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Journalism from Above: Drones, the Media, and the Transformation of Journalistic Practice

Editors
Jonas Harvard, Mats Hyvönen and Ingela Wadbring

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Academic Editors
Jonas Harvard (Mid Sweden University, Sweden)
Mats Hyvönen (Uppsala University, Sweden)
Ingela Wadbring (Mid Sweden University, Sweden)

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Editorial

Journalism from Above: Drones and the Media in Critical Perspective

Jonas Harvard [1,*], Mats Hyvönen [2] and Ingela Wadbring [1]

[1] Department of Media and Communication Science, Mid Sweden University, 851 70 Sundsvall, Sweden;
E-Mails: jonas.harvard@miun.se (J.H.), ingela.wadbring@miun.se (I.W.)
[2] Department of Cultural Anthropology and Ethnology, Uppsala University, 751 26 Uppsala, Sweden;
E-Mail: mats.hyvonen@antro.uu.se

* Corresponding author

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Abstract
In the last decade, the development of small, remotely operated multicopters with cameras, so-called drones, has made aerial photography easily available. Consumers and institutions now use drones in a variety of ways, both for personal entertainment and professionally. The application of drones in media production and journalism is of particular interest, as it provides insight into the complex interplay between technology, the economic and legal constraints of the media market, professional cultures and audience preferences. The thematic issue *Journalism from Above: Drones, the Media, and the Transformation of Journalistic Practice* presents new research concerning the role of drones in journalism and media production. The issue brings together scholars representing a variety of approaches and perspectives. A broad selection of empirical cases from Finland, Spain, Sweden, the UK and the US form the basis of an exploration of the changing relations between the media, technology and society. The articles address topics such as: Adaption of drone technology in the newsrooms; audience preferences and reactions in a changing media landscape; the relation between journalists and public authorities who use drones; and attitudes from journalistic practitioners as well as historical and future perspectives.

Keywords
aerial views; audience preferences; drones; journalism; media history; media production; new media technology; photojournalism; Unmanned Aerial Vehicles

Issue
This editorial is part of the issue "Journalism from Above: Drones, the Media, and the Transformation of Journalistic Practice'' edited by Jonas Harvard (Mid Sweden University, Sweden), Mats Hyvönen (Uppsala University, Sweden) and Ingela Wadbring (Mid Sweden University, Sweden).

1. Introduction

What is it like to be a bird? Ever since the first manned air balloon flights in the 18th century, technologies enabling aerial views have fascinated mankind (Dorrian & Pousin, 2013). In the last decade, the development of small, remotely operated multicopters with cameras, so-called *drones*, has made this perspective from above easily available. Consumers and institutions now use drones in a variety of ways, both for personal entertainment and professionally. The application of drones in media production and journalism is of particular interest, as it provides insight into the complex interplay between technology, the economic and legal constraints of the media market, professional cultures and audience preferences.

As we take stock of nearly ten years of research on the application of drones in the media and journalism, the existing emphasis on analysing drones from the perspective of *innovations* is noteworthy, with key works calling drones a 'disruptive' technology (Belair-Gagnon, Holton, & Owen, 2017; Gynnild, 2014). Although these lines of inquiry have provided important knowledge about the spread and uptake of drones in journalism and the media industry, there is a clear need to broaden the

scope. As time has passed, some of the early promises have failed to materialise, and the reasons are not entirely clear. Differing legal frameworks for operating drones have produced large regional variations, but there are also other factors in play. Enduring safety concerns and integrity issues, as well as a possibly fading novelty factor have created a complex landscape of journalistic drone use.

Innovation centric perspectives thus need to be integrated with insight into counter narratives, limitations and alternative paths (for ethical issues see Bartzen Culver, 2014; for an overview see Chamberlain, 2017). The current thematic issue is therefore designed to provide a comprehensive and critical examination of drones and the media in order to untangle the complexity of the conflicts new media technology raises.

To this end, it is helpful to see drones as part of a body of 'sociotechnical imaginaries'; visions of scientific and technological progress with "implicit ideas of public purpose, collective futures and the common good" (Jasanoff & Kim, 2015). This concept directs attention to issues of power and authority inherent in technology and its application in society.

One example of how drones can embody power relations is the relationship between drone imagery and the so-called 'surveillance gaze' in modern society, connected to widespread use of CCTV cameras and satellite imagery by state agencies (Carlsson, 2009). The use of drones in public frequently raises concerns from those potentially covered by the footage, as people are unsure by whom they are watched and for what purposes (Bajde et al., 2017). The complexity of what drone technology represents is also mirrored in current societal discourse, where drones are portrayed both as an opportunity and as a problem. The proposed benefits of using drones in areas such as agriculture, forestry or rescue services—or news reporting—have clashed with narratives of risk, when drones have been involved in high profile incidents, particularly in relation to airport traffic (Hyvönen, Lindblom, & Harvard, 2018).

Regarding journalism, in contrast to the emphasis on drones as enabling creative new ways of visual reporting, research is now also critically examining the value of drone imagery in news reporting. The use of drones to produce cinematic fly-overs for inclusion in news segments tend to emphasise the entertaining or immersive aspects of news, which may pose a threat to quality journalism (Adams, 2019). This signals a drastic re-coding of the symbolism of a view from above, which previously, in both journalism and the history of science, symbolised detached objectivity, order and systematisation (Ekström, 2009). In addition to techno-optimism, a potential driver behind the interest for drones in the media industry may also be commercial pressure. The development of a 'high-choice' media environment (Prior, 2007) has resulted in disloyal media consumers switching between outlets and channels. Simultaneously, tightening economic conditions (Franklin, 2017) have destroyed business models long taken for granted. The application of new technologies, such as drones, in reporting gives media companies one option to increase the attractiveness of their material, but such a strive for innovation and novelty also raises new concerns.

The thematic issue *Journalism from Above: Drones, the Media, and the Transformation of Journalistic Practice* presents new research concerning the role of drones in journalism and media production. The issue brings together scholars representing a variety of approaches and perspectives. A broad selection of empirical cases from Finland, Spain, Sweden, the UK and the US form the basis of an exploration of the changing relations between the media, technology and society. The articles address topics such as: adaption of drone technology in the newsrooms; audience preferences and reactions in a changing media landscape; the relation between journalists and public authorities who use drones; and attitudes from journalistic practitioners as well as historical and future perspectives.

2. Contributions in the Thematic Issue

This thematic issue begins with James F. Hamilton's (2020) article, 'Drone Journalism as Visual Aggregation: Toward a Critical History,' in which he introduces the concept of 'visual aggregation' to explore what makes drone imagery so compelling for major news organisations. By aggregating space visually, drone journalism produces a visual analogy to the claim to truth of data journalism. To understand how drone journalism is a response to the institutional crisis in journalism, Hamilton employs a cultural and historical approach and identifies key points in the emergence of visual aggregation as authoritative truth, pointing to a wide range of antecedent social formations, devices and practices prior to drone journalism.

In 'Diffusion of Drone Journalism: The Case of Finland, 2011–2020,' Turo Uskali, Ville Manninen, Pasi Ikonen, and Jere Hokkanen (2020) present a case study of how Finnish news organisations' adoption of drones has developed over time. Based on a survey among the 80 most popular newspapers in Finland, Uskali et al. conclude that drone journalism in Finland has diffused from a few pioneering organisations to a large number of newspapers, and that the newspapers who own drones produce more drone journalism.

Jonas Harvard (2020) argues that early optimistic projections of the impact of drones reflect a techno-optimistic innovation discourse. Using an historical theory to distinguish this discourse from actual observations of technology in use, his article, 'Post-Hype Uses of Drones in News Reporting: Revealing the Site and Presenting Scope,' presents an interview study of photojournalists on the role of drones in news reporting. The results show that the post-hype uses of drone photography are, in essence, summarised in two categories: situating the site of a news item, and illustrating the scope or extension of a phenomenon.

At a time when drone footage is ubiquitous, Catherine Adams (2020) seeks to explore the thoughts and actions of those who produce it. Empirically, 'Dual Control: Investigating the Role of Drone (UAV) Operators in TV and Online Journalism,' is based on 17 in-depth interviews with drone operators, journalists and editors, revealing a high degree of creative freedom for the operators, a passion for using drones, and some desire to immerse and impress the viewer. Furthermore, Adam's study shows that aerial images have become paramount in video journalism and that those involved in the production feel that drones have been 'good for journalism.'

Past research has paid little attention to audiences and their acceptance and ethical perception of drones. In 'Technologies, Ethics and Journalism's Relationship with the Public,' Megan Duncan and Kathleen Bartzen Culver (2020) suggest that audiences who are open to personal technology use will perceive news media using unmanned aerial vehicles (UAVs) as more ethical. In a survey (N = 548) of US adults, they explore the correlations between trust, technology, privacy and the use of UAVs. The results indicate that all three are positively correlated with openness toward drone journalism—findings that have implications for newsrooms.

In 'Relationships Between Law Enforcement Authorities and Drone Journalists in Spain,' Jorge Gallardo-Camacho and Vanessa Rodríguez Breijo (2020) formulate three hypotheses: (1) that Spanish law enforcement authorities have more capacity than journalists to shoot aerial news footage; (2) that for Spanish law enforcement authorities, the informational use of the drone footage they obtain is of secondary importance; and (3) that drone journalists feel their work is too restricted by law enforcement authorities. To test the hypotheses, in-depth interviews were conducted with representatives of three law enforcement organisations in Spain and with five drone pilots collaborating with news media outlets. The study concludes that the restrictive regulatory framework for UAVs in Spain hinders the development of drone journalism.

Emotional journalism is driven by audio-visual technology such as drones, which allow for greater immersion of the audience. The aim of Luis Mañas-Viniegra, Alberto García-García, and Ignacio J. Martín-Moraleda's (2020) article, 'Audience Attention and Emotion in News Filmed with Drones: A Neuromarketing Research,' is to determine the differences in attention and intensity of the emotions experienced when viewing different pieces of audio-visual news filmed with and without drones. In the study, eye tracking and galvanic skin response were used on a group of 30 Spanish students. The results suggest that drone footage received a higher concentration of attention from the subjects, and that drones enhance the effectiveness of panoramic images of natural landscapes.

John V. Pavlik's (2020) article, 'Drones, Augmented Reality and Virtual Reality Journalism: Mapping Their Role in Immersive News Content,' identifies a number of areas in which drones are impacting immersive news content, such as a first-person aerial perspective, geo-tagged audio and video for flight-based immersive news content, and capacity for volumetric and 360 video capture, as well as generating content based on data from a broad range of sensors beyond standard video cameras. These areas, Pavlik concludes, may contribute unique experiential media content beyond visual flight-based news material and information.

Taken together, the articles in this thematic issue position drones in journalism as a subject for which meaning is negotiated between different actors and interests in society. The articles also illustrate the usefulness of combining broader and more critical perspectives with previous research on how journalists and media institutions have absorbed, adapted, or rejected media innovations across national contexts and user-regimes.

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Conflict of Interests

The authors declare no conflict of interests.

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About the Authors

Jonas Harvard is Associate Professor and Researcher in media history at the Department of Media and Communication Science, Mid Sweden University. His research focuses on the current and historical roles of technology in journalism and how strategic communication choices by individuals and institutions have interacted with cultural and political ideas of communication.

Mats Hyvönen is a Media and Communications Scholar at Uppsala University and Research Coordinator for the Engaging Vulnerability Research Program. Specializing in media history, he is interested in the vulnerability of the public sphere and how media both feed and resist that vulnerability. Mats is currently conducting research on contemporary and historical links between journalism and academic scholarship.

Ingela Wadbring is Professor in media and communication science at Mid Sweden University and Head of the research center DEMICOM which conducts research on democracy and communication in the digital age. Her areas of interest are media transformation regarding media structure, media business models and media audiences.

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Article

Drone Journalism as Visual Aggregation: Toward a Critical History

James F. Hamilton

Department of Entertainment and Media Studies, University of Georgia, Athens, GA 30602, USA; E-Mail: hamilton@uga.edu

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Abstract
The use of unmanned aerial vehicles (UAVs—commonly referred to as drones) in journalism has emerged only recently, and has grown significantly. This article explores what makes drone imagery as an instance of what scholars of visual culture call an aerial view so compelling for major news organizations as to warrant such attention and investment. To do this, the concept 'visual aggregation' is introduced to theorize the authority of drone imagery in conventional journalistic practice. Imagery produced through drone journalism is a visual analogy to statistical summary and, more recently, of what is referred to as data journalism. Just as these combine an aggregate of cases to produce an understanding of an overall trend, drone imagery aggregates space visually, its broad visual field revealing large-scale spatial patterns in ways analogous to the statistical capture/analysis of large bodies of data. The article then employs a cultural and historical approach to identify key points in the emergence of visual aggregation as authoritative truth. The aerial view as a claim to truth is manifest in a wide range of antecedent social formations, devices and practices prior to their amalgamation in what has today become drone journalism. This analysis aids understanding of how drone journalism is a response to the institutional crises of journalism today.

Keywords
aerial view; drones; journalism; photography; unmanned aerial vehicles; visual aggregation; visual culture

Issue
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1. Introduction

Major news organizations have recently been diverting significant resources to develop the ability to gather imagery using unmanned aerial vehicles (UAVs), which are commonly referred to as drones. In the US alone, in 2015 ten major news companies tested drones for news-gathering (Smith, 2015). In 2016, CNN launched its CNN AIR (Aerial Imagery and Reporting) which, by the end of 2018, was staffed by close to 30 drone pilots. News organizations in the McClatchy company (30 companies in 14 states) included 43 licensed drone pilots on its various staffs. By the end of October 2018, a number of journalism schools in the US had incorporated drone use into their curricula, and industry training programs prepared several hundred journalists to apply for a pilot's certification (Fox, 2018; McAdams, 2016a). Major news organizations have also taken the lead in pioneering key regulations, procedures and uses in order to speed adoption of drones for journalism (Yarrish, 2018).

Given the sizable resources committed to these efforts, industry justifications are surprisingly thin. Claims about the value of drone imagery do not adequately distinguish it from other imaging technologies. After all, drone-mounted cameras are in one sense just another means of generating photographic images, which have been a staple of journalistic content for at least 100 years. Claims that drone imagery for journalistic uses "enable[s] journalists to see where they otherwise cannot and tell stories in new ways" (Fischer, 2019, p. 108), that it provides "spectacular imagery" (McAdams, 2016b), "really tell[s] the story" ("CNN drone cam," 2016), and with it "a new vantage point is reached" (Miller, 2018) can reasonably be made about a variety of remote imaging and listening devices.

So, how might the current attention being paid to drone journalism be better understood? To start, it needs to be placed within the larger current context of interrelated, existential challenges to news organizations throughout the world. These include the partisan tabloidization of news such as efforts by News Corp to intervene in US politics, the continued decline in pubic credibility, and the hemorrhaging of revenue due to the colonization of advertising by digital giants (Gottfried et al., 2019; Pickard, 2019; Rudd, 2020).

This study contends that the development of drone journalism in the midst of perhaps the biggest institutional crisis ever in journalism is not a coincidence. Nor can drone journalism be explained as the whole-cloth and out-of-the-blue invention by a reporter or news CEO. Rather than happenstance or personal invention, this study contends that drone journalism is an emergent social and institutional means of augmenting journalistic authority during a time of unparalleled challenge. Drone journalism is a novel mode of putting into practice traditional goals of professional journalism, which are currently under siege like never before.

To substantiate this claim, this study diverges from existing work on drone journalism in a number of ways. First, in distinction with other studies that valuably address it through such problematics as surveillance (Gynnild, 2014; Herscher, 2014), this article regards drone journalism as an instance of what Dorrian and Pousin (2013) conceptualize more broadly as an 'aerial view,' which is equally the experience, social relation and representation produced through viewing imaginatively and/or actually an imagined or actual landscape while elevated in the air and looking down at it. Second, when seen in this more expansive way, the focus of interest is not simply content or meanings, but cultural practices within determinant conditions (Williams, 1980). Third, and to make clear the connection to journalism, this study conceptualizes the relevant work done by drone journalism as 'visual aggregation.' Operating through key cultural forms and formations, visual aggregation exerts an authoritative claim to truth, an accomplishment of which is essential for journalistic viability and legitimacy.

To examine visual aggregation in the necessary complexity and large scale, and encouraged by chronologically expansive works such as Adey (2010), Cosgrove and Fox (2010), and Mirzoeff (2011), this overview (pun intended) historicizes the aerial view in relation to journalism by recovering its multiple forms and placing them within their generative formations and conditions, in order to analyze the social work it does in generating claims to authority. Drone journalism is the result of numerous transformations in means of communication and the formations in and through which they were made, consisting of widely disparate areas such as theology, scouting, mapping and surveying, military planning and reconnaissance, visual-artistic genres, documentary photography, urban policing, and feature-filmmaking, all of which are sedimented and residual, yet active determinations. Key questions addressed include under what conditions have aerial views been produced? Using what means of production, and consisting of what specific kinds of features? Within what formations, and to meet what kinds of social intentions and expectations? What kinds of authority do these practices produce, and in/through what kinds of formations? How do these inform the practice of visual aggregation in journalism today? In so doing, this study places the specific case of drone imagery in journalism within the much wider intellectual project of not only a "general history of communication about space" (Harley, 1987, p. 1), but one of communicative/spatial cultural production (Couldry & McCarthy, 2004; Harvey, 2001; Lefebvre, 1991; Shome, 2003; Soja, 1989). Counterbalancing the detail that is beyond the reach of an article-length synoptic overview is the analytic, integrative understanding it seeks to enable.

2. Journalism, Visual Aggregation and Authority

To understand the relevance of drone imagery for journalism, one must first establish how drone journalism assists the normative role of journalism, which is to provide authoritative accounts of events and situations in the world (Barnhurst & Nerone, 2001). The relationship is conceptualized here as visual aggregation. How visual aggregation as a process and form furthers this normative role helps make clearer the relevance and important cultural work that drone imagery seeks to do for journalism today.

The degree to which the Western ideal of objectivity as neutral observation and description can be claimed—and thus the authority of the resulting journalistic account—depends on how well it is put into practice through a particular procedure. Informing this characteristic procedure is an epistemology best characterized as rationalist empiricism, which reached institutionalized form in early-modern England. Recalling its emergence and basis explains its nature and relevance for journalism, as well as its role in visual aggregation.

By the 17th century, the generation of authoritative knowledge was generally seen to require logical analysis, but only if paired with systematic observation of the natural world (Ash, 2004). The phrase 'rationalist empiricism' captures how Jacobean exemplar Francis Bacon and contemporaries saw as requirements for authoritative inquiry skilled, systematic deduction by naturalist philosophers, but also the testing of such knowledge in the world (Solomon, 1998, pp. 65–69). In addition to being extensive and comprehensive, the collection of data was to be done in as systematic a way as possible in order to avoid being skewed by personal preference. To do so, their collection was to be as depersonalized, routinized and mechanized as possible. In the case of 17th century Bacon, a large team of workers followed strict, specific procedures to amass the largest amount of data possible, which then were interpreted by the project's leaders.

As empirical data collection put another way, aggregation thus came to be institutionalized as a key component of authoritative inquiry into the natural world. Similarly, in our own day, sufficiently aggregated data are required to bolster journalism's claim to produce an authoritative account of the world. The greater extent of data that are aggregated, the greater the validity and authority of conclusions drawn due to more fully documenting broad-based processes, trends and developments.

Yet, aggregation as an epistemology and methodology is not limited to overtly scientific or journalistic inquiry. It has been done in multiple ways and to meet many kinds of social intentions. One such means of doing so that reached new levels of relevance by the 19th century was population-survey data and statistical analysis, which addressed the particular requirements of expanding national polities. Peters (2001) sees the authority of statistical aggregation as a manifestation of the emergence of modern, far-flung industrial society. Similar to other, modern forms of aggregation such as the novel (which aggregates plots) and the newspaper (which aggregates events), population statistics (which aggregates population characteristics and actions) is a "space- and time-collapsing" form of representation necessary to capture and represent such widely dispersed societies (Peters, 2001, p. 438).

The case of drone journalism suggests the necessity of much more fully recognizing the importance of visual aggregation in journalism. While aggregation in the form of a voluminous data set or documentary record is a staple topic of reporting classes, visual aggregation is largely relegated to conventional data visualization and infographics design. Yet, a more robust practice such as drone journalism seeks to aggregate spatial/geographic points and their relation. Understanding how visual aggregation via the aerial view coalesced into drone journalism today takes account of the emerging importance of spatial analysis in news and public intelligence.

2.1. Journalism and Social Reproduction

Due to habits of media analysis inculcated through the effects tradition, it remains tempting to analyze visual aggregation in terms of information/meanings it conveys and the cognitive/psychological effects it has. Yet, by taking the existence of the messages for granted and as the starting point of analysis, and assuming from the outset that messages and their meanings are the origin of individual and perhaps also social effects, such an approach regards attention to the social means and resources of reproduction as simply irrelevant. But, as Williams notes, this oversight shortsightedly takes for granted what it ought to explain, which is the productive forces that generate such messages and their implications. Furthermore, productive forces are not just factories staffed by wage workers, but consist in the broadest sense of "all and any of the means of the production and reproduction of real life," which includes the production of "social co-operation…[and] the application and development of a certain body of social knowledge" (Williams, 1977, p. 91).

Inquiry into the means of social reproduction of drone journalism deserves the highest level of attention, because it accounts for the relevance of visual aggregation to the current existential challenges faced by journalism as an institution. Underlying these challenges is the key problematic of how the establishment and legitimation of claims of authority in professionalized Western journalism work socially, which is a long-standing issue addressed in the US in such ways as the Lippmann and Dewey debates of the early 20th century (Dewey, 1927; Lippmann, 1922). One way that the authority of journalists' accounts is legitimized is by referencing their specialized training and knowledge. Doing so sets journalists apart from other people as a special group—what is best described as a clerisy. Compared to the less-precise term of 'elite,' clerisy specifies a restricted/protected group distinguished by a high level of learning. While, in some ways, such a basis of authority is assumed as necessary, it is also grounds for dismissal due to its isolation from the lives of a broader range of people and its undemocratic implications of a small group of people telling others what to think.

A second way that the authority of journalists' accounts is legitimized is in many ways the opposite of the first. Instead of basing it in the specialized training of a clerisy, claims of authority in this second form are validated through public deliberation, whether in the apocryphal marketplace of ideas or, as Dewey would have it, by bringing publics into being. Instead of setting them apart if not above others, this way integrates journalists and journalism into the general social process, rendering them as an aid or resource for deliberation, rather than as the source of directives. While this basis addresses the objection regarding the undemocratic implications of authority legitimized by a clerisy, it is also grounds for dismissal due to seeming to lack any basis for judging quality, accuracy or objectivity.

The problematic of claims of authority for professionalized Western journalism rest in the fact that neither of these two bases for claims of authority is sufficient in and of itself. Despite being opposites, both seem to be required. The social and institutional dimension of this problem today is in great part due to the lack of adequate means of melding, synthesizing or at least allowing both to operate. How drone journalism as visual aggregation might address this ongoing problematic is thus of primary interest and importance.

3. Clerisy Production

Two points need to be made regarding the earliest forms of the aerial view as relevant to drone journalism as visual aggregation. First, the aerial view existed much prior to human flight and the invention of mechanical imaging, being instead deduced through rational spec-

ulation, and in varying degrees doctrinaire and faith-based as well as rationally-derived through mathematical proofs and limited observation of the natural world (Dixon, 2010). Second, its production and use were solely in the hands of a clerisy, which then produced the concomitant social distinctions. As will be explained, such origins and uses and their relevance to claims of authority continue to be refracted today in the claims of journalistic professionalism.

3.1. Cosmologies

An initial aerial view as a claim to truth took the form of a cosmology that, by merging theology and myth, aspired to nothing less than a timeless, universal account of existence. Aerial views as cosmologies have been found "in prehistoric times and [in]…nonliterate societies," and were "used as teleological instruments, epitomizing the sacred and mythical space…as well as the more tangible landscapes of the real world" (Harley, 1987, p. 4). Indeed, the presence of aerial views as cosmologies has been documented in as early as the Upper Paleolithic period (40,000 BC to about 10,000 BC; Smith, 1987, p. 55).

Instead of depicting landscapes directly observed or measured, cosmologies are typically wholly imagined 'landscapes' giving form to a mythical, foundational understanding and narrative of existence. Whether "'flat earth' cosmologies, in which the universe is seen as made up of separate layers (heaven, earth, underworld) that are in some way linked," or "spherical cosmologies of the Hindus and of Roman and medieval Europe," they share common characteristics, such as "a central or pivotal feature…such as a mountain…or the Tree of Life," or a labyrinth (Smith, 1987, p. 87). In addition, their levels or zones are "connected with the passage of the human soul after death to the afterlife or from one world to another," thus becoming as much cosmological signs as cosmological maps (Smith, 1987, p. 88).

While asserting theological doctrine, cosmologies also critiqued such doctrines, too. One of the most earth-shaking transformations of early-modern European experience was brought about via the aerial view in which Copernicus challenged church doctrine with "the heliocentric system (now fully equipped with mathematical models capable of predicting planetary positions) and defended it as the true description of the universe" (Lindberg & Numbers, 2003, p. 35).

3.2. Scouting Reports

Cosmologies are not the only form of pre-flight aerial view. In contrast to eternal and universal claims regarding human experience, scouting reports have the much more prosaic and tactical intention of guiding immediate and local needs of navigation, occupation and settlement.

Such reports are of particular importance for military defense and conquest, thus serving military and administrative clerisies. As such, they are an early example of the military heritage of more recent communication practices in the context of expanding empires (Aitken, 1985; Bishop & Phillips, 2010; Williams, 1975). To operate within this military/tactical social intention, scouting reports differ from cosmologies by addressing an immediate area, and by being attuned to a particular moment, tactical situation or need. Finally, scouts who directly observe the landscape use direct speech and gesture to communicate their findings in face-to-face meetings with commanders or leaders. Indeed, direct eyewitness observation of an actual landscape is essential for establishing the authority of the observation (constituting the centrality of witnessing in journalism as the distinction of specialized knowledge).

Scouting reports' broader means of production are also quite different from cosmologies. While naturally-occurring features such as hilltops or treetops enabled for millennia a scouting aerial view, increasingly sophisticated building and engineering techniques made possible the manufacture of manmade hills and towers on military battlements or cathedrals. Archaeological evidence of hill forts as defensive enclosures in what became the British Isles, and central and western Europe dates from the late Neolithic period (6000 BC–4000 BC), becoming more common as time went on. High ground due to the location on a natural or manufactured hill provided occupants with a strategic and defensive advantage over threats, whether human or animal (Lepage, 2012, p. 8). By 9th century England, castles located on as high an elevation as available commonly included a tower for observing the surrounding countryside (Stokstad, 2005, p. 3). Sentries in these watchtowers monitor approaching visitors from a safe distance, as well as more distant locations for signs of encampment and pillage such as columns of smoke from fires of approaching armies (Brice, 1985, p. 13). Similar to manufactured points of elevation are aids for observation. Optical aids such as telescopes extend the range and deepen the detail of what can be observed and subsequently reported.

3.3. Surveying and Mapping

Under pressures of colonization and empire, cosmologies and scouting reports and the work they did came to be synthesized in surveying and mapping, "a *recursive* social process [emphasis original] in which maps [are used to] shape a world that in turn shapes its maps [through the practice of mapping]" (as cited in Craib, 2017, p. 17). While personally-written accounts reproduce and thus more widely distribute the intelligence that had been personally gathered, the spatial-administrative needs of empire required greater scale, precision and authority. With the expansion of empires came more powerful means of rationally deriving not only a much farther-ranging, comprehensive, detailed kind of scouting report but, as has been subsequently recognized by scholars, one that also makes cosmological claims about reality.

Geometrically and mathematically generated aerial views precisely index the topographies of the natural world, accommodating them to more precise military conquest and political control as well as to land ownership (Klinghoffer, 2006). Such maps were created through surveying and the corresponding codification of schematic means of representing and thus widely distributing surveyed observations and measurements. Evidence of surveying conducted on behalf of an official land register or office exists on Sumerian clay tablets and boundary stones created at least as far back as 1000 BC (Richeson, 1966, p. 3). These maps extended the distribution of observations through time and space. When filed away in an administrative land office, maps generated through surveying extended the useful life of the observation so that, after its deposit, it could be consulted for years after.

Mapping and surveying are essential for colonization and empire. While the "connection between cartography and the exercise of imperial power is an ancient one," the "direct use of maps to further the ends of empire seems—at least at first glance—to be a modern phenomenon, closely tied to, if not dependent on, the emergence of the modern state" (Akerman, 2009, p. 1). More specifically, "not until the fifteenth and sixteenth centuries did ruling elites in Europe turn with any regularity to mapping for the management of state affairs" (Akerman, 2009, p. 1). To underscore the relationship between mapping and imperial expansion, Barrow notes that "it is no accident that the Dutch produced some of Europe's finest and most accurate maps at a time [in the 17th century] when the country was deriving enormous profits from an expanding empire" (Barrow, 2008, p. 25).

Their means of communicative production solidified their use and relevance for an imperial, administrative clerisy. While ancient techniques of surveying requiring parsing distances using wooden rods and cords that were demarcated at specific lengths, with the measurements aggregated by using rudimentary geometric principles, the invention and use of a magnetic compass in China by the 10th century and in Europe by the 12th century was pivotal, in that "land maps could [now] be constructed by compass bearings[,] and distances could be measured from a fixed point," and at magnitudes far greater than those demarcated by a wooden rod or multiple lengths of cord (Richeson, 1966, p. 7). By the 16th century, the invention of the technique of triangulation along with the invention of the epipedometron, and aided by the application of more advanced geometry and trigonometry, made it possible to survey and thus authoritatively map "a large area, a kingdom, or a whole country" (Richeson, 1966, p. 9).

In the high precision and great informational density of schematic maps, official administrative needs were well met, while their reliance on complex mathematics along with their schematic mode of representation limits them as well to specialist, administrative uses. Along with the extensive knowledge required for how to use specialized instruments to precisely survey a land mass, specialist knowledge is also needed to decipher the surveyor's map, which are highly schematic and technical. Even early English surveyors' guide/instruction books, such as those published by William Leybourne in the 17th century, are difficult for anyone without specialist knowledge to understand (Richeson, 1966, pp. 113–114). Diagrams reproduced in Richeson (1966, pp. 116–117) from such books that illustrate different methods of surveying appear to the untrained eye as irregular polygons, with dashed lines connecting some corners, degree measurements written in at angles, and compass headings labeling orienting lines. Author William Emerson in 1770 also notes the need for specialist training, urging that "thorough instruction should be had in arithmetic, geometry and trigonometry before the study or practice of surveying is to be done" (as cited in Richeson, 1966, p. 144).

4. Popular Production

Aerial views in the forms of cosmologies, scouting reports and surveyed maps are material productive practices that help reproduce their respective clerisies. This is no simple media effect, manipulation or false consciousness, but the concrete effectiveness of material cultural practices for enabling action in the world and for organizing and managing social relations (Williams, 1977). Their restriction to their respective clerisies further solidifies their claim to authority.

While conventional claims to journalistic authority rely similarly on assertions of news professionals' special training and knowledge, professional journalism in liberal polities traditionally seeks to serve its publics, not lead or govern them. Thus, claims to authority cannot simply be practices that reproduce a clerisy, but those that reproduce the formative role of readers and/or viewers as publics. Given this need, what was necessary to make visual aggregation more amenable to journalism was forms that are popularized, so as to enable the public validation of authority and claims to truth. Two points can be made about these popularizing practices in comparison to those for exclusionary clerisies. First, they validate claims to truth by using iconic instead of schematic forms of representation from sketching to cinematography, which correspond more directly and generally to individual spatial experience. Second, and to fit better the requirements of rationalist empiricism, they use increasingly mechanical means of imaging so as to be able to claim minimal skew by personal bias or preference (a contestable point as argued by Berger, Blomberg, Fox, Dibb, & Hollis, 1973; Sontag, 1977; among others).

4.1. Civic Promotion and Aerial Views

Iconic aerial views are not categorically distinct from schematic, nor universally a popularizing form. For example, while ancient cosmologies were commonly iconic, not only was access to them restricted (due to the

restricted availability and access to textual documents generally prior to the printing press and the emergence of a commercial-book trade), they were also imbued with allusions, notations and iconographic significance decipherable only by members of a clerisy possessing such knowledge (Eisenstein, 1983; Harley, 1987, pp. 2–3). Indeed, Copernicus's treatise challenging the geocentrism of the Catholic Church was hardly meant for popular reading. As Lindberg and Numbers comment: "Copernicus's book was a highly technical astronomical text, dominated by detailed geometric models for all of the planets" (Lindberg & Numbers, 2003, p. 35).

At the same time, however, other practices of iconic representation of aerial views were developed for non-specialist circles. A key formation developed in Europe was civic promotion in the context of Enlightenment scientific and artistic exploration of the geometries of human sight. These iconic pre-flight aerial views were not the opposite of surveys as much as enhancements and popularizations of them that sought experiential rather than mathematical accuracy. As Bury (2013) notes regarding representations of Rome that were created in the 16th century, pre-flight civic aerial views are a sketch of direct visual experience from actually existing elevated viewpoints but that are also imaginatively extended to higher points of elevation (Bury, 2013, p. 36). The result was engravings used to produce multi-panel prints for exhibition, thus requiring as much a draughtsman's as a conventional artist's skill to execute.

While based at least in part on surveys and, as such, seeking at least a degree of cartographic accuracy, pre-flight civic aerial views also accommodate interpretive license such as by selectively enlarging certain categories of buildings and by not depicting inhabitants (Bury, 2013, pp. 27, 34–35). As such, they were not simply flights of individual fancy or surveyed maps, but variable amalgams of both. As dal Buono writes in the early 17th century regarding his aerial view of Bologna, these were not maps but "portraits of cities [that] do not consist in their plans [schematic surveyed maps]…but in their representation exactly as the eye sees them from a determinate point of view" (as cited in Bury, 2013, p. 31). As Bury also observes about a similar case, Duperac's and Tempesta's multi-plate aerial views of Rome are not solely a personal impression, but "synthetic images packed with factual information…for the purpose of extracting detailed information about the individual buildings, streets and squares of the city" (Bury, 2013, p. 41).

4.2. The Formation of Consumer Entertainment

Simply on the basis of appearance, there would seem to be a direct line connecting the observed/imagined civic aerial views of dal Buono and his 17th century contemporaries, and those of 19th century Parisian Nadar as he drifted over Paris in a balloon taking photographs to be later assembled into a panoramic mosaic cityscape for public display. However, a sole focus on the formal similarity masks a number of key transformations that differentiate the two.

By the early 19th century in Europe and North America, of great import for the emergence of drone journalism as visual aggregation was the additional formation of popular-scientific experimentation in the context of consumer commercial entertainment, which was an industry sector already undergoing accelerating growth and expansion in the 19th century. In such a formation, the overriding social intention for visual aggregation was profitability. Aerial views worked in/through this formation by being retail experiences.

Granting the immense complexity of this historical development, two general points deserve mention as a way of making sense of their relevance for drone journalism. First is that innovations in production, distribution and exhibition continued to synthesize uses of aerial views as objective data and as personal impression/experience. Innovation in means of mechanical iconic reproduction in the 19th century further fused an experiential standard of accuracy—in which fidelity to personal visual experience (in combinations real and imagined) was the guiding standard—to the cartographic one.

Second is how the deterritorialization of aerial views in order to maximize market size also underscored the value of appeals to individual sensory experience. Popularized iconic aerial views were valued less in terms of their specific territorial referent (accuracy as judged by their fidelity with personal knowledge and experience) and more in terms of individual abstract sensory experience and pleasure. Instead of comparing the view to what one knew of the specific location to judge how accurate it was, the key comparison increasingly was whether the represented experience convincingly portrays what it would have felt like to have personally experienced it.

4.3. Panoramas

Panoramas as visual simulations of scenic travel engaged middle-class audiences seeking inspirational experience of iconic points of observation from around the world (Oettermann, 1997, pp. 11–12). Where circular panoramas immersed viewers by placing them at the center of a ring whose inside-facing surface was a 360-degree continuous painted image from a particular location, moving panoramas comprising sequential scenes and places scrolled a continuous journey for a seated audience (Huhtamo, 2013, p. 8). Their iconic mode made them easily understood, more fully popularized and thus more easily commodified. As a maker of horizontal panoramas (a type of merger of cartographic and iconic representation that could be reproduced in books) of peaks in the Alps observed, "while map reading is a skill that must be learned, anyone with a few years of elementary school can understand a panorama" (as cited in Oettermann, 1997, p. 37).

Panoramas in the 19th century occupied a liminal space between art and science, thus marking yet another

point in the objective datafication of pre-photographic iconic representation. A self-aggrandizing 1862 account from the creator of a moving panorama of a journey by boat down the Mississippi River indicates as much. While being a painting, the panorama was claimed to display a "remarkable truthfulness of the minutest objects on the shores of the rivers" (Banvard, 1862, pp. 14–15). And, as Oettermann notes regarding the more schematic horizontal panoramas of the Alps (a Cubist-style composite of sketches), their makers praised such work as equally data and evocation of experience. One such alpinist/panoramist notes that "in addition to the scientific data that such correctly sketched views can provide…what pleasure can I not obtain when…I unroll [and look at] my circular drawings….Not even the liveliest imagination can produce such an effect" (as cited in Oettermann, 1997, p. 37).

4.4. Flight and Photography

The key rupture that transformed aerial views was the emergence of human flight, first in balloons then by airplane, and of photography. Together they enabled the further fusion of cartographic and experiential standards of accuracy, thus providing a social means of more fully articulating the clerisy with publics. This transformation of the iconic from personal view to objective data via visual aggregation is crucial to the relevance of drone imagery for journalism.

What up to that point had only been imagined or approximated could now be directly experienced and captured mechanically, thus through eyewitnessing (a journalistic staple) and mechanical capture (a requirement of authoritative aggregation) constituting a more authoritative claim to truth. Indeed, the mechanical capture of images came to be seen in the 19th century as what Daston and Galison call "'noninterventionist' or 'mechanical' objectivity…[which is] only one of several elements that historical pressures have fused together into our current, conglomerate notion of objectivity" (Daston & Galison, 1992, p. 82). In doing so, it also boosts the commercial value of such views, in that accuracy was and is touted as a fundamental competitive advantage. The best journalism (most read and most profitable) has conventionally been that which is the most accurate. It is this combination that today's drone journalism has developed to a high level.

Early examples of non-aerial photography underscore the extent to which the mechanically-produced iconic image was made into objective data through aggregation. One is collections by courtrooms and hospitals of individual photographic mugshots to aid police work and to authenticate passports, permits and licenses (Tagg, 1993). A second is the collection by newspaper photographer Jacob Riis of photographs of individual living conditions among immigrants living in New York City slums (Riis, 1890). Additional uses of iconic forms did the same kind of innovative cultural work. Kelsey notes regarding photographs and illustrations done for the US Geological Survey in the 19th century that the iconic and schematic were not necessarily distinct. Survey photographs exemplify a mingling of forms taken from "the map, the geologic profile, and the diagram," thus infused with "scientific exactitude, perspicacity, and detachment" (Kelsey, 1992, p. 6).

The reflections of early balloonists suggest the value of aerial photography for visual aggregation. Prince Pückler-Muskau in a balloon flight over Berlin in 1817 underscored how there was "nothing to prevent the eye from ranging over the boundless expanse" (as cited in Newhall, 1969, p. 11). Thomas Monck Mason writing in 1836 notes how "localities which he never beheld or expected to behold at one and the same view, [are now] standing side by side in friendly juxtaposition" (as cited in Newhall, 1969, p. 12). Yet, many technical limitations of early photography had to be overcome to make photography amenable to aerial views. Indeed, early imaging using daguerreotyping required not only the photographer and camera to be aloft, but an aerial darkroom complete with chemicals as well so as to process the exposures within the required time frame (Newhall, 1969, p. 19).

Some adventurous experimenters nevertheless took up the challenge of documenting the experience of human flight. The aerial-photography exploits of Parisian caricaturist/publisher-turned-photographer Nadar (née Gaspard Félix Tournachon) are perhaps the most well-known. His conception of aerial photography illustrates the complex transition of iconic representation from personally imagined scene to mechanically transcribed data. Bann notes as much, by tracing in Nadar's written reflections a "decisive shift" from one "cognitive threshold" to another—from art to science, from impression to transcription, from image to data in which aerial photography was "a new, precise mode of seeing, capable of being harnessed to further technical tasks" (Bann, 2013, p. 86). A story that appears in *Le Monde Illustré* in 1858 notes that, prior to photography, where "we have had bird's-eye views seen by the mind's eye imperfectly; now we will have nothing less than the tracings of nature herself, reflected on the plate" (as cited in Newhall, 1969, p. 20).

Further technical innovations in photography enabled its popularization, which expanded access from well-heeled experimenters and adventurers, to key institutions and members of the lay public. The invention in 1871 of gelatino-bromide dry plate photography substantially lengthened the time between exposure and processing, thus obviating the need to travel aloft with an aerial darkroom. Due to being more than 60 times more sensitive than wet collodion plates, it also substantially decreased the exposure time needed (Newhall, 1969, p. 34). Continued experimentation resulted in film on a roll instead of separate plates, which further reduced camera size, while the development of mechanical shutters increased precision of exposure and thus image sharpness still further (Newhall, 1969, p. 35). The result of these and other such innovations was that photogra-

phy came to be "so greatly simplified that almost anyone could take photographs anywhere with no more trouble than pressing a button," meaning that "balloon photography, once a tour de force of the professional, now became common" (Newhall, 1969, p. 36).

Along with its popularization came its relevance for clerisy uses, too, such as military reconnaissance for tactical planning as well as for damage assessment (Kaplan, 2006; Mead, 1983; Oxlee, 1997). Systems for strapping and operating cameras from airplanes pioneered in the early 20th century came to be crucial by WWI, with the enhancement of imagery produced through melding a succession of overlapped images into stereoscopic form (Newhall, 1969, pp. 52–53).

4.5. Cinematic Aerial Views

By the late 19th century, photographic images in popular as well as clerisy formations had come to constitute through aggregation objective visual data. The final piece needed to complete the pre-conditions for drone journalism was not only that of cinema but a cinematic syntax and language, plus their social acceptance and understanding along with public systems and institutions for their production, distribution and exhibition. In doing so, the static iconic view-as-data provided by balloon and later airplane photography could be superseded through commercial visual entertainment and its development, distribution and exhibition of dynamic, iconic visual experience-as-data.

At the start of cinema, the actors moved, but the camera did not. Commonly, a single stationary camera on a tripod captured action that took place in front of it, with the viewpoint thus produced analogous to that of a single seated spectator in an audience watching a play on a theater stage. When used in aerial views, this tableau approach to visual narrative de-emphasized the experiential while emphasizing the objective, such as in its early predominant use in documentary newsreels (Castro, 2013, pp. 123, 127). Aerial views such as these were "eminently instrumental and functional," with practitioners informed that such footage "is good in terms of their documentary quality, such as visibility, topography and reconnaissance capacity" (Castro, 2013, p. 123). As Castro concludes, "indexical images obtained from the air [came to be regarded as]…the natural replacement for cartographic images" (Castro, 2013, p. 123).

A fusion of experiential with objective—and thus a better fit with the requirements of commercial journalism, which must engage as well as inform—required innovations in cinematic editing, which reconfigured this static and unengaging visual approach. Not only do moving images correspond more fully to personal visual-sensory experience by unfolding through time, through the innovation of editing they produce a modernist fragmentation of experience that visually aggregates by producing a supra-individual spatial experience. Marked by the work of major early filmmakers Griffith and Eisenstein, and analogous to expansive panoramic novels of Tolstoy, Dickens and many others, multi-camera filmmaking interlaced scenes and plots to depict what no single person in continuous experience could directly apprehend. With such innovations, spectators themselves while viewing through the camera now moved as did actors. Production and editing innovations allowed cinema to not just mimic the experience of an eyewitness to a single, continuous action, but produce a personal experience of time/space/viewpoint mobility and a paradoxically fragmented/aggregated visual narrative.

While camera movement in the earliest years of cinematic experimentation can be seen in the work of the Lumière brothers, its sophistication proceeded rapidly (Castro, 2013, p. 125). Cameras on dollies (platforms with wheels that move on a set of tracks) could follow actors and action in a panoramic way. But of greater import to cinematic aerial views was the innovation of vertical moving shots and their narrative significance. Booms allowed an operator on the ground to film as the camera attached to one end was levered into the air or returned to earth from an elevated position. Crane shots raised the camera and operator even higher into the air. When booms or cranes were also mounted on dollies, the technical means were in place to create sweeping aerial movement vertically as well as horizontally, which is a signature shot employed in drone journalism. Early innovative examples include a variety of boom and crane shots on dollies in *Intolerance* (Griffith, 1916), and a variety of shots of and from airplanes in *Wings* (Hubbard & Wellman, 1927).

5. Drone Journalism in Retrospect

Concluding this study with the development of aerial scenes in early 20th century scripted silent feature films may seem to be a curious choice, particularly in view of a host of subsequent technological innovations in imaging and sensing, flight and control, visual aggregation and analysis, as well as the emergence of additional relevant activating formations, including journalism and its use of drone imagery for visual aggregation. Journalistic uses range from overviews of protests, demonstrations and other large gatherings of people, to forays into dangerous areas ravaged either by natural disaster or military incursion. Treading the ground of early cinema, drone journalism has only recently begun to embrace multi-camera editing in lieu of single-camera continuous-shot segments. Doubtless additional uses will emerge.

Yet, doing so meets the goal of establishing how visual aggregation exerts an authoritative claim to truth, the accomplishment of which is essential for journalistic viability and legitimacy. Drone journalism's claim to truth is produced not solely by journalistic uses, but contextually and historically by the still active weight of sedimented practices and formations of aerial viewing.

What is most important, then, to recognize regarding the current industry effort to develop drone journalism is

not simply the footage taken, but how drone journalism works socially to claim authority which, for journalism in liberal polities, is both exceptionally important and exceptionally difficult. The challenge is to adequately synthesize a contradiction, both poles of which are necessary: the restriction of production to a clerisy (to validate specialist professional training, but which also produces the problem of elitism and thus social division), and the involvement of publics (to validate what ideally is meant to be the integrative, organic role of journalism to the publics it serves, but which also encourages the problem of tabloidization and the abandonment of professionalism in order to secure commercial success). This crux of the social problem of journalism is embodied in a particularly graphic way by drone journalism. It remains to be seen whether drone journalism will be able to sufficiently address it.

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About the Author

James F. Hamilton is the Jim Kennedy Professor of New Media, Head of the Department of Entertainment and Media Studies, and Director of the New Media Institute at the University of Georgia, US. His research concerns democratic communications, alternative media and communication technologies. Among his published work is *Democratic Communications: Formations, Projects, Possibilities* (2009), *Alternative Journalism* (2009, co-written with Chris Atton), and an edited volume with Robert Bodle and Ezequiel Korin, *Explorations in Critical Studies of Advertising* (2017).

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Article

Diffusion of Drone Journalism: The Case of Finland, 2011–2020

Turo Uskali [1,*], Ville Manninen [1,2], Pasi Ikonen [1] and Jere Hokkanen [1]

[1] Department of Language and Communication Studies, University of Jyväskylä, 40014 Jyväskylän yliopisto, Finland;
E-Mails: turo.i.uskali@jyu.fi (T.U.), pasi.s.ikonen@jyu.fi (P.I.), jere.t.hokkanen@jyu.fi (J.H.)
[2] Innovation and Entrepreneurship InnoLab, University of Vaasa, 65200 Vaasa, Finland;
E-Mail: ville.manninen@univaasa.fi

* Corresponding author

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Abstract
This article details Finnish news organizations' adoption of drones for journalistic purposes from 2011 to 2020. The theoretical starting point of the article is Rogers' (1962) diffusion of innovations theory, which explains how new ideas and technologies spread in societies. The main empirical data for the study were derived from a phone survey conducted among the 80 most popular newspapers in Finland. The findings reveal that drone journalism in Finland has already diffused from a few pioneering organizations to a large number of newsrooms, including regional, mid-sized newspapers. Most of the newspapers are either using in-house drones, buying commissioned images, or using both strategies. The frequency of use was found to be much higher for those newsrooms using their own drones. Finally, the article ponders possible explanations for different trajectories in the adoption of drones in various countries based on the Finnish case.

Keywords
aviation; drone journalism; Finland; news organizations; newspapers; visual journalism

Issue
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1. Introduction

Over the last decade, easy-to-use, inexpensive, remotely piloted aircraft, unmanned aerial vehicles, and unmanned aerial systems—also known as camera drones—have entered the visual storytelling fields. Although newsrooms have long been able to use kites, balloons, planes, helicopters, cranes, and so forth to incorporate spectacular images and videos from a bird's eye view into their reporting, the drone is the first practical tool for aerial photography available to news organizations, regardless of their size or resources.

Drone journalism started internationally in the early 2000s with the help of amateurs, freelancers, and activists in various countries, with varying topics that included floods, demonstrations, and celebrities. After this pioneering testing period, between roughly 2010 and 2014, the largest and most resourceful newsrooms were among the first to invest in their own drone fleets and educate their photographers to become drone pilots. During this phase, the scope of drone activities advanced from isolated ad hoc cases to more continuous operations (Gynnild & Uskali, 2018).

In Finland, the first news images and videos produced by camera drones were published in 2011, which aligns with the general drone journalism timelines in many other Western countries (Gynnild & Uskali, 2018; Lauk, Uskali, Kuutti, & Snellman, 2016). Yet there are many questions in this area. First, how has drone journalism diffused in the context of a single country? In particular, how are mid-sized or small newsrooms using drones, if at all? We find that small and mid-sized news-

papers, in general, are under-researched in journalism studies. Similarly, news photographers have been gravely neglected in contemporary journalism research, which has mainly concentrated on the changes in the journalists' work (see, e.g., Greenwood, 2019).

To fill the current gap in drone journalism research, the present study focused on exploring the diffusion of drone journalism in Finland from 2011 onwards. The starting year of our inquiry is based on findings from previous studies (Lauk et al., 2016). The main research question of the current study is as follows:

> RQ1: How many Finnish newspapers adopted drones for journalistic work between 2011 and 2020?

The Finnish media landscape has quickly digitized. Since 2014, Finns have spent more time on the Internet than with any other media (Ala-Fossi et al., 2018). However, newspapers still hold a distinctively strong position in Finland, as they have done historically (Jyrkiäinen, 2017). Newspaper publishing is the second largest media sector by revenue generation (after television), and seven of the ten largest media companies (by turnover) are newspaper publishers (Statistics Finland, 2020). An important feature of the Finnish newspaper industry is the persistent dominance of subscriptions over single-issue sales. In 2015 (i.e., the most recent data available), over 90 percent of all print copies were home delivered. This has lent Finnish newspapers financial stability and a license to focus on long-term quality over short-term sales.

In terms of journalistic production, newspapers are crucial in Finland. Although the public service broadcaster, Yleisradio, is the largest single employer of journalists in Finland, most private sector reporters work for various newspapers (Union of Journalists in Finland, 2019). The newspaper industry is also notably less concentrated than the radio and television industries (Ala-Fossi et al., 2018). Although the number of newspapers has been declining since 1990, there are still close to 200 individual newspapers—in a country of some 5.5 million inhabitants (Finnish Newspapers Association, n.d.; Statistics Finland, 2020). This (relative) granularity of the field makes newspapers a more interesting object of innovation diffusion studies than, say, the highly centralized television sector. In terms of drone journalism, both liberal regulations and press freedom are vital prerequisites. Finland has consistently been at the top of the Press Freedom Index (Reporters Without Borders, 2020) and its drone regulations have been light, based on informing the authorities about drone activities but not asking for any permission or license.

In the next section, we will present the theoretical foundation of our enquiry based on a literature review in two research fields that we acknowledge as imperative for understanding the diffusion of drone journalism in Finland: innovation studies and research on changes in professional photojournalists' work conditions.

2. Literature Review

2.1. Rogers' Diffusion of Innovations Theory

Digital disruptions, financial crises, and constantly changing media consumption habits have exerted long-lasting negative influences on the journalism business, especially for newspapers (Jahangir & Zhiping, 2015). For more than a decade, news media companies' typical strategy for responding to diminishing revenues has been to cut their workforce. For example, in Finland, this has been done with layoffs and early retirement pension packages (Nikunen, 2014).

However, many experts have emphasized that layoffs are not a sustainable solution for the future of journalism, instead suggesting more proactive measures. Pavlik (2013) argued that the key for journalism's viability is innovation; he defined innovation in news media as "the process of taking new approaches to media practices and forms while maintaining a commitment to quality and high ethical standards" (Pavlik, 2013, p. 183).

However, newsrooms often lack the necessary resources for creating innovations (see, e.g., Küng, 2015; Lowrey, 2012; Steensen, 2009). News organizations are designed first and foremost for effective, constant content production. Even if journalists' and photographers' work includes creative and innovative elements at the level of individual stories, these actors cannot innovate at the procedural or organizational levels. Therefore, we argue that rather than innovating, news organizations mainly adopt or adapt new technologies that they then incorporate into their work routines. This is also the case with drones.

Rogers' (1962) diffusion of innovations theory has been among the most influential theories for predicting how new technologies are communicated and adopted in societies and it has contributed significantly to the field of communication studies (Srivastava & Moreland, 2012).

In journalism studies, the research on diffusion has focused on single platforms, such as journalists using Twitter (English, 2016; Muindi, 2018), TV stations using drones (Ferguson & Greer, 2019), and on the adoption of major technological changes, including the use of computers for reporting (Davenport, Fico, & Weinstock, 1996; Garrison, 2001; Maier, 2000). It has been applied to the emergence of user-generated content in news (Yeo, 2016), the study of multiform change—including technological, relational, and cultural aspects (Ekdale, Singer, Tully, & Harmsen, 2015)—and the processes and influence of convergence (Micó, Masip, & Domingo, 2013; Singer, 2004).

The innovation diffusion curve illustrates a wide variation in the time required by someone to adopt a new technology or service. The categories of adopters, based on the pace of adoption, are: (1) innovators; (2) early adopters; (3) early majority; (4) late majority; and (5) laggards (Rogers, 1962).

In short, innovators are technology enthusiasts. They are the first to test and adopt new technology (Gershon, 2017). Early adopters follow them but tend to be more discerning in their adoption choices; they are crucial in "translating" the innovation and its worth into something the majority can understand (Gladwell, 2001). The early majority is also interested in acquiring new technology, but their rate of adoption is slower than those in the first two categories. Those representing the late majority are more cautious and resistant to change than those belonging to the aforementioned groups. Lastly, laggards are the ones that do not want to spend money or effort on new technology; they are the last to adopt an innovation.

We hypothesized that the diffusion of new technology is always gradual; therefore, the case of camera drones in Finnish newsrooms would be no different. In the current study, we applied Rogers' (1962) diffusion of innovations theory in a manner similar to Zhang and Feng's (2019) application in the context of data journalism in China. Their conclusion was that data journalism was not yet deeply rooted in China's journalistic tradition (Zhang & Feng, 2019, p. 1297).

2.2. Multiskilled and Precarious Photojournalists

The role of photojournalists is crucial in drone adoption. Between 2015 and 2018, the use of drones increased from three percent to eight percent among participants in the World Press Photo Contest (Hadland, Campbell, & Lambert, 2018). Major influences affecting the work of photojournalists from the 2000s onwards include the changing economic situation of media organizations, adoption of new technology, shifts in newsrooms' use of photographs and video, and the requirement of multiskilling.

Redundancies in US newsrooms between 2000 and 2012 led to 43 percent job cuts for photographers, artists, and videographers, exceeding those of their reporter and editor colleagues (Anderson, 2013). Among the participants in the World Press Photo Contest, the number of professionals working full-time in photography decreased from 74 percent to 59 percent between 2015 and 2018 (Hadland et al., 2018). Finnish newsrooms also faced several substantial layoffs between 2009 and 2015 (Atarah, 2012; Ilta-Sanomat, 2014; Yle, 2015). Unfortunately, there are no official statistics on the number of photojournalists in Finland. There are about 8,400 working journalists (Union of Journalists in Finland, 2019), whereas the Finnish Association of Photojournalists has only 254 members (I. Launiala, personal communication, 9 March 2020).

In the 1990s, a shift from using film cameras to digital ones changed photojournalists' work routines (Fahmy & Smith, 2003). Later, Klein-Avraham and Reich (2016) noted the weakened professional status of photojournalists. One reason for this was so-called deskilling: automatic cameras and software, such as Photoshop, allowed almost anyone to capture and distribute decent-quality photographs. A study on Czech photojournalists noted the increased workload and decreased degree of specialization (Štefaniková & Láb, 2016). Notably, newsrooms have used more amateur photographs and video in their news reports because of their low cost and timeliness (Andén-Papadopoulos & Pantti, 2011; Mäkelä, 2014). In part, photographers have either been replaced by multiskilled multimedia journalists or have had to undertake responsibilities that did not exist before, such as producing audio, video, and multimedia (Robinson, 2011; Štefaniková & Láb, 2016; Yaschur, 2012). Because of these pressures and many layoffs during the last decade, photojournalists are in a precarious position (Mortensen, 2014).

Multiskilling is both a threat and a possibility for enhancing photojournalists' professional status. Rapid technological evolution has been a cause of stress internationally (Hadland, Campbell, & Lambert, 2015). In a study on Finnish photojournalists in 2007–2008, Mäkelä (2014) noted that most participants saw multiskilling as a threat to their professional identity.

Drones represent a new tool that requires both technical expertise and the knowledge of ethics and regulations of drone use. On the one hand, learning to use drones is yet another arduous task for many. On the other hand, this new technology might strengthen the professional status of photojournalists by giving them preeminence over amateurs (Klein-Avraham & Reich, 2016), enabling professionals to acquire new skills that could help them career-wise (Greenwood & Reinardy, 2011).

3. Method

The current study is based on two rounds of telephone surveys of Finnish newspapers. The first round (n = 28) was conducted in summer 2019, and it collected extensive data on drone acquisition and use. The second round (n = 52) was conducted in early 2020, and although it included more newsrooms, it only sought to gather data on drone acquisition. Combined, the data provide a comprehensive overview of drones' diffusion into newspaper newsrooms and qualitative information on their use.

Additional qualitative data on drone use was collected by interviewing the representatives of five drone-using newsrooms in spring 2020. These five newsrooms were selected from the latter survey sample (n = 52) to represent newspapers of different sizes and geographical regions.

The full sample (N = 80) was designed to cover all of Finland's major newspapers. First, we compiled two lists of Finland's leading newspapers. One list contained the 50 largest newspapers by print circulation. The second list comprised the 50 largest newspapers by reach (i.e., combined print and digital readership). Merging these two lists produced a sample of 80 newspapers. This composite sampling was chosen to ensure the inclusion of all relevant newspapers. Using only one of the two lists would skew the picture of Finland's newspaper sector.

For example, the country's two leading tabloids, *Iltalehti* and *Ilta-Sanomat*, have opted out of the print circulation audit. In contrast, some regional newspapers have a relatively weak online presence despite their respectable print circulation.

The newspapers in our sample were contacted by telephone and failing that, by email. Contact was preferably made with each newspaper's photo editor, but in some cases, only an individual photographer, news editor, or the editor-in-chief completed the survey. The first round of surveys and supplementing five interviews asked about the time of drone acquisition, the use of outside drone footage, and the frequency of the newsrooms' drone use. In the second round, the respondents were asked to indicate whether the newsroom operated its own drone fleet and, if so, when the drones were first acquired. This information was collected by year quarters. Some respondents were able to cite an exact month or even date of acquisition, but most recalled the time frame only in approximations, usually as a season in a particular year (e.g., "spring of 2019" or "at the end of 2016"). Hence, we recorded the information in similar terms. Most respondents could recall this information with apparent ease, while some had to confirm the time from archival records or their colleagues. Sometimes, definitive answers could not be found, and in these (few) cases, we recorded the earliest year quarter the respondent was certain drones were in the newsroom's possession. Although relying on the respondents' recall can be fallible, the results are likely close to the objective reality: The question is unambiguous and the time frame short (for most newsrooms, less than five years).

Data on when newsrooms adopted freelancer-based drone use was not collected because of methodological difficulties. It would be near impossible to determine when freelance drone services first became an acknowledged option at different newsrooms. Simply recording the first use of commissioned drone footage would be inaccurate as well: A one-off use of drone imagery does not equal adoption in anything but a superficial way. Only a massive content analysis could reveal when drone material has become a newsroom staple. In comparison, newsrooms' acquisition of drones is a relatively clear-cut indication of drones' perceived utility.

Having drones in a newsroom's inventory was defined as having them available without the need to schedule their use with freelancers or affiliated newsrooms. This type of drone use implies a modicum of commitment to drone use, one usually involving the allocation of resources for the devices' purchase and staff training. Many newspapers make use of drone footage by commissioning it from freelancers or from better-equipped affiliates; this was interpreted as newsrooms 'not having' their own drones. Although these newspapers acknowledge drones' usefulness in select situations, they do not—per our definition—see drones as a necessity for their daily operation. A total of 24 newspapers indicated this to be their drone-use strategy. In addition to the dichotomy between the 'haves' and 'have-nots,' one newspaper permanently houses drones owned by the newspaper's photographers. This situation was interpreted as the newspaper 'having' drones.

4. Results

A total of 24 newsrooms of the 80 surveyed newspapers operate their own drone fleets (30 percent). Additional 30 percent (24 newspapers) indicated they have, if need be, access to drone footage through freelancers or affiliated newsrooms. The remaining 32 newspapers (40 percent) showed no interest in drone use although it is almost certain that they, too, could purchase drone services from outside the newsroom. Only one of the surveyed newspapers had once had its own drone but did not have one at the time of contact. Even in this case, the respondent indicated that the newsroom was looking to replace the drone, which had been transferred within the company to a different location.

In terms of a timeline, *Helsingin Sanomat* was the first Finnish newspaper to start using their own camera drones. The newspaper's drones flew their first mission in mid-January 2012. For over two years, it was the only newspaper in our sample to operate its own drone fleet. It was joined in the second quarter of 2014 by the national tabloid, *Ilta-Sanomat*, and the regional news daily, *Karjalainen*. From there on, drones began to diffuse into other large and mid-sized newspapers. The first smaller newspaper to acquire its own drones was *Raahen Seutu*, a tri-weekly regional newspaper with a circulation of a little over 6,000 copies; its history with drones began in the third quarter of 2017. The rate of drone adoption appears to have been steady since the trend caught on in 2014. Figure 1 shows how the ownership of camera drones evolved from 2011 to 2020.

Our survey results show that Finland's seven largest newspapers deploy their own drones. Further, of the 15 largest newspapers, only three have resisted the trend. The sample's mid-range, which consists of regional and large local newspapers, is mixed: about half of them have their own drones. The bottom third of our sample is consistently drone free. This suggests a very straightforward diffusion: drones were first adopted by larger and better-resourced newspapers, with smaller organizations following suit within a few years. At the time of the study, at-the-ready drone fleets appeared to be a must-have for leading newspapers, optional for mid-sized newspapers and unnecessary for small newspapers. The use of freelancers' or affiliates' drones was referenced rather evenly throughout the sample. This implies that drones' value to journalism can be recognized—or dismissed—regardless of newsroom resources.

So far, the rate of drone diffusion has been steady. Our survey, however, indicates that most droneless newsrooms are hesitant—or even opposed—to acquiring them. Some respondents said that they are waiting to see what changes the new EU regulations (being drafted

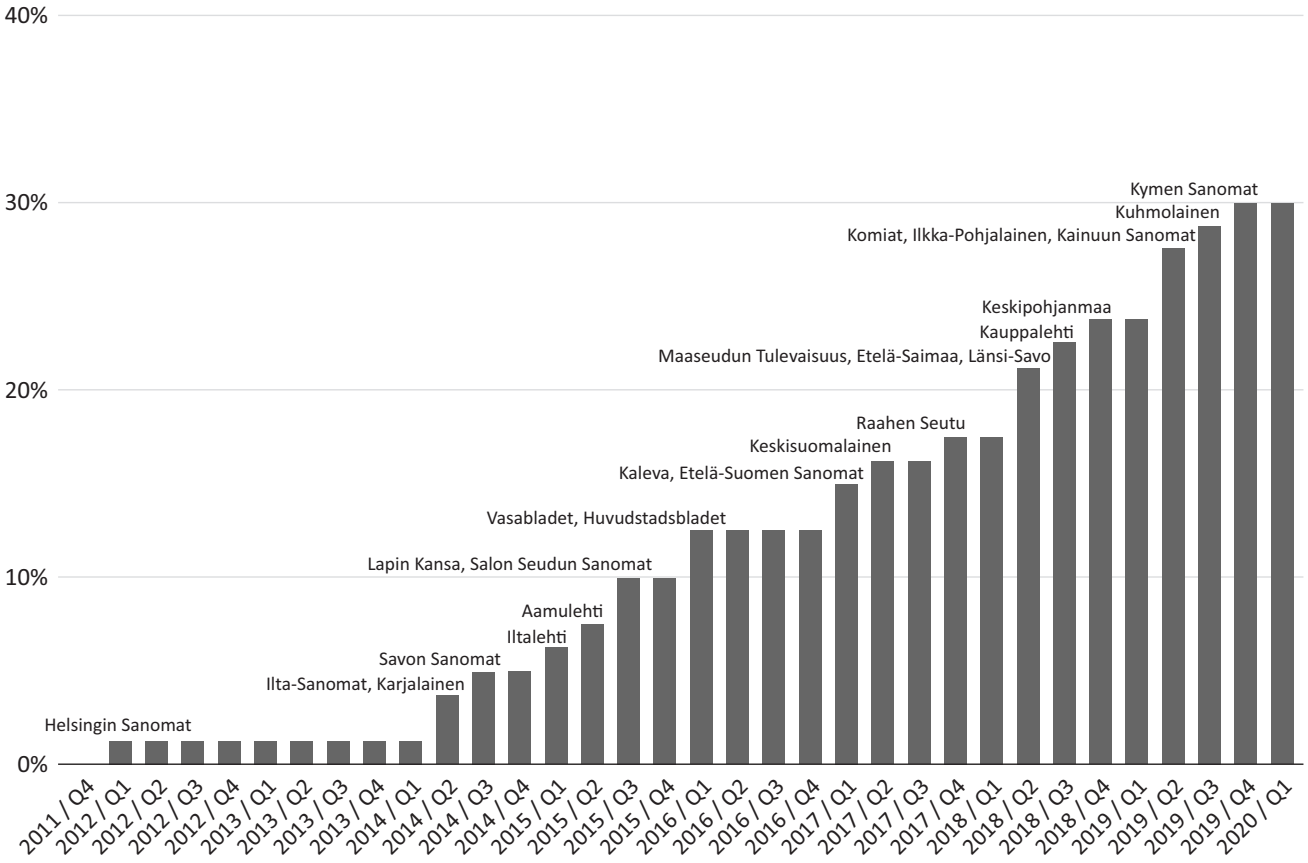

Figure 1. Share of drones and time of acquisition among Finland's 80 leading newspapers, 2011–2020.

at the time of writing) bring, while others suggested that they do not need drones or that their occasional needs can be met through external commissioning.

The first round of surveys (n = 28) supplemented with interviews (n = 5) collected information on drone acquisition, use of outside footage, and the frequency of drone use by asking for an estimate. Of the 33 newsrooms included in this sample, 19 were using their own drones, 12 were using drone footage through freelancers or affiliated newsrooms, and two were not using drone footage at all.

Those equipping their own drones used them more frequently than the ones acquiring footage from outside sources. Newspapers owning drones flew them daily (3), weekly (12), or occasionally (4), whereas the ones employing freelancers used drone footage only occasionally (6) or very rarely (6). Adding this up, of the 31 newsrooms that did use drone footage, three newsrooms were using them daily, 12 weekly, ten occasionally, and six very rarely.

As for the type of use, common themes in drone footage were land use planning and construction, festivals, and nature. However, these data were not collected systematically from the newspapers. The survey and interviews responses also hint at very varied use, from quick and simple high-altitude shots from one specific position, to more complex video rolls like pans and tracking shots.

5. Discussion and Conclusion

In the current article, we have looked at the diffusion of drones among Finnish newspapers. Despite early experiments, their widespread adoption did not begin until mid-2014. Drone journalism in Finland has diffused from a few pioneering organizations to a larger number of newsrooms, including regional and mid-sized newspapers.

At the turn of 2020s, about two-thirds of the newspapers in our sample were using camera drones. Thirty percent use their own drones and equally as many commission drone footage from outside the newsroom. Although we did not explicitly ask about it, many respondents noted that their newsrooms had been exposed to drones through the enthusiasts in their employ. Specifically, freelancers, summer interns, or staff photographers brought their personal drones to the office to show and use. For example, the first sampled newspaper to acquire drones did so at the initiative of their drone-hobbyist photographers. Thus, it is likely that the newsrooms were familiar with drones and their journalistic possibilities, but the uncertainty around their regulatory status was too much of a deterrent for most until 2014.

The newsrooms in our study use drone footage according to two strategies: through buying their own drones or commissioning freelancers. Some supplement in-house material with footage bought outside the organization. Both strategies are valid and enable using

high-quality aerial images and video in reporting. For example, in Spain, Fernández-Barrero (2018) noted that major media companies were mainly preferring to outsource drone services because of tight regulation, the cost of buying drones, limitations of image quality, and many other reasons. The current situation in Finland seems quite different. Our study of 33 Finnish newspapers shows that newsrooms in possession of drones use drone footage more often than those relying on freelancers. In our survey, none of the newsrooms using the freelancer strategy acquired drone footage daily or even weekly. Ferguson and Greer (2019) studied the adoption of drones in 94 local TV stations in the US and found that the stations that use drones use them only to a moderate degree, a mean figure of 2.28 on a scale of 0 to 5 (0 = not at all, 5 = daily). Our findings hint at a similar direction: most newspapers use their drones weekly.

Having a drone (or several) at the newsroom probably makes it much easier to acquire aerial footage, although having a drone increases the costs for the newsroom: the drone(s) must be bought (prices for basic models are around 1000–2000€) and repaired in case of damage. In Finland, insurance is also mandatory. The photographers must be trained both for operating the aerial vehicle and for the ethical and legal aspects of flying. Therefore, choosing to adopt drones via freelancers may prove to be a viable option if the predicted utility of in-house drones does not match the costs.

As per Rogers' (1962) model, drones were first picked up by innovators—in this case, technology-enthusiast photographers. Because of their increasingly precarious professional status, upskilling themselves to drone pilots was an attractive route for improved occupational prospects. At the next stage, early adopters followed the budding trend. In the case of Finland and drone journalism, large, well-resourced newsrooms were the first to adopt drones as soon as the fear over legal repercussions of their use was dispelled. At the next crucial step, early adopters "translated" (Gladwell, 2001)—that is, made salient—the value of drones. By pioneering the forms and practices of drone journalism, they set an actionable example for their peers. After seeing the early adopters successfully use drones for journalism, the early majority—some mid-sized and small newspapers—began adopting drones in 2017. Simultaneously, drones were becoming more affordable, reliable, and easier to pilot. At this point, drone journalism in Finland seems to be reaching the late majority. Some apparent laggards were also present in our sample—those loath to adopt innovations until they are unavoidable.

Next, we will examine how the results of the Finnish case compare with the development of drone journalism elsewhere. First, regulation seems to play an essential role in terms of drone journalism. Compared with other countries, for example, Sweden and the US, Finland received its own drone act quite early; the Finnish drone rules came into effect in 2015 (Finnish Aviation Act, 2014), in Sweden in 2017, and in the US in 2018. Without a permissive legal environment, many news organizations are hesitant to adopt drones. The environment particularly affects the late majority and the laggards because these groups are reluctant to spend their relatively scarce resources on an innovation if there is any uncertainty about the benefits of doing so (Rogers, 1962).

So far, about 40 countries have either declared a total ban on or have heavily restricted the use of camera drones. For example, the US and Sweden have temporarily banned the use of camera drones. In the US, drone journalism education was halted by the authorities from 2013 to 2016. In Sweden, a total ban on using drones for journalism lasted from autumn 2016 to summer 2017 (Uskali & Gynnild, 2018). Finland has never heavily restricted or banned the use of drones in journalism, which has enabled their diffusion.

Second, even minor incidents have had a nationwide influence on how the diffusion of drones evolves. Based on previous research on drone journalism, we can list several cases where only one incident or simply the threat of an incident has triggered a nationwide ban on the use of camera drones: Nepal in 2015, Kenya in 2015, Thailand in 2015, and Sweden in 2016. For example, in the Nepalese case, in the aftermath of a devastating earthquake, as powerful drone videos of the ruins of old buildings in Kathmandu began circulating online, the authorities instituted a nationwide drone ban, mainly to safeguard their country's image and tourism industry (Uskali & Gynnild, 2018).

Therefore, the concept of the 'key incident' is introduced as another complementary explanation for why the diffusion of drone journalism practices have had different trajectories, even in neighboring democratic countries such as Finland and Sweden.

'Key incident' refers to a news event that stimulates public discussions about the ethical use of new technology. Key incidents lead to watershed moments that either strengthen the adoption of a new device or service, hinder the process, or prohibit the use of the device or service. The result of the key incident depends on the conclusion of the public debate and on the decisions made by the authorities and policymakers.

In the literature, the terms 'focusing event' (Birkland, 1998) and 'key event' (Zerback, Reinemann, Van Aelst, & Masini, 2020) have been used to describe certain impactful happenings that have had, for example, an agenda-setting influence in societies. The concepts of focusing event and key event are based on large-scale tragic news. For example, natural disasters and industrial accidents are defined as focusing events (Birkland, 1998), and the Lampedusa shipwreck disaster in 2013 was a key event for immigration reporting in Italy but not in Germany or Belgium (Zerback et al., 2020). A key incident may also be something negative, or it may be neutral or even positive. In addition, Wood (2006) conceptualized the term 'tipping event' which includes minor or even nonexistent incidents (i.e., speculation, fear, or thoughts) that might trigger a change.

Our long-term observations highlighted one case that could be defined as a key incident in terms of drone journalism in Finland: the Sysmä small plane crash in May 2013 (e.g., Ilta-Sanomat, 2013a; Yle, 2013). This plane crash pitted drone pilots against authorities in a brief but dramatic standoff. The initial signal was that drones' journalistic use could be interpreted as unlawful and be met with gunfire. This kind of publicity, even without an official resolution, could have created a perception of drones as a liability to their pilots and a danger to society. However, the incident reached a public conclusion: an authoritative figure articulated the legal and ethical boundaries of drone journalism, to which the police acquiesced by issuing a public apology (e.g., Ilta-Sanomat, 2013b; MTV3, 2013).

At the time of the key incident, no special drone regulation existed in the Finnish aviation law. Although there were no immediate regulatory effects, the widely publicized and discussed incident had a pivotal impact on the legitimacy of drone journalism. We argue that both the early test of the limits of drone journalism, the key incident in 2013, and the early crafted and light drone regulation were vital for the constantly increasing drone adoption in Finnish newspapers. The current regulatory status of drones is permissive, but new EU wide drone regulations are slated to come into force in mid-2020. Starting from July 2020, a common EU regulation will replace all national drone rules, and a drone pilot needs authorization from the state's registry (European Union Aviation Safety Agency, 2020). This contributes to an air of uncertainty. The diffusion of drones among Finnish newspapers might be on a hiatus while journalists anticipate the new regulations. A follow-up study is needed to monitor and analyze the implications of the new EU law for drone journalism in Finland and elsewhere.

The current study has some limitations, and further studies are needed. Although our data cover a good portion of Finnish newspapers, our survey is limited in its depth. The survey of 80 newspapers inquired about drone ownership (or the use of outsourced footage) and does not contain more specific information on how drones are used. Our smaller sample (n = 33) illustrates the frequency of drone use. Further questions remain. These include more specific details on drone use, the effects of legislation from the viewpoint of newspapers, and reasons for (and against) acquiring drones for the newsroom. Also, the status of news photographers should be studied in the light of drone adoption. How has this development affected their work?

The regulatory environment for drone journalism internationally is heterogeneous. Therefore, the key incidents behind divergent developments should be studied and compared with each other. Such comparative research could reveal different patterns of incident, response, and innovation diffusion—perhaps dispelling some deterministic views on media systems and technological diffusion. An international comparison could well illustrate the effect that drone aviation legislation has on the adoption of drones for journalistic use. There is also a need for localized investigations, such as case studies on those outlier large newsrooms that have not adopted drones along with their peers. How drones are actually used is a rarely studied topic and deserves further attention. Data on how much drone footage is used could be collected, and barriers for the adoption of drones should be looked into. Studies comparing owning and commissioning strategies would also help in understanding their use more comprehensively. Furthermore, the professional precarity of photojournalists should be studied in depth.

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Conflict of Interests

The authors declare no conflict of interests.

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About the Authors

Turo Uskali (PhD) is an Associate Professor and the Head of Journalism program at the University of Jyväskylä, Finland. He heads several research projects focusing on innovations in journalism. Uskali has authored, edited, and coedited seven books about the new forms and practices of journalism and contributed to about 50 research articles and book chapters.

Ville Manninen (PhD) is a Researcher, both at the University of Vaasa and University of Jyväskylä, and he also teaches communications in Vaasa. His background is in journalism studies, with most of his work dealing with trust in online journalism and media plurality.

Pasi Ikonen (MA) has worked on numerous research projects on journalism at the Department of Language and Communication Studies at the University of Jyväskylä, Finland. He has studied drones and virtual reality and edited the world's leading news service of journalism research, journalismresearchnews.org.

Jere Hokkanen (MA) graduated in 2019 and is currently doing a PhD on City Planning. He is interested in applying comparative satellite data to study construction projects related to his topic. He has worked as a Research Assistant in Journalism in three different projects, one being Turo Uskali's, and in other fields such as applied linguistics.

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Article

Post-Hype Uses of Drones in News Reporting: Revealing the Site and Presenting Scope

Jonas Harvard

Department of Media and Communication Science, Mid Sweden University, 85170 Sundsvall, Sweden;
E-Mail: jonas.harvard@miun.se

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Abstract
Camera-equipped drones have emerged as an increasingly commonplace tool for media to acquire aerial imagery. Previous research has mainly focused on the innovative aspects and creative potential of the technology. This article argues that early optimistic projections reflected a novelty effect, typical of a culturally embedded idea that new and better technologies continuously replace older ones. Using a historical theory which distinguishes techno-optimistic innovation discourse from actual observations of technology in use, photojournalists were interviewed on the role of drones in news reporting. The results show that the practitioners historicise drones, relating them to previous aerial technologies, and they reflect on current and future uses of drones in journalism based on a notion of phases, where early hype gives way to subsequent drone fatigue. Drones are seen by many as a more convenient tool to do things that journalism has done before, but the convenience increases the use of aerial imagery. The results also show that, although photojournalists see a wide range of potential uses, there are also limitations, including the ideals of the invisible observer, safety concerns, and the perils of over-aesthetic imagery. The post-hype uses of drone photography were summarized in two categories: (a) revealing the site, establishing 'this happened here' and (b) presenting scope, or showing how vast or large something is.

Keywords
drone journalism; drone use; drones; history of technology; media technology; photojournalism; unmanned aerial vehicles

Issue
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1. Introduction

Journalism research has often applied innovation theory and ideas of 'disruption' to map and better understand the adoption of technology in media organisations and by journalists. This has been particularly true for research on drones and journalism (Belair-Gagnon, Owen, & Holton, 2017; Ferguson & Greer, 2019; Gynnild & Uskali, 2018). Innovation theory tends to come with a baggage of techno-optimism, implying that innovations replace or supersede previous technology, and journalism research has been criticised for being too technology centred (Zelizer, 2019).

As camera-equipped drones have quickly gone from a novelty to a multi-billion-dollar industry involving consumers as well as journalists and professionals in many different areas, a larger historical perspective on the current situation is necessary. There may also be signs that the drone industry has seen its golden years; Bloomberg (2019) recently headlined that the "drone bubble" had burst and many drone companies were going bankrupt. Adams observed that "drone fatigue" was increasing in journalism and noted industry comments that drones were a "passing fad" (Adams, 2019, pp. 1–2).

Through interviews with photojournalists and image editors, the current article analyses how drones are historically situated by practitioners in news organisations and how the interaction with previous technologies and professional values, as well as societal factors, shapes how photojournalists see the current potentials and limi-

tations of using drones in newsgathering. This article fills an empirical gap, in that data from practitioners have been scarce, but it also contributes to the discussion of breaks versus continuity in the history of emerging media technologies.

The article also adds a perspective from the Swedish media landscape. In the Swedish media system commercial news media coexist with a public service broadcasting system for television and radio (Weibull, Wadbring, & Ohlsson, 2018). Early Swedish legislation categorized drones as a form of camera surveillance but allowed journalistic uses on condition that a special permit was obtained. In 2016 a court order significantly limited the range of allowed uses and for a period journalistic drone photography was effectively illegal. A revision in 2017 eased restrictions, and since 2018 no permit is needed to fly drones weighing less than 7 kilos, as long as flights follow certain rules and no-fly zones are avoided (Transportstyrelsen, 2017).

Historians have shown that the progression in the life of a new technology—from introduction and visionary statements from proponents, to the subsequent phase of sobering up, potential disappointment and long-term co-existence with other technologies—is a repeating pattern. Similar cycles have been observed for the introduction of telegraphy, telephony, wireless broadcasts, television and other technological advancements (Marvin, 1988; Rhodes, 2012). An important part of the initial phase is the existence of enthusiastic media coverage of the new technology. In the case of drone journalism, the contrast between how the media has covered drones as a news item and how they are actually employing drones in newsrooms has been observed (Vobič, 2020).

This shift from viewing technological changes in the media sector as radical transitions where new technologies *replace* previous ones, to envisioning a process where new technology is added to an existing set of technologies and practices and its complementary benefits absorbed, implies a different temporal focus. Instead of seeking to explain rapid change, we are concerned with processes taking place over a longer period. From a longer historical perspective, the potentially disruptive impact of new journalistic technologies is often moderated by the contexts in which they are applied, and technology is adapted to already existing routines and values by news workers (Fenton, 2010; Singer, 2005).

Within an overall framework of this type of layered journalistic technological development, camera-equipped drones constitute a special type of journalistic technology that is concerned with the production of visuals. From its inception, visual journalism has held a special position as truth-teller, with photography having a strong impact on the documentary legitimacy of news stories (Brennen, 2009; Hall, 1973; Ray, 2020). Camera-equipped drones further constitute a very particular kind of visual technology—the aerial view. Whereas the truth-claims of visual representation from the ground can, in theory, be checked by a member of the public, aerial imagery represents a form of seeing not available to the everyday observer and "a culturally specific way of seeing, or visuality" (Mangold & Goehring, 2019, p. 25).

Implicit in the intersection between drone technology and journalism are both the long lineage of aerial imaging technologies and the tension between the aerial as neutral and truthful and something which gives a previously impossible visual experience.

2. Theory

In a timely critique of innovation-centred histories of technology, David Edgerton (1999) has placed innovation discourse in a larger societal context and provided a historically grounded approach for analysis. A key point is that innovation discourse in itself is an important part of modern society, which makes objects that can be linked to notions of the 'new' or 'groundbreaking' inherently important and interesting. Edgerton argues that rather than adoption, which he suggests can be rather swift and easily traceable, analysis of technological changes should focus on the extent and forms of the uses of technology. Histories of actual use over time often tell a different spatial and geographic story than the history of how a particular technology first came to be adopted by the public, institutions, or professionals. The perspective of *use* often reveals that older technologies continue to be of great importance, long after the time when they were deemed outdated and considered to have been 'replaced' (Edgerton, 1999).

Taking this critical approach further, Müller and Tworek (2016) have proposed the idea of 'imagined use' as a fruitful category of analysis. In an innovation-centric society such as ours, optimistic projections of the potential of new technologies into the future can often serve to guide and influence practical choices in the present. Their analysis highlights the importance of the contents of what can be called the 'hype' phase.

For journalism research, the digital revolution has meant the emergence of lively research streams, but also an increased focus on the tools used to produce journalism. Recently, Katie Day Good (2017) has pointed out the tendency of journalism research to focus solely on technology, and she reiterates warnings about seeing journalistic transformation as a one-way street forward, where new forms and technologies automatically replace old ones. In periods of technological change, she reminds us, different media forms interact in "unsettled" ways as new and old technologies recombine and interact, leaving revised roles for long-existing technologies.

In a broader critique of the tendency to define journalism in relation to technology, as in digital journalism, Zelizer claims that starting with technology obscures not only that changes in journalism are incremental, but also that there sometimes are detrimental outcomes of change. Focusing on technology also fails to distinguish what stays stable in journalism beyond technological change (Zelizer, 2019).

In the current environment, many scholars have observed that journalists are increasingly expected to master multiple production technologies and become multiskilled (Nygren, 2014). Örnebring (2010) has suggested that this constitutes a recent example of the longer historical development of journalistic *labour*, where decisions by employers to invest in technology lead to changes that impact everyday journalistic work such as newsgathering. How journalists choose to interact with new technologies (and their newness) in everyday use, thus also reflects how journalists define and re-define their own agency in relation to evolving technological demands.

3. From Game Changer to Everyday Journalistic Tool

When assessing research on the role of drones in journalism, one encounters several points of view which seem to contradict each other. Some early research in the field has called media use of drones a "disruptive innovation" (Gynnild, 2014) which embodied journalistic eyewitness ideals (Zelizer, 2007), and a "global game changer" in journalism (Gynnild & Uskali, 2018). A study on how early adopters experimented with drones concluded that they dwelled on the fringes of accepted journalistic practice, but implicitly affected their respective organisations, providing an example of innovation adoption from within (Belair-Gagnon et al., 2017). In contrast to such accounts of creative development, however, others have shown the relative lack of actual drone use by news organisations, citing not only legal concerns and safety issues, but also the weak connection to newsworthiness (Barrero, 2018). A survey of local TV stations in the United States indicated that, although half of the stations owned drones, these were only used moderately, and the study found no evidence that drones were used because of their importance for news stories (Ferguson & Greer, 2019). One critical overview agreed that drones could contribute to newsgathering where "geographically unconstrained coverage" was of interest, such as natural disasters, public unrest or conflicts, but pointed to the limited uses of drones in practice by news organizations (Ntalakas, Dimoulas, Kalliris, & Veglis, 2017, p. 193). John Pavlik, in a study of immersive journalism, found a number of production related reasons that drones would become increasingly important for providing visual context, but emphasized that they should be seen in relation to a continued importance of on-the-ground reporting (Pavlik, 2015).

It thus seems that, although there is a broad range of research that places drones as a central component in a major transformation of journalism towards more immersive and audience-oriented practices, there are indications that the actual use of drones in journalistic practice is more limited. Against this background, the *purpose* of the current article is to place drones in a larger historical perspective and, based on interviews with practitioners, analyse how they see the potential and limitations of drone journalism.

4. Method

To shed light on how practitioners see drones in relation to past, current, and future uses of aerial imagery in journalism, in-depth interviews were performed with 19 Swedish photojournalists involved in using drones for media production. Interviews were suitable since the views of practitioners regarding drone uses were the focus (Remenyi, 2011). The interviewees were selected through a combination of strategic samples, by approaching photographers at Swedish newspapers who were known to have used drones, and then through a snowball method enrolling their aid in finding further subjects. An overview of the interview subjects is given in *Table 1*. In relation to images and journalism, the breadth of working roles among those interviewed (N = 19) mirrored the hybrid nature of image production in the current media landscape. Out of those interviewed, 15 worked directly as producers of content, still images, or video for newspapers or television. Four informants worked for newspapers or news organisations, either as head photo editors (N = 2) or editors/producers of online Web TV (N = 2). Those not working directly in the field had backgrounds as photographers or photojournalists and were involved in decision-making on the use of drones in everyday newsgathering. A freelance position was common, and around half of those interviewed (N = 9) worked on a freelance basis. Whereas many freelancers had a steady working relationship with a particular employer, four of the interview subjects worked as free agents.

The interviews followed a semi-structured approach, where open-ended questions were combined with a set of questions where subjects were asked to comment more specifically on the value or appropriateness of using drones in different types of settings. Follow-up questions were used to clarify statements or to encourage further reflection on the themes discussed. The format enabled a certain amount of dialogic interaction, while still adhering to a pre-determined thematic structure (Kvale, 2006).

The interviews were carried out via telephone or video conferencing software during the summer of 2018 and took a total of 11 hours, with on average 35 minutes per interview. The audio material was subsequently transcribed and resulted in 354 pages of text. The transcripts were analysed thematically using a combination of top down and ground up analysis to both identify patterns in the responses to the interview questions and identify spontaneously emerging themes, and to investigate these themes systematically (Dearnley, 2005).

The titles of those interviewed were self-selected during the interviews as part of an introductory question. Although only two mentioned the term *photojournalist*, the majority of those interviewed had working roles which would fit the general definition of a photojournalist as someone who produces visual media content with a journalistic purpose, but who may also write, edit, or do journalistic research (Ferrucci, Taylor, & Alaimo, 2020). The selection is also in line with the broader definition of

Table 1. List of photojournalists interviewed in the study.

Informant code	Title	Freelance	Workplace
PH1	Photographer	Yes	National television
PH2	Video photographer		National daily newspaper
PH3	Photographer	Yes	
PH4	Photographer and journalist	Yes	
PH5	Photographer		Local daily newspaper
PH6	Photographer		National daily newspaper
PH7	Photographer	Yes	National daily newspaper
PH8	Photojournalist		National daily newspaper
PH9	Photographer		National daily newspaper
PH10	Photographer	Yes	National tabloid newspaper
PH11	Photographer	Yes	
PH12	Photojournalist	Yes	National television
PH13	Photographer	Yes	National tabloid newspaper
PH14	Web TV editor		Local daily newspaper
PH15	Video reporter		Local daily newspaper
PH16	Photographer and video producer	Yes	
PH17	Live TV producer		Local daily newspaper
PH18	Head photo editor		National daily newspaper
PH19	Head photo editor		News agency

Adams (2019, p. 16) of drone journalism, which includes "journalism in which a drone is used… but also the relevant scripting and editing." In sum, this selection of informants provides a broad sample of how drones have been used, seen, and integrated in the Swedish media landscape, with an emphasis on newspapers with a national scope.

5. Results

5.1. Comparisons to Historical Aerial Technologies

The advent of drone aerial imaging was placed in a longer historical context by many of those interviewed. They underlined that the use of images taken from above was nothing new, and many different ways of achieving shots from above had been used over time. They described a variety of technologies, both using equipment like "fishing rods" or masts to get the camera higher (PH18), but also basic strategies like climbing up to high spots or setting up in a house near an event (PH15). One interviewee referred to drones as a continuation of renting a "big skylift" (PH13). Another recounted spending many years "mounting cameras," in high places "just to get a shot." From that perspective, drones simplified things (PH8).

The main historical comparison was to that of using motorised vehicles. Many related to well-established practices of hiring helicopters (PH1, 2, 3, 4, 5,7, 8, 10, 15, 16, 17, 18, 19) or airplanes (PH1, 4, 5, 15, 16, 17, 19). Thus it was not the aerial perspective itself that was novel, but that it had become more easily accessible:

> If you take this example with a train accident or Tour de France, those types of images have always existed as a part of the journalistic image, but then they were often taken with a helicopter, so it is not that you have never seen aerial photos before as a reader—you have seen them….So the type of image has always existed, but I can imagine that it has gotten a lot more common. (PH19)

Hiring a helicopter was previously something only larger newspapers or media institutions could afford. Drones had thus broadened access to the production of aerial imagery. Although drones had made aerial photography more accessible, using a helicopter was still preferred on some occasions, in part because they were seen as a controlled part of the airspace: One commented that when covering a highway traffic jam, it would "still be easier to fly a helicopter" (PH18). As they situated drones in this longer historical context, seasoned photojournalists described drones as "just another tool"—just as they may use a wide-angle lens, they could choose to use a drone, as an "equipment detail" (PH1). It was one of many technologies they used as visual journalists, a tool in the toolbox, "just like all other tools" (PH9).

When photojournalists discussed the possibilities and limitations of drones for their craft and media content, their reflections did not constitute reactions to an entirely new media form, but rather ways of relating to a recent variation in a long-standing component of media reporting.

5.2. From Novelty Enthusiasm to Drone Fatigue

In their photojournalistic practice, the interview subjects had seen fads come and go. To them, it was natural that a new technology would initially raise interest. Sometimes

it was "the delight of something new" that made an image interesting (PH8). Several concluded that there had indeed been a phase where everything shot by drone was seen as interesting in itself: "It almost didn't have to be a news event, it was enough to show how a place or a society looked from above to raise a lot of interest." Now the "drone effect, this idea that the unique is that it is a drone shot" had worn off, which meant that there was not "just the same hype around it anymore" (PH14).

The interview subjects drew historical comparisons to other popular formats whose popularity had faded. When a new type of flash appeared or underwater camera houses became common (PH3), or when cameras started to be mounted on top of goalposts (PH8), then all of a sudden there had been a flood of these types of images, which had quickly led to diminished interest. This was also becoming true of drones: "And I would say that we currently have too much drone photography in journalism—It is getting old" (PH7). One saw a future of more restricted use:

> It will definitely play a role, but I don't think it will have the same leading role that it has had….That it can be a thing for a news site to just say 'here we have the drone perspective from this event' for example….I think both producers and consumers will be quite fed up with that. (PH11)

Just as the initial interest in newspapers that produced web TV waned when everyone could have their own channel and broadcast on social media, the popularisation of drones created drone fatigue. Once everyone could own a drone, it was not "as special anymore," and as more non-professionals acquired drones, the more it became trite and seen as a mannerism (PH15). Nowadays, some said, drones were found in "every other home" and so many were using drones that it did not merit special attention. It took something more spectacular for people to light up, and the audience was quickly becoming blasé: "Oh, okay, you flew a drone…that did not make it more interesting" (PH17). Media outlets had to be careful "not to make everything a helicopter or drone session. Then it really loses its purpose" (PH5).

In contrast to the phase when a drone photo or video was interesting just because it was shot with a drone, the goal once usage had matured was to make technology invisible. This was formulated succinctly by one photojournalist who said the goal was not to get a viewer to react: "what a great drone shot" but have them react "what a great shot" (PH8).

5.3. Limiters for Broader Use

In addition to expressing that journalism had become over-saturated with drone-generated aerial footage, the interviewed, based on their professional experience, also saw a number of limiting factors that in many ways hamstrung the future creative use of drones. Although legal and ethical issues were mentioned, they did not constitute the main limitations.

5.3.1. The Ideal of the Invisible Observer

One limiter was that drones were anything but discreet and their intrusive presence clashed with the documentary idea of the photographer as an invisible observer. The principle that as a photographer or filmmaker one should be "noticed as little as possible" (PH1) showed up in many different forms during the interviews. One contentious issue was sound. The sharp noise of drone propellers drew attention in an unwanted way (PH9, 10). Others pointed out how clearly visible the drone was, as a dark object against the bright sky "and people notice it and are bothered by it" (PH15). Several interviewees recounted how the use of drones had interfered with their coverage of news stories. One photojournalist had been shooting a youth football tournament. Once he started the drone, the kids stopped playing and instead came to watch his operation of the drone (PH5). Another stated that drones acted as an integrity trigger: "What shall I say, the presence of a drone can lead to a type of provocation….I am not there to provoke; I am there to document. So, there we need to be careful" (PH14).

Thus, although drones provided easier access to a perspective from above, their presence at the same time interfered with other valued aspects of the photojournalistic work.

5.3.2. Safety and Collaboration with Rescue Services

Safety was a concern mentioned by nearly all the interviewees. Not only could propellers create deep cuts, but getting hit by a crashing drone could be lethal. It would be as though a rock of several kilos dropped on one's head (PH8). There was also a reputation risk inherent in safety concerns. If a major news organisation crashed a drone while reporting, the crash would in itself become a piece of news, an "accident within the accident" (PH3).

Flying near crowds was something that worried many interviewees. That was inherently risky and should be avoided (PH4, 5, 10, 12, 16, 18, 19). Some said they covered crowds, but never flew right over, but remained to the side (PH5). The issue of crowds illustrates the duality of using drones in journalism. Visually reporting the size or movement of a crowd was a typical type of imagery that suited the drone well, but was in practice limited by safety issues. Maintaining good relationships with the police and rescue personnel was another issue. Drones could seldom be used at active crime scenes or where accidents were ongoing, due to the risk of interfering with the work of these personnel (PH2, 3, 4, 5, 8, 11, 15, 16).

5.3.3. The Allure and Peril of Aesthetics and Abstraction

When it first emerged, the quality of drone imagery had stunned many. This was both an asset and a risk. Visually

appealing photography or video was not seen as bad in itself, but the aesthetic side should not be allowed to take over. Filmic imagery was not was required in classic news reporting, where it could detract from legitimacy. The important thing was to tell a straight story rather than have good-looking angles (PH17). It was said that drone footage would never come into play for ordinary coverage of breaking news, but rather in more long-term journalism which aimed at "educating people" (PH4). That is, it was not in regular news stories, but on occasions where filmic quality was important, that drones would be used (PH18). Some were positive towards the "Hollywood" look though; in particular it was seen as interesting to "highlight" in a Hollywood manner something that was not in itself inherently cinematic (PH4).

Drone shots sometimes tended toward the map-like, and some early abstract "guess-where-this-was-taken" types of drone stories had been published. But still photos from drones quickly started to look like "Google maps" all the time, which was boring and of little interest (PH15). Many expressed disdain for abstract graphical drone shots, saying they were "allergic" to map-like pictures (PH3). This also resonated with the idea of getting close to people as an important part of quality journalism. Some of the best photos came from walking around and meeting people, face to face, and using a drone took the photojournalist away from that (PH7).

In sum, the intrusiveness of drones in use, safety risks, and the risk of overly aesthetic or abstract images were three factors limiting the use of drones. There were, however, broad categories of journalistic drone use, on which the interviewees in general agreed.

5.4. Revealing the Site

An appropriate circumstance for using drones was when *revealing a site* to the audience, showing where something happened, but also explaining relationships between objects on the site. In the language of the interviewees, this was most commonly referred to as providing an "overview" (PH16). As an extension of this overview, drones were also used to create explanatory graphics (PH9). Such graphics could, in more advanced cases, involve using the drone for photogrammetry, creating 3D models which could then be adapted to explain a particular situation (PH4, PH18). In such examples, drones provided raw material which was then further refined. In relation to the results found by Belair-Gagnon et al. (2017), the use of drones to create a basis for graphics presented by participants in this study seemed less a pioneering work and more integrated in the production chain.

The concrete examples of situations where drones would be suitable were often related to infrastructure. Drones were perfect if you wanted to shoot a "housing complex" which was hard to cover from the ground (PH19). Using drones to cover infrastructure, such as roads or houses, gave a better overview and showed "where it is in relation to other known landmarks" (PH15). One suggested:

> Say that a whole bridge is about to be taken down, and a new one is built 50 metres away. It is perfect to use a drone for that, just to tell what it actually looks like, instead of drawing or taking bad pictures from the ground. (PH17)

Drones could also be used to illustrate relationships between objects on a site (PH19). Using drones to establish spatial relations could be seen in crime coverage. Using the example of a murder story, a drone could show a road and then the bushes along the road, and the drone could show how close to the road the body had been, telling the viewer "here the body was found" (PH11). Such presentations were formulated to give "a completely different overview" (PH4). This overview could "explain" things much better "than seeing things from the ground," again showing "this happened here" (PH6). When filming a building on fire, a drone could show where exactly it was burning and how (PH14).

Another way of using drones to present a site was to create atmosphere (PH9). Many video news segments begin with an overview image, and if that image could also set a mood, it was considered an advantage (PH3). Sometimes mood-setting illustrations of site played on stereotypes. One occasion of using a drone to illustrate a suburb involved a shot of the location from above showing the subway passing by; the photojournalist reflected: "It is so iconic" (PH12).

5.5. Presenting Scope

A second category seen as relatively unproblematic was *presenting scope*. Here the contribution of the drone could be to show how big something was or how far something reached, sometimes by placing a smaller object in the foreground. Many of the examples involved information that something was the biggest of its kind. One photographer used a drone to present a retirement community which was "the world's biggest" (PH13). If they could be covered safely, public manifestations—not everyday demonstrations, but "something large or a really large demonstration"—would be better illustrated with a drone (PH14). Another example was using a drone to cover the vastness of a giant refugee camp, where over a million people lived in a clearly defined area (PH6). A more everyday example that still illustrates the importance of size involved filming an explosion at a construction site, which was "the biggest" the company had ever done and involved hundreds of kilos of dynamite (PH14).

Drones could make the contrast between big and small or far and near more striking, such as when shooting a lone runner crossing an open field. From the ground "you can't tell how big the area is or how hard it is. On such an occasion it can be very revealing to come up from a higher angle, to show what a giant marshland someone is running through" (PH8). Another example was if

you were travelling with a freight ship across the ocean, it would be "obvious" to bring a drone to show "the open water, the lone boat, coming from out there and looking inwards. There it really contributes something" (PH7).

Natural phenomena were considered an obvious area where drones could be used to present scope. Drones were ideal to illustrate "the size of things which are big" and which could not be captured from the ground, such as forest fires (PH9). For natural phenomena, using drones was "spot on" to show "the extension of flooding or a drought" (PH6). In a story about conflicting land claims, a drone would be useful to "provide an overview of the land mass in itself" (PH11).

6. Conclusion

This article has analysed how photojournalists position drone camera technologies in relation to existing modes of acquiring images from above and the potentials and shortcomings they see with drone photography. Drones were related historically to an already existing visual genre of aerial imagery and its connected technologies, both helicopters and airplanes, but also to simpler methods such as climbing houses or using high poles. Drones did not represent something entirely new, but facilitated the acquisition of imagery which had been more exclusive. This novelty effect initially gave rise to hype and enthusiasm for the new technology: Drones in themselves held a news value. However, this led to overuse and a reaction against them.

This image of a more reserved attitude among photojournalists contrasts with research exploring the creativity of early adopters (Belair-Gagnon et al., 2017) and other studies which have positioned drones as a disruptive innovation (Ferguson & Greer, 2019; Gynnild & Uskali, 2018) The results are more in line with the more critical approaches that have highlighted limiting factors in the actual use of drones (Barrero, 2018; Ntalakas et al., 2017), as well the results of content analysis of drone journalism, which found that in the majority of the cases, drone footage was used to establish context (Adams, 2019).

On a theoretical level, the results illustrate the value of analysing technology in use to get a broader sense of how a new technology affects society (Edgerton, 1999). In actual use, old and new technologies co-exist, and in the case of drones, their incorporation into journalistic practices was facilitated by the pre-existence of a well-established genre of aerial photography. The rapid spread of drones in society over time, paradoxically, decreased the attractiveness of drone imagery among photojournalists. Some still preferred to use helicopters to achieve aerial shots.

The analysis also showed that photojournalists imagined a wide range of potential applications for drone filming and photography, but that safety—as well as problems with intrusiveness and aesthetic ideals—limited several of these application areas. Some of these potential but unfulfilled uses could be understood using the category of imagined use (Müller & Tworek, 2016) which posits that non-experienced uses can still shape actions. The types of use which were seen as carrying long-term journalistic potential can be summarised into the categories site and scope, where drones are used to establish place and spatial relationships and to communicate size or extension.

The extent to which the photojournalists distanced themselves from the hype around drones can also be interpreted in relation to the issue of journalistic agency and the concept of journalistic labour (Örnebring, 2010). The emphasis that drones were "just a tool" can be seen as way to claim the importance of professional specialist competence, implying that as photojournalists they were not owned by technology, but made independent journalistic judgements of when using drones was suitable, and when it was not.

It should also be acknowledged that the results of the study may have been impacted by the selection of informants. Many worked at well-established media outlets in the Swedish media landscape, and in some cases these had a generous history of using resources to acquire aerial imagery. Such experiences may have led to a less convinced attitude towards the newness factor of drone photography. To other media outlets, with fewer resources, drones could represent a previously unavailable opportunity to get an aerial view. The contrasts to earlier research also likely reflect that the present interviews were conducted at a later point in time, when more mature usage patterns had developed. The early adopters interviewed in earlier research might later come to exhibit signs of drone fatigue.

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Conflict of Interests

The author declares no conflict of interests.

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About the Author

Jonas Harvard is Associate Professor and Researcher in media history at the Department of Media and Communication Science, Mid Sweden University. His research focuses on the current and historical roles of technology in journalism and how strategic communication choices by individuals and institutions have interacted with cultural and political ideas of communication. He has published several articles and book chapters about the history of the electric telegraph and analysed public discourse about political opinion and persuasion in the Nordic countries and the United Kingdom.

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Article

Dual Control: Investigating the Role of Drone (UAV) Operators in TV and Online Journalism

Catherine Adams

Journalism and Media, Nottingham Trent University, Nottingham, NG1 4FQ, UK; E-Mail: catherine.adams@ntu.ac.uk

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Abstract
At a time when TV and online journalism embraces more moving images filmed from drones than ever before, this article seeks to explore the thoughts and actions of those who produce them. It builds on earlier research into how aerial images impact on the viewer through the lens of 'quality journalism' (Adams, 2018). It investigates how drone operators are involved in the journalistic process, what meanings and effects they seek and who controls their work in a market-driven environment. Qualitative analysis was carried out of seventeen in-depth interviews with drone operators, journalists and editors working in UK and around the world. Data revealed a high degree of creative freedom among the operators, a passion for using drones and some desire to immerse and impress the viewer. It showed that aerial images have become paramount in video journalism amid market pressures to find ever more sophisticated and 'cinematic' shots. Interviewees felt drones had been "good for journalism," by providing raw data, exciting new perspectives, context and story-telling techniques and "space to think." The article explores the significant yet often unplanned contribution to the journalistic process of the drone operator and recommends more is done to increase understanding between journalist and pilot, such as providing training courses designed to teach quality drone journalism, as the media approaches 'peak drone.'

Keywords
drone; journalism; operator; pilot; TV; unmanned aerial vehicles

Issue
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1. Introduction

As online and broadcast journalism embraces more moving images filmed from unmanned aerial vehicles (UAVs) than ever before, it is timely to deepen the research in this field by investigating the thoughts and actions of those who produce the shots. Although much has been written about the impact of the digital revolution on journalists' jobs, such as multi-skilling and convergence, a glimpse into the camera operator's point of view is rare.

The term 'dual control' is a reference to a system where two consoles are plugged into the same aircraft: one for an operator to fly and direct the drone itself, and the other for a person to work the camera. The operator and camera person can stand close together, discuss and collaborate in order to decide what and how to film. Most UAVs now are operated by one person with 'single control' but the phrase 'dual control' is useful in the context of this study, which seeks to explore the roles of operator and journalist and how they work together and interact. For the purposes of this article, the term 'operator' will be used interchangeably with 'pilot' and the term 'journalist' will be used to describe anyone involved in making journalistic decisions, such as reporter, editor or producer.

The role of drone operator is relatively new and previous research into the cross-over with the role of journalist is hard to find. Unlike jobs in the news industry which merged to produce new roles such as the 'video journalist,' (adding filming skills to reporting and editing ones), UAV pilots have so far tended to work as special-

ist technicians; 'drone journalists' exist but are uncommon. However, the newsgathering carried out by drone operators, as by any camera person or photographer, is bound to involve a degree of editorial decision-making which must affect the journalistic output. It is this involvement by drone operators in journalism which is of concern here, not least because research has shown that early adopters of new technology are more likely to want to please their TV consumers than their journalist colleagues (Wallace, 2009).

We know from previous research that drones have not turned out to be the widely predicted 'gamechangers' of the industry, but that they have brought new 'players' and 'narratives' to the 'game' of journalism. A multiple case study of audio-visual news and feature items from several different countries (Adams, 2018) identified thirteen hypothetical perspectives or 'narratives' in aerial filming which potentially affect journalism. These included a diagnostic view, a sense of global connection, drama through movement, a feeling of (unrealistic) power, suggestion of surveillance, beauty or art, unnecessary gloss and occasionally the immersion of the viewer. Some shots were found to enhance while others detracted from the quality of the journalism. This research puts these 'narratives' to the test by presenting them to drone users themselves for comment and asks, among other things, whether their actions are deliberate or unconscious.

The article is based on in-depth interviews with operators based in the UK and the journalists they work with in order to try to answer four key questions: what the current role and status of the drone pilot is, how they are involved in the journalistic process, what meanings and effects they seek through drone-filming and whether any of their work is threatening the quality journalism needed for a functioning democracy.

2. Journalism and Quality Control

When judging the effect of drones in this medium, it is important to revisit the underlying aims of journalism itself. In its most basic sense, journalism aims to report or tell its audience what is happening, often in the form of a story. 'Democratic' or 'quality' journalism is defined in professional codes of conduct and industry-accredited guidelines and training courses across the world. Among its recognisable traits, perhaps none is as important as the idea of the journalist as 'truth-seeker.' The concept of the press as the Fourth Estate, speaking truth to power and 'monitoring' the establishment mostly prevails, even while journalism is constantly undermined (McQuail, 2013, p. 112).

Authors agree that quality journalism should also reveal something which is not only new but also of substance (de Beer & Merrill, 2008, p. 17; Ray, 2003, p. 23), presented in 'original' form (Shapiro, 2014, p. 561), fact-based, neutral, accurate and proportional (Deuze, 2005, p. 447) and serving a public interest (Curran & Gurevitch, 2005, p. 144) or even a 'public enlightenment' function (SPJ, 2014). Professional bodies state that journalism recognises the right of the public to information and truth (IFJ, 2020; NUJ, 2018). It is incumbent on journalism to communicate well and explain (Ray, 2003, p. 23), provide insight and/or analysis and engage viewers through means such as drama, visual attractiveness and entertainment (Golding & Elliott, 1979, pp. 115–118). There is also an expectation in our modern networked society that it should present audiences with context, a wide range of voices (Overholser, 2009) and link the local to the global (Zuckerman, 2013, p. 7). It should ask difficult questions and challenge the status quo (Greenwald, 2014, p. 230). Journalism should convey not only facts, but discourse and cultural information (Auslander, 1999, p. 2). In order to be trusted, it needs to display "ability, benevolence and integrity" (Blöbaum, 2016, p. 8) and above all to balance engagement and objectivity. As one of the editors interviewed put it: "There's a massive element of trust and once we overstep that mark we're in trouble. Viewers have to believe what they see" (M. Dolan, personal communication, January 20, 2020).

It is important to highlight that journalism is struggling to retain this trust and to control its future in the face of market forces and economic pressures (Deuze, 2008, p. 5). The news industry is forced to attract larger revenues' which "may not be in the public interest" (Dominick, Wurtzel, & Lometti, 1975, p. 213). The knock-on effect is to reduce the range of angles, opinions and sources journalism offers (Davies, 2008, p. 203), to cut fees, salaries and resources, to over-simplify complex issues and to rely more heavily on public relations and business interests (Greenwald, 2014, p. 233). In short, increased commercialisation leads to a lowering of news standards. Cheaper, digital technology presents challenges such as online interactivity which undermines journalism via clickbait as "audience feedback seems to take centre stage" (Phillips, 2014, p. 6). It has also brought about shifts in journalism practice, including multi-skilling, multi-platform production and the blurring of news and entertainment (Lee-Wright, Phillips, & Witschge, 2011, p. xi) which can "imperil the public service function of the media" (p. 13). In this context, the introduction of drones to the journalism industry has brought both welcome and unwelcome changes.

3. The Drone's Point of View

Drones were expected to be 'game-changers' for media and society (Hamilton, 2015; Roug, 2014), a disruptive innovative technology (Belair-Gagnon, Owen, & Holton, 2017) which would transform journalism and markets (Levine, 2014) and signal new value networks (Gynnild, 2014, p. 360). Aerial filming was regarded as 'central to modern imagination' and viewers' appetite for it "ever-increasing" (Dorrian & Pousin, 2013, p. 9). Drones have even been attributed with the power to "change the way that we see" (Rothstein, 2015, p. 125). Drones, also

known as UAVs, were "set to go mainstream" (Waterson, 2014) and to revolutionise news reporting (Waite, 2014). Scholars identified the 'emergent genre' of *drone journalism* (Gynnild, 2014, p. 334; Hamilton, 2015). At the same time, critics warned of 'drone fatigue' (Wyndham, 2017), 'drone fetishism' (Krisis, 2017) and a "short-lived novelty wow factor" (Rocha, 2016).

Gynnild and Uskali highlighted a lack of research into following up these predictions and expectations of drones in journalism (2018, p. 8). Scholarly investigation to verify them or look at their effect on media discourse has been slow to catch up (Belair-Gagnon et al., 2017, p. 11; Chamayou, 2014; Choi-Fitzpatrick, 2014, p. 31). Recent work has now produced a number of indications and insights into the use of aerial footage in TV news (Adams, 2018): namely that drones are used in news more often to provide context than content; that they are not revolutionising newsgathering but can undermine quality journalism by encouraging style over substance. Drone footage can potentially immerse viewers, with the danger that they lose their objective, critical perspective on the story and the absence of interviews can de-humanise a topic, as distant views replace a grittier reality.

Building on these findings, drone shots can be categorised into three types by looking at the degree of control which they seem to offer or suggest to the viewer. The 'informative' ones treat the viewers as passive 'learners,' informing them or helping them to understand the story. This type includes footage which underlines story content, adds meaning or insight and creates a sense of global context. This plays out one of the classic roles of quality, Reithian journalism. On other occasions, edited footage can take the viewer on a journey by framing a story (deliberately or otherwise) to produce an effect on their perception. This second type of 'journey' shot might, for example, turn a landscape into an aesthetic entertainment, for example displaying a rural scene as a patchwork quilt, imitating surveillance or military reconnaissance, presenting a diagnostic, quasi-scientific view, or creating armchair super-power shots which mimic video-gaming. In this case, it gives viewers a false sense of control, or "manufactured authority," to quote Marek Vanzura (2019), turning views into something else, or something "unreal." Thirdly there are shots which result in the viewer feeling out of control. These 'fairground' or 'floating' shots can immerse the viewer and take them on a wild, playful 'ride,' using unexpected dramatic movement. An audience might enjoy the feeling of escapism, novelty and liberation from the ground, or feel distracted from the story itself, depending on the context. These last two types may be more about entertaining the viewer than telling the story.

4. Angle and Trajectory

My approach was to focus mainly on the operators and investigate the part they play in determining and controlling the form, content and style of journalistic products and in shaping narratives by finding, choosing and filming their footage. I sought to find out what was going through the minds (not only of the pilots, but also their journalistic counterparts) and to probe their deeper knowledge and understanding of drones to seek more general insights into contemporary and future practice and culture.

I used a variety of methods to identify and approach drone operators, starting with my own professional network of journalistic contacts, then searching online for drone operators and approaching the main local and regional broadcasters, BBC and ITV. I submitted a request for interviewees through the National Union of Journalists newsletter and the Association of Drone Operators. The sampling followed a snowballing pattern, often added to by personal contacts and word of mouth recommendations. This led to a broad spectrum of interviewees, some who worked internationally and others on region-wide level. The interviews were mostly with drone pilots who were purely technical camera operators (eleven), but I also interviewed five journalists (reporters, editors and producers), who worked closely with operators, and one who carried out both roles simultaneously, as a 'drone journalist,' in order to see how their perspectives differed or complemented each other. In two cases I was able to interview a pilot and journalist (editor) together to observe the dynamic between them. The other eleven pilots strongly resisted the suggestion that they were also journalists, although their work sometimes included editing the footage.

Qualitative analysis was carried out into seventeen semi-structured in-depth interviews of drone operators and journalists: fifteen men and two women; fifteen white and two of colour. They came from various professional backgrounds, mostly journalism, photography and camerawork, but also the police, insurance and building industries. They included early adopters and newcomers, working for a range of local, regional, national and international news, entertainment and current affairs programmes, both public service and commercial. The sample size recommended for this kind of research can be from five to fifty interviewees (Dworkin, 2012) depending on the quality of information gathered. In this case, the process reached saturation point by the seventeenth interview and no new, relevant data was forthcoming.

The interviews took on average an hour and were carried out either in person (eight) or on the phone (nine) and recorded and/or transcribed. Interviewees were presented with twenty-two questions divided into six sections and a list of the thirteen 'narratives.' They were asked how they 'got into' drones; why they enjoyed using them; why drone footage was used; what kind of shots they liked; what they saw, felt, or thought when filming, editing or producing; what the relationship was between operator and journalist; whether drones had changed journalism; whether the 'narratives' resonated with them and how they saw the future of drone journalism. The aim of the interviews was to seek exploratory

data through their comments and descriptions, looking for patterns and themes, nuances and tensions and deep information or knowledge (Hesse-Biber & Leavy, 2005) with regard to the four research questions.

A distinction should be made here between the types of journalism in question. This article discusses the use of journalism in both news and features (longer ones coming under the heading of 'programmes' in the television industry). News differs starkly from features in that items are conventionally shorter and more factual while a feature seeks new insight into a topic and can be crafted in a more creative or dramatic way to sustain audience engagement. It is to be expected therefore that drones are used in different ways for each.

5. The 'Reveal'

5.1. The Role of the Drone Operator

The role of the UAV pilot in journalism has not only been enhanced by the increased number of pilots employed in the news industry, but in the status of drones themselves. Interviewees working in the UK said they had experienced a great deal of freedom to film and found that they could do almost anything: "people are relaxed" about drones, one said. Although laws and restrictions vary greatly around the world, several felt that the general public were used to journalism drones and had warmed to them. Pilots revealed as a "trick of the trade" that editors would sometimes add the sound of a helicopter over the drone shots, because it sounded "more authentic" and powerful than the feebler whir of the UAV blades. It must be concluded that this marginally unethical practice also serves to enhance the status of the drone and remind the viewer of its presence.

The research indicated that the use of drones was widespread and would almost certainly continue to be, depending on the format. Interviewees from UK programmes (features, documentaries and drama) said they had "reached peak drone," as Choi-Fitzpatrick predicted (2014, p. 32), while in regional news there was "still room" for "much more." In national programmes the trend was for more "filmic, stylised" sequences whereas local and regional TV newsgathering "aren't bothered about quality, just the story." Regional BBC TV documentaries were "expected" to use drones heavily, partly because they had more time to plan, whereas interviewees working in daily news said they were currently only using them approximately twice a month.

Operators' comments revealed that they were in a strong, privileged position, because it was often impossible for colleagues on the ground to know what the shots would look like until the drone went up in the air, when they were the first to see the images: "You don't know what you're going to get," as one put it. This gave them exclusive access and perhaps enhanced their status vis-a-vis the journalist, or at least made the work more fun than other kinds of filming.

The operators' passion and love of drone filming came across very strongly in the interviews. They often associated words "love" and "like" with their aerial filming work. I had not expected to find such emotional attachment to what is essentially a routine technical job. One remarked on the intellectual challenge of "making you think in a completely different way"; another said they liked to film with drones "because it's cool." The drone was referred to both "toy" and "tool": one operator said he was "aware it's not a toy," associating it simultaneously with playfulness and work.

5.2. The Operators' Involvement in the Journalistic Process

The overriding view among the interview subjects was that drones were now a vital part of the job of journalism: shots were described by journalists as "very powerful" and "so valuable"; aerial footage was now "a staple" in TV news and current affairs, where "it's all about the pictures," with drones regarded as "essential tools" of the trade. If aerial shots were available, they would automatically be used as 'teasers' for the news item. The strength of images has long been a determining factor in prioritising news stories (Hunt, 1999, p. 94) and the importance of drone shots has already been suggested by their frequent appearance as headline or opening shots (Adams, 2018).

Although most of the operators were not journalistically trained, they nevertheless understood that 'the story' was paramount and that simulating videogaming was 'not appropriate' for news. There was widespread criticism of poor or pointless drone shots on TV, an admission that some stories would not have aired without the drone shots and several complaints about "overkill" and "overdroning" which could confuse or bore viewers. This showed that these drone users understood some of the requirements of quality journalism, even though they were not journalists, and wanted to work within its parameters.

The relationship between pilot and journalist was a key insight provided by the data, which suggested that this varied widely in terms of who had dominance over what was filmed and used in the final product. One operator said the "reporter reins me in," while another experienced "heavy handed or prescriptive" editing. Several pilots were given carte blanche to get the shots they liked and some "guided the reporter" rather than the other way around. Two referred to the practice of the journalist acting as "observer" for their pilot during filming (a legal requirement), making them their technical assistant in a temporary role reversal. In one joint interview the operator described an increase in his status and authority, due to new skills, accreditation and knowledge about permissions and regulations, which his editor was keen to underplay, insisting that he simply "contributes."

The data often revealed a lack of communication and a wide knowledge gap between operator and journal-

ist: Pilots reported journalists "not knowing" what shots they wanted and criticised inexperienced operators who "don't think about the pictures." None of the subjects had had any training on drone filming for journalism and there was a lack of universal code to describe shots, so they had often developed their own working language and terminology with colleagues. In one case the operator admitted he did not use any specialist language at all and his editor said he "didn't need to talk" about the filming in detail to or go on a training course: it was "just terminology." This lack of template or job delineation for drone journalism could be problematic but also allows the process of navigating unchartered territory to be creative and organic.

5.3. Meanings and Effects Sought by Operators

Many pilots spoke enthusiastically about the creative and artistic possibilities of drone filming they enjoyed, the "buzz" or thrill of finding and producing aerial images and the aesthetic rewards of producing "pretty pictures," particularly the "breath-taking" or "wow" shots: One said that the images "blew my mind." Some were disparaging about the "pretty" shots and talked about striving for ever more unusual angles. The comments suggest that drone filming is still a ground-breaking and experimental activity and that a certain amount of thrill-seeking is involved in filming.

The use of drone filming to produce dramatic effects was seen by most as a positive attribute, while others, particularly working in news, did not think it was appropriate, highlighting the contrasting requirements of the news and programme genres. However, when asked to pick a shot he had particularly enjoyed filming, one pilot working for a regional newsroom described a very dramatic tracking shot of a viaduct ending in a wide 'reveal' of the surrounding countryside.

Interviewees by and large recognised the narratives identified in previous research (Adams, 2018), although some criticised the research as "reading too much into it," but often needed to have the concepts explained, suggesting that their filming was done without consciously reflecting on its deeper significance or effect. The idea that bird's-eye views might give an audience a sense of imaginary omnipotence, as described by McCosker (2015, pp. 2, 5) was reinforced by the pilot who revealed that these are referred to in the newsroom as "God-shots.'' One editor indicated that drone footage was useful as a kind of marketing tool to "show off" the region; it was also regarded simply as an effective way of conveying "information." Most interviewees dismissed the idea that drone journalism would ever remind viewers of surveillance or the military but they could recognise it in other types of programmes.

A few operators and journalists articulated the opinion that the aerial shots can be used to allow the viewer to think or wonder, in their words, as a "breathing space, a thought." An extended version of the story online could "let them breathe," and by giving space to the footage, "allow [the viewer] to relax; people are so pressured." This resonates with the idea that drones can bring viewers some kind of *Aufklärung* (enlightenment; Jablonowski, 2014) and access to deep, even philosophical or existential thinking, by taking their view skyward (McCosker, 2015, p. 15). Some delved further into the question of why people liked to see aerial shots. One drone journalist cited a "sense of global connection": Viewers could feel they were "a small part in a massive world" or as Monaco (2000) puts it, "an abstract…global" point of view (p. 205).

5.4. The Influence and Effect of Drone Operators on Journalism

Most operators found challenging the idea that immersing the viewer might result in sacrificing objectivity on the altar of audience engagement. Several said it was indeed their aim: One said about the viewers, "I want them to be immersed," while another common view was that immersion was acceptable as long as there was context to go with it. In contrast at least one journalist baulked at the idea of immersion, insisting that, "we're telling stories rather than giving experiences." One editor felt that his audience desired an aerial view because "it takes our viewers to places they wouldn't normally go." He regarded the drone as a pioneering tool because it was "going somewhere new."

The operators' motive for getting into the field often came from a passion for technology and 'gadgets,' suggesting that their interest in innovation might drive new practices. Operators said "innovation will continue" in future as more "sophisticated shots" are looked for, and that "a different camera technique" would at some point supercede drone filming. "People are used to drone shots now, so you're looking for something different," explained one interviewee, in line with Cardoso's observation that an audience is quickly satiated (2015, p. 43). Perhaps the operators' presence itself helps to drive innovation more than ever, in an industry which tends to bow to the narrative agency of technology (Stewart, 2009, p. 45). The use of drones is also potentially a gender issue, in the context of the dearth of women professionals in the industry (Kuzma & Dobson, 2019).

Beyond this, pilots and journalists (especially those working in programmes) felt pressured by market forces to attract viewers away from more popular commercial outlets by being "filmic, cinematic." "We're competing against Netflix," was one regional editor's view. One journalist suggested that the resources spent on drones were potentially being diverted away from quality journalism, because it was a cheaper way to provide eye-catching news: "Journalism needs more resources to investigate," she said. This recognises that UAVs are rarely necessary for newsgathering and cannot replace the skills of an investigative journalist (Jolley, 2014, p. 6; Marron, 2013). This reference to the political-economic context was rare

in the interviews and may indicate a lack of interest in investigative journalism by pilots, who, after all, would be out of work if money was diverted back to hiring more reporters.

The interviewees all felt drones had been "good for journalism," (in its normative role as Fourth Estate), by providing a "unique perspective," illustrating "scope and scale" and offering new story-telling techniques. Some defended the use of dramatic shots as necessary "to engage people." They also provided examples of crucial story content (an illegal recycling dump, a flood breach) which had created programming. There was no acknowledgement that seeing scenes from above using drone techniques can potentially be counter-productive and create a "form of blindness" to the story (Lee-Morrison, 2015, p. 214). There were mixed views about how much the UAV had actually changed journalism. One said it had "changed the game a bit" while another claimed only the style and quality of the material broadcast had changed. Another operator indicated that "it changes things" dramatically in terms of his role and status. One (ex-policeman) pilot expressed concern about intrusion into privacy or revealing "sensitive intel," demonstrating a consciousness of the law, of the drone user's power and responsibility and of how an individual's particular (non-journalistic) background can influence the output.

6. Conclusion: In and Out of Control

While the power of drone journalism may still not be fully understood (Radnor, 2014), especially in an era where the old newsroom job delineations are blurred, this research takes clear steps towards that comprehension. It highlights the crucial and under-valued role of the drone operator, portrays the complex and varied relationship between them and their journalistic counterparts and reveals their powerful influence on the evolution of journalism today.

The article reveals the importance of the initial stage of producing drone journalism: the operator's often private and unpredictable experience of discovering the pictures, when their creativity, skills and imagination are at play as they experiment with the technology and test out possibilities. When the journalist/editor sees the footage, they will approach it with their set of news and ethical values and journalistic skills. In the ensuing dialogue, choices and decisions are made which contribute to the final edit and the published product, influenced by technological development, market forces and corporate interests, such as the pressure of ratings and audience size and reach: Technology and commerce driving 'news as escapism.'

The interviews underscore earlier research which has shown that aerial images present new perspectives and 'players' to viewers and that they continue to be highly prized in video journalism. The more important the pictures, the more important the person who takes them, yet interviewees indicated that the changing role of the operator was barely discussed or accounted for in the workplace, even though drone filming had transformed their working lives.

Instead of having equal or 'dual' control, the journalist and operator (whose input may take place at different times), are better described as being "in and out of control." Their aims usually align but due to the new technology, responsibilities and highly skilled nature of drone filming, a knowledge gap has opened up between them.

This article clarifies that aerial shots can be positive for journalism, enriching it through alternative perspectives, stronger audience engagement and new opportunities to trigger their imagination, sense of wonder and 'blue skies thinking.' The operators' comments reveal the potential value of "the wow factor," "fairground" and "floating shots" and show that without their new creative freedom, the "mind-blowing" images in video journalism would not exist. Drones represent a clear trend away from quality journalism and towards producing marketable, 'pretty' pictures and immersive, escapist moments, often being used to 'prettify' and dramatize a story, prioritising engagement over objectivity. Pilots enjoy the experience of deliberately "flying" the viewer, letting them feel a loss of control yet at the same time the range of voices and difficult questions vital for quality reporting is reduced. Operators and journalists do not always appear to know why or how this is happening, where it is leading drone journalism and which 'new value networks' it may be signalling; thus the direction of travel is not being planned or thought out.

Stories are being experimented with and told in different ways from the past; the technical and commercial interests of a neo-liberal environment are challenging quality journalism as never before and the camera operator has unprecedented power. I contend that journalists themselves would benefit from learning more about the potential—good and bad—of drones in journalism and from realising how, when and why the output is being driven by their use. A closer working relationship and understanding between journalist and operator could help to close this knowledge gap, bring back 'dual control' and enhance the quality of drone journalism. There is a case for further examination of this topic and for continuing to ask how the increased use of aerial footage is impacting the audience, as TV and online media reach "peak drone.''

7. Future Directions

It is still not clear why viewers love to see aerial footage. One reporter/operator suggested that wide aerial shots may give viewers the sense of awe at their place in the universe. It could be simply a desire to see more of the natural world. More research would be useful to tease this out through interviews with professionals and audiences. Drones may well be changing the way we see but certainly the 'wow factor' associated with aerial shots is still impressing audiences and does not look like going away. More training for both journalists and operators

could be useful yet I could find few if any appropriate drone journalism courses outside universities beyond technical ones. Future research into new technological developments such as live broadcasting, streaming and new types of lenses and batteries will be required to keep pace with this field. Any researchers into drone filming should be conscious of the overwhelmingly male dominance of this sector of industry. Although women drone pilots are increasing, they make up just 5.8% of certified operators in the US (UAV Coach, 2019). Investigations are well overdue into the role played by gender, and other diversity factors, to determine further who is 'calling the shots' in the production of drone journalism.

Conflict of Interests

The author declares no conflict of interests.

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About the Author

Catherine Adams has been a Journalist for local, national and international print, online, agency, radio and TV outlets for over thirty years, including periods as a newsreader and a foreign correspondent for the BBC World Service. As a Senior Lecturer at Nottingham Trent University she has written journal articles on journalism for *Gender and Society*, *Digital Journalism* and *Journalism Practice*. She is a local branch official for the National Union of Journalists.

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Article

Technologies, Ethics and Journalism's Relationship with the Public

Megan Duncan [1,*] and Kathleen Bartzen Culver [2]

[1] Department of Communication, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA; E-Mail: megandunc an@vt.edu
[2] School of Journalism and Mass Communication, University of Wisconsin, Madison, WI 53715, USA; E-Mail: kbculver@wisc.edu

* Corresponding author

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Abstract
Drones can provide a bird's eye view of breaking news and events that can be streamed live or used in edited news coverage. Past research has focused on the training and ethics of journalists and drone operators. Little attention, however, has been given to audiences and their acceptance and perception of ethics. We suggest that audiences who are open to personal technology use will perceive news media using unmanned aerial vehicles (UAVs) as more ethical in an extension of the Diffusion of Innovation Theory. In a survey ($N = 548$) of adults living in the United States, we explore the correlates between trust, technology, privacy, and the use of UAVs. Results suggest all three are positively correlated with openness toward drone journalism. We find the audience has preferences for the types of news stories that should be covered using drones. Participants indicated they welcome drone journalism when covering traffic and investigative stories, but not celebrities and politicians. The findings have implications for newsrooms, suggesting transparency and outreach to educate people on the technology could help build trust. Further, the results suggest that Diffusion of Innovation theory can be applied when mediated through news media.

Keywords
drones; innovation; journalism; news audiences; unmanned aerial vehicles

Issue
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1. Introduction

When then-Kentucky Governor Matt Bevin faced a scandal in 2017 over an exceptionally low tax assessment of his home and property, the Louisville, Kentucky, Fox News affiliate WDRB flew an unmanned aerial vehicle (UAV) over the home during an inspection and subsequent meeting at the home (Andrews, 2017). Bevin was angry and invoked the privacy of his family to argue it was an inappropriate way to cover the news story. At first incorrectly blaming two different news organizations for the drone above, he took to Twitter and called a political reporter a 'peeping Tom': "Drones again flying directly over and around my home filming my children…@wave3news @courierjournal #PeepingTom Loftus" (Bevin, 2017a).

Soon after, he corrected which news organization was responsible for the UAV, again emphasizing that the UAV was "flying over my home & filming my children" (Bevin, 2017b) The WDRB news director responded that he was flying the UAV according to federal regulations and did not film the governor's children.

Much of the public is wary of UAVs circling above to capture video and still images. Often citing privacy concerns or suspicion about technology (Tompkins, 2017), about 20% of Americans say they would be angry or

scared if they saw a UAV flying near their home (Hitlin, 2017). Audiences may not readily accept drone journalism if they are reluctant to adopt drones as new innovation. Though newsrooms have been criticized for their slow adoption of technology (Garrison, 2001; Roberts & Saint, 2015), audiences, too, are reticent to accept journalists' use of technology in reporting (Jung, Song, Kim, Im, & Oh, 2017; Kiousis, 2006; Tsfati, 2010). Diffusion of innovation theory—or the process of learning about and developing an attitude toward an emerging technology (Rogers, 2010)—illuminates the acceptance and openness toward communication technologies like UAV-aided journalism.

Newsrooms adopt new technologies for a variety of reasons, but among the considerations are how journalists think the technology will be received by the audience (Boczkowski, 2004) and how the technology will affect the relationship between journalists and the audience (Ekdale, Singer, Tully, & Harmsen, 2015). A lack of support of drone journalism from the public could have an impact on UAV adoption in newsrooms or the type of news stories that are covered with the aid of a UAV. Yet, avoiding adopting UAV technology into the newsroom because of audience worries could allow for competitors to gain a foothold in the market of drone news (Christensen, Raynor, & McDonald, 2015). While drone journalism has been investigated through the lens of legal fights (Goldberg, 2015; Holton, Lawson, & Love, 2015; McIntyre, 2015), ethical questions for the news industry (Culver, 2014), and technological implications (Gynnild, 2014; Tremayne & Clark, 2014), this study asks the audience what ethical stances and opinions it has about the use of drones in gathering news. Using the theory of Diffusion of Innovation (Rogers, 2010), we investigate how audience attitudes toward privacy, technology adoption, and journalism ethics influence its openness to drone journalism.

Using a survey of residents of the United States (N = 548), we measure attitudes toward technology adoption, concerns about privacy, and perception of journalism ethics. We find all three are positively correlated with openness toward drone journalism. The findings have implications for newsrooms considering adopting UAV technology, and for applying Diffusion of Innovation theory to technology mediated by news media.

2. Literature Review

2.1. Public Perceptions of News Media Ethics

News media in the past decade saw a historic dip in levels of public trust and perception of ethics. A third of Americans ranked the ethical behavior of journalists as high or very high in 2018, ranking above bankers but below accountants (Gallup, 2018). While that percentage seems dismal, it was a 10-point improvement from the public's perception in 2016. The way journalists think of themselves and the way the public thinks of journalists are consistently far apart. The public thinks journalists are motivated by legalities and business competition while journalists feel motivated by professional ethics and personal morals (Voakes, 1997). Journalists think their roles should focus on providing analysis and playing watchdog while audiences think journalists should focus on neutrality and providing basic information (Willnat, Weaver, & Wilhoit, 2019). Losing the trust of the audience or misunderstanding what the audience expects from the news media can be costly to journalism's business and its credibility. When the audience loses trust in media, it seeks alternative sources of information (Tsfati, 2010).

In times of low media credibility, journalists turn to practices that give their work the appearance of objectivity and neutrality. Drones, or UAVs (also called remotely piloted aircraft), have expanded the ability of journalists to bring images to the audience of news events that journalists cannot get from ground level, including those of natural disasters like Alabama tornados in 2011 (Estes, 2011), a comprehensive view of Occupy Wall Street protests that same year (Gynnild, 2014), celebrities vacationing on the beach (Tremayne & Clark, 2014), and investigative journalism (Chamberlain, 2017; Tremayne & Clark, 2014), like WDRB's look at Bevin's home. Images of events lend to journalists' credibility and an appearance of objectivity (Zelizer, 2010). When journalists complement textual narratives with visual accounts through photographs or video, the audience stands to benefit because members can see for themselves evidence of the narrative told by the news media. By providing 'indisputable images,' journalists can bolster the trust of the audience and reduce the room for claims of bias, hopefully retaining the audience.

2.2. Introduction of Drones into Journalism

When newsrooms and journalism schools first started adopting UAVs for reporting, best practices, ethics, and the laws surrounding them were ambiguous. Some journalists and journalism educators like Matt Waite of the University of Nebraska saw the ability to capture still and video images from above the treetops as an exciting innovation with potential to improve visual journalism with less safety risk and cost than a news helicopter (Culver, 2014). Soon though, Waite and others were sent cease-and-desist letters and told they must get a small aircraft pilot's license. Though he did, those rules were clearly a burden on newsrooms, and the Federal Aviation Administration revised them in 2016. This new rule, called the Small Unmanned Aircraft Rule or Part 107—established a separate certification process for commercial drone operators. Journalists, who are considered commercial under the regulations, had a new path to using UAVs in journalism that involved taking a knowledge test but no operation test (Federal Aviation Administration, 2016).

While the regulations primarily addressed the law, they also set some ethical guardrails for newsrooms and other drone operators who were working at the boundaries. For example, ethicists argued that remote drone operation could lead to dehumanization through gamification and offer a limited field of vision that would reduce safety compared to visual line-of-sight operation (Culver, 2014). The Federal Aviation Administration regulations made line-of-sight operation mandatory. Additionally, the regulations emphasize bystander safety by prohibiting drone operation over people and crowds and operating after dark (Federal Aviation Administration, 2016). For situations where personal and professional ethics have failed to catch up to technology innovations, these regulations may provide the baseline for ethical decision making in newsrooms.

2.3. UAVs and Early Technology Adoption

UAVs represent an innovation in the journalism market. According to diffusion of innovation theory (Rogers, 2010), the innovation itself generally holds the characteristics of an improvement over past technology, providing a market need, and visibility (Rogers, 2010). From a news organization's perspective, UAVs provide this by offering a low-cost, easy-to-use alternative to news helicopters (Culver, 2014; Tremayne & Clark, 2014) that is visible to mass audiences when the footage is shown on television or streamed online. Hence, the adoption of UAVs for journalism purposes has been studied from the perspective of early newsroom adopters (Belair-Gagnon, Owen, & Holton, 2017). Here, though, we take the perspective of the audience through the lens of diffusion of innovation theory. This is a slight departure from the original intention of the theory, as we are not focused on the audience's use of the technology directly, but rather its buy-in and openness toward journalistic reporting that uses the technology. It is an indirect adoption of the technology that is rewarded not by purchases but rather views and granting of credibility.

Diffusion of innovation theory approaches the proliferation (or failure) of new technology through social systems as a process that begins with knowledge, and progresses through interest, persuasion, adoption and confirmation (Rogers, 2010). The first step toward adoption of a technology is knowledge about it. Thus, communication systems are key to spreading initial knowledge and subsequent information that leads to persuasion (Rogers, 2010). It likely did not help public trust of drones that in the years after September 11, 2001, many audiences first heard of drones in the context of military reconnaissance and warfare (Tremayne & Clark, 2014). Yet, news organizations are in the unique position of having direct access to a mass audience to which to communicate knowledge about the innovation.

In any diffusion of innovation, some people are willing to adopt the technology in the early stages where there are risks and higher costs, while laggards are content to wait until the technology is widely adopted and the costs and risks have diminished (Rogers, 2010). This openness to early adoption of a technology compared to peers and wider society defines an individual's 'innovativeness' (Rogers & Shoemaker, 1971). Early adopters of innovation tend to have consistent attitudes toward openness to technology. Research into adoption of communication technologies has demonstrated that those who were among the first to adopt digital television were more likely to have been early adopters of email, for example (Atkin, Neuendorf, Jeffres, & Skalski, 2003). Early adoption of fax technology was more strongly predicted by these attitudes toward technology than social and demographic factors (Neuendorf, Atkin, & Jeffres, 1998).

Past research into the adoption of communication technologies has used these attitudes toward technology and past early adoption behavior as predictors of direct adoption of a technology. Yet, this variable was such a strong predictor of early adoption in these cases, we posit that the theory of Diffusion of Innovation will work similarly for a case of indirect adoption. Thus, we hypothesize that those with early adopter attitudes toward technology will be more open to the adoption and use of drones in journalism:

> H1: Audiences who adopt technology earlier will be more open to drone journalism.

2.4. Privacy and Technology Innovation

A chief concern among those who fear technology diffusion may be the loss of privacy. When online journalism emerged in the market, audiences were wary of their privacy. And, indeed, Culver (2014) identified privacy of those who were surveilled as one of four main ethical concerns drone operators should consider. The author's research found that drone developers had no clear ethical principles on which their decisions about the privacy of those on the ground were made. Instead, the developers defaulted to legal definitions, and referenced the conception of "reasonable expectation of privacy" (Culver, 2014, p. 59). While eyewitness accounts hold strong value in journalism, drone journalism becomes a form of a digitized robot eyewitness that transforms the norms of journalism (Gynnild, 2014). Tremayne and Clark (2014) argued that while surveillance is one of the key functions of journalism, journalists need to address the ethical boundary between violating citizens' privacy and getting the best story. They called for a balance between using drone journalism to paint a more realistic version of reality and transforming the outdoors into a Foucauldian panopticon. Gynnild and Uskali (2018) poses the question: Where should journalists never fly drones in respect of privacy?

If journalists are conflicted and unclear about the ethical policies surrounding UAVs, it follows that the audience may not have confidence in journalists to respect their privacy. While it is true that much of the Digital

Age has been about giving up various forms of privacy, Gynnild and Uskali (2018) argue that recent pushback on technology giants from the public demonstrate the public still cares about and expects privacy. There's little research on where the American public thinks journalists should and should not fly UAVs. A 2017 Pew Research poll, though, shines light on the public's thoughts about drones in general. More than half of Americans think drones should not be flown near people's homes, but 44% were accepting of drones in public parks (Hitlin, 2017). These results suggest that the public has concerns about privacy. We suggest that this concern will be extended to UAVs flown by journalists, and that support for drone journalism will decrease as personal concerns about privacy increase:

> H2: Audiences more concerned with privacy will be less open to drone journalism.

2.5. Media Ethics and Technology Innovation

Early adoption of online communication technologies was predicated on the amount of social trust (Mutz, 2005). Because the systems were new and most of their workings were behind a black box, the public needed some blind trust that people they could not see or talk to would act ethically with their credit card numbers, for example (Mutz, 2005). While research has found gaps between how the audience thinks about journalism ethics and how journalists think (Tsfati, Meyers, & Peri, 2006; Voakes, 1997), audience members rank journalistic values as high priorities when it comes to earning their trust (Chung, 2009; Heider, McCombs, & Poindexter, 2005; Van Der Wurff & Schoenbach, 2014). Trust in news workers to act ethically and without bias is a consistent predictor of news media use (Tsfati, 2010; Tsfati & Cappella, 2003). Similarly, perceived credibility of online news is positively related with its use (Johnson & Kaye, 1998, 2004; Wanta & Hu, 1994):

> H3: Audiences who think news media act ethically will be more open to drone journalism.

In it its infancy, citizen journalism was an alternative for audiences who had low trust in media ethics. Audience perception of mainstream news trust predicted use of early online mainstream news use so that those who had greater trust in mainstream media were more likely to use mainstream media online (Tsfati, 2010; Tsfati & Cappella, 2003). Those who had distrust in mainstream news were the early users of citizen blogs, which they saw as an alternative source of information (Johnson & Kaye, 2009). Because audiences with low media trust turned to citizen alternatives in past communication innovations, we hypothesize that those who have low perceptions of media ethics will support civilian UAV use more than journalism UAV use:

> H4: Audiences who have a low perception of news ethics will support drone use by civilians more than journalists.

3. Method

In a survey ($N = 548$) of adults living in the United States, we explore the correlates between concern about privacy, attitude toward technology adoption, and perception of news media ethics with the audience's openness to drone journalism. The survey was distributed through Survey Sampling International, and participants were paid incentives for participating through their agreement.

3.1. Participants

The sample of survey respondents was drawn from across the United States and designed to approximate a nationally representative sample. Participants were 51% female; the average household salary was $50,000 to $59,000; and the average participant had a two-year post-secondary degree. Where participants were allowed to select more than one race, 82% indicated they were white; 11% black or African-American; and 5% Asian. About 9% of the sample indicated their ethnicity was Hispanic. The average age was between 35 and 44 years old.

3.2. Procedure

Participants double opted-into the survey by first agreeing to be included on Survey Sampling International's email list to participate in surveys. Then, they chose to participate in this survey in exchange for incentives as outlined by their agreement with Survey Sampling International. Once participants were screened for the age of majority, they were shown an information sheet about this research study. Those who consented to the information sheet continued to the survey, which took on average 18 minutes to complete. Participants were asked about their use of, attitudes toward, and engagement with news media. Then, they were given the following information statement before they began answering drone questions:

> The United States is writing rules for civilians to use Unmanned Aerial Vehicles (often referred to as drones) in the National Airspace. This will include recreational use by hobbyists, as well as some commercial uses like capturing video to use in movies. Some news organizations are interested in using these technologies in their reporting to take photos, capture video or sense data. We'd like to hear what you think about this topic.

After answering questions about drone use, participants indicated their demographic and sociographic information before concluding the survey.

3.3. Variable Construction

3.3.1. Technology Adoption

Technology adoption (M = 2.95, SD = 1.25) was measured using Chau and Hui's (1998) index of eight items to measure early adoption of information technology products. These eight items were measured on a scale of 1 to 5 where 1 indicated avoidance of early adoption and 5 indicated early adoption. The answers to the items were averaged so that higher values on the resulting variable indicated earlier adoption of technology. The Cronbach's alpha of the eight items was .97 (Table 1).

3.3.2. Privacy Concern

Privacy concern (M = 4.08, SD = 0.78) was measured using a four-item index adapted from the Internet Users Information Privacy Concern scale (Malhotra, Kim, & Agarwal, 2004) that included 'Privacy is important to me,' 'I worry new technology is a threat to privacy,' 'Compared with other subjects on my mind, personal privacy is very important,' and 'I am concerned with threats to my personal privacy today.' The questions were asked on a 1 to 5 scale, where 1 was strongly disagree and 5 was strongly agree. The items were averaged so that higher numbers on the resulting variable indicate stronger concerns about privacy. The Cronbach's alpha for the four items was 0.81 (Table 2).

3.3.3. Media Ethics

Perception of media ethics (M = 2.90, SD = 1.92) was measured using an eight-item scale based on the ethical principles of journalism. The items asked the participants to rate how well most news media organizations do at meeting the ethical principles such as 'seek the truth and report it' and 'be accountable' on a scale of 1 to 5 where 1 was strongly disagree and 5 was strongly agree. The items were averaged so that higher values on the resulting variable indicate a higher perception of media ethics. The Cronbach's alpha for the eight items was 0.94 (Table 3).

3.3.4. Openness to Drone Journalism

Openness to drone journalism (M = 3.71, SD = .83) was measured by support for 11 types of news stories that have been covered using UAVs to capture images on a 1 to 5 scale where 1 indicated not open to that type of drone journalism story and 5 indicated very open to that type of drone journalism story. These included weather, breaking news, celebrity events and investigative stories and were shown in randomized order. The Cronbach's alpha for these 11 items was 0.92. The items were averaged so that higher values on the resulting scale indicate more openness toward drone journalism. For a complete list of the 11 types of stories included in this variable, see Table 4.

Table 1. Means of early technology adoption by scale item.

Variable	*M*	*SD*
I often seek out information about new hardware/software products	3.21	1.38
When I go hardware/software shopping, I find myself spending a lot of time checking out new products	3.01	1.35
I like to go to places where I will be exposed to information about new hardware/software products	2.98	1.36
I like magazines that introduce new hardware/software products	2.94	1.39
I frequently look for new hardware/software products	2.93	1.39
I take advantage of the first available opportunity to find out about new hardware/software products	2.86	1.38
I am continually seeking new hardware/software product experiences	2.85	1.39
I seek out situations in which I will be exposed to new and different sources of new hardware/software products	2.84	1.38

Notes: The resulting variable of the eight-item scale (M = 2.95, SD = 1.25) has a Cronbach's alpha of .97. Source: Based on Chau and Hui's (1998) early technology adoption scale.

Table 2. Means of privacy concerns by scale item.

Variable	*M*	*SD*
Privacy is important to me	4.38	0.89
Compared with other subjects on my mind, personal privacy is very important	4.09	0.97
I worry new technologies are a threat to privacy	3.95	1.01
I am concerned about threats to my personal privacy today	3.89	1.04

Notes: The resulting variable of the 4-item index (M = 4.08, SD = .78) has a Cronbach's alpha of .811. Items based on the Internet Users Information Privacy Concerns scale (Malhotra et al., 2004).

Table 3. Means of perception of media ethics by scale item.

Variable	*M*	*SD*
Provide the audience with information they need to know	3.17	1.20
Engage with communities	3.16	1.12
Seek the truth and report it	3.01	1.26
Be accountable (e.g., correct errors or listen to feedback)	2.93	1.16
Minimize harm	2.79	1.20
Be transparent (e.g., disclose reporting processes and ethical choices)	2.78	1.22
Act independently and avoid outside influence	2.71	1.28
Minimize bias	2.65	1.24

Note: The resulting variable of the eight-item index ($M = 2.90$, $SD = 1.02$) has a Cronbach's alpha of .94.

Table 4. Means of openness to drone journalism by index item.

Variable	*M*	*SD*
Cover severe weather events, such as a hurricane	4.15	1.01
Monitor possible environmental damage, such as rising sea levels	4.07	1.02
Monitor traffic congestion, such as a live feed during rush hour	4.03	1.04
Get video from breaking news involving a hazardous incident, such as a fire	3.96	1.04
Do investigative reporting, such as a long-term look traffic safety in an area	3.93	1.05
Cover a story on the outdoors, such as best places to rock climb	3.90	1.10
Show raw footage of events live as they happen, such as high-speed police chases	3.63	1.19
Report on civilian protests, such as the Occupy movement	3.62	1.14
Get video of breaking news involving a crime, such as a mass shooting	3.60	1.21
Cover celebrity events, such as a wedding	3.01	1.35
Document impropriety by well-known figures, such as a politician having an extramarital affair	2.95	1.35

Note: The resulting variable of the 11-item index ($M = 3.71$, $SD = .83$) has a Cronbach's alpha of .918.

3.3.5. Civilian/Journalist UAV Support Gap

Civilian/journalist UAV support gap ($M = -.09$, $SD = 1.07$) captured the extent to which a participant supported UAV use by civilians more than by journalists. This was done by calculating the difference between participants' answers to the statements: 'I support civilian UAV (drone) use' ($M = 3.34$, $SD = 1.20$) and 'I support use of UAVs (drone) for journalism' ($M = 3.43$, $SD = 1.21$). Each statement was measured on a scale of 1 to 5 where 1 was strongly disagree and 5 was strongly agree. In the resulting variable, a number above zero indicated stronger support for civilian use than for journalism use while a number below zero indicated stronger support for journalist use than for civilian use.

4. Results

4.1. Descriptive Results

A repeated measures test was used to compare the 11 drone journalism story types that compose the Openness to Drone Journalism index. When Bonferroni's correction was applied, there were significant differences in support for many of the story types. For example, audiences were significantly more open to journalists using UAVs to cover weather than traffic ($MD = .12$, $SE = .03$), $p = .015$; hazards ($MD = .21$, $SE = .04$), $p = < .001$; investigations ($MD = .25$, SE = .04), $p < .001$; outdoors ($MD = .52$, $SE = .05$, $p < .001$; live events ($MD = .52$, $SE = .04$), $p < .001$; protests ($MD = .52$, $SE = .04$), $p < .001$; celebrity events ($MD = 1.14$, $SE = .06$), $p < .001$; or impropriety ($MD = 1.2$, $SE = .07$), $p < .001$ (Figure 1).

A paired-sample t-test was used to compare the support for civilian ($M = 3.34$, $SD = 1.20$), and journalist use of UAVs ($M = 3.43$, $SD = 1.21$). The results indicate that the difference ($MD = -.09$) rose to a level of significance so that there was stronger support for use of UAVs for journalism than by civilians, $t(547) = -2.00$, $p = .046$.

4.2. Controls

Demographic and sociographic characteristics have been shown to be associated with both trust in news media and news use habits. For example, age and income are

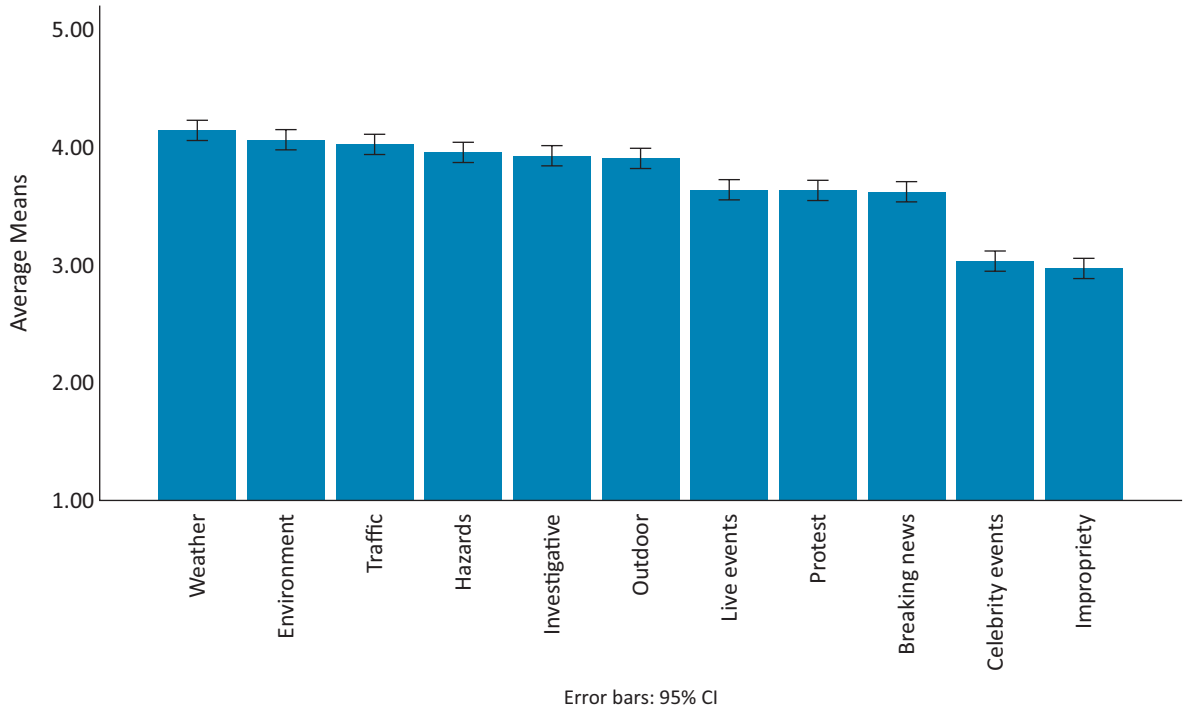

Figure 1. Differences of means of drone story type items. Note: Findings indicate there is significantly more openness toward using UAVs for covering weather, environment and traffic stories than covering celebrity events or impropriety.

positively associated with news seeking behavior (Gil de Zúñiga & Hinsley, 2013; Ksiazek, Malthouse, & Webster, 2010). Similarly, youth and higher incomes are associated with earlier adoptions of technologies (Rogers, 2010). Meanwhile, political conservatives are less likely to have trust in news media than are liberals (Lee, 2010; Stroud & Lee, 2013). To isolate the variables of interest, age, gender, race, income, and political ideology were controlled for in the model.

4.3. Hypotheses Testing

The first three hypotheses were tested using an Ordinary Least-Squares regression model. Openness to drone journalism was used as the outcome variable. Attitude toward technology adoption, privacy concerns, and perception of news ethics were used as independent variables. Age, income, race, gender, and ideology were included in the model as controls. The results of the regression indicated the model was significant (adjusted $R^2 = .21$, $F(9,547) = 17.42$, $p < .001$). The three independent variables together explained 20% of the variance and explained significantly more variance than the control variables alone (adjusted $R^2 = .20$, $F(3,538) = 47.07$, $p < .001$). Each of the independent variables was positively correlated with the dependent variable to a level of significance: attitude toward technology adoption ($\beta = .18$, $p < .001$), privacy concerns ($\beta = .15$, $p < .001$), and perception of media ethics ($\beta = .346$, $p < .001$). These results provide support for H1 and H3, which suggested that those who are more open to adopting technology and those who perceive the news media to act ethically will be more open to drone journalism. There is no evidence to support H2, which suggested that those more concerned about privacy would be less open to drone journalism. While the variable is a significant predictor of openness to drone journalism, the relationship is positive, not negative (Table 5).

To test the final hypothesis, which suggested that those who have a low perception of news ethics will support drone use by civilians more than by journalists, an Ordinary Least-Squares regression used the same model as the previous one. The dependent variable in this model was the civilian/journalist UAV support gap. The results of the regression indicated the model was significant (adjusted $R^2 = .04$, $F(9,547) = 3.45$, $p < .001$). Perception of media ethics explained 3% of the variance and explained significantly more variance than the control variables, privacy concerns and technology adoption together (adjusted $R^2 = .01$, $F(1,538) = 14.76$, $p < .001$). Perception of media ethics was negatively correlated with the civilian/journalist UAV support gap ($\beta = .18$, $p < .001$). The model also indicates that early tech adoption was positively correlated with the civilian/journalist UAV support gap ($\beta = .15$, $p < .004$). These results provide support for H4, suggesting that the less people perceive the media as ethical the more they support civilian use of UAVs compared to journalistic use (Table 6).

5. Discussion

These findings shed light on an understudied area of drone journalism: The audience's perspective. We find that the audience is more likely to support some types

Table 5. The influence of privacy concerns, early technology adoption and perception of media ethics on the openness to civilian drone use.

	Openness to drone journalism			
	SE	*B*	*t*	*p*
Constant	0.25		7.02	< .001
Age	0.02	0.02	0.55	0.58
Gender (Female = 1)	0.07	0.07	1.66	0.098
Race (White = 1)	0.09	0.03	0.78	0.434
Income	0.01	0.04	0.77	0.442
Education	0.02	−0.01	−0.27	0.788
Political ideology	0.04	−0.02	−0.37	0.712
Tech adoption	0.03	0.18	3.72	< .001
Privacy concern	0.04	0.15	3.77	< .001
Media ethics	0.04	0.35	8.15	< .001
$N = 548$		*Adj.* $R^2 = .213$		

of drone journalism stories than others. For example, we find high support for coverage of severe weather events and low support for documenting impropriety by public figures. While overall, we observe openness to drone journalism from the public, we find that concerns about privacy, attitudes toward technology and perception of media ethics are all significant predictors of the audience's openness to drone journalism.

Fundamentally, audiences who perceive news media to act ethically, who are concerned about privacy, and who are early technology adopters are more open to drone journalism. This provides evidence that those who see the benefits of technology and believe that news media take professional ethics seriously will support the use of UAVs in news reporting. Interestingly, the correlation between privacy concerns and openness to drone journalism is positive. This suggests that in this case, those who have personal privacy top of mind are open to drone journalism, while prior research suggests that those who are more concerned about privacy will be less likely to accept new communication technologies.

Additionally, we find a negative correlation between the perception of media ethics and the civilian/journalist UAV support gap. As the audience's perception of media ethics decreases, the support for civilian drones increases in comparison to the support for drone journalism. When audiences do not think news media act ethically, they are less supportive of journalists using drones. This is similar to past literature that suggests those distrustful of journalism are more likely to turn to alternative sources of information during innovative periods (Johnson & Kaye, 2009).

5.1. Limitations

While this study provides evidence to understand the audience's perspective on drone journalism, it does have some limitations. Chief among these is causation. Like any survey, we are unable to say that concerns about privacy, early technology adoption, or perception of ethics are the cause of openness to drone journalism or support of civilian drone use compared to drone journalism.

Table 6. The influence of privacy concerns, early technology adoption and perception of media ethics on the support gap between civilian UAV use and journalist UAV use.

	Support for civilian UAV use over drone journalism			
	SE	*B*	*t*	*p*
Constant	0.35		2.02	0.043
Age	0.03	−0.07	−1.60	0.11
Gender (Female = 1)	0.1	−0.05	−1.07	0.283
Race (White = 1)	0.12	−0.09	−1.98	0.048
Income	0.02	−0.01	−0.28	0.777
Education	0.03	−0.00	−0.06	0.955
Political ideology	0.06	0.01	0.27	0.788
Privacy concern	0.06	−0.04	−0.87	0.385
Tech adoption	0.05	0.15	2.87	0.004
Media ethics	0.05	−0.18	−3.84	< .001
$N = 548$		*Adj.* $R^2 = .04$		

Hence, these results should be understood as influencing factors.

Second, while the survey pool was designed to be representative of the United States Census, racial and ethnic minorities were underrepresented. While the Census indicates 13% Black or African-American, our sample included only 11%. Additionally, while 18% of the population is Hispanic, our sample included only 9%. The underrepresentation of these groups in our sample could alter results in comparison to the general population.

Finally, audiences are exposed to and learn more about drones with each passing natural disaster or high-speed car chase. These results described here, which are from data collected in July 2016, may change as drones are seen as less novel.

5.2. Practical Implications

Gynnild (2014) suggested that the theory of diffusion of innovation might not go far enough to fully explain the impact UAVs could have on journalism. She posited that drone journalism qualified as a case deserving of a look through the lens of 'disruptive innovation.' Disruptive innovation theory (Bower & Christensen, 1995) applies to instances where market incumbents ignore a technological innovation by market challengers to the incumbent's eventual peril. Economists laid out a thorough case that the struggle between legacy news media and new media fit the profile of a disruptive innovation (Christensen, Skok, & Allworth, 2012). In disruptive innovations, incumbents spend too much time paying attention to current customers who want the status quo rather than the innovation on the horizon. Hence, news organizations who pay too much attention to audiences who are distrustful of drone journalism will pay a cost to challengers who innovate regardless of current audience preferences.

Rather than interpreting these results as evidence that playing it safe is preferable, we suggest newsrooms and journalists see these results as evidence that educating the audience will help them accept and support newsroom innovation. For example, participants said news media were doing poorly on transparency. Building a relationship with the audience that does more to disclose how the news story was crafted builds news credibility (Curry & Stroud, 2019). Newsrooms that engage with the audience to demonstrate how its privacy will be respected and how it will decide and enforce the boundaries of ethics should increase the audience's openness to innovation. This will allow newsrooms to both keep current audience members and grow it to those who are looking for that innovation to change their news experience.

5.3. Theoretical Implications

In the past, the theory of diffusion of innovation (Rogers, 2010) has provided guidance to researchers about who will be open to using a wide variety of technologies, including many online and digital communication technologies. In this study, we expand the theory to look at how early adopters are more open to an innovation that they do not directly use but would benefit from through a relationship with a news organization. This new perspective on the theory suggests that those who avoid early adoption of technologies are also less willing to see newsrooms adopt technologies that could improve the information they get. This framework should be examined in the context of other early-stage innovations to understand its generalizability. We see this as a potentially important theoretical contribution to understanding why legacy media lag behind their new media counterparts in news innovation.

Additionally, we find supporting evidence for a past trend: Those who have low trust in news media turn to non-journalists during periods of journalism innovation. In the early days of the internet, these low-media-trust users turned to citizen blogs (Johnson & Kaye, 2009). Here, those with low perceptions of media ethics were more trusting of civilians using drones, who are not necessarily certified by the Federal Aviation Administration for safety and knowledge, than journalists, who presumably are certified. Future research should examine whether the audience's knowledge about the certification process journalists must complete elevates the audience's trust in journalists to operate drones. Capturing a measure of media cynicism may also shed some light on this finding.

6. Conclusion

Taken together, the results provide a way forward for newsrooms looking to adopt new technology and build relationships with the audience. First, they should work to educate the audience on ethical practices of the news organization, perhaps through a transparent policy posted online or through community events. That ethical policy should be clear about the boundaries of privacy for private citizens, celebrities, and public officials. Second, newsrooms should educate the audience about how the technology works so that late-adopters are less concerned about the technology's implications. The findings provide avenues for theoretical exploration between generalized audience trust in news media and its trust in newsroom technology.

Conflict of Interests

The authors declare no conflict of interests.

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About the Authors

Megan Duncan (PhD, University of Wisconsin-Madison) is an Assistant Professor in the Department of Communication at Virginia Tech. She studies how audiences engage with and judge the credibility of news in emerging news environments.

Kathleen Bartzen Culver is the James E. Burgess Chair in Journalism Ethics, an Associate Professor in the University of Wisconsin-Madison School of Journalism & Mass Communication and Director of the Center for Journalism Ethics. Long interested in the implications of digital media on journalism and public interest communication, Culver focuses on the ethical dimensions of social tools, technological advances and networked information. She combines these interests with a background in law and free expression.

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Article

Relationships between Law Enforcement Authorities and Drone Journalists in Spain

Jorge Gallardo-Camacho [1,*] and Vanessa Rodríguez Breijo [2]

[1] Department of Communication, Camilo José Cela University, 28692 Madrid, Spain; E-Mail: jgallardo@ucjc.edu
[2] Department of Communication Sciences and Social Work, University of La Laguna, 38320 Tenerife, Spain; E-Mail: vrbreijo@ull.edu.es

* Corresponding author

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Abstract
The article analyzes the relationship between law enforcement authorities and drone journalists, professionals who use unmanned aerial vehicles (UAVs) for newsgathering purposes, in Spain. The study has two specific objectives. First, to identify the criteria that law enforcement authorities have set for the public dissemination in traditional and social media of the drone footage they have obtained as part of their police operations, and to characterize the relationship that exists between law enforcement authorities and drone journalists. The study is guided by three hypotheses: Spanish law enforcement authorities have more capacity than journalists to shoot aerial news footage (H1); for Spanish law enforcement authorities, the informational use that can be made of the drone footage they obtain is of secondary importance (H2); and drone journalists feel their work is heavily restricted by law enforcement authorities (H3). These hypotheses are tested with the use of in-depth interviews with representatives of three law enforcement organizations in Spain and five drone pilots who have collaborated with news media outlets. The study concludes that the current regulatory framework for UAVs in Spain is very restrictive, in comparison to other countries, which prevents the development of drone journalism.

Keywords
aerial footage; drones; journalism; news production; television; unmanned aerial vehicles

Issue
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1. Introduction

Drones, also known as unmanned aerial vehicles (UAVs), are remotely guided aircraft that can carry high-resolution video cameras that work at high altitudes and distances (Brasil & Moratti Frazão, 2014). The first uses of UAVs for journalistic purposes date back to 2010, when a paparazzi used a drone to take aerial pictures of Paris Hilton on the French Riviera. Then in 2011, the Daily (a former iPad-only news app) and CNN used drones to capture the damage caused by a tornado (Cruz Silva, 2014). Since then, drone journalism has rapidly spread around the world (Şahin, 2018).

Drones have many advantages over manned aircraft, like airplanes and helicopters, when it comes to capturing aerial footage. The first advantage is their lower cost. Drones can also improve the quality of videos and photos, thanks to the miniaturization of image-capturing technology (Mazur, Wiśniewski, & McMillan, 2016). Another benefit for journalists is that drones provide a range of perspectives that other forms of photography do not allow (Belair-Gagnon, Owen, & Holton, 2017). UAVs are also an attractive option for the live coverage of man-made and natural disasters, and for filming hard-to-reach and dangerous areas, such as war zones and flooded areas (Mademlis et al., 2019).

The drone industry in Spain consists mostly of small businesses and freelancers (93% of the total), whose scope is mainly regional. Moreover, 75% of drone operators have been on the market for less than 3 years. In terms of turnover, 78% of them earn less than €50,000 per year, and only 2.4% exceeds €5 million. It is a small niche of providers who operate low-cost, yet professional, equipment and offer basic services, most of them audiovisual (46% of the total), so it is difficult for them to carry out large-scale projects (ToDrone, 2016).

Large television companies in Spain do not have their own drones (Fernández Barrero, 2018), and buy footage from aerial cinematographers or news agencies whenever they need it. They also use material produced and shared, free of charge, by institutions and organizations, such as the army, NGOs, and police departments. Private television companies sometimes commission the filming of aerial footage but at very low fees which, according to drone pilots, are not enough to make a living out of this profession. In 2016, natural disaster footage represented 72% of all the images shoot by drones and broadcast in news programs in Spain (Gallardo-Camacho & Lavín, 2016).

Increased use of drones has raised significant public safety concerns, as drones can collide and cause injuries or interfere with aircraft. Their use near dangerous places, such as burning buildings and flooded cities, can hinder rescue operations. Not to mention the risk of UAVs being hacked or hijacked (Alwateer, Loke, & Zuchowicz, 2019). In addition, camera-equipped drones can potentially violate their right to privacy of the people they photograph (McIntyre, 2015).

In Norway and Sweden, Gynnild (2014) found that another problem with the use of drone footage for journalistic purposes has to do with errors in the selection, collection, editing, contextualization and dissemination of videos. As Gynnild (2014) points out, these errors are caused by the fact that a large part of drone footage is not produced by professional journalists nor filmed in the country where it is shown. Drone footage is in fact created and contextualized in other parts of the world by secondary sources, such as news agencies, citizens or government institutions. This is particularly worrying in the case of surveillance images, whose dissemination has increased markedly due to the growing fear of crime and terrorism, when they are presented without disclosing the way data were collected and when they are recontextualized by people who are unaware of their real origin and do not apply journalistic criteria.

Commercial drone operations are permitted in many countries but are often strictly regulated, while regulations for recreational drone flights are more permissive. Aviation authorities around the world often require drone pilots to obtain a license, certificate or permit, and most countries classify drone flights according to the capabilities of the unmanned aircraft. Careless or reckless drone operations face civil or criminal punishments in almost any jurisdiction. Another trend among international regulations is to require pilots to assess their operations through a certification or permit. Drone regulations are relatively permissive in Europe, Canada, the Middle East, South America and South Pacific countries, while the early stages of drone regulation in the United States of America and Asia have been characterized by some resistance (Ravich, 2016). Drone liability insurance, for bodily injury or property damage, is mandatory in Canada, China, Germany, Poland, the United Kingdom and other countries (Mazur et al., 2016).

The use of drones in Spain was regulated from 2014 to 2017 by the Royal Decree 552/2014, which established that drones weighing less than two kilograms could only fly over unpopulated areas and below 122 meters (Gallardo-Camacho & Lavín, 2016). The Royal Decree 1036/2017, which defined the new regulatory framework for drones in Spain, allows drone flights over urban areas, crowds, and in non-controlled airspace, provided they are within the visual line of sight, have a maximum takeoff weight lower than 10 kilograms, and keep a 50-meter horizontal distance from buildings or people (Ministry of Interior, 2017). To fly a drone, it is essential to request authorization from the National Aviation Safety Agency (*Agencia Estatal de Seguridad Aérea*) and to demonstrate that the drone will be operated in 'standard scenarios,' through an aeronautic safety assessment. Otherwise, drone pilots must undertake this assessment using standardized methods and submit it together with the application and the rest of the documentation (National Aviation Safety Agency, 2020).

In the United States of America, the Federal Aviation Administration initially defined drone journalism as an illegal operation on the grounds that it had a commercial purpose. This regulation led to actions and investigations against those who used UAVs to take aerial photographs and video for newsgathering. For this reason, unmanned aircraft were not widely used by media professionals, who strongly criticized this legislation (Holton, Lawson, & Love, 2015). Meanwhile, the ethics of drone journalism were discussed outside the newsrooms as it was a practice that developed on the fringes of the law. However, the legal requirements to operate UAVs were relaxed in 2016. The current regulation allows small unmanned aircraft to fly, even over people and in restricted airspace (Belair-Gagnon et al., 2017).

European countries at the top of the World Press Freedom Index, such as Finland, Norway, Denmark, The Netherlands and Sweden, as well as Australia, have set regulations that allow the development of drone journalism without excessive restrictions, but also without neglecting security and privacy issues. In contrast, countries at the bottom of this index—compiled by Reporters Without Borders (2019)—apply severe limitations. In Cambodia, Kenya and Nepal, bans on drone flights were enacted and flying restrictions were tightened after individuals made illegal use of drones or disclosed materials the government did not want the public to see. In Thailand, drone operators must ask permis-

sion directly from the Minister of Transport before flying. The United Arab Emirates have banned the use of drones in Abu Dhabi. In South Africa, the legal ban on drones is complete, although the government cannot efficiently monitor compliance with this regulation. This context seems to indicate that there is a correlation between the general state of freedom of expression in a country and the extent of restrictions set to drone journalism on such a country (Lauk, Uskali, Kuutti, & Hirvinen, 2016).

As from July 2020, a common regulatory framework came into force in the EU to create an Unmanned Traffic Management System, called the U-Space. In this new framework, drone operations are classified into three types depending on the level of risk involved: open, specific and certified (for low, medium or high risk, respectively), adopting a different regulatory approach for each category. Standardized risk assessments will only be required for medium—and high-risk categories. National aviation authorities shall ensure compliance with EU legislation and the registration and authorization of aircraft (Drone Rules, 2020).

There is consensus on the scarcity of research on drone journalism, because it is a very recent activity (Adams, 2018; Fernández Barrero, 2018; McIntyre, 2015) and because most studies have focused on the legal and ethical implications of UAV in general (Belair-Gagnon et al., 2017; Hebbel-Seeger, Horky, & Theobalt, 2017) instead of their journalistic applications.

However, there are some research works that address drone journalism from different perspectives: its ethical considerations (Bartzen Culver, 2014); the implications and awareness of privacy regulations in the use of drones for newsgathering purposes (Finn & Wright, 2016; McIntyre, 2015); the journalistic features of the stories made with UAVs (Adams, 2018; Şahin, 2018); the ethical principles of journalists who used UAVs despite bans in the United States of America and their role as disruptive innovators (Belair-Gagnon et al., 2017), and expectations and experiences in relation to the use of drones in sporting events (Hebbel-Seeger et al., 2017). In case of Spain, the studies of Gallardo-Camacho and Lavín (2016) and Fernández Barrero (2018) have examined the situation of the use of drones in journalism.

Some of the research carried out around the world on journalists' relationship with law enforcement authorities has allowed us to approach this subject matter in the Spanish context in this article. Tremayne and Clark (2014) focused on the capacity of synoptic surveillance of UAVs operated by private citizens and journalists who hold political or economic power. After analyzing eight cases of drone journalism, they concluded that most of them fulfilled this function, managing to reverse the 'panoptic gaze' traditionally exerted from the authorities and corporations towards people.

Bakir (2015) also examined the problem of surveillance of citizens by government and journalists' efforts to counteract and oppose it. Although he does not address this issue from the perspective of drone journalism, he concludes that the way to achieve a balance in power relations is to enhance mutual watching and surveillance. Brucato (2015), for his part, has also confirmed that surveillance of the government by the press increases the information the government institutions provide on a voluntary basis. His study, however, found that police violence has not undergone significant changes, despite the possibility of being always watched by ubiquitous surveillance cameras and new technologies.

Finn and Wright (2016) interviewed civil aviation and data protection authorities in Europe and concluded that they are mostly suspicious of commercial and private drone operators as they are thought to be associated with significant privacy, data protection and ethical risks. In contrast, Feeney (2016) highlights the threat that law enforcement drones pose to the privacy of citizens and the lack of law reforms to address this problem.

Finally, Gynnild (2016) has shed light on one of the factors she identifies as responsible for the lack of alignment between drone journalism and journalistic and transparency ideals: the use of drone footage filmed by government and not by journalists themselves. According to the author, this fact increases the chances of news decontextualization and disconnection between graphic and textual materials.

So far, there are no studies on the relationship between people who use drones for newsgathering and the Security Forces and Corps, which in addition to being responsible for enforcing the law, are UAV operators and provide aerial footage to the media. For this reason, this article aims to develop a better understanding of some of the characteristics of this relationship in Spain.

In Spain, law enforcement is carried out by numerous civilian and military organizations. The civilian category includes the National Police (*Policía Nacional*/*Cuerpo Nacional de Policía*); autonomous police forces, under the rule of the regional governments, like the Catalan Police (*Mossos d'Esquadra*), the Basque Police (*Ertzaintza*) and the Navarrese Chartered Police (*Policía Foral*); and the local police forces of each municipality. The military law enforcement authorities include the Civil Guard (*Guardia Civil*), at the national level, and the port, customs and forest surveillance services. Their objective is to maintain public safety at all these levels of action.

The first specific objective of this research is to address the role of the main Security Forces and Corps as producers of drone footage, which is used by the media for news making. In other words, the objective is to analyze this transfer of material from one law-enforcement organization to an institution responsible for informing the public.

The second specific objective is to explore the relationship between drone pilots who provide aerial footage to news media outlets and the Security Forces and Corps, as law enforcement institutions, more than two years after the new regulation came into force. We investigated drone journalists' perception of freedom

and repression, the prohibitions or sanctions they have received, their opinion on the status of the Spanish legislation in comparison to that in other countries, and the specialized training they received to work in television.

2. Hypotheses and Methods

This research is guided by the following three hypotheses:

> H1: In Spain, the Security Forces and Corps have a greater capacity than the media to obtain aerial news footage, because they have their own drones for surveillance and crime investigation and because they have fewer flight restrictions.
>
> H2: The main function of the footage obtained by the Security Forces and Corps through drones is to ensure the safety of citizens, while its informative function is secondary. They distribute the footage only after it has fulfilled its main function.
>
> H3: Interviewed drone pilots who provide news footage to news media outlets believe this activity faces many restrictions: they consider the requirements to be excessive and the administrative waiting times too long to be able to cover breaking news events.

To test these hypotheses, we have used a qualitative approach and an exploratory, descriptive research design. A structured interview applied to two expert panels. One composed of the communications officers of the National Police, the Civil Guard and the Catalan Police, and another made up of drone journalists who provide aerial news footage to news media outlets. Tables 1 and 2 show the composition of the panels.

This study ruled out the inclusion of representatives of port, customs and forest surveillance services, as they do not have a direct link to the research questions. Also excluded from the study were experts from the local police departments because their authority in security matters is lower than that of their regional and national counterparts. As for the inclusion of the regional autonomous police forces, it was not possible to obtain a response from the Basque Police and the Navarrese Chartered Police, due to the current national emergency caused by the coronavirus pandemic outbreak. We consider that the responses provided by the representatives of the national armed organizations are the most relevant to the objectives of this study, as they operate the largest number of drones and cover the broadest capacities in the field of security.

As for the second expert panel, it consists of five drone videographers who produce or have produced news footage for media companies. One of them belongs to the Spanish Association of Drones and Similar Devices, while three belong to other companies that provide aerial filming and photography services (Drone Madrid and GoDrone) or connect UAV pilots with potential customers (The Drones Post); and a journalist who owns two drones and works for *El Mundo*, a national newspaper. This last participant was included to complement the panel with a more particular vision.

The questions asked to the first panel investigated the number of drones owned by their institutions, the news footage production process, the selection and transfer of that material to the media and the publica-

Table 1. Panel of experts representing the Security Forces and Corps.

Participants	Affiliation	Position/department	Interview date	Interview type
Antonio Nevado Raja	National Police	Head of Press and Media Relations Office	10 March 2020	Email
Fernando Cubillo	Civil Guard	Head of Information and PR Office	7 March 2020 11 March 2020	Email and Phone
Jordi Peña Camí	Catalan Police	Communications Office representative	10 March 2020	Phone and email

Table 2. Panel of experts representing drone journalists who provide aerial news footage to the media.

Participants	Affiliation	Position	Interview date	Interview type
Salvador Bellver Escrihuela	Spanish Association of Drones and Similar Devices	President	11 March 2020	Email
César González Galindo	GoDrone	Technical Director	9 March 2020	Email
Roger Persiva	The Drones Post	Founder	10 March 2020	Phone and email
Ignacio Espinoza	Drone Madrid	Founding CEO	12 March 2020	Email
Álvaro Undabarrena Infante	*El Mundo*	Reporter, drone-owner	3 July 2020	Phone and email

tion of this material on the institution's social networks, the characteristics of their relationship with journalists and the specific training of their UAVs operators. In the second panel we were interested in knowing how free or restricted drone pilots feel they are to carry out their profession, their perception of the new regulations in comparison to the regulations in other countries, their experience with the Security Forces and Corps while using drones to obtain aerial footage for journalistic purposes, their contractual relationship with the media and their specialized training to work in television.

Once the answers were obtained from the expert panels, they were systematized in a comparative table that was used as a reference to test the hypotheses and answer the research questions, using a qualitative, exploratory-descriptive design, with no statistical representativeness.

3. Results

3.1. Aerial Footage Filmed by the Security Forces and Corps

The question about the number of drones owned by the Civil Guard was answered only by Fernando Cubillo, Lieutenant Colonel and head of the Head of Media and Social Relations of the Civil Guard. He stated that they own 60 drones. The communications officers of the National Police and the Catalan Police stated that their institutions cannot disclose that figure, for security reasons.

Jordi Peña Camí, the representative of the Communications Office of the Catalan Police, explained that this institution uses drones for the purposes of citizen safety, mainly for police investigation. He remarks that if a case is under secrecy in summary proceedings, they do not distribute drone footage about it. In cases like the Mobile World Congress or air and rail accidents, he narrates, the Catalan Police offers the media images captured by the security devices to show how their agents are working in those areas.

Cubillo (Civil Guard), for his part, explains that the Civil Guard uses drones to capture audiovisual evidence of crimes and administrative misconduct, not to provide the media with these materials. He mentions that UAVs belong to the Research Units, not to the communication offices. Once the images are authorized by the competent judicial body, they are offered to the Information and Public Relations Office for release.

Public dissemination of drone footage through the media and social networks occurs in the three law enforcement institutions. Peña Camí (Catalan Police) adds that the footage they distribute to the media are also published on their social networks and vice versa, with the aim of publicizing the work of the Catalan Police.

Antonio Nevado Raja, Head of the Press and Media Relations Office of the National Police, explains that they send footage to all accredited news media outlets on their distribution lists. Prior to this, "they assess the suitability of the distribution of the footage, edit it to cut out restricted information or images, and distribute it with the relevant press release." Peña Camí (Catalan Police) claims that the Catalan Police also sends the information to all media outlets.

With regard to the most frequent themes of the images, Peña Camí (Catalan Police) mentions that the footage filmed by the Catalan Police is about "investigations in which there is no classified information, issues of citizen safety, rail or air accidents, etc." Meanwhile, according to Nevado Raja (National Police), the footage shot by the National Police refers to "concluded police operations." The Civil Guard provided no answers to this question.

The three organizations acknowledged, through their communication officers, that they have agents with formal education and authorization to fly UAVs but did not reveal the number of agents.

3.2. Relationship between Drone Pilots and the Security Forces and Corps

As for the relationship between the Security Forces and Corps and drone journalists, Peña Camí (Catalan Police) explained that they have to comply with the same regulations as any professional drone-operating company:

> Specific authorizations by the National Aviation Safety Agency are required in certain areas, in outdoor locations you have to notify the Interior department 10 days in advance; if it is a space near an airport, more air permits are needed, and the documentation of pilots and drones (insurance, medical certificates, etc.) must be in order.

Journalists cannot fly drones over rail accidents, even if they are not on a restricted area, simply because a police investigation is underway. Moreover, drone filming can be banned for security reasons, as it happened during the Carnival of Sitges.

Neither the National Police nor the Civil Guard make distinctions in their treatment of journalists. Nevado Raja (National Police) explains that the Police acts when a drone flies over areas restricted by security reasons, regardless of who the drone operator is. He remarks that the use of drones can never violate people's privacy and security.

None of the institutions has developed a manual to guide their relationships with media regarding the use of drones. Violations committed by those who work in them, or for them, have not been counted because they do not differentiate between the different persons reported.

When the panel of drone pilots were asked their opinion about the Spanish legislation, those who represent companies that provide audiovisual services, or serve as link for this activity, and Alvaro Undabarrena Infante, re-

porter of *El Mundo*, agree to describe it as very restrictive. Four pilots consider that other countries are more permissive and are more advanced on regulatory issues. The examples they mentioned were the United States of America, France and Germany. Roger Persiva, founder of The Drones Post, mentions that in the latter two countries, it is up to municipalities to decide whether to authorize or deny permission to fly, making operations easier. For his part, the president of Spanish Association of Drones and Similar Devices, Salvador Bellver Escrihuela, rightly points out that the regulatory framework is more restrictive in some countries and more permissive in others, and that it is necessary to achieve a balance between safety and operability.

César González Galindo, technical director of GoDrone, explains that the regulatory framework establishes a series of requirements and encompasses all operations in general, without specific guidelines for the media. He warns that "drones cannot fly over urban areas, cannot fly over people, cannot fly within 8 km of any airport or 12 km if it is instrumental, and cannot fly at night." He then reconsiders:

> You could apply for special permits to fly in restricted areas, but these procedures are painstaking and the authority can take up to six months to reply to your permit application; if you do not receive a response within this period, administrative silence is taken as a denial of the request.

It concludes that it is difficult to do aerial drone filming events under these circumstances.

Ignacio Espinoza, the founder of Drone Madrid, also provides details of the restrictions set by the legislation: "The Ministry of Defense restricts the publication of footage filmed in restricted zones, for security reasons, or because it is vulnerable content." Persiva (The Drones Post) recognizes that the new regulation opens the door to flying and filming in areas that were previously prohibited, such as urban environments and areas close to airports, but with many conditions. He explains that "permits must be requested, security assessments must be carried out, we have to wait for the administration's response, and ultimately hope the police or the Civil Guard do not have any impediment." For this drone pilot, this procedure makes it very difficult to use a drone for the coverage of breaking news. He concludes: "Sometimes permits must be processed and the administration's response can take several months."

Undabarrena Infante (*El Mundo*) summarizes his opinion in the following way: "Currently everything is forbidden except for exceptional cases, those that do not violate the privacy of others, that is, you can only film monuments and things like that." To film sporting events drone pilots must request authorization from the National Aviation Safety Agency, which is very complicated. According to him:

> The regulations that have been passed so far in Spain have not solved the needs of journalists. The regulatory framework in Spain has made drone pilots and operators feel that every drone flight they perform is in violation of the law.

With this view of the Spanish law, it is not surprising that three of the drone pilots would respond that they do not feel free when performing unmanned flights for journalistic purposes. González Galindo (GoDrone) explains that "depending on the incident, it is better to refrain from flying drones, unless the Security Forces and Corps themselves ask for your help, to avoid hindering their work." Persiva (The Drones Post) considers that "with the law in hand, in the event of an incident, even if it occurred in a free-flight area, it could not be done." He remarks that "if there are emergency and police teams in the area, they would surely prohibit drone flights." Undabarrena Infante (*El Mundo*) acknowledges that he has done aerial filming, "but never in Madrid, because it is risking more than you should." He considers that one way to be able to publish his videos is to upload them to YouTube and share the link in an article of the newspaper where he works, "but never as a journalist, always as a citizen."

Espinoza (Drone Madrid) did not answer the question but sent a link to the ENAIRE initiative of the Ministry of Transport, Mobility and Urban Agenda (2020), which has an extraordinary procedure to fly a drone in situations of risk, catastrophe or public calamity, subject to the request of the public authority responsible for managing such situations. However, the pilot did not offer further comment on it. Bellver Escrihuela (Spanish Association of Drones and Similar Devices) is the only pilot on the panel who stated that he does feel free and considers that there is no problem if drone users comply with the regulations.

None of the pilots on the panel reported a bad relationship with the Security Forces and Corps in this study. Even Bellver Escrihuela (Spanish Association of Drones and Similar Devices) describes their relationship as "very good," adding that "professional drone pilots are aware of their limitations and the penalties they are exposed to." In the same line, González Galindo (GoDrone) and Persiva (The Drones Post) believe that there are no problems when drone operators comply with the regulations. Espinoza (Drone Madrid) points out that some agents lack information, but drone operations are gradually becoming standardized. However, Persiva (The Drones Post) remembers that once the police prevented him from taking aerial news footage of an event that took in an isolated mountain site. He concludes that "despite no authorization was requested from the National Aviation Safety Agency, police officers can, at any given time, decree that you cannot fly a drone over an area where police intervention is taking place."

Tables 3 and 4 summarize the responses obtained from the expert panels.

Table 3. Summary of answers provided by the panel of experts representing the Security Forces and Corps.

Questions	Jordi Peña Camí Catalan Police	Antonio Nevado Raja National Police	Fernando Cubillo Civil Guard
How many drones does your institution own? How many of them are used to generate news content for audiovisual media?	We cannot disclose the number of drones at our disposal. Sometimes our operations are filmed to show the media how we work.	We cannot disclose the number of drones at our disposal.	60 drones. They belong to the Research Units, not the communications offices.
Do you have a manual to guide relationships between law enforcement authorities and the media regarding drone use?	No. The communication area serves as link between journalists and police authorities.	We do not know.	No.
Do journalists feel free to cover news events with drone filmography?	There are restrictions, so they cannot be used freely.	We do not know what journalists think in general.	(Did not answer).
How many journalists or freelancers hired by media companies have been fined?	We do not have these data. When a pilot is fined, we do not differentiate between journalists and non-journalists.	No.	No.
Does your organization have properly trained drone operators?	Yes.	Yes.	Yes.

None of the drone pilots in the panel is dedicated exclusively to the production of news footage for the media. They use their UAVs for several activities, not just audiovisual filming. However, three of them (the representatives of GoDrone, Drone Madrid and The Drones Post) claimed to have specific training to work in television. According to the GoDrone's representative, in most cases there is no economic benefit in offering their videos to the media, because they only "include your logo or mention your name in the broadcast news report."

4. Discussion and Conclusions

The National Police and the Catalan Police did not disclose the number of drones they own. However, the number revealed by the Civil Guard (60 UAVs) is much higher to than the number revealed by the Spanish media, who outsource the production of aerial images to individuals or small companies, which in turn have a much lower capacity for newsgathering than the aforementioned Security Forces and Corps. The interviews have shown that the National Police and the Civil Guard have trained and accredited drone pilots and can fly over areas where there are ongoing operations (unlike the media), which confirms the first hypothesis (H1) of this exploratory and descriptive study, which proposed that these law enforcement organizations have greater capacity to obtain aerial news footage than the media.

However, the interviews have also shown that the main use of the footage shot by the drones owned by the National Police, the Civil Guard and the Catalan Police is not public dissemination, which also seems confirms the second hypothesis (H2). These unmanned aircraft are primarily used to ensure safety, collect evidence and conduct investigations. Only when these police operations are not under secrecy in summary proceedings, the Security Forces and Corps shares the images to the media and disseminates them through their social networks. They are mainly videos of accidents or completed police operations. Before their public dissemination, these videos are edited to highlight the way the organization works (as in the case of the Catalan Police).

Therefore, while these audiovisual materials are useful to inform about events that the media cannot cover due to the legal restrictions, their source is not necessarily always independent and impartial and their production is not necessarily governed by journalistic criteria, which means that they may be edited with certain bias. In media theory, there is some consensus on the role of journalists as guardians of the public interest, to hold those in political and economic power accountable for their possible mistakes (Lashmar, 2017), controlling their

Table 4. Summary of answers provided by the panel of experts representing drone pilots working for the media.

Questions	César González Galindo (GoDrone)	Roger Persiva (The Drones Post)	Álvaro Undabarrena Infante (*El Mundo*)	Ignacio Espinoza (Drone Madrid)	Salvador Bellver Escrihuela (Spanish Association of Drones and Similar Devices)
How is your relationship with the Security Forces and Corps?	It is good, provided the regulations are complied with.	It is good, if you have fly permits, although they are useless if there is an ongoing police investigation.	For news outlets, it is very complicated to avoid being fined.	Some agents lack information, but drone use is gradually becoming regularized and standardized.	It is very good, as pilots already know the legal restrictions.
What is the difference between drone regulations in Spain and in other countries?	In Spain it is very restrictive in many respects. Countries like the United States of America, France and Germany are way ahead.	Our regulations make us feel we break the law on every flight. In France and Germany, municipalities have the power to issue fly permits.	Our regulations do not allow us to film virtually anything, except for monuments. Drone use in sporting events is very complicated.	In Spain, it is more restrictive. Other countries are already more permissive in challenging environments.	Restrictions vary across countries. We must find a balance between safety and operability.
Do you feel you are free to cover news events with drone filmography?	Not in this type of situation. Depending on the incident in question, it is better not to use drones, unless the authorities ask for your support.	No. With the law in hand, in the event of an incident, even if it occurred in a free-flying area, it cannot be done.	For the media it is not convenient to buy their own drones. It is better for them to use the footage other people film for recreational purposes.	(Did not answer but shared a link to the website of the ENAIRE initiative of the Ministry of Transport, Mobility and Urban Agenda, 2020).	Yes. We all must know the regulations. If we comply with it, we will not have any problems.

abuses and guaranteeing citizens' right to information (Martínez-Sanz & Durántez-Stolle, 2019), which is impossible to achieve without investigation and surveillance. However, the circumstances described in this study suggest that it might be difficult for journalists to carry out both activities when the entity under journalistic investigation is the Security Forces and Corps. Although the conducted interviews lack statistical representativeness, the data obtained through them are reminiscent of the findings of Bakir (2015), Brucato (2015) and Mills (2018), who indicate that the 'synoptic' surveillance from journalists and citizens towards power is not balanced against the 'panoptic gaze' that occurs in the opposite direction. In addition, as Gynnild (2016) explains, the use of externally-produced videos could make complicate the contextualization and explanation of the news stories the journalist has investigated, and could increase the risk of the situation described by Diezhandino (2007), in which the media mainly develop an institutional agenda based on government interests, rather than an agenda of their own based on the investigation and inquiries carried out by their own journalists.

Ideally, to take advantage of all the opportunities that UAVs offer to journalism—like bird's eye views of difficult news situations and live surveillance for investigative journalism, to mention just two—journalists should be the ones who use drones for newsgathering or the ones who commission others to do so. According to the drone pilots interviewed for this research, the administrative processing of the requirements established by the legislation should be shortened and streamlined, always within the limits imposed by security and privacy concerns. The expert panel should be expanded in future studies, to determine whether this view can be generalized to all those who use drones for newsgathering.

In Spain, the restrictions applied to the filming of news footage are the same as for any other commercial use of drones. The representatives of the Security Forces and Corps interviewed for this study do not process these requests separately nor consider the speed of

authorization required to produce news footage. There is no specific manual or regulation for the media. Some of the pilots interviewed mention that it was precisely for these reasons that they do not feel free to use drones for newsgathering, because of the large number of restrictions imposed by the regulations and the Security Forces and Corps during ongoing police operations. These participants also fear the sanctions the authorities may impose on them. Their general perception is that drone legislation is more permissive and flexible in the rest of the world. These results confirm the third hypothesis (H3), although the number of interviews conducted for the study does not allow us to generalize the results.

Although the new law expands the types of places where drones can film, it requires drone operators to perform a security assessment when drone filmography is going to be carried out in non-standard scenarios. The waiting times involved in this assessment and the resolution of the administration limit the use of drone cameras to cover breaking news events. This could be the reason why some of the interviewed drone pilots feel the new law imposes even more restrictions on drone journalism and, essentially, only allows the filming of monuments. For the panel of drone pilots, the procedures are complicated and the waiting times for their resolution are too long, as if the limitations set by the previous law remained in force. They perceive the requirements as restrictions because the waiting times of the procedures hinder the immediate coverage of news events.

Authors such as Lauk et al. (2016) and Ravich (2016) have found correlations between regulations on the use of drones for newsgathering and the level of freedom of expression of countries. International regulations range from permissive, as in Nordic nations, to totally restrictive, such as those in Kenya and the United Arab Emirates. In this context, it is necessary to assess whether the restrictions are based only on the dangers that drones pose to security and privacy, or whether are related to the need to prevent the filming and disclosure of videos potentially harmful to the reputation of institutions and individuals in power, or the desire to restrict access to certain types of information. In any case, the relationship between the media and the Security Forces and Corps, according to the panel of drone pilots, is confrontational to some extent, because the enforcement of drone legislation by the latter is perceived as an obstacle in newsgathering.

Therefore, we agree with Ntalakas, Dimoulas, Kalliris, and Veglis (2017), who point out that the great challenge for drone journalism is to advocate for a regulatory framework that offers drone journalists the desired freedom to investigate and inform, without violating ethical, privacy and security implications. However, in Spain there is also an economic motivation. Interviewed drone pilots acknowledge that they do not work exclusively for media companies, because it is not profitable for them. Most of them operate other types of UAVs, despite several of them have journalistic and audiovisual training.

Drone-generated content can be a valuable tool for storytelling, for its profitability and data collection capabilities (Ntalakas et al., 2017). Drone footage provides credibility to news storytelling because of the reality it conveys, which previously required the physical presence of the reporter, and raises awareness about issues, places and events that were previously ignored (Gynnild, 2016). However, the circumstances described in this article seem to constitute obstacles that currently prevent the development of drone journalism in Spain. However, the forthcoming entry into force of the new European legislation, which classifies drone operations according to risk levels, reduces requirements and unifies national regulations, could open new opportunities. It will be useful to study the impact of this new legislation on the development of the newsgathering use of UAVs once its provisions begin to be implemented. Moreover, a study with a wider sample of drone pilots and law enforcement authorities needs to be carried out to be able to generalize the results.

Based on this work, we propose the creation of a green paper to guide relationships between journalists and law enforcement authorities to find a democratic balance between citizen security, investigative journalism and the obtaining of aerial images that expand audiovisual news content. This green paper should enable a specific procedure for the coverage of journalistic events, in which UAV flight requirements are shortened and reduced. One premise for expediting these procedures could be giving local and non-national authorities power to issue drone flight permits, to avoid the accumulation of applications. In any case, the security and privacy criteria, considered in the current legislation, should also include the need to inform citizens and specify under what circumstances the right to information should prevail over drone flight restrictions.

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Conflict of Interests

The authors declare no conflict of interests.

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About the Authors

Jorge Gallardo-Camacho is a Professor at the School of Communication and Humanities of the Camilo José Cela University, where he directs the BA program in Communication. He holds a PhD in Communication from the University of Malaga and an MBA in Television Enterprises from the University of Salamanca. He has 15 years of teaching and research experience. His research areas are audiences, social media and new media. He also works as Director of news programming in *Antena 3 Noticias* (Spain).

Vanessa Rodríguez Breijo is a Professor at the School of Social Sciences and Communication of the University of La Laguna, where she is also Vice-Dean for Quality. She has nine years of university teaching experience and is accredited as a full-time Professor by the National Agency for Quality Assessment and Accreditation of Spain. Author of two books, 22 journal articles and 21 book chapters. She has participated in 15 international conferences. Winner of the National Award for Excellence in Academic Performance at the Doctoral level in 2011.

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Article

Audience Attention and Emotion in News Filmed with Drones: A Neuromarketing Research

Luis Mañas-Viniegra *, Alberto García-García and Ignacio J. Martín-Moraleda

Department of Applied Communication Studies, Complutense University of Madrid, 28040 Madrid, Spain;
E-Mails: lmanas@ucm.es (L.M.-V.), algarci@ucm.es (A.G.-G.), ignmar05@ucm.es (I.J.M.-M.)

* Corresponding author

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Abstract
Emotional journalism is being driven by audiovisual technology such as drones, also known as unmanned aerial vehicles, which have demonstrated their usefulness in transforming objective news into news stories from a new visual perspective, facilitating access to dangerous or difficult places. They also allow for greater immersion by an audience that has become an active participant in the news, and they contribute to the storytelling of communication despite the risk to privacy and security that their misuse might entail. The aim of this research is to determine the differences in attention and intensity of the emotions experienced when viewing two pieces of audiovisual news: One was filmed with the technological support of a drone, and the other was produced in the conventional way. The techniques of eye tracking and galvanic skin response were used in 30 Spanish university students. The results suggest that attention was focused on the most spectacular visual elements, although the images filmed with a drone received a higher concentration of attention from the subjects, and this attention was spread throughout the entire image, which demonstrates that drones enhance the effectiveness of panoramic images with natural landscapes. The greatest emotion generated by viewing the images recorded with drones was statistically significant, but it was limited exclusively to these particular scenes, and not to the entire recording of the news.

Keywords
audiovisual technology; breaking news; communication; drone; emotional journalism; eye tracking; galvanic skin response; neuromarketing; unmanned aerial vehicles

Issue
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1. Introduction

In contrast to objective, unbiased, rational journalism (Liu, 2019) in which journalists even suppress or modify their own emotions as part of their work (Huxford & Hopper, 2020), setting themselves up as independent observers (Wahl-Jørgesen, 2020), there is a new trend known as emotional journalism, which revolves around emotions driven by technology, as already occurs in immersive or virtual reality journalism for the purpose of reconnecting with fragmented audiences (Lecheler, 2020).

These new ways of generating news transform facts into personal experiences that create a link between the public, the news, and the journalist (Sánchez-Laws, 2017). Although journalism has always included emotion within the narration and presentation of news, this new emotional journalism, even further from news objectivity, involves audiences more emotionally and increases the attention, identification and memory of news stories (Wahl-Jørgesen, 2020).

Attention and emotion are affecting both the production and consumption of news, and more research is

needed for both of these issues (Beckett & Deuze, 2016). We conceive the world around us both cognitively and emotionally, which is why authors such as Orgeret (2020) have pointed out that Neuroscience can strengthen the research in this area.

Drones comprise the audiovisual technology analysed in this article, and they are capable of contributing to the development of emotional journalism, since the natural human–drone interaction (HDI) currently allows for the recognition of up to three emotional states from its recordings (Cauchard, Zhai, Spadafora, & Landay, 2016). In short, basic information about the news is not enough to awaken the emotions of the audience, and now it is necessary to personalise the stories and represent them with images that awaken the empathic connection (Maier, Slovic, & Mayorga, 2017).

1.1. Journalism and Drones

The technical name for drones is unmanned aerial vehicles, or unmanned aircraft, and they have demonstrated their usefulness in covering breaking news in dangerous locations from a new visual perspective (Holton, Lawson, & Love, 2015), thereby enabling fast, inexpensive access to scenes where events take place (Fernández-Barrero, 2018). Drones also allow images to be captured in places that are difficult to access, and new technological developments allow for the integration of intelligent systems for the automatic identification of people or vehicles, which facilitates the recording of news in places without full visibility (Cavaliere, Loia, Saggese, Senatore, & Vento, 2019). Along these lines, it is also possible to use multi-view video systems to generate 360º video images, which makes drone journalism more similar to immersive journalism (Ballout, Ghaddar, & Wehbi, 2019). Moreover, its ability to perform wireless broadcast or point-to-multipoint transmission with 5G links (Sekander, Tabassum, & Hossain, 2018) will promote the use of live connection.

Detractors highlight the risk to property, privacy and security that its misuse might entail in a regulatory context poorly adapted to new technologies (Rule, 2015). However, drones have been integrated into everyday life through devices such as smartphones, cameras, or even the drones themselves, which make up the so-called sensor society in which the capturing of data is always active (Andrejevic & Burdon, 2015). In spite of this, some research on citizen perception has shown that there is a relatively neutral attitude toward the risk posed by drones, as they are considered neither a major threat nor a great benefit (Clothier, Greer, Greer, & Mehta, 2015).

The fact that media audiences have become simultaneous receivers, producers and active participants (Lewis & Westlund, 2015) is partially a result of the new interactive ways of transmitting information, as well as the new interaction between humans and technology. This interconnection has led to a voluntary renunciation of some privacy in order to obtain more personalized, and consequently more satisfying content for the audience.

Even from the most quantitative journalistic point of view, the contribution of storytelling (Coddington, 2015) and emotion in professional journalism (Papacharissi, 2015) has been recognized, and drones are contributing to the creation of such storytelling from new points of view. The growing importance of images in newspaper stories has boosted digital journalism and social networks (Caple & Bednarek, 2016), and in turn has impelled the use of 'arresting audiovisuals' as an innovative feature of added value to the news (Harcup & O'Neill, 2017). This audiovisual perspective is where drones are capable of making a great contribution to journalism.

In short, the use of drones rapidly evolved from military use to logistics and entertainment, at which time their contribution to the media came under consideration (Tham, Selem, & Ogulin, 2017) thanks to their novelty, recording stability, high camera resolution, and reduced price (Galvane et al., 2018), as well as their versatility ranging from panoramic shots (panning) to over-the-shoulder angles (Mademlis et al., 2019). Although drone filming has been presented as a game-changer in the media industry (Adams, 2019), there is very little research on the subject (Table 1), and what exists focuses primarily on safety and ethics in relation to news production (Belair-Gagnon, Owen, & Holton, 2017).

One of the first research studies conducted in the USA found that half of the 94 local television news directors interviewed were already using drones in the news, although moderately (Ferguson & Greer, 2019). Its positive contribution has also been assessed by Turkish news agencies for its ability to record images in places that are difficult to access (Budak, 2019), sometimes replacing the use of eyewitnesses, who sometimes imply sound and visual manipulation of the event that diminishes the critical and informative role of the media (Spaziante, 2018). Recording images with drones requires knowledge of audiovisual language, so more and more drone pilots with journalistic goals work as television camera operators in Spain (Gallardo-Camacho & Lavín, 2016).

The scientific literature also includes research into other technological applications that could be incorporated into audiovisual news, such as 360º video or immersive journalism (Mañas-Viniegra, Veloso, & Sierra-Sánchez, 2020), yet there has been no focus on the integration of images filmed with drones as a way of capturing the attention of conventional media audiences, which in the case of television in Spain has experienced a drop in numbers (or coverage) of 4.04% since 2012, with 14–19 year olds and 20–24 year olds being the two groups with the lowest audience figures, at 79.6% and 78.4%, respectively (AIMC, 2019).

The first research to compare the aerial recording of a drone with that of a tripod-mounted video camera focused on differences in the ability to observe the behaviour of school-aged children, with no significant differences detected (King, Bloomfield, Fischer, Dart, &

Table 1. Scientific literature on drone journalism.

Authors	Research topics
Andrejevic and Burdon (2015); Ballout, Ghaddar, and Wehbi (2019); Belair-Gagnon, Owen, and Holton (2017); Cavaliere, Loia, Saggese, Senatore, and Vento (2019); Clothier, Greer, Greer, and Mehta (2015); Fernández-Barrero, 2018; Holton, Lawson, and Love (2015); Rule (2015); Sekander, Tabassum, and Hossain (2018);	Advantages, barriers and opportunities regarding the technology and use of drones applied to journalism.
Adams (2019); Galvane et al. (2018); Mademlis et al. (2019); Tham, Selem, and Ogulin (2017)	Contribution of drones to the media.
Ferguson and Greer (2019); Gallardo-Camacho and Lavín (2016)	Use of drones for news purposes on television.
Budak (2019)	Use of drones in news agencies.
Cauchard, Zhai, Spadafora, and Landay (2016)	Human–drone interaction.
King, Bloomfield, Fischer, Dart, and Radley (2020)	Comparison of a recording made by a drone with a recording made with a video camera mounted on a tripod, though not for journalistic purposes.

Radley, 2020). This issue, applied to the recording of news, is the focus of this research, which intends to offer an answer to this issue by means of neuromarketing techniques.

2. Materials and Methods

The overall objective of this research is to determine the differences in attention and intensity of the emotions produced in young Spanish university students when viewing a news item filmed with the technological support of a drone when compared to other conventional news items. The following specific objectives were established:

- Record the attention and emotion of the subjects toward the news filmed with drones.
- Determine the differences between the attention and emotion directed at the different audiovisual formats.
- Establish differences between the appearance, or non-appearance, of people in the filming of the news.

The research questions posed for the objectives above are as follows:

RQ 1: Is there a relation of dependence between the attention and emotion of young people toward news filmed with drones?

RQ 2: Are there any differences between a drone recording and a conventional news recording?

RQ 3: Is it the technology, or the recorded scene, that determines the difference?

The research techniques used have been fully consolidated (Morin, 2011) and are typical of neuromarketing, or applied neurocommunication (Cuesta-Cambra, Niño-González, & Rodríguez-Terceño, 2017), as they allow for measurement of the subjects' cognitive processes based on the stimuli presented. Moreover, they incorporate the principles of neuroscience, psychology and economics (Madan, 2010). Specifically, eye tracking has been used to record the subjects' attention to stimuli, and galvanic skin response (GSR) was used to analyse emotional arousal. When simulating a natural viewing environment, priority is given to the use of non-intrusive equipment, with an ability to predict efficiency between 70% and 80% (Varan, Lang, Barwise, & Bellman, 2015).

Eye tracking allows the subjects' visual attention to be recorded using biometric techniques that register eye movements toward the areas of interest (AOI) of the stimuli shown to the participating subjects. This technique separates the attention directed at the AOI from areas that are ignored, or that are simply browsed over while heading toward AOI to the subjects (Duchowski, 2013). In this way, the software records the AOI that capture the most attention and emotion, taking into account that the young audience has more ability to quickly focus their attention on the information in a stimulus that is relevant and of interest to them (Añaños-Carrasco, 2015). From the attention registered, the software generates heat maps in which it is possible to see visually where the attention is concentrated, as well as the different intensities depending on the colour, with the colour red being located in the centre of the heat map and representing the area with the most intense level of attention. In research in which people are asked to visualize stimuli, even though it is common for participants to register a higher level of attention compared to an unobserved environment, the fact that they do not know which stimuli

are of interest to the researchers allows these investigators to analyse the differences between the stimuli.

Also known as electro dermal activity, GSR records the changes in electrical conductance of the skin from the phasic changes that occur in sympathetic neuronal activity. In this way, changes in emotional arousal are obtained, which influence the cognitive perception that the subjects have of the stimuli (Critchley, 2002).

Eye tracking and GSR techniques record the unconscious responses of subjects to visualized stimuli and partially indicate whether an influence on the audience is occurring through the analysis of cognitive and affective processing (Bornstein & D'Agostino, 1992; Goodrich, 2011; Pieters, Warlop, & Wedel, 2002). Recording these unconscious responses allows for the study of cognitive processing, as traditional research methods are limited by the difficulty subjects have in reporting their own perceptions, attitudes or behaviours (Ariely & Berns, 2010).

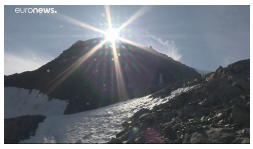
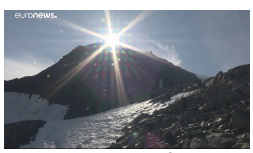
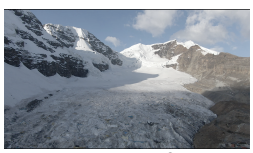
Thirty subjects participated in this study on a random voluntary basis, and all of the subjects fulfilled the requirement of being university students between 18 and 23 years of age, which is the group closest to the application of technology to audiovisual media (Casillas-Alvarado, Ramírez-Martinell, & Ortega-Guerrero, 2016). Despite the fact that the incidental sample had been planned for 50 subjects, the health crisis of the Covid-19 forced a halt to the fieldwork, which was carried out between January and February of 2020. The sample was taken from Madrid (Spain). The final sample size is valid for a neuromarketing study, as it fulfils the number of 15 to 50 subjects recommended by the scientific literature (Kerr-Gaffney, Harrison, & Tcanturia, 2018).

Data collection was performed using a Gazepoint eye tracker GP3HD 150 Hz sampling rate, along with a GSR Gazepoint Biometrics system, integrating the analysis of the recorded data into the Gazepoint Analysis UX Edition v.5.3.0 software. The statistical use of the results was carried out using SPSS v.25 software.

The stimuli presented to the subjects (randomly and interspersed with other stimuli) were two versions of the same 40-second audiovisual news item about France's decision to restrict access to Mont Blanc for unguided climbers. The first was a conventional news item published by Euronews, while the second version was interspersed with ad hoc images filmed with the technological support of a drone. The aerial images were recorded with a Mavic 2 Pro Zoom drone. The shots were captured at an altitude of over 4,000 meters, which involved heating the batteries to overcome the low air density and temperature of less than 5 degrees below 0 Celsius (–5 °C). The two stimuli analysed were intermixed with other news items, with a total duration of 15 minutes. The AOI (Table 2) were defined, which allowed for a comparison to be made between the images filmed with a drone and those taken with conventional means in a place of difficult access, such as Mont Blanc.

The level of attention recorded by eye tracking, and the peaks of emotional arousal recorded by GSR when visualizing the stimuli, were considered to be dependent variables. As an independent variable, the gender of the participants was taken into account, since both the age range and socio-cultural profile were similar in all subjects. An initial qualitative evaluation of the content was made using heat maps of attention toward the stimuli, combined with a conscious statement by the subjects with regard to the positive, negative or neutral emotion shown toward the AOI, for which the technological support offered by GSR Gazepoint Biometrics was used. Subsequently, a quantitative analysis of attention was carried out based on the seconds that passed from the appearance of the stimulus until the first fixation, or time from fixation (TFF), the number of eye fixations, or fixa-

Table 2. Areas of interest (AOI) of the stimuli.

STIMULUS	AOI 1	AOI 2	AOI 3	AOI 4
S1 (Conventional new)	 Long shot of the mountain (1–10")	 Long shot of the mountain with people (11–22")	 Medium long shot of people (23–40")	— —
S2 (News modified with a drone)	 Long shot of the mountain (1–5")	 Long shot of the mountain filmed with a drone (6–10"; 17–24")	 Long shot of the mountain with people (11–16")	 Medium long shot of people (25–40")

Sources: Euronews (2018) and Volandovoy.tv.

tion count (FC), and the number of total seconds of attention to each area of interest, or total fixation duration (TFD). A quantitative analysis of emotional arousal was carried out using the GSR peaks that arose from each minimum-maximum pair from the beginning of the emotional activation.

This research was approved by the Research Ethics Committee (CEI) of the Department of Applied Communication Studies of the School of Media and Communication, Complutense University of Madrid. Participants signed the consent form, which included voluntary participation and their anonymous contribution, in accordance with the Declaration of Helsinki.

3. Results

3.1. Qualitative Content Analysis

The qualitative content analysis of the stimuli carried out using heat maps (Table 3) had already indicated similar behaviour among the young audience in the presence of different AOI and their visual elements. These visual elements stand out in all cases, except with the images filmed by drones, in which case the attention of the young audience is focused on one or more elements present in the scene, whether due to spectacular panoramas, luminosity, movement or colour.

The long shot of the mountain (S1-AOI 1; S2-AOI 1) recorded similar levels of attention in both stimuli, which was focused on the natural lighting caused by the sunset on the mountain peak. In the first stimulus, which lasted longer, the secondary viewing surface was larger and more extended.

In the second long shot of the mountain (S1-AOI 2; S2-AOI 3), the attention is focused on people moving within the static shot. In the first stimulus, as a consequence of longer duration on the area of interest, the attention of both groups of people is extended to the path going up the mountain.

With regard to the medium long shot with climbers in motion (S1-AOI 3; S1-AOI 4), in the first sequence of both stimuli, attention is focused on the two climbers in motion, the tents with their striking colour, and the Mont Blanc information poster, also in bright colours. In the second sequence, attention is also drawn to the two climbers in motion, although in this case most of the attention is focused on the climber in brightly-coloured clothing.

The exception to this pattern of attention behaviour is in the long shot of the mountain filmed with a drone, composed of two separate sequences in the timeline of the stimulus. In both, the attention is distributed horizontally along the entire mountain, accompanying the movement of the camera.

3.2. Quantitative Analysis of Attention

In the first comprehensive analysis of attention registered by the subjects, the shot of the mountain filmed with a drone (S2-AOI 2) was the AOI in which the attention was focused by the highest percentage of participants (93.33%), although this comprehensive datum is always high in this type of study in which subjects are asked to visualize stimuli.

The analysis of results, which was carried out using the medians of TFF, TFD and FC measurements described in the section entitled 'Materials and Methods,' did not identify significant differences based on the gender of participants, and this question has been omitted for that reason.

In all AOI, both stimuli recorded a median elapsed time of less than a tenth of a second from the appearance of the area of interest to the first fixation (TFF), so the content did not create any distractions for the participants, as the attention was fast in all AOI. The significant differences ($p = <0.001$) are a consequence of the diverse moments when each area of interest appeared in the news.

In stimulus 1, AOI 2 had the longest total duration of attention (TFD) with regard to total screen time of the AOI (91.02%), compared to 89.42% for AOI 3 and 89.13% for AOI 1. Therefore, attention recorded by visual elements that move within a static shot is somewhat higher, despite the fact that there is little difference between the three AOI. In the same way, the number of fixations (FC) was significantly higher in the AOI of longer duration, but in relative terms there were hardly any differences.

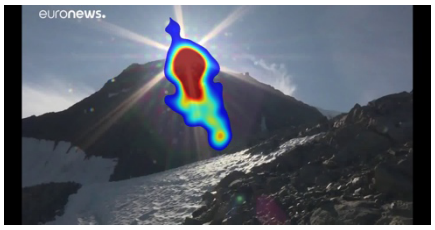
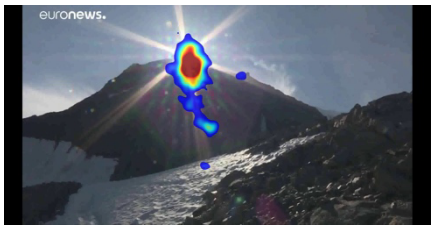
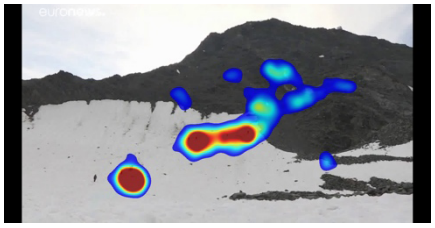
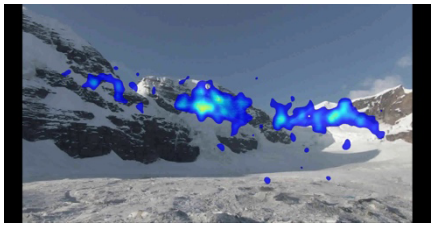
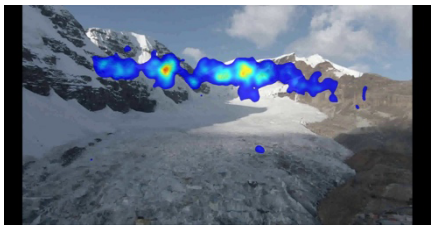
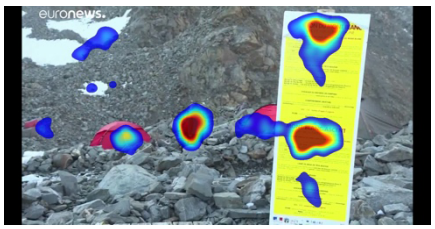
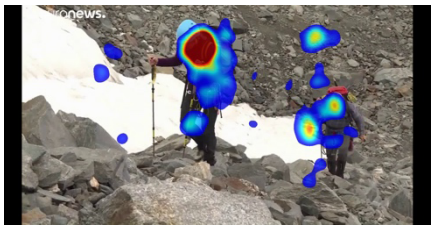
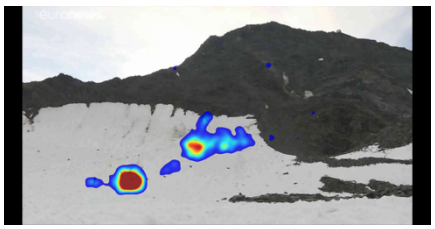
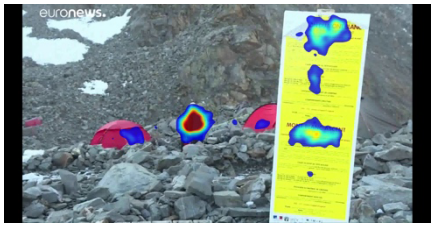
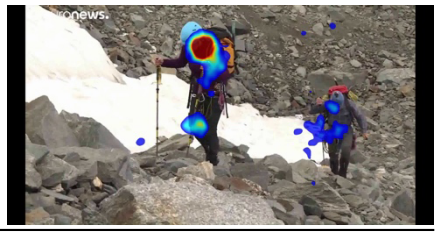
In stimulus 2, the total duration of attention (TFD) was also very similar among all AOI in relative terms according to the duration of each stimulus. Thus, all of them reached an attention duration of between 90.32% and 91.73% of the total. In absolute terms, close-ups of climbers in motion and images recorded with drones were the AOI with the longest total duration of attention. However, the number of eye fixations (FC) was significantly higher in images filmed with drones (FC = 35), both in absolute and relative terms for the duration of the stimuli.

After analysing these absolute results, similar AOI of both stimuli were analysed in pairs, applying a weighting factor to the results according to the different duration lengths of each AOI. Thus, both the total duration of attention (TFD) and the total number of eye fixations (FC) toward the long shot of the mountain in both stimuli was very similar, showing no significant differences (TFD = 4.751 vs. 4.885; $p = 0.311$; FC = 11 vs. 10; $p = 0.094$), which is consistent, due to the fact that the same shot was used in both stimuli.

Real-time analysis (non-cumulative results) of the heat maps (Table 4) shows that the longer total duration of the scene in stimulus 1, recorded with a camera on a tripod, initially allows for a larger vertical viewing area, although the main focus of attention is then concentrated on the sunrise, which is the same for both stimuli.

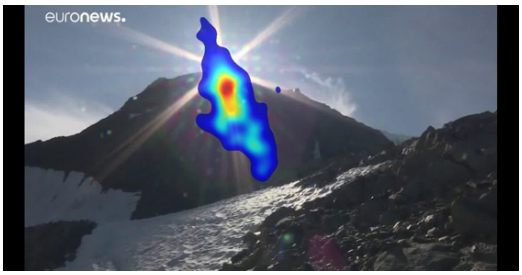
Moreover, a comparison between the total duration of attention in both stimuli show significant differences (TFD = 4.975 vs. 5.014; $p = 0.328$), although the number

Table 3. Heat maps of the stimuli.

AOI	S1	S2
AOI 1		
AOI 2		 
AOI 3	 	
AOI 4	—	 

Source: Euronews (2018).

Table 4. Heat maps of the stimuli.

AOI	S1	S1
AOI 1		

Source: Euronews (2018).

of eye fixations (FC = 11 vs. 13; $p = 0.042$) was significantly higher in the case of the stimulus that included the scene filmed with the drone.

In the real-time heat maps of stimulus 1, in which the scene is twice as long as in stimulus 2 (Table 5), it became clear that the attention was focused more intensely on the moving climbers, first on the group in the foreground, after which the attention moved toward the other secondary groups of climbers before continuing its visual movement toward the route they were likely to take to climb Mont Blanc. Precisely due to the shorter duration of the scene in stimulus 2, the attention was concentrated on the groups of climbers, and only on the beginning of that particular route to ascend Mont Blanc.

As for the medium long shot with the climbers in motion, the attention was also similar in both stimuli, with no significant differences in the total duration of attention and the number of eye fixations (TFD = 14.271 vs. 14.546, $p = 0.229$; FC = 35 vs. 34, $p = 0.895$).

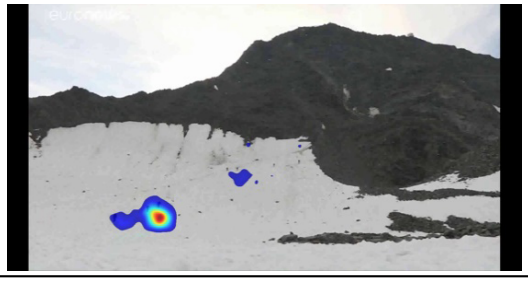
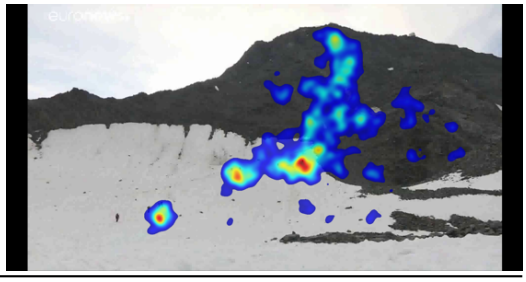
The real-time heat maps showed (in Table 6) that stimulus 1, which was of longer duration, first captured the focused attention of the moving climbers, and then the attention was distributed among the climbers and the elements that stood out with intense colour, especially the Mont Blanc information poster. In stimulus 2, in which the scene has a shorter duration, the evolution of the heat maps was the same, although it was observed that the main element was the people in motion and not the features with intense colours, because when the viewing time is shorter, the subjects have to prioritise the elements that most capture their attention.

The real-time heat maps of the second part of the same scene (Table 7) confirmed that attention was concentrated on the main element of the scene with movement, which was the first climber, and then the attention was shared with similar intensity between both climbers, and finally focused on the second climber, with insignificant attention placed on the natural environment when the people in movement appeared, as was seen in other AOI.

Results of the paired analysis of identical AOI in both stimuli suggest that the inclusion of a new scene filmed with a drone has no influence on the attention paid to the rest of the shots included in the original stimulus. Therefore, at this point it is necessary to make a specific comparison related to the long shot of the mountain filmed with a drone that was introduced in stimulus 2, which modified the original Euronews broadcast. Thus, by comparing the long shot of the mountain with the long shot filmed with the drone of stimulus 2, there was no significant difference regarding the total duration of attention (TFD = 4.885 vs. 4.815; $p = 0.166$), but there were differences in the number of eye fixations, which were much higher in the case of the long shot recorded with the drone (FC = 10 vs. 14; $p = <0.001$).

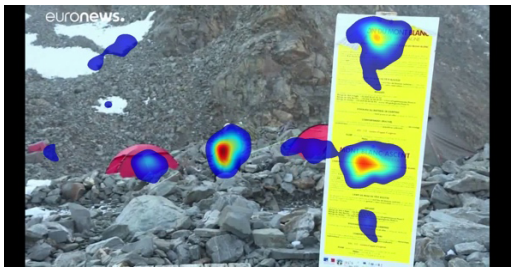
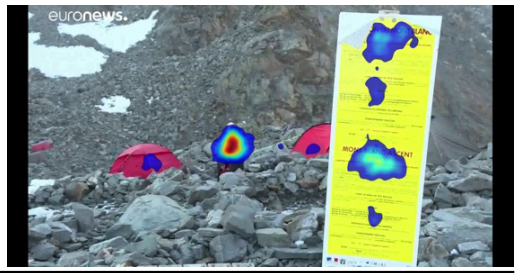
Real-time analysis of the heat maps shows that unlike the long shot of the mountain recorded with a tripod camera, the recording made with the drone (Table 8)

Table 5. Heat maps of the stimuli.

AOI	S1	S1
AOI 2		

Source: Euronews (2018).

Table 6. Heat maps of the stimuli.

AOI	S1	S1
AOI 3		
AOI 4		

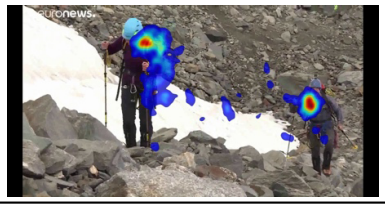
Source: Euronews (2018).

shifts from an initial focus on the mountain peak to a horizontal distribution a few seconds later, as opposed to the vertical distribution recorded with a tripod camera.

Already in stimulus 2, the young audience had the same reaction when comparing the long shot of the mountain filmed with the drone and the long shot of the mountain with people. There were no significant differences in the total duration of attention (TFD = 4.937 vs. 5.014, $p = 0.086$), but there were differences in the number of eye fixations, which were significantly higher in the case of the sequence filmed with the drone (FC = 15 vs. 13; $p = 0.002$).

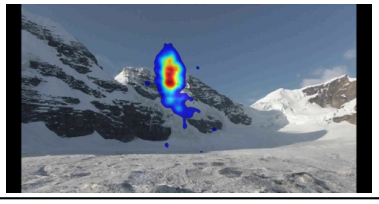
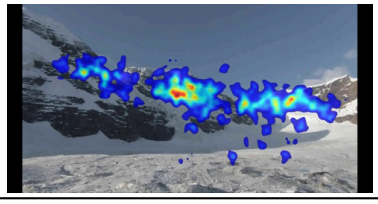
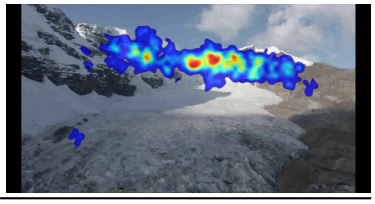
Finally, a comparison made between the shot filmed with a drone and the medium long shot of the climbers also showed no significant differences between the total duration of attention of the two stimuli (TFD = 11.716 vs. 11.823; $p = 0.225$), but there was a much higher number of eye fixations, which was statistically significant, in the case of the long shot of the mountain filmed with the drone (FC = 35 vs. 28; $p = <0.001$).

Table 7. Heat maps of the stimuli.

AOI	S2	S2	S2
AOI 4			

Source: Euronews (2018).

Table 8. Heat maps of the stimuli.

AOI	S2	S2	S2
AOI 2			

Source: Euronews (2018).

3.3. Emotional Intensity Analysis

The subjects' conscious responses remained neutral in all AOI, except in the long shot of the mountain (S1-AOI 1; S2-AOI 1) and the long shot of the mountain filmed with the drone (S2-AOI 2), in which case they expressed a positive response to the stimulus. In terms of emotional intensity from the participants' unconscious responses, provided by GSR data (Figure 1), it remained constant during the news broadcast, with slight growth as the narrative progressed. However, there are two GSR peaks that coincide with the long shot of the mountain in which the sunset stands out, with 510.75 kOhm. (S2-AOI 1) and 498.79 kOhm. (S1-AOI 1), as well as the long shot of the mountain filmed with the drone (S2-AOI 2), with a peak GSR of 644.54 kOhm. (S2-AOI 2), the maximum recorded in both stimuli.

4. Discussion

The usefulness of drones in the audiovisual production of news that takes place in locations that are difficult to access or involve risks for people can be summarized as the recording of high-resolution images at a low cost, capable of having its own tailored storytelling developed for the purpose of providing different points of view to the audience. In order carry out this task, pilots must be trained professionals who need to be officially licenced by the appropriate administration, but they must also be specialists in audiovisual communication. While the younger audience continues to stay informed about topics in which they are interested, they are doing so less with conventional media and increasingly with digital media, the latter of which is more innovative in aesthetics and narratives, with the result being that drones can contribute to revitalizing conventional media.

Within each area of interest and each shot, the subjects' attention was focused on the most spectacular visual elements, which can be grouped according to their panorama, luminosity, movement or colour.

The highest percentage of the subjects' attention was focused on the images filmed with drones, and unlike the rest of the shots, it was distributed throughout the entire image, which confirms the effectiveness of drones for panoramic shots, precisely the easiest to obtain in places of difficult access.

Although the total duration of attention to the AOI repeated in both stimuli did not register significant differences, nor did the shots filmed with the drone, the latter showed significantly more eye fixations, as well as the highest GSR peak of all, which concurred with the subjects' conscious statement of experiencing positive emotions during their viewing. However, inclusion of the scene filmed with the drone in stimulus 2 did not result in higher emotional arousal with regard to the entire stimulus to a significant degree, except in the two specific scenes in which the images were recorded with a drone.

In the long shot taken by the drone, the focus of attention was distributed throughout the entire shot, while in the other long shots the focus of the view depended on the internal movement within the shot. This may suggest that shots filmed with drones have greater focus throughout the entire shot, thereby uncovering more all-encompassing aspects, while long shots taken at ground level have an impact on the precise location of features within the shot. Therefore, shots filmed with drones offer much more detail and place greater attention on the shot itself, both in viewing time and in the viewing space (inside the shot).

The factor involving the spectacular aspect of the shots analysed is an element that must be taken into

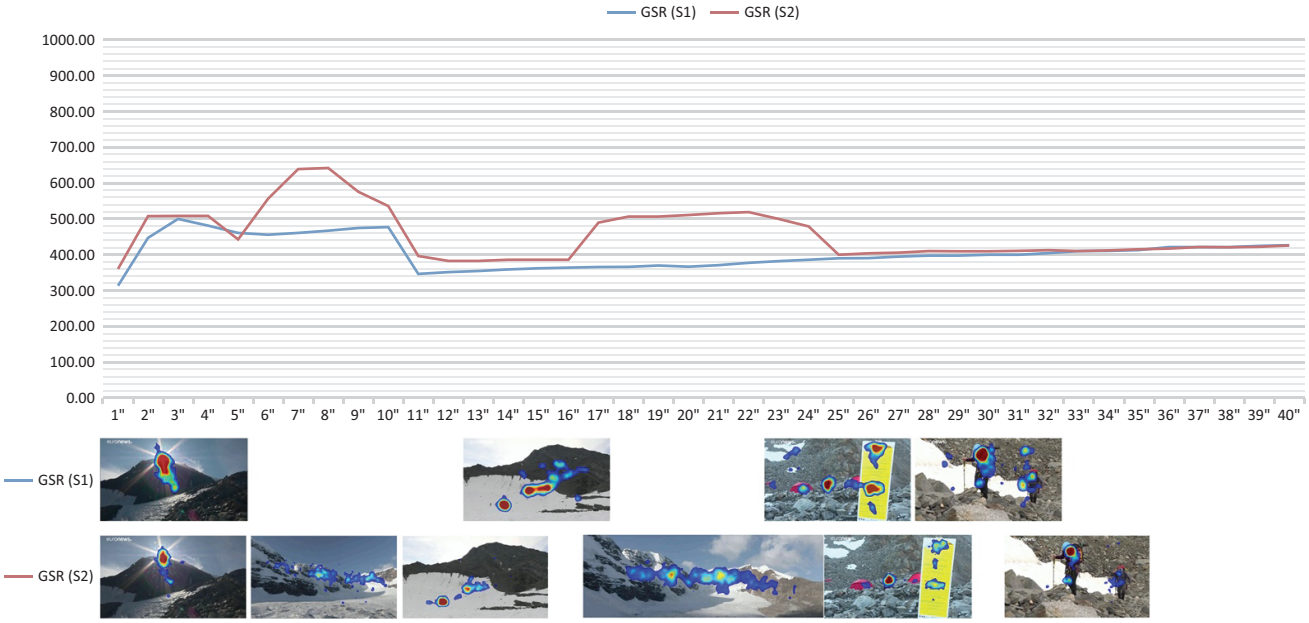


Figure 1. GSR peaks of the stimuli. Source: Euronews (2018).

account in order to fully understand the objective of this research. The use of drones necessarily requires open spaces to be able to comply with all of the regulatory restrictions their use implies. Therefore, not all topics—in this case news—can be addressed with shots made with drones. The variables of attention and emotion are altered to some extent by this regulatory situation. This fact, together with the extensive visual culture of the spectators, especially the youngest, among whom are included the subjects used for this study, directly influences and determines the spectacular aspect factor that seems to be mandatory when dealing with certain subjects.

The function of the producer or journalist, who selects the images used to visually describe a news item, as was the case herein, is to select a point of view on which to build the narrative. The position of the camera is the focal point from which the viewer contemplates a scene. Therefore, in the shots taken with the camera, it is natural for the area of interest to be focused on those elements within the shot that stand out, either because of their luminosity or their movement. It is important to note that the human eye is especially sensitive to brightness (not so much to colour) as well as internal movement within its field of vision. In fact, this is the foundation on which the entire digital coding of the MPEG system for television has been built: First, the brightness is analysed, after which only those elements that change within a structured pattern of pixel grids are examined.

The use of drones implies a new point of view, which in the end is something that cannot possibly occur in a natural way for the spectator. It is not possible for a human being to contemplate for him or herself the visual space as shown by a drone. In addition, this means that the capacity for discovery is implied in the shot itself. The spectator explores this new reality and tries to discover the main essence of all the elements that make up the shot. Therefore, the range of AOI is more horizontal and includes a larger area of exploration, altering both attention and emotion at the same time and at the same levels. The use of drones broadens and helps to rediscover the patterns on which the perception of reality that the human brain created from more or less standardized points of view had been built. In this case, we see the mountain and the activity described in the shots as a pattern or image already established in our brain, though with different actors. The recording made by drones is new to the visual imaginary on which reality has been built, and thereby forces the audience to explore it to a greater extent and with a higher degree of attention, while at the same time altering it emotionally on nearly identical levels, according to the data obtained.

Drones alter the point of view and add new perspectives on which the reality proceeding from the images is built. The data reflected in the AOI show the influence of this new perspective. Although the recording technology is similar to that of conventional cameras, the quality of the images obtained influences their perception. Higher resolution cameras, which can attain a greater level of detail in the captured image, allow a higher level of exploration of all parts of the image. Therefore, drone cameras have high definition technology to support this new area of visual exploration regarding the resolution detail of the image. As such, it is clear that as the level of resolution increases, the ability to influence attention is greater, and consequently, emotional levels as well, if we consider the data obtained in this research.

These results confirm the fact that the incorporation of technology in the audiovisual production of news has already taken place (Marcos-Recio, Edo-Bolós, & Parra-Valcarce, 2018), and provides alternative views of events that raise the public's awareness (Sacco, Gorin, & Schiau, 2018), due to the fact that they have a narrative experience that improves understanding and empathy toward the key players in the news (Ruiz-Collantes, 2008). In addition, all of these issues improve the dissemination of content thanks to the virality of social networks (Sundar, Kang, & Oprean, 2017). Moreover, the idea that filming with drones provides images for the context of the news rather than for informational content has also been reinforced (Adams, 2019), as well as the importance of using wider visual fields (Cummings & Bailenson, 2016), and the fact that drones are able to capture visually appealing images of destinations that generate attention (Stankov, Kennell, Morrison, & Vujicic, 2019).

In spite of this situation, drones are not included as emerging technologies in journalism or communication degrees in Spanish Universities, despite the fact that big data, photography/360º video, cloud computing, augmented/virtual reality, the 'Internet of Things,' artificial intelligence, and connected television are already present, although the sum of these represents only 14.04% of the total number of technology subjects (Sierra-Sánchez, Liberal-Ormaechea, & Mañas-Viniegra, 2020). However, universities in the USA are beginning to create specific courses on drones (Chapa, 2013).

5. Conclusions

Emotional journalism transforms facts into experiences with the support of audiovisual technology, narratives, and the conversion of news into news stories. Drones can be an element that brings new points of view to this emotional journalism. The digitisation of the image has modified the narrative structure by allowing the message to be cloned, and with it, the viral use of such messages according to specific interests. The overall aim is to influence the attention, and above all the emotion, of the message's receiver.

Digitisation has also ushered in a new way of approaching recorded reality thanks to greater definition of inner detail. Moreover, this new achievement influences emotion and attention as it allows us to rediscover a filmed object from a more comprehensive perspective. The appearance of drones adds another important factor to the way in which reality is re-recorded: points of view

that are impossible for human beings. Furthermore, this is the place where we must set new standards of filming that will help to optimize the use of drones as a tool at the service of the visual narrative.

Either due to the characteristics of the area filmed and/or the events recorded, or considering both variables at once, if one contemplates open spaces and the spectacular nature of the filming, these factors should serve as a basis for choosing this tool in order to explore new ways of creating emotion and attention in the spectator.

In the specific case analysed in this research, the premise of the spectacular aspect of the area filmed has been achieved, as a foundation from which to stimulate the viewer's attention and emotion. The data verify their correlation and usefulness in reinforcing the levels of visual exploration of the image shown.

Scenes recorded with a drone activate emotion more intensely than they activate attention (RQ 1), and they provide more spectacular panoramic images when it comes to natural landscapes (RQ 2), which may explain why attention is more distributed in the horizontal shot and not focalised, as in the natural landscapes recorded using a static shot with a camera on a tripod (RQ 3).

These results can be used to help understand the superiority of implementing a tool such as a drone to 'hook' the viewer on the image shown. The massive number of images emitted and visualized in the digital society through all kinds of platforms and social networks is resulting in lower levels of interest, as well as less motivation to delve deeper into the comprehension and stimulation of such images by the public. The use of drones allows for the exploration of new kinds of loyalty to the image based on quality and new points of view. In order to achieve these objectives to a high degree of excellence, it is necessary to specify appropriate training that would allow for an examination of all of these new channels.

5.1. Management Implications

The implications for management would be to increase the use of drone footage in news stories that require the viewing of large areas, or those that are difficult to access on foot, in order to better understand the scope of the news as well as to offer a type of immersion in the place where news is occurring. From the point of view of universities, they should include subjects that apply the technology and narratives of drones to the curricula of journalism as well as audiovisual communication and advertising, in order for students to obtain the necessary professional skills.

5.2. Limitations and Future Lines of Research

One of the main shortcomings of this research is the non-representativeness of the sample. Even though the size is adequate for a neuromarketing study, it is limited to Spanish university students. In addition, the lack of funding for this research has prevented the author from having access to AFFDEX analysis of facial expression of emotions, which has been replaced by recording the emotional intensity and conscious reporting of the types of emotions experienced by the participants. The difficulty of simulating a real environment in a neuromarketing laboratory should also be noted (Mileti, Guido, & Prete, 2016). However, this issue offers the advantage of delving deeper into causes by combining them with qualitative research (Berns, Capra, Moore, & Noussair, 2010). As a result, future lines of research should involve carrying out cross-cultural investigation to establish sociocultural differences between diverse geographical areas (Alsaleh, Elliott, Fu, & Thakur, 2019), analysis of facial coding when funding is obtained, comparison with other scenes recorded using drones, such as images of disasters, as well as the development of tailored storytelling for content based on aerial images of drones, according to whether their use would be for journalistic, audiovisual or advertising-related purposes.

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Conflict of Interests

The authors declare no conflict of interests.

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About the Authors

Luis Mañas-Viniegra (PhD) is Professor and Researcher in the Department of Applied Communication Studies at Complutense University of Madrid. He holds a PhD in Audiovisual Communication and Advertising with Extraordinary Award from the same University. He has been Professor at Carlos III University of Madrid, King Juan Carlos University and University of Valladolid. He is bachelor in Journalism and Advertising and Public Relations, and he is a member of the Complutense Research Group of Branding and Integrated Communication.

Alberto García-García (PhD) is a Lecturer of Television Technology at the Faculty of Media and Communication at the Complutense University of Madrid since 2006. For more than 15 years, he worked in sports transmissions of 'La Liga' as a relay operator. He has taught different specialization courses in live TV transmission techniques. His research interests focus on new technologies in television production, UHD (Ultra High Definition), Virtual Reality (which was the subject of his doctoral thesis presented in 2000), post-production and the use of drones.

Ignacio J. Martín-Moraleda (PhD) is an Associate Professor of Audiovisual Communication and Advertising at the CAP Department in the Complutense University of Madrid where he serves as a researcher in technology media, production and realization systems. Counting over twenty-five years of professional experience in radio-tv projects, management, and data mining. He has participated in a lot of projects in advertising and media companies in different countries.

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Article

Drones, Augmented Reality and Virtual Reality Journalism: Mapping Their Role in Immersive News Content

John V. Pavlik

Journalism and Media Studies, Rutgers University, New Brunswick, NJ 10516, USA; E-Mail: jpavlik@comminfo.rutgers.edu

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Abstract
Drones are shaping journalism in a variety of ways including in the production of immersive news content. This article identifies, describes and analyzes, or maps out, four areas in which drones are impacting immersive news content. These include: 1) enabling the possibility of providing aerial perspective for first-person perspective flight-based immersive journalism experiences; 2) providing geo-tagged audio and video for flight-based immersive news content; 3) providing the capacity for both volumetric and 360 video capture; and 4) generating novel content types or content based on data acquired from a broad range of sensors beyond the standard visible light captured via video cameras; these may be a central generator of unique experiential media content beyond visual flight-based news content.

Keywords
augmented reality; drones; journalism; photogrammetry; virtual reality; volumetric

Issue
This article is part of the issue "Journalism from Above: Drones, the Media, and the Transformation of Journalistic Practice" edited by Jonas Harvard (Mid Sweden University, Sweden), Mats Hyvönen (Uppsala University, Sweden) and Ingela Wadbring (Mid Sweden University, Sweden).

1. Introduction

Drones are playing an increasingly central role in the development of immersive news content production, including in the development of augmented reality, virtual reality and mixed reality (which is essentially a fusion of augmented reality and virtual reality) applications in news content. This essay examines four sets of important implications for immersive news content and its production.

As drones have evolved from analog to digital platforms, their use in journalism has grown slowly but significantly (Chamberlain, 2017; Chapa, 2013; Goldberg, Corcoran, & Picard, 2013). In their earliest applications, drones were used much as helicopters had been used in newsgathering to obtain aerial perspectives (Pool, 2012). Aerial perspectives are valuable to news users because it can give a new vantage point that allows them to see the bigger picture, patterns not visible from the ground, and even facilitate a sense of wonder, a capacity further enhanced by immersive experiences such as virtual reality or augmented reality.

Notably, drones offered news organizations and individual journalists a much cheaper and safer alternative means to capture aerial perspectives. Guided and shaped by ethical concerns regarding privacy and safety as well as regulatory provisions, drone usage has grown gradually in journalism around the globe (Tremayne & Clark, 2014). Falling prices and increasing affordability have fueled this growth, as well, although costs for production of augmented reality, virtual reality and mixed reality have been relatively high. We should acknowledge the parallel use of the drone technology in various other contexts such as in sports, in military, crowd control by police (e.g., during the COVID-19 crisis, law enforcement has begun using surveillance drone technology to enforce social distancing regulations) and this can increasingly infringe upon personal freedom, even if it is done for journalistic purposes.

Because of their increasingly miniature and high-performance capacity, including improved battery performance and portability, drones have enabled creative and expanded aerial video and photography capabilities

including capturing news content indoors, as well as in various novel situations such as for documentary production for extreme sports, pointing toward augmented reality, virtual reality and other immersive applications as well. Underwater drones have also been developed and utilized in newsgathering. Likewise, terrestrial 'drones,' or remotely operated or autonomous land-based robots equipped with cameras and other sensors have been developed for a variety of applications such as to descend into narrow caves or other environments unsafe or otherwise inaccessible for humans including reporters (Coxworth, 2019).

The advent of experiential news (Pavlik, 2019a) has introduced a new set of opportunities for the utilization of drones in journalism. Advances in drone technology as well as in the development of and integration of advanced cameras and various sensors, from night vision to depth or 3D measurement, have enabled at least four arenas for the use of drones in the production of experiential news (Pavlik, 2019b; Peters, 2015). Experiential news utilizes experiential media forms that feature six qualities: interaction, immersion (both audio and video envelopment as well as psychological immersion), multi-sensory content, algorithms and data driven content, first-person perspective, and natural user interface design (e.g., voice or gesture control). Experiential media include augmented reality, virtual reality, mixed reality, which blends these two, and other forms of media that collectively are sometimes referred to as extended reality, as advanced ultra-high definition video systems (e.g., 8K, 240 frames per second, high dynamic range). The journalism industry often refers collectively to these formats as immersive news, but although this is an important quality of the content, it is really only one of a half dozen.

2. Four Implications of Drones for Augmented Reality, Mixed Reality and Virtual Reality Journalism

Drones present at least four sets of opportunities or implications for the development of news content utilizing experiential media, including augmented reality, virtual reality and mixed reality in journalism.

2.1. First-Person Perspective

First is by using 360-degree cameras, drones can provide the capacity for aerial content (or data) for first-person perspective flight-based immersive journalism experiences. Aerial perspectives are of particular relevance in this arena because they can enable the news consumer to obtain unique vantage points on news events. Examples from recent news reporting utilizing drones to capture 360-degree or omnidirectional video can help illustrate the importance of the technology. Multiple news operations have used drones equipped with 360-degree cameras to obtain omnidirectional, aerial vantage points for reports about the evolving character of urban environments (6abc, 2019) to refugee movements (Estrin, 2016). Drones that utilize 3D panoramic video or photographic capture can also further support the possibility of more immersive news content.

Climate change and other environmental stories can also benefit from the use of drones in the production of immersive content (Dorroh, 2015). Haner ("Taking visual journalism into the sky," 2018) states:

> The first drone images I made were on a trip to Greenland's ice sheet, where I captured images of a meltwater river flowing across the top of the ice. In Llapallapani, Bolivia, I used a drone to show that the second-largest lake in Bolivia had dried up, leaving boats stranded in the sand and a fishing community having to reinvent itself. More recently, I was able to get an aerial angle of the giant moai statues on Easter Island showing their proximity to an eroding coastline, which would not have been possible any other way.

Illustrating the potential for immersive aerial drone video journalism is a 2015 report produced by *The New York Times*, which used a 360-degree video captured from inside three different refugee camps (Lba, 2015). Viewed via a Google cardboard head-mounted display, the report enabled the user to gain a compelling sense of the life of a displaced person. In one case, the virtual reality camera rig was positioned on the handlebars of a child's bicycle and the omnidirectional video was captured as the child rode about the camp. The user could virtually ride along and look in any direction, hearing the child's voice and other sounds of the refugee camp. By extension, a drone could capture similar omnidirectional and potentially 3D imagery if equipped with the required imaging technology in a wide spectrum of stories, from empty city streets during the COVID-19 crisis to surveying the devastation of brush fires in California (Owen, Pitt, Aronson-Rath, & Milward, 2015).

Drones operating in other environments such as underwater or on land extend this capacity further. The BBC employed a robotic drone designed to look like a tuna to capture under water video of a dolphin megapod swimming near Costa Rica (Lopez, 2014). The combination of robotics and underwater drones in fact has potentially wide spread application in journalism, especially immersive forms, so to speak. Illustrative are the growing number of long-lost shipwrecks around the world have been discovered in recent years and months via robotically controlled underwater drones. In one case, a drone using sonar discovered the WWII aircraft carrier USS Hornet lost during the battle of Santa Cruz in October 1943. The drone located the ship more than five kilometers below the surface of the South Pacific Ocean, not far from the Solomon Islands (Fingas, 2019). Video and photos of the wreck have been used in news reporting about the discovery, and future drone expeditions that utilize 360-degree video or 3D image capture could facilitate more immersive news reporting (Fingas, 2019).

It is especially worth noting the highly skilled autonomous flight capacity of robotic drones (D'Andrea, 2013). Such drones can operate in a wide range of indoor or outdoor environments without direct human operation, although continuous observation is essential for security reasons, as well as safety. Yet, such robotic drones can fly into potentially dangerous situations where a human journalist or pilot could not. Such was the case in a report about an erupting volcano in Iceland. Two drones flew in; one was destroyed. The other suffered serious damage from the extreme heat, including the melting of the camera, but not until after it had obtained rare and remarkable video and the memory stick survived (Rose, 2014).

It is important to note that not all drone video or image capture will necessarily support the creation of immersive or experiential news content. Drone flights equipped with standard field-of-view 2D cameras can capture important scale, context and perspective to a landscape. Yet, such cameras do not enable the generation of imagery or video that can surround or immerse the viewer (unless there are multiple cameras obtaining multiple video streams that are subsequently stitched together, such as via the Google Jump virtual reality rig, which has been used by news organizations such as *The New York Times*). Moreover, standard video cameras do not allow for interactivity between the viewer and the environment beyond family video control functions (e.g., pause, rewind, fast forward). Drones equipped with 3D, 360-degree camera systems could enable more user interactivity.

2.2. Geo-Tagged Audio and Video

The second implication of drones for immersive news is to provide geo-tagged audio and video for flight-based (or terrestrial or underwater) immersive news content (Pavlik, 2014). This capacity enables the generation of immersive content experienced in a geo-located context. To date, there are few industry examples to draw upon as illustration of the potential of geo-located drone-generated reporting. But one limited example suggests the possibilities. Some drones, including those of the leading provider from China, DJI, has introduced a platform for full motion video geotagging capabilities, including longitude, latitude and altitude (Remotegeo, 2019). This technology enables journalists (or anyone else) to create map-based immersive video playback that can precisely overlay visually the location of the aerial video onto terrestrial locations, enabling the viewer to see and understand the mapping location. This can be especially important in providing before-and-after video imagery, such as in a story about climate change, a report about a natural disaster (e.g., a wildfire, earthquake, tsunami, etc.), a refugee camp or migration patterns, civil unrest or protests, or other scenes where visualizing change over time is a critical part of the narrative (Corcoran, 2015; Hauser, 2013; Visser, 2016; Wilson, 2014).

News media have already started producing geo-tagged content, though distributing such material captured via drone has yet to emerge. In early 2020, *National Geographic* produced an interactive, immersive augmented reality news experience for Earth Day 28 April, and distributed via Instagram (*National Geographic*, 2020). Users interact with a 3D visualization depicting what Earth will be like in 2070 given patterns in climate change and carbon emissions. Such an immersive narrative developed using 3D geo-tagged drone video or photographs could give users an additional layer of understanding of a critically important story.

2.3. Volumetric 360-Degree Video and 3D Audio

The third implication of drones for immersive news is the capacity for both volumetric and 360-degree video and 3D audio capture (as well as other 3D data). Volumetric capture incorporates 3D data and when combined with high-resolution imagery enables 'photogrammetry' capabilities (i.e., maximum accuracy) for ultra-virtual presence in news experiences (Keyser, Chryssos, & Buchleitner, 2019a). Photogrammetry is a map-making technology that uses photography and was invented in 1851 by French inventor Aimé Laussedat, although it has been advanced significantly in the digital age and in applications via drones especially for terrestrial surveying (Britannica, 2019). Although photogrammetry in general can be generated using a smartphone (Keyser et al., 2019b), producing it via drones in particular requires special technology. One approach is to develop a "custom-built hexacopter to capture smooth 360-degree aerial video content for news organizations and film productions using a custom gimbal (for stabilization) commissioned for this solution" (King, 2018). Capturing binaural 3D audio is also a potentially valuable capability via drone (Tépper, 2019). Binaural refers to audio for both ears, and to capture such audio in 3D forms requires multiple microphones positioned to capture depth information and precise sound source location. Although this approach has not yet been employed in drone journalism, it could prove important to immersive drone news for an authentic user experience.

Another approach to generating photogrammetry involves Light Detection and Ranging (LiDAR), or laser scanners (using time of flight, triangulation or interferometry), to scan an area and return x, y, and z 3D coordinates for multiple points on an object or in an area. Photographs and video enabled by photogrammetry can define the edges of buildings and thereby allow journalists to generate precise 3D models or renderings of news environments (Grut, 2019). Capturing and producing photogrammetry via drones requires Light Detection and Ranging or other sensor technology that is relatively small in size, and is increasingly available at low cost, even for use in smartphones.

Paris-based Parrot has also developed drone video acquisition systems that generate photogrammetry-

designed content. In particular, the company employs Pix4D visualization tools to acquire video with precise time-stamped 3D coordinates (Parrot, 2016). Others have as well (Paladrone, 2016). Pix4D is a Swiss company whose system uses a combination of computer vision algorithms and photogrammetry to transform digital single-lens reflex, Red-Green-Blue, thermal and multispectral images into 3D models and 3D maps (Pix4D, 2019).

Drone-produced photogrammetry enables the production of experiential media news content with six degrees of freedom, vital for fully immersive augmented reality/virtual reality/mixed reality news content (e.g., beyond simple 360-degree video). These six degrees of freedom include rotational (i.e., enabling the user to look in any direction, as in 360-degree video) and translational (i.e., enabling the user to move in any direction, which is especially relevant for virtual flight). Combined, these six degrees of freedom can generate a user news experience with a heightened sense of presence and authenticity in the news venue. Cadoux (2019) argues that creating spatial content will be transformative to journalism:

> The most significant divergence from traditional media is the introduction of user-directed spatial dynamics, adding a new level of presence to readers. This will bring the concept of 'spatial journalism' to the forefront of the industry….Instead, it may use 3D imagery to immerse you, putting you in the cinematographer's shoes. Imagine walking through a war zone, flying over 3D terrain maps, analyzing interactive data sets, standing next to Mick Jagger on stage, or bumping in a rover on Mars.

Drones using photogrammetry technology will be instrumental in the production of such news content.

A particular benefit of drone production for augmented reality/virtual reality/mixed reality news content is the utilization of improved efficiencies in automated, algorithm enabled data capture and post-production. Such drone-based augmented reality/virtual reality/mixed reality production has widespread application to news content topics from climate change to natural disasters to conflict zones and refugee situations.

Another important benefit of volumetric drone video 3D capture especially via photogrammetry is improved accuracy. Accuracy in reporting long has been a key dimension of quality journalism. Accuracy establishes the basis for public trust in the facts as reported. By capturing high-resolution 360-degree photographs and video encoded with precise 3D data, immersive drone reporting can generate news content that offers the public facts that can be trusted and relied upon to understand the truth in journalism and the content it provides.

A revealing illustration of the potential of improved accuracy through 3D data captured from above ground, including via satellite, is improved reporting on stories about the melting of glaciers in the Himalayas (Qiu, 2012). Measuring precisely how quickly the glaciers are melting has proven difficult, but a series of studies of the melting Himalayan glaciers has measured their surface elevations with a laser altimeter to improve accuracy. "It was designed for smooth topography of the polar regions and cannot be readily used to map rough terrains such as the Himalayas," says Andreas Kääb (Qiu, 2012), a remote-sensing authority at the University of Oslo in Norway. The researchers corrected the data using elevation measurements from the Shuttle Radar Topography Mission. Similar data collected via drone today could enable improved accuracy in both scientific inquiry as well as in news reporting about the rate of glacial melt, a key consequence of climate change and a matter often contested for political reasons. Providing more accurate, reliable data via drone for immersive news content would offer the public journalism it could better trust. The value of data-driven virtual reality content can enhance its credibility in the same manner that data-based facts in other realms of news content can increase its reliability.

Among the potential benefits is the potential for creating haptic journalism (Pavlik & Feiner, 2018). Pavlik and Feiner (2018, p. 1) state: "Haptic interfaces present an opportunity to create a new form of storytelling in journalism. These interfaces communicate through haptics—the bodily sensations of touch, pressure, vibration, temperature, pain, and proprioception." Pavlik and Feiner (2018, p. 2) outline the potential relevance of haptics to news content:

> Applying haptic interaction to create *haptic journalism* could aid news consumers in understanding a variety of stories, from science to the environment, allowing them to *feel the data*. We propose to explore haptic journalism by creating haptic interfaces for data visualizations, or data maps, based on U.S. Census data. An important benefit of haptic journalism is that it can provide a means to enable visually impaired users to experience and interact with these (haptic) visualizations.

Volumetric drone news content enables the potential to offer news users the capability to explore and experience aerial immersive news through a haptic interface, such as a data glove. Such an interface could be useful for the visually impaired, but also for news consumers in general as an additional sensory dimension of news engagement. It might allow users to virtually feel the density of particulate matter in the atmosphere as it varies by time or place.

Research shows that engagement in virtual environments, particularly those that utilize haptic or other multisensory interfaces, can increase the user's sense of presence in the story, empathy with individuals in the news, and concern about or understanding of a wide range of issues from deforestation to melting glaciers (Rogers, 2019). Utilizing haptic content interfaces generated from 3D drone volumetric capture could prove effective in increasing public empathy for and understand-

ing of vital issues such as climate change. Such outcomes are key in enabling the user to become more than simply a news consumer; and instead become a virtual participant in the news or a virtual witness to news events.

Illustrating the potential of this drone-generated volumetric content is *Time*'s immersive Amazon rainforest experiential report from 2019 ("Inside the Amazon," 2019). The augmented reality experience was generated using a variety of newsgathering technologies. Among them were "drone photography and 3-D photogrammetry of some of the most remote, difficult-to-reach and threatened locations that takes readers deep into the disappearing Amazon in a way never seen before ("Inside the Amazon," 2019). The immersive journey:

> Follows a team of journalists *Time* sent deep into the Amazon. There, they met the indigenous people fighting illegal logging, the loggers cutting paths into the jungle, and the frontiersmen and women making an illicit living from the land. Guided by renowned primatologist and environmentalist Jane Goodall, you'll explore tribal villages, inspect lumberyards and see for yourself how the Amazon is under threat. ("Inside the Amazon," 2019)

By using drones to capture 3D high-resolution imagery, the report enables users to observe and explore the character and destruction of the Amazon from a perspective that can provide greater contextualization. Research shows that virtual reality content that enables the user to experience phenomena from alternative perspectives can build long-term empathy (Herrera, Bailenson, Weisz, Ogle, & Zaki, 2018).

Immersive, drone-produced stories might feature news experiences in which the user can engage in virtual flight, as has been done in some documentary productions and other non-fiction immersive experiences (Hynes, 2015). One notable example is an immersive virtual flight production created for visitors to the Space Needle in Seattle (Tracy, 2015). Using drones equipped with 360-degree, depth-sensing cameras, the Space Needle Visitor Center has designed an immersive experience for visitors who don a virtual reality headset (Space Needle Visitor Center, 2019). Once wearing the headset, visitors can fly virtually around the exterior of the Space Needle at 605 feet above the street to obtain the view of the tourist attraction from the vantage point of the so-called Halo Walk, normally off limits to visitors.

It should be noted that for users to fully experience immersive drone video journalism requires the user to don a head-worn display (e.g., a virtual reality headset such as the Oculus Quest; Community Content, 2020). Likewise, to fully experience augmented-reality generated drone news content requires the user to access that augmented reality via a digital device such as a smart phone or an augmented reality-headset.

A recent report from Quartz illustrates even more advanced immersive, drone-generated capabilities. Titled *The 2050 Project*, Quartz (Johnson, 2019; "The 2050 project," 2019) utilized advanced drone technology to capture a wide spectrum of 3D data about cities. As the report states, "by 2050, two-thirds of the world's population will live in cities. We explore creative solutions to the challenges of urban living" (Johnson, 2019). They do this by using advanced drone and other technologies for volumetric news gathering, including photogrammetry, in order to produce an augmented reality news package (Johnson, 2019).

Johnson provides important context to explain how and why *Time* employed these tools in its immersive report:

> To see the evolution of how we can use 3D imagery and aspects of virtual reality in city planning, retail, education, and journalism, look no further than augmented reality (augmented reality). This technology has been used in test cases in journalism, but never has augmented reality been the backbone of a series of stories and so deeply integrated into the editorial process. (Johnson, 2019, p. 1)

Simply put, the goal of the report was to "use augmented reality to better understand what cities will look like in 2050" (Johnson, 2019, p. 1). The authors explain they chose to use augmented reality because of its advantage in better illustrating context. Moreover, this was amplified by using aerial drone video. Combined, the tools enabled Quartz to "put our views into perspective and build healthy discussions on complex issues" (Johnson, 2019).

Quartz combined the 3D data, video and photographs to generate models of buildings and other objects in the cities reported on. Through augmented reality the report enabled users (i.e., news consumers accessing the content via their mobile app) to experience on their phone (or other digital device) objects that:

> Aren't just architectural renderings—they are photorealistic models. They show how a building fits in living with the environment around it, how people are using it. They offer a snapshot in time that reflects the role of a particular place in its community, and how that place evolves. (Johnson, 2019)

This is essential context. Quartz adds that "The models inform the future, too—you can begin to build your own understanding of why community-driven solutions help lift cities into becoming healthier and more prosperous for the people who live there" (Johnson, 2019).

Quartz explains that they created the augmented reality models using photogrammetry. This required a multi-stage process:

> First, we captured hundred of images of the building, shot from the ground and by drones. Then, AutoDesk Recap Photo, (the photogrammetry software we used), looked at every pixel in each photo

> and compared them across all of the photographs to measure distance. It then built hundreds of thousands of triangles that are made up of these measurements and built a 3D model. It then took the pictures to overlay a skin or texture onto the 3D model, which gives you the final product. (Johnson, 2019)

Others have similarly examined the role of 3D generated drone video and photography in immersive news content (Ntalakas, Dimoulas, Kalliris, & Veglis, 2017, p. 194). They explain: "Refinement is possible through motion analysis and image-matching (i.e., near-duplicate detection and other similar techniques), while GPS and time-related information can be further utilized along with user-provided metadata." The consequences of such drone-generated 3D news content may be far reaching, including in leading to alternative audience perceptions of news subject matter. Ntalakas et al. (2017, p. 194), explain:

> In general, different users will focus on the part of the story they find interesting (in any context), so practically they capture different parts and/or views of the same event (Dimoulas & Symeonidis, 2015). This plurality of streams offers the wanted multiple viewpoints, which can be combined and enhanced, augmenting audience interaction and engagement through immersive storytelling experiences (i.e., multi-view selection, augmented reality projection, location and language adaptation, channel—and terminal-oriented playback, 3D reproduction, panoramic and time-lapse virtual navigation, etc.). Specifically, in the newsgathering case, reporters (professional journalists and/or UGC-users) impose their own subjective point of view, either unintentionally or purposely (this is usually reflected on the involved audiovisual captures, but also on the textual comments and reportages).

2.4. Generate Novel Content Types

The fourth implication of drones for immersive news is to generate novel content types or content based on data acquired from a broad range of sensors including 3D photogrammetry as well as electromagnetic spectrum data beyond the standard visible light captured via video cameras. These may be a central generator of unique experiential media content beyond visual flight-based news content. This approach is one that highlights innovation in the news production process, and therefore requires a certain amount of risk-taking and boldness of vision, as there is always the risk of failure with any new initiative. As a new tool for reporting, drones offer new capacities for storytelling in the immersive realm. As Harvard and Lindblom (2019, p. 11) have stated, "Journalism continually adds new tools for storytelling." The key is doing so effectively and maintaining the news values that make journalism essential to society: "The negotiation regarding how to integrate such tools in relation to existing norms, values and practices often reveal underlying, sometimes unspoken, professional identities" (Harvard & Lindblom, 2019, p. 11).

Experiential media are immersive but feature several additional capacities for journalism content including interactivity, multi-sensory engagement, and natural user interface design (e.g., user control by gaze approximation or voice). Drone captured content is central. Combined, the features of experiential media ultimately give the news user the capacity to virtually experience news events and issues as if present as a participant or eyewitness in flight or other drone-generated contexts. Natural user interface enables the user to have an intuitive level of control over their navigation through the content experience or news story. Research indicates such immersion can enhance user engagement, sense of presence, empathy and understanding of the news. Foer (2011) has outlined how spatial understanding fundamentally shapes human memory. Spatial content is a basic characteristic of volumetric news content.

Among these capabilities is the enabling of multiple users to simultaneously experience immersive drone video or other types of data (e.g., visualizations generated from atmospheric data such as particulate matter measuring air pollution or smoke from fires) either in real-time or from a recorded news experience. Key to this is the development of 5G wireless services, which will enable broadband (high-speed Internet) across urban areas and beyond as well as immersive drone reporting in real-time or near real-time (i.e., low latency) situations such as during breaking news (Horwitz, 2019).

One drone system developed for this purpose has been tested at the Technological University of Crete, Greece (Libelium, 2019):

> Drones equipped with compact sensors can provide data at nearly any point in a 3D axis. This interesting characteristic favors the reduction of sensor nodes used in every smart cities or smart environment project, diminishing the total cost of the solution. Additionally, permits the user to obtain local data for production monitoring, problem detection and local climate control.

Among the measures that can be captured in 3D format are air temperature, atmospheric pressure, humidity, carbon monoxide, carbon dioxide, sulfur dioxide, ozone, nitrogen dioxide, and ammonia. Journalism could employ such data captured via drone to provide immersive news offerings an entirely new perspective on cities and other locations around the world (i.e., enabling users to see or otherwise experience phenomena not visible to the human eye). Tracking over time could enable greatly expanded understanding the context to that 3D drone-based reporting.

A somewhat theoretical example here might effectively illustrate the potential use of drones in this regard. In particular, equipping drones with sensors that could

capture haptic data (e.g., tactile data, perhaps from surfaces observed) would enable the creation of news narratives that offer the user a more tangible news experience. The Oculus Quest has emerged as a popular, untethered virtual reality platform with haptic, handheld controllers. Designing news experiences that not only enable the user to enter an enveloping news experience visually and aurally, but also with haptic engagement could heighten the realism of those stories.

Fueling all four of these applications of drone technology for immersive journalism is the rise of cloud computing and its utilization in providing sufficient bandwidth and distributed AI data processing to enable live and broadband capabilities, a key factor in volumetric, photogrammetry in drone journalism (Dimoulas & Symeonidis, 2015; Dimoulas, Veglis, & Kalliris, 2014).

It is worth noting that many of the technologies needed to generate the immersive drone content described in this article are as of this writing expensive and complex to use. Small newspapers and television stations may find these capabilities out of reach as of now, unless they collaborate with larger news organizations or technology partners. For the most part, it is only major national and international companies such as *The New York Times*, *Time* and *National Geographic* who can afford the requisite drone technology, personnel and production tools. Yet, if past is prologue, it is likely the cost and technical complexity of the needed tools are likely to decline in coming months and years, and the quality is likely to improve, and these developments will make drone-produced immersive journalism more accessible to local TV stations and other local news media (Carey & Elton, 2010).

3. Concluding Reflections

This essay has outlined four sets of implications regarding the use of drones in creating augmented reality, virtual reality and mixed reality journalism. These are: 1) providing aerial perspective for first-person perspective flight-based immersive journalism experiences; 2) providing geo-tagged audio and video for flight-based immersive news content; 3) providing the capacity for both volumetric and 360-degree video capture; and 4) generating novel content types or content based on data acquired from a broad range of sensors beyond the standard visible light captured via video cameras; these may be a central generator of unique experiential media content beyond visual flight-based news content.

It is critical to note that although these implications bring a variety of potential benefits to news content, including more engaging and more accurate reporting, there are possible adverse consequences as well. Among these adverse implications are the possible accidental or intentional misuse of drones to create immersive news content that is compelling, apparently real, but a new class of deep fakes from an aerial perspective (Pavlik, 2019b).

Moreover, it is imperative that journalists and news media employing drones in the production of immersive news adhere to the highest ethical standards in order to maximize public trust (Culver, 2014; Jarvis, 2014; Tompkins, 2017). Developing clear industry guidelines for the ethical use of drones in producing immersive journalism is a key next step (Waite & Kreimer, 2017). Keyser et al. (2019a), identify four ethics-related questions journalists using photogrammetry and 3D modeling should ask, including for drone production. These are: 1) whether the entire story will be told using photogrammetry; 2) whether the story is about exploration or discovery; 3) will the "model have visual/visceral impact while it is motionless" (p. 1); and 4) will the reporter (or drone operator) have "control to get your location and subject to remain motionless long enough to capture every image you need to reconstruct the model?" (p. 1). Per question four, this may not be a problem for objects such as buildings, but for subjects more animated (e.g., people, animals, etc.), it may be a significant challenge.

Future research should explore several important research questions regarding the use of drones in generating immersive news content. First, research should examine the impact of drone-generated immersive news content experienced either from aerial or underwater perspective on user empathy and other effects. Although existing research suggests such immersive experiences can shape user affect and understanding, it is essential to assess such content experiences within a drone-generated context. Second, drone-generated immersive news should be studied for any unintended consequences that flight (or underwater) based experiences could produce. Finally, research should examine the potential impact that the use of drones in producing immersive news has on journalistic practice, including workload and possible ethical considerations. Especially because nonverbal data tracking is a significant part of the virtual reality experience, designing such immersive news content designed to protect user privacy is essential (Bailenson, 2018).

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Conflict of Interests

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About the Author

John V. Pavlik is Professor in the Department of Journalism and Media Studies in the School of Communication and Information at Rutgers, the State University of New Jersey. Pavlik's books include *Journalism in the Age of Virtual Reality* (Columbia University Press), *Converging Media*, with Shawn McIntosh (Oxford University Press) and *Mobile Disruptions in the Middle East*, with Everette E. Dennis, Rachel Davis Mersey and Justin Gengler (Routledge Press).

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