Breaking News: How Push Notifications Alter the Fourth Estate

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Abstract:
News outlets increasingly capitalize on the potential of push notifications to drive engagement and enhance readership. Such changes in news reporting and consumptions offer a new, largely overlooked, research perspective into the competing narratives about the definition of news, their impact on political participation, entrenchment of political views, the ubiquity of media environments, and anxiety in media consumption. Situated within discussions about fake news, how new technologies have changed journalism, and the nature of news consumption overall, this paper and a larger ongoing empirical project seek to explore: 1) how push notifications and online "breaking news" phenomenon differ from traditional news reporting; 2) relationships between objectivity in journalism, reader affect and trust; and 3) what this means for participatory politics and its relationship to the fourth estate. This article illustrates patterns and key insights about the impact of push notifications on journalism and changes in sentiment in news communication through a case study comparing reporting on President Nixon firing Special Prosecutor Archibald Cox in 1973 to the recent firing of FBI Director James Comey by President Trump. While headlines and push notifications vary significantly by news providers, push notifications are similar across platforms in distinguishing characteristics such as emotionally-loaded and subjective language. Both of these are defining elements of fake and deceptive news and may potentially account for some of the media mistrust in recent years.

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Introduction

Recent events, including the 2016 US Presidential election, bring to light new, and disturbing, trends surrounding changes to the media environment that are destabilizing to the fourth estate: fake news, de-legitimization of journalism, and new media echo chambers (Hanitzsch and Vos, 2016; Jacobson, Myung, and Johnson, 2016). Yet, a number of other developments, producing less obvious public outrage,

concurrently impacted the media environment: push notifications and social consumption (Gil de Zúñiga, Jung, and Valenzuela, 2012; Goode, 2009). Specifically, push notifications have changed the world of mobile applications. Unlike other mediums, where users must actively seek information, products, or services, mobile push notifications are served to users' lock screen, alerting them to any vital information, even when they do not immediately access the app (Stănescu, 2015). The result is an environment in which these new, often interruptive, technologies quietly alter consumption, engagement, and context of political information acquisition, concurrent with more obvious and polarizing changes. Yet, this raises questions, as of yet unanswered, about how these changes are related and what they mean for an informed electorate.

Similar changes in access to, dissemination of, and the context and quality of news have been the subject of a growing body of academic literature (e.g. Costera Meijer and Bijleveld, 2016; Couldry, Livingstone, and Markham, 2016; Strömbäck, Djerf-Pierre, and Shehata, 2016; Weaver and Willnat 2016), yet exploration of the very significant changes in news distribution via push notifications and breaking news, as well as their relationships to media trust, moral panic, and perceptions of media, has been extremely limited. Aiming to address this gap, the piece provides a glimpse into the effect of push notifications and broad changes in media dissemination and consumption on news distribution and readers trust. Comparing news headlines from two factually similar events, President Nixon firing special prosecutor Archibald Cox in 1973 and President Trump firing FBI Director James Comey in 2017, this analysis uncovers differences even within comparable dissemination avenues. As shown below, news headlines communicated the two events differently within the same six newspapers examined. In addition to a significantly higher number of news articles, which can be attributed to technological changes, the 2017 headlines are less objective, negative with greater statistical confidence, and more emotional than their 1973 counterparts. Differences in word choice further reveal the partisan nature of communication around these events, implying a growing shift from objective justice to subjective politics in the media. Alongside a more analytical reporting style, the 2017 headlines also exhibited more tentative quality, probably due to the shrinking lag time between events and news coverage in the age of rapidly breaking news. Computational linguistic and sentiment analysis of the 2017 online article headlines and push notifications further highlights the relationship between news dissemination mode and actual content: the negative language choice in push notifications is not only more subjective, angry, and tentative, then the one of online news headlines but also introduces elements of fear into this already-intrusive form of news consumption.

Background

The importance of an informed electorate has been recognized historically (Jefferson, 1799) and within the academic literature (e.g. Bullock, 2011), emphasizing the importance of transparency and journalism in informing the public to support functional democracy (Diamond, 2014; Goode, 2016; Hanitzsch and Vos 2016). Roles of the fourth estate within a system of checks and balances, as well as in supporting participatory politics, are constantly evolving (e.g. Benkler, 2013; Felle, 2016) and have received considerable scholarly scrutiny.

The fourth estate, as an independent press which holds other institutions accountable and pushes for social pluralism, has been impacted significantly by technological change (Newman, Dutton, and Blank, 2012). Synergy between fourth estate and the proposed fifth estate of networked non-institutional and social media contribute to the evolution of legacy news practice (Newman, Dutton, and Blank, 2012). Changes in news and media, associated with technology, and interactions between new and traditional media also raise tensions regarding media legitimacy, trust, and consumption.

Technological developments, and especially those related to information and communication technologies, have reconfigured traditional media in two significant ways. First, reproduction and distribution

costs have decreased significantly. The content of a newspaper, for instance, does not have to be printed and distributed as a hard copy. Legacy media have both enjoyed and suffered the reduced costs of production and dissemination: while it economized on production and dissemination costs, it had to face competition from decentralized information producers (Benkler, 2013). Second, technology has opened the media to new distribution channels and mediums. Specifically, the spread of mobile devices and digital network generated a new playing field for news outlets. Notwithstanding evidence of early reluctance towards news consumption via mobile devices (Westlund, 2007) mobile news publishing has become a dominant avenue for news distribution, outstripping desktop news access in many countries (Newman, Fletcher, Kalogeropoulos, Levy, and Kleis Nielsen, 2017). Allowing users to stay informed without actively seeking information, mobile push notifications have multiplied significantly in the last year, especially in the US (Newman, Fletcher, Kalogeropoulos, Levy, and Kleis Nielsen, 2017).

In 1997, when push technology was introduced and celebrated as a technological revolution, push appeared to be a suitable solution to the slow connection of that time. Users no longer needed to search for information and wait for long durations of time as it loads; they could simply have the information they are interested in delivered to their mailbox (Lasica, 1997.) In fact, people found the concept of a "push" so appealing that several news providers offered paid subscription services for breaking news SMS alerts (Fidalgo, 2009). Since then, much has changed. Today, virtually all major news providers have popular mobile apps that incorporate customizable push notifications.

Pushed news alerts place their receivers in a somewhat passive state. Users often have no control over the time of the push or the number of alerts, though recently some apps have introduced the option to turn off nighttime notifications. Tomi Ahonen (2008) referred to mobile mass media as "the only always-on mass media." Indeed, with news content pushed to users' phones at any time, mobile mass media is "the only media that can reach us in our sleep." Users can still exercise some control over the content of the notifications pushed to them, commonly by customizing the notifications flow through the setting menu of the relevant news app. However, when individuals are presented with too many choices they often prefer that the choice be made for them, maintain default settings (Ariely, 2008); personalized news alerts are no different. Most readers refrain from configuring their push diet, opening up a fertile market for news alerts personalization (Newman, 2016). For example, the New York Times effectively targeted interested users by sending a push notification about Pizzagate only to those users who had read one of the Pizzagate stories (Renner, 2016).

Complexity of distribution for news generally, beyond these specifics of push notifications, grow with technological innovation (Pavlik, 2000). As news outlets adopt new digital strategies, including push notifications (Sheller, 2015), engagement has increased among many demographics and is more easily monitored, yet this gamification of news has risks and consequences, including filter bubbles and politicization, in part due to personalization (Conill and Karlsson, 2016). In order to garner more attention and engage readers, or users, modes of distribution and framing of content has changed in order to take advantage of click bait tendencies (Chen, Conroy, and Rubin, 2015). These subtle manipulations are often misleading and generate outrage, both about the partisan issues or implications, and about the practice itself.

Yet there is a long history of moral panics developing due to media coverage, regardless of new technologies, as documented by (Furedi, 2016). Sensationalism, beyond conjuring moral outrage, in press coverage is also an entrenched, historical vein in journalism, not only dating back to yellow journalism around the turn of the twentieth century (Emery, 1972), but rather to the *Acta Dicta* of ancient Rome (Stephens, 2007). In this sense, there is an established history of framing information and news, independent of changes to adapt to new technologies and draw attention on social media, that is sometimes problematic, as when associated with scandals around news and media such as those that emphasize

deception (Rubin, Chen, and Conroy, 2015), but is also human. Journalism scholarship has long recognized rhetorical framing and has established methods of news framing analysis (e.g. D'Angelo and Kuypers, 2010), indicating that social construction is an integral part of news communication. While true impartiality is often an elusive objective, extreme editorial bias has consequences.

Coverage of particular stories is often framed uniquely for each publication, in ways that often reflect target audiences; papers in the UK, for example, represent racist trolls and cyberbullies in very different ways, downplaying the seriousness of or vilifying perpetrators in part based on the age, diversity, and population-density of their audiences (Bishop, 2014). This specific study has implications for current discussions around emerging nationalist narratives in far-right media outlets, in comparison to centrist sources, around who these frames appeal to.

Despite technological and economic changes in media dissemination and consumption, scandals, mistrust, and journalistic practice have important threads of continuity over time. The impact of this complexity of how changes and context, as well as established norms and strategies, on the content of news is relatively unexplored. The following case study illustrates what has really changed and segues to a discussion of what should be systematically explored in order to understand relationships between fake news and new technologies, as well as the destabilization of the fourth estate and its potential implications for democratic participation.

Case Study

A 9:40 pm ET push on Tuesday, 9 May 2017 via Apple News succinctly makes the often made historical comparison to the biggest news story from the time period sampled in: "'This is Nixonian': Democrats renew calls for special counsel to handle FBI's Russia probe after Comey's firing." This push pointedly contextualizes an ideal preliminary case study to explore many of the issues around push notifications, trust, the fourth estate, and fake news sensationalism, pertaining to The Washington Post article from the same day, "Democrats hate James Comey. But they hate the fact Trump fired him even more."

A comparison of US newspaper headlines relating to President Nixon firing special prosecutor Archibald Cox (available from ProQuest Historical Newspaper Archives) and President Trump firing FBI Director James Comey might be expected to have relatively similar language, when controlling for names and dates. Using this comparison as a lens through which to explore how communication about breaking news has changed, it is possible to see how differences develop even within the same means of dissemination. Headlines communicate similar events differently with time, as presented in table 1, even within the same six newspapers: Boston Globe, Chicago Tribune, LA Times, New York Times, Wall Street Journal, and Washington Post.

Not only were there significantly more articles within the first week, which is possibly a function of changing technologies and means of consumption impacting traditional and legacy modes of communication, as well, but the 2017 headlines were less objective, negative with greater statistical confidence, and more emotional than those from 1973. However, even if objectivity and neutral attitudes were reflected, the overwhelming number of articles from major news organizations, not to mention other sources, risks confusion and information overload.

Differences in actual word choice do more to reveal the increasingly partisan nature of communication around these events. While, terms such as "inquiry," "investigation," and "impeachment" occurred with similar frequency, they were coupled with words that reveal a sharp divide on whether the incident raises concern about justice or about politics. "Democrat" occurred seven times more frequently in recent headlines, than in the historical set, and "Republicans" nine times more often. In contrast, "just" and

"justice" are twice as likely to appear in a headline about the Saturday Night Massacre, then in a given headline about President Trump firing FBI Director Comey. This reflects a trend from objective justice to subjective politics that echoes anecdotal discussions and previous research surrounding media bias (Entman, 2007).

While the language style employed is analytical in nature for both sets of headlines, as would be expected in serious journalism, it is notable that there is an increase in statistical confidence in the analytical style with time. This likely reflects the nature of spectacle around political scandals and public expectations for media deconstruction of "gate"-level scandals, rather than just the facts. Furthermore, the likelihood that the headlines are tentative in the latter case may reflect the tendency for reporting to get ahead of itself under the pressure of a competitive media environment; new technologies and social demands lead to increasingly little lag time between events and news coverage. While this will be explored within the larger study, with respect to modes of communication (articles, tweets, and push notifications), comparisons between push notifications and headlines within the same sample of articles relative to President Trump firing FBI Director Comey provide further support for this interpretation.

Parallel computational linguistic and sentiment analysis of push notifications and online article headlines relative to the same articles, as summarized in table 2, illustrate that mode of article dissemination impacts content. Even when pertaining to the same article, the negative language employed in push notifications is not only more subjective, angry, and tentative, in the rush to provide news to users before competitors, but also introduces elements of fear into the communication.

Discussion

These results illustrate increasing volumes of news coverage, as well as decreasing certainty in content and increasing sentiment in content. Simultaneous with moves toward more sensational language and abrupt interruptions of day to day activities with news through push notification, anxiety is increasing (Barthel and Mitchell, 2017; Westermann, Möller, and Wechsung, 2015). A possible interpretation is that current media mistrust, distrust, and disdain is partly driven by these changes, which make mainstream media look and sound a lot like fake news. This hypothesis warrants empirical assessment.

It is not to say that these changes are necessarily movement in the wrong direction, from a normative sense, but rather than with the benefit of increasing consumption and social sharing, comes the risk of similarities to fake news, which is a distinct concept, divisible into multiple types, some of which resemble sensationally framed, but mainstream and credible news. As editors employ less formal language in push notification and embrace notifications through Facebook, rather than independent forms of transmission, there is also increasing overlap between clickbait and legitimate stories.

If fake news is divisible into errors, deliberate falsehoods, and deception (Rubin, Chen, and Conroy, 2015; Rubin, Conroy, Chen, and Cornwell, 2016), and all of these things are difficult to differentiate from satire or hyperbole, which often employ sensationalism, there is a risk of confusion, given that sensationalism is pervasive, yet employed as a heuristic for skepticism around content. A more nuanced representation of this confusing misinformation spectrum ranges from: satire to misleading content to false context to manipulated content to purely false and deceptive content (Giglietto, Iannelli, Rossi, and Valeriani, 2016; Marwicke and Lewis, 2017; Verstraete, Bambauer, and Bambauer, 2017). Given the diversity of types of fake news, its similarities to satire (Meddaugh, 2010; Rubin, Conroy, Chen, and Cornwell, 2016) and general sensationalism, and its problematic implications for political discourse and an informed electorate (Giglietto, Iannelli, Rossi, and Valeriani, 2016), development of computational approaches to identification and differentiation are important (Rubin, Chen, and Conroy, 2015). Approaches to identify, and subsequently filter, fake new employ computational linguistic analysis, which can also reveal parallels with partisan and

polarizing legitimate news. Rather than apply case by case scrutiny, computational approaches support automated detection of fake news (e.g. Conroy, Rubin, and Chen, 2015; Zhou, Burgoon, Nunamaker, and Twitchell, 2004) depending on deception detection (e.g. Feng, Banerjee, and Choi, 2012; Mukherjee, 2015; Lee, Welker, and Odom, 2009), as well as identification facets of: absurdity, grammar, humor, negative affect, and punctuation (Rubin, Conroy, Chen, and Cornwell, 2016).

One way to improve upon textual analysis of news items themselves is to examine the credibility and conflicting viewpoints within discussion and sharing networks around the items (Jin, Cao, Zhang, and Luo, 2016). This is consistent with work that illustrates people are more likely to believe fake stories that favor their preferred ideology or candidate (Allcott and Gentzkow, 2017), as well as documentation of ideological filter bubbles on social media (Pariser, 2011).

When similar methods are applied to this small sample of real news headlines and notifications, there are distinct similarities between increasingly less formal socially shared news and fake news, particularly with push notifications. It is thus intuitive that these changes in communication from reputable journalistic sources contribute to the confusion surrounding what is trustworthy (e.g. Marchi, 2012). An implication is the potential for destabilization of the fourth estate, at a time when it is extremely critical given the aversion to ethical standards, transparency, and accountability of elected officials, who are actively contributing to the confusion by bemoaning fake news and clouding public perception of news providers, as well as tacitly accepting and benefiting from less public sources of ambiguity, such as personalization and clickbait generation due to large social data sets around political issues, as with Cambridge Analytica.

Conclusion

While only one comparison, there are a number of key insights from the case presented. First, looking at the differences in headlines about Nixon and Trump, language is noticeably more subjective, emotional, and tentative. While different models and tools for sentiment analysis may provide different specific metrics, based on the data, distributions on these factor consistently favor greater neutrality in historical headlines, even on a sensational story like the Saturday Night Massacre, in comparison to recent rhetoric. The implication is that with less formal and non-neutral language, attention may be gained, but ambiguity about differences between reliable news and fake news increases. A proposition, to be explored in future empirical work, is that media distrust is influenced by increased sensationalism in coverage and similarities between representations of stories in mainstream and fake or deceptive purveyors.

Second, information overload, the intrusiveness of push notifications, and increasing personalization of news content frames and consumption represent dramatic changes to individuals' information grounds and the legitimacy of the fourth estate. Not only are perceptions of legitimacy of the fourth estate overall, as well as of specific news organizations, growing more hyper-partisan (Barthel and Mitchell, 2017), but ambiguity between what is real and what is fake, given social consumption and new, more informal, norms of journalism dissemination and communication confuses the electorate and destabilizes democratic participation. This is particularly true when articles and notifications address the legitimacy of other democratic institutions or threats to them, such as voting integrity.

This work is only a preliminary attempt to explore changes in communication and trust, the fourth estate, and technology and fake news. Based on this case and situated within existing literate are a number of research questions to explore in future work, including: how modes of dissemination impact content; how changes in dissemination, access, and consumption impact trust, information overload, and misinformation; why fake news and intrusive dissemination are problematic; and what are appropriate interventions? Overall, this project will examine how online breaking news and push notifications have impacted news coverage and consumption, with an emphasis both on differences by communication technology mode and historical
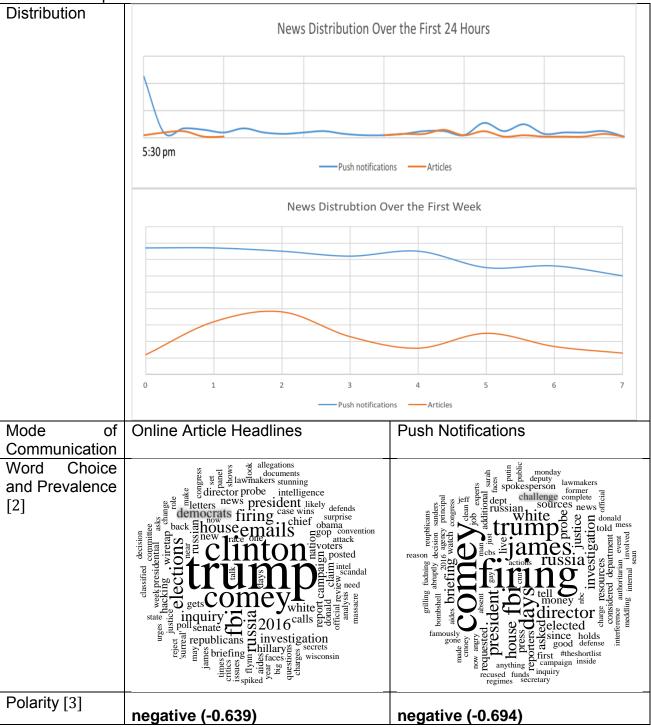
comparisons, exploring analogous changes, such as the impact of cable news, and historical coverage of analogous events, as with the example provided. Furthermore, exploring the relationships between these factors and fake news will be touched on as with pushes and errors. Fake news providers have been able to capitalize on a common behavioral trait: studies have shown that when people are presented with information that contradicts their pre-existing beliefs, they will double down on their original opinions rather than amending them (e.g. Del Vicario, Scala, Caldarelli, Stanley, and Outtrociocchi, 2017; Giglietto, Iannelli, Rossi, and Valeriani, 2016; Rubin, Conroy, Chen, and Cornwell, 2016; Tan and Ang, 2017). This project will thus explore how does mainstream media mends errors and deals with cognitive bias, as well.

Table 1. Headline Comparison Across Six Major Newspapers [1]

Event	President Nixon fires Special Prosecutor Archibald Cox	President Trump fires FBI Director James Comey
Date	Saturday, 20 October 1973	Tuesday, 9 May 2017
Number of Articles (in first 7 days)	90	185
Word Choice and Prevalence [2]		
Polarity [3]	**negative (-0.486)**	**negative (-0.639)**
Objectivity [3]	Objective	weak subjective
Emotion [4]	< .5 = not likely present > .5 = likely present > .75 = very likely present Anger 0.49 (UNLIKELY) Disgust 0.17 (UNLIKELY) Fear 0.04 (UNLIKELY) Joy 0.03 (UNLIKELY) Sadness 0.15 (UNLIKELY)	< .5 = not likely present > .5 = likely present > .75 = very likely present Anger 0.51 (LIKELY) Disgust 0.54 (LIKELY) Fear 0.44 (UNLIKELY) Joy 0.04 (UNLIKELY) Sadness 0.49 (UNLIKELY)

Language Style [4]	Analytical	0.61 (LIKELY)	Analytical	0.69 (LIKELY)
	Confident	0.00 (UNLIKELY)	Confident (UNLIKELY)	0.00
	Tentative	0.22 (UNLIKELY)	Tentative	0.53 (LIKELY)

Table 2. Comparison of Push Notifications to Article Headlines.

Distribution		
Mode of Communication	Online Article Headlines	Push Notifications
Word Choice and Prevalence [2]		
Polarity [3]	**negative (-0.639)**	**negative (-0.694)**

Objectivity [3]	weak subjective		Subjective	
Emotion [4]	< .5 = not likely present > .5 = likely present > .75 = very likely present Anger 0.51 (LIKELY) Disgust 0.54 (LIKELY) Fear 0.44 (UNLIKELY) Joy 0.04 (UNLIKELY) Sadness 0.49 (UNLIKELY)		< .5 = not likely present > .5 = likely present > .75 = very likely present Anger 0.82 (LIKELY) Disgust 0.55 (LIKELY) Fear 0.59 (LIKELY) Joy 0.11 (UNLIKELY) Sadness 0.48 (UNLIKELY)	
Language Style [4]	Analytical 0.69 (LIKELY) Confident 0.00 (UNLIKELY) Tentative 0.53 (LIKELY)		Analytical 0.70 (LIKELY) Confident 0.00 (UNLIKELY) Tentative 0.88 (LIKELY)	

About the authors

Madelyn Rose Sanfilippo is as a postdoctoral Research Scholar at the Information Law Institute at New York University. Her research fundamentally addresses legal, social, and political issues surrounding information and information technology access, applying a social informatics perspective, particularly as it relates to unequal outcomes regarding interactions between policies, institutions, and information. Current projects examine these relationships with respect to knowledge management, data science, and artificial intelligence. She studied at the University of Wisconsin, Madison as an undergraduate and completed her masters and doctoral studies in Information Science at Indiana University, Bloomington's School of Informatics and Computing.

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Yafit Lev-Aretz is a postdoctoral research fellow at the Information Law Institute and an adjunct professor at the Media, Culture, and Communications Department at New York University. As the digital environment constantly evolves, Yafit studies self-regulatory regimes set by private entities and the legal vacuum they create. She is especially interested in the growing use of algorithmic decision-making, choice architecture in the age of big data, and the ethical challenges posed by machine learning and artificially intelligent systems. Her research also highlights the legal treatment of beneficial uses of data, such as data philanthropy and the data for good movement, striving to strike a delicate balance between privacy protection and competing values. Previously, Yafit was an intellectual property fellow at the Kernochan Center for the Law, Media, and the Arts at Columbia University, where she analyzed online practices from copyright and trademark law perspectives. Yafit holds an SJD from the University of Pennsylvania Law School, an LLM from Columbia Law School, and an LLB from Bar-Ilan University in Israel.

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Notes

1. This reflects articles in the Boston Globe, Chicago Tribune, LA Times, New York Times, Wall Street Journal, and Washington Post.
2. Analyzed within NVivo.
3. Analyzed with RTextTools in R.
4. Analyzed with IBM Watson Tone Analyzer.

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