

Effects of Incorporating Citizen-Eyewitness Images into the News on Audience Trust in  
News Organizations and News Engagement

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## **Dedication**

I dedicate this dissertation:

To my father and mother, who have offered me consistent and unconditional support and affection to pursue my dreams and finish my dissertation.

## Abstract

Recently, news organizations have actively been requesting and endorsing private citizens' contributions to the news production through eyewitness images so as to circulate up-to-minute information and draw more audience attention to the news. Despite anecdotal evidence of growing numbers of citizen-eyewitness images in the news, there has been little systematic research on the extent of using citizen-eyewitness images by news organizations and the impact of incorporating citizen-eyewitness images into news content.

In order to fill this gap in the research on citizen-eyewitness images, this study aims to examine: (1) the extent to which U.S. newspaper organizations incorporate images captured by private citizens into their news articles, and (2) the effects of incorporating citizen-eyewitness images in the news on audience trust in the news organization and audience engagement with the news. To achieve the goals, this study first conducted a machine-coded content analysis of news images published by 71 U.S. newspaper organizations to calculate the percentage of citizen-eyewitness images out of all news images with identifiable and classifiable sources (Study 1). This study then collected and analyzed user behavioral data on Twitter to compute a proxy measure representing trust in the news organizations using the Trust Scores in Social Media (TSM) algorithm and audience engagement with news (Study 2). The effects of the extent to which a news organization uses citizen-eyewitness images on audience trust in the news organization and audience engagement with news articles published by it were tested.

The results showed that U.S. newspapers tended to incorporate a rather small number of citizen-eyewitness images in their news reports, and there were some variations in the degree of using citizen-eyewitness images in news reports among different groups of news organizations. In addition, the findings demonstrated that the extent to which a news organization incorporated citizen-eyewitness images in its news articles was positively related to the level of audience engagement with its news posted on Twitter. In contrast, there was no significant effect of incorporating images captured by private citizens into the news on audience trust in the news organization.

This study contributes to advancing the participatory journalism research by providing systematic data depicting the current state of the newsroom practice using citizen-eyewitness images in the U.S. and examining the effects of citizen-eyewitness images in the news on audience trust in news organizations and engagement with news. Additionally, this study offers useful practical implications for news organizations as they develop strategies to deal with audience's participation in the news production.

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## CHAPTER 1

### INTRODUCTION

With the popularity of digital technology, it has become easy for individuals to take photos (or videos) with their smartphones and share them with others. This trend allows private citizens to participate in the journalism process. When individuals happen to be near news events, they can make a record of witnessing with their smartphones and can submit them to news organizations or post them on social media. These images taken by private citizens and submitted to news organizations or uploaded on social media have become a useful source for news organizations (Pantti & Bakker, 2009).

Scholars have termed this phenomenon as “citizen witnessing” (Allan, 2013), which refers to private citizens’ contributions to generating firsthand reportage, including eyewitness accounts, tweets, blog posts, and visual footage. Recently, news organizations have actively been requesting and endorsing private citizens’ contributions to news production through eyewitness images (Andén-Papadopoulos & Pantti, 2013). For example, *BBC* and *CNN* have their own user-generated content hubs that allow audiences to submit images or videos of news events (e.g., CNN iReport). *AP* also has a web interface that curates verified content from private citizens, such as images of breaking news (Wang, 2017). Particularly for crisis events, if private citizens are near news events and take and share breaking news photography, news organizations can save resources to update their news stories (Andén-Papadopoulos & Pantti, 2013).

News organizations have been embracing eyewitness images captured by private citizens and distributing citizen-eyewitness images as a part of their news content through their news websites and social media pages, with or without editing. They seem to see

specific values in citizen-eyewitness images, such as proximity, immediacy, intimacy, authenticity, diversity, a heightened sense of presence, and the democratic value of empowered citizens participating in the journalism processes (e.g., Ahva & Pantti, 2014; Andén-Papadopoulos & Pantti, 2013; Lewis, Kaufhold, & Lasorsa, 2010; Mast & Hanegreefs, 2015; Singer, 2010). In addition, news editors believe that citizen-eyewitness accounts could help them reach other members of the audience and increase audience engagement with their news content (Andén-Papadopoulos & Pantti, 2013; Nilsson & Wadbring, 2015; Singer, 2010). However, news editors and journalists have also been concerned about the low quality and inaccuracy of user-generated content in general (e.g., Singer, 2010), which could ruin their professional integrity and authority (e.g., Andén-Papadopoulos & Pantti, 2013; Schmieder, 2015; Singer, 2010). Thus, journalists and news editors tend to hold ambivalent perceptions and attitudes toward the use of user-generated content, including citizen-eyewitness images, in their reports (Andén-Papadopoulos & Pantti, 2013; Mast & Hanegreefs, 2015; Singer, 2010).

Although there has been some discussion in the newsroom about the increasing use of citizen-eyewitness images in the news (e.g., Andén-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Pantti & Bakker, 2009; Wardle & Williams, 2010), due to a lack of research, it is difficult to know to what extent news organizations actually incorporate citizen-eyewitness images into their news. There have been only four peer-reviewed articles on the extent of using news images captured by private citizens (Greenwood & Thomas, 2015; Mast & Henegreefs, 2015; Nashmi, North, Bloom, & Cleary, 2017; Nilsson & Wadbring, 2015), and the findings are inconclusive and non-generalizable.

More importantly, there are a great number of questions about the impact of incorporating citizen-eyewitness images into news content, but very little systematic or scientific research exists. Only a few in-depth interviews and open-ended survey studies have examined audiences' opinions about images captured by private citizens in the news (Ahva & Hellman, 2015; Ahva & Pantti, 2014; Allan & Peters, 2015; Brown, 2015; Puustinen & Seppänen, 2011; Wahl-Jorgensen et al., 2010). The findings suggest that, in contrast to journalists' ambivalent views of using citizen-eyewitness images, audiences tends to evaluate images captured by private citizens more positively (Ahva & Hellman, 2015; Ahva & Pantti, 2014; Allan & Peters, 2015; Brown, 2015; Puustinen & Seppänen, 2011; Wahl-Jorgensen, Williams, & Wardle, 2010). With respect to the actual effects of citizen-eyewitness images on audiences' reactions to news and news organizations, however, the research is almost non-existent.

### **Research Purpose and Focus**

In order to fill this gap in the research on citizen-eyewitness images, the purpose of this study is twofold: (1) to examine the extent to which U.S. newspaper organizations incorporate images captured by private citizens into their news; and (2) to investigate the effects of incorporating citizen-eyewitness images into the news on audience trust in the news organization and audience engagement with the news (i.e., liking and redistributing news content) on social media. There are several reasons why this study focuses on trust in news organizations and audience engagement with news on social media as important outcome variables.

First, with respect to trust in news organizations, there has been a sharp decrease in audience trust toward the news media in the U.S. within the past forty years. For

example, a recent Gallup survey report revealed that only 45 percent of Americans trust the mass media (cf. it was 32 percent in 2016) (Jones, 2018). With a continuously changing newsfeed algorithm and information disorder (“fake news”) in online and social media environments, declining audience trust in the news media within our society is a growing concern (Lewis, 2019).

Journalists used to be viewed as noble and respectful figures who protect democracy and the public interest in our culture (Ladd, 2012), with limited competition in the market (Lewis, 2019). However, with the declining confidence in journalism among audience members and the increase in independent and partisan media channels, the respected status of journalists and audience trust in news organizations have been eroded (Lewis, 2019). To address this issue, some journalism scholars have argued that news organizations should develop and maintain closer relationships with their audiences, such as being more open to private citizens’ contributions to news production in order to maintain audience trust (Boczkowski & Lewis, 2018; Lewis, 2019). Incorporating citizen-eyewitness images into news could be one way to achieve this goal, based on audiences’ positive views on using citizen-eyewitness images in the news (Ahva & Hellman, 2015; Ahva & Pantti, 2014; Allan & Peters, 2015; Brown, 2015; Puustinen & Seppänen, 2011; Wahl-Jorgensen et al., 2010).

Regarding audience engagement with news on social media, this study focuses on audiences’ behavioral engagement with the news, especially liking and redistributing (i.e., retweeting) news on Twitter. With rapidly growing numbers of individuals getting their news from social media, there is an increasing need for news organizations to understand their audiences on social media. For example, approximately 70 percent of

adults in the U.S. obtained their news from social media in 2018 (Matsa & Shearer, 2018). News organizations view social media as a platform to drive traffic, increase the visibility of their news, interact with their audiences, and reach new groups of audiences (e.g., Cornia, Sehl, Levy, & Nielsen, 2018). Scientific research-based knowledge regarding the factors that influence audience engagement behaviors on social media would help news organizations develop more effective digital strategies on social media platforms.

In order to examine how the incorporation of citizen-eyewitness images into news by news organizations affects audience trust in news organizations and engagement behaviors, this study conducts two separate studies. Study 1 is a machine-coded content analysis that examines the extent to which citizen-eyewitness images are used in news published by newspaper organizations in the U.S. Study 2 tests the effects of incorporating citizen-eyewitness images into the news on audience trust in news organizations and engagement with news on social media, through regression modeling involving data obtained from Twitter.

This study makes important contributions to advancing participatory journalism research and theory building, and addressing the problem of increasing public distrust of news media. Another novel contribution of this study is the application of trust theory to journalism research. While trust in the news and trust of the news media have been frequently discussed, no prior research in the journalism studies field has conducted a rigorous conceptualization or measurement of trust, nor has there been research that systematically tests the antecedents of trust. In addition, this study offers useful practical implications for news organizations and journalists regarding how citizen-eyewitness

images can be strategically incorporated into the news to improve public trust and engagement with the news.

### **Dissertation Chapters and Organization**

The outline of this dissertation is as follows. Following the current introduction chapter (Chapter 1), Chapter 2 presents a thorough review of the existing literature on citizen-eyewitness images, trust research, computational trust, and audience engagement. Chapter 3 presents the study's research questions and hypothesis, followed by Chapter 4, where the detailed research method for Study 1 (content analysis of news content) and data analysis results are presented. Chapter 5 presents Study 2's (regression analysis testing the effects of citizen-eyewitness images) research method and data analysis results. Chapter 6 summarizes and synthesizes the two studies' key findings and discusses the theoretical and practical implications. The limitations of this study and suggestions for future research are also discussed.

## CHAPTER 2

### LITERATURE REVIEW

#### 1. Literature Review on Citizen-Eyewitness Images

The literature review on citizen-eyewitness images is divided into four subsections. The first section will provide the conceptualization of citizen-eyewitnessing and the implications of citizen eyewitnessing for journalism, followed by the section that reviews research on the current status of using citizen-eyewitness images in news. Subsequent sections will review the research on journalists' and the audience's perceptions of using citizen-eyewitness images in news.

#### **Conceptualization of Citizen Eyewitnessing as Citizen Journalism Activities**

Historically, most news images have been taken by professional journalists or photographers hired by news organizations and photo agencies. However, with the advent of digital technologies and participatory journalism practices, news organizations have started to use eyewitness images from private citizens in their news (Mortensen, 2011). Scholars have named citizens' participation in the journalism processes by sharing what they saw and felt at the scene as "citizen witnessing" (Allan, 2013) and have termed images of newsworthy events captured by private citizens as "citizen-eyewitness images" (Andén-Papadopoulos & Pantti, 2013).

Citizen eyewitnessing is regarded as a type of citizen journalism activities, which refers to "first-person reportage in which ordinary individuals temporarily adopt the role of journalist in order to participate in newsmaking, often spontaneously during a time of crisis, accident, tragedy or disaster when they happen to be present on the scene" (Allan, 2013, p. 9). Citizen witnessing includes a range of first-person footage produced by

citizens from a snapshot of a news event to a high-quality video or documentary. Among them, this study particularly focuses on images of news events captured by private citizens, conceptualized as “citizen-eyewitness images.”

Private citizens’ eyewitness images are regarded as a unique contribution to news organizations’ news production (Andén-Papadopoulos & Pantti, 2013). In order to acknowledge this contribution and to emphasize private citizens’ roles in news creation, scholars have used such terms as citizen journalism or citizen eyewitnessing, rather than amateur images or user-generated content (Greenwood & Thomas, 2015).

Although journalists’ use of images captured by non-professionals in their news content is nothing new (e.g., private photographs from readers, photographs from soldiers, and paparazzi photography), the volume and value of citizen-provided content have changed dramatically due to the development of digital technologies, including the Internet and smartphones (Williams, Wahl-Jorgensen, & Wardle, 2011). In the 21<sup>st</sup> century, the use of citizen-eyewitness images has become prevalent in mainstream news, especially around crisis reporting, including news coverage of the attack on the World Trade Center in New York in 2001 and the South Asian tsunami of December 2004 (Allan, Sonwalkar, & Carter, 2007; Becker, 2011). In such situations, private citizens made remarkable contributions to news reporting by offering their first-hand footage. Nowadays, when private citizens happen to be near or involved in the outbreak of unexpected news events such as disasters, crimes, or accidents (which need up-to-the minute coverage), images and videos captured by private citizens and shared with news organizations or on social media become a useful source for news organizations. Citizen-

eyewitness images are considered especially more valuable when journalists have limited access to the events (Pantti & Bakker, 2009).

The increasing contribution of citizen-eyewitness images to news production offers important implications for journalism, especially in terms of (1) the professional authority of journalists and (2) the relationship between journalists and their audiences in news production.

First, journalists have used the photography of news events and eyewitness statements to prove their presence at news events and to corroborate their stories (Brennen & Brennen, 2015). By providing first-hand footage of the news events that cannot be easily confirmed otherwise, journalists underscore, establish, and maintain their boundaries and authority for reporting (Zelizer, 2007). Therefore, journalists' eyewitnessing has strengthened journalism's credibility and authority, especially under questionable circumstances (Zelizer, 2007).

However, as private citizens fill in as eyewitnesses with their mobile phones, the value of journalists' eyewitnessing as a key activity to establish the credibility and authority of news reporting has been challenged and changed (Zelizer, 2007). With an increasing number of images captured and shared by private citizens in online and social media environments, the proximity and immediacy value of eyewitness images captured by private citizens and their availability for news reporting have encouraged news organizations to incorporate citizen-eyewitness images into their news reports (e.g., Ahva & Pantti, 2014). Given that eyewitnessing used to be one of the crucial journalistic works to establish journalists' credibility and professional authority (Zelizer, 2007), the use of citizen-eyewitness images in the newsroom could be regarded as a threat to journalists.

Furthermore, journalists raise concerns about the unreliability, inaccuracy, lack of structure, and lack of verifiability regarding citizen-eyewitness images. Journalists are also worried about the risk of incorporating citizen-eyewitness images into the news, claiming that it may harm their reputation and transgress the boundaries of professional journalism (Becker, 2011). Thus, there has been tension between the advantages of using citizen-eyewitness images due to their proximity and immediacy values and the challenges of citizen-eyewitness images to journalists' boundaries and authority for news reporting.

Second, some scholars have examined a possible connection between citizen journalism activities and a public journalism reform movement in the late 1980s (Merritt, 2010; Merritt & McCombs, 2004). Public journalism tried to encourage news organizations to be more closely connected with their audiences so that they could lead these audiences to discuss and resolve common problems and issues. The scholars interested in this aspect of citizen journalism argue that the normative idea of public journalism still exists in the discourse of citizen journalism. More specifically, citizen journalism encourages news organizations to get close to their audiences and local communities to motivate them to be aware of public issues in their local communities and their lives and to motivate them to discuss these issues (Merritt, 2010; Merritt & McCombs, 2004).

Thus far, a great deal of research has investigated the phenomenon of citizen-eyewitness images through case study, interview, and qualitative content analysis approaches. A majority of the studies have focused on: (1) how citizen-eyewitness images were used in, and how they changed news reporting (e.g., Allan, 2007 for the

London bombings; Harkin, Anderson, Morgan, & Smith, 2012 for the Syrian conflict; Mortensen, 2013 for the Boston Marathon bombings; Semati & Brookey, 2014 for the death of Neda Agha Soltan, Robinson, 2009 for Hurricane Katrina; and so on); and (2) the tension between journalists' professional authority and audience participation or contributions to news regarding the use of citizen-eyewitness images in the news (e.g., Andén-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Lewis et al., 2010; Pantti & Bakker, 2009; Pantti & Sirén, 2015; Singer, 2010; Schmieder, 2015; Wardle & Williams, 2010). Most of these studies have examined how journalists assess and react to citizen-eyewitness images.

Relatively, only a small number of content analysis studies have examined the frequency or extent to which news organizations incorporate citizen-eyewitness images into their news content (Greenwood & Thomas, 2015; Mast & Henegreefs, 2015; Nashmi et al., 2017; Nilsson & Wadbring, 2015). The next subsection discusses the content analysis studies that have examined the extent to which news organizations incorporate citizen-eyewitness images into the news.

### **Use of Citizen-Eyewitness Images in the News**

Prior content analysis studies examining the use of citizen-eyewitness images in the news have shown that the relative proportions of citizen-eyewitness images (compared to professionally shot images in news content) vary widely, ranging from less than 1 percent to 40 percent. While the content analysis research is limited, the findings are most relevant to the current study and provide useful snapshots of this phenomenon. Each of these content analysis studies is reviewed below.

Nilsson and Wadbring (2015) analyzed images published in the online and print editions of four Swedish newspapers published in 1995, 2001, 2007, and 2013. They found that news images captured by private citizens played an extremely limited role in the news content (i.e., less than 1 percent of news images, in both print and online editions). Similarly, in a content analysis of online news stories with photographs related to the Ferguson shooting in 2014 from three U.S. local news organizations (*St. Louis Post-Dispatch*, *Columbia Missourian*, and *Chicago Sun-Times*), Greenwood and Thomas (2015) found that among 724 photographs in online coverage of the shooting and racial unrest in Ferguson, only 32 news images (or 4.5 percent of all news images) were captured by private citizens.

These studies seem to suggest a minimal role of citizen-eyewitness images in news content, but these results should be interpreted with caution. The small portion of citizen-eyewitness images might be due to the unique characteristics of the two studies' samples. Nilsson and Wadbring's (2015) data included the time period when smartphones (or camera phones) were not common, and smartphones play an important role in capturing and sharing images with ease. Also, Greenwood and Thomas's sample (2015) included only local news organizations' news images of one local event, where the local journalists would have easy access to the news event. Thus, their findings might not be directly applicable to the general practice of incorporating citizen-eyewitness images by national news organizations.

In fact, there are two content analysis studies that showed a relatively higher proportion of citizen-eyewitness images in the news. For example, Mast and Henegreefs (2015) conducted a content analysis of photographs of the Syrian War in the archived

news content from three Flemish news media outlets between March 2011 and December 2012. They discovered that 38.3 percent of the news images involving the coverage of the Syrian War were generated by private citizens. Notably, during the first half of the study period (i.e., up to February 2012), the number of citizen-eyewitness images incorporated by news organizations was equal to that of professional images, and sometimes exceeded the number of professional images. The researchers speculated the reason for this finding, conjecturing that severe sectarian violence was escalating at that time, and journalists were unable to access the conflict area. That is, the proximity and accessibility to news events by professional journalists might be an important factor influencing the extent of incorporating citizen-eyewitness images by news organizations.

In another study, Nashmi et al. (2017) examined videos posted on international news organizations' YouTube channels (e.g., *Al Jazeera English*, *France 24 English*, *Russia Today*, *CNN international*, and *Al Arabiya*) during one week in September 2013. They found that 19 percent of the videos included some types of user-generated content. Notably, the researchers found that more than half of the citizen-eyewitness images covered news events in the Middle East area, where serious armed conflicts were happening. When they analyzed videos without citizen images, they could not find this pattern. Thus, this study provides additional supportive evidence that news organizations tend to include more citizen-eyewitness images in their news when they cannot access news events themselves.

In sum, previous content analysis studies on the frequency or the extent to which news organizations incorporate citizen-eyewitness images into their news content have shown that the relative proportion of citizen-eyewitness images varies, depending on the

characteristics of news organizations (international vs. national vs. local) and news topics. It seems that the relative proportions of using citizen-eyewitness images are high when news organizations are international organizations (Nashmi et al., 2017) or when they report news regarding international news events (e.g., Mast & Henegreefs, 2015). However, since none of the prior studies have analyzed a representative sample of U.S. news organizations or provided a systematic analysis offering a full picture of the extent of incorporating citizen-eyewitness images into the news, the question regarding the extent to which citizen-eyewitness images are incorporated into news reporting by U.S. news organizations remains unanswered, calling for further research.

### **Journalists' Perceptions of Citizen-Eyewitness Images in the News**

Unlike the limited research on the content of news incorporating citizen-eyewitness images, a greater number of studies have examined how journalists and news editors perceive and react to citizen-eyewitness images. A large majority of these studies have been in-depth interviews with journalists or news editors (e.g., Andén-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Lewis et al., 2010; Pantti & Bakker, 2009; Pantti & Sirén, 2015; Singer, 2010; Schmieder, 2015; Wardle & Williams, 2010).

This line of research is set against a backdrop of a long history of tension between journalists as professionals and private citizens, who could potentially make contributions to the news and might threaten journalists' authority to produce news stories (Becker, 2011). Overall, early studies on journalists' perceptions of citizen-eyewitness images have suggested that journalists hold negative perceptions of incorporating citizen-eyewitness images into the news, in the interest of protecting their professional authority and control in news reporting (e.g., Schmieder, 2015; Singer, 2010).

However, since the turn of the 21<sup>st</sup> century, as the proportion of citizen-eyewitness images in the news has increased, journalists and news editors have acknowledged some positive values of using citizen-eyewitness images and have held mixed views, since citizen-eyewitness images could help represent alternative and varied perspectives, and could improve interactions with their audiences (e.g., Andén-Papadopoulos & Pantti, 2013; Wardle & Williams, 2010). In addition, journalists have started to see the immediacy, directness, intimacy, and authenticity values of citizen-eyewitness images (e.g., Hermida & Thurman, 2008; Pantti & Bakker, 2009). Thus, journalists and news editors now seem to hold ambivalent viewpoints toward using citizen-eyewitness images in the news, depending on different aspects of journalism.

Specifically, with respect to journalists' professional identity and autonomy, extant research suggests that journalists tend to believe that using citizen-eyewitness images in news or citizen journalism itself could ruin their professional identity (e.g., Hermida & Thurman, 2008; Schmieder, 2015) and disrupt their journalistic autonomy (e.g., Andén-Papadopoulos & Pantti, 2013). For example, in-depth interviews with journalists from news organizations in Finland and Sweden (Andén-Papadopoulos & Pantti, 2013) revealed that the interviewed journalists resisted using citizen-eyewitness images in the news, in the fear of losing their editorial control and standards in their news reports. In addition, they emphasized their skills, competence, and moral responsibility to capture the eyewitness images of important news events (Andén-Papadopoulos & Pantti, 2013). Another in-depth interview study by Pantti and Siren (2015) with Finnish journalists also found that the interviewed journalists perceived the incorporation of

citizen-eyewitness images as possibly risking the loss of credibility and reputation for news organizations.

This reluctance and negative attitude toward citizen-eyewitness images and citizen journalism itself might be rooted in journalists' interest in protecting their professional boundaries. According to Lewis (2012), journalists have developed professionalism related to their expertise in collecting, filtering, and distributing truth about the world by invoking objectivity. The ideology of professionalism is based on expert control, so the professionalism of journalists is incompatible with private citizens' participation in news production, which requires journalists to share their control in news reporting. Therefore, journalists have struggled to reconcile the key tension between the ideologies of professionalism and open participation, resulting in the negative perception of incorporating citizen-eyewitness images into the news, even though they acknowledge the normative purpose of open participation for achieving a more engaged, representative, and collectively intelligent society (Lewis, 2012).

In contrast, when considering the relationships with their audiences and the immediacy and authenticity values of citizen-eyewitness images, journalists tend to believe that incorporating citizen-eyewitness images into the news could be a way to bond with their audiences and communities, and could enrich the narratives of the news (e.g., Ahva & Pantti, 2014; Anden-Papadopoulos & Pantti, 2013; Lewis et al., 2010). In addition, some journalists even perceive eyewitness images provided by private citizens as authentic, even though the quality of the images is sometimes low (e.g., Pantti & Bakker, 2009).

For example, in-depth interviews with Dutch reporters revealed journalists' ambivalent attitudes toward images captured by private citizens (Pantti & Bakker, 2009). The interviewed journalists stated that they could take advantage of using images from private citizens to connect with their audiences by giving them the opportunity to participate in news production, which could be an enjoyable experience for these audiences. This study also found that journalists acknowledged the values of immediacy, directness, intimacy, and the authenticity of images captured by private citizens. However, the interviewed journalists still stressed their roles as moderators and gatekeepers for citizen-sourced images, which tend to be low in quality and newsworthiness. Another in-depth interview study with newspaper editors in Texas also found that news editors regarded incorporation of content from private citizens in the news as a way of being connected with their audiences and communities. However, the editors emphasized the need to corroborate any articles produced by private citizens in order to avoid legal issues, which might overwhelm their reporters (Lewis et al., 2010).

Anden-Papadopoulos and Pantti (2013) also found that journalists in Finland and Sweden believed that the use of citizen-eyewitness images in the news would enhance the credibility of their crisis reporting as a source to reaffirm journalists' reports and alternative viewpoints of news events. In addition, such a practice could reaffirm journalists' commitment to reporting in the public interest, thereby enhancing their public service role. Also, the interviewed journalists tended to value the alternative, and often varied perspectives on crisis events afforded by citizen-eyewitness images and acknowledged the democratic benefits of citizen-eyewitness images in allowing citizens to participate in news creation. Some journalists were even open to modifying their

traditional standards of image quality – for example, accepting blurry, graphically exaggerated, and unverified visuals in order to enrich the narratives in news reporting and cover news events that they could not access (Anden-Papadopoulos & Pantti, 2013). Similar to previous studies (Lewis et al., 2010; Pantti & Bakker, 2009), however, the Finish and Swedish journalists interviewed by Anden-Papadopoulos and Pantti (2013) still showed resistance to sharing their authority over the news production process with private citizens and stressed that citizen-eyewitness images should be used only for enriching professional narratives and temporarily covering information gaps until professional journalists could arrive at the scene.

Similarly mixed viewpoints are also reported in a survey examining journalists' perceptions regarding the influence of content generated by private citizens on their work routines and professional norms (Singer, 2010). This study found that journalists tended to perceive content generated by private citizens as being helpful for engaging audiences, and for building website traffic and providing useful ideas and information for their news reporting. However, they still considered the impact of the content provided by private citizens on their editorial decisions as minor and insignificant.

On the other hand, one case study of the BBC reported a more optimistic and positive view of central BBC decision-makers regarding the benefits of citizen-sourced content (Wardle & Williams, 2010). The informants in this study believed that content from private citizens could enrich the quality of BBC news content, and even some key members of senior management were enthusiastic about ceding some of their editorial power to audiences in order to encourage a two-way interaction between journalists and audiences.

Overall, the research literature on journalists' reactions and perceptions of citizen-eyewitness images suggests evolving and ambivalent views of journalists involving citizen-eyewitness images. As Hermida and Thurman (2008) discussed, most journalists used to have only negative attitudes toward citizen-eyewitness images in the past. They were not very interested in hearing or embracing audience perspectives or content. However, in recent years, it seems that journalists have begun to see some benefits of incorporating citizen-eyewitness images, such as the immediacy, directness, intimacy, and authenticity values of citizen-eyewitness images, which could be helpful in bonding with audiences, showing their commitment to local communities and audiences, filling the gap in their reporting of unexpected news events, and enriching the quality of news output with diverse perspectives. Although a majority of journalists seem to still view private citizens as a type of source for newsgathering, and not as a collaborative partner (Usher, 2017), some news organizations and journalists have slightly shifted their perceptions and practices toward embracing the value of citizens' materials and incorporating citizen-eyewitness images into their news production (e.g., Pantti & Bakker, 2009; Wardle & Williams, 2010).

### **Audience Perceptions of Citizen-Eyewitness Images in the News**

Audience perceptions and attitudes toward citizen-eyewitness images in the news media and impact have been underexplored (Brown, 2015). There have been only seven studies regarding audience perceptions of citizen-eyewitness images in news reports (Ahva & Hellman, 2015; Ahva & Pantti, 2014; Allan & Peters, 2015; Brown, 2015; Halfmann et al., 2018; Puustinen & Seppänen, 2011; Wahl-Jorgensen et al., 2010). Wahl-Jorgensen et al. (2010) conducted focus group interviews with members of news

audiences to examine their views of user-generated content, including first-hand footage from audiences. Contrary to news editors' and journalists' concerns about the low quality, legal liability, bias, inaccuracy, and irrelevancy of user-generated content (Singer, 2010), audience members generally considered user-generated content as authentic, immediate, and "real" (Wahl-Jorgensen et al., 2010).

Another interview study by Puustinen and Seppänen (2011) examined audience trust in news images captured by private citizens. The researchers presented the interviewees with several examples of news images taken by private citizens and asked them about their thoughts regarding the images. The results revealed that, unlike journalists' perceptions, most interviewees did not raise any issues regarding the trustworthiness of the news images. As a source of eyewitness images, interviewees perceived private citizens as less skillful in capturing news images than professional journalists, but as having more authenticity, since private citizens were considered to be free from the editorial selection of news images.

Allan and Peters (2015) also showed similar findings. They conducted an open-ended survey to examine young audiences' perceptions and attitudes toward citizen-eyewitness images in the news. While some respondents considered the use of citizen-eyewitness images as an indicator of journalists' laziness, a majority of the respondents focused on the benefits of incorporating citizen-eyewitness images into the news. The survey participants reported that citizen-eyewitness images could provide alternative perspectives of news events, make the news report more real, and encourage audiences to feel more connected. Regarding the quality of citizen-eyewitness images, respondents considered them as more reliable and authentic, due to a lack of editing processes. A few

respondents pointed out that the news images taken by professionals (e.g., journalists) might provide neutral, detailed, refined, and serious images, but a majority of the respondents perceived citizen-eyewitness images as being helpful for audiences to see the reality of the news events. The authors summarized that the survey respondents' answers regarding the perceived quality of citizen-eyewitness images or videos seemed to revolve around the authenticity, truth, and credibility of images.

Brown (2015) conducted focus group interviews with audience members in the UK in order to examine their attitudes toward citizen-eyewitness images or videos. The results revealed that audience members viewed citizen-eyewitness images as bringing immediacy, intimacy, and authenticity to news coverage. Although the respondents held positive attitudes toward citizen-eyewitness images in general, they also expected journalists to identify and separate newsworthy eyewitness images from others on social media as gatekeepers, and to verify citizen-eyewitness images before using these images in news reports.

As the only study that empirically tested the impact of citizen-eyewitness materials on news audiences, Halfmann et al. (2018) conducted an experiment to test the effects of citizen-eyewitness videos in TV news reports on the trustworthiness of news reports, mediated through perceived presence, empathy, authenticity, and bias. One group of participants was presented with a news video containing an embedded citizen-eyewitness video, which was more blurred, unfocused, with low resolution and was marked as "amateur footage," while the other group was shown a news report containing an embedded professional video. The results showed that the incorporation of a citizen-eyewitness video into the news report did not have a significant impact on the audience's

perceived trustworthiness of the news. The researchers explained that this lack of a significant effect occurred through the mechanism of perceived bias canceling out the positive influence of the citizen-eyewitness video on perceived presence and empathy.

In sum, although there have been only a few studies on audience perceptions involving the use and impact of citizen-eyewitness images in news content, these studies have shown that audience perceptions of citizen-eyewitness images or videos in news seem to be more consistently positive than those of journalists. However, with respect to the actual effects of citizen-eyewitness images on news audiences' reactions to news, one experimental study found no significant impact of a citizen-eyewitness image on the perceived trustworthiness of news, whereas it had positive influences on perceived presence and empathy. Other than this single study, there is a lack of research on the influence of citizen-eyewitness images involving audiences' reactions to the news and trust in news organizations, although some prior studies have examined audience trust in the news media in general.

The next section discusses the theoretical concept of trust, followed by a review of the research on the antecedents of trust, and reviews prior research on trust in the news media in general. This section provides an overall theoretical framework for developing this study's hypotheses regarding the effects of incorporating citizen-eyewitness images into the news on audience trust in individual news organizations.

## 2. Literature Review on Trust Theory and Research

### The Trust Concept

Scholars in various fields, including mass communication, political science, psychology, business, economics, and sociology, have examined trust as an influential factor for stable relationships and cooperation (e.g., Fukuyama 1995; Huh & Shin, 2012; Lewis & Weigart, 1985; Mayer, Davis, & Schoorman, 1995; Moorman, Zaltman, & Deshpande, 1992; Morgan & Hunt, 1994; Williamson, 1993). Different disciplinary lenses help investigate diverse dimensions involving the concept of trust, but also lead to conceptual confusion because trust has been defined and operationalized in different ways (Gefen, Karahanna, & Straub, 2003; Mayer et al., 1995; McKnight & Chervany, 2001).

The concept of trust has been defined in a number of different ways, depending on which aspect of trust is emphasized. One approach of conceptualizing trust involves defining it as the trustor's beliefs or expectancy in the trustworthiness of the trustee, based on characteristics of the trustee such as ability, benevolence, and integrity (e.g., Cook & Wall, 1980; Doney & Cannon, 1997; Morgan & Hunt, 1994; Nicholson, Compeau, & Sethi, 2001). For example, Doney and Cannon (1997) defined trust as the perceived credibility (or ability) and benevolence of an entity (the trustee's intention to care about the trustor's interest). Other scholars have conceptualized trust as the trustor's belief or confidence in the other's reliability and integrity (e.g., Cook & Wall, 1980; Morgan & Hunt, 1994; Nicholson et al., 2001).

The second conceptualization approach focuses on the behavioral aspect of trust (e.g., Gambetta, 1988; Hosmer, 1995). Specifically, Gambetta (1988) defined trust as the

behavioral willingness to cooperate with the other party. Hosmer (1995) proposed the reliance by a person, group, or organization on the partner in order to protect their rights and interests in a joint behavior or economic exchange as the conceptualization of trust.

The third approach includes both belief and behavioral components (e.g., Mayer et al., 1995; McKnight, Cummings, & Chervany, 1998; Mishara, 1996; Moorman et al., 1992). Specifically, Mayer et al. (1995) defined trust as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor” (p. 712). Mishara (1996) also proposed a similar definition of trust as one’s willingness to be vulnerable to another, based on his or her belief that the other party is competent, open, concerned, and reliable. McKnight et al. (1998) defined trust as one’s belief and willingness to depend on another party, and suggested trusting intention (one’s willingness to depend on the other party) and trusting beliefs (one’s belief that the other party is benevolent, competent, honest, and predictable) as two sub-concepts of trust.

Applying the third conceptualization approach, this study defines trust in a news organization as “the willingness of audience to be vulnerable to rely on news content from a news organization based on their expectations of intention or behavior of the news organization.” Since journalists select news topics and information following their gatekeeping criteria, there is uncertainty and risk in the audience’s reliance on a news organization as an information source, based on how they would make important decisions, such as voting and financial investment (Kohring & Matthes, 2007). Therefore, based on their beliefs and expectations of news organizations’ practices, audiences would have different levels of willingness, depending on each news organization.

### **Sub-dimensions of Trust**

Prior research has examined the various sub-dimensions of trust, such as ability, benevolence, integrity, honesty, and predictability (e.g., Mayer et al., 1995; McKnight & Chervany, 2001; McKnight, Choudhury, & Kacmar, 2002). Mayer et al. (1995) identified three frequently examined dimensions of trust: ability, benevolence, and integrity. Ability (“competence” in McKnight et al., 2002) is defined as the trustor’s belief that the trustee has a group of skills or competencies in a specific domain. Integrity refers to the trustor’s perception that the trustee keeps a set of rules that are acceptable to the trustor. Some scholars view consistency in the trustee’s past actions as an important property of the integrity dimension and have combined the ability and integrity dimensions in order to distinguish them from the benevolence dimension of trust (e.g., Ganesan, 1994).

Compared to the ability and integrity dimensions, benevolence refers to the trustor’s belief about the trustee’s motivations or good intention to care about the trustor’s interests, aside from self-serving motivation (Mayer et al., 1995). Benevolence has also been understood as the trustor’s perception of the trustee’s efforts and willingness to achieve some values that could be beneficial to their relationship (Wu, Chen, & Chung, 2010). That is, benevolence includes not only the degree of fairness, goodwill, and the propensity to help and make sacrifices out of altruistic motives (e.g., Ganesan, 1994), but also the trustee’s efforts to look out for and respond to the trustor’s needs and desires for successful relationships between them (Wu et al., 2010).

Previous studies have demonstrated that the dimension of benevolence tends to be more crucial than the other dimensions for building and maintaining desirable relationships between two parties (e.g., Ganesan & Hess, 1997; Wu et al., 2010). For

example, Wu et al. (2010) examined the influence of individuals' trusting belief (i.e., ability, benevolence, integrity, and predictability) regarding a virtual community using a web-based survey, and found that only benevolence and predictability had positive effects on the respondents' relational commitment to the virtual community. Similarly, in a mail survey of retail buyers from department store chains, Ganesan and Hess (1997) found that organizational benevolence was a more important predictor of the buyers' commitment to the vendor organization than the other dimensions of trusting belief.

### **Factors Influencing Trust**

A number of different antecedents of trust have been identified across different disciplines, including the trustor's disposition to trust (e.g., McKnight et al., 1998), the trustor's belief regarding the environmental structure (i.e., institutional trust) (e.g., McKnight et al., 1998; 2001; Gefen et al., 2003; Pavlou, 2002), the calculative process of the cost and/or rewards from the relationship (e.g., Williamson, 1993), and the trustor's evaluation and interpretation of the trustee's ability to fulfill its promise or concerns about the trustor (e.g., Coulter & Coulter, 2002; Doney & Canon, 1997).

Different theoretical models have been proposed and tested regarding initial trust formation by examining the trustor's disposition to trust, trust in the system, or the whole industry in which the trustee is involved (i.e., institution-based trust), and other cognitive processes that affect the formation of trust (e.g., Gefen et al., 2003; McKnight et al., 1998; McKnight et al., 2002). For example, McKnight and his colleagues (2002) proposed a trust-building model and examined the factors that influence trusting beliefs in a web vendor and trusting intention (i.e., willingness to depend on the web vendor) in the context of e-commerce. They found that the belief that the web business had the

ability to facilitate business transactions in a safe and secure manner (i.e., institutional trust) had positive influences on trusting intention and trusting beliefs. In addition, perceived vendor reputation and perceived site quality as a trust cue positively influenced trusting intention and trusting beliefs.

Gefen et al. (2003) also proposed a model and examined different antecedents of trust in a web vendor. The results revealed that (1) the trustor's calculation that the web vendor would not gain anything from being dishonest (i.e., calculative-based beliefs); (2) the belief that the website took steps to make sure that the interaction would happen safely (i.e., institution-based beliefs); and (3) an easy-to-use interface increased the level of trust in the web vendor.

Slightly different from these studies, Doney and Canon (1997) focused more on the cognitive processes in trust-building in the context of a buyer-seller relationship. By reviewing the previous trust literature, they proposed that trust could be developed in five different cognitive processes: (1) the trustor's calculation of the costs and rewards of the trustee's untrustworthy actions; (2) the trustor's confidence in predicting the trustee's behaviors; (3) the trustor's evaluation of the trustee's ability to fulfill its promises and (4) motivations; and (5) the trustor's identification of trusted sources associated with the trustee. Based on this theoretical model, they suggested several factors invoking each cognitive process.

Regarding the trustor's evaluation of the trustee's ability to fulfill its promises and motivations in particular, Doney and Cannon (1997), based on a survey with the buyer, found that the seller's expertise (which was related to the seller's ability) had a positive influence on the buyer's trust in the seller. In addition, the seller's likability and similarity

with the buyer (which were related to the relationship between the buyer and the seller) affected the buyer's evaluation regarding the trust of the seller.

Similarly, from a survey with small business owners on their trust in health insurance providers, Coulter and Coulter (2002) also discovered that such features of an organization as customization, empathy, similarity, competence, reliability, promptness, and politeness had positive influences on respondents' trust in health insurance providers. These studies suggest that the trustor's perception of the trustee's characteristics and its behaviors as consistently significant influences on trust.

Taken together, the previous research on the influencing factors of trust reveals several different antecedents of trust, including the trustor's calculation (e.g., Gefen et al., 2003), perceived reputation of the trustee (e.g., McKnight et al., 2002), evaluation of the trustee's ability or concerns about the trustor (e.g., Coulter & Coulter, 2002; Doney & Canon, 1997), and perceptions of the web interface (e.g., Gefen et al., 2003; McKnight et al., 2002). Among these different antecedents, the most relevant to the current study is the trustor's evaluations of the trustee's ability to fulfill its promises and motivations with respect to caring for the trustor (e.g., Coulter & Coulter, 2002; Doney & Canon, 1997), since this study examines the influences of news organizations' specific reporting practices, which could potentially affect audiences' evaluation of the news organizations' ability and intention to care for these audiences.

Trust has been used to examine all kinds of relationships between the trustor and the trustee in various contexts, ranging from business transactions (e.g., Gefen et al., 2003), to organizational relationships (e.g., McKnight et al., 1998), and to interpersonal communication on social media (e.g., Cheng, Fu, & de Vreede, 2017). The relationship

between a news organization (i.e., the trustee) and its audience (i.e., the trustor) can also be analyzed within the theoretical framework of trust. While some research has examined audience trust in the news media in general, research on audience trust in individual news organizations and influencing factors is lacking. The following subsection briefly reviews the research on trust in the news media.

### **Research on Trust in the News Media**

Trust in the news media has been regarded as an important factor necessary for the proper functioning of the democratic process (Bennett, Rhine, Flickinger, & Bennett, 1999). While media credibility has been frequently examined (e.g., Johnson & Kaye, 2004; Kiouisis, 2001; Stroud & Lee, 2013) and some journalism and communication scholars have used the terms of “credibility” and “trust” interchangeably (e.g., Kiouisis, 2001), there has been very limited research on trust in the news media (Engelke, Hase, & Winterlin, 2019; Kohring & Matthes, 2007). Thus, while some previous research in the journalism field provides meaningful insight regarding trust in the news media in general, the conceptualization and operationalization of trust in prior research is not as systematic as those developed in other disciplines, such as marketing, management, and sociology (Engelke et al., 2019).

Having said that, a small number of communication scholars in recent years have attempted to conceptualize and operationalize trust in the news media (e.g., Engelke et al., 2019; Hanitzsch, van Dalen, & Steindl, 2018; Kohring & Matthes, 2007). For example, Kohring and Matthes (2007) conceptualized trust in the news media as audience trust in journalists’ selectivity of news reporting in terms of choosing issues, personalities, and events. Since journalists selectively choose some types of information

over others, they argued that audiences take a risk by relying on information selected by news organizations. They developed and validated a multi-dimensional scale for the assessment of trust in the news media and suggested “trust in the selectivity of topics,” “trust in the selectivity of facts,” “trust in the accuracy of depictions,” and “trust in journalistic assessment” as the dimensions of trust in the news media.

Hanitzsch et al. (2018) defined trust in the news media at the system level as “the willingness of the audience to be vulnerable to news content based on the expectation that the media will perform in a satisfactory manner” (p. 5). By analyzing data from the World Values Survey (WVS) and the European Values Study (EVS) from 1981 to 2014, they examined the individual and societal levels of factors that affect audience trust in news across different countries. They found that a decrease in trust was strongest in the U.S. compared to other countries, and that trust in political institutions was a key factor that influenced trust in the news media. Furthermore, the relationship between trust in political institutions and news media appeared to become stronger over time.

While a small number of studies have examined audience trust in the news media in general, given a lack of research on audience trust in individual news organizations in the journalism field, the current study’s conceptual framework is guided by useful and applicable insights from the relevant trust research literature of other fields.

Methodologically, this study is guided by and built on computational trust research, which is reviewed in the next section.

### **3. Literature Review on Computational Trust**

#### **Computational Trust**

In the social science fields, trust has been examined through individuals' self-reported measurement data collected using questionnaires. Scholars have developed and validated various trust measures that reflect the complex and multidimensional nature of the trust concept in different contexts (McKnight et al., 2002). While this approach has aptly served the purpose of measuring individuals' trust in a specific object/entity/person, it has limitations in examining trust with respect to a large number of individuals in a large number of entities all at once. The computational trust research approach provides an excellent alternative methodological approach for such situations.

The computational trust research approach applies the concept of trust developed in the social science field to examine trust in computer-mediated relationships between human actors (Roy, Huh, Pfeuffer, & Srivastava, 2017a) or other entities. It relies on certain representations or proxies of trust based on diverse trust definitions (Liu, Datta, & Lim, 2015). Computational trust researchers have taken several different approaches to examine the distinct aspects of trust (Sabater & Sierra, 2005).

The first study examining trust from a computational perspective was Marsh (1994). In his Ph.D. thesis, Marsh (1994) proposed a computational trust model reflecting three different aspects of trust by analyzing the interactions of agents: basic trust, general trust, and situational trust. Basic trust represents an agent's disposition to trust and is calculated from all of the accumulated direct experiences that the agent has had. General trust indicates the agent's general trust toward the other agent, without considering any specific situation. Situational trust represents the agent's trust in the other agent with

respect to a specific situation. Situational trust is calculated on the basis of general trust, the importance of the situation, and the utility that the agent would derive from the situation. Since this work, several different computational trust models have been proposed in the computer science field (e.g., Abdul-Rahman & Hailes, 1997; Roy, 2015; Schillo, Funk, & Rovatsos, 2000; Yu & Singh, 2002).

Sabater and Sierra (2005) categorized computational trust research approaches into four groups. The first group of research relies on observing an agent's direct interactions with other members of a community in order to compute trust values. The second group of research relies on the information and opinions obtained from other members of a community who have interacted with the target agent in question. The third group of research calculates trust based on the social relations or network of an agent. The fourth approach to trust computation relies on community members' stereotypes regarding the group to which the target agent belongs. This approach is used especially when no other available information about the target agent is available. In this approach, one's stereotype would be formed by aggregating his or her previous experience with other members of the same corresponding group. The most relevant approach to the trust computing algorithm that the current study uses is the third approach, which takes the social network-based approach to calculate the trust scores of each actor or node within a social network. This approach analyzes the structure of a social network that comprises the links among different actors.

By definition, trust is dyadic in nature, since trust is formed based on the relationship or interactions between two parties – the trustor and the trustee. Thus, examining the formation of trust should be conducted from a dyadic perspective (Roy,

2015). However, in order to calculate and compare the trust scores of multiple agents in a social network, trust values should be calculated from a global or network perspective.

The trust score in a social network is defined as “a single or a set of scores that is assigned to each actor in the network representing his/her level of trust in the network” (Roy, Singhal, & Srivstava, 2017b, p. 4). Social network-based computational trust approaches have been applied to examine trust among actors in the Massively Multiplayer Online Games (MMOGs) network (e.g., Roy, 2015), peer-to-peer file sharing networks (e.g., Kamvar, Schlosser, & Garcia-Molina, 2003), e-commerce (e.g., Yu & Singh, 2002), and social media users’ behaviors (e.g., Adali et al., 2010; Roy et al., 2017a).

The advantage of computational trust research using social network data involves the ability to calculate the trust values of actors by collecting and analyzing the activities of a massive number of actors at the same time. (Roy et al., 2017a). In addition, this approach could help address the self-report bias that is common in the self-report measurement approach because it is based on individuals’ actual behaviors. However, there are also limitations in this approach. Most importantly, trust is an abstract concept, which cannot be directly observed, captured, or quantified. In order to resolve this issue, computational trust scholars rely on a proxy measure to represent some specific properties of trust that could be simplified and captured algorithmically (Adali et al., 2010). Peer-to-peer file-sharing activities, following, direct messaging, and sharing information on social media could be examples of such proxy measures. Thus, computational trust research is constrained by the availability of data that can be used to compute trust proxy measures.

Within the framework of the social network approach to computational trust, the basic research approach to compute a trust score for each actor in a social network is an iterative matrix algorithm (Roy et al., 2017a). The iterative matrix algorithm mathematically calculates the trust score of each actor in a network and updates the scores for every iteration (Roy et al., 2017a). The next subsection briefly reviews the following computational trust algorithms for calculating trust scores using iterative algorithms: PageRank (Page, Brin, Motwani, & Winograd, 1999), HITS (Kleinberg, 1999), EigenTrust (Kamvar et al., 2003), and the Bias-Deserve algorithm (Mishra & Bhattacharya, 2011).

### **Previous Research on Computational Trust Algorithms**

These iterative algorithmic approaches were advanced based on the development of graph theoretical models in the late 1990s, represented by PageRank (Page et al., 1999) and HITS (Kleinberg, 1999) in the context of web searches in order to rate each website's or webpage's trustworthiness (sometimes such terms as "prestige" and "reputation" were used) (Roy et al., 2017a). Specifically, PageRank is widely used by Google search to compute each webpage's reputation for search results. The algorithm measures the relative importance of all webpages, based on the structure of the hyperlinks between webpages. In PageRank, the prestige (i.e., reputation) of the page  $p$  is calculated based on the number and quality of incoming hyperlinks that page  $p$  has. The quality of incoming hyperlinks is based on the prestige of other pages that point to page  $p$ . Since the prestige of the pages influence and is influenced by other pages' prestige, the links of the webpages in this algorithm are based on a mutually reinforcing relationship.

The HITS algorithm was also developed to identify relevant and authoritative webpages for web searches (Kleinberg, 1999). HITS first creates a network of webpages relevant to the search topic and calculates two complementary measures, the “hubs” and “authority” scores, for all pages in the network. A webpage becomes an authoritative page on the given topic if it provides good information, and it becomes a hub page if it is linked to high-authority pages (Miller, Rae, & Schaefer, 2001). All pages in the network receive the same score at the beginning. Then, in each iteration to calculate the hubs and authority scores, the hub scores of a webpage are updated, based on the authority scores of all other pages connected to the webpage, and vice versa. Thus, the relationship between the authority and hub scores is a mutually reinforcing relationship.

Later researchers (Asano, Tezuka, & Nishizeki, 2007; Fernandez-Luque, Karlsen, & Melton, 2011) applied and modified HITS to calculate trust scores in various contexts. For example, Asano et al. (2007) proposed a modified trust-score algorithm to identify web spam by allocating different trust scores to every webpage. These trust scores are calculated based on whether the pages are trusted by a number of reliable sources or not. Another example is HealthTrust (Fernandez-Luque et al., 2011). HealthTrust aims to rate the trustworthiness of YouTube channels related to a specific topic and ranks them, based on authoritative scores calculated by the HITS algorithm.

In the context of a peer-to-peer file-sharing network, Kamvar et al. (2003) proposed the EigenTrust model, which calculates a trust score for each actor in a peer-to-peer file-sharing network. The calculation process is based on feedback from other actors regarding the quality of content that an actor has shared with them. These trust scores

calculated by EigenTrust help peer-to-peer file-sharing users identify whom they should trust for downloading content.

As another iterative matrix algorithm approach, Mishra and Bhattacharya (2011) proposed the Bias-Deserve algorithm, which does not consider all of the incoming links as positive, unlike the PageRank and HITS approaches, which give high rank scores to pages with higher numbers of incoming links from other pages. The Bias-Deserve algorithm approach calculates the “deserve” and “bias” scores of each actor in a social network. The bias score shows the actor’s propensity to trust the other actors connected with the actor, and the deserve score indicates the “true” trustworthiness score that the actor deserves. The deserve score is calculated based on the quality of incoming links, and not on the quantity of links that the actor has in a network. The same iteration process as HITS is conducted to compute the bias and deserve scores of every actor in the network. Specifically, the bias score of an actor is dependent on the deserve scores of other actors surrounding the actor, and vice versa. Thus, the two scores mutually reinforce each other.

In the Bias-Deserve algorithm, it is important to note that the links from a biased actor to other actors in a network has less weight, compared to unbiased actors. That is, if an actor in a network trusts (or has a link that points to) a less deserving actor, its opinion about the other actor’s trustworthiness is regarded as less reliable. In addition, an actor receiving incoming links from highly biased actors in a network has a lower deserve value, compared to the actor having incoming links from less biased actors. This work has made a significant contribution to the trust algorithm field, in that the Bias-Deserve algorithm considers the propensity of a node to trust other nodes in a network (i.e., the

bias score). However, since it does not capture the quantity of links along with the quality, it has a limitation in that it fails to analyze the whole network structure.

The previously proposed iterative matrix algorithms in the computational trust research field contribute to advancing these trust models' ability to compute complementary scores to measure an actor's prestige and/or propensity to trust others in a network. However, the previous algorithms fail to identify the situation when an actor's propensity to trust others and its trustworthiness negatively reinforce each other.

Reflecting and building on the previous computational trust algorithms, Roy (2015) developed the Trust Score in Social Media (TSM) algorithm, which captures the negative feedback/reinforcement property of trust. In the TSM algorithm, when a node has a high propensity to trust other nodes in a network, its vote has a lower weight than a node who selectively trust others. By considering both the quantity and quality of links in a network and capturing the negative feedback in the trust computation, this approach provides a more precise computation of trust within a social network, compared to previous algorithms (Roy et al., 2017a). Thus, the current study applies this TSM algorithm to measure a large number of news organizations' trust scores. A detailed explanation of the TSM algorithm is presented in the Method Chapter.

## **4. Literature Review on Audience Engagement with the News**

### **Definition of Audience Engagement**

The definition of audience engagement with the news (or news engagement) is based on the general conceptualization of online user engagement and is developed in the Human Computer Interaction (HCI) field. HCI scholars have broadly defined this concept in order to apply it to examine online users' diverse experiences with digital content and systems. Specifically, Attfield et al. (2011) defined user engagement as the cognitive, emotional, and behavioral connections between a user and a resource (e.g., digital system or content) at any point in time, and possibly over time. O'Brien and Toms (2008) conceptualized user engagement as "a quality of user experiences with technology that is characterized by challenge, aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control and time, awareness, motivation, interest, and affect" (p. 949), which also includes the cognitive, emotional, and behavioral aspects of the experiences that users have with digital content, design, and interactive applications.

Being apparent in these definitions, user engagement has both psychological and behavioral dimensions. In the media consumption context, the psychological dimension refers to how individuals are attentive to and cognitively or emotionally involved in media content (e.g., Busselle & Bilandzic, 2008; O'Brien, 2017; O'Brien & Toms, 2008; O'Brien & Toms, 2010), while behavioral engagement includes physical interactions with media content (e.g., zooming in/out) and digital outreach (i.e., sharing content with other individuals, liking, or commenting) (e.g., Lagun & Lalmas, 2016; Oh, Bellur, & Sundar, 2018).

Based on this conceptualization approach, HCI and media studies scholars have broadly defined audience engagement with the news as a number of different types of experiences that audiences have with news content, including audience attention to news; affective reactions to news; gaze behaviors; reading news; seeking news from diverse sources; liking, commenting on, and redistributing news in online and social media environments; and participating in news production (e.g., Arapakis et al., 2014; Ha et al., 2018; Lagun & Lalmas, 2016; O'Brien, 2017; O'Brien & McKay, 2016; Oh et al., 2018; Ørmen, 2015). Depending on the research purpose, different studies have focused on different aspects of news engagement.

With respect to the behavioral aspect of news engagement on social media, which is the main focus of the current study, the most common type of news engagement behavior is clicking on links to news stories, followed by liking news stories, sharing or redistributing news stories, and commenting on news stories (Mitchell, Gottfried, Barthel, & Shearer, 2016). Liking, redistributing, and commenting on news stories on social media are less common than clicking on news links on social media, since such behaviors tend to require more effort for the user than simply clicking on links (Chung, 2008; Larsson, 2018). Still, these three types of engagement behaviors are considered important for news organizations and journalism researchers, since they provide an opportunity for journalists and news organizations to obtain audience feedback on news and interact with audiences by giving them an indirect opportunity to participate in the journalistic process (e.g., Hille & Bakker, 2014; Robinson, 2015).

### **Prior Research on Audience Engagement with News**

With the advent of social media platforms such as Twitter or Facebook, social media have become an important channel for individuals to obtain news (Shearer & Gottfried, 2017). Approximately 68 percent of adults in the U.S. obtained their news on social media in 2018, and approximately 70 percent of Facebook and Twitter users were exposed to news on the platform (Matsa & Shearer, 2018). More importantly, users of social media not only read and view news stories, but also monitor, check, like, recommend, comment on, and redistribute news (e.g., Hermida, Fletcher, Korell, & Logan, 2012).

Therefore, there is an increasing need for news organizations to understand their audiences on social media. According to a recent report from the Reuters Institute for the Study of Journalism (Cornia et al., 2018), commercial news organizations in Europe regard social media as a crucial platform for their digital strategy to drive traffic, increase the visibility of their news, and reach new groups of audiences. For this reason, audience engagement has become the buzzword in contemporary newsrooms (Nelson, 2018a).

Audience engagement has been studied from two different perspectives in the journalism field. First, from the journalists' or news organizations' perspectives, studies focusing on the news production and sociology of news have examined newsroom practices by journalists and news organizations aiming to achieve audience engagement as an important goal (e.g., Belair-Gagnon, Nelson, & Lewis, 2019; Holton, Lewis, & Coddington, 2016; Lawrence, Radcliffe, & Schmidt, 2018; Nelson, 2018b). In addition, there has been a growing body of research on how news organizations use audience engagement metrics (e.g., the most viewed or liked news articles) in their news

production, including news selection and news reporting processes (e.g., Lee, Lewis, & Powers, 2014; Wendelin, Engelmann, & Neubarth, 2017; Vu, 2014; Welbers et al., 2016).

Second, from the audience perspective, research on audience engagement or news engagement takes the Human-Computer Interaction (HCI) research approach for examining user engagement (e.g., Oh et al., 2018). A majority of studies in this line of research have examined factors influencing audiences' engagement with news in online and social media environments, including audiences' media habits, motivations, and characteristics of news articles (Bright, 2016; Choi, 2016a; 2016b; García-Perdomo, Salaverría, Kilgo, & Harlow, 2018; Kalogeropoulos, Negredo, Picone, & Nielsen, 2017; Karnowski, Leonhard, & Kümpel, 2018; Khuntia, Sun, & Yim, 2016; Kilgo, Lough, & Riedl, 2017; Ksiazek, Peer, & Lessard, 2016; Lee & Ma, 2012; Ma, Lee, Goh, 2011; Picone, De Wolf, & Robijt, 2016; Rudat & Buder, 2015; Trilling, Tolochko, & Burscher, 2017; Valenzuela, Piña, & Ramírez, 2017; Weeks & Holbert, 2013).

Previous studies have identified three types of key influencing factors of audience behavioral engagement with news on social media: (1) the audience's media use habits and news consumption (Choi, 2016a; 2016b; Kalogeropoulos et al., 2017; Weeks & Holbert, 2013); (2) audience motivations for engaging with news (Choi, 2016a; Karnowski et al., 2018; Lee & Ma, 2012; Ma et al., 2011; Picone et al., 2016); and (3) news content factors (Bright, 2016; García-Perdomo et al., 2018; Khuntia et al., 2016; Kilgo et al., 2017; Ksiazek et al., 2016; Rudat & Buder, 2015; Trilling et al., 2017; Valenzuela et al., 2017). Although the third line of research is more extensive than the other two, research on news engagement on social media is still relatively new and

limited in both quantity and scope. Most of the prior research on factors influencing audience engagement with the news has been conducted in an exploratory manner.

In the first line of research, a few studies have explored the influence of audiences' media use habits and news consumption on news engagement behaviors on social media (Choi, 2016a; 2016b; Kalogeropoulos et al., 2017; Weeks & Holbert, 2013). The research findings indicated that the extent of obtaining and reading news online (Choi, 2016a; 2016b; Kalogeropoulos et al., 2017; Weeks & Holbert, 2013) and from social media platforms (Choi 2016b; Weeks & Holbert, 2013) was positively related to the audiences' news engagement behaviors. In addition, the extent of obtaining news from traditional media (e.g., print outlets, TV, talk radio) was also positively related to audience engagement with the news (Choi, 2016a; Kalogeropoulos et al., 2017; Weeks & Holbert, 2013). The amount of time spent using social media or receiving news from news organizations and the journalists or public figures they follow on social media also had positive relationships with audiences' behavioral engagement with the news on social media (Choi, 2016b; Weeks & Holbert, 2013).

The second line of research has demonstrated that audience motivations for engaging with news tend to predict their behavioral engagement with the news (e.g., Choi, 2016a; Karnowski et al., 2018; Lee & Ma, 2012; Ma et al., 2011; Picone et al., 2016). The research findings include the following motivation types as significant influences on news engagement: motivation for building and maintaining good relationships with other users (Lee & Ma, 2012; Ma et al., 2011; Picone et al., 2016), motivation for obtaining relevant and timely information (Choi, 2016a; Lee & Ma, 2012; Ma et al., 2011), motivation for exchanging their views and thoughts with other users

(Choi, 2016a; Ma et al., 2011), and motivation for gaining status or making a good impression (Lee & Ma, 2012; Ma et al., 2011).

In the third line of research, several studies have examined various news content factors, including (1) news values (García-Perdomo et al., 2018; Rudat & Buder, 2015; Trilling et al., 2017; Valenzuela et al., 2017); (2) news topics (García-Perdomo et al., 2018; Valenzuela et al., 2017); and (3) content features reflecting news organizations' strategies for reporting news (Bright, 2016; Khuntia et al., 2016; Valenzuela et al., 2017). While a few studies have used experiments (e.g., Rudat & Buder, 2015), the majority of previous studies have conducted content analyses to identify the characteristics of news content and have measured audience engagement metrics using the number of likes or shares to examine the influence of content factors on audience engagement on social media. In terms of the news engagement behavior type, most previous studies have focused on examining the influence of news content characteristics on audiences' news liking and sharing activities.

With respect to news values, different types of news values that have been explored include: timeliness, proximity, prominence, personalization, conflict and controversy, unexpectedness, impact, and human interest (García-Perdomo et al., 2018; Rudat & Buder, 2015; Trilling et al., 2017; Valenzuela et al., 2017). The research findings showed that news articles with the values of conflict and controversy (García-Perdomo et al., 2018; Trilling et al., 2017; Rudat & Buder, 2015), human interest (García-Perdomo et al., 2018; Trilling et al., 2017), geological distance, cultural distance, positivity, and negativity (Trilling et al., 2017) were more likely to attract audience engagement on social media, compared to news articles without these values. In contrast,

the existence of the timeliness value in news articles tended to be related to a decrease in the number of shares on Facebook (García-Perdomo et al., 2018). The value of proximity was found to significantly predict audiences' news engagement in one study (Trilling et al., 2016), but not in another (García-Perdomo et al., 2018). With respect to news topics, one study found that the audience tended to engage with news articles about space, science, technology (Bright, 2016), while another found that entertainment, life/society, and strange and funny topics were likely generate more news engagement (García-Perdomo et al., 2018).

Another type of news content factor is linked to news organizations' strategies to report and publish the news. Specifically, studies have found that the existence of embedded audio or images (Bright, 2016; Khuntia et al., 2016; Valenzuela et al., 2017) and social media quotes in news articles (Valenzuela et al., 2017) tended to increase audience engagement with news on social media. In addition, the use of a subjective and sentimentally polarized headline (Khuntia et al., 2016) and the time duration for which a news article stayed on the front page (Bright, 2016) were found to be positively related to the audiences' new engagement on social media.

While research is growing in regard to different factors influencing audience news engagement, compared to accumulated research on how news organizations apply different digital strategies and practices to engage audiences from the perspective of news production (e.g., Belair-Gagnon et al., 2019; Cornia et al., 2018; Lawrence et al., 2018; Nelson, 2018b), empirical testing regarding the effects of such strategies has been scarce. As one type of news organizations' strategies that would likely affect news content, and thus, audience engagement with news, the current study, therefore, examines the effect of

incorporating citizen-eyewitness images into the news by news organizations on audience trust and engagement behaviors. The next chapter will present this study's research questions and hypothesis.

## CHAPTER 3

### HYPOTHESIS AND RESEARCH QUESTIONS

Based on the literature review on citizen-eyewitness images, trust research, and audience engagement and influencing factors, this chapter proposes two research questions and one hypothesis regarding the extent to which news organizations in the U.S. incorporate citizen-eyewitness images into news, and the effects of using citizen-eyewitness images in news on audience trust in news organizations and engagement behaviors on social media.

#### **The Extent to which U.S. News Organizations Incorporate Citizen-Eyewitness Images into Their News**

Since people increasingly use smartphones to capture and share newsworthy images with others in online and social media environments, news organizations are incorporating citizen-eyewitness images in the news. Looking at the increasing number of citizen-eyewitness images in the news, previous studies on citizen-eyewitnessing and the use of citizen-eyewitness images in the news have mostly focused on how such a phenomenon has changed the process of news reporting, based on case studies (e.g., Allan, 2007; Harkin et al., 2012; Mortensen, 2013; Semati & Brookey, 2014; Robinson, 2009) and journalists' reactions to using citizen-eyewitness images in news, based on in-depth interviews (e.g., Andén-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Lewis et al., 2010; Pantti & Bakker, 2009; Pantti & Sirén, 2015; Singer, 2010; Schmieder, 2015; Wardle & Williams, 2010).

Although there has been some discussion in the newsroom about the increasing use of citizen-eyewitness images in their news (e.g., Hermida & Thurman, 2008; Pantti &

Bakker, 2009; Wardle & Williams, 2010), due to a dearth of research, it is difficult to know to what extent news organizations actually incorporate citizen-eyewitness images into their news. As reviewed in the previous chapter, only four peer-reviewed articles exist addressing the question of how much news organizations incorporate citizen-eyewitness images into their news (Greenwood & Thomas, 2015; Mast & Henegreefs, 2015; Nashmi et al., 2017; Nilsson & Wadbring, 2015).

These prior studies provide a useful snapshot of this practice by news organizations adopting citizen-eyewitness images and show large variation in the extent to which news organizations incorporate citizen-eyewitness images into their news, depending on the characteristics of the news organizations and the news topics analyzed in each study. However, the research findings cannot be generalized because they rely on very small, non-representative samples of news organizations and in the context of news coverage regarding a specific event.

Therefore, although journalism scholars are paying more attention to changes and tensions in newsrooms around the use of citizen-eyewitness images, much is unknown about the phenomenon of incorporating citizen eyewitness images into news production. No systematic research exists offering a full picture of the extent of such a practice in newsrooms, especially in the U.S. context. Thus, this study addresses the following research question:

**RQ1:** To what extent do news organizations in the U.S. incorporate citizen eyewitness images into their news content, and are there any differences across different organizations?

## **Effect of Incorporating Citizen-Eyewitness Images into the News on Audience Trust in News Organizations**

The concept of trust has been defined in a number of different ways, depending on which aspect of trust is emphasized. Based on the conceptualization approach reviewed in the previous chapter (e.g., Mayer et al., 1995; McKnight et al., 1998; Mishara, 1996; Moorman et al., 1992), this study defines trust in news organizations as the willingness of audiences to be vulnerable to relying on news content from a news organization, based on their expectations of the intention or behavior of the news organization.

As reviewed in the previous chapter, there are three different sub-dimensions of trust: ability, integrity, and benevolence dimensions. Previous studies have demonstrated that the dimension of benevolence, which indicates the trustee's efforts to embrace and respond to the trustor's needs and desires for a successful relationship (Wu et al., 2010), would be more important than the other dimensions for building and maintaining desirable relationships between the trustor and the trustee (e.g., Ganesan & Hess, 1997; Wu et al., 2010).

Prior research on the antecedents of trust has identified the trustor's evaluation of the trustee's ability to fulfill its promises and intentions of their behaviors as one of the important factors influencing trust (e.g., Coulter & Coulter, 2002; Doney & Canon, 1997). In particular, the trustee's intention to care for the trustor is likely to be related to the benevolence dimension of trust (Doney & Canon, 1997). Based on the research literature, audience trust in news organizations would likely be influenced by audiences'

evaluations of the news organizations' efforts to embrace and care for their needs and perspectives.

Some findings from prior research examining audiences' perceptions regarding the use and impact of citizen-eyewitness images in news content suggest that audience perceptions of citizen-eyewitness images or videos in the news seem to be more consistently positive than those of journalists. Audiences would likely view the incorporation of citizen-eyewitness images by news organizations as their efforts to embrace and respond to the audiences' needs and perspectives (Allan & Peters, 2015; Brown, 2015; Halfmann et al., 2018; Puustinen & Seppänen, 2011; Wahl-Jorgensen et al., 2010), which can be interpreted as the benevolence of news organizations. For instance, Allan and Peters (2015) showed that an audience believed that the incorporation of citizen-eyewitness images into the news could make news reports more real and could present alternative perspectives. More importantly, the study participants felt more connected when news reports used citizen-eyewitness images. Brown (2015) also revealed that the study participants perceived citizen-eyewitness images as intimate and authentic, and Halfmann et al. (2018) found that news reports with citizen-eyewitness videos had a positive influence on perceived presence and empathy.

As can be seen in these studies, audience members were likely to form certain perceptions regarding news organizations' intention and benevolence toward the audiences when they saw citizen-eyewitness images incorporated. In particular, perceived authenticity and appreciation of news organizations' efforts to connect with their audiences can influence audiences' beliefs about the news organizations' benevolence toward their audiences, given that the benevolence dimension of trust has been found to

be related to the trustee's motivations or intention to care about the trustor's interests (Mayer et al., 1995).

Based on research with respect to the influencing factors of trust and previous studies on audience perceptions regarding the incorporation of citizen-eyewitness images into the news by news organizations, this study predicts that the more a news organization includes citizen-eyewitness images in its news content, the more the audience would likely trust the news organization. Thus, the following hypothesis is posed:

**H1:** The extent to which a news organization includes citizen eyewitness images in its news content would have a positive influence on the level of audience trust in the news organization.

### **Effect of Incorporating Citizen-Eyewitness Images into the News on Audience Engagement on Social Media**

Audience engagement with the news is broadly defined as a number of different types of experiences that audiences have with news content, including liking, sharing or redistributing, and commenting on news stories (e.g., Ha et al., 2018; Oh et al., 2018). In terms of the behavioral aspect of news engagement on social media, which is the main focus of the current study, some limited research has examined different factors that influence audiences' behaviors of liking, redistributing, and commenting on news stories on social media (e.g., Bright, 2016; Choi, 2016b; García-Perdomo et al., 2018; Kalogeropoulos et al., 2017; Lee & Ma, 2012; Trilling et al., 2017).

Research on the influencing factors of audience engagement has explored a host of different news content factors and has identified some significant influencing

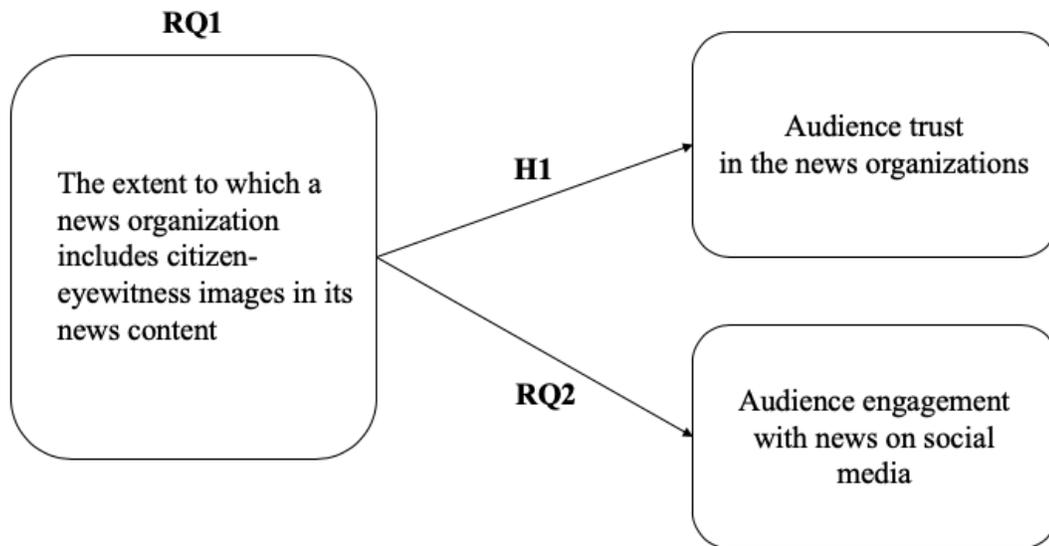
variables, including news values, particularly the values of conflict and controversy and human interest (García-Perdomo et al., 2018; Trilling et al., 2017; Rudat & Buder, 2015), news topics (Bright, 2016; García-Perdomo et al., 2018), and news organizations' strategies used to report and publish news (Bright, 2016; Khuntia et al., 2016; Valenzuela et al., 2017).

As reviewed in the previous chapter, certain news organizations' publishing strategies are reflected in news content features, such as the incorporation of audio, images, or social media quotes in news articles (Bright, 2016; Khuntia et al., 2016; Valenzuela et al., 2017), and the use of a subjective and sentimentally polarized headline (Khuntia et al., 2016), which were found to increase audience engagement with news on social media. Although these particular factors are not directly relevant to the current study's focus, a meaningful implication for the current investigation is the possibility that news organizations' news production strategies that are reflected in news content could significantly affect audience engagement behaviors.

Given that news organizations apply diverse strategies to enhance their audience engagement practices (Belair-Gagnon et al., 2019; Cornia et al., 2018; Lawrence et al., 2018; Nelson, 2018b), it is worthwhile to examine the potential influence of a news organization's practice to use or not to use citizen-eyewitness images on audience news engagement. Thus, this study addresses the following research question:

**RQ2:** What is the effect of incorporating citizen-eyewitness images into news content on audience engagement with news on social media?

Figure 1 shows a visual illustration of the research questions and hypothesis.



*Figure 1.* Hypothesized effects of the incorporation of citizen-eyewitness images on audience trust and engagement behaviors

In order to address the research questions and hypothesis, this study conducted two different computational analyses. Study 1 addresses Research Question 1 through a machine-coded content analysis examining the extent to which U.S. newspaper organizations include citizen-eyewitness images in their news content. Study 2 addresses Hypothesis 1 and Research Question 2 through a regression analysis, for which the main predictor variable is taken from Study 1’s results, and the outcome variables are computed using the TMS algorithm and news engagement computation approaches. The next chapter presents Study 1’s research method and results.

## CHAPTER 4

### STUDY ONE: MACHINE-CODED CONTENT ANALYSIS OF NEWS IMAGES

As mentioned earlier, Study 1 aimed to examine news organizations' practice of using citizen-eyewitness images in their news (RQ1). To address this question, a machine-coded content analysis was conducted to determine the relative proportion of images captured by private citizens compared to professionally-sourced images in news articles published by daily English-language newspapers in the U.S. Obtaining information on the pattern of how a large number of news organizations incorporate citizen-eyewitness images helps journalism scholars have a full picture of the extent of such practice in the U.S. newsrooms.

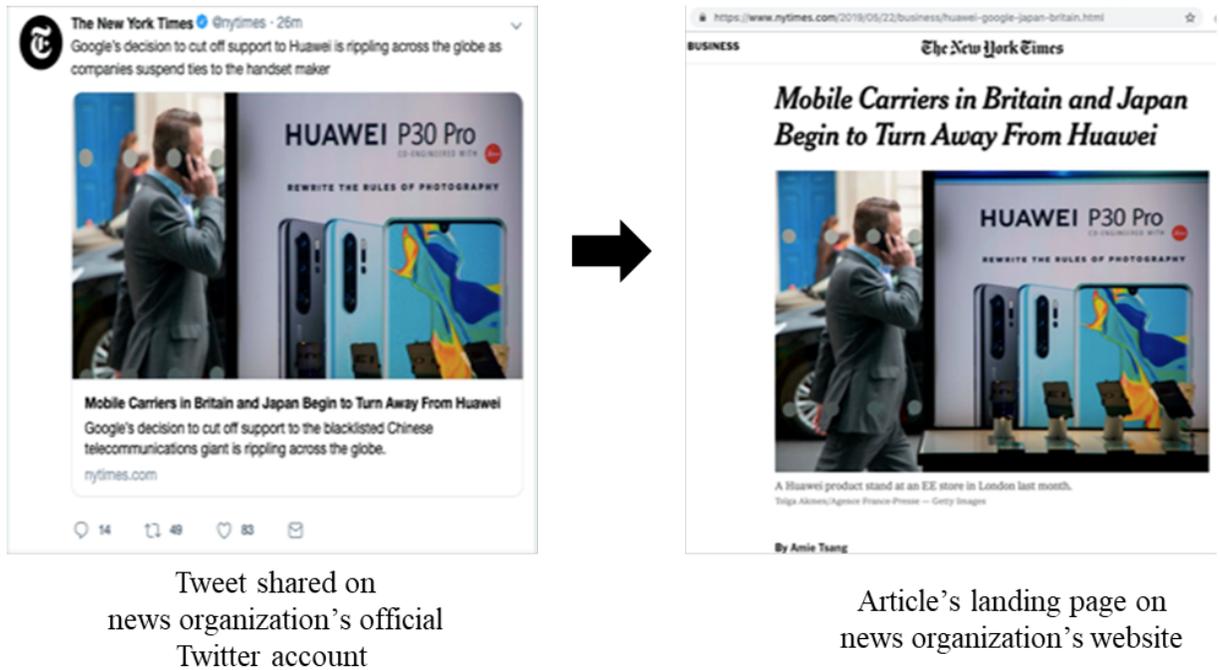
The content analysis data obtained from Study 1 are used in Study 2 as the key independent variable for testing the impact of the extent to which news organizations incorporate citizen-eyewitness images into news on audience trust in news organizations and engagement with news on social media.

#### **News Content Sampling**

While machine-coded content analysis (or computational content analysis) is regarded as a beneficial research tool for its ability to analyze a massive amount of data in an efficient, reliable, and transparent way (e.g., Zamith & Lewis, 2015), some challenges exist in capturing and analyzing the continuously changing online content (e.g., Karlsson & Sjøvaag, 2015). To overcome these challenges, previous research has suggested strategies to freeze the online content to develop an archive, including capturing a website's homepage and saving it as a PDF file or storing HTML source code of the homepage (e.g., Karlsson & Sjøvaag, 2015). However, due to various structural

issues in many news organizations' homepages, including advertisements, image and video galleries, and a list of popular news articles, it can be extremely difficult for researchers to gather, parse, and analyze data from news organizations' homepages -- especially when researchers need to analyze data from a large number of news organizations.

Thus, in order to develop a sample of news articles published by several news organizations for the machine-coded content analysis, this study used a sampling approach relying on the news content data originating from the news organizations' official Twitter accounts. Sampling was conducted by using a computer script. In the first step, the script collected all news tweets posted on selected news organizations' Twitter accounts, then gathered the news links included in the tweets to collect the news articles from the articles' landing pages on the news organizations' websites (See Figure 2.)



Tweet shared on  
news organization's official  
Twitter account

Article's landing page on  
news organization's website

*Figure 2.* Screenshots of an example tweet uploaded on a news organization's official Twitter account and the article landing page connected to the tweet

Similar to news articles posted on the homepage of news organizations' websites, not all news articles published by the organization are shared on their official Twitter account. Therefore, this sampling approach cannot claim to have captured all news articles published by the news organizations selected for this study. However, news articles shared on organizations' Twitter accounts do not frequently change like those posted to a news organizations' homepage, which is why relying on tweets as the starting point of sampling has some advantages. In addition, as Study 2 will analyze Twitter data to examine the effect of incorporating citizen-eyewitness images into news on audience trust in news organizations and engagement with news, the Twitter-based sampling approach is certainly justifiable.

The sampling process started with identifying the top 100 daily English-language newspapers of the U.S. based on weekday print circulation data from the Alliance for Audited Media (AAM) as of December 17, 2018. Then, for each of the newspapers, the automatic news article sampling process described above was performed aimed at gathering all news tweets posted on the newspaper's official Twitter account for a two-week time period (January 28 to February 10, 2019). However, due to time constraints, the sampling procedure had to be limited to the top 80 newspapers.

After all of the news tweets were gathered, content from specific news articles that were linked to the organizations' website was collected. During this process, nine more news organizations were dropped from the sample due to one of the following reasons: (1) technical issues with data collection, (2) having no stand-alone website (i.e. sharing the news website with other newspaper organizations), or (3) having too small number of news articles (less than 5 news articles during the data collection time period). As such, the sampling procedure resulted in the acquisition of news articles from 71 of the 80 daily English-language newspapers in the U.S. included in the sample frame. Appendix A provides a full list of the 71 newspaper organizations.

In total, 61,894 tweets that included links to 41,490 news articles (after removing duplicates) were included in the sample. Table 1 illustrates the number of news articles and news images collected for analysis in the content analysis.

Table 1

*Descriptive Data of the Sample*

<b>News Organizations</b>	<b>Number of Tweets Collected</b>	<b>Number of Tweets Included<sup>a</sup></b>	<b>Number of News Articles<sup>b</sup></b>	<b>Number of News Images</b>
USA Today	3,198	1,986	7,80	4,878
The Wall Street Journal	1,333	1,246	878	1,665
The New York Times	2,992	2,277	963	2,289
Los Angeles Times	1,084	775	540	875
Chicago Tribune	2,176	1,828	664	1,040
New York Post	3,159	2,972	2,755	3,184
The Washington Post	2,005	1,809	1,769	2,299
Newsday	227	206	138	272
Star Tribune	821	708	563	616
Daily News	1,161	897	787	1,020
The Denver Post	898	762	737	1,085
The Dallas Morning News	1,058	789	766	802
The Arizona Republic	1,107	677	547	1,587
Tampa Bay Times	2,356	2,146	941	1,098
Boston Globe	2,478	1,772	1,416	2,052
The Seattle Times	678	561	558	1551
The Star-Ledger	40	40	40	33
The Philadelphia Inquirer	828	814	814	1,392
amNewYork	184	179	149	339
San Francisco Chronicle	807	589	459	1,642
St. Paul Pioneer Press	635	622	552	787
Orlando Sentinel	2,102	2,004	979	1,171
The San Diego Union-Tribune	715	646	637	703
The Kansas City Star	842	474	472	558
Honolulu Star-Advertiser	763	661	605	605
The Atlanta Journal-Constitution	3,262	2,752	994	995
Detroit Free Press	1,192	737	567	2,249
Pittsburgh Post-Gazette	1,127	966	831	1,711
Hartford Courant	419	388	300	660
Express	197	121	91	191
The Mercury News	1,320	1,299	1,297	3,180
Milwaukee Journal Sentinel	592	524	466	1,909
The Virginian-Pilot	385	334	269	573
St. Louis Post-Dispatch	1,188	662	327	1,326
Chicago Sun-Times	968	712	645	1,073
The Sacramento Bee	2,568	796	345	444
Orange County Register	1,119	1,047	1,047	2,996
The Buffalo News	1,627	862	839	845
Sun-Sentinel	2,166	1,845	805	951

Arkansas Democrat Gazette	591	383	241	207
Fort Worth Star-Telegram	1,572	870	429	736
Miami Herald	868	442	389	691
The Columbus Dispatch	1,087	845	688	1,157
Las Vegas Review-Journal	1,083	966	609	2,028
The Cincinnati Enquirer	720	446	413	1,574
The Baltimore Sun	666	505	431	470
The Indianapolis Star	1,751	964	562	2,419
The News & Observer	1,080	974	381	803
The Courier-Journal	963	593	383	1,344
The Charlotte Observer	531	150	133	317
Dayton Daily News	878	703	495	411
San Antonio Express-News	296	251	251	902
The Oklahoman	150	60	30	107
Omaha World-Herald	1,714	1,240	453	2,651
Austin American-Statesman	424	330	285	539
Pittsburgh Tribune Review	3,102	2,675	685	1,252
Albuquerque Journal	417	380	380	355
Boston Herald	513	253	249	591
The Palm Beach Post	706	596	488	1,274
The Morning Call	3,132	939	279	390
The Salt Lake Tribune	786	748	633	1,216
Democrat and Chronicle	797	548	431	1,720
The Blade	213	134	118	526
The Des Moines Register	1,174	827	393	1,861
The Detroit News	1,167	579	461	1,223
The Tennessean	1,161	822	634	3,639
Knoxville News Sentinel	876	644	420	3,084
Daily Herald	605	584	583	1,253
Wisconsin State Journal	813	630	615	1,199
Deseret Morning News	1,542	1,272	563	1,756
The Spokesman Review	196	56	53	73
Total	83,351	61,894	41,490	90,414

*Note:* <sup>a</sup>: The tweets not originally uploaded by the news organizations (i.e., retweeted tweets), tweets without any news links or with broken links which did not connect users to the article landing page were excluded.

<sup>b</sup>: Since news organizations occasionally uploaded the same news article for multiple times, the duplicates of news links were removed.

## **Coding Scheme and Procedure**

To examine the degree of incorporation of citizen-eyewitness images in news by each news organization, the following four variables were coded for each unit of news articles in the sample: (1) the name of the news organization, (2) number of images included in the news article, (3) number of images taken by professional sources included in the news article, and (4) number of images taken by citizen sources included in the news article. All of these variables were measured through machine coding.

For the first variable, the news organization name for each news article was recorded. For the second variable, which assessed the number of images embedded in each news articles, two steps were executed. First, the HTML code of each article was collected, as were the specific tags included in the HTML code for inserting images into the news article (e.g. `<img src= "newsimages.gif">`). Second, the number of the image tags were counted in order to record the number of images embedded in the news article. Although there were some variations among news organization websites in how image tags were included in the HTML code, this approach worked well since all news organizations sampled for this study consistently included specific tags in the HTML code used to insert images into news articles.

To code for the number of images taken by professional and citizen sources, the first step undertaken in this study was to identify the source of each image embedded in each news article. The unit of analysis was the individual news image included in news articles. As demonstrated in Figure 3 and 4, different news organizations used different ways to identify the source of an image in the caption, but regardless of the approach, the source caption tags were clearly identifiable in the HTML code by the computational

script. In sum, the source of the news image was recorded through a series of computational scripts that were designed for each news organization based on the specific way each news organization inserted captions and sources of images into news articles into the HTML code (e.g., `<span class="pb-caption">`). Other information included in the HTML code besides the source of images (e.g., explanation or comments on the image) was excluded.

## ***James O’Keefe, Practitioner of the Sting, Has an Ally in Trump***

By KENNETH P. VOGEL DEC. 7, 2017



James O’Keefe discussed one of his undercover videos on the Hillary Clinton campaign in September 2015. Stephen Crowley/The New York Times

```
<div class="image">
  
```

Figure 3. Screenshots of parts of HTML code of news articles from *The New York Times*. For *The New York Times* the source of the image was included in a specific tag (i.e., `data-mediaviewer-credit="Stephen Crowley/The New York Times"`).



Getty, iStock, and newspapers). Through this set of keywords, approximately 8,000 source names from the news images were classified as professionals. Then, for the remaining sources that were not classified into the known professional source category, I manually checked individual source names to further identify any known professional sources and any patterns of keywords that could be used for identifying citizen sources. This procedure was repeated until I reached the point where there were no more identifiable source keywords. The final classification script included 457 keywords associated with professional sources of images (including news organizations, media channels, photo stocks, commercial photography companies, libraries, museums, non-profit organizations, business entities, government entities, academic institutions, sports teams, and so on) and 12 keywords associated with private citizens (including social media platforms and phrases indicating private citizens' photo submissions, such as "contributed" or "submitted"). Appendix B presents the final list of keywords used for the machine-coding of image sources. It is important to note that the keywords for identifying professional sources were applied first, since some of the keywords used to identify citizen-sourced images were also included in some image captions identifying professional sources (e.g., contributed by AP). In addition, words with less than four characters and potentially used within other words (e.g., AP, book) were searched with space, or []().,;:\\" to enhance accurate coding. Running the computer script with the final set of keywords classified 21,275 sources as professional sources, 532 as citizen sources, and 5486 as unclassifiable.

## Variable Computation

After finishing the coding process, the total numbers of professionally-sourced images and citizen-sourced images for each news organization were computed by counting each type of images in news articles for each news organization. Then, the degree of incorporating citizen-eyewitness images in the news for each news organization was calculated by the following formula:

The degree of incorporating citizen-eyewitness images in the news for each news organization

$$= \frac{\text{Total number of citizen-sourced images}}{\text{Total number of professionally-sourced images} + \text{Total number of citizen-sourced images}} \times 100$$

## Results

### Descriptive Statistics

Research Question 1 examined the extent to which U.S. news organizations incorporate citizen-eyewitness images into their news reports. Following the content gathering procedure described in the Method section, a total of 41,490 news articles including 90,414 images was collected from 71 newspapers' websites. On average about 2.37 ( $SD = 1.41$ ) news images were included in each news article.

Out of the 90,414 images, 6,180 did not have source identification information, and thus this study excluded these images from further analysis. After subjecting the remaining 84,234 news images to the source classification procedure described earlier, it was found that 72,974 images (86.63%) were captured by professional sources, 1,523 images (1.80%) were captured by private citizens, and 9,737 images (11.56%) were unclassifiable by the machine-coding classification approach. Table 2 presents the descriptive statistics for the type of sources of images by newspaper organizations.

Table 2

*Descriptive Statistics for the Type of Image Sources*

News Organizations	P (n)	C (n)	U (n)	N (n)	Total (n)
USA Today	4,400	40	429	9	4,878
The Wall Street Journal	1,369	5	193	98	1,665
The New York Times	1,944	2	265	78	2,289
Los Angeles Times	800	2	70	3	875
Chicago Tribune	744	11	163	122	1,040
New York Post	2,579	149	413	43	3,184
The Washington Post	2,006	34	218	41	2,299
Newsday	126	3	136	7	272
Star Tribune	486	3	95	32	616
Daily News	899	52	62	7	1,020
The Denver Post	931	0	19	135	1,085
The Dallas Morning News	582	6	136	78	802
The Arizona Republic	1,299	28	259	1	1,587
Tampa Bay Times	628	5	112	353	1,098
Boston Globe	1,682	12	187	171	2,052
The Seattle Times	1,364	2	140	45	1,551
The Star-Ledger	25	0	4	4	33
The Philadelphia Inquirer	1,055	35	191	111	1,392
amNewYork	140	4	191	4	339
San Francisco Chronicle	1,422	9	156	55	1,642
St. Paul Pioneer Press	644	8	78	57	787
Orlando Sentinel	867	20	113	171	1,171
The San Diego Union-Tribune	541	4	116	42	703
The Kansas City Star	413	13	55	77	558
Honolulu Star-Advertiser	510	1	92	2	605
The Atlanta Journal-Constitution	687	14	114	180	995
Detroit Free Press	2,042	16	185	6	2,249
Pittsburgh Post-Gazette	1,519	8	136	48	1,711
Hartford Courant	556	14	30	60	660
Express	116	3	52	20	191
The Mercury News	2,624	35	329	192	3,180
Milwaukee Journal Sentinel	1,606	65	238	0	1,909
The Virginian-Pilot	506	4	52	11	573
St. Louis Post-Dispatch	969	2	103	252	1,326
Chicago Sun-Times	834	26	138	75	1,073
The Sacramento Bee	312	23	58	51	444
Orange County Register	2,083	5	688	220	2,996

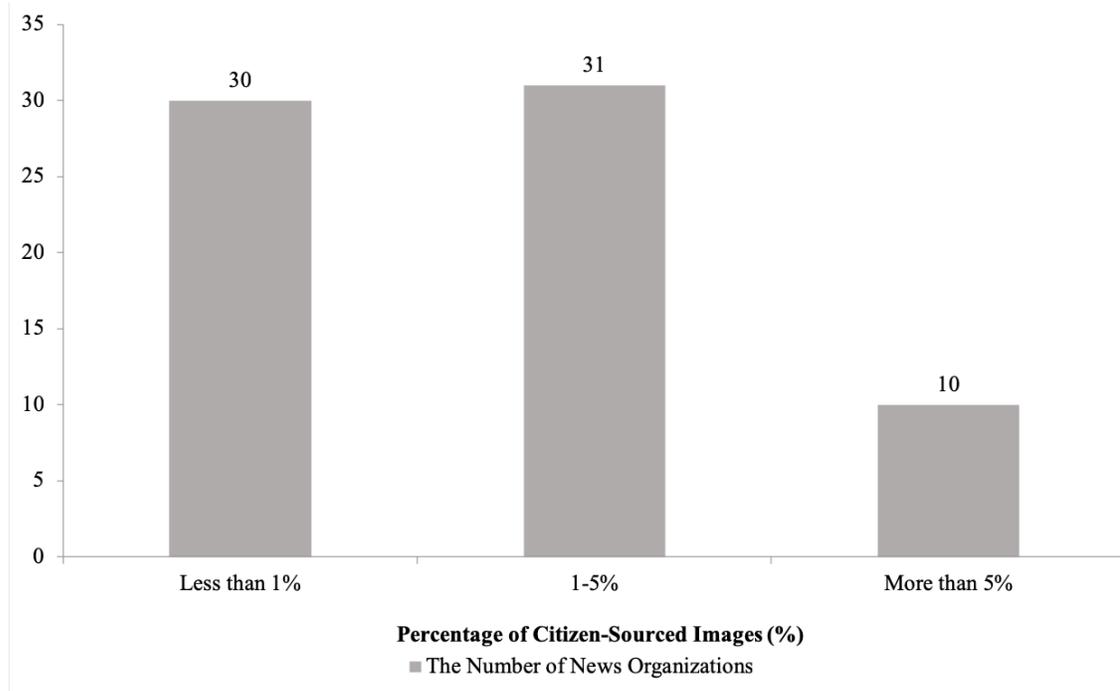
The Buffalo News	715	19	39	72	845
Sun-Sentinel	670	22	201	58	951
Arkansas Democrat Gazette	67	1	42	97	207
Fort Worth Star-Telegram	547	34	127	28	736
Miami Herald	491	18	97	85	691
The Columbus Dispatch	867	29	139	122	1,157
Las Vegas Review-Journal	1,825	24	113	66	2,028
The Cincinnati Enquirer	1,450	12	107	5	1,574
The Baltimore Sun	426	18	20	6	470
The Indianapolis Star	2,174	22	221	2	2,419
The News & Observer	547	24	120	112	803
The Courier-Journal	1,192	4	147	1	1,344
The Charlotte Observer	218	5	66	28	317
Dayton Daily News	112	9	21	269	411
San Antonio Express-News	691	2	201	8	902
The Oklahoman	76	0	9	22	107
Omaha World-Herald	1,714	13	161	763	2,651
Austin American-Statesman	364	11	40	124	539
Pittsburgh Tribune Review	477	27	62	686	1,252
Albuquerque Journal	234	2	23	96	355
Boston Herald	500	2	26	63	591
The Palm Beach Post	962	52	112	148	1,274
The Morning Call	357	19	11	3	390
The Salt Lake Tribune	932	2	149	133	1,216
Democrat and Chronicle	1,533	9	175	3	1,720
The Blade	462	3	9	52	526
The Des Moines Register	1,759	21	78	3	1,861
The Detroit News	1,080	26	116	1	1,223
The Tennessean	3,222	154	262	1	3,639
Knoxville News Sentinel	2,600	213	263	8	3,084
Daily Herald	959	2	150	142	1,253
Wisconsin State Journal	1,005	7	101	86	1,199
Deseret Morning News	1,396	48	288	24	1,756
The Spokesman Review	40	6	25	2	73
Total ( <i>n</i> )	72,974	1,523	9,737	6,180	90,414

*Note:* **P**: the number of professionally-sourced images, **C**: the number of citizen-sourced images, **U**: the number of unclassifiable images, **N**: the number of images without source credit. *n* represents the number of images captured by the categorized source.

### **Degree of Incorporating Citizen-Eyewitness Images in News**

To address Research Question 1, the relative proportion of citizen-eyewitness images in news content in comparison to professionally-sourced images was computed with the total sample used for analysis equaling 74,497 images with identifiable and classifiable sources. On average, only 2.23 percent ( $SD = 2.34$ ) of news images were citizen-eyewitness images. However, there were some variations in the degree of using citizen-eyewitness images in news reports among different newspaper organizations, ranging from 13.04 percent to 0 percent.

As shown in Figure 5, there were only 10 organizations that had more than 5 percent of their news images sourced from citizen-eyewitness images. Particularly, *The Spokesman Review* (13.4%) had the highest percentage of citizen-sourced images included in their news reports, followed by *Knoxville News Sentinel* (7.57%), *Dayton Daily News* (7.44%), *The Sacramento Bee* (6.87%), *Fort Worth Star-Telegram* (5.85%), *Daily News* (5.47%), *New York Post* (5.46%), *Pittsburgh Tribune Review* (5.36%), *The Palm Beach Post* (5.13%), and *The Morning Call* (5.05%). Thirty-one newspaper organizations had between 1 and 5 percent of their news images sourced from citizen-eyewitness images. For example, *The Baltimore Sun* (4.05%), *Miami Herald* (3.54%), *The Philadelphia Inquirer* (3.21%), *Chicago Sun-Times* (3.02%), *amNewYork* (2.78%), *Hartford Courant* (2.46%), *The Arizona Republic* (2.11%), *The Washington Post* (1.67%), *Chicago Tribune* (1.46%), and *The Indianapolis Star* (1.00%) belonged to this group.



*Figure 5.* Newspaper organizations categorized based on the percentage of citizen-sourced images in their news

Additionally, 30 newspaper organizations had less than 1 percent of their news images sourced from private citizens, including *USA Today* (0.90%), *The Virginian-Pilot* (0.78%), *Boston Globe* (0.71%), *Star Tribune* (0.60%), *The Wall Street Journal* (0.36%), *The New York Times* (0.10%), and *The Denver Post* (0.00%). Table 3 presents the percentages of citizen-eyewitness images for all 71 newspapers listed by their circulation size. See Appendix C for a graph detailing the extent to which each group of news organizations incorporated citizen eyewitness images.

Table 3

*Percentage of News Images from Citizen Sources*

News Organizations	Citizen-Sourced Images (%)	Weekday Circulation
USA Today	0.90	2,140,525
The Wall Street Journal	0.36	1,284,407
The New York Times	0.10	694,912
Los Angeles Times	0.25	477,778
Chicago Tribune	1.46	476,549
New York Post	5.46	433,606
The Washington Post	1.67	350,859
Newsday	2.33	312,158
Star Tribune	0.61	281,076
Daily News	5.47	274,816
The Denver Post	0.00	242,028
The Dallas Morning News	1.02	238,605
The Arizona Republic	2.11	237,683
Tampa Bay Times	0.79	230,473
Boston Globe	0.71	221,406
The Seattle Times	0.15	219,792
The Star-Ledger	0.00	217,023
The Philadelphia Inquirer	3.21	210,652
amNewYork	2.78	207,441
San Francisco Chronicle	0.63	181,707
St. Paul Pioneer Press	1.23	181,704
Orlando Sentinel	2.25	175,011
The San Diego Union-Tribune	0.73	169,423
The Kansas City Star	3.05	161,289
Honolulu Star-Advertiser	0.20	157,197
The Atlanta Journal-Constitution	2.00	156,848
Detroit Free Press	0.78	156,321
Pittsburgh Post-Gazette	0.52	152,712
Hartford Courant	2.46	148,325
Express	2.52	145,686
The Mercury News	1.32	145,469
Milwaukee Journal Sentinel	3.89	137,960
The Virginian-Pilot	0.78	137,171
St. Louis Post-Dispatch	0.21	137,157
Chicago Sun-Times	3.02	136,223
The Sacramento Bee	6.87	136,179
Orange County Register	0.24	132,193

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The Buffalo News	2.59	129,478
Sun-Sentinel	3.18	123,871
Arkansas Democrat Gazette	1.47	122,398
Fort Worth Star-Telegram	5.85	120,670
Miami Herald	3.54	113,957
The Columbus Dispatch	3.24	109,885
Las Vegas Review-Journal	1.30	109,523
The Cincinnati Enquirer	0.82	108,959
The Baltimore Sun	4.05	107,986
The Indianapolis Star	1.00	107,802
The News & Observer	4.20	105,258
The Courier-Journal	0.33	104,859
The Charlotte Observer	2.24	103,687
Dayton Daily News	7.44	102,882
San Antonio Express-News	0.29	101,910
The Oklahoman	0.00	100,928
Omaha World-Herald	0.75	99,161
Austin American-Statesman	2.93	98,763
Pittsburgh Tribune Review	5.36	97,281
Albuquerque Journal	0.85	89,916
Boston Herald	0.40	87,818
The Palm Beach Post	5.13	86,847
The Morning Call	5.05	82,690
The Salt Lake Tribune	0.21	81,834
Democrat and Chronicle	0.58	81,260
The Blade	0.65	81,067
The Des Moines Register	1.18	80,647
The Detroit News	2.35	80,145
The Tennessean	4.56	79,283
Knoxville News Sentinel	7.57	75,459
Daily Herald	0.21	75,207
Wisconsin State Journal	0.69	74,731
Deseret Morning News	3.32	73,122
The Spokesman Review	13.04	71,687

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In order to further examine any variations in percentage of news images from citizen sources across the 71 newspaper organizations, this study divided news organizations into different groups based on level of distribution in the U.S. (i.e., national vs. local) and the weekday circulation size (i.e., less than 100,000, between

100,000 and 1,000,000, and bigger than 1,000,000). Due to the small number of national newspaper organizations ( $n = 4$ , *The New York Times*, *The Wall Street Journal*, *USA Today*, and *The Washington Post*) and newspaper organizations with the weekday circulation higher than 1,000,000 ( $n = 2$ , *The New York Times* and *USA Today*), the results are presented descriptively and without statistically testing the difference between groups.

In terms of the type of newspaper organizations, specially between national and local newspaper organizations, national newspaper organizations tended to include less citizen-eyewitness images in their news ( $n = 4$ , 0.76%) than did local newspaper organizations ( $n = 67$ , 2.32%).

Regarding any differences across newspapers grouped based on the weekday circulation size, newspaper organizations that had less than 100,000 weekday circulation showed the highest percentage of citizen-eyewitness images in their news ( $n = 18$ , 3.05%), compared to other groups of newspaper organizations. The finding suggest that relatively smaller-size newspaper organizations, among the Top 100 newspaper organizations in the U.S., tend to include more citizen-eyewitness images in their news reports. For example, some newspaper organizations with smaller weekday circulation sizes than others showed the highest level of citizen-eyewitness image percentages: *The Spokesman Review* (13.4%) and *Knoxville News Sentinel* (7.57%).

Newspaper organizations with a weekday circulation size between 100,000 and 1,000,000 showed a slightly lower percentage of citizen-eyewitness images included in their news reports ( $n = 51$ , 2.01%) than newspapers with a weekday circulation of less than 100,000, but higher than those with circulation higher than 1,000,000. Newspaper

organizations with some of the largest weekday circulation sizes included close to zero percentage of citizen-eyewitness images in news ( $n = 2$ , 0.63%). It appears that the data pattern seems to draw a rough linear line indicating a reverse relationship between the size of newspapers and the extent to which include citizen-eyewitness images in news.

### **Summary of Findings**

Study 1 aimed to provide a full picture of the extent to which U.S. newspapers incorporate citizen-eyewitness images in news. This study was conducted using a machine-coded content analysis of sources of images embedded in news articles from 71 U.S. newspapers, and calculating the percentage of citizen-eyewitness images out of all news images with identifiable and classifiable sources. Overall, the results showed that U.S. newspapers tend to incorporate a rather small number of citizen-eyewitness images in their news reports, with the minimum percentage of 0% and maximum of 13.04%.

However, there were some variations in the degree of using citizen-eyewitness images in news reports among different groups of news organizations. National newspaper organizations showed lower percentages of citizen-eyewitness images in the news than the local newspaper organizations. Additionally, newspaper organizations with smaller weekday circulation sizes (less than 100,000) showed the highest percentages of citizen-eyewitness images in news, while the largest newspapers tended to have extremely low levels of citizen-eyewitness image percentages.

## CHAPTER 5

### STUDY TWO: TESTING EFFECTS OF CITIZEN-EYEWITNESS IMAGES

The purpose of Study 2 was to investigate the effect of incorporating citizen-eyewitness images into the news on audience trust in news organizations (H1) and audience engagement with news on social media (RQ2). Specifically, Hypothesis 1 predicted that the extent of incorporating citizen-eyewitness images in news articles would have a positive influence on the level of audience trust in news organizations. Research Question 2 posed the question of the effect of incorporating citizen-eyewitness images into news content on audience engagement with news on social media.

It is important to note that the analyses to test the effect of incorporating citizen-eyewitness images into the news were conducted at the organizational level, not at the level of individual news articles. That is, this study analyzed the relationship between the general pattern of using citizen-eyewitness images in each news organization's news publication practice and the audience's level of trust in the news organization (for Hypothesis 1). The same approach was applied to examining the influence of such practice in newsrooms on the overall pattern of audience engagement with news published by each news organization (for Research Question 2). The hypothesis and research question were examined through regression models and utilized audience data from Twitter.

There are several reasons why this project used Twitter to collect audience data for the abovementioned hypothesis and research question. First, social media has become a popular place for U.S. adults to get news (Matsa & Shearer, 2018); as well, users can actively follow news organizations and engage with news on social media by liking,

commenting, and redistributing news (e.g., Hermida et al., 2012; Meraz & Papachrissi, 2013). Taken together, data from Twitter provides researchers a way to investigate how users interact with news organizations as well as with news articles.

### **Data Collection and Variable Computation**

To test Hypothesis 1 the independent variable (the extent to which a news organization uses citizen-eyewitness images) was obtained from Study 1 data. For the dependent variable (trust in each news organization), the current study collected and analyzed user behavioral data on Twitter related to newspaper organizations to compute a proxy measure representing trust in news organizations. Trust in a news organization was operationalized as the level of trustworthiness of a news organization as perceived by members of its audience. To measure trust in news organizations, the Trust Scores in Social Media (TSM) Algorithm, originally developed by Roy (2015), was used.

To address Research Question 2, audience engagement with news on social media was operationalized as the extent to which users liked and retweeted news content published by a news organization. This variable was computed using an equation based on the number of likes and retweets of news tweets shared by each newspaper organization's Twitter account, and the number of followers.

### **Computation of Trust in News Organizations Using TSM**

By applying Trust Scores in Social Media (TSM) algorithm (Roy 2015), this study measured audience trust in individual news organizations. TSM is an iterative matrix convergence algorithm, developed within the computational trust research tradition, which was discussed in the Literature Review Chapter. The algorithm

calculates two different scores for each node in a network by analyzing the link structure of the social network, similar to HITS and Bias-Deserve algorithms (Roy, 2015).

However, TSM is different from and more advanced than the previously proposed iterative algorithms in two ways. First, TSM considers both the quality and quantity of links between actors in a network by measuring an actor's propensity to trust others in a network (i.e., trustiness) and the trustworthiness of an actor as perceived by others (i.e., trustworthiness) (Roy et al., 2017a). The trustworthiness of one actor is influenced by the trustiness of its neighbors, and vice versa (Roy, 2015).

Second, and more importantly, TSM is different from previous algorithms in terms of its ability to capture the negatively reinforced relationships between the trustworthiness and trustiness scores. Specifically, a person who has a high propensity to trust others in a social network would not contribute much to the trustworthiness of his/her neighbors, since the person's trust vote should be smaller than other actors who trust others more selectively. That is, one's high trustiness leads to a low degree of contribution to trustworthiness of his/her neighbors. In contrast, those who selectively trust others would make a higher degree of contribution to trustworthiness of their neighbors, compared to those who have high trustiness.

The negative reinforcement concept is illustrated in Figure 4. In the social network exemplified in following figure, actor E has the highest trustiness, since it trusts all actors in the network except actor A. Thus, the contribution of actor E's trust voting to other actors' trustworthiness is smaller than actors B, C, and D, which trust others in the network more selectively. In terms of trustworthiness, while actor A and actor C both have the same number of incoming links indicating trust, actor A would

have a higher trustworthiness score than actor C since it is trusted by those who have lower trustingness than those trusting actor C.

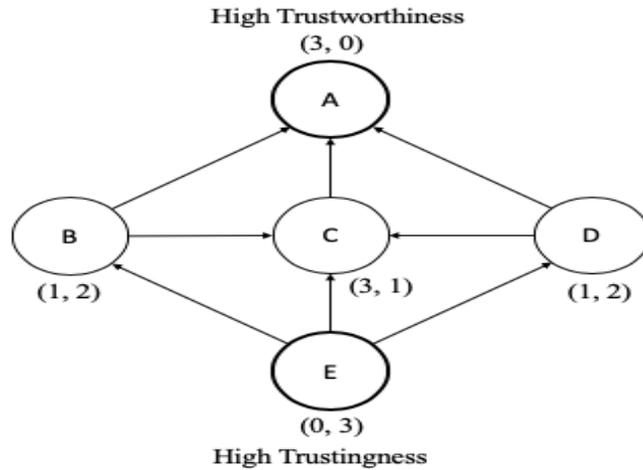


Figure 6. Illustration of Network Example Where Links Indicate Source Trusting Destination.  $(n, m)$  in the figure indicates the number of incoming links ( $n$ ) and the number of outgoing links ( $m$ ) the actor has.

The computation formulas for trustingness and trustworthiness are as follows:

$ti(v)$  corresponds to a trustingness score of actor  $v$ ,  $tw(u)$  indicates trustworthiness of actor  $u$  in a network.  $out(v)$  signifies the sets of outgoing links from  $v$  and  $in(u)$  indicates the sets of incoming links to  $u$ .  $w(v, x)$  denotes a weight of outgoing link from  $v$  to  $x$ , while  $w(x, u)$  denotes a weight of incoming link from  $x$  to  $u$ . Trustingness of an actor in a social network,  $ti(v)$  is calculated by:

$$ti_i(v) = \sum_{\forall x \in out(v)} \left( \frac{w(v,x)}{1+(tw_{i-1}(x))^s} \right)$$

Trustworthiness of an actor in a social network,  $tw(u)$  is computed by:

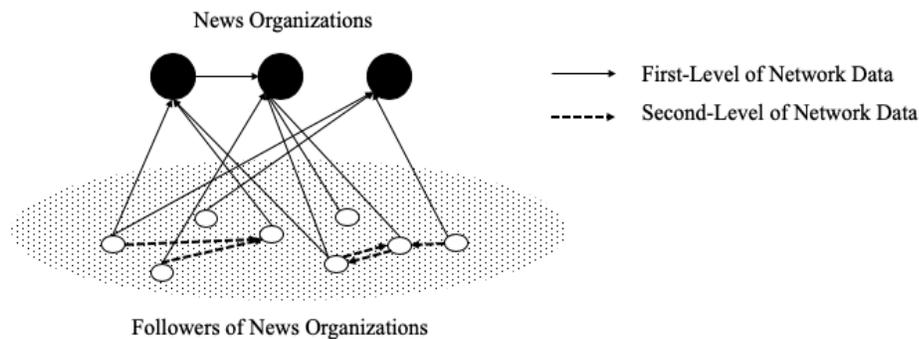
$$tw_i(u) = \sum_{\forall x \text{ in } in(u)} \left( \frac{w(x,u)}{1+(ti_{i-1}(x))^s} \right)$$

Roy et al. (2017a) offers more detailed explanation for each element of the formulas and the TSM algorithm.

For the current study, the TSM algorithm was applied to the following-follower network data for the top 40 newspapers' Twitter accounts. The 40 newspapers included in the data set originated from the list of 71 newspaper organizations used in Study 1 and were selected based on weekday circulation numbers. To ensure a robust dataset, this study focused on newspapers with the highest weekday circulation numbers. With that said, the study decided to drop one news organization—*The Wall Street Journal*. The collection of the following-follower network data of every 7.2 million Twitter users took about 24 hours, which means that gathering data for large-size news organizations with multimillion followers would make the data gathering process prohibitively slow. Given time constraints as provided by the collection process, *The Wall Street Journal* was identified for exclusion based on an examination of the variation in the usage of citizen-eyewitness images among news organizations with multimillions of Twitter followers (*The New York Times* (0.1% of citizen-eyewitness images in news), *The Washington Post* (1.67%), *USA Today* (0.90%), and *The Wall Street Journal* (0.36%)). This put the final sample at 39 news organizations.

Even after reducing the number of news organizations, it was still quite challenging to gather all the connected following-follower network data for the 39 newspapers' Twitter accounts and their followers' accounts due to extremely large

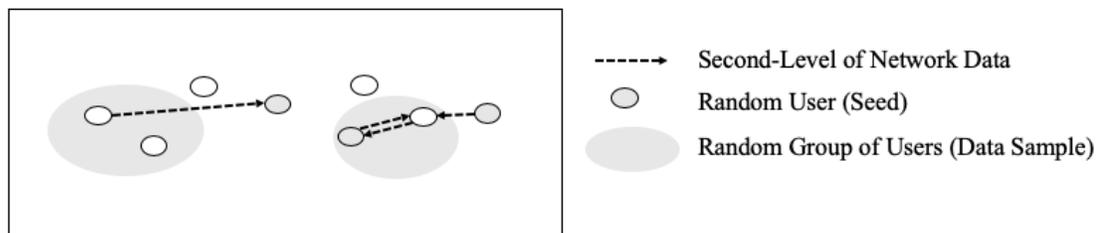
follower numbers. To address this challenge, two levels of network data collection with a snowball sampling approach was performed. As seen in Figure 7, the first-level network data included all links between the 39 news organizations and followers of the news organizations. It is important to note that a follower of a news organization can, and often does, follow other news organizations, and news organizations also occasionally follow other news organizations. These following activities were also included in the first-level network data. The first-level network data included 56,089,809 unique users (i.e., actors in a network) and 75,989,520 unique following relationships (i.e., links in a network) between news organizations and followers.



*Figure 7.* Illustration of First-Level and Second-Level of Network Data

The next step in the network data collection was the second-level network data collection, which gathers following-follower links for each of the users included in the first-level network data set. When this procedure began, it soon became clear that it would be impossible to gather every link linked to all of the users gathered in the first-level network data collection, as the first-level network data included more than 56

million unique users. To overcome this issue, a snowball sampling approach (Goodman, 1961) was applied to collect second-level network data. The snowball sampling approach started by selecting 1,000-2,000 random users (i.e., seeds) among those included in the first-level data. Then, in order to gather the following-follower links from each of the randomly-selected users to other users in the first-level network data, another sample of randomly-selected users was drawn to serve as a so-called “data sample,” in which all potential links to the seed users would be searched (see Figure 8). Then, the users included in the seed sample and those included in the data sample were integrated, and all relationships between those in the seed sample and those in the data sample were collected, which resulted in a snowball-sampled second-level network data.



*Figure 8.* Illustration of Sampling Process for the Second-Level of Network Data

#### Collection

After all of the 39 newspaper organizations’ Twitter following-follower data were obtained, preliminary examination of the data revealed that, unlike most interpersonal social networks, the news organizations’ following-follower network data were quite sparse and contained an extremely large number of followers but relatively very small number of following. In general, news organizations seldom follow their audiences, but

have a large number of followers. For example, *The New York Times* had more than 40 million followers, but followed only 880 other Twitter accounts. This data pattern posed some unique challenges because the TSM algorithm was developed and tested on network data with denser network structure and nodes with reasonably balanced incoming/outgoing links, as shown in most interpersonal networks. Therefore, slight modifications were made to the TSM algorithm to make it more applicable to the current study's network data.

To modify the TSM algorithm, this study added one more equation at the last stage of the TSM algorithm calculation. According to the conceptual principle of the TSM algorithm, for a news organization to be rated high on trustworthiness, it is crucial for it to be trusted by a large number of users who selectively trust others (i.e., low trusting) in a social network. In other words, trustworthiness of a news organization would be influenced by both the number of followers (i.e., the quantity of incoming links) and trustingness of users who follow the news organization (i.e., the quality of incoming links). Translating this principle to the current study's data, trustworthiness of a news organization is calculated by the following formula:

$$Tw_m = \sum_{i=1}^n \frac{1}{\text{trustingness of news organization } m\text{'s } i^{\text{th}} \text{ follower}}$$

where  $Tw_m$  = trustworthiness score of a news organization  $m$ , and  $n$  = the number of followers of the news organization. For example, if the trustingness of six followers of a news organization are 0.3, 0.2, 0.03, 0.5, 0.2, 0.1, respectively, trustworthiness of the news organization will be 58.66 ( $3.33 + 5 + 33.33 + 2 + 5 + 10$ ). The pseudo code for this modified TSM calculation is presented in Appendix D.

### Verification of the News Organization Trust Scores

Since the trustworthiness scores for news organizations using the TSM algorithm is a computational proxy measure for an abstract concept of trust in news organizations, whether this proxy measure is valid or not needs to be tested by comparing the TSM-based trust scores against another kind of measure for audience trust in news organizations. For this purpose, this study used the Simmons Research News Media Trust Index (Simmons, 2018), which was a part of the 2018 Simmons Omnibus Study with a sample of over 2,000 online respondents weighted to the U.S. population.

Survey respondents were presented with 38 different news sources (including TV, newspaper, and online news sources) and asked to answer “How trustworthy do you consider each of the following news sources?” on a scale from *very untrustworthy* (1) to *very trustworthy* (5). In addition, respondents were able to select the “don’t know” option. The Simmons report presented the percentage of respondents who selected either “trustworthy” or “very trustworthy” for each of the 38 news organizations (Simmons, 2018).

Among the 38 news organizations included in the Simmons Research News Media Trust Index (Simmons, 2018), six newspaper organizations overlapped with those included in this study’s selected 39 newspaper organizations. According to the Simmons Research News Media Trust Index (Simmons, 2018), 53.8% of the respondents indicated they trust *The New York Times*, followed by 53.6% indicating trust in *The Washington Post*, 51.1% trusting *USA Today*, 44.8% trusting *Chicago Tribune*, 42.9% trusting *Los Angeles Times*, and 34.0% trusting *San Francisco Chronicle*. The descriptive data from the Simmons Research News Media Trust Index were compared with the news

organization trust scores calculated by applying the TSM algorithm. The comparison results are presented in the result section.

### **Computation of Audience Engagement**

Audience engagement with news was operationalized as audiences' behaviors of liking and retweeting news articles posted on each news organization's Twitter account. Although news commenting has also been regarded as an important type of audience engagement behavior on social media, this study considered only liking and retweeting as audience behavioral engagement with news for three reasons. First, news commenting occurs less commonly than liking or retweeting (Larsson, 2018; Mitchell et al., 2016). Second, commenting requires a higher level of engagement with news than the other two types of news engagement behaviors, thus some scholars have differentiated news commenting as a distinctively different type of news engagement activity than news liking and retweeting (e.g., Choi, 2016a; Krebs & Lischka, 2017). Third, Twitter API does not allow collection of the number of comments (Hwong et al., 2017).

For each news organization's Twitter account, the number of likes and number of retweets for each news tweet (tweets that include news articles) published by the news organization were scraped between January 28 and February 10, 2019. Additionally, the total number of news tweets for the same time period and total number of followers were captured.

By adapting Hwong et al.'s (2017) engagement rate (ER) computation approach, the degree of audience engagement with news tweets posted on each news organization's Twitter account was calculated as follows:

$$\text{The degree of audience engagement with news} = \frac{2 \times \text{the total number of retweets} + 1 \times \text{the total number of likes}}{\text{The number of followers of the news organization}} \times 100$$

Following Hwong et al. (2017), this equation gives higher weight to users' retweeting activities than liking activities. However, unlike Hwong et al. (2017), which measured an engagement rate for a specific message uploaded on a Twitter account, this study computes an aggregate engagement rate for an entire organizational account. Thus, the number of followers for each news organization account was entered as the denominator dividing the sum of the weighted liking and retweeting numbers.

## Data Analysis Results

### Descriptive Data of Trustworthiness of Newspaper Organizations

Using the modified TSM algorithm described in the previous section, individual news organizations' trustworthiness scores were computed. The summary statistics are presented in Table 4. *The New York Times* had the highest trustworthiness score (18,646,916,903,961), followed by *The Washington Post* (4,089,041,592,807), *USA Today* (894,700,090,543), *Los Angeles Times* (882,052,685,936), and *Atlanta-Journal Constitution* (460,314,492,120). Among the 39 newspaper organizations, the *Express* had the lowest trustworthiness score (3,987,564,641).

The trustworthiness scores are quite large, ranging from 3,987,564,641 to 18,646,916,903,961. The large-sized scores are due to two reasons: the equation for calculating the trustworthiness scores aggregates all the reciprocal of trustingness from

each news organization's followers, and news organizations tend to have a large number of followers. The trustworthiness scores should not be understood as an indication of any absolute level of audience trust in each news organization but should be interpreted in a relative sense in comparison of one with another. While the trustworthiness score computation formula included the number of followers as an important computational element, as shown in Table 4, the news organization ranking based on the trustworthiness scores did not exactly align with the ranking based on the number of followers, which demonstrates that the computed trustworthiness score is distinctively different from the number of followers.

Table 4

*Descriptive Data of the Trustworthiness of Newspaper Organizations Computed by TSM Algorithm*

News Organizations	Trustworthiness of News Organizations	The Number of Followers
The New York Times	18,646,916,903,961	43,373,049
The Washington Post	4,089,041,592,807	13,654,643
USA Today	894,700,090,543	3,785,101
Los Angeles Times	882,052,685,936	3,369,543
The Atlanta Journal-Constitution	460,314,492,120	1,042,757
New York Post	330,290,918,127	1,445,691
Chicago Tribune	287,843,960,691	1,081,498
The Dallas Morning News	266,233,038,113	661,451
The Seattle Times	249,780,092,534	630,583
Boston Globe	237,619,868,424	741,015
Detroit Free Press	187,008,150,884	465,059
The Denver Post	166,691,926,296	435,994
The Arizona Republic	153,063,702,378	379,402
Daily News	144,720,650,642	695,096
Orlando Sentinel	120,177,644,354	308,862
Star Tribune	119,282,771,092	361,520
The Kansas City Star	115,441,939,446	282,898
Newsday	110,334,499,497	292,883
Chicago Sun-Times	108,811,665,008	496,438
The Philadelphia Inquirer	103,218,446,092	282,273
Tampa Bay Times	102,527,159,555	267,909
St. Louis Post-Dispatch	97,181,766,937	246,261
The Star-Ledger	96,187,684,760	250,252
Sun-Sentinel	91,438,992,458	262,418
The Mercury News	87,246,547,760	236,395
The Sacramento Bee	81,116,097,214	214,947
Orange County Register	76,503,452,832	210,256
The Buffalo News	62,675,072,423	158,384
The San Diego Union-Tribune	62,316,941,716	178,220
Pittsburgh Post-Gazette	60,101,424,921	162,523
Hartford Courant	59,812,216,544	159,017
San Francisco Chronicle	47,549,723,107	173,353
The Virginian-Pilot	44,263,121,886	114,930

St. Paul Pioneer Press	40,415,665,057	168,498
Arkansas Democrat Gazette	26,682,339,364	71,816
Honolulu Star-Advertiser	25,141,064,773	74,355
Milwaukee Journal Sentinel	22,273,877,813	69,732
amNewYork	11,110,948,178	63,307
Express	3,987,564,641	18,633
<i>M</i>	737,745,556,433	1,971,460.56
<i>SD</i>	3,015,912,266,005	7,163,255.88

*Note:* (1) The organizational trustworthiness of news organizations was rounded to the nearest integer, (2) The number of followers was as of May 2019, and (3) The newspapers are sorted on the basis of the trustworthiness scores.

### **Verification of the TSM-based Trustworthiness Score**

As discussed in the method section, the news organization trustworthiness scores computed using the modified TSM algorithm were compared against the Simmons Research News Media Trust Index data, which measured American adults' perceived trust of different news organizations using a self-report survey measurement approach.

The Simmons Research News Media Trust Index measured audience trust in news organizations across broadcast, print, radio, and online media, and six of the news organizations included in the survey were also included in the current study (i.e., *The New York Times*, *The Washington Post*, *USA Today*, *Chicago Tribune*, *Los Angeles Times*, and *San Francisco Chronicle*). Thus, the six news organizations' relative trust ranking was compared between the two different measurement approaches. The comparison result, presented in Table 5, showed that the rank order from the survey results and the computational results was the same for four out of the six news organizations.

Table 5

*Comparison of Organizational Trustworthiness of News Organizations with The Simmons Research News Media Trust Index Data*

News Organizations	TSM algorithm-based data	Rank	Simmons data (%)	Rank
The New York Times	18,646,916,903,961	1 (1 <sup>st</sup> out of 39)	53.8	1
The Washington Post	4,089,041,592,807	2 (2 <sup>nd</sup> out of 39)	53.6	2
USA Today	894,700,090,543	3 (3 <sup>rd</sup> out of 39)	51.1	3
Chicago Tribune	287,843,960,691	5 (7 <sup>th</sup> out of 39)	44.8	4
Los Angeles Times	882,052,685,936	4 (4 <sup>th</sup> out of 39)	42.9	5
San Francisco Chronicle	47,549,723,107	6 (32 <sup>nd</sup> out of 39)	34	6

*Note:* The Simmons Research News Media Trust Index data are percentages of the survey participants who indicated trusting each news organization. The “Rank” columns indicate the rank order of the six compared newspaper organizations according to each measurement approach.

Specifically, *The New York Times*, *The Washington Post*, *USA Today*, and *San Francisco Chronicle* were similarly ranked between the computational and self-report measurement approaches. The only discrepancy between the data coming from the two different measurement approaches was *Chicago Tribune* and *Los Angeles Times*, which switched places between the 4<sup>th</sup> and 5<sup>th</sup> position. In sum, the comparison in the rank order of the six newspaper organizations in terms of audience trust between the TSM computation and self-report measurement approaches seems to support the validity of the trustworthiness scores calculated by the TSM algorithm.

## **H1: Effects of Extent of Incorporating Citizen-Eyewitness Images into News on Trust in News Organizations**

Hypothesis 1 predicted that the more a news organization incorporates citizen-eyewitness images in the news, the more the audience would likely trust the news organization. In order to test this hypothesis, a simple linear regression analysis was conducted with the percentage of citizen-eyewitness images in the news articles as the predictor and the trustworthiness of news organizations computed by TSM as the dependent variable. Since some news organizations among the 39 newspaper organizations had an extremely high trustworthiness scores compared to other newspaper organizations (e.g., *The New York Times*), the homogeneity of variance was not satisfied for the regression analysis. After checking standardized residuals against standardized predicted values, four news organizations with trustworthiness scores higher than 800,000,000,000 (*The New York Times*, *The Washington Post*, *USA Today*, and *Los Angeles Times*) were excluded. Then, the organizational trustworthiness of news organizations was regressed on the percentage of citizen-eyewitness images in the news.

The result showed that the regression model was not significant ( $F(1, 33) = 0.05$ ,  $R^2 = 0.001$ ,  $p = .83$ ). Specifically, the extent to which a news organization includes citizen-eyewitness images in its news articles did not significantly predict the level of audience trust in the news organization ( $\beta = .04$ ,  $p = .83$ ). Thus, H1 was not supported.

### **Descriptive Data of Audience Engagement**

Table 6 presents descriptive statistics for two different types of news engagement behaviors (number of likes and retweets per news tweet), the computed news engagement score, and the total number of news tweets posted by each of the 39 news organizations

examined. The average number of tweets uploaded on each news organization's Twitter account was 1082.82 ( $SD = 785.28$ ) during the two-week data collection period. In general, the number of likes was higher than the number of retweets: on average, the 39 news organizations had 32.49 likes ( $SD = 75.94$ ) and 14.42 retweets ( $SD = 32.56$ ) per news tweet. These statistics show that liking is a more common type of news engagement behavior than retweeting. Specifically, the audience engagement scores ranged from 0.08 for *The Star-Ledger* to 45.07 for *The Virginian-Pilot*, and the mean score of audience engagement was 6.47 ( $SD = 7.80$ ).

Table 6

*Descriptive Data of the Number of Likes, Retweets, News Tweets, and Audience Engagement*

News Organizations	Average Number of Likes	Average Number of Retweets	Total Number of News Tweets	Audience Engagement Score
The Virginian-Pilot	57.45	46.79	343	45.07
San Francisco Chronicle	22.98	13.42	639	18.36
Detroit Free Press	54.06	20.59	848	17.36
Chicago Tribune	44.77	19.93	1,922	15.04
The Sacramento Bee	14.02	6.38	928	11.56
Sun-Sentinel	8.42	3.79	1,877	11.44
USA Today	97.74	37.65	2,312	10.57
Boston Globe	20.46	6.59	2,230	10.12
Daily News	32.67	16.17	984	9.20
New York Post	22.48	9.93	3,083	9.03
The Atlanta Journal-Constitution	12.42	6.92	2,942	7.41
Tampa Bay Times	4.67	1.87	2,162	6.79
The Washington Post	259.03	106.01	1,902	6.56
Chicago Sun-Times	15.49	8.95	785	5.28
Honolulu Star-Advertiser	3.12	1.16	715	5.23
Milwaukee Journal Sentinel	3.30	1.65	551	5.21
St. Louis Post-Dispatch	8.88	3.32	684	4.31

The New York Times	406.72	174.91	2,377	4.15
The Buffalo News	3.73	1.52	958	4.10
The Arizona Republic	10.74	3.59	838	3.96
Star Tribune	11.53	3.88	729	3.89
Los Angeles Times	76.99	34.97	876	3.82
Pittsburgh Post-Gazette	3.45	1.34	996	3.76
The Kansas City Star	10.37	2.75	574	3.22
Orlando Sentinel	2.48	1.18	2,014	3.16
The Seattle Times	12.78	7.40	576	2.52
The Denver Post	7.49	2.95	788	2.42
The Mercury News	1.84	1.06	1,301	2.18
The San Diego Union-Tribune	3.27	1.23	649	2.09
amNewYork	3.90	1.73	179	2.08
The Dallas Morning News	8.90	4.14	789	2.05
Express	1.35	0.49	161	2.02
St. Paul Pioneer Press	3.10	0.87	623	1.79
Orange County Register	1.72	0.87	1,051	1.73
Hartford Courant	3.52	1.65	392	1.68
The Philadelphia Inquirer	2.80	1.21	814	1.51
Arkansas Democrat Gazette	0.85	0.44	390	0.94
Newsday	4.50	2.26	208	0.64
The Star-Ledger	3.025	0.9	40	0.08
<i>M</i>	32.49	14.42	1,082.82	6.47
<i>SD</i>	75.94	32.56	785.28	7.80

*Note:* The average number of likes for each newspaper was calculated by dividing the total number of likes by the total number of news tweets posted by the news organization. The average number of retweets was calculated by the same formula.

## **RQ2: Effects of Extent of Incorporating Citizen-Eyewitness Images into News on Audience Engagement with News on Social Media**

In order to address Research Question 2, a hierarchical regression analysis was conducted with the percentage of citizen-eyewitness images in the news article as the predictor, audience engagement score as the dependent variable, and the total number of news tweets as a control variable. Similar to H1, the homogeneity of variance was

examined prior to conducting the analysis. As a result, three newspaper organizations were excluded from analysis (i.e., *The Virginian-Pilot*, *San Francisco Chronicle*, and *Detroit Free Press*), because their news engagement scores were outliers to the engagement scores observed for the other news organizations. For the regression analysis, the total number of news tweets was entered in the first block as a control variable. In the second block, the predictor variable, the extent of incorporating citizen-eyewitness images into news, was entered. The hierarchical regression result is shown in Table 7. The final regression model was significant ( $F(2, 33) = 18.126, p < .001$ ), and predicted 52% of the observed variance in audience engagement. The extent of incorporating citizen-eyewitness images into news articles by a news organization was a significant positive predictor of audience engagement with the news organization's news articles ( $\beta = .33, p = .01$ ), after controlling for the total number of news tweets posted by the news organization. The result suggests that, when a news organization includes more citizen-eyewitness images in its news articles, the audience are more likely to engage with news posted on the news organization's Twitter account.

Table 7

*Hierarchical Regression Analysis Testing the Effect of Incorporating Citizen-Eyewitness Images into News on Audience Engagement*

	Audience Engagement
	$\beta$
<b>Block 1</b>	
Total Number of News Tweets	.64***
$R^2$	.415
	$F(1, 34) = 24.13***$
<b>Block 2</b>	
Total Number of News Tweets	.62***
Percentage of Citizen-Eyewitness Images	.33*
$R^2_{\text{change}}$	.108
	$F_{\text{change}}(1, 33) = 7.51^*$

Note: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

### Summary of Findings

This study tested the effect of incorporating citizen-eyewitness images into news on audience trust in news organizations and audience engagement with news on social media. The findings demonstrated that the extent to which a news organization incorporated citizen-eyewitness images in its news articles was positively related to the level of audience engagement with the news articles posted by the organization on Twitter. Unlike what this study predicted, however, the extent of incorporating citizen-eyewitness images was not significantly related to audience trust in the news organization.

## CHAPTER 6

### GENERAL SUMMARY AND DISCUSSION

The widespread use of smartphones and social media in today's world gives individuals the opportunity to contribute to news production by capturing images or videos of newsworthy events and sharing them with others on social media or directly with news organizations. In response, news organizations have become more likely to incorporate citizen-eyewitness images into their news reports (Pantti & Bakker, 2009). This phenomenon blurs the line between professional journalists and audience members (Lewis, 2012) and, as a result, journalism scholars have paid increasing attention and investigated how citizen eyewitnessing may change news reporting (e.g., Allan, 2007; Harkin et al., 2012; Mortensen, 2013; Semati & Brookey, 2014; Robinson, 2009), as well as journalists' perceptions around the use of citizen-eyewitness images in their news (e.g., Andén-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Lewis et al., 2010; Pantti & Bakker, 2009; Pantti & Sirén, 2015; Singer, 2010; Schmieder, 2015; Wardle & Williams, 2010).

Although previous studies on citizen eyewitnessing have shed light on how newsrooms perceive the value of images captured by private citizens and how citizen-eyewitness images are used in news reports of certain events (e.g., the Boston Marathon bombings, the London bombings, Syrian conflict, and so on), there has been limited research on the extent of using citizen-eyewitness images by news organizations, audience perceptions of images captured by private citizens in the news, and the effects of the practice of using citizen-eyewitness images in newsrooms on audience perceptions and behaviors. This study's purpose is to address these underexplored questions and to

contribute to the growing research literature on the phenomenon of citizen-eyewitnessing and more broadly to the research on participatory journalism. Specifically, this study examined the current state of newsroom practice incorporating citizen-eyewitness images into the news by analyzing the news content of U.S. newspapers, and the effects of a news organization's practice of including citizen-eyewitness images in news articles on audience trust in the news organization and engagement with the news published by the news organization on social media, by applying a computational research approach.

### **Summary of Findings**

#### **The Extent to Which U.S. Newspapers Incorporate Citizen-Eyewitness Images into Their News**

A systematic machine-coded content analysis was conducted to analyze the extent to which 71 U.S. newspapers use citizen-eyewitness images (vs. professional images) in news articles for a two-week time period in 2019. The content analysis included 41,490 news articles containing 90,414 images, and the source of each image was coded automatically using a pre-determined keyword-based coding script. Then, the extent to which each newspaper incorporates citizen-eyewitness images was determined by computing the percentage of citizen-eyewitness images out of all source-identifiable and classifiable images.

The results revealed that the news articles across different newspapers contained a rather small percentage of citizen-eyewitness images, as indicated by the range of citizen-eyewitness image percentages from 0% to 13.04%. This suggests that U.S. newspaper organizations seem to incorporate citizen-eyewitness images in their news in a very limited way.

When variations in percentages of citizen-eyewitness images were examined by comparing different types of newspapers, a few interesting patterns emerged. First, national newspapers tended to have lower percentages of citizen-eyewitness images in their news articles, compared to local newspapers. Second, the newspapers that had a weekday circulation of less than 100,000 showed higher percentages of citizen-eyewitness images in their news than did the newspapers with more than 100,000 weekday circulation, while newspapers with more than 1,000,000 weekday circulation showed the lowest reliance on citizen-eyewitness images.

### **Effects of Incorporating Citizen-Eyewitness Images into the News on Audience Trust and News Engagement**

In order to examine the effects of the general pattern of using citizen-eyewitness images in each news organization's news on audience trust in the news organization and audience engagement with news on social media, this study collected and analyzed user behavioral data on Twitter related to 39 U.S. newspaper organizations. Audience trust in the news organization was measured by the TSM algorithm, which is one of the latest developments in the computational trust research field, using the Twitter following-follower network data. Audience engagement was measured based on the aggregate data of liking and retweeting by the audience of each news organization regarding all news tweets posted by the news organization for a two-week time period. Then, regression analyses were conducted to examine the relationships between the independent and dependent variables.

The results demonstrated that the extent of using citizen-eyewitness images in the news by a news organization was not found to be significantly related to audience trust in

the news organization. However, the extent of using citizen-eyewitness images by a news organization was significantly and positively related to audience engagement with news published by the news organization on social media. The results suggest that, while the extent of using citizen-eyewitness images by a news organization does not seem to have significant impact on the level of audience trust in the news organization, audience news engagement behaviors, such as liking news articles posted on the news organization's social media account and retweeting news tweets, increase when citizen-eyewitness images are incorporated in the news.

### **Discussion of Findings**

This study's findings regarding the extent of using citizen-eyewitness images in the news suggest that newspaper organizations in the U.S. are still reluctant to include images captured by private citizens in their news, and that in the largest national newspapers, such reluctance appears to be more pronounced. The findings are consistent with the previous content analysis studies showing low percentages of citizen-eyewitness images in the news in both national and local newspapers. Prior research discovered that national newspaper organizations (Nilsson & Wadbring, 2015) and local newspaper organizations dealing with local news events (Greenwood & Thomas, 2015) had less than 5 percent of citizen-eyewitness images in their news, while news content from international news organizations (Nashmi et al., 2017) or news covering an international event (Mast & Henegreefs, 2015) had relatively higher percentages of citizen-eyewitness images in the news.

Given some previous studies suggesting journalists tend to use citizen-eyewitness images more in situations where access to the news site is restricted (e.g., Syrian War)

(Andén-Papadopoulos & Pantti, 2013), there might be some systematic differences in the level of using citizen-eyewitness images between national/local news organizations and international news organizations. However, this cannot be empirically tested using the current study's data as only U.S.-based news organizations were examined.

The relatively low percentage of citizen-eyewitness images in the news seems to be connected to prior findings showing journalists' ambivalent viewpoints toward using images captured by private citizens. Although journalists acknowledge some value in citizen-eyewitness images, including immediacy, directness, intimacy, authenticity, and diversity (e.g., Anden-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Pantti & Bakker, 2009), prior research has suggested that journalists are still concerned about the risk of incorporating citizen-eyewitness images into the news and resist to share their authority to report news with private citizens (e.g., Anden-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Schmieder, 2015). The tension in newsrooms between the need to protect the professional boundary of journalists and the interest in being open to audience's participation in the news production might be the reason for the low levels of using citizen-eyewitness images. Without knowing the costs and benefits of using images captured by private citizens in the news, news organizations probably keep questioning the value of using citizen-created images in their news reports.

The variations in the percentages of citizen-eyewitness images incorporated in news articles across different types of newspapers seem to suggest that news organizations' strategies and decision-making for incorporating citizen-eyewitness images might be influenced by a variety of organizational factors, including the

circulation size and the geographical scope of newspapers (i.e., national or local news organizations).

The apparently higher interest in using citizen-eyewitness images or user-generated content among relatively smaller newspaper organizations can be explained by previous studies on political-economy factors influencing news organizations' participatory journalism strategies (e.g., Jönsson & Örnebring, 2011; Vujnovic et al., 2010). In general, user-generated content (including images captured by private citizens) has an economic value in providing free content, attracting audience attention to news, increasing traffic to news sites, reaching new members of the audience, and maintaining relationships with the audience, which could increase audience loyalty to the news organizations (Jönsson & Örnebring, 2011; Manosevitch & Tenenboim, 2017; Vujnovic et al., 2010). Particularly, Vujnovic et al. (2010), based on interviews with journalists and news editors from leading newspaper organizations in eight European countries, found that news editors and journalists, especially in smaller media markets, admitted that their management team viewed user-generated content as a cost-cutting strategy, which could potentially result in layoffs in newsrooms and outsourcing of news images. The current study's finding that local newspapers with smaller circulation sizes tend to use relatively more citizen-eyewitness images than do larger newspaper organizations seem to be in line with this account.

Regarding the effect of using citizen-eyewitness images by a news organization on audience trust in the news organization, consistent with Halfmann et al. (2018), this study found that incorporating citizen-eyewitness images in the news did not have a significant effect on audience trust in news organizations. The non-significant finding

might be explained by the possibility of audience's ambivalent reactions to citizen-eyewitness images in connection to their evaluation of the news organization using them. In previous studies, audience members believed that images captured by private citizens would show diverse perspectives and offer the value of intimacy, authenticity, and immediacy (Ahva & Hellman, 2015; Ahva & Pantti, 2014; Allan & Peters, 2015; Brown, 2015; Halfmann et al., 2018; Puustinen & Seppänen, 2011; Wahl-Jorgensen et al., 2010), which should indicate a positive effect on the benevolence dimension of trust. However, some studies also found that the audience believed professional journalists would be more skillful and have the expertise to capture quality news images (Allan & Peters, 2015; Puustinen & Seppänen, 2011), and even some limited findings suggested audience perception of journalists using citizen-eyewitness images as being lazy and unprofessional (Allan & Peters, 2015). As such, this perception would likely affect the ability dimension of trust negatively. If such conflicting views exist among the audience, positive views of citizen-eyewitness images affecting the benevolence dimension of trust in the news organization might be negated by negative views affecting the ability dimension of trust, which would result in a null result.

Regarding the effect of using citizen-eyewitness images by a news organization on audience engagement with news on social media, the level of incorporation of citizen-eyewitness images in the news was a significant positive predictor of audience engagement with news tweets posted on the news organization's Twitter account, even when controlling for the total number of news tweets by the news organization, which was also significantly related to audience's news engagement behaviors. Although there is no prior research on the effect of citizen-eyewitness images in the news on audience

engagement with news on social media, a few previous studies have shown that certain strategies for reporting and publishing news, especially embedded images and social media quotes in the news, tended to encourage the audience to engage with news posted on social media (Bright, 2016; Khuntia et al., 2016; Valenzuela et al., 2017). The current study's finding could be situated in this emerging line of research, as whether and how much to incorporate citizen-eyewitness images in news reporting is a kind of news production strategy.

Reciprocal journalism as an analytical framework in journalism studies (Lewis, Holton, & Coddington, 2014) provides relevant insight for interpreting the result. Reciprocal journalism refers to “a way of imagining how journalists might develop more mutually beneficial relationships with audiences across three forms of exchange—direct, indirect, and sustained types of reciprocity” (Lewis et al., 2014, p.1). Lewis et al. (2014) claimed that, although the concept is exploratory and rather idealistic, reciprocal journalism proposes that news organizations' engagement with their audience would increase audience engagement with the news organizations as a building block for reciprocity in the relationships between journalists and the audience.

In the context of this study, the incorporation of images captured by private citizens would likely be regarded by the audience as journalists' reciprocal response to audience's participation in the news production, which could result in developing reciprocal relationships between them. Although not everyone captures and shares citizen-eyewitness images with news organizations, it is plausible that even those who never engage in such activities would still be affected by seeing citizen-eyewitness images used in the news as a sign of reciprocal relationships between journalists and

audience, and more likely be engage with news articles published by the news organization.

### **Implications for Journalism Research and Practice**

This study provides important implications for participatory journalism, trust, and audience engagement research. Thus far, a great deal of research on citizen eyewitnessing has focused on how citizen eyewitnessing have changed news reporting (e.g., Allan, 2007; Harkin et al., 2012; Mortensen, 2013; Semati & Brookey, 2014; Robinson, 2009) and journalists' perceptions of using citizen-eyewitness images in the news (e.g., Andén-Papadopoulos & Pantti, 2013; Hermida & Thurman, 2008; Lewis et al., 2010; Pantti & Bakker, 2009; Pantti & Sirén, 2015; Singer, 2010; Schmieder, 2015; Wardle & Williams, 2010). Relatively, a systematic examination of the extent of using citizen-eyewitness images in the news and audience perception of using images captured by private citizens has been scarce. By examining how 71 U.S. newspaper organizations incorporated citizen-eyewitness image in their news content, this study fills the gap in the literature on citizen eyewitnessing and improves our understanding of how different news organizations embrace audience participation in the news production, depending on the organizations' characteristics (e.g., circulation size).

More importantly, by testing the effects of incorporating citizen-eyewitness images into the news on audience trust in news organizations and engagement with news on social media, this study expands the scope of participatory journalism and audience engagement research. Compared to the embrace of audience engagement as a journalistic goal in news organizations (Nelson, 2018a) and an increasing number of news organizations' strategies to engage their audience (e.g., Belair-Gagnon et al., 2019;

Holton et al., 2016; Lawrence et al., 2018; Nelson, 2018b), the effects of news organizations' strategies to engage their audience on audience engagement with news has been unexplored. Furthermore, compared to a growing body of research on various factors that influence audience engagement with news on social media, including audience's media consumption, motivations, and news content characteristics (e.g., news values or topics), journalism scholars have not paid much attention to the effect of news organizations' particular strategies to report and publish news on audience's news engagement behaviors (Bright, 2016; Khuntia et al., 2016; Valenzuela et al., 2017). By empirically testing the effects of news organizations' strategy to embrace audience's participation in the news production, this study bridges the participatory journalism and audience engagement literature. Future research is needed to further examine the effects of news organizations' different strategies for engaging audiences on the overall patterns of audience engagement with news published by the news organizations.

In addition, this study advances the emerging research and theory building on trust in news media and trust in individual news organizations and news sources, by providing systematic conceptualization and innovative operationalization of trust. Thus far, journalism scholars have interchangeably used the terms of "credibility" and "trust" in the literature, and, thus, the conceptualization and operationalization of audience trust in news organizations has not been fully developed, compared to research in other fields (Engelke et al., 2019 Hanitzsch et al., 2018; Kohring & Matthes, 2007). By conceptualizing audience trust in news organizations on the basis of a thorough review of the trust concept in multiple related disciplines, this study contributes to the understanding of audience trust in news organizations. In addition, this study examines

audience trust in individual news organizations, instead of audience trust in the entire news media system (Hanitzsch et al., 2018). This approach allows researchers to compare audience trust in different news organizations and helps identify organizational level factors that influence audience trust in the news organizations.

This study also contributes to advancing the methodological aspect of trust research. Particularly, this study applies a unique computational trust research approach and the TSM algorithm developed by Roy (2015) to measure audience trust in news organizations. Thus far, social science scholars have heavily relied on self-reported measures to examine trust (e.g., McKnight et al., 2002), but such a measurement approach has limitations in examining individuals' trust in a number of different entities at the same time, and self-report bias issues. By using the computational trust approach, the level of audience trust in multitude of different news organizations can be measured at once and compared at the organization level.

Regarding practical implications, this study's findings help news organizations and journalists to better understand the benefits and costs of using citizen-eyewitness images in the news, while also developing an effective strategy regarding citizen-sourced images. Regarding the potential cost of using citizen-eyewitness images in the news, from the previous research, it appears that journalists seem to have concerns about using citizen-eyewitness image in their news due to the potential risk of losing their credibility and reputation of reporting news (e.g., Pantti & Sirén, 2015). This study's findings offer new information that might alleviate such concerns: While the extent of incorporating citizen-eyewitness images by a news organization will not likely have any significant

positive impact on audience trust in the news organization, it will not likely have any of the feared detrimental impact either.

Rather, this study's finding provides empirical support for the argument that news organizations' strategies to involve audiences can improve audience engagement.

Previous studies have shown that news organizations apply diverse strategies to engage audiences in their journalism practice (e.g., Belair-Gagnon et al., 2019; Holton et al., 2016; Lawrence et al., 2018; Nelson, 2018b), but there have not been many studies focused on understanding the effects and effectiveness of such strategies on engaging audience members. As the first step, this study shows the incorporation of citizen-eyewitness images can be an effective strategy to engage the audience on social media.

More generally, from the reciprocal journalism perspective, this finding suggests that news organizations' reciprocal response to audience's participation in the news production would increase audience's news engagement behaviors. Thus, this finding would guide news organizations to embrace other participatory journalism practices in their news-making and news-sharing.

### **Limitations**

This study has some methodological limitations that should be considered when interpreting the study's results. First, since this study's sample included only newspaper organizations in the U.S., the findings might not be generalizable to news content from other types of news organizations, such as broadcast media, online media, international news organizations, and news organizations in other countries. Additionally, while this study started out aiming at examining top 100 newspapers in the U.S., the sample size

had to be reduced to only 39 newspaper organizations due to time constraints. It would be worthwhile to conduct a similar study with a larger sample of news organizations.

Second, the study's news content analysis sampling was done by relying on each news organization's news tweets posted on its Twitter account for a two-week time period. It is possible that there were other news articles, particularly articles not posted on Twitter, missed by this sampling approach and there might be some differences in news image sources between news articles posted on Twitter and those only published on the print or online version of the newspaper.

Third, only Twitter users' behavioral data were used to compute the trustworthiness of news organizations and audience engagement. Although Twitter is an important social media platform to consume and engage with news, it would be worthwhile to conduct a similar study with data from other social media platforms such as Facebook and Instagram.

Fourth, while the machine-coded content analysis of news image sources was conducted carefully based on data-driven keyword development to identify and distinguish different sources of images, 9,737 out of the 90,414 sources (10.77%) could not be unclassified by using the codebook script this study developed. It is possible that a large portion of the unclassifiable images might be citizen-eyewitness images. Future computational research studies in our field are strongly encouraged to develop and improve computing scripts for identifying and classifying the sources of news articles and news images.

Finally, due to the inherent limitations of computational research approach that relies on available data, this study could not include other organizational factors that

might have significant influence on audience trust in a news organization and news engagement behaviors. In order to further examine the effects of incorporating citizen-eyewitness images in the news on audience trust and engagement behaviors, future researchers should develop different research methods and try multi-method approaches.

### **Suggestions for Future Research**

This study provides several suggestions for future research. First, future studies are encouraged to examine the extent of incorporating citizen-eyewitness images into news by different types of news organizations. Previous content analysis studies suggested that news content dealing with international events and news from international news organizations would likely include relatively higher percentages of images captured by private citizens (Mast & Henegreefs, 2015; Nashmi et al., 2017). If future studies find different degree of using citizen-eyewitness images in the news across TV, newspapers, and other types of news organizations, those findings could make an important contribution to the citizen eyewitnessing research by taking organizations' characteristics into consideration.

Another interesting avenue for future research is to examine the effects of news organizations' different strategies to report and publish news on audience trust in the news organizations and audience engagement with news on social media. Despite concerns about declining audience trust in our society (Lewis, 2019) and the ongoing embrace of audience engagement in newsrooms (Nelson, 2018b), there has very limited studies examining how news organizations' strategies can make changes in audience trust and engagement, especially in their strategies to engage the audience. This study wishes

to encourage researchers to examine a wider variety of factors that may improve or harm audience trust in news organizations and engagement with news.

Future studies should also examine the psychological mechanism of the effect of citizen-eyewitness images in news on audience trust. Trust is a multidimensional construct, which should be understood and examined with the different dimensions carefully considered. More research is needed to examine audience trust in the news media and in individual news organizations along different dimensions, and to test potentially differential effects of various new production strategies and practices on different dimensions of trust and their psychological mechanisms.

Lastly, future studies are encouraged to replicate and verify the trustworthiness scores for news organizations calculated by the TSM algorithm with different datasets including audience trust in different news organizations. Although this study compared the TSM-algorithm-based trustworthiness scores for the newspaper organizations with the Simmons Research News Media Trust Index survey data (Simmons, 2018), further research is needed to test the validity of the algorithm-based trust scores in comparison to self-reported trust measures.

In addition, this study used Twitter users' following activities to compute the trustworthiness of news organizations via TSM. If future studies compute the trustworthiness of news organizations by using other behavioral proxy (e.g., retweeting) or using audience's behavioral data from different social media platforms and compare them with this study's scores, those findings would make a significant contribution to the application of TSM or any other computational research approaches and to advance methodological innovations for measuring audience trust in news organizations.

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## Appendix A

## List of the Top 80 Daily Newspaper Organizations in the U.S.

<b>News Organizations</b>	<b>Twitter ID</b>	<b>Circulation</b>	<b>Included</b>
USA Today	@USATODAY	2,140,525	O
The Wall Street Journal	@WSJ	1,284,407	O
The New York Times	@nytimes	694,912	O
Los Angeles Times	@latimes	477,778	O
Chicago Tribune	@chicagotribune	476,549	O
New York Post	@nypost	433,606	O
The Washington Post	@washingtonpost	350,859	O
Newsday	@Newsday	312,158	O
Star Tribune	@StarTribune	281,076	O
Daily News	@NYDailyNews	274,816	O
Houston Chronicle	@HoustonChron	273,810	X <sup>a</sup>
The Denver Post	@denverpost	242,028	O
The Dallas Morning News	@dallasnews	238,605	O
The Arizona Republic	@azcentral	237,683	O
Tampa Bay Times	@TB_Times	230,473	O
Boston Globe	@BostonGlobe	221,406	O
The Seattle Times	@seattletimes	219,792	O
The Star-Ledger	@starledger	217,023	O
The Philadelphia Inquirer	@PhillyInquirer	210,652	O
amNewYork	@amNewYork	207,441	O
Metro New York	@metronewyork	192,762	X <sup>b</sup>
The Plain Dealer	@ThePlainDealer	187,208	X <sup>c</sup>
San Francisco Chronicle	@sfchronicle	181,707	O
St. Paul Pioneer Press	@PioneerPress	181,704	O
Orlando Sentinel	@orlandosentinel	175,011	O
The San Diego Union-Tribune	@sdut	169,423	O
The Kansas City Star	@KCStar	161,289	O
The Oregonian	@Oregonian	157,606	X <sup>a</sup>
Honolulu Star-Advertiser	@StarAdvertiser	157,197	O
The Atlanta Journal-Constitution	@ajc	156,848	O
Detroit Free Press	@freep	156,321	O
Pittsburgh Post-Gazette	@PittsburghPG	152,712	O
Hartford Courant	@hartfordcourant	148,325	O
Express	@WaPoExpress	145,686	O

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The Mercury News	@mercnews	145,469	O
Milwaukee Journal Sentinel	@journalssentinel	137,960	O
The Virginian-Pilot	@virginianpilot	137,171	O
St. Louis Post-Dispatch	@stltoday	137,157	O
Chicago Sun-Times	@Suntimes	136,223	O
The Sacramento Bee	@sacbee_news	136,179	O
Orange County Register	@ocregister	132,193	O
The Record	@TheRecordNJ	130,212	X <sup>c</sup>
The Buffalo News	@TheBuffaloNews	129,478	O
Sun-Sentinel	@SunSentinel	123,871	O
Arkansas Democrat Gazette	@ArkansasOnline	122,398	O
Fort Worth Star-Telegram	@startelegram	120,670	O
Miami Herald	@MiamiHerald	113,957	O
The Columbus Dispatch	@DispatchAlerts	109,885	O
Las Vegas Review-Journal	@reviewjournal	109,523	O
The Cincinnati Enquirer	@Enquirer	108,959	O
The Baltimore Sun	@baltimoresun	107,986	O
The Indianapolis Star	@indystar	107,802	O
The News & Observer	@newsobserver	105,258	O
The Courier-Journal	@courierjournal	104,859	O
The Charlotte Observer	@theobserver	103,687	O
Dayton Daily News	@daytondailynews	102,882	O
San Antonio Express-News	@ExpressNews	101,910	O
The Oklahoman	@TheOklahoman	100,928	O
Omaha World-Herald	@OWHnews	99,161	O
The Times-Picayune	@NOLAnews	98,914	X <sup>a</sup>
Austin American-Statesman	@statesman	98,763	O
Pittsburgh Tribune Review	@TribLIVE	97,281	O
Richmond Times-Dispatch	@RTDNEWS	90,012	X <sup>a</sup>
Albuquerque Journal	@ABQJournal	89,916	O
Boston Herald	@bostonherald	87,818	O
The Palm Beach Post	@pbpost	86,847	O
Metro Philadelphia	@MetroPhilly	83,369	X <sup>b</sup>
The Morning Call	@mcall	82,690	O
The Salt Lake Tribune	@sltrib	81,834	O
Democrat and Chronicle	@DandC	81,260	O
The Blade	@toledonews	81,067	O
The Des Moines Register	@DMRegister	80,647	O
The Detroit News	@detroitnews	80,145	O

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The Tennessean	@Tennessean	79,283	O
Knoxville News Sentinel	@knoxnews	75,459	O
Daily Herald	@dailyherald	75,207	O
Wisconsin State Journal	@WiStateJournal	74,731	O
Deseret Morning News	@DeseretNews	73,122	O
The Spokesman Review	@SpokesmanReview	71,687	O
The Republican	@masslivenews	70,257	X <sup>b</sup>

*Note:* The top 80 daily English-language newspaper organizations in the U.S were selected based on the weekday circulation data reported by the Alliance for Audited Media (AAM) as of December 17, 2018. For *The Dallas Morning News*, *The Philadelphia Inquirer*, *Orlando Sentinel*, *The Baltimore Sun*, and *The Morning News*, only part of the news images included in the gallery were extracted. A small number of images had the source on the image, but not in the caption of images. As such, these images were regarded as lacking a source in the data set.

<sup>a</sup>: Technical issues with data collection

<sup>b</sup>: No stand-alone website

<sup>c</sup>: Too few news articles shared on Twitter or no Twitter activity (no tweets since October 2018)

## Appendix B

## Keywords/Sources Used to Code the Source of Images

**Professional Source Keywords**

**News organizations/ Media channels/ Film companies.** Associated Press, AP, Reuters, REUTERS, NBC, ABC, CBS, PBS, CNN, Fox News, FOX, Gazette, Bloomberg, USA Today, Wall Street Journal, New York Times, NYT, Los Angeles Times, Chicago Tribune, New York Post, Washington Post, Newsday, Star Tribune, Daily News, Houston Chronicle, The Denver Post, Dallas Morning News, Arizona Republic, Tampa Bay Times, Boston Globe, Seattle Times, The Star-Ledger, Philadelphia Inquirer, amNewYork,, Metro New York, Plain Dealer, San Francisco Chronicle, St. Paul Pioneer Press, Orlando Sentinel, The San Diego Union-Tribune, Kansas City Star, Oregonian, Honolulu Star-Advertiser, Star-Advertiser, Atlanta Journal-Constitution, Detroit Free Press, Pittsburgh Post-Gazette, Hartford Courant, Express, The Mercury News, Milwaukee Journal Sentinel, Virginian-Pilot, St. Louis Post-Dispatch, Chicago Sun-Times, Sacramento Bee, Orange County Register, The Record, Buffalo News, South Florida Sun-Sentinel, Arkansas Democrat Gazette, Fort Worth Star-Telegram, The Miami Herald, Columbus Dispatch, Las Vegas Review-Journal, Cincinnati Enquirer, The Baltimore Sun, Indianapolis Star, News & Observer, Courier-Journal, Charlotte Observer, Dayton Daily News, San Antonio Express-News, Oklahoman, Omaha World-Herald, Times-Picayune, Austin American-Statesman, Tribune Review, Richmond Times-Dispatch, Albuquerque Journal, Boston Herald, The Palm Beach Post, Metro Philadelphia, Morning Call, The Salt Lake Tribune, Democrat And Chronicle, Blade

Des Moines Register, The Detroit News, Tennessean, Knoxville News Sentinel, Daily Herald, Wisconsin State Journal, Deseret Morning News, Spokesman Review, Republican, Commercial Appeal, Akron Beacon Journal, Post-Standard, Fresno Bee, Providence Journal, Tulsa World, Chattanooga Times Free Press, Times of Northwest Indiana, Lexington Herald-Leader, Press-Enterprise, Times Union, Grand Rapids Press, Asbury Park Press, Metro Boston, Sarasota Herald-Tribune, Patriot-News, LNP, Arizona Daily Star, Florida Times-Union, Naples Daily News, The News Journal, Daily Gazette, News Tribune, Post And Courier, Lincoln Journal Star, Daytona Beach News-Journal, The Birmingham News, State, News-Press, File (e.g., Dispatch file photo), Archive (e.g., staff archive, state archive), Staff, Media, Yakima Herald-Republic, SCNG (Southern California News Group), Contra Costa Times, Walla Walla Union-Bulletin, Daily Pilot, Santa Cruz Sentinel, Winnipeg Free Press, Daily Breeze, UPI (United Press International), The Press-Enterprise, KDKA-TV, KIRO-TV, KNXV-TV, KTLA, WCPO-TV, KSTP-TV, NOAA, The chronicle, TNS (Tribune News Service), Kaiser Health News, courant.com, The Courant, Times, Daily News, Daily Commercial, Post-Gazette, BBC, palmbeachpost.com, Dispatch, Press, News, Tribune, The World, Investigation, Discovery, FX, ThisWeek, KGUN9, The CW, Augusta Chronicle, Bravo, National Geographic, Recode, Chicago Sun-Times, Philadelphia Inquirer, HERALD, WWE, Waterloo-Cedar Falls Courier, Albuquerque Journal, Journal, Fayetteville Observer, Animal Planet, Arizona Daily Star, UPI, Magazine, C-SPAN, CQ Roll Call, USA Today Sports, Boulder City Review, TNT, Spokesman-Review, Correspondent, Animal Planet, Freeform, Channel, HBO, Bachelor of Provo, Netflix, Channel, Hulu, Comedy, 20th Century Fox, Twentieth Century Fox, Theatre, Drafthouse, Sony Pictures Classics,

Warner Bros. Pictures, Disney, Elysium Film and Photo, Marvel Studios or Marvel, Hollywood Pictures, Paramount Pictures, LucasFilm, Pixar, Film, AMC, Annapurna Pictures, Kremlin Pool, Obituary, Capital Weather Gang, Broadway, Commerical Appeal, The Register, Page Six, The Republic, Indy\_star, The Star, The Southern, The Tennessee (typo, but frequently appeared), MTV, Daily Camera, Denver7, Cinemax, Universal Pictures

**Photo stock/ (Commercial) Photo services.** Getty, Shutterstock, iStock, Wireimage, EPA, EPA-EFE (European press photo agency), Thinkstock, AFP, Agence France-Presse, Alamy stock photo, David Bachman Photography, UNLV Photo Services, Dreamstime, Katelyn Bell Photography, studio, Rex Features, PDNB Gallery, C. Stanley Photography, Chanel Jaali Photography, libbyvision.com, Benoit Photo, Two and Two Photography, Photo Stock, Unsplash, MGN Online, Adobe Stock, Bigstock, Stock Image, Flight photo agency

**Libraries/ Museums.** Library of Congress Prints and Photographs Division, National Archives and Records Administration, Library of Congress collection, Art Center, Institute of arts, Hall, Museum, Carnegie Museum of Art, Library, Artist, Painter, Blue Rider, Pictorial Directory

**Government entities/ State/ County/ City.** Sheriff, BCSO, PennDOT, Police, Jail, Prison, Enforcement, Allegheny County Jail, NASA, The White House, Navy, Law, Office, Airnow.gov, Bureau, CBP, CDC, CDFW, CWG, CalTrans, Coast Guard, CorrectionsUSA, GAO, ICE, Council, NCPD, NYPD,.gov, FBI, State, County, City, Pennsylvania, Utah, Pittsburgh, Nevada, Chicago, California, Atlanta, Columbia, Texas, Republic of Mexico, American, International

**Academic institutions.** University, Seton Hill, School, BYU, College, MIT, UNLV, UCLA, academy, Brookings, USCD, UW-Madison, Laboratory

**Sports teams.** Sports, Football, Basketball, NBA, Athletics, Crew SC, New England Patriots, Cleveland Monsters, NFL, Youngstown Phantoms, Minnesota Twins, Allsport, Columbus Clippers

**Non-profit organizations/ Businesses.** Sundance Institute, Pittsburgh Cultural Trust, United Way of Salt Lake, ProMedica, Wikimedia, Association, Change the Ref, change.org, Company, Hospitality Group, Inc, Amazon, Apple, firm, Chase, Longview Power, Public Relations, Filevine, Aurora Innovation, Tiffany & Co, In Tune Partners, Jon Kohler & Associates, Nintendo, Brewing, Cooking, Loloi, Architect, Pepsi, Foundation, Co., Resort, Skiplagged, Sony, Vade Secure, Weisshouse, Aerion, Airline, Clinic, Auster Agency, BOKA Powell, Performance, Bell, NoMad Las Vegas, Institute, Clothing, Hotel, Inn, Colgate, Foundation, Bud Light, Bulletproof, Bumble, Caesars Entertainment, Coca-Cola, Trader Joe, TripAdvisor, AMD, Construction, App in the Air, Google, Google map, Google street images, Entertainment, Restaurant, Brewery, Heather Likes Food, Greek Gourmet, Services, Real Estate, Book, Balzer + Bray, Bloomsbury, Invision, GoFundMe, Group, Center, Business, Healthcare, Hospitality Group, Church, Macmillan, Advocacy Group, Seneca Anti-Wind Union, Project, CNP, Institution, CFI, International Center of Photography, APD, Rescue, CBRE, CapRock Partners, CoStar, Cushman & Wakefield, Gucci, Krispy Kreme, Doritos, Adobe, Red Bull, Airbnb, TCF

**Websites/ Others.** zoo, Audubon Society of Western Pennsylvania, Kennywood, Norah Jones, Sammy Hagar & the Circle, Everyday Jenny, Cooking with Karli, Your Cup of Cake, Emojipedia, Salt & Baker, Dessert Now Dinner Later, Friends of Cedar

Mesa, Misra Records, Terrace Plaza Playhouse, Mote Marine, Alive, Brightline, Record, Camino Real Playhouse, Casa Romantica, Universal Studios

### **Citizen Source Keywords**

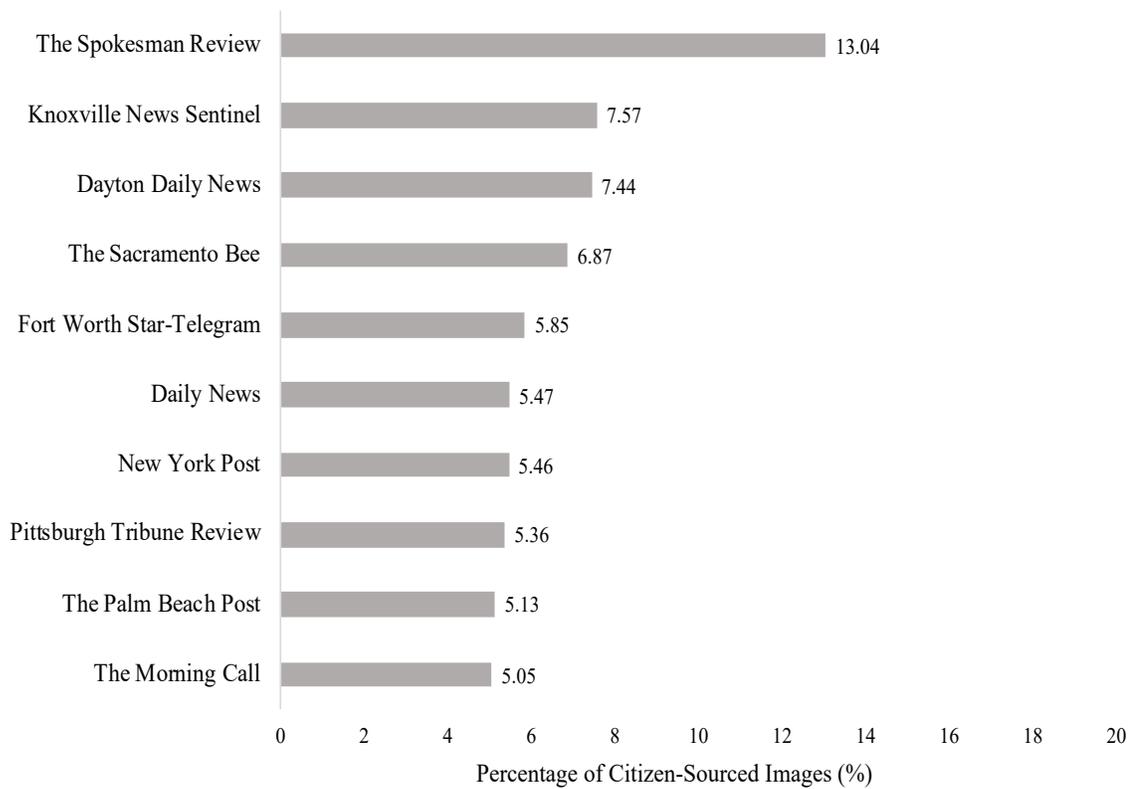
Flickr, TWITTER, Handout, Facebook, Contributed, Instagram, family, PublicDomainPictures.com, Reddit, YouTube, Submitted, Black Lives Matter

*Note:* The level of specificity of keywords varied, since some of the keywords were the names of specific organizations identified by manual checking (e.g., Audubon Society of Western Pennsylvania, Crew SC), while other keywords were more general so as to capture multiple specific organizations (e.g. Business, Sports).

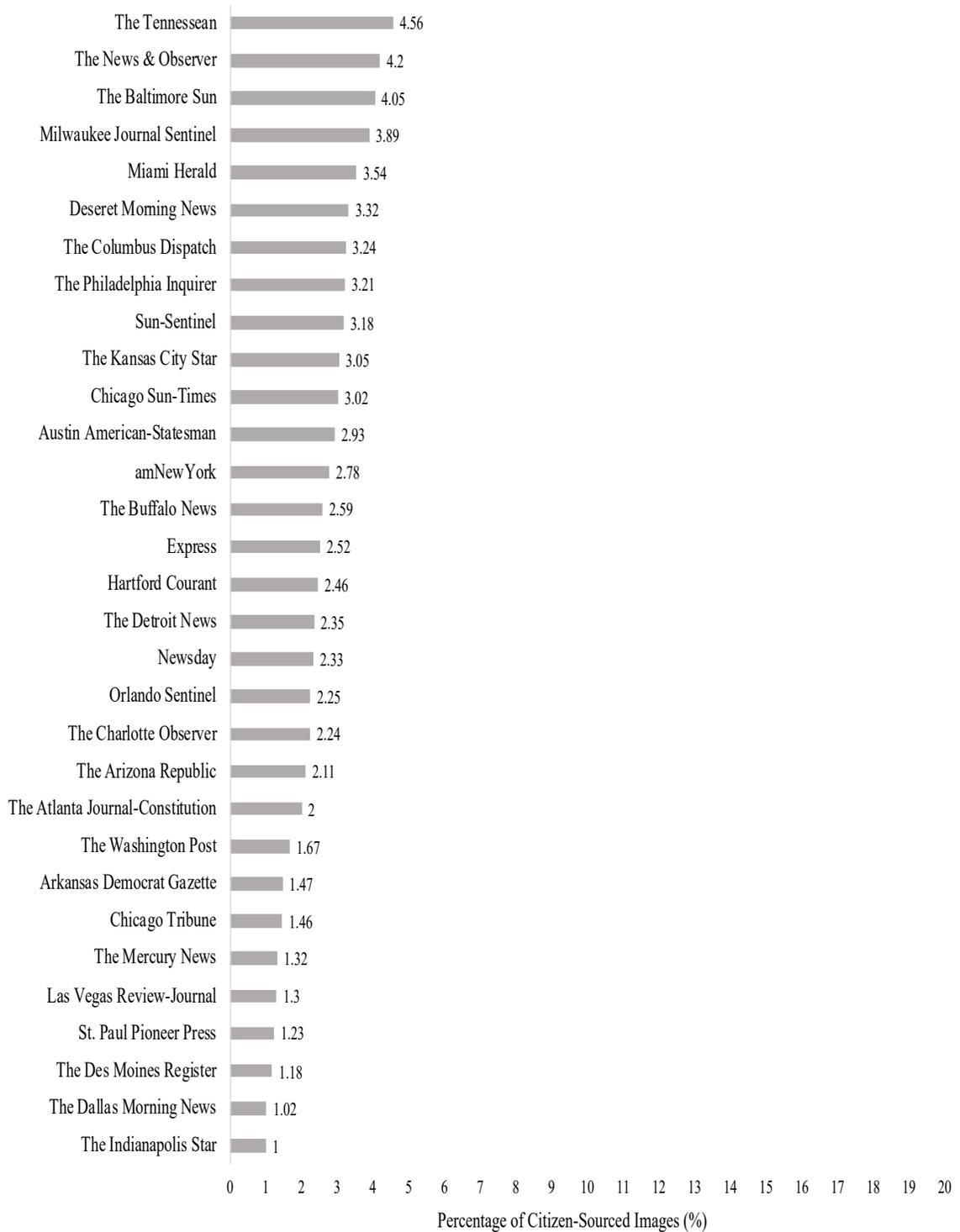
## Appendix C

## The Percentage of Citizen-Eyewitness Images in the News across Different News Organizations

News organizations which included more than 5 percent of citizen-sourced images in their news

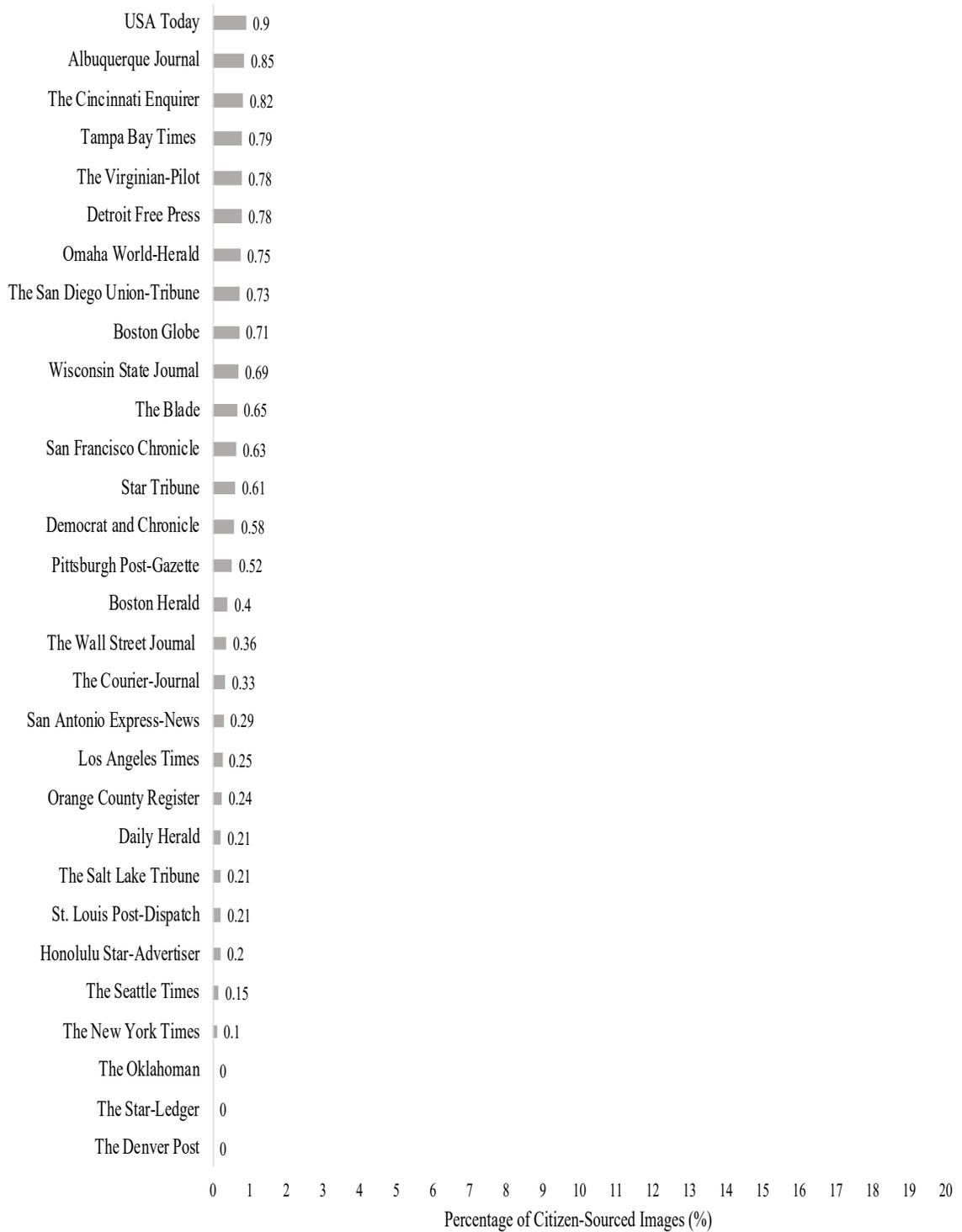


News organizations which included more than or equal to 1 percent and less than 5 percent of citizen-sourced images in their news



News organizations which included less than 1 percent of citizen-sourced images in their

news



## Appendix D

## Pseudo TSM Code for Calculating Trustworthiness of a News Organization

Input: 1) a directed graph  $G = (V, E)$  consisting of vertices and edges with or without weights, and,  
 2) maximum number of permitted iterations  $k$ , and/or,  
 3) Difference of scores between 2 iteration,  $\delta$ .

Result: Trustworthiness scores of each news organization  $m$

Initialize all  $v \in V$  to  $(1, 1)$ ;

for  $(i = 1;$   
 $\max(\max(|t_i(v) - t_{i-1}(v)|), \max(|tw_i(v) - tw_{i-1}(v)|)) < \delta$  or  $i \leq k; ++ i)$  do

for each node  $v \in V$  do

update scores of each vertex  $u$  using scores from last iteration;

$t_i'(v) = \sum_{v \in \text{out}(v)} \frac{e^{-\frac{w(v,x)}{1+(t_{i-1}(x))^2}}}{(1+(t_{i-1}(x))^2)}$ ;

$\text{out}(v) =$  set of all vertices which are destination vertex of all outgoing edges from  $v$ ;

end

for each node  $v \in V$  do

$tw_i'(u) = \sum_{v \in \text{in}(u)} \frac{d^{-\frac{w(x,u)}{1+(t_{i-1}(x))^2}}}{(1+(t_{i-1}(x))^2)}$ ;

$\text{in}(v) =$  set of all vertices which are source vertex of all incoming edges to  $v$ ;

end

$t_i = \text{Normalize}(t_i')$ ;  $tw_i = \text{Normalize}(tw_i')$ ;

for each news organization  $m$

$Tw_m = \sum_{i=1}^n \frac{1}{\text{Trustiness of news organization } m\text{'s } i^{\text{th}} \text{ follower}}$

$Tw_m =$  trustworthiness score of a news organization  $m$ ;

$n =$  the number of followers of the news organization  $m$

end

end