karlsson et al. mention, the fact that all content provided by news outlets actually remains in the organization's database makes it very easy for media to represent themselves as accountable by correcting their mistakes (Karlsson, Clerwall, and Nord 2017, 150).

A traditional question is to what extent and how news organizations display *disclosure transparency*, i.e., “the idea of openness regarding the production of news and the

professional standards of media organizations” (Karlsson 2010, 537–538). Newspapers tend to publish corrections in such a way that they would receive similar prominence and attention as the story in error, for example on the same page in the next edition, or in a dedicated section where several corrections are grouped together (Appelman and Hettinga 2021; Maier 2002). Online, news fluidity provides additional options, as can be seen in the fact that journalists sometimes append the erroneous story: the mistake is corrected in the body of the text, and a note is added at the end indicating the correction (Appelman and Hettinga 2021; Thornburg 2010). A second option is to erase the error in the original story without noting the change (Cornish 2010; Silverman 2007; Thornburg 2010). Unfortunately, research shows that in most cases, news organizations do not inform readers when fundamental changes are made, implying that they are hiding the fact that a mistake has been made, a practice known as “scrubbing” (Forde, Gutsche, and Pinto 2022; Karlsson 2012; Silverman 2007). For example, an online story on court proceedings published by BBC on May 2, 2012 was altered significantly afterwards. Other than a short indication at the top of the screen that the article had been updated, it did not specify what changes were made by whom or why, even though over 65% of the article had been rewritten (Fass and Main 2014).

Despite the importance of these studies, there is a strong need for more research, performed on larger datasets, to understand not only what types of incremental news updates, including corrections, appear in online news, but also to what extent they have penetrated the news production process. We aim to contribute to this emerging research field by using in-house developed software acquiring data from six Flemish news outlets to construct a large-scale dataset. The acquired data provide a full image on the updates that were applied to online news articles by six Flemish news outlets in the period of April 2019–March 2021. A subset of article updates was subject to a manual content analysis to get deeper insight into the update purposes. We hereby specifically focus on the purposes of the updates performed during *regular news periods*. These are defined as periods during which the number of articles published by news outlets is close to the average for those outlets and news reporting is not dominated by one specific topic. In contrast to this, we distinguish *periods determined by event-driven news* when large amounts of articles (and updates) are devoted to one or several major events.

In summary, we aim to answer the following explorative research questions:

RQ1. How many articles are updated after initial publication?

RQ2. How are articles updated after initial publication?

RQ2a. How many updates do articles receive after initial publication?

RQ2b. How many characters are added/removed?

RQ2c. Which types of news updates are published during regular news periods?

Methodology

In this section, we explain how the data were collected and how a data subset was manually coded. It should thereby be noted that the methodology has already been reported on extensively in an earlier publication (Author, 2022). As such, in this section,

only those methodological choices that are directly relevant for the current study are detailed out.

Our research is situated in Belgium, a federal country in Western-Europe which is divided in two political and media systems organized around the two main language communities: Flanders, the Dutch-speaking part of the country, and Wallonia, the French-speaking part. The study includes the main news outlets in Flanders, which is considered a democratic-corporatist region (Hallin and Mancini 2004). News media are highly consumed in Flanders, with 88% of the people following the news on a daily basis. People mainly consult the news on television and radio (especially the older population) and online (especially the young population) (De Marez et al. 2023). Flemish journalism is characterized by a high degree of professionalism, with journalists indicating to value the distribution of trustworthy information as their most important role (Van Leuven et al., 2019). As such, although the findings of our study are not generalizable to other countries or regions, Flanders provides a good case study to investigate how online news is produced and consumed in Western-Europe.

Data Collection

A large dataset of online news articles and associated updates was collected. Our approach follows the principles of Regular Interval Content Capture (Kautsky and Widholm 2008). Here, URLs containing an article are repetitively visited over time. Subsequent snapshots of the same article are obtained in this way, thereby detecting updates that were performed in the meantime. Data were collected in a fully automated way and, hence, on a large scale. Our custom-made software regularly visited articles published by six Flemish news websites (VRT,¹ Knack,² Het Laatste Nieuws,³ Het Nieuwsblad,⁴ De Morgen⁵ and De Standaard⁶). VRT is the Flemish public broadcaster, Het Laatste Nieuws and Het Nieuwsblad are popular/tabloid news outlets and Knack, De Morgen and De Standaard are quality/broadsheet outlets. All of them are amongst the most visited Flemish news websites (Newman et al. 2022). Software was implemented such that, for each news outlet, all newly published articles were detected (so not only those on the front page as in Widholm 2016). For each article, the textual content was downloaded with the associated publication time and topic. Only freely accessible articles were collected.

Having acquired the textual content of a newly published article, the article was revisited automatically every 15 min. Each time, the content of the article was compared with the content of the previous version. If differences existed, the article was downloaded again and a new “version” of the same “article” was added, together with the timestamp at which this updated version was first encountered. Each article was monitored for the first 24 h after publication. Indeed, Saltzis (2012) found that the updating period of online articles almost never exceeds 24 h. If coverage of an event continues for more than one day, separate follow-up reports are written, rather than further incrementally updating the original article. Moreover, our own data support this choice as well: a majority of articles (62%) is finalized within the first four hours after publication. Around 7% of the articles is updated more than 16 h after publication. As such, although probably some articles were updated after more than 24 h, we feel confident that most updates were detected.

All articles were stored in a database, together with a corresponding topic. This topic was determined based on the information provided by the news outlets and belonged to an overarching, self-composed set of 15 topics. Finally, the number of characters involved in each update was calculated with the help of custom-made text comparison software. The software compared, for each update, the original and new article version and determined the number of added and deleted characters. Hereby, the number of characters was counted on the level of individual words. If, for example, the misspelled word “persin” was corrected to “person”, both the number of added and removed characters were considered to be six. The total number of added/removed characters was divided by the original article length to obtain normalized measures.

Data collection started on April 1, 2019 and ended on March 31, 2021. All liveblogs were deleted from the database because they might distort the findings. Liveblogs are used to report on events while they are happening. As such, it is part of their nature to be updated very frequently (O’Mahony 2014), whereas we are interested in unanticipated modifications to regular articles. After removing all liveblogs, the database eventually consisted of 197,979 updates belonging to 291,666 articles. The acquired data provide a full image on the updates that were applied to online news articles by six Flemish news outlets in the period of April 2019–March 2021. An overview of the number of collected articles for each news outlet and topic is given in [Table A1](#) of Appendix A.

Considering the explorative nature of our research, we used Kruskal–Wallis tests to check for potential differences between news outlets and topics (Kruskal and Wallis 1952). Adherence of the data to the test assumptions was verified beforehand. Effect sizes were calculated as proposed by Kelley (1935) and were categorized using a rule of thumb (Peter Statistics 2023). Finally, post-hoc tests were performed using Dunn’s procedure (1964) with Bonferroni correction for multiple comparisons.

Coding a Subset of the Data

To answer research question 2c, a representative subset of 7546 updates belonging to 11,293 articles, evenly distributed across the two-year period, was submitted to a quantitative content analysis. As the main focus in this paper lies on the types of changes performed during regular news periods, we decided to refrain from random sampling. Only articles written during *regular* news periods were selected (i.e., periods during which no major events happened and, hence, a regular amount and diverse sample of articles was produced). These periods were chosen by finding, for every two consecutive two months in the two year period, the two consecutive days for which the total number of published articles (and updates) was closest to the average across the entire dataset. This choice is motivated by the fact that we suspected that a difference would exist between the share of error corrections applied during regular and during event-driven news periods.

Content analysis consisted of manually analyzing the changes that were made when updating news articles. Each change was coded with its corresponding type. Based on the literature review and our own work (Author, 2022), change types that were distinguished consisted of corrections of objective, subjective and linguistic errors, as well as a number of change types that do not involve error corrections: additions or clarifications of information, deletions of information, updates of old information, content-neutral

reformulations, displacements of information, or changes that do not fit in one of these categories. Precise change type descriptions are given in Appendix B.

An important share of changes (i.e., 33%) was coded automatically. This was done for updates during which only one change was made in which a large amount of text was added. Consequently, these changes were classified as *additions or clarifications of information*. All other changes were coded manually by the first author of this paper by making use of an in-house developed online platform. The choice to perform the coding process with a single coder was motivated by the complexity of the coding task. Experimental coding rounds with voluntary coders that were not a member of the research team resulted only in moderate inter-annotator agreement. This was mainly caused by wrong understanding and application of change type definitions. Therefore, it was decided to involve only one, well-trained coder in the final coding process. The reliability of this single-rater coding process was evaluated by calculating the intra-rater reliability using Fleiss' kappa (Fleiss 1971). To this end, a subset of 1,100 changes (i.e., 5% of the changes) was coded again by the same coder more than one year after the initial coding process had finished. Fleiss' kappa was preferred over existing alternatives because it performs well for nominal and non-missing data and because it has been used in other journalism studies (Watanabe 2018; Zapf et al. 2016). The result indicated a very strong agreement ($\kappa = .900$ (95% CI, .870 to .930), $p < .0005$), thereby providing strong evidence for the reliability of the coding process.

Results

RQ1: How many articles are updated after initial publication?

In total, 101,994 or 35% of the 291,666 articles were updated at least once in the 24 h following initial publication. Fractions were calculated for each news outlet and topic separately (see Tables 1 and 2). Results illustrate that the updating practice is adopted widely by all outlets and for all topics. Updating articles is clearly a common practice in Flemish online news.

The percentage of updated articles varies significantly between news outlets, ranging from 20% (Knack) to 60% (VRT). All pairwise differences are significant (see Table C1 in

Table 1. Number of articles, number and percentage of articles that were updated at least once in the 24 h following initial publication, total number of updates registered for these articles, average number of updates per **updated** article and average number of updates per **published** article for each news outlet. Median updating fractions were significantly different between news outlets, $\chi^2(5) = 19264.995$, $p = .000$, $\epsilon^2 = 0.07$. Median number of updates per updated article were significantly different between news outlets, $\chi^2(5) = 5397.733$, $p = .000$, $\epsilon^2 = 0.05$.

News outlet	Articles (n)	Updated articles (n)	Updated articles (%)	Updates (n)	Avg. updates per updated article	Avg. updates per published article
VRT	44,129	26,477	60.00	66,644	2.52	1.51
De Standaard	30,640	13,074	42.67	26,240	2.01	0.86
HLN	97,244	33,040	33.98	55,895	1.69	0.57
De Morgen	20,335	6,381	31.38	12,205	1.91	0.60
Het Nieuwsblad	83,152	19,703	23.70	30,755	1.56	0.37
Knack	16,166	3,319	20.53	6,240	1.88	0.39
Total	291,666	101,994	34.97	197,979	1.95	0.68

Table 2. Number of articles, number and percentage of articles that were updated at least once in the 24 h following initial publication, total number of updates registered for these articles, average number of updates per updated article and average number of updates per published article for each topic. Median updating fractions were significantly different between topics, $\chi^2(14) = 3625.555$, $p = .000$, $\epsilon^2 = 0.01$. Median number of updates per updated article were significantly different between topics, $\chi^2(14) = 2383.294$, $p = .000$, $\epsilon^2 = 0.02$.

Topic	Articles (n)	Updated articles (n)	Updated articles (%)	Updates (n)	Avg. updates per updated article	Avg. updates per published article
Factchecking & analysis	1739	1083	62.28	2732	2.52	1.57
Tips & tricks	181	102	56.35	145	1.42	0.80
Weather forecast	975	397	40.72	894	2.25	0.92
Domestic news	61,225	24,851	40.59	54,710	2.20	0.89
Economy	11,903	4312	36.23	7806	1.81	0.66
Local news	15,239	5516	36.20	10,508	1.91	0.69
Science	7343	2638	35.93	5059	1.92	0.69
Sports	80,184	28,285	35.28	50,233	1.78	0.63
International news	61,024	21,264	34.85	45,622	2.15	0.75
Video & podcast	631	190	30.11	281	1.48	0.45
Tech	3440	998	29.01	1537	1.54	0.45
Showbizz	32,153	8925	27.76	14,013	1.57	0.44
Lifestyle	11,215	2725	24.30	3582	1.31	0.32
Miscellaneous	2508	539	21.49	643	1.19	0.26
Car	1906	169	8.87	214	1.27	0.11

Appendix C). The largest effects are observed when comparing VRT to the other outlets: the fraction of updated articles is significantly larger for VRT. Pairwise comparisons were also performed to assess significance of differences between topics (Table C2 of Appendix C). Most topics have around 25% to 40% of their articles updated. Three topics stand out in comparison to the global average: car (only 9%), factchecking and analysis (62%) and tips and tricks articles (56%). These results should be interpreted carefully however. Considering the low number of articles for these topics, the distribution of the number of articles per outlet clearly deviates from the general distribution (see Table A1 in Appendix A). For example, more than 70% of the factchecking and analysis articles are written by VRT (in comparison to 15% for the entire dataset). As such, the high updating percentage for factchecking and analysis articles may be explained by the news outlets instead of the topic itself.

RQ2a: How many updates do articles receive after initial publication?

The 102,460 articles that were updated at least once were updated 198,781 times in total. Each updated article is thus updated 1.94 times on average. Figure 1 shows that most articles ($\pm 80\%$) are updated only once or twice. However, around 7% of the articles are updated at least five times.

Table 1 shows the numbers for each outlet separately. The average number of updates per updated article ranges from 1.56 for Het Nieuwsblad to 2.52 for VRT. Pairwise comparisons (see Table C2 in Appendix C) indicate that all differences are significant, obtaining the highest effect sizes for VRT. Not only does the public broadcaster update the largest fraction of articles, it also performs the largest number of updates per updated article. Table 2 depicts the obtained numbers for each topic separately. Pairwise

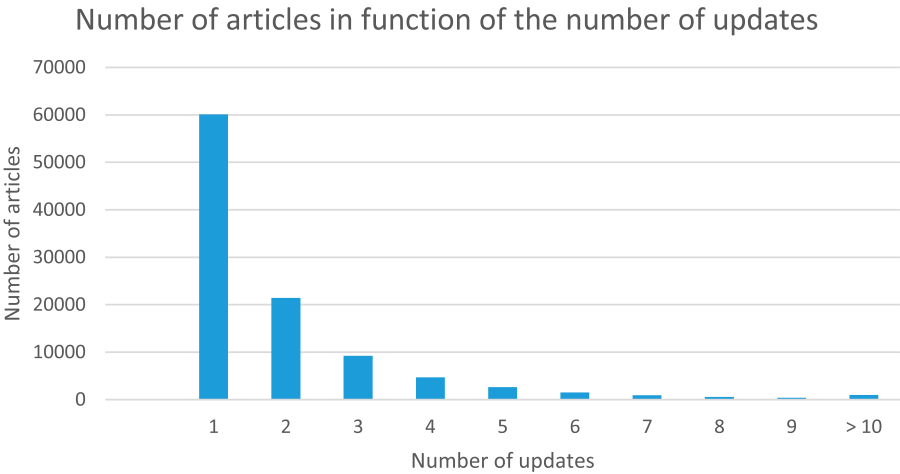


Figure 1. Number of articles in terms of the numbers of updates that have been performed.

comparisons (given in [Table C7](#) of Appendix C) show that most differences between topics are significant. Factchecking and analysis, domestic news and international news articles are updated frequently. On the contrary, lifestyle, car and articles on miscellaneous topics receive relatively few updates.

RQ2b: How many characters are added/removed?

Figure 2 depicts the number of updates in terms of the fraction of added/removed characters (relatively to the original article length). Most updates affect a limited amount of characters. More than 75% of the updates removes less than 5% of the

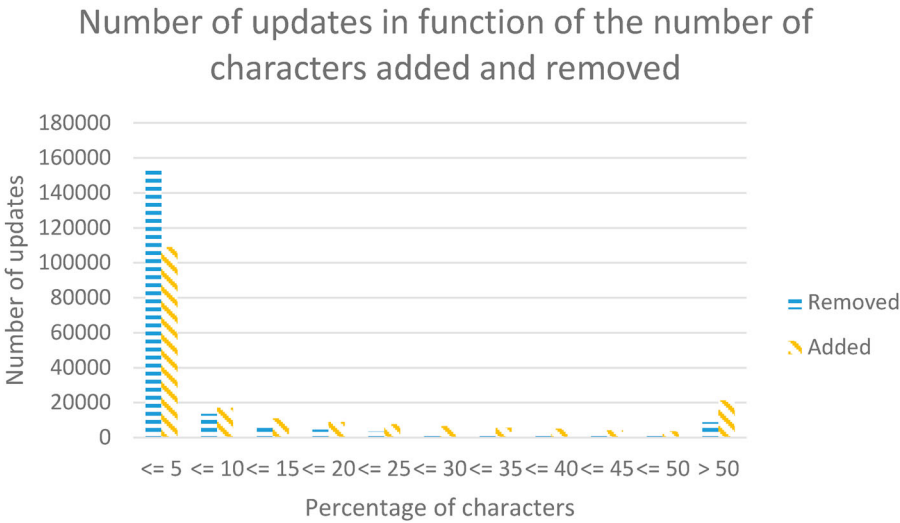


Figure 2. Graph depicting the number of article updates in terms of the percentage of added and removed characters during the update.

article. For additions, this is 55%. As such, additions as well typically involve only a limited amount of characters. However, a non-negligible share of updates involves the addition/removal of large amounts of text. Almost 5% of the updates deletes more than 50% of the article, and more than 10% of the updates adds more than 50% text on top of the previous draft. It is clear that a subgroup of updates that almost entirely rewrite the original article exists.

Notable in this context are the articles that initially contain almost no information, the so-called “news flashes”. These are used to report on breaking news (Ekström, Ramsälv, and Westlund 2021; Usher 2018). In our study, we operationalize news flashes as the subset of articles initially containing a title, possibly an introductory text and, apart from that, a text body that consists of 30 characters at most. This threshold was chosen to include articles that initially contain only a few words like “More information coming soon” or “This article will be updated”. This group encompasses 2574 articles (i.e., 0.9% of all articles). The relative share of news flashes ranges from 0.4% for Knack and Het Laatste Nieuws to 2.0% for VRT NWS. 2249 of these articles (i.e., 87% of the initially very short articles) are updated at least once, where the update involved at least 50% of the original text length being added and/or removed. In other words, these articles do not contain much information other than that “something is happening”. Subsequently, entire paragraphs are added/rewritten as new information comes in. Our data thus shows that the emphasis on immediacy, liveness and “firstness” (Ekström, Ramsälv, and Westlund 2021; Usher 2018; Zelizer 2021) results in a high usage of news flashes by Flemish outlets.

The average update deletes 7% of the original text, while on average 16% extra text is added. Typically, an update thus adds more text than it removes. Table 3 contains numbers for each news outlet separately. Several significant differences exist (see Tables C3 and C4 of Appendix C), especially between VRT (3.65% and 9.75%) and the other outlets (percentages in the range of 7%–13% and 15%–21% respectively). Interestingly, VRT performs more updates, generally involving fewer characters. On the contrary, Het Nieuwsblad and Knack perform a limited number of updates, typically involving a larger text portion.

Table 4 contains percentages for the topics. Most differences are significant (see Table C8 and C9 of Appendix C), though effect sizes are typically not strong. Sports and weather forecast articles stand out in comparison to the global average. Sports articles often start reporting the moment the event ends. As such, their content is typically

Table 3. Average fraction of characters that are added and removed in a single news update for each news outlet. Median fractions of added characters were significantly different between news outlets, $\chi^2(5) = 11659.093$, $p = .000$, $\epsilon^2 = 0.06$. Median fractions of removed characters were significantly different between news outlets, $\chi^2(5) = 10714.106$, $p = .000$, $\epsilon^2 = 0.07$.

News outlet	Average percentage of added characters (%)	Average percentage of removed characters (%)
De Morgen	21.06	12.57
Het Nieuwsblad	21.32	10.29
Knack	20.94	7.89
HLN	18.14	8.19
De Standaard	15.17	7.53
VRT	9.75	3.65
Total	15.69	7.72

limited at first, but a lot of information is added afterwards. The results for weather forecasts are intuitive as well, since these are frequently updated when new forecasts are available.

RQ2c: Which types of news updates are published?

Update purposes were investigated by making use of the coded data subset. Table 5 gives an overview of the prevalence of the change types. Almost half of the changes made during updates on articles written during regular news periods is devoted to the addition, removal or updating of information without error correction. Another 30% do not change information present in the article, but rephrase sentences or move information to another position. Finally, 22% of the changes corrects errors. Most of the corrected errors are linguistic (81%). However, in the 11,293 investigated articles, a total of 930 objective and subjective errors were corrected. This adds up to 4.2% of all inspected changes. As such, 5.4% of the articles that were manually analyzed are (objectively or subjectively) corrected at least once after initial publication. It thus seems that updates are extensively used for the correction of erroneous information.

Examples of encountered objective errors include wrong numbers, names or dates, claiming that an underaged girl was raped while she was an adult, or claiming that a person was imprisoned for poaching while he was sentenced to perform forced labor. Examples of subjective errors include exaggeration (f.e. using the word “always” instead of “often”/“sometimes”), formulating unconfirmed news in a very certain way (indicating a lack of epistemic caution, f.e. using the word “is” instead of “could be”, see Rom and Reich 2020), or failing to report essential information (f.e. reporting on a new law and not mentioning that it will only be introduced next year).

Updates may also *introduce* errors. For example, when large parts of an article are rewritten, often linguistic errors are made. These are subsequently corrected during a next update. Similarly, “updates of old information” may lead to factual inconsistencies.

Table 4. Average fraction of characters that are added and removed in a single news update for each topic. Median fractions of added characters were significantly between topics, $\chi^2(14) = 9064.991$, $p = .000$, $\epsilon^2 = 0.05$. Median fractions of removed characters were also significantly between topics, $\chi^2(14) = 4150.513$, $p = .000$, $\epsilon^2 = 0.03$.

Topic	Average percentage of added characters (%)	Average percentage of removed characters (%)
Weather forecast	18.52	12.65
Sports	21.97	8.40
International news	15.75	8.08
Local news	14.81	8.68
Economy	14.85	6.30
Domestic news	13.88	6.36
Science	11.07	6.17
Video & podcast	10.16	7.63
Tech	10.38	5.94
Car	11.22	4.56
Showbizz	9.01	4.22
Miscellaneous	6.92	5.56
Lifestyle	6.22	4.10
Tips & tricks	3.17	1.94
Factchecking & analysis	1.44	1.06

Table 5. Percentage of changes for each change type. Basic change types are grouped in three encompassing categories: content-changing changes, content-neutral changes and errors (indicated in bold).

Change type	Number of changes	Percentage of changes (%)
Content-changing changes	9747	44.30
Addition or clarification of information	7014	31.88
Deletion of information	1701	7.73
Update of old information	1032	4.69
Content-neutral changes	6606	30.02
Content-neutral reformulation	6168	28.03
Displacement of information	438	1.99
Errors	4988	22.67
Correction of a linguistic error	4058	18.44
Correction of an objective error	575	2.61
Correction of a subjective error	355	1.61
Other	661	3.05

Several examples were found in which a given number was updated (f.e. the number of casualties in an accident) at one place in the article, but not throughout the remainder of the article. Although inconsistencies are typically removed afterwards, they may confuse readers consulting the article in the meantime.

Content-changing changes mainly encompass additions of information. These often include the addition of only a few words (f.e. adding a year of birth) or only a few sentences (f.e. adding a source for a claim). However, some changes add large amounts of text, especially when an event has just happened and new information is added as it comes in (cf. *supra*: news flashes).

The opposite change type (information deletion) encompasses opposite actions. As an example, detailed information (f.e. a birth year) may be removed for often unclear reasons. Another common scenario is when sources that confirm the facts that are reported on in the original article (when uncertainty concerning the story is present) are removed in subsequent versions when journalists become more certain. The use of sources in early drafts under circumstances of high uncertainty was identified as a “semiotic disclaimer” in a study by Rom and Reich (2020).

An overview of the prevalence of change types for different outlets and topics is given in Tables 6 and 7. Statistical results indicate that, both for objective and subjective error corrections, no practically important differences exist between outlets or topics. Regarding the other change types it seems that, while VRT and De Standaard exhibit a larger share of changes that only include a small number of characters (f.e. corrections of linguistic errors), Het Nieuwsblad and Knack have a tendency to apply more changes that include larger portions of text (f.e. additions).

In a more qualitative assessment, our data confirms previous literature in showing that most error corrections are applied silently, indicating a lack of disclosure transparency (Karlsson 2010). While all investigated outlets do mention the time at which the last update was performed, they do not provide any information on the number of and the reason for the updates. Both VRT and De Standaard keep up a dedicated “corrections and clarifications” page. However, these pages (1) discuss only a small minority of corrections and (2) focus on mistakes made during television or radio broadcasts (VRT) or in printed articles (De Standaard).

Table 6. Overview of the percentage of changes belonging to the different types for each news outlet. Median percentages of the prevalence of objective error corrections were significantly different between news outlets, $\chi^2(5) = 24.006$, $p = < .001$, $\epsilon^2 = 0.00$. Median percentages of the prevalence of subjective error corrections were not significantly different between news outlets, $\chi^2(5) = 5.939$, $p = .312$.

News outlet	Correction of an objective error (%)	Correction of a subjective error (%)	Correction of a linguistic error (%)	Addition or clarification of information (%)	Deletion of information (%)	Update of old information (%)	Content-neutral reformulation (%)	Displacement of information (%)	Other (%)
VRT	3.37	1.62	28.28	28.72	5.57	3.58	25.95	1.24	1.68
HLN	2.31	1.86	12.60	36.63	8.17	4.79	28.09	2.44	3.60
De Standaard	2.69	1.43	21.31	25.83	7.98	4.09	32.31	2.13	2.49
Het Nieuwsblad	2.35	1.45	15.42	32.16	8.72	5.88	28.66	2.03	3.85
De Morgen	1.80	1.47	9.47	32.60	10.60	8.27	28.93	2.13	5.07
Knack	1.71	0.93	9.61	42.79	9.30	3.41	27.29	2.48	2.79

Table 7. Overview of the percentage of changes belonging to the different types for each topic. Median percentages of the prevalence of objective error corrections were not significantly different between topics, $\chi^2(14) = 15.750$, $p = .399$. Median percentages of the prevalence of subjective error corrections were significantly different between topics, $\chi^2(14) = 31.388$, $p = 0.008$, $\epsilon^2 = 0.00$.

News outlet	Correction of an objective error (%)	Correction of a subjective error (%)	Correction of a linguistic error (%)	Addition or clarification of information (%)	Deletion of information (%)	Update of old information (%)	Content-neutral reformulation (%)	Displacement of information (%)	Other (%)
Lifestyle	4.04	1.90	19.71	25.42	1.66	1.66	37.53	0.24	7.84
Economy	4.01	1.45	13.15	37.90	3.46	2.56	30.21	1.78	5.46
Domestic news	2.71	2.06	17.83	38.44	2.54	4.36	28.28	1.28	2.50
Tech	2.60	2.08	19.27	23.96	2.08	3.65	38.54	1.56	6.25
Showbizz	2.48	2.12	26.44	25.20	2.78	1.02	36.23	0.66	3.07
Sports	3.36	1.18	16.86	42.38	2.58	5.70	23.59	1.18	3.16
Car	4.35	0.00	17.39	34.78	0.00	0.00	23.18	0.91	2.27
International news	2.65	1.46	16.27	37.58	3.18	7.25	27.89	1.31	2.42
Science	2.65	1.39	20.06	33.70	1.53	6.96	30.50	1.39	1.81
Local news	2.99	0.86	19.25	33.26	3.96	7.27	28.34	1.39	2.67
Factchecking & analysis	1.36	2.27	55.00	14.55	0.45	0.00	23.18	0.91	2.27
Weather forecast	0.00	1.82	14.55	21.82	1.82	18.18	40.00	3.64	0.00
Video & podcast	0.00	0.00	50.00	20.00	0.00	0.00	10.00	10.00	10.00
Tips & tricks	0.00	0.00	31.91	4.26	0.00	0.00	63.83	0.00	0.00
Miscellaneous	0.00	0.00	28.57	17.86	1.79	0.00	42.86	0.00	8.93

Discussion

In this paper, we examined the usage of news updates by using a large-scale dataset consisting of articles written by six Flemish news websites in the period April 2019–March 2021. Results demonstrate that incrementally updating online news has become common practice in Flanders. More than one in three articles receive at least one update, and many articles are updated multiple times. As such, our study confirms the custom implementation of updating practices in Flemish newsrooms, and carries a strong argument to support the assumption of online news liquidity (Bødker and Brügger 2018; Fass and Main 2014; Karlsson and Strömbäck 2010; Widholm 2016). It also shows that updates are used both for commercial reasons (i.e., with short news flashes to try to stay ahead of competitors) (Ekström, Ramsälv, and Westlund 2021; Usher 2018) and to make everyday news reporting more accurate (Saltzis 2012). In comparison to the updating percentage obtained during the NewsDiff project (Price and Sullivan 2013), the fraction observed during our analysis is slightly smaller (i.e., 35% in comparison to 44%). However, this difference should be interpreted cautiously. Firstly, the characteristics of the dataset on which the NewsDiff analysis was performed, are unclear (f.e. to which extent were liveblogs included?). Secondly, their analysis included only one outlet (The New York Times), while we have illustrated that significant differences in updating patterns exist between outlets, ranging from 20% to 60% of an outlet's news items being incrementally updated.

With regards to the observed differences in updating strategies between news outlets, it stands out that the public broadcaster updates a significantly larger portion of articles in comparison to its commercial competitors. This might indicate that it is too careless and uploads articles that are incomplete or need to be rectified. This seems to contradict with its public service function and demands of high-quality news in exchange for public subsidies. Yet, from a media accountability perspective (Karlsson, Clerwall, and Nord 2017), it might also suggest that the public broadcaster more thoroughly monitors the content and quality of articles. On the other end of the spectrum, i.e., the news outlets conducting relatively few updates (Het Nieuwsblad and Knack), the reverse question should be posed: are articles published by these outlets typically already complete and correct at initial publication time, or do they monitor less thoroughly once articles are published? Additionally, whereas the public broadcaster (and to a lesser extent De Standaard) publishes many short updates, the other newspapers update their articles less frequently but with more substantial changes. This all suggests news outlets have developed different updating routines. Further, probably qualitative, research with online news editors could help us to better understand whether newsrooms have already developed formal or informal rules for incremental updates and what the motivations behind these practices are.

Differences in updating practices also exist between topics, although these differences are generally smaller than between outlets. They should be interpreted carefully, since they are impacted by the underlying outlet distribution for some less-prevailing topics. Nonetheless, results indicate that articles handling general interest topics, such as domestic and international news, exhibit a greater number of updates per updated article than the average article. On the contrary, articles handling softer or niche topics (such as showbizz, tech, lifestyle) have a lower number of associated updates. These findings raise questions, such as whether differences between topics can be explained by

different working routines of the journalists behind them (f.e. more pressing deadlines in domestic and international news).

A subset of the data was coded to understand which change types occur most in updates on articles written during regular news periods. It turns out that one in three updates are content-neutral changes such as sentence rephrasing, whereas almost half of the changes are devoted to the addition, removal or updating of information without error correction. Importantly, more than one in five changes are corrections of errors present in previous versions. Even though most of the corrected errors are linguistic mistakes (81%), 4.2% of all observed changes were corrections of objective and subjective errors. This results in the fact that, in total, 5.4% of all articles are at least corrected once. This percentage is again lower than the numbers obtained during the analysis of the New York Times articles (9%) (Price and Sullivan 2013). However, both numbers should again be compared cautiously. Probably, event-driven news periods were included in the NewsDiff analysis (while we were focusing exclusively on articles written during regular news periods). Moreover, it is unclear to which extent liveblogs were considered and, finally, it is unclear how an error correction was defined.

The large majority of error corrections are applied silently. It is clear that there is still a lack of disclosure transparency (Karlsson 2010) concerning how, when and by whom online news is updated. This demonstrates that the news outlets in this study are very hesitant to communicate corrections to their readers. Maybe they worry that openness about corrections will damage their credibility, or they are still looking for a good way to reveal corrections without impacting readability. Moreover, although sometimes clues are present (such as “More information to come”), mostly it is unclear to news consumers whether they are reading the final article version or only an intermediate draft, which holds the risk that people might not realize they are processing information that is not yet (completely) verified (see also Karlsson and Strömbäck 2010).

A limitation of our study is that only freely accessible articles were collected. This is often breaking or event-driven news, short and factual news that usually also can be found elsewhere on the web, or “shareable” news that can generate website traffic. Instead, publishers have learnt to install paywalls for those articles that create added value for readers, who are therefore more willing to take a subscription, such as opinion pieces, analysis and in-depth reporting (Kvalheim 2013; Myllylahti 2017). Therefore, future research could investigate the hypothesis that news behind the paywall contains less updates because journalists feel less time pressure to publish these stories and are more careful in avoiding errors in the premium content of the news brand. A second limitation is that we are only observing the errors that are actually corrected. In that sense, it is not clear whether correcting plenty of errors is a sign of good or bad quality management. Future work could investigate how the number of corrections compares to the actual number of errors, as in the seminal study of Charnley (1936). Third, our research focuses on Flemish news. Although the findings are therefore not generalizable to other contexts, the Flemish case is very comparable to many other Western countries with similar levels of press freedom, public and private ownership of news media, and online news consumption (see Hallin and Mancini 2004; Newman et al. 2022). Nonetheless, it remains vital to expand this research interest to other countries and regions to gain a more complete understanding of the adoption of incremental news updates in newsrooms worldwide. Finally, in our analysis of the update purposes, we have only focused on articles written during regular news periods.

However, it can be expected that the observed prevalence of error corrections will be different (i.e., higher) during periods in which a major event is being reported on. Further research is needed to confirm this hypothesis.

Notes

1. <https://www.vrt.be/vrtnws/nl/>
2. <https://www.knack.be/>
3. <https://www.hln.be/>
4. <https://www.nieuwsblad.be/>
5. <https://www.demorgen.be/>
6. <https://www.standaard.be/>

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Data Availability Statement

The data that support the findings of this study are openly available in Zenodo at <http://doi.org/10.5281/zenodo.8055719>.

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Appendices

Appendix A. Overview of number of collected articles per news outlet and topic

Table A1. Number of unique articles for each news outlet and topic separately.

	VRT	Knack	HLN	Het Nieuwsblad	De Morgen	De Standaard	Total
Sports	14,685	359	22,174	30,988	1,288	10,690	80,184
International news	6,676	4,772	21,825	14,449	6,654	6,648	61,024
Domestic news	11,402	6,420	13,998	14,623	6,739	8,043	61,225
Showbizz	2,434	250	18,164	7,573	2,138	1,594	32,153
Local news	5,083	0	2,216	7,681	259	0	15,239
Economy	808	1,411	4,592	1,748	1,178	2,166	11,903
Lifestyle	0	663	6,746	2,562	136	1,108	11,215
Science	1,132	444	4,174	521	885	187	7,343

(Continued)

Table A1. Continued.

	VRT	Knack	HLN	Het Nieuwsblad	De Morgen	De Standaard	Total
Tech	165	451	2,075	302	447	0	3,440
Miscellaneous	12	0	418	1,960	9	109	2,508
Car	0	1,242	470	171	23	0	1,906
Factchecking & analysis	1,305	154	0	24	187	69	1,739
Weather forecast	194	0	247	284	231	19	975
Video & podcast	208	0	14	251	151	7	631
Tips & tricks	25	0	131	15	10	0	181
TOTAL	44,129	16,166	97,244	83,152	20,335	30,640	291,666

Appendix B. Overview of change types

This Appendix contains an overview of the different categories of changes that coders could categorize changes into. Beneath, for each change type the (translated) definition as it was provided to the coders is given. These were also the definitions that were used by the first author of this paper to verify correctness of the work by the voluntary coders on. In total, nine different types of changes were distinguished, based on literature and our own inspection of the data.

- (1) **Corrections of objective errors:** changes during which an objective or factual error is corrected. Amongst others, this type of error correction encompasses the following error types: wrong names, wrong roles or job descriptions, wrong ages, wrong addresses, wrong quotes, wrong numbers, wrong dates or timestamps and wrong locations.
- (2) **Corrections of subjective errors:** changes during which a subjective error is corrected. Amongst others, this type of error correction encompasses the following error types: non-representative (sub)titles, sensationalized writing, news that is formulated in a too modest way, essential information is missing, misleading numbers and quotes that are taken out of context.
- (3) **Corrections of linguistic errors:** changes during which a spelling or other linguistic mistake (f.e. a grammatically wrong sentence) is corrected.
- (4) **Additions or clarifications of information:** changes that only encompass adding additional text, such that information is present in the new article version that was not present in the original version. No information is deleted when making this type of change. Information can be added that was not yet known at the time of original publication, information that was already known at the time of original publication but was not essential for correctly bringing the news or information that was added to clarify statements made in the original article. If information was added only afterwards, while it was actually essential for the correct dissemination of the news, the correct change type is “correction of a subjective error”.
- (5) **Deletions of information:** changes that only encompass deleting text, such that information is removed from the article that was present in the original article version. No new information is added when making this change. Information can be removed because it has become erroneous, or because of any other reason. However, the deletion of information for error correction (f.e. because the information was already wrong at the time of original publication) should be categorized as “correction of objective error/subjective error/linguistic error”.
- (6) **Updates of old information:** changes that encompass both the deletion of old information and the replacement of this old information by new, updated information. These changes thus include both a deletion and an addition of text, whereby the deleted/added text should refer to the same (though updated) facts. As an example, a change of the number of deaths in a terroristic attempt from 15 to 20 because five people died in the meantime.
- (7) **Content-neutral reformulations:** changes whereby text is removed/added/replaced, without errors being corrected or information being added, deleted or updated in comparison to the original article version. This includes rephrasing of sentences without changing the actual information they carry, information that is removed because it was present twice ...
- (8) **Displacements of information:** changes whereby a text extract in the original article version is copied to another position in the new article version. No information is corrected, added, deleted, updated or formulated in another way. The information is just being displaced to another position in the article.
- (9) **Other change types:** all changes that do not fit in any of the earlier mentioned categories.

Appendix C. Post-hoc results

This Appendix contains an overview of all post-hoc statistical tests that were applied following the initial Kruskal-Wallis tests. All post-hoc tests were performed using Dunn's procedure (1964) with a Bonferroni correction for multiple comparisons. The tables beneath are partially filled up with the value X. The reason for this is that (1) news outlets are not compared with themselves and (2) the result is present somewhere else in the table (indeed, the pairwise comparison of news outlets A and B is the same as the comparison of B with A).

Table C1. Results obtained by performing post-hoc tests for the difference in updating fractions between news outlets. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported. Statistically significant results ($p < .05$) are highlighted in bold.

	VRT	Knack	HLN	Het Nieuwsblad	De Morgen	De Standaard
VRT	X	.000 (0.20)	.000 (0.13)	.000 (0.18)	.000 (0.14)	.000 (0.09)
Knack	X	X	.000 (0.07)	.000 (0.02)	.000 (0.05)	.000 (0.11)
HLN	X	X	X	.000 (0.05)	.000 (0.01)	.000 (0.04)
Het Nieuwsblad	X	X	X	X	.000 (0.04)	.000 (0.09)
De Morgen	X	X	X	X	X	.000 (0.06)
De Standaard	X	X	X	X	X	X

Table C2. Results obtained by performing post-hoc tests for the difference in the number of updates per updated article between news outlets. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

	VRT	Knack	HLN	Het Nieuwsblad	De Morgen	De Standaard
VRT	X	.000 (0.11)	.000 (0.13)	.000 (0.15)	.000 (0.11)	.000 (0.08)
Knack	X	X	.004 (0.02)	.000 (0.04)	1.000	.000 (0.04)
HLN	X	X	X	.000 (0.02)	.000 (0.03)	.000 (0.05)
Het Nieuwsblad	X	X	X	X	.000 (0.05)	.000 (0.07)
De Morgen	X	X	X	X	X	.000 (0.03)
De Standaard	X	X	X	X	X	X

Table C3. Results obtained by performing post-hoc tests for the difference in fractions of added characters between news outlets. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

	VRT	Knack	HLN	Het Nieuwsblad	De Morgen	De Standaard
VRT	X	.000 (0.16)	.000 (0.15)	.000 (0.18)	.000 (0.16)	.000 (0.11)
Knack	X	X	.995	.000 (0.03)	1.000	.000 (0.05)
HLN	X	X	X	.000 (0.03)	.000 (0.01)	.000 (0.04)
Het Nieuwsblad	X	X	X	X	.000 (0.02)	.000 (0.08)
De Morgen	X	X	X	X	X	.000 (0.05)
De Standaard	X	X	X	X	X	X

Table C4. Results obtained by performing post-hoc tests for the difference in fractions of removed characters between news outlets. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

	VRT	Knack	HLN	Het Nieuwsblad	De Morgen	De Standaard
VRT	X	.000 (0.12)	.000 (0.15)	.000 (0.19)	.000 (0.16)	.000 (0.14)
Knack	X	X	.000 (0.03)	.000 (0.07)	.000 (0.05)	.000 (0.02)
HLN	X	X	X	.000 (0.04)	.017 (0.01)	.000 (0.01)
Het Nieuwsblad	X	X	X	X	.000 (0.03)	.001 (0.05)
De Morgen	X	X	X	X	X	.000 (0.02)
De Standaard	X	X	X	X	X	X

Table C5. Results obtained by performing post-hoc tests for the difference in prevalence of objective errors between news outlets. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

	VRT	Knack	HLN	Het Nieuwsblad	De Morgen	De Standaard
VRT	X	.240	.003 (0.01)	.048 (0.01)	.012 (0.01)	1.000
Knack	X	X	1.000	1.000	1.000	1.000
HLN	X	X	X	1.000	1.000	1.000
Het Nieuwsblad	X	X	X	X	1.000	1.000
De Morgen	X	X	X	X	X	1.000
De Standaard	X	X	X	X	X	X

Table C6. Results obtained by performing post-hoc tests for the difference in updating frequency between topics. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

	Sports	International news	Domestic news	Show-bizz	Local news	Economy	Life-style	Science	Tech	Miscellaneous	Car	Fact-checking	Weather forecast	Video & podcast	Tips & tricks
Sports	X	1.000	.000 (0.03)	.000 (0.04)	1.000	1.000	.000 (0.05)	1.000	.000 (0.03)	.000 (0.07)	.000 (0.13)	.000 (0.14)	.045 (0.03)	.756	.000 (0.10)
International news	X	X	.000 (0.03)	.000 (0.04)	.151	.495	.000 (0.05)	1.000	.000 (0.03)	.000 (0.07)	.000 (0.13)	.000 (0.14)	.016 (0.03)	1.000	.000 (0.10)
Domestic news	X	X	X	.000 (0.08)	.000 (0.03)	.000 (0.03)	.000 (0.10)	.000 (0.03)	.000 (0.03)	.000 (0.10)	.000 (0.16)	.000 (0.13)	1.000	.000 (0.07)	.002 (0.08)
Showbizz	X	X	X	X	.000 (0.04)	.000 (0.04)	.000 (0.02)	.000 (0.03)	1.000	.000 (0.03)	.000 (0.09)	.000 (0.17)	.000 (0.06)	1.000	.000 (0.14)
Local news	X	X	X	X	X	1.000	.000 (0.06)	1.000	.000 (0.04)	.000 (0.07)	.000 (0.14)	.000 (0.13)	.539	.168	.000 (0.10)
Economy	X	X	X	X	X	X	.000 (0.06)	1.000	.000 (0.04)	.000 (0.07)	.000 (0.14)	.000 (0.13)	.556	.185	.000 (0.10)
Lifestyle	X	X	X	X	X	X	X	.000 (0.06)	.000 (0.02)	1.000	.000 (0.08)	.000 (0.19)	.000 (0.08)	.373	.000 (0.16)
Science	X	X	X	X	X	X	X	X	.000 (0.03)	.000 (0.07)	.000 (0.13)	.000 (0.13)	.357	.380	.000 (0.10)
Tech	X	X	X	X	X	X	X	X	X	.000 (0.04)	.000 (0.10)	.000 (0.17)	.000 (0.06)	1.000	.000 (0.13)

(Continued)

Table C6. Continued.[illegible]

Table C7. Results obtained by performing post-hoc tests for the difference in the number of updates per updated article between topics. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

[illegible]

Table C8. Results obtained by performing post-hoc tests for the difference in fractions of added characters between topics. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

[illegible]

Table C9. Results obtained by performing post-hoc tests for the difference in fractions of removed characters between topics. For each test, the statistical significance (p) and effect size (ϵ^2) (between brackets) are reported.

[illegible]