An Automated Approach to Fact Checking User-Generated Content for Journalists

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Abstract

Journalists have exhibited widespread caution in regard to using content generated by citizen journalists because of the threat it poses to traditional news values and their role as gatekeepers. But text, photos and videos provided by citizens who witness breaking news events is one category of user-generated content that journalists are willing to use, which helps supplement their storytelling when fewer resources means journalists cannot personally be there. This willingness does not dampen several of their concerns; journalists require fact checking to be an integral part of any system that aggregates and accepts submissions by citizen journalists. This paper explores three different sets of tools that could be used to automate fact checking in a system that hosts user-generated content to ensure that content is accurate, neutral, timely and useful. These tools include vandalism detection software that identifies bias, inappropriate language, spam and copyright violations; crowdsourcing, which ensures that content is relevant, helpful and accurate; and photo and video authentication tools.

Keywords

Citizen journalism, user-generated content, design-oriented research, curation, fact checking

Introduction

"Instead of dying, newspapers will in effect be reborn."
- Ken Paulson, president of the American Society of Newspaper Editors

The traditional model of journalism, that of a one-way dissemination of information from large news organizations like newspapers, television broadcasters and radio stations to the general public, is changing rapidly. The last decade has seen an accelerating loss of newspaper readers, as well as revenue. The advent of simple technologies that allow anyone to write, research and publish is challenging the gatekeeping role traditionally held by journalists (Lewis, et al., 2010), as well as the norms and values of journalism like neutrality, accuracy, timeliness and balance.

This explosion in the popularity of self-publishing tools has created a new set of storytellers: citizen journalists. There is a proliferation of websites that share stories told by citizen journalists, which are executed with varying degrees of success. Many researchers, however, agree that ordinary citizens lack the training of professional journalists, whose job it is to carefully and accurately report and edit stories, as well as consider the ethical and legal implications of stories. Citizens that lack this kind of training are more prone to publishing stories that lack authenticity and accuracy, and ultimately undermine the practice of storytelling. Citizens can, however, be a valuable source of information and in some cases, help journalists report stories by providing eyewitness accounts, photos and videos, especially for stories that journalists cannot immediately access.

In reaction to this new reality in journalism, I undertook a design-oriented research study to discover if there was a way to design a website that would allow users and journalists to share information about the kind of user-generated content needed by journalists and how
users could provide journalists with this content. Preliminary user and journalist studies indicated there was a need for such a service; users were confused as to how to get their proprietary news content into the hands of journalists, while journalists rarely used this content because of the time-consuming task of scouring social media sites to find it and fact checking it. However, the journalists indicated their extreme caution in using user-generated content because of concerns that it would not uphold the journalistic norms and values of neutrality, accuracy, timeliness and balance.

The second part of this research focused on creating a prototype, which illustrated the functionality of a website that would allow users to upload text, photos or video relating to a breaking news story, and journalists could choose whether to use the content to supplement their reporting. The five-page prototype took into account the requirements and concerns of users and journalists, as expressed in initial user surveys, but was built solely for journalists as they were the group that would benefit most. The prototype and questionnaire offered insights into how journalists interacted with a website and illuminated three different design implications that are important to consider when designing for journalists: the constant threat of looming deadlines and the need to provide information quickly and succinctly; the journalists’ prevailing concern for content over aesthetics; and the unequivocal need to have fact checking as an integral part of any system.

The last finding formed the basis for the research question explored in this paper: how to design a system that will automate fact checking for journalists. Fact checking was the overwhelming concern of journalists throughout the research project, with many asking how a website, such as the one proposed in this research, could adequately ensure that the content posted by users was proprietary and accurate, and that the sources were properly vetted to ensure that there was no conflicting agenda or bias. A few fact checking mechanisms were employed in the prototype to address some of these concerns: contact information was provided for each user, a request that was made in the journalist surveys, and a ratings system would allow users to rate content on the basis of journalistic norms and values like factuality, neutrality and usefulness. Though these tools addressed some of the concerns raised in the earlier surveys, the journalists indicated in the prototype questionnaire that such a website needed to go further and more effectively fact check the content on the site in order for it to be useful.

This paper will discuss several methods and tools that can be used to automatically fact check user-generated content provided by citizen journalists. The research focuses on three different sets of tools that can be employed to ensure that content on the site is likely to be factually correct, authentic and relevant. One tool is vandalism detection software that will root out and flag content that indicates bias, inappropriate language, spam and copyright violations. Another tool is crowdsourcing, or harnessing the power of the crowd, to ensure that the content is relevant, helpful and accurate. And the final tool involves software programs that authenticate photos and videos, and ensure that visual content appearing on the site has not been tampered with.

These principles of fact checking not only uphold the norms and values that journalists value so highly, but it curates that content to ensure that the best information possible is on the site at all times. Curation has become an important tool in news and has been identified as a trend that will become more and more important as content is continually added to the web (Liu, 2010). Combining the power of software tools with human actors helps to weed out unconstructive and inaccurate information in order to help journalists do their jobs better. Journalists generally employ a multi-round fact checking process and
these tools will help journalists complete a round of automated fact checking before they read the content. This cuts down on the time it takes a journalist to check the content and ensures that citizen journalists can helpfully offer their services while continuing to uphold the norms and values that have guided responsible journalism for years.

**Background**

In this section, comprehensive background information will be provided on the state of the journalism industry today; the efforts to bring the practice of citizen journalism into the mainstream; the relationship between journalists and citizen journalists and how professional journalists view user-generated content and its use; and the emerging trend of information curation, an increasingly important process in new journalism ventures that weeds through millions of pieces of information to find the most relevant and important ones. These issues will be presented in the following four chapters.

**A Changing Industry**

The journalism industry has changed dramatically over the last decade. Revenues have sunk, circulation figures have dropped and newsrooms have had to cut their staff. The move from a print base to a digital one has eroded the business’s traditional advertisement-based revenue model. The shift to digital has also fundamentally altered the traditional news cycle _ publishing immediately on the web in order to compete instead of saving stories to be published in the morning paper _ and as a consequence altered how newsrooms are staffed. The new global marketplace has also made it more difficult for news organizations to effectively target their audience; now readers can cherry-pick the stories they like without paying for the delivery because every English-language newspaper online is competing with one another (Kramer, 2010). “The captive audience has escaped,” writes Larry Kramer, founder and CEO of CBS Marketwatch (2010).

According to the Pew Research Center’s Project for Excellence in Journalism, the industry saw improvements in 2010 after two horrible years with fewer staff cuts and the moderate success of several new revenue models. Despite major efforts made by newspapers to compete digitally, they continued to see revenues decline, illustrating that the problems newspapers face are worse than for other types of media (Pew, 2010).

“Beneath all this, however, a more fundamental challenge to journalism became clearer in the last year. The biggest issue ahead may not be lack of audience or even lack of new revenue experiments. It may be that in the digital realm the news industry is no longer in control of its own future” (Pew, 2010).

This shift to digital has also “opened the gates” to user-generated content in the form of photos and videos, blogs, comments and, in some cases, news articles written by readers (Lewis, et al., 2010). As a result there is an expectation that users can engage with and control content online, “blurring traditional boundaries and roles of news producers and news consumers and threatening to undermine the gatekeeping function so central to the professional purpose of the press” (Lewis, et al., 2010). However, journalists are not ready

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1 The Pew Research Center is an independent and neutral organization that studies the perception of politics, the press and public policy. The center’s Project for Excellence in Journalism helps journalists and the public better understand media coverage, changes in the industry and what shapes the change.
to give up their gatekeeping role, despite their desire to create online communities that interact with and supplement their content.

“What arises, then, is a tension for newspaper journalism in the twenty-first century: the practical logic of building participatory platforms to attract greater communities of users, for economic survival as well as to foster greater civic dialogue, against the professional logic of retaining authority over information flow” (Lewis, et al., 2010).

These issues provide a strong challenge to the current business model, which Kramer believes is obsolete and unworkable. He said that instead, a new business model will have to be created to support the news business and there is currently a scramble to figure out what it will be. He believes it will be a combination of smaller business models that will emerge to solve the current crisis and form the new foundation of journalism (2010). His hypothesis could prove to be correct, especially if the current spate of journalism startup companies find success in their work with smaller and more specific aspects of journalism; instead of a newspaper covering local news, politics, entertainment, food and more these ventures take a specific part of that storytelling mandate. Patch, for example, is owned by AOL and is focused on hyperlocal storytelling, while The Daily Meal, run by the former CEO of Forbes, would like to become a hub of food and wine content (Smith, 2010). This trend of more niche-focused approaches to storytelling triggered the idea for this design-oriented research; focusing just on providing user-generated content could answer a gaping need for journalists and users alike.

**Citizen Journalism**

As the journalism industry continues to change rapidly, one of the new potential models of journalism is that of citizens as storytellers. Citizen journalism websites such as NowPublic and Demotix, which publish user-generated content, are helping to shape this new contribution to storytelling. However, the value of user-generated content as a stand-alone product is highly debated. Researchers are looking into the value of this type of content and whether it can compete with content produced by professional journalists in terms of quality, frequency and relevance. Lacy, et al. (2010) found in their content analysis of citizen blog sites, citizen news sites and daily newspaper sites that these sites are not viable replacements for the information provided by daily newspapers. The main reason for this is that citizen sites lack the resources of larger newspapers and cannot update content often enough in order to be a suitable substitute for daily newspapers (Lacy, et al., 2010). The lack of training is also seen in these sites; content is often incorrectly categorized and the top stories targeted are routinely of little interest to most readers.

Much of the research has pointed to the continued need for professionals to provide edited, vetted and carefully reported stories. However, the decision about the top stories each day is no longer solely the job of professional journalists. Increasingly, an involved public that uses and interacts with social media, such as blogs, Twitter, Facebook and YouTube, are deciding the top stories of the day, and these differ greatly from major news organizations. These users have created passionate communities that harness the power of the masses to

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2 NowPublic is a news site powered by approved contributors, who submit stories, photographs and videos.

3 Demotix publishes user-generated news, photos and videos and pays contributors.
elevate stories that are not being covered by major news outlets to the level of national or even international news.

Ordinary citizens’ can also be a valuable source of breaking news content. As the research has shown, citizen journalists might not be well suited to executing the full spectrum of storytelling _ reporting, editing, fact checking and publishing _ but they do possess valuable information in the form of eyewitness accounts and images. This has always been of value in storytelling and is often solicited by news organizations, whether they post requests on their websites, have dedicated webpages for citizens to post content or have reporters contact those who have posted information online. The value of this information in aiding the story coverage of professional journalists is especially valuable as news organizations have had to cut their staffs in order to cope with dwindling budgets. The value of these eyewitness reports from ordinary citizens has been seen over and over again, particularly during emergencies. The recent political uprisings in the Middle East and North Africa, as well as the Japanese earthquake in March 2011 show the value of reports from ordinary people, who are in the midst of these stories. Their contributions on Twitter, Facebook, Flickr and YouTube have value for news organizations, many of whom cannot get their reporters to the story quickly enough. They also provide a unique, domestic and personal perspective that a journalist covering the story might not have.

“Citizen journalists can be of great assistance to news organizations when they are in locations we can’t get to right away. They can provide us color and detail about what is happening when major breaking news unfolds.” - Krista Larson, editor and supervisor on Africa Desk for The Associated Press.

Hundreds of user-generated videos of the recent Japanese earthquake were uploaded to CNN’s iReport 4, and a few contributors were invited as guests on CNN television shows to describe their experiences (Owens, 2011). An older, but strong example was the user-generated photographs submitted to news organizations after the London terrorist bombings in 2005. The bombings on a bus and in subway stations meant that ordinary citizens were the only witnesses to the attack, leaving journalists behind police cordons and unable to access the scene. Citizens used their mobile phones to take photos and videos underground, which were then given to news organizations and used on the front pages of several London newspapers. Many experts said the grainy videos taken by their phones were the most compelling content in the aftermath because it lent a very human and real element to events that were being recorded as they happened (Allan, 2007).

Despite the many benefits, journalists are reticent to use user-generated content because of prevailing concerns that it challenges their gatekeeping role, and because of concerns over quality and the potential for legal liability in the case of publishing information that has not been properly fact checked (Singer, 2010). The partnership between users and professional journalists can only happen if users want to participate and if news organizations are willing to “open the gates” (Lewis, et al., 2010).

**Journalists and User-Generated Content**

Journalists see their primary goal as that of a gatekeeper; to provide the public with the most important information after it has been fact checked, the sources vetted and it has been reviewed by professionals. It is the responsibility of journalists to uphold news

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4 CNN’s iReport is one of the only user-generated content platforms employed by a major news organization. The website takes the best user-generated content and incorporates it into their storytelling.
standards and values, such as publishing unbiased content that provides an even-handed presentation of the news, and strictly control against libel and other legal complications (Singer, 2010).

There are new challenges to the institution of journalism with the introduction of social media, which allows users to contribute to and talk more about the news, and publishing tools that allow users to research, write and source their own content. The use of user-generated content by news organizations today is varied; it ranges from letters to the editor, to the sharing of content in breaking news situations, to incorporating curated Twitter feeds into multimedia packages, as The Washington Post and The New York Times did during the recent political uprisings in Egypt, giving the citizen-on-the-ground perspective, in addition to its traditional storytelling (Luckie, 2011).

However, the existing ways in which users can now contribute do not offer them a real opportunity to influence or select the news. The decisions about what content to use and how to use it is still strictly controlled by professional journalists due to their overarching concern that user-generated content poses a threat to traditional norms and values and can introduce bias, liability and poor quality into the news product (Lewis, et al., 2010). In a survey of local, British journalists, Singer (2010) found that more than 96 percent agreed with the statement “journalists have important skills that users lack.” Many journalists widely acknowledge the benefits of user-generated content in informing and at times supplementing their reporting. But in many cases the challenges outnumber the benefits in journalists’ eyes; user-generated content challenges their gatekeeping role, threatens traditional values and is an unworkable practice for today’s overburdened newsrooms. The one category of user-generated content that journalists seem to agree is valuable and necessary is eyewitness reports that supplement professional storytelling. This consensus anchors this research project, which aims to design a system that effectively utilizes citizen journalist contributions, while understanding and respecting the prevailing concerns of journalists.

The journalists surveyed in connection with this research said that citizen journalists can provide valuable assistance to news organizations, especially in remote locations. A forty-year news veteran, who participated in the survey, said that citizen-journalist reports are valuable in breaking news situations where professionals are not able get to the scene quickly enough. He used the 2004 Indian Ocean tsunami and the 2009 Iranian elections as an example:

“The real-time images and first person accounts gave a real sense of what the experience (tsunami) was like. During the protests that followed disputed Iran elections, journalists were banned from reporting anti-regime statements and foreign journalists were not given visas. Social media were the only outlets but many of the reports posed serious challenges for determining where the events took place and when.” - Nicolas Tatro, former Deputy International Editor, AP

Several of the journalists surveyed by Lewis et. al. (2010) agreed that citizen journalism is a way for newspapers with dwindling resources to “obtain news that it otherwise would not acquire.” A journalist surveyed by Singer (2010) said that “readers are the best source of news for a good newspaper; they always have been.” They do, however, see user-generated content as a compliment to professional news gathering and not a replacement for it (Singer, 2010). The journalists surveyed by Singer (2010) categorized the areas in which they were comfortable accepting user submissions, such as sources, leads, ideas and contributions to stories that were being written by professionals. Editors in Lewis, et al.’s
(2010) study said they saw citizen journalism as an advancement in the practice of journalism ushered in by technological changes, and a way of better connecting with their communities. They said they saw users offering valuable contributions, such as comments, photographs, online polls and expertise, and felt that citizen journalism will continue to grow in importance (Lewis, et al., 2010).

Though most of the journalists in Singer’s (2010) survey said they were open to using user-generated content, their need to monitor the content and how and where it is used creates a disconnect between their desire to use the content and their need to control it. None of the journalists surveyed by Singer (2010) felt that this job of monitoring user-generated content would fit in with current newsroom routines. This caution employed in using user-generated content is the biggest barrier to more citizen participation in the news. This limited use of user-generated content in large newsrooms was illustrated in the survey responses for this research. The journalists said they generally did not use user-generated content, and in the cases in which they did, they used photos because the time stamp could be quickly checked and a photo editor could easily determine if it had been tampered with.

Singer’s (2010) study of British journalists and Lewis, et al.’s (2010) study of community journalists in the U.S. found that journalists see user-generated content as unworkable because of the time it takes to edit and confirm content. Part of the reason for this is the state of overburdened newsrooms that do not have the time or staff to devote to this time-consuming process. Coupled with this concern is the general wariness of user-generated content. Nahal Toosi, a reporter for the AP in Islamabad, Pakistan, opined that user-generated content should be used very carefully. “A lot of it is not necessarily solid material. I approach the content the way I approach Wikipedia or other information I see _ as a useful tip sheet that needs verification.” This concern about the quality of user-generated content is shared industry-wide. Journalists in Singer’s (2010) study rated the quality as low, expressing worry that could weaken the news product. Part of the reason for this perceived lack of quality is that citizens lack the training of professionals (Lewis, et al., 2010). There is also widespread concern that citizen journalists do not fully understand the need for neutrality and balance (Singer, 2010). In fact, more than 80 percent of journalists in Singer’s (2010) survey agreed that users could manipulate content platforms to further their own agendas.

The legal liability involved with publishing content that has not been properly fact checked and sourced by professional journalists is another major concern (Singer, 2010). This was a fact echoed by former AP manager Nicolas Tatro in the journalist survey. “Citizen journalist reports and images should be used after being vetted and edited by professional journalists, who are trained in legal issues and time-tested practices on when to publish and when not to.” The journalists surveyed by Lewis, et al. (2010) echoed these concerns, saying that they had experimented with various forms of citizen journalism but found it to be unwieldy and unsatisfying because of concerns about legal issues, such as being sued for libel. The journalists surveyed in connection with this research also made it clear that properly vetting sources _ not only someone who might be quoted in a user-generated story, but the user themselves _ was of utmost importance. AP editor and supervisor Krista Larson said they would want to know something about the contributors’ backgrounds, such as their employer, to ensure there is no conflict of interest or that the contributor does not work for an oppressive government. AP reporter Nahal Toosi echoed this point, saying that the material would need to have “excellent, on-the-record sourcing.” And former AP manager Nicolas Tatro said that contributors should provide contact information so that journalists who use the reports or images can talk to the contributors themselves.
Information Curation

Part of the challenge in using content provided by citizen journalists on the web is the plethora of information and the insufficiency of tools available that help to weed through and curate the content in order to provide the best information. Over the past few years, “curation” has become a buzzword and an emerging technology trend (Liu, 2010), and it’s no surprise as to why. The internet now has more than two billion users, according to the UN’s International Telecommunication Union (Melanson, 2011), each of them with the power to research, write and publish material. Twitter users post about 110 million tweets per day (Chiang, 2011) and Facebook users post more than 30 billion pieces of content a month (Facebook, 2011). This ease of content creation has triggered information overload, where there is a massive amount of material on the web that is very difficult to sort and organize (Liu, 2010). Liu (2010) says that this information inundation can hinder us both in the short and in the long term. She predicts that in the next few years, there will be an emergence of curatorial technology to deal with the overload and “help people sift through and make sense of these massive content streams in the immediate term, while also helping to manage and preserve information in the long term” (Liu, 2010).

There are several new startup websites that allow users to curate content or do the curating for them. Storify and Storyful are two new solutions in the journalism industry, which allow for what Liu (2010) calls “human-aided algorithmic curation;” algorithms search enormous information streams and humans have editorial control over what to publish and where. Storyful, which was founded by several Irish journalists, says their mission is to “separate the news from the noise.” It allows users to gather tweets, YouTube videos and images in their story-building tool to create their own curated stories (Storyful, 2011). Storify is almost identical and has garnered greater success to date, most likely because it allows users to embed the story they have created into another webpage. According to their website, Storify allows users to “search multiple social networks from one place, and then drag individual elements into your story; you can re-order the elements and also add text to give context to your readers” (Storify, 2011). The story curation tool on their site has already been used by journalists; for example, the L.A. Times used the tool to bring together fans’ reactions to Harry Potter (Rosenbaum, 2011). However, it does not appear that the site has yet been used to curate content for a breaking news story.

These sites keep relatively quiet about the tools or algorithms they use to curate content, most likely because as startup companies is is most important to be first with the technology. Despite the success of Storify and Storyful, there is still not a website that has come up with a successful way to curate breaking news updates provided by citizen journalists on social media sites in a way that allows journalists to find the information quickly and easily. This was echoed by the journalists surveyed in this research; they said that there was no go-to site that collects and filters reports from citizens. In response to this reality and the results gathered from the user and journalist surveys mentioned earlier, this research proposes a new model for the exchange and solicitation of user-generated content. While individual news organizations often solicit information from readers, they do so on their individual websites. On the other hand, many news wires, like the AP, do not have a website on which visitors can view stories and thus do not have a way of soliciting reader contributions. This unique problem makes it difficult for journalists to

5 See more about Storify here: http://www.storify.com
6 See more about Storyful here: http://www.storyful.com
contact potential contributors. An effective new system to address these current problems would allow news professionals to post specific requests for information they are seeking, and allow ordinary citizens to share eyewitness accounts and the resulting content in the form of text, photographs and videos. This central forum would address the journalists’ problem of having to scour the web for relevant user-generated content and would provide users with one place to share their content with journalists from many news organizations.

### Design Project

This section discusses how the design project linked to this research came about; the first set of user surveys and the results; the prototype that resulted from user and journalist feedback in the survey; and the implications for designing for journalists that resulted from the prototype use study.

#### Initiating a design project for journalism

My work as a journalist made me keenly aware of the challenges that the news industry is facing as a result of this switch to digital. With newsrooms shrinking, journalists that still have jobs have the mandate to tell better stories with fewer resources. This has caused many to turn to social media in order to find user-generated content that will help inform their reporting and in some cases supplement it. However, there are currently few ways in which this content can be curated and fact checked so that journalists can more easily find the relevant content and quickly use it to supplement their reporting. Having faced some of these challenges myself, I wondered if there were a way to create a system that would help facilitate this exchange of information between journalists and citizen journalists.

This research began with user and journalist surveys that aimed to discover if there was a need for such a system, in what form it should take, and the prevailing concerns about operating such a system. The user survey garnered responses from 18 people, ranging in age from 20 to 65 years of age. The questions were meant to get a sense of users’ interaction with news organizations and their propensity to share newsworthy content that they might be able to collect. The major finding here was that users were largely unaware of where to submit content they had collected if they were to witness a breaking news event. They suggested that they could send their content via email, post to an organization’s Facebook wall, upload it to CNN’s iReport or call a news organization to find the correct recipient. Generally, there was no consensus and several suggested no alternatives. The answers echoed my own feelings and uncertainty as a user and supported the idea that a system was needed to fill a valuable gap.

The separate journalist survey garnered responses from five journalists, most of whom work for The Associated Press in positions as varied as Islamabad correspondent and former deputy international editor. They all have years of experience and are highly regarded journalists. The questions were designed to get a sense of how they interacted with citizen journalist-produced content and if they would be open to a new forum for collecting that information. Their responses offered valuable insights into news gathering practices and how journalists interact with user-generated content. The research was then focused more specifically on how to create a system optimized for journalists; this group

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7 The Associated Press is one of the largest global news agencies in the world, providing news coverage to thousands of newspaper, radio, television and online customers.
has more to gain from using such a system, and though the users provide content, journalists would be the primary users. From the surveys, it was clear that a website would be the most effective system. The site would have to bring together journalists and citizen journalists to exchange information; journalists should be able to ask for the content they need and users should have one, central place to upload their user-generated content. It should also curate the content, only providing the most useful information and weeding out posts that were unhelpful, inaccurate and biased. Finally, it should have a layer of fact checking, which cuts down on the work of journalists and ensures the content journalists and users view is of high quality. This fact checking aspect of the site is perhaps the most important because of the prevailing concerns of journalists, as seen in this research and as found by other researchers: that ordinary citizens lack the training and awareness to responsibly report stories on a level that compares to professional journalists.

**Designing a prototype for citizen journalist-generated content**

After gathering responses to the separate user and journalists surveys and deciding to focus solely on the journalists, I created a prototype to illustrate to journalists the content platform proposed earlier that would allow them to view user-generated content relating to various breaking news stories, and to garner feedback from them on its design and usability. The prototype was designed to answer the initial research question; was there a desire and a need for a website of this type and how could I design it in a way that would allow journalists to consume and use user-generated content easily. The prototype was created quickly in the Adobe program Fireworks in order to get it to journalists quickly to test. The five-page prototype only focused on breaking news. The main workspace contained a simple interface with three different topic boxes that each listed text, photos and video pertaining to that specific topic. Check boxes allowed journalists to view text, photos or video in any combination they wanted. There were also additional topic boxes at the bottom of the page that journalists could drag and drop onto the main workspace. The other pages contained content (text, photos, videos), pages that displayed each individual’s submissions and their contact information.

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8 Fireworks is an Adobe program that allows users to create graphics and prototypes for the web and other devices.
Image 1: Prototype main page. This picture show the main page of the prototype with the three topic boxes and the drag-and-drop topic boxes at the bottom.
Requiring users to submit their contact information was an important aspect of vetting the sources and giving journalists interested in using their content a way of contacting them. Another fact-checking mechanism included in the prototype was a one-to-five star rating system, where users and journalists were meant to rank the validity and usefulness of the content. Content that ranked low would be pushed to the bottom of results for the topic it pertained to, while content ranked highly would feature more prominently in the results. The prototype was sent to six journalists, who were asked to test the prototype and answer an eight-question survey on the design of the interface. The questions were modeled after the developer-user contextual evaluation (DUCE) process for evaluating prototypes (Smith & Dunckley, 2002). The questions asked journalists to evaluate the simplicity or difficulty of the interface; the features, layout and organization of the interface; and the usefulness of the interface in their daily work. It also asked them to make suggestions for improvement. Four journalists participated in the prototype use study; three were from the AP and one was a sports journalist based in Ohio, U.S.

**Results from prototype use study - Implications for design**

The journalists reported that the pages in the prototype were well organized, the information easy accessible, and they said they found the color-coded system for text, photos and video clear and effective (see image 1). They also said that navigation of the site was simple and that they appreciated the lack of visual clutter. About half reported that the
prototype was easy to test while the others felt a bit more daunted, perhaps because of a
general unfamiliarity with prototypes and the limited functionality they possess.

Fällman’s (2004) warnings about the unanticipated ways in which people use an artifact in
design-oriented research came true in this phase. As it turns out, the most valuable
information provided by the journalists did not pertain to the design of the interface.
Instead, their answers to the prototype questionnaire revealed three prominent themes
that are vital to consider when designing for journalists: the existence of time constraints
and constant deadlines; the importance they place on content over aesthetics; and the
paramount importance of fact checking and sourcing before publication. All three themes,
while teased out through the questionnaire, deftly illustrate the norms and values of a
journalist and their mindset when approaching content of any kind.

**Time constraints a problem for journalists**

Journalists are accustomed to strict time pressures necessitated by covering breaking news
stories and the competitive environment in which they work. This was evidenced in the
feedback given in the prototype use study and in the initial survey. At the time, these
journalists were inundated with a series of global breaking stories including the unrest in
Libya and Egypt, the aftermath of the Japanese earthquake and a national basketball
tournament in the U.S. This led to a misreading of directions due to their need to speed
through the process, as well as poorly formed responses to the questions posed. This
finding could indicate flaws in the questionnaires or in the study setup, but determining
this would require a more thorough investigation. The journalists themselves indicated
throughout the process that their time was limited due to all of these stories happening at
once.

**Importance of content over aesthetics**

The results from the prototype use studies also made it clear that the journalists were far
more concerned with content than aesthetics. Their answers provided very little design
feedback, not a surprising result considering that journalists are trained to focus on facts
and content. Posing these design questions to journalists made it clear where their
interests and concerns lie. They likely were not looking at the aesthetics of the system
other than a cursory glance at the interface. A few of the strongest indications of their
preference for content over aesthetics was the comment by some respondents that they
would like to see different categories added, such as sports or entertainment. Others
worried about the rating system and wondered who would be rating the content. There
were surprisingly few suggestions on how to alter the design of the website in order to
improve its usability.

**Fact checking content is paramount concern**

The biggest concern of the journalists, however, was how the content provided by ordinary
users would be fact checked, even in a questionnaire designed to garner feedback on the
design of the interface. This was also evident in the preliminary surveys before the
prototype testing. The biggest concern of the journalists was how the content on the site
would be fact checked to ensure the authenticity of text, photos and video from non-
journalists. They also expressed concern about the contributors and wondered if they
would be carefully vetted before they submit content to ensure they are unlikely to
fabricate content or were working for an organization with a strong motive, for example, an authoritarian government.

The journalists’ concerns about fact checking were a recurring theme throughout the research. News organizations have found themselves mired in controversy in the past because they have published information that has not been properly checked and the sources vetted, so it is no wonder this concern figured so prominently in this research. Since this concern was so overwhelming for journalists and it is perhaps the greatest threat user-generated content could pose to storytelling, this research aims to address the following research question; how can one design to automate the fact checking of user-generated content for journalists.

The Importance of Fact Checking User-Generated Content for Journalists

The paramount importance that journalists place on fact checking user-generated content was a key finding in my design-oriented research. No matter the design or functionality of a system, journalists found fact checking and proper sourcing the most important characteristics. This concern is firmly based on the norms and values that journalists hold dear, including neutrality, balance and accuracy. As mentioned earlier, journalists generally perceive content produced by citizen journalists as a direct threat to these norms and values. Without the specialized training that journalists have, citizen journalists are likely to either misunderstand or discard these values, which together ensure that news coverage is trustworthy and responsible.

The finding in this research about fact checking has important implications for the design of systems created for journalists. The premium placed on fact checking indicates the importance of designing a system that automates this process for journalists. As a result, a theoretical study was conducted of tools that could be used to make fact checking an automatic process on the website proposed in this research. These tools have the capability to reduce vandalism, detect tampering in photos and videos, and harness the wisdom of the crowds to authenticate content and flag disruptive users. It also employs curation, a tool mentioned earlier, which is becoming ever more important for our information overloaded web. By weeding out content that is unhelpful, inaccurate and biased, we can provide journalists with a set of facts that have been curated and fact checked in order to provide the most relevant and useful content.

Vandalism in open-access websites

Vandalism is one of the biggest threats to any open-access website. It was a challenge faced by online encyclopedia site Wikipedia; any user can easily post offensive, biased, inaccurate and copyrighted content to the site. However, Wikipedia combatted this sustained threat by employing a combination of human and technological controls that regularly monitor the content posted to the site. The controls are so effective that most vandalistic edits are corrected within days, if not sooner (Niederer & van Dijck, 2010). The technological tools are of particular interest in this research; both Wikipedia and the website proposed here have an open-access model that allows users to post content, which may or may not be in alignment with each sites’ values and policies. On Wikipedia, automated software applications called bots carry out specific tasks on the site to remove unwanted content behind the scenes (Niederer & van Dijck, 2010). The bots police the site
in a such a vast way that humans could not replicate. Instead, “human judgements, such as reliability, accuracy or factuality are turned into machine-coded and regulated alert systems” (Niederer & van Dijck, 2010).

There are two types of bots on Wikipedia: editing bots, which make automated edits and additions to content; and non-editing bots, which carry out administrative tasks like blocking spam, detecting vandalism, spellchecking, blocking banned users and taking away editing rights. Each bot is assigned with carrying out a small task and have more rights than registered users, though they are only allow to carry out specific functions (Niederer & van Dijck, 2010). One example of a highly effective bot on Wikipedia is the one that identifies copyright violations by comparing text on the site to text available on the web (Niederer & van Dijck, 2010).

In a study that combined three of the leading Wikipedia vandalism detection approaches, Adler, et al. (2011) found that the combination of several approaches to detecting vandalism worked better than individual approaches alone. The authors looked specifically at rooting out vandalism by analyzing metadata, which includes basic editing information like time stamps; text or the language-independent features, like the ratio of uppercase to lowercase letters; natural language processing features, which identify the use of bad or biased words; and reputation or the behavior history of a user (Adler, et al., 2011). Their combined system would root out specific types of vandalism in each of these four categories. All of the tools listed below would be of particular use on the website proposed within this research; they would remove content or refer problematic content to human editors to ensure that content is of the highest possible quality.

• Metadata could be used to geo-locate users’ IP addresses to pinpoint the time-of-day where they are located; this indicates if they are posting during work and school hours, which have been found to be the peak of vandalistic activity (Adler, et al., 2011). Geo-location could also be used to ensure that users claiming to post eyewitness accounts about certain events on the website proposed here have posted their content during the time period in which the event occurred; content could be falsified if it is posted before the event began.

• Text bots could be tasked with examining the ratio of uppercase to lowercase letters to help identify messages that are written in all caps in order to draw attention. It could also examine the digit ratio to determine if non-sensical messages were posted, i.e. a series of random numbers (Adler, et al., 2011).

• Natural language bots could identify the use of first and second person pronouns, such as ‘I’ and ‘we’, which strongly indicate bias when used outside of quotes. Other bots could identify the use of bad or biased words, including superlatives like “huge” and “coolest”, slang terms like “gotcha” and “wanna”, or vulgar and offensive words (Adler, et al., 2011). These words often indicate posts of a lower quality; journalists generally seek out information that is of high quality because of the higher likelihood that the source is trustworthy and providing accurate, unbiased content.

• Reputation tools could identify and track users with a history of helpful and high-quality contributions, who are less likely to engage in vandalism (Adler, et al., 2011). WikiTrust is an example of one of these tools; it uses an algorithm to compute the credibility of content and the user’s reputation (Wikipedia, 2011). It also gives users information about the author, their location and the reliability of the text; stable content is displayed in black type, while unstable content is displayed in yellow or orange (Wikipedia, 2011).
Tracking a user’s reputation could be of particular use to the website proposed in this research; each user could have a vandalism tracking page of their own and the website could monitor and track their contributions. If they commit an act of vandalism, their post is removed; if they commit three separate acts of vandalism they are banned from the site. If a user is anonymous, then the site can flag a user based on acts of vandalism from certain IP addresses. If the site proposed here also tracks a user’s helpful and positive contributions, then that user could be rewarded with more permissions on the site; their contributions could appear higher in search results because they are trusted by the site. The reputation of the country from which users are posting could also be tracked, particularly if they are anonymous users (Adler, et al., 2011). If the system aggregates the behavior histories of users from specific countries, then that information could provide some indication as to which countries are more at risk for vandalism (Adler, et al., 2011). A final factor could be topic (Adler, et al., 2011); the system could also analyze behavior histories based on certain topics to pinpoint subjects or categories that might be particularly prone to vandalism.

Wisdom of the Crowd

As strong as Wikipedia’s technological controls are in ensuring that content is of high quality on the site, those controls can never act alone. Human actors are also a vital component of any open-access website, including Wikipedia, to police content as well as manage users. This use of crowds to help police the validity of content as well as the community is called “crowdsourcing.” This relatively new term describes “the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call” (Brabham, 2008). Crowdsourcing is a particularly useful tool for the website proposed within this research; if the crowd of citizen journalists and users collectively rates the content, we harness their wisdom, expertise and perhaps the advantage of their geographical location in relation to certain events to indicate which is compelling and useful content that journalists can use and which is not. A challenge of crowdsourcing, however, is a lack of diversity. Most web users are white, affluent, English speaking and educated. Particularly active web users are also usually under 30 years of age (Brabham, 2008). In addition, those without internet access or high-speed connections cannot participate, and many of those with the tools might not want to participate (Brabham, 2008). This challenge was brought up by a journalist in the survey conducted as part of this research; Krista Larson, an editor and supervisor for AP in South Africa said that limited internet access there meant that citizen journalists were most often friends of the journalists. Despite these challenges, crowdsourcing has become a widely used resource in the online world and has the potential to outsource the fact checking of a website like the one proposed here to a dedicated group of users committed to high-quality content. As James Surowiecki, author of the book “The Wisdom of Crowds,” puts it:

“Think about what happens if you ask 100 people to run a 100-meter race, and then average their times. The average time will not be better than the time of the fastest runners. It will be worse. ... But ask a hundred people to answer a question or solve a problem, and the average answer will often be at least as good as the answer of the smartest member. You could say it’s as if we’ve been programmed to be collectively smart” (Surowiecki, 2004).
Wikipedia makes particularly constructive use of dedicated users; it employs a sophisticated hierarchical managerial system of human actors to ensure quality and accuracy on the site (Niederer & van Dijck, 2010). Users are assigned different permission levels depending on their role within the site; administrators have more permissions than bots, bots have more permissions than registered users, and registered users have more permissions than anonymous users. The only group with no permissions are blocked users. This hierarchical system allows users to overrule an edit if they have similar or higher permissions. It also gives users rewards for participation, like higher or lower authority levels based on their activity. Users that contribute high-quality edits and are effective at ensuring that bad content is repaired have more power, while users that abuse their editing privileges are blocked (Niederer & van Dijck, 2010). This hierarchical system would be particularly effective in managing the community and empowering human actors to effectively police the website proposed in this research. An extra feature could be giving responses from users who rank higher more prominence in search results. The site could also reward active and responsible users with authority upgrades; if they perform well and are consistently helpful actors on the site, then their authority could be upgraded, which also weighs their contributions more heavily.

This harnessing of the wisdom of the crowds is a powerful tool, but Wikipedia's model for gathering this feedback would not work on the site proposed in this research because it would allow users to change other users' individual contributions. Since the site proposed here does not gather contributions into one main text and rather displays individual contributions as belonging to certain users, another method needs to be employed to harness this feedback into an effective fact-checking mechanism of citizen journalist-produced content. One way of doing this without interfering with the user-generated content itself could be to implement a ratings system that allows users to rate on the basis of quality, usefulness and accuracy. A rudimentary ratings system was incorporated into the prototype created as part of this research. It was a five-star, Likert-style rating system, similar those employed on e-commerce sites like Amazon.com. However, there was confusion when journalists tested the prototype in terms of who would rate the content and how the feedback would be accounted for. However, in looking for the “best” ratings system for this type of site, the research indicated there is no single, ideal system. Cosley, et al. (2003) found that users’ responses were consistent across ratings scales and only found mild evidence to support the idea that certain ratings scales were preferred over others.

“Recommender systems work well despite asking users to map complex opinions to a number between 1 and N. We suspect that identifying good values for N will help recommender systems work better” (Cosley, et al., 2003).

Cosley, et al. (2003) said that when designing rating scales, the most important factor to consider is whether users can meaningfully and easily express their opinions. They found that users generally prefer fine-grained rating scales, though the type of scale does not particularly matter. In their survey, the half-star scale (0.5 to 5) was most preferred, followed by a 1-to-5 scale, then a no-zero scale (-3 to +3) and lastly the binary scale, which gives two options, much like a thumbs up, thumbs down rating (Cosley, et al., 2003). The researchers indicated no preference for any of the scales, implying that they were mostly equal and that designers could let users rate on the scale they preferred and compute the ratings using normalized scores (Cosley, et al., 2003). They did, however, express

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A Likert scale is generally a five-choice scale in which a quantitative value is given to qualitative data so the results can be statistically analyzed.
reservations about the binary scale; their research found that users who ranked content as a 1 or 2 on a Likert-type scale got a thumbs down, while 3-to-5 rankings got a thumbs up. Rating a 3 as a thumbs up tends to skew results more positively, as users tend to rate upwards when only offered the two choices (Cosley, et al., 2003). The implications of this research on the website proposed here are quite clear; the type of rating scale is not important as long as users understand on what basis and according to what standards they are rating user-generated content.

Cosley, et al. (2003) also discovered that user opinion could be manipulated if ratings given by other users were shown; this makes it difficult to get an accurate picture of how content is perceived. Users preferred the ability to hide ratings as they correctly suspected that seeing them could influence their decision (Cosley, et al., 2003). This behavior relates to the conformity effect, whereby users feel a need to “fit in” when seeing the opinions provided by others (Cosley, et al., 2003). The ratings system employed in the prototype for the journalists in this research was meant to be seen by other users, but this research suggests that the ratings system should be hidden from users so that they can rate citizen journalist-produced content in an unbiased way. Instead, the rankings can be used internally to determine how information is sorted and how prominently it appears in search results for each breaking news story.

Photo and Video Authentication

Citizen journalists may not have the proper training or skills in terms of writing and editing a news article, which as the research has shown, is probably better left to the professionals. But one area in which citizen journalists can make a major contribution to professional storytelling is with photos and video. The value of photos and video provided by ordinary citizens has been illustrated over and over by major international newspapers that have used user-generated content to supplement their reporting, particularly for breaking stories in areas that are difficult for the professionals to reach. The use of photos and video taken by ordinary citizens in the aftermath of the London bombings by newspapers and online outlets is a strong illustration of this value (Allan, 2007). But for as many helpful and valuable contributions there are in this area, there are also those that have to intention to fool and dupe the wider public with tampered photos and video. As photo editing software becomes more sophisticated, so do the many ways in which it is used to manipulate images that sometimes end up on the front pages of our newspapers and degrade the quality of our news. One prime example is a July 2008 photo that the media arm of Iran’s Revolutionary Guard released showing four missiles being launched. The photo graced the covers of the Financial Times and the Los Angeles Times before it was discovered that it was doctored to mask the failure of one of the four missiles to launch (Farid, 2009). These inaccuracies must be taken seriously; fraudulent content is a major challenge to news organizations and it undermines the news product, as well as traditional journalistic values. If a system like the one proposed in this research aims to effectively and responsibly automate fact checking for journalists, then tools to authenticate photos and video must be included, and are perhaps the most important tools in the system.

Dr. Hany Farid, who is head of the Image Science Laboratory at Dartmouth University in the U.S. and widely considered to be the founder of digital forensics, is one of the few researchers developing tools that help authenticate images (Dreifus, 2007). He has developed software algorithms that scan images for signs of tampering, which are used by the FBI and the Reuters news agency (Kanellos, 2006). Another news agency, Agence

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10 Reuters is a global news agency, specializing in business news.
France-Presse\(^{11}\), also recently announced that they would start using forensic software to
detect tampering in photographs. The software, called Tungstene, examines the
information in digital images, including inconsistencies in pixels, light and color, to
determine if a photo has been altered (Agence France-Presse, 2011). These types of
algorithms, like the ones discussed above, can use different image forensics tools to
determine the authenticity of a photo, including:

- **Pixel-based techniques**: root out statistical anomalies; can include cloning, splicing
  and resampling.
- **Format-based techniques**: detects tampering by looking at the JPEG lossy
  compression scheme.
- **Camera-based techniques**: detects artifacts introduced by the camera lens, sensor or
  chip; this can include camera response, sensor noise and color filter array.
- **Physics-based techniques**: detects problems with lighting and orientation of objects
  in a frame.
- **Geometric-based techniques**: measure the objects and their positions relative to the
  camera (Farid, 2009).

Although alerting video is much more difficult and time consuming than tampering with
an image, new video editing tools make it easier to do so (Wang, 2009). Professional video
editors are able to easily delete something from a sequence and insert an object from
another video or to insert a piece of media that was created graphically (Wang, 2009).
There have been few instances of high-profile video forgeries fooling journalists and
making it into the news product, but as software becomes more advanced, so will the
attempts to alter it in some way. This means that employing tools that detect video
forgeries are just as important as forgeries in photos in the system this research proposes.

Digital watermarking is a way of authenticating photos and videos; these watermarks are
inserted when the image is recorded and will show up as altered if the images are modified.
However, newer and specially equipped digital cameras do not insert this watermark, so
this technique alone is not enough to detect tampering (Wang, 2009; Farid, 2009).
Weihong Wang, who worked under the supervision of Farid at Dartmouth, has introduced
some new forensic tools to detect tampering with video, which in many ways are similar to
the tools used to detect photo tampering. He says that “these tools operate under the
assumption that video contain naturally occurring properties which are disturbed by
tampering, and which can be quantified, measured, and used to expose video
fakes” (Wang, 2009). The tools he introduces target specific statistical or geometric
artifacts in the video, including:

- **Interlaced**: cameras record in interlaced mode; even and odd scan lines are
  recorded differently; tampering disrupts the expected motion of the lines.
- **De-interlaced**: sometimes videos are de-interlaced, which introduces correlations
  among pixels; tampering will destroy these correlations.
- **Double compression**: MPEG videos that are modified and re-saved will have double
  compression, which introduces spatial and/or temporal artifacts; these can be
  quantified and indicate tampering.
- **Duplication**: algorithms can detect duplicated frames and duplicated regions across
  frames.
- **Re-projection**: recording a video from a theater screen, which usually introduces
distortion (Wang, 2009).

\(^{11}\) AFP is a global French news agency.
The tools and algorithms listed above would be an invaluable part of the automated fact checking mechanisms proposed in this paper. These algorithms could scan photos and video posted to the site proposed in this research, flag the content that has been identified as potentially fraudulent, and alert human actors behind the scenes to determine whether the content has been tampered with. In addition, content that has been flagged as potentially fraudulent could be removed from the site until an investigation is complete. These automatic scans using algorithms will not guarantee the accuracy of user-generated content, but it will at least assure users of the greater likelihood that the content they are viewing is accurate.

Conclusion

As the journalism industry undergoes rapid changes, those in the field are looking for new models to support the business that move away from the traditional one-way dissemination of information. Citizen journalism and the use of user-generated content in storytelling is one new approach. However, research has shown that citizens lack the training and ethical grounding that professional journalists possess. As a result, this research focused on utilizing user-generated content in a way that has been widely supported by journalists: the contribution of text, photos and video obtained as an eyewitness that can supplement professional reporting, especially in situations where journalists cannot get to a breaking news story quickly enough. The same journalists that support this use of user-generated content, however, also have concerns that this type of content threatens to undermine the gatekeeping role that journalists hold dear, as well as the traditional values and norms of journalism including accuracy, balance, neutrality and timeliness.

This research proposed a website that would provide one place for citizen journalists and professional journalists to exchange and request this kind of user-generated content. The prototype of the site was tested by journalists, who were asked to provide feedback on the design of the site. The feedback they provided, while it did not give specific reflections on the design of the system, illustrated three prominent themes that are vital for designers to consider when designing a system for journalists: the existence of time constraints and constant deadlines; the importance they place on content over aesthetics; and the paramount importance of fact checking and sourcing before publication. While there are numerous aspects of this type of system that could be investigated, this paper only focused on the most prominent concern of the journalists surveyed in connection with this research: fact checking. The paper, through a theoretical research study, aimed to answer the question of how to design a system that automates fact checking for journalists.

A theoretical study was conducted to discover tools that could be used to make fact checking an automatic process on the website proposed in this research. These tools help reduce vandalism, detect tampering in photos and videos, and harness the wisdom of the crowds to authenticate content and flag disruptive users. These tools also help curate the content, an emerging trend in technology and journalism today, to ensure that unhelpful, inaccurate and biased content is removed from the site. This automated fact checking approach helps journalists do their jobs faster, find usable content more easily, and helps uphold traditional journalistic norms and values. This research, however, does not claim that these automated fact checking processes can be used as the sole fact checking mechanism or replace the traditional fact checking process. Journalists are regularly
required to complete several rounds of fact checking before concluding that a piece of information is accurate and usable. Journalists are still responsible for verifying the content to ensure its accuracy. However, the use of technical tools and human actors to fact check content as proposed here automatically completes the first round of fact checking for journalists and ensures that the rest of their fact checking process can happen faster. The site proposed here ensures that the content presented has been reviewed in order to remove much of the unusable content that will inevitably be posted.

The results from this research also indicated areas for further investigation regarding a website of the kind proposed here. A new investigation could be conducted to gain feedback from journalists on the usefulness of these automated fact checking tools. This could include an additional survey that asks them to evaluate the tools, their ability to root out unwanted content and their suggestions for additional tools. Another prototype that builds on the one created here could also implement these tools and help evaluate the usefulness of these tools.
References


