



universität
wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„Domo Arigato, Mr. Roboto Journalist:
Differences in Perception of Automated Journalism
between the United States and Japan“

verfasst von / submitted by

Amanda Bianca Kontor, BA

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of
Master of Science (MSc.)

Wien, 2018 / Vienna 2018

Studienkennzahl lt. Studienblatt /
degree programme code as it appears on
the student record sheet:

A 066 550

Studienrichtung lt. Studienblatt /
degree programme as it appears on
the student record sheet:

Masterstudium Communication Science

Betreut von / Supervisor:

Univ.-Prof. Folker Hanusch, PhD

Abstract

Heliograf, Quakebot, and IamFNBOT may not sound like the names of respected reporters, but these and other data-driven news bots are quickly becoming mainstays in newsrooms around the world. The present study contributes to the growing body of literature on this trend of automated journalism, assessing credibility perceptions and fear levels in a cross-cultural comparison of the United States and Japan. Through an online survey experiment, a sample of American and Japanese respondents ($N = 256$) was asked to read a short news article with a manipulated byline, evaluate the article's credibility, and communicate how strongly they felt fear-related emotions. Statistical analysis found that (1) American respondents gave a human-marked article a higher credibility rating than a robot-marked one and (2) reported higher levels of fear after reading a robot-marked article as opposed to a human-marked one, while (3) Japanese respondents reported lower levels of fear than Americans after reading a robot-marked article. The findings point to the influence of national culture on technology acceptance and offers important considerations for news organizations that use automated journalism.

Keywords: automated journalism, technology acceptance, fear, credibility, cross-cultural comparisons

Abstract

Heliograf, Quakebot und IamFNBOT hören sich möglicherweise nicht wie die Namen von respektierten Reportern an, doch diese und andere Nachrichten-Bots werden immer häufiger zu einer wichtigen Stütze in Nachrichtenabteilungen auf der ganzen Welt. Die vorliegende Studie leistet einen Beitrag zur wachsenden Literatur über den Trend des automatisierten Journalismus und bewertet Wahrnehmungen hinsichtlich der Glaubwürdigkeit und der Angstgefühle im interkulturellen Vergleich von US-Amerikanern und Japanern. Mittels einer Online-Umfrage wurde eine Stichprobe von amerikanischen und japanischen Befragten ($N = 256$) gebeten, einen kurzen Nachrichtenartikel mit einem manipulierten Autornamen zu lesen und danach die Glaubwürdigkeit des Artikels zu bewerten sowie zu berichten, in welchem Ausmaß Angstgefühle verspürt wurden. Nach statistischer Analyse ergaben sich die drei folgenden Ergebnisse: (1) Amerikanische Befragte bewerteten einen durch einen menschlichen Autor gekennzeichneten Artikel als glaubwürdiger als einen durch einen Roboterautor gekennzeichneten Artikel und (2) berichteten höhere Angstzustände, nachdem sie einen durch einen Roboterautor gekennzeichneten Artikel gelesen hatten, im Gegensatz zu einem Artikel mit einem menschlichen Autor, wobei (3) japanische Befragte geringere Angstzustände als amerikanische Befragte berichteten, nachdem sie einen durch einen Roboterautor gekennzeichneten Artikel gelesen hatten. Diese Ergebnisse deuten darauf hin, dass die Akzeptanz eines Landes im Hinblick auf den Einsatz neuer Technologien seine Bürger beeinflusst. Darüber hinaus bieten sie wichtige Einblicke für Nachrichtenorganisationen, die von automatisiertem Journalismus Gebrauch machen.

Schlagwörter: automatisierter Journalismus, Technikakzeptanz, Angst, Glaubwürdigkeit, interkultureller Vergleich

Domo Arigato, Mr. Roboto Journalist:

Differences in Perception of Automated Journalism between the United States and Japan

On November 9, 2016, Democrat Kamala Harris beat her fellow party member Loretta Sanchez in the race for the California Senate seat. Within minutes of the official result announcement, *The Washington Post*'s online politics page published an article outlining the race, describing California's special primary system, giving a short biography of the candidates, and even supplying a map of how each county in the state voted. In the post-presidential election uproar, what journalist had time to write up such a comparatively minor story so quickly and thoroughly, in the *Washington Post*'s signature style, and "with the clarity and verve for which [the paper's] reporters are known" (Keohane, 2017, para. 1)? Only when the reader scrolls to the bottom of the article can they receive the answer to this question in the form of a robotic byline—"from reports...powered by Heliograf, the *Post*'s artificial intelligence system" (Heliograf, 2016).

While the mental image of robots churning out automated content in a newsroom for the general public to consume may seem like a storyline out of a science fiction novel, it is a more common practice than the average person might think. Quakebot of the *Los Angeles Times*, for example, continues to monitor seismic activity in California after its famous 2014 coverage of a Los Angeles earthquake just three minutes after it occurred (Carlson, 2014). Likewise, Heliograf is still loyally contributing around a thousand articles on various topics for the *Post* (Moses, 2017), while the Associated Press' Automated Insights service covers tens of thousands of sport games annually (Mullin, 2016). Automated journalism is not a phenomenon that is unique to the United States, either. Abroad, most notably in Asia, robots like Tencent's Dreamwriter can deliver a 1,000-word story in Chinese within a minute deadline (Huifeng, 2015) while IamFNBOT can hand in a local stock market report to

Korea's *Financial Times* before checking the contents of its own email inbox (Tae-hoon, 2016).

Regardless of location in the world, news organizations tend to have similar motives for adopting automated journalism, including desires for convenience, expense reduction, audience expansion, modernization, and prestige (Carlson, 2014). However, the academic community has limited information about what goes on in the minds of the consumers who ultimately read automated content as opposed to normal content published by the organizations' human journalists. It is unknown whether one or both types of author satisfies consumers' expectations of journalism as a whole, for example, or repels them. Moreover, few if any empirical studies make cross-cultural comparisons between news consumers with respect to different countries' technology acceptance levels. This leads to two research questions that the present study intends to answer:

RQ1: How do news consumers' perceptions of human-authored news articles differ from robot-authored news articles?

RQ2: Do news consumers' perceptions about the news articles differ if they come from countries with two different levels of technology acceptance, like the United States and Japan?

Literature Review

Credibility Perceptions

Credibility perceptions in traditional and online journalism. Credibility has long been considered one of the most important cornerstones of journalism worldwide (Meier, 2009). The Society of Professional Journalists, which has represented journalists in the United States since 1909, is just one of many longstanding journalism organizations that has highlighted credibility as a main pillar of the profession (Society of Professional Journalists, 2014). It goes without saying, then, that journalists must work diligently—gathering facts,

interpreting information, and reporting it honestly, objectively, and accurately—for their news stories to live up to this institutional ideal.

On the receiving end of a journalist's published work, credibility is simultaneously “at the heart of every assessment of a news story” (van der Kaa & Krahmer, 2014, p. 2; Clerwall, 2014) for readers. This implies that news consumers also have to work hard, subconsciously or not, taking into account a variety of factors before deciding whether they can give an article their seal of credibility. When reading a traditional article in a newspaper, for instance, they rely on available “credibility clues” to inform their opinion (Clerwall, 2014, p. 522). In order to trust that what they read is true, they might consider the topic of the article, the presentation and plausibility of the story's message, their own needs, or the medium through which the story is being delivered (Clerwall, 2014; Miller & Kurpius, 2010; Hamilton, 1998). In addition to these clues, considering the author or sender of the message can prove useful to news consumers, who are then “cued by that source attribution to employ different processing strategies that result in the subsequent message arguments' being more readily accepted or rejected” (Slater & Rouner, 1996, p. 975).

The rise of digital technology in recent decades has added yet another layer to the discourse on credibility. For journalism, technological advances meant that news content moved to digital platforms and could now be read or listened to on websites, experienced through virtual reality, and more. This posed a new challenge to news consumers, forcing them to apply what they already knew about credibility clues and to reconcile any old processing strategies with new mediums, new needs, and—especially in the face of automated journalism—new authors. It also led scholars to the conclusion that credibility is “a perceived quality...[not residing]...in an object, a person, or a piece of information...[and that]...in discussing the credibility of a computer product, one is always discussing the perception of credibility” as a product of trustworthiness and expertise (Fogg & Tseng, 1999,

p. 80). High levels of these two dimensions, which measure “perceived goodness and morality” and “perceived knowledge and skill” respectively (Fogg & Tseng, 1999, p. 80), indicate a high credibility assessment in digital environments.

Credibility perceptions in automated journalism. Automated journalism is worthy of further examination in the context of this institutional pillar, not least because “credibility matters when computer products act as knowledge sources” (Fogg & Tseng, 1999, p. 81). To provide a short background, this technology had technically existed for decades in an ancestral form before it was picked up as a futuristic digital storytelling tool by news agencies like the Associated Press in contemporary times. Software developers in the 1990s began working on simple algorithms that could generate text based on a template for non-news-related applications (van der Kaa & Krahmer, 2014). Since then, the process has not only become significantly more intelligent and robust, but it has also disrupted the field of journalism and garnered a wide catalogue of titles along the way. Among the most popular are “robot journalism” (Clerwall, 2014; Van Dalen, 2012), “computational journalism” (Jung, Song, Kim, Im, and Oh, 2017; Hamilton and Turner, 2009), and “algorithmic news” (Anderson, 2013). However, perhaps Carlson (2014) described it best as “automated journalism” in his seminal work about robotic reporters, detailing the “algorithmic processes that convert data into narrative news texts with limited to no human intervention beyond the initial programming choices” (p. 416). Here, “automated journalism” and “robot-marked article” or the like will be used interchangeably.

As recently as 2013, automated journalism was still considered to be in its infancy stages, which made it ripe for academic research. Since then, many scholars have published works on the topic related to credibility, with Clerwall (2014) being the first. This researcher conducted a small experiment ($N = 46$) to check Swedish perceptions of articles that were written by either robots and humans, but that were anonymous within the frame of the

study—that is, the bylines were concealed from the respondents. The scale of the experiment interfered with the possibility of significant results, but Clerwall (2014) did observe that the robot-authored article was labeled as more objective and trustworthy by respondents than the human-authored one.

Van der Kaa and Krahmer (2014) built on this study soon after in the Netherlands, with the intent of gauging quality perceptions of automated journalism. The authors exposed Dutch journalists and citizens to sports and finance news articles, which were labeled with one of two manipulations: “This article is written by a computer.” or “This article is written by a journalist.” No effect was found among the news consumer group, but results showed that journalists displayed a preference for the familiar—fellow journalists—through ingroup psychology. They perceived the article marked as being written by someone in their profession more credible than one by an outsider, the computer (van der Kaa & Krahmer, 2014).

Jung and colleagues (2017) broke the chain of automated journalism studies based in Europe and turned to Asia, applying van der Kaa and Krahmer’s (2014) idea of article author manipulation to Korean journalists and citizens. The authors (2017) also added a reverse author manipulation, so that some respondents received an article that was marked in the experiment as being written by a human but that was actually written by a robot, and vice versa. Interestingly, Korean citizens who were exposed to the robot-written article rated it higher in credibility when it was accurately marked as robot-written, but lower in credibility when reversely marked as journalist-written (Jung et al., 2017). When it came to the Korean journalists, however, ingroup and outgroup psychology took center stage again (Jung et al., 2017). The respondents ignored all other available credibility clues and gave ratings solely based on the manipulated byline (Jung et al., 2017). Since the journalists viewed fellow journalists as one of their “own” and robot journalists as the threatening “other,” it is not

surprising that they only gave high credibility ratings if an article was marked with a human journalist author (Jung et al., 2017).

Clerwall (2014), van der Kaa and Krahmer (2014), Jung and colleagues (2017), and other scholars have all contributed interesting findings to the credibility discourse on automated journalism, but gaps and opportunities still remain. For example, few if any studies have employed an author manipulation experiment exclusively among news consumers. Likewise, only a handful of studies have focused on automated journalism in the United States, and none have compared results cross-culturally after conducting the same byline manipulation experiment in different languages.

Credibility perceptions cross-culturally. Certain elements engrained in a news consumer's socio-cultural environment can also influence the way they perceive journalistic credibility—online and off—and may point to how they will uniquely perceive the credibility of automated journalism.

In the United States, for example, Pew Research Center found that news consumers are increasingly divided by their trust in media outlets, plagued by reports of fake news bots, and as a result, always taking into account several factors to decide whether an article can be trusted (Barthel & Mitchell, 2017). A hefty percentage of those surveyed in a nationally representative sample indicated that the person who shares the story with them has either some or a large impact on their credibility perceptions (Barthel & Mitchell, 2017). Many do put their trust in stories published by reporters working for news organizations, but they also give weight to stories shared by close friends—in other words, people to whom they can actually put a face or name (Barthel & Mitchell, 2017). In the context of automated journalism, this paired with the psychology of ingroups discussed in the previous section, suggests that Americans will likely approach news articles written by a robot with the

perspective the “that ‘we’ [as humans] are more...trustworthy ...and honest than ‘they’” (Jung et. al, 2017, p. 294).

Across in the pond in Asia, attitudes toward journalistic performance are typically more aggressive. In Korea, for example, following national tragedies where journalists fell short in their reporting responsibilities, the public began to—and continues to—disparage journalists as unreliable and unethical, even creating a name for journalists that equates them with trash (Jung et al., 2017). Jung and colleagues (2017) observed the phenomenon when their Korean respondents were unwilling to rate an article credibly if it was associated with a human journalist, even though they gave the same article a high credibility rating if it was marked as being written by a computer.

Korea may be an extreme example of hostility towards journalists, but iterations of it carry over to other parts of the continent, including Japan. According to a Worlds of Journalism country profile by Oi and Sako (2017), Japan’s news production continues to be influenced primarily by the military, police, state security, and media conglomerates. As a result, many news consumers see journalists as puppets who cannot be trusted to deliver articles with adequate levels of credibility or impartiality (Oi & Sako, 2017). Likewise, they have come to expect that if journalists must confront those in a position of power and present it in their work, they will do so delicately or weakly (Hirose, 1990). In this sense, while Americans maintain some level of faith in their human journalists, Japanese people might likely find a robot journalist more credible because data-driven robots cannot be swayed by the high-level organizational influences to which the Asian country’s human journalists often fall victim.

Fear of Technology

Fear of technology in journalism. New technology and fear from those who are not familiar with it go hand-in-hand, an experience to which the newsroom is certainly no

stranger. As discussed previously, the journalism field has undergone massive changes in the last century, with news stories jumping from the printed page to the static television screen to the navigable computer screen. News teams were introduced to computer-assisted reporting as early as the 1960s, and those accustomed to setting type with molten lead in newspaper composing rooms were forced to handle computerized typesetting starting in the 1970s (Jung et al., 2017), just to name a few. The recent rise of participatory media, where citizens who have no background in journalism can broadcast useful information about events online while physically on the scene, became yet another feature with which reporters had to learn to coexist (Carlson, 2014).

With each development, uncertain newsroom employees went on the defensive, seeing new technology as an external threat to be reckoned with—which is “a rational response...because change invariably involves losses in routines, relationships, and traditions” (Jung et al., 2017, p. 294). Indeed, many of these technological advancements did change newsrooms irreversibly. Less personnel were needed to complete the jobs that machines were now capable of handling and they were subsequently let go, while some journalist roles disappeared altogether (Jung et al., 2017).

Fear of automated journalism technology. Automated journalism is the newest addition to this saga of technophobia. Despite the practice being a relatively abstract trend until late, many journalists have already taken a stance of resistance against it. Most fear that the unknown will cause instability, make them dispensable, and take their jobs away since it is impossible for a human journalist to produce news articles or discover trends in a data set as quickly as a robot one can (Jung et al., 2017; Kim & Kim, 2017). To them, even a marginally automated newsroom signals the beginning of a survival competition where they must fight to prove the worth of their skills and secure the remaining human positions over their colleagues. The fears of these journalists are not entirely unfounded. According to Kim

and Kim (2017), it is highly likely for decision-makers at newspaper companies to restructure their human staff after adopting automated technology.

However, it is worth noting that not all journalists feel this way. Van Dalen (2012), who analyzed newspaper articles to gauge the overall attitude of the journalism community about automated journalism, explained that some journalists are actually early adopters of new technology in the field and express excitement at the prospect of change. Other scholars like Hamilton and Turner (2009) and Carlson (2014) have found that some journalists appreciate automated journalism's ability to support their accountability function and to manage their time, especially by reporting on minor stories—often about sports or finance—that they might not have the time to cover themselves.

Fear of technology and technology acceptance. It is understandable for journalists, like members of any profession, to be skeptical or uneasy about technology that affects their work processes. However, what can be said about regular citizens who are exposed to similar technology? Davis' (1989) technology acceptance model theorizes that certain values predict a user's acceptance of new technology. Straub, Keil, and Brenner (1997), one of the first research teams to test this model in regions outside of the United States, found that cultural effects were behind why American, Swiss, and Japanese respondents adopted the technology introduced in an experiment at different levels. These findings were supported by Zakour (2009), who bridged culture theory with the model to present a slightly modified version where national culture accounted for differences in technology acceptance.

The technology acceptance model may not be directly applicable to journalism because news consumers cannot "use" news articles the same way they use other technologies such as ATMs, for example. However, the model's principles provide an appropriate baseline for discussions about technology, fear, and cross-cultural differences. Aside from culture playing an important role (Zakour, 2009), a significant negative

relationship exists between technophobia and technology acceptance (Khasawneh, 2015). When a person is exposed to a “new stimulus...in the form of a technology that modifies and/or changes the [person’s] normal or previous routine” (Khasawneh, 2015, p. 10), they may respond irrationally—whether that is actively through fear, or passively through anxiety—and reject a certain technology. Sinkovics, Stottinger, Schlegelmilch, Bodo, and Sundaresan (2002), seeing the need for a standard and versatile technophobia scale, developed one based on the three factors of personal failure, human versus machine ambiguity, and convenience. Their final measure can easily be adapted to measure fear-related emotions—anxious, agitated, frustrated, nervous, intimidated, and comfortable—associated with any technology of interest, including automated journalism (Sinkovics et al., 2002).

Fear and acceptance of technology cross-culturally. In the United States, people seem to approach the idea of robots with suspicion, even though the country’s highest venture-capital regions—Silicon Valley, for instance—champion innovations in artificial intelligence and robotics. In fact, 70% of Americans express a feeling of fear when they think about a world where machines perform tasks originally done by humans (Smith & Anderson, 2017). This includes a future with robots that autonomously take care of seniors, drive cars, and select the most qualified human candidates for a position from a stack of resumes. When surveying American adults, Smith and Anderson (2017) found that an overwhelming majority echoed the sentiments of some “robo-skeptic” journalists—that robots will create economic instability rather than new, higher quality jobs for the humans they leave in their dust.

However, differences do appear to exist outside of the United States. In other parts of the world, robots are not only treated largely with empathy instead of cynicism, but they are also seen as a positive addition to human life rather than a threat to it. One case study done in Spain by Gonzales and González (2017) is an illustration of this phenomenon. The authors

employed a multi-method approach to understand how much audiences value a news bot called Politibot. The bot was established in 2016 as a service that could provide audiences with supplemental information about the Spanish elections taking place during that time, through direct conversation with Politibot (Gonzales and González, 2017). After just a month of being live, the service already had almost 10,000 subscribers (Gonzales and González, 2017). Interestingly enough, the authors found that when users interacted with Politibot, many came to establish an emotional connection with it and, later, expressed positions that reflected positive emotions in statuses on social media platforms like Twitter. The most common emotion reported was love, which included feeling trust, empathy, acceptance, affinity, respect, devotion, gratitude, and even infatuation toward Politibot (Gonzales and González, 2017).

This being said, no area of the world trumps the United States in harmonious human-robot relations more than Asia—namely, Japan, a country that “stands out for its long love affair with humanoid robots, a phenomenon that is creating what will likely be the world’s first mass robot culture” (Hornyak, 2006, n.p.). While America’s pop-culture is saturated with apocalyptic movies that shine an unflattering, antagonistic light on robots, including *I, Robot*, *Terminator*, and *Transformers*, Japan takes its obsession with anthropomorphic robots in the opposite direction, toward reverence (Šabanović, 2014; Hornyak, 2006). For years now, the automated household helper has been taking out the trash, the robotic store clerk has been handling customer transactions at the cash register, and even the autonomous senior caretaker—the same ones that Americans surveyed by Smith and Anderson (2017) expressed fear at the very thought of—has been providing care in Japanese nursing homes. In the context of automated journalism, news bots also unsurprisingly exist in Japan and are used by Japanese newspapers like the *Shinano Mainichi Shimbun* to generate accurate leads and summaries with concise sentences (Hornyak, 2018). However, developers have also created

physical robots which can wander around areas where a news story occurred to gather multimedia, including photos and videos, to append to articles as well (Saenz, 2010).

According to Hornyak (2006), the Ministry of Economy, Trade, and Industry seeks to integrate robots into all aspects of society, but locals do not seem to mind. In fact, the innocent demeanors and unique personalities of the existing Japanese robots seem to have already won over the people's hearts (Šabanović, 2014). These findings make it reasonable to assume that Japanese people, being immersed in a robotic culture like none other in the world, will fear automated journalism less than Americans. However, no studies have broached this topic, nor have they compared fear levels related to automated journalism cross-culturally.

Fear of technology and age. Studies on automated journalism have also neglected age as a variable, despite its importance in this discussion. After all, aside from factors such as economic status, educational level, and personality, technology acceptance heavily relies on how old someone is (Anderson & Perrin, 2017). It is true that younger adults are traditionally more up-to-date on the newest technologies than their elders, but older adults are using technology now more than ever before, overcoming the health conditions, disabilities, and other physical challenges that may make it difficult for them to do so (Smith, 2014). In fact, a majority (77%) of seniors in the United States own a basic cell phone, with a sizeable amount (27%) owning a tablet or e-reader—numbers that are expected to grow with time (Smith, 2014).

Despite these encouraging numbers, older adults are still the largest age group that is disconnected from the current digital revolution, especially when compared to young adults. In the United States, Kennedy and Funk (2016) explain that while most adults stick to the familiar rather than the new when it comes to technology, seniors have historically scored the lowest on the “early technology adopter” index. They are very uncomfortable when using an

unfamiliar technological product, unless a relative or friend introduces it to them and shows them how to use it (Kennedy & Funk, 2016). In fact, older adults are skeptical about modern technology's benefits (Smith, 2014) and feel threatened by any devices that they think could compromise their personal privacy, including webcams and home security cameras (SafeHome, 2017). These findings are supported by the fact that one-third of American seniors never go on the Internet and that half do not even have broadband subscriptions set up (Anderson & Perrin, 2017).

Age's effects even play out within the older adult age group, not just between them. Based on a nationally representative sample surveyed by Anderson and Perrin (2017), seniors in the United States are significantly less likely to participate in digital activities, such as using the Internet, subscribing to broadband services, or owning a smartphone, as they get older. This stands in stark contrast to the digital natives who have been exposed to the most current technological advances since birth and who are comparatively unwilling to give their devices up, even if they may fear any negative consequences associated with their technology (SafeHome, 2017). It suggests that older adults would be more fearful of new technology, like a news article written by a robot, than younger adults.

Hypotheses

The study formalizes the relevant literature outlined previously into the following three hypothesis groups:

H1: Readers' perceptions of an article's credibility will change based on whether the article is marked as having a human or robot author.

H1a: Japanese readers will rate robot-marked articles as more credible than human-marked articles.

H1b: American readers will rate human-marked articles as credible than robot-marked articles.

- H1c: Japanese readers of robot-marked articles will rate them as more credible than American readers.
- H2: Readers' level of fear will change based on whether the article is marked as having a human or robot author.
- H2a: American readers of robot-marked articles will report high levels of fear than American readers of human-marked articles.
- H2b: Japanese readers of robot-marked articles will report lower levels of fear than American readers of robot-marked articles.
- H3: American readers' level of fear will change based on their age.
- H3a: American older adults will report higher levels of fear than American young adults when presented with a robot-marked article.

Method

Drawing directly from similar research on automated journalism (Haim & Graefe, 2017; Jung et al., 2017; Clerwall, 2014; van der Kaa & Krahmer, 2014), an online survey-experiment was conducted to test the three hypothesis groups. Data was collected from American and Japanese respondents, who were asked to read a short news article manipulated with one of two bylines and answer credibility- and fear-related questions after, during a one-week timeframe in April 2018. The following sections elaborate further on the study's sample, instruments, and construct measurement.

Sample

The total sample size for the study was 256 respondents ($N = 256$), all of which were recruited via an online survey platform's targeted audience panel. While demographic characteristics, including gender and education level, did not exclude respondents from

participation in any way, nationality—in this case, whether someone is from the United States or Japan—did determine eligibility.

American sample. Out of the 256 respondents, 135 were Americans who identified more as female (70.8%) than male (29.2), and considered themselves moderately (35.3%) to very (32.3%) technologically savvy. In terms of highest education level, a majority of respondents had graduated high school (40.8%), while others pursued a bachelor's (33.8%) or graduate degree (25.4%). Most reported regularly getting their news on their televisions (62.4%), mobile devices (61.7%), or computers (59.4%), with a drop-off occurring on radio (39.1%) and print (35.3%) platforms. The sample's age distribution is depicted in Table 1.

Table 1

Age Distribution Percentages by Nationality

Age group	American	Japanese
18-24	16.3%	5.8%
25-34	14.1%	14.8%
35-44	7.4%	0.8%
45-54	14.1%	21.5%
55-64	23.7%	33.9%
65+	24.4%	17.4%

Japanese sample. The remaining 121 respondents of the total sample were Japanese. Unlike the American sample, it presented a more balanced showcase of males (55%) and females (45%). Respondents had graduated high school (43.7%), pursued a bachelor's degree (46.2%), or obtained a graduate degree (10.1%). Even though many of the Japanese respondents modestly considered themselves not very (28.9%) or moderately (43.8%) technologically savvy, they did report getting their news regularly from digital technologies

like their computers (45.5%) and mobile devices (61.2%), along with television (69.4%), radio (19%), and print (24%).

Instruments

To be successful, this study required two instruments. The first, a short news article originally published by California's Solano County *Daily Republic* reviewing a local high school baseball game (Daily Republic Staff, 2018), served as the stimulus material that respondents were prompted to read (see Appendix A) upon activating the online survey link. The 140-word article was edited for clarity using Automated Insights' Wordsmith service, a natural language generator whose software helps create tens of thousands of articles annually for news agencies such as the Associated Press (Automated Insights, 2018; Finley, 2015; Mullin, 2016). Baseball was chosen as the article topic not just because sports are some of the most popular data-driven narrative topics in automated journalism but also because it was used with success in similar research (van der Kaa & Krahmer, 2014), including studies based in Asia (Jung et al., 2017). Baseball, being a top sport in both the United States and Japan, would be at least familiar to all respondents in this study, as opposed to a sport with more specialized appeal like American football. Selecting a local high school game of which respondents were extremely unlikely to have prior knowledge ensured that the article was stripped of some "credibility clues" described by Clerwall (2014) and could be evaluated without bias.

The second instrument required was the survey itself (see Appendix B). Once respondents read their assigned article, they answered several questions about it and themselves on the survey platform. Aside from queries measuring variables of interest, respondents were also required to answer manipulation check questions and enter their demographic information.

It is worth noting that both instruments, which were originally drafted in native English by the researcher, were then translated into Japanese characters by another native speaker. English and Japanese instruments were all reviewed by respective groups of native speakers in a small pretest to check for any errors in translation, clarity, grammar, and spelling before being officially launched for data collection.

Construct Measurement and Operationalization

Constructs in the context of this survey-experiment are defined, measured, and operationalized in the following sections. Before delving into the specific constructs related to the hypotheses, it is first important to define the independent variable of author as it is the main manipulation in the survey-experiment. Here, “author” denotes the entity who wrote the stimulus article, and can be either a human or robot. In practice, this variable was operationalized at the end of the stimulus text with one of two author-marking statements: “This article was written by a human.” or “This article was written by a robot.” as suggested by prior research (Jung et al., 2017; van der Kaa & Krahmer, 2014). The author-marking statement that respondents ultimately encountered while taking the survey depended entirely on random assignment.

H1. The first hypothesis group introduces the dependent variable of a respondent’s perception of credibility. Credibility is defined here as information that is believable, or a product of credibility, trustworthiness, and expertise (Fogg & Tseng, 1999).

In the online survey, this construct will be operationalized with Likert-scale questions guided by Fogg & Tseng’s (1999) work, which provides the terminology for properly assessing these dimensions of computer product credibility. The questions pertaining to the credibility construct that respondents were prompted to answer in the survey are presented in Table 2.

Table 2

Credibility Operationalization Measures

Questions and sub-questions	Low scale end (1)	High scale end (5)
On a scale of 1 to 5, how strongly do you agree with the following statements about the article?		
I trust the information presented in the article.	Strongly disagree	Strongly agree
The information in the article is unbiased.	Strongly disagree	Strongly agree
The author of the article is knowledgeable and/or competent.	Strongly disagree	Strongly agree
On a scale of 1 to 5, how highly would you rate the article on the following descriptors?		
Credibility	Very low	Very high
Trustworthiness	Very low	Very high
Expertise	Very low	Very high

H2. Fear is the dependent variable introduced in the second hypothesis group. This construct denotes a respondent's unpleasant feeling of anxiety or discomfort as a result of being exposed to a threat of some kind.

Like credibility in H1, it was operationalized with Likert-scale questions that relied on respondent self-reporting guided by Sinkovics and colleagues (2002). Respondents selected ratings between 1 and 5 to communicate how strongly they felt afraid, anxious, disturbed, frustrated, nervous, intimidated, and comfortable after reading the stimulus article. In addition to these fear-related emotions, respondents were also asked to report their general fear of automated journalism after being briefed on the topic. These latter fear construct questions, which were also guided by prior research on technophobia (Sinkovics et al., 2002) are presented in Table 3.

Table 3

Fear Operationalization Measures

Question and sub-questions	Low scale end (1)	High scale end (5)
On a scale of 1 to 5, how strongly do you agree with the following statements?		
I prefer to have robots writing news articles than humans.*	Strongly disagree	Strongly agree
I resent that robots are becoming so prevalent in our daily lives.	Strongly disagree	Strongly agree
I feel more confident reading an article written by a robot rather than a human.*	Strongly disagree	Strongly agree
Robots should not write articles.	Strongly disagree	Strongly agree

Note. Asterisks (*) denote reverse score items.

H3. The third hypothesis introduces a final variable of age to explain readers' reported levels of fear. Age is defined here as the number of years a person has lived, with young adults meaning people aged 18-35 years and older adults meaning those aged 55 years or older. In the survey environment, age will be operationalized with a multiple-choice question asking, "How old are you?" with answer options for age groups starting from "18-24" up to "65+".

Data analysis

Once the online survey-experiment data was downloaded, it was cleaned and analyzed with the Statistical Package for Social Sciences (SPSS) software. Missing cases, as well as cases that incorrectly answered manipulation check questions about the article's subject and author, were eliminated from analysis. Three indices were also created to facilitate analysis. The index assessing credibility consisted of six items (Cronbach's $\alpha = 0.929$), that measuring fear induced by the stimulus article was comprised of seven items (Cronbach's $\alpha = 0.847$),

and a second fear index measuring overall technophobia related to robot journalists consisted of four items ($\alpha = 0.724$). No items were deleted from the indices due to their high internal consistencies.

Results

Testing the study's hypotheses relies on comparing several different groups—for example, American and Japanese respondents, robot- and human-marked articles, or younger and older adults. For this reason, six independent samples t-tests were conducted to confirm whether or not any significant relationships existed between nationality, author condition, credibility perception, fear level, and age group, as well as to quantify the effect sizes for any significant findings.

H1

Japanese credibility perceptions by author. The H1 hypothesis group covers the credibility portion of the study. H1a, the first sub-hypothesis, posits that Japanese respondents would rate a robot-marked article as more credible than a human-marked counterpart.

The results of the independent t-test indicated that there was no significant difference in Japanese readers' credibility perception of the human-marked article ($M = 3.11$, $SD = 0.76$) compared to the robot-marked article ($M = 2.96$, $SD = 0.66$); $t(64) = 0.893$, $p = 0.375$. Because the p value of 0.375 is greater than 0.05, the null hypothesis equating credibility ratings between stimuli among members of the Japanese nationality ultimately failed to be rejected.

American credibility perceptions by author. On the other hand, H1b posits that American respondents in the human author condition would rate the stimulus article higher in credibility than those in the robot author condition.

A significant difference was indeed found between the human ($M = 3.62$, $SD = 0.96$) and robot ($M = 3.01$, $SD = 1.02$) conditions for this nationality; $t(100) = 3.114$, $p = 0.002$, $d = 0.616$. Because the p value of 0.002 is less than 0.05, the null hypothesis was rejected, indicating that Americans did tend to find an article more credible when it had a human byline. A medium effect size was observed here with a Cohen's d value of 0.616.

Credibility perceptions by nationality. The final sub-hypothesis related to credibility suggested that nationality would play a role in credibility perceptions—more specifically, that Japanese respondents would rate robot-marked articles higher in credibility than American respondents.

A significant difference in credibility perception did not exist between American ($M = 3.01$, $SD = 1.02$) and Japanese readers ($M = 2.96$, $SD = 0.66$) of the robot-marked article; $t(79) = 0.258$, $p = 0.797$. Because the p value of 0.797 is greater than 0.05, the null hypothesis equating the two nationalities' credibility perceptions of the robot-marked articles failed to be rejected.

H2

American fear levels by author. Departing from the subject of credibility, the H2 hypothesis group incorporates respondent fear levels after being exposed to the stimulus. H2a posits that American respondents reading the robot-marked article would report higher levels of fear than those reading the human-marked one.

After running the independent samples t-test, there was a significant difference in American fear levels between the human author ($M = 1.37$, $SD = 0.52$) and robot author ($M = 1.62$, $SD = 0.727$) conditions; $t(99) = -1.990$, $p = 0.049$, $d = 0.395$. The null hypothesis was rejected with the p value of 0.049 being less than 0.05, indicating that Americans who received the robot stimulus scored higher on the fear index. However, it is worth noting that since Cohen's d equals 0.395, the overall effect size is small.

Fear levels by nationality. A second independent samples t-test related to fear was conducted to check whether Japanese readers were in fact less frightened after reading a robot-marked article than American readers.

A significant difference was observed between fear levels reported by American ($M = 3.81$, $SD = 0.86$) and Japanese respondents ($M = 2.82$, $SD = 0.79$) in the robot-author condition; $t(79) = 5.177$, $p = 0.000$, $d = 1.196$. The p value of 0.000 was less than 0.05, rejected the null hypothesis, and suggested that American respondents felt much less comfortable reading an article written by a robot than Japanese respondents. The Cohen's d value of 1.196 confirms a large effect size .

H3

The final hypothesis was interested in age, positing that older Americans would report a higher level of fear than younger Americans when they encountered a robot-marked article.

The results of the independent t-test indicated that there was no significant difference in fear levels between younger Americans ($M = 1.78$, $SD = 0.83$) and older Americans ($M = 1.50$, $SD = 0.63$); $t(46) = 1.293$, $p = 0.202$. Because the p value of 0.202 is greater than 0.05, the null hypothesis equating fear levels among the age groups failed to be rejected. Surprisingly, these results actually point in the opposite direction of the hypothesis, suggesting that younger Americans feel significantly more fearful than older Americans when presented with a robot-marked article.

Summary

Ultimately, based on the results of the six independent samples t-tests conducted, H1 was partially supported, H2 was fully supported, and H3 was not supported at all. An overview of all sub-hypotheses are depicted in Table 4.

Table 4

Analysis Results

ID	Hypothesis	Result
<i>H1a</i>	Japanese readers will rate robot-marked articles as more credible than human-marked articles.	Not supported
<i>H1b</i>	American readers will rate human-marked articles as more credible than robot-marked articles.	Supported
<i>H1c</i>	Japanese readers of robot-marked articles will rate them as more credible than American readers.	Not supported
<i>H2a</i>	American readers of robot-marked articles will report higher levels of fear than American readers of human-marked articles.	Supported
<i>H2b</i>	Japanese readers of robot-marked articles will report lower levels of fear than American readers of robot-marked articles.	Supported
<i>H3</i>	Older Americans will report higher levels of fear than younger Americans when presented with a robot-marked article.	Not supported

Discussion

Credibility Perceptions

The H1 group focused on credibility perceptions as a function of byline manipulation. H1a posited that Japanese respondents would find the robot-marked article more credible than the human-marked one, while H1b predicted the opposite for American respondents. H1c, on the other hand, projected that Japanese respondents would rate the robot-marked article higher in credibility than American respondents in the same condition. The only sub-hypothesis ultimately supported was H1b, meaning that the H1 group was partially supported.

American respondents gave human-marked articles higher credibility ratings than robot-marked ones, exhibiting the ingroup preferences observed by Jung and colleagues (2017) and van der Kaa and Krahmer (2014). Taking source-related credibility clues into

account, they deemed a fellow human as one of their “own,” who could be trusted as a competent messenger of believable information, as opposed to the “other” robot. The American respondents’ reluctance to rate the robot author credibly indicates that they might have been influenced to some degree by the general fear of automation described by Smith and Anderson (2017).

The insignificant findings related to the Japanese respondents in H1a and H1c were more surprising based on Jung and colleagues’ (2017) findings that many Korean citizens not only hold unflattering opinions about human journalists, but also are more likely to bestow the highest credibility ratings on robot-authored articles. With journalists popularly seen as state puppets and robots occupying a special cultural status not far away in Japan, a similar outcome among the Japanese respondents in this survey-experiment was expected. However, Japanese respondents were ultimately not as generous in their assessment of the robot-marked article. This suggests that in certain situations involving the assessment of robots and humans as knowledge sources, Japanese people may set aside their reverence for the former and evaluate both on a level playing field. The results demonstrate that while attitudes toward human journalists and credibility perceptions of robot journalists may seem similar on the surface between countries, they may not actually be the same upon further inspection. The lack of significant results for H1a and H1c highlight the importance of studying individual cultures before making blanket statements about an entire region.

Fear Levels

The H2 group, which included two sub-hypotheses, posited that a respondent’s level of fear would change based on their nationality and which byline manipulation they encountered in the survey-experiment. H2a suggested that American respondents would be more fearful after reading the robot-marked article as opposed to the human-marked one, while H2b suggested that Japanese respondents would be less fearful of the robot-marked

article than American respondents in the same condition. H2 was fully supported with the sub-hypotheses H2a and H2b carrying small to large effect sizes, respectively.

These results are not surprising when held up to previous research, especially findings by Straub, Keil, and Brenner (1997), Zakour (2009), and Khasawneh (2015) detailing the relationship between technology, culture, and fear. Respondents were indeed informed by their respective cultures in deciding how afraid they should feel or how open they should be to accepting a certain technology—in this case, automated journalism. On the American side, respondents reported higher fear levels when exposed to a robot-marked article, which supported Smith and Anderson's (2017) claim that Americans fear automation. Smith and Anderson (2017) exclusively looked at opinions on self-driving cars, robot caregivers, and resume-sorting algorithms, but the results of this analysis definitively add robot journalists to the group of automated technologies met with suspicion by Americans.

Supporting Hornyak's (2006) observations on American culture, the influence of pop culture on the results of the survey-experiment cannot be understated here. The average American may not encounter real robots in their daily lives, but they do quite frequently in the entertainment products they enjoy. Despite being far removed from the *Terminator* era, it continues to perpetuate the killer robot theme, with the latest iteration being played out on the small screen with the hit Netflix series *Black Mirror*. The negative robot trope is so engrained in American pop culture and rears its head often enough to remind viewers that robots are bad or intimidating. It is plausible that American respondents may have called it to mind in the survey-experiment and reflected it in their reports of fear.

In stark contrast to their American counterparts, Japanese respondents reported feeling less afraid after reading the robot-marked article. This also falls in line with prior research, which confirms that while Japan has lower levels of technology acceptance in general, the country's strong robotics culture makes robot technology an exception to any

rule (Hornyak, 2006; Straub, Keil, & Brenner, 1997). In accordance with Hornyak's (2006) portrayal of Japanese society, many Japanese respondents have likely heard of a robot performing a task or have often seen it happen themselves in a familiar environment like a store, fostering a confidence from an early age that robots are benevolently programmed to help society. In other words, Japanese respondents were not as impacted with fear as Americans were after reading the robot-marked article in the survey-experiment because robots hold a special place in Japanese culture. To them, generating a news article is yet another bullet in a long list of functions that they are already aware robots have.

As automated technology continues to seep into the daily cycle of news gathering and reporting, news organizations worldwide have to become more mindful of how robot-generated pieces may negatively affect consumer emotions, similar to how the robot-marked article in the survey-experiment stoked fear within the American respondents. The results indicate that doing so is not as urgent for organizations serving Japanese audiences. However, those with primarily American consumers must find a balance between running their newsrooms efficiently and respecting their news consumers' boundaries. Otherwise, news consumers who consistently experience fear and anxiety—or, in light of H1, raise doubts about credibility—brought on by an extensive catalogue of robot-authored articles may turn to another organization as their primary or preferred news source.

Age

Finally, H3 posited that age would be a significant predictor of fear of automated journalism—namely, that older Americans would score higher on an index of fear-related emotions after reading the robot-marked article. This hypothesis was not supported at all. In fact, the opposite—that younger Americans reported significantly higher fear levels—was true, which contradicts observations by Kennedy and Funk (2016) and Smith (2014).

It is worth noting that respondents were only able to take the survey if they were part of the online survey platform's panel, which required a computer or mobile device as well as an online bank account. As such, adults over 55 years entered the survey-experiment with some level of technological savvy despite their comparatively older age. This could have translated to a lower fear level related to new technologies, including automated journalism, among older adults because they can personally see the benefits technology brings to their daily lives. Many in the sample indeed reported using digital technologies regularly to get their news, strengthening their chance of having actually encountered robot-authored articles in real life.

A preexisting familiarity with technology may justify why the older respondents in the sample did not display overwhelming fear in the face of a robot author, but it does not explain the surprising and somewhat counterintuitive finding that younger Americans scored significantly higher on the fear index. This latter group considered themselves technologically savvy and reported using digital technologies regularly to get their news, a fact that would under normal circumstances suggest a higher level of comfort with and acceptance of a new technology like automated journalism. Considering the unique events unfolding in the United States at the time the survey-experiment was launched may be the only way to provide clarification. In April 2018, with data collection underway, American headlines were saturated with topics related to fake news bots, compromised data privacy, and successful online election interference by foreign governments—topics about which Facebook CEO Mark Zuckerberg was preparing to testify before Congress. It is reasonable to assume that young digital natives, who are the heaviest users of various data-driven platforms and therefore are the most affected by this news (Smith & Anderson, 2018), may have been alarmed by these headlines and called them to mind when seeing the robot byline in the stimulus article.

Zuckerberg's testimony was unexpectedly timed to run alongside data collection, and while it may have biased some respondents' answers, it also gave another surprisingly relevant insight into the age and technology components of H3. Many social media users and news outlets "were quick to point out [that those] questioning Zuckerberg weren't exactly digital natives—the average age of the lawmakers at the hearing was 62, and the median age of the chairs and ranking members...holding the hearing was nearly 80" (Stewart, 2018, para. 11), which was reflected in their often out-of-touch and confused round of questions about technology. One lawmaker, for example, asked if Facebook could see emails sent through one of its applications, Whatsapp, which is encrypted and does not support emailing. The hearing raised the issue of older adults being so divorced from digital technology that they might not clearly understand the gravity of new advancements, like automated journalism, or be in a place to accurately report related emotions.

Study Limitations and Suggestions for Future Research

Several precautions were taken to avoid limitations related to the study's cross-cultural nature. In terms of instrumentation and translation, the topic of baseball was chosen based on its relevance to both American and Japanese audiences, while strictly native Japanese speakers were hired to carefully translate and proofread any text that respondents would read. However, with a language as specific as Japanese—so specific that it includes at least a dozen forms of "you" depending on person, mood, or situation (Jones, 2015)—it can be difficult even for native speakers to find a perfect translation capturing the same literal and cultural meaning of a text. The existence of this limitation is somewhat unknown without personal knowledge of the language, but it highlights the importance of asking a group of experienced native translators, ideally with a specialization in the study's topic of interest, for help. By doing so, researchers can be fully confident that any differences found between the study's cultural groups are not in any way influenced by translation error. Future studies

should replicate the survey-experiment in other countries, perhaps ones with different technology acceptance levels or on different continents, with this precaution in mind.

This being said, the study did suffer from some perceptible limitations. The first pertained to the study's sample and was especially glaring when considering the lack of support for H3. All data was collected from respondents online, meaning that adults were comfortable enough with technology that they could open their emails on a computer or mobile device, activate a hyperlink to the survey, and navigate through the questions. This naturally excluded adults who do not have such high exposure to digital technologies and whose answers to the survey questions about automated journalism could have been drastically different if they had a chance to field them. In the future, researchers who want to replicate this study or conduct a similar one should recruit respondents in both offline and online settings to obtain results that represent a wide range of technology use.

The final limitations dealt with the study's stimulus article. Only one stimulus article about baseball was presented to respondents, who were then asked to report levels of seven fear-related emotions. Even though respondents' answers to these questions ultimately supported H2, the question arose early on about how effective a static article was in portraying automated journalism and namely in eliciting emotions that were discernible enough for respondents to report. Future studies should experiment not only with multiple stimulus articles, but with different article topics—even branching out beyond the typical automated journalism topics of sports, weather, election results, and stock market reports to investigate the effects of opinion pieces and feature profiles marked with robot authors. Likewise, researchers should implement a feature in their survey where respondents can choose a topic and see a dynamic, real-time simulation of an article being written by a robot. This would give respondents a sense of just how quickly and accurately a robot can write a news article on the topic of their choosing, and create an impact that would perhaps

more effectively tune them in to their emotions. Implementing state-of-the-art biometric research methods, including monitoring heart rate and brain signals, could also be a more accurate way of assessing fear in respondents than self-reporting in future research.

Conclusion

Limitations notwithstanding, the present study is one of the first pieces of literature on automated journalism to compare credibility perceptions and fear-levels cross-culturally. Here, it was determined that Japanese news consumers are more open to robot bylines, but for those from the United States, human journalists still hold more precedence. However, in order to paint a more comprehensive portrait of the dynamic between reader and robot, similar studies must be conducted in other countries around the world. Since automated journalism is becoming an increasingly common tool in newsrooms globally, it is ever-more relevant to understand how news consumers perceive articles written by a human journalist or a news robot. Doing so is a benefit not only to the local, national, and international news companies who want to be sensitive in catering to their audiences' sensibilities, but also to the journalistic field as a whole in recognizing how much technology is too much—or not enough—in the eyes of its stakeholders.

References

- Anderson, M., & Perrin, A. (2017). Tech adoption climbs among older adults. *Pew Research Center: Internet & Technology*. Retrieved from http://assets.pewresearch.org/wp-content/uploads/sites/14/2017/05/16170850/PI_2017.05.17_Older-Americans-Tech_FINAL.pdf
- Automated Insights. (2018). Wordsmith. *Automated Insights*. Retrieved from <https://automatedinsights.com/wordsmith>
- Barthel, M., & Mitchell, A. (2017) Americans' attitudes about the news media deeply divided along partisan lines. *Pew Research Center: Journalism & Media*. Retrieved from http://assets.pewresearch.org/wp-content/uploads/sites/13/2017/05/09144304/PJ_2017.05.10_Media-Attitudes_FINAL.pdf
- Carlson, M. (2014). The robotic reporter. *Digital Journalism*, 3(3), 416–431.
doi:10.1080/21670811.2014.976412
- Clerwall, C. (2014). Enter the robot journalist. *Journalism Practice*, 8(5), 519–531.
doi:10.1080/17512786.2014.883116
- Daily Republic Staff. (2018). Prep baseball: Vacaville Christian crushes Encina Prep. *Daily Republic*. Retrieved from <https://www.dailyrepublic.com/sports/prep-baseball-vacaville-christian-crushes-encina-prep/>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319. doi:10.2307/249008
- Finley, K. (2015). This news-writing bot is now free for everyone. *Wired*. Retrieved from <https://www.wired.com/2015/10/this-news-writing-bot-is-now-free-for-everyone/>
- Gonzales, H. M. S., & González, M. S. (2017). Bots as a news service and its emotional connectivity with the audience. The case of Politibot. *Doxa Comunicación*, 25, 63–84.

- Retrieved from http://dspace.ceu.es/bitstream/10637/8765/2/Bots_as_HadaSanchez_MariaSanchez_Doxa_2017.pdf
- Haim, M., & Graefe, A. (2017). Automated news. *Digital Journalism*, 5(8), 1044–1059. doi:10.1080/21670811.2017.1345643
- Hamilton, J. T., & Turner, F. (2009). Accountability through algorithm: Developing the field of computational journalism. *Center for Advanced Study in the Behavioral Sciences at Stanford University*, 1–20. Retrieved from <https://web.stanford.edu/~fturner/Hamilton%20Turner%20Acc%20by%20Alg%20Final.pdf>
- Heliograf. (2016). Kamala Harris wins 2016 California Senate race. *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/politics/2016-race-results-california-senate/?utm_term=.0216697460f3#comments
- Hirose, H. (1990). The development of discussions on journalism in postwar Japan. *Media, Culture & Society*, 12(4), 465–476. doi:10.1177/016344390012004003
- Hornyak, T. (2018). Here's how one Japanese newspaper is moving robo-journalism forward. *Media Shift*. Retrieved from <http://mediashift.org/2018/02/heres-how-one-japanese-newspaper-is-moving-robo-journalism-forward/>
- Hornyak, T. (2006). *Loving the machine: The art and science of Japanese robots*. New York, NY: Kodansha International.
- Huifeng, H. (2015). End of the road for journalists? Tencent's robot reporter “Dreamwriter” churns out perfect 1,000-word news story in 60 seconds. *South China Morning Post*. Retrieved from <http://www.scmp.com/tech/china-tech/article/1857196/end-road-journalists-tencents-robot-reporter-dreamwriter-churns-out>
- Jones, C. P. A. (2015). ‘Vague’ Japanese language can be maddeningly specific. *The Japan Times*. Retrieved from <https://www.japantimes.co.jp/life/2015/04/20/language/vague-japanese-language-can-maddeningly-specific/#.WtvcPYhuY2w>

- Jung, J., Song, H., Kim, Y., Im, H., & Oh, S. (2017). Intrusion of software robots into journalism: The public's and journalists' perceptions of news written by algorithms and human journalists. *Humans in Computer Behavior*, 71, 291–298.
doi:<https://doi.org/10.1016/j.chb.2017.02.022>
- Kennedy, B., & Funk, C. (2016). 28% of Americans are “strong” early adopters of technology. *Pew Research Center: Fact Tank*. Retrieved from <http://www.pewresearch.org/fact-tank/2016/07/12/28-of-americans-are-strong-early-adopters-of-technology/>
- Keohane, J. (2017). What news-writing bots mean for the future of journalism. *The Washington Post*. Retrieved from <https://www.wired.com/2017/02/robots-wrote-this-story/>
- Kim, D., & Kim, S. (2017). Newspaper companies' determinants in adopting robot journalism. *Technological Forecasting and Social Change*, 117, 184-195.
doi:<https://doi.org/10.1016/j.techfore.2016.12.002>
- Meier, K. (2009). Transparency in journalism: Credibility and trustworthiness in the digital future. Retrieved from http://www.academia.edu/11543629/transparency_in_journalism_credibility_and_trustworthiness_in_the_digital_future
- Moses, L. (2017). The Washington Post’s robot reporter has published 850 articles in the past year. *Digiday UK*. Retrieved from <https://digiday.com/media/washington-posts-robot-reporter-published-500-articles-last-year/>
- Mullin, B. (2016). The AP will use automated writing to cover the minor leagues. *Poynter*. Retrieved from <https://www.poynter.org/news/associated-press-will-use-automated-writing-cover-minor-leagues>
- Oi, S., & Sako, S. (2017). Country report: Journalists in Japan. *Worlds of Journalism Study*. Retrieved from https://epub.ub.uni-muenchen.de/36330/1/country_report_Japan.pdf

- Šabanović, S. (2014). Inventing Japan's "robotics culture": The repeated assembly of science, technology, and culture in social robotics. *Social Studies of Science*, 44(3), 342–367.
doi:10.1177/0306312713509704
- Saenz, A. (2010). Robot journalist takes pictures, asks questions, publishes online. *Singularity Hub*. Retrieved from <https://singularityhub.com/2010/03/18/robot-journalist-takes-pictures-ask-questions-publishes-online/#sm.00000cxlltkordawv5b294xqzu7er>
- SafeHome. (2017). Privacy and technology. *SafeHome*. Retrieved from <https://www.safehome.org/resources/privacy-and-technology/>
- Smith, A. (2014). Older adults and technology use. *Pew Research Center: Internet and Technology*. Retrieved from http://assets.pewresearch.org/wp-content/uploads/sites/14/2014/04/PIP_Seniors-and-Tech-Use_040314.pdf
- Smith, A., & Anderson, M. (2017). Automation in everyday life. *Pew Research Center: Internet & Technology*. Retrieved from http://assets.pewresearch.org/wp-content/uploads/sites/14/2017/10/03151500/PI_2017.10.04_Automation_FINAL.pdf
- Smith, A., & Anderson, M. (2018). Social Media Use in 2018. *Pew Research Center: Internet and Technology*. Retrieved from http://assets.pewresearch.org/wp-content/uploads/sites/14/2018/03/01105133/PI_2018.03.01_Social-Media_FINAL.pdf
- Society of Professional Journalists. (2014). SPJ code of ethics. *Society of Professional Journalists*. Retrieved from <https://www.spj.org/ethicscode.asp>
- Straub, D., Keil, M., & Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & Management*, 33(1), 1–11.
doi:10.1016/s0378-7206(97)00026-8

Stewart, E. (2018). Lawmakers seem confused about what Facebook does—and how to fix it.

Vox. Retrieved from <https://www.vox.com/policy-and-politics/2018/4/10/17222062/mark-zuckerberg-testimony-graham-facebook-regulations>

Tae-hoon, L. (2016). Will robot reporters replace humans? *The Korean Observer*. Retrieved

from <http://www.koreaobserver.com/will-robot-reporters-replace-humans-63057/>

Van Dalen, A. (2012). The algorithms behind the headlines. *Journalism Practice*, 6(5-6),

648–658. doi:10.1080/17512786.2012.667268

van der Kaa, H. A. J., & Krahmer, E. J. (2014). Journalist versus news consumer: The

perceived credibility of machine written news. *Computation + Journalism*

Symposium. Retrieved from https://pure.uvt.nl/ws/files/4314960/cj2014_session4_paper2.pdf

Zakour, A. B. (2009). Information Technology Acceptance across Cultures. *Information*

Resources Management, 25–53. doi:10.4018/978-1-59904-102-5.ch002

Appendix A

Adapted Stimulus Article in English

Falcons Crush the Bulldogs 13-0

VACAVILLE, CALIFORNIA — It did not take long for the Vacaville Falcons to get on the scoreboard in Tuesday's baseball game against the visiting Encina Bulldogs.

The Falcons scored three runs in the first inning before adding four more by the third inning, all en route to a 13-0 victory over the Bulldogs. The team shut down the competition with six more runs at the end of the fourth inning. With a scoreless fifth inning, the Bulldogs were not able to recover.

Senior pitchers Justin Neace, Quinlan Sweany, and Brett Huntley were just a few of the players who contributed to the Falcon victory by scoring two times each during the game.

The teams are scheduled to square off again on Thursday at Encina's baseball field, where the Bulldogs will be waiting for the chance to redeem themselves.

- This article was written by a robot.
- This article was written by a human.

Appendix B

Survey in English

- What was the subject of the article?
 - Politics
 - Fashion
 - Sports
 - Finance
- Who wrote the article?
- On a scale of 1 to 5, how strongly do you agree with the following statements about the article?
 - I trust the information presented in the article.
 - The information in the article is unbiased.
 - The author of the article is knowledgeable and/or competent.
 - 1, strongly disagree
 - 5, strongly agree
- On a scale of 1 to 5, how highly would you rate the article on the following descriptors?
 - Credibility
 - Trustworthiness
 - Expertise
 - 1, very low
 - 5, very high
- On a scale of 1 to 5, how strongly do you feel the following emotions after reading the article?
 - Afraid
 - Anxious
 - Disturbed
 - Frustrated
 - Nervous
 - Intimidated
 - Comfortable
 - 1, not at all
 - 5, very strongly
- On a scale of 1 to 5, how technologically savvy do you consider yourself?
 - 1, not at all tech savvy
 - 5, extremely tech savvy
- Which of the following platforms do you use regularly to get news?
 - Online (desktop/laptop)
 - Online (smartphone/tablet)
 - Television
 - Radio

- Print
- In recent years, some news organizations have introduced “robot journalism” into their news rooms. This refers to special technology that can pull data from different sources and generate news articles on its own within seconds. We would now like to ask you opinion about this practice.
- On a scale of 1 to 5, how strongly do you agree with the following statements?
 - I prefer to have robots writing news articles than humans.
 - I resent that robots are becoming so prevalent in our daily lives.
 - I feel more confident reading an article written by a robot rather than a human.
 - Robots should not write news articles.
- What is your nationality?
 - American
 - Japanese
 - Other
- What is your age?
 - 18-24
 - 25-34
 - 35-44
 - 45-54
 - 55-64
 - 65+
- What is your gender?
 - Male
 - Female
 - Non-specific
- What is your highest education level?
 - None
 - High school (including associate’s degree)
 - Bachelor’s degree
 - Master’s degree or higher